

1-Pair HDSL2 Fiber Optic Link System®

**MANUFACTURER
DISCONTINUED**

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PART NUMBERS

MULTIMODE

HDSL2 CO CARD	8806-1360-01
HDSL2 SUB CARD	8806-1370-01

SINGLE-MODE

HDSL2 CO CARD	8806-1351-01
HDSL2 SUB CARD	8806-1361-01

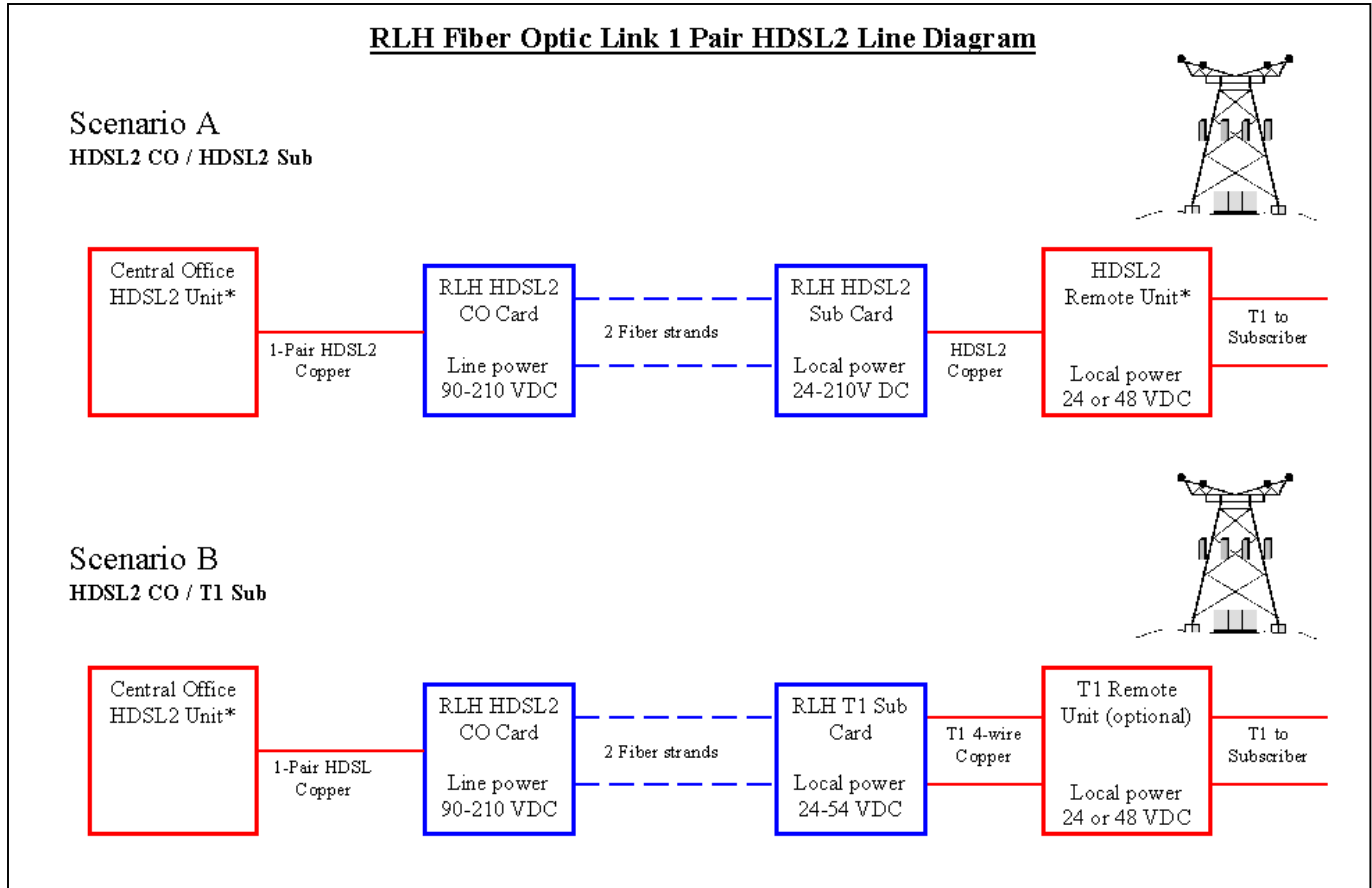
1. General

This practice provides installation and maintenance procedures for the 1-Pair HDSL2 Fiber Optic Link system.

