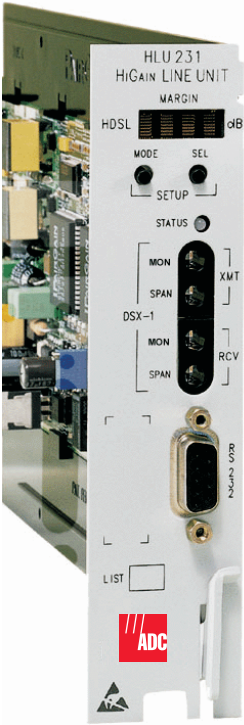


# QUICK INSTALLATION

## HLU-231 LIST 8A LINE UNIT



---

# THE HLU-231 LIST 8A

The ADC's HiGain® Line Unit HLU-231 List 8A is the Central Office (CO) side of a repeaterless, T1 transmission system. When used in conjunction with a HiGain Remote Unit (HRU), the system provides 1.544 Mbps transmission on two unconditioned copper pairs over the full Carrier Service Area (CSA) range. The CSA includes loops up to 12,000 feet of 24 AWG or 9,000 feet of 26 AWG wire, including bridged taps. This line unit can be used in applications with or without HiGain Doubler Units (HDUs).

## FEATURES

- 
- Front-panel status LED, four-character status display, and RS-232 craft port
  - Five-span range with four doublers (60 kft, 24 AWG)
  - Selectable Power Feed modes
  - Loss of Signal (LOS)/Alarm Indicator signal (AIS) payload alarm option
  - Ultra low wander
  - Additional screens for inventory and troubleshooting
  - Payload (PL) or HiGain (HG) loopback source identification
  - Low line-power option (-140 Vdc) for circuits with a single doubler
  - Bit Error Rate (BER) alarm options
  - Bipolar Violation Transparency (BPVT) options
  - Reduced power consumption
  - Grounded loop detection
- 

## SPECIFICATIONS

---

<b>Operating Temperature</b>	-40 °F to +149 °F (-40 °C to +65 °C)
<b>Operating Humidity</b>	5% to 95% non-condensing
<b>HDSL Span Voltage</b>	0, -140 or ±112 Vdc
<b>Mounting</b>	220 mechanics
<b>HDSL Line Code</b>	784 kbps 2B1Q
<b>HDSL Output</b>	+13.5 dBm ±0.5 dB at 135 Ω
<b>Maximum Provisioning Loss</b>	35 dB at 196 KHz, 135 Ω
<b>DS1 Line Rate</b>	1.544 Mbps ±200 bps
<b>DS1 Line Format</b>	Alternate Mark Inversion (AMI), Bipolar with 8-Zero Substitution (B8ZS) or Zero Byte Time Slot Interchange (ZBTSI)
<b>DS1 Frame Format</b>	Extended SuperFrame (ESF), SuperFrame (SF) or Unframed (UNFR)
<b>DSX-1 Pulse Output</b>	6 V <sup>pk-pk</sup> , pre-equalized for 0 - 655 feet of ABAM cable
<b>DSX-1 Input Level</b>	+1.5 to -7.5 dB DSX

---

---

# 1 INSTALLATION

To ensure proper installation of the HLU-231:

- 1 Align the HLU with the shelf rails and slide the unit in.
- 2 When the HLU is properly seated, the retaining latch on the HLU snaps closed.

# 2 POWER-UP SEQUENCE

When the HLU powers up, the four-character display illuminates and reports status messages.

If the HLU is not communicating with the next span device, the following occurs:

- 1 The HLU displays alarm and diagnostic messages (see the Front-panel Alarm Messages and Front-panel Diagnostic Messages tables inside), followed by the SELF TEST message.
- 2 The Status LED turns yellow, indicating it has entered self-test mode.

If the HLU is communicating with the next span device, the following occurs:

- 1 The Status LED flashes red while acquiring each device in the system, and turns a steady green when the entire system is operating without any alarms.
- 2 The four-character display reports margin (signal-to-noise ratio) readings and insertion loss.
- 3 If the status LED is not solid green, the display reports alarm conditions (see the Front-panel Alarm Messages table inside).

# 3 PROVISIONING

- 1 Access the Maintenance Terminal screens by pressing the **SPACEBAR** several times.
  - a Set the date and time (select Set Clock from the Main Menu).
  - b Set the circuit IDs (select View System Inventory).
- 2 Access the Systems Settings selection on the Main Menu to change the default settings of any system parameters.
- 3 Access the View Troubleshooting screen to view a graphical analysis of any potential system problems.
- 4 When the HLU has been successfully installed and provisioned, clear Span Status, Performance Data, Performance History, and Alarm History screens to ensure accurate data and alarm reporting.

