CISCO SYSTEMS

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Release Notes for Cisco IOS Release 11.2 Software Feature Packs—Cisco 3600 Series Routers

August 11, 1997

These release notes identify the Cisco IOS Release 11.2 feature packs for Cisco 3600 series routers.

Product numbers for the supported feature packs are as follows:

- CD36-C-11.2= (Cisco 3600 IP Feature Pack)
- CD36-CP-11.2= (Cisco 3600 IP Plus Feature Pack)
- CD36-CW-11.2= (Cisco 3600 IP Plus 40 Feature Pack)*
- CD36-CY-11.2= (Cisco 3600 IP Plus 56 Feature Pack)*
- CD36-B-11.2= (Cisco 3600 IP/IPX/AT/DEC Feature Pack)
- CD36-BP-11.2= (Cisco 3600 IP/IPX/AT/DEC Plus Feature Pack)
- CD36-BW-11.2= (Cisco 3600 IP/IPX/AT/DEC Plus 40 Feature Pack)*
- CD36-BY-11.2= (Cisco 3600 IP/IPX/AT/DEC Plus 56 Feature Pack)*
- CD36-A-11.2= (Cisco 3600 Enterprise Feature Pack)
- CD36-AP-11.2= (Cisco 3600 Enterprise Plus Feature Pack)
- CD36-AW-11.2= (Cisco 3600 Enterprise Plus 40 Feature Pack)*
- CD36-AY-11.2= (Cisco 3600 Enterprise Plus 56 Feature Pack)*

* These feature packs contain encryption images.

Note   The feature packs listed here contain Cisco IOS Release 11.2(7)P software images and a selection of back rev images. The feature packs contain Router Software Loader (RSL) Version 5.01.

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These release notes contain the following sections:

Platforms Supported

RSL 5.01 supports the following Cisco 3600 series routers:

- CiscoPro CPA3620 and CPA3640

- Cisco 3620 and Cisco 3640

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. 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

    — 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

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Note Before running RSL, read the section "Installation Tips," page 10.

Note If you are installing feature sets on a Cisco 3600 series router with no Ethernet, Fast Ethernet, or Token Ring interface, use the loading procedures described in the section "Alternatives to RSL," page 17.

Cisco Feature Pack Descriptions

This section describes the Cisco feature packs, listing the software feature sets comprising each 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 12. The table in that section identifies which features are supported for a feature set on a specific platform.

Software Feature Packs

This section includes two tables: Table 1 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 your specific platform; 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.

Note RSL 5.01, contained in every Cisco IOS Release 11.2 software feature pack, supports Ethernet, Fast Ethernet, and Token Ring interfaces.

Table 1   Cisco Feature Pack Image Filenames and Memory Requirements

Router Software Loader Description	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required
Cisco 3600 IP Feature Pack Release 11.2 and 11.1 (model number CD36-C-11.2=)				
Cisco 3620 IP feature set 11.2(7)P	c3620-i-mz.112-7a.P	*80155207*	4 MB	16 MB
Cisco 3640 IP feature set 11.2(7)P	c3640-i-mz.112-7a.P	*80156007*	4 MB	16 MB
Cisco 3620 IP feature set 11.2(4)XA	c3620-i-mz.112-4.XA	*80155204*	4 MB	16 MB
Cisco 3640 IP feature set 11.2(4)XA	c3640-i-mz.112-4.XA	*80156004*	4 MB	16 MB
Cisco 3620 IP feature set 11.1(8)AA	c3620-i-mz.111-8.AA	*80131008*	4 MB	16 MB
Cisco 3640 IP feature set 11.1(8)AA	c3640-i-mz.111-8.AA	*80131908*	4 MB	16 MB
Cisco 3600 IP Plus Feature Pack Release 11.2 and 11.1 (model number CD36-CP-11.2=)				
Cisco 3620 IP Plus feature set 11.2(7)P	c3620-is-mz.112-7a.P	*80155307*	4 MB	16 MB
Cisco 3640 IP Plus feature set 11.2(7)P	c3640-is-mz.112-7a.P	*80156107*	4 MB	16 MB
Cisco 3620 IP Plus feature set 11.2(4)XA	c3620-is-mz.112-4.XA	*80155304*	4 MB	16 MB
Cisco 3640 IP Plus feature set 11.2(4)XA	c3640-is-mz.112-4.XA	*80156104*	4 MB	16 MB
Cisco 3620 IP feature set 11.1(8)AA	c3620-i-mz.111-8.AA	*80131008*	4 MB	16 MB
Cisco 3640 IP feature set 11.1(8)AA	c3640-i-mz.111-8.AA	*80131908*	4 MB	16 MB

Table 1   Cisco Feature Pack Image Filenames and Memory Requirements (Continued)

