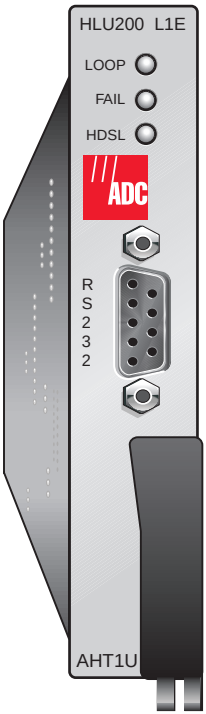
HiGain

USER MANUAL



HLU-200 List 1E Line Unit
Product Catalog: 350-200-115-02
CLEI: SLILNS5AAA

Revision History of This Manual

To order copies of this document, use document catalog number 350-200-115-02.

Issue	Release Date	Revisions Made
01	September 25, 1998	Initial Release
02	April 9, 2002	ADC Rebranding

USING THIS MANUAL

Three types of messages, identified by icons, appear in text.

Notes contain information about special circumstances.

Cautions indicate the possibility of personal injury or equipment damage.

The Electrostatic Discharge (ESD) symbol indicates that a device or assembly is susceptible to damage from electrostatic discharge.

UNPACK AND INSPECT YOUR 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 ADC DSL Systems, Inc. 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 ADC DSL Systems, Inc. as described in Product Support. If you must store the equipment for a prolonged period, store the equipment in its original container.

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OVERVIEW

The ADC® HiGain® HLU-200 List 1E is an asynchronous DS1 interface unit that plugs into the Channel Bank Assembly (CBA) of a DSC LITESPAN-2000 optical loop carrier system to provide an HDSL interface. The HLU-200 List 1E is essentially an AT1U line unit with its T1 line interface circuit replaced by an HDSL line interface circuit. 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 AWG 24 wire or 9,000 feet of AWG 26 wire, including bridged taps. This CSA range can be doubled with a HiGain Doubler Unit (HDU) and tripled with two doublers. The HiGain system uses HDSL (High-bit rate Digital Subscriber Line) transmission technology as recommended by Bellcore TA-TSY-001210. HiGain complies with TRY-TSY-000063 (Network Equipment Building System (NEBS) Generic Equipment requirements) and TR-TSY-000499 (Transport System Generic Requirements - TSGR) common requirements. Ground faults occurring at any point along any span on any conductor are immediately detected and the HiGain circuit shuts down. The line unit then applies power periodically to the first span to detect the ground fault condition. This power cycling and ground fault protection continues as long as the fault condition exits.

The HLU-200 List 1E is compatible with the DSC LITESPAN 2000 Channel Bank Version 7.1x and 8.1x.

FEATURES

Figure 1 illustrates the HLU-200 List 1E front panel. Table 1 defines the front panel components.

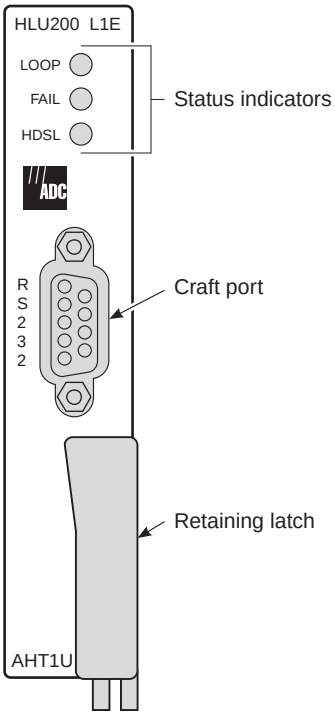


Figure 1. *HLU-200 List 1E Front Panel*

Table 1. *Front Panel Features and STATUS LED States*

Name	Function
Status Indicators	Indicates loopback, HDSL, and error status, as described below.
LOOP	Lights green when a loopback is in effect.
FAIL	Controlled by the channel bank. The LED remains on at all times when the HLU-200 is used with revision 7.1.1 banks due to a software flaw in 7.1.1 When used with revision 7.1.2 or higher, it lights when the HLU-200 is first plugged into the bank and remains on until the bank finishes its program download and handshakes with the HLU-200 line unit. During normal operation, it lights when there is a failure that affects service within the bank.
HDSL	Tri-colored LED: flashes green during HDSL sync acquisition on either HDSL loop. flashes red for any of the alarm conditions. lights steady green when both HDSL loops are in sync and no minor alarms exist. lights steady red if the on-board 48 V fuse opens.
RS-232 Craft port	Provides asynchronous access to the menu interface for system maintenance, provisioning, and performance monitoring firmware. Access is through a maintenance terminal or a PC with terminal emulation software connected to this 9-pin DB-9 female connector. The port is configured as DCE at 9600 baud, with 8 data bits, 1 stop bit, and no parity.
Retaining latch	Secures the HLU-200 into place.

