QUICK INSTALLATION

HLU-432 LIST 2
LINE UNIT

THE HLU-432 LIST 2

The ADC® HiGain® HLU-432 List 2 line unit is the Central Office (CO) side of a repeaterless, T1 transmission system for 200/400 mechanics (Remote type) shelves and enclosures. 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 and four-character status display
- Ultra-low wander
- 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
- Grounded loop detection
- Payload (PL) or HiGain (HG) loopback source identification
- DS1 & HDSL pinout “wired as remote” to allow mixed CO/RT cards in one shelf and one wiring style for Remote shelves
- Reduced power consumption
- Low line-power option (-135 Vdc) for circuits with a single doubler
- Bit Error Rate (BER) alarm options
- Additional screens for inventory and troubleshooting
- Bipolar Violation Transparency (BPVT) options

SPECIFICATIONS

Operating Temperature	-40°F to +149°F (-40°C to +65°C)
Operating Humidity	5% to 95% non-condensing
HDSL Span Voltage	-135 Unipolar to ±112 Bipolar Vdc
Mounting	200 or 400 mechanics shelf
HDSL Line Code	784 kbps 2B1Q
HDSL Output	+13.5 dBm ±0.5 dB at 135Ω
Maximum Insertion Loss	35 dB @ 196 kHz
Maximum Loop Attenuation	28 dB
DS1 Line Rate	1.544 Mbps ±200 bps
DS1 Line Format	Alternate Mark Inversion (AMI) or Bipolar with 8-Zero Substitution (B8ZS)
DS1 Frame Format	Extended SuperFrame (ESF), SuperFrame (SF), or Unframed (UNFR)
DSX-1 Pulse Output	6 $V^{pk\text{-}pk}$, pre-equalized for 0 to 655 feet of ABAM cable
DSX-1 Input Level	+1.5 to -7.5 dB DSX

Observe HDSL & DS1 pinouts and wire accordingly to avoid placing HDSL span power voltage on DS1 equipment. Wiring these leads incorrectly will result in equipment damage and void all warranties.

1 INSTALLATION

To ensure proper installation of the HLU, align the line unit with the enclosure slot guides and slide the unit in. The unit should snap into place, indicating that the unit is properly seated.

2 POWER-UP SEQUENCE

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

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

1 Alarm and diagnostic messages display, followed by the self-test message.

2 The Status LED lights yellow, indicating it has entered self-test mode.

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

1 The Status LED flashes green while acquiring each device in the system, and lights 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.

3 PROVISIONING

Provision the HLU through the SEL and MODE front-panel pushbuttons:

1 Press the MODE pushbutton for approximately one second.

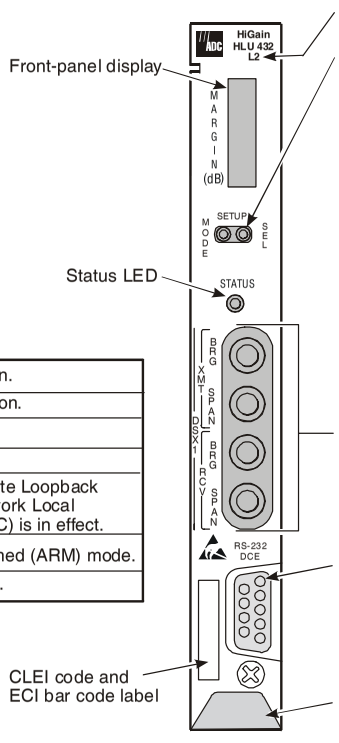
2 Press the SEL pushbutton to step the display through all possible settings.

3 Press the MODE pushbutton to select the desired parameter and move to the next parameter.

4 Upon configuring your final parameter, press either the SEL pushbutton (to install) or press the MODE pushbutton (to bypass). If either of the pushbuttons are not pressed within 30 seconds, the settings are bypassed.

Continued

Front Panel



List number

System option pushbuttons (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 pushbutton for 1 second 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 NO message, or press MODE to cancel all changes.

Front-panel display

Status LED

DSX1 transmit (XMT) and receive (RCV) bridging jacks

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.

