Modem Signal and Line States

First Published: May 8, 2001
Last Updated: May 14, 2009

This chapter contains information on how to configure automatic dialing for modems and provides illustrations describing modem signal and line states.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the "Identifying Supported Platforms" section in the "Using Cisco IOS Software" chapter.

For a complete description of the modem support commands in this chapter, refer to the *Cisco IOS Modem Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the "Feature Information for Modem Signal and Line State" section on page 16.

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Contents

Information About Signal and Line State Diagrams

Signal and line state diagrams accompany some of the tasks in the following sections to illustrate how the modem control works. The following diagrams are described here:

## EXEC and Daemon Creation on a Line with No Modem Control

The diagrams show two processes:

- The "create daemon" process creates a tty daemon that handles the incoming network connection.
- The "create EXEC" process creates the process that interprets user commands. (See Figure 1 through Figure 5.)

In the diagrams, the current signal state and the signal that the line is watching are listed inside each box. The state of the line (as displayed by the **show line** EXEC command) is listed next to the box. Events that change that state appear in italics along the event path, and actions that the software performs are described within ovals.

Figure 1 illustrates line states when no modem control is set. The DTR output is always high, and CTS and RING are completely ignored. The Cisco IOS software starts an EXEC session when the user types the activation character. Incoming TCP connections occur instantly if the line is not in use and can be closed only by the remote host.
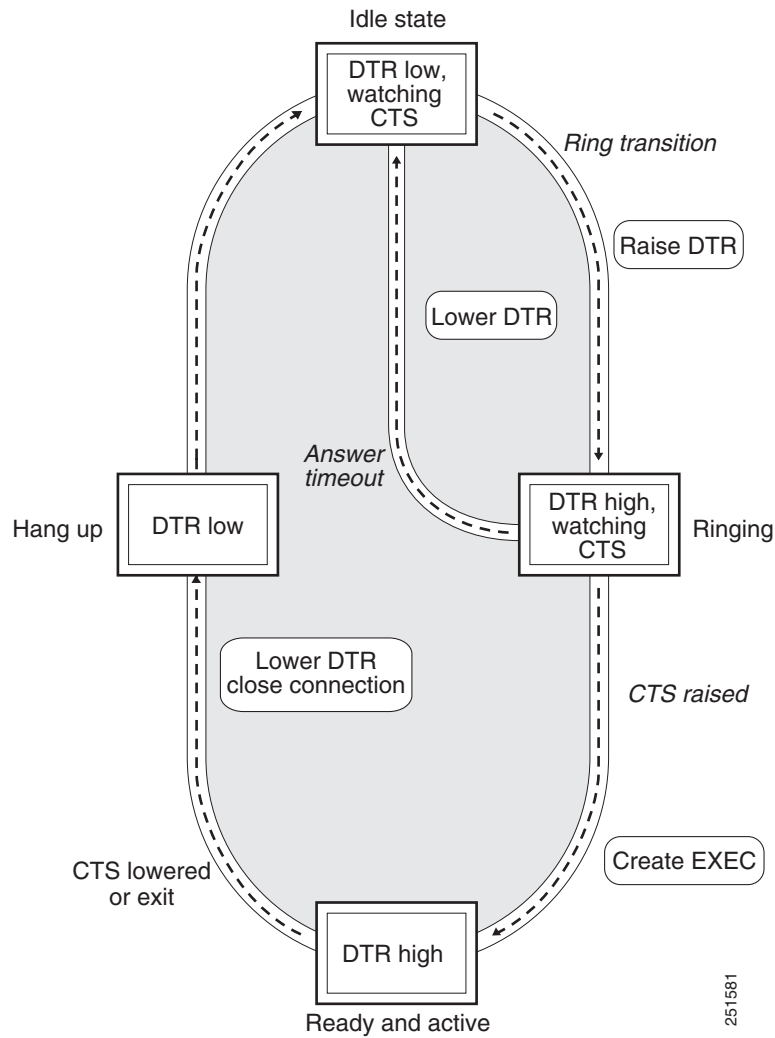
Figure 1   EXEC and Daemon Creation on a Line with No Modem Control
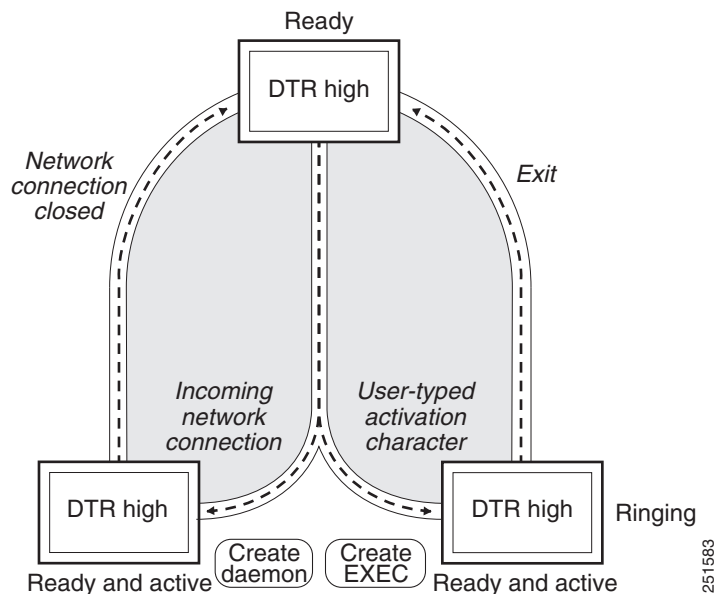
EXEC Creation on a Line Configured for a High-Speed Modem

