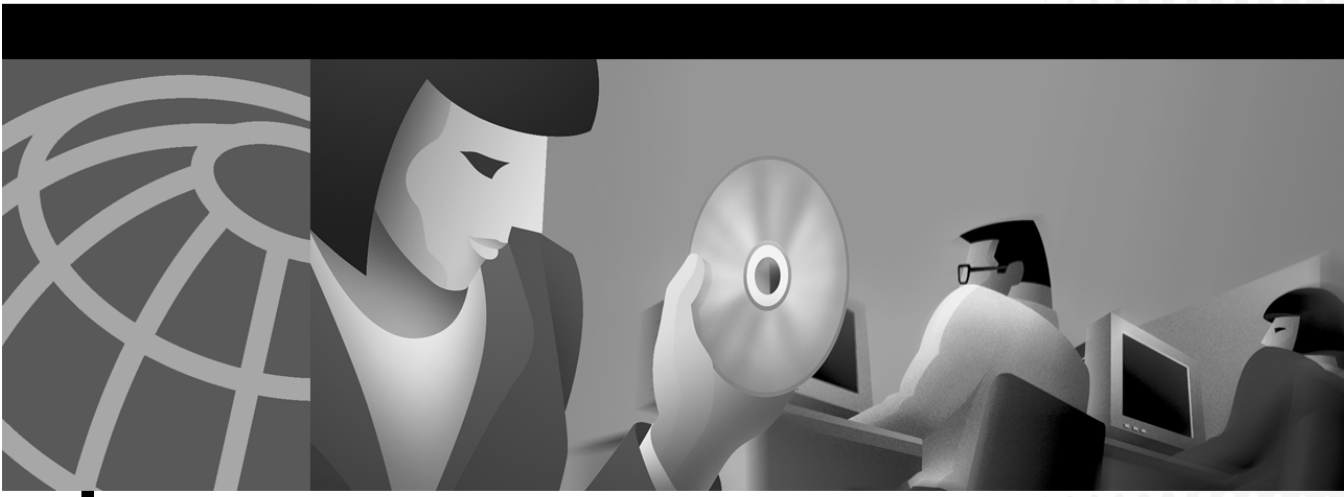

Cisco 1721 Router Hardware Installation Guide

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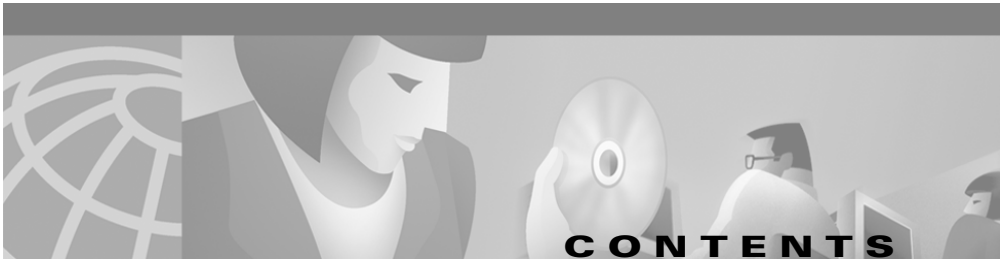

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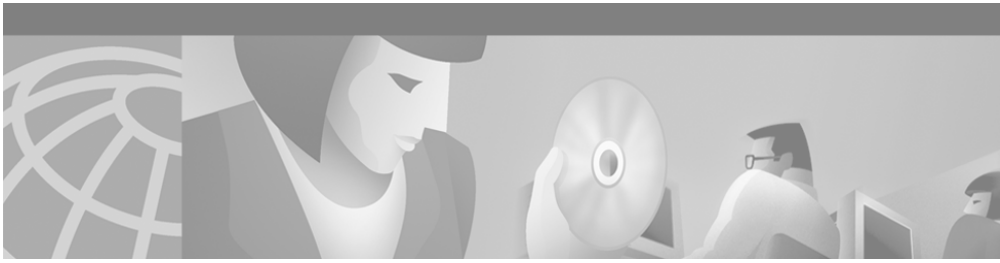

Preface

This section discusses the intended audience, scope, and organization of the *Cisco 1721 Router Hardware Installation Guide* and defines the conventions used to convey instructions and information.

Audience and Scope

This guide is for users who have some experience installing and maintaining networking hardware. Cisco 1721 router users should be familiar with the terminology and concepts of local Ethernet and wide-area networking.

This guide describes the functional and physical features of the Cisco 1721 router and provides installation procedures, troubleshooting information, technical specifications, and cable and connector guidelines and specifications.

Organization

This guide is organized as follows:

- Chapter 1, "Cisco 1721 Router Overview," describes the router features, LEDs, and connectors.
- Chapter 2, "Installation," describes how to install the router by connecting cables and power, and tells how to install WAN interface cards (WICs).
- Chapter 3, "Troubleshooting," describes some problems that you might have with the router and how to solve these problems.

- Appendix A, "Technical Specifications," lists the physical characteristics, environmental requirements, and power specifications for the router.
- Appendix B, "Cabling Specifications," describes the cables and cabling guidelines for the router.
- Appendix C, "Installing and Upgrading Memory and Virtual Private Network Modules," describes how to install or upgrade memory modules in your router.
- Appendix D, "Ordering and Configuring an ISDN Line," describes how to order and configure ISDN line so that it will operate with a Cisco 1700 Series router.

Related Documentation

The following publications provide related information on this product:

- The *Quick Start Guide for Installing Your Cisco 1721 Router,* which came with your router, has instructions for quickly cabling and powering up the router.
- *Cisco 1700 Router Software Configuration Guide* describes some common network scenarios and how to use the Cisco IOS command-line interface (CLI) to configure the router in these scenarios.
- *Cisco WAN Interface Cards Hardware Installation Guide* describes how to install and configure the WICs that are supported by the Cisco 1721 router.
- Cisco IOS command reference and configuration guides provide complete information about all Cisco IOS CLI commands and how to use them, as well as information on designing and configuring LANs and WANs.

Conventions

This guide uses the following conventions for information and instructions.

Notes, Cautions, and Warnings

Notes, cautions, and warnings use the following conventions and symbols:

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution This caution 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 standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.**

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. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.**

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. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).**

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. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.**

Warnung **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. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.**

Avvertenza **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. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.**

Advarsel **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.**

Aviso **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. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.**

¡Advertencia! **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. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.**

Varning! **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. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.**

Commands

Table 1 describes the syntax used with the commands in this document.

Table 1 Command Syntax Guide

Convention	Description
boldface	Commands and keywords.
italic	Command input that is supplied by you.
[ ]	Keywords or arguments that appear within square brackets are optional.
{**x** | **x** | **x**}	A choice of keywords (represented by **x**) appears in braces separated by vertical bars. You must select one.
^ or Ctrl	Represent the key labeled *Control*. For example, when you read ^*D* or *Ctrl-D*, you should hold down the Control key while you press the D key.
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information that you must enter.
< >	Nonprinting characters, such as passwords, appear in angled brackets.
[ ]	Default responses to system prompts appear in square brackets.

Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

http://www.cisco.com

Translated documentation is available at the following URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/go/subscription

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

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You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

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Attn: Document Resource Connection
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

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Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

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You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

http://www.cisco.com

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

http://www.cisco.com/register/

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

Cisco 1721 Router Overview

This chapter introduces the Cisco 1721 router, also referred to in this guide as *the router*, and covers the following topics:

- Key Features
- Back Panel Ports and LEDs
- Front Panel LEDs
- Router Memory
- Unpacking the Router
- Additional Required Equipment

Key Features

The Cisco 1721 router (see Figure 1-1) is a small, modular desktop router that links small- to medium-size remote Ethernet and Fast Ethernet LANs over one to four WAN connections to regional and central offices. Table 1-1 lists the key features of the router.

Figure 1-1 Cisco 1721 Router

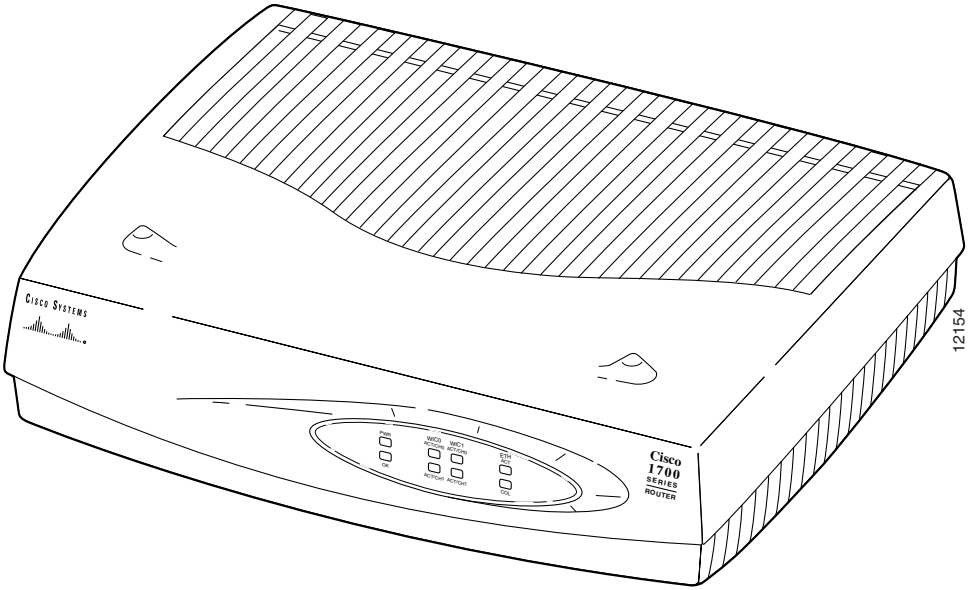


Table 1-1 Key Features

Feature	Description
One Fast Ethernet (10/100BASE-TX) port	• Operates in full- or half-duplex mode (with manual override available). • Supports autosensing for 10- or 100-Mbps operation. • Supports IEEE 802.1Q VLAN encapsulation.
Two Cisco WAN interface card (WIC) slots	• Supports a combination of any two of the following WICs: ISDN BRI, 56-kbps DSU/CSU, FT1/T1 DSU/CSU, high-speed serial, dual-serial, ADSL, G.SHDSL, and Ethernet. • The WAN interface configuration can be changed as your network requirements change.
Console port	Supports router configuration and management with a directly-connected terminal or PC. Supports up to 115.2 kbps.
Auxiliary port	Supports modem connection to the router, which can be configured and managed from a remote location. Supports up to 115.2 kbps.
VPN hardware-assisted 3DES encryption module	Provides IPSEC DES and 3DES hardware encryption.
SNMP support	Router can be managed over a network using Simple Network Management Protocol (SNMP).
AutoInstall support	Configuration files can be easily downloaded to the router over a WAN connection.
Kensington security slot	Router can be secured to a desktop or other surface using Kensington lockdown equipment.
Cisco ConfigMaker support	You can set up networks that include the Cisco 1721 router using the Cisco ConfigMaker application, a wizards-based software tool that helps you easily configure and address Cisco routers, access servers, hubs, switches, and networks.
Support for Cisco IOS software features	Supports IP, IPX, AppleTalk, IBM, Open Shortest Path First (OSPF), NetWare Link Services Protocol (NLSP), Resource Reservation Protocol (RSVP), encryption, network address translation, and the Cisco IOS Firewall Feature Set.

Back Panel Ports and LEDs

This section describes the router back panel ports and LEDs, which are shown in Figure 1-2 and described in Table 1-2 and Table 1-3.

