Configuring X.25

This chapter describes how to configure the Cisco 1700 router to connect to a central-site router over an X.25 line or over an Integrated Systems Digital Network (ISDN) line and provides verification steps and troubleshooting tips.

This chapter contains the following sections:

- X.25

- X.25 Over ISDN B Channel

- X.25 over ISDN D Channel

Before You Begin

The configurations in this chapter are based on the following assumptions:

- The router is connected a central-site router.

- You are routing IP and IPX network traffic.

Before you begin configuration, be aware of the following:

- You need to enter the commands in the order shown in the task tables.

- The values shown in italic are examples. You should substitute the values shown with values that are appropriate for your network.

- You should be familiar with Cisco IOS software and its conventions.

Note   To use the verification steps described in this chapter, you must be familiar with Cisco IOS commands and command modes. When you use the verification steps, you need to change to different command modes. If you are not familiar with command modes, refer to the "Understanding Command Modes" section in the "Cisco IOS Basic Skills" chapter.
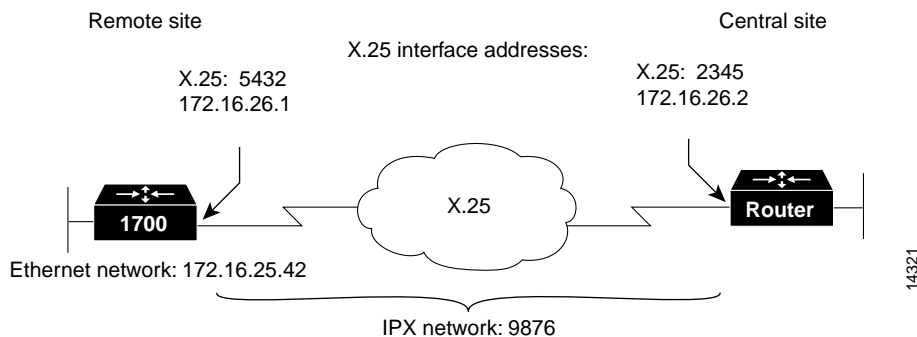

X.25

This section describes how to your router for a point-to-point X.25 WAN connection to the central-site router.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the X.25 Interface
- Configuring Command-Line Access to the Router

Figure 7-1 illustrates the configuration used in this example.

Figure 7-1   X.25 Example Configuration

Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	`Router#`	**configure terminal**
2	Configure the router to show the date and time of all debug messages. This command is optional, but recommended if you use debug commands to troubleshoot your configuration.	`Router(config)#`	**service timestamps debug datetime msec**
3	Configure the router to show the date and time of all log messages. This command is optional, but recommended if you use the verification steps described in this guide. This feature is enabled for all the example command output shown in this guide.	`Router(config)#`	**service timestamps log datetime msec**
4	Enable IPX routing and configure the router with an IPX address.	`Router(config)#`	**ipx routing** *0060.834f.66dd*

Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names. For Point-to-Point Protocol (PPP) authentication, the host name entered with this command must match the username of the central-site router.	Router(config)#	**hostname** *1700*
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	**enable password** *<1700user>*

Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Ethernet interface.	1700(config)#	**interface fast ethernet0**
2	Configure this interface with an IP address and a subnet mask.	1700(config-if)#	**ip address** *172.16.25.42 255.255.255.224*
3	Configure this interface with an IPX network number.	1700(config-if)#	**ipx network** *ABC*
4	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	**no shutdown**
5	Exit configuration mode for this interface.	1700(config-if)#	**exit**

Configuring the X.25 Interface

Use this table to configure the X.25 interface, which connects your router to the central-site router over the wide-area network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the serial interface.	1700(config)#	**interface Serial0**
2	Configure this interface with an IP address.	1700(config-if)#	**ip address** *172.16.26.1 255.255.255.0*
3	Set the encapsulation type on this interface to X.25.	1700(config-if)#	**encapsulation x25**
4	Enable IPX routing on this interface.	1700(config-if)#	**ipx network** *9876*
5	Set the X.121 address of this interface.	1700(config-if)#	**x25 address** *5432*
6	Set up the LAN protocols-to-remote-host mapping for IP and X.25.	1700(config-if)#	**x25 map ip** *172.16.26.2 2345* **broadcast**

