Installing D4 Channel Banks and Cisco 90i IDSL Channel Units

This chapter explains how to install D4 channel banks and Cisco 90i IDSL Channel Units, and contains the following procedures:

- Installing a D4 Channel Bank

- Setting Up a PVC to the Cisco 90 Series DSL Management Agent

- Installing Cisco 90i IDSL Channel Units

- Installing Subscriber Loops

Installing a D4 Channel Bank

To use a D4 channel bank with Cisco 90i IDSL Channel Units, ensure that the physical T1 connections have been made to the D4 channel bank.

Step 1 Connect the T1 interface of the D4 channel bank to the Frame Relay switch either directly (using a T1 card in the Frame Relay switch) or by using a T1 CSU/DSU connected to a synchronous serial port on the switch. The Cisco 90i IDSL Channel Unit can use either an unchannelized or a channelized T1 interface to the switch. Table 4-1 lists the required interface settings.

Step 2 Determine if the D4 channel bank is more than 1500 ft away from the Frame Relay switch T1 card or the T1 CSU/DSU. If the channel bank is more than 1500 ft from the Frame Relay switch, you should install a T1 CSU or Network Terminator Unit to equalize the cable. Note that CSU/DSU is also called networks terminating unit.

Examples of typical physical T1 connections are shown in Figure 4-1.

Table 4-1   **T1 Interface Settings**

| Unit	Parameter	Setting
Channel bank	Line coding	B8ZS
	Framing	ESF
	Channel counting	Sequential (SEQ)
	Timing source[1]	Configure the appropriate timing source—external, loop, or local timing
	T1 equalizer[1]	Set by the distance from the DSX-1 cross-connect or T1 CSU/DSU

Table 4-1   T1 Interface Settings (Continued)

Unit	Parameter	Setting
Frame Relay switch T1 card or T1 CSU/DSU	Line coding	B8ZS
	Framing	ESF
	Timing source	Loop time
	Timeslots	All 24 (for channelized/fractional T1)
	Timeslot rate	64 kbps (for channelized/fractional T1)
Frame Relay switch	Protocol	Frame Relay UNI—2 octet DLCI
	LMI protocol	ANSI T1.617 Annex D network (DCE) side

1. The timing source and T1 equalizer parameters control how the D4 channel bank communicates with the external world; whereas the line coding, frame, and channel counting parameters affect how the Cisco 90i Channel Unit functions within the D4 channel bank.

Note   D4 channel banks may have two T1 interfaces or digroups. You can install either interface for Cisco 90i IDSL Frame Relay service or use them as ordinary time-division multiplexing (TDM) T1s; however, you cannot mix Cisco 90i IDSL and standard TDM channel units in the same digroup.

**Figure 4-1   Cisco 90i Physical Connections**
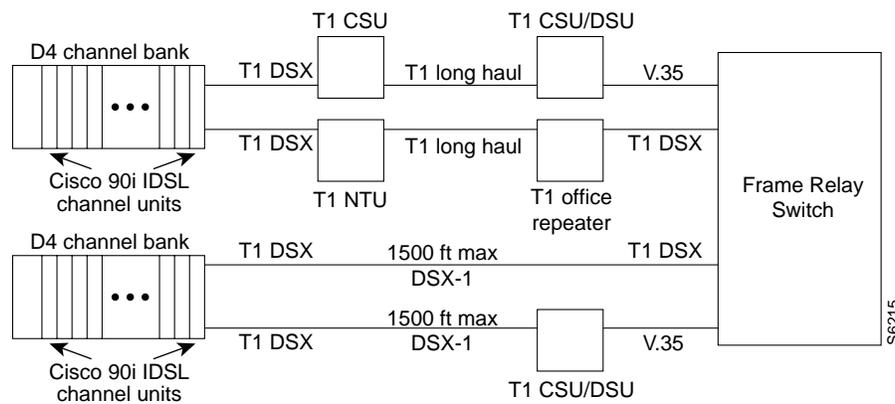
Note   CSU/DSU is also called a network terminating unit.

