



## Loading and Maintaining System Images and Microcode

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This chapter describes how to load and maintain system images and microcode. System images contain the system software. Microcode images contain microcode (ROM-based machine instructions) to be downloaded to various hardware devices.

To benefit most from the instructions and organization of this chapter, your router must contain a minimal configuration that allows you to interact with the system software. You can create a basic configuration file using the **setup** command facility. See the “Using Configuration Tools” chapter in this document for information on using **setup**.

For a complete description of the system image and microcode commands mentioned in this chapter, refer to the “System Image and Microcode Commands” chapter in the Release 12.1 *Cisco IOS Configuration Fundamentals Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

### System Images and Microcode Task List

You can perform the tasks involving images described in the following sections:

- Displaying System Image Information
- Understanding Images
- General Output Conventions for Copy Operations
- Copying Images from Flash Memory to a Network Server
- Copying Images from Flash Memory to a Network Server
- Copying Images from a Network Server to Flash Memory
- Copying Images Between Local Flash Memory Devices
- Specifying the Startup System Image in the Configuration File
- Recovering a System Image Using Xmodem or Ymodem
- Loading and Displaying Microcode Images



**Note**

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These tasks assume you have a minimal configuration that you want to modify.

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# Displaying System Image Information

Use the following commands in EXEC mode to display information about system software:

Command	Purpose
<code>show bootvar</code>	Lists the contents of the BOOT environment variable, the name of the configuration file pointed to by the CONFIG_FILE environment variable, and the contents of the BOOTLDR environment variable.
<code>show flash-filesystem: [partition number] [all   chips   detailed   err   summary]</code> (Class B Flash file systems) <code>show flash-filesystem: [all   chips   fileysys]</code> (Class A Flash file systems) <code>show flash-filesystem:</code> (Class C Flash file systems)	Lists information about Flash memory.
<code>show microcode</code>	Displays microcode information.
<code>show version</code>	Lists the currently running system image file name. Also list system software release version, configuration register setting, and other information.

Refer to the *Cisco IOS Configuration Fundamentals Command Reference* for examples of these commands.

## Understanding Images

System images contain the Cisco IOS software. Your router already has an image on it when you receive it. However, you may want to load a different image onto the router at some point. For example, you may wish to upgrade your software to the latest release, or use the same version of the software for all the routers in a network. Different system images contain different sets of Cisco IOS features. To find out which version (release number) of Cisco IOS is currently running on your system, and the file name of the system image, use the **show version** command. For example, “Version 12.1” indicates Cisco IOS Release 12.1, and “c7200-js-mz” indicates the system image for a Cisco 7200 series router containing the Enterprise feature set.

## Types of Images

The following are two main types of images your router may use:

- System image—The complete Cisco IOS software. This image is loaded when your router boots and is used most of the time.

On most platforms, the image is located in Flash memory. On platforms with multiple Flash memory file systems (Flash, Bootflash, slot 0, or slot 1), the image can be located in any existing Flash file system. Use the **show file systems** command to determine which file systems your router supports. Refer to your hardware documentation for information about where these images are located by default.

- **Boot image**—A subset of the Cisco IOS software. This image is used to perform network booting or to load Cisco IOS images onto the router. This image is also used if the router cannot find a valid system image. Depending on your platform, this image may be called xboot image, rxboot image, bootstrap image, or boot loader/helper image.

On some platforms, the boot image is contained in ROM. In others, the boot image can be stored in Flash memory. On these platforms, you can specify which image should be used as the boot image using the **boot bootldr** command.

Refer to your hardware documentation for information about the boot image used on your router.

## Image Naming Conventions

You can identify the platform, features, and image location by the name of the image. The naming convention for images that are stored on a UNIX system is as follows:

*platform-features-type*

The *platform* variable indicates which platforms can use this image. Examples of *platform* variables are *rsp* (Cisco 7000 series with RSP7000 and Cisco 7500 series), *c1600* (Cisco 1600 series), and *c1005* (Cisco 1005).

The *feature* variable identifies the feature sets supported by the image.

The *type* field can contain the following characters:

- *f*—The image runs from Flash memory.
- *m*—The image runs from RAM.
- *r*—The image runs from ROM.
- *l*—The image is relocatable.
- *z*—The image is zip compressed.
- *x*—The image is mzip compressed.

## General Output Conventions for Copy Operations

During a copy operation, you may get the following characters:

- A pound sign (#) generally means that a Flash memory device is being cleared and initialized. (Different platforms use different ways of indicating that Flash is being cleared.)
- An exclamation point (!) means that ten packets have been transferred successfully.
- A series of “V” characters means that a checksum verification of the file is occurring after the file is written to Flash memory.
- An “O” means an out-of-order packet.
- A period (.) means a timeout.

The last line in the output indicates whether or not the copy was successful.

To interrupt a copy operation, press **Ctrl-^** or **Ctrl-Shift-6**. The operation terminates, but any partial file copied remains until Flash memory is erased.

Refer to the *Internetwork Troubleshooting Guide* publication for procedures on how to resolve Flash memory problems.

## Copying Images from Flash Memory to a Network Server

You can copy system images from Flash memory to an FTP, rcp, or TFTP server. You can use this server copy of the system image as a backup copy, or you can use it to verify that the copy in Flash is the same as the original file on disk. The following sections describe these tasks:

- Copying an Image from Flash Memory to a TFTP Server
- Copying an Image from Flash Memory to an rcp Server
- Copying an Image from Flash Memory to an FTP Server

The protocol you use depends on which type of server you are using. The FTP and rcp transport mechanisms provide faster performance and more reliable delivery of data than TFTP. These improvements are possible because the FTP and rcp transport mechanisms are built on and use the Transmission Control Protocol/Internet Protocol (TCP/IP) stack, which is connection-oriented.

To stop the copy process, press **Ctrl-^** or **Ctrl-Shift-6**.

In the output, an exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully.

Refer to the *Internetwork Troubleshooting Guide* publication for procedures on how to resolve Flash memory problems.

### Copying an Image from Flash Memory to a TFTP Server

You can copy a system image to a TFTP network server. In some implementations of TFTP, you must first create a “dummy” file on the TFTP server and give it read, write, and execute permissions before copying a file over it. Refer to your TFTP documentation for more information.

To copy a system image to a TFTP network server, use the following commands in EXEC mode:

	Command	Purpose
Step 1	<code>show flash-filesystem:</code>	(Optional) Displays the system image filename in Flash memory. Use this command to verify the url-path of the file and the exact spelling of the system image filename for use in the next command.
Step 2	<code>copy flash-url tftp: [[[/location]/directory]/filename]</code>	Copies the system image from Flash memory to a TFTP server. Specify the file location and filename as the flash-url argument.
Step 3		Reply to any router prompts for additional information or confirmation. The prompting will depend on how much information you provide in the <b>copy</b> command and the current setting of the <b>file prompt</b> command.

