CHAPTER 4

Observing System Startup and Performing a Basic Configuration

This chapter describes the initial system startup process, and provides the procedures for performing a basic configuration of your Cisco 12012 Gigabit Switch Router (GSR).

This chapter contains the following sections:

- Starting the System and Observing Initial Conditions
- Configuring the Cisco 12012
- Implementing Other Configuration Tasks
- What To Do Next?
- If You Need More Configuration Information

Note The primary goal of this chapter is to provide you with the necessary information to configure your system so that you can access your network or access your Cisco 12012 remotely via Telnet.

Complex configuration procedures are beyond the scope of this text, and can be found in the configuration publications listed in the section "If You Need More Configuration Information." Also refer to the configuration notes that accompanied the line cards installed in your system.

Checking Connections in Preparation for System Startup

Before you start your system, perform a final check of all connections to ensure they are secure, as follows:

- All line cards are inserted all the way into the slots in the upper card cage, and all captive installation screws are tightened.
- All cards in the lower card cage are inserted all the way into the lower card cage slots.
- All interface cable connections are securely attached; use cable strain relief where provided.
- All power supplies have power cables connected; then, the opposite end of all power cables are connected to the appropriate power source.
- The console terminal is connected to the console port, configured for the appropriate communications parameters, and turned on. To perform the initial configuration of a Cisco 12012 from a console, you need to connect a terminal connection to the Route Processor (RP) console port.
- The Flash memory card that shipped with your system must be installed in PCMCIA slot 0 of the RP.

Note By default, a Flash memory card with a valid Cisco IOS software image ships installed in PCMCIA slot 0 of the RP. Also, by default, the SW configuration register is set to 0x0102; therefore, the system will automatically boot from the Cisco IOS software image in the Flash memory card.

Also, new Flash memory cards must be formatted before you can use them. After you start the system, refer to the section “Formatting a Flash Memory Card,” later in this chapter.

After you complete the final check, proceed to the following section to start up the system.

Starting the System and Observing Initial Conditions

This section describes the initial system startup processes and procedures.

Use the following procedure to start your system:

Step 1 Turn ON each installed power supply by turning its system power switch to the ON (|) position. For AC-input power supplies, the green AC OK LED should go on. For DC-input power supplies, the green input OK LED should go on.

Step 2 Listen for the blower modules; you should immediately hear them operating. In a noisy environment the blower modules might be difficult to hear; therefore, place your hand in front of the exhaust vents to verify that the blower modules are operating.

Step 3 During the RP boot process, observe the RP alphanumeric LED displays, which are located at the end of the RP. (See Figure 4-1.)

Each 4-digit display is capable of showing system messages and displays a sequence that is similar to that shown in Table 4-1.

Figure 4-1 RP Alphanumeric LED Displays (Partial Front Panel View)

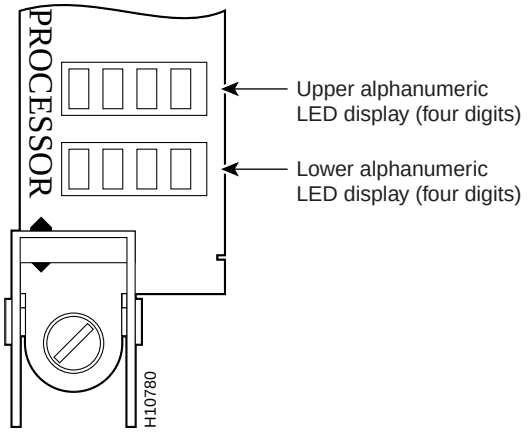


Table 4-1 RP Alphanumeric LED Display Sequences

LED Display	Indication
MRAM *nnnn*	RP microcode loads into MBus random-access memory (RAM); where *nnnn* is the microcode version. For example, Microcode Version 1.17 displays as *0117*.[1]
MSTR RP	This RP is enabled and recognized by the system. Assumes a valid Cisco IOS software version is running.

1. The version of microcode running on your GRP might be different.

Step 4 During the line card boot process, which occurs immediately after the RP boots, observe the alphanumeric LED indicators on each line card. Line cards boot successfully from left to right. (The physical location of the alphanumeric LED displays on the line cards is the same as on the RP, shown in Figure 4-1.)

Each line card displays a sequence that is similar to that shown in Table 4-2.

Table 4-2 Line Card Alphanumeric LED Display Sequences

LED Display[1]	Indication
FABL WAIT	The line card waits for the fabric downloader to begin loading into DRAM.[2]
FABL DNLD	The fabric downloader loads into DRAM.
FABL STRT	The fabric downloader launches from DRAM.
FABL RUN	The fabric downloader runs in DRAM.
IOS DNLD	The Cisco IOS software downloads.
IOS STRT	The Cisco IOS software launches.

Table 4-2 Line Card Alphanumeric LED Display Sequences (Continued)

LED Display	Indications
IOS UP	The Cisco IOS software runs in DRAM.
IOS RUN	The line card is enabled and ready for use.

1. The sequence shown in Table 4-2 might occur too quickly for you to view; therefore, this sequence is provided as a baseline for how the line cards should function at startup.
2. The fabric downloader loads the Cisco IOS software image onto the line card.

Note If you have a Flash memory card installed in PCMCIA slot 0, the Flash memory card contains a valid, bootable Cisco IOS software image, and the software configuration register is set to 0x0102, the system will automatically boot this Cisco IOS software image. The system then enters the setup facility where you will be prompted to perform a basic configuration of the system (as shown in Step 6).

Otherwise, the system will enter the ROM monitor, and the ROM monitor prompt will appear (>). In this case, you must proceed to Step 5.

Step 5 If the ROM monitor prompt (>) appears, you then have to boot the Cisco IOS software image you want to use by entering the appropriate **b** command at the ROM monitor prompt (>):

- **b**—Boots the default system software from onboard Flash memory (if it is present in onboard Flash memory)

Caution To prevent system problems, use the **b flash** command option carefully; otherwise, you might instruct the system to boot a non-Cisco IOS software image from Flash memory.

- **b flash**—Boots the first file in the Flash memory card in PCMCIA slot 0
- **b slot0:** *filename*—Boots the file *filename* from the Flash memory card in PCMCIA slot 0
- **b slot1:** *filename*—Boots the file *filename* from the Flash memory card in PCMCIA slot 1
- **b** *filename* [*host*]—Boots the file *filename* from the server *host* using TFTP

After you boot a Cisco IOS software image, proceed to Step 6. (For additional information on system boot functionality, refer to the section "Manually Booting the System," later in this chapter.)

Step 6 While the system boots from the appropriate Cisco IOS software image, the console screen displays a script and system banner similar to the following:

```
Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-MZ), Released Version 11.2(8)GS
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Sat 10-May-97 06:02a
```

Observe the system startup banner. When you start up an unconfigured system for the first time, the system automatically enters the setup facility, which determines which interfaces are installed and prompts you for configuration information for each one.

On the console terminal, after the system displays the system banner and hardware configuration, you will see the following System Configuration Dialog prompt:

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

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

Continue with configuration dialog? [yes/no]:
```

You have the option of proceeding with the setup facility or exiting from setup and using configuration commands to configure global (system-wide) and interface-specific parameters. You do not have to configure the interfaces immediately; however, you cannot

enable the interfaces or connect them to any networks until you have configured them. (For configuration information, refer to the section "Configuring the Cisco 12012," later in this chapter.)

The interface-specific LEDs on the line cards might not go on until you have configured the line card interfaces. To verify correct operation of each line card interface, complete the first-time setup procedures and configuration, then refer to the LED descriptions in the configuration notes for each line card to check the status of the interfaces.

If the system does not complete each of the preceding steps, proceed to the chapter "Troubleshooting the Installation," in this publication, for troubleshooting recommendations and procedures.

Manually Booting the System

This information in this section is required only if the system does not boot automatically from a specified default Cisco IOS software image.

The system is administered using the Cisco command interpreter, called the *EXEC*. You must boot and log in to the system before you can enter an EXEC command. For security purposes the EXEC has two levels of access to commands: user EXEC mode and privileged EXEC mode. To enter privileged mode, you must enter the enable secret password, which is optional, but must first have been saved in memory. (For information on using passwords, refer to Step 5 and Step 6 in the section "Configuring the Global Parameters," later in this chapter.)

At the ROM monitor prompt, view the contents of onboard Flash memory using the following command:

```
rommon 1> dir bootflash:
   File size                  Checksum      File name
   3277967 bytes (0x32048f)   0x6b331e30    Cisco 12012 gsr-p-mz.112-8
rommon 2>
```

Also, view the Flash memory PCMCIA card in slot 0 or slot 1 using the following command:

```
rommon 2> dir slot0:
   File size                  Checksum      File name
   3054276 bytes (0x2e9ac4)   0x97788495    Cisco 12012 gsr-p-mz.112-8
rommon 3>
```

Locate the Cisco IOS software image that you want to boot and boot from this image using the following commands, as appropriate:

```
rommon 3> boot slot0:filename
```

or...

