

Managing Modems

The Cisco IOS software provides commands that manage modems that reside inside access servers or routers in the form of modem cards. Cisco Systems does not consider external modems, which externally attach to an access server, to be part of its modem management paradigm.

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

This chapter consists of the following sections:

- Cisco's Implementation
- Manageable Versus Basic Modems
- Modem Management Topologies
- Single Chassis Modem Pooling
- Change Modem Configuration
- Verify Connection Speed Performance
- Collect Modem Statistics
- Automatically Run a Modem Diagnostics Test
- Display Local Disconnect Reasons
- Remove Inoperable Modems

Cisco's Implementation

Cisco Systems installs the following different types of modems and terminal adapter cards in its access servers and routers:

- 56K Modems
- V.110 Terminal Adapters
- V.34 Modems

Table 18 shows which Cisco access devices provide hardware support for these dial technologies.

Table 18 Available Modems and Terminal Adapters

Type of Modem or Terminal Adapter	Cisco AccessPath Integrated Access System	Cisco AS5300	Cisco AS5200	Cisco 3600 Series
56K modem card	Yes	Yes	Yes	Yes
V.110 terminal adapter module	No	No	Yes	No
V.34 modem card	Yes	Yes	Yes	Yes

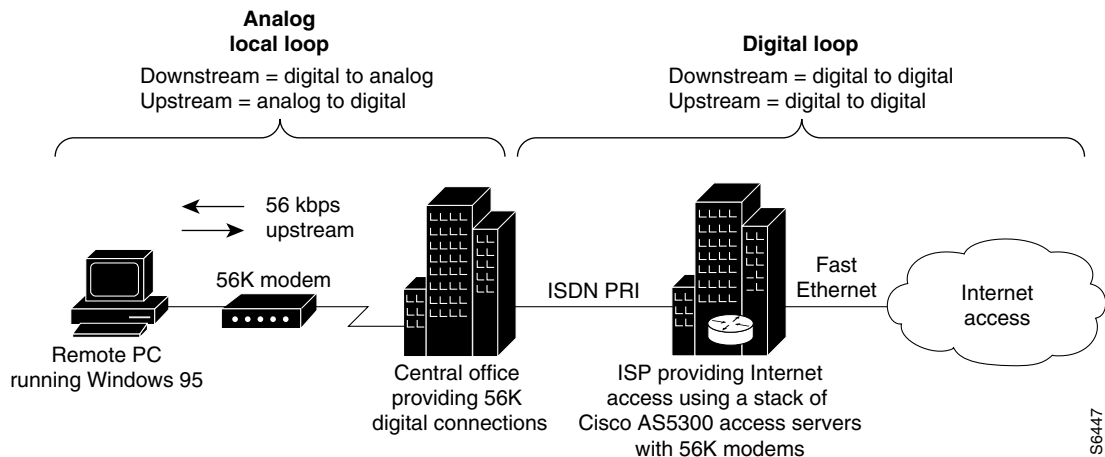
56K Modems

The 56K modems are used for making high-speed connections across digital networks. Ultimately, this means that files transmitted at up to 56 kbps arrive at the desktop nearly twice as fast as standard V.34 (28.8-kbps) connections. The wait for information is reduced by nearly 50 percent.

The 56K modems are ideal for serious Internet multimedia users who want to quickly dial-in to corporate LANs or download web pages containing sound, video, graphics, and other large files over digital networks using standard telephone lines.

Traditional modems assume that both ends of a modem conversation use an analog connection over the public switched telephone network. Data signals are converted from digital to analog and back again to digital, limiting transmission speeds to considerably less than the nominal rate of the modem. The 56K modems, however, assume that one end of the modem conversation has a pure digital connection to the phone network and takes advantage of the high-speed digital connection. This is a new technique where the network is viewed as a digital transmission medium and the data is encoded for transmission over an end user's telephone line, which is also known as the local loop. The downstream data is digitally encoded instead of being modulated. Upstream analog-to-digital communication at the local loop will be less than 56kbps. (This limit to upstream analog modem speed can vary depending on factors such as the local loop connection with the central office and the modem. Downstream digital to analog communication at the local loop can transmit up to 56 kbps. To maximize channel bandwidth for 56 kbps connections, the Integrated Services Digital Network Primary Rate Interface (ISDN PRI) must be used. In the example shown in Figure 219, a stack of Cisco AS5300s is equipped with 56K modems.)

Figure 219 Remote PC Downloading Files Over the Network at 56 kbps



S6447

Special digital signal processor (DSP) software is used in conjunction with 56K modem firmware to enable speeds up to 56 kbps. Both DSP and modem firmware are posted on the Cisco Connection Online (CCO) FTP server for upgrading purposes.

The following prerequisites apply to 56K modems:

- K56flex-compatible modems must be present at both ends of a digital connection in a digital network. K56flex requires a client-side modem and a server-side modem. If not, this speed cannot be achieved. All modem connections will fall back to V.34 speeds.
- Only one analog loop can be in the end-to-end communications path.
- You cannot have any A-law to U-law conversions, which exist at some international gateways.

V.110 Terminal Adapters

V.110 is a bit rate adaptation protocol defined by International Telecommunication Union (ITU). V.110 provides a standard method of encapsulating data over Global System for Mobile Telecommunications (GSM) and ISDN networks. A Cisco AS5200 loaded with V.110 terminal adapter modules provides corporate or Internet access to GSM mobile users.

The 12 port V.110 terminal adapter connects to the AS5200 TDM bus via the universal carrier card. There can be up to five V.110 modules in one Cisco AS5200, which is capable of terminating 60 V.110 sessions. Modem and V.110 terminal adapter port modules can coexist in the same Cisco AS5200. Based on ISDN Q.931 call bearer information, the Cisco IOS software routes calls to the appropriate port module for termination. For example, analog calls are terminated by the modem modules, GSM calls are serviced by the V.110 terminal adapter modules, and ISDN calls are sent to the PPP termination engine. This flexibility allows providing one telephone number to users for analog, GSM, and ISDN data calls.

Figure 220 shows a dial-in scenario for how V.110 technology can be used with a stack of Cisco AS5200 access servers.

Figure 220 V.110 Dial-In Scenario Using a Stack of Cisco AS5200s

V.34 Modems

Recommendation V.34 is the name of the standard that defines how modems should operate at 28.8 kbps. The previous standard for high speed modem communication was V.32bis, which defined how modems should operate at 14.4 kbps.

Manageable Versus Basic Modems

Depending on which modem license you purchase with your access server or router, Cisco modems are either manageable by the Cisco IOS software do not support the out-of-band management feature. The latter are called “basic” modems.

Manageable modems support the one out-of-band feature, which is used for gathering modem performance statistics and transmitting attention (AT) commands. Basic modems do not support the out-of-band feature nor the functionality associated with manageable modems. As you read through this chapter, note which commands apply to manageable versus basic modems.

Table 19 provides a summary of the Cisco IOS commands supported by manageable modems versus basic modems.

Table 19 Commands for Manageable versus Basic Modems

Modem Command	Supported by Manageable Modems	Supported by Basic Modems
called-number	Yes	Yes
clear counters (async)	Yes	Yes
clear counters line	Yes	Yes
clear modem	Yes	Yes
clear modem counters	Yes	Yes
clear modempool-counters	Yes	Yes
copy modem	Yes	Yes
modem answer-timeout	Yes	Yes
modem at-mode	Yes	No
modem at-mode-permit	Yes	No
modem autoconfigure discovery	Yes	Yes
modem autoconfigure type	Yes	Yes
modem autotest	Yes	Yes
modem bad	Yes	Yes
modem buffer-size	Yes	No
modem busyout	Yes	Yes
modem country mica	Yes	Yes
modem country microcom_hdms	Yes	Yes
modem hold-reset	Yes	Yes
modem poll retry	Yes	No
modem poll time	Yes	No
modem recovery action	Yes	Yes
modem recovery-time	Yes	No
modem shutdown	Yes	Yes
modem startup-test	Yes	Yes
modem status-poll	Yes	No
modemcap edit	Yes	Yes
modemcap entry	Yes	Yes
modem-pool	Yes	Yes
pool-range	Yes	Yes
show modem	Yes	Yes
show modem at-mode	Yes	No
show modem call-stats	Yes	No
show modem configuration	Yes	No
show modem connect-speeds	Yes	No
show modem cookie	Yes	Yes
show modem csm	Yes	Yes

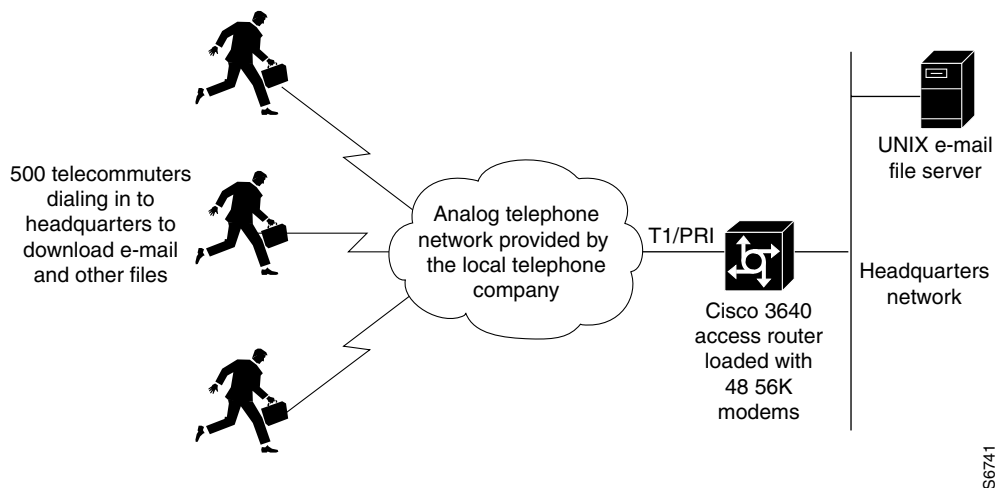
Table 19 Commands for Manageable versus Basic Modems (Continued)

Modem Command	Supported by Manageable Modems	Supported by Basic Modems
show modem log	Yes	Yes
show modem mapping	Yes	Yes
show modem mica	Yes	Yes
show modem operational-status	Yes	No
show modem summary	Yes	Yes
show modem test	Yes	Yes
show modem version	Yes	Yes
show modem-pool	Yes	Yes
test modem back-to-back	Yes	Yes

Modem Management Topologies

Figure 221 shows a typical small scale dial scenario for an Internet service provider. Modem management commands are useful for gathering call statistics and upgrading modem firmware for large modem pools.

