



## **Cisco 828 Router and SOHO 78 Router Hardware Installation Guide**

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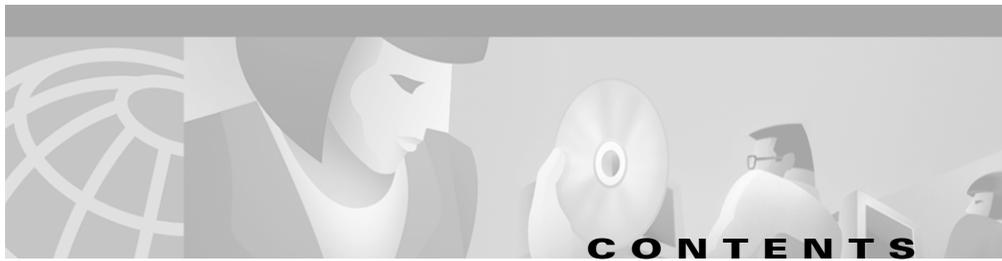
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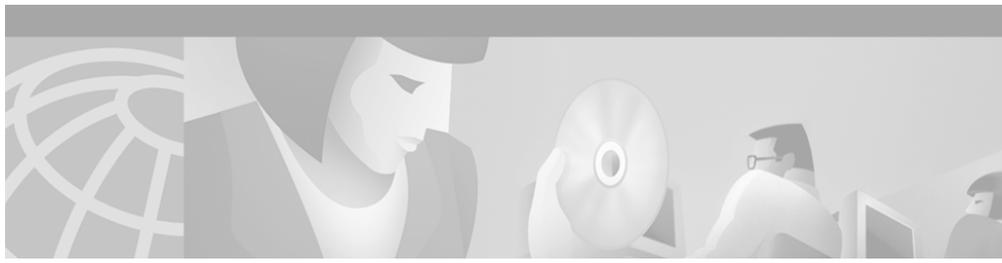
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## Preface

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This preface discusses the audience, organization, and conventions used in this guide. It also discusses related documentation and how to access electronic documentation.

## Audience

This guide is intended for service technicians who have no experience installing routers; their goal is to connect the router to the network as quickly as possible.

## Organization

This guide contains the following information:

- **Product Overview**—Describes the Cisco 828 and SOHO 78 routers and their features.
- **Installation**—Provides information on preinstallation procedures, mounting and connecting the router, and verifying the router connections.
- **Troubleshooting**—Describes problems with the router and how to identify and solve them.
- **Specifications and Cables**—Provides Cisco part numbers for cables that you can order and contains port connector pinouts and specifications for cables that you might need to provide.
- **Glossary**—Describes terms and acronyms that you may find in this manual.

# Conventions

This section describes the conventions used in this guide.



## Note

Means *reader take note*. Notes contain helpful suggestions or references to additional information and material.



## Caution

This symbol means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



## Warning

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with the standard practices for preventing accidents.**

## Waarschuwing

**Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.**

## Varoitus

**Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.**

## Attention

**Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.**

|                   |  |
|-------------------|--|
| <b>Warnung</b>    | <b>Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.</b> |
| <b>Avvertenza</b> | <b>Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.</b>                |
| <b>Advarsel</b>   | <b>Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.</b>                               |
| <b>Aviso</b>      | <b>Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.</b>          |
| <b>¡Atención!</b> | <b>Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.</b>  |
| <b>Varning!</b>   | <b>Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.</b>   |

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## Related Documentation

In addition to this *Cisco 828 Router and SOHO 78 Router Hardware Installation Guide*, the Cisco 828 and SOHO 78 documentation set includes the following:

- *Quick Start Guide—Setting Up the Cisco 828 Router and SOHO 78 Router*
- *Cisco 828 Router and SOHO 78 Router Software Configuration Guide*
- *Cisco 828 Router and SOHO 78 Router Release Notes*

## Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

### Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

## Documentation DVD

Cisco documentation and additional literature are available in a Documentation DVD package, which may have shipped with your product. The Documentation DVD is updated regularly and may be more current than printed documentation. The Documentation DVD package is available as a single unit.

Registered Cisco.com users (Cisco direct customers) can order a Cisco Documentation DVD (product number DOC-DOCDVD=) from the Ordering tool or Cisco Marketplace.

Cisco Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

Cisco Marketplace:

<http://www.cisco.com/go/marketplace/>

## Ordering Documentation

You can find instructions for ordering documentation at this URL:

[http://www.cisco.com/univercd/cc/td/doc/es\\_inpk/pdi.htm](http://www.cisco.com/univercd/cc/td/doc/es_inpk/pdi.htm)

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

## Documentation Feedback

You can send comments about technical documentation to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems  
Attn: Customer Document Ordering  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

# Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

[http://www.cisco.com/en/US/products/products\\_psirt\\_rss\\_feed.html](http://www.cisco.com/en/US/products/products_psirt_rss_feed.html)

## Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—[security-alert@cisco.com](mailto:security-alert@cisco.com)
- Nonemergencies—[psirt@cisco.com](mailto:psirt@cisco.com)



### Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

<http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on>

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In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

## Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

## Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

**Note**

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Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

---

## Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

## Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

## Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:  
<http://www.cisco.com/go/marketplace/>
- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:  
<http://www.ciscopress.com>
- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and

troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

<http://www.cisco.com/packet>

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

<http://www.cisco.com/ipj>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.html>



## Product Overview

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The Cisco 828 router and SOHO 78 router can connect a corporate telecommuter or small office to an Internet Service Provider (ISP) over symmetrical high-data-rate digital subscriber lines (SHDSLs) to the following sites:

- Corporate LANs
- Internet

The routers are capable of bridging and multiprotocol routing between LAN and WAN ports.

## Features

Table 1-1 summarizes the features of the Cisco 828 and SOHO 78 routers.

