HIGAIN ETSI LINE UNIT
QUICK INSTALLATION GUIDE

Model	List Number	Part Number	CLEI Code
ELU-819	1	150-2230-01	VACHNRXC
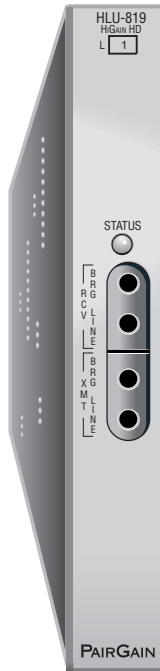
PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING SERVICES
SECTION 350-819-300-01

pairgain

Revision History of This Guide

Revision	Release Date	Revisions Made
01	January 10, 2000	Initial Release.

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**.

- 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 have comments on this PairGain document, send an email to technical_publications@pairgain.com. Type the product name and the section number of the document in the subject area of the email message.

The following related technical practices can be downloaded from the Customer Site portion of the PairGain Web page at *www.pairgain.com* using any Web browser.

Document Title	Section Number	Description
ELU-819 List 1 Technical Practice	150-819-300-01	Provides functional description, configuration, performance, monitoring, and system maintenance information.
ERE-811 List 2, List 3, and List 4 Technical Practice	700-811-102-01	Provides installation, specification, interface, and power connection information on the ERE-811.
UTU-801/802/804 Lists 5 Technical Practice	700-801-905-01	Provides information on installation, configuration, and terminal console screen performance and monitoring
HMU-319 Lists 7 and 7A Technical Practice	150-319-107-01	Provides information on the installation, provisioning, and management of the HMU.
HMU-319 List 7A Technical Practice	150-319-171-01	Provides information on the installation, provisioning, and management of the HMU.

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 PairGain. 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 PairGain as described in the Warranty located inside the back cover. 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:

Input voltage for the UTU-801, UTU-802, and UTU-804 List 5 line units (nominal -48 Vdc, tolerance -36 to -72 Vdc) must be supplied by an isolated DC source that complies with TNV or earthed SELV requirements of the latest version of IEC 950.

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. All wiring external to the product should follow the local wiring codes.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW

PairGain® HiGain-ETSI™ Line Unit ELU-819 List 1 installs in any 3192-compliant chassis and interfaces with the HiGain-ETSI Universal Termination Units UTU-801 List 5, UTU-802 List 5, and UTU-804 List 5. The ELU-819 and the UTUs provide the Central Office (CO) and remote terminal (RT) sides of a repeaterless, High bit-rate Digital Subscriber Line (HDSL), respectively. The RT provides both E1 (G.703) and data interface (V.35, V.36, RS-449, X.21, or RS-530) ports to the customer (see Figure 1). The ELU-819 accepts the respective payloads through a E1 port from a multiplexer or a cross-connect shelf and transports it to the UTU-801 List 5, UTU-802 List 5, or UTU-804 List 5 at a maximum data rate of up to 2.048 Mbps. An internal time-slot assignment function splits the E1 bandwidth between these two ports as two Nx64K tributaries.
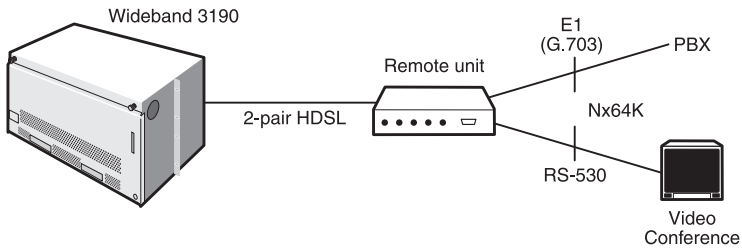
Figure 1.   *Typical ELU-819 List 1 Application (E1 to Dual-Port Operation)*

> **For the ELU-819 List 1 to support E1 transmission over HDSL lines at the customer remote, the ETSI Remote Enclosure ERE-811 List 2 and the UTU-801 List 5, UTU-802 List 5, or UTU-804 List 5 (ETSI cards) must be used at the remote location.**

The ELU-819 List 1 is part of the Open Span Termination Shelf (OSTS) family of products supported by the PairGain Wideband System 3190. With this card, the entire PairGain ETSI family of remote Customer Premise Equipment (CPE), which includes UTU-801, UTU-802, and UTU-804 List 5, can be subtended to the Wideband System 3190 to provide standard Digital Service Unit (DSU) and Channel Service Unit (CSU) data port interfaces.

The ELU-819 fits into a 3192 mechanics shelf and conforms to ANSI T1.403-1989 and AT&T CB 119 standards. The ELU-819 requires -36 to -72 Vdc from the local power supply and can source up to 60 milliamperes (mA) on each of the HDSL data loops to line power the remote unit.

Transmission ranges are based on a signal attenuation of 35 dB at 292 kHz with 135 Ω terminations, and assume the presence of noise according to the model described in ETSI specification TS 101 135. The expected Bit Error Rate (BER) under this noise model is less than $1x10^{-7}$. The reach of the system in such a noise environment is 2.8 km (1.74 miles) over 0.4 mm [26 American Wire Gauge (AWG)] or 3.35 km (2.08 miles) over 0.51 mm (24 AWG) twisted-pair copper wire.