COMPATIBILITY

The HLU-200 List 1E operates as a channel card within a DSC LITESPAN 2000 Channel Bank. The LITESPAN 2000 system consists of a CO bank that is connected to a remote bank over an OC3 fiber link. Each bank has slots for 56 channel plug-ins. The HLU-200 List 1E is typically installed in the remote bank where it is used to transmit a T1 payload to a remote HRU over two unconditioned HDSL cable pairs, with or without doublers. It is the HDSL equivalent to an AT1U channel card, which is used to transmit a T1 payload to a remote location over conventional T1 spans.

The HLU-200 List 1E is compatible with software releases 7.1.x and 8.1.x and above, of the LITESPAN 2000 system. The List 1E is not compatible with the LITESPAN 2000 Management System and must be maintained, provisioned, and monitored from its front panel RS-232 Craft port. The HLU-200 List 2D (AHDSL) line unit provides integrated management and is compatible with the LITESPAN 2000 TL1-based Network Management System and the LITECRAFT Management System in Version 8.x.

The HLU-200 List 1E timing is not synchronized to the LITESPAN bank timing but runs asynchronously with respect to it.

The HLU-200 List 1E can be cross-connected to another HLU-200 or another asychronous T1 channel unit within its own channel bank or in the distant channel bank. This is shown in Figure 3 on page 16, where test access at either the remote or local ends can be accomplished by use of ADS1U and AT1U line cards. These point-to-point dedicated circuits are initiated by issuing the standard TL1-based cross-connect commands to the Maintenance and Test Interface (MTI) card that identifies the HLU-200 List 1E as an AHT1U plug.

INSTALLATION

Before installing the HLU-200 List 1E, visually inspect the unit for signs of damage. If the equipment was damaged in transit, report the extent of the damage to the transportation company and to ADC.

INSTALLING THE HLU-200 LIST 1E

To install the HLU-200 List 1E into a Litespan-2000 channel bank:

1 Slide the HLU-200 List 1E into the card guides for the desired slot, then push the unit in until it touches the channel-bank backplane card-edge connector.

If the HLU-200 List 1E is removed from a slot, it must not be reinserted for at least 15 seconds. Reinserting it sooner may temporarily lock the HLU-200 List 1E into an unstable state.

2 Carefully push the unit in until it is entirely within the card guide and the retaining latch closes.

3 Install the HLU-200 List 1E into the 2000 channel bank.

4 Ensure that the following LEDs illuminate:

- The FAIL LED lights red until the handshake between the bank and the HLU-200 List 1E is complete.
- The HDSL LED flashes GREEN until an HDSL link is established between the HLU-200 List 1E and an HRU (when an HRU is installed).

5 Once the HDSL link has been established, the LEDs return to a normal operational state as described in Table 1 on page 3.

CARD-EDGE CONNECTOR

Figure 2 shows the HLU-200 List 1E pinouts.

