



CHAPTER 2

Installing the Cisco 7201 Router

This chapter explains how to install a Cisco 7201 router in a rack in a general tabletop or workbench installation, how to attach cables, and how to power on the router.

This chapter contains the following sections:

- [Preparing to Install the Cisco 7201 Router, page 2-1](#)
- [Installing the Router, page 2-5](#)
- [Attaching a Chassis Ground Connection, page 2-12](#)
- [Installing a Port Adapter, USB Flash Memory Module, or SFP Module That Did Not Ship in the System, page 2-14](#)
- [Connecting Port Adapter Cables, page 2-14](#)
- [Connecting I/O Cables, page 2-14](#)
- [Using the Cable-Management Bracket, page 2-23](#)
- [Connecting Power, page 2-24](#)

The Cisco 7201 router operates as either a tabletop or a rack-mounted unit. A rack-mount kit is standard equipment included with the Cisco 7201 router when it is shipped from the factory. The kit provides the hardware needed to mount the router in a 19-inch equipment rack or a 23-inch equipment rack.

If you are not rack-mounting your Cisco 7201 router, place it on a sturdy tabletop or platform.

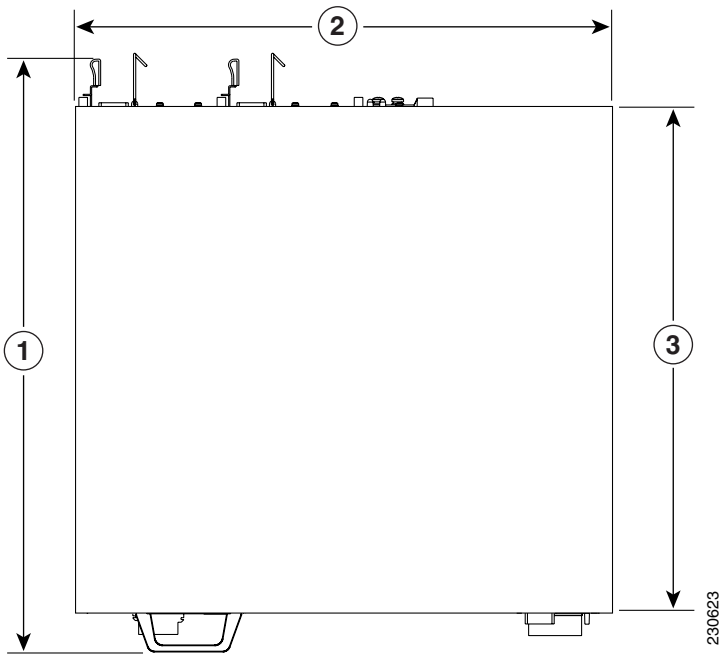
Preparing to Install the Cisco 7201 Router

Before installing your Cisco 7201 router, you should consider the power and cabling requirements that must be in place at your installation site, the equipment you need to install the router, and the environmental conditions your installation site must meet to maintain normal operation. This section guides you through the process of preparing for your router installation and the installation in a rack.

This section contains the following topics:

- [Site Preparation and Unpacking, page 2-2](#)
- [Tools and Parts Required, page 2-3](#)
- [Electrical Equipment Guidelines, page 2-4](#)
- [Preventing Electrostatic Discharge Damage, page 2-4](#)
- [Site Requirement Guidelines, page 2-4](#)

Figure 2-1 *Dimensions of Cisco 7201 Router*



1	19.17 in. (48.69 cm)	3	16.2 in. (41.20 cm)
2	17.3 in. (43.94 cm)		

Table 2-1 provides dimensions and weight information.

Table 2-1 *Cisco 7201 Router Dimensions and Weight*

Cisco 7201	
Dimensions	Height—1.73 in. (4.39 cm)
	Width—17.3 in. (43.94 cm)
	Depth—16.2 in. (41.20 cm)
Weight	Chassis fully configured with a port adapter ~ 16.5 lb (7.48 kg)

Site Preparation and Unpacking

- Lift the router safely out of the packing container.
- Ensure the power service at the site is suitable for the router you are installing.
- Check the packing slip to ensure that all the proper components are present.
- Locate and have accessible the Site Log for recording information about this installation.

Tools and Parts Required

Your Cisco 7201 chassis is fully assembled at the factory; no assembly is required. However, you need the following tools and equipment to install the chassis and the rack-mount and cable-management kit, and the DC power supplies:

- Number 2 Phillips screwdriver
- A 3/16-inch flat-blade screwdriver
- Tape measure (optional)
- Level (optional)
- Chassis grounding lug and wires:
 - A grounding lug with two number-10 screw holes with a 0.63-inch (16.002-mm) spacing between them
 - A wire receptacle large enough to accept a 6-AWG multistrand, copper wire
 - Two Phillips machine screws with locking washers—M5 (metric), 0.031-inch (.08-mm) pitch, 0.315-inch (8-mm) length
 - A crimping tool to fit the grounding lug wire receptacle
 - A wire stripper
 - One grounding wire—6-AWG, 0.162-inch (4.115-mm) diameter, with approximately 0.108-inch (2.743-mm) insulation, for a total wire diameter of approximately 0.27 inches (6.858 mm). The wire length depends on your router location and site environment.
- The rack-mount and cable-management kit (RCKMNT-7201) includes the following parts:
 - Two rack-mount brackets for mounting the chassis in the rack
 - One cable-management bracket
 - Four 6-32 x 0.25-in. screws to secure the rack-mount brackets to the chassis
 - Two M3 x 8-mm screws to secure the rack-mount brackets to the chassis
 - Four 10-32 or 12-24 screws to secure the rack-mount brackets to a 19-inch or 21–23-inch rack
 - One M4 x 20-mm screw to attach the cable-management bracket to the rack-mount bracket
- For DC power supplies installation, the following parts:
 - Ratcheting torque screwdriver with a Phillips head that exerts up to 15 pound force-inches (lbf in.) or 240 ounce force-inches (ozf in.) of pressure
 - Panduit crimping tool with optional controlled cycle mechanism
 - 18-gauge copper ground wire (insulated or noninsulated)
 - Four leads of 18-gauge copper wire
 - Wire-stripping tool for stripping 18-gauge wire

In addition, you might need the following external equipment:

- Ethernet transceiver
- Token Ring multistation access unit (MSAU)
- ESD-preventative wrist strap
- Power cords
- Appropriate cables to connect the router to the network, console, and auxiliary ports

- Optional Cisco USB Flash memory module or Aladdin USB eToken Pro key
- Straight-through or roll-over cable for use with Fast Ethernet Management port

Electrical Equipment Guidelines

The port adapter is designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. Each port adapter consists of a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the carrier helps protect the boards, use an antistatic strap whenever handling the port adapter. Handle the carriers by the handle and the carrier edges only; never touch the boards or connector pins.

Site Requirement Guidelines



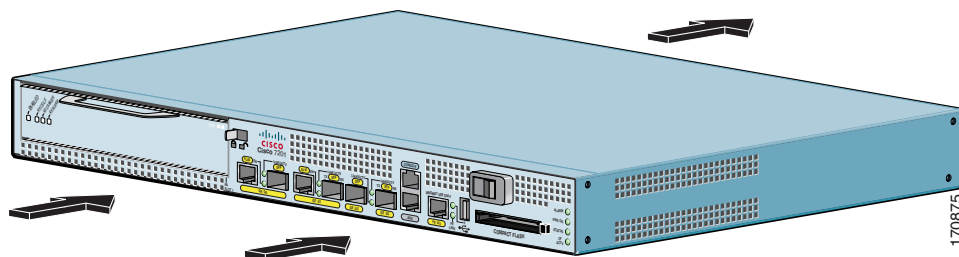
Warning

Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers* publication. This document provides important safety information you should know before working with the system. Statement 200

The environmental monitoring functionality in the Cisco 7201 router protects the system and components from potential damage from overvoltage and overtemperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure the site maintains an ambient temperature of 32°F through 104°F (0°C through 40°C), and keep the area around the chassis as free from dust as is practical.

Planning a proper location for the Cisco 7201 router and the layout of your equipment rack or wiring closet is essential for successful system operation. Equipment placed too close together or inadequately ventilated can cause system overtemperature conditions. In addition, chassis panels made inaccessible by poor equipment placement can make system maintenance difficult. Following are precautions that can help avoid problems during installation and ongoing operation.

Figure 2-2 **Airflow Through the Chassis**



When you plan the location and layout of your equipment rack or wiring closet, you need to consider how air flows through your router. The Cisco 7201 router draws cooling air in through the intake vents on the front of the chassis and moves the air across the internal components and out the exhaust vents on the rear of the chassis. [Figure 2-2](#) shows airflow through the router.

Temperature sensors on the system board monitor the internal air temperature and send warning messages when the internal air temperature approaches a specified threshold. If the internal temperature exceeds the specified threshold, the system environmental monitor shuts down all internal power to prevent equipment damage from excessive heat. (See the [“Environmental Monitoring and Reporting Functions”](#) section on [page 3-4](#) for temperature threshold information.)

Installing the Router

This section explains how to install a Cisco 7201 router in a general tabletop or workbench installation and in a rack, and how to attach I/O, port adapter, and power cables. This section contains the following topics:

- [General Tabletop or Workbench Installation, page 2-5](#)
- [Rack-Mounting a Cisco 7201 Router, page 2-6](#)
- [Attaching the Chassis Rack-Mount and Cable-Management Brackets, page 2-7](#)
- [Installing the Chassis in the Rack, page 2-9](#)

General Tabletop or Workbench Installation

The router should already be in the area where you will install it, and your installation location should already be determined. If not, see the [“Preparing to Install the Cisco 7201 Router”](#) section on [page 2-1](#), and the [“Site Requirement Guidelines”](#) section on [page 2-4](#).

