Configuring the Access Server Manually

This chapter describes how to use the Cisco IOS software command line interface to configure basic access server functionality. Basic access server functionality includes: LAN and WAN configuration (including ISDN PRI and channelized T1 and E1) and modem configuration. Follow the procedures in this chapter if you prefer to configure the access server manually or if you want to change the configuration after you have run the setup script (described in the chapter, "Configuring the Access Server for the First Time").

This chapter does not describe every configuration possible—only a small portion of the most commonly used configuration procedures. For more advanced configuration topics, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that came with your access server, on the World Wide Web from Cisco's home page, or you can order printed copies separately.

If you are experienced using the Cisco IOS software, you might find the "Comprehensive Configuration Example" section at the end of this chapter a useful reference for configuration.

Note If you skipped the previous chapter, "Cisco IOS Software Survival Skills," and you have never configured a Cisco access server, go back to that chapter and read it now. Do not proceed with configuring the access server until you have read the previous chapter. This chapter provides important information you will need to successfully configure your access server.

Timesaver Always make sure you are in the correct command mode before you enter a command. If you are not in the correct command mode when you enter a command, one of two problems occurs—either the command has no effect or it has an unexpected (and possibly detrimental) effect.

Prerequisites for Configuring the Access Server

Before you begin, make sure you have completed the following tasks:

- Connect a console to the access server and turn on the access server. If you need instructions to connect a terminal console to the access server, refer to the access server hardware installation guide.
- Write down the IP address of your Ethernet (LAN) interface.
- Write down the set of available IP addresses to be assigned to dial-in IP clients.
- Make sure your access server is connected to the Ethernet network and the T1 PRI line. Refer to the quick reference guide and the *Cisco AS5200 Universal Access Server Hardware Installation Guide*, which shipped with your access server, for more information about connecting cables.

- Write down the ISDN switch type, framing type, and line code of your T1 PRI or E1 PRI line. Obtain this information from your telephone company service provider.

Configuring the Host Name and Password

This section assumes that you have access to user level EXEC mode (`Router>`). (See the chapter "Configuring the Access Server for the First Time" for information on setting up your router with a basic configuration using a setup script.)

Note If you do not type anything for 10 minutes while you are configuring your system, the session times out and is disconnected. If it times out, the message "`Press RETURN to get started`" appears. This is not an error. If this message appears, press **Return** and the `Router>` prompt appears again. Table 3-1 shows you how to change this timeout interval.

Router is the default name of your access server. This name appears in all system prompts (`Router>`). You can change the host name to any name you wish by using the **hostname** global configuration command. For example, to change the name of a host from Router to 5200, you would enter **hostname 5200** at the global configuration prompt. The prompt would therefore appear as `5200>`.

This chapter does not describe every configuration possible—only a small portion of the most commonly used configuration procedures. For more advanced configuration topics, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that came with your access server, on the World Wide Web from Cisco's home page, or you can order printed copies separately. See the chapter "Configuring the Access Server for the First Time" for information on how to access these documents.

Enter the commands from Table 3-1 to configure basic parameters.

Table 3-1 Ethernet Host Name and Password

Step	Command	Purpose

1	`5200> enable`
	`Password:`
	`5200#`
		Enter privileged EXEC mode (represented by `5200#`). If you are in user EXEC mode (represented by the `5200>` prompt), enter privileged EXEC mode by entering the **enable** command. If an enable password has been set, you are prompted for a password. If none has been set, you are not prompted for a password. If you are in any other mode, type **exit** and press **Return** until the `5200#` prompt appears.

2	`5200# config term`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`5200(config)#`
		Enter global configuration mode. The abbreviated command **config term** represents the command **configure** terminal.
		You can abbreviate commands by entering the minimum number of characters that uniquely identify the command.

3	`5200(config)# hostname 5200` `5200(config)#`	Change the name of the access server to a meaningful name. Substitute your own name for 5200.

Table 3-1 Ethernet Host Name and Password (Continued)

Step	Command	Purpose
4	`5200(config)# enable secret guessme` `5200(config)#`	Enter a secret enable password. This password provides access to privileged EXEC mode. When you type **enable** at the EXEC prompt (`5200>` or `5200>`), you must enter the enable password to gain access to configuration mode. Substitute your own enable secret password instead of using the **guessme** password.

5	`5200(config)# line con 0`
	`5200(config-line)# exec-timeout 0 0`
	`5200(config-line)# exit`
	`5200(config)#`
		Enter line configuration mode to configure the console port to which you are connected. You can see when you enter line configuration mode because the prompt changes to `5200(config-line)#`. Enter **exec-timeout 0 0** to prevent the access server's EXEC facility from timing out if you do not type any information on the console screen for an extended period. Exit back to global configuration mode.

6	`5200(config)# exit`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console by console`
		Exit back to privileged EXEC mode. If you have altered any parameters while in global configuration mode (or any other command mode), the message "`%SYS-5-CONFIG_I: Configured from console by console`" appears. This is normal and does not indicate an error condition.

Verify

To verify you configured the right host name and passwords, use the following commands.

- Enter the **show config** command:

```
5200(config)# show config
Using 1888 out of 126968 bytes
!
version XX.X
.
!
hostname 5200
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1loO/w8/
.
.
```

  Notice the host name and encrypted password display near the top of the command output.

- Exit global configuration mode and attempt to reenter it using the new enable password:

```
5200# exit
.
5200 con0 is now available
Press RETURN to get started.
5200> enable
Password: guessme
5200#
```

Tips

If you are having trouble, check the following:

- Make sure **Caps Lock** is off.
- Make sure you entered the correct passwords. Passwords are case sensitive.

Configuring Ethernet 10BaseT

Assign an IP address to the Ethernet 10BaseT interface of your access server so that it can be recognized as a device on the Ethernet LAN. Use the commands from Table 3-2 to configure Ethernet 10BaseT.

Table 3-2 Configuring Ethernet 10Base T

Step	Command	Purpose

1	`5200> enable`
	`Password:`
	`5200#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to `5200#`.

2	`5200# config term`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`5200(config)#`
		Enter global configuration mode. You have entered global configuration mode when the prompt changes to `5200(config)#`.

3	`5200(config)# interface ethernet 0` `5200(config-if)#`	Enter Ethernet interface configuration mode.
4	`5200(config-if)# ip address 172.16.254.254 255.255.255.0`	Assign an IP address and subnet mask to the interface.

5	`5200(config-if)# end`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console by console`
	`5200#`
		Return to privileged EXEC mode.
		This message is normal and does not indicate an error.

Verify

To verify you have assigned the correct IP address, use the following command.

- Enter the **show arp** command:

```
5200# show arp
Protocol Address          Age (min) Hardware Addr    Type   Interface
Internet 172.16.254.254           _   0800.207e.bead  ARPA   Ethernet0
5200#
```

Tips

If you are having trouble, check the following:

- Check that the cable connections are not loose or disconnected.
- Make sure you are using the correct the IP address.

Configuring ISDN PRI

Configure the access server interfaces for ISDN PRI lines by using the commands from Table 3-3.

Table 3-3 Configuring ISDN PRI

Step	Command	Purpose
1	5200> **enable** Password: 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **config term** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **isdn switch-type** [**primary-4ess** | **primary-5ess** | **primary-dms100** | primary-net5 | primary-ntt | primary-ts014]	Enter your telco's switch type.
4	5200(config)# **controller** [**t1** | **e1**] [**0** | **1**] 5200(config-controller)#	Enter controller configuration mode to configure your controller port. The controller ports are labeled 0 or 1 on the dual T1/PRI and dual E1/PRI cards.
5	5200(config-controller)# **framing** [**esf** | **sf** | **crc4** | **nocrc4**]	Enter your telco's framing type.
6	5200(config-controller)# **linecode** [**ami** | **b8zs** | **hdb3**]	Enter your telco's line code type.
7	5200(config-controller)# **clock source line primary**	Enter the clock source for the line. Configure other lines as clock source secondary or clock source internal. Note that only one PRI can be clock source primary and only one PRI can be clock source secondary.
8	5200(config-controller)# **pri-group timeslots** [**1-24** | **1-31**]	Configure all channels for ISDN. Enter **pri-group timeslots 1-24** for T1. If E1, enter **pri-group timeslots 1-31**.
9	5200(config-controller)# **controller t1 1** 5200(config-controller)# **framing esf** 5200(config-controller)# **linecode b8zs** 5200(config-controller)# **clock source line secondary** 5200(config-controller)# **pri-group timeslots 1-24**	Repeats Steps 2 to 6 to configure each additional controller (there are four). In this example, note that the controller number is 1, instead of 0. And the clock source is secondary, instead of primary.
10	5200(config-controller)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console	Return to privileged EXEC mode. This message is normal and does not indicate an error.

Verify

To verify you have configured the interfaces correctly, use the following commands.

- Enter the **show controller t1** or **show controller e1** command and specify the port number.

```
5200# show controller t1 0
T1 0 is up.
  No alarms detected.
  Framing is ESF, Line Code is B8ZS, Clock Source is Line Primary.
  Version info of slot 2:  HW: 2, Firmware: 14, NEAT PLD: 13, NR Bus PLD: 19
  Data in current interval (476 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
T1 1 is up.
  No alarms detected.
  Framing is ESF, Line Code is B8ZS, Clock Source is Line Primary.
  Version info of slot 2:  HW: 2, Firmware: 14, NEAT PLD: 13, NR Bus PLD: 19
  Data in current interval (476 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

  Note the following:

  — The controller must report being up.

  — No errors should be reported.

- Enter the **show isdn status** command:

```
5200# show isdn status
The current ISDN Switchtype = primary-5ess
ISDN Serial0:23 interface
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
        No Active Layer 3 Call(s)
    Activated dsl 0 CCBs = 0
    Total Allocated ISDN CCBs = 0
ISDN Serial1:23 interface
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 0, State = TEI_ASSIGNED
    Layer 3 Status:
        No Active Layer 3 Call(s)
    Activated dsl 0 CCBs = 0
    Total Allocated ISDN CCBs = 0
5200#
```

- Note the following information for Serial 0:23 (the first half of the messages):

  — Layer 1 Status should be “Active.”

  - Layer 2 Status should be “Multiple_Frame_Established.” (It might take several seconds for Layer 2 status to appear.)
  - Layer 3 Status should be “No Active Layer 3 Call(s).”
- The second half of the messages display information for Serial 1:23. Ignore those messages.

Tips

If you are having trouble, check the following suggestions:

- Make sure the cable connection is not loose or disconnected if the Layer 1 Status is “Deactivated.” This status message indicates a problem at the physical layer.
- There may be a problem with your telco or the framing and line code types you entered may not match your telco’s. A Layer 2 error indicates that the access server cannot communicate with the telco. There is a problem at the data link layer.

Configuring Channelized T1or E1

Configure the access server for channelized T1 or E1 lines by using the commands from Table 3-4.

Table 3-4 Configuring Channelized T1 or E1

Step	Command	Purpose

1	`5200> enable`
	`Password:`
	`5200#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to `5200#`.

2	`5200# config term`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`5200(config)#`
		Enter global configuration mode. You have entered global configuration mode when the prompt changes to `5200(config)#`.

3	`5200(config)# controller [t1 | e1] [0 | 1]` `5200(config-controller)#`	Enter controller configuration mode to configure your controller port. The controller ports are labeled 0 or 1 on the dual T1/PRI and dual E1/PRI cards.
4	`5200(config-controller)# framing [esf | sf | crc4 | nocrc4]`	Enter your telco’s framing type.
5	`5200(config-controller)# linecode [ami | b8zs | hdb3]`	Enter your telco’s line code type.
6	`5200(config-controller)# clock source line primary`	Enter the clock source for the line. Configure other lines as clock source secondary or clock source internal. Only one PRI can be clock source primary and only one PRI can be clock source secondary.

Table 3-4 Configuring Channelized T1 or E1 (Continued)

Step	Command	Purpose
7	5200(config-controller)# **cas-group 1 timeslots** [**1-24** | **1-31**] <**type**>	Configure all channels and enter **1-24** for T1. If E1, enter **1-31**. Signaling types: e&m-fgbE & M Type II FGB, e&m-fgdE & M Type II FGD, e&m-immediate-start E & M Immediate Start, fxs-ground-start FXS Ground Start, fxs-loop-startFXS Loop Start, sas-ground-startSAS Ground Start, sas-loop-start AS Loop Start For E1 using the Anadigicom converter, use cas-signalling e&m-fgb.
8	5200(config-controller)# **controller t1 1** 5200(config-controller)# **framing crc4** 5200(config-controller)# **linecode hdb3** 5200(config-controller)# **clock source line secondary** 5200(config-controller)# **cas-group 2 timeslots 1-24 type e&m-fgb**	Repeats Steps 3 to 7 to configure each additional controller (there are four). In this example, note that the controller number is 1, instead of 0. The clock source is secondary, instead of primary. And the cas-group is 2, instead of 1.
9	5200(config-controller)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console 5200#	Return to privileged EXEC mode. This message is normal and does not indicate an error.

Verify

To verify your controller is up and running and is not reporting errors, use the following command.

- Enter the **show controller t1** or **show controller e1** command and specify the port number:

```
5200# show controller t1 0
T1 0 is up.
  No alarms detected.
  Version info of slot 0:  HW: 2, Firmware: 16, PLD Rev: 2
```

Note the following:

— The controller must report being up.

— No errors should be reported.

Tips

If you are having trouble, check to make sure the **show controller t1** or **show controller e1** output is not reporting alarms or violations.

Configuring the D Channels for Modem Signaling

Configure the ISDN D channels, which carry the control and signaling information for ISDN calls, for each ISDN PRI line. Use the commands from Table 3-5 to configure the ISDN D channels.

Table 3-5 Configuring the D Channels for Modem Signaling

Step	Command	Purpose
1	5200> **enable** Password: 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **config term** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **interface serial** [**0:15** | **0:23**] 5200(config-if)#	Enter serial interface configuration mode. After you have configured the controller, a corresponding D channel serial interface is created instantly. For example, serial interface 0:23 is the D channel for controller 0. You must configure each serial interface to receive incoming and send outgoing modem signaling.
4	5200(config-if)# **ip address 172.16.253.254 255.255.255.0**	Assign an IP address and subnet mask to the interface.
5	5200(config-if)# **isdn incoming-voice modem**	Configure all incoming voice calls to go to the modems.
6	5200(config-if)# **dialer-group 1**	Assign the serial interface to dialer group 1. The dialer group number is used with the **dialer-list** command to determine which packets will be "interesting" and activate the ISDN connection. Interesting packets meet the criteria specified by the **dialer-list** command.
7	5200(config-if)# **encapsulation ppp**	Change the default to encapsulation ppp so you can enter ppp commands.
8	5200(config-if)# **ppp multilink**	Enable PPP multilink on the serial interface.
9	5200(config-if)# **ppp authentication chap pap**	Enable CHAP and PAP authentication on the serial interface.
10	5200(config-if)# **peer default ip address pool default**	Support dial-in PC clients.
11	5200(config-if)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console 5200#	Return to privileged EXEC mode. This message is normal and does not indicate an error.

Verify

To verify your D-channel configuration, use the following command.

- Enter the **show interface** command:

```
5200# show interface s0:23
Serial1:23 is up, line protocol is up
  Hardware is DSX1
  Interface is unnumbered. Using address of FastEthernet0 (15.0.0.60)
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     54 packets input, 214 bytes, 0 no buffer
     Received 0 broadcasts, 10 runts, 0 giants, 0 throttles
     10 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     53 packets output, 211 bytes, 0 overruns
     0 output errors, 0 collisions, 10 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
  Timeslot(s) Used:24, Transmitter delay is 0 flags
```

Tips

If you are having trouble, use the following commands.

- Check the serial interface. For a successful connection, LCP must be “Open” as shown on the sixth line of the following example:

```
5200(config)# show interface serial 0:0
Serial0 is up, line protocol is up
  Hardware is BRI
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  LCP Open
  Open: IPCP, CDP
  Last input 00:00:02, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     16536 packets input, 612628 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     9036 packets output, 208401 bytes, 0 underruns
     0 output errors, 0 collisions, 51 interface resets
     0 output buffer failures, 0 output buffers swapped out
     378 carrier transitions
```

- Enter the **debug dialer** command:

```
5200# debug dialer
PRI0: Dialing cause: PRI0: ip PERMIT
PRI0: No dialer string defined.  Dialing cannot occur..
PRI0: Dialing cause: PRI0: ip PERMIT
PRI0: No dialer string defined.  Dialing cannot occur..
PRI0: Dialing cause: PRI0: ip PERMIT
PRI0: No dialer string defined.  Dialing cannot occur..
PRI0: Dialing cause: PRI0: ip PERMIT
PRI0: No dialer string defined.  Dialing cannot occur..
PRI0: Dialing cause: PRI0: ip PERMIT
PRI0: No dialer string defined.  Dialing cannot occur..
```

- Enter the **no debug dialer** command to turn off the messages. If you do not turn off the messages, they will continue to display. See Table 3-6 for descriptions of the debug dialer messages.

Table 3-6 Debug Dialer Messages

Message	Description
`PRI0: No dialer string defined. Dialing cannot occur.`	This message is displayed when a packet is received that should cause a call to be placed. However, there is no dialer string configured, so dialing cannot occur. This message usually indicates a configuration problem. Reenter the **dialer string** command in Step 4 of Table 3-5 in the "Configure" section.
`PRI0: Attempting to dial xxxxxxxxxx`	This message indicates that a packet has been received that passes the dial-on-demand access lists. That packet causes dialing of a phone number. The xxxxxxxxxx variable is the number being called.
`PRI0: Unable to dial xxxxxxxxxx`	This message is displayed if for some reason, the phone call could not be placed. This might be due to a lack of memory, full output queues, or other problems.
`PRI0: disconnecting call`	This message is displayed when the Cisco AS5200 attempts to hang up a call.

`PRI0: idle timeout`
`PRI0: re-enable timeout`
`PRI0: wait for carrier timeout`
	One of these three messages is displayed when their corresponding dialer timer expires. They are mostly informational, but are useful when debugging a disconnected call or call failure.

- If dialing cannot occur, check the configuration by entering the **debug isdn q931** command:

```
5200# debug isdn q931
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0:22, changed
state to up
ISDN Event: Call to 9086154535 dsl 3 at 64 Kb/s
TX ->  SETUP dsl = 3 pd = 8 callref = 0x188C
          Bearer Capability i = 0x8890
          Channel ID i = 0xE1808397
          Called Party Number i = 0xA1, '95163287448'
RX <-  RELEASE_COMP dsl = 3 pd = 8 callref = 0x988C
          Cause i = 0x83E020 - Mandatory IE missing
ISDN PRI 3: entering process_rxstate, CALL_CLEARED
ISDN PRI 3: received message 1F
ISDN Event: Hangup call to call id 0xCE2 on dsl 2
```

- Enter the **no debug isdn q931** command to turn off the messages. If you do not turn off the messages, they will continue to display. See Table 3-7 for descriptions of the debug IDSN messages.

Table 3-7 Debug ISDN Messages

Message	Description
`TX ->`	Indicates this message is being transmitted from the local router (user side) to the network side of the ISDN interface.
`RX <-`	Indicates this message is being received by the user side of the ISDN interface from the network side.
`SETUP`	Indicates the SETUP message has been sent to initiate call establishment between peer network layers. The message can be sent from the local router or network.
`pd`	Indicates the protocol discriminator. The protocol discriminator distinguishes messages for call control over the user-network ISDN interface from other ITU-T[1]-defined messages, including other Q.931 messages. The protocol discriminator is 8 for call control messages such as SETUP.
`callref`	Indicates the call reference number in hexadecimal. The field value indicates the number of calls made from the router (outgoing calls) or the network (incoming calls). Note that the originator of the SETUP message sets the high-order bit of the call reference number to 0. The destination of the connection sets the high-order bit to 1 in subsequent call control messages, such as the CONNECT message. For example, callref = 0x04 in the request becomes callref = 0x84 in the response.
`Bearer Capability`	Indicates the requested bearer service to be provided by the network.
`i=`	Indicates the Information Element Identifier. The value depends on the field it is associated with. Refer to the ITU-T Q.931 specification for details about the possible values associated with each field for which this identifier is relevant.
`Channel ID`	Indicates the Channel Identifier. The value 83 indicates any channel, 89 indicates the B1 channel, and 8A indicates the B2 channel. For more information about the Channel Identifier, refer to ITU-T Q.931.
`Called Party Number`	Identifies the called party. This field is only present in outgoing SETUP messages. It can be replaced by the Keypad facility field. This field uses the IA5 character set.
`RELEASE`	Indicates that the sending equipment will release the channel and call reference. The recipient of this message should prepare to release the call reference and channel.
`RELEASE_COMP`	Indicates that the sending equipment has received a RELEASE message and has now released the call reference and channel.

1. ITU-T1 = International Telecommunication Union Telecommunication Standardization Sector.

Configuring the Asynchronous Group Interface

You can assign the asynchronous interfaces to a group so that you can configure them as a group, instead of individually. Use the commands in Table 3-8 to configure the asynchronous group interfaces.

Timesaver Because there are so many asynchronous interfaces on the access server, configuring them as a group will save you time.

Table 3-8 Configuring the Asynchronous Group Interface

Step	Command	Purpose
1	5200> **enable** Password: 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **config term** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **interface group-async 1** 5200(config-if)#	Place all asynchronous interfaces in a single group, so that you configure the same parameters quickly on all interfaces at one time.
4	5200(config-if)# **ip unnumbered ethernet 0**	To conserve IP addresses, configure the asynchronous interfaces as unnumbered and assign the IP address of the Ethernet interface to them.
5	5200(config-if)# **encapsulation ppp**	Enable PPP to run on the set of interfaces in the group.
6	5200(config-if)# **async mode interactive**	Configure interactive mode on the asynchronous interface.
7	5200(config-if)# **ppp authentication chap pap**	Enable CHAP and PAP authentication on the interface.
8	5200(config-if)# peer default ip address pool default	Support dial-in PC clients. At the global level, define the pool of addresses.
9	5200(config-if)# **group-range 1 48** Building configuration... 5200(config-if)#	Define the group range of the interface. The number you use with the **group-range** command depends on the number of asynchronous interfaces you have on your access server. That is, if your access server has 48 asynchronous interfaces, you can specify **group-range 1 48**. If 60, specify **group-range 1 60**.
10	5200(config-if)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console 5200#	Return to privileged EXEC mode. This message is normal and does not indicate an error.

Verify

To verify your group interface configuration, use the following command.

- Enter the **show interface async** command:

```
5200# show interface async 1
Async1 is up, line protocol is up
modem(slot/port)=1/0, csm_state(0x00000204)=CSM_IC4_CONNECTED, bchan_num=18
modem_status(0x0002): VDEV_STATUS_ACTIVE_CALL.