7	Set up the LAN protocols-to-remote-host mapping for IPX and X.25.	`1700(config-if)#`	**x25 map ipx** *9876.0000.0c03.ecc6 2345* **broadcast**
8	Enable the interface and the configuration changes that you have just made on the interface.	`1700(config-if)#`	**no shutdown**
9	Exit configuration mode for this interface.	`1700(config-if)#`	**exit**

Verifying Your Configuration

You can verify your configuration to this point by

- Confirming Connectivity to the Central-Site Router Over IP.
- Confirming Connectivity to the Central-Site Router Over IPX.
- Confirming That the Serial Interface Is Functioning Correctly.
- Confirming That the X.25 Map Is Configured Correctly.
- Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information.

Confirming Connectivity to the Central-Site Router Over IP

Step 1   Confirm that the router is connected to the central-site router.

Step 2   From the privileged EXEC command mode, enter the **ping** command followed by the IP address of the central-site router:

```
1700# ping 172.16.26.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echo to 192.168.39.41, timeout is 2 seconds: !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
```

Step 3   Confirm that the success rate shown in the output (shown in bold in the example) is 60 percent (3/5) or greater. This means that your router is successfully transferring data to the central-site router.

Step 4   To continue configuration, re-enter global configuration mode.

Confirming Connectivity to the Central-Site Router Over IPX

Step 1   Confirm that the router is connected to the central-site router.

Step 2   From the privileged EXEC command mode, enter the **ping** command.

Step 3   Respond to the prompts shown in the following example:

Note   Substitute the IPX address of your central-site router for the IPX address shown in the example.

```
1700# ping
Protocol [ip]: ipx
Target IPX address: 9876.0000.0c03.ecc6
Repeat count [5]: <Return>
Datagram size [100]: <<Return>>
Timeout in seconds [2]: <<Return>>
Verbose [n]: <<Return>>
Novell Standard Echo [n]: <<Return>>
```

```
Type escape sequence to abort.
Sending 5, 100-byte IPX cisco Echoes to 9876.0000.0c03.ecc6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24 ms
```

Step 4   Confirm that the success rate shown in the output (shown in bold in the example) is 60 percent (3/5) or greater. This means that your router is successfully transferring data to the central-site router.

Step 5   To continue configuration, re-enter global configuration mode.

Confirming That the Serial Interface Is Functioning Correctly

Step 1   From the privileged EXEC command mode, enter the **show interface serial 0** command.

Step 2   Check that the "line protocol is up" and the "State CONNECT" messages (shown in bold in the example) appear in the command output:

```
1700# show interface serial 0

Serial0 is up, line protocol is up
Hardware is QUICC Serial
Internet address is 172.16.26.1/24
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255 Encapsulation
X25, loopback not set
x25 DTE, modulo 8, k 7, N1 12056, N2 20
T1 3000, interface outage (partial T3) 0, T4 0 State CONNECT, VS 6, VR 1, Remote
VR 6, Retransmissions 0
Queues: U/S frames 0, I frames 0, unack. 0, reTx 0 IFRAMEs 22/25 RNRs 0/0 REJs 0/0
SABM/Es 0/1 FRMRs 0/0 DISCs 0/0 X25 DTE, address 5432, state R1, modulo 8, timer 0
Defaults: cisco encapsulation, idle 0, nvc 1
input/output window sizes 2/2, packet sizes 128/128 Timers: T10 60, T11 180, T12
60, T13 60, TH 0 Channels: Incoming-only none, Two-way 1-1024, Outgoing-only none
RESTARTs 1/1 CALLs 1+0/2+2/0+0 DIAGs 0/0 Last input 00:00:32, output 00:00:32,
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
40 packets input, 1903 bytes, 0 no buffer Received 0 broadcasts, 0 runts, 0 giants
2 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored, 0 abort 42 packets output,
2033 bytes, 0 underruns 0 output errors, 0 collisions, 11 interface resets 0 output
buffer failures, 0 output buffers swapped out 7 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up
```

Step 3   If you do not see these messages, refer to the following "X.25 Over ISDN B Channel" section for suggestions.