When installing a Cisco 7201 router on a workbench or tabletop, ensure that the surface is clean and in a safe location and that you have considered the following:

- The router requires at least 3 inches (7.62 cm) of clearance at the inlet and exhaust vents (the front and back sides of the router).
- The router should be installed off the floor. (Dust that accumulates on the floor is drawn into the interior of the router by the cooling fans. Excessive dust inside the router can cause overtemperature conditions and component failures.)
- There must be approximately 19 inches (48.26 cm) of clearance at the front and rear of the router for installing and replacing router parts—such as the port adapter, SFP module, USB module, or CompactFlash Disk—or accessing network cables or equipment.
- A port adapter blank panel is installed if a port adapter or service adapter is not in place.
- The router will receive adequate ventilation (it is not being installed in an enclosed cabinet where ventilation is inadequate).
- If you plan to install the cable-management bracket, unpack and have handy the cable-management bracket and one M4 x 20-mm screw.
- An adequate chassis ground (earth) connection exists for your router chassis.

**Warning**

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 120 VAC, 20A U.S. (240 VAC, 10A international).

Statement 1005

Following are the steps for installing a Cisco 7201 router on a workbench or tabletop:

-
- Step 1** Remove any debris and dust from the tabletop or workbench, as well as the surrounding area. Also make sure your path between the router and its new location is unobstructed.
 - Step 2** On the chassis, ensure that the port adapter lever is in the locked position.
 - Step 3** Lift the chassis by placing your hands around the chassis sides and lifting the chassis from underneath. To prevent injury, avoid sudden twists or moves.
 - Step 4** Place the router on the tabletop or workbench.
 - Step 5** Ensure that there is at least 3 inches (7.62 cm) of clearance at the inlet and exhaust vents of the router and no exhaust air from other equipment will be drawn into the chassis. Also, ensure that there is approximately 19 inches (48.26 cm) of clearance at the front and rear of the chassis.
-

This completes the general tabletop or workbench installation. Go to the [“Attaching a Chassis Ground Connection” section on page 2-12](#) for the next step in installing the Cisco 7201 router.

Rack-Mounting a Cisco 7201 Router

The chassis mounts to two rack posts with brackets that attach to either the front or the rear sides of the chassis. The inside width between the two posts or mounting strips (left and right) must be at least 19 inches (48.26 cm).

Some equipment racks provide a power strip along the length of one of the mounting strips. [Figure 2-7](#) shows a typical four-post 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 to ensure that you will be able to pull the port adapter, SFP module, USB module, or CompactFlash Disk straight out of their respective slots.

The inlet and exhaust ports for cooling air are located on the front and rear of the chassis, respectively, so multiple routers can be stacked in a rack with little or no vertical clearance.

Before beginning the installation, determine the type of rack you are using and whether or not you want the chassis front- or rear-mounted.

**Note**

To use the cable-management bracket with the Cisco 7201 router rear-mounted, you must purchase a second rack-mount kit, attach a rack-mount bracket to the left front of the chassis, and attach the cable-management bracket to it. See the [“Attaching the Cable-Management Bracket” section on page 2-8](#) for cable-management bracket installation instructions.

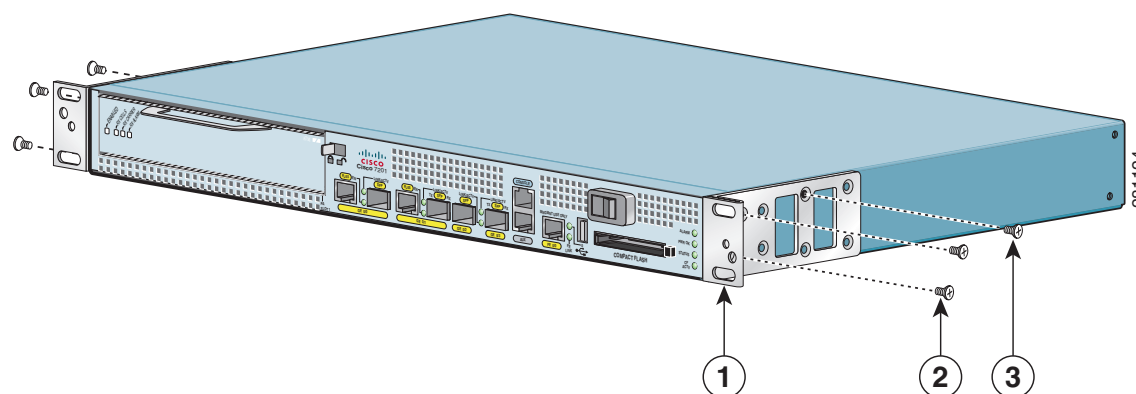
Attaching the Chassis Rack-Mount and Cable-Management Brackets

This section explains how to install the rack-mount and cable-management brackets at the front and the rear of a Cisco 7201 router. Before installing the chassis in the rack, you must install a rack-mount bracket on each side of the front or rear of the chassis.

The parts and tools required for installing the rack-mount brackets and cable-management bracket are listed in the “Tools and Parts Required” section on page 2-3.

Installing Rack-Mount Brackets on the Front of the Chassis

Figure 2-3 Attaching the Rack-Mount Brackets to the Front of the Chassis



1	Rack-mount bracket	3	Two M3 x 8-mm screws
2	Four 6-32 x 0.25-in. screws		

Figure 2-3 shows the brackets being attached for a front rack-mount.

To install the rack-mount and cable-management brackets on a Cisco 7201 router for a front rack-mount configuration, complete the following steps:

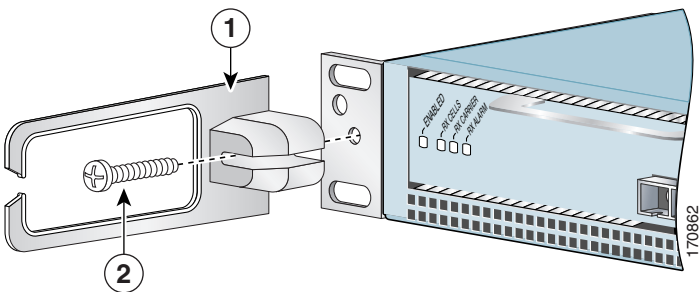
- Step 1** Locate the threaded holes in the front sides of the chassis.
- Step 2** Align the rack-mount bracket to the rack-mount bracket holes on the side of the router.
- Step 3** Remove any existing cover screws from the front sides of the chassis that align with the rack-mount bracket holes and then realign the bracket. (You should have to remove one cover screw from each side of the chassis.)
- Step 4** Insert and tighten two 6-32 x 0.25-in. screws in the two holes nearest the front of the chassis.
- Step 5** Insert and tighten the longer M3 x 8-mm screw in the hole nearest the rear of the chassis. (This screw replaces the cover screw that you removed in Step 3.)
- Step 6** Repeat Step 1 through Step 5 on the other side of the router.

This completes the steps for attaching the rack-mount brackets to the Cisco 7201 router.

To install the cable-management bracket, go to the [“Attaching the Cable-Management Bracket”](#) section on page 2-8. If you are not installing the cable-management bracket, go to the [“Installing the Chassis in the Rack”](#) section on page 2-9.

Attaching the Cable-Management Bracket

Figure 2-4 Installing the Cable-Management Bracket



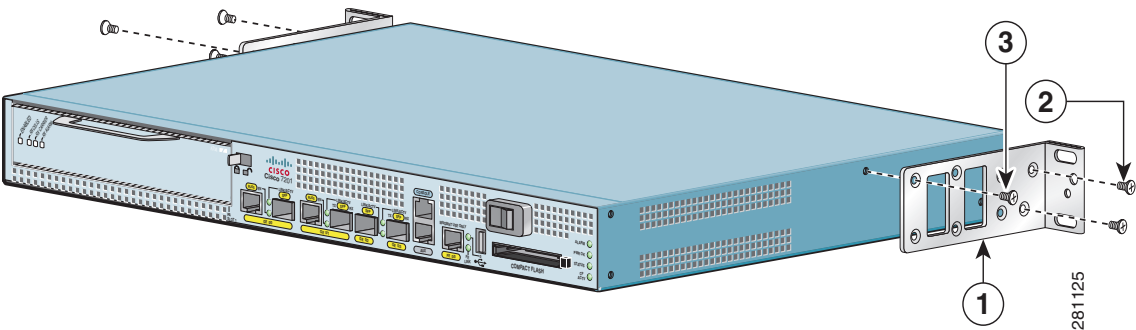
1	Cable-management bracket	2	M4 x 20-mm screw
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- Step 1** Align the cable-management bracket to the rack-mount bracket on the left side of the Cisco 7201 router.
- Step 2** Using a Phillips screwdriver and the M4 x 20-mm screw, thread and tighten the screw to the cable-management bracket.

This completes the procedure for installing the cable-management bracket on a Cisco 7201 router for a front rack-mount configuration. Go to the [“Installing the Chassis in the Rack”](#) section on page 2-9.