Figure 2 illustrates the **modem dialin** process with a high-speed dialup modem. When the Cisco IOS software detects a signal on the RING input of an idle line, it starts an EXEC or autobaud process on that line. If the RING signal disappears on an active line, the Cisco IOS software closes any open network connections and terminates the EXEC facility. If the user exits the EXEC or the software terminates because of no user input, the line makes the modem hang up by lowering the DTR signal for 5 seconds. After 5 seconds, the modem is ready to accept another call.

Figure 2   *EXEC Creation on a Line Configured for a High-Speed Modem*
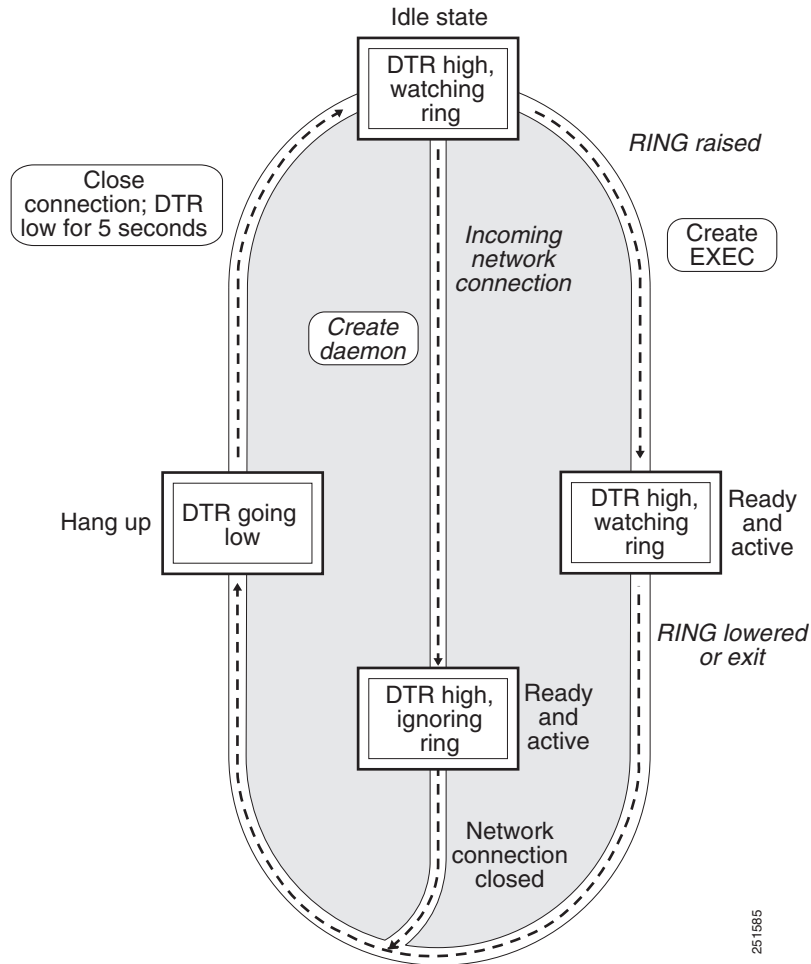
EXEC and Daemon Creation on a Line for Incoming and Outgoing Calls

Figure 3 illustrates the **modem inout** command. If the line is activated by raising the data set ready (DSR) signal, it functions exactly as a line configured with the **modem dialin** line configuration command described in the section "Automatically Answering a Modem". If the line is activated by an incoming TCP connection, the line functions similarly to lines not used with modems.

