HiGain

QUICK INSTALLATION

HRU-402 LIST 4F
REMOTE UNIT

ADC

HRU-402 LIST 4F

The HiGain® HRU-402 List 4F functions as the remote end of a repeaterless T1 transmission system when connected to a High-bit-rate Digital Subscriber Line (HDSL) HiGain Line Unit (HLU). The HiGain system provides 1.544 Mbps transmission on two unconditioned copper pairs over the full Carrier Service Area (CSA) range. HiGain Doubler Units (HDUs) can also be used to extend the range. The HRU-402 supports both local and line powering. The local power option has an expanded input voltage range of -20 to -70 volts.

FEATURES

- 1.544 Mbps full-duplex transmission on two unconditioned copper pairs
- Status Light Emitting Diodes (LEDs) for Digital Signal Level 1 (DS1) and HDSL
- Craft port access for maintenance terminal connection
- Narrow 200 mechanics
- Support for up to five spans
- Remote provisioning
- Generic and addressable repeater loopback activation codes
- Lightning and power cross-protection on HDSL and DS1 interfaces
- Applied Digital Access (ADA) performance monitoring options
- DS1 transmit and receive monitor jacks for testing
- Ultra-low wander

SPECIFICATIONS

Operating Temperature	-40°F to +149°F (-40°C to +65°C)
Operating Humidity	5% to 95% non-condensing
Power Consumption	
Line-powered	3.1W (when connected to HLU-231 List 8x, HLU-319 List 5x, or HLU-388 List 5x; 4.5W when connected to all other line units)
Locally powered	5.2W (sealing current on); 4.7W (sealing current off)
Electrical Protection	Secondary surge and power cross-protection on all DS1 and HDSL2 ports
Mounting	Narrow 200 mechanics shelf (half-width 400 mechanics)
HDSL Line Rate	784 Kbps 2B1Q
HDSL Output	+13 dBm ±0.5 dBm, 135 Ω
DS1 Pulse Output	0 dB, -7.5 dB, -15 dB
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), Bipolar with 8-Zero Substitution (B8ZS) or Zero Byte Time Slot Interchange (ZBTSI)
DS1 Frame Format	Extended SuperFrame (ESF), SuperFrame (SF) or Unframed (THRU)

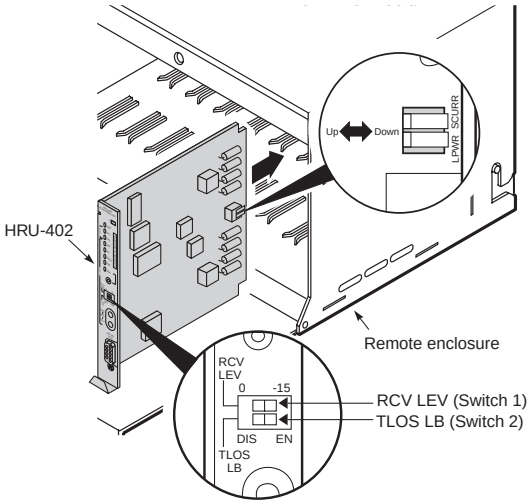
1 INSTALLATION

1 Set the RCV LEV and TLOS LB configuration switches located on the front panel. These switches set the DS1 receive line buildout level toward the Customer Interface (CI).

RCV LEV	0	Sets the DS1 receive level toward the CI to 0 dB (default setting).
	-15	Sets the DS1 receive level toward the CI to -15 dB.
TLOS LB	ENA	Enables the TLOS loopback option. The TLOS message displays on the HLU when the HRU is in a logic loopback state caused by a loss of its T1 input from the CI.
	DIS	Disables the TLOS loopback option.

