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Release Notes for Cisco IOS Release 11.2(5) Software Feature Packs—Cisco AS5200 Access Servers

June 10, 1997

These release notes identify the Cisco IOS Release 11.2 feature packs for Cisco AS5200 access servers.

Product numbers for the supported feature packs are as follows:

- CD52-C-11.2= (Cisco AS5200 IP Feature Pack)
- CD52-CP-11.2= (Cisco AS5200 IP Plus Feature Pack)
- CD52-B-11.2= (Cisco AS5200 Desktop Feature Pack)
- CD52-BP-11.2= (Cisco AS5200 Desktop Plus Feature Pack)
- CD52-A-11.2= (Cisco AS5200 Enterprise Feature Pack)
- CD52-AP-11.2= (Cisco AS5200 Enterprise Plus Feature Pack)

Note The feature packs listed here contain Cisco IOS Release 11.2(5)P software images and a selection of back rev images. The feature packs contain Router Software Loader (RSL) Version 5.0.

Note Before running RSL, read the section “Installation Tips,” page 5.

Corporate Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

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What Is a Feature Pack?

The heart of a Cisco IOS software feature pack is a CD-ROM that contains software images and RSL, a Windows 95 application, which loads the images onto the router. Each Cisco IOS Release 11.2 feature pack CD contains feature sets and one modem firmware image. For users without Windows 95, images can also be loaded with a Trivial File Transfer Protocol (TFTP) server application.

Each Cisco IOS Release 11.2 software feature pack box contains the following:

- CD-ROM with the following software:
 - Feature set software images
 - Modem software image
 - RSL program (a Windows 95 application)
- Instruction booklet for using RSL
- Release notes (this document), which include instructions for using a TFTP server application on a system not running Windows 95
- Software license—for using Cisco software in object code form on a single router
- Cisco Documentation CD-ROM, which contains all Cisco IOS software documentation

Cisco Feature Pack Descriptions

This section describes the Cisco feature packs, listing the software feature sets comprising each feature pack. You can use this information to identify your feature pack set in conjunction with the corresponding information provided in the table in the section “Cisco IOS Release 11.2 Feature Sets,” page 6. The table in that section identifies which features are supported for a feature set on a specific platform.

Note RSL 5.0, contained in every Cisco IOS Release 11.2 software feature pack, supports Ethernet, Fast Ethernet, and Token Ring interfaces.

Software Feature Packs

This section includes two tables: Table 1, on the following page, identifies each feature pack as specified on the label of the CD containing the router software. It also lists the feature sets comprising the feature pack, giving the UNIX and DOS filenames of the images. The table provides a brief description of each feature set and the router platform on which the feature set runs. Table 1 also identifies the memory required to run each feature set on the Cisco AS5200 access server; Table 2 describes the memory delivered by default and the memory upgrades available.

You can use Table 1 to identify the memory required for your configuration based on the image you run. You can then check this against Table 2 to determine how much memory is available on the router as the factory default and the upgrades that you can obtain to satisfy your requirements.

Table 1 Cisco Feature Pack Image Filenames and Memory Requirements

Feature Sets Included	Image Name (UNIX)	Image Name (DOS)	Flash Mem Required	Main Mem Required	Boot Flash Mem Req	Shared Mem Req	Description
Cisco AS5200 IP Feature Pack Release 11.2 and 11.1 (model number CD52-C-11.2=)							
IP	c5200-i-1.112-5.P	80138005	8 MB	8 MB	4 MB	4 MB	IP feature set 11.2(5)P
IP	as5200-iz-1.111-9.AA	80111609	8 MB	8 MB	4 MB	4 MB	IP feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					
Cisco AS5200 IP Plus Feature Pack Release 11.2 and 11.1 (model number CD52-CP-11.2=)							
IP Plus	c5200-is-1.112-5.P	80138105	8 MB	8 MB	4 MB	4 MB	IP Plus feature set 11.2(5)P
IP-Modem	as5200-iz-1.111-9.AA	80111609	8 MB	8 MB	4 MB	4 MB	IP Modem feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					
Cisco AS5200 Desktop Feature Pack Release 11.2 and 11.1 (model number: CD52-B-11.2=)							
Desktop	c5200-d-1.112-5.P	80137805	8 MB	8 MB	4 MB	4 MB	Desktop feature set 11.2(5)P
Desktop	as5200-dz-1.111-9.AA	80111509	8 MB	8 MB	4 MB	4 MB	Desktop feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					
Cisco AS5200 Desktop Plus Feature Pack Release 11.2 and 11.1 (model number CD52-BP-11.2=)							
Desktop Plus	c5200-ds-1.112-5.P	80137905	8 MB	8 MB	4 MB	4 MB	Desktop Plus feature set 11.2(5)P
Desktop-Modem	as5200-dz-1.111-9.AA	80111509	8 MB	8 MB	4 MB	4 MB	Desktop Modem feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					
Cisco AS5200 Enterprise Feature Pack Release 11.2 and 11.1 (model number CD52-A-11.2=)							
Enterprise	c5200-j-1.112-5.P	80138205	8 MB	8 MB	4 MB	4 MB	Enterprise feature set 11.2(5)P
Enterprise	as5200-jmz-1.111-9.AA	80111409	8 MB	8 MB	4 MB	4 MB	Enterprise feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					
Cisco AS5200 Enterprise Plus Feature Pack Release 11.2 and 11.1 (model number CD52-AP-11.2=)							
Enterprise Plus	c5200-js-1.112-5.P	80138305	8 MB	8 MB	4 MB	4 MB	Enterprise Plus feature set 11.2(5)P
Enterprise-Modem	as5200-jmz-1.111-9.AA	80111409	8 MB	8 MB	4 MB	4 MB	Enterprise Modem feature set 11.1(9)AA
Modem Firmware	mcom-modem-firmware.2.1.9.bin	80146101					

Table 2 Cisco AS5200 Memory Upgrade Options

	Default	Upgrade Options
Flash System	8 MB	16-MB upgrade: MEM-1X16-AS52=
Flash Bootflash	4 MB	8-MB upgrade: MEM-BF-52=
DRAM	8 MB	16-MB upgrade: MEM-16M-52=
Shared	4 MB	8-MB upgrade: MEM-8S-52=

Installation Tips

This section describes several solutions to problems you might encounter when using RSL. These solutions are additions to RSL's online help.