  Hardware is Async Serial
  Interface is unnumbered.  Using address of FastEthernet0 (15.0.0.60)
  MTU 1500 bytes, BW 115 Kbit, DLY 100000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive not set
  DTR is pulsed for 5 seconds on reset
  LCP Open
  Open: IPCP
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/5, 0 drops; input queue 1/5, 0 drops
  5 minute input rate 37000 bits/sec, 87 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     31063 packets input, 1459806 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     33 packets output, 1998 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

Tips

Check for errors and the local and remote addresses.

- Enter the **show async status maps** command:

```
5200# show async status maps
Async protocol statistics:
  Rcvd: 27887 packets, 1294133 bytes
        0 format errors, 0 checksum errors, 0 overrun, 0 no buffer
  Sent: 2141 packets, 117673 bytes, 0 dropped

 Int           Local          Remote Qd     InPack     OutPac Inerr  Drops  MTU
*  1       15.0.0.60        50.2.8.1  0        542         35     0      0 1500
*  2       15.0.0.60        50.3.8.1  0        544         35     0      0 1500
*  3       15.0.0.60       100.2.1.1  0        542         35     0      0 1500
*  4       15.0.0.60        50.1.1.1  0        544         35     0      0 1500
*  5       15.0.0.60        99.2.7.1  0        542         34     0      0 1500
*  6       15.0.0.60        99.1.4.1  0        543         34     0      0 1500
*  7       15.0.0.60       100.2.3.1  0        451         34     0      0 1500
*  8       15.0.0.60       100.2.5.1  0        451         34     0      0 1500
*  9       15.0.0.60       100.2.6.1  0        452         34     0      0 1500
* 10       15.0.0.60       100.2.8.1  0        452         34     0      0 1500
* 11       15.0.0.60        30.2.6.1  0        449         34     0      0 1500
* 12       15.0.0.60        30.3.5.1  0        450         34     0      0 1500
* 13       15.0.0.60        30.2.4.1  0        450         34     0      0 1500
* 14       15.0.0.60        30.2.8.1  0        450         34     0      0 1500
  15       15.0.0.60            None  0          0          0     0      0 1500
* 16       15.0.0.60        50.3.5.1  0        355         27     0      0 1500
```

- For other async debugging commands, enter the **debug ppp negotiation** and **debug ppp authentication** commands.

```
5200# debug ppp negot
5200# debug ppp authen
Aug 28 15:40:40.963: ppp: sending CONFREQ, type = 2 (CI_ASYNCMAP), value = 0xA0000
Aug 28 15:40:40.967: ppp: sending CONFREQ, type = 3 (CI_AUTHTYPE), value = 0xC023
Aug 28 15:40:40.967: ppp: sending CONFREQ, type = 5 (CI_MAGICNUMBER), value = 0xC9BAE6A0
Aug 28 15:40:41.091: PPP Async1: state = REQsent fsm_rconfack(0xC021): rcvd id 3
Aug 28 15:40:41.095: ppp: config ACK received, type = 2 (CI_ASYNCMAP), value = 0xA0000
Aug 28 15:40:41.099: ppp: config ACK received, type = 3 (CI_AUTHTYPE), value = 0xC023
Aug 28 15:40:41.099: ppp: config ACK received, type = 5 (CI_MAGICNUMBER), value = 0xC9BAE6A0
Aug 28 15:40:41.103: ppp: config ACK received, type = 7 (CI_PCOMPRESSION)
Aug 28 15:40:41.103: ppp: config ACK received, type = 8 (CI_ACCOMPRESSION)
Aug 28 15:40:42.271: PPP Async1: received config for type = 2 (ASYNCMAP) value = 0xA0000 acked
Aug 28 15:40:42.275: PPP Async1: received config for type = 5 (MAGICNUMBER) value = 0xA0149 acked
Aug 28 15:40:42.275: PPP Async1: received config for type = 7 (PCOMPRESSION) acked
Aug 28 15:40:42.279: PPP Async1: received config for type = 8 (ACCOMPRESSION) acked
Aug 28 15:40:42.283: PPP Async1: received config for type = 13 (CALLBACK) rejected
Aug 28 15:40:42.391: PPP Async1: received config for type = 2 (ASYNCMAP) value = 0xA0000 acked
Aug 28 15:40:42.395: PPP Async1: received config for type = 5 (MAGICNUMBER) value = 0xA0149 acked
Aug 28 15:40:42.399: PPP Async1: received config for type = 7 (PCOMPRESSION) acked
Aug 28 15:40:42.399: PPP Async1: received config for type = 8 (ACCOMPRESSION) acked
Aug 28 15:40:42.515: PPP Async1: PAP receive authenticate request poolme
Aug 28 15:40:42.523: PPP Async1: PAP authenticating peer poolme
Aug 28 15:40:42.575: PPP Async1: Remote passed PAP authentication sending Auth-Ack.
Aug 28 15:40:42.911: ipcp: sending CONFREQ, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
Aug 28 15:40:42.915: ipcp: sending CONFREQ, type = 3 (CI_ADDRESS), Address = 170.9.186.68
Aug 28 15:40:43.039: PPP Async1: state = REQsent fsm_rconfack(0x8021): rcvd id 1
Aug 28 15:40:43.039: ipcp: config ACK received, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
Aug 28 15:40:43.043: ipcp: config ACK received, type = 3 (CI_ADDRESS), Address = 170.9.186.68
Aug 28 15:40:43.983: %LINEPROTO-5-UPDOWN: Line protocol on Interface Async1, changed state to up
Aug 28 15:40:45.035: ipcp: sending CONFREQ, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
Aug 28 15:40:45.039: ipcp: sending CONFREQ, type = 3 (CI_ADDRESS), Address = 170.9.186.68
Aug 28 15:40:45.363: PPP Async1: state = REQsent fsm_rconfack(0x8021): rcvd id 2
Aug 28 15:40:45.367: ipcp: config ACK received, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
Aug 28 15:40:45.371: ipcp: config ACK received, type = 3 (CI_ADDRESS), Address = 170.9.186.68
Aug 28 15:40:45.691: ppp Async1: ipcp_reqci: rcvd COMPRESSTYPE (ACK)
Aug 28 15:40:45.691: ppp Async1: Negotiate IP address: her address 0.0.0.0
Aug 28 15:40:45.695: AAA/AUTHOR/IPCP: Async1: start: her address 0.0.0.0, we want 170.9.186.75
Aug 28 15:40:45.699: AAA/AUTHOR/IPCP: Async1: done: her address 0.0.0.0, we want 170.9.186.75
Aug 28 15:40:45.699: AAA/AUTHOR/IPCP: Async1: authorization succeeded (NAK with address 170.9.186.75) (NAK)
Aug 28 15:40:45.703: ppp Async1: Negotiate Primary DNS address: her address 0.0.0.0 (NAK with address
170.9.10.70) (NAK)
Aug 28 15:40:45.707: ppp Async1: Negotiate Primary NBNS address: her address 0.0.0.0 (NAK with address
170.9.186.40) (NAK)
Aug 28 15:40:45.711: ppp Async1: Negotiate Secondary DNS address: her address 0.0.0.0
Aug 28 15:40:45.715: ppp Async1: Secondary DNS address unknown (REJ)
Aug 28 15:40:45.719: ppp Async1: Negotiate Secondary NBNS address: her address 0.0.0.0
Aug 28 15:40:45.719: ppp Async1: Secondary NBNS address unknown (REJ)
Aug 28 15:40:45.723: ppp: ipcp_reqci: returning CONFREJ.
Aug 28 15:40:45.827: ppp Async1: ipcp_reqci: rcvd COMPRESSTYPE (ACK)
Aug 28 15:40:45.831: ppp Async1: Negotiate IP address: her address 0.0.0.0
Aug 28 15:40:45.835: AAA/AUTHOR/IPCP: Async1: start: her address 0.0.0.0, we want 170.9.186.75
Aug 28 15:40:45.835: AAA/AUTHOR/IPCP: Async1: done: her address 0.0.0.0, we want 170.9.186.75
Aug 28 15:40:45.839: AAA/AUTHOR/IPCP: Async1: authorization succeeded (NAK with address 170.9.186.75) (NAK)
Aug 28 15:40:45.843: ppp Async1: Negotiate Primary DNS address: her address 0.0.0.0 (NAK with address
170.9.10.70) (NAK)
Aug 28 15:40:45.847: ppp Async1: Negotiate Primary NBNS address: her address 0.0.0.0 (NAK with address
170.9.186.40) (NAK)
Aug 28 15:40:45.851: ppp: ipcp_reqci: returning CONFNAK.
Aug 28 15:40:45.963: ppp Async1: ipcp_reqci: rcvd COMPRESSTYPE (ACK)
Aug 28 15:40:45.967: ppp Async1: Negotiate IP address: her address 170.9.186.75
Aug 28 15:40:45.971: AAA/AUTHOR/IPCP: Async1: start: her address 170.9.186.75, we want 170.9.186.75
Aug 28 15:40:45.975: AAA/AUTHOR/IPCP: Async1: done: her address 170.9.186.75, we want 170.9.186.75
```

```
Aug 28 15:40:45.975: AAA/AUTHOR/IPCP: Async1: authorization succeeded (ACK)
Aug 28 15:40:45.979: ppp Async1: Negotiate Primary DNS address: her address 170.9.10.70 (ACK)
Aug 28 15:40:45.983: ppp Async1: Negotiate Primary NBNS address: her address 170.9.186.40 (ACK)
Aug 28 15:40:45.987: ppp: ipcp_reqci: returning CONFACK.
Aug 28 15:40:45.995: Async1: install route to 170.9.186.75
```

Configuring the Modems

Configure the modems to allow users to dial in to your network by using the modem commands in Table 3-9.

Table 3-9 Configuring the Modems

Step	Command	Purpose
1	5200> **enable** Password: 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **config term** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **modem country mica** *country name* [or]	Specify the country to set the modem parameters (including country code and encoding) for MICA modems. The default is **usa** if the access server is configured with T1 interfaces and **e1-default** if the access server has E1 interfaces.
	5200(config)# **modem country microcom_hdms** *country name*	Specify the country to set the modem parameters (including encoding) for Microcom modems. The default is **usa**. Note that the access server will reset the Microcom modems for the command to take effect. For list of country codes, see "Country Code Tables" later in this section.
4	5200(config-if)# **line 1 48** 5200(config-line)#	Enter the number of modem lines to configure. If you have 48 modems, enter **line 1 48**. If 60, enter **line 1 60**.
5	5200(config-line)# **transport input all**	Allow all protocols to be used when connecting to the line.

Table 3-9 Configuring the Modems (Continued)

Step	Command	Purpose
6	`5200(config-line)# autoselect ppp`	Enable remote IP users running a PPP application to dial in, bypass the EXEC facility, and connect directly to the network.
7	`5200(config-line)# modem inout`	Enable incoming and outgoing calls.

8	`5200(config-line)# end`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console by console`
	`5200#`
		Return to privileged EXEC mode.
		
		This message is normal and does not indicate an error.

Country Code Tables

The following table lists the current Microcom modem codes.

Table 3-10 Microcom Modem Codes

Country	Code	Country	Code
Argentina	argentina	italy	italy
Australia	australia	Japan	japan
Austria	austria	Korea	korea
Belgium	belgium	Malaysia	malaysia
Brazil	brazil	Mexico	mexico
Canada	canada	Netherlands	netherlands
Chile	chile	New Zealand	new-zealand
China	china	Norway	norway
Columbia	columbia	Peru	peru
Czech/Slovak Republic	czech-republic	Philippines	philippines
Denmark	Denmark	Poland	poland
Finland	Finland	Portugal	portugal
France	France	Saudi Arabia	saudi-arabia
Germany	Germany	Singapore	singapore
Greece	Greece	South Africa	south-africa
Hong Kong	hong-kong	Spain	spain
Hungary	hungary	Sweden	sweden
India	india	Switzerland	switzerland
indonesia	indonesia	Taiwan	taiwan
Ireland	ireland	Thailand	thailand
Israel	israel	United Kingdom	united-kingdom

Table 3-10 Microcom Modem Codes

Country	Code	Country	Code
USA	usa		

The following table lists the current MICA modem codes.

