CHAPTER 3

Basic Configuration Using the Command-Line Interface

Note The information herein applies to the Cisco AS5350, Cisco AS5400, and Cisco AS5400HPX universal gateways. Note that the latter requires use of Cisco IOS release 12.2(2)XB or later.

After you have verified your basic setup, you are ready to begin configuring basic tasks that prepare your system for data call processing.

This chapter describes how to use the Cisco IOS software command-line interface (CLI) to commission your Cisco AS5350 or Cisco AS5400 universal gateway and includes the following tasks:

Note After commissioning your gateway, proceed to Chapter 4 to configure the software features that are most commonly used on your system.

Tip

- For further help with AS5350 universal gateway configurations, see http://www.cisco.com/en/US/products/hw/univgate/ps501/ps503/index.html
- For advanced configuration topics and procedures, go to *Configuring Selected 12.1 Cisco IOS Software Features*, available online at http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5400/index.htm

  You can also view these publications on the Documentation CD-ROM that arrived with your gateway.
- If you are experienced using the Cisco IOS software, you might find the "Where to Go Next" section on page 3-42 a useful reference for configuration.

Configuring the Host Name, Password, and Time Stamps

The first configuration tasks you might want to execute are assign a host name to your Cisco AS5350 or Cisco AS5400, set an encrypted password, and turn on time stamps because:

- Assigning a host name allows you to distinguish between different network devices.
- Setting an encrypted password in the configuration file adds greater security on your gateway.
- Time stamps help you trace debug output for testing connections. Not knowing exactly when an event occurs hinders you from examining background processes.

Configure

	Command	Purpose

Step 1	`Router> enable`
	`Password: password`
	`Router#`
		Enters enable mode (also called privileged EXEC mode). Enters the password. You are in enable mode when the prompt changes to `Router#`.

Step 2	`Router# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`Router(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `Router(config)#`.

Step 3	`Router(config)# hostname AS5400` `AS5400(config)#`	Changes the name of the gateway to a meaningful name. Substitute your host name for `AS5400`.
Step 4	`AS5400(config)# enable secret guessme`	Enters an enable secret password. This password provides access to privileged EXEC mode. When you type **enable** at the EXEC prompt (`AS5350>` or `AS5400>`), you must enter the enable secret password to gain access to configuration mode. Substitute your enable secret for **guessme**.

	Command	Purpose
Step 5	`AS5400(config)# service password-encryption`	Applies password encryption. When password encryption is enabled, the encrypted form of the password is displayed when a **show configuration** command is entered. **Note** You cannot recover a lost encrypted password.
Step 6	`AS5400(config)# service timestamps debug datetime msec`	Enters timestamp debugging messages to include milliseconds in the date and time stamp.
Step 7	`AS5400(config)# service timestamps log datetime msec`	Enters timestamp logging messages to include milliseconds in the date and time stamp.
Step 8	`AS5400(config)# line con 0`	Enters line configuration mode to configure the console port. You are in configuration mode when the prompt changes to `AS5350(config-line)#` or `AS5400(config-line)#`.
Step 9	`AS5400(config-line)# exec-timeout 0 0`	Prevents the gateway's EXEC facility from timing out if you do not type any information on the console screen for an extended period.
Step 10	`AS5400(config-line)# exit` `AS5400(config)#`	Exits global configuration mode.

Note The **enable password** command is obsolete. Do not use it.

Verify

To verify that you configured the right host name and passwords:

- Enter the **show configuration** command:

```
AS5400(config)# show configuration
Using 1888 out of 512000 bytes
!
version XX.X
.
.
!
hostname AS5400
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1loO/w8/
.
```

Check the host name and encrypted password displayed near the top of the command output.

- Exit global configuration mode and attempt to login using the new enable secret password. The **show privilege** command shows the current security privilege level.

```
AS5400# exit

AS5400 con0 is now available
Press RETURN to get started.
AS5400> enable
Password:
AS5400# show privilege
Current privilege level is 15
AS5400#
```

Configuring Local AAA Security

Configure authentication, authorization, and accounting (AAA) to perform login authentication by using the local username database. The **login** keyword authenticates EXEC shell users. Additionally, configure PPP authentication to use the local database if the session was not already authenticated by **login**.

AAA (called triple A) is the Cisco IOS security model used on all Cisco devices. AAA provides the primary framework through which you set up access control on the Cisco AS5350 or Cisco AS5400.

The same authentication method is used on all interfaces. AAA is set up to use the local database configured on the gateway. This local database is created with the **username** configuration commands.

Step 1 Create a local login username database in global configuration mode. In this example, the administrator's username is *admin*. The remote client's login username is *Harry*.

```
AS5400(config)# username admin password adminpasshere
AS5400(config)# username Harry password Harrypasshere
```

Caution This step also prevents you from getting locked out of the gateway. If you get locked out, you must reboot the device and perform password recovery.

Step 2 Configure local AAA security in global configuration mode. You *must* enter the **aaa new-model** command before the other two authentication commands.

```
AS5400(config)# aaa new-model
AS5400(config)# aaa authentication login default local
AS5400(config)# aaa authentication ppp default if-needed local
```

Table 3-1 explains the previous configuration example.

Table 3-1 Local AAA Commands

Command	Purpose
`AS5400(config)# aaa new-model`	Initiates the AAA access control system. This command immediately locks down login and PPP authentication.

Table 3-1 Local AAA Commands (continued)

Command	Purpose
`AS5400(config)# aaa authentication login default local`	Configures AAA to perform login authentication by using the local username database. The **login** keyword authenticates EXEC shell users.
`AS5400(config)# aaa authentication ppp default if-needed local`	Configures PPP authentication to use the local database if the session was not already authenticated by **login**.

Step 3 Log in with your username and password:

```
AS5400# login

User Access Verification

Username: admin
Password:

AS5400#
```

A successful login means that your local username works on any TTY or VTY line. Do not disconnect your session until you can log in.

Note For comprehensive information about how to implement a Cisco AAA-based security environment for dial-based and router environments, see *Cisco AAA Implementation Case Study*, available online at http://www.cisco.com/univercd/cc/td/doc/cisintwk/intsolns/aaaisg/index.htm

Creating a Login Banner

A banner shows you which unit you are connected to (or are connecting through, in the case of a console server).

Step 1 Create the banner:

```
AS5400(config)# banner login |
Enter TEXT message.  End with the character '|'.
This is a secured device.
Unauthorized use is prohibited by law.
|
AS5400(config)# ^Z
AS5400#
```

Step 2 Test the banner:

```
AS5400# login

This is a secured device.
Unauthorized use is prohibited by law.

User Access Verification
```

```
Username: admin
Password:

AS5400#
```

Configuring Loopback Interfaces, Fast Ethernet Interfaces, and IP Route

To commission a basic dial access service perform the following tasks:

- Create two loopback interfaces.
- Bring up the Fast Ethernet interface.
- Add an IP route to the default gateway.

Step 1 Assign the IP addresses as in the following example, and create an IP route to the default gateway:

```
AS5400(config)# interface loopback 0
AS5400(config-if)# ip address 172.22.99.1 255.255.255.255
AS5400(config-if)# exit
AS5400(config)# interface loopback 1
AS5400(config-if)# ip address 172.22.90.1 255.255.255.0
AS5400(config-if)# exit
AS5400(config)# interface FastEthernet 0/0
AS5400(config-if)# ip address 172.28.186.55 255.255.255.240
AS5400(config-if)# no shutdown
AS5400(config-if)# exit
AS5400(config)# ip route 0.0.0.0 0.0.0.0 172.28.186.49
```

In this example:

- Interface loopback 0—Identifies with a unique and stable IP address. One unique IP address from a common block of addresses is assigned to each device in the IP network. This technique makes security-filtering easy for the Network Operations Center (NOC). One class C subnet used for device identification can support 254 distinct devices with unique loopback addresses.
- Interface loopback 1—Hosts a pool of IP addresses for the remote nodes. In this way, one route, instead of 254 routes, is summarized and propagated to the backbone. Pick the IP address for loopback 1 from the range of addresses that you will assign to the local address pool.

