HiGain

QUICK INSTALLATION

HRU-402 REMOTE UNITS
LIST 1 (LOCAL AND LINE POWER)
LIST 3 (LOCAL POWER)

THE HRU-402 LIST 1 AND LIST 3

The HiGain® Remote Units, HRU-402 List 1 or HRU-402 List 3, function as the remote end of a repeaterless T1 transmission system. An HRU connects to a HiGain HDSL Line Unit (HLU), creating a HiGain system that 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 List 1 supports both local and line powering. The HRU-402 List 3 is only locally powered and has an expanded input voltage range of -20 to -70 volts.

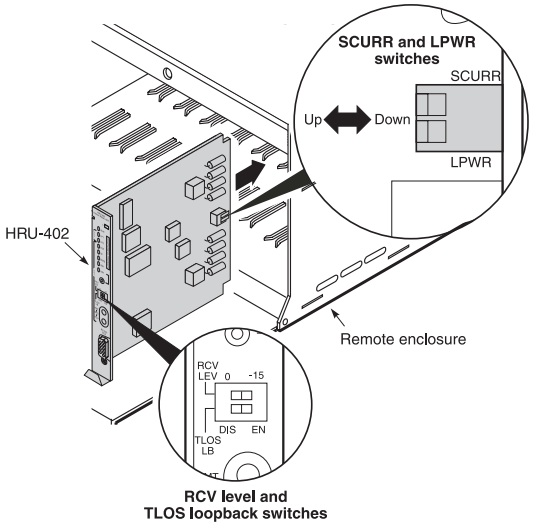
FEATURES

- 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
- Generic and addressable repeater loopback activation codes
- Lightning and power cross-protection on HDSL and DS1 interfaces
- DS1 transmit and receive monitor jacks for testing
- Remote provisioning
- 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	3.1 W (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.) Line powered: 5.2 W (List 1, sealing current on); 4.7 W (List 3, sealing current on) Locally powered: 4.1 W (List 1, sealing current off); 3.7 W (List 3, 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 Code	784 kbps 2B1Q full duplex
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 THRU (unframed)

1 INSTALLATION

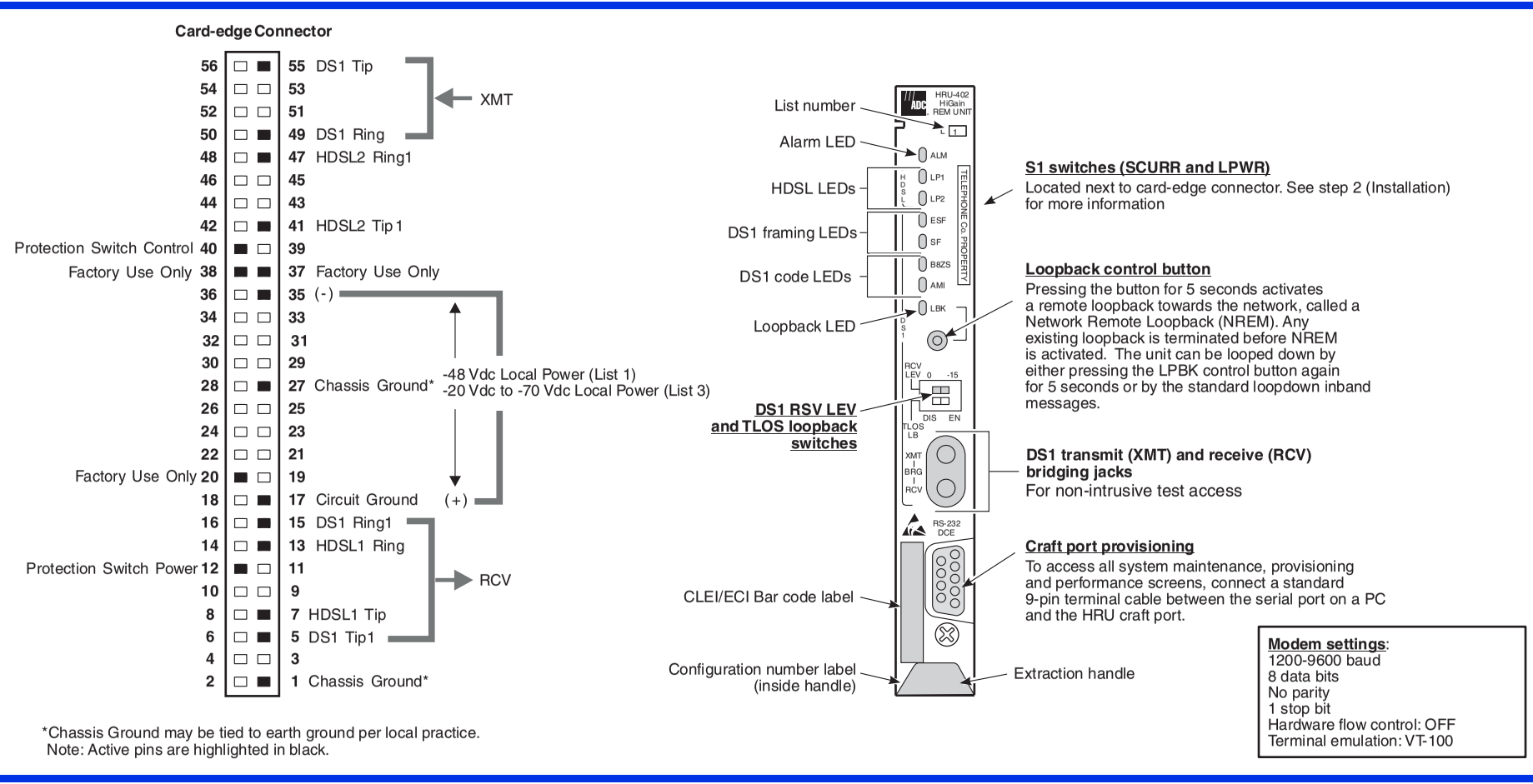


1 Set the DS1 RCV LEV and TLOS loopback switches. These switches set the DS1 receive line buildout level toward the Customer Interface (CI).