Figure 3   *EXEC and Daemon Creation on a Line for Incoming and Outgoing Calls*

Idle state

DTR high,
watching
ring

RING raised

Close
connection; DTR
low for 5 seconds

Create
EXEC

*Incoming
network
connection*

*Create
daemon*

Hang up

DTR going
low

DTR high,
watching
ring

Ready
and
active

*RING lowered
or exit*

DTR high,
ignoring
ring

Ready
and
active

Network
connection
closed

251585

**Note** If your system incorporates dial-out modems, consider using access lists to prevent unauthorized use.

EXEC and Daemon Creation on a Line Configured for Continuos CTS

Figure 4 illustrates the **modem cts-required** command operating in the context of a continuous CTS signal. This form of modem control requires that the CTS signal be high for the entire session. If CTS is not high, the user input is ignored and incoming connections are refused (or sent to the next line in a rotary group).

Figure 4   EXEC and Daemon Creation on a Line Configured for Continuous CTS
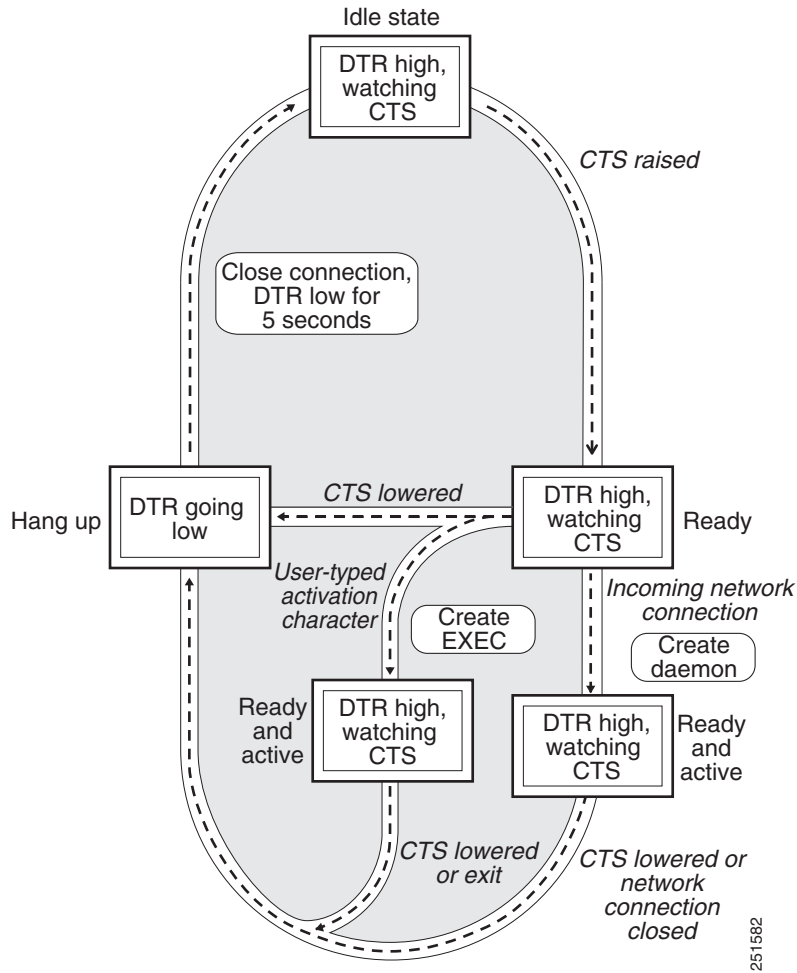
Daemon Creation on a Line Configured for Modem Dial-Out

Figure 5 illustrates the **modem callout** process. When the Cisco IOS software receives an incoming connection, it raises the DTR signal and waits to see if the CTS signal is raised to indicate that the host has noticed the router DTR signal. If the host does not respond within the interval set by the **modem answer-timeout** line configuration command, the software lowers the DTR signal and drops the connection.