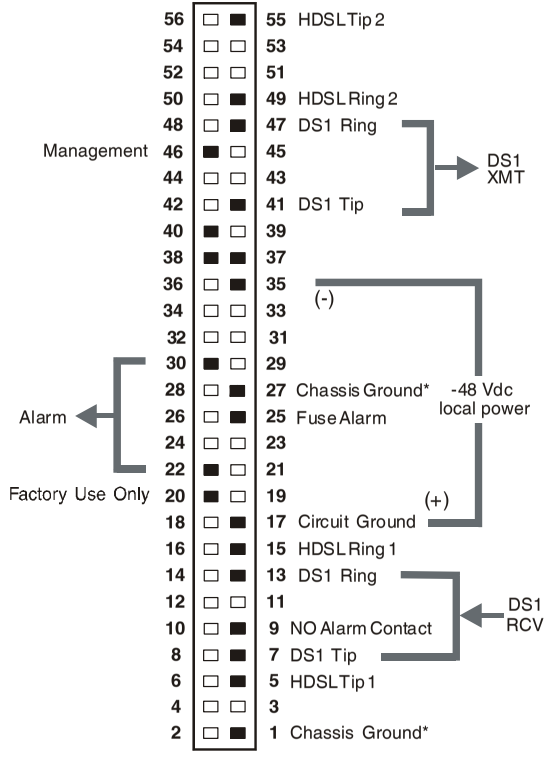
CLEI code and ECI bar code label

Extraction handle

Modem settings:
1200-9600 baud
8 data bits
No parity
1 stop bit
Hardware flow control: OFF
Terminal emulation: VT100

Green LED	Normal operation.
Flashing Green LED	HDSL2 acquisition.
Red LED	Fuse alarm.
Flashing Red LED	System alarm.
Yellow LED	Customer Remote Loopback (CREM) or Network Local Loopback (NLOC) is in effect.
Flashing Yellow LED	System is in Armed (ARM) mode.
Off	Line power is off.

Card-Edge Connector



*Chassis ground may be tied to earth ground per local practice.

Observe HDSL & DS1 pinouts and wire accordingly to avoid placing HDSL span power voltage on DS1 equipment. Wiring these leads incorrectly will result in equipment damage and void all warranties.

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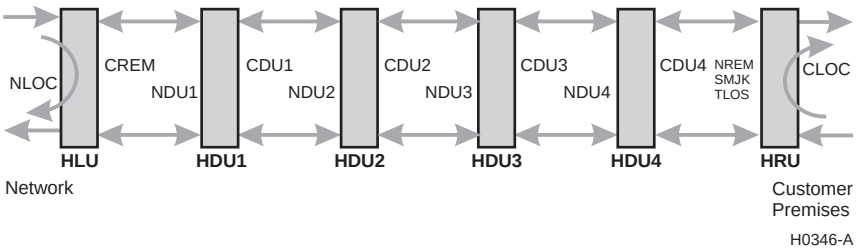
4 LOOPBACK TESTING

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



GNLB Loopback Commands

Loopback	Inband Code	Description
NLOC	1111000	DSX-1 signal is looped back to DSX-1 at HLU.
NDU1	110000	Query to initiate loopback at doubler 1 to the network.
NDU2	111000	Query to initiate loopback at doubler 2 to the network.
NDU3	1010001	Query to initiate loopback at doubler 3 to the network.
NDU4	1010010	Query to initiate loopback at doubler 4 to the network.
NREM	1110000	DS1 signal is looped back to DS1 at HRU.
SMJK	11000	Signal from DS1 is looped back at the HRU by the HRU SmartJack module.
CREM	1111110	Signal from customer is looped back to the customer at the HLU.
CDU1	111100	Query to initiate loopback at doubler 1 to the customer premises.
CDU2	111110	Query to initiate loopback at doubler 2 to the customer premises.
CDU3	1011001	Query to initiate loopback at doubler 3 to the customer premises.
CDU4	1011010	Query to initiate loopback at doubler 4 to the customer premises.
CLOC	1111100	Signal from customer is looped back to the customer at the HRU.
Loopdown	11100	Loops down any of the above loopback commands.

Copies of this publication or the user manual (LTPH-UM-1193-01) can be downloaded from the ADC website at *www.adc.com*. To order a hard copy, please contact your sales representative.

System Configuration Codes

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 Alternate Mark Inversion (AMI) or Bipolar with 8-Zero Substitution (B8ZS).
PLEV *xxxx*	Indicates the HDSL line voltage in its LOW (-140 Vdc), HIGH (±112 Vdc), or DIS (disabled) state.

