

Understanding the User Interface

The router user interface provides several different command modes. Each command mode provides a group of related commands. This chapter describes how to access and list the commands available in each command mode. It also discusses how to set terminal and line parameters for a session, and how to configure and use Telnet sessions. For more information about configuring terminal lines see the “Configuring Terminal Lines and Modem Support” chapter.

Entering a question mark (?) at the system prompt allows you to obtain a list of commands available for each command mode.

The command interpreter is called the EXEC. The EXEC interprets the commands you type and carries out the corresponding operations. You must log in to the router before you can enter an EXEC command. For security purposes, the EXEC has two levels of access to commands: *user* and *privileged*. The EXEC commands available at the user level are a subset of the EXEC commands available at the privileged level. From the privileged level, you can also access global configuration mode and seven specific configuration modes: interface, subinterface, controller, line, router, ipx-router, map-list, map-class and route-map configuration.

Almost every system configuration command also has a **no** form. In general, use the **no** form to disable a feature or function. Use the command without the keyword **no** to reenable a disabled feature or enable a feature that is disabled by default. For example, IP routing is enabled by default. Specify the command **no ip routing** to disable IP routing and specify **ip routing** to reenable it. The *Router Products Command Reference* publication provides the complete syntax for every command and describes what the **no** form of a command does.

If your router does not find a valid system image, or if its configuration file is corrupted at startup, the system might enter read-only memory (ROM) monitor mode. A brief description of the ROM monitor mode is included in this chapter.

The user interface also provides context-sensitive help on command syntax. This chapter describes how to use the help system. It also describes the command editing and command history features that enable you to recall previous command entries and easily edit command entries.

For a complete description of the commands mentioned in this chapter, refer to the “User Interface Commands” chapter in the *Router Products Command Reference* publication.

User Interface Task List

You can perform the tasks in the following sections to become familiar with the router's user interface, to configure various aspects of the user interface, and to use Telnet connections:

- Access Each Command Mode
- Get Context-Sensitive Help
- Check Command Syntax
- Use the Command History Features
- Use the Editing Features
- Set Terminal Parameters
- Lock the Keyboard
- Set Pending Output Notification
- Prevent Errant Connection Attempts
- Configure Telnet Capabilities for a Session
- Use Telnet Connections
- Monitor Telnet Connections

Access Each Command Mode

This section describes how to access each of the router's command modes:

- User EXEC Mode
- Privileged EXEC Mode
- Global Configuration Mode
- Interface Configuration Mode
- Subinterface Configuration Mode
- Controller Configuration Mode
- Map-List Configuration Mode
- Map-Class Configuration Mode
- Line Configuration Mode
- Router Configuration Mode
- IPX-Router Configuration Mode
- Route-Map Configuration Mode
- ROM Monitor Mode

Table 2-1 lists the command modes, how to access each mode, the prompt you will see while you are in that mode, and the method to exit that mode. The prompts listed assume the default router name Router.

Table 2-1 Summary of Command Modes

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Log in to router.	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 exit into global configuration mode, use the configure privileged EXEC command.
Global configuration	From privileged EXEC mode, use the configure privileged EXEC command.	Router(config)#	To exit to privileged EXEC mode, use the exit or end command or press Ctrl-Z. To exit to 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, press Ctrl-Z. To exit to subinterface configuration mode, specify a subinterface with the interface command.
Subinterface configuration	From global configuration mode, specify a subinterface with an interface command.	Router(config-subif)#	To exit to global configuration mode, use the exit command. To exit to privileged EXEC mode, press Ctrl-Z.
Controller configuration	From global configuration mode, use the controller command to configure a channelized T1 interface.	Router(config-controller)#	To exit to global configuration mode, use the exit command.
Map-list configuration	From global configuration mode, define a map list with the map-list command.	Router(config-map-list)#	To exit to map class configuration mode, use the map-class command. To exit to privileged EXEC mode, press Ctrl-Z.
Map-class configuration	From global configuration mode, configure a map class with the map-class command.	Router(config-map-class)#	To exit to global configuration mode, use the exit command. To exit to privileged EXEC mode, press Ctrl-Z.
Line configuration	From global configuration mode, enter by specifying a line with a line command.	Router(config-line)#	To exit to global configuration mode, use the map-class command. To exit to privileged EXEC mode, press Ctrl-Z.
Router configuration	From global configuration mode, enter by specifying a router with a router command.	Router(config-router)#	To exit to global configuration mode, use exit command. To exit to privileged EXEC mode, press Ctrl-Z.
IPX router configuration	From global configuration mode, enter by specifying the ipx router command.	Router(config-ipx-router)#	To exit to global configuration mode, use the exit command.

Command Mode	Access Method	Prompt	Exit Method
Route map configuration	From global configuration mode, enter by specifying the route-map command.	Router(config-route-map)#	To exit to global configuration mode, use the exit command. To exit to privileged EXEC mode, press Ctrl-Z.
Hub configuration	From global configuration mode, enter by specifying a hub with the hub command.	Router(config-hub)#	To exit to global configuration mode, use the exit command. To exit to privileged EXEC mode, press Ctrl-Z.
ROM monitor	From privileged EXEC mode, use the reload EXEC command. Press Break during the first 60 seconds while the system is booting.	>	To exit to user EXEC mode, press c to continue.

Table 2-1 might not include all of the possible ways to access or exit each command mode.

User EXEC Mode

After you log in to the router, you are automatically in user EXEC command mode. The EXEC commands available at the user level are a subset of those available at the privileged level. In general, the user EXEC commands allow you to connect to remote routers, change terminal settings on a temporary basis, perform basic tests, and list system information.

To list the user EXEC commands, complete the following task:

Task	Command
List the user EXEC commands.	?

The user-level prompt consists of the router’s host name followed by the angle bracket (>):

```
Router>
```

The default host name is `Router`, unless it has been changed during initial configuration using the **setup** command. (Refer to the *Router Products Getting Started Guide* for information on the setup facility.) You can also change the router name using the **hostname** global configuration command described in the “System Management Commands” chapter in the *Router Products Command Reference* publication.

To list the commands available in user EXEC mode, enter a question mark (?) as shown in the following example:

```
Router> ?
Exec commands:
  connect          Open a terminal connection
  disconnect       Disconnect an existing telnet session
  enable           Turn on privileged commands
  exit             Exit from the EXEC
  help             Description of the interactive help system
  lock             Lock the terminal
  login            Log in as a particular user
  logout           Exit from the EXEC
  name-connection Name an existing telnet connection
  ping             Send echo messages
  resume           Resume an active telnet connection
  show             Show running system information
  systat           Display information about terminal lines
  telnet           Open a telnet connection
  terminal         Set terminal line parameters
  where            List active telnet connections
Router>
```

The list of commands might vary slightly from this example, depending upon how your router has been configured.

The user EXEC commands that set terminal parameters are shown in the section “Configure Telnet Capabilities for a Session” later in this chapter.

Privileged EXEC Mode

Because many of the privileged commands set operating parameters, privileged access should be password-protected to prevent unauthorized use. The privileged command set includes those commands contained in user EXEC mode, as well as the **configure** command through which you can access the remaining command modes. Privileged EXEC mode also includes high-level testing commands, such as **debug**. For details on the **debug** command, see the *Debug Command Reference* publication.

To access and list the privileged EXEC commands, complete the following tasks:

Task	Command
Step 1 Enter the privileged EXEC mode.	enable [password]
Step 2 List privileged EXEC commands.	?

If the system administrator has set a password, you are prompted to enter it before being allowed access to privileged EXEC mode. The password is not displayed on the screen and is casesensitive. The system administrator uses the **enable password** global configuration command to set the password that restricts access to privileged mode. This command is described in the “System Management Commands” chapter in the *Router Products Command Reference* publication.