**Example: Copying an Image from Flash Memory to a TFTP Server**

The following example uses the **show flash:** command to learn the name of the system image file and the **copy flash: tftp:** command to copy the system image to a TFTP server.

```
RouterB# show flash:

System flash directory:
File Length Name/status
  1  4137888  c3640-c2is-mz.Feb24
[4137952 bytes used, 12639264 available, 16777216 total]
16384K bytes of processor board System flash (Read/Write)\

Router# copy flash: tftp:
IP address of remote host [255.255.255.255]? 172.16.13.110
filename to write on tftp host? c3640-c2is-mz.Feb24
writing c3640-c2is-mz.Feb24 !!!!!...
successful tftp write.
```

**Example: Copying an Image from Partitioned Flash Memory to a TFTP Server**

In this example, the file `your-ios` is copied from partition 1 of the Flash memory PC card in slot 0 to the TFTP server at 172.23.1.129. The file will be saved with the name `your-ios` in the `dirt/sysadmin` directory relative to the directory of the remote username.

```
Router# copy slot0:1:your-ios tftp://172.23.1.129/dirt/sysadmin/your-ios
Verifying checksum for 'your-ios' (file # 1)... OK
Copy 'your-ios' from Flash to server
  as 'dirt/sysadmin/ios-2'? [yes/no] yes
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Upload to server done
Flash device copy took 00:00:23 [hh:mm:ss]
```

## Copying an Image from Flash Memory to an rcp Server

You can copy a system image from Flash memory to an rcp network server.

If you copy the configuration file to a personal computer used as a file server, the computer must support rsh.

### Understanding the rcp Username

The rcp protocol requires a client to send a remote username on each rcp request to a server. When you copy an image from the router to a server using rcp, the Cisco IOS software sends the first valid username in the following list:

1. The remote username specified in the **copy** command, if one is specified.
2. The username set by the **ip rcmd remote-username** command, if the command is configured.
3. The remote username associated with the current TTY (terminal) process. For example, if the user is connected to the router through Telnet and was authenticated through the **username** command, the router software sends the Telnet username as the remote username.
4. The router host name.

For the rcp copy request to execute successfully, an account must be defined on the network server for the remote username. If the server has a directory structure, the configuration file or image is written or copied relative to the directory associated with the remote username on the server. The path for all files and images to be copied begins at the remote user's home directory. For example, if the system image resides in the home directory of a user on the server, specify that user's name as the remote username.

If you are writing to the server, the rcp server must be properly configured to accept the rcp write request from the user on the router. For UNIX systems, you must add an entry to the .rhosts file for the remote user on the rcp server. For example, suppose the router contains the following configuration lines:

```
hostname Rtr1
ip rcmd remote-username User0
```

If the router's IP address translates to Router1.domain.com, then the .rhosts file for User0 on the rcp server should contain the following line:

```
Router1.domain.com Rtr1
```

Refer to the documentation for your rcp server for more details.

## Copying an Image from Flash Memory to an rcp Server Tasks

To copy the system image from Flash memory to a network server, use the following commands:

	Command	Purpose
Step 1	<code>show flash-filesystem:</code>	(Optional) Displays the system image filename in Flash memory. Use this command to verify the <i>url-path</i> of the file and the exact spelling of the system image filename for use in the <b>copy</b> command.
Step 2	<code>configure terminal</code>	(Optional) Enters global configuration mode from the terminal. This step is required only if you want to change the default remote username (see Step 3).
Step 3	<code>ip rcmd remote-username username</code>	(Optional) Configures the remote username.
Step 4	<code>end</code>	(Optional) Exits global configuration mode. This step is required only if you want to change the default remote username (see Step 3).
Step 5	<code>copy flash-url rcp: [[[/[username@] location] /directory] /filename]</code>	Copies the system image from Flash memory to a network server using rcp.
Step 6		Reply to any router prompts for additional information or confirmation. The prompting will depend on how much information you provide in the <b>copy</b> command and the current setting of the <b>file prompt</b> command.

### Example: Copy from Flash to RCP Server

The following example copies the system image c5200-ds-1 to the network server at 172.16.1.111 using rcp and a username of netadmin:

```
Router# copy flash:c5200-ds-1 rcp:netadmin1@172.16.1.111/c5200-ds-1
Verifying checksum for 'c5200-ds-1' (file # 1)...[OK]
Writing c5200-ds-1 -
```

### Example: Copy from Slot1 to RCP Server

The following example copies a system image file called test from the second PCMCIA slot to a network server using rcp. The remote username is netadmin1. Because the destination address and filename are not specified, the router prompts for this information.

```
Router# configure terminal
Router(config)# ip rcmd remote-username netadmin1
Router(config)# end
Router# copy slot1:test rcp:
Address or name of remote host [UNKNOWN]? 172.16.1.111
File name to write to? test
Verifying checksum for 'test' (file # 1)...[OK]
Writing test
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Upload to server done
Flash device copy took 00:00:08 [hh:mm:ss]
```

## Copying an Image from Flash Memory to an FTP Server

You can copy a system image to an FTP network server.

### Understanding the FTP Username and Password

The FTP protocol requires a client to send a remote username and password on each FTP request to a server. When you copy a configuration file from the router to a server using FTP, the Cisco IOS software sends the first valid username in the following list:

1. The username specified in the **copy** command, if a username is specified.
2. The username set by the **ip ftp username** command, if the command is configured.
3. Anonymous.

The router sends the first valid password in the following list:

1. The password specified in the **copy** command, if a password is specified.
2. The password set by the **ip ftp password** command, if the command is configured.
3. The router forms a password *username@routername.domain*. The variable *username* is the username associated with the current session, *routername* is the configured host name, and *domain* is the domain of the router.

The username and password must be associated with an account on the FTP server. If you are writing to the server, the FTP server must be properly configured to accept the FTP write request from the user on the router.

If the server has a directory structure, the configuration file or image is written to or copied from the directory associated with the username on the server. For example, if the system image resides in the home directory of a user on the server, specify that user's name as the remote username.

Refer to the documentation for your FTP server for more details.

Use the **ip ftp username** and **ip ftp password** commands to specify a username and password for all copies. Include the username in the **copy** command if you want to specify a username for that copy operation only.

## Copy from Flash Memory to an FTP Server Tasks

To copy a system image to an FTP network server, use the following commands, beginning in privileged EXEC mode:

	Command	Purpose
Step 1	<code>configure terminal</code>	(Optional) Enters global configuration mode. This step is required only if you override the default remote username or password (see Steps 2 and 3).
Step 2	<code>ip ftp username <i>username</i></code>	(Optional) Changes the default remote username.
Step 3	<code>ip ftp password <i>password</i></code>	(Optional) Changes the default password.
Step 4	<code>end</code>	(Optional) Exits global configuration mode. This step is required only if you override the default remote username or password (see Steps 2 and 3).
Step 5	<code>show flash-filesystem:</code>	(Optional) Displays the system image file in the specified Flash directory. If you do not already know it, note the exact spelling of the system image filename in Flash memory.
Step 6	<code>copy flash-filesystem:filename ftp:[[://[username[:password]@]location]/directory]/filename]</code>	Copies the image to the FTP server.
Step 7		Reply to any router prompts for additional information or confirmation. The prompting will depend on how much information you provide in the <b>copy</b> command and the current setting of the <b>file prompt</b> command.