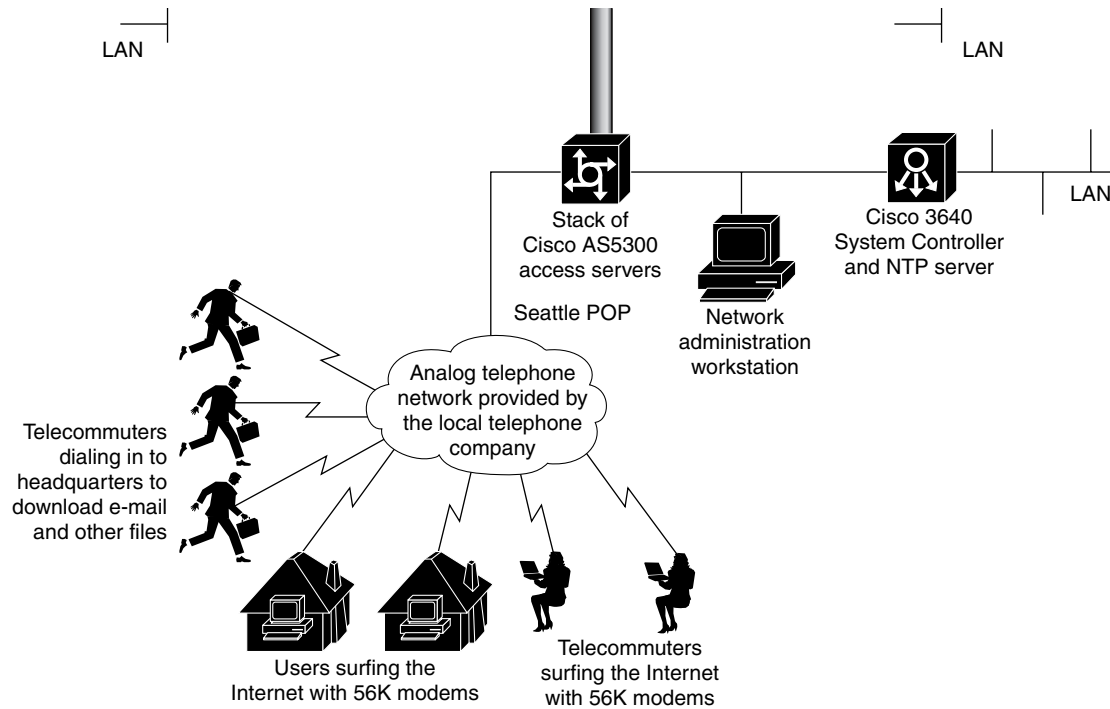
Figure 221 Small-Scale POP Using a Cisco AS3640 Access Server



S6741

Figure 222 shows a large scale dial scenario for an Internet service provider extending over several states in the USA.

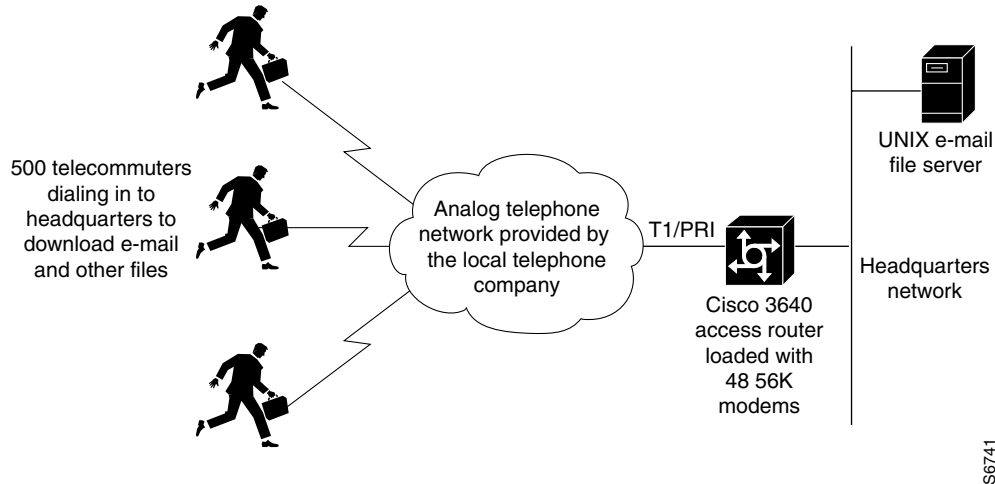
Figure 222 Large-Scale POP Network



15815

Figure 223 shows a typical dial scenario for an enterprise network using a Cisco 3640 router.

Figure 223 Typical Dial Scenario for an Enterprise Network



Single Chassis Modem Pooling

Modem pooling assigns physical modems to a single dialed number identification service number (DNIS). It enables you to create pools of physical modems in one access server, assign a unique DNIS to each modem pool, and set maximum simultaneous connect limits.

This feature is used for physically partitioning or virtually partitioning modems inside one network access server. Modem pooling offers these benefits:

- A certain number of modem ports can be guaranteed per DNIS.
- Maximum simultaneous connection limits can be set for each DNIS.

The following subsections are provided:

- Restrictions
- Platforms Supported
- How Modem Pooling Works
- Configuring Modem Pooling
- Verify Modem Configuration
- Physical Partition with Dial-In and Dial-Out

List of Terms

DNIS—Dialed number identification service number. The same DNIS cannot exist in more than one modem pool. Each modem pool must have its own unique DNIS number(s).

Called party number—DNIS number used to dial into an access server. For example, suppose Modem ABC is dialing into Access Server DEF. The DNIS called party number is the number assigned to Access Server DEF.

Calling party number—Telephone number assigned to a calling device. For example, suppose Modem ABC is dialing into Access Server DEF. The calling party number is the number assigned to Modem ABC. Calling party number is similar to Caller ID.

Modem pool—A range of physical modems that are grouped together and assigned one or more DNIS.

Restrictions

The following restrictions apply:

- Modem pooling is not a solution for large scale dial access. It cannot be used to create virtual modem pools across multiple access servers that are connected together. Modem pooling is physically restricted to one access server.
- MICA and Microcom modems support modem pooling. However, only MICA modems support modem pooling for CT1 and CE1 configurations using channel associated signalling (CAS). To use modem pooling with CT1 or CE1 connections, you must reserve at least two modems in the default modem pool. These reserved modems decode DNIS before handing off calls to the modems assigned to modem pools.

If you see many call failures appearing on the access server, try assigning more modems to the default pool. Use the **show modem** and **show modem summary EXEC** commands to view the modem call failure and success ratio.

- No MIBs support modem pooling.
- The same DNIS cannot exist in more than one modem pool.

Platforms Supported

Modem pooling is supported on the following access servers:

- Cisco AccessPath
- Cisco AS5300
- Cisco AS5200

How It Works

Modem pooling allows you to control which modem a call connects to, based on DNIS. Without using modem pooling, incoming and outgoing calls are arbitrarily assigned to modems. For example, consider a Cisco AS5300 loaded with a 4-port ISDN PRI card. After an analog modem call comes into the first PRI trunk, the call is greeted by a general pool of B channels and a general pool of modems. Any B channel can be connected to any modem in the access server. A random assignment takes place. Modem resources cannot be controlled.

You can either physically partition or virtually partition your modems to enable different dial-in and dial-out services.

Configure Modem Pooling

You must first decide to physically partition or virtually partition your modems. For more information, see the previous subsection. After you have made this decision, create a modem pool for a dial-in service or specific customer by performing the tasks in the following table, beginning in EXEC configuration mode.

Step	Command	Purpose
1	configure terminal	Access global configuration mode.
2	modem-pool <i>name</i>	Create a modem pool, and assign it a name.
3	pool-range <i>number-number</i>	Assign a range of modems to the pool. A dash (-) is required between the two numbers.
4	called-number <i>number</i> [max-conn <i>number</i>]	Assigns the DNIS to be used for this modem pool. The max-conn option specifies the maximum number of simultaneous connections allowed for this DNIS. If you do not specify a max-conn value, the default (total number of modems in the pool) is used. ¹
5	Ctrl Z	Return to EXEC mode.
6	show configuration	Display the running configuration to verify the modem pool settings. Make changes accordingly.
7	copy running-config startup-config	Save the running configuration to the start-up configuration.

1. The DNIS string can have an integer x to indicate a don't care digit for that position. For example, 555111x.

Note If you have active modem calls on the access server prior to using modem pooling, modem pooling gracefully applies itself to the access server. Modem pooling first waits for active calls to hang up before assigning modems to modem pools and directing calls according to DNIS.

Verify Modem Configuration

To verify the modem configuration, enter the **show modem-pool** command to view the configuration. This command shows you the structure and activity status for all the modem pools in the access server. See Table 20 for a description of each display field.

```
as5300# show modem-pool
modem-pool: System-def-Mpool
modems in pool: 0   active conn: 0
0 no free modems in pool

modem-pool: v90service
modems in pool: 48  active conn: 46
8 no free modems in pool
called_party_number: 1234
max conn allowed: 48, active conn: 46
8 max-conn exceeded, 8 no free modems in pool

modem-pool: v34service
modems in pool: 48  active conn: 35
0 no free modems in pool
called_party_number: 5678
max conn allowed: 48, active conn: 35
0 max-conn exceeded, 0 no free modems in pool
```

Table 20 Show Modem-Pool Field Descriptions

Field	Description
modem-pool	Name of the modem pool. In the previous example, there are three modem pools configured: System-def-Mpool, v34service, and v90service. To set modem pool name, see the modem-pool command. All the modems not assigned to a modem pool are automatically assigned to the system default pool (displayed as System-def-Mpool).
modems in pool	Number of modems assigned to the modem pool. To assign modems to a pool, see the pool-range command.
active conn	Number of simultaneous active connections for the specified modem pool or called party DNIS number.
no free modems in pool	Number of times incoming calls were rejected because there were no more free modems in the pool to accept the call.
called_party_number	Specified called party DNIS number. This is the number that the remote clients use to dial in to the access server. You can have more than one DNIS number per modem pool. To set the DNIS number, see the called-number command.
max conn allowed	Maximum number of modems that a called party DNIS number can use, which is an overflow protection measure. To set this feature, see the called-number command.
max-conn exceeded	Number of times an incoming call using this called party DNIS number was rejected because the max-conn number parameter specified by the called-number command was exceeded.

For modem pool configuration examples, see the section “Physical Partition with Dial-In and Dial-Out Scenario.”

Check the following if you are having trouble:

- Make sure you have not configured the same DNIS for multiple pools.
- Make sure you have not placed the same modem in multiple pools.

Note Modem pools using MICA or Microcom modems support incoming analog calls over ISDN PRI. However, only MICA modems support modem pooling for T1 and E1 configurations with channel associated signaling.

Physical Partitioning Scenario

Physical partitioning uses one access server to function as multiple access servers loaded with different types of modem services (for example, V.34 modems, fax-capable modems, and point-of-sale (POS) modems). Each modem service is part of one physical modem pool and is assigned a unique DNIS number. See Figure 224.