The privileged-level prompt consists of the router’s host name followed by the pound sign (#). (If the router was named with the **hostname** command, that name would appear as the prompt instead of “Router.”)

```
Router#
```

The following example shows how to access privileged EXEC mode and list privileged EXEC commands:

```
Router> enable
Password:
Router# ?
Exec commands:
  bfe          For manual emergency modes setting
  clear        Reset functions
  clock        Manage the system clock
  configure    Enter configuration mode
  connect      Open a terminal connection
  copy         Copy a config file to or from a tftp server
  debug        Debugging functions
  disable      Turn off privileged commands
  disconnect   Disconnect an existing telnet session
  enable       Turn on privileged commands
  exit         Exit from the EXEC
  help         Description of the interactive help system
  llc2         Execute llc2 tests
  lock         Lock the terminal
  login        Log in as a particular user
  logout       Exit from the EXEC
  name-connection Name an existing telnet connection
  ping         Send echo messages
  reload       Halt and perform a cold restart
  resume       Resume an active telnet connection
  send         Send a message to other tty lines
  setup        Run the SETUP command facility
  show         Show running system information
  systat       Display information about terminal lines
  telnet       Open a telnet connection
  terminal     Set terminal line parameters
  test         Test subsystems, memory, and interfaces
  trace        Trace route to destination
  where        List active telnet connections
  which-route  Do route table lookup and display results
  write        Write running configuration to memory, network, or terminal
```

The list of commands might vary slightly from this example, depending upon how your router has been configured.

From the privileged level, you can access global configuration mode. For instructions, see “Global Configuration Command Mode” which follows this section.

To return from privileged EXEC mode to user EXEC mode, perform the following task:

Task	Command
Move from privileged EXEC mode to user EXEC mode.	disable

Global Configuration Mode

Global configuration commands apply to features that affect the system as a whole. Use the **configure** privileged EXEC command to enter global configuration mode. When you enter this command, the EXEC prompts you for the source of the configuration commands:

```
Configuring from terminal, memory, or network [terminal]?
```

You can then specify either the terminal, nonvolatile memory (NVRAM), or a file stored on a network server as the source of configuration commands (see the “System Image, Microcode Image, and Configuration File Load Commands” chapter in the *Router Products Command Reference* publication). The default is to type in commands from the terminal console. Pressing the Return key begins this configuration method.

Commands to enable a particular routing or bridging function are also global configuration commands. For information on protocol-specific global configuration commands, see the appropriate chapter in this guide.

To access and list the global configuration commands, complete the following tasks:

Task	Command
Step 1 At the terminal, from the privileged EXEC mode, enter global configuration mode.	configure ¹ <CR>
Step 2 List the global configuration commands.	?

1. This command is documented in the “System Image, Microcode Image, and Configuration File Load Commands” chapter in the *Router Products Command Reference* publication.

The following example shows how to access global configuration mode and list global configuration commands:

```
Router# configure
Configuring from terminal, memory, or network [terminal]? <CR>
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# ?
Configure commands:
  access-list      Add an access list entry
  apollo           Apollo global configuration commands
  appletalk        Appletalk global configuration commands
  arp              Set a static ARP entry
  async-bootp      Modify system bootp parameters
  autonomous-system Specify local AS number to which we belong
  banner           Define a login banner
  boot             Modify system boot parameters
  bridge           Transparent bridging
  buffers          Adjust system buffer pool parameters
  busy-message     Display message when connection to host fails
  chat-script      Define a modem chat script
  clns             Global CLNS configuration subcommands
  clock            Configure time-of-day clock
  decnet           Global DECnet configuration subcommands
  default-value    Default character-bits values
  dialer-list      Create a dialer list entry
  enable           Modify enable password parameters
  end              Exit from configure mode
  exit            Exit from configure mode
  frame-relay      Global frame relay configuration commands
  help             Description of the interactive help system
  hostname         Set system's network name
  interface        Select an interface to configure
  ip               Global IP configuration subcommands
  ipx              Novell/IPX global configuration commands
  line             Configure a terminal line
  lnm              IBM Lan Manager
  locaddr-priority-list Establish queuing priorities based on LU address
  logging          Modify message logging facilities
  login-string     Define a host-specific login string
  mop              The DEC MOP Server
  netbios          NETBIOS access control filtering
  no               Negate a command or set its defaults
```

ntp	Configure NTP
priority-list	Build a priority list
queue-list	Build a custom queue list
rif	Source-route RIF cache
route-map	Create route-map or enter route-map command mode
router	Enable a routing process
scheduler-interval	Maximum interval before running lowest priority process
service	Modify use of network based services
smt-queue-threshold	Set the max number of unprocessed SMT frames
snmp-server	Modify SNMP parameters
source-bridge	Source-route bridging ring groups
stun	STUN global configuration commands
tacacs-server	Modify TACACS query parameters
tftp-server	Provide TFTP service for netload requests
tn3270	tn3270 configuration command
username	Establish User Name Authentication
vines	Vines global configuration commands
x25	X.25 Level 3
xns	XNS global configuration commands

The list of commands might vary slightly from this example, depending upon how your router has been configured.

To exit global configuration command mode and return to privileged EXEC mode, use one of the following commands:

Task	Command
Exit global configuration mode.	exit end Ctrl-Z

From global configuration mode you can access nine configuration sublevels: interface, controller, map-list, map-class, subinterface, line, router, ipx-router, and route-map configuration commands. These command modes are described in the following sections.

Interface Configuration Mode

Many features are enabled on a per-interface basis. Interface configuration commands modify the operation of an interface such as an Ethernet, FDDI, or serial port. Interface configuration commands always follow an **interface** command, which defines the interface type.

For details on interface configuration commands that affect general interface parameters, such as bandwidth, clock rate, and so on, see the “Configuring Interfaces” chapter. For protocol-specific commands, see the appropriate chapter in this guide.

To access and list the interface configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, enter interface configuration mode.	interface <i>interface-type interface-number</i> ¹
Step 2 List the interface configuration commands.	?

1. This command is documented in the “Interface Commands” chapter in the *Router Products Command Reference* publication.

In the following example, serial interface 0 is about to be configured. The new prompt (config-if)# indicates interface configuration mode. In this example, the user asks for help by requesting a list of commands.

```
Router(config)# interface serial 0 <CR>
Router(config-if)# ?
Interface configuration commands:
access-expression    Build a bridge boolean access expression
apollo              Apollo interface subcommands
appletalk           Appletalk interface subcommands
arp                Set arp type (arpa, probe, snap) or timeout
backup             Modify dial-backup parameters
bandwidth          Set bandwidth informational parameter
bridge-group       Transparent bridging interface parameters
clns               CLNS interface subcommands
clockrate          Configure serial interface clock speed
custom-queue-list  Assign a custom queue list to an interface
decnet             Interface DECnet config commands
delay             Specify interface throughput delay
description        Interface specific description
dialer            Dial-on-demand routing (DDR) commands
dialer-group       Assign interface to dialer-list
down-when-looped   Force looped serial interface down
encapsulation      Set encapsulation type for an interface
ethernet-transit-oui Token-ring to Ethernet OUI handling
exit              Exit from interface configuration mode
frame-relay        Set frame relay parameters
hdh               Set HDH mode
help              Description of the interactive help system
hold-queue         Set hold queue depth
ip                Interface Internet Protocol config commands
ipx              Novell interface subcommands
isis              IS-IS commands
iso-igrp          ISO-IGRP interface subcommands
keepalive          Enable keepalive
lapb              X.25 Level 2 parameters (Link Access Procedure, Balanced)
llc2              LLC2 Interface Subcommands
lnm               IBM Lan Manager
locaddr-priority  Assign a priority group
loopback          Configure internal loopback on an interface
mac-address        Manually set interface MAC address
mop               DEC MOP server commands
mtu               Set the interface Maximum Transmission Unit (MTU)
netbios           Use a defined NETBIOS access list or enable name-caching
no                Negate a command or set its defaults
ntp               Configure NTP
ppp              Point-to-point protocol
priority-group     Assign a priority group to an interface
pulse-time        Enables pulsing of DTR during resets
pup              PUP interface subcommands
sdlc              SDLC commands
sdllc             Configure SDLC to LLC2 translation
shutdown          Shutdown the selected interface
smds              Modify SMDS parameters
source-bridge     Configure interface for source-route bridging
stun              STUN interface subcommands
transmit-interface Assign a transmit interface to a receive-only interface
transmitter-delay Set dead-time after transmitting a datagram
tunnel            protocol-over-protocol tunnelling
tx-queue-limit    Configure card level transmit queue limit
vines             Vines interface subcommands
xns              XNS interface subcommands
```

The list of commands might vary slightly from this example, depending upon how your router has been configured.

