Using Cisco IOS Software

This chapter provides helpful tips for understanding and configuring Cisco IOS software using the command-line interface (CLI) and includes the following sections:

For an overview of Cisco IOS software configuration, refer to the *Configuration Fundamentals Configuration Guide*. See "Related Documentation" section on page xi for additional information.

Conventions

Command descriptions use the following conventions:

Convention	Description
boldface font	Commands and keywords are in **boldface**.
italic font	Arguments for which you supply values are in *italics*.
[ ]	Elements in square brackets are optional.
{*x* | *y* | *z*}	Alternative keywords are grouped in braces and separated by vertical bars.
[*x* | **y** | *z*]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
`screen` font	Terminal sessions and information the system displays are in `screen` font.
`boldface screen` font	Information you must enter is in **`boldface screen`** font.
italic screen font	Arguments for which you supply values are in *italic screen* font.

Convention	Description
——→	`This pointer highlights an important line of text in an example.`
^	The symbol ^ represents the key labeled Control—for example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the publication.

Getting Help

Entering a question mark (**?**) at the system prompt displays a list of commands available for each command mode. You can also get a list of any commands associated keywords and arguments with the context-sensitive help feature.

To get help specific to a command mode, a command, a keyword, or an argument, use one of the following commands:

Command	Purpose
help	Obtain a brief description of the help system in any command mode.
*abbreviated-command-entry***?**	Obtain a list of commands that begin with a particular character string. (No space between command and question mark.)
abbreviated-command-entry <**Tab**>	Complete a partial command name.
?	List all commands available for a particular command mode.
command **?**	List command-associated keywords. (Space between command and question mark.)
command keyword **?**	List keyword-associated arguments. (Space between the keyword and question mark.)

Note Press **Ctrl-P** or the up arrow key to recall commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands. Press **Ctrl-N** or the down arrow key to return to more recent commands in the history buffer after recalling commands with **Ctrl-P**

or the up arrow key. Repeat the key sequence to recall successively more recent commands.

The arrow keys function only on ANSI-compatible terminals such as VT100s.

Finding Command Options

This section provides an example of how to display syntax for a command. The syntax can consist of optional or required keywords. To display keywords for a command, enter a question mark (**?**) at the configuration prompt or after entering part of a command followed by a space. The Cisco IOS software displays a list of keywords available along with a brief description of the keywords. For example, if you were in global configuration mode and wanted to see all the keywords for the **arap** command, you would type **arap ?**.

Table 1-1 shows how to use the question mark (**?**) to find the command options for the following two commands:

- **controller t1 1**
- **cas-group 1 timeslots 1-24 type e&m-fgb dtmf**

Table 1-1 How to Find Command Options

Command	Comment

`Router> enable`
`Password: <password>`
`Router#`
	Enter the **enable** command and password to access privileged EXEC commands.
	You have entered privileged EXEC mode when the prompt changes to Router#.

`Router# configure terminal`
`Enter configuration commands, one per line.`
`End with CNTL/Z.`
`Router(config)#`
	Enter global configuration mode.
	You have entered global configuration mode when the prompt changes to Router(config)#.

`Router(config)# controller t1 ?`
`  <0-3>  Controller unit number`
`Router(config)# controller t1 1`
`Router(config-controller)#`
	Enter controller configuration mode by specifying the T1 controller that you want to configure using the **controller t1** global configuration command.
	Enter a **?** to display what you must enter next on the command line. In this example, you must enter a controller unit number from 0 to 3.
	You have entered controller configuration mode when the prompt changes to Router(config-controller)#.

Table 1-1 How to Find Command Options (continued)

Command	Comment

`Router(config-controller)# ?`
`Controller configuration commands:`
`  cablelengthSpecify the cable length for a DS1 link`
`  cas-groupConfigure the specified timeslots for CAS (Channel Associate Signals)`
`  channel-groupSpecify the timeslots to channel-group mapping for an interface`
`  clockSpecify the clock source for a DS1 link`
`  defaultSet a command to its defaults`
`  descriptionController specific description`
`  ds0ds0 commands`
`  exitExit from controller configuration mode`
`  fdlSpecify the FDL standard for a DS1 data link`
`  framingSpecify the type of Framing on a DS1 link`
`  helpDescription of the interactive help system`
`  linecodeSpecify the line encoding method for a DS1 link`
`  loopbackPut the entire T1 line into loopback`
`  noNegate a command or set its defaults`
`  pri-groupConfigure the specified timeslots for PRI`
`  shutdownShut down a DS1 link (send Blue Alarm)`
`Router(config-controller)#`
	Enter a **?** to display a list of all the controller configuration commands available for the T1 controller.