Table 3-11 MICA Modem Codes

Country	Code	Country	Code
Australia	australia	Netherlands	netherlands
Austria	austria	New Zealand	new-zealand
Belgium	belgium	Norway	norway
China	china	Poland	poland
Cyprus	cyprus	Portugal	portugal
Czech/Slovak Republic	czech-republic	Russia	russia
Denmark	denmark	Singapore	singapore
Default E1 (A Law)	e1-default	South Africa	south-africa
Finland	finland	Spain	spain
France	france	Sweden	sweden
Germany	germany	Switzerland	switzerland
Hong Kong	hong-kong	Default T1 (u Law)	t1-default
India	india	Taiwan	taiwan
Ireland	ireland	Thailand	thailand
Israel	israel	Turkey	turkey
Italy	italy	United Kingdom	united-kingdom
Japan	japan	USA	usa
Malaysia	malaysia		

Resetting to Default Values for Country Codes

To reset to default settings for country codes, enter the following commands in global configuration mode:

- **no modem country mica**—Resets to default MICA setting.
- **no modem country microcom-hdms**—Resets to default Microcom setting.

Verify

To verify your modem configuration, use the following commands.

- Enter the **show line** command to display a summary for all the lines.

```
5200# show line
 Tty Typ     Tx/Rx     A Modem  Roty AccO AccI  Uses    Noise   Overruns
*  0 CTY               -    -      -    -    -     0        0        0/0
I  1 TTY 115200/115200 - inout     -    -    -     0        0        0/0
I  2 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   3 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   4 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   5 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   6 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   7 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   8 TTY 115200/115200 - inout     -    -    -     0        0        0/0
   9 TTY 115200/115200 - inout     -    -    -     0        0        0/0
  10 TTY 115200/115200 - inout     -    -    -     0        0        0/0
.
.
.
  90 VTY               -    -      -    -    -     0        0        0/0
```

- Enter the **show line #** command to display a summary for a single line.

```
5200# show line 1
 Tty Typ     Tx/Rx     A Modem  Roty AccO AccI  Uses    Noise   Overruns
I  1 TTY 115200/115200 - inout     -    -    -     0        0        0/0

Line 1, Location: "", Type: ""
Length: 24 lines, Width: 80 columns
Baud rate (TX/RX) is 115200/115200, no parity, 1 stopbits, 8 databits
Status: none
Capabilities: Hardware Flowcontrol In, Hardware Flowcontrol Out
  Modem Callout, Modem RI is CD, Line usable as async interface
Modem state: Idle
Special Chars: Escape  Hold  Stop  Start  Disconnect  Activation
                ^^x    none   -     -       none
Timeouts:      Idle EXEC    Idle Session   Modem Answer  Session   Dispatch
               00:10:00        never                      none     not set
                            Idle Session Disconnect Warning
                              never
Modem type is unknown.
Session limit is not set.
Time since activation: never
Editing is enabled.
History is enabled, history size is 10.
DNS resolution in show commands is enabled
Full user help is disabled
Allowed transports are pad telnet rlogin.  Preferred is telnet.
No output characters are padded
No special data dispatching characters
modem(slot/port)=1/0, csm_state(0x00000100)=CSM_IDLE_STATE, bchan_num=-1
modem_status(0x0000): VDEV_STATUS_UNLOCKED

Modem hardware state: CTS noDSR  DTR RTS
```

Tips

If you are having trouble, check the following:

- If you are having problems with making or receiving calls, make sure you turned on the protocols for connecting to the lines (Step 3 in Table 3-9) and configured for incoming and outgoing calls (Step 6 in Table 3-9).

- If the calls are not coming up at all, turn on the **debug modem**, **debug modem csm**, and **debug isdn q931** commands to check for problems. When you finish viewing the messages, turn off the messages by entering the **no debug modem** command.

```
5200# debug modem
5200# debug modem csm
5200# debug isdn q931
5200# no debug modem
5200# no debug modem csm
5200# no debug isdn q931
```

The following is the sample output for a MICA modem for an outgoing ISDN voice call:

```
5200# 1.17.30.12 2004
Trying 1.17.30.12, 2004 ... Open

TTY4: asserting DTRatdt1000
Mica Modem(2/3): Rcvd Dial String(1000)
CSM_PROC_IDLE: CSM_EVENT_MODEM_OFFHOOK at slot 2, port 3

CSM_PROC_OC3_COLLECT_ALL_DIGIT: CSM_EVENT_GET_ALL_DIGITS at slot 2, port 3
CSM_PROC_OC3_COLLECT_ALL_DIGIT: called party num: (1000) at slot 2, port 3

ISDN Se0:23: TX -  SETUP pd = 8  callref = 0x0001
        Bearer Capability i = 0x8090A2
        Channel ID i = 0xE1808397
        Called Party Number i = 0xA1, '1000'
ISDN Se0:23: RX <-  CALL_PROC pd = 8  callref = 0x8001
        Channel ID i = 0xA98397
EVENT_FROM_ISDN::dchan_idb=0x60DD2D74, call_id=0xA001, ces=0x1
   bchan=0x16, event=0x3, cause=0x0

EVENT_FROM_ISDN:(A001): DEV_CALL_PROC at slot 2 and port 3

CSM_PROC_OC4_DIALING: CSM_EVENT_ISDN_BCHAN_ASSIGNED at slot 2, port 3
Mica Modem(2/3): Configure(0x1)
Mica Modem(2/3): Configure(0x0)
Mica Modem(2/3): Configure(0x6)
Mica Modem(2/3): Call Setup
ISDN Se0:23: RX <-  ALERTING pd = 8  callref = 0x8001
Mica Modem(2/3): State Transition to Call Setup
ISDN Se0:23: RX <-  CONNECT pd = 8  callref = 0x8001
EVENT_FROM_ISDN::dchan_idb=0x60DD2D74, call_id=0xA001, ces=0x1
   bchan=0x16, event=0x4, cause=0x0

EVENT_FROM_ISDN:(A001): DEV_CONNECTED at slot 2 and port 3

CSM_PROC_OC5_WAIT_FOR_CARRIER: CSM_EVENT_ISDN_CONNECTED at slot 2, port 3

Mica Modem(2/3): Link Initiate
ISDN Se0:23: TX -  CONNECT_ACK pd = 8  callref = 0x0001
Mica Modem(2/3): State Transition to Connect
Mica Modem(2/3): State Transition to Link
Mica Modem(2/3): State Transition to Trainup
CONNECT 16800 /V.42/V.42bis

Mica Modem(2/3): State Transition to EC Negotiating
Mica Modem(2/3): State Transition to Steady State
```

This is the sample output for an incoming ISDN voice call on a MICA modem:

```
ISDN Se0:23: RX <-  SETUP pd = 8  callref = 0x0065
        Bearer Capability i = 0x8090A2
        Channel ID i = 0xE1808381
```

```
        Called Party Number i = 0xA1, '1000'
ISDN Se0:23: Incoming call id = 0x3
EVENT_FROM_ISDN::dchan_idb=0x60DD2D74, call_id=0x3, ces=0x1
   bchan=0x0, event=0x1, cause=0x0

VDEV_ALLOCATE: slot 2 and port 2 is allocated.

EVENT_FROM_ISDN:(0003): DEV_INCALL at slot 2 and port 2

CSM_PROC_IDLE: CSM_EVENT_ISDN_CALL at slot 2, port 2

Mica Modem(2/2): Configure(0x0)
Mica Modem(2/2): Configure(0x0)
Mica Modem(2/2): Configure(0x6)
Mica Modem(2/2): Call Setup
ISDN Se0:23: TX -  CALL_PROC pd = 8  callref = 0x8065
        Channel ID i = 0xA98381
ISDN Se0:23: TX -  ALERTING pd = 8  callref = 0x8065
Mica Modem(2/2): State Transition to Call Setup
Mica Modem(2/2): Went offhook
CSM_PROC_IC1_RING: CSM_EVENT_MODEM_OFFHOOK at slot 2, port 2
ISDN Se0:23: TX -  CONNECT pd = 8  callref = 0x8065
ISDN Se0:23: RX <-  CONNECT_ACK pd = 8  callref = 0x0065
EVENT_FROM_ISDN::dchan_idb=0x60DD2D74, call_id=0x3, ces=0x1
   bchan=0x0, event=0x4, cause=0x0
.
.
.
```

- Enter the **debug modem ?** command for list of additional modem debugging commands:

```
5200# debug modem ?
  b2b          Modem Special B2B
  csm          CSM activity
  maintenance  Modem maintenance activity
  mica         MICA Async driver debugging
  oob          Modem out of band activity
  tdm          B2B Modem/PRI TDM
  trace        Call Trace Upload
```

Configuring Modem Pooling

Use modem pooling to define, select, and use separate pools of modems within a single access server and enable different dial-in services for different customers. The primary application is to allocate specific modems based on called party numbers and a predetermined number of modem ports, based on Dialed Number Information Service (DNIS).

There is no restriction on the number of modem pools that you can configure. A pool can contain a minimum of one modem and a maximum equal to all the modems in the system. If you do not configure any modem pools, all the modems are placed into a single pool.

This section briefly shows how to set up a minimum configuration.

Note To support modem pooling over channelized T1 lines, you need to configure the lines as described in the following table. If you are using R2 signaling over channelized E1, you do not need any special configuration options because DNIS information is always collected.

Table 3-12 Configuring Modem Pooling

Step	Command	Purpose
1	5200 **enable** Password: **<***password***>** 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **configure terminal** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **controller** [**t1** | **e1**] [**0** | **1**] 5200(config-controller)#	Enter controller configuration mode to configure your controller port. The controller ports are labeled 0 and 1 on the T1/PRI and E1/PRI cards.
4	5200(config-controller)# **cas-group 1 timeslots** [**1-24** | **1-31**] <*type***>**	Configure all channels for E&M, FXS, and SAS analog signaling. For T1, enter **1-24** and for E1, enter **1-31**. Signaling types include **e&m-fgb**, **e&m-fgd**, **e&m-immediate-start**, **fxs-ground-start**, **fxs-loop-start**, **sas-ground-start**, and **sas-loop-start**. **Note:** To set up **e&m-fgb** to support modem pooling, see Step 8 in this table. You must use the same type of signaling that your central office uses. For E1 using the Anadigicom converter, use **cas e&m-fgb** signaling.