To exit interface configuration mode and return to global configuration mode, enter the **exit** command. Or, press Ctrl-Z to exit configuration mode and return to privileged EXEC mode.

Subinterface Configuration Mode

You can configure multiple virtual interfaces (called subinterfaces) on a single physical interface. This feature is supported on serial interfaces with Frame Relay encapsulation

Subinterfaces appear to be distinct physical interfaces to the various protocols. For example, Frame Relay networks provide multiple point-to-point links called permanent virtual circuits (PVCs). PVCs can be grouped under separate subinterfaces that in turn are configured on a single physical interface. From a bridging spanning tree viewpoint, each subinterface is a separate bridge port, and a frame arriving on one subinterface can be sent out on a another subinterface.

Subinterfaces also allow multiple encapsulations for a protocol on a single interface. For example, a router can receive an ARPA-framed IPX packet and forward the packet back out the same physical interface as a SNAP-framed IPX packet.

For detailed information on how to configure subinterfaces, see the “Configuring Interfaces” chapter.

To access and list the subinterface configuration commands, complete the following tasks:

Task	Command
Step 1 From interface configuration mode, configure a virtual interface.	See the example that follows. For a list of all interface commands that allow subinterface implementation, see the “Configuring Interfaces” chapter.
Step 2 List the subinterface configuration commands.	?

In the following example, a subinterface is configured for serial line 2, which is configured for Frame Relay encapsulation. The subinterface is called 2.1 to indicate that it is subinterface 1 of serial interface 2. The new prompt `(config-subif)#` indicates subinterface configuration mode. The subinterface can be configured to support one or more Frame Relay PVCs. To list the commands available in subinterface configuration mode, enter a question mark (?).

```

Router(config)# interface serial 2
Router(config-if)# encapsulation frame-relay
Router(config-if)# interface serial 2.1
Router(config-subif)# ?
Interface configuration commands:
apollo          Apollo interface subcommands
appletalk       Appletalk interface subcommands
bandwidth       Set bandwidth informational parameter
bridge-group    Transparent bridging interface parameters
clns            CLNS interface subcommands
decnet          Interface DECnet config commands
delay           Specify interface throughput delay
description     Interface specific description
exit            Exit from interface configuration mode
frame-relay     Set frame relay parameters
ip              Interface Internet Protocol config commands
ipx             Novell interface subcommands
isis            IS-IS commands
iso-igrp        ISO-IGRP interface subcommands
no              Negate a command or set its defaults
ntp             Configure NTP
    
```

`shutdown` Shutdown the selected interface

The list of commands might vary slightly from this example depending upon how your router has been configured.

To exit subinterface configuration mode and return to global configuration mode, enter the **exit** command. Or, press Ctrl-Z to exit configuration mode and return to privileged EXEC mode.

Controller Configuration Mode

You can configure channelized T1 interfaces in the controller configuration mode.

To access and list the controller configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, configure a channelized T1 interface.	controller t1 slot/port¹
Step 2 List the controller configuration commands.	?

1. This command is documented in the “Interface Commands” chapter in the *Router Products Command Reference* publication.

In the following example, a channelized T1 interface is being configured on interface 0/0:

```
Router(config)# controller t1 0/0
Router(config-controller)# ?
Controller configuration commands:
  channel-group  Specify the timeslots to channel-group mapping for an
                  interface
  clocksource    Specify the clock source for a DS1 link
  exit           Exit from controller configuration mode
  framing        Specify the type of Framing on a DS1 link
  help          Description of the interactive help system
  linecode       Specify the line encoding method for a DS1 link
  loopback       Put the entire T1 line into loopback
  no             Negate a command or set its defaults
  shutdown       Shut down a DS1 link (send Blue Alarm)
```

Note The controller configuration mode applies only to the Cisco series 7000 Multi-Channel Interface Processor (MIP) that has one or two CxBus Channelized T1 (CxCT1) port adaptor modules attached.

Map-List Configuration Mode

The Asynchronous Transfer Mode (ATM) interface in the Cisco 7000 series router supports a static mapping scheme that identifies the ATM address of remote hosts or routers.

Map-list configuration commands configure a map list. They always follow a **map-list** global configuration command. To access and list the map list configuration commands, complete the following tasks:.

Task	Command
Step 1 From global configuration mode, use the map-list command.	map-list name
Step 2 List the map-list configuration commands.	?

The following example shows how to enter map-list configuration mode and list the map list configuration commands. In this example, the static map list configuration commands are listed:

```
Router (config)# map-list atm
Router (config-map-list)# ?
Static maps list configuration commands:
A.B.C.D          Protocol specific address
aarp             AppleTalk ARP
apollo           Apollo Domain
appletalk        AppleTalk
arp              IP ARP
bridge           Bridging
clns             ISO CLNS
clns_es          ISO CLNS End System
clns_is          ISO CLNS Intermediate System
cmns             ISO CMNS
compressedtcp    Compressed TCP
decnet           DECnet
decnet_node      DECnet Node
decnet_prime_router DECnet Prime Router
decnet_router    DECnet Router
exit-class       Exit from static map class configuration mode
help             Description of the interactive help system
ip               IP
ipx              Novell IPX
no               Negate or set default values of a command
pad              PAD links
rsrb             Remote Source-Route Bridging
stun             Serial Tunnel
vines            Banyan VINES
xns              Xerox Network Services
```

Map-Class Configuration Mode

The ATM interface allows you to specify Quality of Service (QOS) parameters that control how much traffic the source router will be sending over a switched virtual circuit (SVC).

To define QOS parameters that are associated with a static map for an SVC, use the **map-class** global configuration command.

Task	Command
Step 1 From global configuration mode, configure a map class.	map-class encapsulation class-name
Step 2 List the map-class configuration commands.	?

In the following example, the static map class configuration commands are listed:

```
Router (config)# map-class atm aaa
Router (config-map-class)# ?
Static maps class configuration commands:
atm          Configure atm static map class
exit-class   Exit from static map class configuration mode
help         Description of the interactive help system
no           Negate or set default values of a command
```

Note The static mapping configuration mode applies only to the Cisco 7000 series router.

Line Configuration Mode

Line configuration commands modify the operation of a serial terminal line. Line configuration commands always follow a **line** command, which defines a line number. These commands are generally used to connect to remote routers, change terminal parameter settings on a line-by-line basis, and set up the auxiliary port modem configuration to support Dial-on-Demand Routing (DDR) (see the “DDR Commands” chapter in the *Router Products Command Reference* publication).

To access and list the auxiliary port, console port, and virtual terminal line configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, configure an auxiliary, console, or virtual terminal line.	line {aux con vty} line-number [ending-line-number] ¹
Step 2 List the line configuration commands.	?

1. This command is documented in the “Terminal Lines and Modem Support Commands” chapter in the *Router Products Command Reference* publication.

