

2-Pair HDSL1 Adtran® Fiber Optic Link System®

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PART NUMBERS

MULTIMODE

HDSL1 ADTRAN® CO CARD	8806-1339-01
HDSL1 ADTRAN® SUB CARD	8806-1349-01

SINGLE-MODE

HDSL1 ADTRAN® CO CARD	8806-1340-01
HDSL1 ADTRAN® SUB CARD	8806-1350-01

1. General

This practice provides installation and maintenance procedures for the 2-Pair HDSL1 Adtran® Fiber Optic Link system.

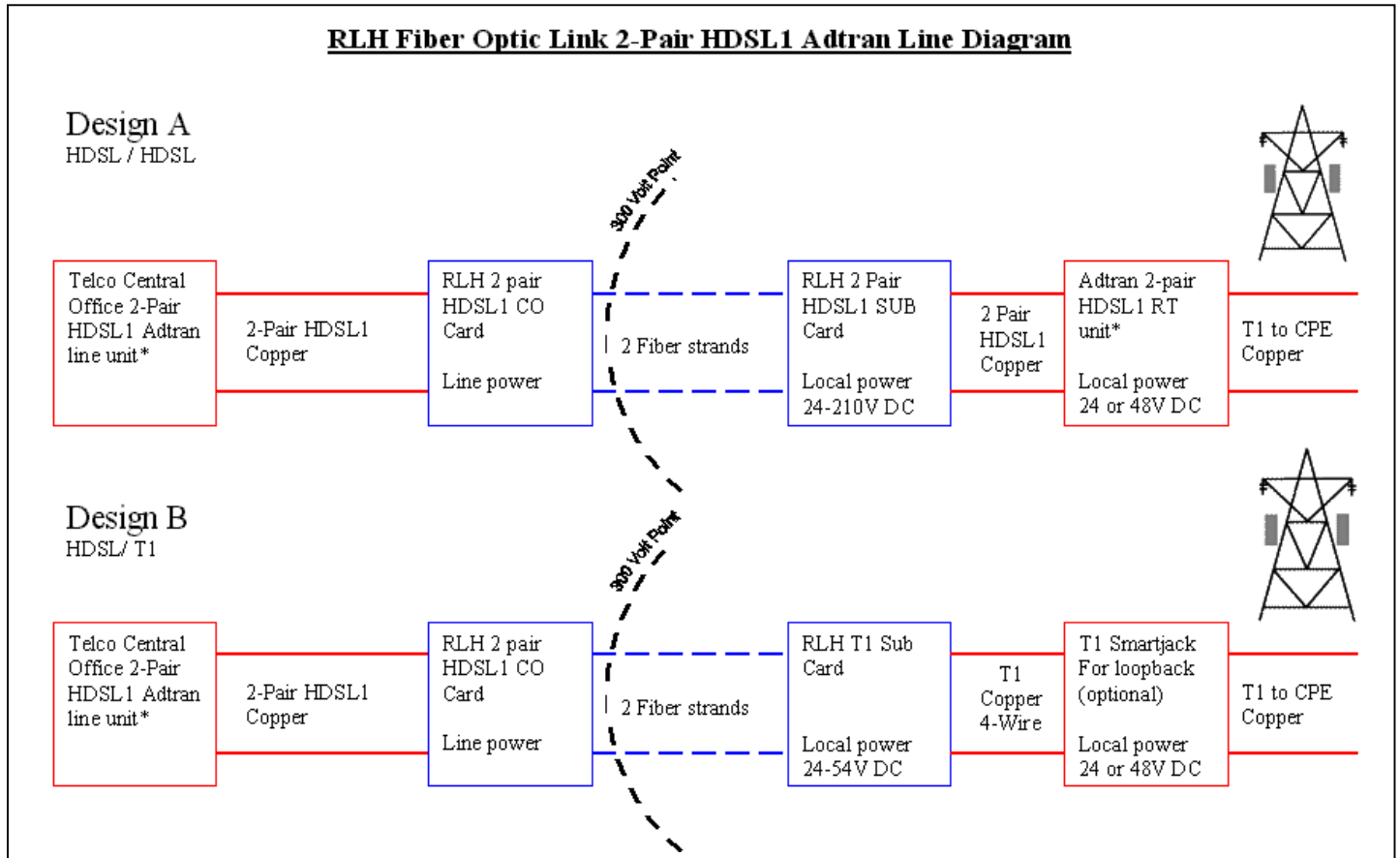
The RLH Industries, Inc. 2-Pair HDSL1 Adtran® Fiber Optic Link System interfaces with a standard 2-Pair Adtran copper HDSL1 line from the Central Office. The CO side HDSL1 Adtran Fiber Optic Link card converts the copper signal for transmission over fiber optic cable (multimode or single-mode). The Sub side Card converts the signal back to copper format, either HDSL or T1 by using the HDSL1 Adtran® Sub Card or T1 Sub Card (See diagram on page 2).