```
rommon 3> boot slot1:filename
```

or...

```
rommon 3> boot bootflash:filename
```

If you did not change the configuration register setting, the next reload will revert to the default configuration register setting. (The factory default configuration register setting for systems and for RP spares is 0x0102.)

Configuring the Cisco 12012

You can a complete a basic configuration of the Cisco 12012 system using one of the procedures described in the following sections:

- Performing a Basic Manual Configuration Using the Setup Facility or the setup Command
- Performing a Basic Configuration Using Configuration Mode

Follow the procedure that best fits the needs of your network configuration. You will need to acquire the correct network addresses from your system administrator or consult your network plan to determine correct addresses before you can complete the router configuration.

Performing a Basic Manual Configuration Using the Setup Facility or the setup Command

At initial startup, the Cisco 12012 defaults to the setup facility; the system automatically goes into the setup facility. (The **setup** command facility functions exactly the same as a completely unconfigured system functions when you first boot it up. You can run the setup facility any time you are at the enable prompt (#) by entering the **setup** command.)

Two parameters of the system configuration are considered during setup: global parameters and interface parameters.

The primary difference between what you see with the setup facility and what you see with the **setup** command facility is that with the latter, any current system configuration defaults are displayed in square brackets [ ] as you move through the **setup** command process and are queried by the system to make changes.

For example, during the setup facility for a POS interface, assuming the interface has *not* been configured, you will see the following:

```
Configuring interface POS4/0:
  Is this interface in use?: yes
  Configure IP on this interface?: yes
```

Note that *no* default or current conditions are shown in square brackets [ ].

Conversely, you will see the following during the **setup** command facility, assuming the POS interface *has* been configured and you are being queried by the system to change it:

```
Configuring interface POS4/0:
  Is this interface in use?[yes]: yes
  Configure IP on this interface?[yes]: yes
```

Note that the default or current conditions of the interface *are* shown in square brackets [ ].

Proceed to the following section to configure the system using the setup facility or the **setup** command facility. Differences are clearly noted.

Configuring the Global Parameters

When you first start the setup facility or enter the **setup** command, you are queried by the system to configure the global parameters. The global parameters are used for controlling system-wide settings.

Use the following procedure to boot the Cisco 12012 and enter the global parameters:

Step 1 Connect a console terminal to the console port on the RP, and then boot the system to the user EXEC prompt (`Router>`).

Step 2 When you have booted the system, the following information appears after about 30 seconds. (This information is similar to what should appear on your console screen.) When you see this information displayed, you have successfully booted your system:

```
System Bootstrap, Version 11.2(8)GS [biff 571], RELEASED SOFTWARE
Copyright (c) 1994-1997 by cisco Systems, Inc.

Restricted Rights Legend

Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.

           cisco Systems, Inc.
           170 West Tasman Drive
           San Jose, California 95134-1706

Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-MZ), Released Version 11.2(8)GS
[biff-bfr_112]
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 25-Aug-97 20:13 by biff
Image text-base: 0x60010900, data-base: 0x604FE000

ROM: System Bootstrap, Version 11.2(8)GS [biff-bfr_112], RELEASED
SOFTWARE
BOOTFLASH: GS Software (GSR-BOOT-M), Released Version 11.2(8)GS
[biff-bfr_112 1913]

Router uptime is 20 days, 12 hours, 16 minutes
System restarted by reload
System image file is "biff/gsr-p-mz", booted via tftp from 1.1.1.254

cisco GRP (R5000) processor (revision 0x00) with 65536K bytes of
memory.
Processor board ID 00000000
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2
Cache)
Last reset from power-on
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
2 four-port OC3 POS controllers (8 POS).
5 OC12 POS controllers (5 POS).
1 Ethernet/IEEE 802.3 interface(s)
13 Packet over Sonet network interface(s)
507K bytes of non-volatile configuration memory.
```

```
20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Notice: NVRAM invalid, possibly due to write erase.
```

Note The first two sections of the preceding configuration script (the banner and the installed hardware) appear only at initial system startup. On subsequent uses of the **setup** command facility, the setup script begins with the following System Configuration Dialog.

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

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

Continue with configuration dialog? [yes/no]:
```

Note The examples in this section represent a continuation of the setup facility or the **setup** command facility.

Step 3 Enter **yes** or press **Return** when asked if you want to enter the configuration dialog and if you want to see the current interface summary. Press **Return** to accept the default (yes):

```
Would you like to enter the initial configuration dialog? [yes]:

First, would you like to see the current interface summary? [yes]:
```

In the following example of a **yes** response (during the setup facility), the partial summary shows a Cisco 12012 system at first-time startup; that is, nothing has been configured, and the following summary reflects this.

```
Interface   IP-Address      OK? Method Status                Protocol
Ethernet0   unassigned      YES unset  administratively down down
POS3/0      unassigned      YES unset  administratively down down
POS3/1      unassigned      YES unset  administratively down down
```

```
POS3/2      unassigned      YES unset  administratively down down
POS3/3      unassigned      YES unset  administratively down down
ATM4/0      unassigned      YES unset  administratively down down
(Additional displayed text omitted from this example.)
```

In the following example of a **yes** response (during the **setup** command facility), the partial summary shows a Cisco 12012 system in which some interfaces have already been configured, and the following summary reflects this.

```
Interface   IP-Address      OK? Method Status                Protocol
Ethernet0   3.3.1.1         YES NVRAM  up                    up
POS3/0      2.1.1.1         YES NVRAM  up                    up
POS3/1      2.1.1.2         YES NVRAM  up                    up
POS3/2      2.1.1.3         YES NVRAM  up                    up
POS3/3      2.1.1.4         YES NVRAM  up                    up
ATM4/0      1.1.1.2         YES NVRAM  up                    up
(Additional displayed text omitted from this example.)
```

Step 4 Choose which protocols to support on your interfaces. For Internet Protocol (IP)–only installations, you can accept the default values for most of the questions.

A typical minimal configuration using IP follows, and continues through Step 10:

```
Configuring global parameters:

  Enter host name [Router]: Router
```

Step 5 Enter the enable secret password when the following is displayed, and make a note of this password for future reference:

```
The enable secret is a one-way cryptographic secret used
instead of the enable password when it exists.

Enter enable secret [<Use current secret>]: barney
```

Step 6 Enter the enable password when the following is displayed, and make a note of this password for future reference:

```
The enable password is used when there is no enable secret
and when using older software and some boot images.

  Enter enable password: wilma
```

The commands available at the user level are a subset of those available at the privileged level. Because many privileged-level EXEC commands are used to set operating parameters, you should password-protect these commands to prevent unauthorized use.

The enable secret password functionality is available for Cisco 12000 series systems. You must enter the correct password to gain access to privileged-level commands. When you are running from the boot ROM monitor, the enable password might be used depending on your boot ROM level.

The passwords should be different for maximum security. If you enter the same password for both during the setup script, the system will accept it, but you will receive a warning message indicating that you should enter a different password.

An enable secret password can contain from 1 to 25 uppercase and lowercase alphanumeric characters; an enable password can contain any number of uppercase and lowercase alphanumeric characters. In both cases, a number cannot be the first character. Spaces are also valid password characters; for example, “two words” is a valid password. Leading spaces are ignored; trailing spaces are recognized.

Step 7 Enter the virtual terminal password when the following is displayed, and make a note of this password for future reference:

```
Enter virtual terminal password: bambam
```

Step 8 In most cases you will use IP routing. If so, you must also select an interior routing protocol. You can specify Interior Gateway Routing Protocol (IGRP) to operate on your system using setup.