Determining Timing Source for the T1 Line

The D4 channel bank will always receive T1 data using a clock recovered from the incoming T1 signal; however, you must select the timing source used by the D4 channel bank to transmit the T1 signal. There are three options: using an external source, using T1 receive timing, or using an internal (to the bank) source. These are described below. (Refer to Table 4-1 for the D4 channel bank settings.)

1   Option 1—"External timing" is also called "central office timing supply" or "stratum clock." If the central office as a whole (all the equipment) is timed off an external clock, the D4 bank should be configured for external timing and wired appropriately. External timing is also referred to by its acronym "EXT." Refer to Figure 4-2 for an illustration of external timing.

Figure 4-2   External Timing
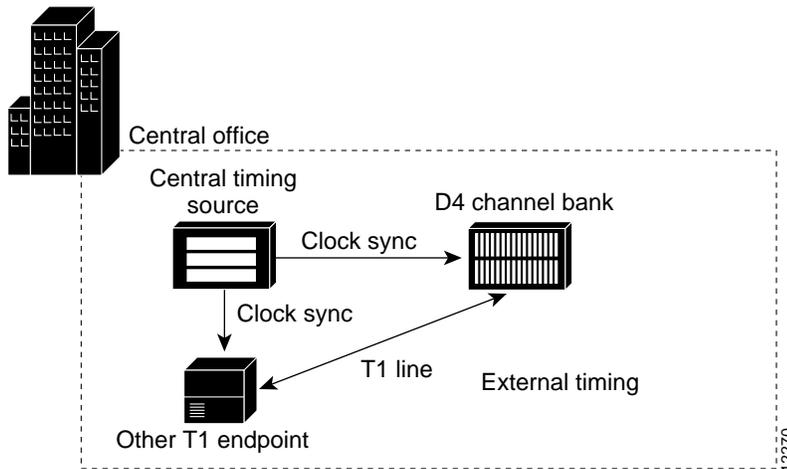
2 Option 2—"Loop timing." If the other T1 endpoint should supply transmit clock synchronization for the D4 bank, then the D4 bank should be configured to derive the clock from the incoming T1 signal. This configuration is known as "loop timing." Loop timing is also referred to by the acronym "LP." Refer to Figure 4-3 for an illustration of loop timing.

Figure 4-3   Loop Timing
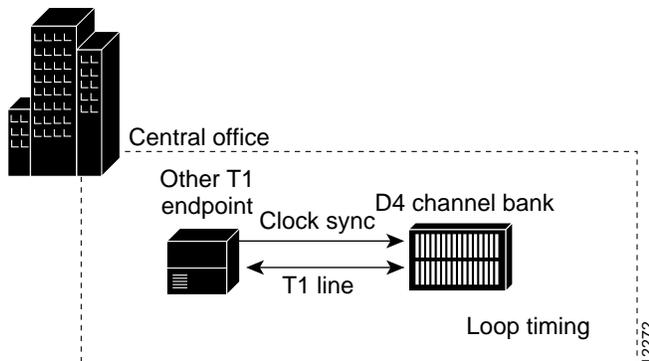
3 Option 3—"Local timing." If the other T1 endpoint cannot supply clock synchonization and no external clock is available, then the D4 bank should be configured to use its internal clock. This configuration is known as "local timing" because the clock is generated locally. Local timing is also referred to by its acronym "LOCT." Refer to Figure 4-4 for an illustration of local timing.

