HIGAIN LINE UNIT

QUICK INSTALLATION GUIDE

Model	List	Part Number	CLEI Code
HLU-231	7B	150-1111-72	T1L2FKHAAA
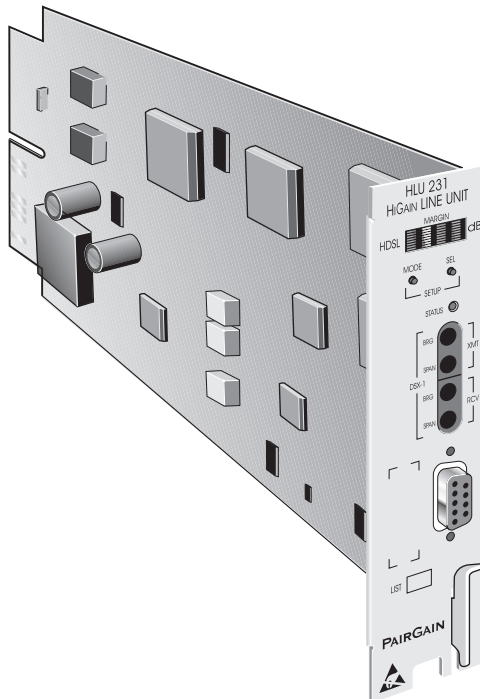
PAIRGAIN TECHNOLOGIES, INC.
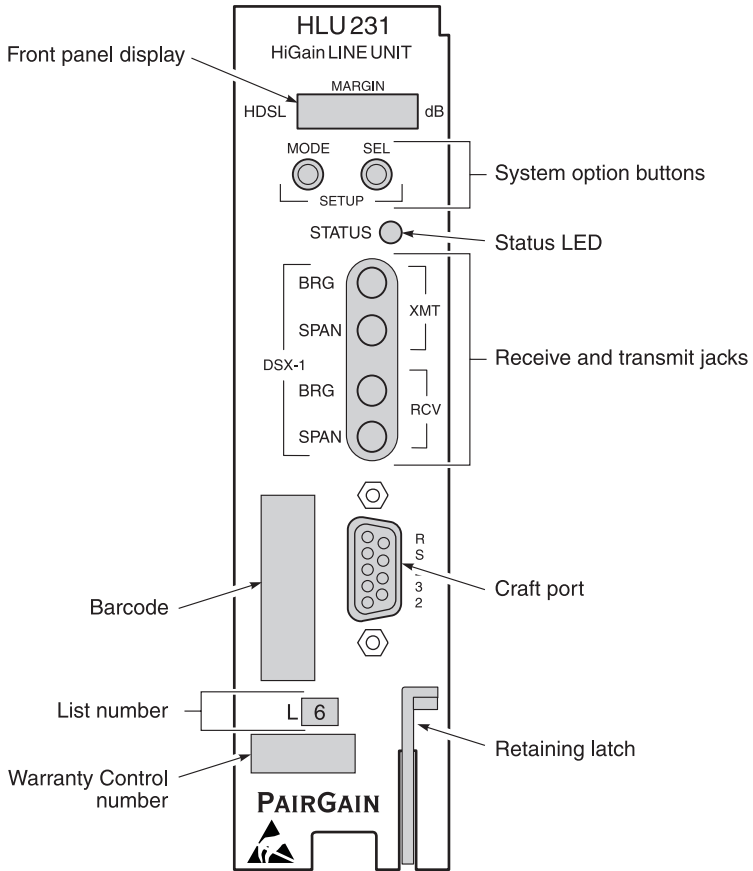## SECTION 350-231-172-01

Table of Contents

Introduction

The PairGain® HiGain® Line Unit Model HLU-231 List 7B (Part Number 150-1111-72) is the Central Office (CO) side of a repeaterless T1 transmission system. It is used in conjunction with the HiGain HRU Remote Unit to provide a complete HiGain High-bit-rate Digital Subscriber Line (HDSL) system.