The following example shows how to enter line configuration mode for virtual terminal line 3 and list the line configuration commands:

```
Router(config)# line vty 3 <CR>
Router(config-line)# ?
Line configuration commands:
access-class          Filter connections based on an IP access list
activation-character  Define the activation character
autobaud              Set line to autobaud
autocommand           Automatically execute an EXEC command
autohangup            Automatically hangup when last connection closes
autohost              Automatically connect to a host
cts-required          Require CTS on line
data-character-bits   Size of characters being handled
databits              Set number of data bits per character
disconnect-character  Define the disconnect character
dispatch-character    Define the dispatch character
dispatch-timeout      Set the dispatch timer
editing               Enable command line editing
escape-character      Change the current line's escape character
exec                  Start an EXEC process
exec-banner           Enable the display of the EXEC banner
exec-character-bits   Size of characters to the command exec
exec-timeout          Set the EXEC timeout
exit                  Exit from line configuration mode
flowcontrol           Set the flow control
```

help	Description of the interactive help system
history	Set the size of the command history buffer
hold-character	Define the hold character
length	Set number of lines on a screen
location	Enter terminal location description
lockable	Allow users to lock a line
login	Enable password checking
modem	Configure the Modem Control Lines
monitor	Copy debug output to the current terminal line
no	Negate a command or set its defaults
notify	Inform users of output from concurrent sessions
padding	Set padding for a specified output character
parity	Set terminal parity
password	Set a password
private	Configuration options that user can set will remain in effect between terminal sessions
refuse-message	Define a refuse banner
rotary	Add line to a rotary group
rxspeed	Set the receive speed
session-limit	Set maximum number of sessions
session-timeout	Set interval for closing connection when there is no input
traffic	
special-character-bits	Size of the escape (and other special) characters
speed	Set the transmit and receive speeds
start-character	Define the start character
stop-character	Define the stop character
stopbits	Set async line stop bits
telnet	Telnet protocol-specific configuration
telnet-transparent	Send a CR as a CR followed by a NULL instead of a CR followed by a LF
terminal-type	Set the terminal type
transport	Define transport protocols for line
txspeed	Set the transmit speeds
vacant-message	Define a vacant banner
width	Set width of the display terminal
Router(config-line)#	

The list of commands might vary from this example, depending upon how your router has been configured.

To exit line configuration mode and return to global configuration mode, use the **exit** command. To exit configuration mode and return to privileged EXEC mode, press Ctrl-Z.

Router Configuration Mode

Router configuration commands configure a routing protocol and always follow a **router** command. To access and list the router configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, enter router configuration mode.	router [keyword] ¹ See the list in the example for keywords.
Step 2 List the router configuration commands.	?

1. This command is documented in the “IP Routing Protocols Commands” chapter in the *Router Products Command Reference* publication.

To list the available router configuration keywords, enter the **router** command followed by a space and a question mark (?) at the global configuration prompt:

```
Router(config)# router ?
  bgp      Border Gateway Protocol (BGP)
  egp      Exterior Gateway Protocol (EGP)
  igrp     Interior Gateway Routing Protocol (IGRP)
  isis     ISO IS-IS
  iso-igrp IGRP for OSI networks
  ospf     Open Shortest Path First (OSPF)
  rip      Routing Information Protocol (RIP)
  static   Static CLNS Routing
```

In the following example, the router is configured to support the routing information protocol (RIP). The new prompt is (config-router)#.

```
Router(config)# router rip
Router(config-router)# ?
router configuration commands:
  default-information  Control distribution of default information
  default-metric       Set metric of redistributed routes
  distance             Define an administrative distance
  distribute-list       Filter networks in routing updates
  exit                 Exit from routing protocol configuration mode
  help                 Description of the interactive help system
  neighbor             Specify a neighbor router
  network              Enable routing on an IP network
  no                   Negate or set default values of a command
  offset-list          Add or subtract offset from IGRP, RIP, or HELLO metrics
  passive-interface    Suppress routing updates on an interface
  redistribute          Redistribute information from another routing protocol
  timers               Adjust routing timers
```

The list of commands might vary slightly from this example, depending upon how your router has been configured.

To exit router configuration mode and return to global configuration mode, enter the **exit** command. Or, press Ctrl-Z to exit configuration mode and return to privileged EXEC mode.

IPX-Router Configuration Mode

Internet Packet Exchange (IPX) is a Novell network-layer protocol. To access and list the IPX routing configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, enter ipx-router configuration mode.	ipx router [keyword] ¹ See the appropriate IPX chapter for keywords.
Step 2 List the ipx-router configuration commands.	?

1. This command is documented in the "Novell IPX Commands" chapter in the *Router Products Command Reference* publication.

Example

In the following example, IPX RIP routing is configured. The new prompt is (config-ipx-router):

```
Router(config)# ipx router rip<CR>
Router(config-ipx-router)# ?
```

To exit IPX router configuration mode and return to global configuration mode, enter the **exit** command. Or, press Ctrl-Z to exit configuration mode and return to privileged EXEC mode.

Route-Map Configuration Mode

Use the route-map configuration mode to configure routing table and source and destination information. To access and list the route-map configuration commands, complete the following tasks:

Task	Command
Step 1 From global configuration mode, enter route-map configuration mode.	route-map [route map tag] ¹
Step 2 List the route-map configuration commands.	?

1. This command is documented in the “IP Routing Protocols Commands” chapter in the *Router Products Command Reference* publication.

In the following example, a route map named arizona1 is configured. The new prompt is (config-route-map). Enter a question mark (?) to list route-map configuration commands.

```
Router(config)# route-map arizona1 <CR>
Router(config-route-map)# ?
Route Map configuration commands:
  exit  Exit from route-map configuration mode
  help  Description of the interactive help system
  match Match values from routing table
  no    Negate or set default values of a command
  set   Set values in destination routing protocol
```

To exit route-map configuration mode and return to global configuration mode, enter the **exit** command. Or, press Ctrl-Z to exit configuration mode and return to privileged EXEC mode.

ROM Monitor Mode

If your router does not find a valid system image, or if its configuration file is corrupted at startup, the system might enter read-only memory (ROM) monitor mode. From ROM monitor mode, you can boot the router or perform diagnostic tests.

From the Cisco 2000, Cisco 3000, and Cisco 4000, you can also enter ROM monitor mode by entering the **reload** EXEC command and then pressing the Break key during the first 60 seconds of startup. To save changes to the configuration file, use the **write memory** command before issuing the **reload** command.

To access and list the ROM monitor configuration commands, complete the following tasks:

Task	Command
Enter ROM monitor mode from privileged EXEC mode.	reload Press Break during the first 60 seconds while the system is booting.
List the ROM monitor commands.	?

The ROM monitor prompt is the angle bracket (>):

```
> ?
$ state      Toggle cache state (? for help)
B [filename] [TFTP Server IP address | TFTP Server Name]
              Load and execute system image from ROM or from TFTP server
C [address]  Continue execution [optional address]
D /S M L V   Deposit value V of size S into location L with modifier M
E /S M L     Examine location L with size S with modifier M
G [address]  Begin execution
H           Help for commands
I           Initialize
K           Stack trace
L [filename] [TFTP Server IP address | TFTP Server Name]
              Load system image from ROM or from TFTP server, but do not
              begin execution
O           Show configuration register option settings
P           Set the break point
S           Single step next instruction
T function   Test device (? for help)
Deposit and Examine sizes may be B (byte), L (long) or S (short).
Modifiers may be R (register) or S (byte swap).
Register names are: D0-D7, A0-A6, SS, US, SR, and PC
```

To return to user EXEC mode, enter **c** to continue. To boot the system image file, use the **b** command (described in the “System Image, Microcode Image, and Configuration File Load Commands” chapter in the *Router Products Command Reference* publication). For details on other ROM monitor mode commands, refer to the appropriate hardware installation guide.