The ELU-819 List 1 has the following standard features:

- E1 interface at the CO

- E1 interface 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 data into E1 network

- HDB3 line code

- Time-slot prioritization on loss of one pair

- Point-to-multipoint transport

- Status LED

- Compatible with OSTS

- E1 splitting and bridge access

- Line power to drive the remote unit

- Integrated dual port fractional E1 delivery system

FRONT PANEL

Figure 2 shows the ELU-819 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.

Configuration number label
(on inside of handle)

ELU-819
HiGain HD
L 1

Status LED

STATUS

B R G L I N E
R C V

B R G L I N E
X M T

E1 (G.703) access jacks

CLEI code label
(on outside of handle)

PairGain
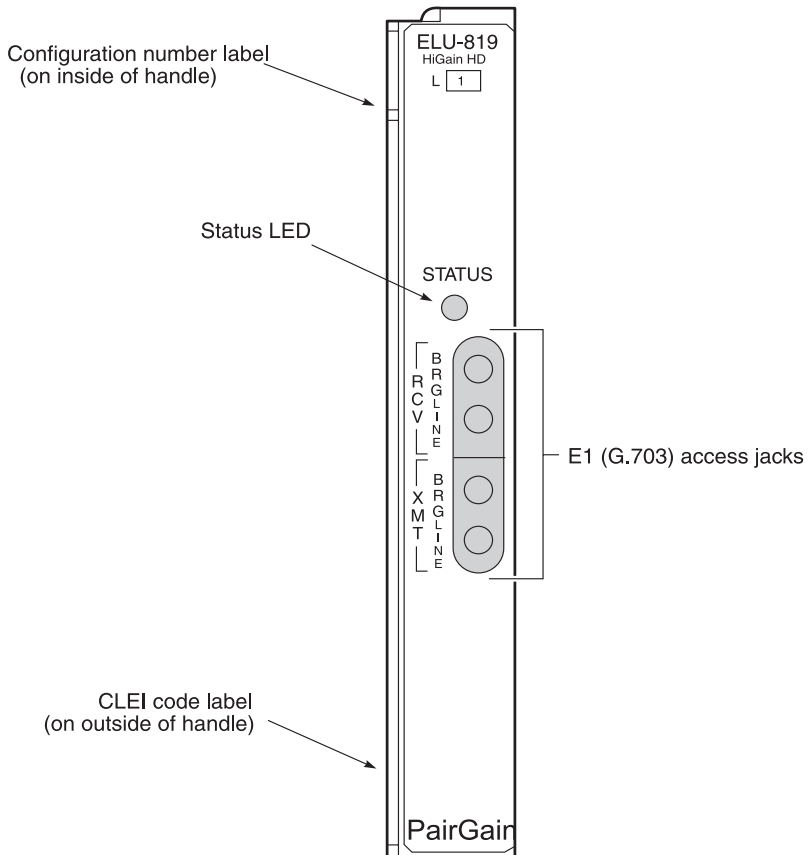
Figure 2.   ELU-819 List 1 Front Panel

Table 1. *ELU-819 List 1 Front-panel Status LED Description*

Item	Function
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 E1 signal, Receive Alarm Indication Signal (RAIS), or Loss of Frame Alignment (LFA).
Steady Yellow	Indicates ELU loopback is in effect.
E1 (G.703) access jacks	
BRG	Provides non-intrusive bridging jack access to XMT and RCV at the E1 interface. Allows the two E1 payloads to be monitored.
LINE	Provides splitting jack access to Transmit (XMT) and Receive (RCV) at the E1 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.
Configuration Number (located on the side of the unit)	Contains 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 and 5 = Configuration number
	The configuration number can also be found on a small bar label that contains the Julian date code and part number. This gummed label may be attached to the PC board or to the front panel.
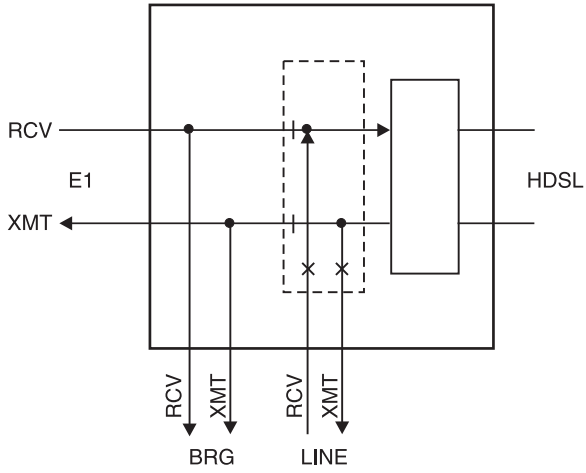
Figure 3.   *E1 (G.703) Access Jacks*

INSTALLATION

This section provides instructions for setting up the ELU-819 and installing the UTU-801 List 5, UTU-802 List 5, or UTU-804 List 5 into the ERE-811 List 2 remote unit. The remote unit can be powered from either the ELU-819 (must be configured) or locally, using either 110 Volts, Alternating Current (VAC) or -48 Vdc power. The remote unit must be set up independently from the CO terminal if the HDSL loops are down and the remote is powered locally.