This guide addresses HLU-231 List 7B operation when used with and without doublers. For applications without doublers, the HLU-231 List 7B is directly connected to the HRU by the two cable pairs. For doubler applications, one or two doublers may be used in the HDSL loops between the HLU-231 List 7B and the HRU.

For more detailed information consult the HLU-231 List 7B Technical Practice (Section Number 150-231-172).

Features

The HLU-231 Line Unit List 7B front panel features are:

The HLU-231 List 7B front panel components are:

Name	Function
Front panel display	Four character LCD that provides status messages for HDSL, S/N margin, optional settings and alarms.
System option buttons	MODE and SEL (Select) buttons used to set system modes.
Status LED	Tri-color LED that indicates system state:
	Green — Normal Operation
	Flashing Green — HDSL Acquisition
	Flashing Red — Minor Alarm
	Red — FUSE ALRM
	Yellow — Self Test in progress or an HLU-231 List loopback in effect (CREM) or (NLOC)
	Flashing Yellow — The HLU-231 intelligent loop-back is in an ARMED state
Receive (RCV) and Transmit (XMT)	Splitting access and bridging "210-Bantam"-type jacks.
Craft port	RS-232 connector that provides access to the maintenance, provisioning, and performance monitoring interface through a dumb terminal.
Retaining latch	Secures the HLU-231 to the shelf in which it is installed.

Compatibility

The HLU-231 List 7B is designed to mount in the following shelves with 220 mechanics:

- PairGain HCS-418 19-inch shelf

- PairGain HCS-417 23-inch shelf

- 220-configuration Office Repeater Bay (ORB) shelf or equivalent Small Cross Section Shelf (SXSS)

- Kentrox T-Term shelf

- PairGain HCS-402 shelf

Installation

Upon receipt of the equipment, visually inspect it 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 Technologies (see *Technical Support* on page 16).

HLU-231 Card-Edge Connectors

The HLU-231 card-edge connector pinouts are shown below. The following rules apply to the HLU-231 card-edge connector:

- If the shelf uses pin 23 remove resistor R39 from the HLU-231 board. This removes the burn-in circuit from pin 23.

- The HLU-231 uses pins 20 and 21 as alarm-relay output. The Kentrox 220 T-Term shelf uses the same pins for external equalizer output. If the HLU-231 is installed into a Kentrox shelf, the HLU-231 ALM option must be disabled (see *Provisioning* on page 6 for further information).

HDSL2 TIP	26	1
HDSL2 RING	27	2
	28	3
	29	4
	30	5
	31	6
FUSE ALARM*	32	7
	33	8
HDSL1 TIP 1	34	9
HDSL1 RING 1	35	10
	36	11
	37	12
KEY		KEY
	38	13
-48V	39	14
	40	15
	41	16
DS1 TIP	42	17 GROUND
DS1 RING	43	18
Ground	44	19
	45	20 ALARM**
Network Management	46	21
DSX-1	47	22
	48	23 BURN-IN
DS1 TIP1	49	24
DS1 RING1	50	25
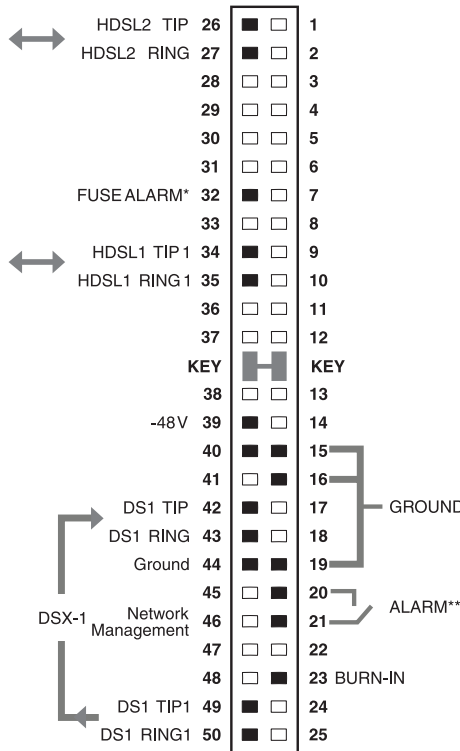
* Fuse alarm is normally floating and at -48V when activated.
** Minor alarm contacts (pins 20 and 21) are normally open and close upon alarm.