Figure 224 Modem Pooling Using Physical Partitioning



Physical partitioning can also be used to set up an access server for bidirectional dial access. See Figure 225.

Figure 225 shows one Cisco AS5300 loaded with 96 MICA modems and configured with two modem pools. One modem pool has 84 modems and collects DNIS. This pool is shared by 400 salespeople who remotely download e-mail from headquarters. The other modem pool contains 12 fax-capable modems and does not collect DNIS. This pool is shared by 40 employees using PCs on a LAN. Each time an outbound call is initiated by a PC, a modem on the Cisco AS5300 is seized and used to fax out or dial out. Not configuring DNIS support in the fax-out modem pool protects the pool from being used by the calls coming in from the field. Regardless of how many salespeople are dialing in or which telephone number they use, the fax-out/dial-out modem pool will always be reserved for the PCs connected to the LAN.

Physical Partition Example

The following example creates one V.34 modem pool and one 56K modem pool on a Cisco AS5200. Each modem pool is configured with its own DNIS. Depending on which DNIS the remote clients dial, they connect to a V.34 Microcom modem or a 56K MICA modem.

The following hardware configuration is used on the Cisco AS5200:

- One 2-port T1 PRI card
- One 48-port card containing four 6-port MICA 56K modem modules and two 12-port Microcom V.34 modem modules

Complete the following steps to configure basic physical partitioning:

Step 1 Enter global configuration mode:

```
as5200# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
as5200(config)
```

Step 2 Create modem pool for the 56K MICA modem services using the **modem-pool name** command. The modem pool is called 56kservices, which spans across four 6-port MICA 56K modem modules.

```
as5200(config)# modem-pool 56kservices
as5200(config-modem-pool)#
```

Note You are in modem pool configuration mode after the prompt changes from as5200(config)# to as5200(config-modem-pool)#.

- Step 3** Assign a range of modems to the modem pool using the **pool-range** *number-number* command. Because all the 56K MICA modems are seated in slot 1, they are assigned TTY line numbers 1 to 24. Use the **show line EXEC** command to determine the TTY line numbering scheme for your access server.

```
as5200(config-modem-pool)# pool-range 1-24
```

- Step 4** Assign a DNIS to the modem pool using the **called-number** *number* [**max-conn** *number*] command. This example uses the DNIS 5551111 to connect to the 56K modems. The maximum simultaneous connection limit is set to 24. The 25th user dialing 5551111 gets a busy signal.

```
as5200(config-modem-pool)# called-number 5551111 max-conn 24
```

- Step 5** Return to EXEC mode by pressing **CTRL Z**. After you do this, display the modem pool configuration with the **show modem-pool** command. In this example, the 56K modems are in the modem pool called 56kservices. The remaining 24 v.34 Microcom modems are still in the default system pool.

```
as5200(config-modem-pool)# ^Z
as5200# show modem-pool
modem-pool: System-def-Mpool
modems in pool: 24  active conn: 0
0 no free modems in pool

modem-pool: 56kservices
modems in pool: 24  active conn: 0
0 no free modems in pool
called_party_number: 5551111
max conn allowed: 24, active conn: 0
0 max-conn exceeded, 0 no free modems in pool
```

- Step 6** Create the modem pool for the Microcom physical partition. After the configuration is complete, the **show modem-pool** command shows that there are no remaining modems in the system default modem pool.

```
as5200# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
as5200(config)# modem-pool v34services
as5200(config-modem-pool)# pool-range 25-48
as5200(config-modem-pool)# called-number 5552222 max-conn 24
as5200(config-modem-pool)# ^Z
as5200# show modem-pool

modem-pool: System-def-Mpool
modems in pool: 0  active conn: 0
0 no free modems in pool

modem-pool: 56kservices
modems in pool: 48  active conn: 0
0 no free modems in pool
called_party_number: 5551111
```

```

max conn allowed: 48, active conn: 0
0 max-conn exceeded, 0 no free modems in pool

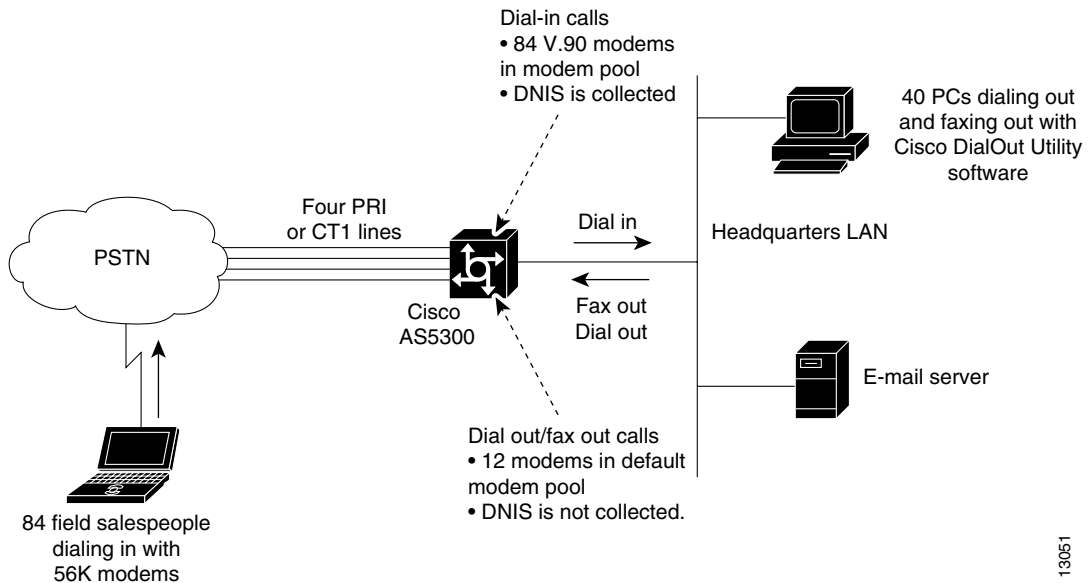
modem-pool: v34services
modems in pool: 48 active conn: 0
0 no free modems in pool
called_party_number: 5552222
max conn allowed: 48, active conn: 0
0 max-conn exceeded, 0 no free modems in pool

as5200# copy running-config startup-config
    
```

Physical Partition with Dial-In and Dial-Out Scenario

The following example is for a bidirectional dial scenario using a Cisco AS5300. Two modem pools are configured. One modem pool contains 84 56K MICA modems, which is shared by 400 remote salespeople dialing in to headquarters. The other modem pool contains 12 fax-capable modems, which is shared by 40 employees dialing out of the headquarters LAN using the Cisco DialOut Utility software. See Figure 225 for the network topology.

Figure 225 Modem Pooling Used for Bidirectional Dialing



The following hardware configuration is used on the Cisco AS5300:

- One 4-port T1 PRI card
- Two 48-port cards containing fourteen 6-port MICA 56K modem modules and two 6-port MICA fax capable modem modules

Complete the following steps to configure physical partitioning with dial-in and dial-out capability:

Step 1 Create the 56K modem pool for the 400 remote salespeople. This modem pool contains 84 modems, which are reserved for the dial-in calls. To get access, the salespeople dial the DNIS 5553333. The total number of simultaneous calls is limited to 84. The 85th call and above is rejected. The **modem dialin** line configuration command is used to prevent modems 1 to 84 from dialing out.

```

as5300# configure terminal
    
```

```

Enter configuration commands, one per line. End with CNTL/Z.
as5300(config)# modem-pool 56ksalesfolks
as5300(config-modem-pool)# pool-range 1-84
as5300(config-modem-pool)# called-number 5553333 max-conn 84
as5300(config-modem-pool)# exit
as5300(config)# line 1 84
as5300(config-line)# modem dialin
as5300(config-line)# transport input all
as5300(config-line)# rotary 1
as5300(config-line)# autoselect ppp
as5300(config-line)# exit
as5300(config)#

```

- Step 2** Create the dial-out/ fax-out modem pool for the 40 local employees connected to the headquarters LAN. This modem pool contains 12 fax-capable MICA modems. No DNIS is assigned to the pool. Because lines 85 to 96 are used for the fax-out/ dial-out modem services, the async lines are configured for reverse telnet. This is needed for the telnet extensions to work with the dial-out application, which is installed on the LAN PCs.

```

as5300(config)# modem-pool dialoutfolks
as5300(config-modem-pool)# pool-range 85-96
as5300(config-modem-pool)# exit
as5300(config)# line 85-96
as5300(config-line)# refuse-message z [!NMM!] No Modems Available z
as5300(config-line)# exec-timeout 0 0
as5300(config-line)# autoselect during-login
as5300(config-line)# autoselect ppp
as5300(config-line)# modem inout
as5300(config-line)# rotary 1
as5300(config-line)# transport preferred telnet
as5300(config-line)# transport input all
as5300(config-line)# exit
as5300(config)#

```

- Step 3** Configure the group asynchronous interface, which assigns core protocol characteristics to all the asynchronous interfaces in the system. Regardless of the direction that the modems are dialing, all modems in the access server leverage this group asynchronous configuration.

```

as5300(config)# interface group-async 1
as5300(config-if)# ip unnumbered ethernet 0
as5300(config-if)# encapsulation ppp
as5300(config-if)# async mode interactive
as5300(config-if)# ppp authentication chap pap paplocal
as5300(config-if)# peer default ip address pool bidir_dial_pool
as5300(config-if)# no cdp enable
as5300(config-if)# no ip mroute cache
as5300(config-if)# no ip route cache
as5300(config-if)# async dynamic routing
as5300(config-if)# async dynamic address
as5300(config-if)# group range 1-96
Building configuration...
as5300(config-if)# exit
as5300(config)#

```

- Step 4** Create an IP address pool for all the dial-in clients and dial-out clients. Both types of clients borrow addresses from this shared pool.

```

as5300(config)# ip local pool bidir_dial_pool 10.4.1.1 10.4.1.96
as5300(config)# ^z
as5300# copy running-config startup-config

```

Step 5 (Optional) If you are using CiscoSecure AAA and a remote TACACS server, the following security statements must be included on the access server:

```

aaa new-model
aaa authentication login default tacacs+
aaa authentication login noaaa local
aaa authentication login logintac tacacs+
aaa authentication ppp ppttac tacacs+
aaa authentication ppp paplocal local
aaa authorization exec tacacs+
aaa authorization network tacacs+
aaa authorization reverse-access tacacs+
aaa accounting exec start-stop tacacs+
aaa accounting network start-stop tacacs+
aaa accounting update newinfo
enable password cisco
    
```