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

INSTALLING THE **ELU-819** INTO A **3192 S**HELF
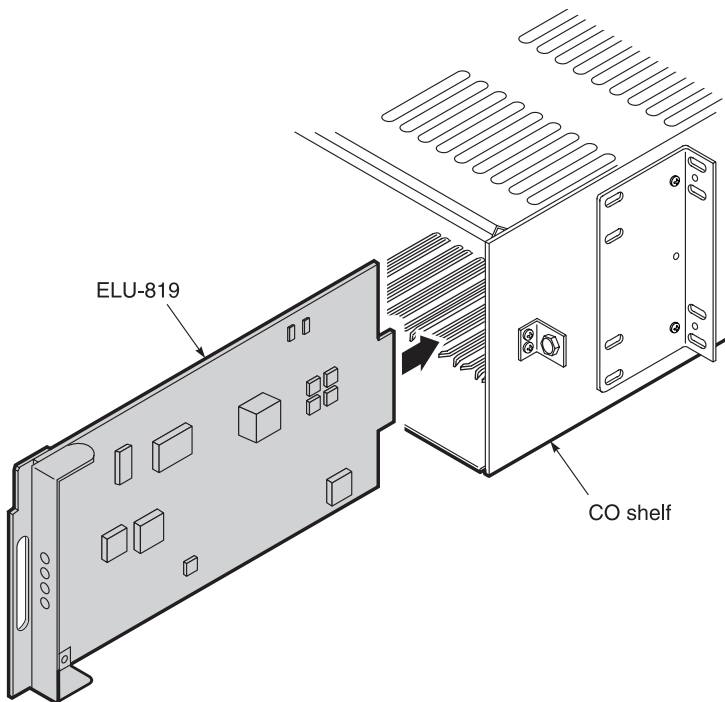
Figure 4. *Installing the ELU-819 into a 3192 Shelf*

1 Align the ELU-819 with the enclosure slot guides and slide the unit in. (Figure 4).

2 Push the unit back until it touches the backplane card-edge connector and is firmly seated. Once the ELU-819 is in place, it is automatically configured as an LTU which displays on the maintenance terminal console screens.

INSTALLING A UTU INTO THE ERE-811 REMOTE ENCLOSURE

UTU Jumper Settings

Jumpers must be set on the UTU units if using a 120 Ω interface or if grounding your G.703 cables at the data port on the shelf or remote enclosure. The locations of these jumpers (P8, P11, and P12) are shown in Figure 5.
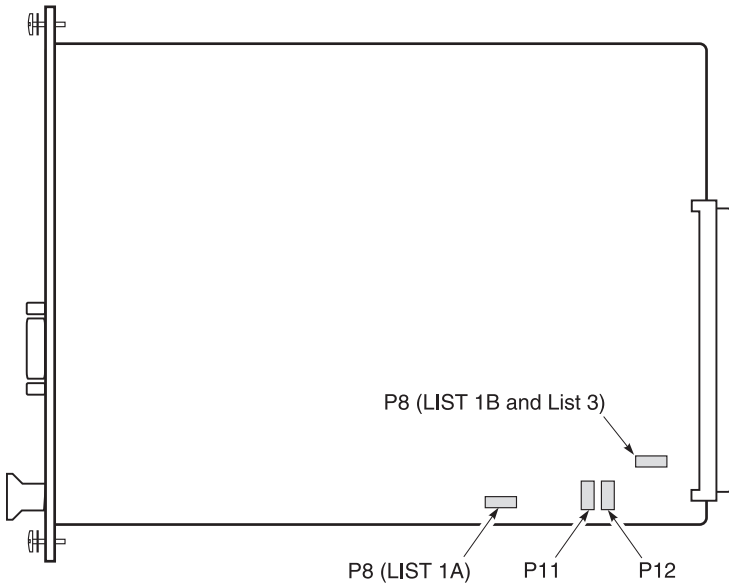
Figure 5. *Jumper Locations*

To set the jumpers on the UTU line units:

1   Jumper P8 complies with the ITU G.703 requirement that an option be
provided to allow the connection of the outer conductor of the coaxial
pair or the screen of the symmetrical pair to earth (frame) ground at the
G.703 input data port. Do one of the following:

- Do not install a jumper. This is the factory setting and provides the
standard G.703 input port interface. Cable grounding is not used.

- Short P8 pins 1 and 2 if grounding the screen of the 120 Ω cable.

- Short P8 pins 2 and 3 if grounding the outer conductor of the
75 Ω input cable.