**Table 1-1** *Summary of Cisco 828 and SOHO 78 Routers Features*

| <b>Feature</b>           | <b>Routers</b> | <b>Description</b>   |
|--------------------------|----------------|--|
| 10BaseT Ethernet port(s) | All            | Provides connection to 10BaseT (10-Mbps) Ethernet networks. Compatible with 10/100-Mbps devices. |
| G.SHDSL port             | All            | Provides connection to G.SHDSL network.  |

**Table 1-1 Summary of Cisco 828 and SOHO 78 Routers Features (continued)**

| Feature                 | Routers  | Description  |
|-------------------------|--|--|
| Flash memory            | <ul style="list-style-type: none"> <li>• 828</li> <li>• SOHO 78</li> </ul> | <ul style="list-style-type: none"> <li>• Onboard 12 MB of Flash memory, upgradable to 20 MB.</li> <li>• 12 MB of Flash memory (not upgradable).</li> </ul> |
| Dynamic RAM (DRAM)      | <ul style="list-style-type: none"> <li>• 828</li> <li>• SOHO 78</li> </ul> | <ul style="list-style-type: none"> <li>• Onboard 16 MB of SDRAM, upgradable to 32 MB.</li> <li>• Onboard 16 MB of SDRAM (not upgradable).</li> </ul>       |
| Ease of installation    | All  | Color-coded ports and cables to reduce the chance of error.  |
| Cisco IOS software      | All  | Supports Cisco IOS software.   |
| Console port            | All  | Provides connection to terminal or PC for software configuration using command-line interface and for troubleshooting.                                     |
| Locking power connector | All  | Locks power connector in place.  |
| Wall-mount feature      | All  | Brackets on router bottom provide a way to mount router on wall or vertical surface.   |

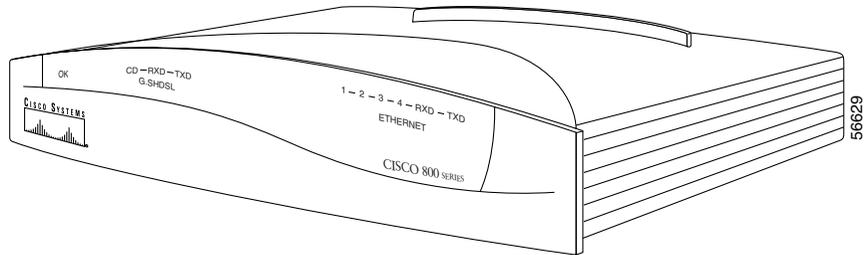
## Router Overview

This section shows the front and rear panels of each router, and identifies the function of each LED.

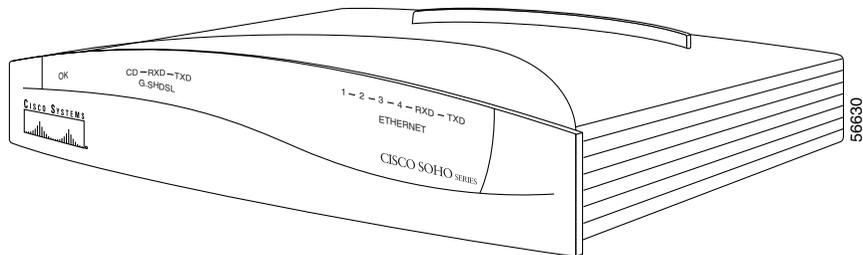
## Front Panels

Figure 1-1 and Figure 1-2 show the front panels of the Cisco 828 router and the SOHO 78 router.

**Figure 1-1 Cisco 828 Router Front Panel**



**Figure 1-2 SOHO 78 Router Front Panel**



## Back Panels

Figure 1-3 and Figure 1-4 show the back panels of the Cisco 828 router and the SOHO 78 router.

**Figure 1-3 Cisco 828 Router Back Panel**

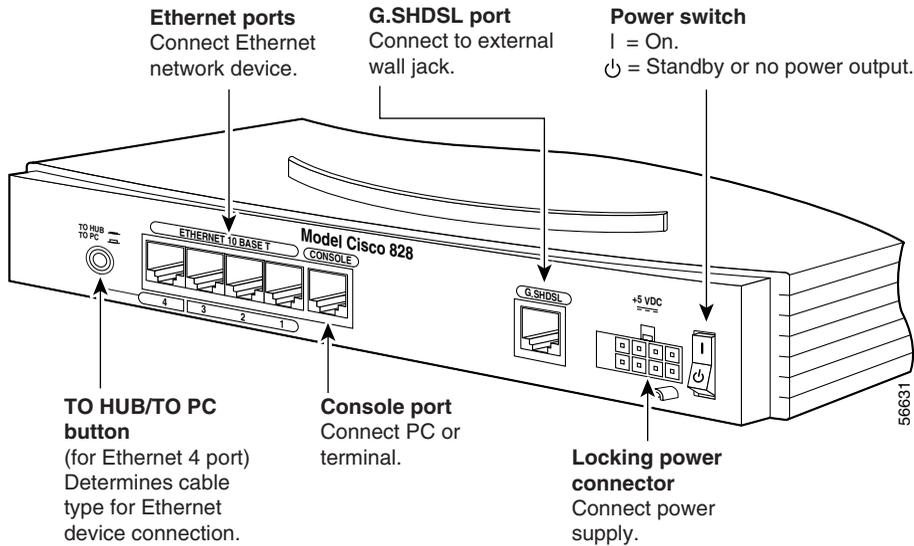
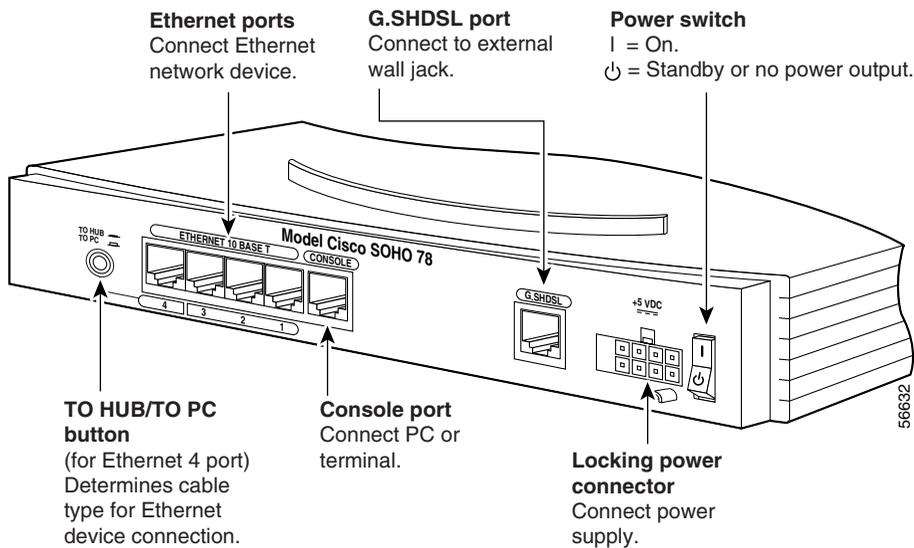


Figure 1-4 SOHO 78 Back Panel



## LEDs

Table 1-2 summarizes the functions of the LEDs on the Cisco 828 and SOHO 78 routers.

