



AREA CODE CHANGE

Please note that the area code for Paradyne Corporation in Largo, Florida has changed from 813 to 727.

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**HOTWIRE
MODEL 7924 STANDALONE
T1 HDSL TERMINATION UNIT
USER'S GUIDE**

Document No. 7924-A2-GB20-10

June 1997

Preliminary Draft

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Important Safety Instructions

1. Read and follow all warning notices and instructions marked on the product or included in the manual.
2. Do not allow anything to rest on the power cord and do not locate the product where persons will walk on the power cord.
3. Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous high voltage points or other risks. Refer all servicing to qualified service personnel.
4. General purpose cables are provided with this product. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.
5. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.
6. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are interconnected, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.
7. In addition, if the equipment is to be used with telecommunications circuits, take the following precautions:
 - Never install telephone wiring during a lightning storm.
 - Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
 - Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
 - Use caution when installing or modifying telephone lines.
 - Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
 - Do not use the telephone to report a gas leak in the vicinity of the leak.

EMI Warnings

⚠ WARNING:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The authority to operate this equipment is conditioned by the requirements that no modifications will be made to the equipment unless the changes or modifications are expressly approved by Paradyne Corporation.

⚠ WARNING:

To Users of Digital Apparatus in Canada:

This Class A digital apparatus meets all requirements of the Canadian interference-causing equipment regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.

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About This Guide

Document Purpose and Intended Audience

This guide contains information needed to set up, configure, and operate HotWire Model 7924-A1 T1 HDSL termination units.

It is expected that readers of this document are central office and/or special service installation technicians or network engineers who have an understanding of digital subscriber line systems and High-bit-rate Digital Subscriber Loop (HDSL) transmission systems plus the deployment of such systems in a telephone company or private network environment.

Document Summary

Section	Description
Chapter 1	<i>About HotWire 7924 Termination Units.</i> Describes the features of each version of the Model 7924 and typical configurations.
Chapter 2	<i>Installing the Unit.</i> Describes how to install the unit and make connections.
Chapter 3	<i>Using Terminal and Switchpack Modes.</i> Provides instructions for connecting a VT100-compatible terminal user interface. Also describes how to make manual configuration changes directly on the board hardware.
Chapter 4	<i>Customizing DSX-1-Compatible Units.</i> Provides procedures for modifying configuration options by using the terminal interface or DIP switches and jumpers on the board.
Chapter 5	<i>Customizing V.35-Compatible Units.</i> Provides procedures for modifying configuration options by using the terminal interface or DIP switches and jumpers on the board.
Chapter 6	<i>Monitoring the Unit.</i> Describes how to monitor unit status, LEDs, and network statistics. Also describes how to monitor the status of the unit on the opposite side of the HDSL connection.

Section	Description
Chapter 7	<i>Testing.</i> Provides information about available loopback tests.
Appendix A	<i>Worksheets.</i> Contains all the configuration options, default settings, and possible settings to use for planning.
Appendix B	<i>Cable Pin Assignments.</i> Contains connector and interface details.
Appendix C	<i>Switchpacks and Jumpers.</i> Defines the switchpack and jumper positions on the board hardware. Includes board layout diagram.
Glossary	Defines acronyms and terms used in this document.
Index	Lists key terms, acronyms, concepts, and sections in alphabetical order.

Product-Related Documents

Document Number	Document Title
7900-A2-GB20	<i>HotWire Model 7900 Basic Maintenance Processor User's Guide</i>
7900-A2-GB21	<i>HotWire Model 7900 SNMP Maintenance Processor User's Guide</i>
7900-A2-GN10	<i>HotWire Models 7900 10-Slot Standalone Shelf Installation Instructions</i>
7900-A2-GN20	<i>HotWire Model 7900 Equipment Nest and Options Installation Guide</i>
7920-A2-GB20	<i>HotWire Models 7924 and 7925 T1 and E1 HDSL Nest Cards User's Guide</i>
7915-A2-GB20	<i>HotWire Models 7915 E1 SDSL Termination Unit User's Guide</i>
7925-A2-GB20	<i>HotWire Models 7925 E1 HDSL Termination Unit User's Guide</i>

To order additional product documentation, refer to *Warranty, Sales, and Service Information* on page A at the beginning of this User's Guide.

About HotWire Model 7924 Termination Units

1

HotWire 7924-A1 Models and Features

Products in the HotWire 7924 family provide “last mile/last kilometer” transport of T1-compatible circuits between customer facilities and central site equipment over 2- or 4-wire copper lines. The units can be used over distances substantially exceeding traditional T1 spans and CSA loop standards.

HotWire 7924 standard features include:

- V.35 or DSX-1 interface
- Full support for T1 using two twisted-copper pairs
- Full support for fractional T1 using one or two twisted-copper pairs
- Meets the requirements of repeaterless T1 transmission on loops exceeding standard specifications
- Automatic detection and compensation for inverted pairs and swapped loops – significantly simplifies installation
- Tolerates bridged tap
- Local and remote alarm surveillance
- Local and remote T1 and HDSL performance monitoring

HotWire 7924 may be ordered either as a standalone unit (7924-A1-xxx) or as a nest-mounted card (7924-B1-xxx) that fits in a HotWire 7900 nest. This guide describes the installation and maintenance procedures for the standalone version, Model 7924-A1-xxx. See *Product-Related Documents* in *About This Guide* for information on manuals for the nest and nest-mounted cards.

There are several versions of the Model 7924-A1, each supporting a different interface (DSX-1 or V.35) and power supply (–48 Vdc, 220 Vac, or 120 Vac):

Model Number	Features
7924-A1-201	1.544 Mb/s DSX-1 compatible. Connection to 120 Vac power supply.
7924-A1-202	1.544 Mb/s V.35 compatible. Connection to 120 Vac power supply.
7924-A1-301	1.544 Mb/s DSX-1 compatible. Connection to 230 Vac power supply.
7924-A1-302	1.544 Mb/s V.35 compatible. Connection to 230 Vac power supply.
7924-A1-501	1.544 Mb/s DSX-1 compatible. Direct connection to –48 Vdc power supply.
7924-A1-502	1.544 Mb/s V.35 compatible. Direct connection to –48 Vdc power supply.

Typical Configurations

HotWire Model 7924 standalone units can be used in campus applications where long loop distances normally require the campus to contract with the local telephone exchange carrier to deliver private line services across the campus.

Figure 1-1 shows two typical campus applications where remote routers or multiplexers are interconnected across a campus using two HotWire Model 7924 standalone units. In each pair, one unit is configured as a central site unit or central office (CO) and the other is the customer premises (remote) unit (CP).

Each HotWire Model 7924 standalone unit is configured at the factory to operate at the CP side of an T1 HDSL connection. However, you can easily reconfigure a unit for use at the CO end, as would be necessary for the configurations in Figure 1-1. (Conversely, HotWire Model 7924 nest cards are preconfigured for CO operation.)

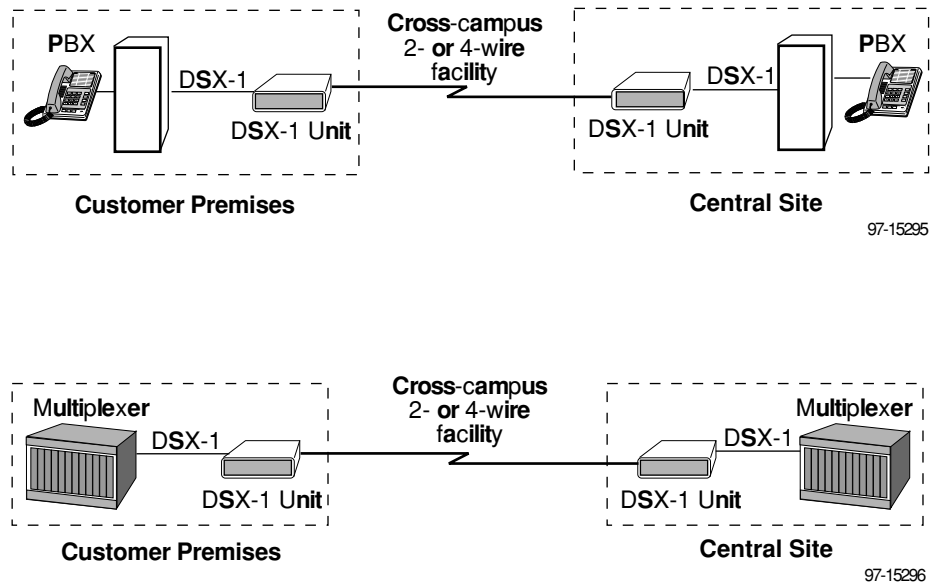


Figure 1-1. Campus Network Applications

HotWire Model 7924 standalone units are also ideal for delivering T1 services from a central site to the customer premises over long loop distances without repeaters.

