

# HIGAIN LINE UNIT TECHNICAL PRACTICE



**HLU-819 List 1**  
Part Number: 150-2238-01  
CLEI Code: VACHPSXC



Section 150-819-200-01



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## Revision History of this Guide

Revision	Release Date	Revisions Made
01	July 27, 2000	Initial release

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## USING THIS GUIDE

The following conventions are used in this guide:

- Monospace type indicates screen text, including text you type at a screen prompt.
- Keys you press are indicated by small icons such as **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 equipment damage or personal injury.**



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

## DOCUMENTATION

If you need to obtain either of the documents listed below, refer to [“Appendix B - Product Support”](#) on page 23.

Section Number	Title
700-811-102-01	ERE-811 List 2, List 3, and List 4 Technical Practice
700-814-112-01	UTU-814 List 1B Quick Installation Guide

## INSPECTING THE 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 DSL Systems, 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 DSL Systems, Inc. as described in [“Returns” on page 23](#). If you must store the equipment for a prolonged period, store the equipment in its original container.

## SAFETY

To ensure your safety when servicing and installing this equipment, please take the following precautions:



**Be careful when installing or modifying telephone lines. Dangerous voltages can be present. It is unsafe to install telephone wiring during a lightning storm.**

**Always disconnect all telephone lines and power connections before servicing or disassembling this equipment. For performance and safety reasons, only power supplies listed for use with telephone equipment by a locally recognized organization should be used with ADC equipment. All wiring external to the product should follow the local wiring codes.**

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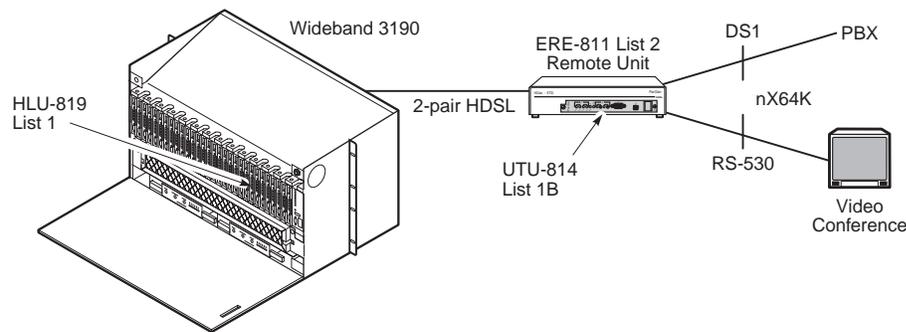
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# OVERVIEW

This guide contains installation information for the HiGain® Line Unit HLU-819 List 1. The HLU-819 installs in any 3192-compliant chassis and interfaces with the HiGain ETSI™ Universal Termination Unit UTU-814 List 1B. The HLU-819 and the UTU-814 provide the Central Office (CO) and remote terminal (RT) sides of a repeaterless, High-bit-rate Digital Subscriber Line (HDSL). The RT provides both DSX-1 (T1) and data interface (V.35, V.36, RS-449, X.21, or RS 530) ports to the customer (see Figure 1). The HLU-819 accepts the respective payloads through a DSX-1 port from a multiplexer or a DS1 cross-connect shelf and transports it to the UTU-814 List 1B at a maximum data rate of up to 1.544 Mbps. An internal time slot assignment function splits the DS1 bandwidth as two Nx64K tributaries between these two ports.



**Figure 1.** Typical HLU-819 List 1 Application  
(T1 to Dual-Port Operation)



**In order for the HLU-819 List 1 to support T1 transmission over HDSL lines at the customer remote, the ETSI Remote Enclosure ERE-811 List 2 and the UTU-814 List 1B (ETSI card) must be used at the remote location.**

The HLU-819 List 1 is part of the Open Span Termination Shelf (OSTS) family of products supported by the Wideband System 3190. With this card, the entire ADC ETSI family of remote Customer Premise Equipment (CPE) can be subtended to the Wideband System 3190 to provide standard Data Service Unit (DSU) and Channel Service Unit (CSU) data port interfaces.

The HLU-819 fits into a 3192 mechanics shelf and conforms to ANSI T1.403-1989 and AT&T CB 119 standards. It has a transmission range of up to 12,000 ft. (3.66 km) when using 24 American Wire Gauge (AWG) and 9,000 ft. (2.74 km) when using 26 AWG twisted pair copper wire, including bridged taps. The HLU-819 requires -36 to -72 Vdc from the local power supply and can source up to 50 milliamperes (mA) on each of the HDSL data loops to line power the remote unit.

## STANDARD FEATURES

- DSX-1 (T1) interface at the CO
- DS1 (T1) and data port interfaces at the remote
- Two pair High-bit-rate Digital Subscriber Line (HDSL) interface to an ETSI remote unit
- Terminal Access Option (TAO) and Transaction Language (TL1) command interfaces
- Framing insertion for transmission of framed and unframed data into T1 network

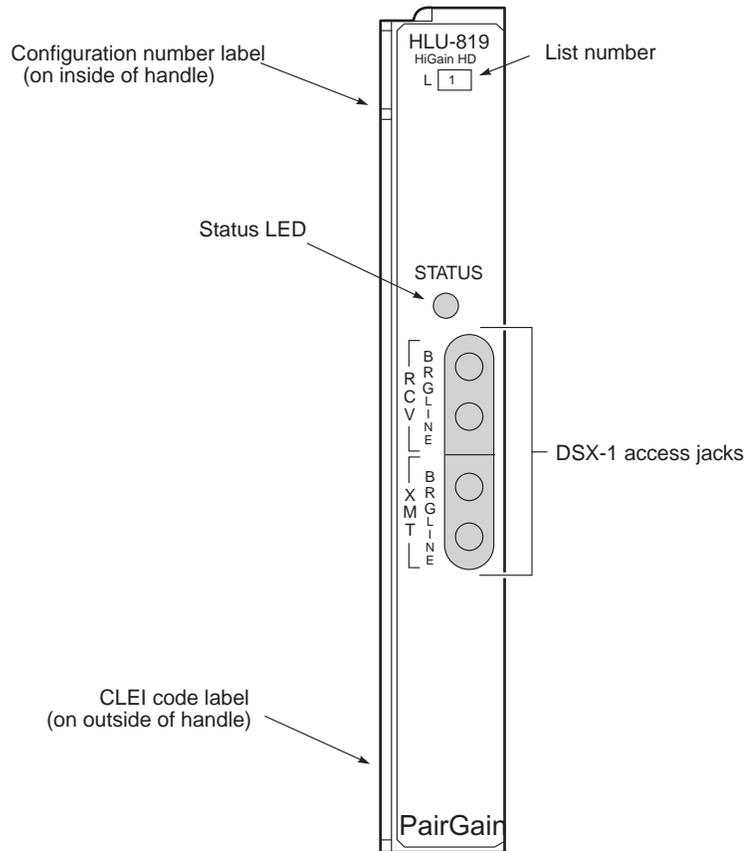
- Detection of standard CSU loopup and loopdown codes
- Time slot prioritization
- Single pair operation
- Status Light Emitting Diode (LED)
- Compatible with OSTs
- DSX-1 splitting and bridge craft access
- Line power to drive the remote unit
- Integrated dual port fractional T1 delivery system

## COMPATIBILITY

The HLU-819 List 1 is designed to mount in 3192 mechanics shelves. For a list of compatible shelves see [“Appendix A - Compatibility” on page 22](#).