**Table 1-2 Functions of LEDs on the Cisco 828 and SOHO 78 Routers**

| LED         | Color | Function   |
|-------------|-------|--|
| OK LED      | Green | On when power is supplied to the router and when the router completes the self-test procedure and begins operating.              |
| G.SHDSL CD  | Green | On when the G.SHDSL device is physically connected. Blinks when the connection has a problem. See the “Troubleshooting” chapter. |
| G.SHDSL RXD | Green | Blinks when the G.SHDSL port receives data.  |
| G.SHDSL TXD | Green | Blinks when the G.SHDSL port sends data.   |

**Table 1-2 Functions of LEDs on the Cisco 828 and SOHO 78 Routers (continued)**

| <b>LED</b>          | <b>Color</b> | <b>Function</b>  |
|---------------------|--------------|--|
| ETHERNET 1, 2, 3, 4 | Green        | On when Ethernet device is connected. Blinks when the connection has a problem. See the “Troubleshooting” chapter. |
| ETHERNET RXD        | Green        | Blinks when an Ethernet port receives a packet.  |
| ETHERNET TXD        | Green        | Blinks when an Ethernet port sends a packet.   |



# Installation

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This chapter provides information on the following topics:

- Preparing for Installation
- Preventing Router Damage
- Installing Your Router
- Verifying the Router Installation
- Mounting the Router
- Where to Go from Here

## Preparing for Installation

This section provides information on safety, mounting of the router, and unpacking the contents of the router box.

### Safety

This section discusses the safety warnings and electrostatic and router damage information for the Cisco 828 and SOHO 78 routers.

## Warnings

Before installing the router, read the following warnings:



**Warning**

---

**Only trained and qualified personnel should be allowed to install or replace this equipment.**

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**Warning**

---

**Read the installation instructions before you connect the system to its power source.**

---



**Warning**

---

**Before working on a system that has a standby/off switch, turn the power to standby and unplug the power cord.**

---



**Warning**

---

**Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.**

---



**Warning**

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**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.**

---



**Warning**

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**Ultimate disposal of this product should be handled according to all national laws and regulations.**

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## Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) is a transfer of electrostatic charge between bodies of different electrostatic potentials, such as an operator and a piece of electrical equipment. It occurs when electronic components are improperly handled, and it can damage equipment and impair electrical circuitry. Electrostatic discharge is more likely to occur with the combination of synthetic fibers and dry atmosphere.

Always use the following ESD-prevention procedures when removing and replacing components:

---

**Step 1** Wear an ESD-preventive wrist strap that you provide, ensuring that it makes good skin contact.



**Caution**

To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. Always follow the guidelines in the preceding section, “Safety.”

**Step 2** Do not touch any exposed contact pins or connector shells of interface ports that do not have a cable attached.

If cables are connected at one end only, do not touch the exposed pins at the unconnected end of the cable.



**Note**

This router is intended for use in residential and commercial environments only.



**Caution**

Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

---

## Unpacking the Box

Table 2-1 lists the items that come with your router. All these items are in the accessory kit that is inside the box that your router came in. If any of the items is missing or damaged, contact your customer service representative.

**Table 2-1 Router Box Contents**

|  |
|--|
| • Power cord (black)                               |
| • Desktop power supply                             |
| • Console cable (light blue)                       |
| • DB-9-to-RJ-45 adapter for use with console cable |
| • xDSL cable (lavender)                            |
| • Ethernet cable (yellow)                          |
| • Product documentation                            |

To prepare for installation, follow these steps:

- 
- Step 1** Remove the yellow Ethernet cable, light blue console cable, lavender xDSL cable, and product documentation from the box. Remove the desktop power supply and the black power cord from the accessory kit. Gather the Ethernet devices to be connected to the router: hub, server, workstation, or PC.
- Step 2** Obtain the G.SHDSL line.
- Step 3** If you plan to configure the software using a terminal or PC connected to the router, provide the terminal or PC.
- 

## Preventing Router Damage

Follow these guidelines when connecting devices to your router:

- Connect the color-coded cables supplied by Cisco Systems to the color-coded ports on the back panel of the router.

- If you must supply your own cable, see the cabling specifications in Appendix A. If this appendix does not provide specifications for a particular cable, we strongly recommend ordering the cable from Cisco Systems.

## Installing Your Router

To install the Cisco 828 router or the SOHO 78 router, you need to perform the following tasks in order:

- Connect the Ethernet devices to the router.
- Connect the G.SHDSL line.
- Connect a terminal or PC to the router (for software configuration, using the command-line interface [CLI], or for troubleshooting).
- Connect the router to the power source.
- Verify the router installation.
- Mount the router.

## Connecting Ethernet Devices

Table 2-2 lists the types of Ethernet devices you can connect to the router, identifies the connections for each device, and tells the settings of the router TO HUB/TO PC button for Ethernet port 4 (the default setting is IN).

**Table 2-2 Ethernet Device Connections**

| Network Device Connected to Router                | Router Port     | Ethernet Cable Type <sup>1</sup> | Router TO HUB/TO PC Button Setting | Network Device Button Setting <sup>2</sup> |
|---|-----------------|----------------------------------|------------------------------------|--|
| Hub with equivalent to router TO HUB/TO PC button | ETHERNET port 4 | Straight-through                 | IN                                 | MDI (IN)                                   |
| Hub with equivalent to router TO HUB/TO PC button | ETHERNET port 4 | Straight-through                 | OUT                                | MDI-X (OUT)                                |