Router Software Loader Description	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required
Cisco 3600 IP Plus 40 Feature Pack Release 11.2 and 11.1 (model number CD36-CW-11.2=)				
Cisco 3620 IP Plus 40 feature set 11.2(7)P[1]	c3620-is40-mz.112-7a.P	*80200507*	4 MB	16 MB
Cisco 3640 IP Plus 40 feature set 11.2(7)P[1]	c3640-is40-mz.112-7a.P	*80200607*	4 MB	16 MB
Cisco 3620 IP Plus feature set 11.2(4)XA	c3620-is-mz.112-4.XA	*80155304*	4 MB	16 MB
Cisco 3640 IP Plus feature set 11.2(4)XA	c3640-is-mz.112-4.XA	*80156104*	4 MB	16 MB
Cisco 3620 IP feature set 11.1(8)AA	c3620-i-mz.111-8.AA	*80131008*	4 MB	16 MB
Cisco 3640 IP feature set 11.1(8)AA	c3640-i-mz.111-8.AA	*80131908*	4 MB	16 MB
Cisco 3600 IP Plus 56 Feature Pack Release 11.2 and 11.1 (model number CD36-CY-11.2=)				
Cisco 3620 IP Plus 56 feature set 11.2(7)P[2]	c3620-is56-mz.112-7a.P	*80200707*	4 MB	16 MB
Cisco 3640 IP Plus 56 feature set 11.2(7)P[2]	c3640-is56-mz.112-7a.P	*80200807*	4 MB	16 MB
Cisco 3620 IP Plus feature set 11.2(4)XA	c3620-is-mz.112-4.XA	*80155304*	4 MB	16 MB
Cisco 3640 IP Plus feature set 11.2(4)XA	c3640-is-mz.112-4.XA	*80156104*	4 MB	16 MB
Cisco 3620 IP feature set 11.1(8)AA	c3620-i-mz.111-8.AA	*80131008*	4 MB	16 MB
Cisco 3640 IP feature set 11.1(8)AA	c3640-i-mz.111-8.AA	*80131908*	4 MB	16 MB
Cisco 3600 IP/IPX/AT/DEC Feature Pack Release 11.2 and 11.1 (model number: CD36-B-11.2=)				
Cisco 3620 IP/IPX/AppleTalk/DECnet feature set 11.2(7)P	c3620-d-mz.112-7a.P	*80155007*	4 MB	16 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet feature set 11.2(7)P	c3640-d-mz.112-7a.P	*80155807*	4 MB	16 MB
Cisco 3620 IP/IPX/AppleTalk/DECnet feature set 11.2(4)XA	c3620-d-mz.112-4.XA	*80155004*	4 MB	16 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet feature set 11.2(4)XA	c3640-d-mz.112-4.XA	*80155804*	4 MB	16 MB
Cisco 3620 Desktop feature set 11.1(8)AA	c3620-d-mz.111-8.AA	*80130808*	4 MB	16 MB
Cisco 3640 Desktop feature set 11.1(8)AA	c3640-d-mz.111-8.AA	*80131708*	4 MB	16 MB
Cisco 3600 IP/IPX/AT/DEC Plus Feature Pack Release 11.2 and 11.1 (model number CD36-BP-11.2=)				
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(7)P	c3620-ds-mz.112-7a.P	*80155107*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(7)P	c3640-ds-mz.112-7a.P	*80155907*	4 MB	24 MB
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3620-ds-mz.112-4.XA	*80155104*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3640-ds-mz.112-4.XA	*80155904*	4 MB	24 MB
Cisco 3620 Desktop feature set 11.1(8)AA	c3620-d-mz.111-8.AA	*80130808*	4 MB	16 MB
Cisco 3640 Desktop feature set 11.1(8)AA	c3640-d-mz.111-8.AA	*80131708*	4 MB	16 MB

Table 1 Cisco Feature Pack Image Filenames and Memory Requirements (Continued)