# FRONT PANEL

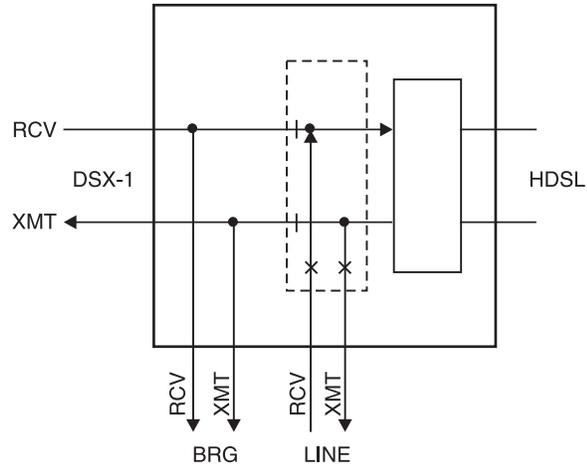
Figure 2 shows the HLU-819 List 1 front panel. Table 1 on page 4 describes the front-panel components. A diagram of the line and bridging access jacks is shown in Figure 3 on page 5.



**Figure 2.** HLU-819 List 1 Front Panel

**Table 1. HLU-819 List 1 Front-Panel Status LED Description**

<b>Front-Panel Feature</b>	<b>Function</b>
Status LED	Displays synchronization state and alarm status for HDSL Loop.
Steady Green	HDSL Loop is ready to transmit and receive data across all spans.
Slow Blinking Green	HDSL Loop acquisition is in progress for local span.
Pulsing Red	Indicates Loss of Sync Word (LOSW), Margin (MAR) below threshold, or Errored Second (ES) count above threshold. Pulses for every ES on any span. Indicates Loss of Clock (LOC) or DSX-1 signal, Receive Alarm Indication Signal (RAIS), or Loss of Frame Alignment (LFA).
Steady Yellow	Indicates local loopback.
DSX-1 access jacks	
BRG	Provides non-intrusive bridging jack access to Transmit (XMT) and Receive (RCV) at the DSX-1 interface. Allows the two T1 payloads to be monitored.
LINE	Provides splitting jack access to XMT and RCV at the DSX-1 interface. Breaks the XMT and RCV paths to permit test signal insertion and retrieval.
CLEI and ECI bar code label (located on the side of the unit)	Provides the human-readable Common Language Equipment Identifier (CLEI) code number and the Equipment Catalog Item (ECI) bar code number.
List number	Identifies the list number of the HLU-819.
Configuration Number (located on the side of the unit)	For some products the configuration number may contain either a five- or six-digit warranty configuration number or a standalone two- or three-digit configuration number as follows: Digit 1 - Last digit of shipment year Digits 2 and 3 - Shipment month Digits 4, 5, and 6 - Configuration number The configuration number identifies the version of the product. New configuration numbers usually accompany changes in the last two characters of the CLEI code. The configuration number is found on a small label attached to the front panel. It is the last two numbers (following the x) of a 13-character part number. For example: 150-1234-01-x <b>01</b> .



**Figure 3.** DSX-1 Access Jacks

# INSTALLATION

This section provides instructions for setting up the HLU-819 and installing the UTU-814 List 1B into the ERE-811 remote unit. The remote unit can be powered from either the HLU-819 (must be configured) or locally, either AC or -48 Vdc. The remote unit must be set up independently from the CO terminal.



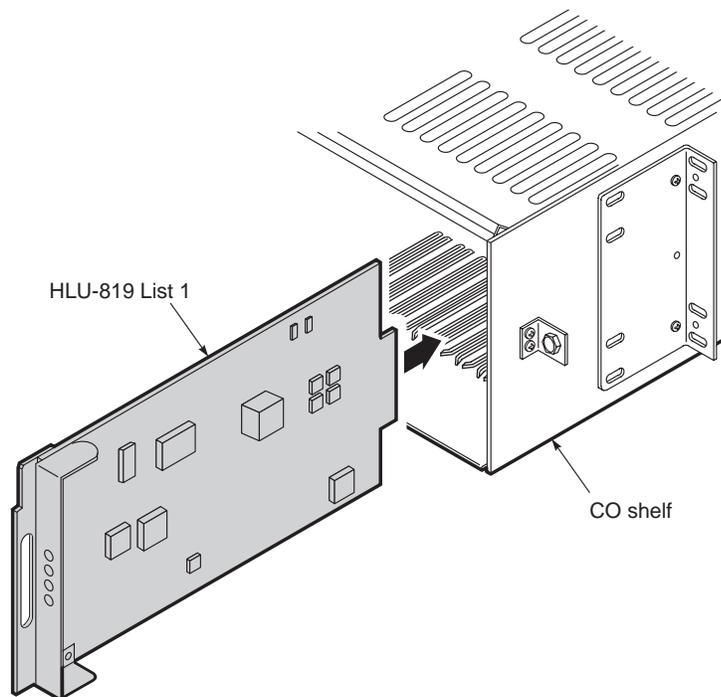
**Shelf and remote enclosure chassis ground must be connected to earth ground to protect the equipment and for safety of personnel.**

**Additional protection is required when the network side of the equipment is extended to an outside facility.**



**When installing an HLU in a chassis or a UTU in a remote enclosure, be sure to wear an antistatic wrist strap. Avoid touching components on the circuit board.**

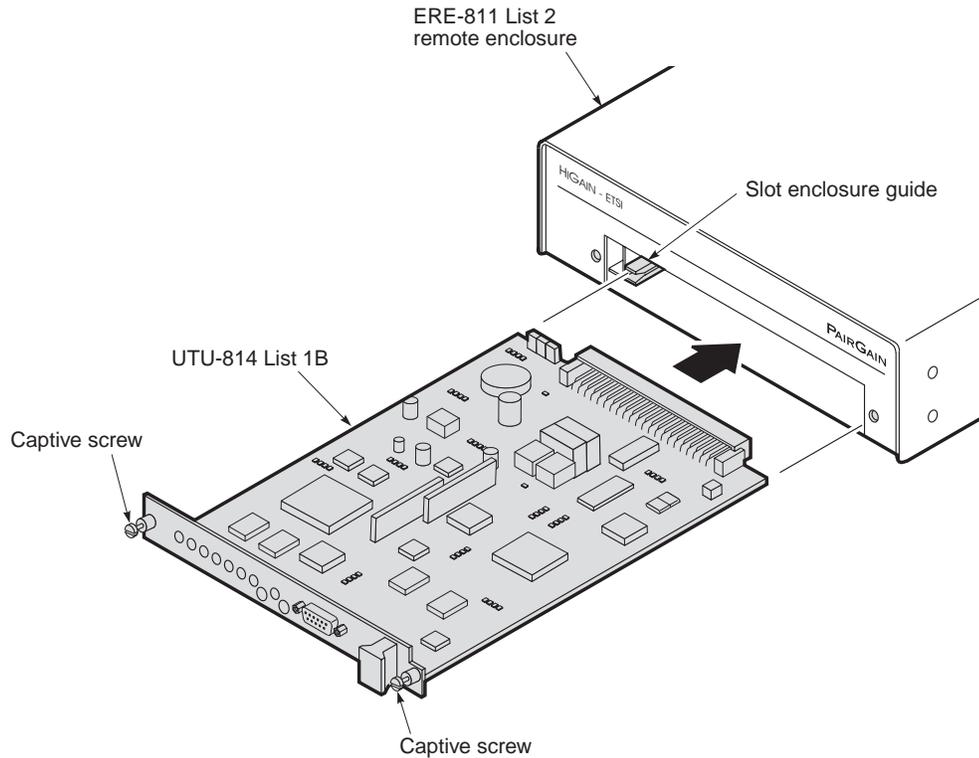
## INSTALLING THE HLU-819 INTO A 3192 SHELF