Installing Rack-Mount Brackets on the Rear of the Chassis

Figure 2-5 Attaching the Rack-Mount Brackets to the Rear of the Chassis



1	Rack-mount bracket	3	Two M3 x 8-mm screws
2	Four 6-32 x 0.25-in. screws		

To install the rack-mount and cable-management brackets on a Cisco 7201 router for a rear rack-mount configuration, complete the following steps:

-
- Step 1** Locate the threaded holes in the rear sides of the chassis.
 - Step 2** Align the rack-mount bracket to the rack-mount bracket holes on the side of the router.
 - Step 3** Remove any existing cover screws from the front sides of the chassis that align with the rack-mount bracket holes and then realign the bracket. (You should have to remove one cover screw from each side of the chassis.)
 - Step 4** Insert and tighten two 6-32 x 0.25-in. screws in the two holes nearest the rear of the chassis.
 - Step 5** Insert and tighten the longer M3 x 8-mm screw in the hole nearest the front of the chassis. (This screw replaces the cover screw that you removed in Step 3.)
 - Step 6** Repeat Step 1 through Step 5 on the other side of the router.
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**Note**

To use the cable-management bracket with the Cisco 7201 router rear-mounted, you must purchase a second rack-mount kit, attach a rack-mount bracket to the left front of the chassis, and attach the cable-management bracket to it. See the [“Attaching the Cable-Management Bracket” section on page 2-8](#) for cable-management bracket installation instructions.

This completes the procedure for installing the rack-mount brackets and cable-management brackets on a Cisco 7201 router for a rear rack-mount configuration. Go to the [“Installing the Chassis in the Rack” section on page 2-9](#).

Installing the Chassis in the Rack

After installing the brackets on the chassis, you mount the router by securing the rack-mount brackets to two posts or mounting strips in the rack using the four screws provided. Because the brackets support the weight of the entire chassis, be sure to use all four screws to fasten the two rack-mount brackets to the rack posts. [Figure 2-6 on page 2-10](#) and [Figure 2-7 on page 2-11](#) show typical installations in two-post and four-post equipment racks.

We recommend that you allow at least 1 or 2 inches (2.54 or 5.08 cm) of vertical clearance between the router and any equipment directly above and below it.

To install the chassis in the rack, complete the following steps:

-
- Step 1** On the chassis, ensure that the port adapter lever is in the locked position, and that the CompactFlash Disk, USB module, and any SFP modules are installed.
 - 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.
 - Step 3** Position the chassis so that the front end is closest to you. Lift the chassis and move it to the rack. To prevent injury, avoid sudden twists or moves.
 - Step 4** Slide the chassis into the rack, pushing it back until the brackets (installed at the front or rear of the chassis) meet the mounting strips or posts on both sides of the equipment rack.
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For two-post rack installation, go to the [“Two-Post Rack Installation”](#) section on page 2-10.

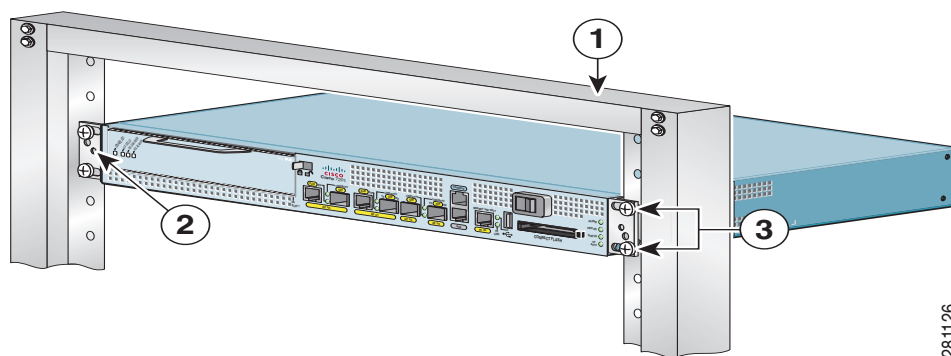
For four-post rack installation, go to the [“Four-Post Rack Installation”](#) section on page 2-11.

Two-Post Rack Installation

**Note**

Inner clearance (the width between the inner sides of the two posts or rails) must be at least 19 inches (48.26 cm). The height of the chassis is 1.73 inches (4.39 cm). Airflow through the chassis is from front to back.

Figure 2-6 Installing the Cisco 7201 Router in a Two-Post Rack



1	Two-post rack	3	Four 10-32 or 12-24 screws
2	Screw hole for the cable-management bracket		

- Step 1** Make sure that the port adapter lever is in the locked position.
- Step 2** Make sure the rack brakes are locked or the rack is stabilized.
- Step 3** Position the router so the front is closest to you and lift it carefully into the rack. To prevent injury, avoid any sudden twists or moves.
- Step 4** Slide the chassis into the rack, pushing it back until the brackets meet the mounting strips or posts on both sides of the rack.
- Step 5** Keeping the brackets flush against the posts or mounting strips, align the holes in the brackets with the holes on the rack or mounting strip.
- Step 6** For each bracket, insert and tighten two 10-32 or 12-24 screws to the rack.

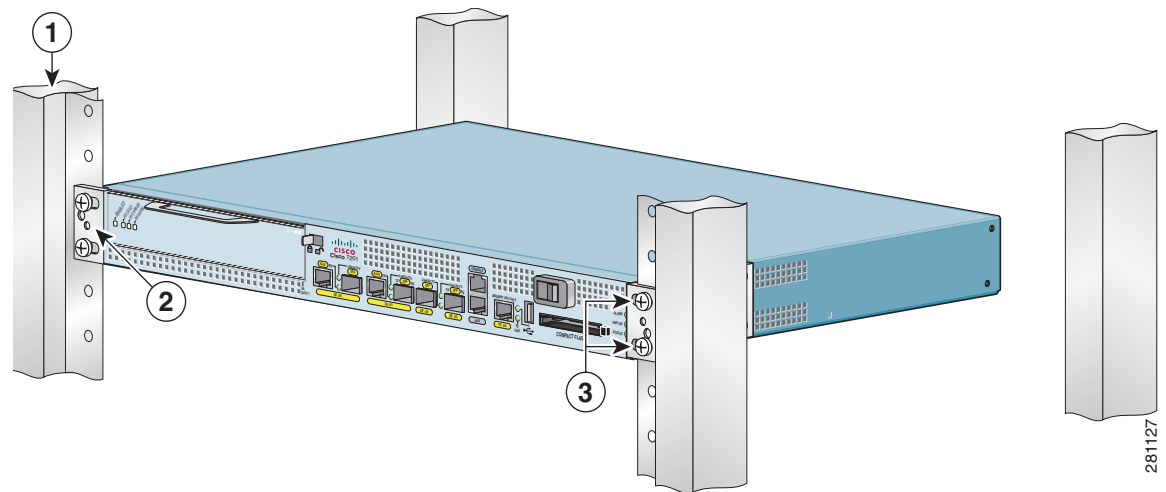
This completes the procedure for installing the chassis in the rack. Proceed to the [“Attaching a Chassis Ground Connection”](#) section on page 2-12 to continue the installation.

Four-Post Rack Installation


Note

Inner clearance (the width between the inner sides of the two posts or rails) must be at least 19 inches (48.26 cm). The height of the chassis is 1.73 inches (4.39 cm). Airflow through the chassis is from front to back.

Figure 2-7 Installing the Cisco 7201 Router in a Four-Post Rack



1	Four-post rack	3	Four 10-32 or 12-24 screws
2	Screw hole for the cable-management bracket		

- Step 1** Make sure that the port adapter lever is in the locked position.
- Step 2** Make sure the rack brakes are locked or the rack is stabilized.
- Step 3** Position the router so the front is closest to you and lift it carefully into the rack. To prevent injury, avoid any sudden twists or moves.
- Step 4** Slide the chassis into the rack, pushing it back until the brackets meet the mounting strips or posts on both sides of the rack.
- Step 5** Keeping the brackets flush against the posts or mounting strips, align the holes in the brackets with the holes on the rack or mounting strip.
- Step 6** For each bracket, insert and tighten two 10-32 or 12-24 screws to the rack.

This completes the procedure for installing the chassis in the rack. Proceed to the [“Attaching a Chassis Ground Connection”](#) section on page 2-12 to continue the installation.

Attaching a Chassis Ground Connection



Warning

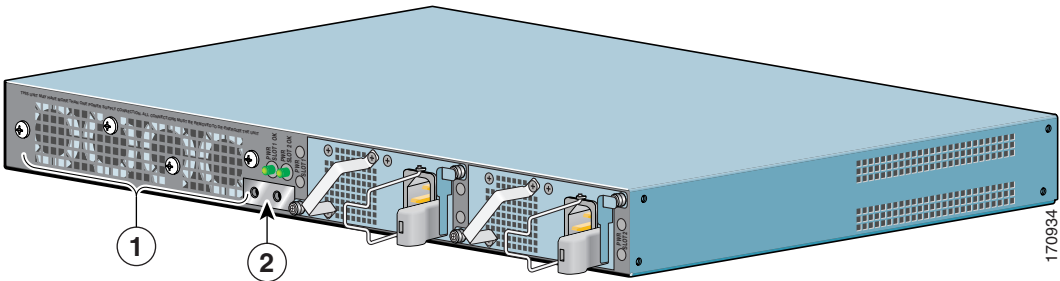
This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Before you connect power or turn on power to your router, you must provide an adequate chassis ground (earth) connection for the router chassis. A chassis ground connector is provided on each Cisco 7201 router chassis. (See [Figure 2-8](#).)