Router Software Loader Description	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required
Cisco 3600 IP/IPX/AT/DEC Plus 40 Feature Pack Release 11.2 and 11.1 (model number CD36-BW-11.2=)				
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus 40 feature set 11.2(7)P[1]	c3620-ds40-mz.112-7a.P	*80200907*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus 40 feature set 11.2(7)P[1]	c3640-ds40-mz.112-7a.P	*80201007*	4 MB	24 MB
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3620-ds-mz.112-4.XA	*80155104*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3640-ds-mz.112-4.XA	*80155904*	4 MB	24 MB
Cisco 3620 Desktop feature set 11.1(8)AA	c3620-d-mz.111-8.AA	*80130808*	4 MB	16 MB
Cisco 3640 Desktop feature set 11.1(8)AA	c3640-d-mz.111-8.AA	*80131708*	4 MB	16 MB
Cisco 3600 IP/IPX/AT/DEC Plus 56 Feature Pack Release 11.2 and 11.1 (model number CD36-BY-11.2=)				
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus 56 feature set 11.2(7)P[2]	c3620-ds56-mz.112-7a.P	*80201107*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus 56 feature set 11.2(7)P[2]	c3640-ds56-mz.112-7a.P	*80201207*	4 MB	24 MB
Cisco 3620 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3620-ds-mz.112-4.XA	*80155104*	4 MB	24 MB
Cisco 3640 IP/IPX/AppleTalk/DECnet Plus feature set 11.2(4)XA	c3640-ds-mz.112-4.XA	*80155904*	4 MB	24 MB
Cisco 3620 Desktop feature set 11.1(8)AA	c3620-d-mz.111-8.AA	*80130808*	4 MB	16 MB
Cisco 3640 Desktop feature set 11.1(8)AA	c3640-d-mz.111-8.AA	*80131708*	4 MB	16 MB
Cisco 3600 Enterprise Feature Pack Release 11.2 and 11.1 (model number CD36-A-11.2=)				
Cisco 3620 Enterprise feature set 11.2(7)P	c3620-j-mz.112-7a.P	*80155407*	8 MB	24 MB
Cisco 3640 Enterprise feature set 11.2(7)P	c3640-j-mz.112-7a.P	*80156207*	8 MB	24 MB
Cisco 3620 Enterprise feature set 11.2(4)XA	c3620-j-mz.112-4.XA	*80155404*	8 MB	24 MB
Cisco 3640 Enterprise feature set 11.2(4)XA	c3640-j-mz.112-4.XA	*80156204*	8 MB	24 MB
Cisco 3620 Enterprise feature set 11.1(8)AA	c3620-j-mz.111-8.AA	*80131408*	4 MB	24 MB
Cisco 3640 Enterprise feature set 11.1(8)AA	c3640-j-mz.111-8.AA	*80132308*	4 MB	24 MB
Cisco 3600 Enterprise Plus Feature Pack Release 11.2 and 11.1 (model number CD36-AP-11.2=)				
Cisco 3620 Enterprise Plus feature set 11.2(7)P	c3620-js-mz.112-7a.P	*80155507*	8 MB	24 MB
Cisco 3640 Enterprise Plus feature set 11.2(7)P	c3640-js-mz.112-7a.P	*80156307*	8 MB	24 MB
Cisco 3620 Enterprise Plus feature set 11.2(4)XA	c3620-js-mz.112-4.XA	*80155504*	8 MB	24 MB
Cisco 3640 Enterprise Plus feature set 11.2(4)XA	c3640-js-mz.112-4.XA	*80156304*	8 MB	24 MB

Table 1   Cisco Feature Pack Image Filenames and Memory Requirements (Continued)

Router Software Loader Description	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required
Cisco 3620 Enterprise feature set 11.1(8)AA	c3620-j-mz.111-8.AA	*80131408*	4 MB	24 MB
Cisco 3640 Enterprise feature set 11.1(8)AA	c3640-j-mz.111-8.AA	*80132308*	4 MB	24 MB
Cisco 3600 Enterprise Plus 40 Feature Pack Release 11.2 and 11.1 (model number CD36-AW-11.2=)				
Cisco 3620 Enterprise Plus 40 feature set 11.2(7)P[1]	c3620-js40-mz.112-7a.P	*80201307*	8 MB	24 MB
Cisco 3640 Enterprise Plus 40 feature set 11.2(7)P[1]	c3640-js40-mz.112-7a.P	*80201407*	8 MB	24 MB
Cisco 3620 Enterprise Plus feature set 11.2(4)XA	c3620-js-mz.112-4.XA	*80155504*	8 MB	24 MB
Cisco 3640 Enterprise Plus feature set 11.2(4)XA	c3640-js-mz.112-4.XA	*80156304*	8 MB	24 MB
Cisco 3620 Enterprise feature set 11.1(8)AA	c3620-j-mz.111-8.AA	*80131408*	4 MB	24 MB
Cisco 3640 Enterprise feature set 11.1(8)AA	c3640-j-mz.111-8.AA	*80132308*	4 MB	24 MB
Cisco 3600 Enterprise Plus 56 Feature Pack Release 11.2 and 11.1 (model number CD36-AY-11.2=)				
Cisco 3620 Enterprise Plus 56 feature set 11.2(7)P[2]	c3620-js56-mz.112-7a.P	*80201507*	8 MB	24 MB
Cisco 3640 Enterprise Plus 56 feature set 11.2(7)P[2]	c3640-js56-mz.112-7a.P	*80201607*	8 MB	24 MB
Cisco 3620 Enterprise Plus feature set 11.2(4)XA	c3620-js-mz.112-4.XA	*80155504*	8 MB	24 MB
Cisco 3640 Enterprise Plus feature set 11.2(4)XA	c3640-js-mz.112-4.XA	*80156304*	8 MB	24 MB
Cisco 3620 Enterprise feature set 11.1(8)AA	c3620-j-mz.111-8.AA	*80131408*	4 MB	24 MB
Cisco 3640 Enterprise feature set 11.1(8)AA	c3640-j-mz.111-8.AA	*80132308*	4 MB	24 MB

1. Contains 40-bit encryption feature.
2. Contains 56-bit encryption feature.

Note   You can use a calculator on the Web (www.cisco.com/techtools/mem-calc.html) to estimate the amount of memory that will be required for your Cisco 3600 series configuration.