Figure 1-2 shows a central-site application with a HotWire 7900 Nest containing HotWire Model 7924 nest cards. The nest cards at the central site each terminate a single HDSL subscriber line. Each line is then converted to a DSX-1 interface for connection to other central office equipment, such as a digital cross-connect system (DCS).

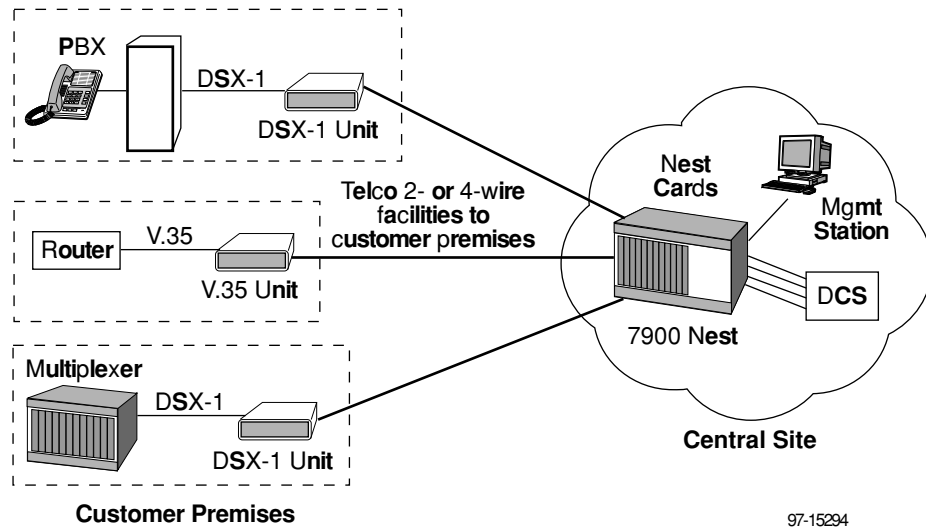


Figure 1-2. T1 Extension to Customer Premises

Cellular network providers must lease large numbers of T1 circuits in order to connect remote cell sites to mobile telephone switching offices (MTSOs). HotWire Model 7924 products provide an alternative to standard repeated T1 services. Figure 1-3 depicts a typical cellular network access application.

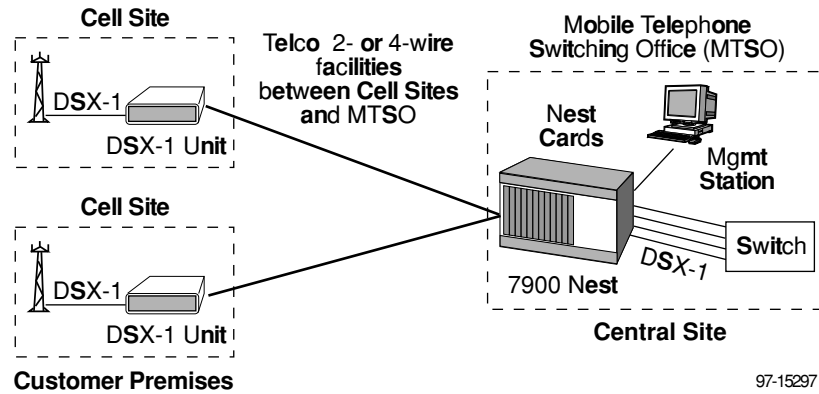


Figure 1-3. Cellular Network Access

User Interface Types

There are three types of user interfaces to the standalone units:

- VT100-compatible terminal interface (see [Chapter 3](#))
- Manual setting of switches and jumpers (see [Chapter 3](#))
- Front Panel LED status indicators (see [Chapter 6](#))

Installing the Unit

2

Package Checklist for HotWire Model 7924-A1

Verify that your package contains the following:

- A HotWire Model 7924-A1 unit
- VT100 Terminal Cable
- A 14' twisted-pair network cable
- Power cord with power transformer (optional)
- Warranty card

Connecting to the Network

► Procedure

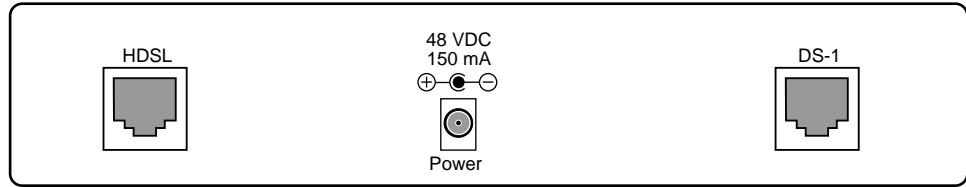
1. Connect one end of the supplied 14' twisted-pair network cable into the rear panel HDSL jack. Connect the other end to your HDSL network interface.

NOTE:

Do *not* use a flat VF network cable, as this may severely degrade the performance of the termination unit. Use only twisted-pair network cable.

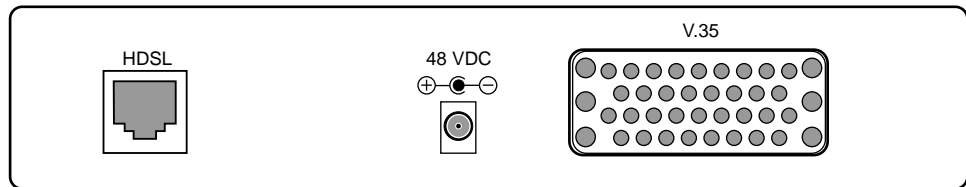
2. Connect a V.35- or DSX-1-interface cable into the appropriate connector on the rear panel. Connect the other end to your V.35 or DSX-1 equipment.

Connecting Power to the Unit



97-15356

DSX-1-Compatible HotWire 7924 – Rear Panel



97-15264

V.35-Compatible HotWire 7924 – Rear Panel

As described in [Chapter 1](#), there are several options for power cords, depending on your power source (120 Vac, 230 Vac, or –48 Vdc).

Your package may also include a country-specific adapter. To obtain information on the various power cord adapters available, refer to [Warranty, Sales, and Service Information](#) on page A at the beginning of this User's Guide.

If your package includes a 120 Vac or 230 Vac power cord with transformer: Plug the power transformer into an available 115/230 Vac power outlet, running the power lead to the unit housing. Neatly route the –48 Vdc cable to the housing, securing the cable to the wall and providing strain relief. Connect the power lead into the –48 Vdc plug on the rear panel.

If your package did not include a power cord: Connect the unit into an external –48 volt power source.

Using Terminal and Switchpack Modes

3

Choosing an Interface Mode

You can make configuration changes either through the system terminal menus (Terminal Mode) or by manually changing switches and jumpers on the board (Switchpack Mode). Terminal Mode is the default setting.

In Terminal Mode:

- You change configuration parameters by selecting menu options that appear on a VT100-compatible terminal attached to the front panel of the termination unit.
- The unit is preconfigured at the factory for CP (customer premises) operation.

In Switchpack Mode:

- All configuration parameters are taken from the current setting of the switchpacks and jumpers.
- You must ensure that the switchpacks and jumpers are set as desired. (They are not preconfigured at the factory.)
- You can still display information about the unit from the terminal.
- Any changes you had made in Terminal Mode are lost when you change to Switchpack Mode.

Connecting to a System Terminal

An optional system maintenance terminal may be attached to your Model 7924 standalone termination unit through the modular jack on the front panel. You may have terminals attached to both endpoints (CO and CP).

The system terminal must be a VT100-compatible terminal or emulation software on a PC.

Connect the 9-pin end of the terminal cable into a COM port on your PC. Plug the other end into the modular jack on the front panel. If your PC requires a 25 pin

connector to the COM port, see Appendix B, *Cable Pin Assignments*, for the correct cable pinouts.

Make sure the terminal parameters on your PC are set to:

- 9600 baud
- 8 bit
- no parity
- 1 stop bit
- no flow control

Press return from your VT100-compatible terminal window to activate the Main Menu for the attached unit. The system runs diagnostics and status checks as it comes up. After a few moments, the Main Menu screen will appear on your VT100-compatible terminal. Menus are described in [Chapters 4 and 5](#) for the DSX-1 and V.35 units, respectively.

Switching Between Terminal and Switchpack Modes

The following procedure is used to change the operating mode of the unit to either Terminal Mode (the default setting) or Switchpack Mode. Refer to [Chapter 4](#) (for DSX-1-compatible units) or [Chapter 5](#) (for V.35-compatible units) for information on changing configuration options using either of these modes.