Figure 4-4   Local Timing
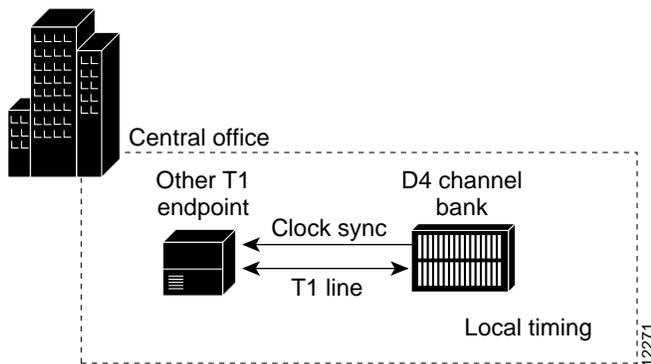
Options 2 and 3 (loop timing and local timing) must be complementary in the two T1 endpoints. If the other T1 endpoint is configured to supply clock, the D4 bank cannot also be configured to supply clock. Conversely, if the D4 bank is configured to supply clock, the other T1 endpoint cannot be configured to supply clock. The configuration of other T1 endpoint and D4 bank must result in only one clock source.

Testing the Physical Connection

To test the physical connections between the Cisco 90i IDSL Channel Unit and the Frame Relay switch, do the following:

Step 1   Temporarily insert a Cisco 90i IDSL Channel Unit into any open slot in the D4 channel bank. If you are using a standard D4 channel bank with two T1 interfaces, you must use a slot associated with the T1 interface connected in the previous section. Push the channel unit into its slot until the locking lever on the front panel of the unit engages.

Step 2   Ensure that all the LEDs on the front panel of the Cisco 90i IDSL Channel Unit blink three times and then the Backplane Status LED goes out. This indicates that the Cisco 90i IDSL Channel Unit has passed its self-test.

Step 3   Test the physical connections between the Cisco 90i IDSL Channel Unit and the Frame Relay switch. Wait at least 30 to 40 seconds for the Annex-D protocol to come up. Verify from the Frame Relay switch management station that the Annex-D protocol is up and error-free. Leave the Cisco 90i IDSL Channel Unit in the D4 channel bank while performing the procedures in the following sections "Setting Up a PVC to the Cisco 90 Series DSL Management Agent" and "Testing the PVC to the Cisco 90 Series DSL Management Agent."

Setting Up a PVC to the Cisco 90 Series DSL Management Agent

The information in this section lets you create a permanent virtual circuit (PVC) through the Frame Relay network between the Cisco 90 Series DSL Management Agent and a newly installed digroup. This PVC is used to manage all the channel units in the digroup. The data-link connection identifier (DLCI) is used to identify the PVC that is assigned to each function. In addition, the PVC assignment also automatically assigns a bank digroup identification number that is used to address the digroup using SNMP. These numbers range from 16 to 1007.

Configure the PVC with the following DLCIs at each end:

- Channel bank end—DLCI 31 is always used for the connection to the main Cisco 90 Series DSL Management Agent.

- Channel bank end—DLCI 30 is always used for the connection to the backup Cisco 90 Series DSL Management Agent, if one is used.

- Cisco 90 Series DSL Management Agent end—Any DLCI from 16 to 1007 can be used. This DLCI becomes the D4 channel bank digroup number, so the same DLCI number should be used for the main and backup Cisco 90 Series DSL Management Agents.

The D4 channel bank digroup number is automatically configured by the PVC connection. For example, a digroup with DLCI 99 will be referenced on the SNMP agent by the channel bank index 99. If both digroups of the D4 channel bank are used for Cisco 90i service, a management PVC must be set up for each digroup. It may be useful to number the two digroups of the same channel bank using consecutive numbers, with the A digroup having an even number (such as 16) and the B digroup having the next higher odd number (17).

Figure 4-5 illustrates an example of four digroups located in two D4 channel banks connected to a main and backup Cisco 90 Series DSL Management Agent.

Each virtual circuit should have a Committed Information Rate (CIR) of 4 kbps and be set to the highest priority allowed. This will ensure that management traffic can get through under severe congestion conditions.