### Example: Copying from Flash Memory to an FTP Server

The following example uses the **show flash:** command to learn the name of the system image file and the **copy flash: tftp:** command to copy the system image (c3640-2is-mz) to a TFTP server. The router uses the default username and password.

```
Router# show flash:

System flash directory:
File Length Name/status
  1 4137888 c3640-c2is-mz
[4137952 bytes used, 12639264 available, 16777216 total]
16384K bytes of processor board System flash (Read/Write)\

Router# copy flash: tftp:
IP address of remote host [255.255.255.255]? 172.16.13.110
filename to write on tftp host? c3600-c2is-mz
writing c3640-c2is-mz !!!!!...
successful ftp write.
```

### Example: Copying from Slot1 to an FTP Server

The following example uses the **show slot1:** command to display the name of the system image file in the second PCMCIA slot and the copies the file (test) to an FTP server.

```
Router# show slot1:

-#- ED --type-- --crc--- -seek-- nlen -length- -----date/time----- name
1  .. 1          46A11866 2036C  4    746      May 16 1995 16:24:37 test

Router# copy slot1:test ftp://thisuser:thatpass@172.16.13.110/test
writing test!!!!...
successful ftp write.
```

### Example: Copying from Partitioned Flash to an FTP Server

In this example, the file your-ios is copied from partition 1 of the Flash memory PC card in slot 0 to the TFTP server at 172.23.1.129. The file will be saved with the name your-ios in the dirt/sysadmin directory relative to the directory of the remote username.

```
Router# show slot0: partition 1

PCMCIA Slot0 flash directory, partition 1:
File Length Name/status
  1  1711088 your-ios
[1711152 bytes used, 2483152 available, 4194304 total]

Router# copy slot0:1:your-ios ftp://myuser:mypass@172.23.1.129/dirt/sysadmin/your-ios

Verifying checksum for 'your-ios' (file # 1)... OK
Copy 'your-ios' from Flash to server
  as 'dirt/sysadmin/ios-2'? [yes/no] yes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Upload to server done
Flash device copy took 00:00:23 [hh:mm:ss]
```

## Copying Images from a Network Server to Flash Memory

You can copy system images or boot image from a TFTP, rcp, or FTP server to a Flash memory file system to upgrade or change the Cisco IOS software or boot image on your router.

The protocol you use depends on which type of server you are using. The FTP and rcp transport mechanisms provide faster performance and more reliable delivery of data than TFTP. These improvements are possible because the FTP and rcp transport mechanisms are built on and use the Transmission Control Protocol/Internet Protocol (TCP/IP) stack, which is connection-oriented.

The following sections describe the copying tasks. The first two tasks and the last task are required. If you have a run-from-Flash system, the third section is required. Perform one of the remaining tasks, depending on which file transfer protocol you use.

- Restrictions on File Naming
- Understanding Flash Memory Space Considerations
- Output for Image Downloading Process
- Copying to Flash Memory for Run-from-Flash Systems

- Copying an Image from a TFTP Server to a Flash Memory File System
- Copying an Image from an rcp Server to a Flash Memory File System
- Copying an Image from an FTP Server to a Flash Memory File System
- Verifying the Image in Flash Memory

**Note**

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When you are upgrading or changing to a different Cisco IOS release, refer to the appropriate release notes for information on system requirements and limitations.

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## Restrictions on File Naming

Filename in Flash memory can be up to 63 characters long; they are not case-sensitive and are always converted to lowercase.

**Note**

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The destination filename must be an alphanumeric expression. For example, the filename 1 is invalid.

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The filename can be in either lowercase or uppercase; the system ignores case. If more than one file of the same name is copied to Flash, regardless of case, the last file copied becomes the valid file.

## Understanding Flash Memory Space Considerations

Be sure there is enough space available before copying a file to Flash memory. Use the **show flash-file system:** command, and compare the size of the file you want to copy to the amount of Flash memory available. If the space available is less than the amount needed, the **copy** command is partially executed, but the entire file is not copied into Flash memory. The failure message “buffer overflow - xxx/xxx” appears, where xxx/xxx is the number of bytes read from the source file and the number of bytes available on the destination device.

**Caution**

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Do not reboot the router if there is no valid image in Flash memory.

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**Note**

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For the Cisco 3600 series, if you do not have access to a network server and need to download a system image, you can copy an image from a local or remote computer (such as a PC, UNIX workstation, or Macintosh) using the Xmodem or Ymodem protocols. See the section “Recovering a System Image Using Xmodem or Ymodem” later in this chapter.

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On Cisco 2500, Cisco 3000, and Cisco 4000 systems, if the file being downloaded to Flash memory is an uncompressed system image, the **copy** command automatically determines the size of the file being downloaded and validates it with the space available in Flash memory.

On Class B Flash file systems, the router gives you the option of erasing the existing contents of Flash memory before writing to it. If there is no free Flash memory available, or if no files have ever been written to Flash memory, the erase routine is required before new files can be copied. If there is enough free Flash memory, the router gives you the option of erasing the existing Flash memory before writing to it. The system will inform you of these conditions and prompt you for a response.

**Note**

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If you enter **n** after the “Erase flash before writing?” prompt, the copy process continues. If you enter **y** and confirm the erasure, the erase routine begins. Be sure to have ample Flash memory space before entering **n** at the erasure prompt.

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If you attempt to copy a file into Flash memory that is already there, a prompt informs you that a file with the same name already exists. This file is “deleted” when you copy the new file into Flash.

- On Class A and B Flash file systems, the first copy of the file still resides within Flash memory, but it is rendered unusable in favor of the newest version and is listed with the “deleted” tag when you use the **show flash-filesystem:** command. If you terminate the copy process, the newer file is marked “deleted” because the entire file was not copied and is not valid. In this case, the original file in Flash memory is valid and available to the system.
- On Class C Flash file systems, the first copy of the file is erased.

You can copy normal or compressed images to Flash memory. You can produce a compressed system image on any UNIX platform using the **compress** command. Refer to your UNIX platform’s documentation for the exact usage of the **compress** command.

On some platforms, the Flash security jumper must be installed in order to write to Flash memory. In addition, some platforms have a write protect switch which must be set to *unprotected* in order to write to Flash memory.

## Output for Image Downloading Process

The output and dialogue may vary depending on the platform.

