

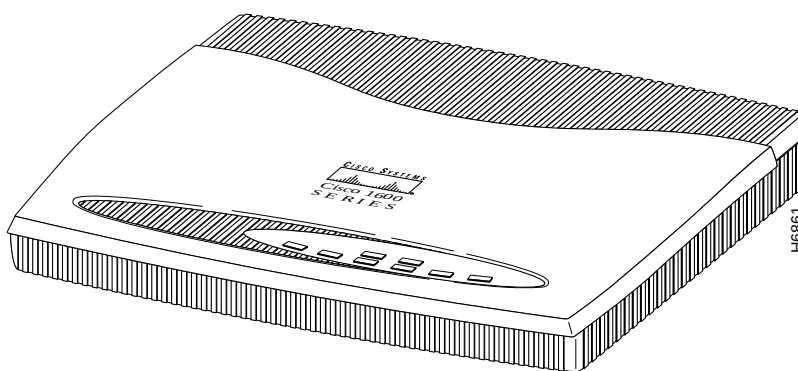
Overview of the Router

Cisco 1600 series routers are a family of small desktop routers that link small-to-medium remote Ethernet LANs to regional and central offices over multiple WAN connections.

This chapter contains the following sections:

- Router Features
- WAN Interface Cards
- Rear-Panel Connectors
- Router Memory
- Unpacking the Router
- Equipment That You Must Provide

Figure 1-1 Cisco 1600 Series Router Front (All Models)



Router Features

Note The Cisco 1600 series routers are either run-from-flash (RFF) or run-from-RAM (RFR) models. Router model names with an *R* are RFR routers; all other models are RFF. In this document, model names without an *R* refer to both RFF and RFR models, except where noted. The “Router Memory” section later in this chapter describes the differences between RFF and RFR models.

Listed below are some features of the Cisco 1600 series routers:

- One or two Ethernet LAN connections, using either the 10BaseT or AUI LAN ports. (Refer to Table 1-1 for more information about the LAN connections supported by each model.)
- One fixed WAN port (except for the Cisco 1605). (Refer to Table 1-1 for more information about the WAN connections supported by each model.)
- One slot for a WAN interface card, for flexibility in choosing WAN connections that the router supports. (Refer to the section “WAN Interface Cards” later in this chapter for more information about WAN interface cards.)
- Flash memory PC card (PCMCIA-compatible), which can be preconfigured by a network administrator and installed in the router at a remote site.
- Console port, which supports router management using a terminal or a PC with terminal emulation software.
- Router management over the network using Simple Network Management Protocol (SNMP).
- AutoInstall for downloading configuration files automatically over a WAN connection.
- Security slot for Kensington-compatible lockdown cable.

Table 1-1 describes in detail the types of LAN and WAN connections that are supported by each of the five router models.

Table 1-1 Network Connections Supported By Cisco 1600 Series Routers

Model	LAN Interface(s)	Fixed WAN Interface
Cisco 1601	- One 10BaseT - One AUI¹	Serial: - Supports synchronous modes, such as leased lines, Frame Relay, 56-kbps services, SMDS, and X.25, up to 2.048 Mbps (EIA/TIA-232, V.35, X.21, EIA/TIA-499, EIA-530). - Supports asynchronous connections up to 115.2 kbps.
Cisco 1602	- One 10BaseT - One AUI	Serial—Supports synchronous mode, including 56-kbps and dataphone digital service (DDS) connections, with an integrated 56-kbps DSU/CSU ² .
Cisco 1603	- One 10BaseT - One AUI	ISDN BRI S/T—Supports one ISDN BRI connection. (An ISDN BRI connection consists of two 64-kbps B channels and one 16-kbps D channel.)
Cisco 1604	- One 10BaseT - One AUI	One ISDN BRI U—Supports routing over an ISDN BRI connection. One ISDN BRI S/T (with integrated NT1 ³)—Supports one additional ISDN device (such as an ISDN telephone) on the same ISDN line as the router.
Cisco 1605	- Two 10BaseT - One AUI The Cisco 1605 supports two LAN connections.	The Cisco 1605 supports one WAN interface on a WAN interface card that can be installed in the router. A variety of WAN types are supported, depending on the type of card installed. For more information on individual cards, refer to the <i>Cisco WAN Interface Cards Hardware Installation Guide</i> that comes with each card.