Figure 1-2 Back Panel Ports and LEDs

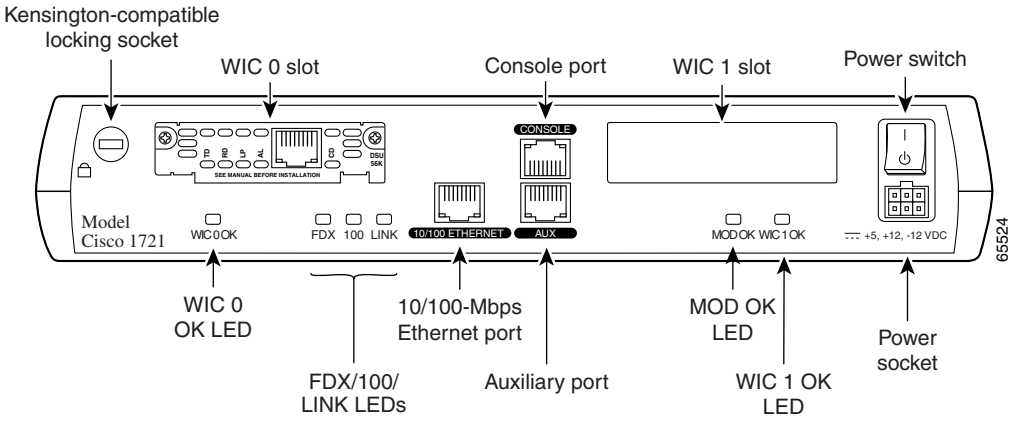


Table 1-2 Back Panel Connectors

Connector/Slot	Label/Color	Description
Ethernet port	10/100 ETHERNET (yellow)	Connects the router to the local Ethernet network through this port. This port autosenses the speed (10 Mbps or 100 Mbps) and duplex mode (full- or half-) of the device to which it is connected and then operates at the same speed and in the same duplex mode.
Auxiliary port	AUX (black)	Connects to a modem for remote configuration with Cisco IOS software.
Console port	CONSOLE (blue)	Connects to a terminal or PC for local configuration using Cisco IOS software.

Table 1-2 Back Panel Connectors (continued)

Connector/Slot	Label/Color	Description
WIC slot 0 (WIC0)	No label	Supports one Cisco WIC. For detailed information, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, which comes with every card.
WIC slot 1 (WIC1)	No label	Supports one Cisco WIC. For detailed information, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, which comes with every card.

Use the back panel LEDs during router installation to confirm that you have correctly connected all the cables to the router.

Table 1-3 Back Panel LEDs

LED Label	Color	Description
WIC0 OK	Green	On when a WIC is correctly inserted in the card slot.
FDX	Green	On solid—Ethernet port is operating in full-duplex mode. Off—Ethernet port is operating in half-duplex mode.
100	Green	On solid—Ethernet port is operating at 100 Mbps. Off—Ethernet port is operating at 10 Mbps.
LINK	Green	On when the Ethernet link is up.
MOD OK	Green	On when the VPN hardware encryption module is installed and recognized by the IOS.
WIC1 OK	Green	On when a WIC is correctly inserted in the card slot.

Front Panel LEDs

Use the router front panel LEDs to determine network activity and status on the Ethernet port and on the WIC ports. The front panel LEDs are illustrated in Figure 1-3 and described in Table 1-4.

Figure 1-3 Front Panel LEDs

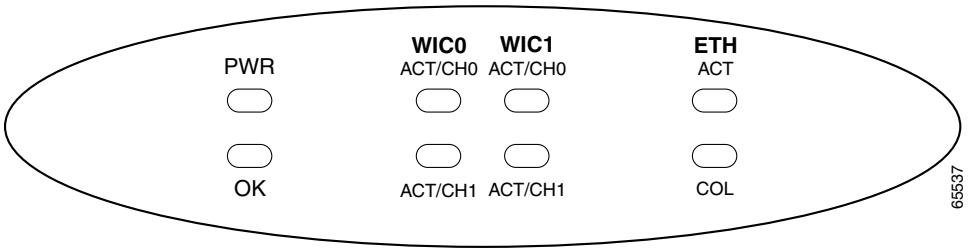


Table 1-4 Front Panel LEDs

LED Label	Color	Description
PWR	Green	On means that DC power is being supplied to the router.
OK	Green	On means that the router has successfully booted up and the software is functional. This LED blinks during the power-on self-test (POST). See the section "OK LED Diagnostics" in Chapter 3, "Troubleshooting," for information on how to use this LED for router diagnostics.
WIC0		
ACT/CH0	Green	Serial and DSU/CSU cards—Blinks when data is being sent to or received from the port on the card in the WIC0 slot.
		ISDN cards—On solid when the first ISDN B channel is up for the card in the WIC0 slot.
		2-port serial cards—Blinks when data is being sent to or received from the first port on the 2-port card in the WIC0 slot.
ACT/CH1	Green	Serial and CSU/DSU cards—Remains off.
		ISDN cards—On solid when the second ISDN B channel is up for the card in the WIC0 slot
		2-port serial cards—Blinks when data is being sent to or received from the second port on the 2-port card in the WIC0 slot.

Table 1-4 Front Panel LEDs (continued)

LED Label	Color	Description
WIC1		
ACT/CH0	Green	Serial and DSU/CSU cards—Blinks when data is being sent to or received from the port on the card in the WIC1 slot.
		ISDN cards—On solid when the first ISDN B channel is up for the card in the WIC1 slot.
		2-port serial cards—Blinks when data is being sent to or received from the first port on the 2-port card in the WIC1 slot.
ACT/CH1	Green	Serial and DSU/CSU cards—Remains off.
		ISDN cards—On solid when the second ISDN B channel is up for the card in the WIC1 slot.
		2-port serial cards—Blinks when data is being sent to or received from the second port on the 2-port card in the WIC1 slot.
ETH		
ACT	Green	Blinks when there is network activity on the Ethernet port.
COL	Yellow	Blinks when there are packet collisions on the local Ethernet network.

Router Memory

This section describes the types of memory stored in the router and how to find out how much of each type of memory is stored in the router.

For instruction on how to upgrade memory in the router, see Appendix C, "Installing and Upgrading Memory and Virtual Private Network Modules."

Types of Memory

The Cisco 1721 router has the following types of memory:

- Dynamic random-access memory (DRAM)—This is the main storage memory for the router. DRAM is also called *working storage*. It contains the dynamic configuration information. The Cisco 1721 router stores a working copy of the Cisco IOS software, dynamic configuration information, and routing table information in DRAM.
- Nonvolatile random-access memory (NVRAM)—This type of memory contains a backup copy of your configuration. If the power is lost or the router is turned off, this backup copy enables the router to return to operation without reconfiguration.
- Flash memory—This special kind of erasable, programmable memory contains a copy of the Cisco IOS software. The Flash memory structure can store multiple copies of the Cisco IOS software. You can load a new level of the operating system in every router in your network and then, when convenient, upgrade the whole network to the new level.

Amounts of Memory

Use the **show version** command to view the amount of DRAM, NVRAM, and Flash memory stored in your router. The following example of the **show version** command output displays the amount of memory in this router.

```
1721# show version
Cisco Internetwork Operating System Software
IOS (tm) C1700 Software (C1700-K9SY-M), Version 12.2(4)YA EARLY
DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Mon 14-Jan-02 16:34 by ramesh
Image text-base: 0x80008108, data-base: 0x80BC77E8

ROM: System Bootstrap, Version 12.2(7r)XM1, RELEASE SOFTWARE (fc1)

1721 uptime is 4 days, 23 hours, 54 minutes
System returned to ROM by reload
Running default software

cisco 1721 (MPC860P) processor (revision 0x101) with 36864K/12288K
bytes of memory.
```

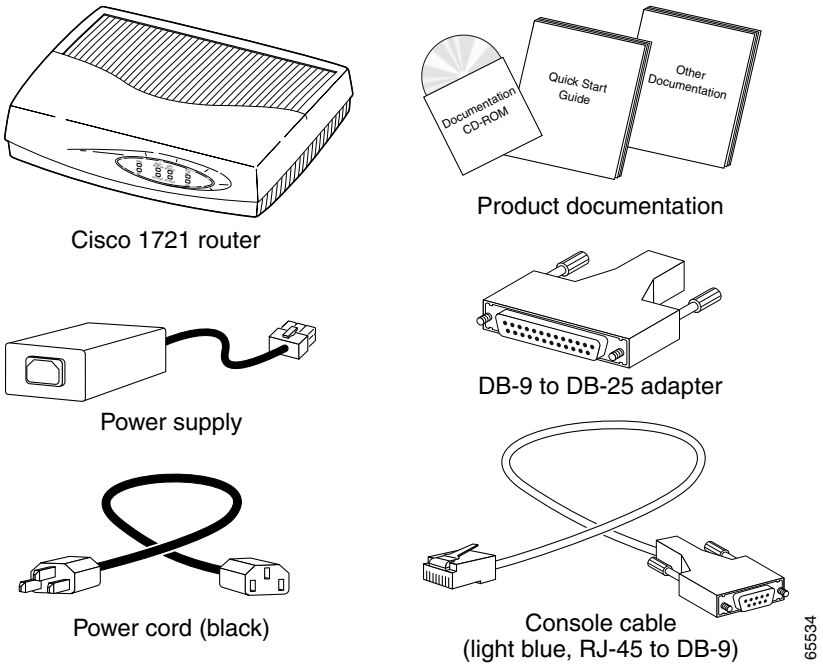
```
Processor board ID VEN0539000D (3033334544), with hardware revision
0000
MPC860P processor: part number 5, mask 2
Bridging software.
X.25 software, Version 3.0.0.
1 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
1 Virtual Private Network (VPN) Modules(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)

Configuration register is 0x0
```

Unpacking the Router

Figure 1-4 shows the items that come with your router. All of these items are in the accessory kit that is inside the box that your router came in.

Figure 1-4 Router Box Contents



Additional Required Equipment

Depending on your local network and on which Cisco WICs you install in your router, you will require other items, listed in Table 1-5, to complete your router installation.

Table 1-5 Additional Required Equipment

Equipment	When You Use It
Ethernet hub	A hub connects pieces of network equipment (including the Cisco 1721 router) to create a network. You can use a 10-, 100-, or 10/100-Mbps hub with the Cisco 1721 router.
Ethernet switch	A switch connects pieces of network equipment (including the Cisco 1721 router) to create a network. You can use a 10-, 100-, or 10/100-Mbps switch with the Cisco 1721 router.
Phillips screwdriver	Although the WICs use thumbscrews, you might need a Phillips screwdriver to loosen the WIC slot cover.
Cisco WIC	In order to make a WAN connection, the Cisco 1721 router must have a supported WIC installed. The router supports up to two cards. You can order the cards when you order the router, and they will be installed for you. Or, you can order the cards separately, after you receive the router, and then install them yourself.
Straight-through RJ-45-to-RJ-45 cable	This cable connects the router to the Ethernet LAN and connects the WICs to various WAN services, including ISDN, T1/FT1, and 56-kbps services. You will need one cable for each connection that requires this cable type.
Serial cable	This cable connects a serial card to serial services. You must order this cable from Cisco. For detailed information about serial cable types, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, which comes with every card.
NT-1	Some ISDN service providers require a Network Termination 1 (NT-1) device to connect an ISDN S/T port to the ISDN line.
Asynchronous modem	Connect a modem to the AUX port on the router when you want to configure the router from a remote location.

Installation

This chapter provides procedures for installing the Cisco 1721 router and includes the following sections:

- Before Installing the Router
- Connecting the Router to Your Local Network
- Installing WICs
- Connecting Power to the Router
- Verifying Your Installation
- Optional Installation Steps

Before Installing the Router

The Cisco 1721 router is shipped ready for desktop mounting. Before making the power and network connections, simply set the router on a desktop, shelf, or other flat surface.

Note For instructions on wall-mounting the router, see the "Wall-Mounting" section later in this chapter.

Be sure to read the safety information in the *Regulatory Compliance and Safety Information for Cisco 1700 Routers* document that came with your router.