Recovering From a Connection Error

This installation tip provides a possible recovery solution in the event that you are unable to connect to your router. You can skip this section unless you are experiencing a connection error.

In some cases, you might receive the following error message while connecting to the target router:

```
"Failed to configure the router to enable the Cisco IOS software image and configuration
file upload and download operations. You may want to check the router to make sure that
the selected interface exists."
```

If you encounter this message, try increasing the Short Timeout value, which is set to 25 seconds, in the Options dialog box, especially if one of the following situations applies:

Note Increasing the Short Timeout value may increase the time it takes for RSL to connect to the target router.

- You are connecting to a router that has a large configuration file.
- You are connecting to a Cisco AS5200. A Cisco AS5200 requires up to 45 seconds to write a configuration to nonvolatile random-access memory (NVRAM), due to the amount of interfaces that must be checked during this process. Increase the Short Timeout value to 60 seconds.

Restoring the Startup Configuration

In some cases, RSL is unable to restore the startup configuration. If this happens, take the following steps:

- Step 1** Ensure that all cables are properly attached to both the router and the PC.
- Step 2** Restart RSL and connect using the **Preconfigured router** option.
- Step 3** When asked if you want to overwrite the existing startup configuration file, choose **NO**.
- Step 4** When asked if you want to continue, choose **YES**.
- Step 5** When connected, select **Download Router Configuration** in the Router Software Loader dialog box.

Step 6 Select the appropriate file, and click the radio button beside **Copy configuration to the router's nonvolatile memory**.

The router should now contain the startup configuration it had before the initial RSL connection. You can now exit RSL.

Note In the previous situation, the router's configuration register is not restored.

Note If you enter **Ctrl-Alt-Delete** to terminate RSL, the router's configuration and configuration register are not restored. However, in this case the configuration file is not deleted from the PC, so it can be restored using the previous steps.

Helpful Hints

The following information about RSL operations can help you with the installation process:

- If you have added any static entries to the PC's Address Resolution Protocol (ARP) table, one of them may be deleted by RSL. This entry will need to be manually re-entered into the PC's ARP table.
- If your router is configured with a **boot system flash filename** command, where *filename* is the name of the previous image residing in the first partition of Flash memory, this command must be manually changed to reflect the name of the image that was copied to the router's first Flash memory partition.
- If the router's running configuration at connection time is not the same as the router's startup configuration, the exact configuration will not be restored. Any changes that you have made since the last time a **copy running-config startup-config** or **write memory** command was entered will be lost.
- If you connect to a router with multiple Flash memory partitions, it will always copy the new image to the first partition and reload to the first partition. This will fail if there is not enough memory in the first partition.
- RSL will restore the router's running configuration, but some configuration commands will not be restored. However, the startup configuration will be correct. You can restore the exact running configuration by rebooting the router. Commands not restored to the running configuration include the following interface configuration commands: **no shutdown**, **no ringspeed**, and **media-type aui**.

Cisco IOS Release 11.2 Feature Sets

Table 3 shows specific features supported for Cisco IOS Release 11.2 on Cisco AS5200 access servers.

The table uses these conventions to identify features:

- Yes: the feature is offered in the basic feature set
- – : the feature is not offered in the feature set
- Plus: the feature is offered only in the Plus feature sets, not in the basic feature set

Table 3 Cisco IOS Release 11.2 Feature Sets for Cisco AS5200 Access Servers

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise ¹
LAN Support			
Apollo Domain	—	—	Yes
AppleTalk 1 and 2 ²	—	Yes	Yes
Banyan VINES	—	—	Yes
Concurrent routing and bridging (CRB)	Yes	Yes	Yes
DECnet IV	—	Yes	Yes
DECnet V	—	—	Yes
GRE	Yes	Yes	Yes
Integrated routing and bridging (IRB) ³	Yes	Yes	Yes
IP	Yes	Yes	Yes
LAN extension host	Yes	Yes	Yes
Multiring	Yes	Yes	Yes
Novell IPX ⁴	—	Yes	Yes
OSI	—	—	Yes
Source-route bridging (SRB)	—	—	Yes
Transparent and translational bridging	Yes	Yes	Yes
XNS	—	—	Yes
WAN Services			
ATM LAN emulation: Rate queues for SVC per subinterface	—	—	Yes
Combinet Packet Protocol (CPP)	Yes	Yes	Yes
Dialer profiles	Yes	Yes	Yes
Frame Relay	Yes	Yes	Yes
Frame Relay SVC Support (DTE)	—	—	Yes
Frame Relay traffic shaping	Yes	Yes	Yes
Half bridge/half router for CPP and PPP	Yes	Yes	Yes
HDLC	Yes	Yes	Yes
IPXWAN 2.0	—	Yes	Yes
ISDN ⁵	Yes	Yes	Yes
Multichassis Multilink PPP (MMP)	—	—	Yes
PPP ⁶	Yes	Yes	Yes
SMDS	Yes	Yes	Yes
Switched 56	Yes	Yes	Yes
Virtual Private Dial-up Network (VPDN)	—	Yes	Yes
X.25 ⁷	Yes	Yes	Yes

Table 3 Cisco IOS Release 11.2 Feature Sets for Cisco AS5200 Access Servers (Continued)