**Figure 4.** *Installing the HLU-819 List 1 into a Shelf*

- 1 Slide the HLU-819 into the slot enclosure guides of any of the open 28 slots on the shelf (Figure 4).
- 2 Push the unit back until it touches the backplane card-edge connector and is firmly seated. Once the HLU-819 is in place, it is automatically configured as a Line Termination Unit (LTU) which displays on the maintenance terminal console screens.

## INSTALLING THE UTU-814 INTO THE ERE-811 REMOTE ENCLOSURE



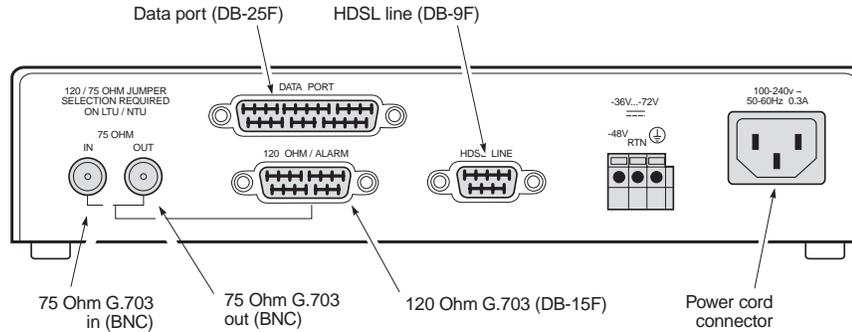
**Figure 5.** Installing the UTU-814 List 1B into the ERE-811 List 2 Remote Enclosure

- 1 Align the card with the enclosure guides at the left and right sides of the enclosure opening (Figure 5).
- 2 Push the card into the enclosure until the front panel is flush with the front.
- 3 Tighten the captive screws.
- 4 Connect the DS1 port cable DB-15F (Figure 6 on page 8), if applicable.
- 5 Connect the Nx64K data port cable DB-25F (Figure 6), if applicable. The following adapters can be used when connecting the cable:
  - ECA-800 List 1 (DB-25M to M-34F, V.35)
  - ECA-801 List 1 (DB-25M to DB-15F, X.21)
  - ECA-807, List 1 (DB-25M to DB-37F, RS-449, V.36)
- 6 Connect the HDSL line port cable DB-9F (Figure 6). The following adapter can be used when connecting the cable:
  - ECA-806, List 1 (DB-15M to RJ-48C)

The UTU-814 is automatically configured as an Network Termination Unit (NTU), which displays on the maintenance terminal console screens after HDSL startup and synchronization.



**Jumpers and bayonet-locking connector (BNC) are not applicable for UTU-814 List 1B. For T1 applications, UTU-814 List 1B uses the standard 100  $\Omega$  (DB-15), G.703 interface.**



**Figure 6.** ERE-811 List 2 Rear Panel

## HDSL STARTUP AND SYNCHRONIZATION

Power-up the shelf where the HLU-819 is installed and observe the following:

- 1 During the power-up self test, the HLU-819 List 1 LED is a steady yellow. If the LED stays yellow for more than 30 seconds after power-up, verify that the unit is not in a loopback mode. If no loopback conditions are present, the unit has failed the self test. (See “[Appendix B - Product Support](#)” on page 23 if assistance is required.)
- 2 The Status LED flashes green once per second as the unit attempts to establish synchronization.
- 3 After approximately 30 seconds, confirm one of the following:
  - The Status LED is steady green, indicating the unit is synchronized and ready to transmit and receive data. The unit can now be configured through the maintenance terminal console screen menus.
  - The Status LED continues to flash. If the LED does not stop flashing after approximately one minute, it indicates that the HDSL pair corresponding to the indicator is experiencing an excessive signal loss or is in an open condition. Check the line and repair if necessary.

## SYSTEM CONFIGURATION

A maintenance terminal is used to access the line unit console screens and configuration menus. Through these screens and menus, the HDSL system is configured, monitored, tested, and its circuit inventory can be displayed.

The console screens must be viewed through the HMU-319 or Operating System (OS) port located at the back of the Wideband System 3190, or through a Trivial File Transfer Protocol (TFTP) session over an Ethernet Local Area Network (LAN) connected to the chassis. The console screens cannot be accessed through the HLU-819 because this model does not provide a craft port.



**HMU-819 firmware must be version 3.0 and higher.**

**Refer to document 150-319-107-01 for more detailed information on terminal connections (see “[Appendix B - Product Support](#)” on page 23).**

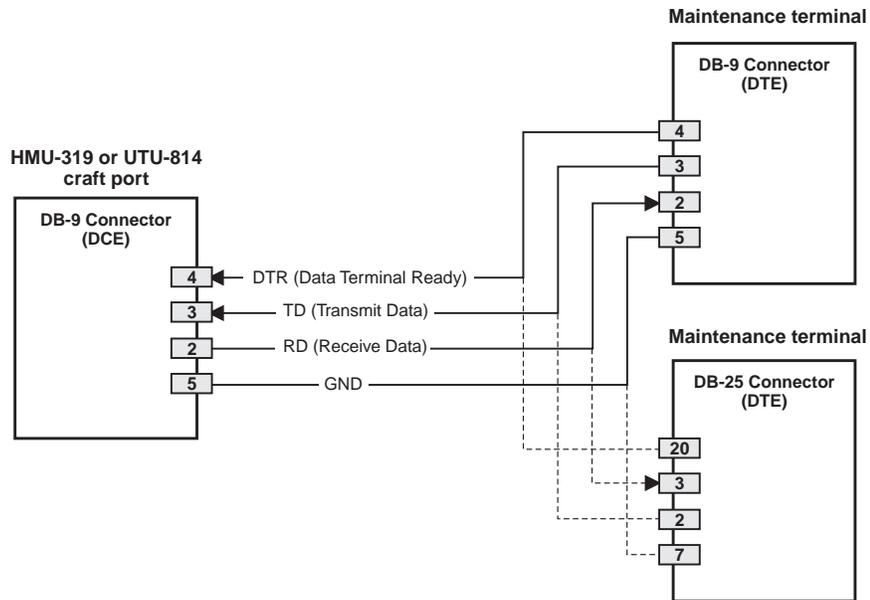
After HDSL establishes communication with the remote unit, the HDSL system can be configured and performance monitored from the HMU-319 management unit. Both the HLU-819 and UTU-814 are configured at this time from the same maintenance screens. If the HDSL link is down, the only parameters that can be changed are those on the local unit.

