USER MANUAL

LPS-H4TU-C-L5 CO Line Unit

Product Catalog: LPS-H4TU-C-L5

CLEI: SOC3GHBD

For Soneplex Systems using SCU v3.6.2 through SCU v4.1

///ADC®

Revision History of This Manual

To order copies of this document, use documentation catalog number LTPS-UM-8054-01. To order a hard copy, please contact your sales representative.

Issue	Release Date	Revisions Made
1	December 3, 2003	Initial release

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December 3, 2003

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USING THIS MANUAL

The following conventions are used in this manual:

- `Monospace type` indicates screen text.

- Keys you press are indicated by small icons such as `Y` or `ENTER`. Key combinations to be pressed simultaneously are indicated with a plus sign as follows: `CTRL` + `ESC`.

- Items you select are in **bold**.

- Three types of messages, identified by icons, appear in text.

Notes contain information about special circumstances.

Cautions indicate the possibility of personal injury or equipment damage.

The Electrostatic Discharge (ESD) symbol indicates that a device or assembly is susceptible to damage from electrostatic discharge.

For a list of abbreviations used in this document, refer to "Appendix C - Abbreviations" on page 40.

INSPECTING SHIPMENT

Upon receipt of the equipment:

- Unpack each container and inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC Telecommunications, Inc. Order replacement equipment, if necessary.

- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in "Appendix B - Product Support" on page 39. If you must store the equipment for a prolonged period, store the equipment in its original container.

RELATED PUBLICATIONS

Listed below are related manuals and their publication numbers. Copies of these publications can be downloaded from the ADC website at *www.adc.com*. To order a hard copy, please contact your sales representative.

Title	Catalog Number
Soneplex HDSL Compatibility Quick Reference Guide	ADCP-61-168
Soneplex Loop Extender Design, Description, and Application Manual (V5)	ADCP-61-317
Soneplex System TL1 Interface Specification	ADCP-61-419
Soneplex Loop Extender Operation and Maintenance Manual (V5)	ADCP-61-467
Soneplex Broadband System Operation and Maintenance Manual (V5)	ADCP-61-471
Soneplex Broadband System Design, Description, and Application Manual (V5)	ADCP-61-472
Soneplex Shelf Controller Unit Operation and Maintenance Manual	ADCP-61-756
Soneplex Shelf Controller Unit (SCU) System Description and Engineering Guide	ADCP-61-758
Soneplex Shelf Controller Unit (V3.5) Operation and Maintenance Manual	ADCP-61-776
Soneplex System Installation Manual (Broadband and Loop Extender Chassis)	LTPS-UM-8010-xx
H2TU-R-402 List 5A Remote Unit Quick Installation Guide	LTPH-QI-1154-xx
H4D-409 List 2 Doubler Unit Quick Installation Guide	LTPH-QI-1120-xx
LPS-H4TU-C-L5 Line Unit Quick Installation Guide	LTPS-QI-8053-xx
LPS-H4TU-C-L5 Line Unit User Manual for SCU v5.0 and higher	LTPS-UM-8068-xx

SAFETY WARNINGS AND NOTICES

To avoid electric shock, be careful when working near HDSL4 loop connections or telecommunications circuits. Be careful when working near power supplies. Soneplex equipment uses -48 Vdc office power and some remote HDSL4 equipment uses -130 Vdc. Coming in contact with high electrical potential will result in death or severe personal injury.

The chassis must be properly grounded to ensure human and equipment safety.

To prevent electrical shock, never install telephone equipment in a wet location or during a lightning storm. When installing or modifying telephone lines, disconnect lines on the network side before working with uninsulated lines or terminals.

Electronic components can be damaged by electrostatic discharge (ESD). Before handling modules, wear an antistatic discharge wrist strap to prevent damage to electronic components. Place components in antistatic packing material when transporting or storing. When working on components, always place them on an approved antistatic mat that is electrically grounded.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW

The LPS-H4TU-C-L5 Central Office (CO) module is a low-power, plug-in unit that installs in a Soneplex Broadband Chassis or Soneplex Loop Extender Chassis at the central office. Hereinafter referred to as the H4LXC, this CO module provides DS1/HDSL4 signal conversion, and status and alarm reporting. The module is only compatible with the H4TU-R-402-5A remote module.

The LPS-H4TU-C, when used in conjunction with an H4TU-R-402-5A remote unit (H4LXR), provides 1.544 Mbps full-duplex T1 transmission on two unconditioned copper pairs over the full Carrier Service Area (CSA) range. The CSA includes loops of up to 16,000 feet on 24 AWG wire or 12,000 feet on 26 AWG wire, including bridged taps.

> **The H4LXC functions and features described in this manual are supported by Shelf Controller Unit (SCU) Software Version 3.5 through 4.1.1. For information about this card when running under SCU v5.0 and higher, refer to LTPS-UM-8068-xx.**

FEATURES

- Remote provisioning of the line through the H4LXR

- Status Light Emitting Diodes (LEDs) for Digital Signal Level 1 (DS1) and HDSL4 interfaces

- Lightning and power cross-protection on HDSL4 and DS1 interfaces

- 1.544 Mbps full-duplex transmission on one unconditioned copper pair

- 34 kft range with two H4D repeaters (using 26 AWG copper)

- Ultra-low wander (0.26 UI)

- Alternate Mark Inversion (AMI) or Bipolar with 8-Zero Substitution (B8ZS) line code

- Unframed, Superframe (SF), or Extended Superframe (ESF) frame format

- Dual (bi-directional) loopbacks (initiated from H4LXC front panel, H4LXR front panel, or SCU craft screen)

> **DS1 is used throughout this document to refer to either the remote unit's DS1 interface or the line unit's DSX-1 interface.**

HDSL4 SHELF COMPATIBILITY

The LPS-H4TU-C is designed to mount in the LEC or Broadband chassis. For a list of compatible doublers (see Table 1).

HDSL4 MODULE COMPATIBILITY

The LPS-H4TU-C module is only compatible with the H4TU-R-402-5A remote module and the H4D-409-L2 doubler units. Refer to the H4D installation document LTPS-QI-1120-xx for more information on doubler operational procedures. Table 1 shows the various transmission distances possible with and without doublers.

Table 1. *HDSL4 System Transmission Distances*

H4D-409-L2 Doublers	Maximum Transmission (distance in feet)		
Number	22 AWG Wire	24 AWG Wire	26 AWG Wire
0	21,000	16,000	12,000
1	41,600	30,000	23,000
2	62,200	44,000	34,000

APPLICATIONS

HDSL4 systems provide a cost-effective, easy-to-deploy method for delivering T1 High Capacity Digital Service (HCDS) over two pair of wires. HDSL4 systems support a multitude of network connections.

- The service is deployed over two unconditioned, non-loaded copper pair at 784 kps per loop.

- Conventional, inline DS1 repeaters are no longer required.

- Cable pair conditioning, pair separation, and bridged tap removal are not required.

For Span 1, each loop has no more than 47 dB of loss at 196 kHz, with driving and terminating impedances of 135Ω; for Span 2 and Span 3, each loop has no more than 43 dB of loss at 196 kHz. In general, HDSL4 systems:

- Operate effectively in the same cable binder group with other HDSL4 lines, HDSL, T1, ADSL, SDSL, POTS, Digital Data Service (DDS), and other transmission schemes.

Can be used with customers requiring DS1 service on a temporary or permanent basis.

FRONT PANEL

Figure 1 shows the features of the H4LXC front panel and Table 2 on page 4 describes these features. Refer to Figure 26 on page 38 for a diagram of the H4LXC card-edge connector pinout.

> **The H4LXC and H4LXR modules are initially configured through a maintenance terminal connected to the SCU craft port. Depending on the security level assigned to a user, future remote unit configuration changes may be made through the H4LXR craft port using a laptop PC (see "Provisioning" on page 12).**
>
> **For information about the H4TU-R-402-5A, refer to document LTPH-QI-1254-xx.**
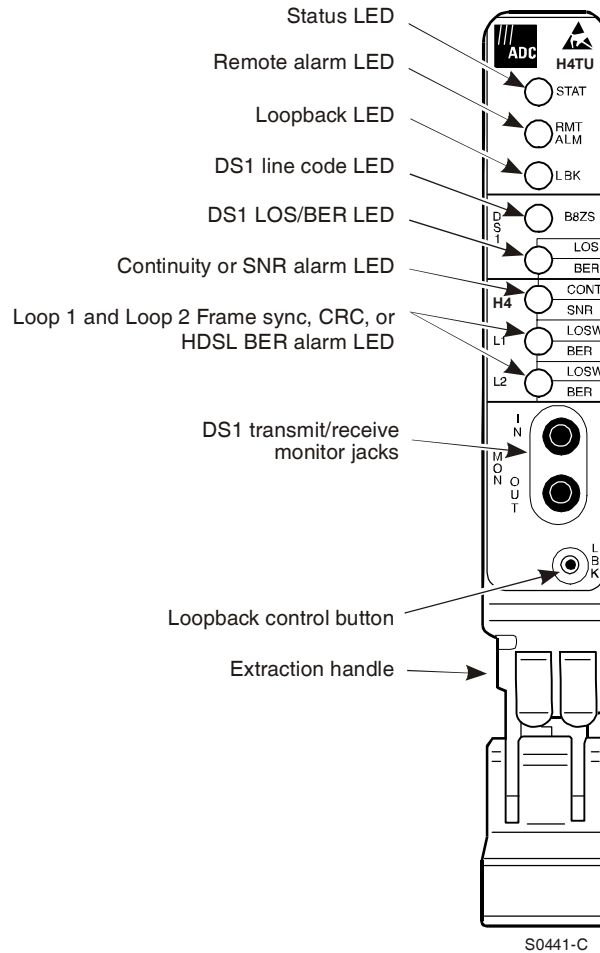
Figure 1.   H4LXC *Front Panel*

Table 2. H4LXC *Front-Panel Components*

LED	Color	Description
Status (STAT)		Displays results of self-test diagnostics.
	Red	Internal fault detected during diagnostics.
	Yellow	Module is initializing or performing self-test diagnostics.
	Green	Normal operation.
	Off	No power to the module or blown fuse
RMT ALM		Indicates detection of remote alarm.
	Yellow	Remote alarm detected at the H4LXR module.
	Off	Normal operation.
LBK		Indicates loopback activity at the H4LXC.
	Yellow	**Flashing:** 1 flash per second when armed in intelligent loopback modes.
		Steady: a.) Active DS1 loopback at the Central Office (CO), or b.) when the DISP RMT pushbutton on the APU is pressed and there is an active loopback anywhere else in the system.
	Off	Normal operation.
DS1 B8ZS		Indicates output line code configuration. In other words, it indicates what the CO is transmitting to the network, and how the CO is configured. However, by pressing the DISP RMT pushbutton on the APU, the RT setting is displayed as off for AMI and Green if B8ZS is transmitted to the CPE.
	Green	Output code is provisioned for B8ZS.
	Off	Output code is provisioned for AMI.
DS1 LOS/BER		Indicates loss of DS1 signal (LOS), Bipolar Violation (BPV), or Bit Error Rate (BER) errors at DS1 interface.
	Red	LOS (DS1 receive signal is lost).
	Yellow	**Brief Flash:** Intermittent BPV errors. **Steady:** BER threshold exceeded at local DS1 interface (default is 10^{-7}).
	Off	Normal operation.
H4 CONT/SNR		Indicates loss of loop continuity and signal-to-noise ratio (SNR) errors.
	Red	The HDSL4 loop has lost continuity.
	Flashing Red	Indicates absence of span power.
	Yellow	SNR exceeded threshold value at near end of local loop (default is +5 dB).
	Off	Normal operation.
L1 and L2 LOSW/BER		Indicates loss of HDSL4 frame synchronization (LOSW), Cyclical Redundancy Check (CRC), or BER errors on Loop1 or Loop 2.
	Red	HDSL4 LOSW detected.
	Yellow	**Brief Flash:** HDSL4 CRC error on any segment of indicated loop. **Steady:** BER threshold exceeded on indicated HDSL4 loop, (default is 10^{-7}).
	Flashing Green	HDSL4 activation in progress.
	Green	Normal operation.

DS1 Test Jacks	Description
MON	Bantam jacks that provide non-intrusive access to monitor the DS1 signal.
IN	Provides bridging jack access to the DS1 signal from the network.
OUT	Provides bridging jack access to the DS1 signal from the CPE.

Controls	Description
LBK pushbutton	Creates a dual loopback at the H4LXR when the pushbutton is pressed >5 seconds and a loopback is not present. If any loopback is present in the system (H4TU-C, H4DU, or H4TU-R) by pressing this pushbutton >5 seconds that loopback will be dropped.
Extraction handle	Pushing up on the extraction handle seats the H4LXC into the backplane card connector. Pulling down on the extraction handle extracts the H4LXC from the backplane card connector.

INSTALLATION

This section provides instructions for installing the H4LXC module and performing initial turnup. This includes testing the earth ground potential of the H4LXR remote enclosure, testing the local power supply, and verifying successful completion of self-test diagnostics. This procedure assumes that the chassis and remote enclosure have been mounted, and that all wiring to the chassis and remote enclosure has been completed.

> **Never install telephone equipment in a wet location or during a lightning storm. When installing or modifying telephone lines, disconnect lines at the network interface before working with uninsulated lines or terminals to prevent electrical shock.**

> **Wear an antistatic wrist strap to prevent damage to module components. Place modules in antistatic packing material when transporting or storing.**

> **To comply with the intrabuilding wiring requirements of GR-1089 CORE, Section 4.5.9, the shields of the ABAM-type cables that connect the CO line card DSX-1 output ports to the cross-connect panel must be grounded at both ends.**

> **If possible, install the H4LXC and perform T1 provisioning before installing the H4LXR. The H4LXC must be** EQUIPPED **and T1 Provisioning set to** YES **before any provisioning can be performed at the H4LXR. The H4LXR craft interface can then be used to place the facility into service (including unit, T1, and HDSL4 service states) after turnup testing is complete.**

To install and turn up the H4LXC:

1   Open the shipping carton, carefully unpack the module from the protective packing material, and inspect the module.

> **If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC Telecommunications, Inc. Contact ADC if there are any damages or irregularities. See "Appendix B - Product Support" on page 39 for procedures.**

2   Check each component against the packing list to verify that the correct catalog numbers and quantities were received.