2   Jumpers P11 and P12 configure the line unit for use with a 75 Ω or
120 Ω G.703 interface (see Figure 7 on page 11). Place the four-position
jumper block on one of the following:

- P11 for balanced 120 Ω circuits

- P12 for unbalanced 75 Ω circuits (factory setting)

UTU Installation
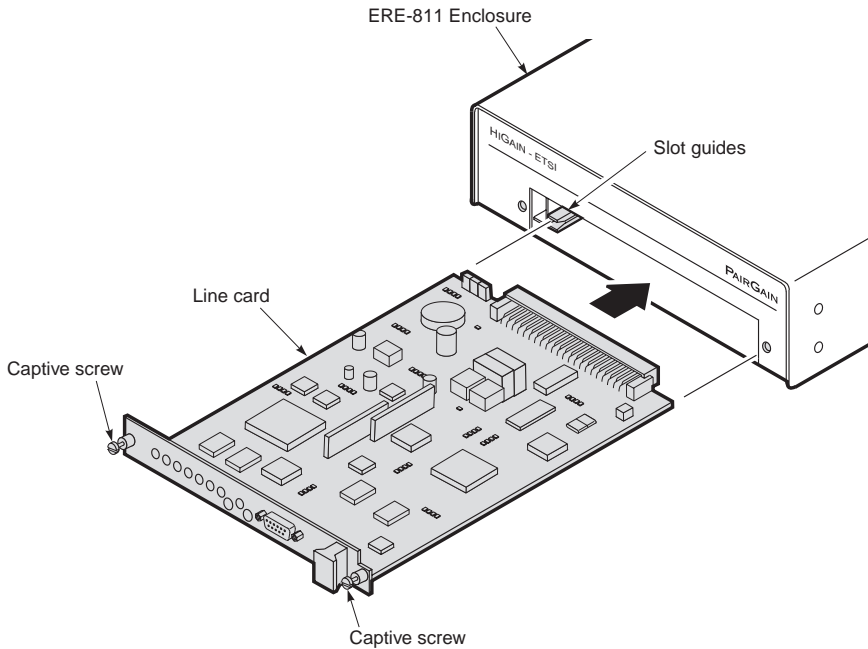
Figure 6.   Installing a UTU into the ERE-811 Remote Enclosure

1   Align the card with the enclosure slot guides at the left and right sides of the enclosure opening (Figure 6).

2   Push the card into the enclosure until the front panel is flush with the front of the enclosure.

3   Tighten the captive screws.

4   Connect the E1 port cable DB-15F (see Figure 7 on page 11), if applicable. The ECA-806 List 1 (DB-15M to RJ-45C) and the ECA-808 List 1 (DB-15M to RJ-45X) adapters can be used when connecting the cable.

5 Connect the Nx64K data port cable DB-25F (Figure 7), 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 7).

The UTU defaults as an NTU, which displays on the maintenance terminal console screens after HDSL startup and synchronization.
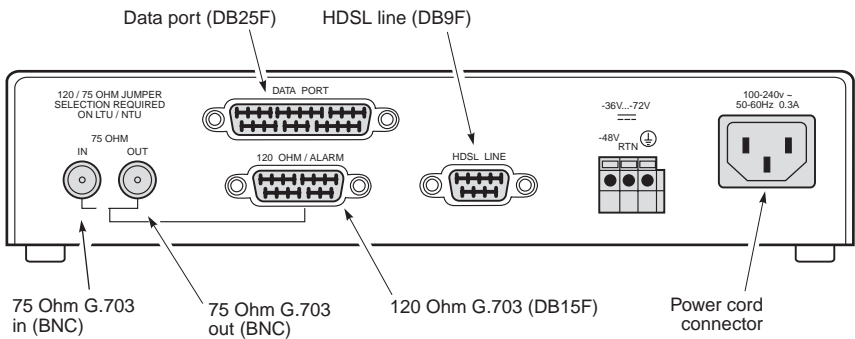
Figure 7.   *ERE-811 List 2 Rear Panel*

HDSL STARTUP AND SYNCHRONIZATION

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

1   The Status LED flashes green once per second as the unit attempts to establish synchronization.

2   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.

> **HMU-319 List 7A must be loaded with software version V.3.0 or higher to provide this function. If this is not available, configuration must be performed from the remote unit.**
>
> **Refer to document 150-319-107-xx for more detailed information on terminal connections (see "Documentation" on page iv).**

- 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 craft port or Operating System (OS) port located at the back of the Wideband System 3190, or through a TELNET session over an Ethernet Local Area Network (LAN) connected to the chassis. The console screens cannot be accessed through the ELU-819 because this model does not provide a craft port.

After HDSL establishes communication with the remote unit, the HDSL system can be configured and performance monitored from the HMU-319 management unit. The ELU-819 and UTUs 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 ELU-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 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 8 on page 15.