Step 2 Verify that the Fast Ethernet interface is up. Ping the default gateway to verify this.

```
AS5400# ping 172.28.186.49

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.186.49, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/4 ms
```

This step verifies that you have IP connectivity with another device on the subnet. If the ping succeeds to the default gateway, try pinging the DNS server in your backbone. Make sure that the backbone routers are configured to get to the gateway; otherwise, the ping does not work. Configure the backbone routers to support the routes to the networks you are using.

Note An 80% ping-success rate is normal for the first time you ping an external device. The Cisco AS5350 and Cisco AS5400 do not have an Address Resolution Protocol (ARP) entry for the external device. A 100% success rate is achieved the next time you ping the device.

Configuring the Asynchronous Group Interface

Asynchronous group interfaces allow administrators to easily configure a large number of asynchronous interfaces by allowing them to clone from one managed copy. This can also reduce the number of lines in the configuration, because each individual asynchronous interface configuration can be replaced by at least one group-async. To assign the asynchronous interfaces to a group-async interface, first determine the number of asynchronous lines that need to be aggregated. This can be determined from the running configuration.

Notice that, in the "Checking the Initial Running Configuration" section on page 2-5, the asynchronous lines are numbered from 0 to 107.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters the **enable** command. Enters your password. You are in privileged EXEC mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5540(config)#` or `AS5350(config)#`.

Step 3	`AS5400(config)# interface group-async 1` `AS5400(config-if)#`	Places all asynchronous interfaces in a single group, so that you configure the same parameters quickly on all interfaces at one time.

Step 4	`AS5400(config-if)# group-range slot/port slot/port`
	`Building configuration...`
	`AS5400(config-if)#`
		Defines the slot/port group range of the interface. The range that you specify depends on the number of asynchronous interfaces you have on your gateway. If your gateway has 108 asynchronous interfaces, you can specify **group-range 1/1 1/107.**

Step 5	`AS5400(config-if)# Ctrl-Z` `AS5400#`	Returns to enable mode.

Verify

To verify your group interface configuration:

- Enter the **show interface async** command to check if the protocol is up:

  `AS5400# show interface async 4/0`

```
Async4/00 is down, line protocol is down
  modem(slot/port)=4/0, state=IDLE
  dsx1(slot/unit/channel)=NONE, status=VDEV_STATUS_UNLOCKED
  Hardware is Async Serial
  MTU 1500 bytes, BW 115 Kbit, DLY 100000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SLIP, loopback not set
  DTR is pulsed for 5 seconds on reset
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/10/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 86 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 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
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

Tip If you are having trouble:

- Enter the **show async status** command to check for errors and local and remote addresses:

```
AS5400# show async status

Async protocol statistics:

Int    Local            Remote    Qd      InPack   OutPac Inerr  Drops  MTU
 1/00  42.1.1.1         None       0      0        0      0      0      1500
 1/01  192.168.10.100   None       0      0        0      0      0      1500
 1/02  192.168.10.100   None       0      0        0      0      0      1500
 1/03  192.168.10.100   None       0      0        0      0      0      1500
 1/04  192.168.10.100   None       0      0        0      0      0      1500
 1/05  192.168.10.100   None       0      0        0      0      0      1500
 4/52  192.168.10.100   None       0      0        0      0      0      1500
.
.
.
*6/00  192.168.10.100   34.6.42.1  0      130      50     5      0      1500
*6/01  192.168.10.100   34.6.92.1  0      131      53     5      0      1500
*6/02  192.168.10.100   34.5.92.1  0      130      50     5      0      1500
*6/03  192.168.10.100   34.4.14.1  0      116      40     4      0      1500
.
.
.
*7/102 192.168.10.100    34.1.89.1  0      119     40     4      0      1500
*7/103  192.168.10.100   34.4.34.1  0      118     40     4      0      1500
*7/104  192.168.10.100   34.1.67.1  0      105     40     4      0      1500
 7/105  192.168.10.100   None       0      0       0      0      0      1500
*7/106  192.168.10.100   34.4.90.1  0      119     40     4      0      1500
*7/107  192.168.10.100   34.1.42.1  0      119     40     4      0      1500

 Rcvd: 25762 packets, 1052214 bytes
    0 format errors, 891 checksum errors, 0 overrun
 Sent: 8891 packets, 222264 bytes, 0 dropped
```

Configuring Channelized T1 and E1 Trunk Cards

On a Cisco AS5350 or Cisco AS5400, you can allocate the available channels for channelized E1 and T1 in the following ways:

- All channels can be configured to support ISDN PRI.
- If you are not running ISDN PRI, all channels can be configured to support robbed-bit signaling (also known as channel-associated signaling).
- All channels can be configured in a single channel group.
- Mix and match channels supporting ISDN PRI, channel grouping, and channel-associated signaling (CAS).
- Mix and match channels supporting ISDN PRI, channel grouping, and robbed-bit signaling across the same T1 line. For example, on the same channelized T1 you can configure the **pri-group timeslots 1-10,24** command, **channel-group 11 timeslots 11-16** command, and **ds0-group 17 timeslots 17-23 type e&m-fgb** command. This is an unusual configuration because it requires you to align the correct range of timeslots on both ends of the connection.

Note For configuration information about leased-line or nondial use, see the Cisco IOS publication *Configuration Fundamentals Configuration Guide* available online.

Note You can install, in one Cisco AS5350 or Cisco AS5400 chassis, a maximum of two T1 trunk cards, two E1 trunk cards, or one CT3 trunk card.

Controller Numbering

The CT1/E1 controller numbering convention is dfc-slot/port in CLI commands. Trunk-card slot numbering starts from the motherboard and works up from left to right. Slot **0** is reserved for the motherboard. CT1/E1 trunk-card slots are numbered sequentially from **1** to **7**. Port numbering is from **0** to **7**.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode. Enters the password. You have entered enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

	Command (continued)	Purpose (continued)
Step 3	AS5400(config)# **controller** [**t1** | **e1**] *slot/port* AS5400(config-controller)#	Enters controller configuration mode to configure your controller slot and port. Slot values range from **1** to **7**. Port values range from **0** to **7** for T1 and E1.
Step 4	AS5400(config-controller)# **framing esf**	Enters your telco's framing type: **esf** or **sf**.
Step 5	AS5400(config-controller)# **linecode b8zs**	Enters your telco's line code type: **ami** or **b8zs**.
Step 6	AS5400(config-controller)# **Ctrl-Z** AS5400#	Returns to enable mode.

Verify

To verify that your controller is up and running and no alarms have been reported:

- Enter the **show controller** command and specify the controller type, slot, and port numbers:

```
AS5400# show controller t1 1/7

T1 1/7 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.

  The TDM subsystem troubleshooting commands are not used during normal system operation. Instead, the Cisco IOS commands show the current status and settings of the TDM backplane, enable debug output for display to the user when TDM programming occurs, and provide a set of test commands to test the functionality of the TDM path. TDM commands are generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

Note For details on the TDM feature, refer to the Cisco IOS software configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that ships with your gateway and on the World Wide Web from the Cisco home page, or you can order printed copies. See "Obtaining Documentation" on page xvi.

Tip If you are having trouble:

- First decide if the problem is due to the T1 or E1 line or with a particular channel group. If the problem is with a single channel group, you have a potential interface problem. If the problem is with the T1 or E1 line, or with all channel groups, you have a potential controller problem. (See the "Configuring ISDN PRI" section on page 3-13.)
- To troubleshoot your E1 or T1 controllers, first check that the configuration is correct. The framing type and line code should match to what the service provider has specified. Then check channel group and PRI-group configurations, especially to verify that the timeslots and speeds are what the service provider has specified. At this point, the **show controller t1** or **show controller e1** commands should be used to check for T1 or E1 errors. Use the command several times to determine if error counters are increasing, or if the line status is continually changing. If this is occurring, you need to work with the service provider.
- Another common reason for failure is the **dial-tdm-clock priority** setting. The default setting is a free-running clock that causes clock slip problems if not set properly. (See the "Configuring Clocking" section on page 3-31.)

Configuring a Channelized T3 Trunk Card

Your AS54-DFC-CT3 trunk card offers 28 individual T1 channels (bundled in the T3) for serial transmission of data. The CT3 link supports the maintenance data link channel in C-Bit parity mode and also payload and network loopbacks. The T1s multiplexed in the CT3 link support facilities data link (FDL) in extended super frame (ESF) framing.