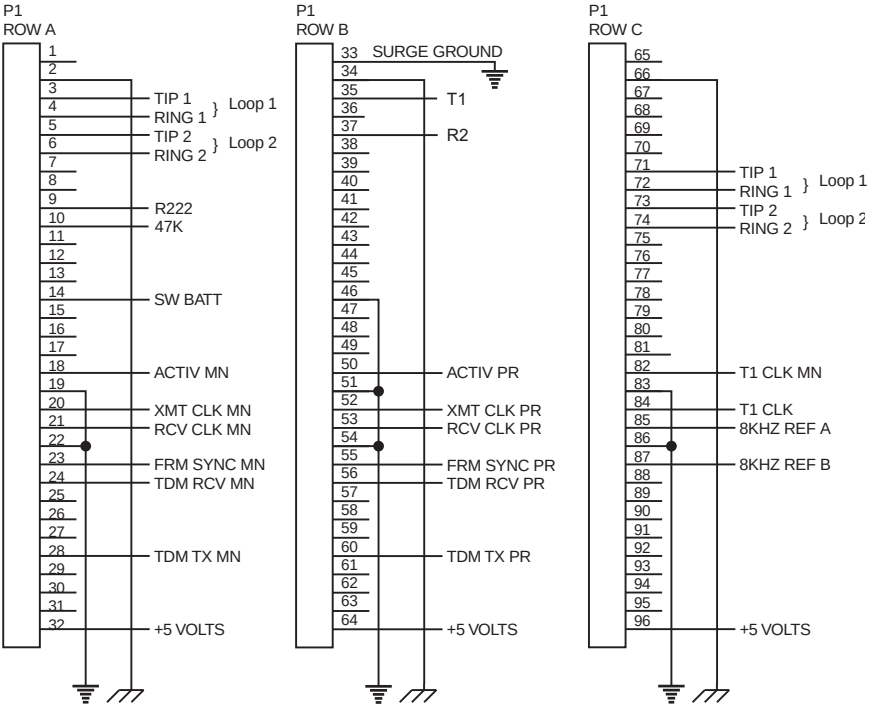


Figure 2. *HLU-200 List 1E Pinouts*

PROVISIONING

The HLU-200 List 1E specific user options can only be set from its front panel RS-232 Craft port. Only one of these options, the DS1 line code (B8ZS or AMI), is sent to the LITESPAN system manager, which reads the value and then provisions the LITESPAN Gate Array accordingly. The HLU-200 List 1E line code setting is not available from OMAPS. It must be provisioned and read from the RS-232 Craft port.

LINE CIRCUIT SETTINGS OPTION

The HLU-200 List 1E supports the following Line Circuit Settings Option:

1 Retrieve Line Circuit Settings (DLP-322) on a slot occupied by a HLU-200 List 1E:

- **a** Access ID.
- **b** AIS (Alarm Indicating Signal). This entry determines the type of AIS that is sent upstream of the CBA when the HLU-200 List 1E is in its alarm state. It is permanently set to the all ones state. The *None* or *All* option, normally available in standard Litespan cards, is not available in the HLU-200 List 1E.
- **c** Red Lined. A Yes or No indicating a circuit's Red Lined status. A circuit cannot have its provisioning changed without first notifying the customer served by that circuit.
- **d** Cross Connection Type. Indicates that an AHT1U is cross connected to another T1 or DS1 line unit.
- **e** Service State IS or OOS of the unit.
- **f** Status: Indicate the status of the AHT1U: Cross Connected, OOS, MT.

2 EDIT T1U Circuit Settings (DLP-323).

USING THE MAINTENANCE TERMINAL

The 9-pin RS-232 connector on the HLU-200 front panel allows you to use a standard RS-232 cable to connect your system to a maintenance terminal or PC running a terminal emulation program. Once connected you can access the maintenance, provisioning, and performance screens.

CONNECTING TO THE CRAFT PORT

To provision the HLU-200 through the RS-232 Craft port:

1 Configure the maintenance 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

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 Craft port on the maintenance terminal to the HLU-200 front panel RS-232 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.

4 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 user options must be set through the RS-232 Interface: Circuit ID, Time and Date, DS0 Blocking, and Margin Alarm Threshold.

SYSTEM SETTINGS

Table 2 shows the System Settings for the HLU-200 List 1E.

Table 2. *System Settings*

Mode	Selection	Description
ZBTS	ON	The HiGain system is in the ESF frame and is operating in its Zero-Byte Timeslot Interchange (ZBTSI) mode.
	OFF*	The HiGain system is in the ESF frame and is operating in its normal non ZBTSI mode.
ESAL	17	Activates the alarm input signal to the LITESPAN microprocessor and flashes the red Status LED when 17 Errored Seconds (ES) (17 HDSL CRC errors on either HDSL loop or a total of 17 BPVs and FERR) occur within a 24-hour period.
	170	Activates the alarm input signal to the LITESPAN microprocessor and flashes the red Status LED when 170 Errored Seconds (ES) (170 HDSL CRC errors on either HDSL loop or a total of 170 BPVs and FERR) occur within a 24-hour period.
	NONE*	Prevents the generation of an alarm due to excessive Errored Seconds.
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	Disables the Alarm input signal to the LITESPAN processor from the HLU processor. The HDSL LED still flashes Red for an alarm condition even when ALM DIS option is chosen.
	ENA*	Enables activation of the system alarm input signal to the LITESPAN processor from the HLU processor.
LPBK	DIS	Configures the HLU-200 to ignore the 2 in 5 SmartJack loopback command.
	ENA*	Enables the HLU-200 to respond to the 2 in 5 SmartJack loopback command.