Loopback testing can be performed through the HDSL1 Adtran® system using in-band codes.

2. Application

Telecommunication equipment in high voltage areas can be at risk due to Ground Potential Rise (GPR). A copper telephone line referenced to a remote ground can become a path for high voltages during a ground fault. Placement of All-Dielectric fiber optic cable (instead of copper) from the 300V point of GPR you completely eliminate the presence of a telephone remote ground, which dramatically increases safety of personnel and equipment.

RLH Fiber Optic Link 2-Pair HDSL1 Adtran Line Diagram



* Adtran information listed on page 10

3. Housings

RLH CO and Sub cards are compatible with all RLH Fiber Optic Link housings. RLH also carries weatherproof enclosures. For more information please contact RLH customer support or go to www.fiberopticlink.com

Card Housings:

- 1-Card Housing PN 8806-1200-04 wall mountable
- 2-Card Housing (PN 8806-1200-05) wall or pole mountable
- 2-Card Rack Enclosure (PN 8806-1292-01)
- 5-Card Shelf (PN 8806-1231-02) wall or rack mountable
- 8-Card Shelf (PN 8806-1229-01) wall or rack mountable
- 12-Card Shelf (PN 8806-1230-02) wall or rack mountable

4. Installation

4.1 Inspection

After unpacking the unit, immediately inspect it for possible shipping damage. If damage is discovered, file a claim immediately with the carrier, and then contact RLH Customer Service. See page 10 for warranty and customer support.

CAUTION

- Never install telephone wiring during a lightning storm
- Active HDSL pairs carry high DC voltages (90-210v DC)
- This product incorporates static sensitive components. Proper electrostatic discharge procedures must be followed.

4.2 Installer Connections

When installing the RLH HDSL1 Adtran® CO and Sub Cards the copper pair is connected via green terminal on the front of the card. The HDSL1 Adtran®

® Card has a transmit and receive optical connector (ST female). Fiber should be



Figure 4-1
RLH HDSL1 Adtran CO Card
installed inside RLH card housing

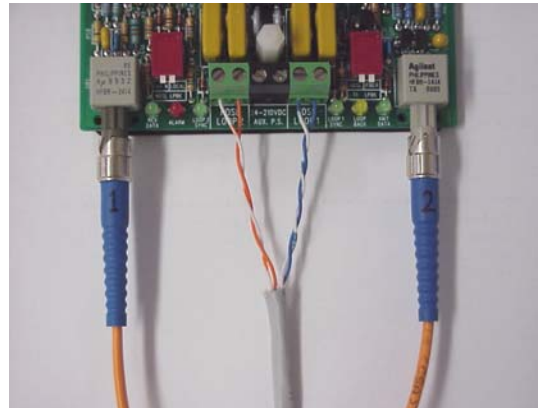


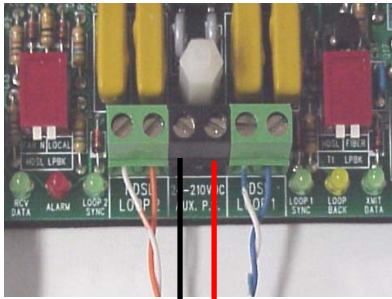
Figure 4-2
Close up view of CO Card copper
and fiber connections.

4.3 Powering

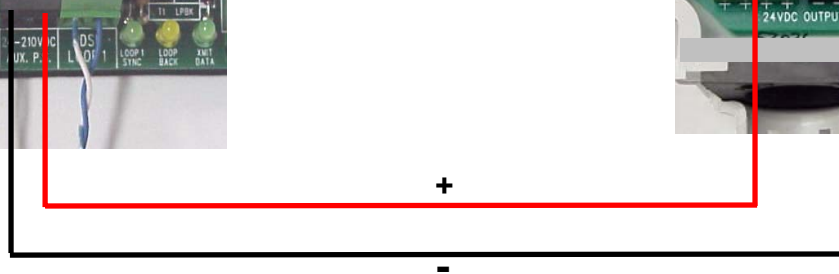
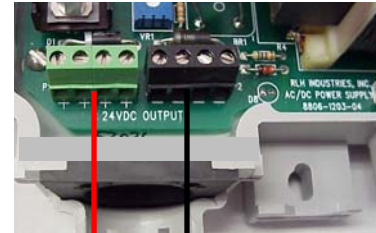
The RLH HDSL1 Adtran® CO Card is line powered via the HDSL pairs (90-210V DC).