Table 3-12 Configuring Modem Pooling (Continued)

Step	Command	Purpose
5	5200(config-controller)# **cas-group 1 timeslots 1-24 e&m-fgb mf dnis** [or] 5200(config-controller)# **cas-group 1 timeslots 1-24 e&m-fgb dtmf dnis**	Configures **e&m-fgb** signaling to support modem pooling and the digital number identification service (DNIS) over channelized T1 lines. You must specify the tone type: **mf** or **dtmf**. By configuring DNIS as part of the **cas-group** command, the system collects DNIS digits for incoming calls, which are then redirected to specific modem pools. You must be running MICA modems in the system and have at least 10% of your total modems in the default modem pool. Free modems are needed in the default pool to detect the incoming called number or DNIS before handing the call off to the appropriate modem pool. Therefore, a second modem is needed to handle each incoming call. Note: Make sure your switch provides inband address information for incoming analog calls before you enable this feature.
6	5200(config-controller)# **controller t1 1** 5200(config-controller)# **cas-group 2 timeslots 1-24 e&m-fgb mf dnis** [or] 5200(config-controller)# **cas-group 2 timeslots 1-24 e&m-fgb dtmf dnis**	Repeats Steps 3 to 6 to configure the second controller. In this example, note that the controller number is 1, instead of 0. And the cas-group is 2, instead of 1.
7	5200(config)# **modem-pool** *name*	Enter the name of the modem to configure for pooling.
8	5200(config-modem-pool)# **pool-range** *number-number*	Defines the range of the modems in the pool. A dash is required between the two numbers.
9	5200(config-modem-pool)# **called number** *phone #* **max-conn** *number*	Specifies the DNIS to be used for this modem pool. The DNIS string can have an integer *x* to indicate a don't care digit for that position. The **max-conn** option specifies the maximum number of 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. The **max-conn** values can range from 1 to the total number of modems in the pool.
10	5200(config-modem-pool)# **Ctrl-Z** 5200#	Return to enable mode.

Verify

To verify your modem pooling configuration:

- Enter the **show modem-pool** command to view information for all modem pools. To view information for a specific modem pool, enter the **show modem-pool** *name* command.

```
5200# show modem-pool
modem-pool: System-def-Mpool
modems in pool: 119 active conn: 0
 0 no free modems in pool

modem-pool: test
modems in pool: 1 active conn: 0
 0 no free modems in pool
called_party_number: 1000
  0 max-conn exceeded, 0 no free modems in pool
```

Tips

If you are having trouble, check out the following:

- You have not configured the same called party number for multiple pools.
- You have not placed modems in multiple pools.

Configuring 6-Port Modem Modules

Take the following steps to configure the 6-port modem modules:

Step 1 Configure the asynchronous group interface. See the earlier section "Configuring the Asynchronous Group Interface."

Step 2 Configure the modems. See the earlier section "Configuring the Modems."

Step 3 Configure the controller. See Table 3-13 for details.

Step 4 Configure the serial interfaces. See Table 3-14 for details.

Note For a description of AT commands and registers for the 6-port modem modules, see the *AT Command Set and Register Summary for MICA Six-Port Modules* publication on CCO. See the section "Where to Go Next" for details on accessing CCO.

Table 3-13 describes how to configure the controller.

Table 3-13 Configuring the Controller

Step	Command	Purpose
1	`5200 (config)# isdn switch-type primary-5ess`	Enter your telco switch type. The following switch types are available: **primary-4ess**, **primary-5ess**, **primary-dms100**, **primary-net5**, **primary-ntt**, and **primary-ts014**.

Table 3-13 Configuring the Controller (Continued)

Step	Command	Purpose
2	5200(config)# **controller t1 0** [or] 5200(config)# **controller e1 0** 5200(config-controller)#	Enter controller configuration mode to configure your controller port. The controller ports are labeled 0 and 1 on the dual T1/PRI and dual E1/PRI cards and the controller ports are labeled 0, 1, 2, 3 on the quad T1/PRI and quad E1/PRI cards.
3	5200(config-controller)# **framing esf**	Enter your telco framing type. The following framing types are available: **esf**, **sf**, **crc4**, and **nocrc4**.
4	5200(config-controller)# **linecode b8zs**	Enter your telco line code type. The following line code types are available: **ami**, **b8zs**, and **hdb3**.
5	5200(config-controller)# **clock source line primary**	Enter the clock source for the line. Configure one line as the primary or most stable clock source line. Configure the other line as the secondary clock source line.
6	5200(config-controller)# **pri-group timeslots 1-24** [or] 5200(config-controller)# **pri-group timeslots 1-31**	Configure all channels for ISDN. For T1, enter **pri-group timeslots 1-24**. For E1, enter **pri-group timeslots 1-31**.
7	5200(config-controller)# **controller t1 1** [or] 5200(config)# **controller e1 0** 5200(config-controller)# **framing esf** 5200(config-controller)# **linecode b8zs** 5200(config-controller)# **clock source line secondary** 5200(config-controller)# **pri-group timeslots 1-24** [or] 5200(config-controller)# **pri-group timeslots 1-31**	Repeats Steps 2 to 6 to configure subsequent controllers. Note that the controller number is 1, 2, or 3, instead of 0. And the clock source is secondary, instead of primary.

Table 3-14 describes how to configure the serial intefaces.

Table 3-14 Configuring the Serial Interfaces

Step	Command	Purpose
1	5200(config-controller)# **interface serial 0:23** 5200(config-if)#	Enter serial interface configuration mode. After you have configured the controller, a corresponding D-channel serial interface is created instantly. Serial interface 0:23 is the D-channel for controller 0. You must configure each serial interface to receive incoming and send outgoing modem signaling.
2	5200(config-if)# **isdn incoming-voice modem**	Configure all incoming voice calls to go to the modems.
3	5200(config-if)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console <**Return**> 5200#	Return to privileged EXEC mode. When this message appears, press **Return** to get the 5200# prompt.

Table 3-14 Configuring the Serial Interfaces (Continued)

Step	Command	Purpose
4	5200# **copy running-config startup-config** Building configuration... [OK] <**Return**> 5200#	Save the configuration changes to NVRAM.

Verify

To verify that the new modems are working properly, enter the following command:

```
5200# debug modem
```

You should receive a set of messages similar to the following:

```
May  5 18:05:12.476: MODEM_REPORT:dchan_idb=0x27EC48, call_id=0x2E64,
ces=0x1 bchan=0x15, event=0x1, cause=0x0
May  5 18:05:12.476: CSM_MODEM_ALLOCATE: slot 1 and port 0 is allocated.
May  5 18:05:12.480: MODEM_REPORT(2E64): DEV_INCALL at slot 1 and port 0
May  5 18:05:12.484: CSM: Fast Ringing On at modem slot 1, port 0
May  5 18:05:12.484: CSM_PROC_IDLE: CSM_EVENT_ISDN_CALL at slot 1, port 0
May  5 18:05:12.756: %LINK-3-UPDOWN: Interface Async48, changed state to up
May  5 18:05:13.284: CSM_PROC_IC1_RING: CSM_EVENT_MODEM_OFFHOOK at slot 1, port 0
May  5 18:05:13.288: CSM: Fast Ringing Off at modem slot 1, port 0
May  5 18:05:13.292: MODEM_REPORT:dchan_idb=0x27EC48, call_id=0x2E64,
ces=0x1 bchan=0x15, event=0x4, cause=0x0
May  5 18:05:13.296: MODEM_REPORT(2E64): DEV_CONNECTED at slot 1 and port 0
May  5 18:05:13.296: CSM_PROC_IC2_WAIT_FOR_CARRIER: CSM_EVENT_ISDN_CONNECTED at slot 1,
port 0
May  5 18:05:15.076: %LINEPROTO-5-UPDOWN: Line protocol on Interface Async48, changed
state to up
```

To turn off the messages, enter the command:

```
5200# no debug modem
```

If you do not turn off the messages, they will continue to display.

Configuring Dual T1/PRI and E1/PRI Feature Cards

This section describes how to use the Cisco IOS software command line interface (CLI) to configure basic access server functionality. Basic access server functionality includes LAN and WAN configuration (including ISDN PRI and channelized T1 and E1). Follow the procedures in this section to configure the access server after installing a new T1/PRI or E1/PRI feature card.

This section does not describe every configuration possible—only a small portion of the most commonly used configuration procedures. For more advanced configuration topics, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that came with your access server, on CCO (see the section “Where to Go Next” for details), or you can order printed copies separately.

For information about features supported by the Cisco IOS release installed on your access server, see the release notes that shipped with your chassis.

Prerequisites to Configuring Dual T1/PRI and E1/PRI Feature Cards

Before you begin, make sure you have completed the following tasks:

- Connect a console to the access server and turn on the server. If you need instructions to connect a terminal console to the access server, refer to the access server hardware installation guide.
- Write down the IP address of your Ethernet (LAN) interface.
- Write down the set of available IP addresses to be assigned to dial-in IP clients.
- Make sure your access server is connected to the Ethernet network and the T1 PRI line. For more information about connecting cables, refer to the quick reference guide and the *Cisco AS5200 Universal Access Server Hardware Installation Guide*, which shipped with your access server.
- Write down the ISDN switch type, framing type, and line code of your T1 PRI or E1 PRI line. Obtain this information from your telephone company service provider.

Note If you do not type anything for 10 minutes while you are configuring your system, the session times out and is disconnected. If it times out, the message "`Press RETURN to get started`" appears. This is not an error. If this message appears, press **Return** and the `5200>` prompt appears again.

Configuring Dual T1/PRI and E1/PRI Feature Cards

Configuring the feature cards is a three-step process:

Step 1 Configure the access server for ISDN PRI lines. See the section "Configuring ISDN PRI."

Step 2 Configure the access server for channelized T1 or E1 lines. See the section "Configuring Channelized T1or E1."

Step 3 Configure the D channels for modem signaling. See the section "Configuring the D Channels for Modem Signaling."

Configuring R2 Signaling

R2 signaling is an international signaling standard that is common to channelized E1 networks. You can configure a channelized E1 interface to support different types of R2 signaling, which is used in older analog telephone networks. Note that this feature is available for MICA modems.

Table 3-15 Configure R2 Signaling

Step	Command	Purpose

1	`5200>` **`enable`**
	`Password: <`*`password`*`>`
	`5200#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to `5200#`.

2	`5200#` **`configure terminal`**
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`5200(config)#`
		Enter global configuration mode. You have entered global configuration mode when the prompt changes to `5200(config)#`.

3	`5200(config)#` **`controller e1`** [**`0`** | **`1`**] `5200(config-controller)#`	Enter controller configuration mode to configure your E1 controller port. The E1 controller ports are labeled 0 and 1 on the E1/PRI cards.

Table 3-15 Configure R2 Signaling (Continued)

Step	Command	Purpose
4	5200(config-controller)# **framing crc4** [or] 5200(config-controller)# **framing no-crc4**	Configures framing to E1 with CRC[1]. Configures framing to E1 only.
5	5200(config-controller)# **linecode ami** [or] 5200 (config-controller)# **linecode hdb3**	Configures line code to AMI[2] encoding. Configures line code to HDB3 encoding.
6	5200(config-controller)# **clock source internal** [or] 5200(config-controller)# **clock source line primary** [or] 5200(config-controller)# **clock source line secondary**	Configures the clock source to the internal clock. Configures the clock source to the primary recovered clock. Configures the clock source to the secondary recovered clock.
7	5200(config-controller)# **cas-group 1 timeslots 1-30 type r2-analog r2-compelled ani**	Configures the timeslots that belong to each E1 circuit for R2 signaling. Sets R2 signaling to R2 ITU Q411, the tone signal to R2 Compelled Register Signaling, and the ANI addr info provisioned option. R2 line signaling options include **r2-analog**, **r2-digital, and r2-pulse**. Tone signaling options include **dtmf** (default), **r2-compelled**, **r2-non-compelled**, and **r2-semi-compelled**. You can also set **ani** (ANI addr info provisioned) for any of the above options.
8	5200(config-controller-cas)# **cas-custom 1**	Enter the channel number to customize.
9	5200(config-ctrl-cas)# **country** *country name* **use-default**	Use defaults for the specified country. Note: To view the parameters for the country (if the country defaults are the same as ITU defaults), enter **write term**. The default setting for all countries is **ITU**. See “Country Codes for R2 Signaling” later in this section for a list of supported countries.