Table 2. *System Settings (Cont.)*

Mode	Selection	Description
SPLB	GNLB*	Configures the HiGain system to respond to the generic (3/4/5/6 in 7) 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 in-band loopback codes of the Wescom addressable repeater.
	A4LB	Configures the HiGain system to respond to the in-band loopback codes of the Wescom Mod 1 addressable repeater.
	A5LB	Configures the HiGain system to respond to the in-band loopback codes of the Teltrend Mod 1 addressable repeater.
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.
DS1	B8ZS	Places both the HLU-200 and HRU into their B8ZS modes.
	AMI*	Places both the HLU-200 and HRU into their AMI modes.
	AUTO	The AUTO mode is not supported. If selected, the DS1 code defaults to AMI.
FRMG	AUTO*	Configures the HiGain system to operate in an auto-framing (AUTO) mode in which it continuously searches the input T1 bit stream for a valid SF or ESF frame pattern. This feature is required for fractional T1 applications (DS0 blocking) where it insures proper channel time slot alignment. While the HiGain system can also process unframed data in AUTO mode, it is recommended that the unframed (UNFR) 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 the HiGain system to operate in an unframed mode. This mode disables the auto framing process and forces the HiGain system to function as a transparent bit pipe.

Table 2. *System Settings (Cont.)*

Mode	Selection	Description
HAIS	2LP*	Causes the HiGain system to transmit the AIS signal at both the HLU-200 and HRU T1 output ports when both of the HDSL loops are not in sync (LOSW).
	1LP	Causes the HiGain system to transmit the AIS signal at both the HLU-200 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 List HRU to transmit the AIS signal towards the Customer Interface (CI) when in NREM or SmartJack loopback.
	DIS	Prevents the AIS signal from being transmitted to the NI and replaces it with the network test signal in the HRU or by a quiet termination (LOS) in the HRU.
MARG	0 to 15 dB 0*	The Margin Alarm Threshold determines the minimum allowable margin below which an alarm will occur.
DSO	Any combination of the 24 DSO channels/NONE*	The DSO blocking option allows any number of the 24 DSO channels to be blocked at both T1 output ports where they are replaced by the FF idle code.

*Indicates HLU-200 List 1E factory default settings

ALARMS

The alarms are detected and reported to the LITESPAN microprocessor though the “Alarm” signal from the HLU microprocessor as shown in Table 3. They also cause the HDSL LED to flash red.

Table 3. *Alarm LEDs*

ALRM Message	Indication
ALRM LOSW	Either of the HDSL loops has lost sync.
ALRM RLOS	Loss of the HRU DS1 input signal.
ALRM TLOS	A user option that causes the loss of the HRU DS1 input from the CI to initiate a logic loopback state in the HRU.
ALRM H1ES	HDSL loop 1 has exceeded the 24-hour user-selected Errored Seconds CRC threshold.
ALRM H2ES	HDSL loop 2 has exceed the 24-hour user-selected Errored Seconds CRC threshold.
ALRM DS1	The total number of bipolar violations (BPV) at the HRU DS1 input has exceeded the 24-hour user-selected threshold.
ALRM MAL1	The margin on HDSL loop 1 has dropped below the minimum threshold value set at the maintenance terminal Margin Alarm Threshold option.
ALRM MAL2	The margin on HDSL loop 2 has dropped below the minimum threshold value set at the maintenance terminal Margin Alarm Threshold option.

DIAGNOSTIC MESSAGES

The HLU-200 List 1E diagnostic messages are described in Table 4.