Get Context-Sensitive Help

The previous sections described the first level of help available with the user interface. 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 command’s associated keywords and arguments with the context-sensitive help feature.

To get help specific to a command mode, a command, a keyword, or arguments, perform one of the following tasks:

Task	Command
Obtain a brief description of the help system in any command mode.	help
Obtain help for the full set of user-level commands.	full-help
Obtain help for the full set of user-level commands in user EXEC command mode.	terminal full-help EXEC
Obtain a list of commands that begin with a particular character string.	<i>abbreviated-command-entry?</i>
Complete a partial command name.	<i>abbreviated-command-entry<Tab></i>
List all commands available for a particular command mode.	?
List a command’s associated keywords.	<i>command ?</i>
List a keyword’s associated arguments.	<i>command keyword ?</i>

When using context-sensitive help, the space (or lack of a space) before the ? is significant. To obtain a list of commands that begin with a particular character sequence, type in those characters followed immediately by the ?. Do not include a space. This form of help is called *word help*, because it completes a word for you.

To list keywords or arguments, enter a ? in place of a keyword or argument. Include a space before the ?. This form of help is called *command syntax help*, because it reminds you which keywords or arguments are applicable based on the command, keywords, and arguments you already have entered.

You can abbreviate commands and keywords to the number of characters that allow a unique abbreviation. For example, you can abbreviate the **show** command to **sh**.

Enter the **help** command (which is available in any command mode) for a brief description of the help system:

```
Router# help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must back up until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
   command argument (e.g. 'show ?') and describes each possible
   argument.
2. Partial help is provided when an abbreviated argument is entered
   and you want to know what arguments match the input
   (e.g. 'show pr?'.)
```

As described in the **help** command output, you can enter a partial command name and a (?) to obtain a list of commands beginning with a particular character set. See “Complete a Partial Command Name” later in this chapter for more detail.

The following example illustrates how the context-sensitive help feature enables you to create an access list from configuration mode. First enter the letters **co** at the system prompt followed by a question mark (?). Do not leave a space between the last letter and the (?). The system provides the commands that begin with **co**.

```
Router# co?
configure connect copy
```

Enter the **configure** command followed by a space and a (?) to list the command’s keywords and a brief explanation.

```
Router# configure ?
memory    Configure from NV memory
network   Configure from a TFTP network host
terminal  Configure from the terminal
<cr>
```

Enter the **terminal** keyword to enter configuration mode from the terminal:

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

Enter the **access-list** command followed by a space and a **?** to list the command's keywords:

```
Router(config)# access-list ?
<1-99>      IP standard access list
<100-199>   IP extended access list
<1000-1099> IPX SAP access list
<1100-1199> Extended 48-bit MAC address access list
<200-299>   Protocol type-code access list
<300-399>   DECnet access list
<400-499>   XNS standard access list
<500-599>   XNS extended access list
<600-699>   Appletalk access list
<700-799>   48-bit MAC address access list
<800-899>   IPX standard access list
<900-999>   IPX extended access list
```

Enter the access list number **99** and then enter another **?** to see the arguments that apply to the keyword and brief explanations:

```
Router(config)# access-list 99 ?
deny    Specify packets to reject
permit  Specify packets to forward
```

Enter the **deny** argument followed by a **?** to list additional options:

```
Router(config)# access-list 99 deny ?
A.B.C.D  Address to match
```

Enter the IP address followed by a **?** to list additional options:

```
Router(config)# access-list 99 deny 131.108.134.0 ?
A.B.C.D  Mask of bits to ignore
<cr>
```

The **<cr>** symbol appears in the list, indicating that one of your options is to press Return to execute the command. The other option is to add a wild-card mask. Enter the wildcard mask followed by a question mark (**?**) to list further options.

```
Router(config)# access-list 99 deny 131.108.134.0 0.0.0.255 ?
<cr>

Router(config)# access-list 99 deny 131.108.134.0 0.0.0.255
```

The **<cr>** symbol by itself indicates there are no more keywords or arguments. Press Return to execute the command. The system adds an entry to access list 99 that denies access to all hosts on subnet 131.108.134.0.

Check Command Syntax

The user interface provides syntax checking in the form of an error location indicator (^). The ^ character appears at the point in the command string where you have entered an incorrect command, keyword, or argument. The error location indicator and interactive help system allow you to easily find and correct syntax errors.

In the following example, suppose you want to set the router clock. First, use context-sensitive help to check the syntax for setting the clock.

```
Router# clock ?
set    Set the time and date
Router# clock
```

The help output shows that the **set** keyword is required. Next, check the syntax for entering the time:

```
Router# clock set ?  
hh:mm:ss Current time  
Router# clock set
```

Enter the current time:

```
Router# clock set 13:32:00  
% Incomplete command.
```

The system indicates that you need to provide additional arguments to complete the command. Press Ctrl-P (see the next section, “Use the Command History Features”) to automatically repeat the previous command entry. Then add a space and question mark (?) to reveal the additional arguments:

```
Router# clock set 13:32:00 ?  
<1-31> Day of the month  
January Month of the year  
February  
March  
April  
May  
June  
July  
August  
September  
October  
November  
December
```

Now you can complete the command entry:

```
Router# clock set 13:32:00 23 February 93  
^  
% Invalid input detected at '^' marker.
```

The caret symbol (^) and help response indicate an error at 93. To list the correct syntax, enter the command up to the point where the error occurred and then enter a question mark (?):

```
Router# clock set 13:32:00 23 February ?  
<1993-2035> Year  
Router# clock set 13:32:00 23 February
```

Enter the year using the correct syntax and press Return to execute the command.

```
Router# clock set 13:32:00 23 February 1993
```

Use the Command History Features

With the current software release, the user interface provides a history or record of commands you have entered. This feature is particularly useful for recalling long or complex commands or entries, including access lists. With the command history feature, you can complete the tasks in the following sections:

- Set the Command History Buffer Size
- Recall Commands
- Disable the Command History Feature

Set the Command History Buffer Size

By default, the system records 10 command lines in its history buffer. To set the number of command lines the system will record during the current terminal session, complete the following task in EXEC mode:

Task	Command
Enable the command history feature for the current terminal session.	terminal history size <i>number-of-lines</i>

The **terminal history no size** command resets to default.

To configure the number of command lines the system will record, complete the following task in line configuration mode:

Task	Command
Enable the command history feature.	history size <i>number-of-lines</i> ¹

1. **no history size** resets to default.

Recall Commands

To recall commands from the history buffer, perform one of the following tasks:

Task	Key Sequence/Command
Recall commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.	Press Ctrl-P or the up arrow key. ¹
Return to more recent commands in the history buffer after recalling commands with Ctrl-P or the Up Arrow. Repeat the key sequence to recall successively more recent commands.	Press Ctrl-N or the down arrow key. ¹
While in EXEC mode, list the commands you have just entered.	show history

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

Disable the Command History Feature

The command history feature is automatically enabled. To disable it during the current terminal session, complete the following task in EXEC mode:

Task	Command
Disable the command history feature for the current session.	terminal no history

To configure a specific line so that the command history feature is disabled, complete the following task in line configuration mode:

Task	Command
Configure the line so that the command history feature is disabled.	no history

Use the Editing Features

The current software release includes an enhanced editing mode that provides a set of editing key functions similar to those of the Emacs editor.

You can enter commands in uppercase, lowercase, or a mix of both. Only passwords are casesensitive. You can abbreviate commands and keywords to the number of characters that allow a unique abbreviation. For example, you can abbreviate the **show** command to **sh**. After entering the command line at the system prompt, press the Return key to execute the command.