You should also include the host name, timeout interval, and authentication key:

```

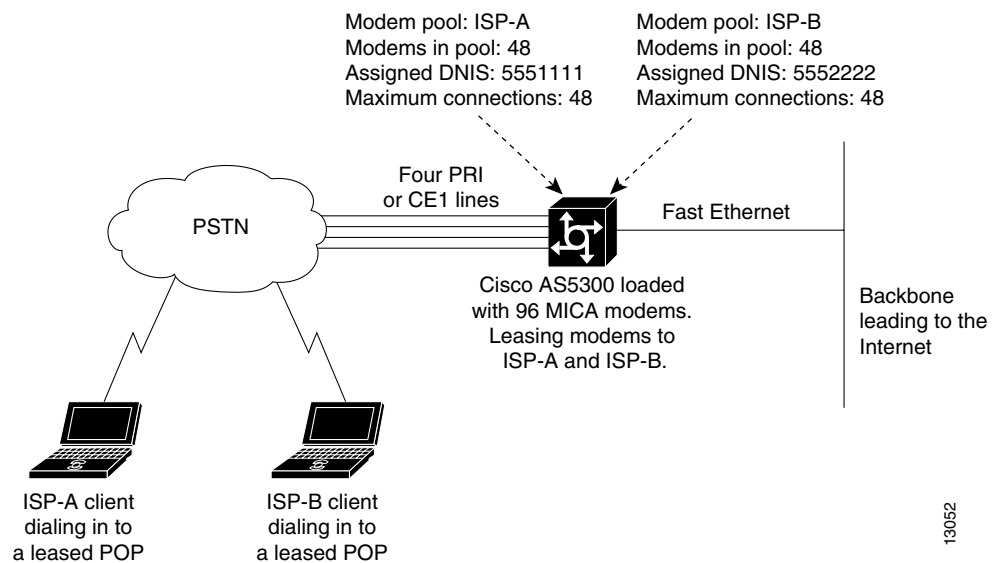
tacacs-server host 10.4.1.10
tacacs-server timeout 20
tacacs-server key nas1
    
```

Virtual Partitioning Scenario

Virtual partitioning creates one large modem pool on one access server, but assigns different DNIS numbers to different customers. Each incoming DNIS consumes resources from the same modem pool, but a maximum connect option is set for each DNIS.

Figure 226 shows two ISP customers leasing modems from another service provider. Each ISP is assigned its own DNIS number and range of modems. Each ISP is guaranteed a certain number of physical modem ports for simultaneous connections. After an ISP uses up all the modems assigned to its DNIS, a busy signal is issued.

Figure 226 Modem Pooling Using Virtual Partitioning



13052

Virtual partitioning essentially resells modem banks to customers, such as a small size ISP. However, keep in mind that modem pooling is a single chassis solution, not a multichassis solution. Modem pooling is not a solution for reselling ports on a large scale basis.

Virtual Partition Example

The following example creates one modem pool on a Cisco AS5300 for two ISP customers. The shared modem pool is called `isp56kpool`. However, both ISP customers are assigned different DNIS numbers and limited to a maximum number of simultaneous connections.

See Figure 226 for the network topology.

The following hardware configuration is used on the Cisco AS5300:

- One 4-port T1 PRI card
- Two 48-port cards containing sixteen 6-port MICA 56K modem modules

Perform the following steps to configure virtual partitioning:

Step 1 Enter global configuration mode:

```
as5300# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
as5300(config)
```

Step 2 Create the shared modem pool for the 56K MICA modem services. This modem pool is called `isp56kpool`, which spans across sixteen 6-port MICA 56K modem modules.

```
as5300(config)# modem-pool isp56kpool
as5300(config-modem-pool)#
```

Step 3 Assign all the modems to the modem pool using the **pool-range number-number** command. Use the **show line EXEC** command to determine your TTY line numbering scheme.

```
as5300(config-modem-pool)# pool-range 1-96
```

Step 4 Assign a unique DNIS to each ISP customer using the **called-number number [max-conn number]** command. In this example, the **max-conn number** option limits each ISP to 48 simultaneous connections. The 49th user to dial either DNIS will get busy signal.

```
as5300(config-modem-pool)# called-number 5551111 max-conn 48
as5300(config-modem-pool)# called-number 5552222 max-conn 48
```

Step 5 Return to EXEC mode by pressing **CTRL Z**. After you do this, display the modem pool configuration with the **show modem-pool** command. In this example, all the 56K modems are in the `isp56kpool` modem pool. The output also shows two DNIS numbers configured: 5551111 and 5552222.

```
as5300(config-modem-pool)# ^Z
as5300# show modem-pool
modem-pool: System-def-Mpool
modems in pool: 0   active conn: 0
0 no free modems in pool

modem-pool: isp56kpool
modems in pool: 96  active conn: 0
0 no free modems in pool
called_party_number: 5551111
max conn allowed: 48, active conn: 0
0 max-conn exceeded, 0 no free modems in pool
```

```
called_party_number: 5552222
max conn allowed: 48, active conn: 0
0 max-conn exceeded, 0 no free modems in pool

as5300# copy running-config startup-config
```

Change Modem Configuration

You can automatically change the running configuration for external modems (not embedded in modem cards) by issuing a single command. Additionally, you can change an integrated modem's running configuration by sending individual AT commands:

- Changing Automatically for Externally Attached Modems
- Changing Manually by Sending AT Commands to Integrated Modems

Changing Automatically for Externally Attached Modems

The Cisco IOS software can issue initialization strings automatically for most types of modems externally attached to an access server. A modem initialization string is a series of parameter settings that are sent to your modem to configure it to interact with the access server in a specified way. The Cisco IOS software defines seven initialization strings that have been found to properly initialize most modems so that the modems function properly with Cisco access servers. These initialization strings have the following names:

- Codex_3260
- Usr_courier
- Usr_sportster
- Hayes_optima
- Global_village
- Viva
- Telebit_t3000

Note Internal or integrated modems, such as those used by the Cisco AS5200 and Cisco AS5300, are preconfigured by Cisco Systems and do not need to be initialized.

If you do not know which of these modem strings is appropriate for your modems, issue the **modem autoconfigure discovery** line configuration command, as shown in the following example:

```
2511# configure terminal
2511(config)# line 1 16
2511(config-line)# modem autoconfigure discovery
2511(config-line)# Ctrl-Z
2511# copy running-config startup-config
```

The Cisco IOS software first tries the first of these strings to see if the modem initializes properly. If not, the Cisco IOS software cycles to the next string and repeats the process until the appropriate string is found. If none of the strings properly initializes the modem, you must manually configure the modem.

If you know that your modem can be configured using an initialization string from one of these scripts, you can issue the **modem autoconfigure type** *modem-name* command, where *modem-name* is one of the strings in the preceding list. If you list a specific modem type, initialization proceeds more quickly.

To display the list of modems for which the router has modem string entries, issue the **show modemcap** command. You can change a modem value that was returned from the **show modemcap EXEC** command. For example, you might want to add the factory default, **&F**, entry to the configuration file. To do this, enter the **modemcap edit** *modem-name attribute value* line configuration command. Configure one attribute of one modem at a time.

The following example shows how to enter line configuration mode and issue the **modem autoconfigure type** *modem-name* command for a US Robotics Sportster modem.

```
2511(config-line)# modem autoconfigure type usr_sportster
```

For more information about the recommended strings for any type of modem, refer to the section “Sample Modem Strings” in the appendix “Configuring Modem Support and Chat Scripts” in the *Dial Solutions Command Reference*. If you have access to Cisco Connection Online (CCO), you can also access the following URL for more information (which is subject to change without notice):

<http://www.cisco.com/warp/customer/76/4.html>

Changing Manually by Sending AT Commands to Integrated Modems

Manageable Microcom modems have an out-of-band feature, which is used to poll modem statistics and transmit AT commands. The Cisco IOS software uses a direct connect session to transfer information through this out-of-band feature. To send AT commands to a Microcom modem, you must permit a direct connect session for a specified modem, open a direct connect session, send AT commands to a modem, and clear the directly connected session from the modem when you are finished.

Note This section does not describe how to send AT commands to MICA digital modems. If your system uses MICA modems, refer to the publication *AT Command Set and Register Summary for MICA Six-Port Modules*.

Open a direct connect session by issuing the **modem at-mode** *slot/port* command in Privileged EXEC mode. From here, you can transmit AT commands directly from your terminal session window to the internal Microcom modems. Most incoming or outgoing calls on the modems are not interrupted when you open a direct connect session and transmit AT commands. However, some AT commands interrupt a call—for example, the **ATH** command, which hangs up a call. Open and close one direct connect session at a time. Beware that multiple open sessions slow down modem performance.

Refer to the AT command set that came with your router for a complete list of AT commands that you can transmit to the modems.

For Microcom modems, you can clear or terminate an active directly connected session in two ways:

- Press **Ctrl-C** after transmitting all AT commands as instructed by the system when you enter AT command mode.
- Enter a second Telnet session and enable the **clear modem at-mode** *slot/port* command in EXEC configuration mode. This method is used for closing a directly connected session that may have been mistakenly left open by the first Telnet session.

Transmit AT Command Example

The following example opens a directly connected session on modem 1/1, enters AT command mode on modem 1/1, and transmits the **at%v** and **at\s** commands via the out-of-band feature on modem 1/1:

```
router# modem at-mode 1/1
You are now entering AT command mode on modem (slot 1 / port 1).
Please type CTRL-C to exit AT command mode.
at%v

MNP Class 10 V.34/V.FC Modem Rev 1.0/85

OK
at\s

IDLE          000:00:00
LAST DIAL

NET ADDR:     FFFFFFFF
MODEM HW: SA 2W United States
4 RTS 5 CTS 6 DSR - CD 20 DTR - RI
MODULATION    IDLE
MODEM BPS     28800  AT%G0
MODEM FLOW    OFF    AT\G0
MODEM MODE    AUT    AT\N3
V.23 OPR.     OFF    AT%F0
AUTO ANS.     ON     AT$0=1
SERIAL BPS    115200 AT%U0
BPS ADJUST    OFF    AT\J0
SPT BPS ADJ.  0      AT\W0
ANSWER MESSGS ON     ATQ0
SERIAL FLOW   BHW    AT\Q3
PASS XON/XOFF OFF    AT\X0
PARITY        8N     AT
```

The manageable modem returns “OK” if the AT command you transmit is successfully enabled.

Clear a Direct Connect Session from a Second Telnet Session Example

The following examples are for Microcom modems.

The following example shows how to execute the **modem at-mode** command from a Telnet session:

```
router# modem at-mode 1/1
```

The following example shows how to execute the **clear modem at-mode** command from a second Telnet session while the first Telnet session is connected to the modem:

```
router# clear modem at-mode 1/1
clear "modem at-mode" for modem 1/1 [confirm] <press Return>
router#
```

The following output is displayed in the first Telnet session after the modem is cleared by the second Telnet session:

```
Direct connect session cleared by vty0 (171.69.1.164)
```

Verify Connection Speed Performance

Making sure that your modems are connecting at the correct connection speeds is an important aspect of managing modems. To display modem connection speed statistics for a specific modem or range of modems, use the following EXEC commands:

Step	Command	Purpose
1	show modem connect-speeds [<i>max-speed</i> [<i>slot</i>]]	Displays connection speed statistics for all the modems.
2	show modem [<i>slot/port</i> <i>group number</i>]	Displays a high-level performance report for all the modems or a single modem. You must type in the forward slash.