To ensure the chassis ground connection that you provide is adequate, you will need the following parts and tools:

- One grounding lug—Ships on the chassis along with two M5 grounding screws
- One grounding wire—6-AWG, 0.162-inch (4.115-mm) diameter multistrand, copper wire, with approximately 0.108-inch (2.743-mm) insulation, for a total wire diameter of approximately 0.27 inches (6.858 mm). The wire length is dependent on your router location and site environment. This wire is not available from Cisco; it is available from a commercial cable vendor.
- Number 2 Phillips screwdriver
- Crimping tool large enough to accommodate the diameter of the wire receptacle on your grounding lug
- Wire stripper

Figure 2-8 Locating the Chassis Ground Connector

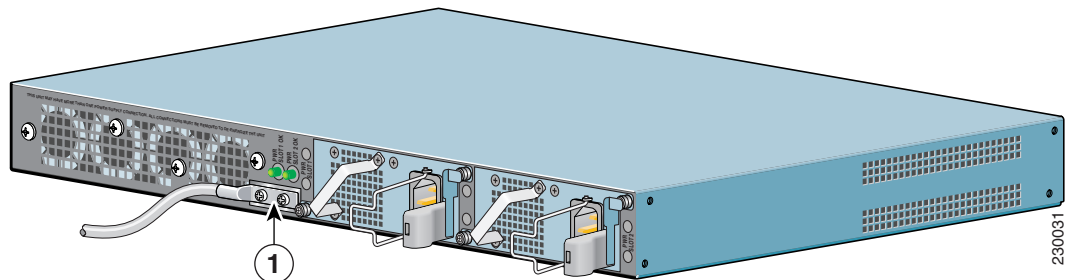


1	Fan vents	2	Chassis ground connector
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Use the following procedure to attach the grounding lug to the chassis ground connector on your router chassis:

- Step 1** Use the wire stripper to strip one end of the 6-AWG wire approximately 0.75 inches (19.05 mm).
- Step 2** Insert the 6-AWG wire into the wire receptacle on the grounding lug.
- Step 3** Use the crimping tool to carefully crimp the wire receptacle around the wire; this step is required to ensure a proper mechanical connection.

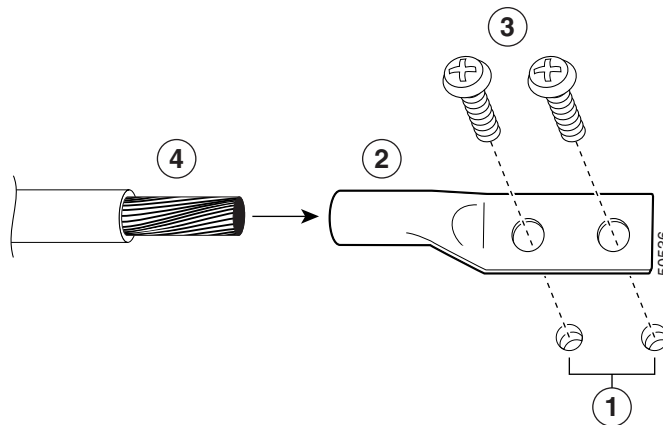
Figure 2-9 Attaching the Grounding Lug



1	Grounding lug
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- Step 4** Attach the grounding lug with the wire on the left to avoid having the grounding wire overlapping the power supply. See [Figure 2-9](#).

Figure 2-10 Attaching a Grounding Lug to the Chassis Ground Connector



1	Chassis ground connector	3	Screws
2	Grounding lug	4	Wire

- Step 5** Locate the chassis ground connector on the rear of your router chassis.
- Step 6** Insert the two screws through the holes in the grounding lug.

- Step 7** Use the Number 2 Phillips screwdriver to carefully tighten the screws until the grounding lug is held firmly to the chassis. Do not overtighten the screws.
- Step 8** Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

This completes the procedure for attaching a chassis ground connection. Go to the following cabling sections for information on attaching cables.

Installing a Port Adapter, USB Flash Memory Module, or SFP Module That Did Not Ship in the System

For information on installing a port adapter that did not ship in the system, see the [“Removing and Installing a Port Adapter or Service Adapter” section on page 4-5](#). Also see the *Cisco 7201 Port Adapter Documentation Roadmap* for a linked listing to all online port adapter documentation.

For information on installing a USB Flash memory module that did not ship in the system, see the [“Removing and Installing a USB Flash Memory Module or USB eToken Pro Key” section on page 4-4](#).

For information on installing an SFP module that did not ship in the system, see the [“Removing and Installing an SFP Module” section on page 4-2](#).

Connecting Port Adapter Cables

The instructions for connecting the cables for the port adapter installed in the Cisco 7201 router are contained in the respective configuration notes for each port adapter. For example, if you are connecting the optical fiber cables for the PA-POS-OC3 port adapter, refer to the *PA-POS-OC3 Packet OC-3 Port Adapter Installation and Configuration* guide at

http://www.cisco.com/en/US/docs/interfaces_modules/port_adapters/install_upgrade/pos/pa-pos-oc3_install_config/paposoc3.html.

Port adapter documents are also available on the Cisco Documentation DVD.

Connecting I/O Cables

This section contains input/output (I/O) connection equipment information for the native Gigabit Ethernet, Fast Ethernet Management, console, and auxiliary ports.



Warning

The ports labeled “Ethernet,” “10BaseT,” “Token Ring,” “Console,” and “AUX” are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits. Because the BRI circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits. Statement 22

Connecting Console and Auxiliary Port Cables


Note

The console cable kit product number is ACS-2500ASYN.

The Cisco 7201 router has a DCE-mode console port for connecting a console terminal, and a DTE-mode auxiliary port for connecting a modem or other DCE device (such as a CSU/DSU or other router) to your router.


Note

Both the console and the 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.)

The Cisco 7201 router uses RJ-45 ports for both the auxiliary port and the console port.

For console and auxiliary port pinouts for the RJ-45 connector, see [Appendix A, “Specifications.”](#)

Table 2-2 Pinouts for the RJ-45-to-DB-25 Adapters

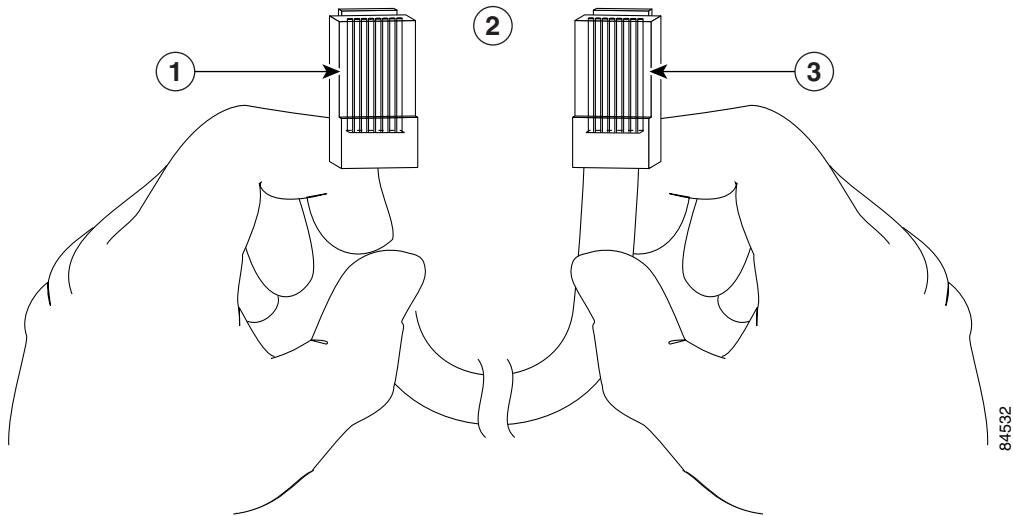
Adapter	DTE M/F Pins ¹	DCE M/F Pins	MMOD Pins ²
1	4	5	5
2	20	6	8
3	2	3	3
4	7	7	7
5	7	7	7
6	3	2	2
7	6	20	20
8	5	4	4

1. The female data terminal equipment (FDTE) adapter that is available from Cisco is labeled “Terminal”.
2. The MMOD adapter that is available from Cisco is labeled “Modem”.

Refer to [Table 2-2](#) for a list of the pins used on the RJ-45-to-DB-25 adapters, used with an RJ-45 cable, to connect terminals and modems to the Cisco 7201 router. The cable you use may be a roll-over cable or a straight-through cable.

A roll-over cable can be detected by comparing the two modular ends of the cable. Holding the cables in your hand, side-by-side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the pin on the outside of the right plug. If your cable was purchased from Cisco, pin 1 will be white on one connector, and pin 8 will be white on the other (a roll-over cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5). (See [Figure 2-11.](#))

Figure 2-11 Identifying a Roll-Over Cable



1	Pin 1	3	Pin 8
2	Pin 1 and pin 8 should be the same color		

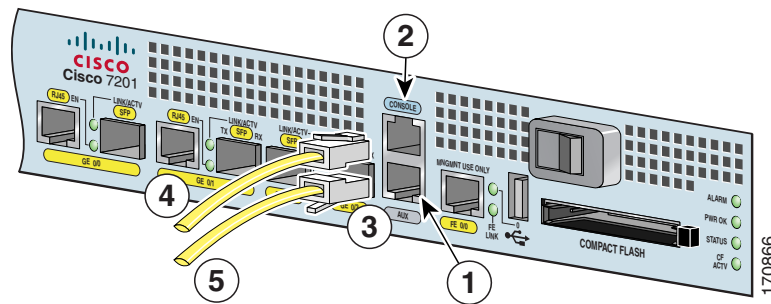
The Cisco 7201 router ships with a roll-over cable. Connection to a terminal or a modem will require an RJ-45-to-DB-25 adapter, and possibly a DB-25-to-DB9 adapter. Refer to [Table 2-3](#) for the cable and adapter configurations that can be used to connect terminals and modems to the Cisco 7201 router.