**Table 2-2 Ethernet Device Connections (continued)**

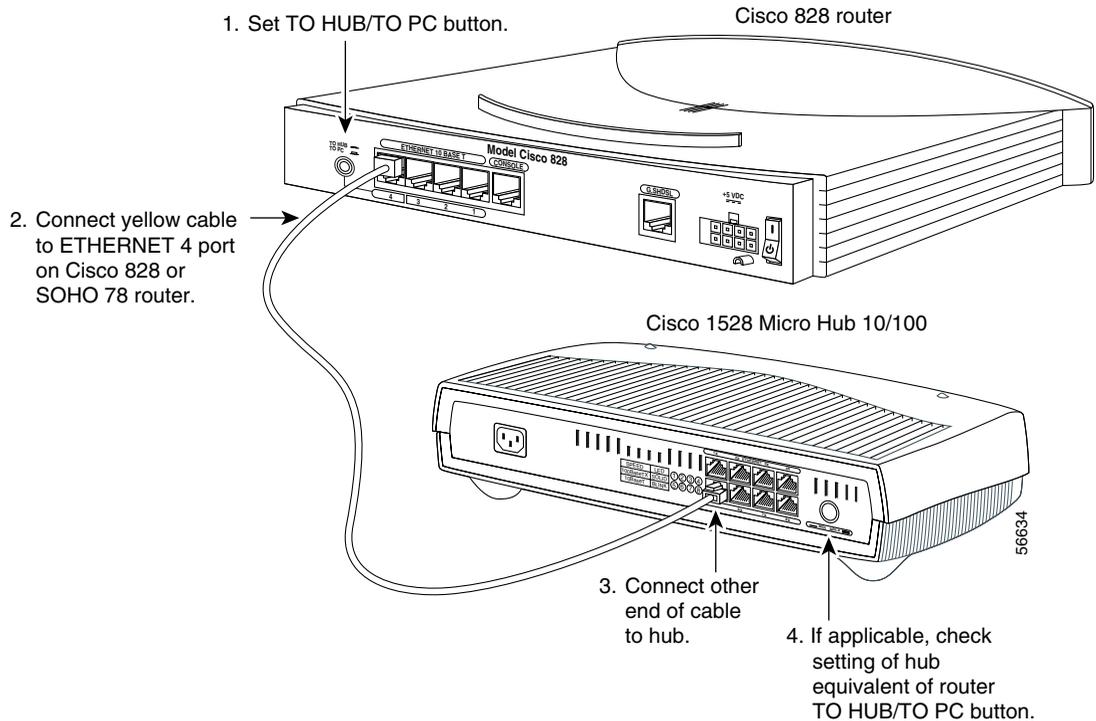
| <b>Network Device Connected to Router</b>            | <b>Router Port</b>    | <b>Ethernet Cable Type<sup>1</sup></b> | <b>Router TO HUB/TO PC Button Setting</b> | <b>Network Device Button Setting<sup>2</sup></b> |
|--|-----------------------|--|---|--|
| Hub without equivalent to router TO HUB/TO PC button | ETHERNET port 4       | Straight-through                       | OUT                                       | MDI-X (OUT)                                      |
| Server, PC, or workstation                           | ETHERNET port 4       | Straight-through                       | OUT                                       | –  |
| Hub with equivalent to router TO HUB/TO PC button    | ETHERNET port 1, 2, 3 | Crossover                              | N/A                                       | MDI (IN)   |
| Hub with equivalent to router TO HUB/TO PC button    | ETHERNET port 1, 2, 3 | Straight-through                       | N/A                                       | MDI-X (OUT)                                      |
| Hub without equivalent to router TO HUB/TO PC button | ETHERNET port 1, 2, 3 | Crossover                              | N/A                                       | MDI-X (OUT)                                      |
| Server, PC, or workstation                           | ETHERNET port 1, 2, 3 | Straight-through                       | N/A                                       | –  |

1. Cisco provides a yellow straight-through cable. You provide crossover or additional straight-through cables. For cable specifications, see Appendix A.
2. Hub vendors choose different names for the button controlling cable selections. For this table, the Cisco 1528 Micro Hub 10/100 with an MDI/MDI-X button is assumed. Determine the button name and setting for your particular hub. See your hub documentation for details.

## Connecting Hubs

Before connecting a hub, see Table 2-2. To connect one of these devices, follow the steps in Figure 2-1.

**Figure 2-1 Connecting a Hub**



To verify your hub connection, ensure that the appropriate Ethernet LED on the front panel is on after you have completed the router installation. For example, if you have connected the cable to Ethernet port 3, ensure that the ETHERNET 3 LED on the front panel is on.

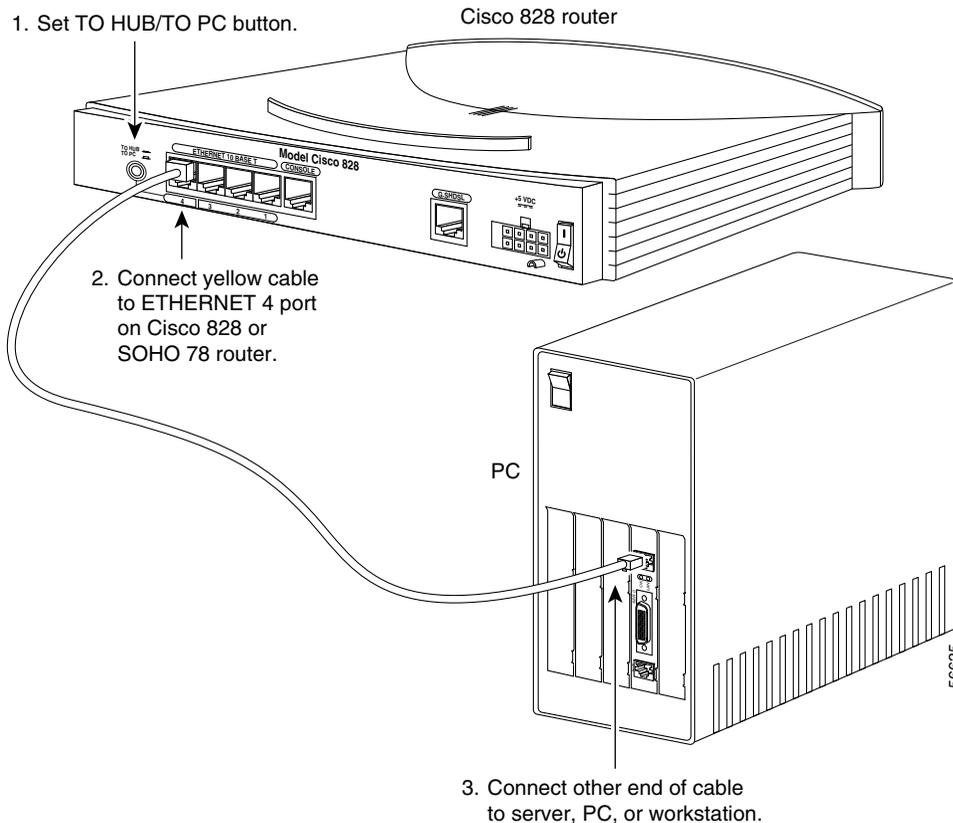
If the LED is not on, see Table 3-2 in Chapter 3 for troubleshooting information.

## Connecting a Server, PC, or Workstation

Before connecting the server, PC, or workstation, see Table 2-2 to determine how to set the router TO HUB/TO PC button.

To connect one of these devices, follow the steps in Figure 2-2.