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

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

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

Connecting the Router to Your Local Network

The Cisco 1721 router is connected to your local Ethernet network through the yellow 10/100 Ethernet port. You must provide the following items for this connection:

- A straight-through, RJ-45-to-RJ-45, Ethernet cable
- A 10/100-Mbps Ethernet hub or switch

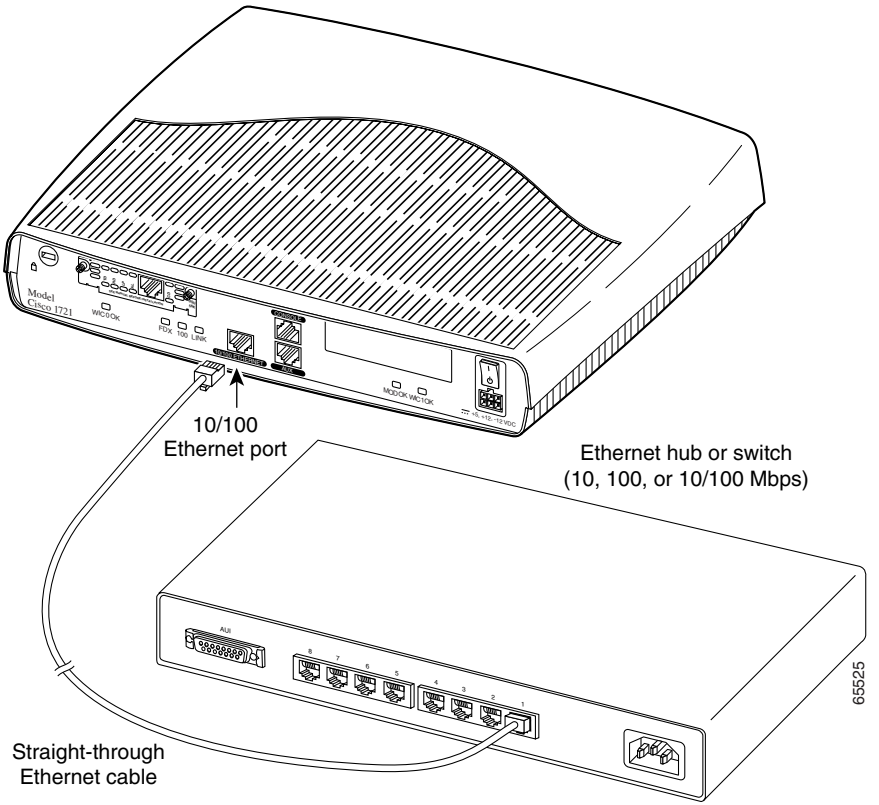
Warning **The ports labeled 10/100 ETHERNET and CONSOLE are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits. Because BRI circuits are treated like telephone-network voltage, avoid connecting the SELV circuits to the telephone network voltage (TNV) circuits. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information for Cisco 1700 Routers* document that came with the router.)**

Caution Always connect the Ethernet cable to the yellow ports on the router. Do not connect the cable to an ISDN S/T or U port (on a WIC) or to an NT-1 that is connected to a WIC. Accidentally connecting the cable to the wrong port can damage your router.

Follow these steps to connect the router to the local network:

Step 1 Connect one end of the cable to the yellow Ethernet port (labeled 10/100 ETHERNET), as shown in Figure 2-1.

Figure 2-1 Connecting the Router to the Local Network



Step 2 Connect the other end of the cable to a network port on the hub or switch.

Installing WICs

The Cisco 1721 router supports one or two Cisco WAN interface cards (WICs). Each card has one or two WAN ports. This section describes the general procedure for installing a card in the Cisco 1721 router.

Note For details on specific WICs, how to connect the card to the WAN line, and how to configure the interface with Cisco IOS software, refer to the *Cisco WAN Interface Cards Hardware Installation Guide* that came with the card(s).

Safety Information

This section lists safety warnings that you should be aware of before installing WICs in the router.

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information for Cisco 1700 Routers* document that came with the router.)**

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. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information for Cisco 1700 Routers* document that came with the router.)**

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information for Cisco 1700 Routers* document that came with the router.)**

Caution Do not connect a WAN cable to the card until you have completed the installation procedure.

WIC Installation

This section describes how to install WICs in the router.

Installing the Cards in Correct Sequence

The Cisco 1721 router discovers interfaces on WICs installed in the WIC0 slot before it discovers those installed in the WIC1 slot. This can affect your router configuration. This section describes how to ensure that your existing router configuration is not affected when you install WICs.

If you are installing a WIC in the router for the first time, install the card in the WIC0 slot to ensure that your software configuration will not be affected if you install a second card at a later time.

If you are installing a second WIC in a Cisco 1721 that has a card installed in the WIC1 slot, follow this general procedure to prevent having to reconfigure your router:

Caution Read the instructions in the following section, "Installing the Cards," before you install the cards.

Step 1 Remove the installed card from the WIC1 slot.

Step 2 Reinstall the card (removed in Step 1) in the WIC0 slot.

Step 3 Install the new card in the WIC1 slot.

Installing the Cards

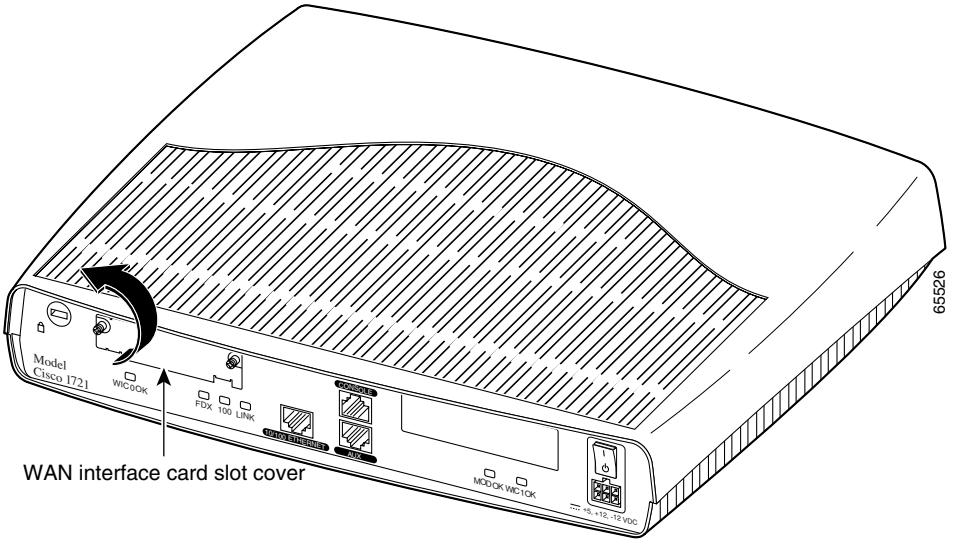
Follow these steps to install the card in a Cisco 1721 router:

Step 1 Make sure that the power switch is set to the STANDBY position (⏻) and that the power cable is not connected to the power socket on the rear panel.

Caution Power must be removed from the system prior to installing or removing WICs to avoid damaging them. When WICs are pushed into or pulled out of a router that is powered up, there is a very good chance that they could be damaged electrically and will no longer function.

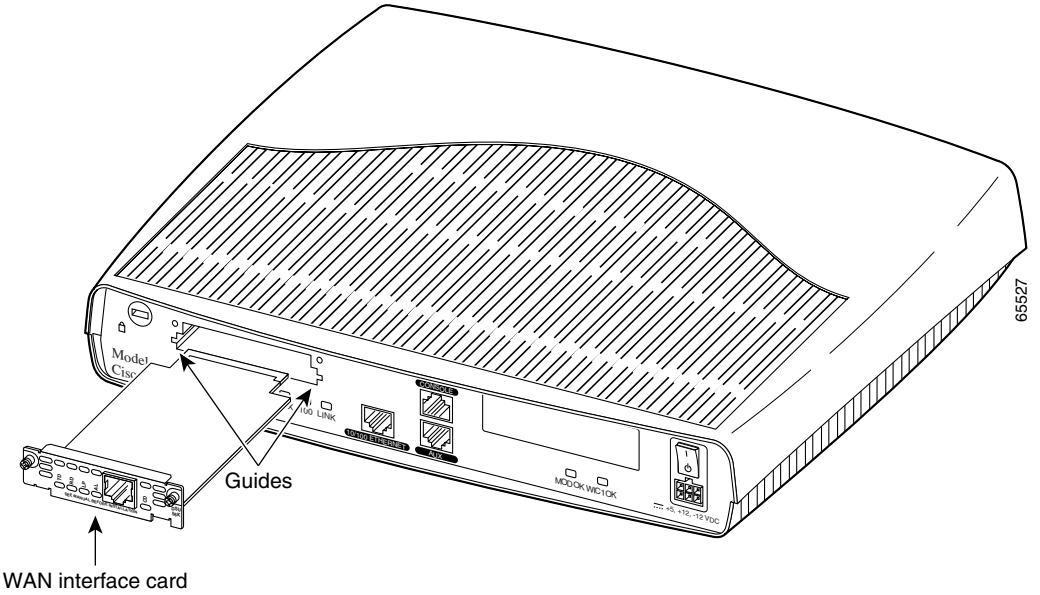
Step 2 Loosen the thumbscrews on the WIC slot cover on the rear panel, as shown in Figure 2-2, and then remove the slot cover. You should be able to loosen the screws using your fingers; however, if the screws are very tight, you might need to use a Phillips screwdriver.

Figure 2-2 Removing the WIC Slot Cover



Step 3 Hold the WIC by the edges on either side of the card front panel, and line up the card edges with the guides inside the card slot, as shown in Figure 2-3.

Figure 2-3 Inserting a WIC in the Router



Step 4 Insert the card in the slot and gently push it into the router until the front panel of the card is flush with the rear panel of the router.

Step 5 Tighten the screws.

Connecting Power to the Router

Read the following warnings before connecting the router to power.

Warning **The power supply is designed to work with TN power systems.**

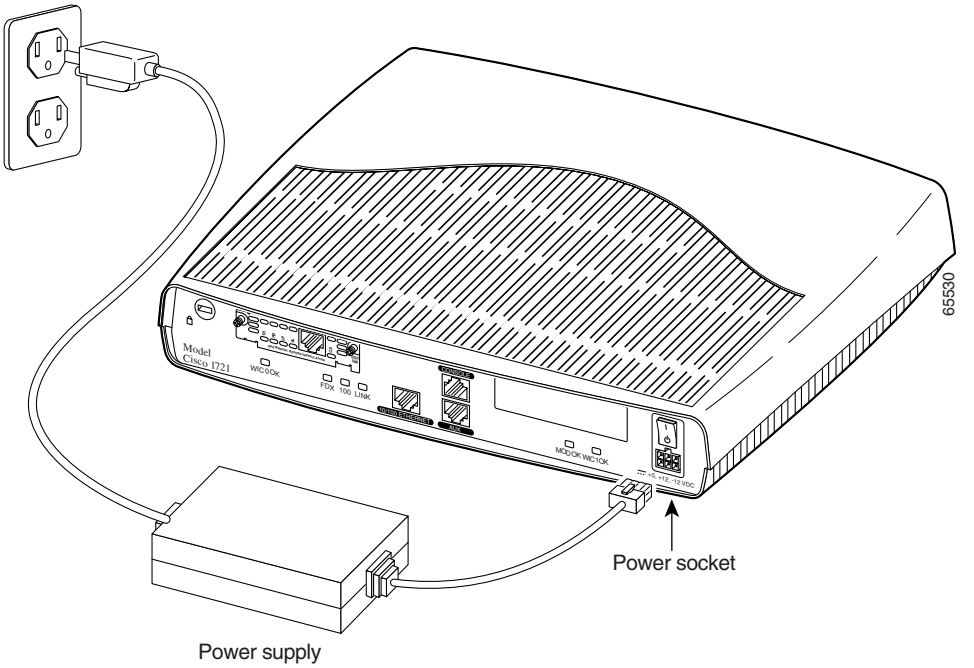
Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120VAC, 15AU.S. (240VAC, 16A international) is used on the phase conductors (all current-carrying conductors).**

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.**

Take the following steps to connect power to the router and to turn the router on:

Step 1 Connect the attached power-supply cord to the power socket (labeled *+5, +12, -12 VDC*) on the router rear panel, as shown in Figure 2-4.

Figure 2-4 Connecting the Power Supply



Step 2 Connect one end of the separate power cord to the socket on the power supply.

Step 3 Connect the other end of the separate power cord to a power outlet.