3   Align the card with the card-slot guides and slide it into the chassis. Grasping the card lever, gently lift the card and hook the latch on the lip of the chassis (Figure 2 on page 6 shows an example of installing a module), then pull up on the lever to seat the card. If excessive resistance is encountered, remove the module and check for obstructions or improper alignment.
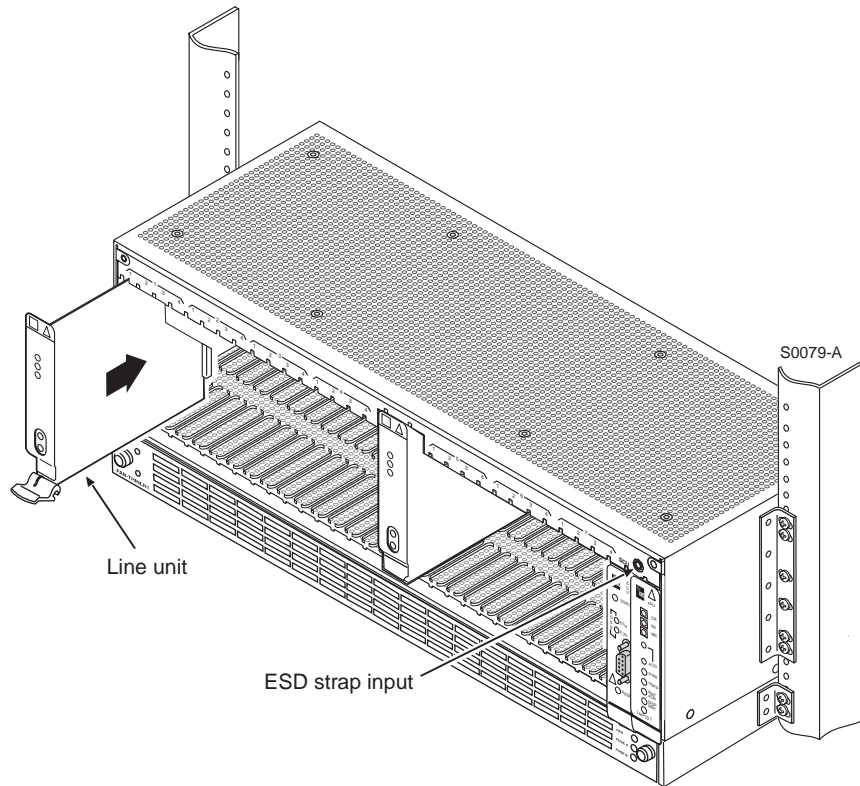
Figure 2.   Example of Installing the H4LXC into a chassis

4   Following module insertion the STAT LED lights red, indicating that power is on. The STAT LED then lights yellow, indicating the start of self-test diagnostics. All LEDs momentarily light yellow, then go out (except for the STAT LED, which remains yellow).

Following successful completion of self-test diagnostics, the front-panel LEDs appear as follows:

- STAT: Green indicates successful completion of self-test diagnostics.

- RMT ALM: Off or yellow when the HDSL4 LOSW/BER LED is red.

- LBK: Off

- DS1 LOS/BER: Off, red, or yellow (see Table 3 on page 7 for details).

- H4 CONT/SNR: Off

- L1 or L2 LOSW/BER: Red or flashing red (for up to 90 seconds) until the HDSL4 loop is synchronized, then green. If an intermittent CRC error is detected on the HDSL4 loop, a yellow flash will be observed.

5   If the LED indicators respond as described, proceed to Step 6; otherwise, refer to "Turnup Troubleshooting" on page 7 to isolate the problem.

6   Assuming that a working SCU resides in the CO chassis, press the LMPTST switch on the APU to verify that all the LEDs on the H4LXC front-panel light yellow; this indicates that the LEDs are functional.

7   If all LEDs do not light yellow, the H4LXC is considered defective. Remove the H4LXC module, replace it with a new module, then repeat Steps 2 through 6.

8   Before installing the associated H4LXR, connect a maintenance terminal to the SCU craft port (see "Connecting a Maintenance Terminal to the Craft Port" on page 8), logon the SCU craft interface (see "H4LXC Status Display" on page 13), and set the H4LXC Unit Equip State to EQUIPPED and T1 Provisioning to YES (see "H4LXC Configuration" on page 16).

H4LXR INSTALLATION

Install the H4LXR in a remote chassis. Refer to the H4LXR installation document LTPH-QI-1083-xx for more information.

TURNUP TROUBLESHOOTING

Use the information in Table 3 when the H4LXC or H4LXR fails its self-test at initial turnup.

Table 3. *Troubleshooting the* H4LXC *and H4LXR Using LED Indicators*

LED	Description
STAT is red	The module has failed self-test diagnostics. Remove and reinsert the H4LXC module, then wait while the module again performs self-test diagnostics. If the STAT LED lights red at the end of the second self-test, the module is defective. Remove the module and replace it with a new module. Repeat Steps 2 through 6 of "Installation" on page 5.
RMT ALM is yellow	An alarm condition (e.g., no DS1 signal, or a loop in LOSW) exists at the H4LXR or at the H4D doubler.
DS1 LOS/BER is yellow	The Bit Error Ratio (BER) of the DS1 network signal exceeds the threshold value (default value is 10^{-7}).
DS1 LOS/BER is red	A DS1 signal is not being received from the network.
H4 CONT/SNR is yellow	The Signal-to-Noise ratio (SNR) on the HDSL4 loop is below the threshold value (default setting is +5 dB).
H4 CONT/SNR is red	There is an open circuit (that is, no continuity) on the HDSL4 loop.
L1 or L2 LOSW/BER flashes yellow	An intermittent CRC error is being detected on the HDSL4 loop. Verify that the loop is within CSA specification and that all connections are good.
L1 or L2 LOSW/BER is steady yellow	The Bit Error Ratio (BER) of the HDSL4 signal on the loop exceeds the threshold value (default value is 10^{-7}).
L1 or L2 LOSW/BER is red	The HDSL4 loop is not synchronized. Verify that the H4LXR is installed properly; that power is available to the H4LXR; and that all HDSL4 loop connections are completed.

SCU AND H4LXR CRAFT PORT INTERFACE

CONNECTING A MAINTENANCE TERMINAL TO THE CRAFT PORT

The SCU and H4LXR craft interfaces are accessed through the Craft Port on their respective front panels. For initial setup of the line unit, connect a PC running a terminal emulation program (such as Hyperterminal or ProComm) or a VT100-compatible terminal to the SCU Craft port (Table 3). The SCU Craft port is a DCE RS-232 DB9 connector. The procedure for connecting to an H4LXR Craft port is the same.

> **Connect a maintenance terminal to the SCU Craft port using a shielded cable with a maximum length of approximately 50 feet (at 9600 baud, 8 bits, no parity, and 1 stop bit as specified for RS-232 protocol).**
>
> **Use a straight-through cable for connecting the SCU DCE port to DTE equipment. Use a cross-over cable for connecting the SCU DCE port to DCE equipment**

1 Connect one end of the interface cable to the serial COM port of a PC, maintenance terminal, or to other networking equipment.
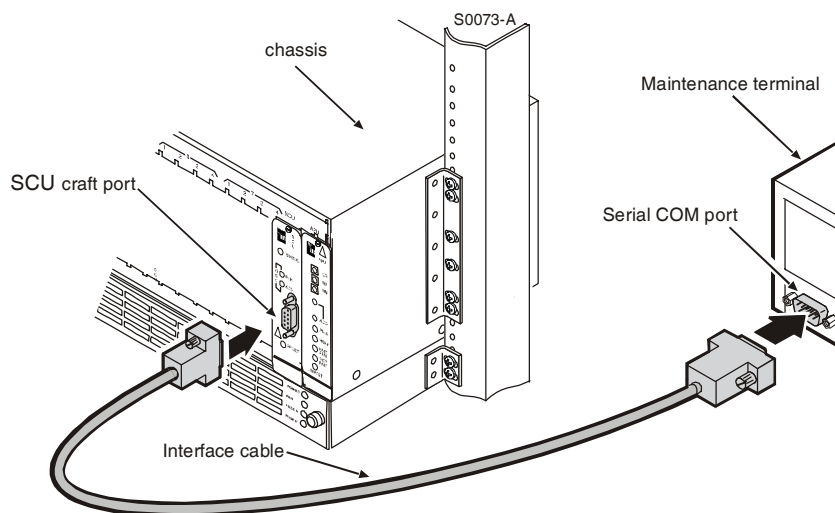
Figure 3.   *Connect SCU Craft Port to Maintenance Terminal*

2 Connect the other end of the interface cable to the SCU Craft port (see Figure 4 for pinouts).

Table 4.   *SCU Craft Port Pinouts*

Pin	Name	Source	Circuit CCITT	Circuit EIA/RS
2	Transmitted Data (TD)	DTE	103	BA [a]
3	Received Data (RD)	DCE	104	BB [a]
5	Frame Ground (FG)	–	101	AA [a]
7	Request to Send (RTS)	–	102	AB [a]

(a) Standard references for EIA/RS232 pinouts.

LOGGING ON TO THE CRAFT MAINTENANCE INTERFACE

After connecting the maintenance terminal to the Craft port, log on as follows (refer to Table 5 on page 10 for information on navigating through the screens):

1 Turn on the power to the maintenance terminal.

2 Configure the following settings for the maintenance terminal (or emulation software) serial COM port:

- Bits per second: 9600

- Data bits: 8

- Parity: None

- Stop bit: 1

- Flow control: None

The COM port settings shown above are the default values for the SCU Craft port and for Port 2 on the chassis back panel.

3 From the terminal screen (or the terminal emulation software), press `ENTER`. The following Welcome and Logon screen is displayed.

> **The following procedure is an example of Logging On to a Soneplex Chassis using SCUv4.1.1.**


```
Connect  Edit  Terminal  Help




          Welcome to ADC: Soneplex SCU Shelf Interface  Version 4.1.1
              (C) Copyright 1998-2002 ADC Telecommunications, Inc.


                  Enter User Name: █
```

SCU Login Defaults	
Login:	SONEPLEX
Password:	SONEPLEX1
(use only uppercase characters)	

```
                                                            S0298-A
```

Figure 4. *Example of Logging On to the Management Interface Using SONEPLEX, SONEPLEX1*

4   Enter the default user name SONEPLEX in the Enter User Name field and the default password
SONEPLEX1in the Enter Password field, then press ENTER . The Main Menu appears.
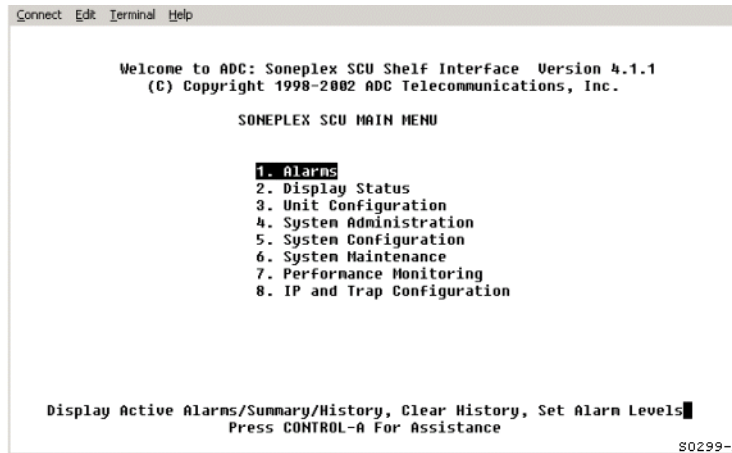
Figure 5.   Access the Soneplex SCU Main Menu

NAVIGATING THE MANAGEMENT INTERFACE

The Craft management interface is a text-based and menu-driven application. Through this interface, you can
configure, monitor, and manage the Soneplex system. Table 5 provides a summary of shortcut keys that assist you
in navigating the Craft management interface.

Table 5.   Navigational Keys for the Management Interface

Press this . . .	To do this . . .
Cursor	Indicate menu selections, option settings, and data entry fields.
SPACEBAR	Toggle (move) through field options.
R	Toggle backward through field options.
Arrow key	Move from field to field. ↑ and ↓ arrow keys move screen up and down one line at a time in screens that have more than one page. ← arrow key moves the screen up one page. → arrow key moves the screen down one page
Number keys	Select menu
ENTER	Confirm new or modified data. Selection may be entered into the system in one of two ways: • Press an arrow key, then press ENTER . • Press ENTER twice to save all edits.
ESC	Return to the previous menu.
CTRL + A	Display Help screen.
CTRL + D	Terminate session and log user out.
CTRL + E	Display current alarms screen.
CTRL + G	Display Status screen.
CTRL + P	Cancel current operation; cursor moves to the previous menu.
CTRL + R	Refresh current screen with last saved values.
CTRL + T	Cancel current operation; cursor moves to Main Menu.