¹ AUI = attachment unit interface.

² DSU/CSU = data service unit/channel service unit.

³ NT1 = Network Termination 1.

WAN Interface Cards

On the Cisco 1601 through Cisco 1604, you can use the WAN interface card connection as a secondary WAN connection, which can be used if the router on-board WAN connection fails. On the Cisco 1605, you can choose the type of WAN connection that you want for your network.

For more information about the cards, including function, installation, and configuration, refer to the *Cisco WAN Interface Cards Hardware Installation Guide* document that comes with the card. You received this document if you ordered a WAN interface card.

Rear-Panel Connectors

Figure 1-2 through Figure 1-6 illustrate the connectors for each of the five router models.

Figure 1-2 Cisco 1601 Rear Panel

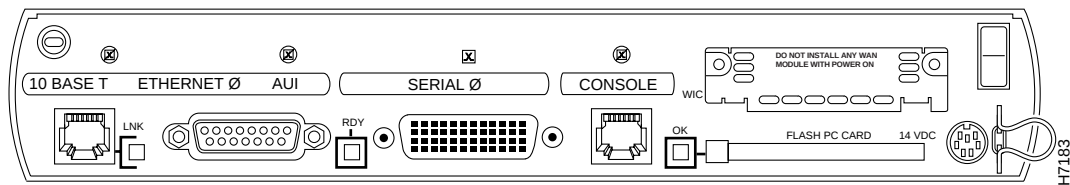


Figure 1-3 Cisco 1602 Rear Panel

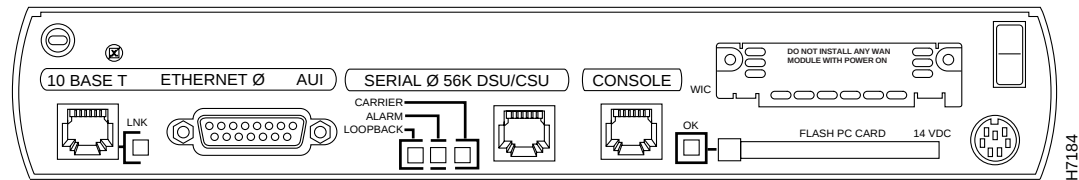


Figure 1-4 Cisco 1603 Rear Panel

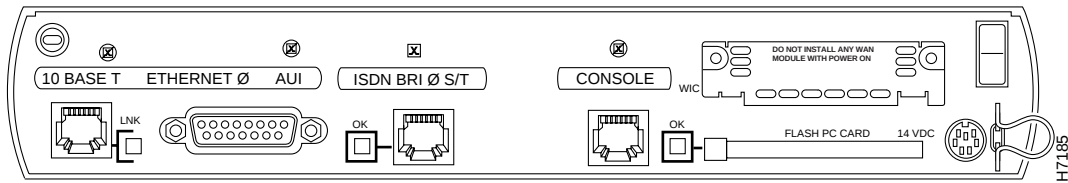


Figure 1-5 Cisco 1604 Rear Panel

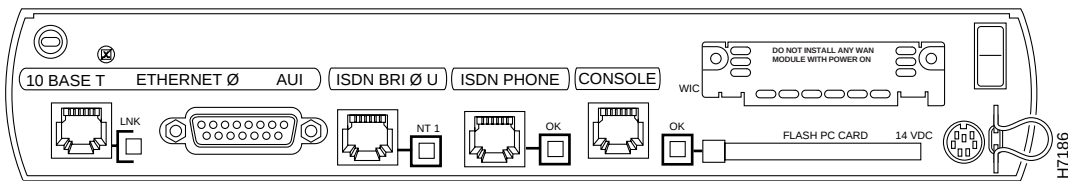
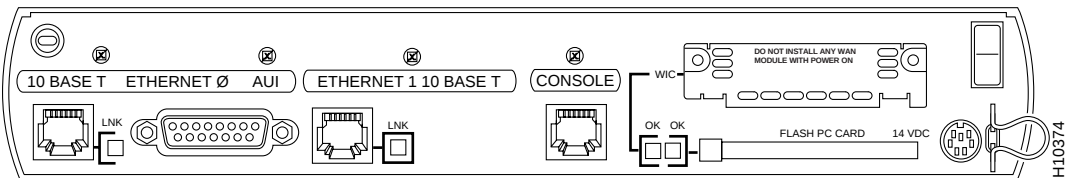


Figure 1-6 Cisco 1605 Rear Panel



Rear-Panel Connectors

Table 1-2 describes the connectors on the rear panel of the router.