Step 4 Press the router power switch to ON (|).

Step 5 Confirm that the router has power by checking that the PWR LED on the front panel is on.

Verifying Your Installation

You can verify that you have correctly installed the router by checking the following LEDs:

- PWR (front panel)—On when power is being supplied to the router.

- OK (front panel)—On when the router software is loaded and functional. Blinking means that the router is performing a power-on self-test (POST).
- WIC0/WIC1 OK (back panel)—On when a WIC is correctly installed in the corresponding WIC slot.
- ETH ACT (front panel)—Blinking when there is network traffic on the local 10/100 Ethernet LAN.
- WIC0ACT or WIC1 ACT (front panel)—Varies, depending on the WIC installed. Refer to Table 1-4 in Chapter 1, "Cisco 1721 Router Overview."
- LINK (back panel)—On when the router is correctly connected to the local Ethernet LAN through the 10/100 ETHERNET port.
- MOD OK (back panel)—On when the VPN hardware encryption module is installed and recognized by the IOS.

Optional Installation Steps

This section describes some installation steps that you might or might not use, depending on your site and on how you are configuring the router. This section describes the following procedures:

- Connecting a PC
- Connecting a Modem
- Wall-Mounting
- Stacking the Router
- Unstacking the Router

Connecting a PC

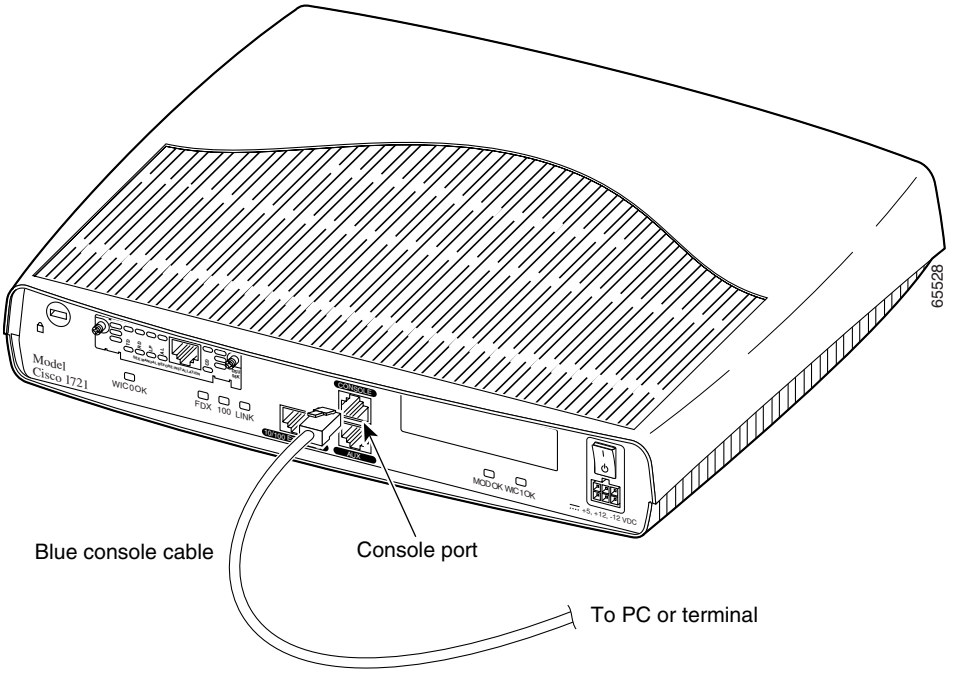
If you want to configure the router by using the Cisco IOS command-line interface, you must connect the router console port to a terminal or PC. The cable and adapter required for this connection are included with the router.

To configure the router by using a PC, the PC must have some type of terminal emulation software installed. The software should be configured with the following parameters: 9600 baud, 8 data bits, no parity bits, 1 stop bit. Refer to the *Cisco 1700 Router Software Configuration Guide* that came with your router for detailed information about configuring the router using Cisco IOS software.

Follow these steps to connect the router to a terminal or PC:

Step 1 Connect the blue console cable to the blue console port on the back of the router, as shown in Figure 2-5.

Figure 2-5 Connecting the Console Cable to the Router



Step 2 Connect the DB-9 end of the console cable to the console port (also called the *serial port*) on your PC. If this adapter does not fit your PC console port, you must provide an adapter that fits.

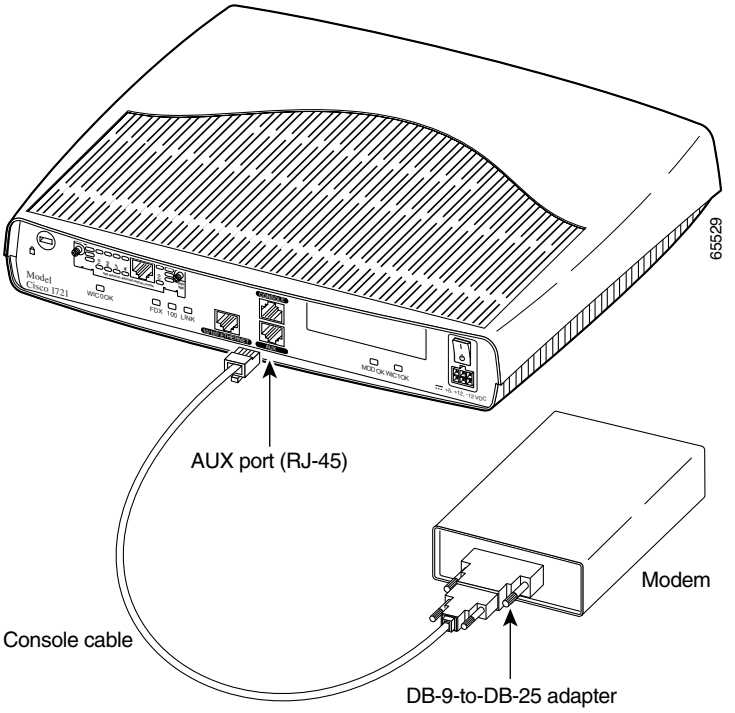
Connecting a Modem

When a modem is connected to the auxiliary port, a remote user can dial into the router and configure it. You can use the blue console cable that came in the accessory kit.

Follow these steps to connect a modem to the router, using the console cable:

Step 1 Connect the RJ-45 end of the cable to the black AUX port on the back of the router, as shown in Figure 2-6.

Figure 2-6 Connecting a Modem to the Router



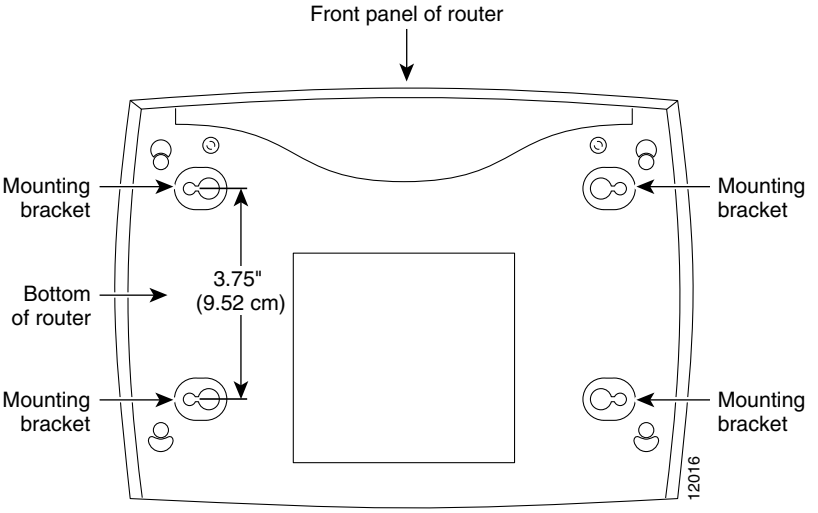
Step 2 Connect the DB-9 end of the cable to the DB-9 end of the DB-9-to-DB-25 adapter.

Step 3 Connect the DB-25 end of the adapter to the modem.

Wall-Mounting

The Cisco 1721 router can be wall-mounted using two number six, 3/4-inch screws and the molded mounting brackets on the bottom of the hub, as shown in Figure 2-7. You must provide the screws. We recommend using pan-head or round-head screws.

Figure 2-7 Wall-Mount Brackets—Bottom of Router



To mount the router on a wall or other surface:

Step 1 Install the two screws 3.75 inches (9.52 centimeters) horizontally apart on a wall or other vertical surface.

The screws should protrude 0.25 inch (0.64 centimeter) from the surface of the wall.

Step 2 Hang the router on the screws with either the left side or right side mounting brackets so that

- The LEDs are visible to the user—Because the LEDs indicate the router operating status, they need to be easily visible.
- The power supply does not hang from its cable—If the power supply is not supported, it might disconnect from the cable that connects it to the router.

Caution If you install the screws in drywall, use hollow wall anchors (1/8 inch by 5/16 inch) to secure the screws. If the screws are not properly anchored, the strain of the cables connected to the router rear-panel connectors could pull the router from the wall.

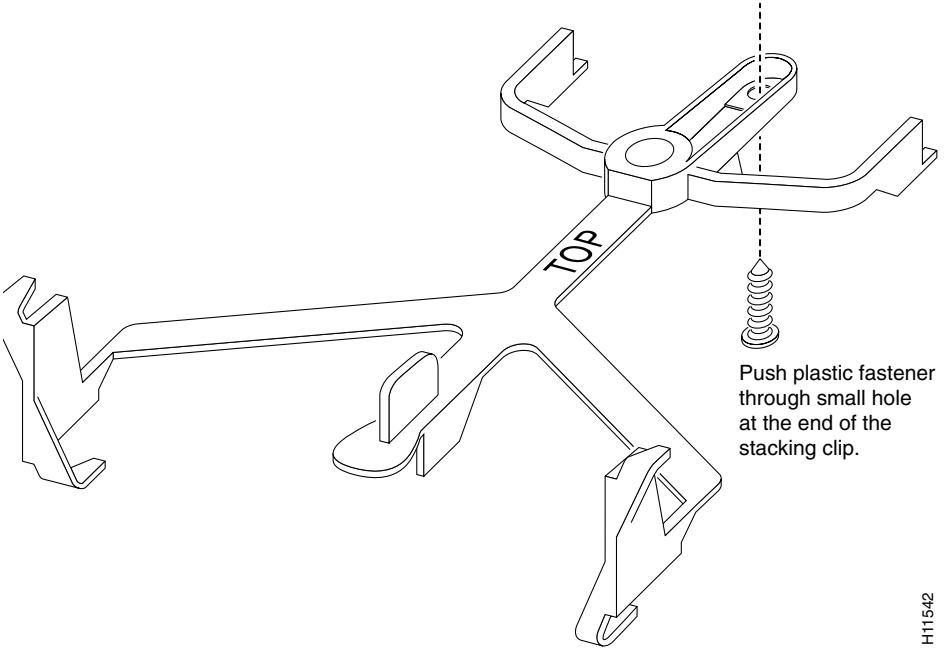
Stacking the Router

You can stack one Cisco 1721 router in a four-device stack, along with other Cisco products designed to be stacked with the router. You can stack each device directly on top of another device.

Note The Cisco 1721 router is not shipped with the stacking equipment described in this section; however, the equipment is included with all other Cisco products that are designed to be stacked.

Each Cisco product designed to be stacked with the router comes with a stacking clip and a fastener for keeping the multiple devices together in a stack. Before you stack the devices, assemble the clip and fastener as shown in Figure 2-8.