The RLH Industries, Inc. 1-Pair HDSL2 Fiber Optic Link System interfaces with a standard 1-Pair copper HDSL2 line from the Central Office. The CO side 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 HDSL2 Sub Card or T1 Sub Card (See diagram on page 2). Loopback testing can be performed through the HDSL2 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.



* HDSL manufactures 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 dielectric Housing PN 8806-1200-04 wall mountable: 13.0" X 11.50" X 4.0"
- 2-Card dielectric Housing (PN 8806-1200-05) wall or pole mountable: 13.00" X 11.50" X 4.0"
- 5-Card dielectric Shelf (PN 8806-1231-02) wall or rack mountable: 7.87" X 7.87" X 12.75"
- 12-Card dielectric Shelf (PN 8806-1230-02) wall or rack mountable: 15.00" X 7.87" X 12.75"

Telco Interface Units:

- 5-Card Interface (PN 8806-1403-01) weatherproof enclosure: 18"x16"x10"
- 8-Card Interface (PN 8806-1404-01) weatherproof enclosure: 18"x16"x10"
- 2-Card Pedestal (PN 8806-1405-01) 14" dia. x 46" height
- 5-Card Pedestal (PN 8806-1409-01) 14" dia. x 46" height
- 8-Card Pedestal (PN 8806-1406-01) 14" dia. x 46" height

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 HDSL2 CO and Sub Cards the copper pair is connected via green terminal on the front of the card. The HDSL2 Card has a transmit and receive optical connector (ST female). Fiber should be routed loosely without tight bends to avoid excessive optical signal loss. Make sure fiber connections are rolled or transposed at opposite ends of the system. Refer to figures 4-1 and 4-2 for further instruction



Figure 4-1
RLH HDSL2 CO Card installed
inside RLH card housing

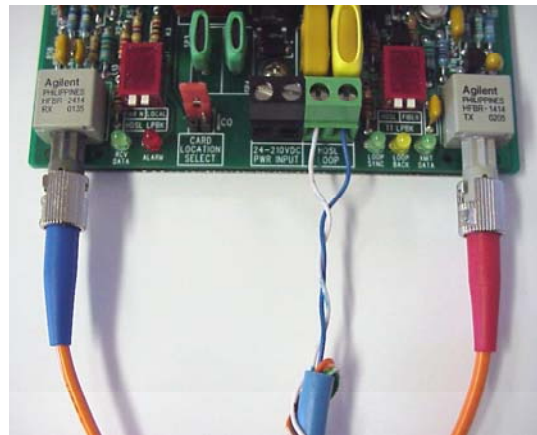
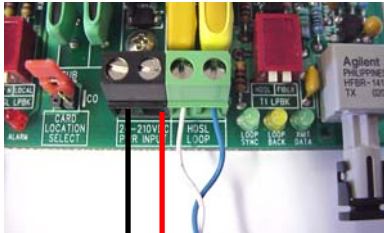


Figure 4-2
Close up view of CO Card copper
and fiber connections.

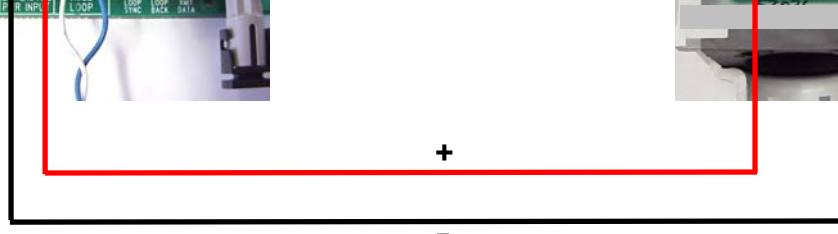
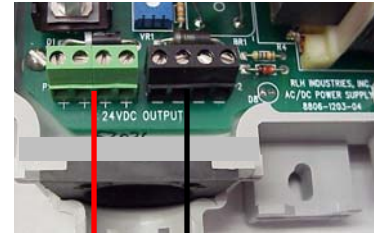
4.3 Powering

The RLH HDSL2 CO Card is line powered via the HDSL pair (90-210V DC). RLH 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.