These commands also provide performance information to investigate possible bad or corrupt modems or T1/E1 lines. For example, suppose you have an access server that is fully populated with V.34 modems. If you notice that modem 1/0 is only getting V.34 connections 50% of the time, whereas all the other modems are getting V.34 connections 80% of the time, then modem 1/0 is probably malfunctioning or bad. If you are reading low connection speeds across all the modems, you may have a faulty channelized T1 or ISDN PRI line connection.

To display connection speed information for all modems running in your system, use the **show modem connect-speeds** *max-speed* EXEC command. Because most terminal screens are not wide enough to display the entire range of connection speeds at one time (for example, 75 to 56000 bps), the *max-speed* variable is used. This variable specifies the contents of a shifting baud-rate window, which provides you with a snap shot of the modem connection speeds for your system. Replace the *max-speed* argument with the maximum connect speed that you want to view. You can specify from 12000 to 56000 bps. If you are interested in viewing a snap shot of lower baud rates, specify a lower connection speed. If you are interested in viewing a snap shot of higher baud rates, specify a higher connection speed.

See the *Dial Solutions Command Reference* for a complete description of each of the fields displayed in the following example:

```
router# show modem connect-speeds 33600

transmit connect speeds

Mdm   14400  16800  19200  21600  24000  26400  28800  31200  33600  TotCnt
* 0/0      0      0      0      0      0      0      4      4      1      9
* 0/1      2      0      0      0      0      0      3      3      1      9
  0/2      2      0      0      0      0      1      2      4      1     10
* 0/3      0      0      0      1      0      0      3      4      1      9
* 0/4      1      0      0      0      0      2      2      1      1      7
* 0/5      0      0      0      0      0      0      4      4      1      9
* 0/6      0      0      0      0      0      1      3      3      1      8
* 0/7      0      0      0      2      0      0      4      3      1     10
* 0/8      2      0      0      0      0      0      3      4      1     10
* 0/9      0      0      0      0      0      0      4      3      0      7
* 0/10     1      0      0      0      0      1      3      2      1      8
* 0/11     0      0      0      0      0      0      4      3      1      8
  0/12     1      0      0      0      0      0      4      2      1      8
* 0/13     0      0      0      0      0      0      4      2      1      7
* 0/14     1      0      0      0      0      1      2      2      1      7
* 0/15     0      0      0      0      0      0      4      2      1      7
* 0/16     0      0      0      1      0      0      3      2      1      7
* 0/17     1      0      0      0      0      0      4      2      1      8
* 0/18     1      0      0      0      0      0      3      3      1      8
* 0/19     0      0      0      0      0      0      5      3      1      9
* 0/20     0      0      0      0      0      0      4      2      1      7
```

Verify Connection Speed Performance

* 0/21	1	0	0	0	0	0	4	2	0	7
* 0/22	0	0	0	0	0	0	7	9	1	17
* 0/23	0	0	0	0	0	2	2	3	1	8
* 2/0	0	0	0	1	0	0	3	3	1	8
* 2/1	0	0	0	0	0	0	5	2	1	8
* 2/2	0	0	0	1	0	0	4	1	1	7
* 2/3	1	0	0	0	0	0	4	2	1	8
* 2/4	0	0	0	0	0	0	5	2	1	8
* 2/5	0	0	0	0	0	0	4	3	1	8
* 2/6	0	0	0	0	0	0	3	2	1	6
* 2/7	1	0	0	0	0	1	3	2	0	7
* 2/8	1	0	0	0	0	0	3	2	1	7
* 2/9	0	0	0	0	0	1	3	2	1	7
* 2/10	2	0	0	0	0	2	1	0	1	6
* 2/11	0	0	0	1	0	1	3	5	1	11
* 2/12	0	0	0	0	0	0	5	2	1	8
* 2/13	1	0	0	0	0	0	5	0	1	7
* 2/14	1	0	0	0	0	0	3	3	1	8
* 2/15	1	0	0	0	0	1	2	3	1	8
* 2/16	0	0	0	0	0	0	4	3	1	8
* 2/17	0	0	0	0	0	0	5	11	0	16
* 2/18	0	0	0	1	0	1	1	2	1	6
* 2/19	0	0	0	0	0	0	2	3	1	6
* 2/20	1	0	0	0	0	2	3	9	1	16
* 2/21	1	0	0	0	0	0	4	1	1	7
* 2/22	0	0	0	1	0	0	2	3	1	7
* 2/23	0	0	0	0	0	1	3	3	1	8
Tot	23	0	0	9	0	18	165	141	44	400
Tot %	5	0	0	2	0	4	41	35	11	

receive connect speeds

Mdm	14400	16800	19200	21600	24000	26400	28800	31200	33600	TotCnt
* 0/0	0	0	0	0	0	4	1	3	1	9
* 0/1	2	0	0	0	0	3	1	2	1	9
0/2	2	0	0	0	0	3	1	3	1	10
* 0/3	0	0	0	1	0	3	4	0	1	9
* 0/4	1	0	0	0	0	4	0	1	1	7
* 0/5	0	0	0	0	0	4	3	1	1	9
* 0/6	0	0	0	0	0	4	0	3	1	8
* 0/7	0	0	0	2	0	4	1	2	1	10
* 0/8	2	0	0	0	0	3	0	5	0	10
* 0/9	0	0	0	0	0	4	2	0	1	7
* 0/10	1	0	0	0	0	4	0	2	1	8
* 0/11	0	0	0	0	0	4	0	3	1	8
0/12	1	0	0	0	0	2	2	2	1	8
* 0/13	0	0	0	0	0	4	1	1	1	7
* 0/14	1	0	0	0	0	2	3	0	1	7
* 0/15	0	0	0	0	0	4	1	1	1	7
* 0/16	0	0	0	1	0	3	2	0	1	7
* 0/17	1	0	0	0	0	4	1	1	1	8
* 0/18	1	0	0	0	0	3	2	1	1	8
* 0/19	0	0	0	0	0	5	1	2	1	9
* 0/20	0	0	0	0	0	4	0	3	0	7
* 0/21	1	0	0	0	0	4	0	1	1	7
* 0/22	0	0	0	0	0	6	6	4	1	17
* 0/23	0	0	0	0	0	4	2	1	1	8
* 2/0	0	0	0	1	0	3	1	2	1	8
* 2/1	0	0	0	0	0	3	3	1	1	8
* 2/2	0	0	0	1	0	4	0	1	1	7
* 2/3	1	0	0	0	0	3	2	1	1	8
* 2/4	0	0	0	0	0	4	2	1	1	8
* 2/5	0	0	0	0	0	4	1	2	1	8
* 2/6	0	0	0	0	0	3	0	3	0	6
* 2/7	1	0	0	0	1	2	2	0	1	7

* 2/8	1	0	0	0	0	3	0	2	1	7
* 2/9	0	0	0	0	0	4	1	1	1	7
* 2/10	2	0	0	0	0	3	0	0	1	6
* 2/11	0	0	0	1	0	3	1	5	1	11
* 2/12	0	0	0	0	0	4	3	0	1	8
* 2/13	1	0	0	0	0	2	3	0	1	7
* 2/14	1	0	0	0	0	3	2	1	1	8
* 2/15	1	0	0	0	0	3	0	3	1	8
* 2/16	0	0	0	0	0	4	0	4	0	8
* 2/17	0	0	0	0	0	5	2	8	1	16
* 2/18	0	0	1	0	0	2	1	1	1	6
* 2/19	0	0	0	0	0	2	2	1	1	6
* 2/20	1	0	0	0	0	4	2	8	1	16
* 2/21	1	0	0	0	0	4	0	1	1	7
* 2/22	0	0	1	0	0	2	0	3	1	7
* 2/23	0	0	0	0	0	4	2	1	1	8
Tot	23	0	2	7	1	167	64	92	44	400
Tot %	5	0	0	1	0	41	16	23	11	

The following example shows the connection statistics for modem 1/2, which is a V.34 Microcom modem. See the *Dial Solutions Command Reference* for a complete description of each of the fields displayed by the **show modem** command:

```
router# show modem 1/2
Mdm Typ Status Tx/Rx G Duration TX RX RTS CTS DSR DCD DTR
1/2 V34 Idle 26400/28800 1 00:18:42 x x x x
```

```
Modem 1/2, Microcom (Select), Async3, TTY3
Firmware (Boot) Rev: 3.1(30) (3.0(4))
DSP Controller (SPX) Rev: 1.1(0) (1.1(0))
Modem config: Incoming and Outgoing
Protocol: reliable/LAPM, Compression: V42bis
Management port config: Status polling and AT session
Management port status: Status polling and AT session
TX signals: -13 dBm, RX signals: -19 dBm
```

```
Last clearing of "show modem" counters never
122 incoming completes, 6 incoming failures
0 outgoing completes, 0 outgoing failures
0 failed dial attempts, 0 ring no answers, 0 busied outs
0 no dial tones, 0 dial timeouts, 0 watchdog timeouts
6 no carriers, 0 link failures, 2 resets, 0 recover oob
0 protocol timeouts, 0 protocol errors, 0 lost events
```

Transmit Speed Counters:

```
Connection Speeds      75      300      600      1200      2400      4800
# of connections      0        0        0        0        0        0
Connection Speeds     7200     9600    12000    14400    16800    19200
# of connections      0        0        1        1        2        3
Connection Speeds    21600    24000    26400    28800    31200    32000
# of connections      18       13       51       32       1        0
Connection Speeds    33600    34000    36000    38000    40000    42000
# of connections      0        0        0        0        0        0
Connection Speeds    44000    46000    48000    50000    52000    54000
# of connections      0        0        0        0        0        0
Connection Speeds    56000
# of connections      0
```

Receive Speed Counters:

```
Connection Speeds      75      300      600      1200      2400      4800
# of connections      0        0        0        0        0        0
Connection Speeds     7200     9600    12000    14400    16800    19200
```

Verify Connection Speed Performance

```

# of connections          0          0          1          1          0          3
Connection Speeds        21600      24000      26400      28800      31200      32000
# of connections          2          16         60         39         0          0
Connection Speeds        33600      34000      36000      38000      40000      42000
# of connections          0          0          0          0          0          0
Connection Speeds        44000      46000      48000      50000      52000      54000
# of connections          0          0          0          0          0          0
Connection Speeds        56000
# of connections          0