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise ¹
WAN Optimization			
Bandwidth-on-demand	Yes	Yes	Yes
Custom and priority queuing	Yes	Yes	Yes
Dial backup	Yes	Yes	Yes
Dial-on-demand	Yes	Yes	Yes
Header ⁸ , link and payload compression ⁹	Yes	Yes	Yes
Snapshot routing	Yes	Yes	Yes
Weighted fair queuing	Yes	Yes	Yes
IP Routing			
BGP	Yes	Yes	Yes
BGP4 ¹⁰	Yes	Yes	Yes
EGP	Yes	Yes	Yes
Enhanced IGRP	Yes	Yes	Yes
Enhanced IGRP Optimizations	Yes	Yes	Yes
ES-IS	—	—	Yes
IGRP	Yes	Yes	Yes
IS-IS	—	—	Yes
Named IP Access Control List	Yes	Yes	Yes
Network Address Translation (NAT)	Plus	Plus	Plus
NHRP	Yes	Yes	Yes
On Demand Routing (ODR)	Yes	Yes	Yes
OSPF	Yes	Yes	Yes
OSPF Not-So-Stubby-Areas (NSSA)	Yes	Yes	Yes
OSPF On Demand Circuit (RFC 1793)	Yes	Yes	Yes
PIM	Yes	Yes	Yes
Policy-based routing	Yes	Yes	Yes
RIP	Yes	Yes	Yes
RIP Version 2	Yes	Yes	Yes
Other Routing			
AURP	—	Yes	Yes
IPX RIP	—	Yes	Yes
NLSP	—	Yes	Yes
RTMP	—	Yes	Yes
SMRP	—	Yes	Yes
S RTP	—	—	Yes

Table 3 Cisco IOS Release 11.2 Feature Sets for Cisco AS5200 Access Servers (Continued)

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise¹
Multimedia and Quality of Service			
Generic traffic shaping	Yes	Yes	Yes
Random Early Detection (RED)	Yes	Yes	Yes
Resource Reservation Protocol (RSVP)	Yes	Yes	Yes
Management			
AutoInstall	Yes	Yes	Yes
Automatic modem configuration	Yes	Yes	Yes
HTTP Server	Yes	Yes	Yes
Modem Management	Plus	Plus	Plus
RMON events and alarms ¹¹	Yes	Yes	Yes
RMON full	Plus	Plus	Plus
SNMP	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
Security			
Access lists	Yes	Yes	Yes
Access security	Yes	Yes	Yes
Extended access lists	Yes	Yes	Yes
Kerberized login	—	—	Yes
Kerberos V client support	—	—	Yes
Lock and key	Yes	Yes	Yes
MAC security for hubs	Yes	Yes	Yes
MD5 routing authentication	Yes	Yes	Yes
RADIUS	Yes	Yes	Yes
TACACS+ ¹²	Yes	Yes	Yes
IBM Support (Optional)			
APPN (optional) ²	—	—	—
BAN for SNA Frame Relay support	Plus	Plus	Yes
Bisync	Plus	Plus	Yes
Caching and filtering	Plus	Plus	Yes
DLSw+ ¹³	Plus	Plus	Yes
Downstream PU concentration (DSPU)	Plus	Plus	Yes
Frame Relay SNA support (RFC 1490)	Plus	Plus	Yes
Native Client Interface Architecture (NCIA) Server	Plus	Plus	Yes
NetView Native Service Point	Plus	Plus	Yes
QLLC	Plus	Plus	Yes
Response Time Reporter (RTR)	Plus	Plus	Yes

Table 3 Cisco IOS Release 11.2 Feature Sets for Cisco AS5200 Access Servers (Continued)

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise ¹
SDLC integration	Plus	Plus	Yes
DLSw (RFC 1795)	Plus	Plus	Yes
SDLC transport (STUN)	Plus	Plus	Yes
SDLC-to-LAN conversion (SDLLC)	Plus	Plus	Yes
SNA and NetBIOS WAN optimization via local acknowledgment	Plus	Plus	Yes
SRB/RSRB ¹⁴	Plus	Plus	Yes
SRT	Plus	Plus	Yes
TG/COS	—	—	Yes
TN3270	—	—	Yes
Protocol Translation			
LAT	—	—	Yes
Rlogin	—	—	Yes
Remote Node¹⁵			
ARAP 1.0/2.0	—	Yes	Yes
Asynchronous master interfaces	Yes	Yes	Yes
ATCP	—	Yes	Yes
CHAP	Yes	Yes	Yes
CSLIP	Yes	Yes	Yes
DHCP	Yes	Yes	Yes
IP pooling	Yes	Yes	Yes
IPX and ARAP on virtual async interfaces	—	—	Yes
IPXCP	—	Yes	Yes
MacIP	—	Yes	Yes
NASI	—	—	—
NetBEUI over PPP	—	—	—
SLIP	Yes	Yes	Yes
Terminal Services¹⁵			
LAT ¹⁶	—	—	Yes
Rlogin	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
TN3270	—	—	Yes

1. Enterprise is available with APPN in a separate feature set. APPN includes APPN Central Registration (CRR) and APPN over DLSw+.

2. Includes AppleTalk load balancing.

3. IRB supports IP, IPX, and AppleTalk; it is supported for transparent bridging, but not for SRB; it is supported on all media-type interfaces except X.25 and ISDN bridged interfaces; and IRB and concurrent routing and bridging (CRB) cannot operate at the same time.

4. The Novell IPX feature includes display SAP by name, IPX Access Control List violation logging, and plain-English IPX access lists.

5. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.

6. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, and PPP compression, and Multilink PPP.
7. X.25 includes X.25 switching.
8. IPX header compression (RFC 1553) is available in the feature sets that support IPX.
9. X.25 and Frame Relay payload compression are supported.
10. BGP4 includes soft configuration, multipath support, and prefix filtering with inbound route maps.
11. The RMON events and alarms groups are supported on all interfaces. Full RMON support is available with the Plus feature sets.
12. TACACS+ Single Connection and TACACS+ SENDAUTH enhancements are supported.
13. Cisco IOS Release 11.2 introduces several DLSw+ enhancements available in the Plus, Plus 40, and Plus 56 feature sets.
14. SRB/RSRB is fast switched. This enhancement is on by default, but can be disabled.
15. Supported on access servers (with limited support on router auxiliary ports).
16. Use of LAT requires terminal license (FR-L8-10.X= for an 8-user license or FR-L16-10.X= for a 16-user license).

Back Rev Feature Sets

For a list of features supported by the back rev feature sets, see the release notes available on the Documentation CD-ROM or the World Wide Web (www.cisco.com). See the section “About Cisco IOS Software Electronic Documentation,” page 23. For example, to find a feature set list for Cisco IOS Release 11.1(8), locate the **Cisco IOS Software Configuration** database. Then select **Cisco IOS Release 11.1**, and then select **Release Notes for Cisco IOS Release 11.1**.

Installing the Modem Firmware Using RSL

You can use the Windows 95 application, RSL, to install modem images. Use the instructions in the CD booklet, *Getting Started with the Router Software Loader*, to connect cables and begin the RSL application. In the dialog box, select the **Operations** menu, and then **Load Modem Image**. The Load Modem Image dialog box opens. Follow the instructions in the dialog box.



Caution If you install *both* Cisco IOS images and the modem image, you should install the Cisco IOS images *before* the modem image, or else the installation of the modem image may transparently fail.

To quickly locate the path to your new Microcom firmware image, click the **Browse** button. After entering the target filename, click **OK**.

Note See Table 1 for a list of modem image filenames.

For instructions on installing modem firmware without using Windows 95, see “Installation Process for Modem Software.”

Installing the Router Software Without Using Windows 95

This section describes an alternative method you can use to install the router software from the CD-ROM using a PC running Windows 3.1, a Macintosh, or a UNIX system. The process requires that you first obtain a TFTP application or a remote copy protocol (rcp) application, which you can use to set up your computer as a TFTP server or an rcp server. You can use either the **copy tftp flash** or **copy rcp flash** command to download the router software feature sets to the router. You can use the **copy tftp modem** command to download the modem software to the router.

You can load router software with this alternative method in the following circumstances:

- You are not running Windows 95.
- Your router does not contain an Ethernet, Fast Ethernet, or Token Ring interface.

Note If you do not already have a TFTP or rcp application, you can choose from a number of TFTP applications or rcp applications available from independent software vendors. In addition, a number of TFTP programs are available as shareware from public sources on the World Wide Web.

Note The TFTP server included with RSL will run only on Windows 95.

Installation Process for Router Software Feature Sets

This section describes how to install the router software feature sets using a Microsoft Windows 3.1 PC with a TFTP server application. You can also set up your Macintosh or UNIX workstation as a TFTP server and follow the same steps.

To install the software using an rcp application, follow the same procedure and substitute rcp for TFTP in the instructions. You must also substitute the **copy rcp flash** command for the **copy tftp flash** command.

- Step 1** Install any TFTP server application on the PC. (Not provided by Cisco.)
- Step 2** Launch the TFTP server application on the PC. You commonly do this by double-clicking the application icon or its filename.
- Step 3** Set up the PC as a TFTP server using the TFTP server application setup or configuration facility.

The user interface of most TFTP server applications includes a setup facility that allows you to specify the PC as a server. For example, from the TFTP menu of one application, you can select **Settings** to display a panel that includes a checkbox beside the word Server. To configure the local PC as a server, click in this checkbox.

The TFTP server also allows selection of a “root” directory. You must select the directory in which the Cisco IOS files reside, for example **d:\cpswinst\images**.



Caution Be sure you set up your local PC as a TFTP server. If you overlook this step, you will not be able to perform the copy procedure. This reminder also applies if you are using rcp on your system instead of TFTP.

- Step 4** Establish a console session from your local PC (which is now configured as a TFTP server), to the Cisco router.

You can do this in two ways:

- Connect the PC’s COM port to the router’s console port.

This is the recommended method. If you use this method, when you reload the router with the new image in Step 11, you will remain connected to the router. (If you use Telnet, you will lose connection to the router.)

- Establish a Telnet session from the PC to the router.

Step 5 Connect your PC's Ethernet, Fast Ethernet, or Token Ring port to the router's corresponding LAN port. Use the 10BaseT crossover cable provided if connecting to an Ethernet or Fast Ethernet port. You must use Category 5 cable for Fast Ethernet routers.

Note Use straight-through cables if you are connecting via a 10BaseT hub or a 100BaseT hub.

Step 6 From the console, enter the **copy tftp flash** command.

Step 7 When prompted, enter the PC's IP address.

Step 8 When prompted, enter the filename of the Cisco IOS Release 11.2 image to be copied to the router as in the following example:

```
Source file name? 80138004.bin
```

This example specifies the IP feature set for Cisco AS5200 access servers.

Step 9 In response to the prompt, enter the destination filename and press **Enter** to indicate that you want to copy the image.

This is the name you select for the image file on the router. You do not need to use the full pathname of the image on the CD-ROM attached to the PC. In this example, the UNIX filename is used:

```
Destination file name [80138004.bin]? c5200-i-1.112-4.P
```

During the transfer process, the software displays messages indicating that it has accessed the file you have specified and is loading it.

If the file is not found, check the following: filename; TFTP server is enabled; correct root directory is selected; IP connectivity between the router and TFTP server.