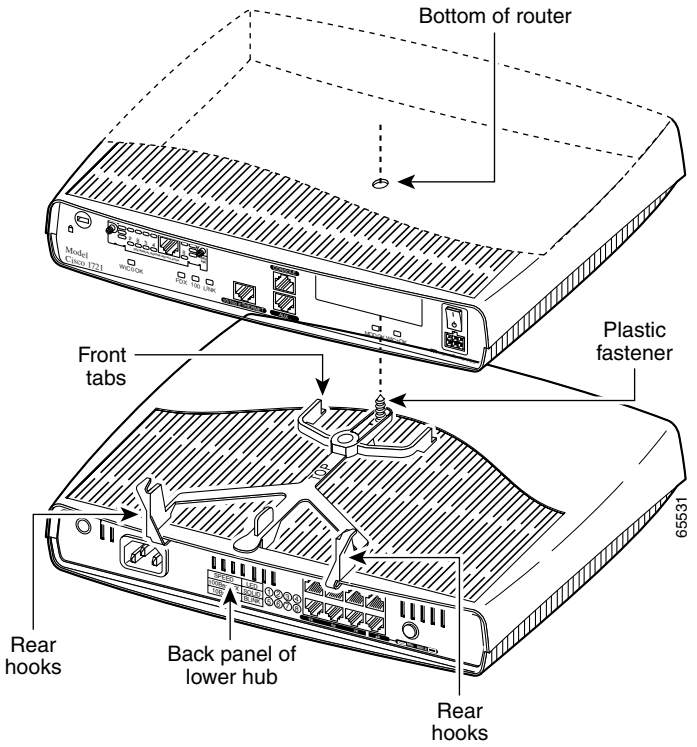
Figure 2-8 Assembling Stacking Clip and Fastener



After assembling the clip and fastener, follow these steps to to stack the router with another device:

Step 1 Place the clip on top of the lower device, as shown in Figure 2-9. Slide the clip forward so that the front tabs slide into the vent slots. Make sure that the rear hooks fit over the edge of the lower device.

Figure 2-9 Stacking the Router



Step 2 Position the router onto the clips so that the rear hooks fit over the edge of the router.

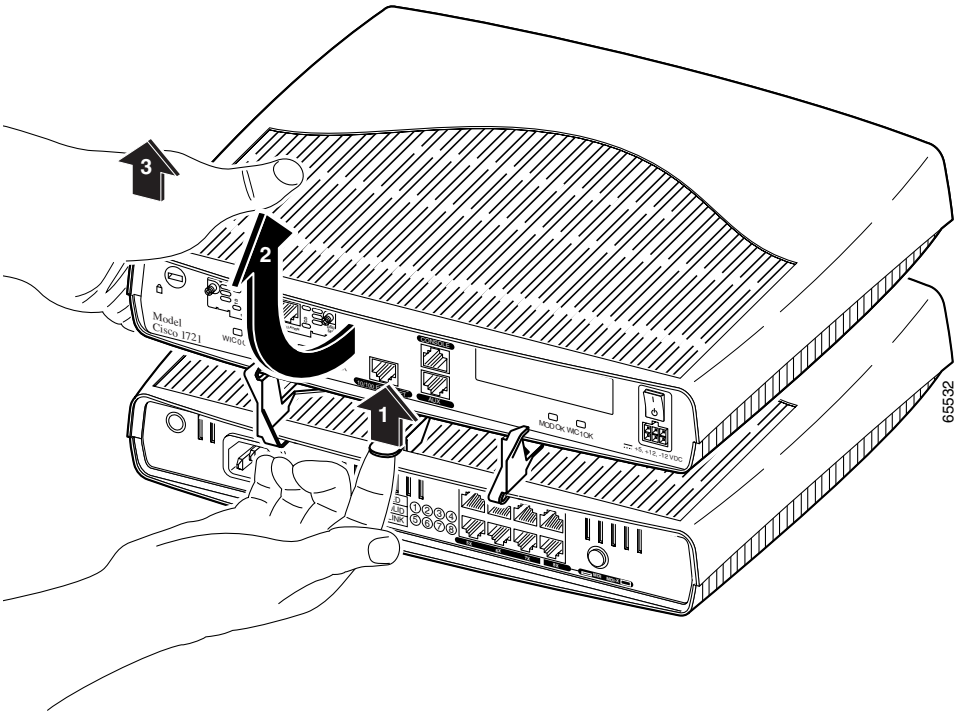
Step 3 Snap the router to the clip by pushing it down. Make sure that the plastic fastener fits into the bottom of the router.

Unstacking the Router

Follow these steps to unstack the router from another device:

Step 1 Press up on the tab over the center of the lower device to release the clip from the vent, as shown in Figure 2-10.

Figure 2-10 Unstacking the Router



Step 2 Slide the clip and router toward you.

Step 3 Use both hands to lift the router and the stacking clip off the lower device. Afterward, remove the clip from the bottom of the router.

Troubleshooting

Use the information in this chapter to help isolate problems you might encounter with the Cisco 1721 router or to rule out the router as the source of the problem.

This appendix contains the following sections:

- Contacting Your Cisco Reseller
- Recovering a Lost Password
- Problem Solving

Contacting Your Cisco Reseller

If you cannot locate the source of a problem, contact your local reseller for advice. Before you call, you should have the following information ready:

- Chassis type and serial number
- Maintenance agreement or warranty information
- Type and version number of the Cisco IOS installed on your router
- Date you received the router
- Brief description of the problem
- Brief description of the steps you have taken to isolate the problem
- Output from the **show tech-support** command

Recovering a Lost Password

This section describes how to recover a lost enable password and how to enter a new enable secret password.

Password recovery consists of the following major processes:

- Determining the Configuration Register Value

  With this process, you determine the configuration of the router, so that you may restore the configuration after the password is recovered.

- Resetting the Router

  With this process, you reconfigure the router to its intial startup configuration. You then display the enable password, if one is used.

- Resetting the Password

  If you are using an enable secret password, you enter a new password with this process. You then restore the router to its prior configuration.

- Resetting the Configuration Register Value

  If you are using an enable password, you use this process to restore the router to its prior configuration.

Note See the "Hot Tips" section on Cisco.com for additional information on replacing enable secret passwords.

Determining the Configuration Register Value

Follow these steps to determine the configuration register value:

Step 1 Connect an ASCII terminal or a PC running a terminal-emulation program to the console port on the router. See the "Connecting a PC" section in Chapter 2, "Installation."

Step 2 Configure the terminal to operate at 9600 baud, 8 data bits, no parity, 1 stop bit and no flow control.

Step 3 Reboot the router by pressing the power switch to the off (0) position and then to the on (|) position.

Step 4 At the user EXEC prompt (`Router>`), enter the **show version** command to display the existing configuration register value (shown at the end of this example output):

```
Router> show version

Cisco Internetwork Operating System Software
IOS (tm) C1700 Software (C1700-K9SY-M), Version 12.2(4)YA EARLY
DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Mon 14-Jan-02 16:34 by ramesh
Image text-base: 0x80008108, data-base: 0x80BC77E8

ROM: System Bootstrap, Version 12.2(7r)XM1, RELEASE SOFTWARE (fc1)

1721 uptime is 4 days, 23 hours, 54 minutes
System returned to ROM by reload
Running default software

cisco 1721 (MPC860P) processor (revision 0x101) with 36864K/12288K
bytes of memory.
Processor board ID VEN0539000D (3033334544), with hardware revision
0000
MPC860P processor: part number 5, mask 2
Bridging software.
X.25 software, Version 3.0.0.
1 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
1 Virtual Private Network (VPN) Modules(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)

Configuration register is 0x0
```

Step 5 Record the setting of the configuration register. It is usually 0x0.

Step 6 Record the break setting, as given by bit 8 of the configuration register.

- Break enabled—Bit 8 is set to 0.
- Break disabled (default setting)—Bit 8 is set to 1.

Resetting the Router

Follow these steps to reset the router:

Step 1 Do one of the following:

- If break is enabled, go to Step 2.
- If break is disabled, turn off the router, wait 5 seconds, and turn it on again. Within 60 seconds, press the **Break** key. The terminal displays the ROM monitor prompt. Go to Step 3.

Note Some terminal keyboards have a key labeled Break. If your keyboard does not have a Break key, refer to the documentation that came with the terminal for instructions on how to send a break. To send a break in Windows HyperTerminal, enter Ctrl-Break.

Step 2 Send a break. The terminal displays the following prompt:

```
rommon 2>
```

Step 3 Enter **confreg 0x142** to reset the configuration register:

```
rommon 2> confreg 0x142
```

Step 4 Initialize the router by entering the **reset** command:

```
rommon 2> reset
```

The router resets, and the configuration register is set to 0x142. The router boots the system image in Flash memory and displays the following:

```
--- System Configuration Dialog ---
```

Step 5 Enter **no** in response to the prompts until the following message is displayed:

```
Press RETURN to get started!
```

Step 6 Press **Return**. The following prompt appears:

```
Router>
```

Step 7 Enter the **enable** command to enter privileged EXEC mode. Configuration changes can be made only in this mode.

```
Router> enable
```

The prompt changes to the privileged EXEC prompt:

```
Router#
```

Step 8 Enter the **show startup-config** command to display an enable password in the configuration file:

```
Router# show startup-config
```

If you are using an enable password, it will appear in the startup configuration. Write down the password and keep the record secure.

If you are using a secret enable password, there will be no enable password in the startup configuration.

Step 9 Enter the **copy startup-config running-config** command to return to your startup configuration:

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

If you are recovering an enable password, skip the next section, "Resetting the Password," and complete the password recovery process by performing the steps in the "Resetting the Configuration Register Value" section.

If you are resetting an enable secret password, you will not see it displayed in the **show startup-config** command output. Complete the password recovery process by performing the steps in the "Resetting the Password" section, which follows.

Resetting the Password

Follow these steps to reset an enable secret password and restore the configuration of the router:

Step 1 Enter the **configure terminal** command to enter configuration mode:

```
Router# configure terminal
```

Step 2 Enter the **enable secret** command to reset the enable secret password in the router:

```
Router(config)# enable secret <gobbledegook>
```

Step 3 Enter the **config-register** command and the original configuration register value that you recorded in Step 5 in the "Determining the Configuration Register Value" section on page 3-2.

Step 4 Press **Ctrl-Z** to exit configuration mode.

```
Router(config)# Ctrl-Z
```

Step 5 Save your configuration changes:

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

Step 6 Reboot the router, and enter the enable secret password.

Resetting the Configuration Register Value

Follow these steps to restore the configuration of the router after you have recovered an enable password:

Step 1 Enter the **configure terminal** command to enter configuration mode:

```
Router# configure terminal
```

Step 2 Enter the **config-register** command and the original configuration register value that you recorded in Step 5 in the "Determining the Configuration Register Value" section on page 3-2.

Step 3 Press **Ctrl-Z** to exit configuration mode:

```
Router(config)# Ctrl-Z
```

Step 4 Reboot the router, and enter the recovered enable password.

Problem Solving

The key to problem solving is to isolate the problem to a specific subsystem by comparing what the router is doing to what it should be doing.

In problem solving, consider the following subsystems of the router:

- WICs—Refer to the LEDs on the cards and the LEDs on the router front panel to help identify a failure. For more information on WICs, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, which comes with each card.
- Cables—Check all the external cables that connect the router to the network.
- Power system—Check the external power source, power cable, router power supply, and circuit breaker. Check for inadequate ventilation or air circulation that might cause overheating.
- ISDN configuration—Consider ISDN-specific hardware and software configurations (ISDN BRI WICs only).

OK LED Diagnostics

Use the front-panel OK LED to determine any problems with the router. When the router first boots up, it performs a power-on self-test (POST). If the router detects a problem during the POST, the OK LED blinks in different patterns (described in Table 3-1), depending on the problem. A pattern consists of a specific number of blinks that is repeated until the router is turned off. If the router experiences any of these problems, contact your Cisco reseller.

Table 3-1 OK LED Blinking Patterns

Number of Blinks	Meaning
2	The 860P dual-port random-access memory (DPRAM) has failed.
3	The parameter RAM area of the 860P DPRAM has failed.
4	The 860P system protection control register has a write failure.
5	The router cannot detect the dynamic random-access memory (DRAM).
6	The user programmable machine has a write failure.
9	The router DRAM has failed.

Troubleshooting WICs and Cables

Use the **show diag** command to help determine problems with a card. Table 3-2 lists problems that could occur with WAN interface cards (WICs) and the possible causes of these problems.