The HLU-819 provides a special lockout feature that prevents users connected to the remote maintenance terminal from changing the circuit configuration. When blocked, the maintenance screens are not accessible from the remote craft port.

## MAINTENANCE TERMINAL CONNECTION

To connect a maintenance terminal:

- 1 Connect a standard serial cable from the maintenance terminal communications (COM) port to the front-panel craft port of the HMU-319. The pinouts for the craft port and maintenance terminal connectors are shown in [Figure 7 on page 10](#).
- 2 Configure the maintenance terminal for the following communication settings:
  - VT100 emulation or ANSI (if VT100 is not available)
  - Clear the modem initialization string if supported by the terminal
  - Bits per second: 9600 (recommended)
  - Data bits: 8
  - Parity: None
  - Stop bits: 1
  - Flow Control: None



**Figure 7.** *HMU-319 Craft Port and Maintenance Terminal Connector Pinouts*

## LOGGING ON



Logon procedure may vary depending on the software revision level on the HMU-319. Consult the software manual for your particular system (refer to “[Appendix B - Product Support](#)” on page 23).

You must log on to the Wideband System 3190 in order to access the HLU-819 maintenance terminal console screens. Perform the following steps in the order indicated.

- 1 Once the maintenance terminal is connected to the HMU and a banner (headline) appears on the screen, press **RETURN**.
- 2 The **Enter TID** field appears to the left of the cursor, then press **RETURN**.
- 3 Type `superuser` in the **Enter Username** field, then press **RETURN**. (The **Enter Username** field may be changed by the user.)
- 4 Type `public#1` in the **Enter Password** field, then press **RETURN**. (The **Enter Password** field may be changed by the user.)
- 5 Type `TAO` at the prompt, then press **RETURN**. This opens the Terminal Access Option (TAO).
- 6 Select the shelf number of the HLU-819 to display the shelf status screen.
- 7 Select the slot number of the HLU-819 to log onto the HLU and display the console screen menus.



If the password or username is forgotten or lost, please contact Customer Service for assistance (see “[Appendix B - Product Support](#)” on page 23).

## NAVIGATING MENUS

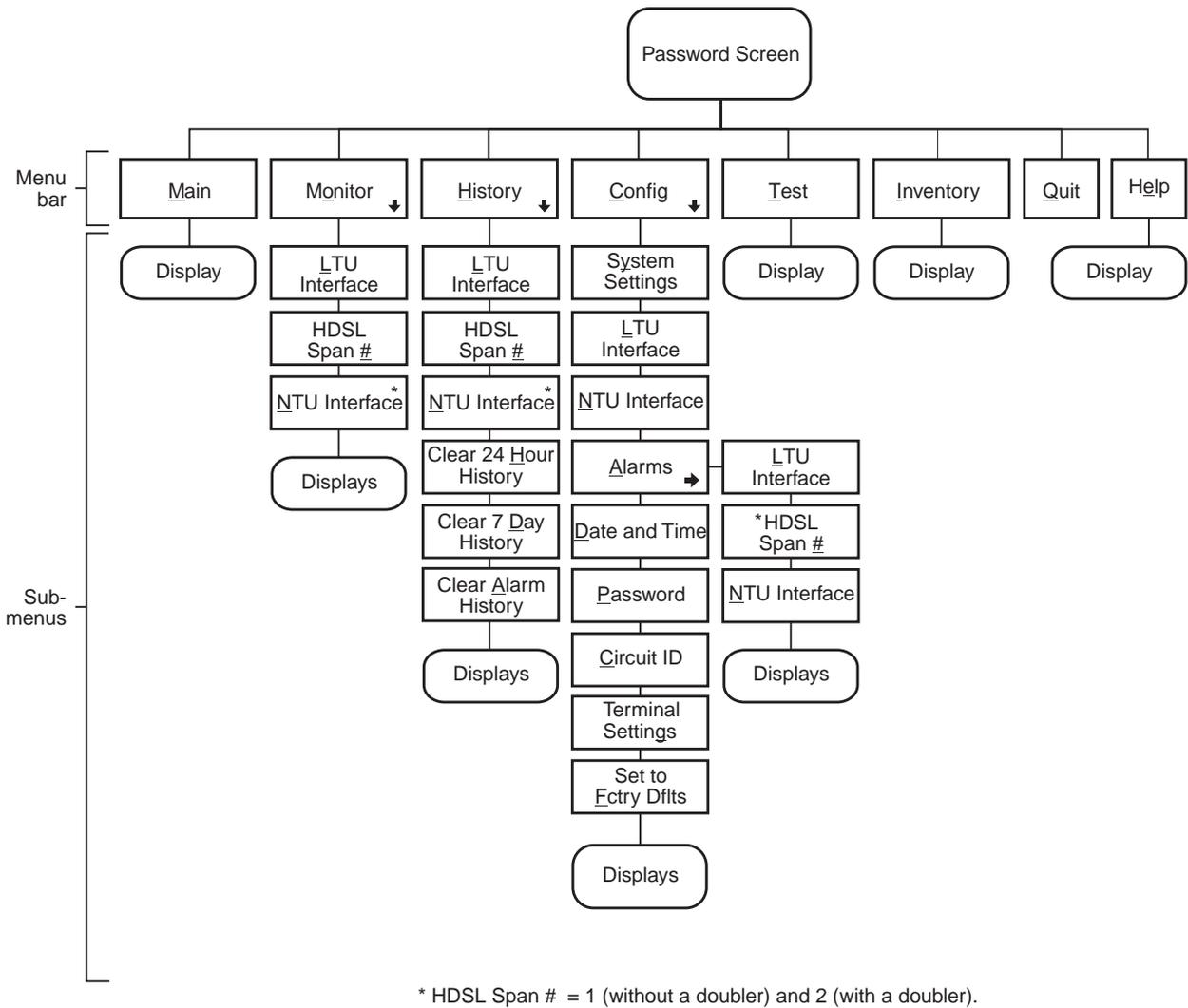
Use the keys described in [Table 2](#) to navigate the console screens and menus.