Additionally, you can allocate your CT1 channels as described in the "Configuring Channelized T1 and E1 Trunk Cards" section on page 3-9.

Controller Numbering

The CT3 controller numbering convention is dfc-slot/port in CLI commands. Trunk-card slot numbering starts from the motherboard and works up from left to right. Slot **0** is reserved for the motherboard. Trunk-card slots are numbered sequentially from **1** to **7**. Port number value is always **0**.

Under the CT3, the CT1 controller numbering convention is dfc-slot/port:channel in CLI commands. Port numbering values range from **1** to **28**.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode. Enters the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

Step 3	`AS5400(config)# controller t3 1/0` `AS5400(config-controller)#`	Enters controller configuration mode to configure your T3 controller for slot **1** port **0**. Slot values range from **1** to **7**. Port number is always **0**.
Step 4	`AS5400(config-controller)# framing c-bit`	Enters your telco's framing type: **c-bit** or **m23**.
Step 5	`AS5400(config-controller)# clock source line`	Enters your clock source: **internal** or **line**.
Step 6	`AS5400(config-controller)# cablelength 450`	Enters your cablelength: values range from **0** to **450** feet.

Step 7	`AS5400(config-controller)# t1 1-28 controller`
	
	`or`
	
	`AS5400(config-controller)# t1 1-10,15-20,23 controller`
		Configures your T1 controllers. Range is **1** to **28**. In this instance, all 28 T1s are configured at once.
		
		or
		
		Omits specified T1 controllers while provisioning others. In this instance, T1 controllers 11-14, 21, 22, and 24-28 are unprovisioned.
		
		Note This CLI command is backward compatible only.

Step 8	`AS5400(config-controller)# Ctrl-Z` `AS5400#`	Returns to enable mode.

Verify

To verify that your controller is up and running and no alarms have been reported:

- Enter the **show controller** command and specify the controller type, slot, and port numbers:

```
AS5400# show controller t3 1/0

T3 1/0 is down.
  Applique type is Channelized T3
  Transmitter is sending remote alarm.
  Receiver has loss of signal.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Line
  Data in current interval (330 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 24 hours)
```

```
9944 Line Code Violations, 0 P-bit Coding Violation,
0 C-bit Coding Violation, 0 P-bit Err Secs,
0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
86400 Unavailable Secs, 0 Line Errored Secs,
0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

Tip If you are having trouble, make sure the **show controller** output is not reporting alarms or violations. Also, see "Configuring Channelized T1 and E1 Trunk Cards" section on page 3-9.

Configuring ISDN PRI

Your ISDN PRI interfaces are configured on the following Cisco AS5350 and Cisco AS5400 trunk cards: AS54-DFC-8CT1, AS54-DFC-8CE1 and AS54-DFC-CT3. ISDN provides out-of-band signaling using the D channel for signaling and the B channels for user data.

Channelized T1 ISDN PRI offers 23 B channels and 1 D channel. Channelized E1 ISDN PRI offers 30 B channels and 1 D channel. Channel 24 is the D channel for T1, and channel 16 is the D channel for E1.

For a complete description of the commands mentioned in this chapter, refer to the *Dial Technologies Command Reference,* available online at http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/index.htm.

Request PRI Line and Switch Configuration from a Telco Service Provider

Before configuring ISDN PRI on your Cisco router, you need to order a correctly provisioned ISDN PRI line from your telecommunications service provider.

This process varies from provider to provider on a national and international basis. However, some general guidelines follow:

- Determine if the outgoing B channel calls are made in ascending or descending order. The Cisco IOS software default is descending order; however, if the switch from the service providers is configured for outgoing calls made in ascending order, the router can be configured to match the switch configuration of the service provider.
- Ask for delivery of calling line identification. Providers sometimes call this CLI or automatic number identification (ANI).
- If the gateway will be attached to an ISDN bus (to which other ISDN devices might be attached), ask for point-to-multipoint service (subaddressing is required) and a voice-and-data line.

Table 3-2 provides a sample of the CT1 configuration attributes you might request for a PRI switch.

Table 3-2 CT1 Configuration Attributes

Attribute	Value
Line format	Extended Superframe Format (ESF)
Line coding	Binary 8-zero substitution (B8ZS)
Call type	23 incoming channels and 23 outgoing channels
Speed	64 kbps
Call-by-call capability	Enabled

Table 3-2 CT1 Configuration Attributes (continued)

Attribute	Value
Channels	23 B + D
Trunk selection sequence	Either ascending order (from 1 to 23) or descending order (from 23 to 1)
B + D glare	Yield
Directory numbers	Only 1 directory number assigned by service provider
SPIDs required?	None

Controller Numbering

The CT1/E1 controller numbering convention is dfc-slot/port in CLI commands. Trunk-card slot numbering starts from the motherboard and works up from left to right. Slot **0** is reserved for the motherboard. CT1/E1 trunk-card slots are numbered sequentially from **1** to **7**. Port numbering is from **0** to **7**.

The CT3 controller numbering convention is dfc-slot/port in CLI commands. Trunk-card slot numbering starts from the motherboard and works up from left to right. Slot **0** is reserved for the motherboard. Trunk-card slots are numbered sequentially from **1** to **7**. Port number value is always **0**.

Under the CT3, the CT1 controller numbering convention is dfc-slot/port:channel in CLI commands. Port numbering values range from **1** to **28**.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode. Enters the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

Step 3	`AS5400(config)# isdn switch-type` *switch-type*	Selects a service provider switch type that accommodates PRI. (Refer to Table 3-3 for a list of supported switch type keywords.)

	Command	Purpose
Step 4	`AS5400(config)# controller t1 1/0`	Specifies T1 controller dfc-slot, port number, and channel. On the CT3 trunk card, port-number values range from **1** to **28**. On the CT1 trunk card, port-number values range from **0** to **7**.
	or	or
	`AS5400(config)# controller e1 1/0`	Specifies E1 controller dfc-slot, port number, and channel. On the CE1 trunk card, port number values range from **0** to **7**.
		Note After you configure the CT1or CE1 controller, a corresponding D-channel serial interface is created instantly. See the "Configuring the D Channels for ISDN Signaling" section on page 3-23 to learn how to configure your D channel.
Step 5	`AS5400(config-controller)# framing esf`	Enters framing type for the CT3 or CT1 trunk card.
	or	or
	`AS5400(config-controller)# framing crc4`	Enters framing type for the CE1 trunk card.
Step 6	`AS5400(config-controller)# linecode b8zs`	Defines the line code as binary 8 zero substitution (B8ZS) for the CT3 or CT1 trunk card.
	or	or
	`AS5400(config-controller)# linecode hdb3`	Defines the line code as high-density bipolar 3 (HDB3) for the CE1 trunk card.
Step 7	`AS5400(config-controller)# pri-group [timeslots range]`[1]	Configures ISDN PRI. If you do not specify the timeslots, the controller is configured for 23 B channels and 1 D channel.
Step 8	`AS5400(config-controller)# Ctrl-Z` `AS5400#`	Returns to enable mode.

1. On CT1, timeslots range 1 to 24. You can specify a range of timeslots (for example, **pri-group timeslots 12-24**) if other timeslots are used for non-PRI channel groups.

For CT1 ISDN PRI—If you do not specify the timeslots, the specified controller is configured for 23 B channels and 1 D channel. B channel numbers range **1** to **23**; channel 24 is the D channel for T1. Corresponding serial interface numbers range **0** to **23**. In commands, the D channel is **interface serial** *slot/port***:23**—for example, **interface serial 1/0:23**.

For CE1 ISDN PRI—If you do not specify the timeslots, the specified controller is configured for 30 B channels and 1 D channel. B channel numbers range **1** to **31**; channel 16 is the D channel for E1. Corresponding serial interface numbers range **0** to **30**. In commands, the D channel is **interface serial** *slot/port***:15**—for example, **interface serial 1/0:15**.

Table 3-3 ISDN Service-Provider PRI Switch Types

Area	Keyword	Switch Type
none	none	No switch defined
Australia	**primary-ts014**	Australia PRI switches
Europe	**primary-net5**	European, New Zealand, and Asia ISDN PRI switches (covers the Euro-ISDN E-DSS1 signaling system and is European Telecommunication Standards Institute or ETSI-compliant)
Japan	**primary-ntt**	Japanese ISDN PRI switches
North America	**primary-4ess**	AT&T 4ESS switch type for the United States
	primary-5ess	AT&T 5ESS switch type for the United States
	primary-dms100	NT DMS-100 switch type for the United States
	primary-ni	National ISDN switch type

Verify

To verify that you have configured the interfaces correctly:

- Enter the **show controller t3** command and specify the slot and port numbers. Verify that the controller is up and that you do not have excessive errors; otherwise your controller might go down frequently. This could indicate switch problems.