► Procedure

To change the mode:

1. Power down the unit and remove the enclosure cover, exposing the circuit board. Use electrostatic discharge (ESD) protection when handling the circuit board.
2. See Appendix C, *Switchpacks and Jumpers*, for jumper locations on your unit's board.
3. Locate the jumper header.
 - Use P11 for DSX-1-compatible units.
 - Use P8 for V.35-compatible units.
4. Place the jumper in the correct position for the desired mode.
 - Switchpack Mode is configured by placing the jumper on Pins 2 and 3.
 - Terminal Mode is configured by placing the jumper on Pins 1 and 2.
5. *If you are enabling Switchpack Mode:* You must set the switchpacks and jumpers to your desired configuration. Refer to *Switchpacks and Jumpers*, Appendix C.
6. Power up the board to reset and enable the new configuration.

Customizing DSX-1-Compatible Units

4

Accessing Configuration Options

This chapter provides instructions on how to change configuration options for HotWire 7924 standalone units that are DSX-1-compatible. Chapter 5 provides similar information for V.35-compatible units.

Configuration option settings determine how the unit operates. You can change a unit's configuration options by:

- Selecting the Board Configuration branch of the Main Menu while in Terminal Mode.
- Changing switch pack and jumper settings on the board hardware while in Switchpack Mode.

The Main Menu for a DSX-1-compatible unit on the customer premises (CP) side appears as follows:

```
Command→ G123

ATTX - CP - T1 - LOOP AB

T1 HDSL HTUR Main Menu

1) Board Status
2) Performance Monitor
3) Board Configuration
4) Board Reset
5) HTUC Menu
?) Redisplays this Menu

Command→
```

- The “G123” code indicates the unit powered up successfully.
- Enter “?” to redisplay the menu from the Command prompt.
- The CP unit is also known as an HTU-R. A unit on the CO side is an HTU-C. Each unit allows you to monitor the unit on the other side. Therefore, CP units have an option “HTUC Menu” and CO units have an option “HTUR Menu”. These options allow you to display information about the far-end unit.
- CO units have two additional options for Local Loopback and Remote Loopback.
- This guide depicts the system terminal menus as they appear from a CP unit. This is the default configuration for Model 7924 standalone units.

Making Changes from the Terminal Interface

The Board Configuration menu displays the current board software and hardware settings. It also allows you to change certain parameters on the board.

This function is affected by the status of the switchpack (DIP switch control) setting.

- When operating in Terminal Mode (the system default) you can make configuration changes through the terminal menus.
- When operating in Switchpack Mode, you can display configuration parameters using the terminal menus, but any configuration changes must be made using the switchpacks and jumpers on the board hardware. Refer to *Making Changes in Switchpack Mode* on page 4-5.

From the Main Menu, select option 3, Board Configuration.

```

Command→ 3

Board Configuration:

1) HDSL Card Type      - CP
   HDSL Rate Type     - T1
2) Loops Enabled      - Dual Loop (Loops A and B)
3) T1 Line Encode     - B8ZS
4) Framing            - D4
5) Line Build Out     - 0 to 133 feet, 0dB
   HDSL FW Rev        - 03
   AT+T FW Rev        - 1.17
   CP Serial #        - 085561

-----

1-5) Board Configuration
6) Switch pack Definitions
7) Line Build-Out Definitions
?) Redisplays this menu
Q) Quit

Config→
    
```

Possible values for each parameter are listed in Table 4-1. See *Worksheets*, Appendix A, for help in selecting the appropriate configuration options for your application.

Table 4-1. DSX-1-Compatible Units Configuration Options (1 of 2)

1) HDSL Card Type
Possible Settings: CP, CO Default Setting: CP
Indicates the placement of the unit in the network configuration. To toggle the card type, enter 1 at the Config prompt. CP – Unit is on the customer premises (remote) side of the HDSL connection. CO – Unit is on the central office (or central site) side of the HDSL connection.
2) Loops Enabled
Possible Settings: Loops A and B, Loop A Default Setting: Loops A and B
Specifies which loops on the HDSL line are to be used in the connection. To change the loops that are enabled, enter 2 at the Config prompt. The system then prompts you to specify either Dual (Loops A and B) or Single (Loop A only). Loops A and B – Loops A and B are enabled. Loop A – Only Loop A is enabled.

Table 4-1. DSX-1-Compatible Units Configuration Options (2 of 2)

3) T1 Line Encode
Possible Settings: B8ZS, AMI Default Setting: B8ZS
Specifies the type of line encoding used to ensure one's density in the transmission signal. To toggle the encoding method, enter 3 at the Config prompt. B8ZS – Binary 8 Zero Substitution. AMI – Alternate Mark Inversion.
4) Framing
Possible Settings: D4, Extended Superframe, Unframed Default Setting: D4
Specifies the type of framing to be used. To toggle the framing method, enter 4 at the Config prompt. D4 – Commonly used framing method on T1 circuits, consisting of 12 frames of 192 bits with the 193rd bit used for error checking and other functions. Also called Super Framing. Extended Superframe – Framing method consisting of 24 frames of 192 bits each, with the 193rd bit providing timing and other functions. An enhanced version of D4. Unframed – Framing is disabled (unsupported at this time).
5) Line Build Out
Possible Settings: 0 to 133 ft, 133 to 255 ft, 266 to 399 ft, 399 to 533 ft, 533 to 699 ft Default Setting: 0 to 133 ft
To change the line build-out length, enter 5 at the Config command prompt. You will then be prompted to select from the following options: 1) 0 to 133 ft 2) 133 to 255 ft 3) 266 to 399 ft 4) 399 to 533 ft 5) 533 to 699 ft N) No change NOTE: Additional options may be displayed on your terminal. These other options (for -7.5, -15, and -22.5 dB) are not designed for use with this product. Use of these other options will cause a weak signal and degrade performance. Select from options 1 through 5 only.

You must reset the board for changes to the card type or loops enabled (options 1 or 2) to take effect. A system message is displayed on the terminal to remind you to reset the board. To reset the board, use option 4 from the Main Menu. (The board may also be reset by cycling the power on the board.) All configuration settings are stored in nonvolatile memory.

The HDSL rate type, firmware revision numbers, and the serial number displayed on the Board Configuration screen cannot be changed.

Options 6 and 7 (Switchpack and Line Build-Out Definitions) on the Config menu display the switchpack and jumper positions used when changing configuration changes manually. These options are described in later sections of this chapter.

Making Changes in Switchpack Mode

When operating in Switchpack Mode, you can change configuration options by moving switches on the board hardware.

To enable Switchpack Mode, refer to *Switching Between Terminal and Switchpack Modes* in Chapter 3.

► Procedure

To open the unit and make changes while in Switchpack Mode:

1. Power down the unit and remove the enclosure cover, exposing the circuit board. Use electrostatic discharge (ESD) protection when handling the circuit board.
2. Refer to the board layout illustration in *Switchpacks and Jumpers*, Appendix C to locate switchpack S1.
3. Place the switchpack in the correct position for each desired configuration option. Definitions of switchpack positions are provided in *Switchpacks and Jumpers*, Appendix C.
For example, to change a unit's card type from CO to CP, move switch 1 on switchpack S1 to the OFF position.
4. Replace the enclosure cover and power up the board to reset and enable the new configuration.

Displaying Switchpack Definitions

Enter **6** at the Config prompt to display the definition of each position in the switchpack. Switchpack definitions are also listed in *Switchpacks and Jumpers*, Appendix C.

```

Config→ 6

Switch pack definition: (OFF=0, ON=1)

1   - CO/CP                OFF=CP, ON=CO
2   - B8ZS                 OFF/ON
3   - Dual/Single Loop Mode OFF=Dual, ON=Single
4   - Line Build Out Bit 0
5   - Line Build Out Bit 1
6   - Line Build Out Bit 2
7,8 - 00=Unframed, 01=D4
      11=ESF

Config→

```

Displaying Line Build-Out Definitions

Enter **7** at the Config prompt to display the switchpack and board settings for line build-out. This information is useful if you need to change the line build-out parameter manually. (Switchpack definitions are also listed in *Switchpacks and Jumpers*, Appendix C.)

```

Config→ 7

***** SWITCHPACK SETTINGS FOR LINE BUILD OUT *****

      Switchpack Settings
-----
Position #4 - Bit 0   OFF=0, ON=1
Position #5 - Bit 1   OFF=0, ON=1
Position #6 - Bit 2   OFF=0, ON=1

***** Switchpack Definitions *****
Bit 2   Bit 1   Bit 0 Application
-----
  0     0     0   0 to 133 feet - 0dB
  0     0     1   133 to 266 feet
  0     1     0   266 to 399 feet
  0     1     1   399 to 533 feet
  1     0     0   533 to 655 feet
  1     0     1   -7.5 dB
  1     1     0   -15 dB
  1     1     1   -22.5 dB

Config→
    
```

For example, to change the line build-out to 399 to 533 feet, while in Switchpack Mode, set position 6 OFF and positions 4 and 5 ON.