*Continued*



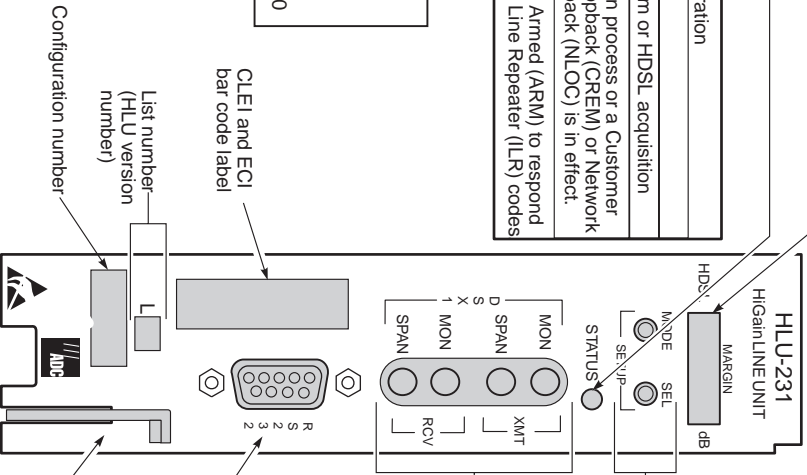
**Four-character display**  
 Displays status, provisioning, and alarm messages. See table below for a list of message descriptions.

**Status LED**  
 Reports the following conditions:

Green LED	Normal operation
Red LED	Fuse alarm
Flashing Red LED	System alarm or HDLSL acquisition
Yellow LED	Self Test is in process or a Customer Remote Loopback (CREM) or Network Local Loopback (NLOC) is in effect.
Flashing Yellow LED	System is in Armed (ARM) to respond to Intelligent Line Repeater (ILR) codes

**Modem settings**  
 1200-9600 baud  
 8 data bits  
 No parity  
 1 stop bit  
 Hardware flow control: OFF  
 Terminal emulation software: VT-100

**Front Panel**



**System option buttons (for manual setting of system parameters)**

- Use MODE and SEL to manually modify user options, initiate loopbacks, and display DSX-1 line parameters.
- 1 Press the MODE button for 2 seconds and release. The front panel alternately displays the first system parameter and its current setting.
  - 2 Press SEL to step through all possible system settings for the displayed parameter.
  - 3 Press MODE to update the parameter and advance to the next parameter.
  - 4 After scrolling through all the parameters, press SEL to confirm changes when prompted with a CONF YES message, or press MODE to cancel all changes.

**DSX-1 test access jacks**

SPAN	Provides splitting jack access to (XMT) and from (RCV) the HDLSL span at the DSX-1 interface.
MON	Provides non-intrusive monitoring jack access to (XMT) and from (RCV) the HDLSL span at the DSX-1 interface. Allows monitoring of the T1 payloads.

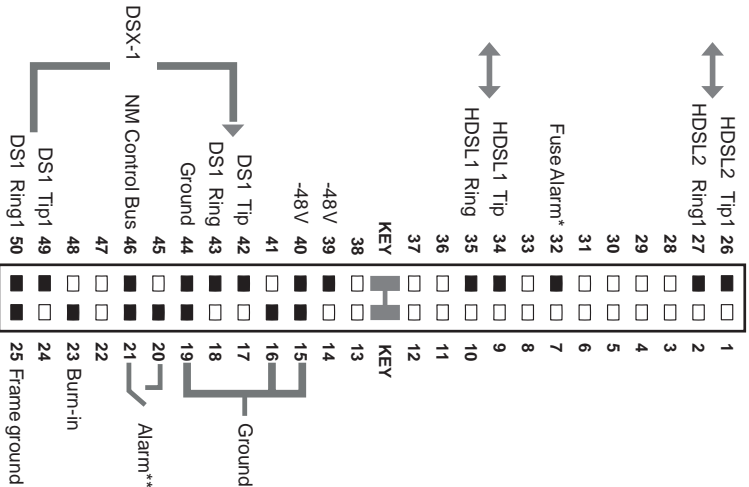
**Craft port provisioning**

To access all system maintenance, provisioning and performance screens, connect a standard 9-pin terminal cable between the serial port on a PC and the HLU craft port.

**Retaining latch**

Retains the card in the shelf when pulled up; extracts the card when pulled down.

**Card-edge Connector**

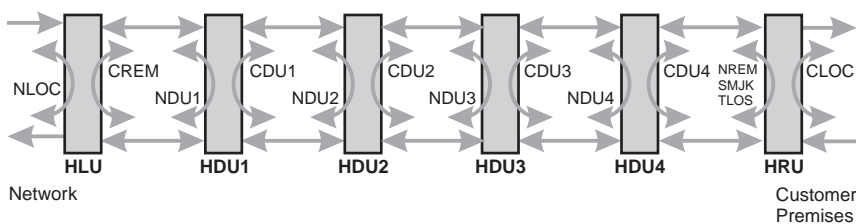


\* Fuse alarm is normally floating and at -48 Vdc when activated.