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
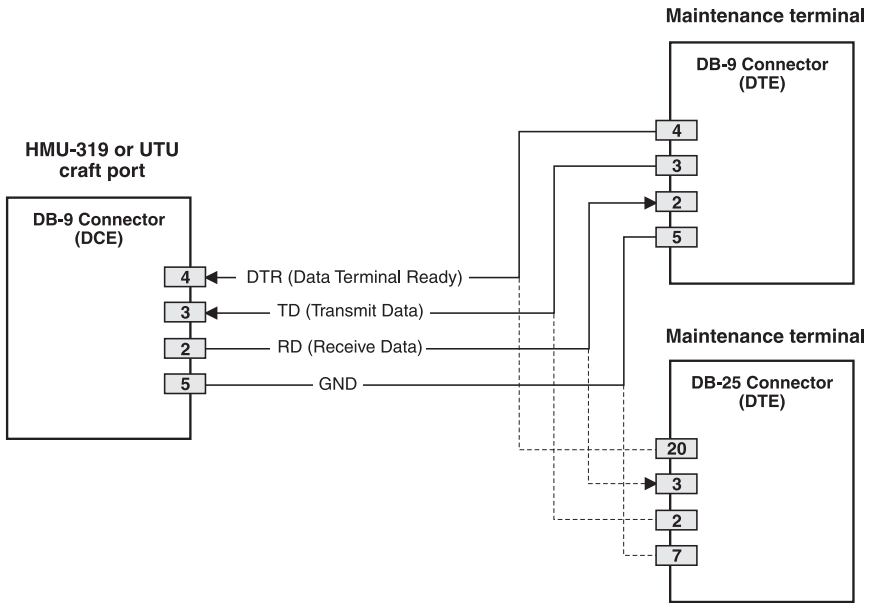
Figure 8.   *HMU-319 Craft Port and Maintenance Terminal*
Connector Pinouts

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 "Documentation" on page iv or "Appendix C - Product Support" on page 34).

You must log on to the WBS-3190 in order to access the ELU-819 maintenance terminal console screens through the HMU interface. 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   When the **Enter TID** field appears to the left of the cursor, 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.) This action logs the user into the TL1 command environment.

5   Type TAO at the prompt, then press RETURN . This opens the Terminal Access Option (TAO).

6   Select the number of the shelf that contains the ELU card you want to configure.

7   Select the slot number of the ELU-819 to log onto this unit and display the console screen menus.

If the password or username is forgotten or lost, please contact Customer Service at 1.800.638.0031 for assistance.

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
Alpha-numeric keys	Type the underlined or highlighted letter to select and execute a menu item. For example, on the console screen menu bar, type `C` to access the *Config* dropdown menu. Also use these keys to enter values in text fields. For example, on the *Config Date and Time* menu, type the date in a MM/DD/YY format.
↑ and ↓ keys	Press the ↓ key to access a console screen dropdown menu. For example, press the ↓ key on *Config* to access the *Config* dropdown menu. Or press the ↑ and ↓ keys to highlight a sub-menu item, then press `ENTER` to select the item.
`TAB` key	Provides same function as the → key.
← and → keys	Moves horizontally across the Menu bar, except when in a text entry field.
`CTRL`+`E` and `CTRL`+`X`	`CTRL`+`E` moves up one line and `CTRL`+`X` moves down one line on the History screens.
`CTRL`+`C` and `CTRL`+`R`	`CTRL`+`C` performs page-down and `CTRL`+`R` performs page-up functions on the History screens.
`SPACEBAR`	Toggles among options displayed for current menu item. For example, to select the Application mode from the *Config System Settings* menu, press the ↓ key to highlight the Application mode option, press the `SPACEBAR` until the desired option (UNSTRUCT, STRUCT, TSP, SINGLE) is highlighted, then press `ENTER`. Press `ENTER` a second time to commit this selection to memory.

Table 2.   *Console Screen Navigation Keys (Cont.)*

These Keys	Perform this Function
`ESC`	Exits the current screen and returns to the previous screen. Selections made on the current screen are discarded. Press `ESC` in a text field to cancel the text entry and restore the old value.
`ENTER`	Applies all selections on the current screen. Press `ENTER` **twice** for numeric changes to take effect. When editing a text field, however, the first `ENTER` terminates editing and a second `ENTER` 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 9 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 (Monitor, History, Config, etc.). The "Display" and "Displays" designation indicates that the menu or sub-menu shows one or more screens. Table 3 on page 20 describes the dropdown menus selected from the Console screen. (For a detailed explanation of the screens, refer to the technical practice. See "Documentation" on page iv.)
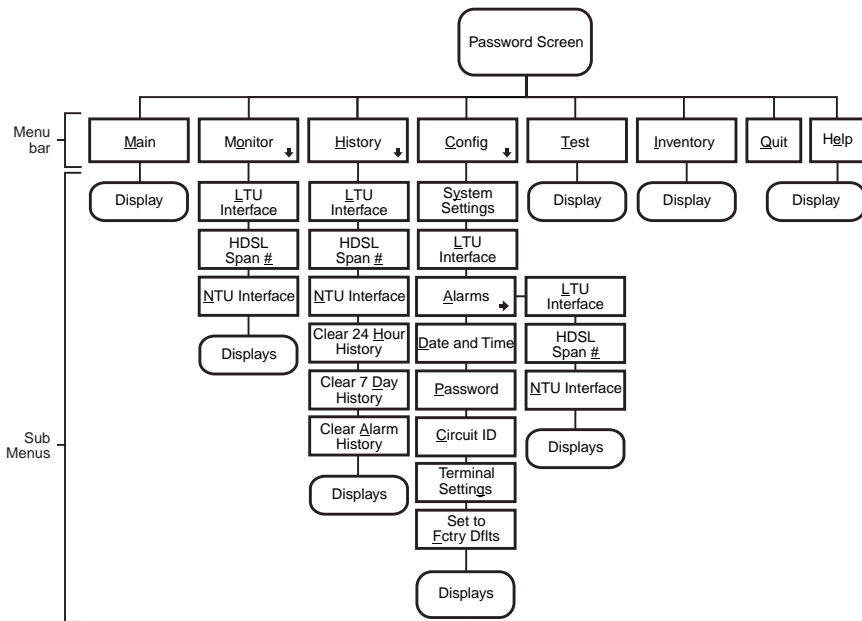
Figure 9.   *Console Screen Menu Structure*