RLH HDSL1 Adtran® Sub side requires local power of 24-210 VDC, 200mA. Power is connected to the black screw down terminal labeled: **(24-210VDC PWR INPUT)**. Power input is not polarity sensitive. See table 4-3 for RLH AC/DC power supplies.

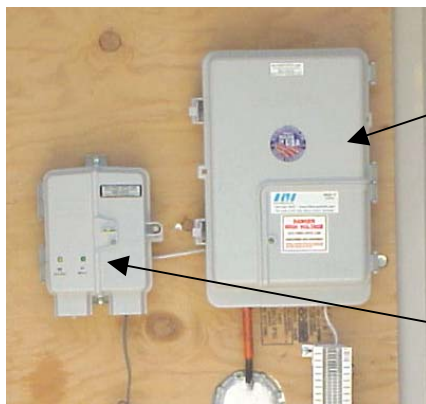
**RLH HDSL1 Adtran
Sub Card**



**24-210V DC
Power Supply**



Example of Sub side setup with AC/DC Power Supply



RLH HDSL1 Adtran Sub Card installed in Card Housing

RLH AC/DC Power Supply

4-3 RLH AC/DC power supplies

P/N	Description
8806-1203-04	115/24V AC/DC Power Supply w/ 1.2A Battery backup, can power max of 2-HDSL1 Cards.
8806-1206-03	115/24V AC/DC Power Supply w/ 7.0A Battery backup, can power max of 8-HDSL1 Cards

5. Provisioning

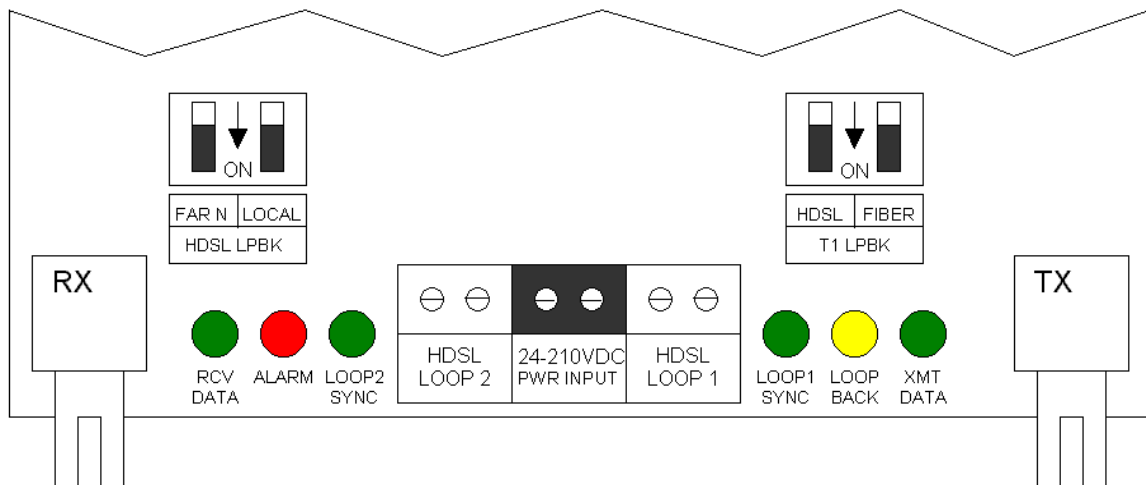
CO and Sub HDSL1 Cards come pre-set at the factory and no adjustments are needed for normal operation. Before installation, inspect factory settings to assure that cards are setup properly per the following:

5.1 CO and SUB Settings

The RLH HDSL1 Card has a jumper for selecting between CO and SUB operation. The jumper is located on the front of the card. See figure 5-1

5.2 Dip Switch Option

CO and Sub Cards have two dip switches located at the front of each Card. Dip switches are used for manual loopback testing. Dip switches should be set in the off position for CO and Sub Cards normal operation. See section 7.2 for diagram of different manual loopback test options.