\*\* System minor alarm contacts (pins 20 and 21) are normally open and close upon alarm.

# 4 LOOPBACK TESTING

Initiate loopback testing from the HiGain maintenance menus or use the MODE and SEL buttons. The hexadecimal inband codes shown below can also be sent by a test set.



## GNLB Loopback Commands

Loopback	Inband Code	Description
NLOC	1111000	DSX-1 signal is looped back to the network at the HLU.
NDU1	110000	DSX-1 signal is looped back to the network at HDU1.
NDU2	111000	DSX-1 signal is looped back to the network at HDU2.
NDU3	1010001	DSX-1 signal is looped back to the network at HDU3.
NDU4	1010010	DSX-1 signal is looped back to the network at HDU4.
NREM	1110000	DSX-1 signal is looped back to the network at the HRU.
SMJK	11000	DSX-1 signal is looped back to the network at the HRU SmartJack module.
CLOC	1111100	Signal from customer is looped back to the customer at the HRU.
CDU1	1111100	Signal from customer is looped back to the customer at HDU1.
CDU2	1111110	Signal from customer is looped back to the customer at HDU2.
CDU3	1011001	Signal from customer is looped back to the customer at HDU3.
CDU4	1011010	Signal from customer is looped back to the customer at HDU4.
CREM	1111110	Signal from customer is looped back to the customer at the HLU.
Loopdown	11100	Deactivates any of the above loopbacks.



For more detailed information about the Maintenance Terminal screens, provisioning, and loopback mode testing, refer to the HLU-231 List 8A technical practice, document number 150-231-181-xx. It can be downloaded from the Customer site portion of the ADC's Web page at [www.ADC.com](http://www.ADC.com). A password is required to access the Customer site web pages. If you do not have a password, contact your ADC sales representative.

## Front-panel Alarm Messages<sup>(a)</sup>

Message	Description
LOSW	One of the HDSL loops has lost sync.
LLOS	No signal is detected at the DSX-1 input to the HLU.
RLOS	No signal is detected at the DS1 input to the HRU.
BER	A system Bit Error Rate alarm is in effect.
MAL1 or MAL2	The margin on HDSL Loop 1 or 2 has dropped below the threshold (1 to 15 dB) setting.
NONE	No alarm present.

(a) ALRM displays prior to any alarm message. Pressing the SEL button initiates an Alarm Cutoff (ACO) message.

## System Configuration Codes<sup>(a)</sup>

Code	Description
VER xxxx	The release revision of the firmware (appears during the System Settings review mode).
LIST xxxx	The model number of the product (appears during the System Settings review mode).
FRM xxxx	Indicates the type of frame pattern being received from the DSX-1, where xxxx is SF, ESF, UNFR, or NONE).
CODE xxxx	The line code setting, where xxxx is AMI or B8ZS.
PLEV xxxx	Indicates the HDSL line voltage in its LOW (-140 Vdc), HIGH ( $\pm 112$ Vdc) state, or DIS (disabled) state.

(a) To view system configuration codes, press the MODE button for 3 or more seconds.

## Front-panel Diagnostic Messages

Message	Description (normal operating messages in bold)
<b>1=xx or 2=yy</b>	Indicates the power of the received HDSL signal on each loop relative to noise. Any value of 06 dB or greater is adequate for reliable system operation.
ACQ1 or ACQ2	The multiplexers of the HLU and the HRU or the first doubler are trying to establish synchronization over Loop 1 or Loop 2 of Span 1.
<i>n</i> nL1 or <i>n</i> nL2	The multiplexers of the two devices on Span <i>n</i> are trying to establish synchronization with each other on Loop 1 or Loop 2, where <i>n</i> is the number of the span.
BAD RT?	The HLU is not receiving any response from the HRU.
DS0	NONE = no DS0 channels blocked. BLK = some channels blocked.
FERR	Framing bit error occurred at HLU T1 input.
H1ES or H2ES	HDSL Loop 1 or Loop 2 CRC error.
<b><i>n</i>HDU</b>	Number ( <i>n</i> ) of doublers in the circuit.
<b>INSL xxdB</b>	The maximum Insertion Loss message (INSL) appears followed by xxdB, where xx is the maximum insertion in dB of all spans and loops.
LBPV	A bipolar violation has been received at the T1 input to the HLU-231.
MNGD	The HLU is under control of the HMU-319 Network management unit.
PWR FEED GND	One of the HDSL loops has been grounded.
PWR FEED ON	Indicates that the HDSL loops are not grounded or shorted.
PWR FEED OFF	HDSL span power has been turned off.
PWR FEED SHRT	Indicates a short between the two HDSL pairs or the inability of the HRU to communicate with the HLU.
SELF TEST	The HLU is in a self-test mode. This occurs every power on/off cycle.
SIG1 or SIG2	The transceivers of the HLU and HRU or first doubler are trying to establish contact with each other on Loop 1 or Loop 2 of Span 1.
<i>S</i> nL1 or <i>S</i> nL2	The transceivers of the two devices on Span <i>n</i> are trying to establish contact with each other on Loop 1 or Loop 2, where <i>n</i> is the number of the span.
TLOS	HRU is in logic loopback mode caused by loss of its T1 input from the CI.