The Craft port includes an EIA-232 DCE connection for a VT100 compatible terminal or PC with VT100 emulation. The Craft port provides a menu-driven interface for viewing the status of and provisioning the H4LXC and associated H4LXR (see Figure 6).
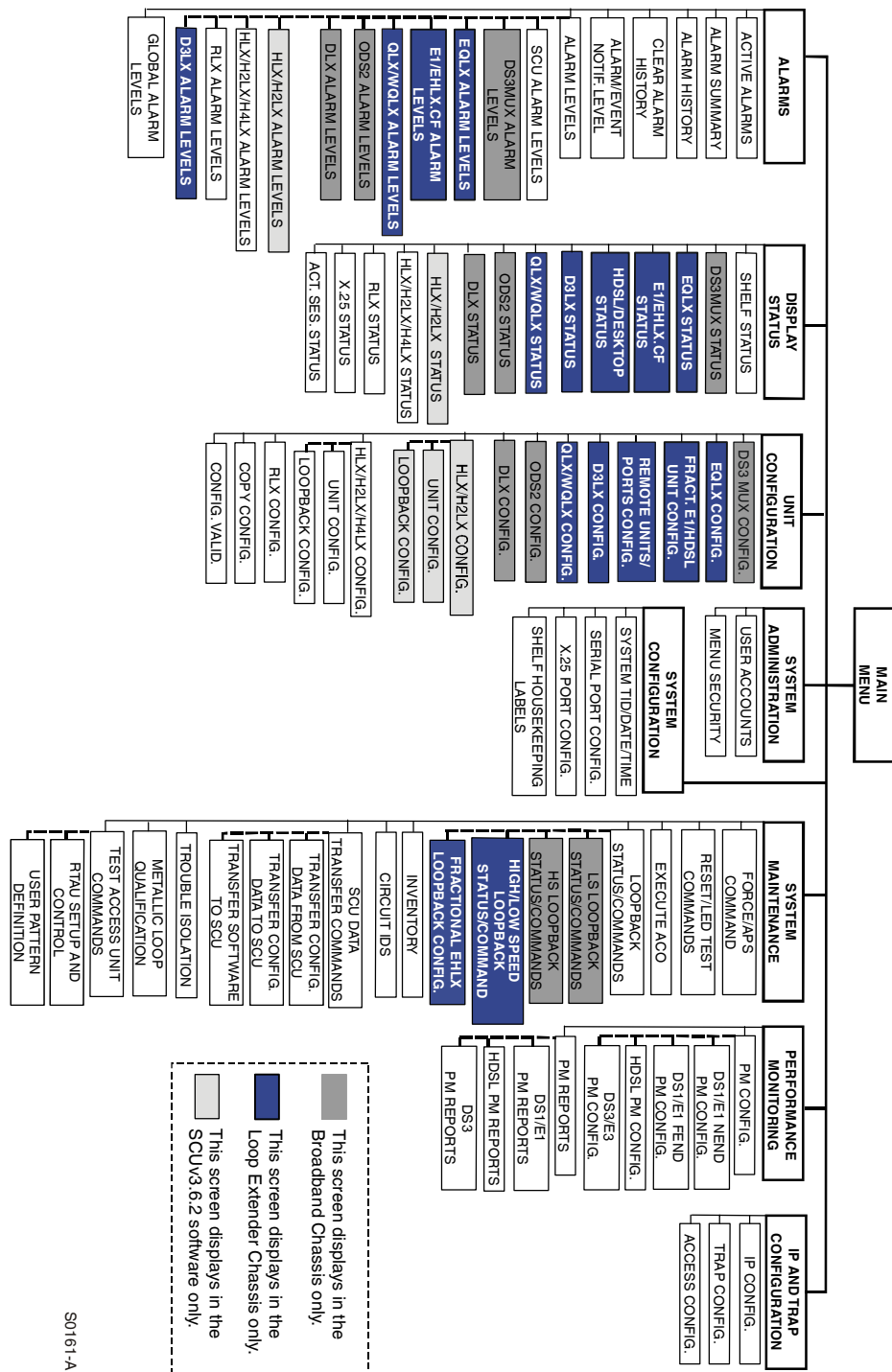
Figure 6. *SCU Craft Port Interface Menu Tree*

PROVISIONING

The primary source for H4LXC and H4LXR provisioning is the SCU's Unit Configuration screen (see Figure 9 on page 16). The secondary provisioning source for the H4LXR is the craft port interface menus available at the H4LXR. The H4LXR craft menus enable the user to alter a subset of the H4LXR provisioning values selectable at the H4LXC. For H4LXR provisioning items that are alterable in the craft port interface menus, the H4LXR communicates provisioning changes back to the H4LXC. All provisioning values which can be altered by the H4LXR craft port interface will remain in the state that was last set at either the H4LXR or H4LXC.

Perform the following procedures in the order listed to provision the H4LXC.

1   Logon to the craft interface (as described in "Logging On to the Craft Maintenance Interface" on page 9).

2   Display H4LXC status information (as described in "H4LXC Status Display" on page 13).

3   Configure the H4LXC circuit (as described in "H4LXC Configuration" on page 16).

4   View the Performance Monitoring Reports (as described in "Performance Monitoring Reports" on page 20).

5   Display the Inventory Status screen (as described in "Inventory Status Display" on page 23).

6   Reset the H4LXC (as described in "Reset/LED Test Commands" on page 24).

USING SCU V3.6.2 SOFTWARE

When using SCU v.3.6.2 software, please take note of the following differences to the screen contents:

•   Any reference to H4LX will not be present. Specifically, the "Shelf Status" will read "H" rather than "4" for HDSL4.

•   The "Loopback Timeout" settings will revert to the fixed values after a `CTRL` + `R` (refresh) is performed (see Table 6).

Table 6.   *Loopback Timeout Settings Before and After Refresh*

Before Refresh	After Refresh
0-9	0
10-39	20
40-89	60
90-255	120

•   The "T1 Framing Format" will display a value of "Ft Only," but if selected, after a `CTRL` + `R` (refresh), it will revert to "Unframed."

•   "SNR Values" outside the range of 0 to 15 will be either 0 (if previously negative) or 15 (if previously >15) after a `CTRL` + `R` (refresh), and cannot be disabled.

•   The "HDSL PA Threshold" must be 1 to +40 (not 0 to +50) and cannot be disabled.

•   If "LBO" is set to 22.5, it will revert back to it's previous setting after a `CTRL` + `R` (refresh). When the LBO is set to "UNIT SWITCH" it reverts to 0.0 after a `CTRL` + `R` (refresh).

•   An "HDSL BER Threshold" setting of 1E-4 or 1E-5 changes to 1E-6 after a `CTRL` + `R` (refresh) and cannot be disabled.

•   The "T1 BER Threshold" cannot be disabled.

•   A "Customer Loopback" will appear as both a Customer and Network loopback in the **Loopback Status** and **Trouble Isolation** screens.

• The "SCU Date and Time" is not updated at the Remote.

• The "SCU Config Circuit ID" is not propagated to the Remote.

H4LXC STATUS DISPLAY

Use this command to display the H4LXC Status screen for the near-end and far-end cards in the HDSL4 circuit. The status of the H4LXR (if present) is also shown on this screen.

> **Press CTRL + A for help information on moving around and editing fields.**

1 From the SCU Main Menu, use the arrow keys or number keys to select **2. Display Status**. Press **ENTER** if using the arrow keys. The Display Status menu appears, as shown in Figure 7.

2 From the Display Status menu, select **5. Display HLX /H2LX/ H4LX Status**. The H4LXC Status screen appears, as shown in Figure 8 on page 14. Table 7 on page 14 provides a key to the H4LXC status columns in Figure 9 on page 16 and Figure 10 on page 16.

```
2. Display Status
```

```
5. Display HLX /
H2LX Status
```
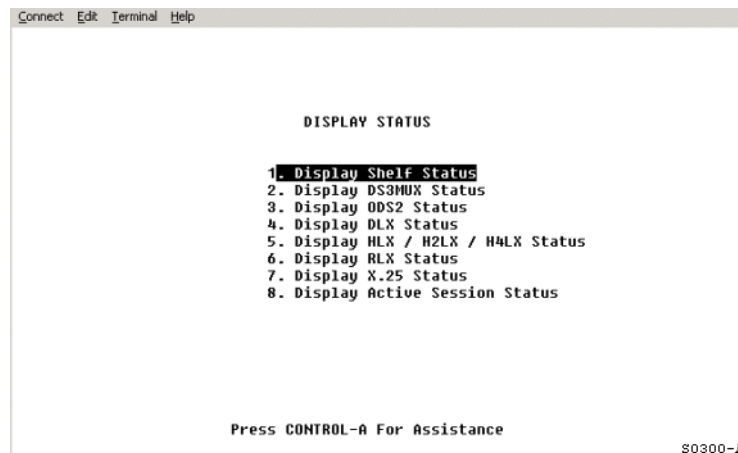

Figure 7.   Display Status Menu

```
Connect  Edit  Terminal  Help
                     DISPLAY H4LX STATUS
           Group: 1        Slot: 1        Circuit ID: LEC-FULL-SHELF
                          H4LXC                 H4LXR
                       ============          ============
     DS1 Loopback      :    INACTIVE            INACTIVE
     DS1 LOS           :       NO                  NO
     DS1 Line Code     :       AMI                 AMI
     DS1 Frame Format  :    AUTO-ESF            AUTO-ESF
     Loop Reversal     :       N/A                 NO

         HDSL4            LOOP1   LOOP2      LOOP1   LOOP2
     =====================  =====   =====      =====   =====
     HDSL4 LP STAT      :   NRM     NRM        NRM     NRM
     Tip-Ring Reversal  :   N/A     N/A        N/A     N/A
     PA Thresh Exceeded :   NO      NO         NO      NO
     SNR Thresh Exceeded:   NO      NO         NO      NO
     BER Thresh Exceeded:   NO      NO         NO      NO
     Pulse Attn   (dB)  :   +0      +0         +0      +0
     SNR (margin - dB)  :   +18     +18        +18     +18
     SNR MIN            :   +18     +18        +18     +18
     SNR MAX            :   +18     +18        +18     +18
     TX Power Back-off (dB) :  D     D          D       D


                  Press CONTROL-A For Assistance
                                                   S0448-A
```

Figure 8. *Typical H4LXC Status Screen*

Table 7. *Fields in H4LX Status Screens*

Field	Display	Description
DS1 Status		
DS1 Loopback	Customer	DS1 loopback towards the customer.
	Network	DS1 loopback towards the network.
	Both Active	DS1 loopback simultaneously in customer and network directions.
	INACTIVE	DS1 loopbacks are inactive at the locations indicated.
DS1 LOS	N/A (Not Applicable)	
	NO	The DS1 signal is present at the locations indicated.
	YES	The DS1 signal is not present at the locations indicated.
DS1 Line Code	AMI	Alternate Mark Inversion
	B8ZS	Bipolar Eight-Zero Substitution
DS1 Frame Format	Ft ONLY (SCUv3.6.2 only - reverts to Unframed) ESF SF AUTO Unframed	H4LX automatically detects and matches frame format received from H4LXC. SCUv3.6.2 displays actual FF, configuration setting.
Loop Reversal	N/A	Not applicable
	NO	Network DS1 Loop 1 and Loop 2 are not reversed at the location indicated.
	YES	Network DS1 Loop 1 and Loop 2 connections are reversed at location indicated.
HDSL4 Status		
HDSL4 LP STAT (Loop Status)	NRM (Normal)	HDSL4 loop is operating normally at the locations indicated.
	DIS (Disabled)	HDSL4 loop is disabled at the locations indicated.
	LSW (Loss of Sync Word)	HDSL4 loop is out of sync at the locations indicated.
Tip & Ring Reversal	N/A	Not applicable
	NO	Tip and Ring not reversed.

Continued

Table 7. Fields in H4LX Status Screens (Continued)

Tip & Ring Reversal (Continued)	YES	Tip and Ring reversed.
PA Thresh Exceeded	NO	The HDSL4 PA threshold (default setting is 33 dB for SCUv3.6.2 and 42 dB for SCUv4.1.1) was not exceeded at the locations indicated.
	YES	The HDSL4 PA threshold (default setting is 33 dB for SCUv3.6.2 and 42 dB for SCUv4.1.1) was exceeded at the locations indicated.
SNR Thresh Exceeded	NO	The HDSL4 SNR threshold (default setting is 5 dB for SCUv4.1.1) was not exceeded at the locations indicated.
	YES	The HDSL4 SNR threshold (default setting is 5 dB for SCUv4.1.1) was exceeded at the locations indicated.
BER Thresh Exceeded	NO	The BER threshold (default setting is $10E^{-7}$ but DISABLED for SCUv4.1.1) was not exceeded at the locations indicated.
	YES	The BER threshold (default setting is $10E^{-7}$ but DISABLED for SCUv4.1.1) was exceeded at the locations indicated.
Pulse Attn (dB)	+0 dB to +39 dB	Current PA value at the locations indicated.
SNR (margin –dB)	-9 dB to +31 dB	Current SNR (Margin) value at the locations indicated.
SNR MIN	-9 dB to +31 dB	The current minimum SNR (Margin) value at the locations indicated.
SNR MAX	-9 dB to +31 dB	The current maximum SNR (Margin) value at the locations indicated.
TX Power Back-off (dB)	D (Default) = 0 to 15 dB	Default and Enhanced values are determined by H4LXC module and not reported to SCU for display.
	E (Enhanced) = 0 to 15 dB	

H4LXC CONFIGURATION

Use this procedure to configure or view the status of the H4LXC and the associated H4LXR.

> 3. Unit Configuration
>
> 6. HLX / H2LX / H4LX Configuration

1   From the SCU Main Menu, use the arrow keys or number keys to select **3. Unit Configuratio**n. Press **ENTER** if using the arrow keys. The Unit Configuration menu appears, as shown in Figure 9.

2   From the Unit Configuration menu, select **6. HLX / H2LX / H4LX Configuratio**n. The H4LXC Unit Configuration screen appears, as shown in Figure 10.