`Router(config-controller)# cas-group ?`
`  <0-23>Channel number`
`Router(config-controller)# cas-group`
	Enter the command that you want to configure for the controller. In this example, the **cas-group** command is used.
	Enter a **?** to display what you must enter next on the command line. In this example, you must enter a channel number from 0 to 23.
	When the system redisplays the command, it indicates that you must enter more keywords to complete the command.

`Router(config-controller)# cas-group 1 ?`
`  timeslots List of timeslots in the cas-group`
`Router(config-controller)# cas-group 1`
	After you enter the channel number, enter a **?** to display what you must enter next on the command line. In this example, you must enter the **timeslots** keyword.
	When the system redisplays the command, it indicates that you must enter more keywords to complete the command.

`Router(config-controller)# cas-group 1 timeslots ?`
`  <1-24> List of timeslots which comprise the cas-group`
`Router(config-controller)# cas-group 1 timeslots`
	After you enter the **timeslots** keyword, enter a **?** to display what you must enter next on the command line. In this example, you must enter a list of timeslots from 1 to 24.
	You can specify timeslot ranges (for example, 1–24), individual timeslots separated by commas (for example 1, 3, 5), or a combination of the two (for example 1–3, 8, 17–24). The 16th time slot is not specified in the command line, because it is reserved for transmitting the channel signaling.
	When the system redisplays the command, it indicates that you must enter more keywords to complete the command.

Table 1-1 How to Find Command Options (continued)

Command	Comment

`Router(config-controller)# cas-group 1 timeslots 1-24 ?`
`  service Specify the type of service`
`  type Specify the type of signaling`
`Router(config-controller)# cas-group 1 timeslots 1-24`
	After you enter the timeslot ranges, enter a **?** to display what you must enter next on the command line. In this example, you must enter the **service** or **type** keyword.
	When the system redisplays the command, it indicates that you must enter more keywords to complete the command.

`Router(config-controller)# cas-group 1 timeslots 1-24 type ?`
`  e&m-fgb E & M Type II FGB`
`  e&m-fgd E & M Type IIFGD`
`  e&m-immediate-start E & M Immediate Start`
`  fxs-ground-start FXS Ground Start`
`  fxs-loop-start FXS Loop Start`
`  sas-ground-start SAS Ground Start`
`  sas-loop-start SAS Loop Start`
`Router(config-controller)# cas-group 1 timeslots 1-24 type`
	In this example, the **type** keyword is entered. After you enter the **type** keyword, enter a **?** to display what you must enter next on the command line. In this example, you must enter one of the signaling types.
	When the system redisplays the command, it indicates that you must enter more keywords to complete the command.

`Router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb ?`
`  dtmf DTMF tone signaling`
`  mf MF tone signaling`
`  service Specify the type of service`
`  <cr>`
`Router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb`
	In this example, the **e&m-fgb** keyword is entered. After you enter the **e&m-fgb** keyword, enter a **?** to display what you must enter next on the command line. In this example, you can enter the **dtmf**, **mf**, or **service** keyword to indicate the type of channel-associated signaling available for the **e&m-fgb** signaling type.
	When the system redisplays the command, it indicates that you can enter more keywords or press <cr> to complete the command.

`Router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb dtmf ?`
`  dnis DNIS addr info provisioned`
`  service Specify the type of service`
`  <cr>`
`Router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb dtmf`
	In this example, the **dtmf** keyword is entered. After you enter the **dtmf** keyword, enter a **?** to display what you must enter next on the command line. In this example, you can enter the **dnis** or **service** keyword to indicate the options available for **dtmf** tone signaling.
	When the system redisplays the command, it indicates that you can enter more keywords or press <cr> to complete the command.

`Router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb dtmf` `Router(config-controller)#`	In this example, enter a <cr> to complete the command.