Customizing V.35-Compatible Units

5

Accessing Configuration Options

This chapter provides instructions on how to change configuration options for HotWire 7924-A1 models that are V.35-compatible. Chapter 4 provides similar information for DSX-1-compatible units.

Configuration option settings determine how the unit operates. You can change a unit's configuration options by:

- Selecting the Board Configuration branch of the Main Menu while in Terminal Mode.
- Changing switchpack and jumper settings on the board hardware while in Switchpack Mode.

The Main Menu for a V.35-compatible unit on the customer premises (CP) side appears as follows:

```
Command→ G123

ATTX - CP - T1 - LOOP AB
V.35 T1 HDSL HTUR Main Menu

1) Board Status
2) Performance Monitor
3) Board Configuration
4) Board Reset
5) HTUC Menu
?) Redisplays this Menu

Command→
```

- The “G123” code indicates that the unit powered up successfully.
- Enter “?” to redisplay the menu.
- The CP unit is also known as an HTU-R. A unit on the CO side is an HTU-C. Each unit allows you to monitor the unit on the other side. Therefore, CP units have an option “HTUC Menu” and CO units have an option “HTUR Menu”. These options allow you to display information about the far-end unit.
- CO units have two additional options for Local Loopback and Remote Loopback.
- This guide depicts the system terminal menus as they appear from a CP unit. This is the default configuration for Model 7924 standalone units.

Making Changes from the Terminal Interface

The Board Configuration menu displays the current board software and hardware settings. It also allows you to change certain parameters on the board.

This function is affected by the status of the switchpack (DIP switch control) setting.

- When operating in Terminal Mode (the system default) you can make configuration changes through the terminal menus.
- When operating in Switchpack Mode, you can display configuration parameters using the terminal menus, but any configuration changes must be made using the switchpacks and jumpers on the board hardware. Refer to *Making Changes in Switchpack Mode* on page 5-4.

From the Main Menu, select option 3, Board Configuration.

```

Command→ 3

Board Configuration:

  1) HDSL Card Type           - CP
     HDSL Interface/Rate     - V.35 T1
  2) Loops Enabled           - Dual Loop (Loops A and B)
  3) Payload Rate            - 1536 Kbps (24x64)
     Transmit Timing         - Loop
     HDSL FW Rev             - 02
     AT+T FW Rev             - 1.17
     CP Serial #             - 85649

-----

1-3) Board Configuration
4) Switch pack Definitions
?) Redisplays this menu
Q) Quit

Config→
    
```

Possible values for each parameter are listed in Table 5-1. See *Worksheets*, Appendix A, for help in selecting the appropriate configuration options for your application.

Table 5-1. V.35-Compatible Units Configuration Options

1) HDSL Card Type	
Possible Settings: CP, CO Default Setting: CP	
Indicates the placement of the unit in the network configuration. To toggle the card type, enter 1 at the Config prompt. CP – Unit is on the customer premises side of the HDSL connection. CO – Unit is on the central office (or central site) side of the HDSL connection.	
2) Loops Enabled	
Possible Settings: Loops A and B, Loop A Default Setting: Loops A and B	
Specifies which loops on the HDSL line are to be used in the connection. To change the loops that are enabled, enter 2 at the Config prompt. The system then prompts you to specify either Dual (Loops A and B) or Single (Loop A only). Loops A and B – Loops A and B are enabled. Loop A – Only Loop A is enabled.	
3) Payload Rate	
Possible Settings: 1 through 9 (for 64 through 1536 kbps) Default Setting: 9 (1536 kbps)	
Specifies the desired payload rate.	
1 – 1 x 64 (64 kbps)	6 – 8 x 64 (512 kbps)
2 – 2 x 64 (128 kbps)	7 – 12 x 64 (768 kbps)
3 – 3 x 64 (192 kbps)	8 – 16 x 64 (1024 kbps)
4 – 4 x 64 (256 kbps)	9 – 24 x 64 (1536 kbps)
5 – 6 x 64 (384 kbps)	N – No change to rate
Options 8 and 9 (1024 and 1536 kbps) are only available when Loops A and B are enabled. If only Loop A is enabled, the maximum payload rate is 768 kbps (option 7).	

You must reset the board for changes to the card type or loops enabled (options 1 or 2) parameters to take effect. A system message is displayed on the terminal to remind you to reset the board. To reset the board, use option 4 from the Main Menu. (The board may also be reset by cycling the power on the board.) All configuration settings are stored in nonvolatile memory.

The transmit timing, HDSL interface/rate, firmware revision numbers, and serial number displayed on the Board Configuration screen cannot be changed.

Option 4 (Switchpack Definitions) on the Config menu is used to display the switchpack and jumper positions used when making configuration changes manually. This menu option is described in *Displaying Switchpack Definitions* on page 5-5

Making Changes in Switchpack Mode

When operating in Switchpack Mode, you can change configuration options by moving switches on the board hardware.

To enable Switchpack Mode, refer to *Switching Between Terminal and Switchpack Modes* in Chapter 3.

► Procedure

To open the unit and make changes while in Switchpack Mode:

1. Power down the unit and remove the enclosure cover, exposing the circuit board. Use electrostatic discharge (ESD) protection when handling the circuit board.
2. Find the switchpack for the configuration options you wish to change. Switchpack positions are defined in *Switchpacks and Jumpers*, Appendix C.
3. Place the switchpacks in the correct position for each desired configuration option. The switchpacks are not preconfigured.
For example, to change a unit's card type from CO to CP, move switch 1 on switchpack S1 to the OFF position.
4. Make sure that positions 4 and 5 on switchpack S1 are set to ON and OFF, respectively, in order to use the HDSL loop for the clock source.
5. Replace the enclosure cover and power up the board to reset and enable the new configuration.

Displaying Switchpack Definitions

Enter **4** at the Config prompt to display the definition of each position in the two switchpacks. Switchpack definitions are also listed in *Switchpacks and Jumpers*, Appendix C.

```
Config→ 4

Switch pack 1 definition:
  1   - CO/CP                      OFF=CP, ON=CO
  2   - Dual/Single Loop Mode      OFF=Dual, ON=Single
  3   - Not Used
  4,5 - 00, 11 Invalid
        01 = Invalid, 10 = Loop Timing
  6-8 - Not Used

Switch pack 2 definition:
  1   - 64 Kbps (1x64)             OFF=0, ON=1
  2   - 128 Kbps (2x64)            OFF=0, ON=1
  3   - 192 Kbps (3x64)            OFF=0, ON=1
  4   - 256 Kbps (4x64)            OFF=0, ON=1
  5   - 384 Kbps (6x64)            OFF=0, ON=1
  6   - 512 Kbps (8x64)            OFF=0, ON=1
  7   - 768 Kbps (12x64)           OFF=0, ON=1
  8   - 1024 Kbps (16x64)          OFF=0, ON=1
All switches off = 1536 Kbps (24x64)

Config→
```

Monitoring the Unit

6

What to Monitor

This chapter presents information on how to access and monitor status and performance statistics for the unit and its network connection. You can monitor operations by viewing:

- Board Status option from the Main Menu
- Performance Monitor option from the Main Menu
- Board Status and Performance Monitor options from the HTUC (or HTUR) menu (for displaying information about the unit on the other end of the connection)
- Front Panel LEDs

Board Status

Board Status option from the Main Menu displays HDSL circuit operational status. Enter **1** at the Command prompt to display board status.

```
Command→ 1

T1 STATUS:      Network is UP

LOOPBACK STATUS: OFF

HDSL STATUS:    LOOP A is UP, LOOP B is UP

S/N RATIO:     Loop A = 44.0 dB, Loop B = 43.5 dB

Command→
```

Board Status for DSX-1-Compatible Unit

```
Command→ 1

DTR:           ACTIVE
DSR:           ACTIVE

LOOPBACK STATUS: OFF

HDSL STATUS:   LOOP A is UP, LOOP B is UP

S/N RATIO:     Loop A = 44.0 dB, Loop B = 43.5 dB.

Command→
```

Board Status for V.35-Compatible Unit

- T1 status displays one of the following: Network is Up, Receive Carrier Loss, Receive Remote Alarm, or Receive Unframed All 1's.
- DTR and DSR are either active or inactive. DSR becomes active in response to DTR (with HDSL loops up and data transmission possible).
- Loopback status is either ON or OFF.
- HDSL Status displays whether each loop is up, down, or disabled.
- Signal-to-Noise (S/N) ratios do not display if loops are down or disabled.

