HiGain

QUICK INSTALLATION

HLU-319 LIST 5D
LINE UNIT

HLU-319 LIST 5D

The HiGain® Line Unit HLU-319 List 5D 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 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
- Provisioning screens for inventory and troubleshooting
- Remote Provisioning
- HRU loopback screen
- Payload (PL) or HiGain (HG) loopback source identification
- Reduced power consumption
- Low line-power option (-135 V) for circuits with a single doubler
- Bit Error Rate (BER) alarm options
- Bipolar Violation Transparency (BPVT) options
- Four line-power spans (three doublers and one remote unit)
- HDSL grounded loop detection

SPECIFICATIONS

Operating Temperature	-40 °F to +149 °F (-40 °C to + 65 °C)
Operating Humidity	5% to 95% non-condensing
HDSL Span Voltage	-140 to ±112 Vdc
Mounting	STS (3192) high-density shelf
HDSL Line Code	784 kbps 2B1Q
HDSL Output	+13.5 dBm ±0.5 dB, 135 Ω
Maximum Provisioning Loss	35 dB at 196 KHz, 135 Ω
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 THRU
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

1 INSTALLATION

To install the HLU, slide the line unit into the card guides for the desired slot, then push the unit back until it seats firmly in the backplane card-edge connector.

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 events occur:

1. Alarm and diagnostic messages are displayed (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.

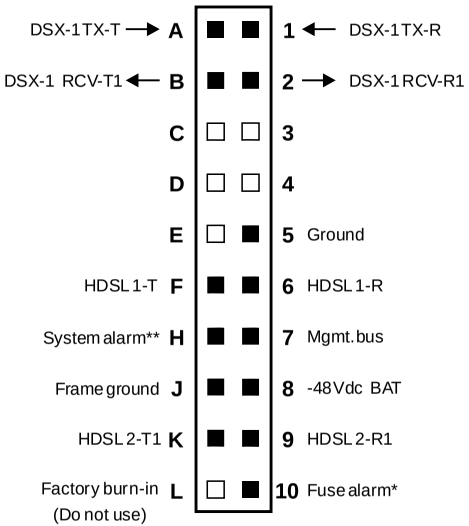
If the HLU is communicating with the next span device, the following occurs:

1. The Status LED flashes green 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 the Span Status, Performance Data, Performance History, and Alarm History screens to ensure accurate data and alarm reporting.

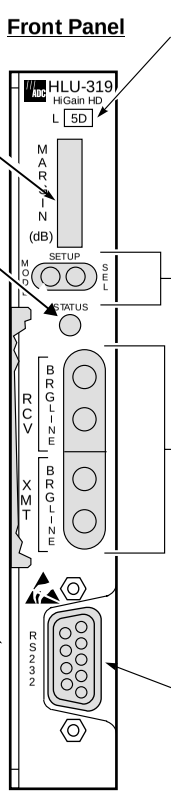
Card-edge Connector



*** Fuse alarm**
Normal = Floating (0 to -60 Vdc maximum)
Activated = -48 Vdc, 10mA maximum

**** System alarm**
Normal = Floating (+5 to -60 Vdc maximum)
Activated = +5 Vdc, 10mA maximum

Front Panel



List number (HLU version number)

Four-character display

Displays status, provisioning, and alarm messages. See the *Front Panel Alarm Messages* table below for a list of message descriptions.

Status LED

Reports the following conditions:

Green LED	Normal operation
Flashing Green LED	HDSL acquisition
Red LED	Fuse alarm
Flashing Red LED	System alarm
Yellow LED	Self Test is in process or a CREM or NLOC loopback is in effect.
Flashing Yellow LED	System is in ARM mode.

Modem settings:

1200-9600 baud
8 data bits
No parity
1 stop bit
Hardware flow control: NONE
Terminal emulation software: VT-100

CLEI and ECI bar code label

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 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

Connect standard test equipment.

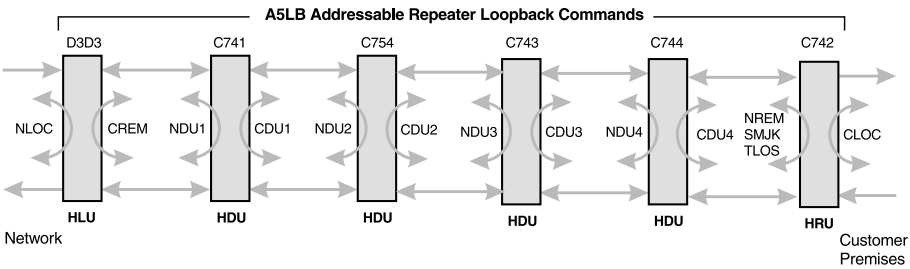
SPAN	Provides splitting jack access to (XMT) and from (RCV) the HDSL span at the DSX-1 interface.
BRG	Provides non-intrusive bridging jack access to (XMT) and from (RCV) the HDSL span at the DSX-1 interface. Allows monitoring of the T1 payloads.