3   Starting at the top of Table 8 on page 17 and working your way to the bottom, configure H4LXC fields. Tab from field to field.

```
Connect  Edit  Terminal  Help



                         UNIT CONFIGURATION


                 1. EQLX Configuration
                 2. Fractional E1 / HDSL Unit Configuration
                 3. Remote Units / Ports Configuration
                 4. D3LX Configuration
                 5. QLX / WQLX Configuration
                 6. HLX / H2LX / H4LX Configuration
                 7. RLX Configuration
                 8. Copy Configuration
                 9. Configuration Validation




         Display/Edit All EQLX Configuration Parameters█
                  Press CONTROL-A For Assistance
                                                      S0602-B
```

Figure 9.   *Unit Configuration Menu*

```
Connect  Edit  Terminal  Help
                        H4LX UNIT CONFIGURATION
               Group: 1     Slot: 1     Circuit ID: LEC-FULL-SHELF

Unit Equip State   : EQUIPPED          Loop Power Setting  : AUTO
Unit Service State : IS                HDSL4 Service State : IS
T1 Provision       : YES               HDSL4 BER Threshold : DISABLED
T1 Service State   : IS                HDSL4 SNR Threshold :  4 dB
T1 Framing Format  : AUTO-ESF          HDSL4 PA Threshold  : 45 dB
T1 BER Threshold   : DISABLED          Network DS1 Source  : BIPOLAR
H4LXC T1 Line Code : AMI               Alarm Pattern       : AIS
H4LXC DSX-1 EQ     : 0-133 FT.         Net Lpbk Pattern    : AIS
H4LXR T1 Line Code : AMI               Net AIS Pattern     : AIS
H4LXR LBO          : 0.0  dB           Perf Rpt Messaging  : OFF
H4LXR TLOS Lpbk    : DISABLED          RAI/RAI-CI Net      : DISABLED
Rmt Provisioning   : ENABLED           ESF-RAI/SF-RAI Ovwrt: DISABLED
Rmt Disc Alarm     : ENABLED           Frame Fmt Conversion: OFF
Tx PBO Network     : DEF
Tx PBO Customer    : DEF


User Notes:
H4LXR Switch Settings - LBO: NOT APPL█

                  Press CONTROL-A For Assistance
                                                      S0449-A
```
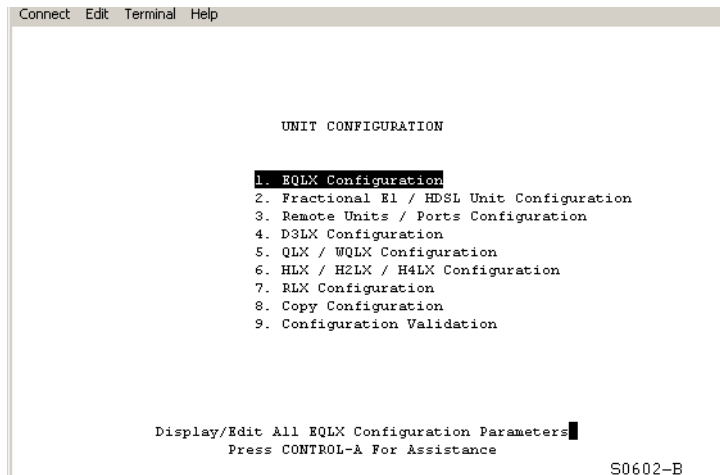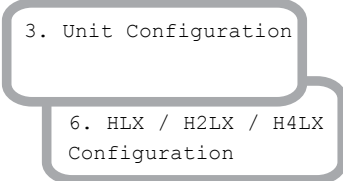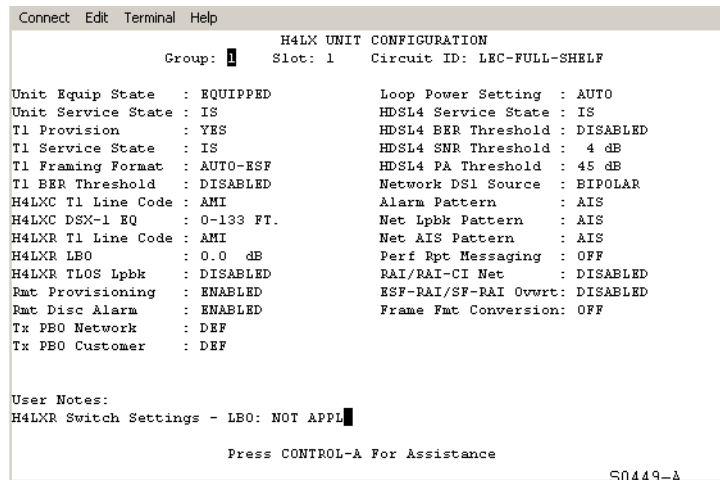
Figure 10.   *H4LX Unit Configuration Screen*

| 📝 | **Although Protect State is shown in the H4LX Unit Configuration Screen, the feature is disabled for this release.** |

Table 8.   *Fields in H4LX Unit Configuration Screen*

Field	Type	Options	Description	Default
Group	Toggle	1, 2, 3, 4, 5, 6, or 7	Specifies the module's group number designated on the chassis. (Groups 6 and 7 are not options with the 19-inch chassis.)	1
Slot	Toggle	1, 2, 3, or 4	Specifies the module's slot number within the group number designated on the chassis.	1
Circuit Identifier This field can *only* be configured after the T1 Provision field (listed below) is set to YES.	Input	Enter up to 20 characters.	This represents the customer's circuit ID. The first character must be alpha or numeric; middle characters can be alpha, numeric, or hyphens; and the last character must be either alpha or numeric.	Blank
Unit Equip State	Toggle	EQUIPPED	Establishes communication with the SCU. Module must be set to EQUIPPED before remaining selections are allowed. Enables DS1 output from H4LXC.	Unequipped
		UNEQUIPPED	No communication with the SCU.	
Unit Service State	Toggle	Leave this field at OOS at this time to avoid undesirable reporting of alarms. Set this field to IS after completing the configuration of the remaining fields.		
		IS (In-Service)	Places the unit in service and allows equipment alarm reporting by the SCU. Must be set to IS for reporting of equipment alarms.	OOS
		OOS (Out-Of-Service)	Removes unit from service and stops equipment alarm reporting by the SCU.	
T1 Provision	Toggle	YES	Brings up T1 default settings and allows configuration changes.	NO
		NO	No configuration changes allowed.	
T1 Service State	Toggle	Leave this field at OOS at this time to avoid undesirable reporting of alarms. Set this field to IS after completing the configuration of the remaining fields.		
		IS (In-Service)	Places DS1 facility in service and allows T1 alarm reporting by the SCU, and enables DS1 PM data collection.	OOS
		OOS (Out-Of-Service)	Removes DS1 facility from service and stops alarm reporting by the SCU.	
T1 Framing Format	Toggle	AUTO	The system automatically detects and establishes the current frame format (UNFRAMED, SF, or ESF). It then displays "AUTO" and the frame format.	AUTO
		Unframed	Unframed data pattern.	
		SF	Super Frame	
		ESF	Extended Super Frame	
T1 BER Threshold	Toggle	Range: From 10^{-3} to 10^{-9}, or DISABLE	The average Bit Error Ratios of the incoming DS1 signals are monitored by the H4LXC. By monitoring DS1 BPVs (Bipolar Violations), the H4LXC is capable of triggering an alarm when any of the monitored signals degrades below the BER threshold level.	10^{-7} (for SCUv3.6.2 only, DISABLED for SCUv4.1.1)
Loop Extender Chassis only: H4LXC T1 Line Code	Toggle	AMI	Alternate Mark Inversion	AMI
		B8ZS	Bipolar Eight-Zero Substitution	

Continued

Table 8. *Fields in H4LX Unit Configuration Screen (Continued)*

Field	Type	Options	Description	Default
Loop Extender Chassis only: H4LXC DSX-1 EQ	Toggle	0 – 133 ft, 133 – 266 ft, 266 – 399 ft, 399 – 533 ft, or 533 – 655 ft	The DS1 signal output provides standard DSX signal levels that can be compensated for various distances.	0 – 133 ft
H4LXR T1 Line Code	Toggle	AMI	Alternate Mark Inversion	AMI
		B8ZS	Bipolar Eight-Zero Substitution	
H4LXR LBO (Line Buildout) [a]	Toggle	0.0 dB, 7.5 dB, or 15.0 dB	LBO: Sets the LBO in decibels for the H4LXR.	0.0 dB
H4TU-R TLOS Lpbk	Toggle	ENABLED / DISABLED		
Rmt Provisioning	Toggle	ENABLED / DISABLED	When enabled, allows configuration from the remote craft port.	DISABLED
Rmt Disc Alarm	Toggle	ENABLED / DISABLED		
TX PBO Network (Transmit Power Back-off) [b]	Toggle	DEF (Default)	Minimum power back-off is applied to the signal.	DEF
		ENH (Enhanced)	Maximizes the amount of power back-off applied to the signal.	
TX PBO Customer (Transmit Power Back-off) [b]	Toggle	DEF (Default)	Minimum power back-off is applied to the signal.	DEF
		ENH (Enhanced)	Maximizes the amount of power back-off applied to the signal.	
Loop Power Setting [c] (only ENABLED or DISABLED for SCUv3.6.2)	Toggle	AUTO	Span power is automatically adjusted to either −130 Vdc or ±130 Vdc.	AUTO (or ENABLED for SCUv3.6.2)
		NEG ONLY	Span power is fixed at −130 Vdc.	
		POS/NEG	Span power is fixed at ±130 Vdc.	
		DISABLED	Disabling loop power turns off the power coming from the H4LXC, and the H4LXR fails (unless a locally powered H4LXC).	
HDSL4 Service State	Toggle	IS (In-Service)	Allows HDSL4 alarms to be reported to the SCU, and enables HDSL4 PM data collection. Must be set to IS for reporting of HDSL4 facility alarms. Setting the Unit Service State field to "IN SERVICE" automatically changes this field to "IS".	OOS
		OOS (Out-of-Service)	No HDSL4 alarms are reported to the SCU.	
HDSL4 BER Threshold	Toggle	Range: 10^{-3} to 10^{-9}	The average Bit Error Ratios of the incoming HDSL4 signals are monitored by the H4LXC. By monitoring HDSL4 CRC errors, the H4LXC is capable of triggering an alarm when any of the monitored signals degrades below the BER threshold level.	10^{-7} (for SCUv3.6.2 only, DISABLED for SCUv4.1.1)
		DISABLED	Turns off H4LXC BER threshold monitoring.	
HDSL4 SNR Threshold	Toggle	Range: 1 to 15 (SCUv4.1.1), -10 to 30 (SCUv3.6.2)	The lowest Signal-to-Noise Ratio margin allowed on the HDSL4 loop before an alarm is triggered.	+5
		DISABLED	Turns off H4LXC SNR threshold monitoring.	
HDSL4 PA Threshold	Toggle	Range: 1 dB to 40 dB (SCUv3.6.2), 1 dB to 50 dB (SCUv4.1.1)	The highest Pulse Attenuation value allowed on the HDSL4 loop before an alarm is triggered.	+35 dB
		DISABLED	Turns off H4LXC PA threshold monitoring.	

Continued

Table 8. *Fields in H4LX Unit Configuration Screen (Continued)*

Field	Type	Options	Description	Default
Network DS1 Source	Toggle	NRZ	**Broadband only:** Non Return to Zero. This tells the Craft that the network DS1 source is at the backplane from the DS3 MUX.	NRZ (Broadband only)
		BIPOLAR	**Broadband only:** This tells the Craft that the network DS1 source is at the Extender Card interface. If BIPOLAR is selected when an Extender Card is **not** being used, the DS1 signal cuts off. **Loop Extender only:** Locked at BIPOLAR.	BIPOLAR (Loop Extender only)
Alarm Pattern	Toggle	AIS/LOS	Not Used for SCU v3.6.2.5 (Used for SCU V4.1.1)	AIS (Note: If in BBC, it is frozen at AIS and the Network DS1 Source is NRZ.)
Net Lpbk Pattern	Toggle	AIS/LOS	Not Used for SCU v3.6.2.5 Used for SCU V4.1.1)	AIS
Net AIS Pattern	Toggle	AIS/CI	Not Used for SCU v3.6.2.5	AIS
Perf Rpt Messaging	---	Not configurable	Not Used for SCU v3.6.2.5	
RAI/RAI-CI Net	Toggle	DISABLED/ENABLED	Not Used for SCU v3.6.2.5	DISABLED
ESF-RAI/SF-RAI Ovwrt	Toggle	DISABLED/ENABLED	Not Used for SCU v3.6.2.5	DISABLED
Frame Fmt Conversion	Toggle	OFF/ACON/FCON	Not Used for SCU v3.6.2.5	OFF
User Notes	Input	Enter up to 30 alphanumeric characters.	Enter additional information in the space provided.	Blank

(a) The H4LXR LBO switch setting of the module being configured is displayed at the bottom of the screen.

(b) Power back-off is used to minimize the amount of crosstalk that is introduced into the cable bundle. Power back-off affects the amplitude of the Power Spectral Density (PSD) Mask. The value shown on the SCU craft interface's H4LXC Configuration screen indicates the change in dBs that has been made. The SCU reports the current attenuation (power back-off) value (ranging from 0 to 15 dB) for each end of each HDSL4 segment under this field. If the user selects D (Default), a minimal power back-off value is selected, and the display reflects that value. If the user selects E (Enhanced), a different power back-off value is enabled and that value is displayed. The H4LXC module determines the power back-off value for the "D" and "E" settings. The SCU only reports the setting.

(c) Set the Loop Power Setting to DISABLED when the remote module is the locally powered H4LXR. The loop-powered H4LXRs require the AUTO, NEG, or POS/NEG Loop Power Setting.

PERFORMANCE MONITORING REPORTS

The Performance Monitoring Reports display error counts logged at the CEND (central office end) and REND (remote end) of the circuit as well as the current readings for the pulse attenuation-high (PA-H) and signal-to-noise ratio-low (SNR-L) parameters. To view:

1 From the SCU Main Menu, use the arrow keys or number keys to select **7. Performance Monitorin**g. Press `ENTER` if using the arrow keys. The Performance Monitoring menu appears (see Figure 11).

```
7. Performance
Monitoring
```
```
2. PM Reports
```

2 From the Performance Monitoring menu, select **2. PM Report**s. The HDSL4 Performance Monitoring Reports screen appears (see Figure 12 on page 21).

3 In the HDSL4 Performance Monitoring Reports selection screen, select the **Group** and **Circuit** containing the H4LXC for which a report will be generated. Press the `ENTER` key. The HDSL4 Performance Monitoring Reports screen appears as shown in Figure 13 on page 21.

The displayed HDSL4 error acronyms are described in Table 9 on page 22. Monitor locations are shown in Figure 14 on page 22.