Step 10 Enter **yes** or **no** in response to the prompt asking if you want to erase the existing image copy resident in the router's Flash memory before copying the new one:

```
Erase flash device before writing? [confirm] yes
```

When copying to internal Flash memory, the system may provide an option to erase existing internal Flash memory before writing onto it. Answer **yes** to the questions. The entire copying process takes several minutes and differs from network to network.

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully. If you see three periods (...), the transfer failed. Check IP connectivity between the router and TFTP server using the **ping** command.

Step 11 Enter the **reload** command to reload the router:

```
# reload
```

You do *not* need to save the system configuration when prompted here. After reload is complete, the router should be running the required Cisco IOS image. Use the **show version** command to verify.

Installation Process for Modem Software

This section provides steps that describe how to install the modem software using a Microsoft Windows 3.1 PC and a TFTP server application. You can also set up your Macintosh or UNIX workstation as a TFTP server and follow the same steps.

To install the software using an `rcp` application, follow the same procedure and substitute `rcp` for TFTP in the instructions. You must also substitute the **copy rcp modem** command for the **copy tftp modem** command.

- Step 1** Install any TFTP server application on the PC. (Not provided by Cisco.)
- Step 2** Launch the TFTP server application on the PC. You commonly do this by double-clicking the application icon or its filename.
- Step 3** Set up the PC as a TFTP server using the TFTP server application setup or configuration facility.

The user interface of most TFTP server applications includes a setup facility that allows you to specify the PC as a server. For example, from the TFTP menu of one application, you can select **Settings** to display a panel that includes a checkbox beside the word Server. To configure the local PC as a server, you click in this checkbox.

The TFTP server also allows selection of a “root” directory. You must select the directory in which the Cisco IOS files reside, for example `d:\cpswinst\images`.



Caution Be sure you set up your local PC as a TFTP server. If you overlook this step, you will not be able to perform the copy procedure. This reminder also applies if you are using `rcp` on your system instead of TFTP.

- Step 4** Establish a console session from your local PC (which is now configured as a TFTP server), to the Cisco router.

You can do this in two ways:

- Connect the PC’s COM port to the router’s console port.
- Establish a Telnet session from the PC to the router.

- Step 5** Connect your PC’s Ethernet, Fast Ethernet, or Token Ring port to the router’s corresponding LAN port. Use the 10BaseT crossover cable provided if connecting to an Ethernet or Fast Ethernet port. You must use Category 5 cable for Fast Ethernet routers.

Note Use straight-through cables if you are connecting via a 10BaseT hub or a 100BaseT hub.

- Step 6** From the console, enter the following command at the router prompt to copy the new Microcom firmware image from the CD-ROM drive of the PC to the router:

```
router# copy tftp modem
```

- Step 7** When prompted, enter the keyword **all** to upgrade the firmware for all modems in the router.

```
Modem Numbers (<slot>/<port> | group <number> | all)? all
```

- Step 8** When prompted, enter the IP address of your local Microsoft Windows 3.1–based PC as in the following example:

```
Address or name of remote host [255.255.255.255]? 131.108.1.1
```

- Step 9** When prompted, enter the filename of the Microcom firmware image to be copied to the router as in the following example:

```
Source file name? 80146101.bin
```

During the transfer process, messages indicate that the software has accessed the specified file and is loading it.

If the file is not found, check the following: filename; TFTP server is enabled; correct root directory is selected; IP connectivity between the router and TFTP server.

An exclamation point (!) indicates that the copy process is taking place. Each exclamation point indicates that ten packets have been transferred successfully. If you see three periods (...), the transfer failed. Check IP connectivity between the router and TFTP server using the **ping** command.

Command Reference Pages for TFTP and rcp

This section includes reference pages providing detailed information about the **copy rcp flash**, **copy tftp flash**, and **copy modem** commands. This information supplements the information provided in the steps described earlier in the section “Installing the Router Software Without Using Windows 95,” page 11.

copy rcp flash

To copy a file from a network server to the router or to another destination using rcp, use the **copy rcp flash EXEC** command.

copy rcp flash

Syntax Description

flash Specifies internal Flash memory as the destination of the copy operation.

Command Mode

EXEC

Usage Guidelines

The rcp protocol requires that a client send the remote username of an rcp request to the server. When you issue the **copy rcp flash** command, by default the Cisco IOS software sends the username associated with the current teletype (TTY), if that name is valid. For example, if the user is connected to the router through Telnet and the user was authenticated through the **username** command, then the software sends that username as the remote username.

Note For Cisco, TTY lines are commonly used for access services. The concept of TTY originated with UNIX. For UNIX systems, each physical device is represented in the file system. Terminals are called TTY devices, which stands for *teletype*, the original UNIX terminal.

If the TTY username is invalid, the software uses the host name as both the remote and local usernames. To specify a different remote username to be sent to the rcp server, use the **ip rcmd remote-username** command, and possibly the **ip rcmd remote-host** command. You can also specify the path of an existing directory along with the remote username.



Caution The remote username must be associated with an account on the destination server. If you do not use the **ip rcmd remote-username** command, and possibly the **ip rcmd remote-host** command, to specify the name of a remote user associated with an account on the server, then the remote username associated with the current TTY process must be associated with an account on the server. If there is no username for the current TTY process, then the host name must be associated with an account on the server. If the network administrator of the destination server did not establish accounts for the remote username used, this command will not execute successfully when a default remote username is used.

If you copy a system image from a personal computer used as a file server, the remote host computer must support the remote shell (rsh) protocol.

Use the **copy rcp flash** to copy a system image from a network server to the router's internal Flash memory using rcp. The Cisco IOS software prompts for the address of the rcp server and rcp filename. When you issue this command, the system provides an option to erase existing Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

Before booting from Flash memory, verify that the checksum of the image in internal Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you issue the **copy rcp flash** command. The README file was copied to the rcp server automatically when you installed the system software image.