Performance Statistics

Performance monitoring allows more detailed observations of error conditions detected on the circuits. The Performance Monitor menu options provide statistics on errors received and recorded, in defined time periods from the previous minute to the previous 24 hours, plus a running total. These statistics can be cleared and restarted at any time.

Performance statistics update every second.

Accumulated performance statistics may be cleared and restarted by selecting option 7 on the performance menu.

NOTE:

There is no verification on this command — be sure you want to clear all statistics before pressing 7!

Enter **2** at the Command prompt to enter the Performance Monitor menu.

```

Command→ 2

Time Since Board Power-Up or Reset: 17:31:51
1 - 1 minute stats.
2 - 15 minute stats.
3 - 1 hour stats.
4 - 12 hour stats.
5 - 24 hour stats.
6 - Running total.
7 - Clear Statistics.
Q - Quit

stats→

```

Select a time frame from the above list to display statistics for a specified time period.

```

stats→ 1

Current 1 minute:
HDSL Errors:          T1 Errors:

FAW LoopA - 0         BPV - 0
FAW LoopB - 0         FAS - 0
CRC LoopA - 0         MOS - 0
CRC LoopB - 0
FEBE LoopA - 0
FEBE LoopB - 0

Previous 1 minute:

FAW LoopA - 0         BPV - 0
FAW LoopB - 0         FAS - 0
CRC LoopA - 0         MOS - 0
CRC LoopB - 0
FEBE LoopA - 0
FEBE LoopB - 0

stats→

```

Performance Statistics for DSX-1-Compatible Unit

The type of statistics displayed under the T1 Errors column depends on which type of framing is selected. When the unit is configured for D4 framing, FAS (frame alignment signal) errors are reported. When the unit is configured for ESF framing, CRC errors are reported.

Refer to the [Glossary](#) for definitions of the types of errors reported.

```
stats→ 1

Current 1 minute:
HDSL Errors:
FAW LoopA      0
FAW LoopB      0
CRC LoopA      0
CRC LoopB      0
FEBE LoopA     0
FEBE LoopB     0

Previous 1 minute
HDSL Errors:
FAW LoopA      0
FAW LoopB      0
CRC LoopA      0
CRC LoopB      0
FEBE LoopA     0
FEBE LoopB     0

stats→
```

Performance Statistics for V.35-Compatible Unit

Refer to the *Glossary* for definitions of the types of errors reported.

Remote Unit Information

The same type of information provided for the locally attached unit (CP or CO) can also be displayed (but not changed) for the unit on the other side of the connection (CO or CP).

From a terminal attached to a CP unit, you can display information about the CO unit by using the HTUC menu options. Similarly, from a terminal attached to a CO unit, the HTUR menu allows you to display information about the CP unit.

To access the HTUC menu from a CP unit, enter **5** at the Command prompt.

To access the HTUR menu from a CO unit, enter **7** at the Command prompt.

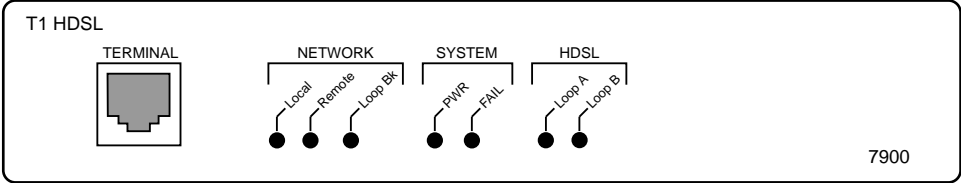
```
***** HTUC Menu *****
1) Board Status
2) Performance Monitor
3) Board Configuration
4) Line Build Out Configuration Help
?) Redisplays this Menu
Q) Quit

HTUC Command→
```

Front Panel LEDs

DSX-1-Compatible Unit

Upon power up, the first three LEDs blink in sequence, indicating a successful start configuration. The green PWR LED lights whenever power is applied to the board. Loop LEDs blink until the loop has been synchronized and then remain off.

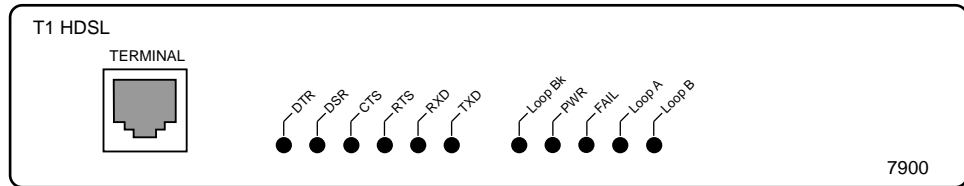


97-15312

LED	Meaning
Local	The local T1 interface has a loss of signal.
Remote	The remote T1 interface has a loss of signal.
Loop Bk	A loopback has been initiated for testing the equipment connected to this unit.
PWR	Power is applied to the unit.
FAIL	The processor has halted and repairs are required.
Loop A	HDSL Loop A has failed. (The LED will blink at board power up until the loop has been synchronized.)
Loop B	HDSL Loop B has failed or has been disabled. (The LED will blink at board power up until the loop has been synchronized.)

V.35-Compatible Unit

The green PWR LED lights whenever power is applied to the board. Loop LEDs blink until the loop has been synchronized and then remain off.



97-15313

LED	Meaning
Loop Bk	A loopback has been initiated for testing the equipment connected to this unit.
PWR	Power is applied to the unit.
FAIL	The processor has halted and repairs are required.
Loop A	HDSL Loop A has failed. (The LED will blink at board power up until the loop has been synchronized.)
Loop B	HDSL Loop B has failed or has been disabled. (The LED will blink at board power up until the loop has been synchronized.)

Testing

7

Detecting a Problem

The unit can detect and report problem conditions and perform diagnostic tests. The unit offers a number of indicators to alert you to possible problems, as described in *Monitoring the Unit*, Chapter 6:

- Front Panel LEDs
- Board status and performance statistics
- Remote unit board status and performance statistics

Understanding Loopback Tests

Loopback is a diagnostic function that enables a technician to isolate equipment on the HDSL circuit to determine where on the circuit trouble may be occurring. Loopback takes the system off-line. Data received from T1- or V.35-application equipment is looped back, as depicted in Figures 7-1 through 7-4.

“Local” and “remote” refer to the point at which the data is looped back. In a local loopback the data is reflected back by the local (CO) unit. In a remote loopback, the data is passed on to the remote (CP) unit and then reflected back.

Loopback tests may only be initiated from the CO end of the connection and only through the system terminal.

Local Loopbacks

When a local loopback is enabled the red Loop Bk LED on the front panel of the CO unit lights up and remains lit until the loopback is disabled.

Figure 7-1 illustrates local loopback in a connection between two DSX-1-compatible units.

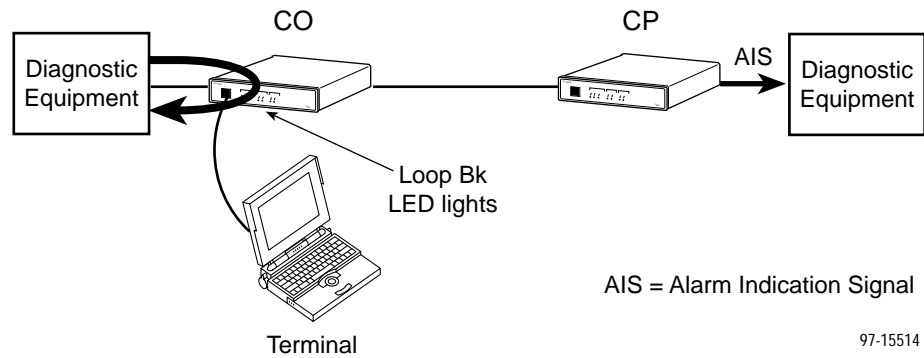


Figure 7-1. Local Loopback, Two DSX-1-compatible Units

Figure 7-2 illustrates local loopback in a connection between a DSX-1-compatible CO unit and a V.35-compatible CP unit. On the CP unit, DSR becomes inactive and the DSR LED turns off.