5-1

6. LED Status

L.E.D. STATUS INDICATORS

There are six (6) Light Emitting Diodes (L.E.D.s) that display operational status of the RLH HDSL Card. Between the Optical Receiver and the Wiring Connector are RCV (receive) DATA , ALARM and LOOP 2 SYNC (synchronized). Between the Wiring Connector and the Optical Transmitter are LOOP 1 SYNC, LOOPBACK and XMIT(transmit) DATA.

Normal operation -- All Green L.E.D.s ON, Red and Yellow OFF.

Loopback Tests ---- Yellow L.E.D. ON

Alarm condition ---- Red L.E.D. ON.

Parameters indicated by L.E.D.s:

RCV DATA (green): ON ---- 22 One bits detected within a 175 bit period starting with the first bit detected and with less than 100 consecutive Zeroes.
OFF ---- Data does not meet above limits or Receive Fiber open, transposed or not connected.

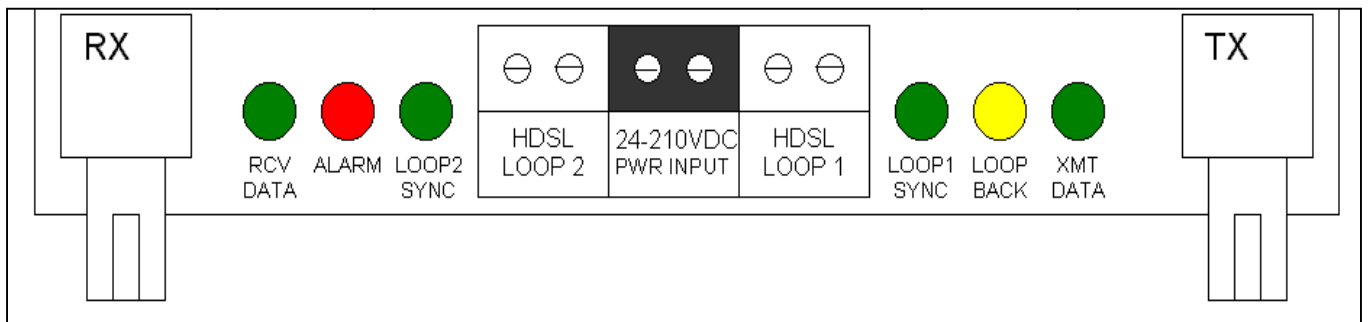
ALARM (red): ON ---- 1. Any Green L.E.D. OFF.
2. If all Green L.E.D.s are ON;
a. Loss of DS1 input data at far-end of HDSL System.
b. HDSL signal margin is below threshold (default value is 4 dB).
c. HDSL errored seconds are above threshold (default value is 170 per 24 hours).
OFF ---- No alarms detected.

LOOP 1 SYNC (green): ON ---- RLH Card is synchronized with Adtran® Card on Loop 1.
OFF ---- Loop 1 is not synchronized.

LOOP 2 SYNC (green): ON ---- RLH Card is synchronized with Adtran® Card on Loop 2.
OFF ---- Loop 2 is not synchronized.

LOOPBACK (yellow): ON ---- 1. Any Loopback Switch in ON position.
2. If all Loopback Switches are OFF, then Loopback has been initiated from Adtran Unit at far-end of HDSL System.
OFF ---- No Loopback in progress.

XMIT DATA (green): ON ---- Data or all Ones transmitted to Fiber.
OFF ---- No transmission to Fiber.