Front-Panel Diagnostic Messages

Message [a]	Description
1=*xx* or 2=*yy*	Indicates the power of the received HDSL signal on each loop relative to noise. Any value of 6 dB or greater is adequate for reliable system operation.
***n*HDU**	Number (*n*) of doublers in the circuit.
INSL *xx*DB	The maximum Insertion Loss (INSL) message appears followed by *xx*dB, where *xx* is the maximum insertion in dB of all spans and loops.
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.
A*n*L1 or A*n*L2	The multiplexers of the two devices on Span *n* are trying to establish synchronization with each other on Loop 1 or Loop 2, where *n* is the number of the span.
BAD RT?	The HLU is not receiving any response from the HRU.
FERR	Framing bit error occurred at HLU DSX-1 input.
H1ES or H2ES	HDSL Loop 1 or Loop 2 CRC error.
LBPV	A local bipolar violation has been received at the DSX-1 input to the HLU.
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.
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.
S*n*L1 or S*n*L2	The transceivers of the two devices on Span *n* are trying to establish contact with each other on Loop 1 or Loop 2, where *n* is the number of the span.
TLOS	HRU is in a logic loopback state caused by a loss of its T1 input from the CI (if enabled at the HRU through its TLOS switch options).

(a) Normal operating messages are in bold.

System Setting Messages

Front-Panel Display Code	Description (default values in bold)
EQL	Sets the DSX-1 equalizer (EQL) to: **0** (0 to 132 ft.), 133 (133 to 265 ft.), 266 (266 to 398 ft.), 399 (399 to 532 ft.), 533 (533 to 655 ft.).
LPBK	Enables (**ENA**) or disables (DIS) all inband SMJK loopback commands.
SPLB	Configures the system for generic inband loopback commands (**GNLB**) or special loopback commands (A1LB, A2LB, A3LB, A4LB, A5LB).
PLEV	DIS = disables HDSL powering. LOW = HDSL line voltage is -140 Vdc maximum. **AUTO** = automatically switches between -140 Vdc for non-doubler applications and ±112 Vdc for doubler applications. HIGH = ±112 Vdc for all applications.
ZBTS	ON = ESF frame is operating in Zero-Byte Time Slot Interchange (ZBTSI) mode. **OFF** = ESF frame is operating in normal non-ZBTSI mode.
BERT	**NONE** = prevents generation of a system alarm due to excessive BER. 1E-6 or 1E-7 = alarm activates when BER threshold exceeds 10^{-6} or 10^{-7}, respectively.
LBTO	Loopback timeout = NONE, 20, **60**, 120 minutes.
ALM	Enables (ENA) or disables (**DIS)** output alarm on pins 22 and 30 when alarm condition occurs.
DS1	Line code = places the HLU and HRU in B8ZS, AUTO, or **AMI** mode.
FRMG	Framing = **AUTO** or Unframed (UNFR).
HAIS	**2LP** = transmits the AIS signal at both the HLU and the HRU T1 output ports when both HDSL loops are not in sync (LOSW). 1LP = applies when either of the two HDSL loops are not in sync or if a Margin alarm occurs.
SAIS	Enables (**ENA**) or disables (DIS) transmission of AIS signal during NREM/SMJK loopbacks.
RDA	Enables (**ENA**) or disables (DIS) alarm indications due to remote DS1 LOS at HRU input.
ALMP	Enables a line to output an (**AIS**) payload of all ones or an (LOS) condition at its DS1 ports for LOSW, DS1 LOS, and margin alarms.
BPVT	Enables (ENA) or disables (**DIS**) Bipolar Violation Transparency (BPVT).
MARG [a]	0 to 15 dB (default = 4 dB).
DS0 [a]	NONE = no DS0 channels blocked; BLK = some channels blocked.
CONF	YES = updates current selections; **NO** =does not update current selection.

(a) Can only be set through the Maintenance Terminal.

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. Refer to the ADC Warranty/Software Handbook for additional information or contact your sales representative or Customer Service for details.

Modifications

FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ADC voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

Standards Compliance

This equipment has been designed to comply with the applicable sections of the following safety standards:

- Binational standard, UL-1950 3rd Edition/CSA-C22.2: Safety of Information Technology Equipment

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World Headquarters

ADC Telecommunications, Inc.
PO Box 1101
Minneapolis, MN 55440-1101

For Technical Assistance

Tel: 800.366.3891

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