Table 3. *Console Screen Menus*

Menu Name	Function
Main	Displays the Main status Console screen to:
	• View the circuit configuration.
	• View performance summary information.
	• View alarm summary information.
Monitor	Monitors the past 24-hour performance of the LTU interfaces, NTU interfaces, or HDSL span. Provides HDSL pair exchange.
History	Views 24-hour, 7-day, or alarm history displays for any of the following:
	• LTU interface.
	• HDSL span.
	• NTU interface.
	• Clear all the 24-hour, 7-day or alarm histories.
Config	Performs any of the following system functions:
	• View or change global operating parameters for the system.
	• View or change LTU interface, HDSL span, or NTU interface operating parameters.
	• View or change alarm parameters.
	• Set the time and date.
	• Set or change the unit password.
	• Change the circuit ID number.
	• Configure terminal display.
	• Set all operating parameters to factory defaults.
Test	Performs any of the following test functions:
	• Set the loopback mode and location.
	• Set the loopback time-out.
	• Enable or disable loopback operation.
	• Initiate Bit Error Rate (BER) test and monitor BER results.
Inventory	Displays registration information to track product manufacturing, configuration, and revision state.
Quit	Logs off the system.
Help	Displays a screen of helpful information regarding product support.

SYSTEM SETTINGS

The settings available in the *Config System Settings* menu are listed in
Table 4. The settings in boldface 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:
UNSTRUCT	System operates in the unstructured (unframed) application mode using 32 time slots. Use when LTU and NTU use either the G.703 or Nx64K port with no framing. Two-port (G.703 and Nx64K) operation is not possible.
STRUCT	System operates in the structured (framed) application mode using 1 to 31 time slots. Use to transport framed voice channels between the LTU G.703 port, and the NTU G.703 and/or Nx64K ports.
PTM	System operates in the point-to-multipoint mode. Two pairs of a single LTU connect to two different NTUs.
TSP	System operates in time slot prioritization mode. Time slots 1 through 15 transport high priority traffic over Loop 1; time slots 16 through 31 transport low priority traffic over Loop 2. If a loop fails, time slots 1 through 15 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 15 on Loop 1. Use to transport framed voice channels between the LTU and NTU G.703 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. Use for TSP and SINGLE application modes.
POWER	Enables the LTU (ELU-819) to supply parallel power (full power) to the NTU via the HDSL loops.
WETTING	Enables the LTU (ELU-819) to supply a low level DC current when not supplying full power. Wetting is used to prevent corrosion of HDSL lines and connections. The NTU must be locally powered when selecting this option.

Table 4.   *Settings in Config System Settings Menu (Cont.)*

System Setting	Description
Remote Power Feed Loop	No selection available. Always displays BOTH.
BOTH	BOTH displays in UNSTRUCT, STRUCT, and TSP application modes. The LTU (ELU-819) uses Loop 1 and Loop 2 to supply power to the NTU.
Remote Console 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.
ALLOWED	NTU console screens can be used to configure 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	Select one of the three protection switch options.
DIS	Disables the protection switch mode.
ENA	Enables the protection switch mode.
MAN	Simulates protection failure condition and manually switches data over to the protection (backup) circuit.

LTU (ELU-819) AND NTU (UTU-801, 802, OR 804) INTERFACE SETTINGS

The settings available in the *Config LTU* and *Config NTU Interface* menus are listed in Table 5. The settings in boldface type are factory default settings.