Understanding Command Modes

The Cisco IOS user interface is divided into many different modes. The commands available to you at any given time depend on your current mode. By entering a question mark (**?**) at the system prompt, you can obtain a list of commands available for each command mode.

When you start a session on the router, you begin in user mode, often called EXEC mode. Only a limited subset of the commands are available in EXEC mode. To have access to all commands, you must enter privileged EXEC mode (also called enable mode). Normally, you must enter a password to enter privileged EXEC mode. From privileged mode, you can enter any EXEC command or enter global configuration mode. Most of the EXEC commands are one-time commands, such as **show** commands, which show the current status of something, and **clear** commands, which clear counters or interfaces. The EXEC commands are not saved across reboots of the router.

Using configuration modes, you can make changes to the running configuration. If you later save the configuration, these commands are stored across router reboots. To get to the various configuration modes, you must start at global configuration mode. From global configuration mode, you can enter interface configuration mode, subinterface configuration mode, and a variety of protocol-specific modes.

ROM monitor mode is a separate mode used when the router cannot boot properly. If your router or access server does not find a valid system image when it is booting, or if its configuration file is corrupted at startup, the system might enter ROM monitor mode.

Summary of Main Command Modes

Table 1-2 summarizes the main command modes of the Cisco IOS software.

Table 1-2 Summary of Main Command Modes

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Log in.	`Router>`	Use the **logout** command.
Privileged EXEC	From user EXEC mode, use the **enable** EXEC command.	`Router#`	To exit back to user EXEC mode, use the **disable** command. To enter global configuration mode, use the **configure terminal** privileged EXEC command.
Global configuration	From privileged EXEC mode, use the **configure terminal** privileged EXEC command.	`Router(config)#`	To exit to privileged EXEC mode, use the **exit** or **end** command or press **Ctrl-Z**. To enter interface configuration mode, enter an **interface** configuration command.
Interface configuration	From global configuration mode, enter by specifying an interface with an **interface** command.	`Router(config-if)#`	To exit to global configuration mode, use the **exit** command. To exit to privileged EXEC mode, use the **exit** command or press **Ctrl-Z**. To enter subinterface configuration mode, specify a subinterface with the **interface** command.

Table 1-2 Summary of Main Command Modes (continued)

Command Mode	Access Method	Prompt	Exit Method
Subinterface configuration	From interface configuration mode, specify a subinterface with an **interface** command.	`Router(config-subif)#`	To exit to global configuration mode, use the **exit** command. To enter privileged EXEC mode, use the **end** command or press **Ctrl-Z**.
ROM monitor	From privileged EXEC mode, use the **reload** EXEC command. Press the Break key during the first 60 seconds while the system is booting.	`>`	To exit to user EXEC mode, type **continue**.

For more information about command modes, refer to the "Using the Command Line Interface" chapter of the *Configuration Fundamentals Configuration Guide*.

Using the no and default Forms of Commands

Almost every configuration command also has a **no** form. In general, use the **no** form to disable a function. Use the command without the keyword **no** to reenable a disabled function or to enable a function that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, specify the **no ip routing** commands, and specify **ip routing** to reenable it. The Cisco IOS software command references provide the complete syntax for the configuration commands and describe what the **no** form of commands does.

Configuration commands can also have a **default** form. The **default** form of a command returns the command setting to its default. Most commands are disabled by default, so the **default** form is the same as the **no** form. However, some commands are enabled by default and have variables set to certain default values. In these cases, the **default** command enables the command and sets variables to their default values. The Cisco IOS software command references describe what the **default** form of a command does if it is not the same as the **no** form.

Saving Configuration Changes

Enter the **copy system:running-config nvram:startup-config** command to save your configuration changes to your startup configuration so that they will not be lost if there is a system reload or power outage. For example:

```
Router# copy system:running-config nvram:startup-config
Building configuration...
```

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

```
[OK]
Router#
```

On most platforms, this step saves the configuration to nonvolatile random-access memory (NVRAM). On Class A Flash memory file systems, such as Cisco 7100 series routers, this step saves the configuration to the location specified by the CONFIG_FILE environment variable. The CONFIG_FILE variable defaults to NVRAM.