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.

4 LOOPBACK TESTING

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



A5LB Special Loopback Commands

Inband Code	
11000. . .	ARMING or NI LPBK (2-in-5 arming code)
11100. . .	IR LPDN or DISARM (3-5 disamarming code)
D3D3	IOR LPBK (NLOC and CREM 230-232 bit errors and 229-231 bit errors)
C741	ILR-1 LPBK (NDU1 and CDU1 10 bit errors)
C754	LR-20 LPBK (NDU2 and CDU2 200 bit errors)
C743	ILR-3 LPBK (NDU3 and CDU3 30 bit errors)
C744	ILR-4 LPBK (NDU4 and CDU4 40 bit errors)
C742	ILR-2 LPBK (NREM and CLOC 20 bit errors)

For more detailed information about the maintenance terminal screens, provisioning, and loopback mode testing, refer to the HLU-319 List 5D technical practice, document number 150-319-154-xx. Copies of this publication or the technical practice can be downloaded from the ADC website at *www.adc.com*. To order a hard copy, please contact your sales representative.

Front Panel Alarm Messages

Message	Description
ALRM	A system alarm condition is in effect.
ACO	A system alarm has been retired to an alarm cutoff condition by pressing the SEL button.
LOSW	Indicates that one of the HDSL loops has lost sync.
LLOS	Indicates that no signal is detected at the DSX-1 input to the HLU.
RLOS	Indicates that no signal is detected at the DSX-1 input to the HRU.
MAL1 or MAL2	The margin on HDSL Loop 1 or Loop 2 has dropped below the threshold (1 to 15 dB) setting.
BER	A system Bit Error Rate alarm is in effect.
NONE	No alarm present.

Front Panel Diagnostic Messages

Message	Description
1=*xx* or 2=*yy*	Indicates the power of the received HDSL signal on each loop relative to noise. Any value of 06 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.
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.
CODE *xxxx*	The line code setting, where *xxxx* is Alternate Mark Inversion (AMI) or Bipolar with 8-Zero Substitution (B8ZS).
FERR	Framing bit error occurred at HLU DSX-1 input.
FRM *xxxx*	Determines the type of frame pattern being received from the DSX-1 where *xxxx* is SF, ESF, THRU, or NONE.
H1ES or H2ES	HLU HDSL Loop 1 or Loop 2 CRC error.
*n*HDU	Number (*n*) of doublers in the circuit.
INSL, then *xx*DB	The maximum Insertion Loss message (INSL) appears followed by *xx*DB, where *xx* is the maximum insertion in dB of all spans and loops.
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.
PWRF GND	One of the HDSL loops has been grounded.
PWRF ON	Indicates that the HDSL loops are not grounded or shorted.
PWRF OFF	HDSL span power has been turned off.
PWRF 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.

System Settings

Display Code	Description (default values in bold)
EQL	Sets the equalizer to DSX-1 for: **0 (0 to 133 ft.)**, 133 (133 to 266 ft.), 266 (266 to 399 ft.), 399 (399 to 533 ft.), 533 (533 to 655 ft.)
LBPK	Enables (**ENA**) or disables (DIS) all inband SMJK loopback commands
PWRF	DIS = disables HDSL powering LOW = HDSL line voltage is -140 V max. **AUTO** = automatically switches between -140 V for nondoubler applications and ±112 V for doubler applications) HIGH = ±112 V for all applications
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}
LBTO	Loopback timeout = NONE, 20, 60, **120** minutes
ALM	Enables (ENA) or disables (**DIS**) the alarm relay
LNCD	Line code = places the HLU and HRU in **B8ZS** or AMI mode
SAIS	Enables (**ENA**) or disables (DIS) transmission of AIS signal during NREM/SMJK loopbacks
MARG	0 to 15 dB (can only be set through a maintenance terminal connected to the craft port); the default is **4dB**
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
RTPV	Enables (ENA) provisioning at the remote (when remotely logged in) or disables (**DIS**) provisioning at the remote
BPVT	Enables (ENA) or disables (**DIS**) bipolar violation transparency (conversion of input DS1 BPVs and HDSL CRC errors into DS1 BPVs at the distant end's DS1 output port)

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

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