Table 4. *HLU-200 List 1E 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 & HRU transceivers are trying to establish contact with each other.
S2(*n*)L1 or 2	Signal 2(*n*) Loop 1 or Loop 2	The transceivers of the first doubler and either the HRU or second doubler are trying to establish contact with each other on loops 1 or 2 of span 2(*n*).
H1(2)ES	HDSL CRC Error Channel 1(2)	HLU HDSL Loop 1(2) CRC error.
ACQ1(2)	Acquisition 1(2)	The HLU & HRU multiplexers are trying to establish synchronization over each loop.
ARM	HiGain System ARMED	Armed to respond to Intelligent Repeater Loop Codes.
ACO	Alarm CutOff	A minor alarm has occurred, and been retired to an ACO condition, by pressing the SEL button on the HLU front panel.
Self Test		The HLU is in a self test mode. This occurs every power ON/OFF cycle.
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 T&R of either HDSL pair in span 1.

Table 4. *HLU-200 List 1E Diagnostic Messages (Cont.)*

Message	Full Name	Description
PWR FEED OFF	Power Feed Off	HDSL span power has been turned off by setting the PWFD option to DIS or HDSL span power has been turned off by use of the A1LB/A2LB/A5LB Intelligent Office Repeater (IOR) Power Down code.
PWR FEED GND	Power Feed Ground	One of the HDSL loops has been grounded.
BER	Bit Error Rate	A system BER alarm is in effect.
BAD RT?	No response from HRU	The HLU does not receive any response from the HRU. Thus, the HRU integrity is questionable.
VER	HLU Software Version #	This 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.

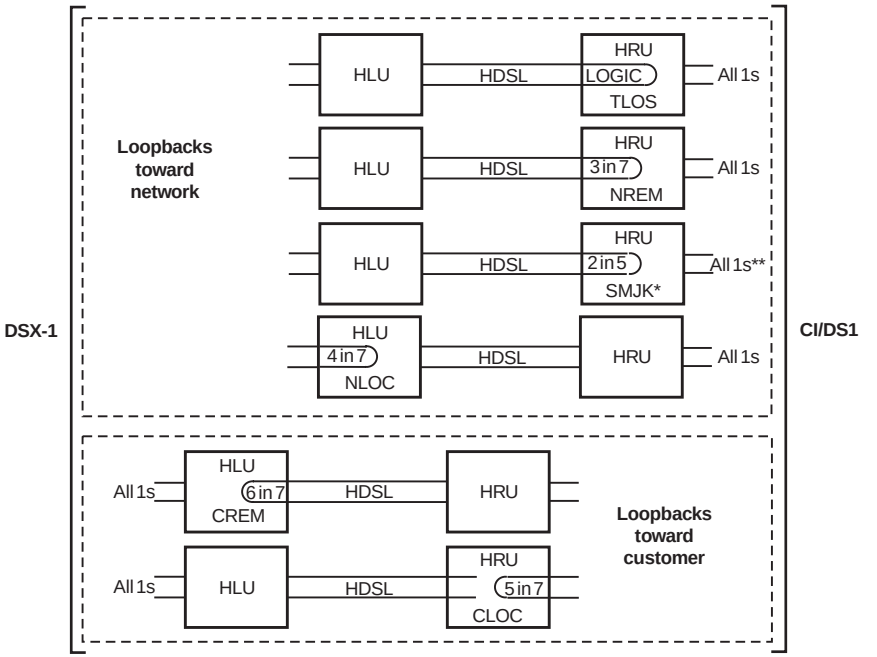
LOOPBACKS

The HLU-200 loopback messages are described in Table 5.

Table 5. *Loopbacks*

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 maintenance terminal.
NLOC	Network Local Loopback	Loopback at HLU toward the network initiated by upstream in-band codes or from the maintenance terminal.
NDU*n*	Network Doubler *n* Loopback	Loopback at Doubler #*n* to network initiated by IOR code or by Manual Loopback buttons on the HLU-200 List 1E front panel or by the maintenance terminal.
CLOC	Customer Local Loopback	Loopback at HRU toward customer initiated from Customer Premises Equipment (CPE) by in-band codes or from the maintenance terminal.
CREM	Customer Remote Loopback	Loopback at HLU toward customer initiated from CPE by in-band codes or from the maintenance terminal.
CDU*n*	Customer Doubler *n* Loopback	Loopback at Doubler #*n* to CI initiated by ILR code, the Manual Loopback buttons on HLU-200 List 1E front panel or by the maintenance 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.

Figure 3 on page 16 shows the configurations for the HLU-200 List 1E FT1 loopbacks with doublers.