```

The next example shows example output for the **show modem** command. See the *Dial Solutions Command Reference* for a complete description of each of the fields displayed by the **show modem** command:

```

router# show modem
      Mdm  Usage  Inc calls  Out calls  Busied  Failed  No  Succ
      Mdm  Usage  Succ  Fail  Succ  Fail  Out  Dial  Answer  Pct.
* 1/0    37%    98     4     0     0     0     0     0     96%
  1/1    38%    98     2     0     0     0     0     0     98%
  1/2    35%   122     6     0     0     0     0     0     95%
  1/3    37%   104     4     0     0     0     0     0     96%
* 1/4    39%   104     5     0     0     0     1     1     95%
* 1/5    37%    96     4     0     0     0     0     0     96%
* 1/6    37%   120     6     0     0     0     0     0     95%
  1/7    34%   130     5     0     0     0     0     0     96%
  1/8    39%   111     6     0     0     0     1     1     94%
  1/9    37%   108     4     0     0     0     0     0     96%
* 1/10   39%   115     8     0     0     0     0     0     93%
* 1/11   37%    86     3     0     0     0     0     0     96%
* 1/12   38%   121     3     0     0     0     1     1     97%
  1/13   35%   107     6     0     0     0     0     0     94%
* 1/14   37%    92     5     0     0     0     0     0     94%
  1/15   41%   106     9     0     0     0     0     0     92%
  1/16   35%   112     6     0     0     0     0     0     94%
  1/17   39%   101     3     0     0     0     0     0     97%
  1/18   40%   102     7     0     0     0     0     0     93%
  1/19   37%    93     3     0     0     0     0     0     96%
  1/20   42%    97     4     0     0     0     0     0     96%
  1/21   38%    86     5     0     0     0     0     0     94%
* 1/22   40%   104    10     0     0     0     0     0     91%
  1/23   41%    76     5     0     0     0     0     0     93%

```

Collect Modem Statistics

There are many commands that enable you to display or poll various modem statistics. To show modem performance statistics, perform the following tasks in EXEC mode:

Step	Command	Purpose
1	show modem [<i>slot/port</i> group number]	Show various performance statistics for a modem or group of modems.
2	show modem csm [<i>slot/port</i> group number]	Show the call-switching module status for a modem or group of modems.
3	show modem log [<i>slot/port</i> group number] ¹	Show the event log status for a modem or group of modems.
4	show modem summary ¹	Display the cumulative system statistics for all modems installed in the access server.
5	show modem at-mode ¹	Display all the active direct connect AT sessions for Microcom modems.

1. This command does not apply to basic modems.

Manageable Microcom modems have an out-of-band feature, which is used for polling modem statistics. To configure the system to poll for modem statistics, perform the tasks in the following task table. Unless otherwise specified, all tasks are performed in global configuration mode.

Step	Command	Purpose
1	modem poll time <i>seconds</i>	Specify the number of seconds between statistical modem polling for Microcom modems. The default is 12 seconds. The configuration range is 2 to 120 seconds.
2	modem poll retry <i>number</i>	Set maximum number of polling attempts to Microcom modems. The default is three polling attempts. The configuration range is from 0 to 10 attempts. ¹
3	modem status-poll	In line configuration mode, poll for a Microcom modem's status and statistics.
4	modem buffer-size <i>number</i>	Define the number of modem events that each modem is able to store. The default is 100 events for each modem. Use the show modem log command to view modem events.

1. If the number of attempts to retrieve modem status or statistics exceeds the number you define, the out-of-band feature is removed from operation. In this case, you must reset the modem hardware using the **clear modem** command.

Show Modem Example

The following example shows example output for the **show modem** command:

```
router# show modem
      Inc calls      Out calls      Busied      Failed      No      Succ
      Mdm  Usage    Succ  Fail    Succ  Fail    Out    Dial    Answer  Pct.
* 1/0   17%     74   3     0    0     0     0     0     96%
* 1/1   15%     80   4     0    0     0     1     1     95%
* 1/2   15%     82   0     0    0     0     0     0    100%
      1/3   21%     62   1     0    0     0     0     0     98%
      1/4   21%     49   5     0    0     0     0     0     90%
* 1/5   18%     65   3     0    0     0     0     0     95%
* 1/6   19%     58   2     0    0     0     0     0     96%
* 1/7   17%     67   5     0    0     0     1     1     93%
* 1/8   20%     68   3     0    0     0     0     0     95%
      1/9   16%     67   2     0    0     0     0     0     97%
```

Collect Modem Statistics

1/10	18%	56	2	0	0	0	1	1	96%
* 1/11	15%	76	3	0	0	0	0	0	96%
* 1/12	16%	62	1	0	0	0	0	0	98%
1/13	17%	51	4	0	0	0	0	0	92%
1/14	16%	51	5	0	0	0	0	0	91%
1/15	17%	65	0	0	0	0	0	0	100%
1/16	15%	73	3	0	0	0	0	0	96%
1/17	17%	67	2	0	0	0	0	0	97%
1/18	17%	61	2	0	0	0	0	0	96%
* 1/19	17%	74	2	0	0	0	0	0	97%
1/20	16%	65	1	0	0	0	0	0	98%
* 1/21	16%	58	3	0	0	0	0	0	95%
* 1/22	18%	56	4	0	0	0	0	0	93%
* 1/23	20%	60	4	0	0	0	0	0	93%

Show Modem Summary Example

You can display a high level summary of the modems' performance with the **show modem summary** command:

```
router# show modem summary
          Incoming calls      Outgoing calls      Busied      Failed      No      Succ
Usage     Succ  Fail Avail      Succ  Fail Avail      Out      Dial  Ans  Pct.
  14%  2489   123   15         0     0   15         0         3    3   95%
```

Show Modem Log Example

The following example shows the event log status for a manageable modem. It also identifies the time elapsed since each modem event was performed (for example, 01:02:41 means the modem event occurred 1 hour, 2 minutes, and 41 seconds ago):

```
router# show modem log 0/0
Modem 0/0 Events Log:
01:03:03: Startup Response: Microcom MNP10 K56 Modem (Select)
          Modem (boot) firmware = 3.1(16) (3.0(4))
          DSP Controller (SPX) rev = 204.173(0) (143.191(0))
01:03:03: Control Reply: 0xFF1F
01:03:03: RS232 event: RTS noDTR* CTS* DSR* noDCD* noRI noTST
01:03:03: RS232 event: RTS noDTR CTS DSR noDCD noRI noTST
01:03:03: Modem State event: Idle
01:03:03: End connection event: Retransmits for MNP block (TX/RX) = 0/0
          Duration = 0:00:00, Number of TX/RX char = 0/0
          Local Disc Reason = Lost Carrier
          Remote Disc Reason = Unknown
01:03:04: Phone number event:
01:02:51: DTR event: DTR On
01:02:51: RS232 event: RTS DTR* CTS DSR noDCD noRI noTST
00:39:52: Startup Response: Microcom MNP10 K56 Modem (Select)
          Modem (boot) firmware = 3.1(16) (3.0(4))
          DSP Controller (SPX) rev = 1.1(0) (1.1(0))
```

Show Modem AT-Mode Example

The following example shows that modem 1/1 has one open AT directly connected session:

```
router# show modem at-mode
Active AT-MODE management sessions:
Modem      User's Terminal
1/1 0 cty 0
```

Time Interval Example

The following example sets the time interval between polls to 10 seconds using the **modem poll time** configuration command:

```
router# configure terminal
router(config)# modem poll time 10
```

Modem Polling Example

The following example enables modem status polling through the out-of-band feature, which is associated to line 1:

```
router# configure terminal
router(config)# line 1
router(config-line)# modem status-poll
```

Polling Attempts Example

The following example configures the server to attempt to retrieve statistics from a local modem up to five times before discontinuing the polling effort:

```
router# configure terminal
router(config)# modem poll retry 5
```

Automatically Run a Modem Diagnostics Test

You can automatically run a diagnostics test for on modems inside access servers, such as a Cisco AS5300 loaded with Microcom modems. Modems that fail the test are automatically busied out of service. To do this, issue the **modem autotest** global configuration command, which is described in the following sections:

- How It Works
- Preliminary Usage Guidelines
- Set Up the Modem Autotest
- Modem Autotest Example
- Manually Isolating a Back-to-Back Modem Test Example

Note The modem autotest feature is not supported on the Cisco 3600 series routers populated with MICA digital modem cards. However, the Cisco 3600 series does support a limited power on startup test, which automatically removes inoperable modems from dial-up services.

How It Works

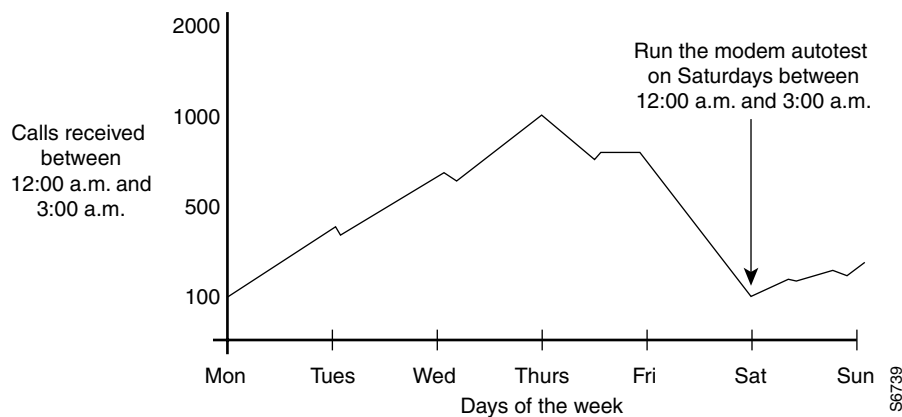
The access server or router performs the test by automatically conducting a series of back-to-back connections and data transfers between two internal modems. The data transfer consists of sending one packet that is 10-bytes large between two modems. All modem test connections occur inside the system. A modem involved in a back-to-back modem test is temporarily marked as busy, which means the modem will not accept a call while the test is running.

If all modems are currently active and the modem autotest is activated, the test will wait until at least two modems drop their calls and become available. The modem auto test moves on to test a second pair of modems as soon as two additional modems become available, and so on. To disable the modem autotest at any time, issue the **no modem autotest** command.

Preliminary Usage Guidelines

We recommend that you set the modem autotest to run during off-peak hours. This provides maximum access to your remote users. For example, if you are an Internet service provider and your peak dial-in hours are between 5:00 p.m. and 12:00 p.m. on weekdays, configure the test to run automatically at 3:00 a.m. on Saturday mornings. Bad or inoperable modems detected by the test will automatically be busied out. See Figure 227.