**Figure 2-2** Connecting a Server, PC, or Workstation



To verify your connection, ensure that the appropriate Ethernet LED is on after the router installation. For example, if you have connected the cable to Ethernet port 4, ensure that the ETHERNET 4 LED on the front panel is on.

If the LED is not on, see Table 3-2 in Chapter 3 for troubleshooting information.

## Connecting the G.SHDSL Line

The procedure for connecting the G.SHDSL line depends on the router and, in some cases, on your location. This section describes how to connect the G.SHDSL line to a cable wall jack.

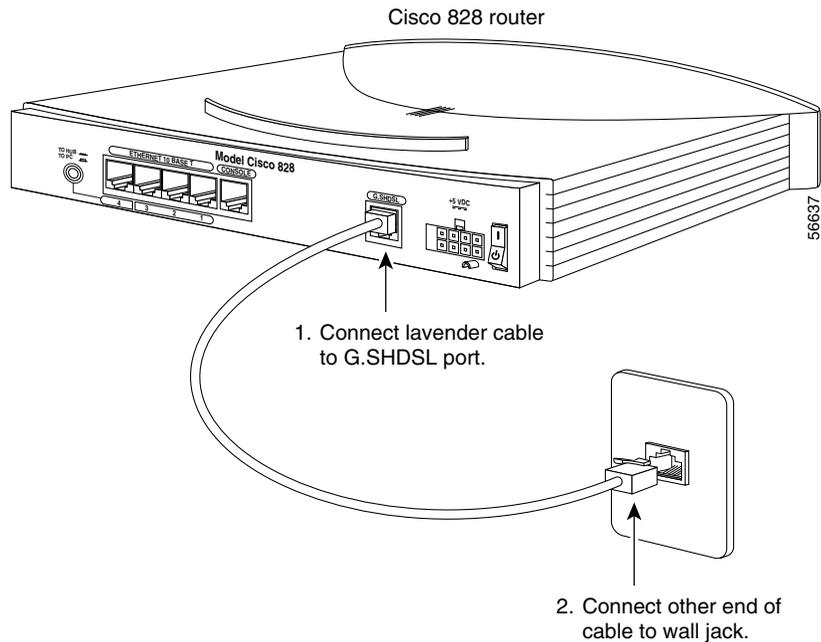


To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.



Do not work on the system or connect or disconnect cables during periods of lightning activity.

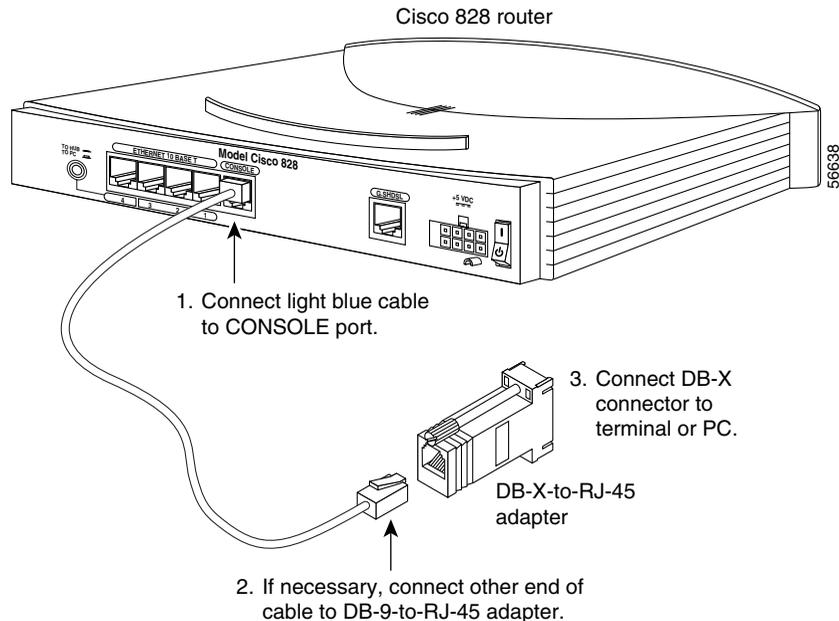
**Figure 2-3** Connecting an G.SHDSL Line to a Wall Jack



## Connecting a Terminal or PC

You can connect either a terminal or a PC for configuring the software, using the CLI, or for troubleshooting. To connect a terminal or PC, follow the steps in Figure 2-4.

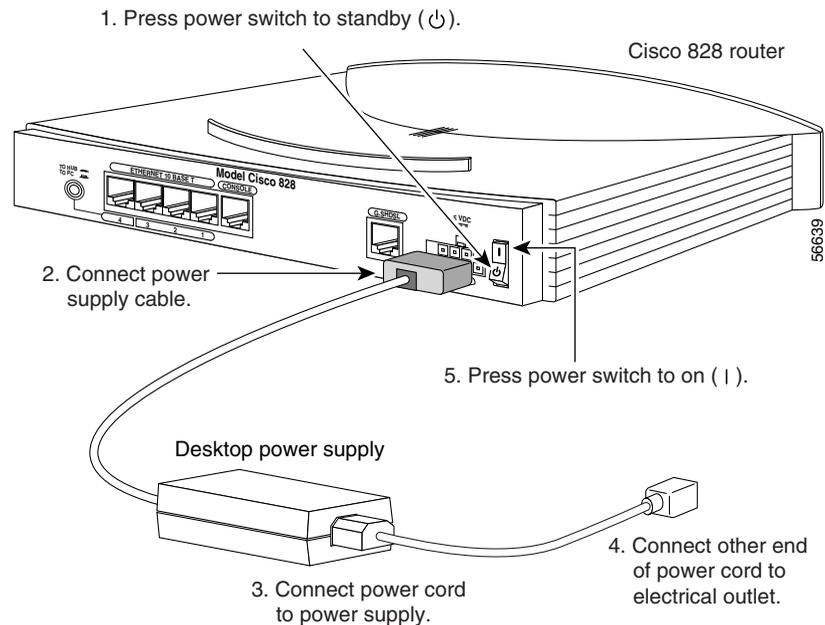
**Figure 2-4** Connecting a Terminal or PC



## Connecting the Power Supply

The power supply on the Cisco 828 router and the SOHO 78 router has a light gray connector and provides dying gasp functionality. The dying gasp feature sends an alert to the router if the box shuts down. For example if there is a power problem at the remote site, the router sends a message to the DLSAM indicated that the router is going to be powered off.

To connect the power supply, follow the steps in Figure 2-5.