> **To clear Performance Monitoring Reports error counts, you must go to the Performance Monitoring, select the PM Configuration screen, then select the configuration you want to clear the error counts from, and press `CTRL` + `C`. This will raise queries to clear these error counts and reset the Elapsed Time counter. Answering yes (`Y`) to these questions clears those conditions. However, if the PM Configuration screens are assigned to security Level 5 through the System Administration Menu Security screen and the user is assigned to a Level 4 or below, the user cannot execute this command. (For more information on editing menu security, refer to the shelf controller unit documentation listed under Related Publications at the beginning of this manual.)**

> **Clearing the Performance Monitoring Reports error counts does not affect current information displayed by the SCU.**
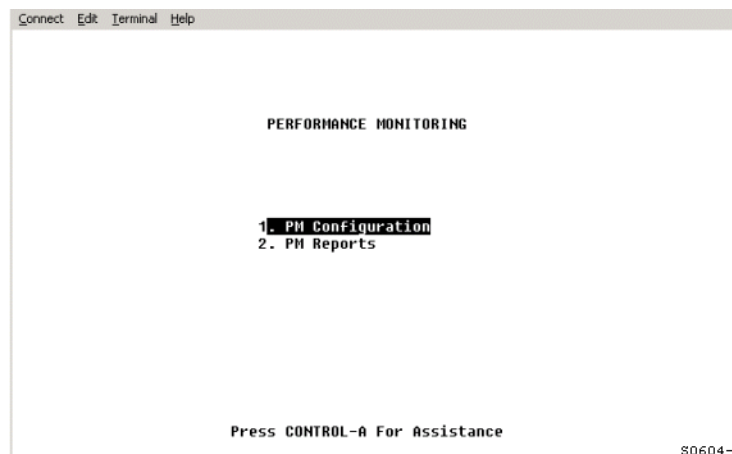

Figure 11. *Performance Monitoring Menu*
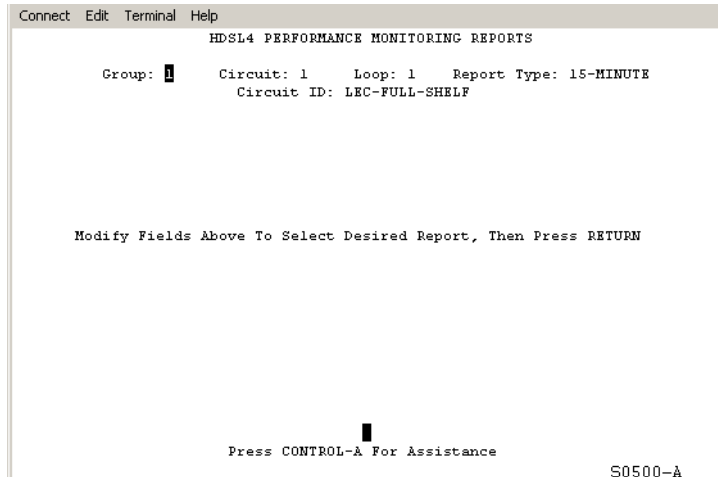
Figure 12. *HDSL4 Performance Monitoring Reports Screen*
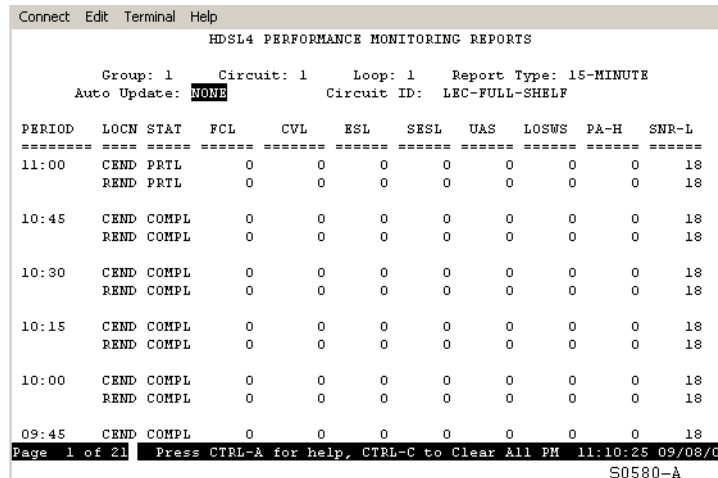
Figure 13. *HDSL4 Performance Monitoring Reports Screen*

Table 9. *Error Acronyms in HDSL4 Performance Monitoring Reports Screens*

Error Acronym (SCUv4.1.1)	Error Acronym (SCUv3.6.2)	Monitor Location	Description
FCL	FCP	CEND	Failure Count, Line – Count of LOSW failures identified for the HDSL4 loop.
CVL	CVP	CEND, REND, CRP1, RRP1, CRP2, RRP2	Code Violations, Line – Count of CRC errors identified for the HDSL4 loop.
ESL	ESP	CEND, REND, CRP1, RRP1, CRP2, RRP2	Errored Second, Line – Count of seconds in which one or more CRC errors occurred without LOSW defects being reported.
SESL	SESP	CEND, REND, CRP1, RRP1, CRP2, RRP2	Severely Errored Second, Line – Count of seconds in which the count of CRC errors is greater than or equal to the user configurable threshold.
UAS	None	CEND, REND, CRP1, RRP1, CRP2, RRP2	Unavailable Seconds – Count of seconds in which 10 or more SES counts occurred.
LOSW	SEFSP	CEND, REND, CRP1, RRP1, CRP2, RRP2	Loss Of Sync Word Seconds – Count of seconds in which one or more LOSW counts occurred.
PA-H		CEND, REND, CRP1, RRP1, CRP2, RRP2	Pulse Attenuation-High – Highest Pulse Attenuation value detected on the HDSL4 loop within the interval. This value is updated only when the HDSL4 loop is active. If the HDSL4 loop has never been activated, this value will be set to 0. The typical PA range is from 0 dB to +38 dB.
SNR-L		CEND, REND, CRP1, RRP1, CRP2, RRP2	Signal-to-Noise Ratio-Low – Lowest SNR detected on the HDSL4 loop within the interval. This value is updated only when the HDSL4 loop is active. If the HDSL4 loop has never been activated, this value will be set to 71. The typical SNR range is from +5 to +27 dB.
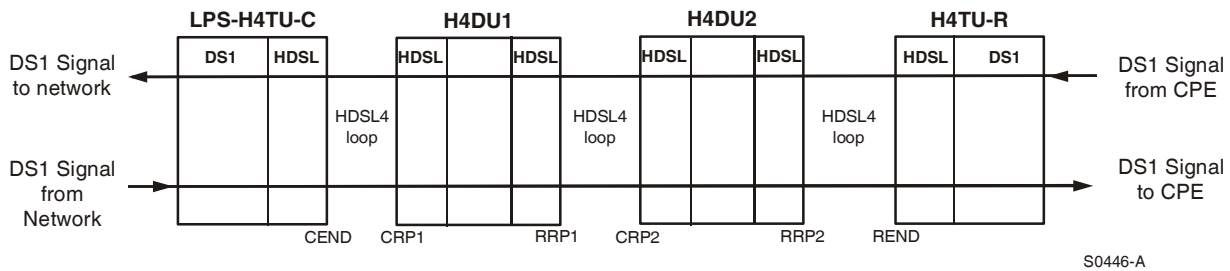
Figure 14. *Location of CEND and REND*

INVENTORY STATUS DISPLAY

Use this procedure to display the inventory of the HDSL4 circuit. The Inventory Status screen shows the Unit Identifier, the corresponding ADC part number and catalog number, the module serial number, date code, software version, and CLEI code.

1   From the SCU Main Menu, use the arrow keys or number keys to select **6. System Maintenance**. Press `ENTER` if using the arrow keys. The System Maintenance menu appears (see Figure 15).

> 6. System Maintenance

2   From the System Maintenance menu, select **5. Display Inventor**y. The Inventory Status screen appears as shown in Figure 16.

> 5. Display Inventory
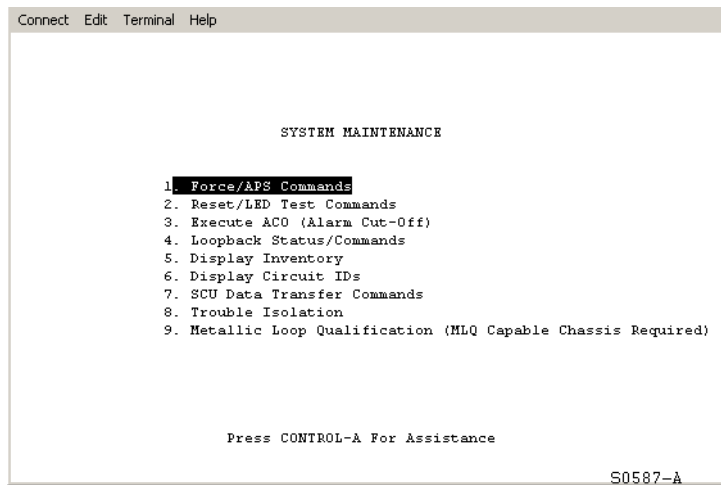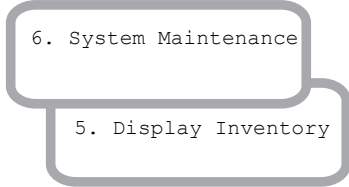
Figure 15.   System Maintenance Menu
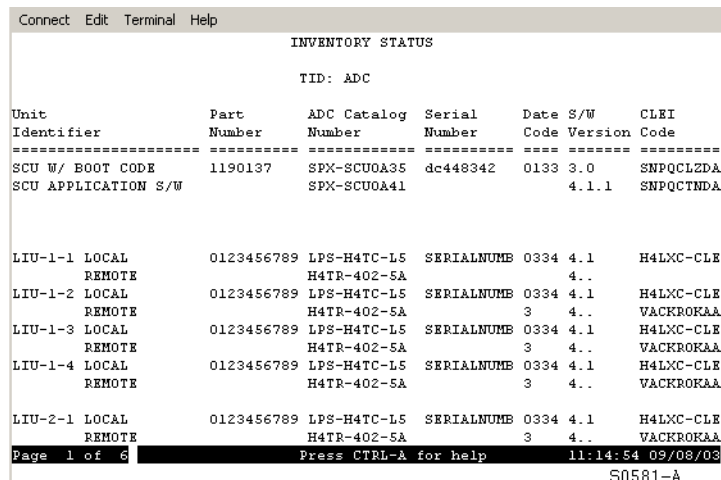
Figure 16.   Inventory Status Screen

RESET/LED TEST COMMANDS

A soft reset re-initializes the module software and clears the error registers shown on the HDSL4 Performance Monitoring Reports.

> **Performing a reset is a non-service affecting software routine. However, if the Reset command is assigned to security Level 5 through the System Administration Menu Security screen and the user is assigned to a Level 4 or below, the user cannot execute this command. (For more information on editing menu security, refer to the shelf controller unit documentation listed under Related Publications at the beginning of this manual.)**

> **Performing a reset logs the user off.**

To reset the H4LXC:

1   From the SCU Main Menu, use the arrow keys or number keys to select **6. System Maintenance**. Press ENTER if using the arrow keys. The System Maintenance menu appears (see Figure 15 on page 23).

```
6. System Maintenance
```

2   From the System Maintenance menu, select **2. Reset/LED Test Command**s. The Reset/LED Test screen appears as shown in Figure 17.

```
2. Reset/LED Test
Commands
```

3   Use the arrow keys to select the module to be reset. Press **R** to execute (the confirmation query shown in Figure 17 appears). Press **Y** to reset the module; press **N** to cancel the module reset.


```
Connect  Edit  Terminal  Help


                          RESET / LED TEST


                   Low Speed Units (Group-Slot)
            R   =================================================
  M M    T   1 -    2 -    3 -    4 -    5 -    6 -    7 -    S
  X X    A   -------  -------  -------  -------  -------  -------  -------  C
  W P    U   1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4   U
  === =   ======= =====                                      ==== ======= =
  R  .    .   .      Resetting indicated units...                       .
                     Are You Sure? (y/n)
            (Legend:  L =                            Unit Reset)




                    Press CONTROL-A For Assistance
                                                              S0609-A
```
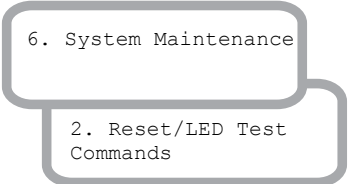
Figure 17.   Reset/LED Test Screen

TESTING

This section provides information on troubleshooting the Soneplex system. Several methods are available for isolating trouble in the system:

- An end-to-end test observing the LED status lights on the H4LXC and the H4LXR units

- SCU alarm screens

- Loopbacks

END-TO-END TEST

This procedure provides instructions for testing the central office H4LXC and the remote H4LXR for proper end-to-end operation. The installation of the remote system must be complete to perform this procedure.

H4LXC End-to-End Test

1   Partially remove the H4LXC module from the chassis to disconnect power from the module.

2   Inform the technician at the remote location that the end-to-end test may be initiated.

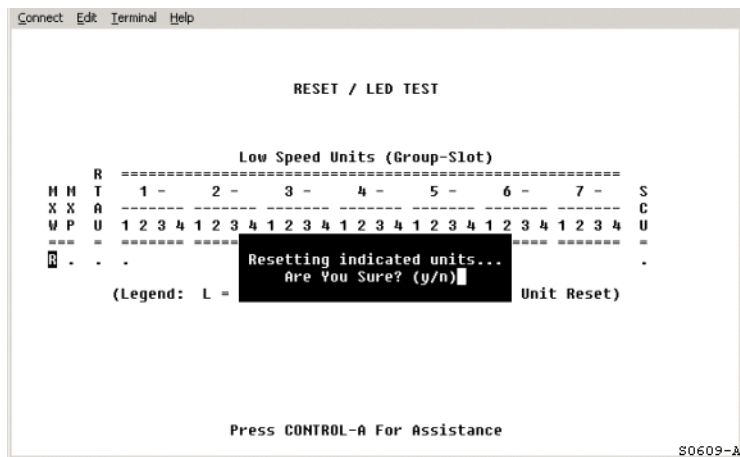> **An H4TU-R-402 List 5A must be installed at the remote location to initiate the end-to-end test.**

3   Re-install the H4LXC in the chassis and observe the front-panel LED indicators. Verify that each LED operates as specified in the following list. If the LED indicators respond as specified, continue with Step 4.