Step 4   To continue configuration, re-enter global configuration mode.

Confirming That the X.25 Map Is Configured Correctly

Step 1   From the privileged EXEC command mode, enter the **show x25 map** command:

```
1700# show x25 map

Serial0: X.121 2345 <--> ip 172.16.26.2,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

Step 2   Confirm that your IPX network number and the central-site router IP address and IPX address appear in the command output (shown in bold in the example). The IP and IPX addresses shown in your output are different than those shown above.

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Step 1   From the privileged EXEC command mode, enter the **show x25 vc** command, as follows:

```
1700# show x25 vc
SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345 <-->
ip 172.16.26.1
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2, output: 2
Packet size input: 128, output: 128
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0 Timer (secs): 0
Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Step 2   Look for the following messages in the output (shown in bold in the example):

- "SVC 1"—Means that the X.25 service is active for the X.25 interface.

- "State: D1"—Means that there is an active virtual circuit on the X. 25 interface.

- "Connects 2345 <-->..."—Means that the X.25 address is correctly associated to the IP address and IPX address of the X.25 interface.

- "Packets 15/19"—Means that data is being transferred across the X.25 interface. The number shown in this message varies and shows the success rate of data that is being sent.

Step 3   To continue configuration, re-enter global configuration mode.

Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	**line console** *0*
2	Set the interval that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	**exec-timeout** *5*
3	Specify a virtual terminal for remote console access.	1700(config-line)#	**line vty** *0 4*
4	Specify a password on the line.	1700(config-line)#	**password** *<lineaccess>*
5	Enable password checking at terminal session login.	1700(config-line)#	**login**

X.25 Over ISDN B Channel

This section describes how to configure the router to encapsulate IP and IPX packets as X.25 and route them over an ISDN B-channel connection.
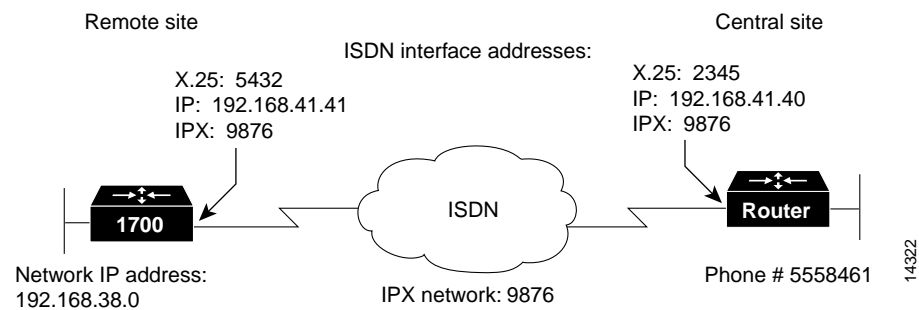
In addition to the assumptions described in the "Before You Begin" section in this chapter, this configuration is based on the assumption that you can only use one of the two ISDN B channels for this type of configuration.

These are the major tasks when configuring your router:

- Configuring Global Parameters
- Configuring Security
- Configuring the Fast Ethernet Interface
- Configuring the ISDN Interface for X.25
- Configuring Command-Line Access to the Router

Figure 7-2 illustrates the configuration used in this example.

Figure 7-2   X.25 over ISDN B Channel Example Configuration

Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	Router#	**configure terminal**
2	Configure the router to show the date and time of all debug messages. This command is optional, but recommended if you use debug commands to troubleshoot your configuration.	Router(config)#	**service timestamps debug datetime msec**
3	Configure the router to show the date and time of all log messages. This command is optional, but recommended if you use the verification steps described in this guide. This feature is enabled for all the example command output shown in this guide.	Router(config)#	**service timestamps log datetime msec**