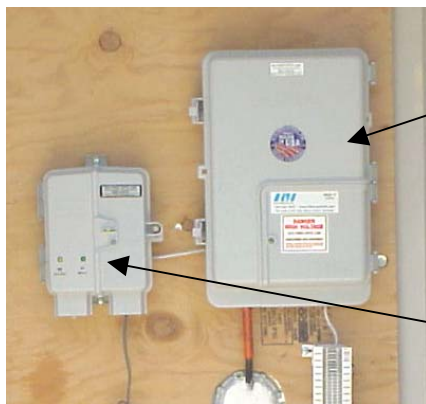
RLH HDSL2 Sub Card



24-210V DC Power Supply



Example of Sub side setup with AC/DC Power Supply



RLH HDSL2 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-HDSL2 Cards.
8806-1206-03	115/24V AC/DC Power Supply w/ 7.0A Battery backup, can power max of 8-HDSL2 Cards

5. Provisioning

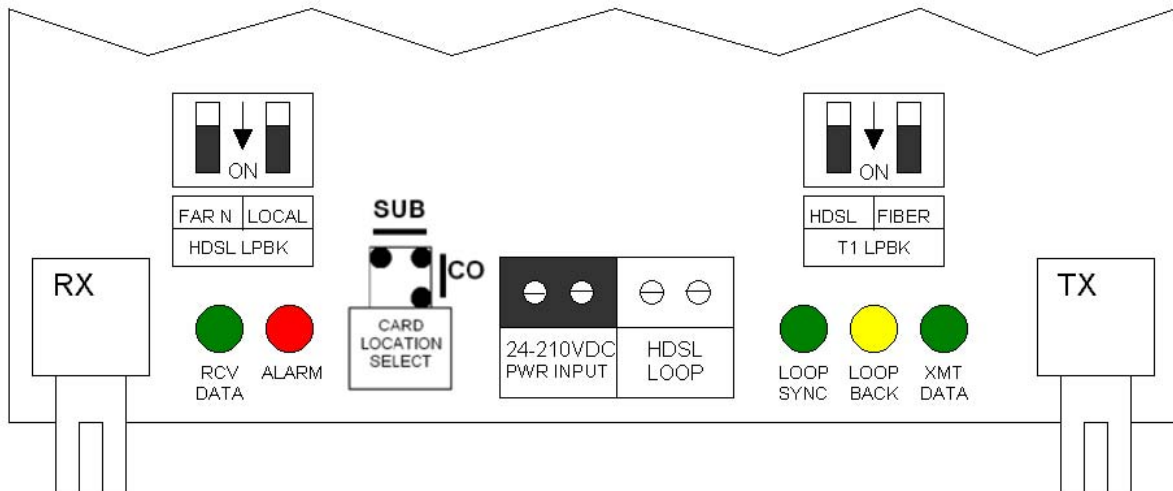
CO and Sub HDSL2 Cards come pre-set at the factory and no adjustments are needed for normal operation. Before installation, inspect factory settings to assure that cards are setup properly per the following:

5.1 CO and SUB Settings

The RLH HDSL2 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 Indicators

There are five (5) 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 and ALARM. Between the Wiring Connector and the Optical Transmitter are LOOP SYNC (synchronized), LOOPBACK and XMIT (transmit) DATA.

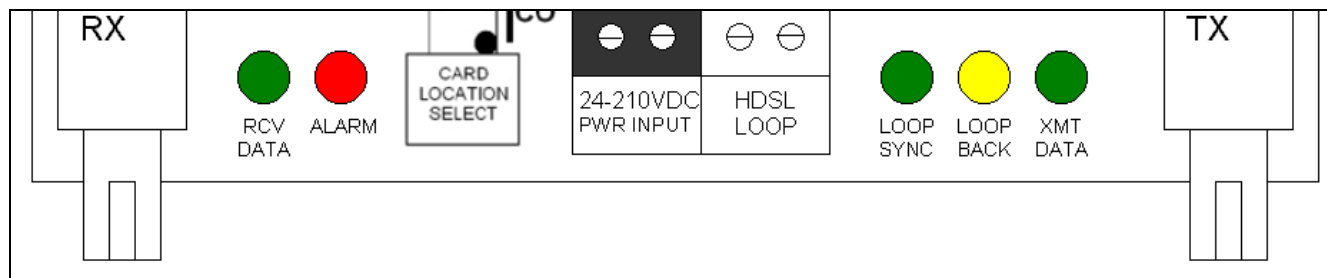
Normal operation -- All Green L.E.D.s ON, Red and Yellow OFF.