The following subsections are included in this section:

- Enable Enhanced Editing Mode
- Move Around on the Command Line
- Complete a Partial Command Name
- Paste in Buffer Entries
- Edit Command Lines that Wrap
- Delete Entries
- Scroll Down a Line or a Screen
- Redisplay the Current Command Line
- Transpose Mistyped Characters
- Control Capitalization
- Designate a Keystroke as a Command Entry
- Disable Enhanced Editing Mode

Enable Enhanced Editing Mode

Although enhanced editing mode is automatically enabled with the current software release, you can disable it and revert to the editing mode of previous software releases. See the section “Disable Enhanced Editing Mode” later in this chapter.

To reenble the enhanced editing mode for the current terminal session, complete the following task in EXEC mode:

Task	Command
Enable the enhanced editing features for the current terminal session.	terminal editing

To reconfigure a specific line to have enhanced editing mode, complete the following task in line configuration mode:

Task	Command
Enable the enhanced editing features.	editing¹

1. This command is documented in the “Terminal Line and Modem Support Commands” chapter in the *Router Products Command Reference* publication.

Move Around on the Command Line

Perform the following tasks to move the cursor around on the command line for corrections or changes:

Task	Keystrokes
Move the cursor back one character.	Press Ctrl-B or press the left arrow key. ¹
Move the cursor forward one character.	Press Ctrl-F or press the right arrow key. ¹
Move the cursor to the beginning of the command line.	Press Ctrl-A.
Move the cursor to the end of the command line.	Press Ctrl-E.
Move the cursor back one word.	Press Esc-B.
Move the cursor forward one word.	Press Esc-F.

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

Complete a Partial Command Name

If you cannot remember a complete command name, you can use the Tab key to allow the system to complete a partial entry. To do so, perform the following task:

Task	Keystrokes
Recall a complete command name.	Enter the first few letters and press the Tab key.

If your keyboard does not have a Tab key, press Ctrl-I instead.

In the following example, when you enter the letters conf and press the Tab key, the system provides the complete command:

```
Router# conf<Tab>
Router# configure
```

If you enter a set of characters that could indicate more than one command, the system beeps to indicate an error. Enter a question mark (?) to obtain a list of commands that begin with that set of characters. Do not leave a space between the last letter and the question mark (?).

For example, there are three commands in privileged mode that start with co. To see what they are, type **co?** at the privileged EXEC prompt:

```
Router# co?
configure connect copy
Router# co
```

Paste in Buffer Entries

The system provides a buffer that contains the last ten items you deleted. You can recall these items and paste them in the command line by performing the following task:

Task	Keystrokes
Step 1 Recall the most recent entry in the buffer.	Press Ctrl-Y.
Step 2 Recall the next buffer entry.	Press Esc-Y.

The buffer contains only the last ten items you have deleted or cut. If you press Esc-Y more than ten times, you will cycle back to the first buffer entry.

Edit Command Lines that Wrap

The new editing command set provides a wraparound feature for commands that extend beyond a single line on the screen. When the cursor reaches the right margin, the command line shifts ten spaces to the left. You cannot see the first ten characters of the line, but you can scroll back and check the syntax at the beginning of the command. To scroll back, perform the following task:

Task	Keystrokes
Return to the beginning of a command line to verify that you have entered a lengthy command correctly.	Press Ctrl-B or the left arrow key repeatedly until you scroll back to the beginning of the command entry, or press Ctrl-A to return directly to the beginning of the line. ¹

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

In the following example, the **access-list** command entry extends beyond one line. When the cursor first reaches the end of the line, the line is shifted ten spaces to the left and redisplayed. The dollar sign (\$) indicates that the line has been scrolled to the left. Each time the cursor reaches the end of the line, the line is again shifted ten spaces to the left.

```
Router(config)# access-list 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1
Router(config)# $ 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1.20 255.25
Router(config)# $t tcp 131.108.2.5 255.255.255.0 131.108.1.20 255.255.255.0 eq
Router(config)# $108.2.5 255.255.255.0 131.108.1.20 255.255.255.0 eq 45
```

When you have completed the entry, press Ctrl-A to check the complete syntax before pressing the Return key to execute the command. The dollar sign (\$) appears at the end of the line to indicate that the line has been scrolled to the right:

```
Router(config)# access-list 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1$
```

The router assumes you have a terminal screen that is 80 columns wide. If you have a width other than that, use the **terminal width** command to tell the router the correct width of your terminal.

Use line wrapping in conjunction with the command history feature to recall and modify previous complex command entries. See the section “Recall Commands” earlier in this chapter for information about recalling previous command entries.

Delete Entries

Perform any of the following tasks to delete command entries if you make a mistake or change your mind:

Task	Keystrokes
Erase the character to the left of the cursor.	Press the Delete or Backspace key.
Delete the character at the cursor.	Press Ctrl-D.
Delete all characters from the cursor to the end of the command line.	Press Ctrl-K.
Delete all characters from the cursor to the beginning of the command line.	Press Ctrl-U or Ctrl-X.
Delete the word to the left of the cursor.	Press Ctrl-W.
Delete from the cursor to the end of the word.	Press Esc-D.

Scroll Down a Line or a Screen

When you use the help facility to list the commands available in a particular mode, the list is often longer than the terminal screen can display. In such cases, a `---More---` prompt is displayed at the bottom of the screen. To view the next line or screen, complete the following tasks:

Task	Keystrokes
Scroll down one line.	Press the Return key.
Scroll down one screen.	Press the Space bar.

Note The `---More---` prompt is used for any output that has more lines than can be displayed on the terminal screen, including **show** command output. You can use the keystrokes listed above whenever you see the `---More---` prompt.

Redisplay the Current Command Line

If you are entering a command and the system suddenly sends a message to your screen, you can easily recall your current command line entry. To do so, perform the following task:

Task	Keystrokes
Redisplay the current command line.	Press Ctrl-L or Ctrl-R.

Transpose Mistyped Characters

If you have mistyped a command entry, you can transpose the mistyped characters by performing the following task:

Task	Keystrokes
Transpose the character to the left of the cursor with the character located at the cursor.	Press Ctrl-T.

Control Capitalization

You can capitalize or lowercase words or capitalize a set of letters with simple keystroke sequences. To do so, perform the following task:

Task	Keystrokes
Capitalize the word at the cursor.	Press Esc-C.
Change the word at the cursor to lowercase.	Press Esc-L.
Capitalize letters from the cursor to the end of the word.	Press Esc-U.

Designate a Keystroke as a Command Entry

Sometimes you might want to use a particular keystroke as an executable command, perhaps as a shortcut. Complete the following task to insert a system code for this purpose:

Task	Keystrokes
Insert a code to indicate to the system that the keystroke immediately following should be treated as a command entry, <i>not</i> an editing key.	Press Ctrl-V or Esc-Q.

Disable Enhanced Editing Mode

To disable enhanced editing mode and revert to the editing mode of software releases before 9.21, perform the following task in EXEC mode:

Task	Command
Disable the enhanced editing features for the local line.	terminal no editing

You might want to disable enhanced editing if you have prebuilt scripts; for example, scripts that do not interact well when enhanced editing is enabled. You can reenable enhanced editing mode with the **terminal editing** command.

The editing keys and functions of software releases before 9.21 are listed in Table 2-2.

Table 2-2 Editing Keys and Functions for Software Release 9.1 and Earlier

Key	Function
Delete or Backspace	Erases the character to the left of the cursor.
Ctrl-W	Erases a word.
Ctrl-U	Erases a line.
Ctrl-R	Redisplays a line.
Ctrl-Z	Ends configuration mode and returns to the EXEC prompt.
Return	Executes single-line commands.

Set Terminal Parameters

The router supplies default serial communication parameters for terminal and other serial device operation. You can change these parameters as necessary to meet the requirements of the terminal or host to which you are attached. Use these commands during an EXEC session while you are using a device connected to the auxiliary port. The local settings temporarily override those configured by the system administrator, remaining in effect only until you exit the system. (To configure terminal parameters on a more permanent basis, use the commands provided in the “Terminal Line and Modem Support Commands” chapter in the *Router Products Command Reference* publication.)