Figure 5   Daemon Creation on a Line Configured for Modem Dial-Out
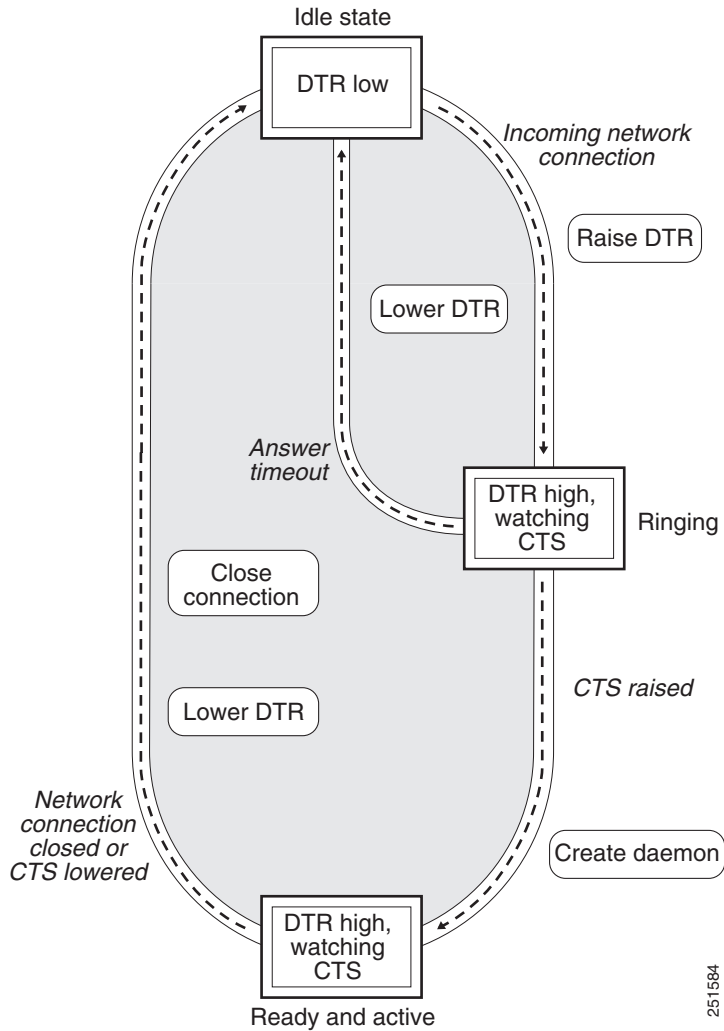
How to Configure Modem Signal and Line States

To configure modem signal and line states, complete the tasks in the following sections:

Supporting EXEC Restarts Triggered Via the Clear to Send (CTS) Hardware Line State

The **modem cts-alarm** command enables the router to react to a CTS drop from the remote device, and to clear any existing EXEC session.

The router reacts to a CTS drop from a connected asynchronous device. When a CTS drop is detected, the existing EXEC session is cleared and there is no need to wait for a timeout. This method improves the speed EXEC recovery by using hardware signals.

Note Use this feature with an asynchronous serial device that relies only on CTS for flow control. The CTS performs a role similar to that of on-hook and off-hook functionality.

To enable the router to react to a Clear to Send (CTS) drop from a remote device, and to clear an existing EXEC session, use the **modem cts-alarm** command in line configuration mode.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem cts-alarm**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# `**`line`**` line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# `**`modem cts-alarm`**	Configures the router to react on a CTS drop from the remote device, and to clear an existing EXEC session.

Configuring Automatic Dialing

The **modem dtr-active** command enables the router to initiate automatic dialin.

With the dialup capability, you can set a modem to dial the phone number of a remote router automatically. This feature offers cost savings because phone line connections are made only when they are needed—you pay for using the phone line only when there is data to be received or sent.

Using the **modem dtr-active** command causes a line to raise DTR signal only when there is an outgoing connection (such as reverse Telnet, NetWare Asynchronous Support Interface (NASI), or DDR), rather than leave DTR raised all the time. When raised, DTR potentially tells the modem that the router is ready to accept a call.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem dtr-active**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# line line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# modem dtr-active`	Configures a line to initiate automatic dialing.

Automatically Answering a Modem

The **modem dialin** command allows the router to configure a line to answer a modem automatically.

You also can configure the modem to answer the telephone on its own (as long as DTR is high), drop connections when DTR is low, and use its Carrier Detect (CD) signal to accurately reflect the presence of carrier. (Configuring the modem is a modem-dependent process.)