Table 1-2 Function—Rear Panel Connectors and Slots

Label	Router Model	Function
ETHERNET Ø • 10BASE T • AUI	All	• Connects the router to a 10BaseT Ethernet LAN through an Ethernet hub or switch. • Connects the router to an Ethernet LAN through a transceiver.
CONSOLE	All	Connects the router to a terminal or to a PC running terminal emulation software for configuration.
WIC	All	Slot for a WAN interface card, which provides an additional WAN connection for models Cisco 1601 through Cisco 1604 and the only WAN connection for the Cisco 1602.
FLASH PC CARD	All	Slot for the Flash PC card. The router is shipped to the customer with the card already installed.
SERIAL Ø	Cisco 1601	Connects the router to serial WAN services, such as leased lines, Frame Relay, 56-kbps services, SMDS, and X.25.
SERIAL Ø 56K DSU/CSU	Cisco 1602	Connects the router to 56-kbps and dataphone digital service (DDS) through an integrated 56-kbps DSU/CSU.
ISDN BRI Ø S/T	Cisco 1603	Connects the router to ISDN services through an external NT1 device (purchased separately from the router).
ISDN BRI Ø U	Cisco 1604	Connects the router to ISDN services through an integrated NT1.
ISDN PHONE	Cisco 1604	Connects an ISDN device, such as an ISDN telephone, through the router to the same ISDN line that the router uses.
ETHERNET 1 10BASE T	Cisco 1605	Connects the router to a 10BaseT Ethernet LAN through an Ethernet hub or switch. The Cisco 1605 supports up to two Ethernet LAN connections.

Router Memory

The Cisco 1600 series routers are either of run-from-flash (RFF) or run-from-RAM (RFR) models. Router model names with an *R* are RFR routers; all other models are RFF. In this document, model names without an *R* refer to both RFF and RFR models, except where noted. This section describes the two memory architectures used in the Cisco 1600 series routers.

Run-From-Flash Architecture

With RFF, the microprocessor uses the uncompressed Cisco IOS software image that is stored in Flash memory. The software image runs directly from Flash memory. RAM stores working data such as Cisco IOS data structures, network routing tables, and packets to be transmitted to and received from network interfaces.

The running software image cannot be used to download new software to Flash memory because it would attempt to overwrite itself. (However, when you are using Dual Flash Bank memory, you can download the new software image into a different Flash memory partition.)

To download a new software image without using Dual Flash Bank memory, a boot-helper image (called *XBOOT*) has been added to the ROM on the RFF models. The boot-helper image is a small subset of Cisco IOS software that supports only a subset of the interfaces and the WAN protocols. RFF ROM supports the following WAN interfaces. (These are all onboard interfaces, not WAN-interface-card interfaces.)

- Serial (synchronous and asynchronous) (Cisco 1601)
- DSU/CSU (Cisco 1602)
- ISDN S/T (Cisco 1603)
- ISDN U (Cisco 1604 and Cisco 1604 R)

When upgrading the Cisco IOS software in Flash memory, you must boot the router from the ROM image. The Flash memory can be overwritten because the Cisco IOS software that is stored in Flash memory is not being used to run the router.

Run-From-RAM Architecture

With RFR, the Cisco IOS image is stored in Flash memory (usually in compressed form), but is loaded into RAM before being used to operate the router. The running software image then resides in RAM, so a new software image can be downloaded and copied over the software image stored in Flash memory.

In RFR routers, only a minimal boot-helper image is stored in the ROM for disaster recovery. Initial loading of a software image into Flash memory is done over the console port or the local Ethernet.

Because the Cisco IOS image is stored in compressed form in Flash memory and then decompressed when loaded into RAM, the standard configuration for the RFR models contains less Flash memory but more DRAM than the RFF models.