- If the STAT LED is red, the H4LXC has failed the self-test diagnostics. Remove and reinsert the H4LXC; then wait while the H4LXC again performs the self-test diagnostics. If the STAT LED lights red at the end of the second self test, the H4LXC is defective. Remove the H4LXC, replace it with a new module, and repeat Steps 1 through 3.

- If the HDSL4 CONT/SNR LED is yellow, the signal to noise ratio on the HDSL4 loop is below the threshold value (default setting is +5 dB equivalent noise margin). Correct as specified by local troubleshooting practice.

- If the HDSL4 LOSW/BER LED momentarily flashes yellow, an intermittent CRC error is being detected on the HDSL4 loop. Verify that the loop is within CSA specifications and that all connections are good. Correct as specified by local troubleshooting practice.

- If the HDSL4 LOSW/BER LED is red, the HDSL4 loop is not synchronized. Verify that the remote H4LXR is installed properly and that all HDSL4 loop connections have been completed.

> **The synchronization process may take approximately 90 seconds to complete. The HDSL4 LOSW/BER LED will be red or blinking green until loop synchronization is complete.**

> **When DISP RMT (Display Remote) is initiated from the APU, the STAT, LBK, HDSL4 CONT/SNR, and L1 and L2 LOSW/BER indicators on the H4LXC will illuminate to represent the H4LXR LED conditions.**

4   Press the LBK pushbutton on the H4LXC front panel for at least 5 seconds. At the end of 5 seconds, the RMT ALM LED will light yellow (if not already active) to indicate that an alarm is present on the H4LXR. Press the DISP RMT button on the APU, and the LBK LED on the H4LXC will light yellow during the button press to indicate the bi-directional DS1 signal loopback at the H4LXR is activated. The signal from the customer is looped back towards the customer and the signal from the network is looped back towards the network.

5   Press LBK pushbutton for at least an additional 5 seconds. At the end of 5 seconds, pressing the DISP RMT button on the APU will no longer light the LBK LED to indicate that the bi-directional DS1 signal loopback at the H4LXR is inactive. If the RMT ALM LED was inactive before the LBK activation, it will be inactive again. When the LBK pushbutton is released, the LBK LED stays off.

If the H4LXC responds as indicated, the local bi-directional DS1 signal loopback is functional. If the H4LXC does not respond as indicated, the H4LXC is defective. Remove the H4LXC, replace it with a new module, and repeat Steps 1 through 5.

H4LXR End-to-End Test

1   Partially remove the H4LXR from the remote enclosure to disconnect power from the module.

2   Inform the technician at the central office that the end-to-end test may be initiated.

The appropriate central office H4LXC must be installed to initiate the end-to-end test.

3   Re-install the H4LXR in the remote enclosure and observe the front-panel LED indicators. Verify that each LED operates normally as specified in Table 10. If the H4LXR does not respond normally, it is defective. Remove the H4LXR, replace it with a new module, and repeat Steps 1 through 3.

4   Press the LLB LBK pushbutton on the H4LXR for 5 seconds. At the end of 5 seconds, the RLB/LLB LED will light green to indicate a bi-directional loopback at the RT.

5   Press the LLB LBK pushbutton on the H4LXR again for 5 seconds. At the end of 5 seconds, verify that the RLB/LLB LED goes out to indicate that the bi-directional loopback at the RT has dropped.

6   Press the RLB LBK pushbutton on the H4LXR for 5 seconds. At the end of 5 seconds, the RLB/LLB LED will light yellow to indicate a bi-directional loopback at the CO.

7   Press the RLB LBK pushbutton on the H4LXR again for 5 seconds. At the end of 5 seconds, verify that the RLB/LLB LED goes out to indicate that the bi-directional loopback at the CO has dropped.

Table 10. *H4LXR LED Descriptions*

LED/Status	Function
DSL1	
OFF	No power is applied to the H4LXR.
Solid green	Loop 1 of all HDSL4 spans has synchronized without error.
Flashing red once every second	Loop 1 of any HDSL4 span is in acquisition.
Solid red	Loop 1 of any HDSL 4 span detects HBER, MARG, or PWRF alarms.
DSL2	
OFF	No power is applied to the H4LXR.
Solid green	Loop 2 of all HDSL4 spans has synchronized without error.
Flashing red once every second	Loop 2 of any HDSL4 span is in acquisition.
Solid red	Loop 2 of any HDSL 4 span detects HBER, MARG, or PWRF alarms.
ALM	
OFF	Normal operation: the DS-1 signal is present at both the H4LXR and the H4LXC.
Solid red	RLOS present at the H4LXR.
Solid yellow	LLOS present at the H4LXC.
DS1	
Solid green	Normal operation: the DS1 signal at the H4LXR is error-free.
Solid red	RLOS, BPV, frame error, or CRC is detected at the H4LXR.
ESF/SF	
OFF	Unframed DS1 present at the H4LXR or no DS1 detected at the H4LXR.
Solid yellow	ESF frame formatting is present at the H4LXR.
Flashing yellow once per second	ESF framing and frame error/CRC detected at H4TU-R DS-1 interface.
Solid green	SF framing present at the H4LXR.
Flashing green once per second	SF framing and frame error are present at the H4LXR.
B8ZS/AMI	
OFF	HDSL4 span is not synchronized (no DS1 signal detected at H4LXR).
Solid yellow	B8ZS line code is provisioned at the H4LXR.
Flashing yellow once per second	B8ZS and excess zeros string are present at the H4LXR.
Solid green	AMI line code is provisioned at the H4LXR.
Flashing green once per second	AMI and BPV are present at the H4LXR.
RLB/LLB	
OFF	H4LXR is not ARMed or in loopback
Solid yellow	H4LXC is looped back toward the network or customer.
Flashing yellow once per second	System ARMed for loopback.
Solid green	H4LXR is looped back toward the network or customer.

TROUBLE ISOLATION DISPLAY

The SCU provides a trouble isolation screen for diagnosing system problems.

1 From the Main Menu, use the arrow or number keys to select **6. System Maintenance**. The System Maintenance menu appears (see Figure 15 on page 23).

2 Select **8. Trouble Isolation** to display the Trouble Isolation screen (see Figure 18).

```
6. System Maintenance

8. Trouble Isolation
```

```
 Connect   Edit   Terminal   Help
                          Trouble Isolation
        Group: 1         DS1#: 1          Circuit ID:LEC-FULL-SHELF
        Time :13:13     Date:09/08/03    Unit Type :H4LXC
                   LOCAL                              REMOTE
                   =====                              ======
Equipment :          OK                                OK
DS1 Status:          OK                                OK
                   LOCAL                              REMOTE
  HDSL4        LP1  LP2                            LP1  LP2
============      ===  ===                            ===  ===
Loop Status :    NRM  NRM                            NRM  NRM

PA/SNR               +0 /+18                    +0 /+18
                 +---------+                    +---------+
                 |         |                    |         |
--------------->|         |-------------------------|         |------------->
     NETWORK     |         |                    |    | CUSTOMER
       DS1       |         |                    |    |   DS1
                 |         |                    |    |
<--------------|         |-------------------------|    |<------█------
                 |         |        HDSL4            |         |
                 +---------+                    +---------+
PA/SNR               +0 /+18                    +0 /+18
                 Press CONTROL-A For Assistance
                                                        S0582-A
```
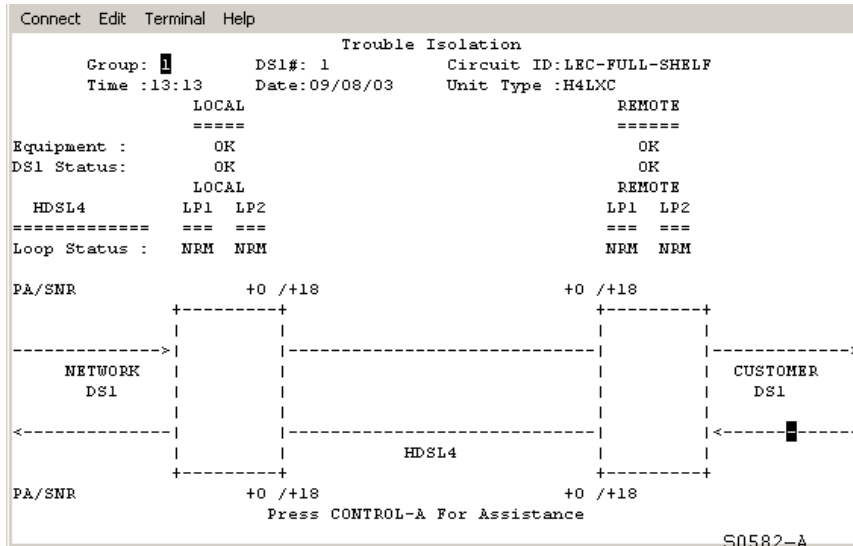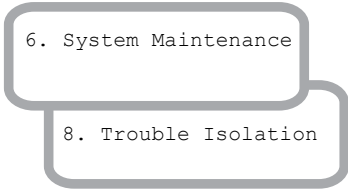
Figure 18. *Trouble Isolation*

3 Select the circuit by pressing the **SPACEBAR** to cycle through the selections in the Group and Slot fields. The trouble isolation screen displays a circuit status diagram and three information fields (Equipment, DS-1 and HDSL4). Table 11 on page 29 defines the types of status that can be reported.

Table 11.   *Trouble Isolation Screen Descriptions*

Status	Description
Equipment	
OK	No errors supported by the Trouble Isolation feature are being reported or the module is not in service
COMM FAIL	A COMM FAIL alarm is indicated for the specified module
NET LPBK	Network loopback condition
CUST LPBK	Customer loopback condition
PWR OSC	A power oscillation condition is present
DC CONT	A DC continuity condition is present
DS-1 Status	
LOS	Loss of Signal alarm
BER EX	Bit Error or Excess Zeros alarm
AIS	Alarm Indication Signal is being received by the H4LXC
RAI	Remote Alarm Indication Signal is being received by the H4LXC
DS1LPM	PM alarm is indicated for the specified DS1
HDSL4 Loop Status	
NRM	Normal operating conditions
LSW	Loss of Sync Word alarm indicated for the specified loop
BER	One or more bit errors have been detected on the specified loop
N/A	No data available
DIS	A Disabled alarm is being reported for the specified loop
TPM	A PM alarm is indicated for the specified loop
PA/SNR	Pulse attenuation/signal-to-noise ratio
Flashing X	Indicates the location of the DS1 status reading

ALARMS

Monitoring alarms and events is explained in detail in the shelf controller unit documentation listed under Related Documentation in the front of this manual. The following is an abbreviated description of the various types of alarm screens—active, summary and history.

Active Alarms

Use this procedure to view currently active alarms. The Active Alarms screen shows the location and level of the alarm conditions for the H4LXC and H4LXR in the circuit.

1 From the Main Menu, use the arrow or number keys to select **1. Alarms**. (Press **ENTER** if using the arrow keys.) The Alarms Menu appears (see Figure 19).

2 Select **1. Display Active Alarms** to display the Active Alarms screen (see Figure 20).

```
1. Alarms

1. Display Active
Alarms
```

```
Connect  Edit  Terminal  Help




                    ALARMS MENU


            1.  Display Active Alarms
            2.  Display Alarm Summary
            3.  Display Alarm History
            4.  Clear Alarm History
            5.  Set Alarm/Event Notification Level
            6.  Set Alarm Levels
            7.  Set Global Alarm Levels





            Press CONTROL-A For Assistance
                                            S0588-A
```
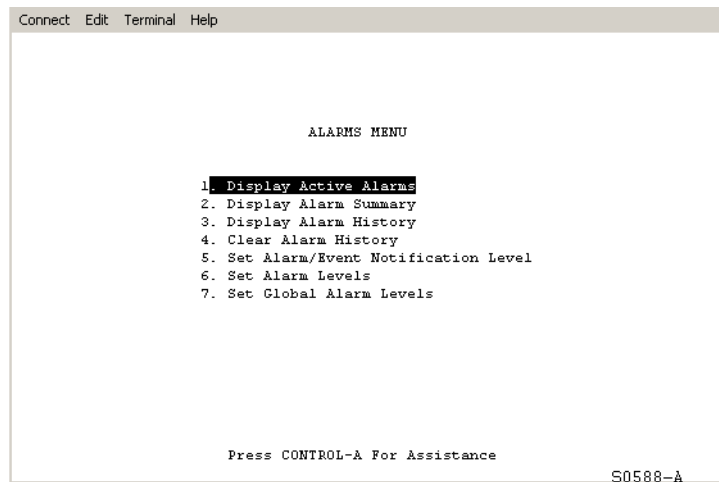
Figure 19.   Alarms Menu
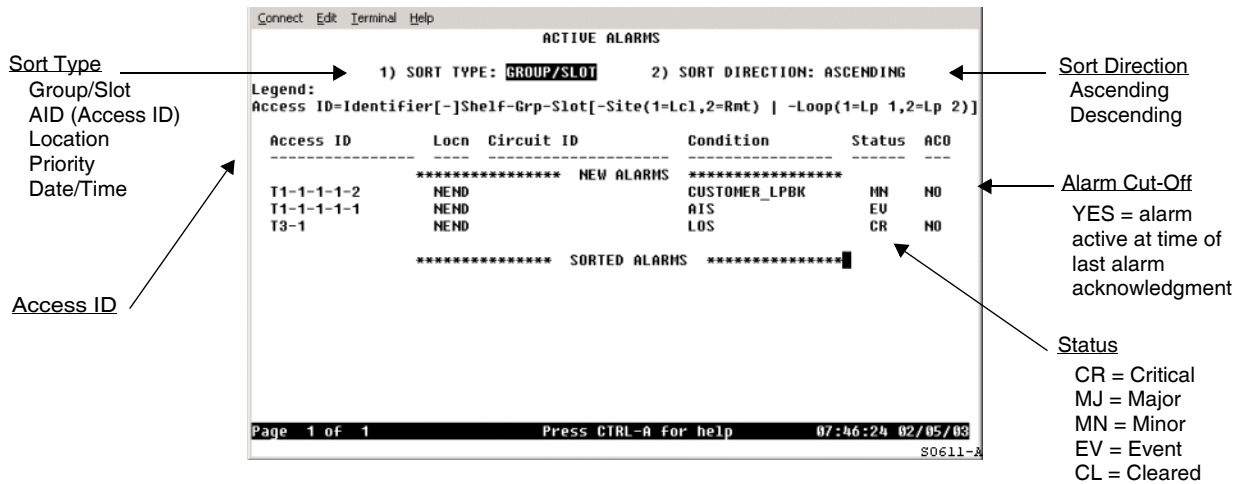
Figure 20. *Active Alarms Screen*

Alarm Summary

Use the following procedure to view the Alarm Summary screen. This screen shows the location and level of the alarm conditions for the H4LXC and H4LXR in the circuit.