```
AS5400# show controller t3 1/0

T3 1/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  MDL transmission is disabled

  FEAC code received:No code is being received
  Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Internal
  Data in current interval (270 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 32 15 minute intervals):
     0 Line Code Violations, 0 P-bit Coding Violation,
     0 C-bit Coding Violation, 0 P-bit Err Secs,
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
     0 Unavailable Secs, 0 Line Errored Secs,
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

- Enter the **show controller t1** command and specify the slot and port numbers.

```
AS5400# show controller t1 1/0

T1 1/0 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info of slot 1: HW:768, PLD Rev:4
  Framer Version:0x8

Manufacture Cookie Info:
 EEPROM Type 0x0001, EEPROM Version 0x01, Board ID 0x041,
 Board Hardware Version 3.0, Item Number 73-4089-03,
 Board Revision 05, Serial Number JAB99432626,
 PLD/ISP Version 0.1,  Manufacture Date 11-Nov-1999.

  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  Data in current interval (264 seconds elapsed):
     3 Line Code Violations, 1 Path Code Violations
     5 Slip Secs, 0 Fr Loss Secs, 1 Line Err Secs, 1 Degraded Mins
     5 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
.
.
.
```

- Enter the **show isdn status** command to view layer status information.

```
AS5400# show isdn status

Global ISDN Switchtype = primary-5ess
ISDN Serial1/0:1:23 interface
    dsl 0, interface ISDN Switchtype = primary-5ess
    Layer 1 Status:
       ACTIVE
    Layer 2 Status:
       TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
       0 Active Layer 3 Call(s)
    Activated dsl 0 CCBs = 0
    The Free Channel Mask: 0x807FFFFF
.
.
.
ISDN Serial1/0:28:23 interface
    dsl 27, interface ISDN Switchtype = primary-5ess
    Layer 1 Status:
       ACTIVE
    Layer 2 Status:
       TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
       0 Active Layer 3 Call(s)
    Activated dsl 27 CCBs = 0
    The Free Channel Mask: 0x807FFFFF
    Total Allocated ISDN CCBs = 0
```

Note the following information for Serial 1/0:1:23 (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 "0 Active Layer 3 Call(s)."
- The second half of the messages display information for Serial 1/0:28:23.

- Monitor ISDN channels and service by entering the **show isdn service** command:

```
AS5400# show isdn service

PRI Channel Statistics:
ISDN Se0:23, Channel (1-31)
  Activated dsl 0
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se1:23, Channel (1-31)
  Activated dsl 1
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se2:23, Channel (1-31)
  Activated dsl 2
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se3:23, Channel (1-31)
  Activated dsl 3
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se4:23, Channel (1-31)
  Activated dsl 4
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se5:23, Channel (1-31)
  Activated dsl 5
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se6:23, Channel (1-31)
  Activated dsl 6
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ISDN Se7:23, Channel (1-31)
  Activated dsl 7
  State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint)
  2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 3 3 3 3 3 3 3 3
  Channel (1-31) Service (0=Inservice 1=Maint 2=Outofservice)
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
```

Note Your Cisco AS5350 or Cisco AS5400 supports a total of 248 ISDN channels per ingress trunk card. If you are configuring individual T1 channels of your CT3 for backup links or serial backhaul connections, the CT1s must be configured into channel-groups—each channel-group using 24 timeslots or channels. For example, to configure 6 CT1s (6x24), 144 ISDN channels are in use leaving a remainder of 104 (248–144) channels for ISDN use. See the "Configuring ISDN PRI" section on page 3-13.

In the following **show running-config** example, six CT1s are configured into channel-groups:

```
AS5400# show running-config

Building configuration...

Current configuration:
!
! Last configuration change at 15:49:30 UTC Mon Apr 3 2000 by admin
! NVRAM config last updated at 01:35:05 UTC Fri Mar 17 2000 by admin
!
version 12.0
service timestamps debug datetime msec localtime show-timezone
service timestamps log datetime msec localtime show-timezone
service password-encryption
!
---text omitted---
!
controller T3 1/0
 framing m23
 clock source line
 t1 1-28 controller
!
controller T1 1/0:11
 framing esf
 channel-group 20 timeslots 1-24 speed 64
!
controller T1 1/0:12
 framing esf
 channel-group 20 timeslots 1-24 speed 64
!
controller T1 1/0:13
 framing esf
 channel-group 20 timeslots 1-24 speed 64
!
controller T1 1/0:14
 framing esf
 channel-group 20 timeslots 1-24 speed 64
!
controller T1 1/0:15
 framing esf
 channel-group 20 timeslots 1-24 speed 64
!
controller T1 1/0:16
 framing esf
 channel-group 20 timeslots 1-24 speed 64
```

Tip If you are having trouble:

- 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 gateway cannot communicate with the telco. There is a problem at the data link layer.

Configuring DS0 Trunk Group Dial Out

The DS0 Trunk Group Dial Out feature adds functionality that enhances outbound call routing by giving the user control over individual DS0s for outbound calls. Previous to this feature, outbound DS0s could not be configured separately from DS1s. The dial out capabilities of a DS1 applied to all DS0s under that DS1.

Currently, the aggregation of DS1s into trunk groups is done via the Trunk Group Resource Manager (TGRM). The DS0 Trunk Group Dial Out feature enables the TGRM subsystem to aggregate DS0s into trunk groups also. The dial out capabilities of these DS0 trunk groups can then be configured directly at the DS0 level, via the TGRM CLI and by setting the Authentication Authorization and Accounting (AAA) attributes.

The configuration of DS0s for outbound calls enables the Dial on Demand feature to initiate outbound calls over a set of B channels.

DS0 Dial Out Trunk Groups are configured on a Network Access Server (NAS). They support both digital and asynchronous calls and can be configured for the following types of circuits.

- Integrated Services Digital Network (ISDN)
  - Primary Rate Interface (PRI)
  - Non-Facility Associated Signaling (NFAS)

A trunk group is a logical grouping of multiple T1/E1 interfaces with the same signaling characteristics. A single trunk group can contain up to 64 trunks. Each trunk group can consist of DS0s from different circuits, but each individual DS0 can belong to only one trunk group. Trunk groups configured for ISDN can consist of both PRI and NFAS interfaces.

Note DS0 Dial Out Trunk Groups can be provisioned for dial out only at present and should not be provisioned as targets of dial-peers.

Note DS0 Dial Out Trunk Groups do not support for voice interfaces.

Trunk Group Resource Manager

The Trunk Group Resource Manager (TGRM) supports the logical grouping, configuration, and joint management of one or more interfaces. The TGRM is used to store configuration information and to accept or select an interface from a trunk group when requested.

A trunk group is provisioned as the target of a dial peer or a dial out profile on an AAA server, and the TGRM transparently selects the specific interface and channels to use for incoming or outgoing calls. Trunks are selected based on the trunk that is least used (default configuration) or the hunt-scheme configured.

Using trunk groups simplifies the task of configuring dial peers and interfaces, and also enables the dynamic selection of interfaces as needed in the access server.

A trunk group can include any number of interfaces, but all the interfaces in a trunk group must use the same type of signaling.

The TGRM subsystem has been enhanced to add fractional trunks to a trunk group. A fractional trunk is a single DS0 or a group of DS0s from a trunk.

Configure

The **trunk-group** command assigns a trunk to a trunk group by specifying the trunk group *label* parameter and optionally setting the *preference* parameter.

The DS0 Dial Out Trunk Group feature adds two new optional keywords:

- **timeslots** <*list of timeslots*>
- **preference** <*preference*>

The **timeslots** keyword allows you to selectively add DS0s from a signaling circuit. Fractional trunk-groups are configured from the controller configuration mode only (as a PRI serial interface may represent multiple member interfaces, including NFAS). If the **timeslots** option is not specified, all the DS0s in the signaling circuit are assigned to the trunk-group.