4	Enable IPX routing and configure the router with an IPX address.	Router(config)#	**ipx routing** *0060.834f.66dd*
5	Configure the type of central office switch being used on the ISDN interface. Use the keyword that matches the ISDN switch type that you are using: • **basic-ts013** —Australian TS013 switches • **basic-1tr6** —German 1TR6 ISDN switches • **basic-nwnet3**—Norway NET3 switches (phase 1) • **basic-net3**—NET3 ISDN switches • **vn2**—French VN2 ISDN switches • **vn3**—French VN3 ISDN switches • **ntt**—Japanese NTT ISDN switches • **basic-5ess**—Basic rate 5ESS switches • **basic-dms100**—NT DMS-100 basic rate switches • **basic-ni**—National ISDN-1 switches • **basic-nznet3**—New Zealand Net3 switches	Router(config)#	**isdn switch-type** *basic-ni*
6	Enter configuration mode for the ISDN interface.	Router(config)#	**interface bri0**
7	Enable the ISDN switch type configuration for the ISDN interface.	Router(config-if)#	**no shutdown**
8	Exit configuration mode for the ISDN interface.	Router(config-if)#	**exit**

Verifying Your Configuration

You can verify your configuration to this point by confirming the ISDN line status as follows:

Step 1 From the privileged EXEC command mode, enter the **show isdn status** command.

Step 2 Confirm that the "State = MULTIPLE_FRAME_ESTABLISHED" message (shown in bold in the example) appears on the command output:

```
1700# show isdn status
The current ISDN Switchtype = basic-5ess
ISDN BRI0 interface
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 80, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
        No Active Layer 3 Call(s)
    Activated dsl 0 CCBs = 0
    Total Allocated ISDN CCBs =
```

Note In some cases, you might see a "State = TEI_ASSIGNED" message instead of the "State = MULTIPLE_FRAME_ESTABLISHED" message. This message also means that the ISDN line is correctly configured.

Step 3 If you do not see the message, do the following:

(a) Make sure that the router is correctly cabled.

(b) Make sure that any external NT1 is functioning correctly. Refer to the documentation that came with the NT1.

(c) Make sure the ISDN line is correctly configured by checking with the ISDN service provider.

(d) Refer to the following "Troubleshooting Problems with X.25 over ISDN B Channel" section for additional suggestions.

Step 4 To continue configuration, re-enter global configuration mode.

Configuring Security

Use this table to configure the router with some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names. For Point-to-Point Protocol (PPP) authentication, the host name entered with this command must match the username of the central-site router.	1700(config)#	**hostname** *1700*
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	**enable password** *<1700user>*
3	Specify the password used during caller identification and CHAP and PAP authentication. For CHAP and PAP authentication, the username entered with this command must match the host name of the central-site router.	1700(config)#	**username** *HQ* **password** *<guessme>*

Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	1700(config)#	**interface fastethernet0**
2	Configure this interface with an IP address.	1700(config-if)#	**ip address** *192.168.38.42 255.255.255.0*
3	Enable the interface and the configuration changes that you have just made on the interface.	1700(config-if)#	**no shutdown**
4	Exit configuration mode for this interface.	1700(config-if)#	**exit**

Configuring the ISDN Interface for X.25

Use this table to configure the ISDN interface, which connects your router to the central-site router over the wide-area network, for X.25 packet encapsulation.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ISDN interface.	1700(config)#	**interface BRI0**
2	Configure this interface with an IP address.	1700(config-if)#	**ip address** *192.168.41.41 255.255.255.0*
3	Set the encapsulation type on this interface to X.25.	1700(config-if)#	**encapsulation x25**

4	Enable snapshot routing. Because your router is dialing into a central-site router, it is considered the client router. The first number is the amount of "active time" (in minutes) during which routing updates are exchanged between your router and the central-site router. The second number is the amount of "quiet time" (in minutes) during which routing entries are frozen and remain unchanged.	`1700(config)#`	**snapshot client** *5 60*
5	Enable IPX routing on this interface.	`1700(config-if)#`	**ipx network** *9876*
6	Set the X.121 address of this interface.	`1700(config-if)#`	**x25 address** *5432*
7	Set up the LAN protocols-to-remote-host mapping for X.25 to IP.	`1700(config-if)#`	**x25 map ip** *192.168.39.40 2345* **broadcast**
8	Set up the LAN protocols-to-remote-host mapping for IPX and X.25.		**x25 map ipx** *9876.0000.0c03.ecc6 2345* **broadcast**
9	Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites based on IP address and dialer string. The name you enter after the **name** keyword in this command must match the name entered with the **username** command in the previous "Configure Security" section.	`1700(config-if)#`	**dialer map ip** *192.168.39.40* **name** *HQ 5558461*
10	Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites based on IP address and dialer string. The name you enter after the **name** keyword in this command must match the name entered with the **username** command in the previous "Configure Security" section.	`1700(config-if)#`	**dialer map ipx** *9876.0000.0c03.e336* **name** *HQ 5558461*
11	Assign this interface to a dialer group.	`1700(config-if)#`	**dialer-group** *1*
12	Define a DDR dialer list to control dialing based on access lists and IP packets.	`1700(config-if)#`	**dialer-list** *1* **protocol ip permit**
13	Define a DDR dialer list to control dialing based on access lists and IPX packets.	`1700(config-if)#`	**dialer-list** *1* **protocol ipx permit**