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

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

Parameters indicated by L.E.D.s:

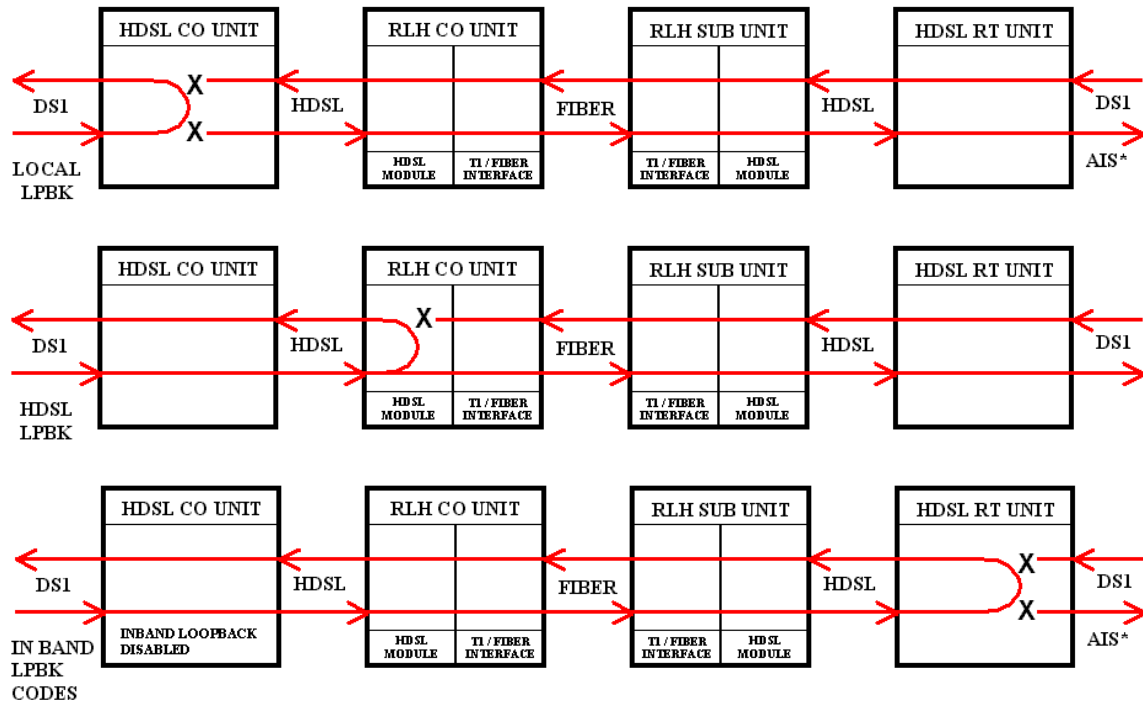
RCV DATA (green):	ON -----	22 One bits detected within a 175 bit period starting with the first bit detected and with less than 100 consecutive Zeroes.
	OFF -----	Data does not meet above limits or Receive Fiber open, transposed or not connected.
ALARM (red):	ON -----	XMIT DATA Green L.E.D. OFF or no DS1 Data on Fiber connected to Optical Receiver (RCV DATA Green L.E.D may be ON).
	FLASHING ----	Loss of DS1 input data at far-end HDSL Unit on copper loop
	OFF-----	No Alarms detected
LOOP SYNC (green):	ON -----	RLH Card is synchronized with far-end HDSL Unit on copper loop.
	FLASHING ----	One cycle per second; RLH Card acquiring synchronization with far-end HDSL2 Unit on copper loop.
	FLASHING ----	Four cycles per second; HDSL2 Signal Margin is below threshold (default value is 4 dB), or Errored Seconds are above threshold (default value is 170 per 24 hours).
	FLASHING ----	10 cycles per second; CRC errors detected.
LOOPBACK (yellow):	ON -----	Any Loopback Switch in ON position.
	FLASHING ----	One cycle per second; Loopback initiated from far-end HDSL2 Unit on copper loop (all dip switches in OFF position).
	FLASHING ----	Four cycles per second; Inband Loopback Arming request detected.
XMIT DATA (green):	ON -----	Data or all Ones transmitted to Fiber.
	OFF -----	No transmission to Fiber.