Enter **yes** (the default) or press **Return** to configure IP, and then select IGRP:

```
Configure IP? [yes]:
  Configure IGRP routing? [yes]:
    Your IGRP autonomous system number [1]: 199
```

Note For complete information on IP routing and autonomous system numbering, refer to the appropriate software configuration publications, which are listed in the section “If You Need More Configuration Information,” later in this chapter. The Ethernet interface does not support external routing functions.

Step 9 Enter **yes** or **no** to accept or refuse SNMP management:

```
  Configure SNMP Network Management? [yes]:
    Community string [public]:
```

Note The Simple Network Management Protocol (SNMP) is the most widely supported open standard for network management. It provides a means to access and set configuration and run-time parameters of routers and communication servers. SNMP defines a set of functions that can be used to monitor and control network elements. (For complete information on SNMP, refer to the appropriate software configuration publications, which are listed in the section "If You Need More Configuration Information," later in this chapter.)

Step 10 Enter **yes** or **no** to accept or refuse CLNS management:

```
  Configure CLNS? [no]: yes
    CLNS router tag [area_1]:
    CLNS domain [49]:
    CLNS area [0001]:
CLNS station id [0027.25E9.B640]:
```

Note The Connectionless Network Service (CLNS) is an Open System Interconnection (OSI) layer service that does not require a circuit to be established before data is transmitted. CLNS routes messages to their destinations independently of any other messages. (For complete information on CLNS, refer to the appropriate software configuration publications, which are listed in the section "If You Need More Configuration Information," later in this chapter.)

As a review of what you have done, the following sample display includes a continuous listing of all configuration parameters you selected in Steps 4 through 10. These parameters and their defaults are shown in the order in which they appeared on your console terminal.

```
Configuring global parameters:

Enter host name: Router
Enter enable secret: barney
Enter enable password: wilma
Enter virtual terminal password: bambam
Configure IP?: yes
    Configure IGRP routing?: yes
      Your IGRP autonomous system number [1]: 199
Configure SNMP Network Management?: yes
    Community string [public]:
Configure CLNS? [no]: yes
    CLNS router tag [area_1]:
    CLNS domain [49]:
    CLNS area [0001]:
    CLNS station id [0027.25E9.B640]:
```

This completes the portion of the setup facility for configuring global parameters. The setup facility continues for configuring interfaces; refer to the following section.

Configuring Interfaces

This section provides steps for configuring installed interfaces (using the setup facility or **setup** command facility) to allow communication over your external networks. To configure the interface parameters, you need your interface network addresses, subnet mask information, and you need to know which protocols you want to configure; consult with your network administrator for this information. (For additional interface configuration information on each of the line cards available for the Cisco 12012, refer to the individual configuration notes that shipped with your line cards.)

Note The examples in this section represent a continuation of the setup facility or the **setup** command facility and are intended as examples only. Your configuration might look differently depending on your configuration requirements.

Use the following procedure to configure the interfaces installed in your Cisco 12012:

Step 1 The IEEE 802.3u interface, located on the RP, allows connections to Ethernet networks. In the following example, the system is being configured for the Ethernet interface using IP. (Note that the Ethernet interface does not support external routing functions.) Respond as appropriate for your needs, using your own address and subnet mask for the setup prompts.

```
Configuring interface Ethernet0:
  Is this interface in use?: yes
  Configure IP on this interface?: yes
    IP address for this interface: 3.3.1.1
    Number of bits in subnet field: 8
    Class A network is 3.0.0.0, 8 subnet bits; mask is 255.255.0.0
  Configure CLNS on this interface?: yes
```

Step 2 The Packet-Over-SONET (POS) interfaces allow connections to external OC-3/STM-1 or OC-12/STM-4 networks. In the following example, the system is being configured for a POS interface using IP. Respond as appropriate for your needs, using your own address and subnet mask for the setup prompts. (Also refer to Step 3, which shows this same interface being configured for IP unnumbered; use whichever step is most appropriate for your needs.)

```
Configuring interface POS4/0:
  Is this interface in use?: yes
  Configure IP on this interface?: yes
  Configure IP unnumbered on this interface?: no
    IP address for this interface: 2.1.1.1
    Number of bits in subnet field: 0
    Class A network is 2.0.0.0, 0 subnet bits; mask is 255.0.0.0
  Configure CLNS on this interface?: yes
```

Note For POS interfaces the cyclic redundancy check (CRC) default is 32-bits.

For more complete POS interface configuration information, refer to the configuration notes *Quad OC-3c/STM-1c Packet-Over-SONET Line Card Installation and Configuration* (Document Number 78-4333-xx) and

OC-12c/STM-4c Packet-Over-SONET Line Card Installation and Configuration (Document Number 78-4341-xx) that accompanied your Quad OC-3c/STM-1c and OC-12c/STM-4c POS line cards, respectively.

Step 3 In the following example, the system is being configured for a POS interface using IP unnumbered. Respond as appropriate for your needs:

```
Configuring interface POS4/0:
  Is this interface in use?: yes
  Configure IP on this interface?: yes
  Configure IP unnumbered on this interface?: yes
    Assign to which interface: ethernet0
  Configure CLNS on this interface?: yes
```

Repeat Step 2 and Step 3 for each POS interface you need to configure; then, if you have ATM interfaces installed, proceed to Step 4. Otherwise, proceed to Step 5 to check and verify your configuration parameters.

Step 4 The Asynchronous Transfer Mode (ATM) interfaces allow connections to external OC-12/STM-4 networks. In the following example, the system is being configured for an ATM interface using IP. Respond as appropriate for your needs, using your own address and subnet mask for the setup prompts:

```
Configuring interface parameters:

Configuring interface ATM1/0:
  Is this interface in use?: yes
  Configure IP on this interface?: yes
    IP address for this interface: 1.1.1.2
    Number of bits in subnet field: 0
    Class A network is 1.0.0.0, 0 subnet bits; mask is 255.0.0.0
```

Note For the ATM interfaces in your system, additional configuration parameters might be required before you can fully use these interfaces (such as configuring permanent virtual circuits [PVCs], and so forth), but are beyond the scope of this publication.

For more complete ATM interface configuration information, refer to the configuration note *OC-12c/STM-4c Asynchronous Transfer Mode Line Card Installation and Configuration* (Document Number 78-4344-xx) that accompanied your OC-12c/STM-4c ATM line card.

Repeat Step 4 for each ATM interface you need to configure; then, to check and verify your configuration parameters, proceed to Step 5.

Step 5 When your interface configuration is complete (you reach and respond to the configuration dialog for the last installed interface), check and verify the entire list of configuration parameters, which should be displayed on your console terminal and end with the following query:

```
Use this configuration? [yes/no]:
```

A **no** response places you back at the enabled mode prompt (#) and you will need to reissue the **setup** command to reenter your configuration. A **yes** response writes the running configuration to NVRAM, as follows:

```
Use this configuration? [yes/no]: yes
[OK]
Use the enabled mode 'configure' command to modify this
configuration.
Press RETURN to get started!
```

After you press the **Return** key, the following prompt will appear:

```
Router>
```

This completes the procedures for configuring global parameters and interface parameters in your system using the setup facility or **setup** command. Your Ethernet, POS, and ATM interfaces are now available for limited use.

If you want to modify the currently saved configuration parameters after the initial configuration, enter the **setup** command; or, to perform more complex configurations, enter configuration mode and use the **configure** command.

Check the current state of the Cisco 12012 using the **show version** command, which displays the release of Cisco IOS software that is available on the Cisco 12012 and the installed interfaces, as follows:

```
Router> sh version
Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-MZ), Released Version 11.2(8)GS [biff-bfr_112]
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 25-Aug-97 20:13 by biff
Image text-base: 0x60010900, data-base: 0x604FE000

ROM: System Bootstrap, Version 11.2(8)GS [biff-bfr_112], RELEASED
SOFTWARE
BOOTFLASH: GS Software (GSR-BOOT-M), Released Version 11.2(8)GS
[biff-bfr_112 1913]

Router uptime is 20 days, 12 hours, 16 minutes
System restarted by reload
System image file is "biff/gsr-p-mz", booted via tftp from 1.1.1.254

cisco GRP (R5000) processor (revision 0x00) with 65536K bytes of memory.
Processor board ID 00000000
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
1 Single-port OC12c ATM controller (1 ATM).
1 four-port OC3 POS controller (4 POS).
1 Ethernet/IEEE 802.3 interface(s)
1 ATM network interface(s)
4 Packet over Sonet network interface(s)
507K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0102

Router#
```

For additional interface configuration information, refer to the configuration notes that accompanied your line cards. For more information on specific system configurations, refer to the section "If You Need More Configuration Information," later in this chapter.