Verifying Your Configuration

You can verify your configuration to this point by:

- Confirming Connectivity with the Central-Site Router Over IP
- Confirming Connectivity to the Central-Site Router Over IPX
- Confirming That the X.25 Map Is Configured Correctly
- Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Confirming Connectivity with the Central-Site Router Over IP

Step 1   Confirm that your router X.25 connection is active.

Step 2   From the privileged EXEC command mode, enter the **ping** command followed by the IP address of the central-site router:

```
1700# ping 192.168.39.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echo to 192.168.39.40, timeout is 2 seconds: !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
```

Step 3   Confirm that the success rate shown in the output (shown in bold in the example) is 60 percent (3/5) or greater. This means that your router is successfully transferring data to the central-site router.

Step 4   To continue configuration, re-enter global configuration mode.

Confirming Connectivity to the Central-Site Router Over IPX

Step 1   Confirm that your router X.25 connection is active.

Step 2   Enter the **ping** command followed by the IPX address of the central-site router:

```
Router# ping 9876.0000.0c03.ecc6
[ip]: ipx
IPX address: 105.0060.834f.667d
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Verbose [n]:
Type escape sequence to abort.5, 100-byte IPX cisco Echoes to
9876.0000.0c03.ecc6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

> **Note**   Substitute the IPX address of your central-site router for the IPX address shown in the example.

Step 3   Confirm that the success rate shown in the output (shown in bold in the example) is 60 percent (3/5) or greater. This means that your router is successfully transferring data to the central-site router.

Step 4   To continue configuration, re-enter global configuration mode.

Confirming That the X.25 Map Is Configured Correctly

Step 1   From the privileged EXEC command mode, enter the **show x25 map** command:

```
1700# show x25 map

Serial0: X.121 2345 <--> ip 192.168.39.40,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

Step 2   Confirm that the following addresses (shown in bold in the example) appear in the command output:

- Your router IPX network number

- Central-site router IP address

- Central-site router IPX address

Note   The IP and IPX addresses shown in your output are different than those shown in the example.

Step 3   To continue configuration, re-enter global configuration mode.