Table 2-3 Asynchronous Device Cabling Options

Access Server Port	RJ-45 Cable Type	DB-25 Adapter	End Device
Console or auxiliary	Roll-over	FDTE ¹	Terminal
Console or auxiliary	Straight-through	FDCE	Terminal
Auxiliary or console	Roll-over	MMOD ²	Modem

- 1. The FDTE RJ-45-to-DB-25 adapter is labeled “Terminal”.
- 2. The MMOD RJ-45-to-DB-25 adapter is labeled “Modem”.

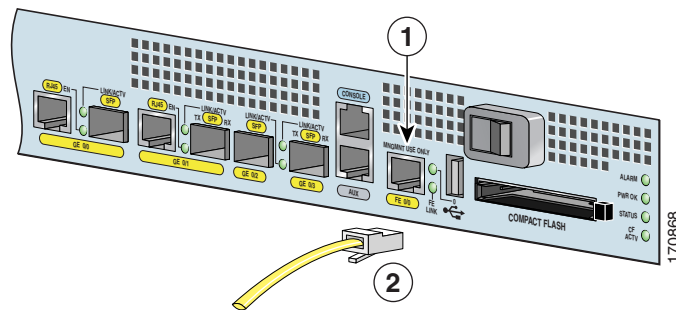
Both ports are configured as asynchronous serial ports. [Figure 2-12](#) shows the RJ-45 console and auxiliary port connections.

Figure 2-12 Console and Auxiliary Port RJ-45 Connectors

1	Auxiliary port	4	Cable to console terminal or DTE
2	Console port	5	Cable to modem or DCE
3	RJ-45 connector		

- Step 1** Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 1 stop bits (9600 8N1).
- Step 2** After you establish normal router operation, you can disconnect the terminal.

Connecting the Fast Ethernet Management Port Cable

Figure 2-13 Installing the Fast Ethernet Management Port Cable

1	Fast Ethernet Management port	2	Fast Ethernet RJ-45 cable
---	-------------------------------	---	---------------------------

When using the Fast Ethernet Management port in the default mode (speed-auto and duplex-auto) the port operates in auto-MDI/MDI-X mode. The port automatically provides the correct signal connectivity through the Auto-MDI/MDI-X feature. The port automatically senses a crossover or straight-through cable and adapts to it.

However, when the Fast Ethernet Management port is configured to a fixed speed (10 or 100 Mbps) through command-line interface (CLI) commands, the port is forced to MDI mode.

When in a fixed-speed configuration and MDI mode:

- Use a crossover cable to connect to an MDI port
- Use a straight-through cable to connect to an MDI-X port

Connecting Native Gigabit Ethernet Cables

The Cisco 7201 router has four native Gigabit Ethernet interfaces and six physical Gigabit Ethernet ports, four SFP ports (optical) and two RJ-45 ports (copper). The use of an RJ-45 port or SFP port on a common Gigabit Ethernet interface is mutually exclusive at any one time.

Gigabit Ethernet SFP Connection Equipment

The SFP port is a 1000-Mbps optical interface in the form of an LC-type duplex port that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard. (See [Figure 2-16](#).)

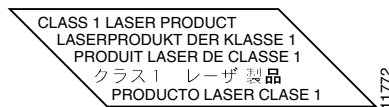


Warning

Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Statement 70

[Figure 2-14](#) shows the Class 1 warning label that appears on the Gigabit Ethernet optical ports.

Figure 2-14 Laser Class 1 Warning Label



[Figure 2-16](#) shows the duplex LC-type connectors on your multimode or single-mode optical fiber cables. For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX). For duplex connectors, only one cable that has both TX and RX connectors is required. You can use either simplex or duplex connectors to the SFP ports on the Cisco 7201 router.

[Appendix A, “Specifications,”](#) provides cabling specifications and configuration information for the SFP modules that you install in the Gigabit Ethernet SFP ports.

The following SFP modules are supported on the Cisco 7201:

- 100BASE-FX SFP—The SFP-GE-F=, 100BASE-FX SFP module is a hot-swappable device that plugs into a Gigabit Ethernet SFP port. It provides full-duplex 100-Mbps connectivity over multimode fiber (MMF) infrastructures. The 100BASE-FX SFP operates on ordinary MMF optical link spans of up to 2 kilometers (km) in length.
- 1000BASE-LH/LX SFP module—The SFP-GE-L= (1000BASE-LH/LX SFP module) operates on ordinary single-mode fiber-optic link spans of up to 32,808 feet (10,000 meters) in length.
- 1000BASE-SX SFP module—The SFP-GE-S= (1000BASE-SX SFP module) operates on ordinary multimode fiber-optic link spans of up to 1804 feet (550 meters) in length.

1000BASE-ZX SFP module—The SFP-GE-Z= (1000BASE-ZX SFP module) operates on ordinary single-mode fiber-optic link spans of up to 43 miles (70 kilometers) in length. Link spans of up to 100 km are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. The SFP module provides an optical link budget of 23 dB—the precise link span length depends on multiple factors, such as fiber quality, number of splices, and connectors.

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 5-decibel (dB) or 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the SFP-GE-Z= at each end of the link whenever the fiber-optic cable span is less than 25 km.

- 1000 BASE-T SFP module—The SFP-GE-T (1000BASE-T copper SFP module) provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure. The SFP-GE-T maximum cabling distance is 328 feet (100 m).

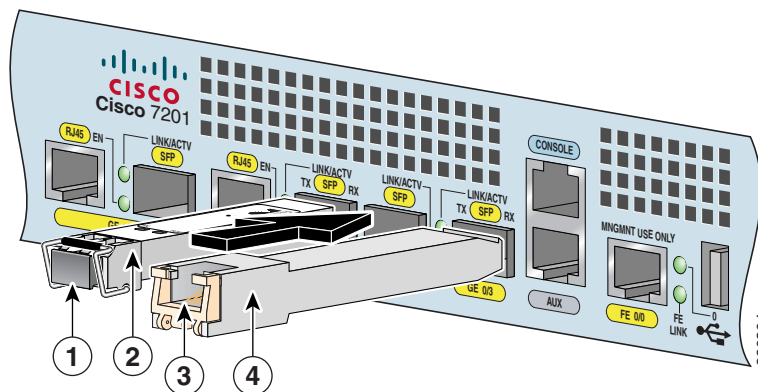
**Note**

Optical fiber cables are commercially available; they are not available from Cisco.

Installing the SFP Module Optical Fiber Cables

SFP modules ordered with the Cisco 7201 router come installed in the system. Optical fiber cables are commercially available; they are not available from Cisco

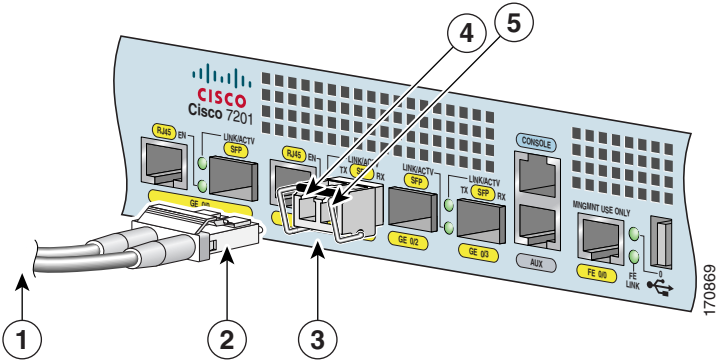
Figure 2-15 *Optical SFP Module and Copper SFP Modules*



1	Optical SFP module plug	3	Copper SFP module RJ-45 connector
2	Optical SFP module	4	Copper SFP module

The optical SFP modules can occupy any of the four optical Gigabit Ethernet ports, 0/0 through 0/3. However, the copper SFP modules can occupy only optical Gigabit Ethernet ports 0/2 and 0/3.

Figure 2-16 SFP Port Connections



1	To external 1000BASEX network	4	TX (SFP port 0/1)
2	Duplex connector (TX and RX)	5	RX (SFP port 0/1)
3	SFP module		

Note

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Cleaning the Fiber-Optic Connections”](#) section on page 5-14 for information.

Warning

Class 1 laser product. Statement 1008

Warning

Class 1 LED product. Statement 1027

- Step 1** Check to be sure that either the SFP optical port or the RJ-45 port is used on ports 0/0 and 0/1. Only one of the pair can be chosen.
- Step 2** Remove the plug from the SFP module so that you can insert the cables. Keep the plug for use should you ever disconnect the optical fiber cables.

Warning

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

- Step 3** Attach the appropriate optical fiber cable directly to the SFP module. You can use either simplex or duplex connectors for most devices. (Figure 2-16 shows an SFP module with a duplex connector being installed in SFP port 0/1.)
- For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX).
 - For duplex connectors, only one cable that has both TX and RX connectors is required.

**Caution**

If you plan to use a SFP-GE-L at distances greater than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber, you must use the mode-conditioning patch cord to prevent data transmission problems.

Mode-Conditioning Patch Cord Description

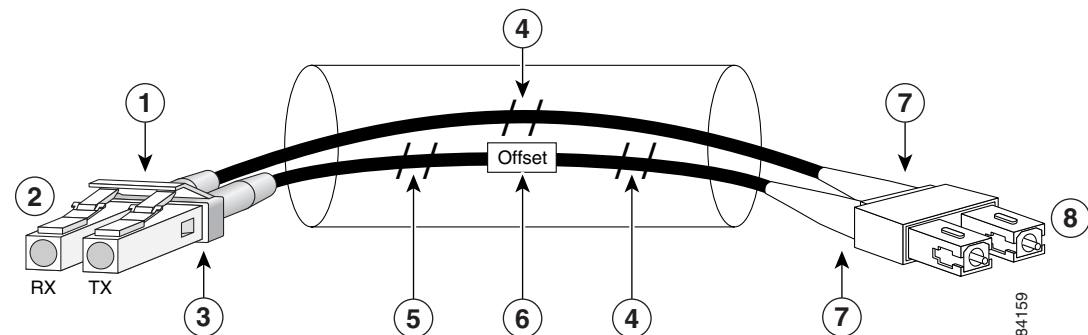
A mode-conditioning patch cord can be used with the SFP-GE-L= (SFP module) to allow reliable laser transmission between the single-mode laser source on the SFP module and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a *mode-conditioning patch cord*.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 2-17) to a graded-index multimode optical fiber. Figure 2-17 shows a diagram of the mode-conditioning patch cord assembly.