First, wire the modem CD signal (generally pin-8) to the router RING input (pin-22), then use the **modem dialin** command in line configuration mode.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem dialin**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# line line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# modem dialin`	Configures a line to automatically answer a modem.

You can turn on modem hardware flow control independently to respond to the status of router CTS input. Wire CTS to whatever signal the modem uses for hardware flow control. If the modem expects to control hardware flow in both directions, you might also need to wire modem flow control input to some other signal that the router always has high, such as the DTR signal.

Supporting Dial-In and Dial-Out Connections

The **modem inout** command enables the router to configure a line for both incoming and outgoing calls.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem inout**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# line line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# modem inout`	Configures a line for both incoming and outgoing calls.

Configuring a Line Timeout Interval

The **modem answer-timeout** command enables the router to change the interval that the Cisco IOS software waits for the CTS signal after raising the DTR signal in response to the DSR (the default is 15 seconds).

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem answer-timeout**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# ` **`line`** *`line-number`*	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# ` **`modem answer-timeout`**	Configures a line for both incoming and outgoing calls.

> **Note** The DSR signal is called RING on older ASM-style chassis.

Closing Modem Connections

> **Note** The **modem cts-required** command was replaced by the **modem printer** command in Cisco IOS Release 12.2.

The **modem cts-required** enables the router to configure a line to close connections from a user's terminal when the terminal is turned off and to prevent inbound connections to devices that are out of service.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **modem answer-timeout**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# `**`line`**` line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# `**`modem cts-required`**	Configures a line to close connections.

Configuring a Line to Disconnect Automatically

The **autohangup** command enables the router to configure automatic line disconnect.

The **autohangup** command causes the EXEC facility to issue the **exit** command when the last connection closes. This feature is useful for UNIX-to-UNIX copy program (UUCP) applications because UUCP scripts cannot issue a command to hang up the telephone. This feature is not used often.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **autohangup**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`Router(config)# line line-number`	Enters line configuration mode for the line number specified.
Step 4	`Router(config-line)# autohangup`	Configures automatic line disconnect.

Supporting Reverse Modem Connections and Preventing Incoming Calls

In addition to initiating connections, the Cisco IOS software can receive incoming connections. This capability allows you to attach serial and parallel printers, modems, and other shared peripherals to the router or access server and drive them remotely from other modem-connected systems. The Cisco IOS software supports reverse TCP, XRemote, and local-area transport (LAT) connections.

The specific TCP port or socket to which you attach the device determines the type of service that the Cisco IOS software provides on a line. When you attach the serial lines of a computer system or a data terminal switch to the serial lines of the access server, the access server can act as a network front-end device for a host that does not support the TCP/IP protocols. This arrangement is sometimes called *front-ending* or *reverse connection mode*.

The Cisco IOS software supports ports connected to computers that are connected to modems. The **modem callout** command enables the router to configure the Cisco IOS software to function somewhat like a modem, and prevents the incoming calls.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line** *line-number*
4. **autohangup**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	Router(config)# **line** *line-number*	Enters line configuration mode for the line number specified.
Step 4	Router(config-line)# **modem callout**	Configures a line for reverse connections and prevents incoming calls.

Additional References

The following sections provide references related to the Modem Signal and Line State feature.

Related Documents

Related Topic	Document Title
Modem Configuration Commands	*Cisco IOS Dial Technologies Command Reference*
Modem Configuration and Management	*Cisco IOS Dial Technologies Configuration Guide*

Standards

Standard	Title
None	

MIBs

MIB	MIBs Link
•	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
None	

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.	http://www.cisco.com/techsupport
To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.	
Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS Dial Command Reference* at http://cisco.com/en/US/docs/ios/dial/command/reference/dia_book.html. For information about all Cisco IOS commands, use the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or the *Cisco IOS Master Command List, All Releases*, at http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html.

- **modem cts-alarm**
- **modem dtr-active**
- **modem dialin**
- **modem inout**
- **modem answer-timeout**
- **modem cts-required**
- **modem callout**

Feature Information for Modem Signal and Line State

Table 1 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note   Table 1 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1   *Feature Information for Modem Signal and Line State*

Feature Name	Releases	Feature Information
Automatic Modem Configuration	11.2(1) 12.0(2)T 12.0(7)T 12.2(11)YT 12.2(11)YV 12.2(13)T 12.2(4)T 12.2(8)T 12.5 12.4T 12.2SX	Automatic Modem Configuration can issue initialization strings automatically for most types of modems externally attached to the access server.