**Table 2.** Console Screen Navigation Keys

These Keys	Perform this Function
Alphanumeric keys	Type the underlined or highlighted letter to select and execute a menu item. For example, on the console screen menu bar, type <b>C</b> to access the <i>Config</i> dropdown menu.  Also use these keys to enter values in text fields. For example, on the <i>Config Date and Time</i> menu, type the date in a DD/MM/YY format on the LTU and NTU.
↑ and ↓ keys	Press the ↓ key to access a console screen dropdown menu. For example, press the ↓ key on <i>Config</i> to access the <i>Config</i> dropdown menu. Or press the ↑ and ↓ keys to highlight a submenu item, then press <b>ENTER</b> to select the item.
<b>TAB</b> key	Provides same function as the ↓ key.
← and → keys	Moves horizontally across the Menu bar, except when in a text entry field.
<b>CTRL + E</b> and <b>CTRL + X</b>	<b>CTRL + E</b> moves up one line and <b>CTRL + X</b> moves down one line on the History screens.
<b>CTRL + C</b> and <b>CTRL + R</b>	<b>CTRL + C</b> performs page-down and <b>CTRL + R</b> performs page-up functions on the History screens.
<b>SPACEBAR</b>	Toggles among options displayed for current menu item. For example, to select the Application mode from the <i>Config, System Settings</i> menu, press the ↓ key to highlight the Application mode option, press the <b>SPACEBAR</b> until the desired option (UNSTRUCT, STRUCT, TSP, SINGLE) is highlighted, then press <b>ENTER</b> to confirm the selection.
<b>ESC</b>	Exits the current screen and returns to the previous screen. Selections made on the current screen are discarded. Press <b>ESC</b> in a text field to cancel the text entry and restore the old value.
<b>ENTER</b>	Applies all selections on the current screen. Press <b>ENTER</b> twice for numeric changes to take effect. When editing a text field, however, the first <b>ENTER</b> terminates editing and a second <b>ENTER</b> applies any changes.  Because the system will not accept invalid configurations, some settings will not be allowed. Verify that all new settings remain set after the highlighted cursor is moved from the selection being changed.

# CONSOLE SCREEN MENU STRUCTURE

The Console screen displays a row of dropdown menus that serve as a guide to the appropriate option or screen. [Figure 8](#) shows the structure of the Console screen menus, which pertains only to the local configuration and not to the remote. Each menu is identified by name in the menu bar (for example, Monitor, History, and Config.). The “Display” and “Displays” designation indicates that the menu or submenu shows one or more screens. [Table 3](#) on [page 14](#) describes the dropdown menus selected from the Console screen.



**Figure 8.** Console Screen Menu Structure

**Table 3. Console Screen Menus**

<b>Menu Name</b>	<b>Function</b>
<u>M</u> ain	Displays the Main status Console screen to: <ul style="list-style-type: none"> <li>• View the circuit configuration</li> <li>• View performance summary information</li> <li>• View alarm summary information.</li> </ul>
<u>M</u> onitor	Monitors the past 24-hour performance of the LTU interfaces, NTU interfaces, or HDSL spans.
<u>H</u> istory	Views 24-hour, 7-day, or alarm history displays for any of the following: <ul style="list-style-type: none"> <li>• LTU interface</li> <li>• HDSL spans</li> <li>• NTU interface</li> <li>• Clear all the 24-hour, 7-day or alarm histories</li> </ul>
<u>C</u> onfig	Performs any of the following system functions: <ul style="list-style-type: none"> <li>• View or change global operating parameters for the system</li> <li>• View or change LTU interface, HDSL span, or NTU interface operating parameters</li> <li>• View or change alarm parameters</li> <li>• Set the time and date</li> <li>• Set or change the unit password</li> <li>• Change the circuit ID</li> <li>• Configure terminal display</li> <li>• Set all operating parameters to factory defaults</li> </ul>
<u>T</u> est	Performs any of the following test functions: <ul style="list-style-type: none"> <li>• Set the loopback mode and location</li> <li>• Set the loopback time-out</li> <li>• Enable or disable loopback operation</li> <li>• Initiate Bit Error Rate (BER) test and monitor BER results</li> </ul>
<u>I</u> nventory	Displays registration information to track product manufacturing, configuration, and revision state.
<u>Q</u> uit	Logs off the system.
<u>H</u> elp	Displays a screen of helpful information regarding the product.

## SYSTEM SETTINGS

The settings available in the *Config System Settings* menu are listed in [Table 4](#). The settings in bold type are factory default settings.

**Table 4.** *Settings in Config System Settings Menu*

System Setting	Description
Application mode	Select one of the following application modes:
<b>UNSTRUCT</b>	System operates in the unstructured (unframed) application mode using 24 time slots. Use when LTU and NTU use either the DSX-1 or Nx64K port with no framing. Two port (DSX-1 and Nx64K) operation is not possible.
STRUCT	System operates in the structured (framed) application mode using 1 to 24 time slots. Use to transport framed voice channels between the LTU and NTU DSX-1 ports and serial data between the Nx64K ports at the same time.
TSP	System operates in time slot prioritization mode. Time slots 1 through 12 transport high priority traffic over Loop 1; time slots 13 through 24 transport low priority traffic over Loop 2. If a loop fails, time slots 1 through 12 are sent over the active loop. The NTU must be locally powered. Remote Power Feed must be set to NONE.
SINGLE	System operates in single-pair mode using time slots 1 through 12 on Loop 1. Use to transport framed voice channels between the LTU and NTU DSX-1 ports or serial data between the Nx64K ports. The NTU must be locally powered. Remote Power Feed must be set to NONE.
Remote Power Feed Mode	Select one of the following power feed modes:
NONE	Disables the remote power feed mode. The NTU must be locally powered. Used for TSP and SINGLE application modes.
<b>POWER</b>	LTU (HLU-819) supplies full power to the NTU through both loops.
WETTING	LTU (HLU-819) supplies a low level DC current to prevent corrosion of HDSL lines and connections. The NTU must be locally powered.
Remote Power Feed Loop	No selection available.
<b>BOTH</b>	BOTH is displayed in UNSTRUCT (unframed), STRUCT (framed), and TSP application modes. The LTU (HLU-819) uses Loop 1 and Loop 2 to supply power to the NTU.
LOOP1	LOOP1 displays in SINGLE application mode when POWER is selected for Remote Power Feed mode. This is followed by the warning <code>NTU LOCAL POWER REQUIRED, PROCEED ANYWAY (Y/N)</code> . This will allow the remote unit to be powered from one loop, but will limit distance.
Remote Console Screen Access	Select whether system settings can be made from the NTU console screen or the settings are read-only. This option is set only at the LTU.
<b>ALLOWED</b>	NTU console screens can be used to make system settings.
BLOCKED	NTU console screens are read-only. The LOC and REM pushbuttons on the NTU are also disabled. System settings can be made only from the LTU console screen. A remote user is unable to log on, either initially or after quitting the screen, if the system setting is set to BLOCKED. If the system setting is changed to BLOCKED while the remote user is logged on, the screen changes to read-only.
Protection Switch Command	Not supported.

## LTU (HLU-819) AND NTU (UTU-814) INTERFACE SETTINGS

The settings available in the *Config LTU* and *Config NTU Interface* menus are listed in [Table 5](#). The settings in bold type are factory default settings.