Table 1-3 is a summary comparison of these two memory architectures.

Table 1-3 Memory Architecture Comparison

Feature	Run-From-Flash Routers	Run-From-RAM Routers
Cisco IOS software online download	Yes, when using Dual Flash Bank memory	Yes
Flash memory use	• Stores uncompressed Cisco IOS software image. • The Flash PC card cannot be removed when the router is operating.	• Stores compressed Cisco IOS software image. • The Flash PC card can be removed after the router has finished booting up and has passed the power-on self-test.
RAM use	• Packet memory • Routing tables • Dynamic memory used by Cisco IOS software	• Packet memory • Routing tables • Dynamic memory used by Cisco IOS software • Running uncompressed Cisco IOS software image
DRAM capacity	• Standard: 2 MB onboard • Maximum: 18 MB (with 16-MB SIMM)	• Standard: 8 MB onboard • Maximum: 24 MB (with 16-MB SIMM)

Table 1-3 Memory Architecture Comparison (Continued)

Feature	Run-From-Flash Routers	Run-From-RAM Routers
Flash PC card capacity	• Standard: 4 MB • Maximum: 12 MB	• Standard: 2 MB • Maximum: 12 MB
Disaster recovery (Router fails and the image store in Flash memory is corrupted).	• Cisco IOS software image can be downloaded over any interface and with any WAN protocol supported by the ROM boot helper. • Cisco IOS software image can be downloaded over the console port by using the xmodem or ymodem commands. • Flash PC card can upgraded by booting from a Cisco IOS software image stored in another Flash memory bank (if using Dual Flash Bank memory).	• Cisco IOS software image can be downloaded with the ROM boot helper over the Ethernet 0 interface. • Cisco IOS software image can be downloaded over the console port by using the xmodem or ymodem commands. • Flash PC card can upgraded by booting from a Cisco IOS software image stored in another Flash memory bank (if using Dual Flash Bank memory).

Identifying the Memory Architecture from Cisco IOS

Use the Cisco IOS **show version** command to display some memory architecture information for your router (show in boldface in the example output):

- Amount of onboard DRAM (a type of RAM)
- Whether the Cisco IOS software is running from RAM or Flash memory
- Amount of Flash memory

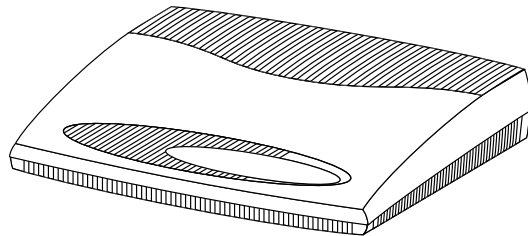
```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 1600 Software (C1600-BNSY-M), EARLY DEPLOYMENT RELEASE SOFTWARE
11.2(9)P
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 11-Aug-97 14:10 by cisco
Image text-base: 0x02005000, data-base: 0x02477BD0
ROM: System Bootstrap, Version 11.1(12)AA,DEPLOYMENT RELEASE SOFTWARE
(f)
ROM: 1600 Software (C1600-RB00T-R), Version 11.1(12)AA, EARLY DEPLOYMENT
RELEASE
Router uptime is 12 minutes
System restarted by power-on
System image file is "flash:c1600-bnsy-mz", booted via flash
cisco 1605 (68360) processor (revision C) with 7680K/512K bytes of
memory.
Processor board ID 06027889, with hardware revision 00000000
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
2 Ethernet/IEEE 802.3 interface(s)
System/IO memory with parity disabled
8192K bytes of DRAM onboard
System running from RAM
8K bytes of non-volatile configuration memory.
4096K bytes of processor board PCMCIA flash (Read/Write)
Configuration register is 0x2102
```

Unpacking the Router

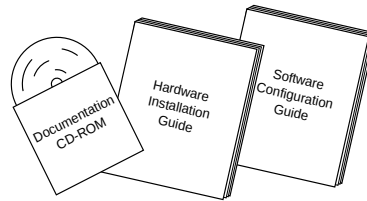
Figure 1-7 shows the other items that come with your router. All of these are in the accessory kit that is inside the box that your router came in.