Table 2   Cisco 3600 Series Default Memory and Upgrade Options

Memory Type	Default	Upgrade Options
Flash memory card	4 MB	8-MB upgrade: MEM3600-8FS=

DRAM[1]	16 MB	Expandable to 64 MB:
		  4-MB upgrade: MEM3620-4D=
		  8-MB upgrade: MEM3620-8D=
		  16-MB upgrade: MEM3620-16D=

DRAM[2]	16 MB	Expandable to 128 MB:
		  4-MB upgrade: MEM3640-4D=
		  8-MB upgrade: MEM3640-8D=
		  16-MB upgrade: MEM3640-16D=
		  32-MB upgrade: MEM3640-32D=

1. On the Cisco 3620 only.
2. On the Cisco 3640 only.

## Additional Information for Routers with ISDN BRI or ISDN PRI Interfaces

System configurations with multiple ISDN PRI interfaces or 12 or more ISDN BRI interfaces require more I/O memory than the default.

Cisco 3600 series routers ship with a 75/25 I/O memory split. If your router has 2 ISDN PRI interfaces or more than 12 ISDN BRI interfaces, you must change the memory split to 60/40. The following sections provide information about reallocating processor and I/O memory and provide examples of the **memory-size iomem** command. Note that if you do not reallocate memory, you will get an error code.

Reallocating Processor Memory and I/O Memory

DRAM memory in Cisco 3600 series routers is organized as one contiguous address space divided between processor memory and I/O memory. Depending on the type and number of network interfaces you have configured in the router, you may need to reallocate the DRAM memory partitioned to processor memory and I/O memory.

Cisco manufacturing configures most Cisco 3600 series routers to have 25 percent of the address space allocated to I/O memory and 75 percent allocated to processor memory. But for customers that use two or more ISDN PRI interfaces, DRAM memory must be configured to provide 40 percent of the address space for I/O memory and 60 percent for processor memory. See Figure 1.

Figure 1   Components and Uses of DRAM Memory for Cisco 3600 Series Routers

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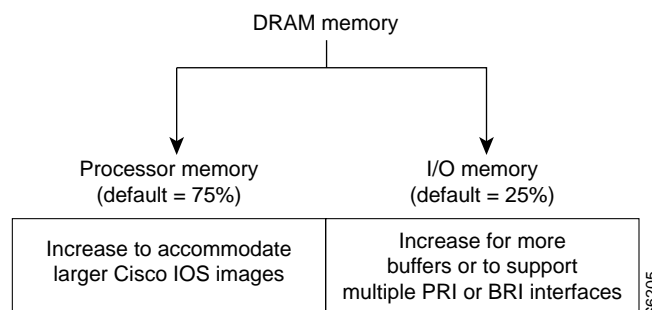
> **Note** Routers running two or more ISDN PRI interfaces or 12 or more ISDN BRI interfaces require a DRAM memory configuration of 60 percent I/O memory and 40 percent processor memory.

There are cases where you may have to manually reallocate the DRAM memory split between processor memory and I/O memory after you have received a router from Cisco Systems.

For example, suppose your Cisco 3640 router has the following running configuration:

- 2 Ethernet and 2 WAN interface card
- 8-port ISDN BRI with NT1 network module
- IP feature set
- 16 MB DRAM memory (by default, processor memory = 75 percent, I/O memory = 25 percent)
- 4 MB Flash memory

Later on however, you add a 4-port ISDN BRI network module to the router. You now have a total 12 ISDN BRI interfaces running on the router. At this point, you must use the **memory-size iomem** command to configure 40 percent of the address space for I/O memory and 60 percent for processor memory.

To view your current mix of processor and I/O memory and reassign memory distribution accordingly, enter the following commands beginning in privileged EXEC mode:

Task		Command
Step 1	View the total amount of memory loaded on the router.	**show version**
Step 2	Determine the amount of free memory.	**show memory**[1]
Step 3	Enter global configuration mode.	**configure terminal**
Step 4	Allocate processor memory and I/O memory.	**memory-size iomem** *I/O-memory-percentage*[2]
Step 5	Exit global configuration mode.	**Ctrl-Z**
Step 6	Write the new configuration to NVRAM.	**copy running-config startup-config** or **write memory**
Step 7	Reload the router to run the new configuration.	**reload**

1. The *Free(b)* column in the **show memory** command's output shows how much I/O memory is available. Note that the output is long! (Only the first page or first six lines of the output is needed.)
2. The default is 40 percent for I/O memory (and 60 percent for processor memory).

Valid I/O memory percentage values are 25, 30, 40 (the default), and 50. I/O memory size is the specified percentage of total memory size, rounded down to the nearest multiple of 1 MB. The remaining memory is processor memory.