Caution If the checksum value does not match the value in the README file, do not reboot the router. Reissue the **copy rcp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

Examples

The following example shows how to use the **copy rcp flash** command on a Cisco AS5200 access server. The interface might differ slightly on other systems. This example copies a system image named file1 from the netadmin1 directory on the remote server named *SERVER1.CISCO.COM* with an IP address of 131.108.101.101 to Flash memory. To ensure that enough Flash memory is available to accommodate the system image to be copied, the Cisco IOS software allows you to erase the contents of Flash memory first.


```

Router1# configure terminal

Router1(config)# ip rcmd remote-username netadmin1
Router(config)# Ctrl-Z
Router# copy rcp flash

System flash directory, partition 2:
File Length Name/status
  1  984   file1 [deleted]
  2  984   file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 131.108.101.101
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 131.108.101.101...
Loading dirt/ssangiah/file1 .from 131.108.101.101 (via Ethernet0): ! [OK]

Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading file1 from 131.108.101.101 (via Ethernet0): !
[OK - 984/8388608 bytes]

Verifying checksum... OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]

```

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system prompts only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash memory bank support in boot ROMs. If the partition entered is not valid, the process terminates. You have the option to enter a partition number, a question mark (?) for a directory display of all partitions, or a question mark and a number (?number) for a directory display of a particular partition. The default is the first read/write partition.

```

Router# copy rcp flash

System flash partition information:
Partition Size Used Free Bank-Size State Copy-Mode
  1 4096K 2048K 2048K 2048K Read Only RXBOOT-FLH
  2 4096K 2048K 2048K 2048K Read/Write Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 2]

```

If the partition is read-only and has dual Flash memory bank support in boot ROMs, the session continues as follows:

```

**** NOTICE ****

Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
-----
Proceed? [confirm]
System flash directory, partition 1:
File Length Name/status
  1 3459720 master/c5200-is-I.112-4.P
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/c5200-is-I.112-4.P

```

```
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Loading master/c5200-is-I.112-4.P from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/c5200-is-I.112-4.P' from TFTP server
as 'master/c5200-is-I.112-4.P' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:
File Length Name/status
  1 3459720 master/c5200-is-I.112-4.P
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/c5200-is-I.112-4.P
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/c5200-is-I.112-4.P' on ABC.CISCO.COM...
Loading master/c5200-is-I.112-4.P from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/c5200-is-I.112-4.P' from TFTP server
as 'master/c5200-is-I.112-4.P' into Flash WITH erase? [yes/no] yes
```

Related Commands

- boot config**
- boot system flash**
- cd**
- copy flash rcp**
- ip rcmd remote-username**
- verify flash**

copy tftp flash

To copy a file from a TFTP server to the router or to another destination, use the **copy tftp flash EXEC** command.

copy tftp flash

Syntax Description

flash	Specifies internal Flash memory as the destination of the copy operation.
--------------	---

Command Mode

EXEC

Usage Guidelines

The system prompts for the address of the TFTP server and TFTP filename if you do not provide them at the command line. When copying to internal Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

Before booting from Flash memory, verify that the checksum of the image in Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you issue the **copy tftp flash** command. The README file was copied to the TFTP server automatically when you installed the system software image.



Caution If the checksum value is not correct according to the value in the README file, do not reboot the router. Issue the **copy tftp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

Examples

The following example shows sample output of copying a system image named file1 into Flash memory:

```
Router# copy tftp flash

System flash directory, partition 2:
File Length Name/status
  1  984  file1 [deleted]
  2  984  file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 223.255.254.254
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 223.255.254.254...
Loading dirt/ssangiah/file1 .from 223.255.254.254 (via Ethernet0): - [OK]

Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading file1 from 223.255.254.254 (via Ethernet0): !!!!(etc.)
[OK - 984/8388608 bytes]

Verifying checksum... OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]
```

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully. A series of “V” characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system will prompt only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash bank support in boot ROMs. If the partition

entered is not valid, the process terminates. You can enter a partition number, a question mark (?) for a directory display of all partitions, or a question mark and a number (?number) for directory display of a particular partition. The default is the first read/write partition.

```
Router# copy tftp flash

System flash partition information:
Partition  Size    Used    Free    Bank-Size  State    Copy-Mode
    1        4096K   2048K   2048K   2048K      Read Only  RXBOOT-FLH
    2        4096K   2048K   2048K   2048K      Read/Write Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 2]
```

If the partition is read-only and has dual Flash bank support in boot ROMs, the session continues as follows:

```
**** NOTICE ****

Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
----- ***** -----

Proceed? [confirm]
System flash directory, partition 1:
File Length Name/status
  1 3459720 master/c5200-is-I.112-4.P
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/c5200-is-I.112-4.P
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Loading master/c5200-is-I.112-4.P from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/c5200-is-I.112-4.P' from TFTP server
as 'master/c5200-is-I.112-4.P' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:
File Length Name/status
  1 3459720 master/c5200-is-I.112-4.P
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/c5200-is-I.112-4.P
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/c5200-is-I.112-4.P' on ABC.CISCO.COM...
Loading master/c5200-is-I.112-4.P from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/c5200-is-I.112-4.P' from TFTP server
as 'master/c5200-is-I.112-4.P' into Flash WITH erase? [yes/no] yes
```

Related Commands

copy flash tftp
verify
verify flash

copy modem

To download firmware to modems in the Cisco AS5200 access server, use the **copy modem** EXEC command.

```
copy {flash | tftp | rcp} modem
```

Syntax Description

flash	Copies firmware from Flash memory to the modem.
tftp	Copies firmware from the TFTP server to the modem.
rcp	Downloads a remote copy of the firmware from a network server to the modem.

Default

Disabled

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2.