Table 3-15 Configure R2 Signaling (Continued)

Step	Command	Purpose
10	`5200(config-ctrl-cas)# answer-signal group-b 6`	Sets the cas custom command answer-signal to group-b to 6. Cas custom commands include **caller-digits**, **category**, **country**, **unused-abcd**, **invert-abcd**, **metering**, **ka**, **kd**, **dnis-digits**, **answer-signal**, and **nc-congestion**.
	`[or]` `5200(config-ctrl-cas)# default answer-signal group-b 6`	Sets answer-signal group-b to the default ITU value.
	`[or]` `5200(config-ctrl-cas)# no answer-signal group-b 6`	Resets answer-signal group-b 6 to the default value. Note: The parameters you do not set are automatically set to the ITU default by the Cisco AS5200.

	`controller E1 0`
	` clock source line primary`
	` cas-group 0 timeslots 1-15,17-31 type r2-analog r2-compelled`
	` cas-custom 0`
	`  country singapore use-defaults`
	`  category 2  <--- default category for singapore`
	`  answer-signal group-b 6   <--- default bxfree for singapore`
	`5200(config-ctrl-cas)# exit`
		After you configure a country with default settings, the Cisco AS5200 displays a write term, similar to the one displayed here.
		Exits the cas-custom mode.

11	`5200(config-if)# Ctrl-Z`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console by console`
		Return to enable mode.
		This message is normal and does not indicate an error.

1. CRC = Cyclic Redundancy Check.
2. AMI = Alternate Mark Inversion.

Country Codes for R2 Signaling

The following table lists the country codes supported for R2 signaling.

Table 3-16 Country Codes for R2 Signaling

Country	Code
Argentina	argentina
Australia	australia
Brazil	brazil
China	china
Columbia	columbia
Costa Rica	costarica
East Europe	easteurope
Ecuador ITU	ecuador-itu

Table 3-16 Country Codes for R2 Signaling (Continued)

Country	Code
Ecuador LME	ecuador-lme
Greece	greece
Guatemala	guatemala
Hong Kong (China variant)	hongkong-china
Indonesia	indonesia
Israel	israel
ITU (default)	itu
Korea	korea
Malaysia	malaysia
New Zealand	newzealand
Paraguay	paraguay
Peru	peru
Philippines	philippines
Saudi Arabia	saudiarabia
Singapore	singapore
South Africa Panafte	southafrica-panaftel l
Telmex	telmex
Telnor	telnor
Thailand	thailand
Uruguay	uruguay
Venezuela	venezuela
Vietnam	vietnam

Verify

To verify your R2 signaling configuration:

- Enter the **show controller e1** command to view the status for all controllers, or enter the **show controller e1 #** to view the status for a particular controller. Make sure the status indicates the controller is up (line 2 in the following example) and no alarms (line 4 in the following example) or errors (lines 9 and 10 in the following example) have been reported.

```
5200# show controller e1 0
E1 0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  Version info of Slot 0:  HW: 2, Firmware: 4, PLD Rev: 2

Manufacture Cookie is not programmed.

  Framing is CRC4, Line Code is HDB3, Clock Source is Line Primary.
  Data in current interval (785 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 13 15 minute intervals):
     0 Line Code Violations, 0 Path Code Violations,
```

```
0 Slip Secs, 12 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 12 Unavail Secs
```

- Enter the **show modem csm [***slot/modem-port***]** command to view status for a specific modem:

```
5200# show modem csm 1/0
MODEM_INFO: slot 1, port 0, unit 0, tone r2-compelled, modem_mask=0x0000,
modem_port_offset=0
tty_hwidb=0x60E63E4C, modem_tty=0x60C16F04, oobp_info=0x00000000, modem_pool=0x60BC60CC
modem_status(0x0002): VDEV_STATUS_ACTIVE_CALL.
csm_state(0x0205)=CSM_IC5_CONNECTED, csm_event_proc=0x600CFF70, current call thru CAS
line
invalid_event_count=0, wdt_timeout_count=0
wdt_timestamp_started is not activated
wait_for_dialing:False, wait_for_bchan:False
pri_chnl=TDM_PRI_STREAM(s0, u3, c7), modem_chnl=TDM_MODEM_STREAM(s1, c0)
dchan_idb_start_index=0, dchan_idb_index=0, call_id=0x0239, bchan_num=6
csm_event=CSM_EVENT_DSX0_CONNECTED, cause=0x0000
ring_no_answer=0, ic_failure=0, ic_complete=3
dial_failure=0, oc_failure=0, oc_complete=0
oc_busy=0, oc_no_dial_tone=0, oc_dial_timeout=0
remote_link_disc=2, stat_busyout=2, stat_modem_reset=0
oobp_failure=0
call_duration_started=00:04:56, call_duration_ended=00:00:00,
total_call_duration=00:01:43
The calling party phone number =
The called party phone number  = 9993003
total_free_rbs_timeslot = 0, total_busy_rbs_timeslot = 0,
total_dynamic_busy_rbs_timeslot = 0, total_static_busy_rbs_timeslot = 0,
min_free_modem_threshold = 0
```

Tips

If you are having trouble, enable the modem management Call Switching Module (CSM) debug mode using the following command.

- Enter the **debug modem csm** command.

  This is the output of **debug modem csm** for an incoming call:

```
5200# debug modem csm 1/0
*May 15 04:05:46.675: VDEV_ALLOCATE: slot 2 and port 39 is allocated.

*May 15 04:05:46.675: CSM_RX_CAS_EVENT_FROM_NEAT:(04BF):  EVENT_CALL_DIAL_IN at slot 2
and port 39

*May 15 04:05:46.675: CSM_PROC_IDLE: CSM_EVENT_DSX0_CALL at slot 2, port 39

*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x0)
*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x3)
*May 15 04:05:46.675: Mica Modem(2/39): Configure(0x6)
*May 15 04:05:46.675: Mica Modem(2/39): Call Setup
*May 15 04:05:46.891: Mica Modem(2/39): State Transition to Call Setup
*May 15 04:05:46.891: Mica Modem(2/39): Went offhook
*May 15 04:05:46.891: CSM_PROC_IC1_RING: CSM_EVENT_MODEM_OFFHOOK at slot 2, port 39
.
.
.
```

When the E1 controller comes up, the following messages appear:

```
%CONTROLLER-3-UPDOWN: Controller E1 0, changed state to up
```

```
It also shows these messages for individual timeslots:

%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 1 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 2 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 3 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 4 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 5 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 6 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 7 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 8 is up
.
.
.
```

Configuring the V.110 Terminal Adapter

Enter the commands from Table 3-17 to configure the access server V.110 terminal adapter.

Table 3-17 Configuring the V.110 Terminal Adapter

Step	Command	Purpose
1	`5200(config)# line 1 48` `5200(config-line)#`	Enter the number of TA lines to configure. If you have 48 modems, enter **line 1 48**. If 60, enter **line 1 60**. There are 12 modems on each V.110 TA card.
2	`5200(config-line)# modem autoconfigure type cisco_v110`	Configure the access server modems automatically. A string of TA configuration commands is sent to the TA each time a TA is reset.
3	`5200(config-line)# speed 9600`	Set the transmit and receive speeds. The maximum speed is 19,600.
4	`5200(config-line)# transport input all`	Allow all protocols to be used when connecting the line.
5	`5200(config-line)# autoselect ppp`	Enable remote IP users running a PPP application to dial in, bypass the EXEC facility, and connect directly to the network.
6	`5200(config-line)# modem inout`	Enable both incoming and outgoing calls.
7	`5200(config-line)# flowcontrol hardware`	Enable hardware flow control.
8	`5200(config-line)# exit` `5200(config)#`	Exit to global configuration mode.

Verify

To verify that you followed all the steps while configuring your AS5200, use the following procedure. This procedure requires that you have already configured your Ethernet port with an IP address.

- Reverse telnet to the terminal adapter port on the router you are configuring. In the following example, the terminal adapter port is 2001. If you configured your terminal adapter port correctly, the version will display on the screen.

```
5200# 172.22.16.124 2001
Trying 172.22.16.124, 2001 ... Open
at
OK
ati2
Boot Code       V2.0
Firmware        V2.7.5
FPGA            V2.2
OK
```

  To disconnect, you must first press Ctrl ^ and the X key at the same time before entering the disconnect command.

```
5200# disconnect
Closing connection to 172.22.16.124 [confirm]
```

Tips

If you are having trouble, check the configuration of the modem by using the following commands.

- If you do not see version numbers of the terminal adapter after entering the **ati2** command, use the **sh run** (show running configuration) command to compare the configuration with the information in Table 3-17.

```
5200# sh run
Building configuration...

Current configuration:
!
.
.
.
```

- Sometimes a modem could busy out. If this is the case, use the **sh mod** (show modem) command to identify the busy out modem (indicated by a lowercase **b** flag left of the modem), then use the **conf** (configure) command to clear the flag. See the following examples.

```
5200# sh mod
                 Inc calls      Out calls   Busied   Failed  No       Succ
  Mdm  Usage    Succ   Fail   Succ   Fail   Out      Dial    Answer   Pct.
b 1/0     0%       -      -      -      -       8        0       0      -
  1/1     0%       -      -      -      -       0        0       0      -
  1/2     0%       -      -      -      -       0        0       0      -
  1/3     0%       -      -      -      -       0        0       0      -
  1/4     0%       -      -      -      -       0        0       0      -
  1/5     0%       -      -      -      -       0        0       0      -
  1/6     0%       -      -      -      -       0        0       0      -
  1/7     0%       -      -      -      -       0        0       0      -
  1/8     0%       -      -      -      -       0        0       0      -
  1/9     0%       -      -      -      -       0        0       0      -
  1/10    0%       -      -      -      -       0        0       0      -
  1/11    0%       -      -      -      -       0        0       0      -

5200#
5200#conf
Configuring from terminal, memory, or network [terminal]? terminal
Enter configuration commands, one per line.  End with CNTL/Z.
5200(config)#li 1 12
5200(config-line)#no modem busyout
5200(config-line)#exit
5200(config)#exit
5200#
5200#show modem
                 Inc calls      Out calls   Busied   Failed  No       Succ
  Mdm  Usage    Succ   Fail   Succ   Fail   Out      Dial    Answer   Pct.
  1/0     0%       -      -      -      -       8        0       0      -
  1/1     0%       -      -      -      -       6        0       0      -
  1/2     0%       -      -      -      -       6        0       0      -
  1/3     0%       -      -      -      -       6        0       0      -
  1/4     0%       -      -      -      -       6        0       0      -
  1/5     0%       -      -      -      -       6        0       0      -
  1/6     0%       -      -      -      -       6        0       0      -
  1/7     0%       -      -      -      -       6        0       0      -
  1/8     0%       -      -      -      -       6        0       0      -
  1/9     0%       -      -      -      -       6        0       0      -
  1/10    0%       -      -      -      -       6        0       0      -
  1/11    0%       -      -      -      -       6        0       0      -
```

Configuring IPX Networks

Use the commands in Table 3-18 to configure the IPX networks for dial-in remote IPX users.