Installing the HLU-231

To install the HLU-231 into a PairGain shelf, slide the unit into the shelf card guides for the desired slot, then push the unit in until it is entirely within the card guide and the retaining latch locks into place, indicating that the unit is properly seated:

HLU-231

CO Shelf
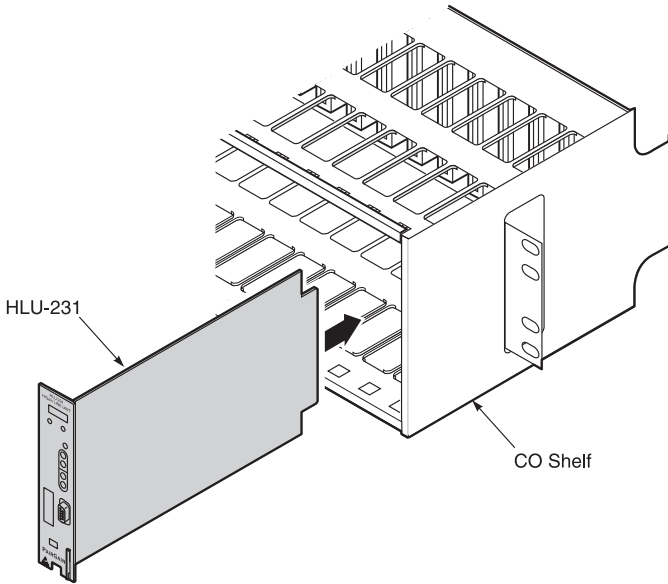
Provisioning

The HLU-231 List 7B contains a non-volatile RAM (NVRAM) that stores the system option settings. The options are set through the SEL (Select) and MODE buttons on the front panel, or through a terminal connected to the Craft port. System option settings are retained if shelf power is lost or if the HLU-231 List 7B is unplugged.

Using the SEL and MODE Front Panel Buttons

To provision the HLU-231 List 7B through the SEL and MODE front-panel buttons:

1   Press the **MODE** button for approximately one second. The message displayed on the front panel alternates between the first system parameter and its current setting.

2   Press the **SEL** button to step the display through all possible settings (one at a time) of the parameter being displayed.

3   Press the **MODE** button to select the desired parameter and move to the next parameter. After you have configured the last parameter, the display prompts you to confirm the settings.

4   Do one of the following:

   •   Press the **SEL** button to install the settings.

   •   Press the **MODE** button to bypass the settings.

If neither button is pressed in 30 seconds, the settings are bypassed.

Default Settings

To return the system options back to the original factory default settings:

1   Press the **SEL** button until the `DFLT NO` message appears.

2   Press the **SEL** button again and `DFLT YES` displays indicating the factory default values are now in effect.

To terminate the DFLT mode without setting the factory default values, press the **MODE** button or do nothing for 30 seconds.

Using the Craft port

The Craft port, a 9-pin RS-232 connector, on the HLU-231 front panel allows you to use a standard RS-232 cable to connect your system to a dumb terminal or PC running a terminal emulation program. Once connected you can access the maintenance, provisioning, and performance screens.

To provision the HLU-231 through the Craft port:

1   Configure the dumb terminal to the following communication settings:

- 1200 to 9600 baud (9600 baud is recommended)

- Parity: NONE

- 8 data bits

- 1 stop bit

- Hardware Flow Control set to NONE

- VT Terminal Emulation

If using the Microsoft Windows terminal emulation program, from the Settings, Terminal Preference menu, deselect *Show Scroll Bars* and *Use Function*, *Arrow*, and *Ctrl Keys for Windows*.