Performing a Basic Configuration Using Configuration Mode

You can configure the Cisco 12012 system manually (via configuration mode) if you prefer not to use the setup facility. Use the following procedure to configure the Cisco 12012 system manually:

Step 1 Connect a console terminal to the console port of your RP.

Step 2 When you are asked if you want to enter the initial dialog, answer **no** to go into the normal operating mode of the Cisco 12012 as follows:

```
Would you like to enter the initial dialog? [yes]: no
```

Step 3 After a few seconds you will see the user EXEC prompt (`Router>`). Type **enable** to enter enable mode. Configuration changes can only be made in enable mode:

```
Router> enable
```

The prompt will change to the privileged EXEC prompt (#) as follows:

```
Router#
```

Step 4 At the enable prompt (#), enter the **config terminal** command to enter configuration mode from the terminal as follows:

```
Router# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

At the prompt, enter the **interface** *type slot/port* command to enter interface configuration mode as follows:

```
Router(config)# interface type slot/port
Router(config-if)#
```

In either of these configuration modes, you can enter any changes to the Cisco 12012 configuration. Press **Ctrl-Z** to exit either configuration mode.

Step 5 Save your settings. (Refer to the section "Saving the Running Configuration Settings and Reviewing Your Configuration," later in this chapter.)

Your Cisco 12012 is now minimally configured and will boot with the configuration you entered. To see a list of the configuration commands available to you, enter **?** at the prompt or press the **help** key while in configuration mode.

Checking the Running Configuration Settings before Saving Them

You can check the configuration settings you entered or changes you made by entering **show running-config** command at the enable prompt (#) as follows:

```
Router# show running-config
.
.
.
Router#
```

Saving the Running Configuration Settings and Reviewing Your Configuration

To store the configuration or changes to your startup configuration in NVRAM, enter **copy running-config startup-config** at the enable prompt (#) as follows:

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

This command saves the configuration settings that you created in configuration mode. If you fail to do this, your configuration will be lost the next time you reload the system. To display information stored in NVRAM, use the **show startup-config** EXEC command**.**

The following sample output shows a typical system configuration:

```
Router# sh startup-config
Using 1133 out of 520184 bytes
!
version 11.2
no service udp-small-servers
no service tcp-small-servers
!
hostname Router
!
enable password wilma
ip cef distributed switch
ip host biff 3.3.3.254
!
interface Ethernet0
 ip address 3.3.1.1 255.255.0.0
 no ip mroute-cache
!
```

```
interface POS3/0
 ip address 2.1.1.1 255.0.0.0
 no keepalive
 crc 16
 no cdp enable
!
interface POS3/1
 ip address 2.1.1.2 255.0.0.0
 no keepalive
 crc 16
 no cdp enable
!
interface POS3/2
 ip address 2.1.1.3 255.0.0.0
 no keepalive
 crc 32
 no cdp enable
!
interface POS3/3
 ip address 2.1.1.4 255.0.0.0
 no keepalive
 crc 32
 no cdp enable
!
interface ATM4/0
 ip address 15.0.0.15 255.0.0.0 secondary
 ip address 1.1.1.2 255.0.0.0
 atm pvc 1 0 64 aal5snap
 atm pvc 2 0 72 aal5mux ip 155000 155000 1
 atm pvc 3 1 90 aal5snap 312000 312000 1
 atm pvc 4 0 108 aal5snap
 atm pvc 10 0 144 aal5mux ip 155000 155000 1
 atm pvc 11 1 91 aal5snap 310000 310000 1
 map-group atm1
!
no ip classless
ip route 2.5.4.254 255.255.255.255 Ethernet0
!
```

```
map-list atm1
 ip 1.1.1.1 atm-vc 1
 ip 1.1.1.3 atm-vc 2
 ip 1.1.1.4 atm-vc 4
 ip 15.0.0.1 atm-vc 3
 ip 15.0.0.5 atm-vc 10
 ip 15.0.0.6 atm-vc 11
no logging trap
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password bambam
 login
!
end
```

Implementing Other Configuration Tasks

This section contains information on the following additional configuration, troubleshooting, and maintenance tasks:

- Configuring the Software Configuration Register
- Boot Field Settings and the boot Command
- Recovering a Lost Password
- Using Flash Memory Cards in the RP

Configuring the Software Configuration Register

The Cisco 12012 system uses a 16-bit software configuration register, which allows you to set specific system parameters. Settings for the software configuration register are written into NVRAM.

Following are some reasons for changing the software configuration register settings:

- To select a boot source and default boot filename.
- To enable or disable the Break function.
- To control broadcast addresses.
- To set the console terminal baud rate.
- To load operating software from Flash memory.
- To enable booting from a Trivial File Transfer Protocol (TFTP) server.
- To recover a lost password.
- To allow you to manually boot the system using the **b** command at the bootstrap program prompt.
- To force an automatic boot from the system bootstrap software (boot image) or from a default system image in onboard Flash memory, and read any **boot system** commands that are stored in the configuration file in NVRAM.

Table 4-3 lists the meaning of each of the software configuration memory bits, and Table 4-4 defines the *boot field*, which consists of bits 0 through 3 of the software configuration register and is specified as a binary number.

Caution To avoid confusion and possibly halting the Cisco 12012, remember that valid configuration register settings might be combinations of settings and not just the individual settings listed in Table 4-3. For example, the factory default value of 0x0102 is a combination of settings.

Table 4-3 Software Configuration Register Bit Meanings

Bit Number[1]	Hexadecimal	Meaning
00 to 03	0x0000 to 0x000F	Boot field (see Table 4-4)
06	0x0040	Causes system software to ignore NVRAM contents
07	0x0080	OEM[2] bit enabled
08	0x0100	Break disabled
09	0x0200	Use secondary bootstrap
10	0x0400	Internet Protocol (IP) broadcast with all zeros
11 to 12	0x0800 to 0x1000	Console line speed (default is 9600 baud)
13	0x2000	Boot default Flash software if network boot fails
14	0x4000	IP broadcasts do not have network numbers
15	0x8000	Enable diagnostic messages and ignore NVRAM contents

1. The factory default value for the configuration register is 0x0102. This value is a combination of the following: binary bit 8 = 0x0100 and binary bits 00 through 03 = 0x0002 (see Table 4-4).
2. OEM = original equipment manufacturer.

Table 4-4 Explanation of Boot Field (Configuration Register Bits 00 to 03)

Boot Field	Meaning
00	Stays at the system bootstrap prompt
01	Boots the first system image in onboard Flash memory
02 to 0F	Specifies a default filename for booting over the network. Enables boot system commands that override the default filename.

Boot Field Settings and the boot Command

Bits 0 through 3 of the software configuration register form the *boot field*, specified as a binary number.

Note The factory default configuration register setting for systems and RP spares is 0x0102.

When the boot field is set to either 0 or 1 (0-0-0-0 or 0-0-0-1), the system ignores any boot instructions in the system configuration file and the following occurs:

- When the boot field is set to 0, you must boot the operating system manually by issuing the **boot** command to the system bootstrap program or *rom monitor.*
- When the boot field is set to 1, the system boots the first image in the onboard bootflash single in-line memory module (SIMM).

You can enter the **boot** command only, or include additional boot instructions with the command such as the name of a file stored in Flash memory or a file that you specify for booting from a network server. If you use the **boot** command without specifying a file or any other boot instructions, the system boots from the default Flash image (the first image in onboard Flash memory). Otherwise, you can instruct the system to boot from a specific Flash image (using the **boot system flash** *filename* command), or boot from a network server by sending broadcast TFTP requests (using the **boot system** *filename* command), or send a direct TFTP request to a specific server (using the **boot system** *filename ip-address* command).

You can also use the **boot** command to boot images stored in the Personal Computer Memory Card International Association (PCMCIA) Flash memory cards located in PCMCIA slot 0 or slot 1 on the RP. If you set the boot field to any bit pattern other than 0 or 1, the system uses the resulting number to form a filename for booting over the network.

To form this filename, the system starts with *cisco* and links the octal equivalent of the boot field value and the processor type in the following format: *cisco<bootfieldvalue>-<processorname>*; for example, *cisco2-grp*. The system uses this filename to invoke the system image by booting over the net. However, if the configuration file contains any boot instructions, the system uses those boot instructions instead of the filename it computed from the configuration register settings.

Note If a bootable Cisco IOS software image exists in a Flash memory card installed in PCMCIA slot 0 or slot 1, the configuration register setting is overridden and the bootable Cisco IOS software image will be booted instead of the default TFTP-bootable Cisco IOS software image (cisco2-grp through cisco17-grp on the GRP and cisco2-prp through cisco17-prp on the PRP).

You must set the boot field for the boot functions you require.

Changing Configuration Register Settings

Use the following procedure to change the configuration register while running the system software:

Step 1 Enter the **enable** command and your password to enter privileged level as follows:

```
Router> enable
Password:
Router#
```

Step 2 Enter the **configure terminal** command at the privileged-level system prompt (#), also called the *enabled prompt*. You are prompted, as shown in the following example:

```
Router# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 3 Set the contents of the configuration register by entering the **config-register** *value* configuration command, where *value* is a hexadecimal number preceded by 0x (see Table 4-3), as in the following:

```
Router(config)# config-register 0xvalue
```

Step 4 Exit configuration mode by entering **Ctrl-Z**. The new value settings are saved to memory; however, the new settings do not take effect until the system software is reloaded by rebooting the system.

Step 5 Display the configuration register value currently in effect and that will be used at the next reload by entering the **show version** EXEC command. The value is displayed on the last line of the screen display, as in the following example:

```
Configuration register is 0x141 (will be 0x102 at next reload)
```

Step 6 Save your settings. (Refer to the section "Saving the Running Configuration Settings and Reviewing Your Configuration," later in this chapter. However, note that configuration register changes take effect only after the system reloads, such as when you issue a **reload** command from the console.)

Step 7 Reboot the system. The new configuration register value takes effect with the next system boot.

This completes the procedure for making configuration register changes.

Configuration Register Bit Meanings

The lowest four bits of the software configuration register (bits 3, 2, 1, and 0) form the *boot field.* (See Table 4-4.) The boot field specifies a number in binary form. If you set the boot field value to 0, you must boot the operating system manually by entering the **b** command at the bootstrap prompt (>).

If you set the boot field value to *0x2* through *0xF* and there is a valid **boot system** command stored in the configuration file, the system boots the Cisco IOS software as directed by that value. If there is no **boot system** command, the Cisco 12012 forms a default boot filename for booting from a network server. (See Table 4-5 for the format of these default filenames.) In the following example, the software configuration register is set to boot the system from onboard Flash memory and to ignore Break at the next reboot of the system:

```
Router# conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# config-register 0x0102
Router(config)# boot system flash [filename]
Ctrl-z
Router#
```

The server creates a default boot filename as part of the automatic configuration process. To form the boot filename, the server starts with the name *cisco* and adds the octal equivalent of the boot field number, a hyphen, and the processor-type name (*grp* or *prp*).

Table 4-5 lists the default boot filenames. A **boot system** configuration command in the configuration file in NVRAM overrides the default filename created for booting over the network.

Note If a bootable Cisco IOS software image exists in a Flash memory card installed in PCMCIA slot 0 or slot 1, the configuration register setting is overridden and the bootable Cisco IOS software image will be booted instead of the default TFTP-bootable Cisco IOS software image (cisco2-grp through cisco17-grp on the GRP and cisco2-prp through cisco17-prp on the PRP).

Table 4-5 Default Boot Filenames

Action/File Name	Bit 3	Bit 2	Bit 1	Bit 0
Bootstrap mode	0	0	0	0
Default software	0	0	0	1
cisco2-grp or cisco2-prp	0	0	1	0
cisco3-grp or cisco3-prp	0	0	1	1
cisco4-grp or cisco4-prp	0	1	0	0
cisco5-grp or cisco5-prp	0	1	0	1
cisco6-grp or cisco6-prp	0	1	1	0
cisco7-grp or cisco7-prp	0	1	1	1
cisco10-grp or cisco10-prp	1	0	0	0
cisco11-grp or cisco11-prp	1	0	0	1
cisco12-grp or cisco12-prp	1	0	1	0
cisco13-grp or cisco13-prp	1	0	1	1
cisco14-grp or cisco14-prp	1	1	0	0
cisco15-grp or cisco15-prp	1	1	0	1
cisco16-grp or cisco16-prp	1	1	1	0
cisco17-grp or cisco17-prp	1	1	1	1

Bit 8 controls the console Break key. Setting bit 8 (the factory default) causes the system to ignore the console Break key. Clearing bit 8 causes the system to interpret the Break key as a command and to force the system into the bootstrap monitor, thereby halting normal operation. Regardless of the setting of the break enable bit, a break will cause a return to the ROM monitor during the first few seconds (approximately five seconds) of booting.

Bit 9 is unused. Bit 10 controls the host portion of the IP broadcast address. Setting bit 10 causes the processor to use all zeros; clearing bit 10 (the factory default) causes the processor to use all ones. Bit 10 interacts with bit 14, which controls the network and subnet portions of the broadcast address.

Table 4-6 shows the combined effect of bits 10 and 14.

Table 4-6 Configuration Register Settings for Broadcast Address Destination

Bit 14	Bit 10	Address (<net> <host>)
Off	Off	<ones> <ones>
Off	On	<zeros> <zeros>
On	On	<net> <zeros>
On	Off	<net> <ones>

Bits 11 and 12 in the configuration register determine the data transmission rate of the console terminal. Table 4-7 shows the bit settings for the four available rates. (The factory-set default data transmission rate is 9600.)

Table 4-7 System Console Terminal Transmission Rate Settings

Baud	Bit 12	Bit 11
9600	0	0
4800	0	1
1200	1	0
2400	1	1

Bit 13 determines the server response to a bootload failure. Setting bit 13 causes the server to load operating software from Flash memory after five unsuccessful attempts to load a boot file from the network. Clearing bit 13 causes the server to continue attempting to load a boot file from the network indefinitely. By factory default, bit 13 is cleared to 0.

Recovering a Lost Password

This section provides information on how to recover a lost password. Following is an overview:

- Enter the **show version** command to note the existing software configuration register value.
- Break to the bootstrap program prompt.
- Change the configuration register to ignore NVRAM.

Note A key to recovering a lost password is to set the configuration register so that the contents of NVRAM are ignored (0x0040), allowing you to see your password.

- Enter privileged level in the system EXEC.
- Enter the **show startup-config** command to display the enable password.
- Change the configuration register value back to its original setting.

Use the following procedure to recover a lost password.

Note If the enable password is encrypted, the following procedure will not work for password recovery and you will have to reconfigure the system; you will be unable to reboot it. To reconfigure the system, use the displayed configuration, which is shown using the **show startup-config** EXEC command (see in Step 11).

Step 1 Attach an ASCII terminal to the RP console port.

Step 2 Configure the terminal to operate at 9600 bps, 8 data bits, no parity, 2 stop bits (or to whatever settings the console port is set).

Step 3 Enter the **show version** command to display the existing configuration register value. Note this value for later use in Step 13.

Step 4 If Break is disabled, power cycle the Cisco 12012. (To power cycle, turn off power, wait five seconds, and then turn it on again.) If Break is enabled on the router, press the Break key or send a break by holding down the **Control** key and pressing the right square bracket key (^]), then proceed to Step 5.

Step 5 Within five seconds of turning on the router, press the Break key. This action causes the terminal to display the bootstrap program prompt as follows:

```
rommon 1>
```

Step 6 Set the configuration register to ignore the configuration file information as follows:

```
rommon 1> confreg

Configuration Summary
enabled are:
console baud: 9600
boot: image specified by the boot system command
or default to: cisco2-grp

do you wish to change the configuration? y/n [n]: y
enable "diagnostic mode"? y/n [n]:
enable "use net in IP bcast address"? y/n [n]:
enable "load rom after netbootfails"? y/n [n]:
enable "use all zero broadcast"? y/n [n]:
enable "break/abort has effect?" y/n [n]:
enable "ignore system config info?" [n]: y
change console baud rate? y/n [n]:
change boot characteristics? y/n [n]

Configuration Summary
enabled are:
console baud: 9600
boot: image specified by the boot system command
or default to: cisco2-grp
```

```
do you wish to change the configuration? y/n [n]

You must reset or power cycle for the new config to take effect
```

Step 7 Initialize the router by entering the **i** command as follows:

```
rommon 1> i
```

The router will power cycle, the configuration register will be set to ignore the configuration file, and the router will boot the boot system image and prompt you with the system configuration dialog as follows:

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

Step 8 Enter **no** in response to the system configuration dialog prompts until the following system message is displayed:

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

Step 9 Press **Return**. After some interface information displays, the prompt appears as follows:

```
Router>
```

Step 10 Enter the **enable** command to enter enabled mode. The prompt changes to the following:

```
Router#
```

Step 11 Enter the **show start-up config** EXEC command to display the enable password in the configuration file.