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 HDSL2 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.



7.2 Manual Loopback

The RLH HDSL2 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

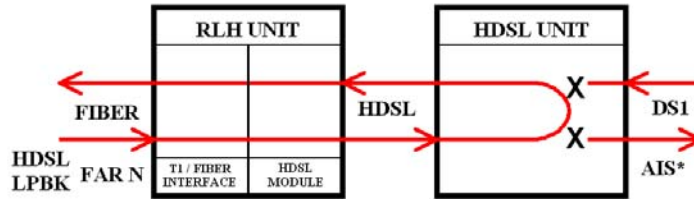


Figure 2

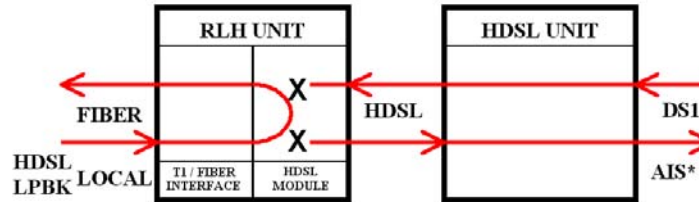


Figure 3

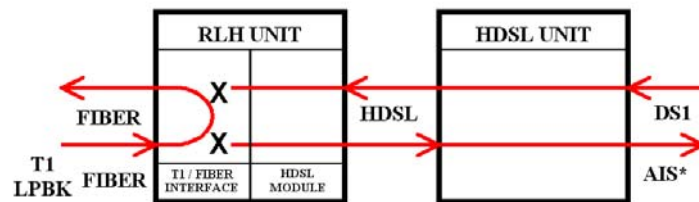
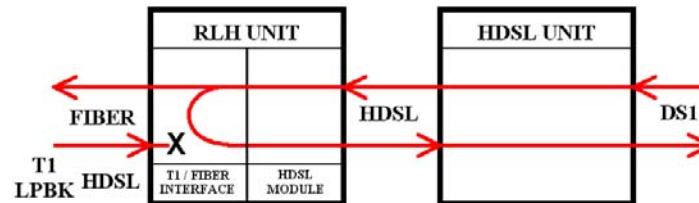


Figure 4



* Alarm Indication Signal (All ones)

Loopback (LPBK) Description:

<u>Dip Switch</u>	<u>Position ON</u>	<u>Result</u>
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 Code	Bellsouth PID
HDSL2 CO Multimode	8806-1360-01	NPIFCL01AA	n/a
HDSL2 Sub Multimode	8806-1370-01	NPIFDL01AA	n/a
HDSL2 CO Single-mode	8806-1351-01	NPIFCG01AA	310012489
HDSL2 Sub Single-mode	8806-1361-01	NPIFDG01AA	311012488

10. Compatibility

The RLH 1-Pair HDSL2 Fiber Optic Link System is universally compatible with all HDSL2 systems. Please contact the following manufacturers for part numbers and technical support.

Adtran 800-726-8663
ADC / PairGain 800-638-0031

11. Specifications

Transmission Method:	Amplitude modulation light via two optical fibers Multimode: 820nm Single-mode: 1310nm
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
HDSL Signal Format:	Full duplex 517 Kbps, Overlapped PAM Transmission
End-to-End Sync:	30 seconds typical, 45 seconds maximum
BER:	<10 ⁻⁹
Transmit Level:	+16.5dBm at 135 Ohms
Surge Protection:	PTC thermistors, surge protectors and varistors
Power Requirements and Methods:	CO Card: Typical HDSL2 line powering 90-210VDC, or 24-210 VDC, 200mA max, from an isolated power source. Sub Card: 24-210 VDC, 200mA max, Local Powered.



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