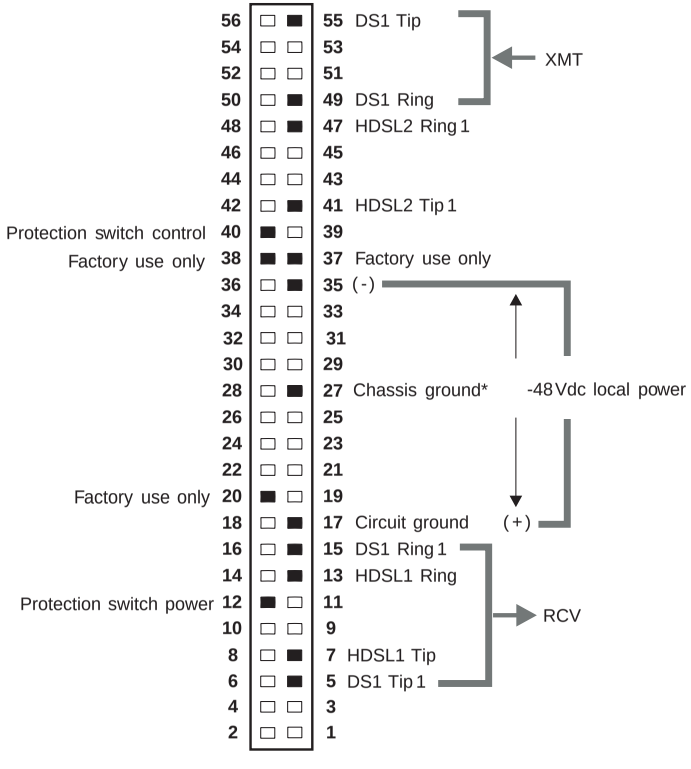
2 Set the S1 switches (SCURR and LPWR) adjacent to the card-edge connector.

SCURR	Disable (up position)	Disables the flow of simplex sealing current towards the upstream unit.
	Enable (down position)	Enables the flow of simplex sealing current towards the upstream unit (default setting). Simplexed sealing current is polarity-sensitive and does not flow if the HDSL loops adjacent to the HRU are reversed.
LPWR	Line power (up position)	Configures HRU to receive power from the upstream line unit over the HDSL pairs.
	Local power (down position)	Configures the HRU to receive power from a local -48 Vdc supply (default setting). If local power is not present, the HRU reverts to line power mode.

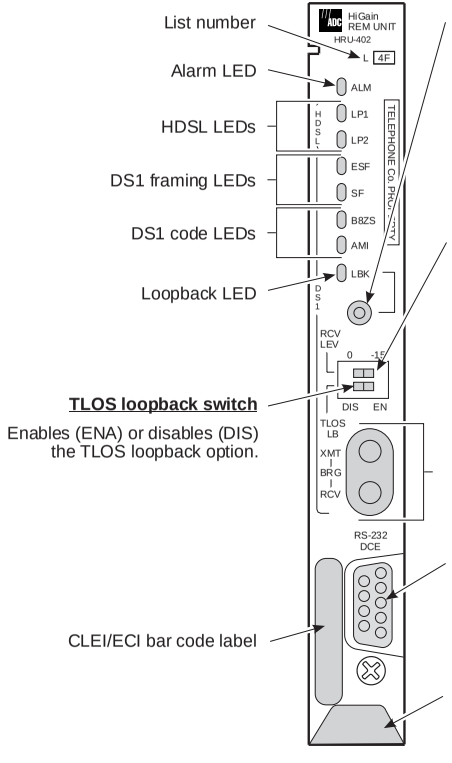


RCV LEV AND TLOS LB Switches

Continued



*Chassis ground must be tied to earth ground per local practice.
Note: Active pins are highlighted in black.



Loopback control pushbutton

Pressing the pushbutton for 5 seconds activates a remote loopback towards the network, called a Network Remote Loopback (NREM). Any existing loopback is terminated before NREM is activated. The unit can be looped down by either pressing the LPBK control pushbutton again for 5 seconds or by the standard loopdown in-band messages.

DS1 receive level switch

Sets the receive line buildout output toward the Customer Interface (CI).

0	Sets the DS1 receive level toward the CI to 0 dB (default).
-15	Sets the DS1 receive level toward the CI to -15 dB.

DS1 transmit and receive monitor jacks

Provide monitoring and test access.

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 HRU craft port.

Extraction handle

Modem terminal modem settings

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

Enable the SCURR switch if you are using the following doublers: HDU-404, HDU-407, HDU-409, HDU-437, HDU-439 List 1 or List 1B, HDU-451 List 4 or 4B.

Disable the SCURR switch if you are using an HDU-451 List 1, List 2, List 3, or List 3B.

3 Align the HRU with the enclosure slot guides, then push the unit in until it is properly seated in the backplane card-edge connector.

2 VERIFICATION

Once the HRU-402 is installed, verify that it is operating properly by monitoring the Status LEDs on the front panel.