Step 12 Enter the **configure terminal** command at the EXEC prompt. You are prompted as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 13 Change the configuration register value back to its original value (noted from Step 3) or change it to a value of 0x0102 (factory default) using the **config-register** 0x *value* command.

Step 14 Exit configuration mode by entering **Ctrl-Z**.

Step 15 Reboot the router and enable it using the recovered password.

This completes the procedure for recovering a lost password.

Using Flash Memory Cards in the RP

This section describes procedures for using Flash memory cards in the Route Processor (RP), and contains information on the following Flash memory card functions:

- Installing and Removing the Flash Memory Card in a RP
- Formatting a Flash Memory Card
- Specifying the Cisco IOS Image Used to Boot the System
- Software Commands Associated with Flash Memory
- Enabling Booting from Flash Memory
- Copying Files to Flash Memory
- Copying a Cisco IOS Software Image into a Flash Memory Card
- Copying Cisco IOS Software Images between Flash Memory Cards
- Copying System Configuration Files Between RP Memory and a Flash Memory Card
- Recovering from Locked Blocks in Flash Memory Cards

Installing and Removing the Flash Memory Card in a RP

The RP has two PCMCIA slots—slot 0 and slot 1—into which you can install a Flash memory card. The slots are positioned with slot 0 on the left and slot 1 on the right (refer to Figure 4-2).

Both slots can be used at the same time. The following procedure is a generic one and can be used for a Flash memory card in either slot position.

Use the following procedure to install and remove a Flash memory card:

Step 1 Facing the RP front panel, hold the Flash memory card with the connector end of the card toward the slot and the label facing right.

Note The Flash memory card is keyed and cannot be seated the wrong way. The ejector button will not pop out if the card is not properly inserted.

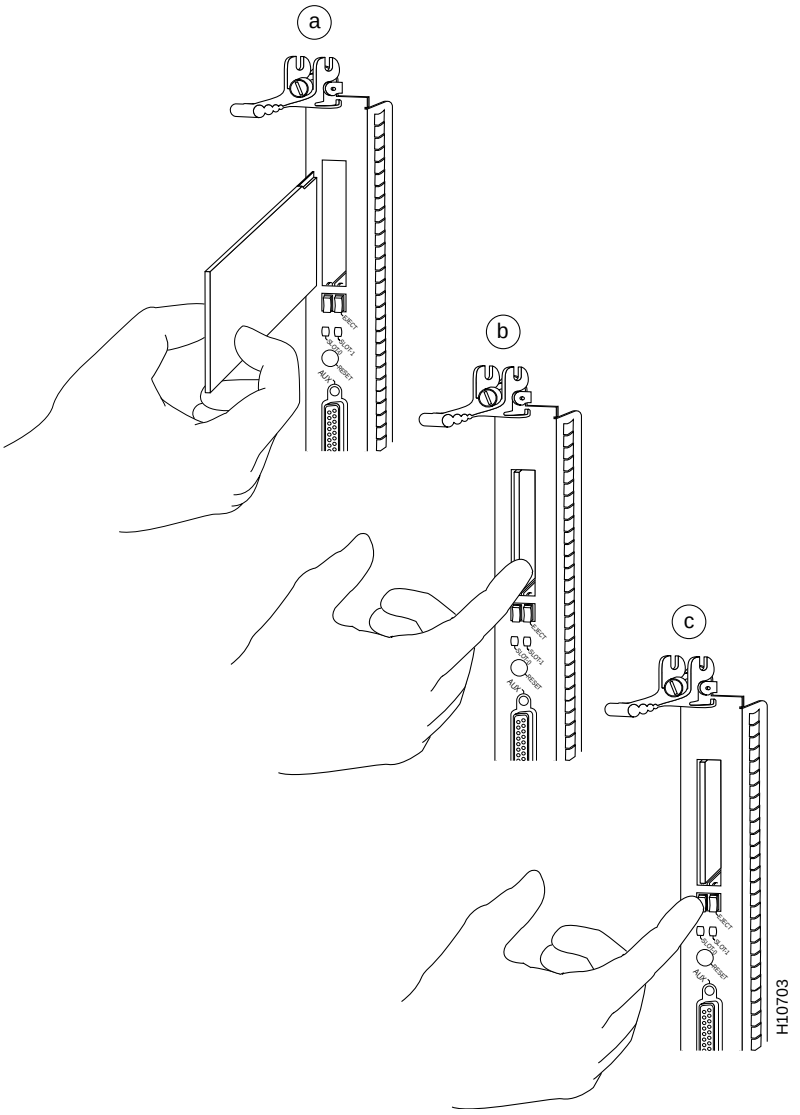
Step 2 Insert the card into the appropriate slot until the card completely seats in the connector at the back of the slot and the ejector button pops out toward you (see Figure 4-2b).

Note that the card does not insert all the way inside the RP; a portion of the card remains outside of the slot. *Do not attempt to force the card past this point.*

Step 3 To eject the card, press the appropriate ejector button until the card is free of the connector at the back of the slot. (See Figure 4-2c.)

Step 4 Remove the card from the slot and place it in an antistatic bag to protect it.

Figure 4-2 Installing and Removing a Flash Memory Card



Formatting a Flash Memory Card

The Flash memory card that shipped with your router contains the Cisco IOS software image you need to boot your router. In some cases, you might need to insert a new Flash memory card and copy images or backup configuration files onto it. Before you can use a *new* Flash memory card, you must format it.

Note The following procedure assumes you have already booted your router. Use only Type 1 or Type 2 Flash memory cards.

Caution The following formatting procedure erases all information on the Flash memory card. To prevent the loss of important data that might be stored on a Flash memory card, proceed carefully. If you want to save the data on a Flash memory card, copy the data to a server before you format the card.

Use the following procedure to format a new Flash memory card:

Step 1 Insert the Flash memory card into slot 0. (Use the procedure in the section "Installing and Removing the Flash Memory Card in a RP," earlier in this chapter.) If slot 0 is not available, use slot 1.

Step 2 Enter the **format slot0:** (or **format slot1:**) command as follows:

```
Router# format slot0:
All sectors will be erased, proceed? [confirm]
Enter volume id (up to 30 characters): MyNewCard
Formatting sector 1
Format device slot0 completed
Router#
```

Note For this example, a 20-MB Flash memory card was used and at the line "Formatting sector," the system counts backward from 160 to 1.

The new Flash memory card is now formatted and ready to use.

For complete command descriptions and configuration information, refer to the *Configuration Fundamentals Command Reference* and the *Configuration Fundamentals Configuration Guide*. (For information on obtaining these publications, refer to the section "If You Need More Configuration Information," later in this chapter.)

Specifying the Cisco IOS Image Used to Boot the System

Use the following series of commands to specify that a Cisco IOS software image is bootable. (In this example, the file named *new.image*.) Note that, since the configuration register must be set to 0x2102, the **config-register** command is part of the sequence.

```
Router# config terminal
Router(config)# no boot system
Router(config)# boot system flash slot0:new.image
Router(config)# config-register 0x2102
Ctrl-z
Router# copy running-config startup-config
Router# reload
```

When the system reloads, it will boot the Cisco IOS software image from the Flash memory card in slot 0.

Note In the preceding example, the configuration register value 0x2000 instructs the system to boot a default Cisco IOS software image from Flash memory if a network boot fails, the value 0x0100 instructs the system to ignore a break, and the value 0x0002 instructs the system to look in Flash memory for this default Cisco IOS software image.

Software Commands Associated with Flash Memory

Following are software commands related to the onboard Flash memory on the RP and the Flash memory cards.