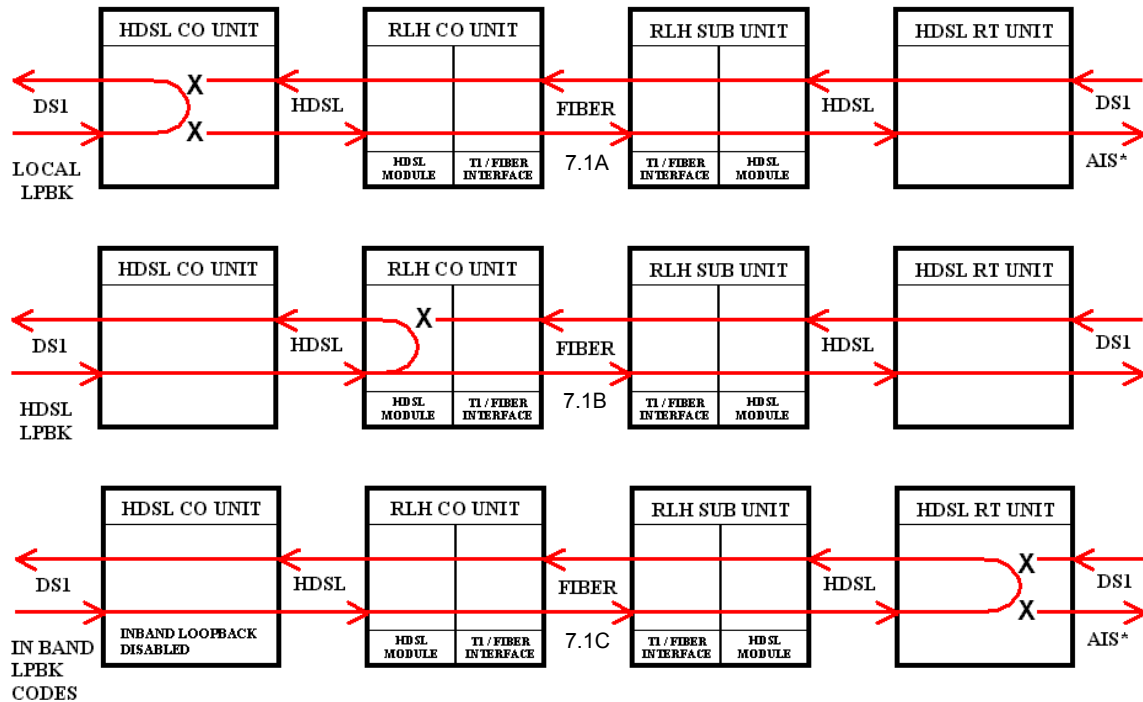


LED Layout

7. Testing

7.1 Loopback Testing

Loopback testing can be performed from the CO to verify proper loop and RLH HDSL Card operation. The RLH HDSL1 system is able to perform loop back testing between the Central Office HDSL unit all the way to the end of the HDSL Span using in-band codes. See different remote loopback options below.



7.1A and 7.1B can be performed using 'out of band' loopback. 7.1B and 7.1C can be performed using inband loopback. Send inband loop-up code 3 in 7 into the Adtran Central Office unit. Within seven seconds, both the RLH CO and the Adtran® RT units will loop-up (Adtran® RT unit loopback is blocked at the RLH CO unit). Send inband codes to test between the Adtran CO unit and the RLH CO unit. After tests, send inband loop-down code 3 in 5 for seven seconds. The RLH CO unit will loop-down but the Adtran® RT unit will not. Send inband codes to tests between the Adtran CO unit and the Adtran® RT. After tests, send inband loop-down code 3 in 5. Within 7 seconds the Adran® RT unit will loop-down.

7.2 Manual Loopback

The RLH HDSL1 Adtran® CO and Sub Card may be looped back manually via 2 dip switches located near the front of the card (See section 5.1 for dip switch location). For a description of different loopback functions available please see diagram on page 8.

Note: For normal Card operation dip switches must be in off position.

LOOPBACK INITIATED FROM RLH UNIT

Figure 1

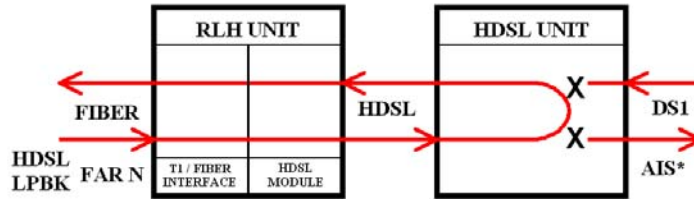


Figure 2

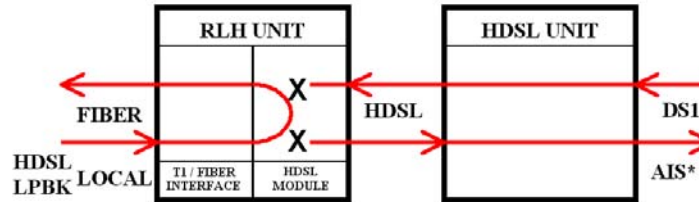


Figure 3

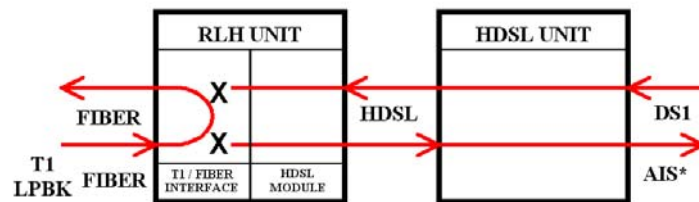
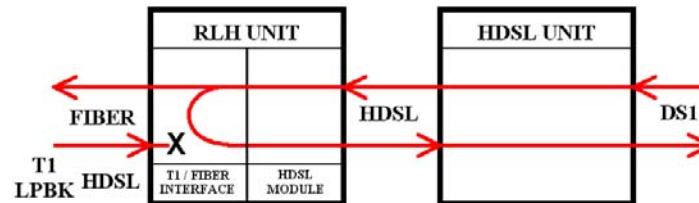