Figure 227 Sample Demand Curve for Dial Access



There are specific syntax functions used for the **modem autotest time hh:mm [interval#]** command. The required **time hh:mm** parameter specifies the start time to initiate the test in hours and minutes (hh:mm; for example 1:00 a.m. is specified as 01:00). By default, the test runs once every 24 hours when enabled. The modem autotest feature synchronizes its timing with the access server's internal clock. The **interval#** parameter gives you the opportunity to specify which day and hour of the week you want the test to run. In place of the interval parameter specify the hour that you want to start the test, which can be between 1 and 168 hours ahead of the current time. For example, suppose that today is Friday and the current time on the access server is 3:00 p.m. If you want the test to run once every Saturday at 3:00 a.m., enter the **modem autotest time 03:00 168** command (03:00 = 3:00 a.m. in military time; 168 = 7 days).

Use the **show clock EXEC** command to determine the current time set on the access server.

Use the **show modem test EXEC** command to see the results of the modem autotest. This command displays which modems were tested and the results of the test. You can also use the **show modem EXEC** command to see which modems are marked bad by the **modem autotest** command. To disable the test at any time, issue the **no modem autotest** command.

Set Up the Modem Autotest

To set up the modem autotest, perform the following tasks beginning in EXEC mode:

Step	Command	Purpose
1	show clock	Take note of the current time set on the access server or router. The modem autotest synchronizes with this time. Be sure this clock matches the current actual time in your time zone.
2	configure terminal	Enter global configuration mode.
3	modem autotest time <i>hh:mm [interval]</i>	Specify the time you want the modem test to automatically begin. Express it in hours and minutes in military time. ¹
4	modem autotest minimum <i>modem</i>	Set the minimum number of modems that will remain untested and available to accept calls during each test cycle. The default is six modems.
5	modem autotest error <i>threshold</i>	Specify a maximum consecutive modem error count that will trigger the modem autotest. You can configure the system to watch for between 3 and 50 errors before the modem autotest begins. To view the list of monitored errors, issue the show modem call-stats command.
6	exit	Return to EXEC mode.
7	show modem test	Display the results of the modem autotest after it has run.
8	show modem	Display the complete list of which modems are marked bad versus good. ²

1. Do not forget to include the required colon (:) between the hours parameter (hh) and the minutes parameter (mm).

2. Inoperable or bad modems are marked with a "B" appearing before the slot/port.

Modem Autotest Example

The following example shows how to set the modem autotest to run once per week on Tuesdays at 3:00 a.m. Additionally, the autotest will activate if the system detects a modem error count higher than 40 errors.

Step 1 Use the **set clock** EXEC command to determine the current time set on the router or access server. In this example, the time and date set on the following router is 3:00 p.m, Monday, August 25, 1997.

```
router# show clock
*15:00:01.031 EST Aug 25 1997
```

Step 2 Enter global configuration mode and set the modem autotest using the **modem autotest time** command. In this example, the access server is configured to run the modem autotest every Tuesday at 3:00 a.m.

```
router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# modem autotest time 03:00 168
```

Step 3 Configure the autotest to activate if the system detects a high modem error count. In this example, the autotest activates if the system detects a modem error count higher than 40 errors. To view the list of monitored errors, issue the **show modem call-stats** EXEC command.

```
router(config)# modem autotest error 40
router(config)# exit
router#
%SYS-5-CONFIG_I: Configured from console by console
```

router#

Step 4 Display the results of the modem autotest after the test has run through a test cycle by issuing the **show modem test EXEC** command:

```
router# show modem test
Date Time           Modem  Test                Reason                State Result
5/15 07:25:17 AM  1/0    Back-To-Back        TIME INTERVAL        Idle  FAIL
5/15 07:25:17 AM  1/1    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/2    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/3    Back-To-Back        TIME INTERVAL        Idle  FAIL
5/15 07:25:17 AM  1/4    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/5    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/6    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/7    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/8    Back-To-Back        TIME INTERVAL        Idle  PASS
5/15 07:25:17 AM  1/9    Back-To-Back        TIME INTERVAL        Idle  PASS
...
```

Alternatively, you can view which modems were marked bad by the modem autotest by issuing the **show modem EXEC** command. Bad modems are marked by the letter **B**. In this example, modem 1/0 and 1/3 are marked bad, which takes them out of commission and makes them unable to participate in dial services.

```
router# show modem
%SYS-5-CONFIG_I: Configured from console by consolem
          Inc calls      Out calls  Busied   Failed   No       Succ
          Mdm  Usage    Succ    Fail    Succ    Fail    Out     Dial    Answer  Pct.
B 1/0      0%      0      0      0      0      1      0      0      0%
  1/1      0%      0      0      0      0      3      0      0      0%
  1/2      0%      0      0      0      0      1      0      0      0%
B 1/3      0%      0      0      0      0      1      0      0      0%
  1/4      0%      0      0      0      0      1      0      0      0%
  1/5      0%      0      0      0      0      1      0      0      0%
  1/6      0%      0      0      0      0      1      0      0      0%
  1/7      0%      0      0      0      0      1      0      0      0%
  1/8      0%      0      0      0      0      1      0      0      0%
  1/9      0%      0      0      0      0      1      0      0      0%
  1/10     0%      0      0      0      0      1      0      0      0%
  1/11     0%      0      0      0      0      1      0      0      0%
  1/12     0%      0      0      0      0      1      0      0      0%
  1/13     0%      0      0      0      0      1      0      0      0%
  1/14     0%      0      0      0      0      1      0      0      0%
  1/15     0%      0      0      0      0      1      0      0      0%
  1/16     0%      0      0      0      0      1      0      0      0%
  1/17     0%      0      0      0      0      1      0      0      0%
  1/18     0%      0      0      0      0      0      0      0      0%
  1/19     0%      0      0      0      0      0      0      0      0%
  1/20     0%      0      0      0      0      0      0      0      0%
  1/21     0%      0      0      0      0      0      0      0      0%
  1/22     0%      0      0      0      0      0      0      0      0%
  1/23     0%      0      0      0      0      0      0      0      0%
```

Manually Isolating a Back-to-Back Modem Test Example

You can also manually isolate an internal back-to-back connection and data transfer between two modems for focused troubleshooting purposes. For example, if mobile users cannot dial in to modem 2/5 (which is the sixth modem port on the modem board in the second chassis slot), attempt a back-to-back test with modem 2/5 and a modem known to be functioning, such as modem 2/6. To do this, issue the **test modem back-to-back first-slot/port second-slot/port**.

You might need to enable this command on several different combinations of modems to determine which one is not functioning properly. A pair of operable modems successfully connect and complete transmitting data in both directions. An operable modem and an inoperable modem do not successfully connect with each other.

Step 1 Perform a back-to-back modem test between two normal functioning modems. This example shows a successful connection between modem 1/1 and modem 1/0, which verifies normal operating conditions between these two modems.

```
AS5200# test modem back-to-back 1/1 1/0
Repetitions (of 10-byte packets) [1]: 10
AS5200#
%MODEM-5-B2BCONNECT: Modems (1/1) and (1/0) connected in back-to-back test: CONN
ECT9600/REL-MNP
%MODEM-5-B2BMODEMS: Modems (1/0) and (1/1) completed back-to-back test: success/
packets = 20/20
```

After you enter the **test modem back-to-back** command, you must define the number of packets transmitted between modems at the *Repetitions* prompt. The ideal range of packets to transmit and receive is from 1 to 100. The default is 1 packet that is 10-bytes large. The response message (for example, “success/packets = 2/2”) tells you how many packets were successfully sent in *both* directions compared to the total number of packets attempted to be sent in both directions. Because the software reports the packet total in both directions, the reported numbers are *two times* the number you originally specify.

Step 2 However, when modem 1/1 is tested against modem 1/3, the back-to-back modem test fails. Therefore, modem 1/3 is suspected or proven to be inoperable or bad.

```
router# test modem back-to-back 1/1 1/3
Repetitions (of 10-byte packets) [1]: 10
router#
%MODEM-5-BADMODEMS: Modems (1/3) and (1/1) failed back-to-back test: NOCARRIER
```

Step 3 Next, you need to manually mark modem 1/3 as an inoperable or bad modem. To do this, you must first find out which line number corresponds with modem 1/3. By issuing the **show modem 1/3 EXEC** command, you can see that TTY line number 4 (shown as TTY4) is used for modem 1/3.

```
router# show modem 1/3
Mdm Typ Status Tx/Rx G Duration TX RX RTS CTS DSR DCD DTR
1/3 V34 Idle 28800/28800 0 00:00:00 x x x x x
```

```
Modem 1/3, Microcom MNP10 V34 Modem (Managed), TTY4
Firmware (Boot) Rev: 1.0(23) (1.0(5))
Modem config: Incoming and Outgoing
Protocol: reliable/MNP, Compression: V42bis
Management port config: Status polling and AT session
Management port status: Status polling and AT session
TX signals: -15 dBm, RX signals: -17 dBm
```

```
Last clearing of "show modem" counters never
0 incoming completes, 0 incoming failures
0 outgoing completes, 0 outgoing failures
0 failed dial attempts, 0 ring no answers, 1 busied outs
0 no dial tones, 0 dial timeouts, 0 watchdog timeouts
0 no carriers, 0 link failures, 0 resets, 0 recover oob
0 protocol timeouts, 0 protocol errors, 0 lost events
```

Automatically Run a Modem Diagnostics Test

Transmit Speed Counters:

Connection Speeds	75	300	600	1200	2400	4800
# of connections	0	0	0	0	0	0
Connection Speeds	7200	9600	12000	14400	16800	19200
# of connections	0	0	0	0	0	0
Connection Speeds	21600	24000	26400	28800	31200	32000
# of connections	0	0	0	1	0	0
Connection Speeds	33600	34000	36000	38000	40000	42000
# of connections	0	0	0	0	0	0
Connection Speeds	44000	46000	48000	50000	52000	54000
# of connections	0	0	0	0	0	0
Connection Speeds	56000					
# of connections	0					

- Step 4** Enter line configuration mode and manually remove modem 1/3 from dial services by issuing the **modem bad** command on line 4:

```
router# configure terminal
router(config)# line 4
router(config-line)# modem bad
router(config-line)# exit
router(config)# exit
router#
```

- Step 5** You can now issue the **show modem EXEC** command or the **show modem slot/port** command to display the bad modem status.