Table 3-2 Troubleshooting WICs

Symptom	Possible Cause(s)

Router does not recognize WIC.	• Confirm that the Cisco IOS software version installed in the router supports the WIC. The *Cisco WAN Interface Cards Hardware Installation Guide* lists the software requirements for each card.
	• Make sure that the WIC is correctly installed in the router. See the "Installing WICs" section in the "Installation" chapter of this guide.
	• Use the **show diag** command to display information about the card:
	`Router# show diag`
	`Slot 0:`
	`C1721 1FE Mainboard port adapter, 4 ports`
	`Port adapter is analyzed`
	`Port adapter insertion time unknown`
	`Hardware revision 0.0 Board revision UNKNOWN`
	`Serial number 1314672220 Part number 00-0000-00`
	`Test history 0x0 RMA number 00-00-00`
	`EEPROM format version 1`
	`EEPROM contents (hex):`
	`0x20: 01 B2 00 00 4E 5C 4E 5C 00 00 00 00 00 00 00 00`
	`0x30: 00 00 00 04 00 00 00 00 00 00 00 00 00 00 00 00`
	`WIC Slot 0:`
	`Serial 1T WAN daughter card`
	`Hardware revision 1.1 Board revision E0`
	`Serial number 7131279 Part number 73-1775-02`
	`Test history 0x0 RMA number 00-00-00`
	`Connector type Wan Module`
	`EEPROM format version 1`
	`EEPROM contents (hex):`
	`0x20: 01 02 01 01 00 6C D0 8F 49 06 EF 02 00 00 00 00`
	`0x30: 70 00 00 00 98 01 23 01 FF FF FF FF FF FF FF FF`

Table 3-2 Troubleshooting WICs (continued)

Symptom	Possible Cause(s)
Router recognizes the WIC(s), but the card port(s) do not initialize.	• Make sure that the WIC is correctly installed in the router. See the "Installing WICs" section in the "Installation" chapter of this guide. • Check the external cable connections to make sure they are secure.
Router does not boot properly, or router continuously or intermittently reboots.	Make sure that the WIC is correctly installed in the router. See the "Installing WICs" section in the "Installation" chapter of this guide.
Router boots, but the console screen is frozen.	• Make sure that the console cable is securely connected to the router and to the PC or terminal. • Verify that the parameters for your terminal are set to the following: – 9600 baud – 8 data bits – No parity generated or checked – 1 stop bit
Router powers on and boots only when a particular WIC is removed from the router.	• Confirm that the Cisco IOS software version installed in the router supports the WIC. The *Cisco WAN Interface Cards Hardware Installation Guide* lists the software requirements for each card. • The router might be overheating. Contact your Cisco reseller.
Router powers on and boots only when a particular cable is disconnected.	There might be a problem with the WIC or with the card cables. Consult your Cisco reseller for warranty information.

Troubleshooting the Power System

If the router external power supply fails, you should return it to your Cisco reseller. Table 3-3 list symptoms and possible causes of power problems.

Table 3-3 Troubleshooting the Power System

Symptom	Possible Cause(s)
Router shuts down after being on a short time.	• Make sure that the area in which the router is installed meets the environmental site requirements in Appendix A, "Technical Specifications," in this guide. • If the front panel PWR LED is not on, the power supply has failed.
The router attempts to boot, but all LEDs remain off.	The power supply has failed.
The router is on, but the front panel PWR LED is off.	The power supply has failed.
The front panel PWR LED is on, the front panel OK LED is off, and the router does not pass console or EIA data.	The power supply has failed.

Troubleshooting ISDN

Because ISDN uses many variables and supports many different configurations, it sometimes can cause problems for the router. This section describes possible problems related to the ISDN line.

Two commands are useful for troubleshooting ISDN:

- For routers with an ISDN S/T WIC, enter the **clear interface** command to terminate any active ISDN calls and to reset the ISDN BRI interface. Do this for each ISDN port installed in the router:

```
Router# clear interface bri0
Router# clear interface bri1
```

- For routers with an ISDN U WIC, use the **clear controller** command to terminate any active ISDN calls, to reset the ISDN BRI interface, and to reset the ISDN line between the router and the central office switch. Do this for each ISDN port installed in the router:

```
Router# clear controller bri0
Router# clear controller bri1
```

Table 3-4 lists troubleshooting methods for ISDN-related problems that might occur.

Table 3-4 Troubleshooting ISDN

WIC	Symptom(s)	Check the Following	Possible Causes
ISDN S/T	Router is on, but OK LED on the card is off.	• Is the OK LED on the router front panel on?	• If the OK LED is not on, the router might be malfunctioning. Contact your Cisco reseller.
		• Are all ISDN cables properly connected?	• If the cables are properly connected, the ISDN line might be malfunctioning. Check with your ISDN service provider.
		• Is the NT-1 LED on?	• If the NT-1 LED is not on, the NT1 might be malfunctioning.
ISDN U	Router is on, but the NT-1 LED on the card is off.	• Is the OK LED on?	• If the OK LED is not on, the router might be malfunctioning. Contact your Cisco reseller.
		• Are all ISDN cables properly connected?	• If the cables are properly connected, the ISDN line might be malfunctioning. Check with your ISDN service provider.
		• Is the ISDN line connected to the card ISDN U port?	• If the line is connected to the port, the ISDN line might be malfunctioning. Check with your ISDN service provider.

Technical Specifications

Table A-1 lists hardware and operating specifications for the Cisco 1721 router.

Table A-1 Cisco 1721 Router Specifications

Description	Specification
Console port	RJ-45
Auxiliary port	RJ-45
Ethernet port	RJ-45
Dimensions	
H x W x D	3.1 x 11.2 x 8.7 in. (7.85 x 28.4 x 22.1 cm)
Weight	2.6 lb (1.18 kg)
With two WICs	2.9 lb (1.32 kg)
Power supply	
External	Universal AC/DC switching—Supplies +5V, +12V, and –12V
On-board	Supplies 3.3V and -5V
Power consumption	20W
Operating Specifications	
Operating temperature	32° to 104°F (0 to 40°C)
Storage temperature	–40° to 149°F (–40 to 65°C)
Operating humidity	10% to 85%, noncondensing

Cabling Specifications

This appendix describes cables and cabling guidelines for the Cisco 1721 router and contains the following sections:

- Ethernet Cables
- Ethernet Network Cabling Guidelines
- Console Cable and Adapter

Note For information about cables used with Cisco WICs, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, which comes with each card.

Ethernet Cables

This section describes the Ethernet cables that are used to connect the router to your local Ethernet network. A 10/100BASE-TX router, such as the Cisco 1721 router, requires Category 5 unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable. Table B-1 gives the pinouts for an Ethernet cable.

Table B-1 Ethernet Cable Pinouts

RJ-45 Pin[1]	Signal	Direction	RJ-45 Pin
1	TX+	—>	1
2	TX–	—>	2

Table B-1 Ethernet Cable Pinouts (continued)

RJ-45 Pin[1]	Signal	Direction	RJ-45 Pin
3	RX+	<—	3
6	RX–	<—	6

1. Pins 4, 5, 7, and 8 are not used for signaling.

Ethernet Network Cabling Guidelines

Table B-2 describes some guidelines for creating Ethernet networks. Figures might vary, depending on the manufacturer of the network equipment.

Table B-2 Ethernet Cabling Guidelines

Specification	10BASE-T	100BASE-TX
Maximum segment length	100 meters	100 meters
Maximum number of segments per network	5	• With Class I repeaters: 1 • With Class II repeaters: 2
Maximum hop count[1]	4	• With Class I repeaters: none • With Class II repeaters: 1
Maximum number of nodes per segment	1024	1024
Cable type required	UTP Category 3, 4, or 5	UTP Category 5 or STP

1. Hop count = Routing metric used to measure the distance between a source and a destination.

Console Cable and Adapter

A console cable is provided with your router. Use this cable to connect the router to a PC or terminal. The router comes with a DB-9-to-DB-25 adapter that may be used for connecting the router to a modem, using the console cable.

Table B-3 describes the wiring for the console port and the console cable. This table also includes pinouts for the DB-9-to-DB-25 adapter.

Table B-3 Console Cable and Adapter Pinouts

Console (DTE)	Console Port	Console Cable	Adapter	Terminal (DTE)
Signal	**RJ-45 Pin**	**DB-9 Pin**	**DB-25 Pin**	**Signal**
RTS	1	8	5	CTS
DTR	2	6	8	DSR
TXD	3	2	3	RXD
GND	4	5	7	GND
GND	5	5	7	GND
RXD	6	3	2	TXD
DSR	7	4	20	DTR
CTS	8	7	4	RTS

Installing and Upgrading Memory and Virtual Private Network Modules

This chapter tells how to install or upgrade memory and how to install a Virtual Private Memory (VPN) module in your Cisco 1721 router and includes the following sections:

- Safety Warnings
- Opening the Chassis
- Locating Modules
- Installing a DIMM
- Installing a VPN Module
- Closing the Chassis

Safety Warnings

Warning **During this procedure, wear grounding wrist straps to avoid ESD damage to the router. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.**

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

Warning **Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.**

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

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

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 **Hazardous network voltages are present in WAN ports regardless of whether power to the router is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the router first.**

Opening the Chassis

In order to upgrade Cisco 1721 router memory, you must open the chassis. Opening the chassis requires a number one Phillips screwdriver.

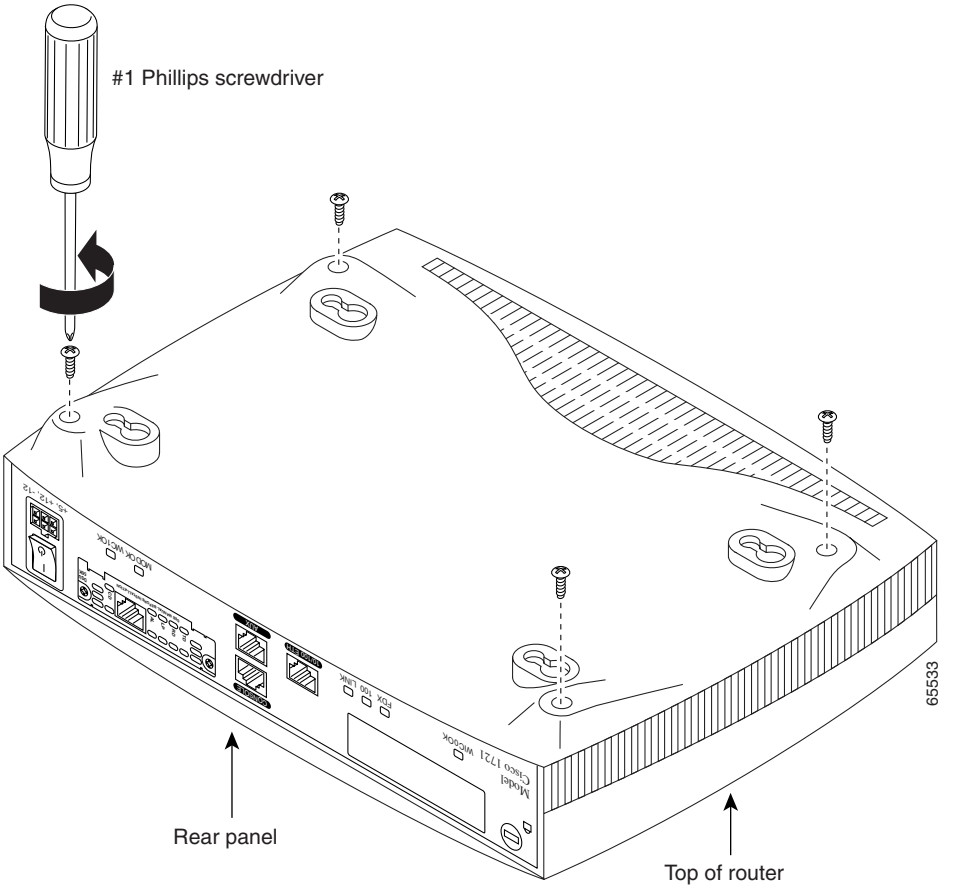
Follow these steps to open the chassis:

Step 1 Make sure the router is turned off and is disconnected from the power supply.