The **preference** keyword is configured after the **timeslots** option and is visible only when the **timeslots** option is used. This helps to differentiate between the *list of timeslots* number and the *preference* number.

The following example shows the syntax for configuring selected DS0s using the **timeslots** keyword and the **preference** keyword.

```
trunk-group <label> timeslot <list of timeslots> preference <preference>
```

The following example shows the syntax for configuring all the DS0s in the signaling circuit:

```
trunk-group <label> <preference>
```

Syntax Parameter Descriptions

label	Trunk group label. Maximum length of the trunk group label is 127 alphanumeric characters.
list of timeslots	List of the interfaces from the signalling circuit to be added to the trunk group. Range is 1 to 64.
preference	Priority of the trunk group member in a trunk group. Range is from 1 (highest priority) to 64 (lowest priority). *Preference* can be used to sort a list of trunks in order. A trunk with no *preference* is given the highest preference.

The following examples show the configuration steps for PRI signalling. Controller T1 3 is a trunk configured for PRI.

PRI Trunk Configuration

Step 1 Configure framing, clock source, DS0 group, etc.

```
AS5400(config)#controller T1 3
AS5400(config-controller)#framing esf
AS5400(config-controller)#clock source line secondary 3
AS5400(config-controller)#linecode b8zs
AS5400(config-controller)#pri-group timeslots 1-24
AS5400(config-controller)#!
```

Step 2 Configure trunk group label.

```
AS5400(config)#interface Serial3:23
AS5400(config-if)#no ip address
AS5400(config-if)#trunk-group PRI-TRUNK-GROUP
```

Note The **timeslots** option is NOT available in the serial interface configuration mode since a serial interface may represent an NFAS serial interface.

Step 3 Configure timeslots and preference.

```
AS5400(config)#controller T1 3
AS5400(config-controller)#framing esf
AS5400(config-controller)#clock source line secondary 3
AS5400(config-controller)#linecode b8zs
AS5400(config-controller)#pri-group timeslots 1-24
AS5400(config-controller)#trunk-group PRI-TRUNK-GROUP-1  timeslots 1-10
AS5400(config-controller)#trunk-group PRI-TRUNK-GROUP-2  timeslots 11-15
AS5400(config-controller)#trunk-group PRI-TRUNK-GROUP-3  timeslots 20-22 preference 10
```

Note When a PRI/NFAS trunk is fractionally added to a trunk-group, the **timeslots** keyword is compulsory.

Verify

The **show trunk group** command displays the DS0s that belong to a particular trunk group. A trunk-group can be a group of DS0s from various signaling channels.

Show Trunk Group Example 2 – Trunk Group with PRI Trunks

```
AS5400#show trunk group pri-tg
Trunk group: pri-tg
         Description:
         trunk group label: pri-tg

         Translation profile (Incoming):
         Translation profile (Outgoing):

         Hunt Scheme is least-used
         Max Calls (Incoming):   NOT-SET (Any)   NOT-SET (Voice) NOT-SET (Data)
         Max Calls (Outgoing):   NOT-SET (Any)   NOT-SET (Voice) NOT-SET (Data)
         Retries: 0

         Trunk 2/1:23     Preference 10
```

```
        Channels :  1-23
        Total channels available : 23
        Data = 0, Voice = 0, Modem = 0, Pending = 0, Free = 23
Total calls for trunk group: Data = 0, Voice = 0, Modem = 0
                             Pend = 0, Free = 23

advertise_flag 0x00000040, capacity timer 25 sec tripl_config_mask 0x00000000
AC_curr 24, FD_curr 0, SD_curr 0

succ_curr 0 tot_curr 0
succ_report 0 tot_report 0
changed 0 replacement position 0
```

Configuring the D Channels for ISDN Signaling

The ISDN D channels carry the control and signaling information for your ISDN calls—for both circuit-switched data calls, and analog modem calls.

The D channel notifies the central office switch to send the incoming call to particular timeslots on the Cisco gateway or router. Each one of the B channels carries data or voice. The D channel carries signaling for the B channels. The D channel identifies if the call is a circuit switched digital call or an analog modem call. Analog modem calls are decoded and then get sent off to the onboard modems. Circuit-switched digital calls are directly relayed off to the ISDN processor in the gateway.

When you configured your ISDN PRI on the CT1 or CE1 controller, you automatically created a serial interface that corresponds to the PRI group timeslots. This interface is a logical entity that is associated with the specific controller. After the serial interface is created, you must configure the D channel serial interface that carries signaling. The configuration applies to all the PRI B channels (timeslots) for that pri group.

Figure 3-1 shows the logical contents of a ISDN PRI interface used in a T1 network configuration. The logical contents includes 23 B channels, one D channel, 24 timeslots, and 24 virtual serial interfaces (total number of Bs + D).

Note To allow a single D channel to control multiple PRI interfaces, see the "Configuring the D Channels for ISDN Signaling" section on page 3-23.

Figure 3-1 Logical Relationship of ISDN PRI Components for T1

Note When you configure your CT1 controller for an NFAS backup D channel, a serial interface is automatically created only when your primary D channel fails. See the "Configuring the D Channels for ISDN Signaling" section on page 3-23.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode. Enters the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

Step 3	`AS5400(config)# interface serial 1/0:23` `AS5400(config-if)#`	Enters serial interface configuration mode. After configuring the CT1 controller, a corresponding D channel serial interface is automatically created. For example, serial interface **1/0:23** is the D channel for CT1 controller **1**. You must configure each serial interface to receive incoming and send outgoing signaling. **Note** On a CE1 PRI line, the serial interface is 1/0:15.
Step 4	`AS5400(config-if)# ip address 172.16.254.254 255.255.255.0`	Assigns an IP address and subnet mask to the interface.

	Command	Purpose
Step 5	`AS5400(config-if)# isdn incoming-voice modem`	Configures all incoming voice calls. **Note** This command has two possible keywords: **data** and **modem**. You must use the **modem** keyword to enable both modem and voice calls. The **modem** keyword represents bearer capabilities of speech.
Step 6	`AS5400(config-if)# exit`	Exits interface configuration mode.

Verify

To verify your D channel configuration:

- Enter the **show interface serial** command and make sure the line protocol is up and you are using the correct IP interface. Also, make sure that excessive errors are not being reported.

```
AS5400# show interface serial 1/0:23

Serial1/0:23 is up, line protocol is up (spoofing)
  Hardware is DSX1
  Internet address is 172.16.254.254/16
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set
  Last input 00:00:03, output never, output hang never
  Last clearing of "show interface" counters 00:00:01
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  1 minute input rate 0 bits/sec, 0 packets/sec
  1 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 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
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
  Timeslot(s) Used:24, Transmitter delay is 0 flags
AS5400#
```

Tip If you are having trouble:

- Make sure the serial interface and protocol are up by entering the **show interface serial** command.
- Check the IP address.

```
AS5400# show interface serial 1/0:23

Serial1/0:23 is up, line protocol is up (spoofing)
  Hardware is DSX1
  Internet address is 172.16.254.254/16
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set
  Last input 00:00:07, output never, output hang never
  Last clearing of "show interface" counters 00:00:06
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  1 minute input rate 0 bits/sec, 0 packets/sec
  1 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 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
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
  Timeslot(s) Used:24, Transmitter delay is 0 flags
AS5400#
```

Configuring the Universal Port Card and Lines

Rather than the more traditional line/modem one-to-one correspondence, lines are mapped to a Service Process Element (SPE) that resides on the universal port card. Associated SPE firmware serves a function similar to modem code on a MICA modem.

One SPE provides services for multiple ports. Busyout and shutdown can be configured at the SPE or port level. There are several universal port cards, each with a different number or ports, available for the Cisco AS5350 and Cisco AS5400.

The universal port card performs the following functions:

- Converts pulse code modulation (PCM) bitstreams to digital packet data
- Forwards converted and packetized data to the main processor, which examines the data and forwards it to the backhaul egress interface
- Supports all modem standards (such as V.34 and V.42*bis*) and features, including dial-in and dial-out

Note For further information, refer to Chapter 5, "Managing and Troubleshooting the Universal Port Card."