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

Field	Description
G.703 Port	
Primary Timing Source DS1:	No selection available.
G.703	Clock extracted from G.703 data stream.
CRC4 Mode	N/A
CAS Mode	Select the multiframe alignment mode for the G.703 interface.
INSERT	Inserts a multiframe alignment code into time slot 16 of frame 0 and 11011101 into time slot 16 of frames 1 through 15.
PASSTHRU	Time slot 16 is passed through unchanged at the G.703 port.
IDLE	Inserts the user-selected idle code into time slot 16 at the G.703 port.
Idle Code	Select a transmit idle code for insertion into unused time slots.
00 to **FF**	Idle code (from 00 to FF) transmits unused time slots from G.703 port.
Data Rate/# of TSs [a]	Specify the G.703 transmit data rate as the number of kbps or the number of Nx64K time slots.
64 to **2048** (kbps) or	Enter the data rate from 64 to 2048 kbps (for example, 64, 256, 768). Factory default setting is 2048 kbps.
0 to **32** (time slots)	Enter the number of Nx64K time slots up to 31 (for example, 1, 12, 31). Factory default setting is 32.
Beginning TS [a]	Enter the number of the beginning time slot for the transmitted E1 data. Options are time slots 1 to 31 in STRUCT application mode and time slot 0 in UNSTRUCT mode. The factory default setting is **0**. The bit rate and starting timeslot of both ports must be compatible or the selection will not be allowed.

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

Field	Description
AIS Mode	Specify the mode used to assert an Alarm Indication Signal (AIS). Used in structured (framed) mode.
FULL	Asserts an AIS when one loop is down.
HALF	Asserts an AIS when both loops are down.
Nx64K Port	
Interface Type	Selection is only available for NTU. The serial data interface at the Nx64K port conforms to V.36, X-21, RS-530, RS-449, or V.35 standards. Factory default setting is **V.36**.
Data Rate/# of TSs [a]	Specify the Nx64K transmit data rate as the number of kbps or the number of Nx64K time slots.
0 to 2048 (kbps)	Enter the data rate from 64 to 2048 kbps (for example, 64 or 256 or 2048). Factory default setting is zero (**0**).
0 to 32	Enter the number of Nx64k time slots up to 32 (for example, 1 or 4 or 32). Factory default setting is **0**. The bit rate and starting timeslot of both ports must be compatible or the selection will not be allowed.
Beginning TS [a]	Enter the number of the beginning time slot for the transmitted serial data. Options are time slots 1 to 31 in STRUCT (framed) application mode and time slot 0 in UNSTRUCT (unframed) mode. The factory default setting is time slot **0**.
Transmit Clock	Specify the transmit data (SD) clock as External (EXT), Internal Rising Edge (**INT_RISING**) 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.36, X-21, RS-530, RS-449, or V.35) serial data port. The Nx64K port is hardware configured as DCE. Set each of these parameters to match the requirements of the application. The choices are:
STD (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.

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

Field	Description
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.
ENA	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 time slots selected for the G.703 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-801, UTU-802, and UTU-804 List 5 perform 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 ELU-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 ELU-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 on page 27 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 FULL or HALF from AIS Mode, it is important to hit the ENTER key once to secure that selection.

Table 6. *Information Displayed in Main Console Screen*

Field	Description
Circuit Configuration	
G.703	Identifies the LTU and NTU G.703 ports.
n TS	Indicates the number of G.703 time slots (n) selected for the G.703 application interface.
V.35	Identifies the NTU V.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.
n k	Indicates the data rate selected for the Nx64K application interface.
RPF/WETTING	Indicates RPF or WETTING mode for Remote Power Feed. Nothing is shown when NONE is selected.
Timing	No selection available.
G.703	Clock extracted from G.703 data stream.
CRC4 Mode	N/A
CAS Mode	Select the multiframe alignment mode for the G.703 interface.
INSERT	Inserts a multiframe alignment code into time slot 16 of frame 0 and 11011101 into time slot 16 of frames 1 through 15.
PASSTHRU	Time slot 16 is passed through unchanged at the G.703 port.
IDLE	Inserts the user-selected idle code into time slot 16 at the G.703 port.
Application Mode	Indicates application mode selected.
STRUCT	With framing.
UNSTRUCT	No framing.
PTM	System operates in the point-to-multipoint mode. Two pairs of a single LTU connect to two different NTUs.
TSP	Time-slot prioritization with framing.
SINGLE	Single pair with framing.

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

Field	Description
Performance	
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 G.703 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.36, X.21, RS-530, RS-449, or V.35) ports and the HDSL Loop 2 interface at the LTU and NTU. ES2 is calculated the same as for ES1.
Alarms	

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 G.703 or V.36, X.21, RS-530, RS-449, or V.35 input.
LFA	Loss of frame alignment at the G.703 input (framed mode only).
AIS	Alarm Indication Signal (unframed all ones) received at the G.703 input.
RAI	Remote Alarm Indication signal received at the G.703 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.
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 G.703 LTU (ELU-819) and NTU (UTU-801, UTU-802, or UTU-804) G.703, and Nx64K ports. lists each field and a description of that field.