## Output for Partitioned Flash Memory

One of the following prompts displayed after the command indicates how the file can be downloaded:

- **None**—The file cannot be copied.
- **RXBOOT-Manual**—You must manually reload to the rxboot image in ROM to copy the image.
- **RXBOOT-FLH**—The copy is done automatically via the Flash load helper software in boot ROMs.
- **Direct**—The copy can be done directly.

If the file can be downloaded into more than one partition, you are prompted for the partition number. To obtain help, enter any of the following at the partition number prompt:

- **?**—Display the directory listings of all partitions.
- **?1**—Display the directory of the first partition.
- **?2**—Display the directory of the second partition.
- **q**—Quit the copy command.

## Copying to Flash Memory for Run-from-Flash Systems

You cannot run the system from Flash memory and copy to it at the same time. Therefore, for systems that run from Flash, do *one* of the following before copying to Flash:

- Partition Flash memory or use Flash load helper to allow the system to run from Flash memory while you copy to it.
- Reload the system to use a system image from boot ROMs.

Refer to “Compare Types of Memory” section in the “Maintaining Router Memory” chapter of the *Configuration Fundamentals Configuration Guide* for more information on run-from-Flash systems.

Refer to the appropriate hardware installation and maintenance publication for information about the jumper settings required for your configuration.

## Copying an Image from a TFTP Server to a Flash Memory File System

To copy a system image from a Trivial File Transfer Protocol (TFTP) server to a Flash memory file system, use the following commands in EXEC mode:

	Command	Purpose
Step 1	See the instructions in the section “Copying Images from Flash Memory to a Network Server.”	Make a backup copy of the current software image or bootstrap image.
Step 2	<code>copy tftp: [[[/location]/directory]/filename] flash-filesystem: [filename]</code>	Copies a system image or a boot image to Flash memory.
Step 3		Reply to any router prompts for additional information or confirmation. The prompting will depend on how much information you provide in the <b>copy</b> command and the current setting of the <b>file prompt</b> command.







## Understanding the rcp Username

The rcp protocol requires a client to send a remote username on each rcp request to a server. When you copy an image from the router to a server using rcp, the Cisco IOS software sends the first valid username in the following list:

1. The remote username specified in the **copy** command, if one is specified.
2. The username set by the **ip rcmd remote-username** command, if the command is configured.
3. The remote username associated with the current TTY (terminal) process. For example, if the user is connected to the router through Telnet and was authenticated through the **username** command, the router software sends the Telnet username as the remote username.
4. The router host name.

For the rcp copy request to execute successfully, an account must be defined on the network server for the remote username. If the server has a directory structure, the configuration file or image is written or copied relative to the directory associated with the remote username on the server. The path for all files and images to be copied begins at the remote user's home directory. For example, if the system image resides in the home directory of a user on the server, specify that user's name as the remote username.

## Copying from an rcp Server to Flash Memory Tasks

To copy an image from an rcp server to Flash memory, use the following commands, beginning in privileged EXEC mode:

	Command	Purpose
Step 1	See the instructions in the section "Copying Images from Flash Memory to a Network Server."	Make a backup copy of the current system or bootstrap software image.
Step 2	<code>configure terminal</code>	(Optional) Enters global configuration mode from the terminal. This step is required only if you override the default remote username (see Step 3).
Step 3	<code>ip rcmd remote-username <i>username</i></code>	(Optional) Specifies the remote username.
Step 4	<code>end</code>	(Optional) Exits global configuration mode. This step is required only if you override the default remote username (see Step 3).
Step 5	<code>copy rcp: [[[/[<i>username@</i>]<i>location</i>]/<i>directory</i>] /<i>filename</i>] flash-filesystem:[<i>filename</i>]</code>	Copies the image from an rcp server to a Flash memory file system.
Step 6		Reply to any router prompts for additional information or confirmation. The prompting will depend on how much information you provide in the <b>copy</b> command and the current setting of the <b>file prompt</b> command.

### Example: Copying from an rcp Server to Flash

The following example copies a system image named `mysysim1` from the `netadmin1` directory on the remote server named `SERVER1.CISCO.COM` with an IP address of `172.16.101.101` 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
Router1(config)# end
Router# copy rcp: flash:

System flash directory:
File name/status
  1 mysysim1
[2076072 bytes used, 21080 bytes available]

Address or name of remote host [UNKNOWN]? 172.16.101.101
Name of file to copy? mysysim1
Copy mysysim1 from SERVER1.CISCO.COM? [confirm]

Checking for file 'mysysim1' on SERVER1.CISCO.COM... [OK]

Erase Flash device before writing? [confirm]
Are you sure? [confirm]
Erasing device...ezeeze...erased.

Connected to 172.16.101.101

Loading 2076007 byte file mysysim1:!!!!...
[OK]

Verifying checksum... (0x87FD)... [OK]
```

### Example: Copying from an rcp Server to Partitioned Slot0

In the following example, the file `/tftpboot/gate/c3600-i-mz` on the rcp server at `172.23.1.129` is copied to partition 3 in slot 0. Because no username is specified, the router uses the default rcp remote username.

```
Router# show slot0: partition 3

PCMCIA Slot0 flash directory, partition 3:
File Length Name/status
  1 426 running-config
[492 bytes used, 4193812 available, 4194304 total]