For detailed information about CLI commands supported on the universal port card, refer to *Monitoring Voice and Fax Services on the Cisco AS5400 Universal Gateway,* available online at http://www.cisco.com/univercd/cc/td/doc/product/software/. Select your Cisco IOS release and search for this title.

SPE Firmware

SPE firmware is automatically downloaded to a universal port card from the Cisco AS5350 or Cisco AS5400 when you boot the system for the first time or when you insert a universal port card while the system is operating. When you insert cards while the system is operating, the Cisco IOS image recognizes the cards and downloads the required firmware to the cards.

The SPE firmware image is bundled with the gateway Cisco IOS image. The SPE firmware image uses an *auto detect* mechanism, which enables the universal port card to service multiple call types. An SPE detects the call type and automatically configures itself for that operation. The firmware is upgradable independent of Cisco IOS upgrades, and different firmware versions can be configured to run on SPEs in the same card.

The universal port card supports the modem standards and features listed in Table 3-4.

Table 3-4 Modem Standards and Supported Features

Feature	Description
Carrier protocols	ITU V.23 at 75/1200 bps Telcordia Technologies (formerly Bellcore) 103 at 300 bps ITU V.21 at 300 bps ITU V.22 at 1200 bps Telcordia Technologies (formerly Bellcore) 212A at 1200 bps ITU V.22*bis* at 2400 bps ITU V.32 up to 9600 bps ITU V.32*bis* up to 14,400 bps V.32 turbo up to 19,200 bps V.FC up to 28,800 bps V.34 up to 28,800 bps V.34+ up to 33.6 bps TIA/ITU V.90 K56flex
Error-correcting link-access protocols	V.42 LAPM, MNP 2-4
Compression protocols	V.42*bis* (includes MNP 5)
Command interface	Superset of the AT command set

Table 3-4 Modem Standards and Supported Features (continued)

Feature	Description
In-band signaling/tone generation and detection	DTMF generation DTMF detection MF generation MF detection
Other	Out-of-band access for management PPP and SLIP framing

Configure

Configure the lines and ports to allow users to dial in to your network.

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters the **enable** command. Enters your password. You are in privileged EXEC mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line.`
	`End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

Step 3	`AS5400(config)# spe country country name`	Specifies the country to set the universal-port-card parameters (including country code and encoding). This setting is applied at the system level. All universal port cards use the same country code. The default is **usa** if the gateway is configured with T1 interfaces and **e1-default** if the gateway is configured with E1 interfaces. Use the **no** form of this command to set the country code to the default of domestic. **Note** All sessions on all universal port cards in all slots must be IDLE for this command to execute.
Step 4	`AS5400(config)# line slot/port slot/port` `AS5400(config-line)#`	Enters the numbers of the ports to configure. If you wish to configure 108 ports on slot 3, enter **line 3/00 3/107**. If you wish to configure 324 ports on slots 3-5, enter **line 3/00 5/107**.
Step 5	`AS5400(config-line)# transport input all`	Allows all protocols to be used when connecting to the line.
Step 6	`AS5400(config-line)# autoselect ppp`	Enables remote IP users running a PPP application to dial in, bypass the EXEC facility, and connect directly to the network.

	Command	Purpose
Step 7	`AS5400(config-line)# modem inout`	Enables incoming and outgoing calls.
Step 8	`AS5400(config-line)# Ctrl-Z` `AS5400#`	Returns to enable mode.

Modems and lines are configured after:

- The ISDN channels are operational
- POTS telephone calls are successfully routed to the modems

Each modem is mapped to a dedicated asynchronous line inside the gateway. After the modem inout command is applied to the lines, the gateway is ready to accept modem calls.

AAA security is applied to the lines by the **aaa new-model** command and **aaa authentication login default local** command. AAA performs login authentication by using the local username database. The **login** keyword authenticates EXEC shell users. For more information about the AAA commands, see the "Configuring Local AAA Security" section on page 3-4.

Note The modem speed 115200 bps and hardware flow control are the default settings for integrated modems.

Resetting to Default Values for Country Codes

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

- **no spe country**—Resets to default setting.

Verify

To verify your SPE configuration:

- Enter the **show spe** command to display a summary for all the lines:

```
AS5400# show spe

SPE settings:
==============
Country code configuration: default T1 (u Law)
Polling interval: 8 secs.
History log events: 50(per port)
Port legends:
============
Port state: (s)shutdown (t)test (r)recovery (d)download
            (b)busiedout (p)busyout pending, (B)bad (a)active call
Call type: (m)modem (d)digital (f)fax-relay (v)voice (_)not in use
System resources summary:
======================
Total ports: 108, in use ports: 0, disabled ports: 0, free ports: 108
Total active calls: modem    0,  voice    0,  digital    0,  fax-relay    0
```

```
                    SPE          SPE     SPE  SPE   Port         Call
SPE#    Port #      State        Busyout Shut Crash State        Type
4/00    0000-0005   ACTIVE             0    0     0 _______      _______
4/01    0006-0011   ACTIVE             0    0     0 _______      _______
4/02    0012-0017   ACTIVE             0    0     0 _______      _______
4/03    0018-0023   ACTIVE             0    0     0 _______      _______
4/04    0024-0029   ACTIVE             0    0     0 _______      _______
.
.
.
```

- Enter the **show line** *number* command to display a summary for a single line:

```
AS5400# show line 1

   Tty Typ     Tx/Rx    A Modem  Roty AccO AccI   Uses   Noise  Overruns   Int
     1 AUX   9600/9600  -    -      -    -    -      0       0     0/0       -
  Ready

Line 1, Location: "", Type: ""
Length: 24 lines, Width: 80 columns
Baud rate (TX/RX) is 9600/9600, no parity, 2 stopbits, 8 databits
Status: Ready
Capabilities: none
Modem state: Ready
Group codes:    0
Modem hardware state: noCTS noDSR  DTR RTS
 TTY NUMBER 1
Parity Error = 0 Framing Error = 0 Receive Error = 0 Overrun = 0
Outcount = 0 totalout = 39 incount = 0 totalin = 0

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
                             Login-sequence User Response
```

Tip If you are having trouble, make sure you turned on the protocols for connecting to the lines (**transport input all**) and configured for incoming and outgoing calls (**modem inout**).

Configuring Clocking

The time-division multiplexing (TDM) bus on the Cisco AS5350 and Cisco AS5400 backplane can receive an input clock from one of four basic sources on the gateway:

- CT1, CE1, and CT3 trunk cards
- An external T1/E1 clock source feed directly through the Building Integrated Timing Supply (BITS) interface port on the motherboard
- Free-running clock providing clock from an oscillator

Note Building Integrated Timing Supply (BITS) is a single building master timing supply. BITS generally supplies DS1 and DS0 level timing throughout an office. In North America, BITS are the clocks that provide and distribute timing to a wireline network's lower levels.

Trunk-Card Ports

The TDM bus can be synchronized with any trunk cards. On the CT1/CE1 trunk card, each port receives the clock from the T1/E1 line. The CT3 trunk card uses an M13 multiplexer to receive the DS1 clock. Each port on each trunk-card slot has a default clock priority. Also, clock priority is configurable through the **dial-tdm-clock priority** CLI command.

External Clock

The TDM bus can be synchronized with an external clock source that can be used as an additional network reference. If no clocks are configured, the system uses a primary clock through a software-controlled default algorithm. If you want the external T1/E1 clock (via the BITs interface) as the primary clock source, you must configure it using the **dial-tdm-clock priority** CLI command; the external clock is never selected by default.

The BITs interface requires a T1 line composite clock reference set at 1.544 MHz and an E1 line composite clock reference set at 2.048 MHz.

Free-Running Clock

If there is no good clocking source from a trunk card or an external clock source, then select the free-running clock from the local oscillator through the **dial-tdm-clock priority** CLI command.

The following table lists commands to help you configure the clock source and clock source priority used by the TDM bus:

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode. Enters the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5400(config)#`
		Enters global configuration mode. The example uses the terminal configuration option. You are in global configuration mode when the prompt changes to `AS5350(config)#` or `AS5400(config)#`.