Figure 2-17 Mode-Conditioning Patch Cord Assembly for an SFP Module



1	Gray color identifier	5	Single-mode bar
2	To Gigabit Ethernet interface	6	Offset
3	Blue color identifier	7	Beige color identifier
4	Multimode bar	8	To cable plant

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASE-LX and 1000BASE-LH links.

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the mode-conditioning patch cord, the SFP-GE-L= is compliant with the IEEE 802.3z standard for 1000BASE-LX.

**Note**

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Cleaning the Fiber-Optic Connections” section on page 5-14](#) for information.

Attaching the Mode-Conditioning Patch Cord

To use a mode-conditioning patch cord, follow these steps:

- Step 1** If you have not already done so, and the mode-conditioning patch cord has been in use, we strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Cleaning the Fiber-Optic Connections” section on page 5-14](#) for information.
- Step 2** Attach a mode-conditioning patch cord to the SFP module. (See [Figure 2-17](#).)
- Step 3** Attach the network ends of your mode-conditioning patch cord to the appropriate 1000BASEX equipment in your building cable plant.

Ensure that you connect the TX and RX ports on one end of the patch cord to the RX and TX ports (respectively) on the other end. Connect TX to RX and RX to TX.

**Note**

See [Chapter 3, “Starting and Configuring the Router,”](#) the [“Configuring the Native Gigabit Ethernet Interfaces” section on page 3-15](#), for information on configuring and troubleshooting the Gigabit Ethernet interfaces.

Attaching the Gigabit Ethernet RJ-45 Cables

The RJ-45 ports support IEEE 802.u (Fast Ethernet) and 802.3ab (Gigabit Ethernet) twisted-pair interfaces compliant with 1000BASETX and 1000BASET specifications.

**Note**

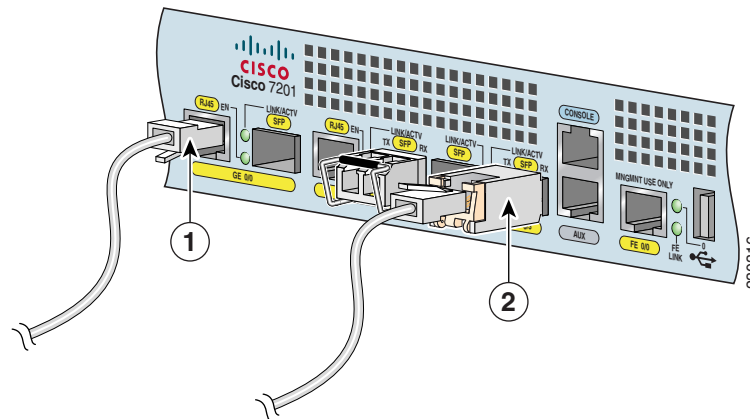
RJ-45 ports GE/00 and GE/01 are always set to MDI mode.

The RJ-45 ports support standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables with RJ-45 connectors. Cisco does not supply Category 5 UTP cables; these cables are available commercially.

See [Appendix A, “Specifications,”](#) for Gigabit Ethernet RJ-45 port specifications.

Intra-Building Lightning Protection

Shielded cables, which are grounded at both ends, are required to be used on the 10/100/1000 Gigabit Ethernet RJ-45 ports in order to be in compliance with requirement R4-11 in GR-1089-Core for a Central Office environment. This is not a requirement for customer premises installations.

Figure 2-18 RJ-45 Port and Copper SFP RJ-45 Gigabit Ethernet Port Cabling

1	RJ-45 connector	2	Copper SFP module RJ-45 connector
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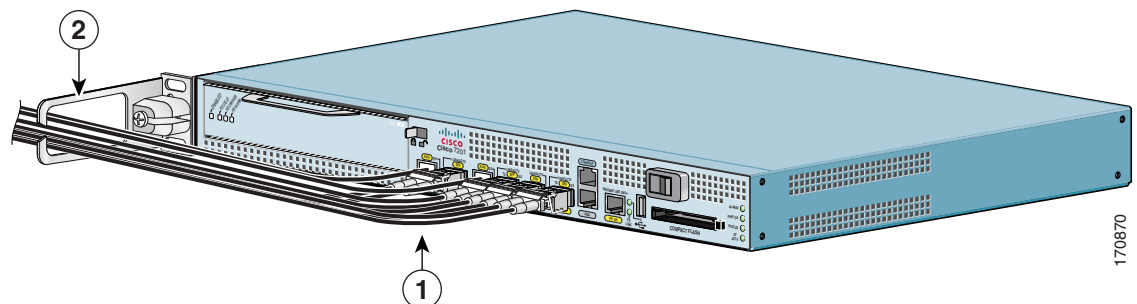
- Step 1** Insert an Gigabit Ethernet RJ-45 cable into Gigabit Ethernet RJ-45 ports 0/0 and 0/1 if you are not using Gigabit Ethernet SFP optical ports 0/0 and 0/1.
- Step 2** Insert an Gigabit Ethernet RJ-45 cable into a copper SFP module in Gigabit Ethernet ports 0/2 and 0/3.



To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables. Statement 1021

This completes the procedures for connecting the I/O cables.

Using the Cable-Management Bracket

Figure 2-19 Securing Interface Cables Through the Cable-Management Bracket

1	Input/output cables	2	Cable-management bracket
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Secure port adapter interface cables and I/O cables by placing them through the cable-management bracket.

Proceed to the [“Connecting Power” section on page 2-24](#) to complete the installation.

Connecting Power

This section provides the procedures for connecting AC-input and DC-input power to your Cisco 7201 router.

- [Connecting AC-Input Power, page 2-24](#)
- [Connecting DC-Input Power, page 2-26](#)



Warning

Installation of the equipment must comply with local and national electrical codes. Statement 1074



Warning

Never install an AC power module and a DC power module in the same chassis. Statement 1050



Warning

This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028



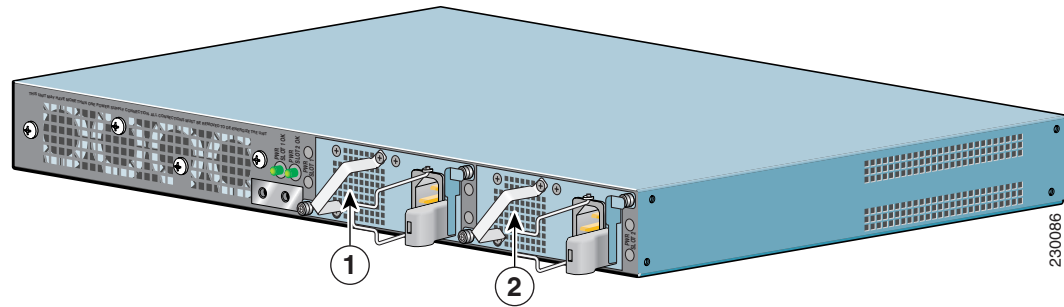
Warning

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 120 VAC, 20A U.S. (240 VAC, 10A international). Statement 1005

Connecting AC-Input Power

This section provides instructions for connecting AC-input power.

The Cisco 7201 router has two of the same type of power supplies in power supply slot 1 and power supply slot 2. The power supply slot numbers are on the chassis to the left of the left power supply, and to the right of the right power supply. See [Figure 2-20](#)

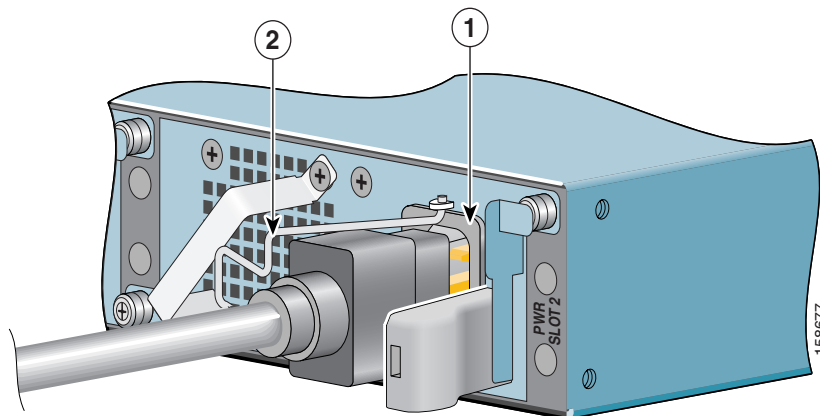
Figure 2-20 Power Supply Slot 1 and Slot 2

1	Power supply slot 1	2	Power supply slot 2
----------	---------------------	----------	---------------------

**Warning**

Never install an AC power module and a DC power module in the same chassis. Statement 1050

Connect an AC-input power supply as follows:

Figure 2-21 Connecting AC-Input Power

1	AC power receptacle	2	Adjustable AC power cable-retention clip
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- Step 1** At the front of the router, check that the power switch is in the standby (I) position.
- Step 2** Swing the wire cable-retention clip to the left.
- Step 3** Plug the power cable into the AC connector of one of the power supplies.
- Step 4** Slide the cable-retention clip to the right, so that the power cable is held by the cable-retention clip.
- Step 5** Plug the AC power supply cable into the AC power source. Repeat these steps for the second AC power supply.
- Step 6** On the front of the router, place the power switch in the on (O) position to turn on the router.
The power supply LEDs light when power is supplied to the router.