Step 2 Turn the router upside down, and rest the top of the router on a flat surface.

Step 3 Use the Phillips screwdriver to remove the four screws that hold the top and bottom of the chassis together, as shown in Figure C-1.

Figure C-1 Removing the Chassis Screws



Step 4 Turn the router back to its original position (top up).

Step 5 Gently pull the top of the router (which is facing up toward you) up and away from the bottom of the router (which is resting on the flat surface).

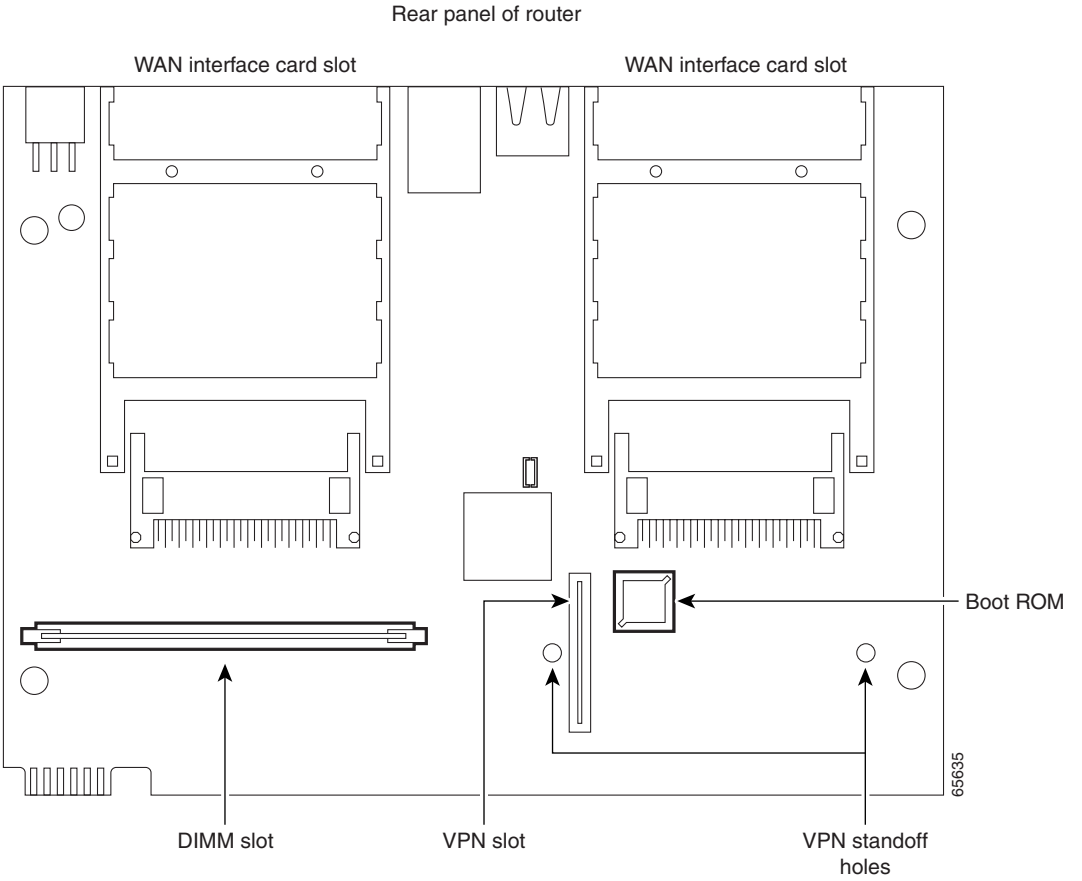
At this point, you might have to disconnect the fan, which is inside the top of the router chassis, from the motherboard. Do this by disconnecting the fan cable from the connector (labeled FAN) on the motherboard.

Step 6 Place the router bottom on an antistatic mat, and begin installing memory.

Locating Modules

Figure C-2 shows where to find slots for a dual in-line memory module (DIMM) and a VPN module on the router motherboard.

Figure C-2 Cisco 1700 Motherboard—Memory Locations



Installing a DIMM

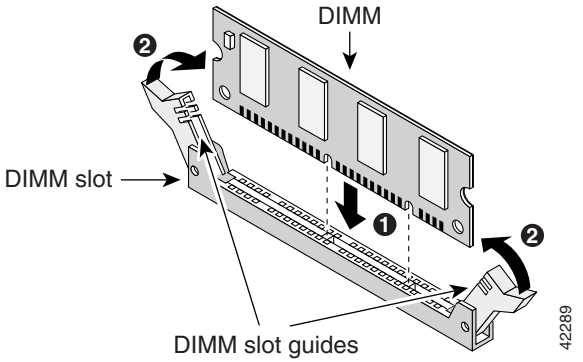
You can install a DIMM to increase the amount of dynamic random-access memory (DRAM) in the router.

Follow these steps to install a DIMM on the router motherboard:

Step 1 Locate the DIMM slot on the motherboard.

Step 2 Remove any existing DIMM by pulling the DIMM slot guides (shown in Figure C-3) away from the DIMM and down toward the motherboard.

Figure C-3 Installing a DIMM



Step 3 Insert the DIMM into the DIMM slot, making sure that the notches on the edge of the DIMM are inserted over the bars inside the DIMM slot, as in Figure C-3.

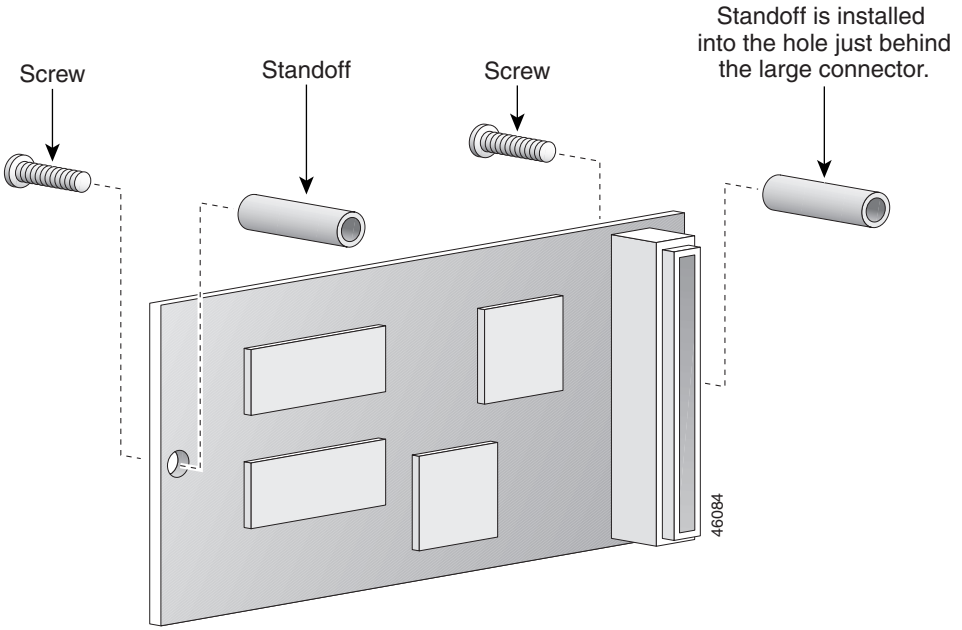
Step 4 Firmly press the DIMM into the slot until the two DIMM slot guides on each side of the slot move up and over the end of the DIMM, as in Figure C-3. If the guides do not move up over the edge of the DIMM, move them with your hands.

Installing a VPN Module

Follow the steps in this section to install a VPN module.

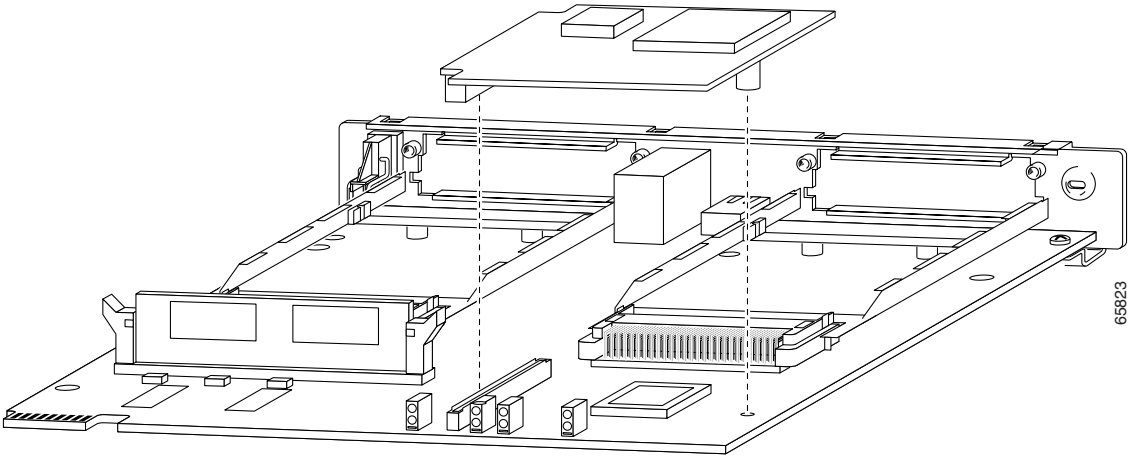
Step 1 Install the two standoffs on the module, as shown in Figure C-4.

Figure C-4 Installing the Standoffs on the VPN Module



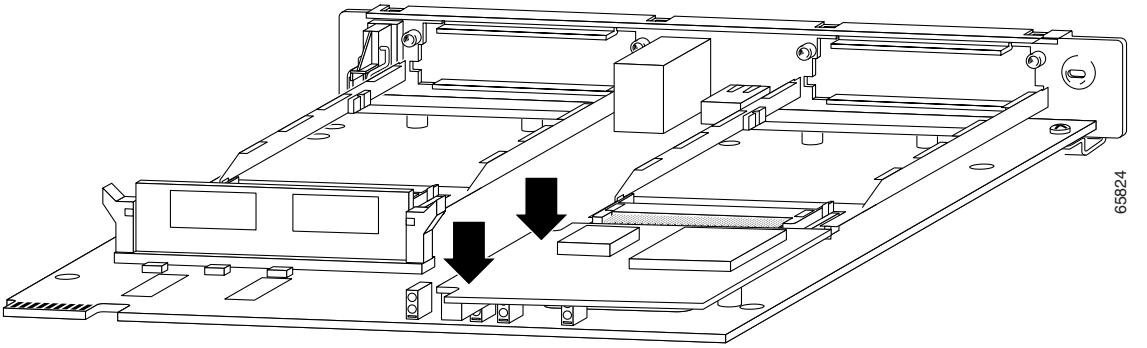
Step 2 Locate the VPN module socket, and insert the VPN module, as shown in Figure C-5.

Figure C-5 VPN Module Location



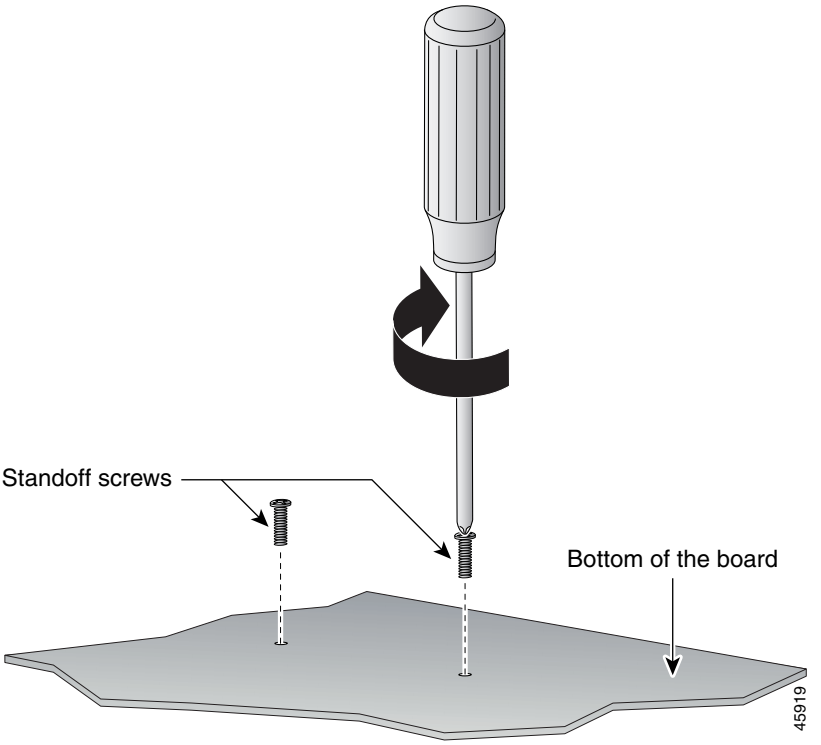
Step 3 Pushing down as indicated in Figure C-6, plug the VPN module into the socket.