You can do the following to define terminal operation characteristics:

- Set Communication Speed, Databits, Stop Bits, and Parity
- Set Flow Control
- Create Packet Dispatch Sequences
- Specify the Terminal Type
- Set the Terminal Screen Length and Width
- Define Escape Character Key Sequences
- Specify the International Character Display
- Set Character Padding
- Lock the Keyboard
- Set Pending Output Notification
- Prevent Errant Connection Attempts

Set Communication Speed, Databits, Stop Bits, and Parity

To change the following parameters for the duration of your session only, perform the appropriate tasks in EXEC mode:

Task	Command
Set the line speed for the current terminal session. Choose from line speed, transmit speed, or receive speed. The line speed applies to the auxiliary port only.	terminal speed <i>bps</i> terminal txspeed <i>bps</i> terminal rxspeed <i>bps</i>
Set the number of data bits per character that are interpreted and generated by hardware for the current terminal session.	terminal databits {5 6 7 8}
Set the stop bits transmitted per byte by the current terminal session.	terminal stopbits {1 1.5 2}
Set the parity bit for the current terminal session.	terminal parity {none even odd space mark}

Set Flow Control

On the auxiliary port, you can set both hardware and software flow control between the router and devices attached to it. Both types of flow control are bidirectional. When you specify software flow control, the direction: **in** causes the router to listen to flow control from the attached device, and **out** causes the router to send flow control information to the attached device. If you do not specify a direction, the router enables software flow control in both directions.

For software flow control, the default stop and start characters are Ctrl-S and Ctrl-Q (XOFF and XON) respectively. However, you can define characters or character sequences that signal the start and end of data transmission when software flow control is in effect. This capability is useful for providing control of data over the serial line.

The keyword **hardware** sets hardware flow control. For information about setting up the RS-232 line, see the hardware installation and maintenance manual for your product.

Use these commands during an EXEC session while you are using a device connected to the auxiliary port. These commands temporarily override the configured flow control parameters.

To set temporary flow control parameters for the current session, perform one or more of the following tasks in EXEC mode:

Task	Command
Set the terminal flow control.	terminal flowcontrol { none software [in out] hardware }
Set the flow control start character.	terminal start-character <i>ascii-number</i>
Set the flow control stop character.	terminal stop-character <i>ascii-number</i>

Create Packet Dispatch Sequences

The router supports configuration of dispatch sequences. You can set up dispatch characters that allow packets to be buffered, then transmitted upon receipt of a character. These characters are useful on an aux port only, and then only if you have some special-purpose device hooked up.

Use these commands during an EXEC session while you are using a device connected to the auxiliary port. These commands temporarily override the configured parameters.

Perform the following tasks in EXEC mode, as needed for your particular system needs:

Task	Command
Define one or more characters that trigger packet transmission for the current terminal session.	terminal dispatch-character <i>ascii-number1</i> [<i>ascii-number2</i> . . . <i>ascii-number</i>]
Set the dispatch timer for the current terminal session.	terminal dispatch-timeout <i>milliseconds</i>

Specify the Terminal Type

You can specify the type of terminal connected to a line. This feature has two benefits: it provides a record of the type of terminal attached to a line, and it can be used in Telnet terminal negotiations to inform the remote host of the terminal type for display management.

To specify the terminal type for the current session, perform the following task in EXEC mode:

Task	Command
Specify the terminal type for the current terminal line.	terminal terminal-type <i>terminal-name</i>

Set the Terminal Screen Length and Width

By default, the router provides a screen display of 24 lines by 80 characters. You can reset these values if they do not meet the needs of your terminal. To set the terminal length or width for the current session, perform the following tasks in EXEC mode:

Task	Command
Set the screen length for the current terminal line.	terminal length <i>screen-length</i>
Set the screen width for the current terminal line.	terminal width <i>characters</i>

The values set can be learned by some host systems that use this type of information in terminal negotiation. Set a value of zero for the screen length to disable pausing between screens of output.

Define Escape Character Key Sequences

You can modify the default key sequences to execute functions such as system escape or terminal pause. To modify the system escape character or hold character for the current terminal session, perform the following task in EXEC mode:

Task	Command
Change the system escape sequence for the current line.	terminal escape-character <i>ascii-number</i>
Define the local hold sequence or character that pauses output to the terminal screen.	terminal hold-character <i>ascii-number</i>

Specify the International Character Display

You can use a 7-bit character set (such as ASCII) or you can enable a full 8-bit international character set (such as ISO 8859) to allow special graphical and international characters for use in banners and prompts. To change the various character sets, perform the following tasks in EXEC mode:

Task	Command
Change the number of databits per character that are generated and interpreted by hardware for the local line.	terminal databits {5 6 7 8}
Change the number of databits per character that are generated and interpreted by software for the local line.	terminal data-character-bits {7 8}
Locally set the character set used in EXEC and configuration command characters.	terminal exec-character-bits {7 8}
Specify the character set used in special characters such as software flow control, hold, escape, and disconnect characters for the current line.	terminal special-character-bits {7 8}

Setting the EXEC character width to eight bits can cause failures. For example, if a user on a terminal that is sending parity enters the command **help**, an “unrecognized command” message appears because the system is reading all eight bits, although the eighth bit is not needed for the **help** command.

Set Character Padding

You can change the character padding on a specific output character. Character padding adds a number of null bytes to the end of the string and can be used to make a string an expected length for conformity. To set the padding for the current terminal session, perform the following task in EXEC mode:

Task	Command
Set padding on a specific output character for the current line.	terminal padding <i>ascii-number count</i>

Lock the Keyboard

If you have enabled a terminal-locking mechanism by using the **lockable** line configuration command, you can lock your keyboard to prevent access to your session while keeping your connection open. Perform the following task in EXEC mode:

Task	Command
Lock the keyboard.	lock

When the terminal-locking mechanism is set and you enter the **lock** EXEC command, you are prompted for a password. You must enter this password before you can use the terminal. This allows you to leave a terminal unattended without concern about unauthorized access. The **lock** EXEC command remains in effect until you execute the **clear line** privileged EXEC command.

Set Pending Output Notification

You can set up a line to inform a user who has multiple, concurrent Telnet connections when output is pending on a connection other than the current one. To do so, perform the following task in EXEC mode:

Task	Command
Enable the current terminal line to notify a user of pending output.	terminal notify

Prevent Errant Connection Attempts

The system accepts a host-name entry at the EXEC system prompt as a Telnet command. If you mistype the host name, the system interprets the entry as an incorrect Telnet command and provides an error message indicating that the host does not exist. You can disable this option by specifying **terminal transport none**. In this case, if you mistype a command at the EXEC prompt, the system will not attempt to make a Telnet connection.

To specify the preferred method of transport, perform the following task in EXEC mode:

Task	Command
Define which protocol can be used to connect to the current line.	terminal transport { telnet none }

Configure Telnet Capabilities for a Session

Telnet, a virtual terminal protocol that is part of the TCP/IP protocol suite, allows for connections to hosts. You can set a connection between the router and a connected device to support the following Telnet capabilities for the duration of a session:

- Generate a Hardware Break Signal
- Suppress Telnet Remote Echo and Go Ahead Options
- Negotiate Speeds
- Send a Telnet Synchronize Signal
- Set End-of-Line Control

If you want to configure these capabilities on a more permanent basis, use the corresponding **telnet** commands provided in “Terminal Line and Modem Support Commands” chapter in the *Router Products Command Reference* publication.