Note

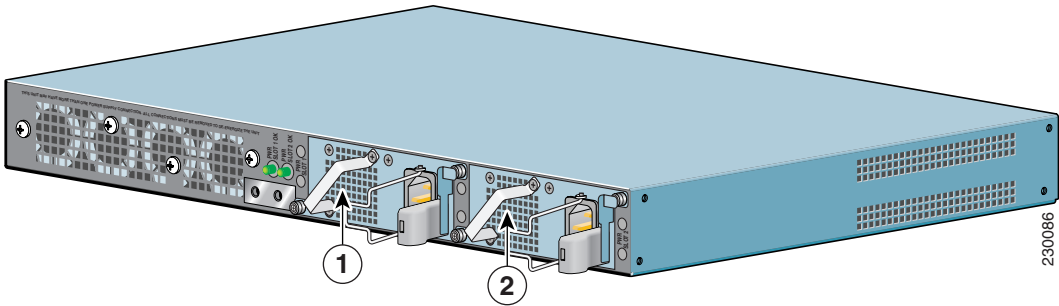
After powering off the router, wait a minimum of 30 seconds before powering it on again.

If required, use Sinewave Output UPS (uninterruptable power supply), not Ferro-resonant type UPS.
This completes the procedure for connecting AC-input power. Your installation is complete. Proceed to [Chapter 3, “Starting and Configuring the Router,”](#) to start the router and to perform a basic configuration.

Connecting DC-Input Power

This section provides instructions for installing the DC power supply ground leads and installing the DC-input power leads.

Figure 2-22 *Power Supply Slot 1 and Slot 2*



1	Power supply slot 1	2	Power supply slot 2
----------	---------------------	----------	---------------------

The Cisco 7201 has two of the same type of power supplies in power supply slot 1 and power supply slot 2. See [Figure 2-22](#). The power supply slot numbers are on the chassis to the left of the left power supply, and to the right of the right power supply.


Warning

Never install an AC power module and a DC power module in the same chassis. Statement 1050


Caution

Before you connect DC-input power, you must install the DC power ground leads to the DC power supply.


Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

**Warning**

Before connecting or disconnecting ground or power wires to the chassis, 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. Statement 140

**Warning**

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

**Note**

To make sure that the equipment is reliably connected to earth ground, follow the grounding procedure instructions, and use a UL-listed lug suitable for 6-AWG wire and two M5 screws.

Obtain these necessary tools and equipment:

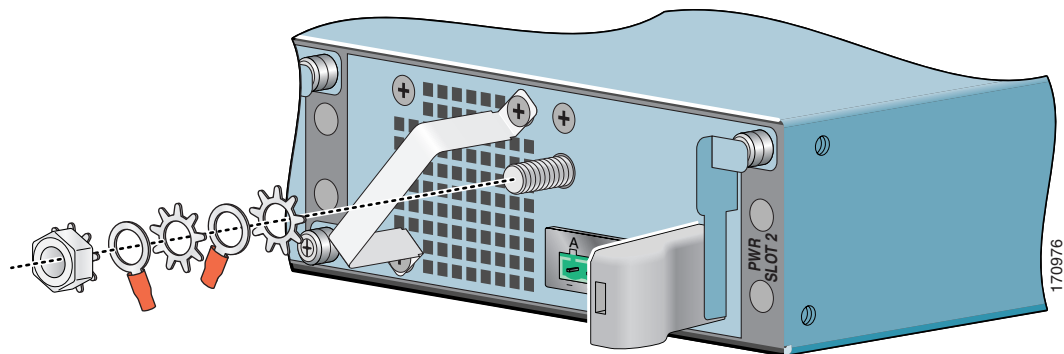
- Ratcheting torque screwdriver with a Phillips head that exerts up to 15 pound force-inches (lbf in.) or 240 ounce force-inches (ozf in.) of pressure
- Panduit crimping tool with optional controlled cycle mechanism
- 18-gauge copper ground wire (insulated or noninsulated)
- Four leads of 18-gauge copper wire
- Wire-stripping tool for stripping 18-gauge wire

Installing the DC Grounding Leads

To install the DC grounding leads on the DC power supply, follow these instructions.

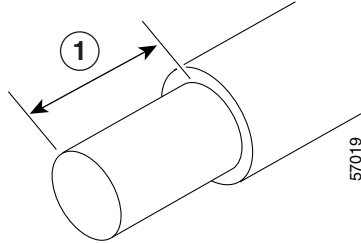
The DC power supply ships with the DC power supply ground lugs, star washers, and nut attached to the grounding stud on the DC power supply.

Figure 2-23 Locating the DC Grounding Stud and Grounding Materials



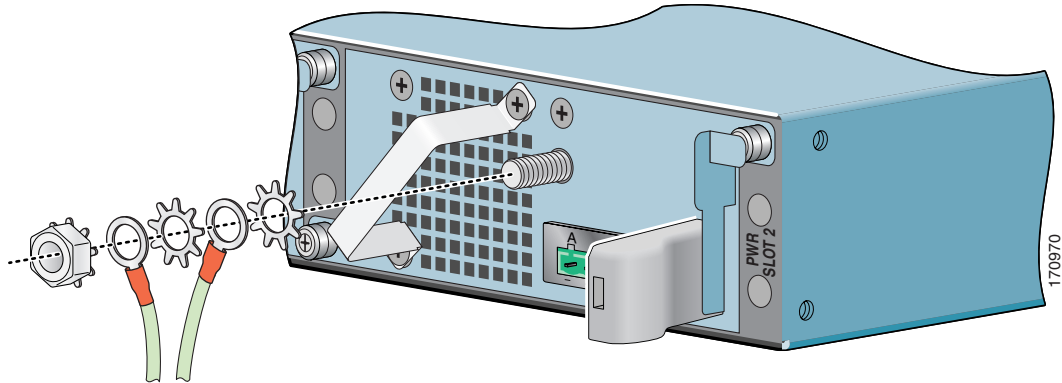
Step 1 Locate the grounding stud on the DC power supply.

Step 2 Remove the nut, ground lug, star washer, and the second ground lug and star washer from the grounding stud.

Figure 2-24 Stripping the DC-Input Power Ground Wire

1	0.5 inch (12.7 mm) \pm 0.02 inch (0.5 mm)		
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- Step 3** If your ground wire is insulated, use a wire stripping tool to strip the 18-gauge wire, (or 16-gauge, but not smaller than the supply conductor) ground wire to 0.5 inch (12.7 mm) \pm 0.02 inch (0.5 mm) as shown in [Figure 2-24](#).
- Step 4** Slide the open end of the ground lug over the exposed area of the 18-gauge wire.
- Step 5** Use a crimping tool to crimp each ground wire to a ground lug.

Figure 2-25 Placing the Ground Lugs, Star Washers, and Nut

- Step 6** Place the ground lugs, star washers, and nut on the grounding stud in this order:
- Star washer
 - Ground lug
 - Star washer
 - Ground lug
 - Nut
- Step 7** Tighten the nut to complete the installation.

- Step 8** Attach the other end of the ground wires to an appropriate grounding point at your site.
- Step 9** Repeat Step 1 through Step 8 on the second DC power supply.
-

Wiring the DC-Input Power Source

**Note**

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Make certain the lead color coding you choose for the DC-input power supply matches lead color coding used at the DC power source.

**Warning**

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

**Warning**

StatThis product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 120 VAC, 20A U.S. (240 VAC, 10A international). Statement 1005

**Warning**

Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003

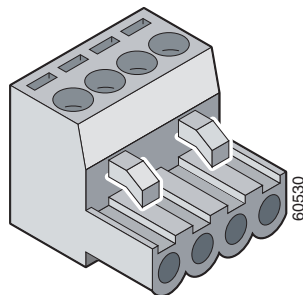
**Warning**

Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Use the information in this section to wire the DC-input power source.

- Step 1** At the front of the router, make sure the power switch is in the standby (I) position.
- Step 2** Move the circuit-breaker switch handle to the off position, and apply tape to hold it in the off position.
- Step 3** Check to make sure the power supply LEDs are off.

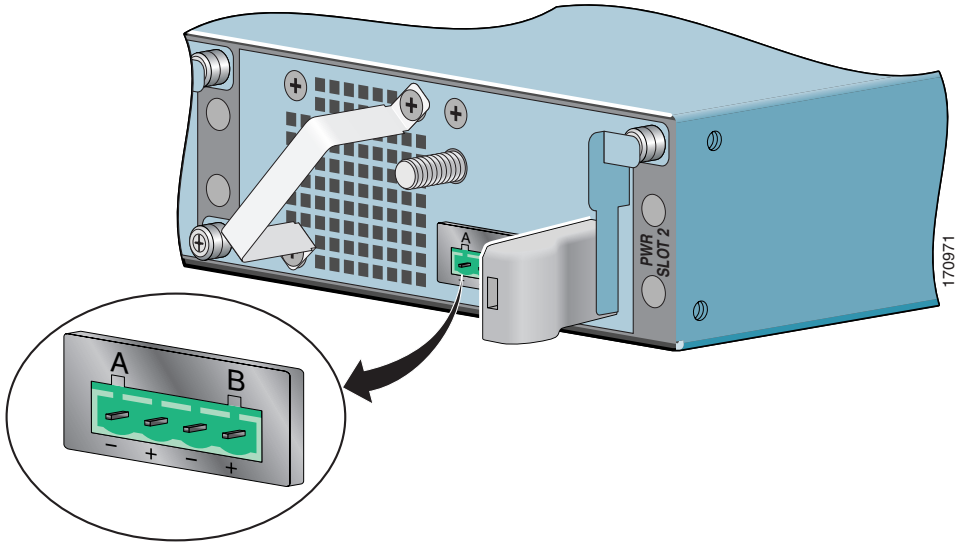
Figure 2-26 **Terminal Block Plug**



- Step 4** Locate and remove the terminal block plug.