After you enable this command, you are asked to provide the download destination (a *slot/modem-port* or **all**), the remote host name, and the path leading to the source modem firmware.

If a modem that you wish to upgrade is busy with a call when the **copy modem** command is enabled, the upgrade for that modem yields until the active call is dropped. All other idle modems in the upgrade range proceed with the downloading operation.

Examples

The following example shows how to copy the modem firmware file called *modem_upgrade* from the TFTP server called *Modem_Server* to modem 2/0, which is installed in the Cisco AS5200 access server:

```
AS5200# copy tftp modem
Modem Firmware Download Modem Numbers? 2/0
Address or name of remote host [UNKNOWN]? Modem_Server
Source file name? dirt/elem/modem_upgrade
Accessing file 'dirt/elem/modem_upgrade' on Modem_Server...
Loading dirt/elem/modem_upgrade .from 223.255.254.254 (via Ethernet0): ! [OK]

Loading dirt/elem/modem_upgrade from 223.255.254.254 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 237503/278528 bytes]
```

```
AS5200#
%MODEM-5-DL_START: Modem (2/0) started firmware download
%MODEM-5-DL_GOOD: Modem (2/0) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
```

As shown in this example, you might want to upgrade and test one modem's firmware before upgrading the firmware of all the modems on the access server, as shown in the next example.

This example shows how to download the same modem firmware file from the TFTP server to all the modems in the Cisco AS5200 access server:

```
AS5200# copy tftp modem
Modem Firmware Download Modem Numbers? all
Address or name of remote host [UNKNOWN]? Modem_Server
Source file name? dirt/elem/modem_upgrade
Accessing file 'dirt/elem/modem_upgrade' on Modem_Server...
Loading dirt/elem/modem_upgrade .from 223.255.254.254 (via Ethernet0): ! [OK]

Loading dirt/elem/modem_upgrade from 223.255.254.254 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 237503/278528 bytes]

AS5200#
%MODEM-5-DL_START: Modem (2/0) started firmware download
%MODEM-5-DL_START: Modem (2/1) started firmware download
%MODEM-5-DL_START: Modem (2/2) started firmware download
%MODEM-5-DL_START: Modem (2/3) started firmware download
%MODEM-5-DL_START: Modem (2/4) started firmware download
%MODEM-5-DL_START: Modem (2/5) started firmware download
%MODEM-5-DL_START: Modem (2/6) started firmware download
%MODEM-5-DL_START: Modem (2/7) started firmware download
%MODEM-5-DL_START: Modem (2/8) started firmware download
%MODEM-5-DL_START: Modem (2/9) started firmware download
%MODEM-5-DL_START: Modem (2/10) started firmware download
%MODEM-5-DL_START: Modem (2/11) started firmware download
%MODEM-5-DL_START: Modem (2/12) started firmware download
%MODEM-5-DL_START: Modem (2/13) started firmware download
%MODEM-5-DL_START: Modem (2/14) started firmware download
%MODEM-5-DL_START: Modem (2/15) started firmware download
%MODEM-5-DL_START: Modem (2/16) started firmware download
%MODEM-5-DL_START: Modem (2/17) started firmware download
%MODEM-5-DL_START: Modem (2/18) started firmware download
%MODEM-5-DL_START: Modem (2/19) started firmware download
%MODEM-5-DL_START: Modem (2/20) started firmware download
%MODEM-5-DL_START: Modem (2/21) started firmware download
%MODEM-5-DL_START: Modem (2/22) started firmware download
%MODEM-5-DL_START: Modem (2/23) started firmware download
%MODEM-5-DL_GOOD: Modem (2/2) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/10) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/4) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/6) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/7) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/12) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/11) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/13) completed firmware download:
MNPCClass10V.34/V.FCModemRev1.0.23/85.23/85
```

```

%MODEM-5-DL_GOOD: Modem (2/1) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/14) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/19) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/22) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/5) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/8) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/9) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/17) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/0) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/3) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/21) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/16) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/15) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/18) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/20) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
%MODEM-5-DL_GOOD: Modem (2/23) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85

```

The following example shows how to copy the modem firmware file called STAR.M from Flash memory to the integrated modem 1/2:

```

AS5200# copy flash modem
Modem Numbers (<slot>/<port> | group <number> | all)? 1/2

System flash directory:
File Length Name/status
  1 3539820 as5200-i-m.allcookies
  2 239203 STAR.M
  3 23072 BOOT.105 [3802288 bytes used, 4586320 available, 8388608 total]
Source file name? STAR.M
AS5200#
%MODEM-5-DL_START: Modem (1/2) started firmware download
%MODEM-5-DL_GOOD: Modem (1/2) completed firmware download:
MNPClass10V.34/V.FCModemRev1.0.23/85.23/85
AS5200#

```

Note The release notes shipped with your router are designed as reference material. The feature pack release notes (this document) should be sufficient for installing your software.

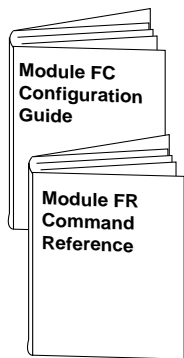
About Cisco IOS Software Electronic Documentation

Cisco IOS software documentation is provided on the Documentation CD-ROM that is included with your feature pack. To locate the correct documentation, first determine the Cisco IOS release level of the image you loaded (see Table 1, the Description column).