2   Use a serial cable to connect the RS-232 COM port on the dumb terminal to the HLU-231 front panel Craft port.

3   On each screen, enter the key represented by the letter in parenthesis for the parameter to be changed.

- Each entry of this letter scrolls the parameter to its next value.

- After all selections have been made, press E to exit and C to confirm the changes. This activates the new choices and returns control to the Main Menu screen.

The following three user options must be set via the dumb terminal interface: Circuit ID, Time and Date, DS0 Blocking, and Margin Alarm Threshold.

System Settings

The asterisks (*) in the following system settings descriptions indicate the factory default settings.

HLU-231 List B System Options

Mode	Selection	Description
EQL	EXT*	Selects extended equalizer.
	0	Sets the internal equalizer to DSX-1 for 0 - 133 feet.
	133	Sets the internal equalizer to DSX-1 for 133 - 266 feet.
	266	Sets the internal equalizer to DSX-1 for 266 - 399 feet.
	399	Sets the internal equalizer to DSX-1 for 399 - 533 feet.
	533	Sets the internal equalizer to DSX-1 for 533 - 655 feet.
ZBTS	ON	Selects the Extended Superframe (ESF) frame ZBTSI mode.
	OFF*	Deslects the ESF frame ZBTSI mode.
LPBK	DIS	Configures the HLU-231 to ignore the 2 in 5 Smart-Jack loopback command.
	ENA*	Enables the HLU-231 to respond to the 2 in 5 Smart-Jack loopback command.
LBTO	NONE	Disables automatic time-out cancellation of all loopbacks.
	20	Sets automatic cancellation of all loopbacks to 20 minutes after initiation.
	60*	Sets automatic cancellation of all loopbacks to 60 minutes after initiation.
	120	Sets automatic cancellation of all loopbacks to 120 minutes after initiation.
ALM	DIS*	Opens the relay alarm contacts, if closed, and prevents another relay alarm closure from occurring.
	ENA	Enables activation of the minor alarm relay when a minor alarm condition occurs.

HLU-231 List B System Options (Continued)

Mode	Selection	Description
ESAL	17	Closes the Alarm relay contacts and flashes the red Status LED when 17 ES (17 HDSL CRC errors on either HDSL loop or a total of 17 BPVs) occur within a 24-hour period.
	170	Closes the Alarm relay contacts and flashes the red Status LED when 170 ES (170 HDSL CRC errors on either HDSL loop or a total of 170 BPVs) occur within a 24-hour period.
	NONE*	Prevents generation of an alarm due to excessive Errored Seconds.
SPLB	GNLB*	Configures the HiGain system to respond to the generic in-band loopback codes.
	A1LB and A2LB	Configures the HiGain system to respond to the Teltrend addressable repeater in-band loopback codes.
	A3LB	Configures the HiGain system to respond to the Wescom addressable repeater in-band loopback codes.
	A4LB	Configures the HiGain system to respond to the Wescom Mod 1 addressable repeater in-band loopback codes.
	A5LB	Configures the HiGain system to respond to the Teltrend Mod 1 addressable repeater in-band loopback codes.
PWRF	DIS	Disables powering to the HRU and/or doubler over the HDSL pairs.
	ENA*	Enables powering to the HRU and/or doubler over the HDSL pairs.
	200V	Sets the HDSL line powering voltage to 200V for all applications with and without doublers.
DS1	B8ZS	Places both the HLU and HRU into their B8ZS modes.
	AMI*	Places both the HLU and HRU into their AMI modes.
	AUTO	If the HLU detects the B8ZS pattern in the incoming T1 bit streams, it enters B8ZS. If not, it enters AMI mode.
MARG	0 to 15 dB	The Margin Alarm Threshold determines the minimum allowable margin below which an alarm will occur.
	4*	Default value.