**Warning****The device is designed to work with TN power systems.****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, 16A international) is used on the phase conductors (all current-carrying conductors).****Warning****This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.****Figure 2-5 Connecting the Power Supply**

# Verifying the Router Installation

Use this table to verify that you have properly installed the router.

**Table 2-3** Verifying Installation

| Power/Link                         | LEDs to Check  | Normal Patterns   |
|------------------------------------|--|---|
| Power                              | OK   | On  |
| To hub, server, PC, or workstation | ETHERNET 1, 2, 3, or 4;<br>ETHERNET RXD; and<br>ETHERNET TXD | <ul style="list-style-type: none"> <li>• LED is on when the Ethernet is physically connected to the appropriate port.</li> <li>• RXD: blinking when an Ethernet port receives an Ethernet packet.</li> <li>• TXD: blinking when an Ethernet port sends an Ethernet packet.</li> </ul> |

## Mounting the Router

You can mount the router on one of the following surfaces:

- A table or other horizontal surface
- A wall or other vertical surface

### Mounting on Table

Do not cover or obstruct the router air vents, which are located on the router sides.

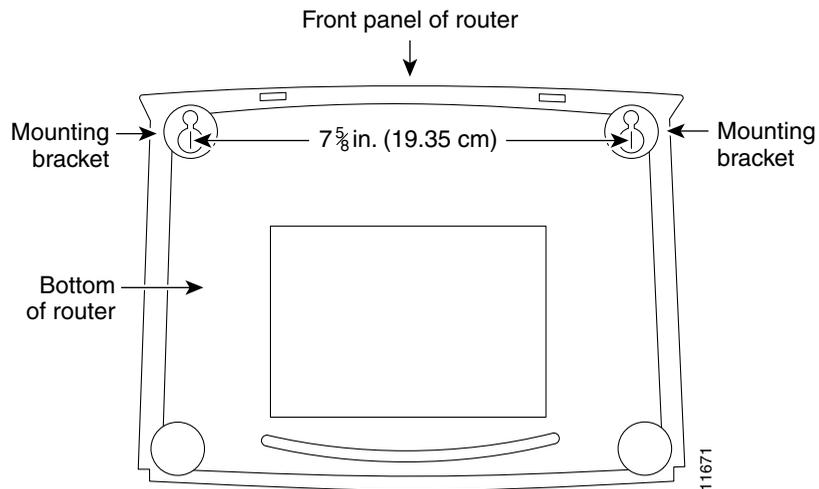
### Mounting on Wall

You can mount the router on a wall or other vertical surface, using the molded mounting brackets on the bottom of the router and two number-six, 3/4-in. (M3.5 x 20 mm) screws. You must provide the screws. Figure 2-6 shows the mounting brackets.

**Caution**

If you are mounting the router on drywall, use two hollow wall anchors (1/8 in. with 5/16-in. drill bit, or M3 with 8-mm drill bit) to secure the screws. If the screws are not properly anchored, the strain of the network cable connections could pull the router from the wall.

**Figure 2-6 Wall-Mounting Brackets (Bottom of Router)**



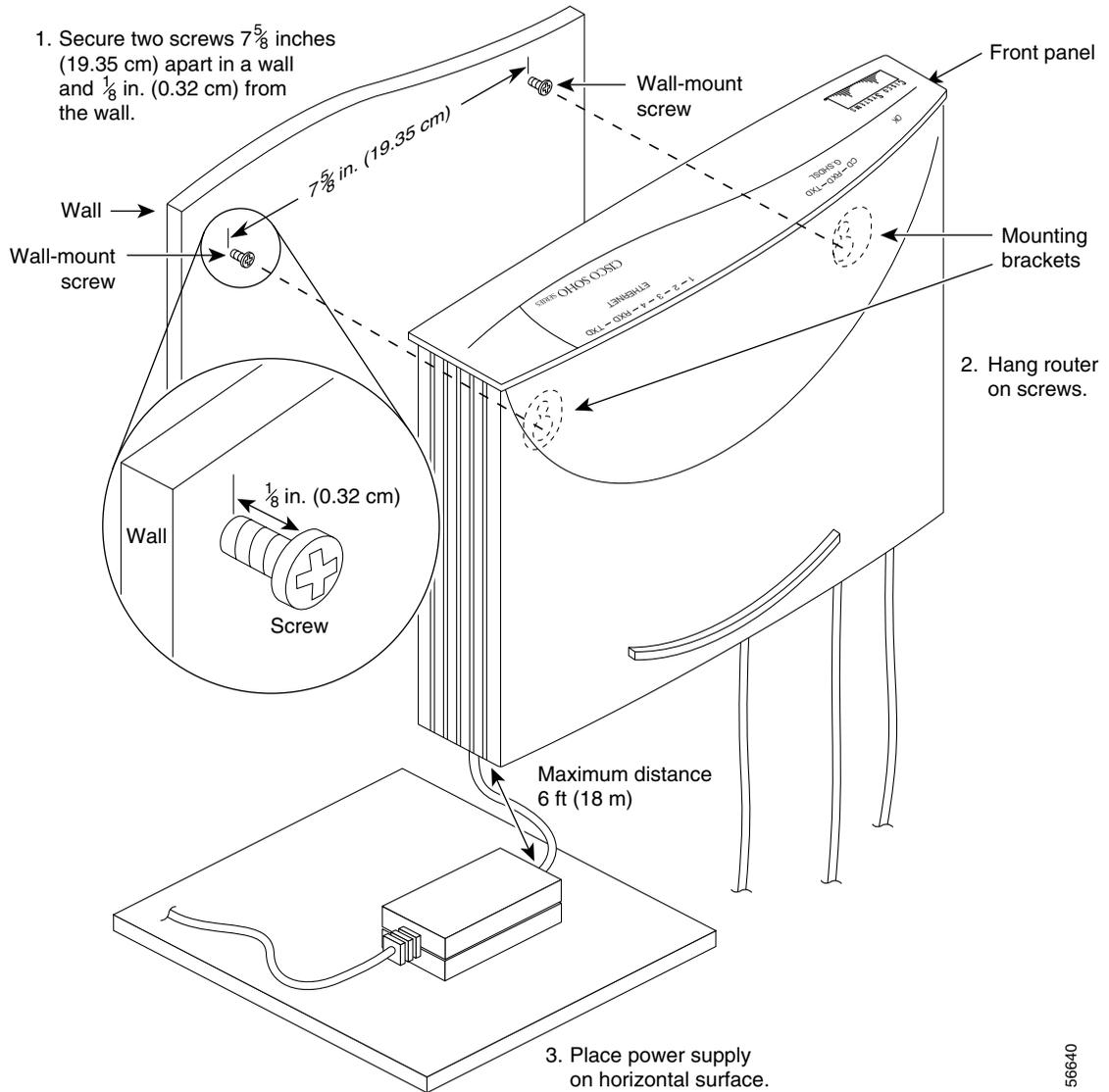
The following conditions must be met when you mount the router:

- Because you will use the LEDs as status and problem indicators, the LEDs on the front panel must face upward and be easily visible.
- The back panel must face downward to reduce strain on the cable connections.
- The power supply must rest on a horizontal surface, such as the floor or a table. If the power supply is not supported, it might place strain on the power supply cable and cause it to disconnect from the connector on the router back panel.