Step 3		Perform step a or b, depending on your configuration.
a.	`AS5400(config)# dial-tdm-clock priority` *priority#* {**external** | **freerun** | **slot/ds1 port**}	Configures the CT1/CE trunk-card clock priority, trunk slot, and port that is providing the clocking source. Priority range is a value between **1** and **99**. Trunk-card slot is a value between **1** and **7**. DS1 port number controller is a value between **0** and **7**. **Note** DS1 port specifies T1 port.
b.	`AS5400(config)# dial-tdm-clock priority` *priority#* {**external** | **freerun** | **slot/ds3 port:ds1 port**}	Configures the CT3 trunk-card clock priority, trunk slot, and port that is providing the clocking source. Priority range is a value between **1** and **99**. Trunk-card slot is a value between **1** and **7**. DS3 port specifies the T3 port. DS1 port number controller is a value between **1** and **28.** **Note** A clock with priority of 100 cannot drive the TDM clock.
Step 4	`AS5400(config)# Ctrl-Z` `AS5400#`	Returns to privileged EXEC mode.
Step 5	`AS5400# copy running-config startup-config`	Saves your changes when ready.

Configuration Examples

In the following example, BITS clock is set at priority 1.

```
AS5400(config)# dial-tdm-clock priority 1 external
AS5400(config)# exit
AS5400#
```

In the following example, a trunk clock from an CT1 trunk card is set at priority 2 and uses slot 4 and ds1 port (controller) 6.

```
AS5400(config)# dial-tdm-clock priority 2 4/6
AS5400(config)# exit
```

In the following example, a trunk clock from a CT3 trunk card is set at priority 2 and uses slot 1, ds3 port 0, and ds1 port 19.

```
AS5400(config)# dial-tdm-clock priority 2 1/0:19
AS5400(config)# exit
```

In the following example, free-running clock is set at priority 3.

```
AS5400(config)# dial-tdm-clock priority 3 free
AS5400(config)# exit
```

Verify

You can verify the system primary and backup clocks, status of all trunk-card controller clocks, and information about and history of last 20 TDM clock changes and the events that caused them.

- Verify your default system clocks and clock history using the **show tdm clocks** command (this example is for T1/E1):

```
AS5400# show tdm clocks

Primary Clock:
--------------
TDM Bus Master Clock Generator State = HOLDOVER

Backup clocks for primary:
Source  Slot  Port  DS3-Port  Priority      Status      State
-----------------------------------------------------------------

Trunk cards controllers clock health information
------------------------------------------------
Slot  Type  7 6 5 4 3 2 1 0
1      T1   B B B B B B B B
```

```
CLOCK CHANGE HISTORY
--------------------------

CLOCK        Event                                  Time
-----        -----                                  ----
1/1     Loss Of Signal (LOS)                    00:00:22 UTC Tue Nov 30 1999
1/2     Loss Of Signal (LOS)                    00:00:22 UTC Tue Nov 30 1999
1/3     Alarm Indication Signal (AIS)           00:00:22 UTC Tue Nov 30 1999
1/4     Alarm Indication Signal (AIS)           00:00:22 UTC Tue Nov 30 1999
1/5     Alarm Indication Signal (AIS)           00:00:22 UTC Tue Nov 30 1999
1/6     Alarm Indication Signal (AIS)           00:00:22 UTC Tue Nov 30 1999
1/7     Alarm Indication Signal (AIS)           00:00:22 UTC Tue Nov 30 1999
AS5400#
```

- Verify your tdm clock history using the **show tdm clocks** command (this example is for CT3):

```
AS5400# show tdm clocks

Primary Clock:
--------------
System primary is slot 7 ds3_port 0 ds1_port 1 of priority 1
TDM Bus Master Clock Generator State = NORMAL

Backup clocks for primary:
Source  Slot  Port  DS3-Port  Priority      Status      State
-------------------------------------------------------------
Trunk   7     8       YES      214          Good        Default
Trunk   7     9       YES      215          Good        Default

Trunk cards controllers clock health information
------------------------------------------------
      CT3         2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1
Slot  Port  Type  8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1
7     0     T3    G G G G G G G G G G G G G G G G G G G G G G G G G G G G


CLOCK CHANGE HISTORY
--------------------------

CLOCK        Event                                  Time
-----        -----                                  ----
7/1     Signal recovered from LOS               00:03:29 UTC Sat Jan 1 2000
7/8     Alarm Indication Signal (AIS)           11:27:48 UTC Fri Feb 25 2000
7/1     Signal recovered from LOS               11:30:22 UTC Fri Feb 25 2000
AS5400#
```

- Verify your user-configured trunk clock selection using the **show tdm clocks** command:

```
AS5400# show tdm clocks

Primary Clock:
System primary is slot 2 port 0 of priority 15
TDM Bus Master Clock Generator State = NORMAL
Backup clocks for primary:
Source  Slot  Port  DS3-Port  Priority      Status      State
Trunk   2     1       NO       205          Good        Default
Trunk cards controllers clock health information
Slot  Type  7 6 5 4 3 2 1 0
2      T1   B B B B G G G G
```

```
CLOCK CHANGE HISTORY

CLOCK        Event                                    Time
2/1     Controller shutdown                    23:23:06 UTC Tue Nov 30 1999
2/0     Change in CLI configuration            23:27:25 UTC Tue Nov 30 1999
AS5400#
```

- Verify your free-running clock selection using the **show tdm clocks** command:

```
AS5400# show tdm clocks

Primary Clock:
System primary is FREE RUNNING with priority 2
TDM Bus Master Clock Generator State = FREERUN
Backup clocks for primary:
Source  Slot  Port  DS3-Port  Priority      Status      State
Trunk   2     0       NO       204          Good        Default
Trunk   2     1       NO       205          Good        Default
Trunk cards controllers clock health information
Slot  Type  7 6 5 4 3 2 1 0
2      T1   B B B B G G G G
CLOCK CHANGE HISTORY

CLOCK        Event                                    Time
Freerun Change in CLI configuration            23:27:25 UTC Tue Nov 30 1999
AS5400#
```

- Verify your BITS clock selection using the **show tdm clocks** command:

```
AS5400# show tdm clocks

Primary Clock:
System primary is external with priority 1
TDM Bus Master Clock Generator State = NORMAL
Backup clocks for primary:
Source  Slot  Port  DS3-Port  Priority      Status      State
Trunk   2     0       NO       204          Good        Default
Trunk   2     1       NO       205          Good        Default
Trunk cards controllers clock health information
Slot  Type  7 6 5 4 3 2 1 0
2      T1   B B B B G G G G
CLOCK CHANGE HISTORY

CLOCK        Event                                    Time
External Change in CLI configuration           23:27:25 UTC Tue Nov 30 1999
AS5400#
```

Tip The most common reason for clock slip problems is that the **dial-tdm-clock priority** parameter is set improperly. Change the default setting for **dial-tdm-clock priority** from free-running clock to a setting that matches your system requirements.

Enabling IP Basic Setup

Fine-tune the IP routing functions and domain-name services for EXEC shell users, by performing the following steps:

Step 1 Optimize IP routing functions in global configuration mode:

```
AS5400(config)# ip subnet-zero
AS5400(config)# no ip source-route
AS5400(config)# ip classless
AS5400(config)# ip domain-lookup
```

Table 3-5 describes the commands in the example.

Table 3-5 IP Routing Commands

Command	Purpose
ip subnet-zero	Specifies that 172.22.0.0 is a legal subnet.
no ip source-route	Tightens security by ensuring that IP-header packets cannot define their own paths through the gateway.
ip classless	Tightens security by ensuring that IP-header packets cannot define their own paths through the gateway.
ip domain-lookup	Enables IP domain-name lookups.

Step 2 In global configuration mode, enter domain-name service commands to support EXEC shell users:

```
AS5400(config)# ip host mymap 172.22.53.101
AS5400(config)# ip domain-name mydomain.com
AS5400(config)# ip name-server 172.22.11.10
AS5400(config)# ip name-server 172.22.11.11
```

Table 3-6 describes the commands in the example.

Table 3-6 Domain-Name Commands

Command	Purpose
ip host mymap 172.22.53.101	Creates a local name-to-address map. When the gateway is not entered in a DNS server, this map is useful.
ip domain-name mydomain.com	Tells the gateway how to qualify DNS lookups. In this example, **mydomain.com** is appended to the end of each looked-up name.
ip name-server 172.22.11.10 **ip name-server 172.22.12.11**	Specifies the primary and secondary name servers. The **ip name-server** command is used for mapping names to IP addresses.