Table 3-18 Configuring IPX Networks

Step	Command	Purpose
1	5200(config)# **ipx routing** 5200(config-if)# **interface loopback 0** 5200(config-if)# **ipx network FEFEFE** 5200(config-if)# **exit** 5200(config)# **interface ethernet 0** 5200(config-if)# **ipx network 123ABCD encapsulation SAP** 5200(config-if)# **exit** 5200(config)# **interface group-Async 1** 5200(config-if)# **group-range 1 48** [or] for E1 PRI 5200(config-if)# **group-range 1 60** Building configuration... 5200(config-if)# **ipx ppp-client Loopback 0** 5200(config-if)# **exit** 5200(config)#	Enable IPX clients to access network resources by dialing through the access server over ISDN.
2	5200(config)# **interface dialer 1** 5200(config)# **ipx ppp-client Loopback 0**	Create a dialer interface. This is the parent interface for all of the ISDN interfaces (this was set using the dialer **rotary-group 1** command in the IP configuration).
3	5200(config)# **dialer map ipx FEFEFE.0000.0c00.1234 name jordan** 5200(config)## **dialer map ipx FEFEFE.0000.0c00.4567 name rodman** 5200(config)# **dialer map ipx FEFEFE.0000.0c00.89AB name kemp** 5200(config)# **exit**	Create a dialer map for the single IPX network address that contains all the dial-in users (for example, FEFEFE). The map for each IPX address differs and is activated by each dial-in user's login sessions. For IP configurations, dialer mapping is automatically constructed when the access server receives a user's name and address. However, when you use the IPX configuration, you must statically configure each user name's IPX address.
4	5200(config)# **dialer-list 1 protocol ipx permit** 5200(config)# exit	Enable IPX packets to reset the idle timer.
5	5200# **copy running-config startup-config** #########[OK] 5200#	This completes the configuration for IPX. Save the running configuration to the startup configuration. The access server will startup with your configuration at the next power up.

Verify

To verify the IPX routing is enabled, use the following command.

- Enter the **show ipx interface serial** command:

```
5200(config)# show ipx interface serial 1:23
Serial1:23 is up, line protocol is up
  IPX address is 2A.00e0.1e6b.2f6e [up]
  Delay of this IPX network, in ticks is 6 throughput 0 link delay 0
  IPXWAN processing not enabled on this interface.
  IPX SAP update interval is 1 minute(s)
  IPX type 20 propagation packet forwarding is disabled
  Incoming access list is not set
  Outgoing access list is not set
  IPX helper access list is not set
  SAP GNS processing enabled, delay 0 ms, output filter list is not set
  SAP Input filter list is not set
  SAP Output filter list is not set
  SAP Router filter list is not set
  Input filter list is not set
  Output filter list is not set
  Router filter list is not set
  Netbios Input host access list is not set
  Netbios Input bytes access list is not set
  Netbios Output host access list is not set
  Netbios Output bytes access list is not set
  Updates each 60 seconds, aging multiples RIP: 3 SAP: 3
  SAP interpacket delay is 55 ms, maximum size is 480 bytes
  RIP interpacket delay is 55 ms, maximum size is 432 bytes
  Watchdog spoofing is disabled, SPX spoofing is disabled, idle time 60
  IPX accounting is disabled
  IPX fast switching is configured (disabled)
  RIP packets received 0, RIP packets sent 1
  SAP packets received 0, SAP packets sent 0
```

Tips

Check for compression errors, events, NLSP activity, IPX activity, and so on by using the **debug ipx** command.

- Enter the **debug ipx ?** command to see a list of IPX debug options available:

```
5200(config)# debug ipx ?
  compression     IPX compression
  eigrp           IPX EIGRP packets
  ipxwan          Novell IPXWAN events
  nasi            NASI server functionality
  nlsp            IPX NLSP activity
  packet          IPX activity
  redistribution  IPX route redistribution
  routing         IPX RIP routing information
  sap             IPX Service Advertisement information
  spoof           IPX and SPX Spoofing activity
  spx             Sequenced Packet Exchange Protocol
```

- Enter the debug command to view the debug information for one above listed options.

Configuring AppleTalk

Configure AppleTalk to enable Macintosh clients to access network resources by dialing through the access server over ISDN. Use the commands in Table 3-19 to configure AppleTalk.

Table 3-19 Configuring AppleTalk

Step	Command	Purpose
1	5200# **configure terminal** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)# **appletalk routing** 5200(config)# **appletalk virtual-net 2 ATCP Zone**	Enable AppleTalk routing and set the AppleTalk zone ATCP on network 2 (your network number and zones may differ). All users that dial in to the system will belong to the AppleTalk network 2 in the AppleTalk zone ATCP Zone. All the dial-in users will look as though they are on a single network. Links will not have their own network numbers. This applies to configurations using PPP instead of ARAP encapsulation.
2	5200(config)# **appletalk cable-range 1-1 1.120** 5200(config-if)# **appletalk zone Ethernet** 5200(config-if)# **exit** 5200(config)# **exit**	Sets the AppleTalk cable range and the AppleTalk zone on the Ethernet.
3	5200# **copy running-config startup-config** #########[OK] 5200#	Completes configuration for AppleTalk operation. Save the running configuration to the startup configuration.

Verify

To verify the AppleTalk interface is up and running, use the following command.

- Enter the **show appletalk interface serial** command:

```
5200# show appletalk interface serial 1:23
Serial1:23 is up, line protocol is up
  AppleTalk address is 10.1, Valid
  AppleTalk zone is "dolzone"
  AppleTalk discarded 37 packets due to output errors
  AppleTalk address gleaning is not supported by hardware
  AppleTalk route cache is disabled, Dial on Demand specified
```

Tips

If you are having trouble, you can troubleshoot the AppleTalk protocol by using its debug commands to view information for the errors, events, and packets and check the Gateway name, NAS name, and if the virtual access interface is up.

- Use the **debug ppp negotiation** command.

```
5200# debug ppp negot
PPP protocol negotiation debugging is on
5200#
%LINK-3-UPDOWN: Interface Async1, changed state to up
PPP Async1: treating connection as a dedicated line
ppp: sending CONFREQ, type = 2 (CI_ASYNCMAP), value = 0xA0000
ppp: sending CONFREQ, type = 3 (CI_AUTHTYPE), value = 0xC223/5
ppp: sending CONFREQ, type = 5 (CI_MAGICNUMBER), value = 0xAB1BAB3
PPP Async1: state = REQsent fsm_rconfack(0xC021): rcvd id 7
ppp: config ACK received, type = 2 (CI_ASYNCMAP), value = 0xA0000
ppp: config ACK received, type = 3 (CI_AUTHTYPE), value = 0xC223
ppp: config ACK received, type = 5 (CI_MAGICNUMBER), value = 0xAB1BAB3
ppp: config ACK received, type = 7 (CI_PCOMPRESSION)
ppp: config ACK received, type = 8 (CI_ACCOMPRESSION)
PPP Async1: received config for type = 1 (MRU) value = 1500 acked
PPP Async1: received config for type = 2 (ASYNCMAP) value = 0x0 acked
PPP Async1: received config for type = 5 (MAGICNUMBER) value = 0x565CFA6A acked
PPP Async1: received config for type = 7 (PCOMPRESSION) acked
PPP Async1: received config for type = 8 (ACCOMPRESSION) acked
ipcp: sending CONFREQ, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
ipcp: sending CONFREQ, type = 3 (CI_ADDRESS), Address = 171.60.199.193
Resetting ATCP
atcp: sending CONFREQ, type = 6 (CI_AT_SERVERINFO), values = 119132, 6
atcp: sending CONFREQ, type = 7 (CI_AT_ZONEINFO), values = 1191B3, 9
atcp: sending CONFREQ, type = 8 (CI_AT_DEFAULT_ROUTER), values = 5, C7
ppp Async1: ipcp_reqci: rcvd COMPRESSTYPE (ACK)
ppp Async1: Negotiate IP address: her address 0.0.0.0 (NAK with address 171.60.199.245)
(NAK)
ppp: ipcp_reqci: returning CONFNAK.
ppp Async1: Negotiate AT address
atcp Async1: NAKing with our address (NAK)
ppp Async1: Negotiate AT routing protocol (rejected) (REJ)
ppp Async1: Negotiate AT broadcast suppression (rejected) (REJ)
ppp: atcp_reqci: returning CONFREJ.
PPP Async1: state = REQsent fsm_rconfack(0x8021): rcvd id 15
ipcp: config ACK received, type = 2 (CI_COMPRESSTYPE), slots = 15, csid = 0
ipcp: config ACK received, type = 3 (CI_ADDRESS), Address = 171.60.199.193
PPP Async1: state = REQsent fsm_rconfnck(0x8029): rcvd id 15
ATcp: config NAK received, type = 1 (CI_AT_ADDRESS), values = 0, 0
ppp: Async1 ATCP NAK for address
atcp: sending CONFREQ, type = 1 (CI_AT_ADDRESS), values = 5, C7
atcp: sending CONFREQ, type = 6 (CI_AT_SERVERINFO), values = 119132, 6
atcp: sending CONFREQ, type = 7 (CI_AT_ZONEINFO), values = 1191B3, 9
atcp: sending CONFREQ, type = 8 (CI_AT_DEFAULT_ROUTER), values = 5, C7
ppp Async1: ipcp_reqci: rcvd COMPRESSTYPE (ACK)
ppp Async1: Negotiate IP address: her address 171.60.199.245 (ACK)
ppp: ipcp_reqci: returning CONFACK.
Async1: install route to 171.60.199.245
ppp Async1: Negotiate AT address
atcp Async1: NAKing with our address (NAK)
ppp: atcp_reqci: returning CONFNAK.
PPP Async1: state = REQsent fsm_rconfack(0x8029): rcvd id 16
atcp: config ACK received, type = 1 (CI_AT_ADDRESS), values = 5, C7
atcp: config ACK received, type = 6 (CI_AT_SERVERINFO), values = 119132, 6
atcp: config ACK received, type = 7 (CI_AT_ZONEINFO), values = 1191B3, 9
atcp: config ACK received, type = 8 (CI_AT_DEFAULT_ROUTER), values = 5, C7
%LINEPROTO-5-UPDOWN: Line protocol on Interface Async1, changed state to up
ppp Async1: Negotiate AT address (ACK)
ppp: atcp_reqci: returning CONFACK.
```

- Use the **show interface async 1** command.

```
5200# show int async 1
Async1 is up, line protocol is up
  Hardware is Async Serial
  Interface is unnumbered.  Using address of Ethernet0 (171.60.199.193)
  MTU 1500 bytes, BW 38 Kbit, DLY 100000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive not set
  DTR is pulsed for 5 seconds on reset
  LCP Open
  Open: IPCP, ATALKCP
  Last input 00:00:01, output 00:00:08, output hang never
  Last clearing of "show interface" counters 07:17:22
  Input queue: 1/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/9 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     753 packets input, 22232 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     638 packets output, 37821 bytes, 0 underruns
     0 output errors, 0 collisions, 3 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

- Use the **show apple interface async 1** command.

```
5200# show apple int async 1
Async1 is up, line protocol is up
  AppleTalk port is in client-mode
  AppleTalk discarded 3 packets due to input errors
  AppleTalk address gleaning is not supported by hardware
  AppleTalk route cache is disabled, port down
```

- You can also set the access server to display events messages for the AppleTalk interface by using the **debug appletalk events** command. When done troubleshooting, enter the **no debug appletalk events** to turn off the messages.