HLU-231 List B System Options (Continued)

Mode	Selection	Description
DS0	BLK	The DS0 blocking option can only be set through the Craft port with a terminal. The 4-character HLU-231 List 7B front panel LED readout only displays the status of the blocking option. BLK indicates at least one channel is blocked.
	NONE*	NONE indicates no channels are blocked.
FRMG	AUTO*	Configures HiGain to operate in an auto-framing (AUTO) mode in which it continuously searches the input T1 bit stream for a valid Superframe or Extended Superframe pattern. This feature is required for fractional T1 applications (DS0 blocking) where it insures proper channel time slot alignment. While HiGain can also process unframed data in this AUTO mode, it is recommended that the UNFR mode be used for all unframed applications. Using the AUTO mode for unframed applications runs the risk of detecting "pseudo valid" frame sequences, which can affect the data integrity.
	UNFR	Configures HiGain to operate in an unframed mode. This mode disables the auto framing process and forces HiGain to function as a transparent bit pipe.
HAIS	2LP*	Causes HiGain to transmit the Alarm Indication Signal (AIS) signal at both the HLU and HRU T1 output ports when **both** of the HDSL loops are not in sync (Loss of Sync-Word).
	1LP	Causes HiGain to transmit the AIS signal at both the HLU and HRU T1 output ports when **either** of the two HDSL loops is not in sync (LOSW) or if a margin alarm occurs.
SAIS	ENA*	Causes the HRU to transmit the AIS signal towards the Customer Interface (CI) when in NREM loopback.
	DIS	Prevents the AIS signal from being transmitted to the network interface and replaces it with the network test signal or by a quiet termination (Loss of Signal) depending on the list number of the HRU.
CONF	YES	Confirms that all operating modes (listed above) are to be updated to their current selections.
	NO*	Prevents the most recently selected operating mode selections from being updated. They remain as they were before the system option settings mode was entered.

Testing

Minor alarm and diagnostic messages routinely appear on the HLU-231 front-panel four-character display. This display automatically turns on when power is initially applied to the HLU-231. To conserve power, the display remains on for only five minutes if neither the **MODE** or **SEL** buttons are pressed. The use of either button activates the four-character display and restarts the 5-minute power-control timer.

Alarms

Only one alarm can be displayed at a time, so the highest priority alarm is displayed if more than one alarm exists. The following table lists the alarms ordered by priority:

Status Menu Alarm Messages

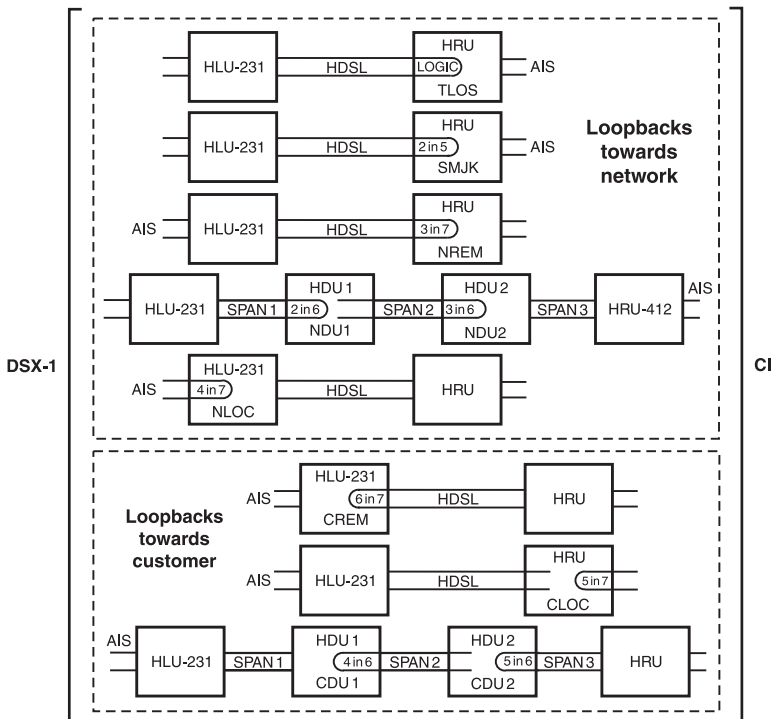| Message	Full Name	Description
NONE	No Alarms	
LLOS	Local Loss of Signal	No signal from HLU-231 local T1 interface.
RLOS	Remote Loss of Signal	No signal from HRU remote T1 interface.
LOSW1 or LOSW2	Loss of Sync Word 1 or 2	HDSL loop 1 or 2 has lost sync.
H1ES or H2ES	HDSL Loop 1 or 2 Errored Second	Loop 1 or 2 has incurred a CRC error.
DS1	Digital Service 1	DS1 input BPVs at the HRU have exceeded the user selected ES threshold.
RAIS	Remote Alarm Indicating Signal	Indicates an AIS (all "1") pattern is being transmitted from the remote or T1 output port.
MAL1 or MAL2	Margin Alarm 1 or 2	The margin on HDSL loop 1 or 2 has dropped below the threshold (1 to 15 dB) set by the user.
CHREV	Channels Reserved	The Loop 1 & 2 HDSL pairs are reversed at the HRU input port. Loop 1 is specified to carry the (-) simplex DC voltage, and Loop 2 is specified to carry the (+) simplex DC voltage.