You can determine which memory media you are accessing using the **pwd** command as follows:

```
Router# pwd
slot0
```

You can move between Flash memory media using the **cd** *device-name* command, where *device-name* can be **slot0:**, **slot1:**, or **bootflash:**. Examples follow:

```
Router# cd slot1:
Router# pwd
slot1
Router# cd slot0:
Router# pwd
slot0
```

You can list the directory of Flash memory media using the **dir** [*device-name*] command, where *device-name* can be **slot0:**, **slot1:**, or **bootflash:**. An example of the **dir** command follows:

```
Router# dir
-#- -length- -----date/time------ name
1   4601977  May 10 1997 09:42:19 myfile1
6   679      May 10 1997 05:43:56 todays-config
7   1        May 10 1997 09:54:53 fun1
```

You can delete a file from any Flash memory media using the **delete** *filename* command, where *filename* is any file within Flash memory. An example of deleting the file *fun1* from the Flash memory card in slot 0 follows:

```
Router# delete fun1
Router# dir
-#- -length- -----date/time------ name
1   4601977  May 10 1997 09:42:19 myfile1
6   679      May 10 1997 05:43:56 todays-config
```

Files that are deleted are marked as deleted, but still occupy space in Flash memory. The **squeeze** *device-name* command (where *device-name* can be **slot0:**, **slot1:**, or **bootflash:**) removes them permanently and pushes all other undeleted files together to eliminate spaces between them.

An example of the **squeeze** command follows:

```
Router# squeeze slot0:
All deleted files will be removed, proceed? [confirm]
Squeeze operation may take a while, proceed? [confirm]
ebESZ
```

To prevent loss of data due to sudden power loss, the “squeezed” data is temporarily saved to another location of Flash memory, which is specially used by the system.

In the preceding command display output, the character "e" means this special location has been erased (which must be performed before any write operation). The character "b" means that the data that is about to be written to this special location has been temporarily copied. The character "E" signifies that the sector that was temporarily occupied by the data has been erased. The character "S" signifies that the data was written to its permanent location in Flash memory.

The **squeeze** command operation keeps a log of which of these functions has been performed so upon sudden power failure, it can return to the correct place and continue with the process. The character "Z" means this log was erased after the successful **squeeze** command operation.

The configuration register setting 0x0101 tells the system to boot the default image (the first image) from onboard Flash memory, but *not* reset the Break disable or check for a default filename to be booted over the network. The configuration register setting 0x0102 tells the system to boot from Flash memory if netboot fails, disable Break, and check for a default netboot filename.

For more information on the **copy tftp:***filename* [**bootflash**: | **slot0:** | **slot1:**]:*filename* command and other related commands, refer to the set of configuration fundamentals configuration and reference publications.

Enabling Booting from Flash Memory

To enable booting from Flash memory, set configuration register bits 3, 2, 1, and 0 to a value between 2 and 15 in conjunction with the **boot system flash** *device:filename* configuration command, where *device* is **bootflash:**, **slot0:**, or **slot1:**, and *filename* is the name of the file from which you want to boot the system. (For a detailed configuration register information, refer to the section "Manually Booting the System," earlier in this chapter.)

To enter configuration mode while in the system software image and specify a Flash filename from which to boot, enter the **configure terminal** command at the enable prompt as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# boot system flash device:filename
```

To disable Break and enable the **boot system flash** *device*:*filename* command, enter the **config-register** command with the value shown in the following example:

```
Router(config)# config-reg 0x0102
Ctrl-z
Router#
```

Copying Files to Flash Memory

Copying a new Cisco IOS software image to Flash memory might be required whenever a new Cisco IOS software release or maintenance release becomes available. Copying a system configuration file might also be required if you want to keep a backup copy of it. Use the information in this section to copy any type of file to Flash memory.

Caution You *cannot* copy a new Cisco IOS software image into Flash memory while the system is running from Flash memory.

Note In general, we recommend that you upgrade Cisco IOS software images in Flash memory one at a time; do not delete all known-good images at one time. Also, upgrade PCMCIA-based Flash memory separately from onboard Flash memory to avoid losing important Cisco IOS software images that are known to be good. (The onboard Flash memory is referred to as the *bootflash*.)

Use the command **copy tftp:***filename* [**bootflash:** | **slot0:** | **slot1:**]:*filename* for the copy procedure, where **tftp:***filename* is the source of the file, and [**bootflash:** | **slot0:** | **slot1:**]:*filename* is the destination in onboard Flash memory or on either of the Flash memory cards.

An example of the **copy tftp:***filename* command follows:

```
Router# copy tftp:myfile1 slot0:myfile1
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 7799951/15599616 bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Router#
```

In the preceding example, the exclamation points (!!!) appear as the file is downloaded, and the “C” characters signify calculation of the cyclic redundancy check (CRC) value, which is a verification that the file has been correctly downloaded to the Flash memory card.

Copying a Cisco IOS Software Image into a Flash Memory Card

You can copy a Cisco IOS software image into Flash memory; however, you must first format the Flash memory card and make the image in the Flash memory card bootable. (If you have not already done this, refer to the sections “Formatting a Flash Memory Card” and “Specifying the Cisco IOS Image Used to Boot the System,” which appear earlier in this chapter.)

To copy a Cisco IOS software image, use the following procedure, which assumes the following:

- You have a formatted Flash memory card in your RP
- You have a good, bootable Cisco IOS software image in the onboard Flash memory so you can start the router

- The bootable Cisco IOS software image you want to copy to the Flash memory card exists on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available to access this server

  To assure access to a TFTP server, you need to configure one interface using the **setup** command facility. For instructions on using this facility, refer to the section "Performing a Basic Manual Configuration Using the Setup Facility or the setup Command," earlier in this chapter, or to the *Configuration Fundamentals Configuration Guide* publication.

- You know the filename of the image you want to copy into the Flash memory card

Use the following procedure to copy a bootable image into the Flash memory card:

Step 1 Boot the router and allow it to initialize.

Step 2 Enable the router and copy the image *new.image* to the Flash memory card in slot 0, using the following series of commands:

```
Router> en
Password:
Router# copy tftp:new.image slot0:new.image
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 7799951/15599616 bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCC
Router#
```

In the preceding example, the exclamation points (!!!) appear as the file is downloaded, and the "C" characters signify calculation of the cyclic redundancy check (CRC) value, which is a verification that the file has been correctly downloaded to the Flash memory card. You must now reboot the system.

This completes the procedure for copying a bootable image into a Flash memory card.

Copying Cisco IOS Software Images between Flash Memory Cards

As future releases of Cisco IOS software become available, you will receive these images either as a file booted from a network server, a file on floppy disk, or a file on a Flash memory card.

The following scenario describes how to use a newly released Cisco IOS software image on a Flash memory card in a system that has an older image on a Flash memory card in slot 0 and a default boot Cisco IOS software image in the onboard Flash memory.

For this scenario, the filenames are as follows:

- The new image on the new Flash memory card is *image.new.*
- The old image in the Flash memory card in slot 0 is *image.old*.
- The bootable image in onboard Flash memory is *image.boot*. (Use the Cisco IOS software image used by default to boot the system if no other images are available.)

You will copy the new Cisco IOS software image from the new Flash memory card onto the Flash memory card that contains the old Cisco IOS software image.

Note The scenario assumes that the new Cisco IOS software image will fit on the Flash memory card in slot 0, alongside the old image. If there is not enough available space, use the **delete** command to delete files from the Flash memory card to make sufficient room for the new Cisco IOS software image; however, *do not* delete the *image.old* file. Then use the **squeeze** command to remove these deleted files from the Flash memory card. (For information on the **squeeze** command, refer to the section "Software Commands Associated with Flash Memory," earlier in this chapter.)

If, after you have deleted files and used the **squeeze** command, the two files cannot coexist on the Flash memory card in slot 0, remove this card (place it in an antistatic bag and store it in a safe place), then insert the new Flash memory card (with the file *image.new*) in slot 0. Proceed to Step 5 and use the command **boot system flash slot0:image.new** to designate the file *image.new* as the default boot Cisco IOS software image.

Use the following procedure to copy bootable Cisco IOS software images between Flash memory cards:

Step 1 Boot the router. (For this example, the file *image.boot* will be used by default.)

Step 2 Enable the router as follows:

```
Router> en
Password:
Router#
```

Step 3 Insert the new Flash memory card in slot 1.

Step 4 Use the following command to copy the file *image.new* in slot 1 to the Flash memory card in slot 0, only *if* there is enough memory space for the two images to coexist:

```
Router# copy slot1:image.new slot0:image.new
```

You can also enter the previous command as **copy slot1:image.new slot0:**.

Step 5 Use the following series of commands to designate the file *image.new* (in the Flash memory card in slot 0) as the default boot image:

```
Router# config t
Router(config)# no boot system
Router(config)# boot system flash slot0:image.new
Ctrl-z
Router# copy running-config startup-config
Router# reload
```

When the system reloads, it will boot the file *image.new* from the Flash memory card in slot 0.

This completes the procedure for copying bootable images between Flash memory cards.

Copying System Configuration Files Between RP Memory and a Flash Memory Card

Copying a configuration file to a Flash memory card in PCMCIA slot 0 or slot 1 might be required if you do not have access to a TFTP server on which you can temporarily store your configuration file. You can then copy the configuration file back to NVRAM at any time. You can copy your startup configuration file (from NVRAM) or your running configuration file (from DRAM).

Use the procedures in the following sections to first copy the configuration file from either NVRAM or DRAM to a Flash memory card, and then to copy the configuration file from a Flash memory card back to NVRAM.

Note You cannot copy files directly into DRAM.

Copying a Configuration File from RP NVRAM to a Flash Memory Card

You can use the command **copy startup-config** [**slot0:** | **slot1:**]:*filename* for the copy procedure where **startup-config** is the file's source (NVRAM), and [**slot0:** | **slot1:**]:*filename* is the file's destination in either of the Flash memory cards. Note that the environmental variable CONFIG_FILE must be pointing (set) to NVRAM, which is the system default.

Use the following procedure to copy a configuration file from RP NVRAM to a Flash memory card:

Step 1 Use the **show boot** command to display the current setting for the environmental variable CONFIG_FILE as follows:

```
Router# show boot
(display text omitted)

CONFIG_FILE variable =
Current CONFIG_FILE variable =

(display text omitted)
```

The preceding example shows that the environmental variable CONFIG_FILE is set for NVRAM, by default.

Step 2 Enter the **copy startup-config slot0:***filename* command as follows:

```
Router# copy startup-config slot0:myfile2
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 7799951/15599616 bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCC
Router#
```

Note In the preceding example, the exclamation points (!!!) appear as the file is copied. The “C” characters signify calculation of the checksum—a verification that the file has been correctly copied.

You can also copy the running configuration (located in DRAM) to a Flash memory card, as shown in the following section “Copying a Configuration File from RP DRAM to a Flash Memory Card.”

Step 3 Verify the file was copied correctly using the **dir** command as follows:

```
Router# dir slot0:
-#- -length- -----date/time------ name
1   5200084  May 10 1997 19:24:12 gsr-p-mz.112-8
3   1215     May 10 1997 20:30:52 myfile1
4   6176844  May 10 1997 23:04:10 gsr-p-mz.112-8.1
5   1186     May 10 1997 16:56:50 myfile2

9197156 bytes available (11381148 bytes used)
Router#
```

This completes the procedure for copying a configuration file between RP NVRAM and a Flash memory card.

Copying a Configuration File from RP DRAM to a Flash Memory Card

You can use the command **copy running-config** [**slot0:** | **slot1**:]:*filename* for the copy procedure where **running-config** is the file’s source (the temporary configuration in DRAM), and [**slot0:** | **slot1:**]:*filename* is the file’s destination in either of the Flash memory cards.

An example of the **copy startup-config slot0:***filename* command follows:

```
Router# copy running-config slot0:myfile2
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!![OK - 7799951/15599616
bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Router#
```

In the preceding example, the exclamation points (!!!) appear as the file is copied. The “C” characters signify calculation of the checksum—a verification that the file has been correctly copied.

Use the **dir** command to verify the file was copied correctly as follows:

```
Router# dir slot0:
-#- -length- -----date/time------ name
1   5200084  May 10 1997 19:24:12 gsr-p-mz.112-8
3   1215     May 10 1997 20:30:52 myfile1
4   6176844  May 10 1997 23:04:10 gsr-p-mz.112-8.1
5   1186     May 10 1997 16:56:50 myfile2

9197156 bytes available (11381148 bytes used)
```

This completes the procedure for copying a configuration file from RP DRAM to a Flash memory card.

Copying a Configuration File from a Flash Memory Card to RP NVRAM

Following is the procedure for copying your configuration file from the Flash memory card in PCMCIA slot 0 or slot 1 back to NVRAM.

Use the command **copy** [**slot0:** | **slot1:**]:*filename* **startup-config** for this copy procedure, where [**slot0** | **slot1**]:*filename* is the source of the file (Flash memory card), and **startup-config** is the destination (NVRAM).

An example of the **copy slot0:***filename* **startup-config** command follows:

```
Router# copy slot0:myfile startup-config
[ok]
Router#
```

Use the **copy startup-config running-config** command to ensure that the startup configuration file, now stored in NVRAM, is the default running configuration file used by the system as follows:

```
Router# copy startup-config running-config
Router#
%SYS-5-CONFIG_I: Configured from memory by console
Router#
```

This completes the procedure for copying a configuration file from the Flash memory card to NVRAM.

Recovering from Locked Blocks in Flash Memory Cards

A locked block in Flash memory cards occurs when power is lost or a Flash memory card is unplugged during a write or erase operation. When a block of Flash memory is locked, it cannot be written to or erased, and the operation will consistently fail at a particular block location. The only way to recover from locked blocks is to reformat the Flash memory card with the **format** command.

Caution Formatting a Flash memory card will cause existing data to be lost.

What To Do Next?

After you have installed the Cisco 12012 hardware, checked all external connections, turned on the system power, allowed the system to boot up, and minimally configured the system, you might need to perform more complete and complex configurations that are beyond the scope of this text.

For specific information on more complex system and interface configuration, and, if necessary, troubleshooting, refer to the publications listed in the section "If You Need More Configuration Information."

Note For additional basic configuration information on each of the line cards available for the Cisco 12012, refer to the individual configuration notes that shipped with your line cards.

If You Need More Configuration Information

The Cisco IOS software running the Cisco 12012 system contains extensive features and functionality. The effective use of many of many of these features is easier if you have more information at hand.

To obtain information about documentation, refer to the following:

- The Documentation CD-ROM.

  Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more up to date than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription.

- The section "Obtaining Technical Assistance" in the chapter "About This Guide."
- Customer Service at 800 553-6387 or 408 526-7208. Customer Service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding company holidays). You can also send e-mail to cs-rep@cisco.com.
- The *Cisco Information Packet* that shipped with your router.

- For systems with Cisco IOS Release 11.2(8)GS or later, refer to the following modular configuration and modular command reference publications, as appropriate for your configuration:
  - *Configuration Fundamentals Configuration Guide*
  - *Configuration Fundamentals Command Reference*
  - *Wide-Area Networking Configuration Guide*
  - *Wide-Area Networking Command Reference*
  - *Network Protocols Configuration Guide, Parts 1, 2,* and *3*
  - *Network Protocols Command Reference, Parts 1, 2,* and *3*
  - *Configuration Builder Getting Started Guide*
  - *Troubleshooting Internetworking Systems*
  - *Debug Command Reference*
  - *System Error Messages*
  - *Cisco IOS Software Command Summary*
  - *Cisco Management Information Base (MIB) User Quick Reference*
- For additional line card interface configuration information, refer to the following:
  - The configuration note *Quad OC-3c/STM-1c Packet-Over-SONET Line Card Installation and Configuration* (Document Number 78-4333-xx) your Quad OC-3c/STM-c1 POS line card
  - The configuration note *OC-12c/STM-4c Packet-Over-SONET Line Card Installation and Configuration* (Document Number 78-4341-xx) that accompanied your OC-12c/STM-4c POS line card
  - The configuration note *OC-12c/STM-4c Asynchronous Transfer Mode Line Card Installation and Configuration* (Document Number 78-4344-xx) that accompanied your OC-12c/STM-4c ATM line card
- For additional GRP information, refer to the configuration note *Gigabit Route Processor (GRP) Installation and Configuration* (Document Number 78-4339-xx) that accompanied your GRP.

- For additional PRP information, refer to the configuration note Performance Route Processor (PRP) Installation and Configuration (Document Number 78-13302-xx) that accompanied your PRP.