**Table 5.** *Settings in Config LTU and NTU Interface Menus*

<b>Field</b>	<b>Description</b>
Primary Timing Source DS1:	Select the clock source for the HDSL transmit direction.
EXT	External 1.544 MHz clock. (This is not a valid option with the HLU-819.)
<b>DSX-1</b>	Clock extracted from T1 data stream.
<b>DSX-1 Port</b>	
Framing Mode	Select the framing mode used by your equipment.
D4-SF	Provides 12 frames of 24 time slots per SuperFrame (SF).
ESF	Provides 24 frames of 24 time slots per Extended SuperFrame (ESF).
<b>N/A</b>	Unit is in unstructured (unframed) application mode.
Idle Code	Select a transmit idle code for insertion into unused time slots.
00 to <b>FF</b>	Idle code (from 00 to FF) is transmitted in unused time slots from DSX-1 port.
Data Rate/# of TSs <sup>(a)</sup>	Specify the DSX-1 transmit data rate as the number of kbps or the number of Nx64K time slots.
64 to 1536 (kbps) or 0 to 24 (time slots)	Enter the data rate from 64 to 1536 kbps (for example, 64, 256, 768). Factory default setting is 1536 kbps (24 time slots).  Enter the number of Nx64K time slots up to 24 (for example, 1, 12, 24). Factory default setting is 24 (1536 kbps).
Beginning TS <sup>(a)</sup>	Enter the number of the beginning time slot for the transmitted T1 data. Options are time slots 1 to 24 in STRUCT (framed) application mode and time slot 1 in UNSTRUCT (unframed) mode. The factory default setting is time slot <b>1</b> .
AIS Mode	Specify the mode used to assert an Alarm Indication Signal (AIS). Used in structured (framed) mode.
<b>FULL</b>	The full AIS mode asserts the AIS when one loop is down.
HALF	The half AIS mode asserts the AIS when both loops are down.
Line Equalization	Select the line equalization according to the distance from the DSX-1 cross-connect to the UTU-814 and the HLU-819.
<b>0</b>	Sets the line equalization for 0 to 132 feet.
133	Sets the line equalization for 133 to 265 feet.
266	Sets the line equalization for 266 to 398 feet.
399	Sets the line equalization for 399 to 532 feet.
533	Sets the line equalization for 533 to 655 feet.
Insert Framing	Enable or disable framing insertion. Use where data requires insertion of D4-SF or ESF framing for transmission over T1 network.
<b>DIS</b>	Disables framing insertion.
ENA	Enables framing insertion.

**Table 5. Settings in Config LTU and NTU Interface Menus (Cont.)**

<b>Field</b>	<b>Description</b>
Line Code	Select Bipolar Eight Zero Substitution (B8ZS) or Alternate Mark Inversion (AMI) line coding.
<b>B8ZS</b>	Outgoing streams of eight consecutive zeros are replaced with B8ZS code words. Received B8ZS words are replaced with all zeros.
AMI	Binary ones (marks) are transmitted as alternating positive and negative pulses, and zeros have an absence of pulses.
<b>Nx64K Port (Data port on the UTU-814)</b>	
Interface Type	Selection is only available for NTU. The serial data interface at the Nx64K port conforms to V.35, V.36, RS-530, RS-449, or X.21 standards.
Data Rate/# of TSs <sup>(a)</sup>	Specify the Nx64K transmit data rate as the number of kbps or the number of Nx64K time slots.
64 to <b>1536</b> (kbps) or 0 to <b>24</b> (time slots)	Enter the data rate from 64 to 1536 kbps (for example, 64, 256, 768). Factory default setting is 1536 kbps (24 time slots).  Enter the number of Nx64K time slots up to 24 (for example, 1, 12, 24). Factory default setting is 24 (1536 kbps).
Beginning TS <sup>(a)</sup>	Enter the number of the beginning time slot for the transmitted serial data. Options are time slots 1 to 24 in STRUCT (framed) application mode and time slot 1 in UNSTRUCT (unframed) mode. The factory default setting is time slot <b>1</b> .
Transmit Clock	Specify the transmit data (SD) clock as External (EXT), Internal Rising Edge ( <b>INT_RISING</b> ), or Internal Falling Edge (INT_FALLING).
CTS/DSR/RLSD	Specify one of three methods the LTU and NTU uses to generate the CTS, DSR, and RLSD control signals for the Nx64K (V.35, V.36, RS-530, RS-449, or X.21) serial data port. The Nx64K port is hardware configured as Data Communication Equipment (DCE). Set each of these parameters to match the requirements of the application. The choices are:
<b>STD</b> (standard)	The output control signal follows the ITU standards.
ON (force ON)	Control signals are always ON.
OFF (force OFF)	Control signals are always OFF.
LL/RL	Select whether the LTU and NTU respond to or ignore the Local Loopback (LL) and Remote Loopback (RL) control signals.
DIS	LTU and NTU ignore LL and RL control signals.
<b>ENA</b>	LTU and NTU respond to LL and RL control signals. Status of local and remote loopbacks appears on the Test display.
(a) The number of times slots selected for the DSX-1 port determines the number of time slots remaining for the Nx64K port, and may determine the beginning time slot for the Nx64K port in NTU only. Overlapping time slots are not allowed.	

## READING THE CONSOLE SCREENS

The UTU-814 List 1B performs the same functions as a HiGain Remote Unit (an HRU). However, in all console screens, the UTU is referred to as an “NTU”, and the HLU-819 is referred to as an “LTU.”



**For proper operation, only NTUs will connect to LTUs.**

## VIEWING STATUS

View status using a maintenance terminal or PC running a terminal emulation program connected to the HMU-319 craft port using TAO to access the HLU-819.

## MAIN CONSOLE SCREEN

The main console screen displays a summary of LTU and NTU circuit configuration, as well as performance statistics and alarm status for each interface. [Table 6](#) lists the information displayed in each field of the main console screen.



**When entering a number on the screen, for example a time slot number, it is important to hit the **ENTER** key slowly two times for the change to take effect.**

**When selecting an option from a set of choices, for example line code B8ZS or AMI, it is important to hit the **ENTER** key once to secure that selection.**

*Table 6. Information Displayed in Main Console Screen*

Field	Description
<b>Circuit Configuration</b>	
DSX-1	Identifies the LTU and NTU DSX-1 port.
<i>n</i> TS	Indicates the number of T1 time slots ( <i>n</i> ) selected for the DSX-1 application interface.
V.35	Identifies the NTUV.35 port.
V.36	Identifies the NTU V.36 port.
RS-449	Identifies the NTU RS-449 port. (RS-530 supersedes RS-449, but does not display on the main console screen. RS-449 must be selected to use the RS-530 interface.)
X.21	Identifies the NTU X.21 port.
<i>n</i> k	Indicates the data rate selected for the Nx64K application interface.
RPF/WETTING	Indicates RPF (POWER) or WETTING mode for Remote Power Feed. Nothing is shown when NONE is selected.
Timing	Indicates the clock source for the HDSL transmit direction.
EXT	External 1.544 MHz clock.
DSX-1	Clock extracted from T1 data stream.
Framing	Indicates the Framing Mode selected for the DSX-1 port.
D4-SF	SuperFrame contains 12 frames with 24 time slots per SuperFrame.