Figure 4-5   Digroup Connections
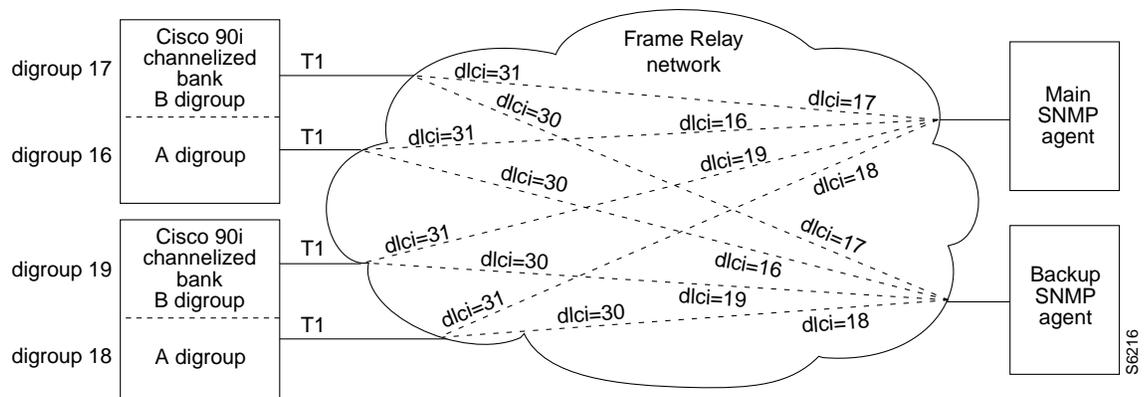
Testing the PVC to the Cisco 90 Series DSL Management Agent

To test the logical connection to the Cisco 90 Series DSL Management Agent, perform the following steps:

Step 1   If not already installed, temporarily insert a Cisco 90i IDSL Channel Unit in the D4 bank digroup.

Step 2   Check the frxAgtChStatus object in the frxSys group and make sure that the agent to switch Frame Relay link is "active."

Step 3   Retrieve the frxBankTable and look at the frxBankIndex. This will return the DLCIs that correspond to the D4 channel banks installed. Verify that the newly-installed channel bank appears in the list. If there are 35 channel banks installed, you should have 35 DLCIs reported.

The appearance of the newly-installed channel bank in the frxBankIndex indicates the Annex D protocol is reporting to the SNMP agent that the virtual circuit to the channel bank digroup exists, and is active at the channel bank.

It may take up to three minutes for all the DLCIs to be reported to the SNMP agent by the Frame Relay switch, so you should allow enough time for this to occur.

Step 4   Using the **get** command, display the frxChUTable and verify the channel unit you installed previously is shown. You may need to wait a few minutes for the SNMP agent to poll the bank and determine that the channel unit is there.

The D4 channel bank digroup is now installed. Note that digroups without channel units do not show up in the Cisco 90 Series DSL Management Agent frxBankTable or frxChUTable.

This concludes installation of the D4 channel bank.

Step 5   If you want, you can remove the Cisco 90i Channel Unit temporarily installed in the D4 bank digroup in Step 1. However, this will cause Annex D on the connection between the D4 channel bank and the Frame Relay switch to go down, and the bank will no longer appear in the frxBank table. At least one Cisco 90i must be installed in a digroup for that digroup to appear in the frxBankTable list.

If you have questions or need assistance, see the section "Cisco Connection Online" in the *Regulatory Compliance and Safety Information for the Cisco 90 Series DSL Management Agent* document.

Installing Cisco 90i IDSL Channel Units

To install Cisco 90i IDSL Channel Units, perform the following steps:

Warning   This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

Step 1   Insert a Cisco 90i IDSL Channel Unit into any open slot in the D4 channel bank. Push the channel unit into its slot until the locking lever on the front panel of the unit engages.

Step 2   Ensure that all the LEDs on the front panel of the Cisco 90i IDSL Channel Unit blink three times and the Backplane Status LED goes out. This indicates that the channel unit has passed its self test.