Loopbacks

The HLU-231 loopback messages are listed in the following tables. A block diagram showing the GNLB locations and their activation codes are shown on page 13.

Status Menu Loopback Messages

Message	Full Name	Description
SMJK	Smart-Jack Loopback	Loopback at HRU toward the HLU initiated by either the (2 in 5) in-band loopback code or the out-of-band ESF data link code.
NREM	Network Remote Loopback	Loopback at HRU toward the HLU initiated by upstream in-band codes or from the dumb terminal.
NLOC	Network Local Loopback	Loopback at HLU toward the network initiated by upstream in-band codes or from the dumb terminal.
CLOC	Customer Local Loopback	Loopback at HRU toward customer initiated from Customer Premises Equipment (CPE) by in-band codes or from the dumb terminal.
CREM	Customer Remote Loopback	Loopback at HLU toward customer initiated from CPE by in-band codes or from the dumb terminal.
ARM	Armed	The HiGain system detected the Intelligent Repeater loopback (2 in 5) arming code.
TLOS	Transmit Loss of Signal (Loopback)	HRU is in a logic loopback state caused by a loss of its T1 input from the customer, if enabled at the HRU through its TLOS switch option.

Status Menu Loopback Messages: (Doublers Only)

Message	Full Name	Description
NDU1	Network Doubler 1 Loopback	The loopback at doubler 1 toward the network initiated by in-band codes, or the maintenance terminal.
NDU2	Network Doubler 2 Loopback	The loopback at doubler 2 toward the network initiated by in-band codes or the maintenance terminal.
CDU1	Customer Doubler 1 Loopback	The loopback at doubler 1 toward CI initiated by in-band codes or the maintenance terminal.
CDU2	Customer Doubler 2 Loopback	The loopback at doubler 2 toward CI initiated by in-band codes or the maintenance terminal.

Four-Character Diagnostic Messages

The HLU-231 diagnostic messages are listed in the table below.