Router# copy rcp://172.23.1.129/tftpboot/gate/c3600-i-mz slot0:3:/tftpboot/gate/c3600-i-mz
Accessing file '/tftpboot/gate/c3600-i-mz' on 172.23.1.129...
Connected to 172.23.1.129
Loading 1711088 byte file c3600-i-mz: ! [OK]
```





## Verifying the Image in Flash Memory

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



### Caution

If the checksum value does not match the value in the README file, do not reboot the router. Instead, issue the **copy** 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, the router will start the system image contained in ROM (assuming that booting from a network server is not configured). If ROM does not contain a fully functional system image, the router will not function and must be reconfigured through a direct console port connection.

The Flash memory content listing does not include the checksum of individual files. To recompute and verify the image checksum after an image is copied into Flash memory or a Flash memory device, use the following EXEC mode command:

Command	Purpose
<code>verify flash-filesystem:[partition-number:] [filename]</code>	Recomputes and verifies the image checksum after the image is copied into Flash memory.

If you do not provide the filename in the command, the router prompts you. By default, it prompts for the last (most recent) file in Flash. Press **Return** to recompute the default file checksum, or enter the filename of a different file at the prompt. Note that the checksum for microcode images is always 0x0000.

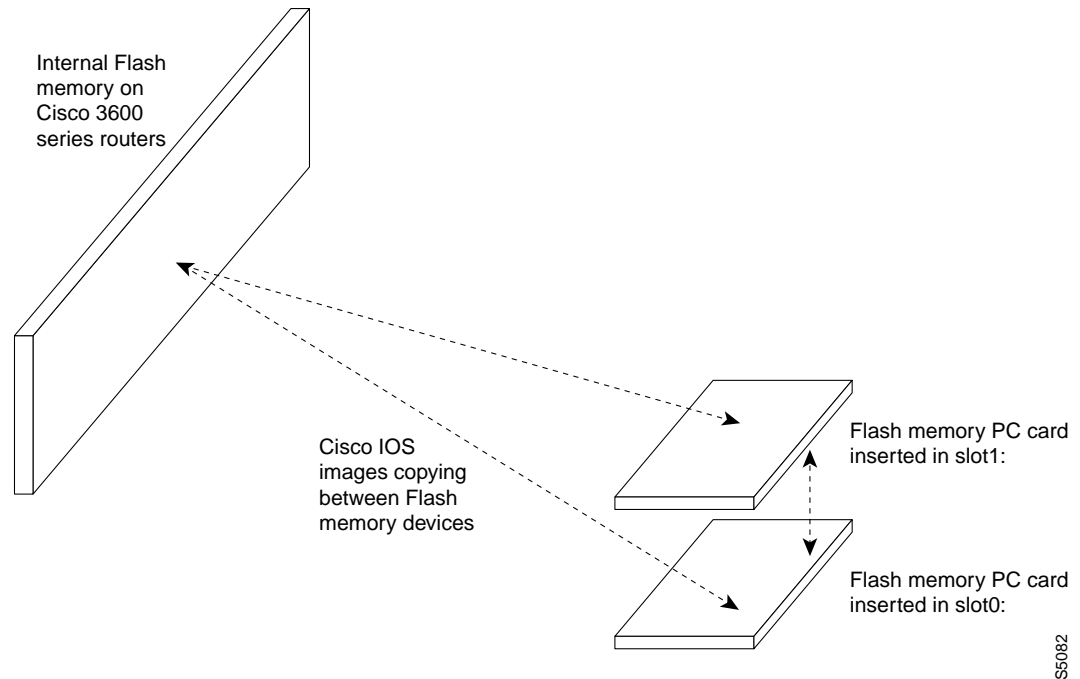
The following example verifies the image c7200-js-mz in slot0:

```
Router# verify slot0:c7200-js-mz
Verified slot0:c7200-js-mz
```

## Copying Images Between Local Flash Memory Devices

On routers with multiple Flash memory file systems, you can copy images from one Flash memory file system, such as internal Flash memory or a Flash memory card in a PCMCIA slot, to another Flash memory file system, as shown in Figure 8. One reason to copy the image to a different flash device is to make a backup copy of it.

**Figure 8 Copying Images Between Flash Memory File Systems**



To copy an image between Flash memory file systems, use these commands in EXEC mode:

	Command	Purpose
Step 1	<code>show flash-filesystem:</code>	Displays the layout and contents of Flash memory.
Step 2	<code>copy source-url destination-url</code>	Copies an image between Flash memory devices.
Step 3	<code>verify flash-filesystem:filename</code>	Verifies the checksum of the image you copied.



**Note**

The source device and the destination device cannot be the same. For example, the command **copy slot1: slot1:** is invalid.

**Example: Copying a File Between Local Flash Memory Devices**

The following example copies the file `admin/images/new-ios` from partition 1 of internal Flash memory to slot 0:

```
Router# show flash: partition 1

System flash directory, partition 1:
File Length Name/status
  1 3142748 admin/images/new-ios
[3142812 bytes used, 1051492 available, 4194304 total]

Router# show slot0:
```



You can enter the different types of boot commands in any order in the startup configuration file or in the BOOT environment variable. If you enter multiple boot commands, the Cisco IOS software tries them in the order they are entered.

**Note**

Booting from ROM is faster than booting from Flash memory. However, booting from Flash memory is faster and more reliable than booting from a network server.

## Loading the System Image from Flash Memory

Use the following sections to configure your router to boot from Flash memory. Flash memory can reduce the effects of network failure by reducing dependency on files that can only be accessed over the network.

### Flash Memory Configuration Process

To configure the router to load a system image in Flash memory, perform the following steps:

	Task
Step 1	(Optional) Copy a system image or boot image to Flash memory using TFTP, rcp, and FTP. See the “Copying Images from a Network Server to Flash Memory” section for more information on performing this step.
Step 2	Configure the system to automatically boot from the desired file and location in Flash memory or bootflash memory. See the “Configuring the Router to Automatically Boot from an Image in Flash Memory” section.
Step 3	(Optional) Depending on the current configuration register setting, you may need to change the configuration register value. See the “Configuring the Router to Automatically Boot from an Image in Flash Memory” section for more information on modifying the configuration register.
Step 4	(Optional) For some platforms, to change the location of the boot image, set the BOOTLDR environment variable.
Step 5	Save your configurations.
Step 6	Power-cycle and reboot your system to ensure that all is working as expected.

### Configuring the Router to Automatically Boot from an Image in Flash Memory

To configure a router to automatically boot from an image in Flash memory, use the following commands beginning in EXEC mode:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters global configuration mode from the terminal.
Step 2	<code>boot system flash [flash-filesystem:] [partition-number:] filename</code>	Specifies the filename of an image stored in Flash memory which should be used for booting.
Step 3	<code>config-register value</code>	Sets the configuration register to enable loading of the system image specified in the configuration file.
Step 4	<code>end</code>	Exits global configuration mode.



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Compiled Thu 05-Nov-94 14:16 by mlw

## Loading the System Image from a Network Server

You can configure the Cisco IOS software to load a system image file from a network server using FTP, TFTP, rcp, or MOP.

If you do not boot from a network server using MOP and you do not specify either FTP, TFTP, or rcp, by default the system image that you specify is booted from a network server via TFTP.



### Note

If you are using a Sun workstation as a network server and TFTP to transfer the file, set up the workstation to enable verification and generation of User Datagram Protocol (UDP) checksums. See the Sun documentation for details.

For increased performance and reliability, use rcp to boot a system image from a network server. The rcp implementation uses the Transmission Control Protocol (TCP), which ensures reliable delivery of data.

You cannot explicitly specify a remote username when you issue the **boot** command. Instead, the host name of the router is used. If the remote server has a directory structure, as do UNIX systems, and you boot the router from a network server using rcp, the Cisco IOS software searches for the system image on the server relative to the directory of the remote username.

You can also boot from a compressed image on a network server. One reason to use a compressed image is to ensure that there is enough memory available for storage. On routers that do not contain a run-from-ROM image in EPROM, when the router boots software from a network server, the image being booted and the running image both must fit into memory. If the running image is large, there might not be room in memory for the image being booted from the network server.

If there is not enough room in memory to boot a regular image from a network server, you can produce a compressed software image on any UNIX platform using the **compress** command. Refer to your UNIX platform's documentation for the exact usage of the **compress** command.

To specify the loading of a system image from a network server, use the following commands beginning in EXEC mode:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>boot system [rcp   tftp] filename [ip-address]</code> or <code>boot system mop filename [mac-address] [interface]</code>	Specifies the system image file to be booted from a network server using rcp, TFTP, or MOP.

	Command	Purpose
Step 3	<code>config-register value</code>	Sets the configuration register to enable loading of the image specified in the configuration file.
Step 4	<code>end</code>	Exits configuration mode.
Step 5	<code>copy system:running-config nvram:startup-config</code>	Saves the configuration file to your startup configuration.

In the following example, a router uses rcp to boot from the testme5.testster system image file on a network server at IP address 172.16.0.1:

```
Router# configure terminal
Router(config)# boot system rcp testme5.testster 172.16.0.1
Router(config)# config-register 0x010F
Router(config)# end
Router# copy system:running-config nvram:startup-config
```

The following section describes how to optionally change request retry times and frequency if you have configured your system to boot using the **boot system mop** command.

## Changing MOP Request Parameters

If you configure your router to boot from a network server using MOP (using the boot system mop command above), the router will transmit a request for the configuration file to the MOP boot server during startup. By default, when the software transmits a request that requires a response from a MOP boot server and the server does not respond, the message will be retransmitted after 4 seconds. The message will be retransmitted a maximum of eight times. The MOP device code is set to the Cisco device code by default.

If the MOP boot server and router are separated by a slow serial link, it may take longer than 4 seconds for the router to receive a response to its message. Therefore, you might want to configure the software to wait longer than 4 seconds before retransmitting the message if you are using such a link. You may also want to change the maximum number of retries for the MOP request or the MOP device code.

To change the Cisco IOS software parameters for transmitting boot requests to a MOP server, use the following commands starting in privileged EXEC mode:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters configuration mode from the terminal.
Step 2	<code>mop device-code {cisco   ds200} mop retransmit-timer seconds mop retries count</code>	Changes MOP server parameters.
Step 3	<code>end</code>	Exits configuration mode.
Step 4	<code>copy running-config startup-config</code>	Saves the configuration file to your startup configuration.

In the following example, if the MOP boot server does not respond within 10 seconds after the router sends a message, the software will retransmit the message:

```
Router# configure terminal
Router (config)# mop retransmit-timer 10
Router (config)# end
Router# copy running-config startup-config
```

## Loading the System Image from ROM

To specify the use of the ROM system image as a backup to other boot instructions in the configuration file, use the following commands beginning in EXEC mode:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>boot system rom</code>	Specifies use of the ROM system image as a backup image.
Step 3	<code>config-register value</code>	Sets the configuration register to enable loading of the system image specified in the configuration file.
Step 4	<code>end</code>	Exits global configuration mode.
Step 5	<code>copy system:running-config nvram:startup-config</code>	Saves the configuration file to your startup configuration.

In the following example, a router is configured to boot from ROM:

```
Router# configure terminal
Router(config)# boot system rom
Router(config)# config-register 0x010F
Router(config)# end
Router# copy system:running-config nvram:startup-config
```



Note

The Cisco 7000 family products cannot load from ROM.

## Using a Fault-Tolerant Booting Strategy

Occasionally network failures make booting from a network server impossible. To lessen the effects of network failure, consider the following booting strategy. After Flash is installed and configured, you might want to configure the router to boot in the following order:

1. Boot an image from Flash.
2. Boot an image from a network server.
3. Boot from ROM image.

This boot order provides the most fault-tolerant booting strategy. Use the following commands beginning in EXEC mode to allow the router to boot first from Flash, then from a system file from a network server, and finally from ROM:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>boot system flash</code> <code>[flash-filesystem:] [partition-number:] filename</code>	Configures the router to boot from Flash memory.
Step 3	<code>boot system [rtp   tftp] filename [ip-address]</code>	Configures the router to boot from a network server.
Step 4	<code>boot system rom</code>	Configures the router to boot from ROM.
Step 5	<code>config-register value</code>	Sets the configuration register to enable loading of the system image specified in the configuration file.

	Command	Purpose
Step 6	<code>end</code>	Exits global configuration mode.
Step 7	<code>copy system:running-config nvram:startup-config</code>	Saves the configuration file to your startup configuration.

In the following example, a router is configured to first boot an internal Flash image called `gsxx`. Should that image fail, the router will boot the configuration file `gsxx` from a network server. If that method should fail, then the system will boot from ROM.

```
Router# configure terminal
Router(config)# boot system flash gsxx
Router(config)# boot system gsxx 172.16.101.101
Router(config)# boot system rom
Router(config)# config-register 0x010F
Router(config)# end
Router# copy system:running-config nvram:startup-config
[ok]
```

Using this strategy, a router has three alternative sources from which to boot. These alternative sources help lessen the negative effects of a failure on network or file server.

## Recovering a System Image Using Xmodem or Ymodem

If you do not have access to a network server and need to download a system image (to update it, or if all the system images in Flash memory somehow are damaged or erased), you can copy an image from a local or remote computer (such as a PC, UNIX workstation, or Macintosh) using the Xmodem or Ymodem protocols. This functionality primarily serves as a disaster recovery technique and is illustrated in Figure 9.



### Note

Recovering system images using Xmodem or Ymodem is performed on the Cisco 1600 series and Cisco 3600 series routers only.

Xmodem and Ymodem are common protocols used for transferring files and are included in applications such as Windows 3.1 (TERMINAL.EXE), Windows 95 (HyperTerminal), Windows NT 3.5x (TERMINAL.EXE), Windows NT 4.0 (HyperTerminal), and Linux UNIX freeware (minicom).

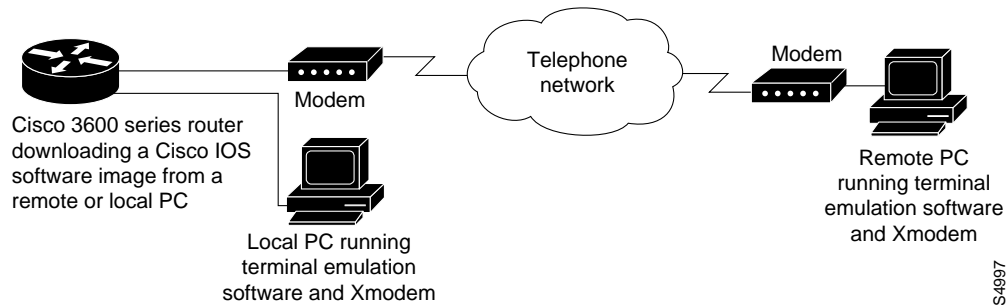
Cisco 3600 series routers do not support XBOOT functionality, a disaster recovery technique for Cisco IOS software, and do not have a separate boot helper (rxboot) image.

Xmodem and Ymodem downloads are slow, so you should use them only when you do not have access to a network server. You can speed up the transfer by setting the transfer port speed to 115200 bps.

On the Cisco 3600 series, you can perform the file transfer using Cisco IOS software or, if all local system images are damaged or erased, the ROM monitor. When you use Cisco IOS software for an Xmodem or Ymodem file transfer, the transfer can occur on either the AUX port or the console port. The AUX port, which supports hardware flow control, is recommended. File transfers from the ROM monitor must use the console port.

On the Cisco 1600 series, you can only perform the file transfer from the ROM monitor over the console port.

Figure 9 Copying a System Image to a Cisco 3600 Series Router with Xmodem/Ymodem



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To copy a Cisco IOS image from a computer or workstation to a router using the Xmodem or Ymodem protocol, use one of the following commands:

Command	Purpose
<pre>copy xmodem: flash-filesystem: [partition:] [filename]  or  copy ymodem: flash-filesystem: [partition:] [filename]</pre>	<p>Copies a system image from a computer to Flash memory using Cisco IOS software in EXEC mode (Cisco 3600 only).</p>
<pre>xmodem [-c] [-y] [-e] [-f] [-r] [-x] [-s data-rate] [filename] (Cisco 1600 series only) xmodem [-c   -y   -r   -x] [filename] (Cisco 3600 series only) The -c option provides CRC-16 checksumming; -y uses the Ymodem protocol; -e erases the first partition in Flash memory; -f erases all of Flash memory; -r downloads the image to DRAM (the default is Flash memory); -x prevents the image from executing after download; and -s sets the console port data rate.</pre>	<p>Copies a system image from a computer to Flash memory using the ROM monitor.</p>

The computer from which you transfer the Cisco IOS image must be running terminal emulation software and the Xmodem or Ymodem protocol.

For the Cisco 1600 series, if you include the **-r** option (download to DRAM), your router must have enough DRAM to hold the file being transferred. To run from Flash memory, an image must be positioned as the first file in Flash memory. If you are copying a new image to boot from Flash memory, erase all existing files first.

## Xmodem Transfer Example Using the Cisco IOS Software

This example shows a file transfer using Cisco IOS software and the Xmodem protocol. The Ymodem protocol follows a similar procedure, using the **copy ymodem:** command.



Note

This functionality is enabled on Cisco 3600 series routers only.

To transfer a Cisco IOS image from a computer running terminal emulation software and the Xmodem protocol, follow these steps:

- Step 1** Place a Cisco IOS software image on the remote computer's hard drive. You can download an image from Cisco Connection Online.
- Step 2** To transfer from a remote computer, connect a modem to the AUX port of your Cisco 3600 series router and to the standard telephone network. The AUX port is set by default to a speed of 9600 bps, 2 stop bits, and no parity. The maximum speed is 115200 bps. Configure the router for both incoming and outgoing calls by entering the **modem inout** command.

Connect a modem to the remote computer and to the telephone network. The remote computer dials through the telephone network and connects to the router.

To transfer from a local computer, connect the router's AUX port to a serial port on the computer, using a null-modem cable. The AUX speed configured on the router must match the transfer speed configured on the local computer.

- Step 3** At the EXEC prompt in the terminal emulator window of the computer, enter the **copy xmodem: flash:** command:

```
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.
          ---- ***** ----
```

Press **Enter** to continue.

- Step 4** Specify whether to use cyclic redundancy check (CRC) block checksumming, which verifies that your data has been correctly transferred from the computer to the router. If your computer does not support CRC block checksumming, answer **no** at the prompt:

```
Proceed? [confirm]
Use crc block checksumming? [confirm] no
```

- Step 5** Determine how many times the software should try to receive a bad block of data before it declares the copy operation a failure. The default is 10 retries. A higher number may be needed for noisy telephone lines. You can configure an unlimited number of retries.

```
Max Retry Count [10]: 7
```

- Step 6** Decide whether you want to check that the file is a valid Cisco 3600 series image:

```
Perform image validation checks? [confirm]
Xmodem download using simple checksumming with image validation
Continue? [confirm]
```

After the transfer has begun, and if the image is valid, the software checks to see whether enough Flash memory space exists on the router to accommodate the transfer:

```
System flash directory:
File Length Name/status
  1 1738244 images/c3600-i-mz
[1738308 bytes used, 2455996 available, 4194304 total]
```

- Step 7** Enter the destination filename:

```
Destination file name ? new-ios-image
```

**Step 8** If you do not want the contents of internal Flash memory erased before the file transfer, enter **no**:

```
Erase flash device before writing? [confirm] no

Copy '' from server
  as 'new-ios-image' into Flash WITHOUT erase? [yes/no] yes
Ready to receive file.....
```

**Step 9** Start an Xmodem or Ymodem send operation with the terminal emulation software on the computer that is sending the system image to the router. See your emulation software application's manual for instructions on how to execute a file transfer. Depending on the application you use, the emulation software may display the progress of the file transfer.

## Xmodem Transfer Example Using the ROM Monitor

This example shows a file transfer using the ROM monitor and the Xmodem protocol. To transmit with the Ymodem protocol, use the **xmodem -y** command.

For the Cisco 3600, the router must have enough DRAM to hold the file being transferred, even if you are copying to Flash memory. The image is copied to the first file in internal Flash memory. Any existing files in Flash memory are erased. Copying files to Flash partitions or to the second-file position is not supported.



### Caution

A modem connection from the telephone network to your console port introduces security issues that you should consider before enabling the connection. For example, remote users can dial into your modem and access the router's configuration settings.

**Step 1** Place a Cisco IOS software image on the remote computer's hard drive. You can download an image from Cisco Connection Online or from the Feature Pack (Cisco 1600 series only).

**Step 2** To transfer from a remote computer, connect a modem to the console port of your router and to the standard telephone network. The modem and console port must communicate at the same speed, which can be from 9600 to 115200 bps (Cisco 3600 series) or from 1200 to 115200 bps (Cisco 1600 series), depending on the speed supported by your modem. Use the **confreg** ROM monitor command to configure the console port transmission speed for the router. For the Cisco 1600 series, you can also set the transmission speed with the **-s** option.

Connect a modem to the remote computer and to the telephone network. The remote computer dials through the telephone network and connects to the router.

To transfer from a local computer, connect the router's console port to a serial port on the computer, using a null-modem cable. The console port speed configured on the router must match the transfer speed configured on the local computer.



### Note

If you are transferring from a local computer, you may need to configure the terminal emulation program to ignore RTS/DTR signals.

**Step 3** You should see a ROM monitor prompt in the terminal emulation window:

```
rommon >
```

Enter the **xmodem** ROM monitor command, along with any desired copy options and, optionally, the filename of the Cisco IOS image. The image loads into Flash memory by default; to download to DRAM instead, use the **-r** option. The image is normally executed on completion of the file transfer; to prevent execution, use the **-x** option. The **-c** option specifies CRC-16 checksumming, which is more sophisticated and thorough than standard checksumming, if it is supported by the computer:

```
rommon > xmodem -c new-ios-image
Do not start the sending program yet...
      File size           Checksum   File name
1738244 bytes (0x1a8604)  0xdd25  george-admin/c3600-i-mz
```