Each of the four IDSL loops has a single LED that indicates out-of-sync when on. The Backplane Status LED goes on when there is a problem with the T1 backplane data format or a backplane signaling conflict.

Step 3   Press the recessed **Download Config** pushbutton on the channel unit faceplate to download the default configuration from the Cisco 90 Series DSL Management Agent, if present, into nonvolatile memory in the channel unit.

You can change the default configuration through the SNMP manager.

Installing Subscriber Loops

To install subscriber loops, perform the following steps:

Step 1   Connect the loop side of the channel unit to the subscriber loop as follows:

Channel Unit	Subscriber Loop
Port A (loop 0)	T and R
Port B (loop 1)	T1 and R1
Port C (loop 2)	E and EG
Port D (loop 3)	M and MB

If the loop side is properly terminated in a BRITE card or a Network Termination (NT1), the associated DSL Sync LED will go out.

Step 2   Wait a few minutes for the Cisco 90 Series DSL Management Agent to poll the bank and determine the channel unit is there. Verify the channel unit is present in the frxChUTable.

Step 3   Set the frxPortSpeed and frxPortProtocol objects for the customer port if they are different than the default value.

Step 4   When the subscriber's equipment is connected on any of the four ports, the frxDSLStatus (frxPortTable) reports "loopUp," and the frxChEsTx and frxChEsRx (both in frxUPerfTable) errored seconds counters should not be increasing.

If the port protocol is set to Frame Relay and the subscriber has properly configured Frame Relay CPE connected, the frxPortLinkErrors and frxPortProtErrors (both in frxMgtPortTable) should not be increasing. If the errors are increasing, use the frxUEocTable to do loopback and BERT diagnostic tests.

See the "Managing Cisco 90i IDSL Channel Units and Subscriber Loops" chapter for detailed information on performing diagnostic tests.

Configuring the Permanent Virtual Circuits

Configure the permanent virtual circuits (PVCs) using the following steps:

Step 1   If the subscriber has Frame Relay customer premises equipment (CPE) and their IDSL port frxPortProtocol object (in frxPortTable) is set to Frame Relay, you can assign up to eight PVCs with DLCIs in the range 16 to 23. (This is called the "subscriber DLCI.") If the subscriber is running Point-to-Point Protocol (PPP) (frxPortProtocol object is set to PPP), the subscriber DLCI is always 16.

These subscriber DLCIs are then mapped to network DLCIs by the Cisco 90i IDSL Channel Unit. The Frame Relay switch should be configured for subscriber PVCs using the corresponding network DLCI.

Network DLCIs can be derived mathematically using the following equation:

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Network DLCI = (32 * Slot) + (8 * Port) +(SubscriberDLCI - 16)
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Refer to the "Network DLCI Assignments" appendix for a table listing the network DLCI assignment mapping.

Step 2   When the network DLCI is determined, provision the PVC in the Frame Relay switch using the network DLCI on the Cisco 90i end of the circuit.

Step 3   When the network PVC is provisioned, verify the corresponding PVC is present in the subscriber circuit. It will be in the DLCI range (16 to 23) corresponding to the network DLCI mapping.

This is done by retrieving the frxCircuitTable for the appropriate bank, channel unit, and port, and observing which values of frxPvcIndex are populated. It may take a minute for the Annex D protocol to transfer this information from the Frame Relay switch to the Cisco 90i IDSL Channel Unit.

Step 4   Set the frxCktCIR, frxCktBc, and frxCktBe (in frxCircuitTable) for each PVC if it is different from the default value. Verify that the CIR, Bc, and Be match the values provisioned in the Frame Relay switch for each subscriber DLCI.

Step 5   If the Frame Relay equipment at the far end of the PVC has been installed, verify that the frxFarEndOpStat (in frxCircuitTable) for the circuit is active.