Status LED Descriptions

LED Status	Description
Alarm (ALM) LED	Shows alarm states for remote and local Loss of Signal (LOS).
Solid red	Indicates an LOS condition at the T1 input of the HRU.
Blinking	Indicates an LOS condition at the T1 input of the line unit.
HDSL LEDs	Displays HDSL Loop 1 (LP1) and Loop 2 (LP2) conditions.
Solid green	Indicates HDSL loop is in synchronization.
Blinking once per second	Indicates the HDSL loop is trying to acquire synchronization.
Blinking 4 times per second	Indicates a margin alarm condition on the HDSL loop.
Blinking 10 times per second	Indicates a Cyclical Redundancy Check (CRC) error on the HDSL loop.
OFF	Indicates no activity on the HDSL loop.
DS1 Framing (FRM) LEDs (ESF and SF)[a]	Indicates framing patterns. If DS1 signals are not detected, the ESF and SF LEDs do not light.
ESF LED (solid green)	Indicates Extended Super Frame (ESF). The LED blinks once per second when a frame error occurs.
SF LED (solid green)	Indicates Super Frame (SF). The LED blinks once per second when a frame error occurs.
OFF	Indicates unframed or no signal.
DS1 Code LEDs (B8ZS and AMI) [a] [b]	Indicates DS1 code options. If DS1 signals are not detected, the B8ZS (Bipolar with 8-Zero Substitution) and AMI (Alternate Mark Inversion) LEDs do not light.
B8ZS LED (solid green)	Indicates that the DS1 line code option is set to B8ZS or the option is set to AUTO and a B8ZS line code is being received at the HRU DS 1 input. The LED blinks once per second when a string of excessive zeros is detected.
AMI LED (solid green)	Indicates that the user DS1 line code option is set to AMI or the option is set to AUTO and an AMI line code is being received at the HRU DS1 input. This LED blinks once per second when a Bipolar Violation (BPV) is detected.
Loopback (LPBK) LED	Shows loopback states to and from the network and to and from the Customer Interface (CI).
Solid yellow	Indicates Network Remote (NREM) loopback, SmartJack (SMJK), or Transmit Loss of Signal (TLOS).
Blinking once per second	Indicates Customer Local (CLOC) loopback state.
Blinking 4 times per second	Indicates the HRU is in an Armed state.

(a) If DS1 signals are not detected, the ESF, SF, B8ZS, and AMI LEDs do not light.
(b) AUTO option indicates when the DS1 code is being detected as AMI or B8ZS. This option is not available with HLU-231 List 8D and List 8E, HLU-319 List 5D and List 5E, or HLU-388 List 5D and List 5E.

3 LOGGING ON TO THE MAIN MENU

The HRU-402 supports local and remote logon through a maintenance terminal (VT100 or a PC running terminal-emulation software) connected to the front panel craft port. Remote logon creates menus and screens for the HRU that are identical to those viewed at the HLU. Once logged on, the user can access the Remote Terminal Main Menu screens to view system settings, initiate loopbacks, and provision the circuit.

To log on and access the Remote Terminal Main Menu screens using a maintenance terminal, perform the following steps:

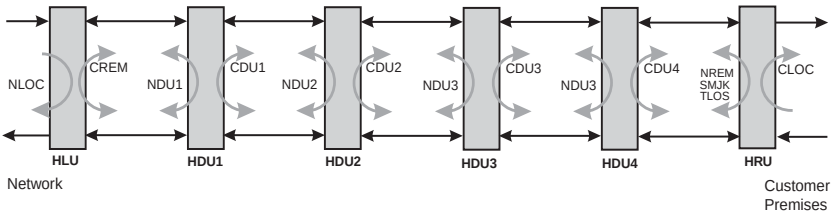
1 Press the **SPACEBAR** several times to display the Remote logon screen.

2 Press the **ENTER** key to view the HiGain maintenance terminal screen. The Remote Terminal Main Menu items are replications of the line unit screens. Depending on the HLU attached to the HRU-402, remote provisioning may be available.

Copies of this publication or an applicable HLU technical practice can be downloaded from the ADC website at *www.adc.com*. To order a hard copy, please contact your sales representative.

4 LOOPBACK TESTING

Initiate loopback testing from the maintenance terminal menus or by using in-band codes. The in-band codes (shown below) can be sent by a test set. For more information, refer to the technical practice for the HLU line unit.



GNLB Loopback Commands

Loopback	In-band 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	111100	Signal from customer is looped back to the customer at HDU1.
CDU2	111110	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.

COMPATIBILITY

The HRU-402 is compatible with the following ADC products:

Line Units	Doublers	Indoor Enclosures	Outdoor Enclosures
HLU-231 List 8x	HDU-404	HRE-420	HRE-450
HLU-319 List 5x	HDU-407	HRE-422	HRE-454
HLU-388 List 5x	HDU-409	HRE-425	
HLU-200	HDU-437	HRE-427	
HLU-432	HDU-439 List 1 or List 1B	HRE-204	
	HDU-451 List 4 or List 4B	200 or 400 mechanics shelves	

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

The 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 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

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Certificated Firm

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