Figure C-6 Seating the VPN Module



Step 4 Turn the motherboard over, and attach the standoffs to it by using the screws provided, as shown in Figure C-7.

Figure C-7 Securing the Standoff to the Router Motherboard



Closing the Chassis

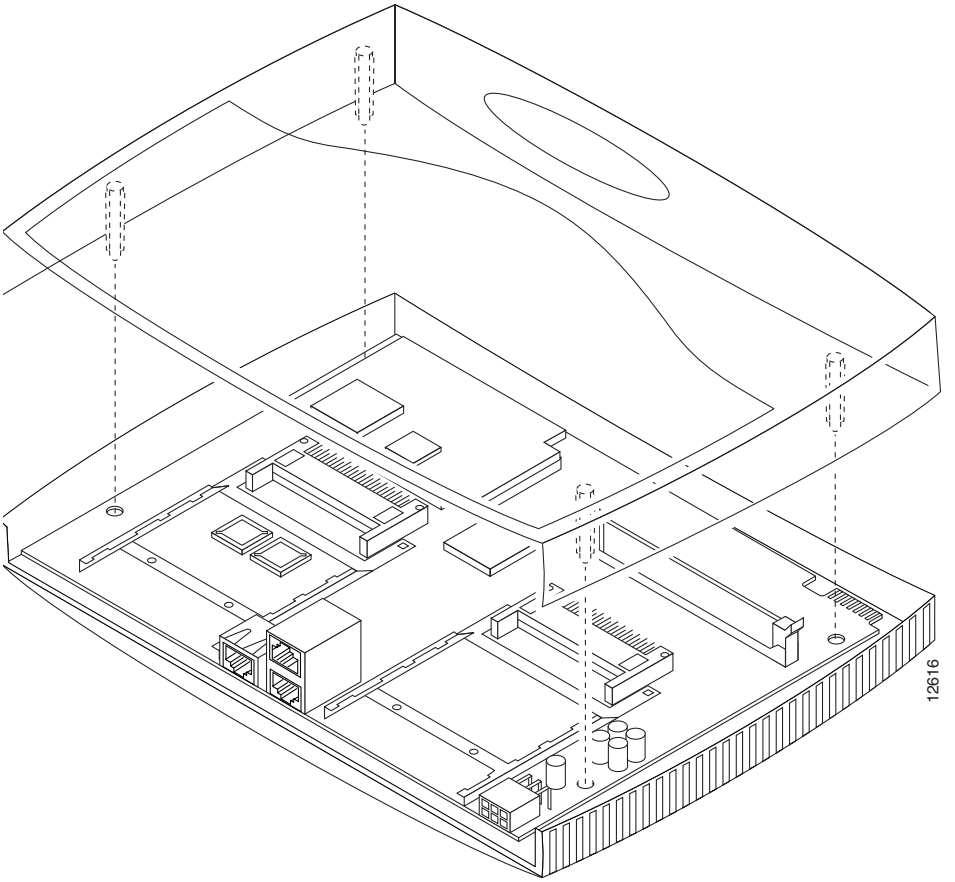
After installing memory or a VPN module on the motherboard, close the chassis by following these steps:

Step 1 If you disconnected the fan from the motherboard as described in the "Opening the Chassis" section, reconnect the fan cable to the connector labeled FAN on the motherboard.

Step 2 Locate the posts that protrude from the inside of the chassis cover, and locate the corresponding openings on the chassis bottom.

Step 3 Line up the posts with the corresponding openings, as shown in Figure C-8, and carefully slide the posts into the openings, taking care not to damage the router motherboard with the posts.

Figure C-8 Closing the Chassis



Step 4 Replace the screws that you removed when you opened the chassis. (See Figure C-1.)

Ordering and Configuring an ISDN Line

This appendix tells how to order and configure an Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) line for use with a Cisco 1721 router with an ISDN BRI WIC installed.

This appendix contains the following sections:

- ISDN BRI Line Configuration Requirements
- ISDN BRI Switch Types
- ISDN BRI Provisioning by Switch Type
- Defining ISDN Service Profile Identifiers
- ISDN Configuration Options

ISDN BRI Line Configuration Requirements

Before using a Cisco 1721 router with an ISDN BRI WIC installed, you must order a correctly configured ISDN BRI line from your local telecommunications service provider.

This process varies dramatically from provider to provider, both nationally and internationally. However, the following are some general guidelines:

- Ask for two channels to be called by one number.
- Ask for delivery of calling-line identification. This is also known as *caller ID* or *automatic number identification* (ANI).

- If the router is going to be the only device attached to the ISDN BRI line, ask for point-to-point service and a data-only line.
- If you will be connecting another ISDN device (such as an ISDN telephone) to the ISDN BRI line, ask for point-to-multipoint service (subaddressing is required) and a voice-and-data line.

ISDN BRI Switch Types

ISDN BRI supports a variety of service provider switches. Table D-1 lists, by geographic area, the ISDN switch types supported by a Cisco 1721 router ISDN BRI interface. Use the **isdn switch-type** command followed by the corresponding keyword. You must reboot the router after you enter this command in order for the change to take effect.

Table D-1 ISDN Switch Types Supported by the Cisco 1721 Router

Switch Type	Keyword
Australia	
TS013 switches	**basic-ts013**
Europe	
German 1TR6 switches	**basic-1tr6**
Norway NET3 switches (phase 1)	**basic-nwnet3**
NET3 ISDN switches (UK and others)	**basic-net3**
VN2 ISDN switches	**vn2**
VN3 ISDN switches	**vn3**
Japan	
NTT switches	**ntt**
North America	
Basic 5ESS switches	**basic-5ess**
NT DMS-100 and 5ESS custom switches	**basic-dms100**
National ISDN-1(NI1) or switches	**basic-ni**

Table D-1 ISDN Switch Types Supported by the Cisco 1721 Router (continued)

Switch Type	Keyword
New Zealand	
Net3 switches	**basic-nznet3**

ISDN BRI Provisioning by Switch Type

The ISDN BRI line is configured (or provisioned) for different types of services by the ISDN BRI service provider. The person ordering the ISDN line must also order the provisioning described in this section.

Table D-2 lists the provisioning that should be ordered for the router, based on the switch type.

Table D-2 Provisioning Required for ISDN Switch Types

Switch Type	Provisioning
5ESS Custom BRI	**For data only** Two B channels for data. Point to point. Terminal type = E. One directory number (DN) assigned by service provider. MTERM = 1. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange.

Table D-2 Provisioning Required for ISDN Switch Types (continued)

Switch Type	Provisioning
5ESS Custom BRI	**For voice and data** (Use these values only if you have an ISDN telephone connected.) Two B channels for voice or data. Multipoint. Terminal type = D. Two directory numbers assigned by service provider. Two service profile identifiers (SPIDs) required, assigned by service provider. MTERM = 2. Number of call appearances = 1. Display = no. Ringing/idle call appearances = idle. Autohold = no. Onetouch = no. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.
5ESS National ISDN (NI1) BRI	Terminal type = A. Two B channels for voice and data. Two directory numbers assigned by service provider. Two SPIDs required; assigned by service provider. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.

Table D-2 Provisioning Required for ISDN Switch Types (continued)

Switch Type	Provisioning
DMS-100 BRI	Two B channels for voice and data. Two directory numbers assigned by service provider. Two SPIDs required; assigned by service provider. Functional signaling. Dynamic terminal endpoint identifier (TEI) assignment. Maximum number of keys = 64. Release key = no, or key number = no. Ringing indicator = no. EKTS = no. PVC = 2. Request delivery of calling line ID on Centrex lines. Set speed for ISDN calls to 56 kbps outside local exchange. Directory number 1 can hunt to directory number 2.

Defining ISDN Service Profile Identifiers

An ISDN service provider, usually a telephone company, can offer a variety of services. Many providers use service profile identifiers (SPIDs) to identify the device that is using the ISDN service, similar to the way that the telephone company uses a telephone number to identify your standard telephone service. If you use such a service provider, the provider assigns your ISDN device one or more SPIDs when you first subscribe to the service. Providers use different numbering schemes, but a SPID is usually a seven-digit telephone number, plus some optional numbers.

The provider also assigns your device one or two local directory numbers (LDNs), which function as the router telephone number. The LDN is the number that a remote router dials to make a call to your router.

Note SPIDs have significance only at the local-access ISDN interface. Every router that uses ISDN must be assigned SPIDs (if used by the service provider) by the service provider for that router.

When the router connects to the service provider's central office ISDN switch, it sends the SPIDs to the switch. If the router is not configured with the correct SPIDs, it cannot place or receive calls. Use the **isdn spid** command to define the SPID and the LDN on the router for both ISDN BRI B channels, as follows:

```
Router(config-if)# isdn spid1 spid-number [ldn]

Router(config-if)# isdn spid2 spid-number [ldn]
```

Note Although the LDN is usually optional, it might be required so that the router answers calls made to the second directory number.

ISDN Configuration Options

For information on how to configure Cisco 1721 router to dial in to a central-site router over ISDN, refer to the *Cisco 1700 Router Software Configuration Guide*.

For more advanced information on configuring ISDN for Cisco 1700 routers, refer to the chapter "Configuring ISDN" in the *Dial Solutions Configuration Guide*, which is on the Documentation CD-ROM that came with your router. This document includes information on the following topics:

- Snapshot Routing
- Dial-on-Demand Routing
- Bandwidth on Demand and Dial Backup

Snapshot Routing

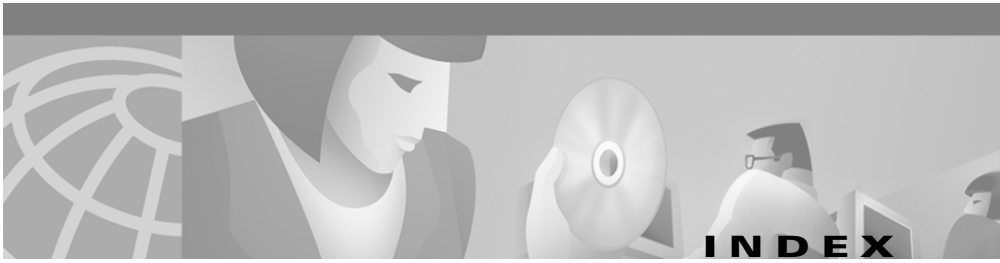
You can configure *snapshot routing* for the router ISDN interface. During snapshot routing, the router is configured to bring up the ISDN line, to dynamically learn about remote routes, and then to take down the ISDN line. The router saves the learned routes for a specified period of time, even though routing updates are not exchanged while the ISDN line is down. See the chapter "Configuring DDR" in the *Wide-Area Networking Configuration Guide* for detailed information about snapshot routing.

Dial-on-Demand Routing

To place calls on the ISDN interface, you must configure it with dial-on-demand routing (DDR). See the chapter "Configuring DDR" in the *Wide-Area Networking Configuration Guide* for detailed information about DDR.

Bandwidth on Demand and Dial Backup

See the chapter "Configuring DDR" in the *Wide-Area Networking Configuration Guide* for detailed information about bandwidth on demand and dial backup.



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