Testing Asynchronous Shell Connections

This task verifies that the following components are working:

- The physical asynchronous data path
- Basic modem links
- Basic IP functionality to support shell sessions

The Cisco IOS software provides a command-line interface (CLI) called the EXEC. The EXEC:

- Can be accessed by dialing in with a modem
- Provides access to terminal-shell services (no PPP) to do the following:
  - Modify configuration files
  - Change passwords
  - Troubleshoot possible problems including modem connections
  - Access other network resources by using Telnet

During this task, some administrators try to make complex services function, such as PPP-based Web browsing. Do not jump ahead. Many other elements still must be configured (for example, PPP and IPCP). The asynchronous-shell test ensures that the EXEC's login prompt can be accessed by a client modem. Taking a layered approach to building a network isolates problems and saves you time.

To test asynchronous-shell connections, perform the following steps:

Step 1 Locate a client PC, client modem, and analog line. From the client PC, open a terminal emulation program (such as Hyper Terminal, not Dial-Up Networking) and connect to the client modem. Figure 3-2 shows the network environment for this test.

Figure 3-2 Test Environment

Step 2 From a terminal-emulation program, test your EIA/TIA-232 connection to the client modem. Enter the **at** command. The modem returns the prompt `OK`.

```
at
OK
```

Note To learn more about the **at** command set, see the various references available online at the Technical Assistance Center website at http://www.cisco.com/pcgi-bin/Support/PSP/psp_view.pl?p=Internetworking:ASYNC&s=Implementation_and_Configuration

Step 3 Dial the PRI telephone number assigned to the gateway (in this example, the number is 5554100). After the modem successfully connects, a connect message appears.

```
atdt 5554100
CONNECT 33600/REL - LAPM
```

Note Many modems support the **a/** command, which recalls the last AT command. The **ath** command hangs up a modem call. The **atdl** command dials the last telephone number.

Step 4 Log in to the EXEC session on the gateway (from the client PC):

```
This is a secured device.
Unauthorized use is prohibited by law.

User Access Verification

Username: Harry
Password:

AS5400>
```

Step 5 Identify the line where the call landed. The following example shows that line TTY 216 accepted the call. The call has been up and active for 30 seconds.

```
AS5400# show caller
                                                Active    Idle
  Line         User               Service       Time      Time
  con 0        admin              TTY           00:39:09  00:00:00
  tty 216      Harry               TTY           00:00:30  00:00:07

AS5400# show caller user Harry

  User: Harry, line tty 216, service TTY
        Active time 00:00:42, Idle time 00:00:19
  Timeouts:            Absolute  Idle      Idle
                                 Session   Exec
      Limits:          -         -         00:10:00
      Disconnect in:   -         -         00:09:40
  TTY: Line 1/00
  DS0: (slot/unit/channel)=2/0/18
  Line: Baud rate (TX/RX) is 115200/115200, no parity, 1 stopbits, 8 databits
  Status: Ready, Active, No Exit Banner
  Capabilities: No Flush-at-Activation, Hardware Flowcontrol In
                Hardware Flowcontrol Out, Modem Callout, Modem RI is CD
                Integrated Modem
  Modem State: Ready
```

Note The **show caller** command is added to the Cisco IOS software in Cisco IOS Release 11.3 AA and Release 12.0 T. If your software release does not support this command, use the **show user** command.

Step 6 Test the IP functionality to support shell sessions. From the gateway, Telnet to another device in your network.

```
AS5400# telnet 171.68.186.49
Trying 171.68.186.49 ... Open

access-gw line 2

access-gw telnet smart
Translating "smart"...domain server (171.68.10.70) [OK]
Trying smart.cisco.com (171.68.191.135)... Open

UNIX(r) System V Release 4.0 (smart)

login: Router
Password:
No directory! Logging in with home=/
Last login: Fri Aug 18 13:50:07 from dhcp-aus-163-230
Sun Microsystems Inc.   SunOS 5.5.1     Generic May 1996
```

Verifying the Final Running-Configuration

The following is an example of a final running configuration:

```
AS5400# show running-config

Building configuration...

Current configuration : 6017 bytes
!
version 12.2
no service single-slot-reload-enable
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname AS5400
!
boot system tftp c5350-js-mz.xm.Feb19 171.69.20.20
no boot startup-test
no logging buffered
logging rate-limit console 10 except errors
enable secret 5 $1$ltzj$8lGJ1cGmyZRdXdPXncLAo/
!
!
resource-pool disable
!
!
voice-fastpath enable
ip subnet-zero
no ip finger
ip domain-name cisco.com
ip name-server 171.69.11.48
ip name-server 171.69.2.132
ip name-server 171.69.2.133
!
no ip dhcp-client network-discovery
!
```

```
!
fax interface-type modem
mta receive maximum-recipients 0
!
!
crypto mib ipsec flowmib history tunnel size 200
crypto mib ipsec flowmib history failure size 200
!
!
controller T1 1/0
 framing sf
 linecode ami
!
controller T1 1/1
 framing sf
 linecode ami
!
.
.
.
controller T1 1/7
 framing sf
 linecode ami
!
!
interface FastEthernet0/0
 ip address 172.21.101.21 255.255.255.0
 no ip route-cache
 no ip mroute-cache
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 no ip route-cache
 no ip mroute-cache
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0
 no ip address
 no ip route-cache
 no ip mroute-cache
 shutdown
 clockrate 2000000
!
interface Serial0/1
 no ip address
 no ip route-cache
 no ip mroute-cache
 shutdown
 clockrate 2000000
!
interface Async4/00
 no ip address
!
interface Async4/01
 no ip address
!
interface Async4/02
 no ip address
!
.
```

```
.
.
interface Async4/107
 no ip address
!
interface Group-Async0
 no ip address
 no ip route-cache
 no ip mroute-cache
 no group-range
!
    ip classless
ip route 0.0.0.0 0.0.0.0 172.21.101.1
no ip http server
!
!
call rsvp-sync
!
!
line con 0
 logging synchronous
 transport input none
line aux 0
 logging synchronous
line vty 0 4
 password #1writer
 login
line 4/00 4/107
 no flush-at-activation
 modem InOut
!
scheduler allocate 10000 400
end
```

Saving Configuration Changes

To prevent the loss of the gateway configuration, save it to NVRAM.

Configure

	Command	Purpose

Step 1	`AS5400> enable`
	`Password: password`
	`AS5400#`
		Enters enable mode (also called privileged EXEC mode) and enter the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.

Step 2	`AS5400# copy running-config startup-config`	Saves the configuration changes to NVRAM so that they are not lost during resets, power cycles, or power outages.
Step 3	`AS5400(config-if)# Ctrl-Z` `AS5400#`	Returns to enable mode.

Where to Go Next

At this point you can go to:

- Chapter 4, "Continuing Configuration Using the Command-Line Interface" to continue system configuration of basic features.
- Chapter 5, "Managing and Troubleshooting the Universal Port Card" to configure, manage, and troubleshoot universal-port-card connections on your gateway.
- Appendix C, "Comprehensive Configuration Examples."
- *Monitoring Voice and Fax Services on the Cisco AS5400 Universal Gateway,* available online at http://www.cisco.com/univercd/cc/td/doc/product/software/. Select your Cisco IOS release and search for this title.

Tip The following publications are available on the Documentation CD-ROM that came with your gateway or on the World Wide Web from the Cisco home page, or you can order printed copies.

- For additional basic configuration information, refer to *Cisco IOS Dial Technologies Configuration Guide* and *Cisco IOS Dial Technologies Command Reference*, available online at http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/index.htm. For more advanced configuration topics, refer to the Cisco IOS software configuration guide, feature modules, and command reference publications that pertain to your Cisco IOS software release.
- For information on available software features available on your Cisco IOS release, refer to the software-configuration documents available online at http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5400/index.htm
- For Cisco AAA-based security information, refer to the *Cisco AAA Implementation Case Study*, available online at http://www.cisco.com/univercd/cc/td/doc/cisintwk/intsolns/aaaisg/index.htm
- For troubleshooting information, refer to the *System Error Messages* and *Debug Command Reference* publications.