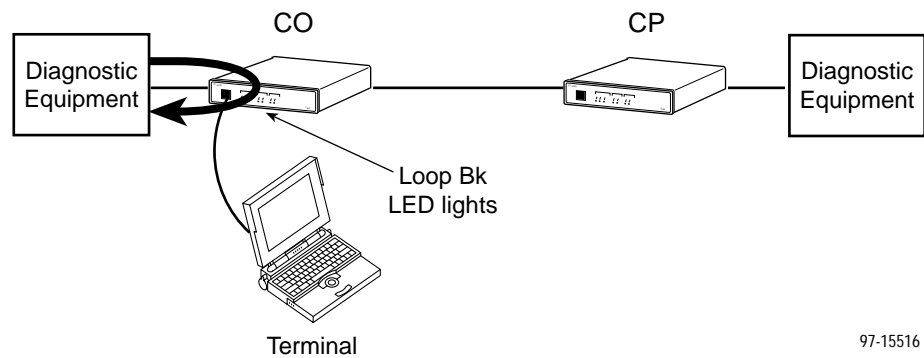


Figure 7-2. Local Loopback, DSX-1-compatible CO Unit, V.35-compatible CP Unit

Remote Loopbacks

When a remote loopback is enabled the red Loop Bk LED on the front panel of the CP unit lights up and remains lit until the loopback is disabled. The loopback LED on the CO unit does not light.

Figure 7-3 illustrates remote loopback in a connection between two DSX-1-compatible units.

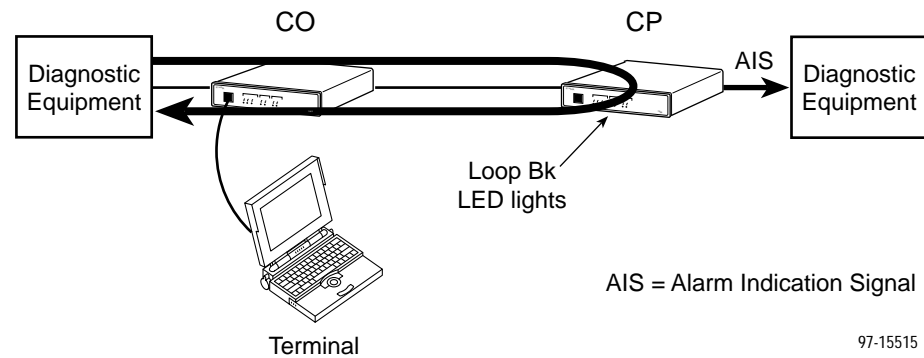


Figure 7-3. Remote Loopback, Two DSX-1-compatible Units

Figure 7-4 illustrates remote loopback in a connection between a DSX-1-compatible CO unit and a V.35-compatible CP unit. On the CP unit, DSR becomes inactive and the DSR LED turns off.

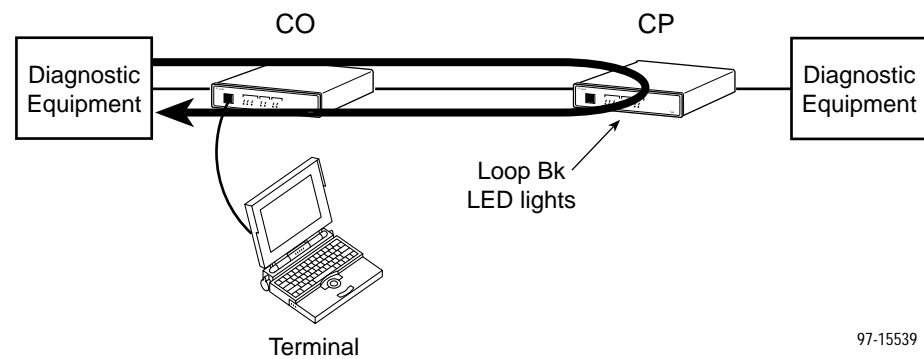


Figure 7-4. Remote Loopback, DSX-1-compatible CO Unit, V.35-compatible CP Unit

Starting and Ending Loopbacks

To start or stop a local loopback test from a CO unit, enter **5** at the Command prompt.

```
Command→ 5

Local Loopback is Enabled!

Command→ 5

Local Loopback is Disabled!
Resetting boards is recommended to ensure payload data
integrity!
```

To reset the unit after stopping (disabling) a local loopback, enter **4** at the Command prompt.

To start or stop a remote loopback test from a CO unit, enter **6** at the Command prompt.

```
Command→ 6

Remote Loopback is Enabled!

Command→ 6

Remote Loopback is Disabled!
```

Resetting the Unit

Enter **4** at the Command prompt to reset the board. This is equivalent to cycling the power.

```
Command→ 4

Reset will bring the loops down. Are you sure? (y/n)

Command→
```

If “y” is selected, the Main Menu reappears, the loops go down, and the FAIL (reset) LED lights.

Pressing any key other than “y” is interpreted as an “n”.

Worksheets



Overview

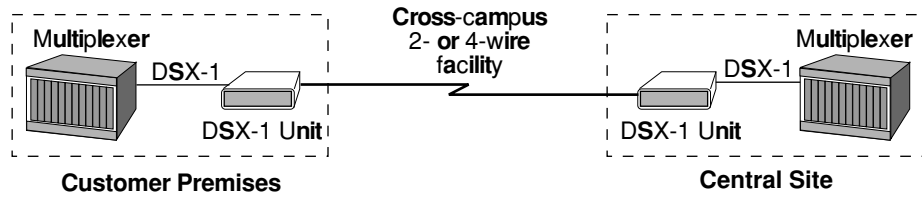
The worksheets in this appendix show the correct configuration settings based on the types of units (DSX-1-compatible or V.35-compatible) on either end of the HDSL connection. There are two combinations of the two types of units:

- DSX-1-compatible units on both ends
- V.35-compatible unit on the CP end, DSX-1-compatible unit on the CO end

NOTE:

HotWire 7924 V.35-compatible units are not designed for use at *both* ends of an HDSL connection. If your application requires V.35 equipment at both ends of an HDSL connection, consider using two Hotwire 7925 E1 HDSL termination units. Contact your sales representative for more information.

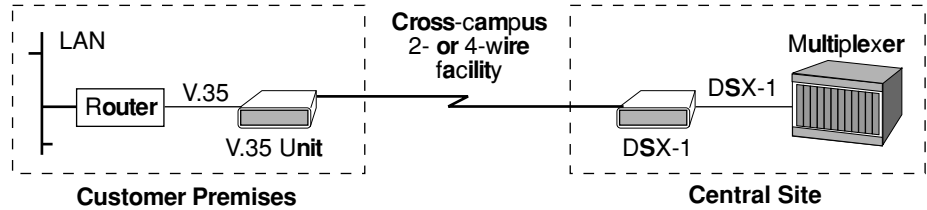
DSX-1-to-DSX-1 Configuration



To connect two DSX-1-compatible units, configure the units as follows (factory defaults are in bold):

Configuration Option	DSX-1-Compatible Unit (Customer Premises)	DSX-1-Compatible Unit (Central Site)
Card Type	CP (default)	CO
Loops Enabled	Dual (Loops A & B) or Single (Loop A)	Must be same as CP side
T1 Line Encode	B8ZS or AMI	Must be same as CP side
Framing	D4 , Extended Superframe, or Unframed	Must be same as CP side
Line Build-Out	Enter 5 at the Config command prompt. Select from the following options: 1) 0 to 133 ft 2) 133 to 255 ft 3) 266 to 399 ft 4) 399 to 533 ft 5) 533 to 699 ft	Enter 5 at the Config command prompt. Select from the following options: 1) 0 to 133 ft 2) 133 to 255 ft 3) 266 to 399 ft 4) 399 to 533 ft 5) 533 to 699 ft

DSX-1-to-V.35 Configuration



97-15420

To connect a V.35-compatible unit on the CP side and a DSX-1-compatible unit on the CO side, configure the units as follows (factory defaults are in bold):

Configuration Option	V.35-Compatible Unit (Customer Premises)	DSX-1-Compatible Unit (Central Site)
Card Type	CP	CO
Loops Enabled	Dual (Loops A & B) or Single (Loop A)	Must be same as CP side
Payload Rate	1 – 9 (64 – 1536 Kbps) Options 8 (1024) and 9 (1536 kbps) are only available if Loops A & B are enabled.	N/A
Framing	N/A	Use D4 or ESF.
T1 Line Encode	N/A	B8ZS or AMI
Line Build-Out	N/A	Enter 5 at the Config command prompt. Select from the following options: 1) 0 to 133 ft 2) 133 to 255 ft 3) 266 to 399 ft 4) 399 to 533 ft 5) 533 to 699 ft

When the V.35 payload rate is set for less than 1536 Kbps, that payload rate determines which T1 DS0s are used, as follows:

V.35 Payload Rate	DSX-1 T1 DS0s Used
1 (64 Kbps)	1
2 (128 Kbps)	1, 2
3 (192 Kbps)	1 – 3
4 (256 Kbps)	1 – 4
5 (384 Kbps)	1 – 6
6 (512 Kbps)	1 – 8
7 (768 Kbps)	1 – 12
8 (1024 Kbps)	1 – 16

DSX-1-Compatible Units Configuration Worksheet

Board Configuration	
Configuration Option	Settings <i>Default in Bold</i>
Card Type	CP , CO
Loops Enabled	Loops A and B , Loop A
T1 Line Encode	B8ZS , AMI
Framing	D4 , Extended Super Frame, Unframed (unsupported at this time)
Line Build Out	1) 0 to 133 feet – 0 dB 2) 133 to 266 feet 3) 266 to 399 feet 4) 399 to 533 feet 5) 533 to 655 feet

V.35-Compatible Units Configuration Worksheet

Board Configuration	
Configuration Option	Settings <i>Default in Bold</i>
Card Type	[CP], CO
Loops Enabled	[Loops A and B], Loop A
Payload Rate	1 – 1 x 64 (64 kbps) 2 – 2 x 64 (128 kbps) 3 – 3 x 64 (192 kbps) 4 – 4 x 64 (256 kbps) 5 – 6 x 64 (384 kbps) 6 – 8 x 64 (512 kbps) 7 – 12 x 64 (768 kbps) 8 – 16 x 64 (1024 kbps) ¹ 9 – 24 x 64 (1536 kbps)¹ N – No change to rate
¹ Options 8 and 9 require Loops A and B.	