## System Settings

Display Code	Description (default values in bold)
EQL	Sets the DSX-1 Equalizer to: EXT (replaces the Internal Equalizer with an External Equalizer), <b>0 (0 to 133 ft.)</b> , 133 (133 to 266 ft.), 266 (266 to 399 ft.), 399 (399 to 533 ft.), 533 (533 to 655 ft.).
LBPK	Enables ( <b>ENA</b> ) or disables (DIS) all inband SMJK loopback commands. ENFT enables response to Digital Data Service latching loopback commands required for fractional T1 applications. The Customer Disconnect Indicator (CDI) option is disabled when ENFT is selected.
SPLB	Configures the system for generic inband loopback commands ( <b>GNLB</b> ) or special loopback commands (A1LB/A2LB, A3LB, A4LB, A5LB).
PWRF	DIS = disables HDSL powering; LOW = HDSL line voltage is -140 V max.; <b>AUTO</b> = automatically switches between -140 V for nondoubler applications and ±112 V for doubler applications; HIGH = ±112 V for all applications.
ZBTS	ON = ESF frame is operating in ZBTSI mode. <b>OFF</b> = ESF frame is operating in non-ZBTSI mode.
BERT	<b>NONE</b> = prevents generation of a system alarm due to excessive BER 1E-6 or 1E-7 = alarm activates when BER threshold exceeds 10 <sup>-6</sup> or 10 <sup>-7</sup> .
LBTO	Loopback timeout = NONE, 20, <b>60</b> , 120.
ALM	System alarms enabled (ENA) or disabled ( <b>DIS</b> ) on pins 20-21.
DS1	Line code = AUTO, B8ZS, or <b>AMI</b> .
FRMG	Framing = <b>AUTO</b> or UNFR (unframed).
HAIS	Transmits the AIS signal at the HLU and HRU output ports if one (1LP) or both ( <b>2LP</b> ) HDSL loops are not in sync.
SAIS	Enables ( <b>ENA</b> ) or disables (DIS) SMJK loopback mode.
DS0	DS0 blocking on (BLK) or off ( <b>NONE</b> ); can only be set through the craft port.
MARG	0 to 15 dB; the default is <b>4dB</b> ; can only be set through the craft port.
RDA	Enables ( <b>ENA</b> ) or disables (DIS) remote DS1 LOS at HRU input.
ALMP	Enable line to output an ( <b>AIS</b> ) payload or an (LOS) condition.
RTPV	Enables ( <b>ENA</b> ) or disables (DIS) remote provisioning.
BPVT	Enables (ENA) or disables ( <b>DIS</b> ) BPV transparency.
CONF	Update all operating mode selections (YES or <b>NO</b> ).

## FCC Class A Compliance

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

## Limited Warranty

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

## Modifications

Any changes or modifications made to this device that are not expressly approved by ADC 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.

## Standards Compliance

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

- GR 63-CORE - Network Equipment-Building System (NEBS) Requirements
- GR 1089-CORE - Electromagnetic Compatibility and Electrical Safety
- Binational standard, UL-1950/CSA-C22.2 No. 950-95: Safety of Information Technology Equipment

## Trademark Information

ADC is a registered trademark of ADC Telecommunications, Inc. Other product names mentioned in this installation guide are used for identification purposes only and may be trademarks or registered trademarks of their respective companies.

## Copyright Information

© 1999 ADC DSL Systems, Inc. All rights reserved. Information contained in this document is company private to ADC DSL Systems, Inc., and shall not be modified, used, copied, reproduced or disclosed in whole or in part without the written consent of ADC.

## ADC DSL Systems, Inc.

14402 Franklin Avenue  
Tustin, CA 92780-7013  
Tel: 714.832.9922  
Tel: 714.832.9924  
Fax: 714.832.9924

## Technical Assistance

Tel: 800.638.0031  
Tel: 714.730.3222  
Fax: 714.730.2400



Product Catalog: 150-1111-81

CLEI: T1L2PYOA

Document: 350-231-181-02



1235846

September 20, 1999