Generate a Hardware Break Signal

A hardware Break signal is generated when a Telnet Break command is received. You can configure the router to also generate a Break on an Interrupt Process command. To enable the system to generate a hardware Break signal on the RS-232 line that is associated with a reverse Telnet connection, complete the following task in EXEC mode:

Task	Command
Set the system to generate a hardware Break signal.	terminal telnet break-on-ip

This capability is useful because several user Telnet programs can send an Interrupt Process command but cannot send a Telnet break signal, while other programs implement a Break signal that sends an Interrupt-Process command. RS-232 devices use the hardware Break signal for various purposes.

Suppress Telnet Remote Echo and Go Ahead Options

You can cause Telnet to refuse to negotiate full-duplex, remote echo options on incoming connections. Doing so suppresses negotiation of the Telnet Remote Echo and Suppress Go Ahead options. Perform the following task in EXEC mode on a reverse Telnet connection to allow the router to refuse these requests from the other end:

Task	Command
Set a line to refuse to negotiate full duplex, remote echo options.	terminal telnet refuse-negotiations

Negotiate Speeds

To allow the line to negotiate a bit rate on an incoming connection for the duration of a session, perform the following task in EXEC mode:

Task	Command
Set the line to negotiate speeds on incoming connections.	terminal telnet speed <i>default-speed</i> <i>maximum-speed</i>

The router uses the default if the connected device does not specify a speed. The maximum-speed is the highest speed the router will use during the session.

Send a Telnet Synchronize Signal

To cause an incoming connection to send a Telnet synchronize signal when it receives a Telnet Break signal during the session, complete the following task in EXEC mode:

Task	Command
Cause an incoming connection to send a Telnet synchronize signal when it receives a Telnet Break signal.	terminal telnet sync-on-break

This capability is used very rarely to ensure the ordering of Break reception with respect to data characters sent after the Break signal.

Set End-of-Line Control

To cause the router to send a carriage return (CR) as a CR followed by a NULL instead of a CR followed by a line feed (LF) during a session, complete the following task in EXEC mode:

Task	Command
Send a CR followed by a NULL instead of a LF.	terminal telnet transparent

This capability is useful for coping with different interpretations of end-of-line handling in the Telnet protocol specification.

Use Telnet Connections

Using Telnet involves connecting to remote routers, switching between Telnet connections, and executing special Telnet sequences. This section includes the **telnet** EXEC command, which is used to connect to other routers for remote configuration or to connect to local systems that might need configuration or setup changes.

Using Telnet, perform the tasks in the following sections:

- Log in to a Server
- Connect to Remote Routers via Telnet
- Switch between Telnet Connections
- Execute Special Telnet Sequences
- Clear a Line
- Exit a Session

Log in to a Server

To log in to a server, enter the EXEC command **login** at the system prompt. Specify your username and optionally a TACACs server by name or IP address.

Task	Command
Log in to a server.	login

Connect to Remote Routers via Telnet

To open a new Telnet connection, exit out of the current connection by typing the escape sequence, which by default is Ctrl ^ X (press the Ctrl, Shift, and ^ keys simultaneously, let go, then press the X key) to return to the system command prompt, then open a new connection.

Perform the following tasks in EXEC mode, as necessary, to connect to a remote host using Telnet.

Task	Command
Make a Telnet connection.	[connect telnet] host [port] [keyword]
Escape out of the current connection and return to the EXEC prompt to make another connection.	Ctrl ^ X

With our implementation of TCP/IP, you are not required to enter the command **connect** or **telnet** to establish a Telnet connection. If you prefer, you can just enter the learned host name. You can disable the ability of the system to interpret a host name as a Telnet command (see the section “Prevent Errant Connection Attempts” earlier in this chapter).

Switch between Telnet Connections

You can switch between connections by escaping out of one connection and resuming a previously opened connection. To do so, perform the following steps:

Task	Command
Step 1 Escape from the current connection and return to the EXEC prompt.	Ctrl ^ X
Step 2 Display the connection name or number.	where
Step 3 Resume a previous connection.	resume [connection] [keyword]

You can also resume the previous connection by pressing the Return key at the EXEC prompt.

Execute Special Telnet Sequences

The Telnet software supports special Telnet commands in the form of Telnet sequences that map generic terminal control functions to operating system-specific functions.

To issue a special Telnet command, type the escape sequence (usually Ctrl ^) and then a command character. You can type the command character as you hold down Ctrl or with Ctrl released, and you can type either uppercase or lowercase letters. Table 2-3 lists the special Telnet commands.

Table 2-3 Special Telnet Commands

Telnet Command	Key Sequence
Break	Ctrl ^ B
Interrupt Process (IP)	Ctrl ^ C
Erase Character (EC)	Ctrl ^ H
Abort Output (AO)	Ctrl ^ O
Are You There? (AYT)	Ctrl ^ T
Erase Line (EL)	Ctrl ^ U

At any time during an active Telnet session, you can list the Telnet commands by typing the escape sequence followed by a question mark. It displays an online table of the special Telnet commands for quick reference.

```
Router# Ctrl ^ ?
```

A sample of this list follows (the Ctrl key is represented by the first ^ character):

```
Router# Ctrl ^ ?
[Special telnet escape help]
^^B sends telnet BREAK
^^C sends telnet IP
^^H sends telnet EC
^^O sends telnet AO
^^T sends telnet AYT
^^U sends telnet EL
```

Clear a Line

You can reset a terminal line to idle state by performing the following task in EXEC mode:

Task	Command
Reset a terminal line.	clear line <i>line-number</i>

Exit a Session

The router EXEC provides two ways for you to terminate an active terminal session. To do so, use one of the commands in Step 1 that follows. Perform Step 2 if you also want to disconnect the line.

Task	Command
Step 1 End an active session; use either command.	exit logout
Step 2 Disconnect a session.	disconnect [<i>connection</i>]

Do not disconnect a session merely to end it. Instead, log off the host, thus allowing the host to initiate the disconnect and then end the session. If you cannot gracefully end an active session, then disconnect the line.

Monitor Telnet Connections

The router supports the connection activities described in the following sections:

- List Open Connections
- Assign a Logical Name to a Connection
- Display TCP Statistics on Open Telnet Connections
- Display Current Terminal Parameters
- Display Line Information
- Enable the Finger Protocol

List Open Connections

You can display information about all open Telnet connections associated with the current terminal line by using one of the following commands. The information displayed includes the host name, address, number of characters waiting to be sent to the terminal, idle time, and connection name. To display the connection information, perform the following task in EXEC mode:

Task	Command
Display connection information.	where show sessions

Assign a Logical Name to a Connection

You can assign a logical name to a connection by performing the following task in EXEC mode. This function can be useful for keeping track of multiple connections.

Task	Command
Rename a connection.	name-connection

You are prompted for the connection number and name to assign when you enter this command. The **where** command displays a list of the assigned logical connection names.

Display TCP Statistics on Open Telnet Connections

You can display TCP statistics on open Telnet connections by performing the following task in EXEC mode:

Display status of all Telnet connections.	show tcp [<i>line-number</i>]
---	--

Display Current Terminal Parameters

You can display a comprehensive report about the settings in effect on the current terminal line, including information such as the line number, line status, modem state, special characters set, and preferred transport protocol. This information can be useful for changing lines to match expected settings using the local terminal parameter-setting tasks described in the section “Set Terminal Parameters” earlier in this chapter.

To show the current terminal parameters, perform the following task in EXEC mode:

Task	Command
Display local terminal settings.	show terminal

Display Line Information

You can display information about the active lines on the router by using one of the following EXEC commands:

Task	Command
Display information about a line.	show users [all] systat [all] show line [<i>line-number</i>]

Enable the Finger Protocol

You can enable the Finger protocol so that people throughout the network can get a list of the users on the router. The information displayed includes the processes running on the system, the line number, connection name, idle time, and terminal location. To enable the Finger protocol, perform the following task in global configuration mode:

Task	Command
Enable the Finger protocol requests.	service finger