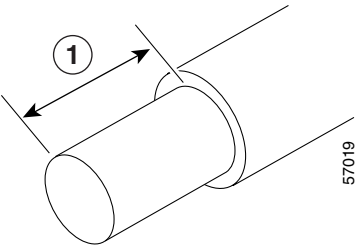
Step 5 Identify the positive and negative feed positions for the terminal block connection. The wiring sequence is positive to positive and negative to negative for both the A and B feed wires.

Figure 2-27 Positive and Negative Positions



The rear panel of the power supply unit identifies the positive and negative positions for both the A and B feed wires. See [Figure 2-27](#).

Figure 2-28 Stripping the DC-Input Power Source Wire



1	0.25 inch (6.3 mm) ± 0.02 inch (0.5 mm)		
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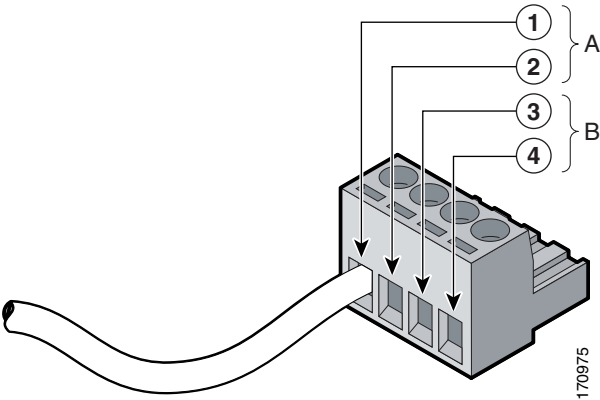
Step 6 Using an 18 gauge wire-stripping tool, strip each of the four wires coming from the DC-input power source to 0.25 inch (6.3 mm) ± 0.02 inch (0.5 mm). Do not strip more than 0.29 inch (7.4 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave exposed wire from the terminal block plug after installation.



Warning

An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the terminal block plug.
Statement 122

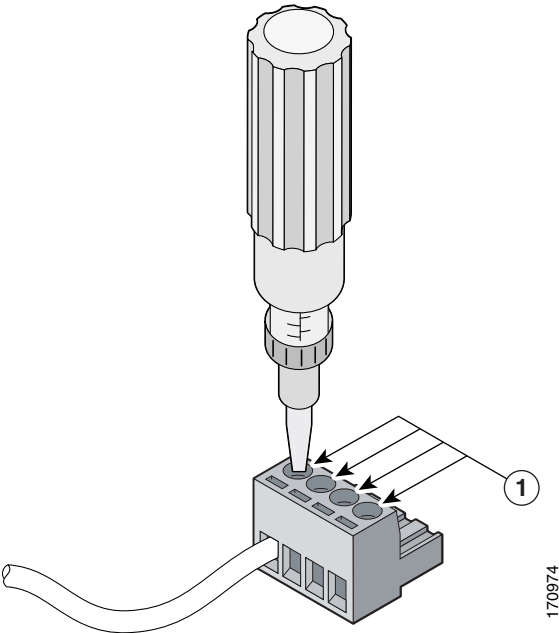
Figure 2-29 Inserting Wires into the Terminal Block Plug



1	Negative (–)	3	Negative (–)
2	Return (+)	4	Return (+)

Step 7 Insert the exposed wire of one of the four DC-input power source wires into the terminal block plug, as shown in [Figure 2-29](#). Make sure that you cannot see any wire lead. Only wire *with insulation* should extend from the terminal block.

Figure 2-30 Torquing the Terminal Block Plug Captive Screws



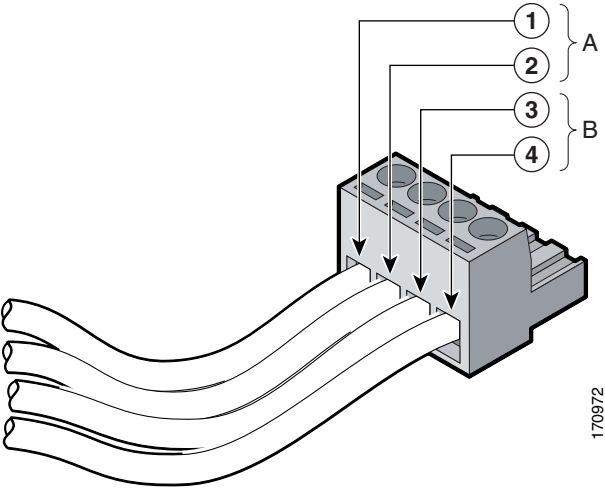
1	Torque is from 0.5 Nm (4.425 lbf in. to 0.6 Nm (5.310 lbf in.))		
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Caution

Do not overtorque the terminal block plug captive screws. The recommended maximum torque is from 0.5 Nm (4.425 lbf in.) to 0.6 Nm (5.310 lbf in.).

Step 8 Use a ratcheting torque screwdriver to torque the terminal block plug captive screw (above the installed wire lead) to from 0.5 Nm (4.425 lbf in. to 0.6 Nm (5.310 lbf in.), as shown in [Figure 2-30](#).

Figure 2-31 Completed Wiring of Terminal Block Plug

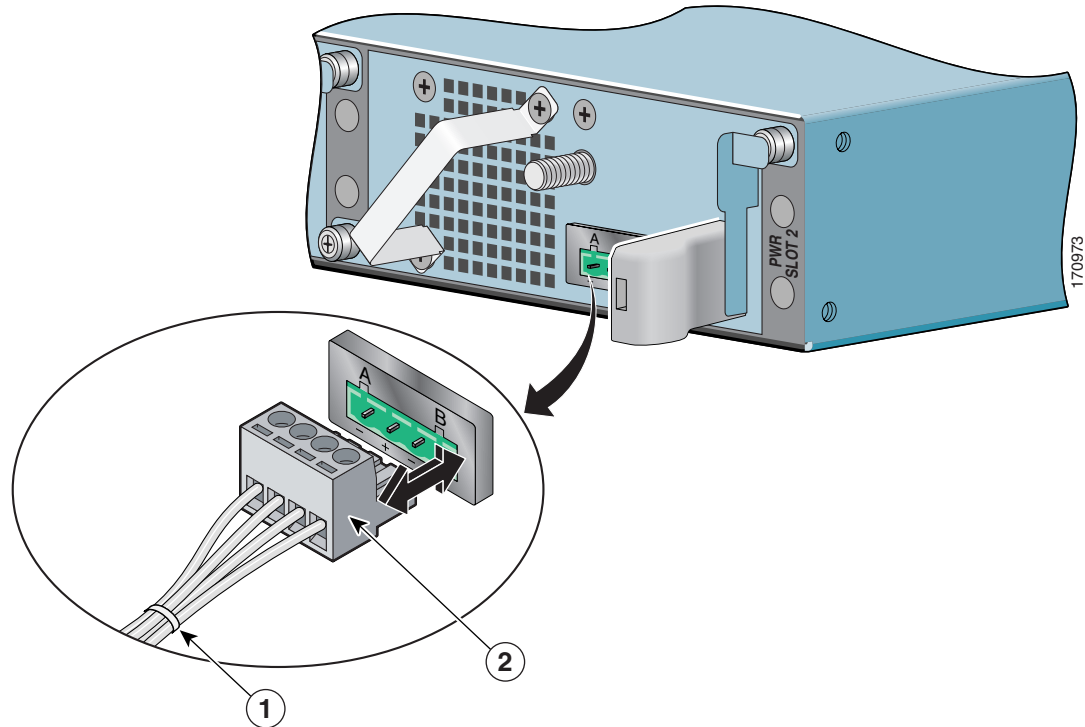


1	Negative (-)	3	Negative (-)
2	Return (+)	4	Return (+)

Step 9 Repeat Step 6 and Step 7 for the remaining three DC-input power source wires. [Figure 2-31](#) shows the completed wiring of a terminal block plug.



Note Each DC power supply accepts two power feeds, but works with only one. You may choose to install only one power feed per power supply. For example, DC power feed A to the power supply in power supply slot 1 and DC power feed B to the power supply in power supply slot 2.

Figure 2-32 Inserting the Terminal Block Plug in the Block Header

1	Tie wrap	2	Terminal block plug
----------	----------	----------	---------------------

**Caution**

Secure the wires coming in from the terminal block plug so that they cannot be disturbed by casual contact.

- Step 10** Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block plug by casual contact. Make sure the tie wrap allows for some slack in the ground wire.
- Step 11** Insert the terminal block plug in the terminal block header on the DC power supply panel, as shown in [Figure 2-32](#).
- Step 12** Repeat Step 1 through Step 10 for the second DC power supply.
- Step 13** Remove the tape from the circuit-breaker switch handle, and move the circuit-breaker switch handle to the on position.
- Step 14** On the front of the router, place the power switch in the on position (O) to turn on the router. The power supply LEDs light when power is supplied to the router.

**Note**

After powering off the router, wait a minimum of 30 seconds before powering it on again.

This completes the procedure for connecting DC-input power. Your installation is complete. Proceed to [Chapter 3, “Starting and Configuring the Router,”](#) to start the router and to perform a basic configuration.