Switch 1	0	Default setting. Sets the DS1 receive level toward the CI to 0 db.
	-15	Sets the DS1 receive level toward the CI according to -15 db.
Switch 2	ENA	Default setting. 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)	Default setting. 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. Simplexed sealing current is polarity-sensitive and will not flow if the HDSL loops adjacent to the HRU are reversed.
LPWR (List 1 only)	Line power (up position)	Default setting. Configures the HRU-402 to receive power from the upstream line unit over the HDSL pairs.
	Local power (down position)	Configures the HRU-402 to receive power from a local -48V supply. If local power is not present, the HRU reverts to line power mode.


Card-edge Connector
56 55 DS1 Tip
54 53
52 51
50 49 DS1 Ring
48 47 HDSL2 Ring1
46 45
44 43
42 41 HDSL2 Tip1
Protection Switch Control 40 39
Factory Use Only 38 37 Factory Use Only
36 35 (-)
34 33
32 31
30 29
28 27 Chassis Ground*
26 25
24 23
22 21
Factory Use Only 20 19
18 17 Circuit Ground (+)
16 15 DS1 Ring1
14 13 HDSL1 Ring
Protection Switch Power 12 11
10 9
8 7 HDSL1 Tip
6 5 DS1 Tip1
4 3
2 1 Chassis Ground*
XMT
RCV
-48 Vdc Local Power (List 1)
-20 Vdc to -70 Vdc Local Power (List 3)
*Chassis Ground may be tied to earth ground per local practice.
Note: Active pins are highlighted in black.
List number
Alarm LED
HDSL LEDs
DS1 framing LEDs
DS1 code LEDs
Loopback LED
DS1 RSV LEV and TLOS loopback switches
CLEI/ECI Bar code label
Configuration number label (inside handle)
HRU-402 HiGain REM UNIT
ALM
LP1
LP2
ESF
SF
B8ZS
AMI
LBK
TELEPHONE Co. PROPERTY
RCV LEV 0 -15
DIS EN
TLOS LB
XMT BRG RCV
RS-232 DCE
Extraction handle
S1 switches (SCURR and LPWR)
Located next to card-edge connector. See step 2 (Installation) for more information
Loopback control button
Pressing the button 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 button again for 5 seconds or by the standard loopdown inband messages.
DS1 transmit (XMT) and receive (RCV) bridging jacks
For non-intrusive 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.
Modem settings:
1200-9600 baud
8 data bits
No parity
1 stop bit
Hardware flow control: OFF
Terminal emulation: VT-100

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

Disable the SCURR switch if you are using an HDU-451 List 1, 2, 3, or 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 is installed, verify that it is operating properly by monitoring the Status LEDs on the front panel.

Status LED Descriptions

LED Status	Indicates
Alarm (ALM) LED	Shows alarm states for remote and local Loss of Signal (LOS).
Solid red	Indicates a Loss of Signal (LOS) condition at the T1 input of the HRU.
Blinking	Indicates a LOS condition at the T1 input of the line unit.
HDSL LED	Displays HDSL Loop 1 (LP1) and Loop 2 (LP2) conditions.
Solid green	Indicates HDSL loop is in sync.
Blinking once per second	Indicates the HDSL loop is trying to acquire sync.
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 will 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 and AMI LEDs will not light.
B8ZS LED = Solid green	Indicates that the DS1 line code option is set to Bipolar with 8-Zero Substitution (B8ZS). 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 Alternate Mark Inversion (AMI). 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), SmartJack (SMJK), or Transmit Loss of Signal (TLOS) loopback.
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 List 1 and List 3 support local and remote logon through a maintenance terminal (VT-100 or a PC running VT-100 terminal-emulation software) connected to the craft port on the front panel. Remote login creates menus and screens for the HRU that are identical to those viewed at the HLU. Once logged on, you 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:

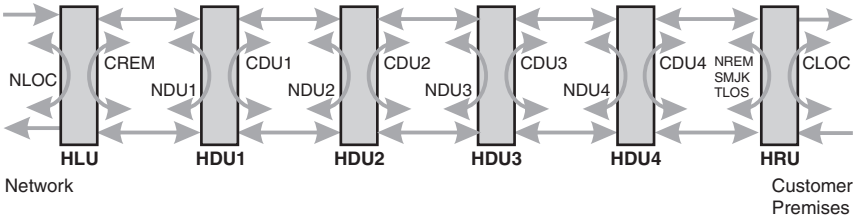
1 Press the SPACEBAR several times to display the Remote Login screen.

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. Refer to the HLU technical practice for details.

For more detailed information about the Maintenance Terminal screens, provisioning, and loopback mode testing, download the appropriate line unit technical practice 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 inband codes. The inband 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	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	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 List 1 and List 3 are 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	
	HDU-439 List 1 or 1B	200 mechanics shelves	
	HDU-451 List 4 or 4B	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. 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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Product Catalog: HRU-402-L1, HRU-402-L3
CLEI: T1L2CW0A, T1L3KLJD
Document: 350-402-100-04, Issue 4

1213778
March 30, 2000