You can either use the Documentation CD or go to www.cisco.com (select **Products & Ordering, Documentation, Cisco Product Documentation, Cisco IOS Software Configuration**, then select the level of release). Typical documentation consists of the following:

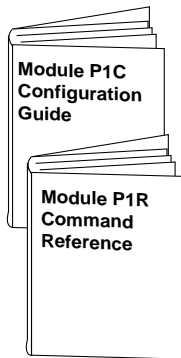
- Release notes—Contains information such as new features, important notes, and caveats.
- Feature guides—Describes new features available in specific Cisco IOS releases.
- Modules that comprise the configuration guides and command references. Figure 1 describes Cisco IOS Release 11.2 modules.
- *Cisco IOS Software Command Summary*—Summarizes the commands in the command reference publications. For each command, the summary provides complete syntax, the purpose of the command, and a description of each keyword and argument in the command syntax.
- *System Error Messages*—Describes system error messages reported by Cisco IOS software.
- *Cisco Management Information Base (MIB) User Quick Reference*—Describes the Cisco Systems private, or local, Management Information Base (MIB), which is provided with all Cisco software releases and with CiscoWorks router management software. A MIB file contains variables that can be set or read to provide information on network devices and interfaces. The Cisco MIB is a set of variables that are private extensions to the Internet standard MIB II.
- *Debug Command Reference*—Provides information about using debug commands to troubleshoot your network. The *Debug Command Reference* is intended for network administrators who already know how to configure a router and are familiar with all relevant network equipment.
- Caveats.

Figure 1 Cisco IOS Configuration Guides and Command References



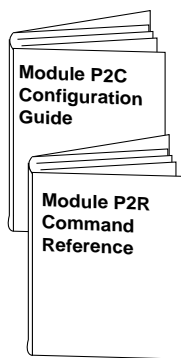
**Module FC/FR:
Configuration
Fundamentals**

- Access Server and Router Product Overview
- Cisco IOS Software Configuration Basics
- Images and Configuration Files
- Interface Configuration
- System Management



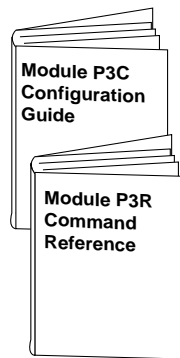
**Module P1C/P1R:
Network Protocols,
Part 1**

- IP Addressing
- IP Services
- IP Routing Protocols



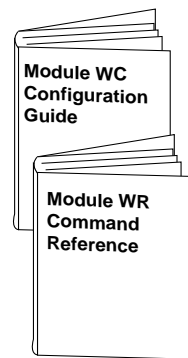
**Module P2C/P2R:
Network Protocols,
Part 2**

- AppleTalk
- Novell IPX



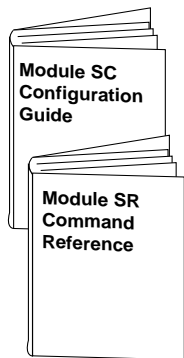
**Module P3C/P3R:
Network Protocols,
Part 3**

- Apollo Domain
- Banyan VINES
- DECnet
- ISO CLNS
- XNS



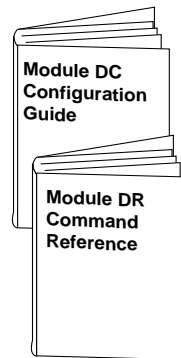
**Module WC/WR:
Wide-Area
Networking**

- ATM
- Frame Relay
- SMDS
- X.25 and LAPB



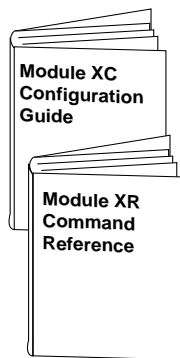
**Module SC/SR:
Security**

- Terminal Access Security
- Network Access Security
- Accounting and Billing
- Filtering Traffic
- Preventing Fraudulent Route Updates
- Network Data Encryption



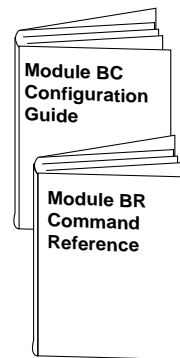
**Module DC/DR:
Dial Solutions**

- Dial Business Solutions and Examples
- Dial-In Port Setup
- DDR and Dial Backup
- Remote Node and Terminal Service
- Cost-Control and Large-Scale Dial Solutions
- VPDN



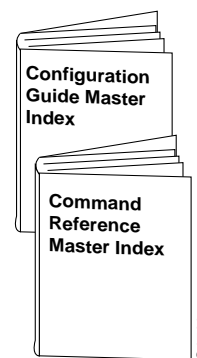
**Module XC/XR:
Cisco IOS Switching
Services**

- Switching Paths for IP Networks
 - Fast Switching
 - Autonomous Switching
 - NetFlow Switching
 - Optimum Switching
- Virtual LAN (VLAN) Switching and Routing
 - Inter-Switch Link Protocol Encapsulation
 - IEEE 802.10 Encapsulation
 - LAN Emulation



**Module BC/BR:
Bridging and IBM
Networking**

- Transparent Bridging
- Source-Route Bridging
- Remote Source-Route Bridging
- DLSw+
- STUN and BSTUN
- LLC2 and SDLC
- IBM Network Media Translation
- DSPU and SNA Service Point
- SNA Frame Relay Access Support
- APPN
- NCIA Client/Server Topologies
- IBM Channel Attach



**Configuration
Guide Master
Index**

**Command
Reference
Master Index**

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Cisco IOS configuration guides describe system configuration and maintenance tasks and provide comprehensive configuration examples. The configuration guides do not include command syntax for every command, so you should use them in conjunction with the command references. The Cisco configuration guides give in-depth descriptions of configuration tasks.

Cisco IOS command references describe the commands necessary for configuring and maintaining your system. If you are new to Cisco software, you should use the Cisco command references in conjunction with the configuration guides to reference commands and detailed information pertaining to their use. If you are an experienced network administrator, you might want to use the Cisco command references as standalone manuals.

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- WWW: <http://www.cisco.com>
- WWW: <http://www-europe.cisco.com>
- WWW: <http://www-china.cisco.com>
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

This document is to be used in conjunction with the Cisco IOS configuration guides and command reference publications.

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