```
5200# debug appletalk events
AppleTalk Events debugging is on
*Aug 15:56:06.907: AT: RTMP GC complete (0 PDBs freed, 0 PDBs waiting)
*Aug 15:17:56:06.927: AT: Connected GC complete (0 PDBs freed, 0 PDBs waiting)
```

Configuring MMP

MMP support on a group of access servers requires that each access server be configured to support the following:

- Stack Group Bidding Protocol (SGBP)
- Virtual templates used for cloning interface configurations to support MMP
- Multilink PPP

Use the commands in Table 3-20 to configure MMP.

Table 3-20 Configuring MMP

Step	Command	Purpose

1	`5200> enable`
	`Password: <password>`
	`5200#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to `5200#`.

2	`5200# config term`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`5200(config)#`
		Enter global configuration mode. You have entered global configuration mode when the prompt changes to `5200(config)#`.

3	`5200(config)# sgbp group stack`q	Create a stack group and assign this access server to it.
4	`5200(config)# sgbp member systemc 172.16.189.254`	Specify the host name and IP address of the peer member of the stack group.
5	`5200(config)# multilink virtual-template number`	Define a virtual template for the stack group.
6	`5200(config)# ip local pool default ip-address`	Specify an IP address pool by using any pooling mechanism—for example, IP local pooling or DHCP pooling.
7	`5200(config)# interface virtual-template number`	Create a virtual template[1] interface, and enter interface configuration mode.
8	`5200(config-if)# ip unnumbered ethernet 0`	If dialers are not configured on the physical interfaces, identify the virtual template interface type and number on the LAN.
9	`5200(config-if)# encapsulation ppp`	Enable PPP encapsulation on the virtual template interface.
10	`5200(config-if)# ppp multilink`	Enable Multilink PPP on the virtual template interface.
11	`5200(config-if)# ppp authentication chap`	Enable PPP authentication on the virtual template interface.

12	`5200(config-if)# end`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console by console`
	`5200#`
		Return to privileged EXEC mode.
		This message is normal and does not indicate an error.

1. A virtual template is a serial interface configuration with no hardware association.

Verify

To verify the MMP configuration on each server, use the following command.

- Enter the **show sgbp** command.

```
5200-7# show sgbp
Group Name: test Ref: 0x4780B252
Seed bid: default, 50, default seed bid setting

  Member Name: 5200-3 State: active Id: 9
  Ref: 0x4780B54D
  Address: 172.22.21.8

5200-3# show sgbp
Group Name: test Ref: 0x4780B54D
Seed bid: default, 50, default seed bid setting

  Member Name: 5200-7 State: active Id: 1
  Ref: 0x4780B252
  Address: 172.22.21.12
```

  Note the following:

  — Check to make sure State is active. State set to idle indicates there is a misconfiguration on either side.

  — Check to make sure the username and password are configured for the SGBP group; otherwise the servers will not be able to talk to each other.

Tips

If you are having trouble, use the following commands.

- Enter the **debug sgbp ?** command to view a list of available debugging commands.

```
5200# debug sgbp ?
  errors    SGBP errors
  events    SGBP events
  hellos    SGBP connection hellos
  messages  SGBP messages
  queries   SGBP mastership queries
```

- Enter the **debug sgbp errors** command to view error messages. When done troubleshooting, enter the **no debug sgbp errors** to turn off the messages.

```
5200# debug sgbp errors
*Mar  4 11:55:24.105 EST: %SGBP-1-MISSCONF: Possible misconfigured member 5200-6 using
172.22.21.11

*Mar  4 11:55:41.185 EST: %SGBP-7-NORESP: Fail to response to 5200-3 group test, may
not have password
```

  Error messages are displayed if one server 5200-6 shows an SGBP group configured but the group is not configured for another server in the group. Error messages are also displayed if the password is not configured for the SGBP group.

- Enter the **debug sgbp events** command to view event messages. When done troubleshooting, enter the **no debug sgbp events** to turn off the messages.

```
5200# debug sgbp events
*Mar  4 12:26:46.441 EST: %SGBP-7-CLOSE: Closing pipe for member 5200-3
*Mar  4 12:26:46.445 EST: %SGBP-5-LEAVING: Member 5200-3 leaving grouptest
```

  The above event message indicates that the SGBP pipe went down and 5200-3 is no longer part of the 5200-7 SGBP group. You can check 5200-3 for the reasons why the SGBP pipe went down. Possibly, the SGBP member entry for 5200-7 was removed or there is no communication between 5200-7 and 5200-3.

Creating Authentication Accounts

You can create authentication accounts for other routers in an MMP stack. If your stack name is STACK1, you need to create a user account called STACK1 on each router with the same password.

```
username STACK1 password cisco
sgbp group STACK1
sgbp member <other router name> <other router IP address>
```

Configuring VPDN

Virtual private dial-up networking (VPDN) enables users to configure secure networks that take advantage of Internet service providers (ISPs) that tunnel the company's remote access traffic through the ISP cloud.

Remote offices or mobile users can connect to their home network using local third-party dial-up services. The dial-up service provider agrees to forward the company's traffic from the ISP Point-of-Presence (POP) to a company-run home gateway. Network configuration and security remains in the control of the client. The dial-up service provider provides a virtual pipe between the company's sites. Use the commands in Table 3-21 to configure VPDN.

Note The MMP feature uses VPDN to connect multiple PPP sessions for which individual dial-in calls have arrived on different stack group members. VPDN provides speed and reliability for the setup and shutdown of Multilink PPP.

Table 3-21 Configuring VPDN

Step	Command	Purpose
1	5200> **enable** Password: **<*password*>** 5200#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to 5200#.
2	5200# **config term** Enter configuration commands, one per line. End with CNTL/Z. 5200(config)#	Enter global configuration mode. You have entered global configuration mode when the prompt changes to 5200(config)#.
3	5200(config)# **vpdn enable**	Enable virtual private dial-up networking.

Table 3-21 Configuring VPDN (Continued)

Step	Command	Purpose
4	5200(config)# **vpdn outgoing domain1.com nas1 ip 172.21.9.18** 5200(config)# **vpdn outgoing domain2.com nas2 ip 173.22.10.19**	Specify the name and IP address of the remote host and the name to use when authenticating a tunnel for forwarding traffic to the remote host on a virtual private dial-up network. In this example, two remote hosts are specified.
5	5200(config-line)# **end** 5200# %SYS-5-CONFIG_I: Configured from console by console 5200#	Return to privileged EXEC mode. This message is normal and does not indicate an error.

Verify

To verify your VPDN configuration, use the following command.

- Enter the **show vpdn** command to make sure the tunnels are active (see line 2 in the following example).

```
5200# show vpdn
Active L2F tunnels = 2

NAS Name        Gateway Name    NAS CLID   Gateway CLID   State
test-mmp        test-mmp          272          272        open
192.168.1.99    192.168.1.119

L2F MIDs = 10
Name                        NAS Name      Interface    MID      State
rw56                        test-mmp       Vi238        1       open
rw55                        test-mmp       Vi240        3       open
rw54                        test-mmp       Vi242        4       open
rw57                        test-mmp       Vi246        7       open
rw57                        test-mmp       Vi248        8       open
rw54                        test-mmp       Vi245        13      open
rw55                        test-mmp       Vi244        14      open
rw16                        test-mmp       Vi249        97      open
rw16                        test-mmp       Vi251        98      open
rw56                        test-mmp       Vi250        100     open
```

Tips

If you are having trouble, you can troubleshoot the VPDN protocol by using its debug commands to view information for the errors, events, and packets and check the Gateway name, NAS name, and if the virtual access interface is up.

- Enter **debug vpdn ?** to view a list of available debug commands:

```
5200# debug vpdn ?
  error        VPDN Protocol errors
  event        VPDN event
  l2f-errors   L2F protocol errors
  l2f-events   L2F protocol events
  l2f-packets  L2F protocol packets
  packet       VPDN packet
```

- Enter debug commands to view error information. Do not forget to turn off the debug messages by entering the **no debug vpdn** command when you are done troubleshooting.

This is sample output for the **debug vpdn event** command:

```
5200# debug vpdn event
VPN events debugging is on
*May 15 17:55:49.367: %LINK-3-UPDOWN: Interface Virtual-Access239, changed
state to down
*May 15 17:55:49.547: Virtual-Access249 VPN reset
*May 15 17:55:49.547: %LINK-3-UPDOWN: Interface Virtual-Access249, changed
state to down
```

This is sample output for the **debug vpdn l2f-events** command:

```
5200# debug vpdn l2f-events
L2F protocol events debugging is on
*May 15 17:56:46.259: L2F_OPEN received
*May 15 17:56:46.263: L2F Got a MID management packet
*May 15 17:56:46.339: %LINK-3-UPDOWN: Interface Virtual-Access239, changed
state to up
```

This is sample output for the **debug vpdn l2f-errors** command:

```
5200# debug vpdn l2f-errors
L2F protocol errors debugging is on
crashsite-t3#
*May 15 17:57:57.827: %LINK-3-UPDOWN: Interface Virtual-Access251, changed
state to down
```

Creating Authentication Accounts

You can create authentication accounts for other routers between the NAS and the HGW for VRDN.

On the NAS an example is:

```
username NAS password cisco
username HGW password cisco
vpdn enable
vpdn outgoing cisco.com NAS ip X.X.X.X
```

On the HGW, an example is:

```
username NAS password cisco
username HGW password cisco
vpdn enable
vpdn incoming NAS HGW virtual-template 1
```

Saving Configuration Changes

To avoid losing the access server configuration, save it to NVRAM. Use the commands in Table 3-22 to save your configuration changes.

Table 3-22 Saving Configuration Changes

Step	Command	Purpose

1	`5200> enable`
	`Password: <password>`
	`5200#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to `5200#`.

2	`5200# copy running-config startup-config`	Save the configuration changes to NVRAM so that they are not lost during resets, power cycles, or power outages.

3	`5200(config-if)# end`
	`5200#`
	`%SYS-5-CONFIG_I: Configured from console 5200#`
		Return to privileged EXEC mode.
		This message is normal and does not indicate an error.

Comprehensive Configuration Example

The following shows a typical T1 configuration:

```
5200# show running-config
Building configuration...

Current configuration:
version 11.2
service slave-log
service udp-small-servers
service tcp-small-servers
!
hostname 5200
!
aaa new-model
aaa authentication login default local
aaa authentication arap default local
aaa authentication ppp default local
enable secret 5 $1$ltBE$Slq0BUs/5mwqw6B4DOapg/
!
username jim password 7 02150C5A110702
!
enable password cisco
!
modem startup-test
no ip domain-lookup
isdn switch-type primary-5ess
!
controller T1 0
 framing esf
 clock source line primary
 linecode b8zs
 pri-group timeslots 1-24
!
controller T1 1
 shutdown
 clock source line secondary
!
interface Ethernet0
 ip address 172.16.254.254 255.255.255.0
!
interface Serial0
 no ip address
 shutdown
 no fair-queue
!
interface Serial1
 no ip address
 shutdown
!
interface Serial0:23
 ip address 172.16.253.254 255.255.255.0
encapsulation ppp
isdn incoming-voice modem
dialer-group 1
 no fair-queue
 ppp multilink
 ppp authentication chap pap
!
interface Group-Async1
 ip unnumbered Ethernet0
 encapsulation ppp
 async mode interactive
 peer default ip address pool default
```

```
 no cdp enable
 ppp authentication chap pap
 group-range 1 24
!
ip local pool default 172.16.254.1 172.16.254.48
!
dialer-list 1 protocol ip permit
!
line con 0
line 1 24
 exec
 autoselect during-login
 autoselect ppp
 modem InOut
 modem autoconfigure type microcom_hdms
 transport input all
 stopbits 1
 rxspeed 57600
 txspeed 57600
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

This concludes the basic access server configuration.

Where to Go Next

At this point you can proceed to:

- The chapter “Access Service Security” to configure security on the access server.
- The Cisco IOS software configuration guide and command reference publications for more advanced configuration topics. These publications are available on the documentation CD-ROM that came with your access server, on the World Wide Web from Cisco’s home page (http://www.cisco.com), or you can order printed copies.
- The *System Error Messages* and *Debug Command Reference* publications for troubleshooting information.