1 From the Main Menu, use the arrow or number keys to select **1. Alarms**. (Press **ENTER** if using the arrow keys.) The Alarms Menu appears (see Figure 19 on page 30).

2 Select **2. Display Alarm Summary** to display the Alarm Summary screen (see Figure 21).

Figure 21. *Alarm Summary Screen*

Alarm History

1 From the Main Menu, use the arrow keys or number keys to select **Alarm**s. Press **ENTER** if using the arrow keys. The Alarms Menu appears (see Figure 19 on page 30).

1. Alarms

2 Select **3. Display Alarm Histor**y to display the Alarm History screen (see Figure 22).

3. Display Alarm History
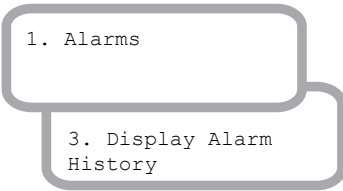
Pressing **CTRL** + **C** clears alarm history information. However, for example, if the Clear Alarm History Command is assigned to security Level 5 through the Edit Menu Security screen and the user is assigned to Level 4 or below, the user will be unable to execute this command.
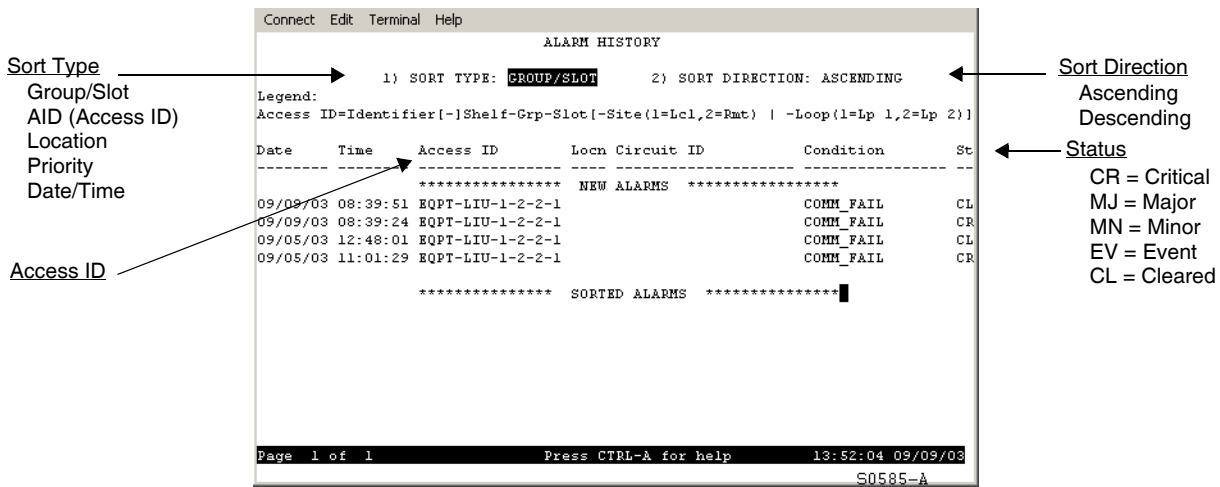
Figure 22. *Alarm History Screen*

LOOPBACK FUNCTIONS

All possible loopbacks are shown in Figure 23, subject to module compatibilities.
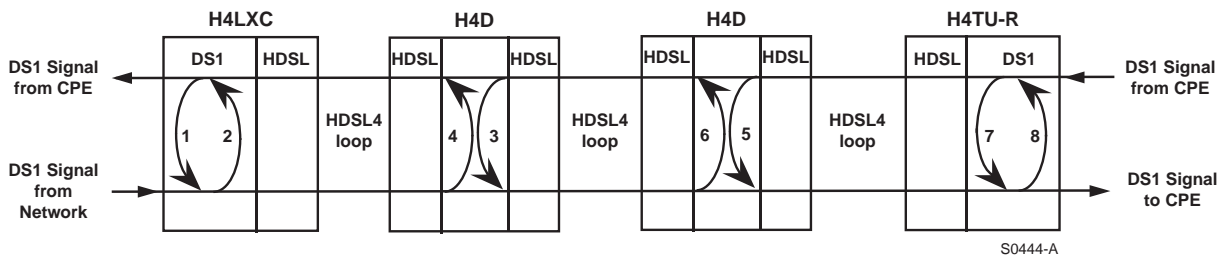
Figure 23. *Network and Customer Loopbacks*

Dual Loopbacks

Dual (bidirectional) loopbacks can be initiated from the SCU Craft Port Interface or by pressing the LBK pushbutton on the H4LXC or the LLB or RLB pushbuttons on the H4LXR front panel.

In the H4LXC, pressing LBK for 5 seconds activates the local bidirectional DS1 signal loopback at the H4LXC. The signal coming from the customer is looped back towards the customer. The signal coming from the network is looped back towards the network. Pressing the LBK pushbutton again for 5 seconds deactivates the loopback.

In the H4LXR, pressing the LLB pushbutton for 5 seconds activates the local bidirectional DS1 signal loopback at the H4LXR. The signal coming from the network is looped back towards the network. The signal coming from the CPE is looped back towards the CPE. Pressing the RLB pushbutton for 5 seconds activates a bi-directional loopback at the H4LXC. To deactive a loopback, press the pushbutton for 5 seconds.

Programmable Loopbacks

Through the SCU Craft Port Interface, each device in the system can be assigned a unique, programmable, 16-bit code for each loopup operation at that device. To access the loopback configuration screen, select Unit Configuration, HLX / H2LX /H4LX, then Loopback Configuration.

Loopback Query Code

A non-programmable query code (binary 1101 0101 1101 0101 or hexadecimal D4D4) allows the technician to find an active loopback. When the query code is entered, the loopback signature of the active loopback closest to the CO is returned.

If the only loopback in the system is at the H4LXR, the signature returned by a query depends on whether the programmable loopback option for the H4LXR has been ENABLED or DISABLED in the Craft Port Interface. If enabled, the signature is associated with the loopup code assigned to the H4LXR; if disabled, the signature is 600 bit errors (the signature of an NID loopback).

Customer Loopback Functions

The H4LXR supports the customer loopback function. When the customer loopback is activated, the network signal is returned to the network at the H4LXR DS1 interface as a keep-alive signal. When the H4LXR remote systems are used in conjunction with the Soneplex Broadband or Loop Extender systems, the network loopbacks can be activated by the Craft Port Interface Menu or TL1 command. The standard inband (SF format) and out-of-band (ESF format) loopback codes activate or deactivate the customer loopback.

Running Line Card Loopbacks

Configure the line card for loopback testing, then execute loopback commands from the Loopback Status/Commands screen (see "Loopback Status And Commands" on page 35).

1 From the Main Menu, use the arrow or number keys to select **3. Unit Configuration**. (Press `ENTER` if using the arrow keys.) Select **6. HLX / H2LX / H4LX Configuration**, then **2. Loopback Configuration**. The HLX/H2LX/H4LX Configuration screen is displayed (see Figure 24).

> 3. Unit Configuration
>
> 6. HLX / H2LX / H4LX Configuration
>
> 2. Loopback Configuration

```
Connect  Edit  Terminal  Help
                  H4LX LOOPBACK CONFIGURATION
        Group: 1    Slot: 1    Circuit ID: LEC-FULL-SHELF

     H4LXC Activation Code    :  1101001111010011
     H4LXC Programmable Lpbk  :  ENABLED

     ESF Inband Loopback      :  ENABLED
     H4LXR NID/Smartjack Lpbk :  ENABLED
     H4LXR Activation Code    :  1100011101000010
     H4LXR Programmable Lpbk  :  ENABLED

     H4RX-1 Activation Code   :  N/A
     H4RX-2 Activation Code   :  N/A
     H4RX Programmable Lpbk   :  N/A

     Common Deactivate Code   :  1001001110010011
     Lpbk Timeout Disable Code :  1101010111010110
     Lpbk Timeout Period      :  60 MIN




                  Press CONTROL-A For Assistance
                                                          S0583-A
```

Figure 24.   H4LX Loopback Configuration Screen

2 Configure the following parameters:

Table 12.   Line Card Loopback Configuration Options

Configuration Option:	Parameter(s):
Group and Slot	Select the group number (1-7) and the slot number (1-4) within the group for the module on which you want to run loopback test.
Circuit ID	Shows the identification string for this circuit.
H4LXC Activation Code	16-bit inband code sent from the Network that will create a Network Loopup on the H4LXC, or sent from the CPE will create a Customer Loopup on the H4LXC when in the armed state. Detection time is 3 sec. Code cannot be changed.
H4LXC Programmable Loopback	Only ENABLED. ENABLED activates the response to programmable loopback codes and is used in conjunction with the H4LXC activation code.
ESF Inband Loopback	Select either ENABLED or DISABLED for ESF inband loopback. For this field to be configured, the line unit configuration screen fields must be configured with the equipment state as EQUIPPED, unit service state is IN SERVICE, T1 provision is YES, T1 service state is IN SERVICE, and T1 framing format is ESF. If disabled, the ESF loopback codes will only be active out of band.
H4LXR NID/Smartjack Lpbk	Select either ENABLED or DISABLED. ENABLED activates response to NID loopback codes.

Continued

Table 12. Line Card Loopback Configuration Options (Continued)

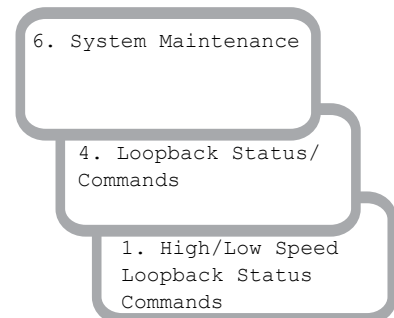| Configuration Option:	Parameter(s):
H4LXR Activation Code	16-bit inband code sent from the Network that will create a Network Loopup on the H4LXR, or sent from the CPE will create a Customer Loopup on the H4LXR when in the armed state. Detection time is 3 seconds. Code cannot be changed.
H4LXR Programmable Loopback	Only ENABLED. ENABLED activates the response to programmable loopback codes and is used in conjunction with the H4LXR activation code.
H4RX-1 Activation Code	16-bit code sent from the Network that will create a Network Loopup on the H4RX-1, or sent from the CPE will create a customer Loopup on the H4RX-1 when in an armed state. Detection time is 3 seconds. Code cannot be changed.
H4RX-2 Activation Code	16-bit code sent from the Network that will create a Network Loopup on the H4RX-2, or sent from the CPE will create a customer Loopup on the H4RX-2 when in an armed state. Detection time is 3 seconds. Code cannot be changed.
H4RX Programmable Lpbk	Only ENABLED. ENABLED activates the response to programmable loopback codes and is used in conjunction with H4RX-1 and H4RX-2 activation codes.
Common Deactivate Code	This signal is sent inband. Units in loopup state go back to armed stated. Detection time is 5 seconds. Used to deactivate any active loopback.
Lpbk Timeout Disable Code	Active loopbacks stay up until deactivation or disarm code is received. Detection time is 3 seconds.
Lpbk Timeout Period	Specifies the minutes that the loopback will remain in effect before reverting to the normal (non-loopback) state. Setting the loopback timeout period to zero disabled the timeout feature.

LOOPBACK STATUS AND COMMANDS

Use this procedure to activate or deactivate and view the status of loopbacks in the H4LXC system. Loopbacks cannot be activated if the circuit does not contain a compatible H4LXR at the far end. If the user is assigned a sufficient security level at the SCU craft interface, loopbacks can be executed toward the CPE or network at the H4LXC or H4LXR.

1 From the Main Menu, use the arrow keys or number keys to select **6. System Maintenance**. Press **ENTER** if using the arrow keys. The System Maintenance menu appears (see Figure 15 on page 23).

2 Select **4. Loopback Status/Command**s, then **1. High/Low Speed Loopback Status/Commands**. The Low Speed Loopback Status/Commands screen displays (see Figure 25 on page 36).

3 Select the desired **Group** and **DS1**#, then highlight the appropriate **COMMANDS: Loopback:** field.

```
6. System Maintenance

    4. Loopback Status/
    Commands

        1. High/Low Speed
        Loopback Status
        Commands
```

> **The DEACTIVATE command can be performed in any field that does not display N/A, and will deactivate all loopbacks (SCU v3.6.2 only).**
>
> **The currently active loopback must be deactivated to initiate another loopback (SCU v3.6.2 only).**
>
> **The DEACTIVATE command can be performed in any field that does not display N/A, and will deactivate all loopbacks on the location selected. Multiple loopbacks may be on each location providing that "circular loopbacks" is not violated (SCU v4.1 only).**

4 Select **ACT NE**T, **ACT CUS**T, **SEND LPB**K, or **DEACTIVATE,** then press **ENTER**. A blank field indicates no selection. (See Table 13 on page 36 for descriptions of loopback selection field options.)

