



APPENDIX **A**

Cisco IOS Software Basic Skills

Understanding how to use Cisco IOS software can save you time when you are configuring your router. If you need a refresher, take a few minutes to read this appendix.

This appendix contains the following sections:

- [Configuring the Router from a PC](#)
- [Understanding Command Modes](#)
- [Getting Help](#)
- [Enable Secret Passwords and Enable Passwords](#)
- [Entering Global Configuration Mode](#)
- [Using Commands](#)
- [Saving Configuration Changes](#)
- [Summary](#)
- [Where to Go Next](#)

If you are already familiar with Cisco IOS software, go to one of the following chapters:

- [Chapter 1, “Basic Router Configuration”](#)
- [Chapter 2, “Sample Network Deployments”](#)
- One of the configuration topic chapters described in [Chapter 10, “Additional Configuration Options.”](#)

Configuring the Router from a PC

You can configure your router from a PC connected through the console port using *terminal emulation* software. The PC uses this software to send commands to your router. [Table A-1](#) lists some common types of this software, which are based on the type of PC you are using.

Table A-1 **Terminal Emulation Software**

PC Operating System	Software
Windows 95, Windows 98, Windows 2000, Windows NT, Windows XP	HyperTerm (included with Windows software), ProComm Plus

Table A-1 Terminal Emulation Software

PC Operating System	Software
Windows 3.1	Terminal (included with Windows software)
Macintosh	ProComm, VersaTerm (supplied separately)

You can use the terminal emulation software to change settings for the type of device that is connected to the PC, in this case a router. Configure the software to the following standard VT-100 emulation settings so that your PC can communicate with your router:

- 9600 baud
- 8 data bits
- No parity
- 1 stop bit
- No flow control

These settings should match the default settings of your router. To change the router baud, data bits, parity, or stop bits settings, you must reconfigure parameters in the ROM monitor. For more information, see [Appendix C, “ROM Monitor.”](#) To change the router flow control setting, use the **flowcontrol** line configuration command.

For information on how to enter global configuration mode so that you can configure your router, see the [“Entering Global Configuration Mode”](#) section later in this chapter.

Understanding Command Modes

This section describes the Cisco IOS command mode structure. Each command mode supports specific Cisco IOS commands. For example, you can use the **interface** *type number* command only from global configuration mode.

The following Cisco IOS command modes are hierarchical. When you begin a router session, you are in user EXEC mode.

- User EXEC
- Privileged EXEC
- Global configuration

[Table A-2](#) lists the command modes that are used in this guide, how to access each mode, the prompt you see in that mode, and how to exit to a mode or enter the next mode. Because each mode configures different router elements, you might need to enter and exit modes frequently. You can see a list of available commands for a particular mode by entering a question mark (?) at the prompt. For a description of each command, including syntax, see the Cisco IOS Release 12.3 documentation set.

Table A-2 Command Modes Summary

Mode	Access Method	Prompt	Exit and Entrance Method	About This Mode
User EXEC	Begin a session with your router.	Router>	To exit a router session, enter the logout command.	Use this mode for these tasks: <ul style="list-style-type: none"> Change terminal settings. Perform basic tests. Display system information.
Privileged EXEC	Enter the enable command from user EXEC mode.	Router#	<ul style="list-style-type: none"> To exit to user EXEC mode, enter the disable command. To enter global configuration mode, enter the configure command. 	Use this mode for these tasks: <ul style="list-style-type: none"> Configure your router operating parameters. Perform the verification steps shown in this guide. <p>To prevent unauthorized changes to your router configuration, access to this mode should be protected with a password as described in “Enable Secret Passwords and Enable Passwords” later in this chapter.</p>
Global configuration	Enter the configure command from privileged EXEC mode.	Router (config)#	<ul style="list-style-type: none"> To exit to privileged EXEC mode, enter the exit or end command, or press Ctrl-Z. To enter interface configuration mode, enter the interface command. 	Use this mode to configure parameters that apply to your router as a whole. <p>Also, you can access the following modes, which are described later in this table:</p> <ul style="list-style-type: none"> Interface configuration Router configuration Line configuration
Interface configuration	Enter the interface command (with a specific interface, such as interface atm 0) from global configuration mode.	Router (config-if)#	<ul style="list-style-type: none"> To exit to global configuration mode, enter the exit command. To exit to privileged EXEC mode, enter the end command, or press Ctrl-Z. To enter subinterface configuration mode, specify a subinterface with the interface command. 	Use this mode to configure parameters for the router Ethernet and serial interfaces or subinterfaces.

Table A-2 Command Modes Summary (continued)

Mode	Access Method	Prompt	Exit and Entrance Method	About This Mode
Router configuration	Enter one of the router commands followed by the appropriate keyword, for example router rip , from global configuration mode.	Router (config- router)#	<ul style="list-style-type: none"> To exit to global configuration mode, enter the exit command. To exit to privileged EXEC mode, enter the end command, or press Ctrl-Z. 	Use this mode to configure an IP routing protocol.
Line configuration	Enter the line command with the desired line number and optional line type, for example, line 0 , from global configuration mode.	Router (config- line)#	<ul style="list-style-type: none"> To exit to global configuration mode, enter the exit command. To exit to privileged EXEC mode, enter the end command, or press Ctrl-Z. 	Use this mode to configure parameters for the terminal line.