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Step 1   From the privileged EXEC command mode, enter the **show x25 vc** command.

```
1700# show x25 vc
SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345 <-->
ip 192.168.39.40
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2, output: 2
Packet size input: 128, output: 128
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0 Timer (secs): 0
Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Step 2   Confirm that the X.25 address is associated with the correct IP and IPX addresses (shown in bold in the example).

Step 3   To continue configuration, re-enter global configuration mode.

Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	**line console 0**
2	Set the interval that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	**exec-timeout** *5*
3	Specify a virtual terminal for remote console access.	1700(config-line)#	**line vty** *0 4*

Step	Task	Router Prompt	Command
4	Specify a password on the line.	`1700(config-line)#`	**password** *<lineaccess>*
5	Enable password checking at terminal session login.	`1700(config-line)#`	**login**
6	Exit configuration mode.	`1700(config-line)#`	**end**

Troubleshooting Problems with X.25 over ISDN B Channel

If you are having problems or the output that you received during the verification steps is very different from what is shown, you can troubleshoot your router by taking some or all of the following actions:

Caution   If you are not familiar with Cisco IOS debug commands, you should read the "Using Debug Commands" section in the "Cisco IOS Basic Skills" chapter before attempting any debugging.

- **debug isdn events**

- If the **ping** command is unsuccessful, use the **debug x25** command.

- If you cannot use the **ping** command to confirm connectivity to any device beyond the central-site router, verify that your routing (static or dynamic) is correctly configured.

- For more detail information than is contained in the **show isdn status** command output, use the **debug isdn q931** and **debug isdn q921** commands.
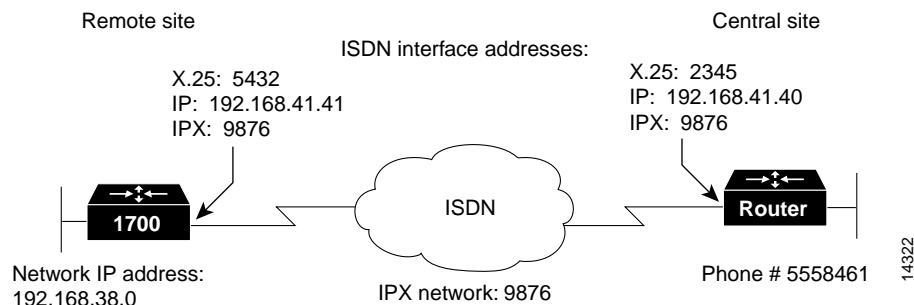
X.25 over ISDN D Channel

This section describes how to configure the router send data as X.25 over an ISDN D-channel connection. This section describes how to configure the router to encapsulate IP and IPX packets as X.25 and route them over an ISDN B-channel connection.

These are the major tasks when configuring your router:

- Configuring Global Parameters

- Configuring Security

- Configuring the Fast Ethernet Interface

- Configuring the ISDN Interface for X.25

- Configuring Command-Line Access to the Router

Figure 7-2 illustrates the configuration used in this example.

Figure 7-3   X.25 over ISDN D Channel Example Configuration

Configuring Global Parameters

Use this table configure some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	`1700#`	**configure terminal**
2	Enable IPX routing and configure the router with an IPX address. If you do not know your router IPX address, you can enter this command without an address. The router then determines its own IPX address. The address is displayed in the **write terminal** command output.	`1700(config)#`	**ipx routing** *0060.834f.66dd*
3	Configure the type of central office switch being used on the ISDN interface. Use the keyword that matches the ISDN switch type that you are using: • **basic-ts013** —Australian TS013 switches • **basic-1tr6** —German 1TR6 ISDN switches • basic-nwnet3—Norway NET3 switches (phase 1) • **basic-net3**—NET3 ISDN switches • **vn2**—French VN2 ISDN switches • **vn3**—French VN3 ISDN switches • **ntt**—Japanese NTT ISDN switches • **basic-5ess**—Basic rate 5ESS switches • **basic-dms100**—NT DMS-100 basic rate switches • **basic-ni**—National ISDN-1 switches • **basic-nznet3**—New Zealand Net3 switches	`1700(config)#`	**isdn switch-type** *basic-5ess*

Verifying Your Configuration

You can verify your configuration to this point by confirming the ISDN line status as follows:

Step 1   Enter the **show isdn status** command.

Step 2   Confirm that the "State = MULTIPLE_FRAME_ESTABLISHED" message (shown in bold in the example below) appears on the command output:

```
1700# show isdn status
The current ISDN Switchtype = basic-5ess
ISDN BRI0 interface
    Layer 1 Status:
        ACTIVE
    Layer 2 Status:
        TEI = 80, State = MULTIPLE_FRAME_ESTABLISHED
    Layer 3 Status:
        No Active Layer 3 Call(s)
    Activated dsl 0 CCBs = 0
    Total Allocated ISDN CCBs =
```

Step 3   If you do not see the message, do the following:

 (a)   Make sure that the router is correctly cabled.

 (b)   Make sure that any external NT1 is functioning correctly. Refer to the documentation that came with the NT1.

 (c)   Make sure the ISDN line is correctly configured by checking with the ISDN service provider.

 (d)   Refer to the following "Troubleshooting X.25 Problems" later in this chapter for additional suggestions.

Configuring Security

Use this table to configure some security measures.

Step	Task	Router Prompt	Command
1	Configure the router with a host name, which is used in prompts and default configuration file names.	1700(config)#	**hostname** *1700*
	For PPP authentication, the hostname entered with this command must match the username of the remote device.		
2	Specify a password to prevent unauthorized access to the router.	1700(config)#	**enable password** *<1700user>*

Configuring the Fast Ethernet Interface

Use this table to configure the Fast Ethernet interface, which connects your router to the local network.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Fast Ethernet interface.	`1700(config)#`	**interface fastethernet0**
2	Configure this interface with an IP address.	`1700(config-if)#`	**ip address** *192.168.38.42 255.255.255.0*
3	Enable the interface and the configuration changes that you have just made on the interface.	`1700(config-if)#`	**no shutdown**
4	Exit configuration mode for this interface.	`1700(config-if)#`	**exit**

Configuring the ISDN Interface for X. 25

Use this table to configure the ISDN, which connects your router to the central-site router over the wide-area network, for X.25 packet encapsulation.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ISDN interface.	`1700(config)#`	**interface BRI0**
2	Configure this interface with an IP address.	`1700(config-if)#`	**ip address** *192.168.40.41 255.255.255.0*
3	Set the encapsulation method on this interface to PPP.	`1700(config-if)#`	**encapsulation ppp**
4	Create a configurable interface for X.25 traffic over the ISDN D channel,	`1700(config-if)#`	**isdn x25 dchannel**
5	Configure a static ISDN Layer 2 terminal endpoint identifier (TEI) for X.25 over the ISDN D channel.	`1700(config-if)#`	**isdn x25 static-tei 1**
6	Configure this interface to place a call to multiple sites and to authenticate calls from multiple sites based on IP address and dialer string. The name you enter after the **name** keyword in this command must match the name entered with the **username** command in the previous "Configure Security" section.	`1700(config-if)#`	*dialer map ip 192.168.40.40* **name** *remote* **broadcast** *5558461* **dialer-group** *1*
7	Enable CHAP or PAP authentication on this interface.	`1700(config-if)#`	**ppp authentication chap**
8	Enable the interface and the configuration changes that you have just made on the interface.	`1700(config-if)#`	**no shutdown**
9	Exit configuration mode for this interface.	`1700(config-if)#`	**exit**

Configuring the ISDN Subinterface for X.25

Use this table to configure an ISDN subinterface.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ISDN subinterface.	`1700(config)#`	**interface BRI0:0**
2	Configure this interface with an IP address and a subnet mask.	`1700(config-if)#`	**ip address** *192.168.41.41 255.255.255.0*
3	Set the encapsulation type on this interface to X.25.	`1700(config-if)#`	**encapsulation x25**
4	Enable IPX routing on this interface.	`1700(config-if)#`	**ipx network** *9876*
5	Set the X.121 address of this interface.	`1700(config-if)#`	**x25 address** *5432*
6	Specify that dial-on-demand routing (DDR) is supported on this interface.	`1700(config-if)#`	**dialer in-band**
7	Set up the LAN protocols-to-remote-host mapping for IP and IPX.	`1700(config-if)#`	**x25 map ip** *192.168.41.40* **ipx** *9876.0000.0c03.ecc6 2345* **broadcast**
8	Define a DDR dialer list to control dialing based on access lists and IP packets.	`1700(config-if)#`	**dialer-list** *1* **protocol ip permit**
9	Enable the interface and the configuration changes that you have just made on the interface.	`1700(config-if)#`	**no shutdown**
10	Exit configuration mode for this interface.	`1700(config-if)#`	**exit**

Verifying Your Configuration

You can verify your configuration to this point by:

- Confirming Connectivity to the Remote Device Over IP

- Confirming Connectivity to the Remote Device Over IPX

- Confirming that the X.25 Map is Configured Correctly

- Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Confirming Connectivity to the Remote Device Over IP

Step 1 Enter the **ping** command followed by the IP address of the remote device.

Step 2 Check the success rate (shown in bold in the example below) in the command output. If the success rate is below 100 percent, refer to the following "Troubleshooting X.25 Problems" section for suggestions.