**Table 6. Information Displayed in Main Console Screen (Cont.)**

<b>Field</b>	<b>Description</b>
ESF	SuperFrame contains 24 frames with 24 time slots per Extended SuperFrame.
Application Mode	Indicates application mode selected.
STRUCT	With framing.
UNSTRUCT	No framing.
TSP	Time slot prioritization with framing.
SINGLE	Single pair with framing.
<b>Performance</b>	
MAR1	Displays the Margin value for the HDSL Loop 1 interface at the LTU and NTU or displays link status (SIG, ACK, etc.) if link is not up.
MAR2	Displays the Margin value for the HDSL Loop 2 interface at the LTU and NTU or displays link status (SIG, ACK, etc.) if link is not up.
ES1	Displays the errored second counts for the LTU and NTU DSX-1 ports and the HDSL Loop 1 interface at the LTU and NTU. The counts are totals for the latest 24-hour period, including the current 15-minute interval.
ES2	Displays the errored second counts for the LTU and NTU Nx64K (V.35, V.36, RS-530, RS-449, or X.21) ports and the HDSL Loop 2 interface at the LTU and NTU. ES2 is calculated the same as for ES1.
<b>Alarms</b>	
The Alarms field displays a list of all active alarms at the LTU and NTU interface and the HDSL Span 1 interface.	
Possible LTU and NTU Interface alarms:	
LOS	Loss of signal at the DSX-1 or V.35, V.36, RS-530, RS-449, or X.21 input.
LFA	Loss of frame alignment at the DSX-1 input (framed mode only).
AIS	Alarm Indication Signal (unframed all ones) received at the DSX-1 input.
RAI	Remote Alarm Indication Signal received at the DSX-1 input (framed mode only).
LOC	Loss of clock when EXT timing is used. The external clock was lost for the previous second. This alarm is reset when the clock is active again.
Possible HDSL Span 1 alarms:	
MAR	Margin has fallen below alarm threshold for one or both loops of the HDSL Span.
ES	Errored second count has exceeded alarm threshold for one or both loops of the HDSL Span.
LOSW	Loss of sync word for one or both loops of the HDSL Span. Remains active during restart, but not a cold start.
PFO	Power feed open for one or both loops of the HDSL Span. Always disabled.
PFS	Power feed short for one or both loops of the HDSL Span. Remains active until power is successfully fed to remote unit, or remote power feeding is disabled.
NOPSW	Protection circuit (backup) is not available.

## MONITOR SCREENS

The monitor screens display the signal activity and Performance Monitor (PM) counts at the LTU (HLU-819) DSX-1 and NTU (UTU-814) DSX-1, and Nx64K ports. Table 7 lists each field and a description of that field.

**Table 7. Information in Monitor LTU and NTU Interface Screens**

Field	Description
<b>DSX-1 Port</b>	
Errored Seconds (ES) 24 Hour Count	The number of one second intervals in which at least one bipolar violation (BPV) or one CRC-6 error was detected at the DSX-1 input port during the last 24hours.
Severely Errored Seconds (SES) 24 Hour Count	The number of one second intervals during which a Loss of Signal (LOS), an Alarm Indication Signal (AIS), or a Loss of Frame (or CRC-6 Multiframe) Alignment (LFA) occurred at the incoming port.
Unavailable Seconds (UAS) 24 Hour Count	The number of seconds that DSX-1 input signals were unavailable during the last 24 hours. After ten consecutive SESs, the system is deemed unavailable, and the current UAS counter begins counting from ten. After ten consecutive non-SESs, the system returns to availability, and the ten counts representing the non-SESs are removed from the UAS counter.
Bipolar Violation Seconds (Cumulative)	The number of seconds in which bipolar violations were detected at the DSX-1 port since error counters were last cleared.
<b>Nx64K Port (Data port on the UTU-814)</b>	
Data & Clk Activity	Displays the status of the data and clock signals at the Nx64K port at one-second intervals. Asterisks (**) indicate an active line. Dashes (--) indicate an inactive line. Displayed fields are: From Data Terminal Equipment (DTE):From DCE: TT SDST RT RD
Ctrl Signal State	Displays the status of the control signals at the Nx64K port at one-second intervals. ON indicates an active line. OFF indicates an inactive line. Displayed fields are: From DTE: From DCE: RTS DTR RL LLCTS DSR RLSD TM
Clear 24 Hour History	The date and time that the 24-hour histories were last cleared are displayed here. Enable this function by pressing <b>L</b> or <b>ENTER</b> to clear all 24-hour history counters (including HDSD). This action must be confirmed by pressing <b>Y</b> .

## Monitor HDSL Span Screens

Table 8 lists the information displayed in the *Monitor HDSL Span 1* screen for Loop 1, LTU-1/NTU-1, and Loop 2, LTU-1/NTU-1.

**Table 8.** *Information Displayed in Monitor HDSL Span 1 Screen*

Field	Description
Current Margin (dB) (MAR)	Indicates the excess signal-to-noise (SNR) ratio relative to a $10^{-7}$ bit error rate. The normal range of a typical margin is from 6 to 22 dB, with a value of 6 dB corresponding to a predicted BER of $10^{-10}$ .
Low Margin (dB)	Indicates the lowest margin since startup or the last 24-hour history clear.
High Margin (dB)	Indicates the highest margin since startup or the last 24-hour history clear.
Pulse Attenuation (dB)	Indicates the attenuation of the 2B1Q pulse from the distant end. This value is related to the cable pair's loss at 292 KHz. The normal range of pulse attenuation is from 1 to 32 dB.
Errored Seconds (ES)	The number of one-second intervals in which at least one HDSL CRC-6 error or loss of Sync Word (LOSW) was detected on the HDSL span during the last 24 hours.
Unavailable Seconds (UAS)	The number of seconds that the HDSL span was down during the last 24 hours.
Pair Exchange	Indicates whether the HDSL pairs carrying the traffic are correctly connected or have been interchanged. The system automatically compensates for an interchange of pairs.
Loop 1 Tip/Ring Reversal	Indicates whether the two conductors of HDSL Loop 1 are correctly connected or have been interchanged. The system automatically compensates for an interchange of wire leads.
Loop 2 Tip/Ring Reversal	Indicates whether the two conductors of HDSL Loop 2 are correctly connected or have been interchanged by error. The system automatically compensates for an interchange of wire leads.
Clear 24 Hour History	Clears all 24-hour history counters (including DSX-1 values) and displays the date and time the error counters were last cleared.

# APPENDIX A - COMPATIBILITY

The HLU-819 is compatible with the following T1 repeater shelves and associated equipment:

- Wideband System 3190 (HMS-357 and HMS-358)
- HMS-317 (28-slot, 23-inch shelf)
- HMS-308 (8-slot, 3192 mechanics, remote enclosure)

The UTU-814 List 1B is compatible with the following HiGain ETSI shelves and enclosures.

- EMS-830 Exchange Office Management Shelf, rear connector access (part number 150-1400-01).
- EMS-831 Exchange Office Management Shelf, front connector access (part number 150-1401-01).
- EMS-832 Exchange Office Management Shelf, front connector access (part number 150-1402-01).
- ERE-811 List 2 Single-Slot Remote Enclosure with internal ac power supply (part number 150-1411-01).