Getting Help

You can use the question mark (?) and arrow keys to help you enter commands.

For a list of available commands at that command mode, enter a question mark:

```
Router> ?
access-enable Create a temporary access-list entry
access-profile Apply user-profile to interface
clear Reset functions
...
```

To complete a command, enter a few known characters followed by a question mark (with no space):

```
Router> s?
* s=show set show slip systat
```

For a list of command variables, enter the command followed by a space and a question mark:

```
Router> show ?
...
clock Display the system clock
dialer Dialer parameters and statistics
exception exception information
...
```

To redisplay a command you previously entered, press the **Up Arrow** key. You can continue to press the **Up Arrow** key for more commands.

Enable Secret Passwords and Enable Passwords

By default, the router ships without password protection. Because many privileged EXEC commands are used to set operating parameters, you should password-protect these commands to prevent unauthorized use.

You can use two commands to do this:

- **enable secret** *password*—A very secure, encrypted password
- **enable** *password*—A less secure, unencrypted local password

Both the **enable** and **enable secret** passwords control access to various privilege levels (0 to 15). The **enable** password is intended for local use and is thus unencrypted. The **enable secret** password is intended for network use; that is, in environments where the password crosses the network or is stored on a TFTP server. You must enter an **enable secret** or **enable** password with a privilege level of 1 to gain access to privileged EXEC mode commands.

For maximum security, the passwords should be different. If you enter the same password for both during the setup process, your router accepts the passwords, but warns you that they should be different.

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.

Entering Global Configuration Mode

To make any configuration changes to your router, you must be in global configuration mode. This section describes how to enter global configuration mode while using a terminal or PC that is connected to your router console port.

To enter global configuration mode, follow these steps:

Step 1 After your router boots up, enter the **enable** or **enable secret** command:

```
Router> enable
```

Step 2 If you have configured your router with an enable password, enter it when you are prompted.

The enable password does not appear on the screen when you enter it. This example shows how to enter privileged EXEC mode:

```
Password: enable_password
Router#
```

Privileged EXEC mode is indicated by the # in the prompt. You can now make changes to your router configuration.

Step 3 Enter the **configure terminal** command to enter global configuration mode:

```
Router# configure terminal
Router(config)#
```

You can now make changes to your router configuration.

Using Commands

This section provides some tips about entering Cisco IOS commands at the command-line interface (CLI).

Abbreviating Commands

You only have to enter enough characters for the router to recognize the command as unique. This example shows how to enter the **show version** command:

```
Router # sh v
```

Undoing Commands

If you want to disable a feature or undo a command you entered, you can enter the keyword **no** before most commands; for example, **no ip routing**.

Command-Line Error Messages

Table A-3 lists some error messages that you might encounter while using the CLI to configure your router.

Table A-3 Common CLI Error Messages

Error Message	Meaning	How to Get Help
% Ambiguous command: "show con"	You did not enter enough characters for your router to recognize the command.	Reenter the command, followed by a question mark (?) with no space between the command and the question mark. The possible keywords that you can enter with the command are displayed.
% Incomplete command.	You did not enter all of the keywords or values required by this command.	Reenter the command, followed by a question mark (?) with no space between the command and the question mark. The possible keywords that you can enter with the command are displayed.
% Invalid input detected at '^' marker.	You entered the command incorrectly. The error occurred where the caret mark (^) appears.	Enter a question mark (?) to display all of the commands that are available in this particular command mode.

Saving Configuration Changes

You need to enter the **copy running-config startup-config** command to save your configuration changes to nonvolatile RAM (NVRAM) so that they are not lost if there is a system reload or power outage. This example shows how to use this command to save your changes:

```
Router# copy running-config startup-config  
Destination filename [startup-config]?
```

Press **Return** to accept the default destination filename *startup-config*, or enter your desired destination filename and press **Return**.

It might take a minute or two to save the configuration to NVRAM. After the configuration has been saved, the following message appears:

```
Building configuration...
Router#
```

Summary

Now that you have reviewed some Cisco IOS software basics, you can begin to configure your router. Remember:

- You can use the question mark (?) and arrow keys to help you enter commands.
- Each command mode restricts you to a set of commands. If you are having difficulty entering a command, check the prompt, and then enter the question mark (?) for a list of available commands. You might be in the wrong command mode or using the wrong syntax.
- If you want to disable a feature, enter the keyword **no** before the command; for example, **no ip routing**.
- Save your configuration changes to NVRAM so that they are not lost if there is a system reload or power outage.

Where to Go Next

To configure your router, go to [Chapter 1, “Basic Router Configuration,”](#) and [Chapter 2, “Sample Network Deployments.”](#)