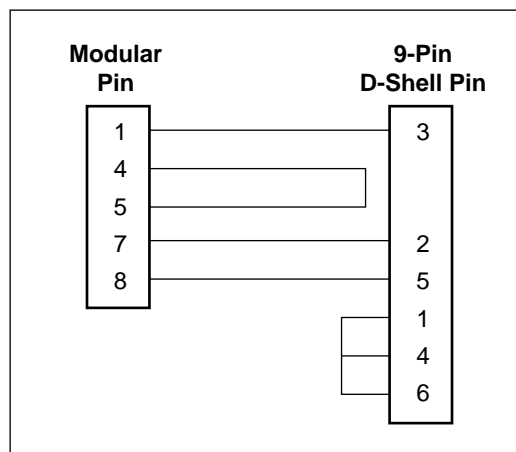
Cable Pin Assignments

B

Terminal Connection Cable Pin Assignments

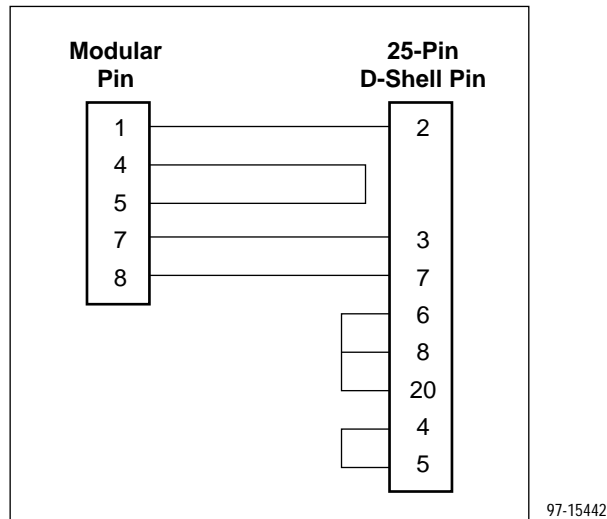
This section defines the pin assignments for the terminal cable from the front panel modular jack to your PC's COM port.

If your PC's COM port requires a 9-pin D-shell connector, the cable must use the following pin assignments.



97-15268-01

If your PC's COM port requires a 25-pin D-shell connector, the cable must use the following pin assignments.



HDSL Loop Connection Cable Pin Assignments

The HDSL modular connector that plugs into the rear panel of the unit has the following pin assignments.

Pin	Signal
1	Loop A Tip
2	Loop A Ring
3	Loop B Tip
4	Loop B Ring
5 – 8	open

NOTE:

Pin 1 is on the left when viewing the jack from its inserted position.

T1 Network Connection Cable Pin Assignments

The modular connector that plugs into the rear panel of DSX-1-compatible units has the following pin assignments.

Pin	Signal
1	Tx Ring
2	Tx Tip
3	open
4	Rx Ring
5	Rx Tip
6 – 8	open

NOTE:

Pin 1 is on the left when viewing the jack from its inserted position.

Switchpacks and Jumpers

C

DSX-1-Compatible Units

Use Figure C-1 to assist you in locating the switchpacks and jumpers on the board.

The jumper and switchpack detailed in Figure C-1 are used to change configuration options. All other jumpers (listed below) should always be left as positioned at the factory.

Jumper	Pins (Factory-Setting)
P1	2-3
P8	2-3
P9	2-3
P10	1-2
P12	1-2

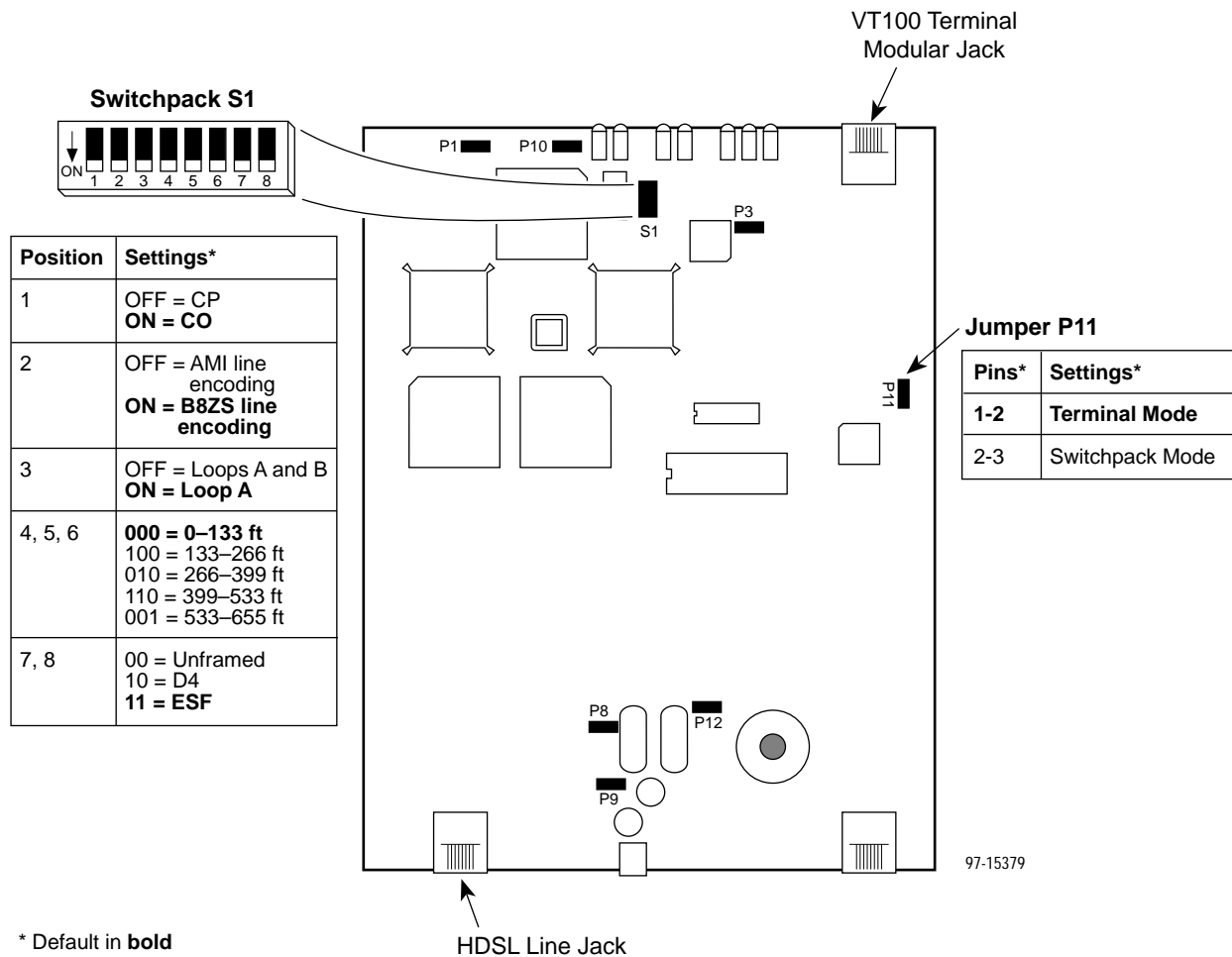


Figure C-1. DSX-1-Compatible Unit Switchpack and Jumper Locations

- Pin 1 on jumpers is labeled on the board.
- The ON position is labeled on the switchpack.
- Positions 4, 5, and 6 work as a trio. Set position 4 to the first digit, position 5 to the second digit, and position 6 to the last digit. For example, set 4 and 5 ON and 6 OFF for 399-533 ft.
- Positions 7 and 8 on Switchpack S1 work as a pair. Set position 7 to the first digit and position 8 to the second digit. For example, set 7 ON and 8 OFF for D4 framing.