Figure 4



* Alarm Indication Signal (All ones)

Loopback (LPBK) Description:

Dip Switch	Position ON	Result
HDSL LPBK	FAR N (Far-end)	Remote unit at Far-end of HDSL system returns data to RLH Card fiber transmitter (far-end loopback). See Figure 1.
	LCL (Local)	Data at optical receiver is looped through HDSL module to optical transmitter (local/ fiber loop). See Figure 2.
T1 LPBK	FIBR (Fiber)	Data at optical receiver is looped through T1/Fiber Interface to optical transmitter (local/ fiber loop). See Figure 3.
	HDSL	Data is looped through T1/Fiber Interface and returned to Remote unit at far-end of HDSL system (near-end loopback to far-end). See Figure 4.

7.3 Troubleshooting

If trouble is encountered, verify all installer connections and dip switch settings. If trouble persists, replace the unit and retest. If technical assistance is required, contact RLH Industries, Inc. technical support department: 800-877-1672 (6 am to 5 pm- PST), or call our 24-hour number (404) 925-0522 or (714) 366-2503.

8. Warranty Repair

All RLH Industries, Inc. products have an unconditional lifetime warranty. If a unit needs repair, call the RLH Customer Service department for a Return Material Authorization (RMA) number and return the defective unit with the RMA number, freight prepaid, along with a brief description of the problem:

RLH Industries, Inc.
936 N. Main St.
Orange, CA 92867
Attn: Repair & Return Dept.

Phone: 1-800-877-1672
Email: info@fiberopticlink.com

As specified in our warranty RLH will repair and return the unit at no charge to the customer. If an out-of-service condition exists, a replacement unit can be obtained; however, a purchase order number will be required to ensure return of the replacement unit.

9. Ordering

RLH Fiber Optic Link products are available directly through RLH Industries, Inc. or its distributors and representatives nationwide. Please call RLH sales or engineering department for ordering assistance.

Card Description	Part Number	CLEI Number
HDSL1 Adtran CO Multimode	8806-1339-01	NPIFEJ01AA
HDSL1 Adtran Sub Multimode	8806-1349-01	NPIFDK01AA
HDSL1 Adtran CO Single-mode	8806-1340-01	NPIFCF01AA
HDSL1 Adtran Sub Single-mode	8806-1350-01	NPIFDF01AA

10. Compatibility

The RLH 2-Pair HDSL1 Fiber Optic Link System is compatible with all Adtran® HDSL1 systems ONLY. Please contact the Adtran® for part numbers and technical support.

Adtran Tech Support# 800-726-8663

11. Specifications

Transmission Method:	Amplitude Modulation Light via two optical fibers
	Multimode:
	Single-mode:
Maximum Fiber Length:	Multimode: 3.0 Miles (4.95km)
	Single-mode: 8.0 Miles (13.2km)
Optical Loss Budget:	Multimode:
	Single-mode:
Maximum Copper Length:	35dB at 196kHz, 135 Ohms
Temperature limits:	-40F to +160F (-40c to +70C)
Humidity:	5-95% non-condensing
Housing Dimensions:	Designed to fit into all RLH Housings
PCB Dimensions:	CO and Sub Cards: 7 X 4 inches (180 X 100mm)
Signal Format:	Full Duplex 784 Kbps, 2B1Q line code (each of two pairs)
End-to-End Sync:	14 seconds typical, 30 seconds maximum
BER:	<10 ⁻⁹
Transmit Level:	+13.5dBm at 135 Ohms
Surge Protection:	PTC Thermistors, Surgeclamps and Varistors
Power Requirements and Methods:	CO Card: Standard Adtran® Line Powering 90-210VDC, Or 24-210VDC, 200mA max, from isolated power source. SUB Card: 24-210VDC, 200mA max, Local Power



RLH Industries, Inc.
936 N. Main St.
Orange, Ca 92867

Toll free: (800) 877-1672
email: info@fiberopticlink.com
Web: www.fiberopticlink.com