Diagnostic Messages

Message	Full Name	Description
FERR	Framing Bit Error Occurred	Framing bit error occurred at HLU T1 input.
LBPV	Local Bipolar Violation	A bipolar violation has been received at the T1 input to the HLU.
SIG1 or SIG2	Signal 1 or Signal 2	The HLU and HRU transceivers are trying to establish contact with each other.
S2L1 or 2[†]	Signal 2 Loop or Loop 2	The 1st Doubler and either the HRU or 2nd Doubler transceivers are trying to establish contact with each other on loops 1 or 2 of span 2.
S3L1 or 2[†]	Signal 3 Loop or Loop 3	The 2nd Doubler and HRU transceivers are trying to establish contact with each other on loops 1 or 2 of span 3.
ACQ1 or ACQ2	Acquisition 1 or Acquisition 2	The HLU and HRU multiplexers are trying to establish synchronization over each loop.
A2L1 or 2[†]	Acquisition 2 Loop 1 or Loop 2	The 1st Doubler and either HRU or 2nd Doubler multiplexers are trying to establish synchronization with each other on loops 1 or 2 of span 2.
A3L1 or 2[†]	Acquisition 3 Loop 1or Loop 2	The 2nd Doubler and either HRU multiplexers are trying to establish synchronization with each other on loops 1 or 2 of span 3.
ACO	Alarm CutOff	A minor alarm has occurred, and been retired to an ACO condition, through the use of the HLU front panel SEL button.
Self Test		The HLU is in a self test mode. This occurs every power ON/OFF cycle.

[†] These messages only apply to systems with doublers present.

Diagnostic Messages (Continued)

Message	Full Name	Description
ALRM	Alarm Condition Exists	A minor alarm condition is in effect.
1=xx or 2=yy	HDSL Loop Margins	Indicates the relative S/N at each HDSL transceiving input port. Any value of '06' or greater is adequate for reliable system operation.
PWR FEED SHRT	Power Feed Short	Indicates a short between the 2 HDSL pairs in span 1. This same message can occur with an HRU is drawing the correct amount of power over good cable pairs but cannot communicate with the HLU.
PWR FEED OPEN	Power Feed Open	Indicates an open circuit in both the tip and ring of either HDSL pair in span 1.
BAD RT?	No response from HRU	The HLU does not receive any response from the HRU. Thus, the HRU's integrity is questionable.
VER	HLU Software Version #	This is displayed during the System Settings review mode. (Depress the **MODE** button for 3 seconds to enter System Settings review mode.)
LIST 0xL	HLU's List #	Displayed during System Settings review mode defined above.
FRM	Frame: SF, ESF, UNFR, NONE	Defines the type of frame pattern being received from the DSX-1. Displayed during System Settings.
CODE	Line Code: AMI, B8ZS	This is the line code that the HLU is set to receive and transmit at its T1 interfaces. Displayed during System Settings mode defined above.

† These messages only apply to systems with doublers present.

Specifications

Maximum Power Consumption
16 Watts (without Doubler); 35Watts (with Doubler)

Maximum Heat Dissipation
7 Watts (without Doubler); 12.5 Watts (with Doubler)

Mounting
AT&T 220-configuration or equivalent.

Dimensions
Height: 5.9" (15 cm)
Width: 1.4" (3.5 cm)
Depth: 10" (25.4 cm)
Weight: 1 lb. 14 oz.

Documentation

The HLU-231, List 7B has a complete technical practice that you can down-load from the PairGain Technical Manuals Web page at: *www.pairgain.com*. A password is required. If you do not have a password, contact your PairGain sales representative.

If you have any comments on any PairGain documentation, send mail to technical_publications@pairgain.com. Type the product name and the section number of the document in the subject area of the email message.

Technical Support

PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contacting PairGain Customer Service Engineering group at:

Telephone: (800) 638-0031 or (714) 832-9922

Fax: (714) 832-9924

During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday - 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.

Bulletin Board Services

PairGain maintains a computer bulletin board system for obtaining current information on PairGain products, product troubleshooting tips and aids, accessing helpful utilities, and for posting requests or questions. This system is available 24-hours-a-day by calling (714) 730-3299. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

Corporate Office
14402 Franklin Avenue
Tustin, CA 92780

Tel: (714) 832-9922
Fax: (714) 832-9924

For Technical Assistance:
(800) 638-0031

ISO 9001

DNV Certification, Inc.
Certificated Firm

PAIRGAIN
THE COPPEROPTICS COMPANY