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

Field	Description
LTU Interface (G.703 Port)	
Errored Seconds (ES) 24 Hour Count	The number of one-second intervals in which at least one bipolar violation (BPV) or one CRC-4 error was detected at the G.703 input port during the last 24 hours.
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-4 Multiframe) Alignment (LFA) occurs at the incoming port.
Unavailable Seconds (UAS) 24 Hour Count	The number of seconds that G.703 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 are detected at the G.703 port since error counters were last cleared.
Clear 24-Hour History	The date and time that the 24-hour histories were last cleared display here. To clear all 24-hour history counters (including HDSL), press `L` or `ENTER`. This action must be confirmed by pressing `Y`.
NTU Interface (Nx64K Port)	
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 DTE:From DCE: TT SD ST 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 LL CTS DSR RLSD TM
Clear 24-Hour History	The date and time that the 24-hour histories were last cleared display here. To clear all 24-hour history counters (including HDSL), press `L` or `ENTER`. This action must be confirmed by pressing `Y`.

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 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 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-4 error or Loss of Sync Word (LOSW) is detected on the HDSL span during the last 24 hours.
Unavailable Seconds (UAS)	The number of seconds that the HDSL span is 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 G.703 values) and displays the date and time the error counters were last cleared.

APPENDIX A - SPECIFICATIONS

This section contains the ELU-819 technical specifications.

Maximum Power C   5.0 watts

Environmental

   Operating temperature   0 °C to 50 °C

   Operating humidity   5% to 95%, non-condensing

   Altitude   197 ft. (60 m) below sea level to 13,123 ft. (4000 m) above sea level

Mounting   3192-type HiGain Management Shelf (HMS)

Dimensions

   Height: 4.75 in. (12.1 cm)

   Width: 0.625 in. (1.59 cm)

   Depth: 10.0 in. (25.4 cm)

   Weight: .75 lb (.34 kg)

Output Signal

   E1 to T1.403 - 1989

   HDSL to ETSI Specification TS101 135

APPENDIX B - COMPATIBILITY

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

- PairGain Wideband System 3190

    – HMS-357, part number 150-2205-01, -02

    – HMS-358, part number 150-2209-01, -02

- PairGain HMS-317, part number 150-1128-21, (28-slot, 23-inch shelf)

- PairGain HMS-308, part number 150-1275-01, (8-slot, 3192 mechanics, remote enclosure)

The UTU-801, -802, and -804 List 5 are compatible with the following PairGain 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 150-1411-02U).

The following cable adapters are available:

Cable Adapter	Connection	Part Number
ECA-800 List 1	DB-25M to M-34F, V.35	150-1470-01
ECA-801 List 1	DB-25M to DB-15F, X.21	150-1471-02
ECA-806 List 1	DB-15M to RJ-45C	150-1476-01
ECA-807 List 1	DB-25M to DB-37F, RS-449, V.36	150-1477-01
ECA-808 List 1	DB-15M to RJ-45X	150-1478-01

APPENDIX C - PRODUCT SUPPORT

PairGain 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 PairGain Customer Service Group at:

Telephone:	800.638.0031 or 714.832.9922 The 800 telephone support line is toll-free in the U.S. and Canada.
Fax:	714. 832.9924
Email:	support@pairgain.com

During normal business hours (7:30 AM to 5:30 PM, Pacific Time, Monday through Friday, excluding holidays), technical assistance calls are normally answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process normally results in a callback within 30 minutes of initiating the request.

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 PairGain 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 PairGain:

1   Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to PairGain's Return Material Authorization (RMA) Department.

2   Call or write PairGain's RMA Department to ask for an 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@pairgain.com

3   Include the following information, in writing, along with the equipment you are returning:

- Company name and address.

- Contact name and telephone number.

- The shipping address to which PairGain should return the repaired equipment.

- The original purchase order number.

- A description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.

- The reason for the return. For example:

    – 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 PairGain's address and the RMA Number you received from the
RMA Department clearly on the outside of the carton and return to:

PairGain Technologies, Inc.
14352 Franklin Ave.
Tustin, CA 92780-7013

Attention: **RMA (Number)**

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

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

PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 60 months from the date of original shipment, given correct customer installation and regular maintenance. PairGain will repair or replace at PairGain's option any unit without cost during this period if the unit is found to be defective for any reason other than abuse or incorrect use or installation.

Do not try to repair the unit. If it fails, replace it with another unit and return the faulty unit to PairGain for repair. Any modifications of the unit by anyone other than an authorized PairGain representative voids the warranty.

If a unit needs repair, call PairGain for a Return Material Authorization (RMA) number and return the defective unit, freight prepaid, along with a brief description of the problem, to:

> PairGain Technologies, Inc.
> 14352 Franklin Avenue
> Tustin, CA 92780-7013
> ATTN: Repair and Return Dept.
> 800.638.0031

PairGain continues to repair faulty modules beyond the warranty program at a nominal charge. Contact your PairGain sales representative for details and pricing.

MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by PairGain Technologies, 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.

STANDARDS COMPLIANCE

The ELU-819 List 1 has been tested and verified to comply with the applicable sections of the following standard.

- UL-1459: Standard Safety - Telephone Equipment

- CSA-C22.2 No. 225-M90: Telecommunication Equipment - Electronics and Electrical Safety

- GR 63-CORE: Network Equipment - Building System (NEBS) Requirements: Physical Protection

- GR 1089-CORE: Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment

ISO 9001

DNV

DNV Certification, Inc.
Certificated Firm

pairgain