Bad modems are marked with the letter *B* in the **show modem** command display output:

```
router# show modem
%SYS-5-CONFIG_I: Configured from console by consolem
      Mdm  Usage  Inc calls  Out calls  Busied  Failed  No      Succ
      Mdm  Usage  Succ  Fail  Succ  Fail  Out  Dial  Answer  Pct.
1/0  0%    0    0    0    0    1    0    0    0%
1/1  0%    0    0    0    0    3    0    0    0%
1/2  0%    0    0    0    0    1    0    0    0%
B 1/3  0%    0    0    0    0    1    0    0    0%
1/4  0%    0    0    0    0    1    0    0    0%
1/5  0%    0    0    0    0    1    0    0    0%
1/6  0%    0    0    0    0    1    0    0    0%
1/7  0%    0    0    0    0    1    0    0    0%
1/8  0%    0    0    0    0    1    0    0    0%
1/9  0%    0    0    0    0    1    0    0    0%
1/10 0%    0    0    0    0    1    0    0    0%
1/11 0%    0    0    0    0    1    0    0    0%
1/12 0%    0    0    0    0    1    0    0    0%
1/13 0%    0    0    0    0    1    0    0    0%
1/14 0%    0    0    0    0    1    0    0    0%
1/15 0%    0    0    0    0    1    0    0    0%
1/16 0%    0    0    0    0    1    0    0    0%
1/17 0%    0    0    0    0    1    0    0    0%
1/18 0%    0    0    0    0    0    0    0    0%
1/19 0%    0    0    0    0    0    0    0    0%
1/20 0%    0    0    0    0    0    0    0    0%
1/21 0%    0    0    0    0    0    0    0    0%
1/22 0%    0    0    0    0    0    0    0    0%
1/23 0%    0    0    0    0    0    0    0    0%
```

“Bad” modems are also marked as *Bad* in the Status column of the **show modem slot/port** command’s display output:

```
router# show modem 1/3
Mdm Typ Status Tx/Rx G Duration TX RX RTS CTS DSR DCD DTR
1/3 V34 Bad 28800/28800 0 00:00:00 x x x x x
```

```
Modem 1/3, Microcom MNP10 V34 Modem (Managed), TTY4
Firmware (Boot) Rev: 1.0(23) (1.0(5))
Modem config: Incoming and Outgoing
Protocol: reliable/MNP, Compression: V42bis
Management port config: Status polling and AT session
Management port status: Status polling and AT session
TX signals: -15 dBm, RX signals: -17 dBm
```

```
Last clearing of "show modem" counters never
 0 incoming completes, 0 incoming failures
 0 outgoing completes, 0 outgoing failures
 0 failed dial attempts, 0 ring no answers, 1 busied outs
 0 no dial tones, 0 dial timeouts, 0 watchdog timeouts
 0 no carriers, 0 link failures, 0 resets, 0 recover oob
 0 protocol timeouts, 0 protocol errors, 0 lost events
```

Transmit Speed Counters:

Connection Speeds	75	300	600	1200	2400	4800
# of connections	0	0	0	0	0	0
Connection Speeds	7200	9600	12000	14400	16800	19200
# of connections	0	0	0	0	0	0
Connection Speeds	21600	24000	26400	28800	31200	32000
# of connections	0	0	0	1	0	0
Connection Speeds	33600	34000	36000	38000	40000	42000
# of connections	0	0	0	0	0	0
Connection Speeds	44000	46000	48000	50000	52000	54000
# of connections	0	0	0	0	0	0
Connection Speeds	56000					
# of connections	0					

Display Local Disconnect Reasons

Use the **show modem call-stats [slot]** EXEC command to find out why a modem ended its connection or why a modem is not operating at peak performance.

Local disconnect reasons are listed across the top of the screen display (for example, wdogTimr, compress, retrain, inacTout, linkFail, moduFail, mnpProto, and lapmProt). In the body of the screen display, the number of times each modem disconnected is displayed (see the # column). For a particular disconnect reason, the % column indicates the percent that a modem was logged for the specified disconnect reason with respect to the entire modem pool for that given reason. For example, out of all the times the rmtLink error occurred on all the modems in the system, the rmtLink error occurred 10% of the time on modem 0/22.

Bad or malfunctioning modems are detected by an unusually high number of disconnect counters for a particular disconnect reason. For example, if modem 1/0 had an astronomically high number of compression errors compared to the remaining modems in system, modem 1/0 would probably be bad or inoperable.

To reset the counters displayed by the **show modem call-stats** command, issue the **clear modem counters** command.

Display Local Disconnect Reasons

Note For a complete description of each of the error display fields displayed by the commands on this page, see the *Dial Solutions Command Reference*. Remote disconnect reasons are not described by the **show modem** command.

The following example displays output for the **show modem call-stats** command. Due to the screen size limitation of most terminal screen displays, not all the possible disconnect reasons are displayed at one time. Only the top eight most frequently experienced disconnect reasons are displayed at one time.

```
router# show modem call-stats

dial-in/dial-out call statistics

      lostCarr  dtrDrop  rmtLink  wdogTimr  compress  retrain  inactTout  linkFail
Mdm   #    %    #    %    #    %    #    %    #    %    #    %    #    %
* 0/0   6    2    2    3    1    0    0    0    0    0    0    0    0    0    0
* 0/1   5    2    2    3    2    1    0    0    0    0    0    0    0    0    0
  0/2   5    2    2    3    4    3    0    0    0    0    0    0    0    0    0
* 0/3   5    2    2    3    2    1    0    0    0    0    0    0    0    0    0
* 0/4   5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/5   5    2    2    3    2    1    0    0    0    0    0    0    0    0    0
* 0/6   4    1    2    3    2    1    0    0    0    0    0    0    0    0    0
* 0/7   4    1    2    3    4    3    0    0    0    0    0    0    0    0    0
* 0/8   6    2    1    1    3    2    0    0    0    0    0    0    0    0    0
* 0/9   5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/10  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 0/11  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
  0/12  5    2    2    3    2    1    0    0    0    0    0    0    0    0    0
* 0/13  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/14  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/15  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/16  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/17  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 0/18  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 0/19  5    2    1    1    3    2    0    0    0    0    0    0    0    0    0
* 0/20  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/21  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 0/22  5    2    1    1    11   10   0    0    0    0    0    0    0    0    0
* 0/23  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/0   4    1    2    3    2    1    0    0    0    0    0    0    0    0    0
* 2/1   5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/2   5    2    2    3    0    0    0    0    0    0    0    0    0    0    0
* 2/3   5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/4   5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/5   5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/6   4    1    1    1    1    0    0    0    0    0    0    0    0    0    0
* 2/7   5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 2/8   5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 2/9   4    1    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/10  5    2    1    1    0    0    0    0    0    0    0    0    0    0    0
* 2/11  5    2    1    1    5    4    0    0    0    0    0    0    0    0    0
* 2/12  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/13  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
* 2/14  5    2    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/15  4    1    1    1    3    2    0    0    0    0    0    0    0    0    0
* 2/16  4    1    1    1    3    2    0    0    0    0    0    0    0    0    0
* 2/17  5    2    2    3    9    8    0    0    0    0    0    0    0    0    0
* 2/18  4    1    1    1    1    0    0    0    0    0    0    0    0    0    0
* 2/19  3    1    1    1    2    1    0    0    0    0    0    0    0    0    0
* 2/20  7    3    1    1    8    7    0    0    0    0    0    0    0    0    0
* 2/21  5    2    1    1    1    0    0    0    0    0    0    0    0    0    0
```

Display Local Disconnect Reasons

```

* 2/22    4  1  1  1  2  1  0  0  0  0  0  0  0  0  0  0
* 2/23    5  2  1  1  2  1  0  0  0  0  0  0  0  0  0  0
Total 233      59      110      0      0      0      0

```

dial-out call statistics

Mdm	noCarr		noDitone		busy		abort		dialStrg		autoLgon		dialTout		rmtHgup	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
* 0/0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/7	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/11	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/14	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/16	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/17	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/18	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/19	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/22	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 0/23	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/7	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/8	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/9	4	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0
* 2/10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/11	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/13	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/14	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/16	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/17	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/18	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/19	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/21	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/22	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* 2/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	84		0		0		0		0		0		0		0	

Remove Inoperable Modems

This section describes how to manually remove inoperable or bad modems from dial-up services.

You can perform the following optional tasks in line configuration mode:

Step	Command	Purpose
1	modem bad	Remove and idle modem from service and indicate it as suspected or proven to be inoperable.
2	modem hold-reset	Reset and isolate the modem hardware for extensive troubleshooting.
3	modem busyout	Gracefully disable a modem from dial services.
4	modem shutdown	Abruptly shut down a modem from dial service.
5	modem recovery-time <i>minutes</i>	Set the maximum amount of time the call-switching module waits for a local modem to respond to a request before it is considered locked in a suspended state. The default is five minutes.

If you use the **modem bad** command to remove an idle modem from dial services and mark it as inoperable, the letter *B* is used to identify the modem as bad. You can see the letter *B* for modems that are marked bad by looking at the *Status* column in the **show modem slotport** command's output. Additionally, look at the far left column in the **show modem** command's output. Use the **no modem bad** command to unmark a modem as *B* and restore it for dial-up connection services. If the letter *b* appears next to a modem number, it means the modem was removed from service with the **modem shutdown** command or the **modem busyout** command.

Note Only idle modems can be marked bad by the **modem bad** command. If you want to mark a modem bad that is actively supporting a call, first issued the **modem shutdown** command then issue the **modem bad** command.

Use the **modem hold-reset** command if you are experiencing extreme modem behavior (for example, if the modem is uncontrollably dialing in to the network). This command prevents the modem from establishing software relationships such as those created by the **test modem back-to-back** command and the **modem autotest** command. The modem is unusable while the **modem hold-reset** command is configured. The **modem hold-reset** command also resets a modem that is frozen in a suspended state. Disable the suspended modem with the **modem hold-reset** command, and then restart hardware initialization with the **no modem hold-reset** command.

The following example disables a suspended modem and resets its hardware initialization:

```
router# configure terminal
router(config)# line 4
router(config-line)# modem hold-reset
router(config-line)# no modem hold-reset
```

The following example gracefully disables the modem associated with line 1 from dialing and answering calls. The modem is disabled only after all active calls on the modem are dropped.

```
router# configure terminal
router(config)# line 1
router(config)# modem busyout
```

The following example abruptly shuts down the modem associated with line 2. All active calls on the modem are dropped immediately.

```
router# configure terminal
```

```
router(config)# line 2
router(config)# modem shutdown
```

In the following example, the modem using TTY line 3 is actively supporting a call. However, we want to mark the modem bad because it has poor connection performance. First abruptly shut down the modem and drop the call with the **modem shutdown** command then issue the **modem bad** command to take the modem out of service.

```
router# show modem
```

Mdm	Usage	Inc calls		Out calls		Busied Out	Failed Dial	No Answer	Succ Pct.
		Succ	Fail	Succ	Fail				
1/0	37%	98	4	0	0	0	0	0	96%
1/1	38%	98	2	0	0	0	0	0	98%
* 1/2	2%	3	99	0	0	0	0	0	1%

...

```
router# configure terminal
router(config)# line 3
router(config)# modem shutdown
router(config)# modem bad
router(config)# exit
router# show modem
```

Mdm	Usage	Inc calls		Out calls		Busied Out	Failed Dial	No Answer	Succ Pct.
		Succ	Fail	Succ	Fail				
1/0	37%	98	4	0	0	0	0	0	96%
1/1	38%	98	2	0	0	0	0	0	98%
B 1/2	2%	3	99	0	0	0	0	0	1%