V.35-Compatible Units

Use Figure C-2 to assist you in locating the switchpacks and jumpers on the board.

The jumper and switchpacks detailed in Figure C-2 are used to change configuration options. All other jumpers (listed below) should always be left as positioned at the factory.

Jumper	Pins (Factory-Setting)
P1	1-2
P2	1-2
P4	2-3
P5	No Jumper
P8	1-2
P9	2-3
P10	2-3
P11	1-2

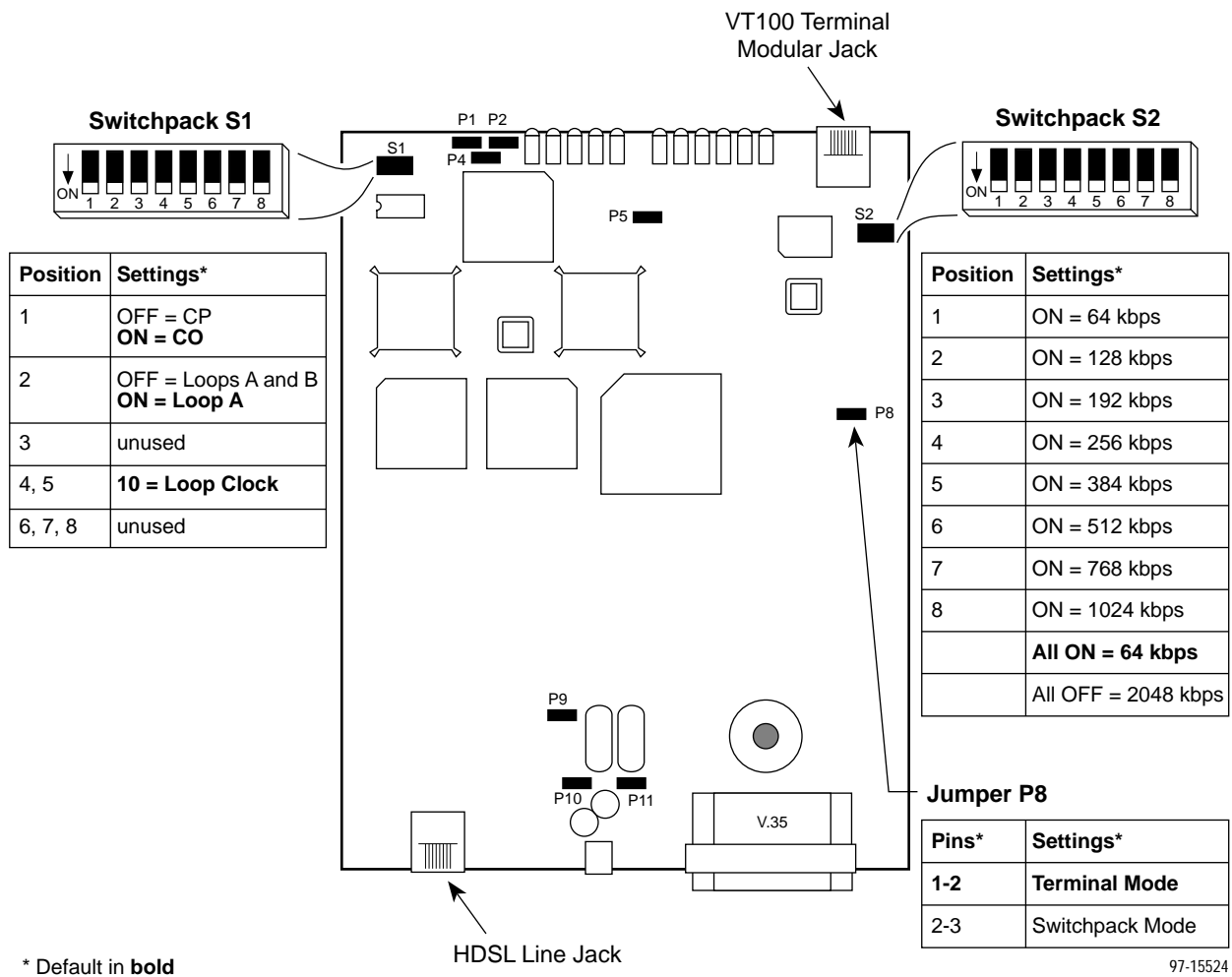


Figure C-2. V.35-Compatible Unit Switchpack and Jumper Locations

- Pin 1 on the jumper is labeled on the board.
- The ON position is labeled on the switchpacks.
- Positions 4 and 5 work as a pair. Position 4 should be ON and position 5 should be OFF. No other combinations are valid.

Glossary

AMI	Alternate Mark Inversion coding format.
BPV	Bipolar Violation. A type of error detected by using a modified bipolar signaling method in which a control code is inserted. Used with AMI coding format.
CD	Carrier Detect. A signal indicating that energy exists on the transmission circuit. Associated with Pin 8 on an EIA-232 interface.
CO	Central Office.
COM port	Communications port. A computer's serial communications port used to transmit to and receive data from a DCE. The DCE connects directly to this port.
CP	Customer Premises.
CPE	Customer Premises Equipment. Terminating equipment supplied by either the customer or some other supplier that is connected to the telecommunications network (e.g., DSUs, terminals, phones, routers, modems).
CRC	Cyclic Redundancy Check. A commonly used method of error detection.
CTS	Clear to Send. An EIA-lead standard for V.24 circuit CT 106; an output signal (DCE-to-DTE).
CV	Code Violation. This is equivalent to a BPV. Used with HDB3 coding format.
DCE	Data Communications Equipment. The equipment that provides the functions required to establish, maintain, and end a connection. It also provides the signal conversion required for communication between the DTE and the network.
DSR	Data Set Ready. An EIA-lead standard for V.24 circuit CT 107; an output signal (DCE-to-DTE).
DTE	Data Terminal Equipment. The equipment, such as computers, printers, and routers, that provide or create data.
DTR	Data Terminal Ready. An EIA-lead standard for V.24 circuit CT 108; an input signal (DTE-to-DCE).
E1	A data signaling rate common outside the United States. A wideband interface operating at 2.048 Mbps defined by CCITT standards G.703 and G.704.
factory defaults	A predetermined set of configuration options for general operation.
FAS	Frame Alignment Signal. A loss of signal (LOS) error detection.
FAW	Frame Alignment Word. A loss of synchronization error detection.
FCC	Federal Communications Commission. Board of Commissioners that regulates all U.S. interstate, intrastate, and foreign electrical communication systems that originate from the United States.
FEBE	Far End Bit Error. Number of errors reported by the remote equipment.
HDB3	High Density Bipolar 3 coding format.
HDSL	High-bit-rate Digital Subscriber Loop. Provides high bandwidth, bi-directional transmission over copper wire for both T1 and E1 services.

HTU	Host Termination Unit. A generic reference to either an HTU-C or HTU-R module.
HTU-C	Host Termination Unit – Central. The module at the CO (central office) or central site end of an HDSL connection. Also known as a Network Termination Unit (NTU).
HTU-M	Host Termination Unit – Maintenance. A carrier–mounted module used to perform maintenance operations on one or more HTU-R and HTU-C modules.
HTU-R	Host Termination Unit – Remote. The module at the CP (customer premises) end of an HDSL connection. Also known as a Line Termination Unit (LTU).
LED	Light Emitting Diode. A status indicator that responds to the presence of a certain conditions.
loopback	Used to test various portions of a data link in order to isolate an equipment or data line problem. A diagnostic procedure that sends a test message back to its origination point.
MOS	Multiframes Out of Sync. A performance statistic that counts the number of multiframes received out of sync.
OOF	Out Of Frame. An error condition in which frame synchronization bits are in error. A network-reported condition.
reset	A reinitialization of the device that occurs at power-up or in response to a reset command.
RTS	Request to Send. An EIA-lead standard for V.24 circuit CT 105; an input signal (DTE-to-DCE).
RXD	Received Data. An EIA-lead standard for V.24 circuit CT 104; an output signal (DCE-to-DTE).
T1	A data signaling rate common in the United States. A term for a digital carrier facility used to transmit a DS1 formatted signal of 1.544 Mbps.
TXD	Transmit Data. An EIA-lead standard for V.24 circuit CT 103; an input signal (DTE-to-DCE).
V.35	ITU-T standard for a high-speed, 34-pin, DCE/DTE interface.

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