The **memory-size iomem** command does not take effect until you save it to NVRAM using the **copy running-config startup-config** EXEC command and reload the router. However, when you enter the command, the software checks whether the new memory distribution leaves enough processor memory for the currently running Cisco IOS image. If not, the following message appears:

```
Warning: Attempting a memory partition that does not provide enough Processor memory for
the current image.If you write memory now, this version of software may not be able to run.
```

When you enter the **reload** command to run a new image, the software calculates the new processor and I/O memory split. If there is not enough processor memory, it automatically reduces I/O memory to an alternative setting to load the image. If there is still not enough processor memory for the image to run, then you do not have enough DRAM.

See the next section for an example of how to configure the **memory-size iomem** command.

Reallocate Processor Memory and I/O Memory Examples

The percentage of DRAM allocated to I/O memory and processor memory is configurable.

The following example allocates 40 percent of DRAM to I/O memory and the remaining 60 percent to processor memory:

Step 1   From EXEC mode, enter the **show memory** command to see whether you need to allocate different percentages of processor and I/O memory. The *Free(b)* column shows how much I/O memory is available:

```
Router# show memory
              Head    Total(b)    Used(b)    Free(b)  Lowest(b) Largest(b)
Processor  60913730    3066064     970420    2095644    2090736    2090892
      I/O    C00000    4194304    1382712    2811592    2811592    2805492
--More--
```

Step 2   Enter global configuration mode and configure the **memory-size iomem** command.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# memory-size iomem 40
Router(config)# Ctrl-Z
Router#
```

Step 3   Write the new configuration to NVRAM:

```
Router# copy running-config startup-config
Building configuration...
[OK]
```

Step 4   Enter the **reload** command to run the new image and boot the router from ROM monitor mode:

```
Router# reload

program load complete, entry point: 0x80008000, size: 0x32ea24
Self decompressing the image :
###############################################################################
###############################################################################
###############################################################################
###### [OK]
```

memory-size iomem Command

To reallocate the percentage of DRAM memory to use for I/O memory and processor memory on Cisco 3600 series routers, use the **memory-size iomem** global configuration command. The **no** form of this command reverts to the default allocation of 25 percent I/O memory and 75 percent processor memory.

> **memory-size iomem** *I/O-memory-percentage*
> **no memory-size iomem** *I/O-memory-percentage*

Syntax Description

I/O-memory-percentage	The percentage of DRAM allocated to I/O memory. The values permitted are **25**, **30**, **40**, and **50** percent.

Default

The default allocation is 25 percent I/O memory and 75 percent processor memory.

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 P.

Once you specify the percentage of I/O memory in the command line, processor memory automatically takes on the remaining percentage of DRAM memory.

Example

The following configuration allocates 40 percent of the DRAM memory to I/O memory and the remaining 60 percent to processor memory.

```
Router# configure terminal
Router(config)# memory-size iomem 40
Router(config)# Ctrl-Z
Router# copy running-config startup-config
Building configuration...
[OK]