# APPENDIX B - PRODUCT SUPPORT

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

## TECHNICAL SUPPORT

Technical assistance is available 24 hours a day, 7 days a week by contacting ADC Wireline Systems Division Customer Service Group at one of the following numbers:

**Telephone:** 800.638.0031 or 714.730.3222  
The 800 telephone support line is toll-free in the U.S. and Canada.

**Fax:** 714.832.9924

A Customer Service Engineer answers technical assistance calls Monday through Friday between 7:30 AM and 5:30 PM, Pacific Time, excluding holidays. At all other times, an on-duty Customer Service Engineer returns technical assistance calls within 30 minutes.

## WORLD WIDE WEB

PairGain product and company information can be found at <http://www.pairgain.com> using any Web browser. To download PairGain product manuals from the Customer Site portion of the web page, you need to provide a customer password. If you do not have a password, contact your PairGain sales representative.

## RETURNS

To return equipment to ADC Wireline Systems Division:

- 1** Locate the number of the purchase order under which the equipment was purchased. You will need to provide this number to ADC Wireline Systems Division Customer Service to obtain a return authorization.
- 2** Call or write ADC Wireline Systems Division Customer Service to ask for a Return Material Authorization (RMA) number and any additional instructions. Use the telephone number, fax number, or email address listed below:
  - Telephone: 800.370.9670
  - Fax: 714.832.9923
  - Email Address: [rma@adc.com](mailto:rma@adc.com)
- 3** Include the following information, in writing, along with the equipment you are returning:
  - Company name, address, telephone number, and the name of a person Customer Service can contact regarding this equipment.
  - The purchase order number provided to Customer Service when the RMA number was requested.
  - A description of the equipment, as well as the number of units that you are returning. Be sure to include the model and part number of each unit.
  - The shipping address to which Customer Service should return the repaired equipment.

- The reason for the return:
  - The equipment needs an ECO/ECN upgrade.
  - The equipment is defective.



**If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.**

- If there is another reason for returning the equipment, please let us know so we can determine how best to help you.
- 4 Pack the equipment in a shipping carton.
  - 5 Write the ADC Wireline Systems Division address and the Return Material Authorization Number you received from Customer Service clearly on the outside of the carton and return to:

ADC Wireline Systems Division  
14352 Franklin Ave.  
Tustin, CA 92780-7013

Attention: **RMA (Number)**



**All shipments are to be returned prepaid. ADC will not accept any collect shipments.**

# APPENDIX C - ABBREVIATIONS

## A

**AIS:** Alarm Indication Signal  
**AMI:** Alternate Mark Inversion  
**AWG:** American Wire Gauge

## B

**B8ZS:** Bipolar Eight Zero Substitution  
**BER:** Bit Error Rate  
**BNC:** Bayonet-Locking Connector  
**BPV:** Bipolar Violation  
**BRG:** Bridge

## C

**CLEI:** Common Language Equipment Identifier  
**CO:** Central Office  
**CPE:** Customer Premise Equipment  
**CSU:** Channel Service Unit  
**CTS:** Clear to Send

## D

**dB:** Decibel  
**DCE:** Data Communication Equipment  
**DS1:** Digital Signal, level 1  
**DSU:** Data Service Unit  
**DSX-1:** DS1 Cross-Connect Frame  
**DTE:** Data Terminal Equipment

## E

**ECI:** Equipment Catalog Item  
**ERE:** ETSI Remote Enclosure  
**ES:** Errored Second  
**ETSI:** European Telecommunications Standards Institute  
**EXT:** External

## H

**HDSL:** High bit-rate Digital Subscriber Line  
**HLU:** HiGain Line Unit  
**HMS:** HiGain Management Shelf  
**HRU:** HiGain Remote Unit

## L

**LED:** Light Emitting Diode  
**LFA:** Loss of Frame Alignment  
**LL:** Local Loopback  
**LOC:** Loss of Clock  
**LOS:** Loss of Signal  
**LOSW:** Loss of Sync Word  
**LTU:** Line Termination Unit

## M

**MAR:** Margin

## N

**NEBS:** Network Equipment - Building System  
**NEC:** National Electrical Code  
**NTU:** Network Termination Unit

## O

**OSTS:** Open Span Termination Shelf

## P

**PFO:** Power Feed Open  
**PFS:** Power Feed Short  
**PM:** Performance Monitor

## R

**RAIS:** Receive Alarm Indication Signal  
**RCV:** Receive  
**RL:** Remote Loopback  
**RLSD:** Receiving Level Signal Detected  
**RPF:** Remote Power Feed  
**RT:** remote terminal  
**RTS:** Request to Send

## S

**SD:** Send Data  
**SES:** Severely Errored Seconds  
**SF:** SuperFrame  
**ST:** Send Timing

## T

**TAO:** Terminal Access Option  
**TL1:** Transaction Language  
**TM:** Test Mode

## U

**UAS:** Unavailable Seconds  
**UTU:** Universal Termination Unit

## X

**XMT:** Transmit



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# CERTIFICATION AND WARRANTY

## FCC 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

ADC DSL Systems, Incorporated (“ADC”) warrants that, for a period of sixty (60) months from the date of shipment, the hardware portion of its products will be free of material defects and faulty workmanship under normal use. ADC’s obligation, under this warranty, is limited to replacing or repairing, at ADC’s option, any such hardware product which is returned during the 60-month warranty period per ADC’s instructions and which product is confirmed by ADC not to comply with the foregoing warranty.

ADC warrants that, for a period of 90 days from the date of purchase, the software furnished with its products will operate substantially in accordance with the ADC published specifications and documentation for such software. ADC’s entire liability for software that does not comply with the foregoing warranty and is reported to ADC during the 90-day warranty period is, at ADC’s option, either (a) return of the price paid or (b) repair or replace of the software. ADC also warrants that, for a period of thirty (30) days from the date of purchase, the media on which software is stored will be free from material defects under normal use. ADC will replace defective media at no charge if it is returned to ADC during the 30-day warranty period along with proof of the date of shipment.

The transportation charges for shipment of returned products to ADC will be prepaid by the Buyer. ADC will pay transportation charges for shipment of replacement products to Buyer, unless no trouble is found (NTF), in which case the Buyer will pay transportation charges.

ADC may use reconditioned parts for such repair or replacement. This warranty *does not* apply to any product which has been repaired, worked upon, or altered by persons not authorized by ADC or in ADC’s sole judgment has subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

Repaired products have a 90-day warranty, or until the end of the original warranty period—whichever period is greater.

ADC DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ITS PRODUCTS AND ANY ACCOMPANYING WRITTEN MATERIALS. FURTHER, ADC DOES NOT WARRANT THAT SOFTWARE WILL BE FREE FROM BUGS OR THAT ITS USE WILL BE UNINTERRUPTED OR REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE SOFTWARE IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY OR OTHERWISE.

## MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC DSL Systems, 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 (NEC).

## STANDARDS COMPLIANCE

The HLU-819 List 1 has been tested and verified to comply with the applicable sections of the following standards:

- Binational standard, UL-1459: Electrical Safety: Telephone Equipments
- CSA-C22.2 No. 225-M90: Telecommunication Equipment - Electronics and Electrical Safety
- GR 63-CORE: Network Equipment - Building System (NEBS) Requirements
- GR 1089-CORE: Electromagnetic Compatibility and Electrical Safety

For technical assistance, refer to “*Appendix B - Product Support*” on page 23.

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