Unpacking the Router

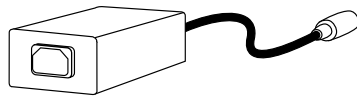
Figure 1-7 Router Box Contents



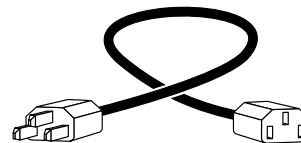
Cisco 1600 router



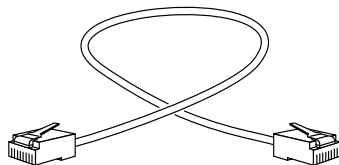
Product documentation



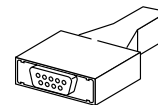
Power supply



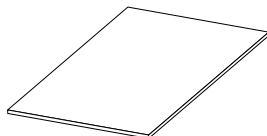
Power cord (black)



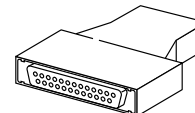
Console cable
(light blue, RJ-45-to-RJ-45)



DB-9-to-RJ-45 console adapter
(light gray)



Flash PC card
(Already installed in router)



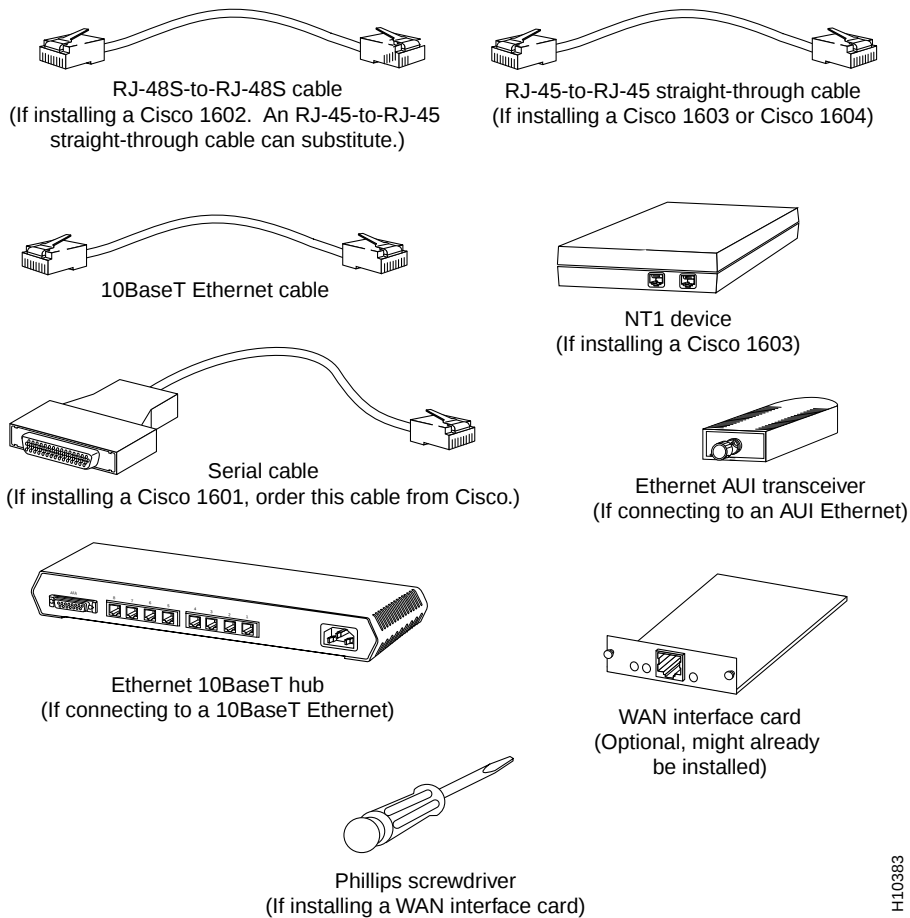
DB-25-to-RJ-45 console adapter
(light gray)

H10382

Equipment That You Must Provide

Figure 1-8 shows items that you will have to provide to install your router. You will require only some of these items, depending on what Cisco 1600 model you are installing.

Figure 1-8 **Items That You Provide**



Equipment That You Must Provide