Router# reload

program load complete, entry point: 0x80008000, size: 0x32ea24
Self decompressing the image :
################################################################################
################################################################################
##################################################################### [OK]
```

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 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

This section identifies specific features, within a category of features, supported on Cisco 3600 series routers. You can use the information given in the table provided in this section in conjunction with the information provided in the section "Cisco Feature Pack Descriptions," page 3, to determine which features a particular feature set supports on a given platform.

Table 3 shows specific features supported for Cisco IOS Release 11.2 feature sets.

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

- Encrypt: the feature is offered in the encryption feature sets, which consist of 40-bit (Plus 40) or 56-bit (Plus 56) data encryption feature sets.

Cisco IOS images with 40-bit Data Encryption Standard (DES) support may legally be distributed to any party eligible to receive Cisco IOS software. 40-bit DES is not a cryptographically strong solution and should not be used to protect sensitive data.

Cisco IOS images with 56-bit DES are subject to International Traffic in Arms Regulations (ITAR) controls and have a limited distribution. Images to be installed outside the U.S. require an export license. Customer orders may be denied or subject to delay because of U.S. government regulations. Contact your sales representative or distributor for more information, or send e-mail to export@cisco.com.

Table 3   Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise
LAN Support			
Apollo Domain	–	–	Yes
AppleTalk 1 and 2	–	Yes	Yes
Banyan VINES	–	–	Yes
Concurrent routing and bridging	Yes	Yes	Yes
DECnet IV	–	Yes	Yes
DECnet V	–	–	Yes
GRE	Yes	Yes	Yes
Integrated routing and bridging (RB)	Yes	Yes	Yes
IP	Yes	Yes	Yes
LAN extension host	Yes	Yes	Yes
Multiring	Yes	Yes	Yes
Novell IPX	–	Yes	Yes
OSI	–	–	Yes
Source-route bridging	–	–	–
Transparent and translational bridging	Yes	Yes	Yes
XNS	–	–	Yes
WAN Services			
Combinet packet protocol	Yes	Yes	Yes
Dialer profiles	Yes	Yes	Yes
Frame Relay	Yes	Yes	Yes
Frame Relay SVC support (DTE)	–	–	Yes
Frame Relay traffic shaping[1]	–	–	–
Half bridge/half router for CPP and PPP	Yes	Yes	Yes
Multichassis Multilink PPP (MMP)	Plus	Plus	Plus
Virtual Private Dial-up Network (VPDN)	–	Yes	Yes
HDLC	Yes	Yes	Yes
IPXWAN 2.0	–	Yes	Yes
ISDN[2]	Yes	Yes	Yes
PPP[3]	Yes	Yes	Yes
SMDS	Yes	Yes	Yes
Switched 56	Yes	Yes	Yes
X.25[4]	Yes	Yes	Yes

Table 3   Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)

	Feature Sets		
Features	**IP Routing**	**Desktop (IP/IPX/AppleTalk/DEC)**	**Enterprise**
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[5], link and payload compression[6]	Yes	Yes	Yes
Snapshot routing	Yes	Yes	Yes
Weighted fair queuing	Yes	Yes	Yes
IP Routing			
BGP	Yes	Yes	Yes
BGP4	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
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
SRTP	–	–	Yes
Multimedia and Quality of Service			
Generic traffic shaping	Yes	Yes	Yes

Table 3   Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)

	Feature Sets		
Features	**IP Routing**	**Desktop (IP/IPX/AppleTalk/DEC)**	**Enterprise**
Random Early Detection (RED)	Yes	Yes	Yes
Resource Reservation Protocol (RSVP)	Yes	Yes	Yes
Management			
AutoInstall	Yes	Yes	Yes
Automatic modem configuration[7]	Yes	Yes	Yes
HTTP server	Yes	Yes	Yes
RMON events and alarms[8]	Yes	Yes	Yes
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
MAC security for hubs	Yes	Yes	Yes
MD5 routing authentication	Yes	Yes	Yes
Network layer encryption (40-bit or export controlled 56-bit DES)	Encrypt	Encrypt	Encrypt
RADIUS	Yes	Yes	Yes
Router authentication	Encrypt	Encrypt	Encrypt
TACACS+	Yes	Yes	Yes
IBM Support			
BAN for SNA Frame Relay support	Plus	Yes	Yes
Bisync[9]	Plus	Yes	Yes
Caching and filtering	Plus	Yes	Yes
DLSw+	Plus	Yes	Yes
Downstream PU concentration (DSPU)	Plus	–	Yes
Frame Relay SNA Support (RFC 1490)	Plus	Yes	Yes
NetView Native Service Point	Plus	Yes	Yes
QLLC[9]	Plus	Yes	Yes
SDLC integration	Plus	Yes	Yes
SDLC transport (STUN)	Plus	Yes	Yes
SDLC-to-LAN conversion (SDLLC)	Plus	Yes	Yes

Table 3   Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)

Features	Feature Sets		
	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise
SNA and NetBIOS WAN optimization via local acknowledgment	Plus	Yes	Yes
SRB/RSRB	Plus	Yes	Yes
SRT	Plus	Yes	Yes
TG/COS	–	–	Yes
Protocol Translation			
LAT	–	–	Yes
Rlogin	–	–	Yes
Remote Node			
ARAP 1.0/2.0	–	Yes	Yes
Asynchronous master interfaces	Yes	Yes	Yes
ATCP	–	Yes	Yes
CPPP	Yes	Yes	Yes
CSLIP	Yes	Yes	Yes
DHCP	Yes	Yes	Yes
IP pooling	Yes	Yes	Yes
IPX and ARAP on virtual asynch interfaces	–	–	Yes
IPXCP	–	Yes	Yes
MacIP	–	Yes	Yes
NASI[10]	–	Yes	Yes
NetBEUI over PPP	Yes	Yes	Yes
PPP	Yes	Yes	Yes
SLIP	Yes	Yes	Yes
Terminal Services			
LAT[11]	–	–	Yes
Rlogin	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
TN3270	–	–	Yes
X.25 PAD	Yes	Yes	Yes
Xremote	–	–	Yes

1. Frame Relay traffic shaping will be available in a future 11.2 P release.
2. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.
3. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, and PPP compression. Multilink PPP is available in Cisco IOS Release 11.0(4) and later releases.
4. Includes X.25 switching.
5. IPX header compression (RFC 1553) is available in the feature sets that support IPX in Cisco IOS Release 11.1(1) and later releases.
6. X.25 and Frame Relay payload compression are supported in Cisco IOS Release 11.0(4) and later releases.

7. Automatic modem configuration is available for all features sets in Cisco IOS Release 11.1(2) and later. For the Enterprise feature set, automatic modem configuration is available in Cisco IOS Release 11.1(1) and later.

8. The RMON events and alarms groups are supported on all interfaces in Cisco IOS Release 11.1 and later releases. Enhanced RMON feature sets are also available.

9. QLLC and Bisync are available in IP/IBM in Cisco IOS Release 11.0(3) and later releases, and in IP/IPX/IBM and Desktop/IBM base in Cisco IOS Release 11.0(2) and later releases.

10. NASI is supported in Cisco IOS Release 11.1(2) and later releases.

11. 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 27. 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**.

Alternatives to RSL

RSL, contained on the feature pack CD, is designed to work with a PC running Microsoft Windows 95. The booklet included with the CD explains how to perform this simple process. However, two alternatives are available to download software in systems that do not use Windows 95:

- Use the console or auxiliary port
- Use a TFTP server application

Installing the Router Software Using the Console or Auxiliary Port

This type of installation uses the **copy xmodem flash** command. You can also use the ROMMON command **xmodem [-cyrx] [filename]**, but on the console port only.

Note   The transfertakes place only on the port at which you issue the comand. If you download via the console, all console output will be discarded for the duration of the transfer. You can only download files to the router; you cannot copy files from the router. Cisco recommends using the auxiliary port for this type of software download. The auxiliary port has hardware flow control and full modem control. In addition, the transfer will not occupy the system console.

The following example shows how to use the **copy xmodem flash** command on a Cisco 3600 series router:

```
Router#copy xmodem flash
                          **** WARNING ****
      x/ymodem is a slow transfer protocol limited to the current speed
      settings of the auxiliary/console ports. The use of the auxiliary
      port for this download is strongly recommended.
      During the course of the download no exec input/output will be
      available.
                          ---- ******* ----
      Proceed? [confirm]y
      Use crc block checksumming? [confirm]y
```

```
Max Retry Count [10]:
Perform image validation checks? [confirm]y
Xmodem download using crc checksumming with image validation
Continue? [confirm]y
Partition   Size    Used       Free      Bank-Size  State          Copy Mode
   1        4096K   3259K      836K      4096K      Read/Write     Direct
   2        4096K      0K      4095K     4096K      Read/Write     Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 1] 2

System flash directory, partition 2:
File  Length   Name/status
  1    68         TESTFILE
[132 bytes used, 4194172 available, 4194304 total]
Destination file name? c3620-i-mz.0918
Erase flash device before writing? [confirm]y
Flash contains files. Are you sure you want to erase? [confirm]y

Copy '' from server
  as 'c3620-i-mz.0918' into Flash WITH erase? [yes/no]yes
Erasing device... eeeeeeeeeeeeeeee ...erased
Ready to receive file...........C
Verifying checksum...  OK (0x5DE8)
Flash device copy took 00:12:06 [hh:mm:ss]
```

You can also download an image to the 3600 series router using the console port via the ROMMON command:

xmodem [-cyrx] [filename]

-c use CRC-16
-y use YMODEM protocol
-r copy image to RAM (default is first Flash memory partition)
-x do not launch image on completion of download to DRAM (dangerous!)

Note   The ROMMON XMODEM/YMODEM transfer works on the console port only.

The following example shows how to use the **xmodem [-cyrx] [filename]** command on a Cisco 3600 series router:

```
rommon 1 > xmodem -c c3620-i-mz.0918
Do not start the sending program yet...
        File size           Checksum   File name
  1910476 bytes (0x1d26cc)   0x5de8    c3620-i-mz.0918

WARNING: All existing data in bootflash will be lost!
Invoke this application only for disaster recovery.
Do you with to continue? y/n  [n]:  y
Ready to receive file c3620-i-mz.0918 ...

Erasing flash at 0x307c0000
Download Complete!
program load complete, entry point: 0x80008000, size: 0x1d25b0
Self decompressing the image : ###############################################
```

Installing the Router Software Using a TFTP Server Application

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 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

This section describes how to install the router software 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 Make 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.

For systems without a LAN interface, make sure that the router and the PC have IP connectivity through the available interface (that is, the router and PC can ping each other with IP traffic).

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? 80155204.bin
```

This example specifies the IP feature set for Cisco 3620 routers.

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, not 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 [80155204.bin]? c3620-i-mz.112-4.xa
```

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 provides 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.

Command Reference Pages for TFTP and rcp

This section includes reference pages providing detailed information about the **copy rcp flash** and **copy tftp flash** commands. This information supplements the information provided in the steps described earlier in the section "Installing the Router Software Using a TFTP Server Application," page 19.

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. 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 3600 series router. 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... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...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. Note that the examples show a Cisco 2500 router.

```
                           ****  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/igs-bfpx.100-4.3
[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/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

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

```
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
```

```
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' 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/igs-bfpx.100-4.3
[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/igs-bfpx.100-4.3
Destination file name [default = source name]?
```

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

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' 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... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...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.