To mount the router, follow the steps in Figure 2-7. The last page of this manual provides a template for measuring the distance between the screws.

## Mounting the Router

**Figure 2-7 Mounting the Router on a Wall**



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# Where to Go from Here

You have completed the hardware installation and are ready to configure the software. For information on how to use the CLI to configure the software, see the *Cisco 828 Router and SOHO 78 Router Software Configuration Guide*





# Troubleshooting

---

This chapter describes problems that could occur with the Cisco 828 router and the SOHO 78 router hardware, describes possible reasons for the problems, and provides steps for solving the problems. The problems are grouped into the following areas:

- Problems during first startup
- Problems after the router has been up and running

For more information on problems that could occur with the software, refer to the *Cisco 828 Router and SOHO 78 Router Software Configuration Guide*.

## Before You Call Your Cisco Reseller

Some of the solutions in this chapter instruct you to contact your Cisco reseller. Before you contact your reseller, gather the following information:

- Router model and serial number (on the back panel)
- Maintenance agreement or warranty information
- Date you received the router
- Brief description of the problem
- Brief description of the steps you have taken to solve the problem

# Problems During First Startup

Table 3-1 lists problems that could occur the first time you turn on the power switch.

**Table 3-1** Problems During First Startup

| Symptom  | Problem  | Solutions  |
|--|--|--|
| All LEDs, including the OK LED, are off.                 | No power to the router.  | Perform the following steps: <ol style="list-style-type: none"> <li>1. Make sure that the power switch is set to ON.</li> <li>2. Make sure that all connections to and from the power supply are secure.</li> <li>3. Make sure that the power outlet has power.</li> <li>4. If the problem continues, the power supply might be faulty. Contact your Cisco reseller.</li> </ol>  |
| No connection to Ethernet device. (Ethernet LED is off.) | A cable-related problem: <ul style="list-style-type: none"> <li>• Improperly connected cable.</li> <li>• Damaged cable.</li> </ul> | Perform the following steps: <ol style="list-style-type: none"> <li>1. To make sure that you have cabled the device correctly, see Figure 2-1 or Figure 2-2 in Chapter 2, “Installation.”</li> <li>2. Make sure that the connectors at both ends of the cable are securely seated.</li> <li>3. Make sure the cable is not physically damaged. If it is damaged, order another cable from Cisco Systems, or replace it with a similar cable.</li> </ol> |
|  | Improperly set router TO HUB/TO PC button or hub equivalent of TO HUB/TO PC button.  | To make sure that you have set the buttons correctly, see Table 2-2 in Chapter 2, “Installation.”  |

**Table 3-1** *Problems During First Startup (continued)*

| Symptom   | Problem                     | Solutions  |
|---|-----------------------------|--|
| No connection to G.SHDSL link.<br>(The CD LED on the front panel is off for a long time.) | Wrong cable.                | To make sure that you are using the correct cable, see Appendix A.   |
|   | Improperly connected cable. | <ul style="list-style-type: none"><li>• To make sure that you have cabled the router properly, see Figure 2-3 in Chapter 2, “Installation.”</li><li>• Make sure that the connectors at both ends of the cable are securely seated.</li></ul> |

# Problems After Router Is Running

Table 3-2 lists problems that could occur after the router has been up and running.

**Table 3-2** Problems After Router Is Running

| Symptom   | Problem  | Solutions   |
|---|--|---|
| Problems with the Ethernet connection. (Ethernet LED is off.)                                   | A cable-related problem: <ul style="list-style-type: none"> <li>• Disconnected cable.</li> <li>• Damaged cable.</li> </ul> | Perform the following steps: <ol style="list-style-type: none"> <li>1. Make sure that the connectors at both ends of the cable are secure.</li> <li>2. Make sure that the cable is not physically damaged. If it is damaged, order another cable from Cisco Systems, or replace it with a similar cable.</li> </ol> |
| Connection to the G.SHDSL line is intermittent or lost. (The CD LED on the front panel is off.) | A cable-related problem: <ul style="list-style-type: none"> <li>• Disconnected cable.</li> <li>• Damaged cable.</li> </ul> | Perform the following steps: <ol style="list-style-type: none"> <li>1. Make sure that the connectors at both ends of the cable are secure.</li> <li>2. Make sure that the cable is not physically damaged. If it is damaged, order another cable from Cisco Systems, or replace it with a similar cable.</li> </ol> |
|   | Problem with G.SHDSL line or WAN service.  | Contact your G.SHDSL line or WAN service provider to determine whether there is a problem.  |



## Specifications and Cables

This appendix provides system, port, and cabling specifications for the Cisco 828 router and the SOHO 78 router.

### System Specifications

Table A-1 outlines the system specifications for the Cisco 828 router and the SOHO 78 router.

**Table A-1 System Specifications**

| Description                                  | Design Specification   |
|--|--|
| <b>Physical Dimensions</b>                   |  |
| Dimensions (H x W x D)                       | 2.0 x 9.7 x 8.5 in. (5.1 x 24.6 x 21.6 cm)                               |
| Dimensions with cables connected (H x W X D) | 2.0 x 9.7 x 10.3 in. (5.1 x 24.6 x 26.2 cm)                              |
| Weight (excludes desktop power supply)       | Cisco 828 router: 1.47 lb (0.67 kg)<br>SOHO 78 router: 1.43 lb (0.65 kg) |
| <b>Environmental Operating Ranges</b>        |  |
| Nonoperating temperature                     | -4 to 149°F (-20 to 65°C)  |
| Nonoperating humidity                        | 5 to 95%, relative humidity  |
| Nonoperating altitude                        | 0 to 15,000 ft (4570 m)  |
| Operating temperature                        | 32 to 104°F (0 to 40°C)  |

**Table A-1 System Specifications (continued)**

| Description         | Design Specification         |
|---------------------|------------------------------|
| Operating humidity  | 10 to 85%, relative humidity |
| Operating altitude  | 0 to 10,000 ft (3000 m)      |
| <b>Router Power</b> |                              |
| AC input voltage    | 100 to 240V                  |
| Frequency           | 50 to 60 Hz                  |
| Power consumption   | 15W maximum                  |

For information on regulatory compliance, see the *Regulatory Compliance and Safety Information for Cisco 828 and SOHO 78 Routers* document that shipped with your router.