```
1700# ping 192.168.39.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.39.40, timeout is 2 seconds: !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/20 ms
```

Confirming Connectivity to the Remote Device Over IPX

Step 1   Enter the **ping** command and respond to the prompts shown in the following example.

Substitute the IPX address of your remote device for the IPX address shown in the example below.

Step 2   Check the success rate (shown in bold in the example) in the command output. If the success rate is below 100 percent, refer to the following "Troubleshooting X.25 Problems" section for suggestions.

```
1700# ping
Protocol [ip]: ipx
Target IPX address: 9876.0000.0c03.ecc6
Repeat count [5]: <Return>
Datagram size [100]: <<Return>>
Timeout in seconds [2]: <<Return>>
Verbose [n]: <<Return>>
Novell Standard Echo [n]: <<Return>>
Type escape sequence to abort.
Sending 5, 100-byte IPX cisco Echoes to 9876.0000.0c03.ecc6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24 ms
```

Note   The modem might need time to synchronize with the central-site router. You might have to enter the **ping** command several times before you get a response.

Confirming that the X.25 Map is Configured Correctly

Step 1   Enter the **show x25 map** command:

```
1700# show x25 map

Serial0: X.121 2345 <--> ip 192.168.39.40,
ipx 9876.0000.0c03.ecc6
PERMANENT, BROADCAST, 1 VC: 1*
```

Step 2   Confirm that your IPX network number and the remote device IP address and IPX address appear in the command output, as shown in bold in the example above. The IP and IPX addresses shown in your output will be different than those shown above.

Confirming Switched Virtual Circuit and Permanent Virtual Circuit Information

Step 1   From the privileged EXEC command mode, enter the **show x25 vc** command, as follows:

```
1700# show x25 vc
SVC 1, State: D1, Interface: Serial0
Started 00:04:10, last input 00:00:26, output 00:00:33 Connects 2345 <-->
ip 172.16.26.1
ipx 9876.0000.0c03.ecc6
multiprotocol cud pid, standard Tx data PID Window size input: 2, output: 2
Packet size input: 128, output: 128
PS: 7 PR: 3 ACK: 3 Remote PR: 7 RCNT: 0 RNR: FALSE Retransmits: 0 Timer (secs): 0
Reassembly (bytes): 0 Held Fragments/Packets: 0/0
Bytes 1540/1724 Packets 15/19 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Step 2 Look for the following messages in the output (shown in bold in the example):

- "SVC 1"—Means that the X.25 service is active for the X.25 interface.

- "State: D1"—Means that there is an active virtual circuit on the X. 25 interface.

- "Connects 2345 <-->..."—Means that the X.25 address is correctly associated to the IP address and IPX address of the X.25 interface.

- "Packets 15/19"—Means that data is being transferred across the X.25 interface. The number shown in this message varies and shows the success rate of data that is being transferred.

Configuring Command-Line Access to the Router

Use this table to configure some parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	1700(config)#	**line console** *0*
2	Set the interval in minutes that the EXEC command interpreter waits until user input is detected.	1700(config-line)#	**exec-timeout** *5*
3	Specify a virtual terminal for remote console access.	1700(config-line)#	**line vty** *0 4*
4	Specify a password on the line.	1700(config-line)#	**password** *<lineaccess>*
5	Enable password checking at terminal session login.	1700(config-line)#	**login**
6	Exit configuration mode.	1700(config-line)#	**end**

Troubleshooting X.25 Problems

If you are having problems or the output that you received during the verification steps is very different from what is shown, you can troubleshoot your router by taking some or all of the following actions:

⚠ **Caution**   If you are not familiar with Cisco IOS debug commands, you should read the "Using Debug Commands" section in the "Cisco IOS Basic Skills" chapter before attempting any debugging.

- If the **ping** command is unsuccessful, use the **debug x25** command.

- If you cannot use the **ping** command to confirm connectivity to any device beyond the central-site router, verify that your routing (static or dynamic) is correctly configured.

- If you do not see the "line protocol up" message in the **show interface** command output, use the **debug x25 event** command.

- If you do not see the "State CONNECT" message in the **show interface** command output, use the **debug lapb** command.

- For more detail information than is contained in the **show isdn status** command output, use the **debug isdn q931** and **debug isdn q921** commands.