```
WARNING: All existing data in flash will be lost!
Invoke this application only for disaster recovery.
Do you wish to continue? y/n [n]: yes
Ready to receive file new-ios-image ...
```

**Step 4** Start an Xmodem send operation, which is initiated from the terminal emulation software on the remote computer that is sending the system image to the router. See your emulation software application's manual for instructions on how to execute an Xmodem file transfer.

**Step 5** The Cisco IOS image is transferred and executed. If you are transferring from a remote computer, the computer maintains control of your console port even after the new Cisco IOS image is running. To release control to a local terminal, reconfigure the speed of the router's console port to match the speed of the local terminal by entering the **speed bps** configuration command from the remote computer at the router prompt:

```
Router# configure terminal
Router(config)# line 0
Router(config-line)# speed 9600
```

The remote connection is broken, and you can disconnect the modem from the console port and reconnect the terminal line.

## Loading and Displaying Microcode Images

On some Cisco routers, including Cisco 7200, 7500, and 12000 series GSRs, you can update microcode by loading it into peripheral components. This section provides information on loading, upgrading and verifying microcode images, as described in the following subsections:

- Understanding Microcode Images
- Specifying the Location of the Microcode Images
- Reloading the Microcode Image
- Displaying Microcode Image Information

## Understanding Microcode Images

Microcode is stored on ROM and allows the addition of new machine instructions without requiring that they be designed into electronic circuits when new instructions are needed. Microcode images contain microcode software which runs on various hardware devices. For example, microcode can be updated in Channel Interface Processors (CIP) on 7500 routers, or in Channel Port Adapters (CPA) on Cisco 7200 routers.

By default, the system loads the microcode bundled with the Cisco IOS system software image. This microcode is referred to as the default microcode image. However, you can configure the router to use microcode stored in Flash.

Cisco 7000 series routers with a RSP7000 and Cisco 7500 series routers each have a writable control store (WCS) which stores microcode. You can load updated microcode onto the WCS from bootflash or from a Flash memory card inserted in one of the PCMCIA slots of the RSP card.

You can update microcode without having physical access to the router by using the **copy** command to copy microcode to a Flash file system.

## Specifying the Location of the Microcode Images

To specify the location where the microcode should be loaded from, configure the router using the following commands, beginning in EXEC mode:

	Command	Purpose
Step 1	<code>copy tftp: flash:</code> or <code>copy tftp: file-id</code>	(Optional) Copies microcode files into Flash. Perform this step only if you wish to load the microcode from Flash.  See the section “Copying Images from a Network Server to Flash Memory” for more information about how to copy images to Flash memory.
Step 2	<code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>microcode interface [flash-filesystem:filename [slot]   system [slot]]</code>	Configures the router to load microcode on a target interface from the specified memory location.
Step 4	<code>end</code>	Exits global configuration mode.
Step 5	<code>copy system:running-config nvram:startup-config</code>	Saves the new configuration information.

If an error occurs when you are attempting to download microcode, the system loads the default system microcode image.



Note

Microcode images cannot be compressed.

## Reloading the Microcode Image

The configuration commands specifying the microcode to load are implemented following one of three events:

- The system is booted.
- A card is inserted or removed.
- The configuration command **microcode reload** is issued.

After you have entered a microcode configuration command and one of these events has taken place, all cards are reset, loaded with microcode from the appropriate sources, tested, and enabled for operation.

To signal to the system that all microcode configuration commands have been entered and the processor cards should be reloaded, use the following global configuration mode command:

Command	Purpose
<code>microcode reload</code>	Reloads the microcode from the source specified in the configuration on to all interface/processor cards.

Immediately after you enter the **microcode reload** command and press **Return**, the system reloads all microcode. Global configuration mode remains enabled. After the reload is complete, enter the **exit** command to return to the EXEC prompt.

If Flash memory is busy because a card is being removed or inserted, or a **microcode reload** command is executed while Flash is locked, the files will not be available and the onboard ROM microcode will be loaded. Issue another **microcode reload** command when Flash memory is available, and the proper microcode will be loaded. The **show flash** command will show if another user or process has locked Flash memory.

**Note**

The **microcode reload** command should not be used while Flash is in use. For example, do not use this command when a **copy {ftp: | rcp: | tftp:} flash-filesystem** or **show flash-filesystem:** command is active.

The **microcode reload** command is automatically added to your running configuration when you issue a microcode command that changes the system's default behavior of loading all processors from ROM.

In the following example, all controllers are reset, the specified microcode is loaded, and the CxBus complex is reinitialized according to the microcode configuration commands that have been written to memory:

```
Router# configure terminal
Router(config)# microcode reload
Router(config)# end
```

## Displaying Microcode Image Information

To display microcode information, use the following command in EXEC mode:

Command	Purpose
<code>show microcode</code>	Displays microcode information.

## Using Microcode on Specific Platforms

The commands for manipulating microcode vary by platform. This section refers you to specialized configuration information found in other Cisco IOS documents.

For information on downloading microcode (Modem Firmware and Portware) into modems on Cisco access servers (like the Cisco AS5800) using SPE, see the document entitled *Cisco IOS 12.1 Dial Services Configuration Guide: Terminal Services*.

For specific information on loading CIP and CPA microcode into adapters on Cisco 7000, 7200, and 7500 routers, see the "Configuring Cisco Mainframe Channel Connection Adapters" chapter in the *Cisco IOS Bridging and IBM Networking Configuration Guide*.

## Loading Microcode Images on the Cisco 12000 GSR

In addition to the Cisco IOS image that resides on the GRP, each line card on the Cisco 12000 series has a Cisco IOS image. When the router is reloaded, the specified Cisco IOS image is loaded onto the GRP, and that image is automatically downloaded to all the line cards.

Normally, you want the same Cisco IOS image on the GRP and all line cards. However, if you want to upgrade a line card with a new version of microcode for testing or to fix a defect, you might need to load a microcode system image that is different from the one on the line card. Additionally, you might need to load a new image on the line card to work around a problem that is affecting only one of the line cards.

To load a Cisco IOS image on a line card, first use the **copy tftp** command to download the Cisco IOS image to a slot on one of the PCMCIA Flash cards. After you have downloaded the Cisco IOS image on the Flash card, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>microcode {oc12-atm   oc12-pos   oc3-pos-4} flash file_id slot-number</code>	Specify the type of line card, location of the microcode image, and the slot of the line card to download the image. If the slot number is omitted, the microcode image is downloaded to all line cards.
Step 2	<code>microcode reload slot-number</code>	Reload the microcode on the specified line card.
Step 3	<code>exit</code>	Exit configuration mode.
Step 4	<code>execute-on slot slot-number show version</code>  or <code>attach slot-number show version exit</code>	Connect to the line card and verify that the new Cisco IOS image is on the line card by checking the version number in the display output.

For further configuration information for Cisco 12000 series GS Routers, see the Cisco IOS 11.2 GS Release documentation, and platform specific documentation, available on CCO at <http://www.cisco.com/univercd/cc/td/doc/product/core/>.