**Warning**

**Ultimate disposal of this product should be handled according to all national laws and regulations.**

## Port Connector Pinouts

This section provides pinouts for the following connectors:

- Ethernet— See Table A-2, Table A-4, and Table A-5
- Console (for connecting a terminal or PC)—See Table A-3

**Table A-2 Cisco 828 Router and SOHO 78 Router Ethernet Connector Pinouts (RJ-45)**

| <b>Pin</b> | <b>Function<br/>(TO HUB/TO PC Button –<br/>IN Position)</b> | <b>Function<br/>(TO HUB/TO PC Button –<br/>OUT Position)</b> |
|------------|---|--|
| 1          | TX+   | RX+  |
| 2          | TX–   | RX–  |
| 3          | RX+   | TX+  |
| 4          | Unused  | Unused   |
| 5          | Unused  | Unused   |
| 6          | RX–   | TX–  |
| 7          | Unused  | Unused   |
| 8          | Unused  | Unused   |

**Table A-3 Console Connector Pinouts (RJ-45)**

| <b>Pin</b> | <b>Function</b> |
|------------|-----------------|
| 1          | RTS             |
| 2          | DTR             |
| 3          | TXD             |
| 4          | GND             |
| 5          | GND             |
| 6          | RXD             |
| 7          | DSR             |
| 8          | CTS             |

The console port is configured as a data communications equipment (DCE) device. The default parameters for the console port are as follows:

- 9600 baud
- 8 data bits
- No parity
- One stop bit

## Cabling Specifications

This section provides specifications for the following types of Ethernet cables, which you might need to provide:

- Straight-through
- Crossover

This section also provides information on Ethernet cable distance limitations.

## Ethernet Cable Specifications

Table A-4 provides the specifications for straight-through and crossover Ethernet cables. See the Glossary for definitions for straight-through and crossover Ethernet cables.

**Table A-4 Ethernet Cable Specifications**

| Type    | Category        | Shielding                     |
|---------|-----------------|-------------------------------|
| 10BaseT | Category 3 or 5 | Shielded twisted-pair (STP)   |
| 10BaseT | –               | Unshielded twisted-pair (UTP) |

## Maximum Cable Distances

Table A-5 shows the maximum distances of Ethernet and xDSL cables that you can use.

**Table A-5** *Maximum Cable Distances*

| <b>Cable</b>   | <b>Maximum Distance</b> |
|----------------|-------------------------|
| Ethernet cable | 328 ft (100 m)          |
| xDSL cable     | 500 ft (152 m)          |





---

## Numerics

### 10BaseT

The 10-Mbps baseband Ethernet specification that uses two pairs of twisted-pair cabling (Category 3 or 5): one pair for transmitting data and the other for receiving data.

---

## C

**carrier detect (CD)** Signal that indicates whether the G.SHDSL line is active.

**crossover Ethernet cable** A cable that wires a pin to its opposite pin; for example, RX+ is wired to TX+. A crossover Ethernet cable connects two similar devices, such as two data terminal equipment (DTE) or data communications equipment (DCE) devices.

---

## D

**DRAM** Dynamic RAM. RAM that stores information that must be refreshed periodically in capacitors.

---

**E**

**EMI** Electromagnetic interference. Interference by electromagnetic signals that can cause reduced data integrity and increased error rates on transmission channels.

**ESD** Electrostatic discharge. A transfer of electrostatic charge between bodies of different electrostatic potentials, such as an operator and a piece of electrical equipment. ESD occurs when electronic components are improperly handled and can damage equipment and impair electrical circuitry. ESD is more likely to occur in the presence of synthetic fibers and dry atmosphere.

---

**F**

**Flash memory** The nonvolatile storage that can be electrically erased and reprogrammed so that data can be stored, booted, and rewritten as necessary.

---

**G**

**G.SHDSL** Symmetrical high-data-rate digital subscriber line technology that enables high-speed transmission over the “last mile” between the service provider and the customer site.

---

**M**

**MDI** Media-dependent interface. A port on an Ethernet network device used to connect the device to the Ethernet network, usually through a hub or switch.

**MDI-X** Media-dependent interface, crossover. A port on an Ethernet hub, such as the Cisco 1528 Micro Hub 10/100, that connects the Ethernet network devices through the MDI port to create a network.

---

**S**

**SELV** Safety extra-low voltage. A secondary circuit that under normal conditions has a voltage less than 42.4V peak or 42 VDC. Under a single fault condition, this circuit should not exceed these values for longer than 0.2 second and should not exceed 71V peak or 120 VDC.

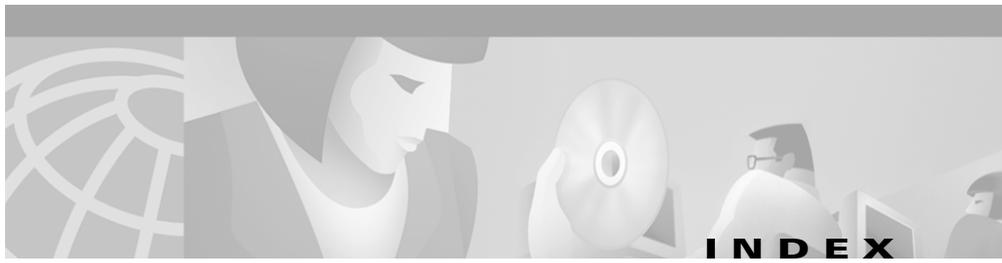
**straight-through Ethernet cable** A cable that wires a pin to its equivalent pin. This cable typically connects a router to a hub. A straight-through Ethernet cable is the most common cable used.

---

**T**

**TO HUB/TO PC button** With this button, you can connect hubs, servers, PCs, and workstations, using the yellow Ethernet (straight-through) cable instead of a crossover Ethernet cable, which you would need to supply. This button identifies the device that you connect to the router Ethernet port. Setting the button to the TO HUB position (in) indicates that you are connecting a hub; setting the button to the TO PC position (out) indicates that you are connecting a server, PC, or workstation.





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