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/igs-bfpx.100-4.3
[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/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

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

```
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' 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/igs-bfpx.100-4.3
[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/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

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

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

Related Commands

copy flash tftp
verify
verify flash

> **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.
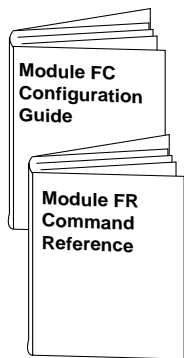
About Cisco IOS Software Electronic Documentation

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 2 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 2   Cisco IOS Configuration Guides and Command References**

Module FC
Configuration
Guide

Module FR
Command
Reference

Module P1C
Configuration
Guide

Module P1R
Command
Reference

Module P2C
Configuration
Guide

Module P2R
Command
Reference

Module P3C
Configuration
Guide

Module P3R
Command
Reference

Module WC
Configuration
Guide

Module WR
Command
Reference

Module FC/FR:
**Configuration
Fundamentals**
• Access Server and
  Router Product
  Overview
• Cisco IOS Software
  Configuration Basics
• Images and
  Configuration Files
• Interface Configuration
• System Management
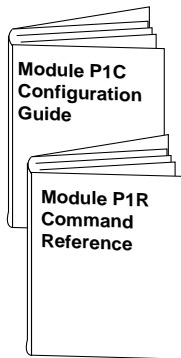
Module P1C/P1R:
**Network Protocols,
Part 1**
• IP Addressing
• IP Services
• IP Routing Protocols
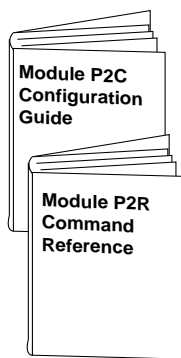
Module P2C/P2R:
**Network Protocols,
Part 2**
• AppleTalk
• Novell IPX
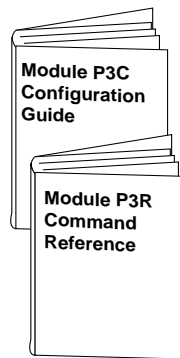
Module P3C/P3R:
**Network Protocols,
Part 3**
• Apollo Domain
• Banyan VINES
• DECnet
• ISO CLNS
• XNS
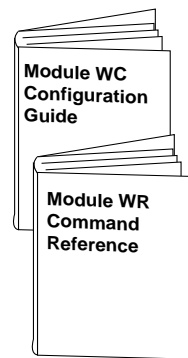
Module WC/WR:
**Wide-Area
Networking**
• ATM
• Frame Relay
• SMDS
• X.25 and LAPB

Module SC
Configuration
Guide

Module SR
Command
Reference

Module DC
Configuration
Guide

Module DR
Command
Reference

Module XC
Configuration
Guide

Module XR
Command
Reference

Module BC
Configuration
Guide

Module BR
Command
Reference

Configuration
Guide Master
Index

Command
Reference
Master Index

S4783
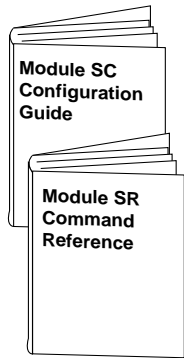
Module SC/SR:
Security
• Terminal Access Security
• Network Access Security
• Accounting and Billing
• Filtering Traffic
• Preventing Fraudulent
  Route Updates
• Network Data Encryption
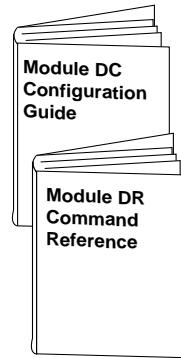
Module DC/DR:
Dial Solutions
• Dial Business
  Solutions and
  Examples
• Dial-In Port Setup
• DDR and Dial Backup
• Remote Node and
  Terminal Service
• Cost-Control and
 Large-Scale Dial
  Solutions
• VPDN
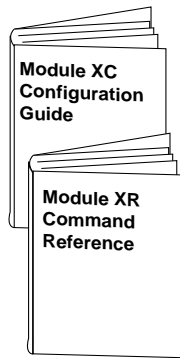
Module XC/XR:
**Cisco IOS Switching
Services**
• Switching Paths for IP
  Networks
  - Fast Switching
  - Autonomous Switching
  - NetFlow Switching
  - Optimum Switching
• Virtual LAN (VLAN)
  Switching and Routing
  - Inter-Switch Link Protocol
    Encapsulation
  - IEEE 802.10
    Encapsulation
  - LAN Emulation
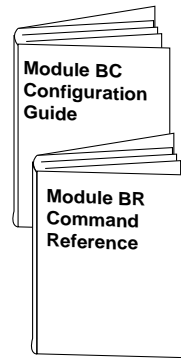
Module BC/BR:
**Bridging and IBM
Networking**
• Transparent Bridging
• Source-Route Bridging
• Remote Source-Route
  Bridging
• DLSw+
• STUN and BSTUN
• LLC2 and SDLC
• IBM Network Media Translation
• DSPU and SNA Service Point
• SNA Frame Relay Access Support
• APPN
• NCIA Client/Server Topologies
• IBM Channel Attach
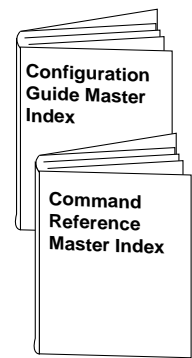
**Configuration
Guide Master
Index**

**Command
Reference
Master Index**

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.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- 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.

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.