* The Smart-Jack loopback is a metallic loopback in the HRU Lists 6 and 7. It is a logic loopback in HRU Lists 1 through 5.

** Set the SAIS option to ENA to send the AIS pattern to the CI during Smart-Jack Loopback.

Figure 3. *GNLB Loopback Configuration with Doublers*

SPECIFICATIONS

Maximum Power Consumption

13 Watts (without doublers) 20 Watts (with doublers)

Maximum Heat Dissipation

5 Watts (without doublers), 6.3 Watts (with doublers)

Mounting

LITESPAN 2000 CBA/ONU-48, 96

Dimensions

Height:	4.42” (11.22 cm)
Width:	0.84” (2.13 cm)
Depth:	10.2” (25.9 cm)
Weight:	1 lb (0.45 kg)

PRODUCT SUPPORT

ADC Customer Service Group provides expert pre-sales and post-sales support and training for all its products.

Technical support is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center (TAC).

Sales Assistance 800.366.3891 extension 73000 (USA and Canada) 952.917.3000 Fax: 952.917.3237	• Quotation Proposals • Ordering and Delivery • General Product Information
Systems Integration 800.366.3891, extension 73000 (USA and Canada) 952.917.3000	• Complete Solutions (from concept to installation) • Network Design and Integration Testing • System Turn-Up and Testing • Network Monitoring (upstream or downstream) • Power Monitoring and Remote Surveillance • Service/Maintenance Agreements • Systems Operation
ADC Technical Assistance Center 800.638.0031 714.730.3222 Fax: 714.730.2400 Email: wsd_support@adc.com	• Technical Information • System/Network Configuration • Product Specification and Application • Training (product-specific) • Installation and Operation Assistance • Troubleshooting and Repair/Field Assistance
Online Technical Support	• www.adc.com/Knowledge_Base/index.jsp
Online Technical Publications	• www.adc.com/library1/
Product Return Department 800.366.3891 ext. 73748 or 952.917.3748 Fax: 952.917.3237 Email: repair&return@adc.com	• ADC Return Material Authorization (RMA) number and instructions must be obtained before returning products.

All 800 lines are toll-free in the USA and Canada.

LIMITED WARRANTY

ADC DSL Systems, Incorporated (“ADC”) warrants that, for a period of sixty (60) months from the date of shipment, the hardware portion of its products will be free of material defects and faulty workmanship under normal use. ADC's obligation, under this warranty, is limited to replacing or repairing, at ADC's option, any such hardware product which is returned during the 12-month warranty period per ADC's instructions and which product is confirmed by ADC not to comply with the foregoing warranty.

ADC warrants that, for a period of 90 days from the date of purchase, the software furnished with its products will operate substantially in accordance with the ADC published specifications and documentation for such software. ADC’s entire liability for software that does not comply with the foregoing warranty and is reported to ADC during the 90-day warranty period is, at ADC’s option, either (a) return of the price paid or (b) repair or replace of the software. ADC also warrants that, for a period of thirty (30) days from the date of purchase, the media on which software is stored will be free from material defects under normal use. ADC will replace defective media at no charge if it is returned to ADC during the 30-day warranty period along with proof of the date of shipment.

The transportation charges for shipment of returned products to ADC will be prepaid by the Buyer. ADC will pay transportation charges for shipment of replacement products to Buyer, unless no trouble is found (NTF), in which case the Buyer will pay transportation charges.

ADC may use reconditioned parts for such repair or replacement. This warranty ***does not*** apply to any product which has been repaired, worked upon, or altered by persons not authorized by ADC or in ADC's sole judgment has subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

Repaired products have a 90-day warranty, or until the end of the original warranty period—whichever period is greater.

ADC DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ITS PRODUCTS AND ANY ACCOMPANYING WRITTEN MATERIALS. FURTHER, ADC DOES NOT WARRANT THAT SOFTWARE WILL BE FREE FROM BUGS OR THAT ITS USE WILL BE UNINTERRUPTED OR REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE SOFTWARE IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY OR OTHERWISE.

FCC COMPLIANCE

This unit complies with the limits for Class A digital devices 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, can 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.Refer to the installation section of the appropriate instruction manual for the unit you are installing to get information on:

- Cabling
- Correct connections
- Grounding

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