5 The following message appears:

```
                    Modifying LOOPBACK Status...
                      Are You Sure? (y/n)
```

6 Press **Y** to activate the loopback command or press **N** to cancel the command. Pressing **Y** causes the screen to disappear momentarily. The currently active loopback then displays (see Figure 25).
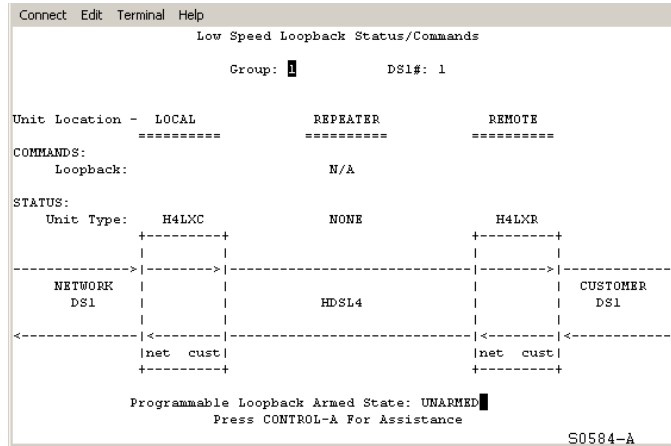
```
 Connect  Edit  Terminal  Help
                  Low Speed Loopback Status/Commands

                    Group: 1          DS1#: 1


 Unit Location -  LOCAL              REPEATER            REMOTE
                  ==========         ==========          ==========
 COMMANDS:
     Loopback:                          N/A

 STATUS:
     Unit Type:   H4LXC               NONE               H4LXR
                 +---------+                           +---------+
                 |         |                           |         |
 -------------->|-------->|---------------------------|-------->|------------->
     NETWORK    |         |                           |         |   CUSTOMER
       DS1      |         |         HDSL4             |         |     DS1
                 |         |                           |         |
 <--------------|<--------|---------------------------|<--------|<-------------
                 |net  cust|                           |net  cust|
                 +---------+                           +---------+

              Programmable Loopback Armed State: UNARMED
                    Press CONTROL-A For Assistance
                                                   S0584-A
```

Figure 25. *Low Speed Loopback Status/Commands Screen*

If an HDSL4 loop goes down during a loopback, the loopback appears to continue, although it does not. The command for this loopback must be deactivated before another loopback can be initiated.

Table 13. *Options in Loopback Selection Fields*

Field	Option	Loopback Type
H4LXC	ACT NET	Network Loopback at the H4LXC [a]
	ACT CUST	Customer Loopback at the H4LXC [b]
	SEND LPBK	DS1 facility loopback at other end of network requested through DS3 MUX [c]
	DEACTIVATE	All Loopbacks (SCU v3.6.2 only)
		All H4TU-C Loopbacks (SCU v4.1 only)
H4LXR	ACT NET	Network Loopback at the H4LXR
	ACT CUST	Customer Loopback at the H4LXR
	DEACTIVATE	All Loopbacks (SCU v3.6.2 only)
		All H4TU-C Loopbacks (SCU v4.1 only)

(a) When a network loopback is in progress, an unframed "all-ones" signal (AIS) or Los Of Signal (LOS) is transmitted to the customer interface, depending on the setting of the network loopback pattern.

(b) When a customer (CPE) loopback is in progress, the Alarm Pattern setting from SCU H4LX Unit Configuration is returned to the network as keep-alive (default is AIS).

(c) The SEND LPBK option sends a request through the DS3 MUX to the network to activate a loopback on a predefined DS1 facility at the other end of the network. This request is indicated by the text "<LPBK RQ" that appears on the loopback screen. The predefined DS1 facility responds by activating a loopback on the associated remote unit. The receipt of the SEND LPBK request is acknowledged by the text "LPBK RQ>" that appears on the loopback screen.

SEND LPBK can only be activated when the DS1 Loopback Mode parameter on the Broadband DS3 MUX Configuration screen is configured as C-Bit parity.

APPENDIX A - SPECIFICATIONS

Table 14. *LPS-H4TU-C Specifications*

Parameter	Specification	Remarks
DS1 Interface		
Input/Output Signals	Per ANSI T1-403	
DS1 Line Rate	1.544 Mbps	±200 ppm
DS1 Equalization	0 to 655 feet	In 133 foot increments
DS1 Line Format	Alternate Mark Inversion (AMI) or Bipolar with 8-Zero Substitution (B8ZS) or AUTO (line format transmitted matches line format received)	
DS1 Frame Format	Extended Superframe (ESF), Superframe (SF), Ft Only (Terminal Framing), or AUTO (detects/adapts to frame format)	
DS1 Pulse Output	6V peak-to-peak	
HDSL4 Interface		
Output Signal Level	+14.1 dBm ± 0.5 dBm	135Ω termination
Loop Type	Single or mixed gauges	With or without bridged taps
Impedance	135 ohms nominal	Balanced
Line Rate	784 Kbps 16-TC	Overlapped Pulse Amplitude Modulation (PAM)
Loop Power Output	-190 ± 8 Vdc	
Loop Loss	47 dB @ 196 kHz	135Ω termination
Loop Wander	0.26 UI maximum	
Power Requirements		
Input Voltage	-48 Vdc (nominal)	
Maximum Power Consumption	32 W for two H4D units, 12 W without units	
Heat Dissipation	5.9 W for no doubler units	
	6.5 W for one doubler unit	
	7.8 W for two doubler units	
Electrical Protection	Secondary surge and power cross-protection on all HDSL4 ports (requires external primary protection)	
Environmental		
Operating Temperature	-40°F to 149°F (-40°C to 65°C)	
Storage Temperature	-40°F to 158°F (-40°C to 70°C)	
Humidity	5% to 95%, operating and storage	Non-condensing
Physical		
Dimensions (H x W x D)	4.6 inches x 0.7 inches x 9.5 inches (11.7 cm x 1.7 cm x 24.1 cm)	

CARD-EDGE CONNECTOR

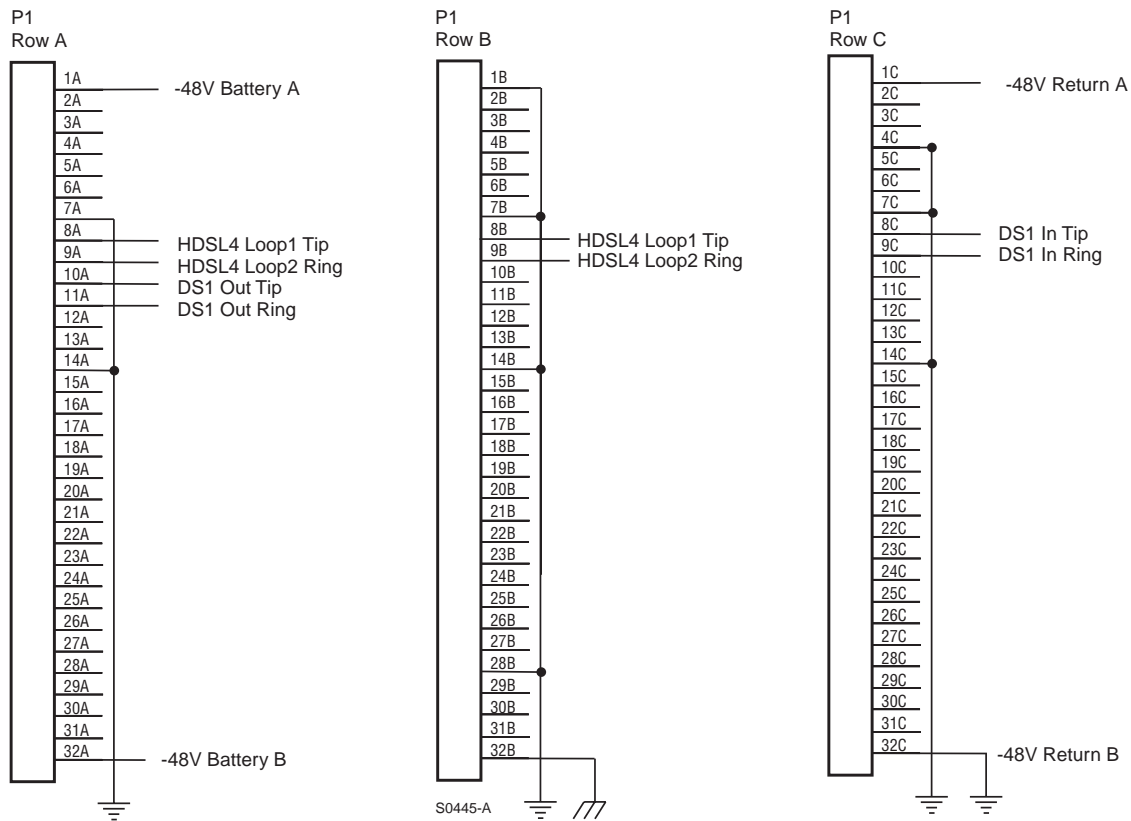Figure 26 shows the pinouts on the card-edge connector for the LPS-H4TU-C.

P1 Row A

1A	-48V Battery A
2A	
3A	
4A	
5A	
6A	
7A	
8A	HDSL4 Loop1 Tip
9A	HDSL4 Loop2 Ring
10A	DS1 Out Tip
11A	DS1 Out Ring
12A	
13A	
14A	
15A	
16A	
17A	
18A	
19A	
20A	
21A	
22A	
23A	
24A	
25A	
26A	
27A	
28A	
29A	
30A	
31A	
32A	-48V Battery B

P1 Row B

1B	
2B	
3B	
4B	
5B	
6B	
7B	
8B	HDSL4 Loop1 Tip
9B	HDSL4 Loop2 Ring
10B	
11B	
12B	
13B	
14B	
15B	
16B	
17B	
18B	
19B	
20B	
21B	
22B	
23B	
24B	
25B	
26B	
27B	
28B	
29B	
30B	
31B	
32B	

S0445-A

P1 Row C

1C	-48V Return A
2C	
3C	
4C	
5C	
6C	
7C	
8C	DS1 In Tip
9C	DS1 In Ring
10C	
11C	
12C	
13C	
14C	
15C	
16C	
17C	
18C	
19C	
20C	
21C	
22C	
23C	
24C	
25C	
26C	
27C	
28C	
29C	
30C	
31C	
32C	-48V Return B

Figure 26. *LPS-H4TU-C Card Connector*

APPENDIX B - PRODUCT SUPPORT

ADC Customer Service Group provides expert pre-sales and post-sales support and training for all its products.

Technical support is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center.

Sales Assistance 800.366.3891	• Quotation Proposals • Ordering and Delivery • General Product Information
Systems Integration 800.366.3891	• Complete Solutions (from concept to installation) • Network Design and Integration Testing • System Turnup and Testing • Network Monitoring (upstream or downstream) • Power Monitoring and Remote Surveillance • Service/Maintenance Agreements • Systems Operation
ADC Technical Assistance Center 800.366.3891 Email: wsd.support@adc.com	• Technical Information • System/Network Configuration • Product Specification and Application • Training (product-specific) • Installation and Operation Assistance • Troubleshooting and Repair/Field Assistance
Online Technical Support	• www.adc.com/Knowledge_Base/index.jsp
Online Technical Publications	• www.adc.com/documentationlibrary/technicalpublications
Product Return Department 800.366.3891 Email: rma@adc.com	• ADC Return Material Authorization (RMA) number and instructions must be obtained before returning products.

All telephone numbers with an 800 prefix are toll-free in the USA and Canada.

APPENDIX C - ABBREVIATIONS

A

ADSL: Asymmetric Digital Subscriber Line

AMI: Alternate Mark Inversion

B

B8ZS: Bipolar with 8-Zero Substitution

BBC: Broadband Chassis

BER: Bit Error Rate

BPV: Bipolar Violation

C

CLEI: Common Language Electrical Interface

CO: Central Office

CONT: Continuity

CRC: Cyclical Redundancy Check

CSA: Carrier Service Area

CVL: Code Violations, Line

D

DDS: Digital Data Service

E

ESD: Electrostatic Discharge

ESF: Extended Superframe

ESL: Errored Second, Line

F

FCL: Failure Count, Line

H

H2LX: HDSL2 CO Line Unit

H4LX: HDSL4 CO Line Unit

H4LXC: HDSL4 CO Line Unit

H4LXR: HDSL4 Remote Line Unit

HLX: HDSL CO Line Unit

I

IS: In-Service

L

LBO: Line Buildout

LEC: Loop Extender Chassis

LED: Light Emitting Diode

LOSW: Loss of Frame Synchronization
Loss Of Sync Word Seconds

LPBK: Loopback

LSW: Loss of Sync Word

N

NID: Network Interface Device

NRM: Normal

O

OOS: Out-Of-Service

P

PA: Pulse Attenuation

PA-H: Pulse Attenuation-High

PBO: Power back-off

PE: Pulse Equalization

POTS: Plain Old Telephone Service

S

SCU: Shelf Controller Unit

SDSL: Symmetrical Digital Subscriber Line

SESL: Severely Errored Second, Line

SF: Superframe

SNR: Signal-to-noise ratio

SNR-L: Signal-to-Noise Ratio-Low

U

UAS: Unavailable Seconds

CERTIFICATION AND WARRANTY

FCC CLASS A COMPLIANCE

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.

LIMITED WARRANTY

Product warranty is determined by your service agreement. Contact your sales representative or Customer Service for details.

MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC Telecommunications, Inc. voids the user's warranty. All wiring external to the products should follow the provisions of the current edition of the National Electrical Code.

SAFETY STANDARDS COMPLIANCE

This equipment has been tested and verified to comply with the applicable sections of the following safety standards:

• GR 63-CORE - Network Equipment-Building System (NEBS) Requirements

• GR 1089-CORE - Electromagnetic Compatibility and Electrical Safety

• UL-60950: Telecommunications Equipment – Electronics and Electrical Safety

For technical assistance, refer to .

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