

# 4 Wire T1 Fiber Link Card System

## SYSTEM INSTALLATION INFORMATION

### Description

The 4 Wire T1 Fiber Link Card Model 2 (backwards compatible with the Model 1) System processes incoming bipolar signals (-30dB to +6dB) within a bandwidth of 100 KHz to 10 MHz T1 (1.544Mbps) or (CCITT 2.048Mbps), optically transmits these signals via fiber optic cable and converts the signal to the original electrical signal with minimal gain or loss. Output to the copper line is automatically maintained at a nominal level. The Fiber Link system is compatible with European E1. Transient voltages appearing on or between the 4 wire pairs and/or power supply input are limited by thermistors, gas tubes and MOVs.

The 4 Wire T1 Fiber Link Card system is compatible with any RLH Fiber Link card housing or shelf, is temperature hardened for tough environmental conditions, and is covered by our **Limited Lifetime Warranty**.

#### T1 CO Side Card

The T1 CO Card provides the interface between a Telco Central Office T1 copper 4 wire line and a two strand fiber optic cable. It may also be used to extend a Telco demarcation point over fiber with the capability to be line powered by a 60mA simplex/loop current. See page 4 for further details.

#### T1 Sub Side Card

The T1 Sub Card provides the interface between the Subscriber equipment copper 4 wire line and a two strand fiber optic cable.



4 Wire T1 Fiber Link Card System

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### Compliance Information

The 4 Wire T1 Fiber Link Card System is compliant with the following industry standards:

- **FCC PART-68B**
- **IEEE-487**
- **IEEE-1590**
- **Motorola R56**
- **BR 876-310-100 BT (Telcordia)**
- **Bellcore SR-3966**
- **GR-1089**
- **GR-63**
- **ANSI T1.403**

Specifications subject to change without notice.

## General Safety Practices

The equipment discussed in this document may require tools designed for the purpose being described. RLH recommends that service personnel be familiar with the correct handling and use of any installation equipment used, and follow all safety precautions including the use of protective personal equipment as required.

### Caution - Severe Shock Hazard

- Never install during a lightning storm or where unsafe high voltages are present.
- Active T1 lines carry high DC voltages up to 56V. Use caution when handling T1 wiring.
- Active UHDSL lines carry high DC voltages up to 210V. Use caution when handling UHDSL wiring.

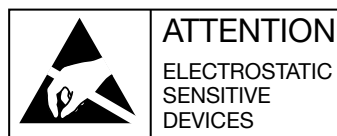
### Warning

The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment **MUST NOT** be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Refer to the Single Channel T1 Fiber Optic Link System **Installation and Troubleshooting Guide** for comprehensive installation information.

## Observe special handling requirements

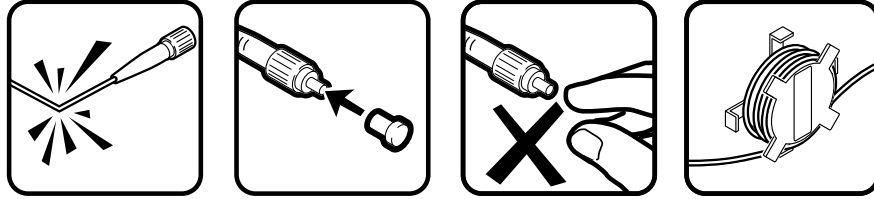
### Be careful when handling electronic components



- This product contains static sensitive components.
- Handle the T1 cards at their edges only.
- Follow proper electrostatic discharge procedures.

This card utilizes circuitry that can be damaged by static electricity. When transporting the card, carry it in an ESD safe container such as the antistatic bag provided with the card. Before handling cards, discharge yourself of static electricity by physical bodily contact with earth ground. When handling cards, hold by outer edges and avoid touching circuitry. Failure to follow ESD precautions may cause serious damage to the card and prevent proper operation.

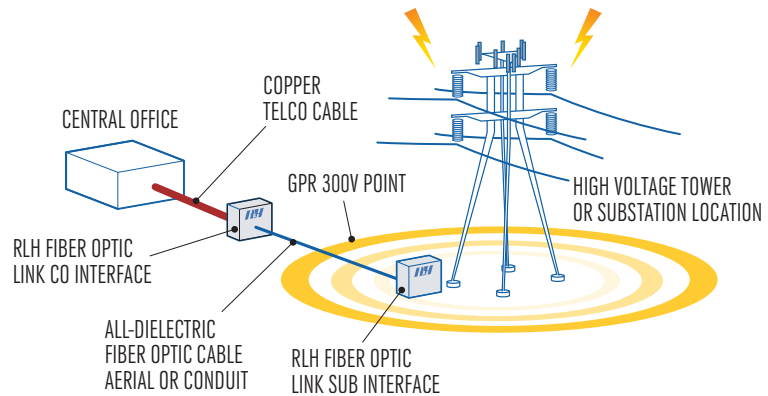
## Guidelines for handling terminated fiber cable



- Do not bend fiber cable sharply. Use gradual and smooth bends to avoid damaging glass fiber.
- Keep dust caps on fiber optic connectors at all times when disconnected.
- Do not remove dust caps from unused fiber.
- Keep fiber ends and fiber connectors clean and free from dust, dirt and debris. Contamination will cause signal loss.
- Do not touch fiber ends.
- Store excess fiber on housing spools or fiber spools at site

## 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 current during a ground fault. Placement of all-dielectric fiber optic cable (instead of copper wire) from outside the high voltage area eliminates the safety hazard to personnel and equipment by removing the telephone remote ground. Standard 3-element gas tube copper protection is recommended at the 300V point for proper installation.



**Note:** In order to maintain high voltage isolation, Fiber Optic Link CO and Sub cards must be powered from separate isolated power sources.

### CO card powering

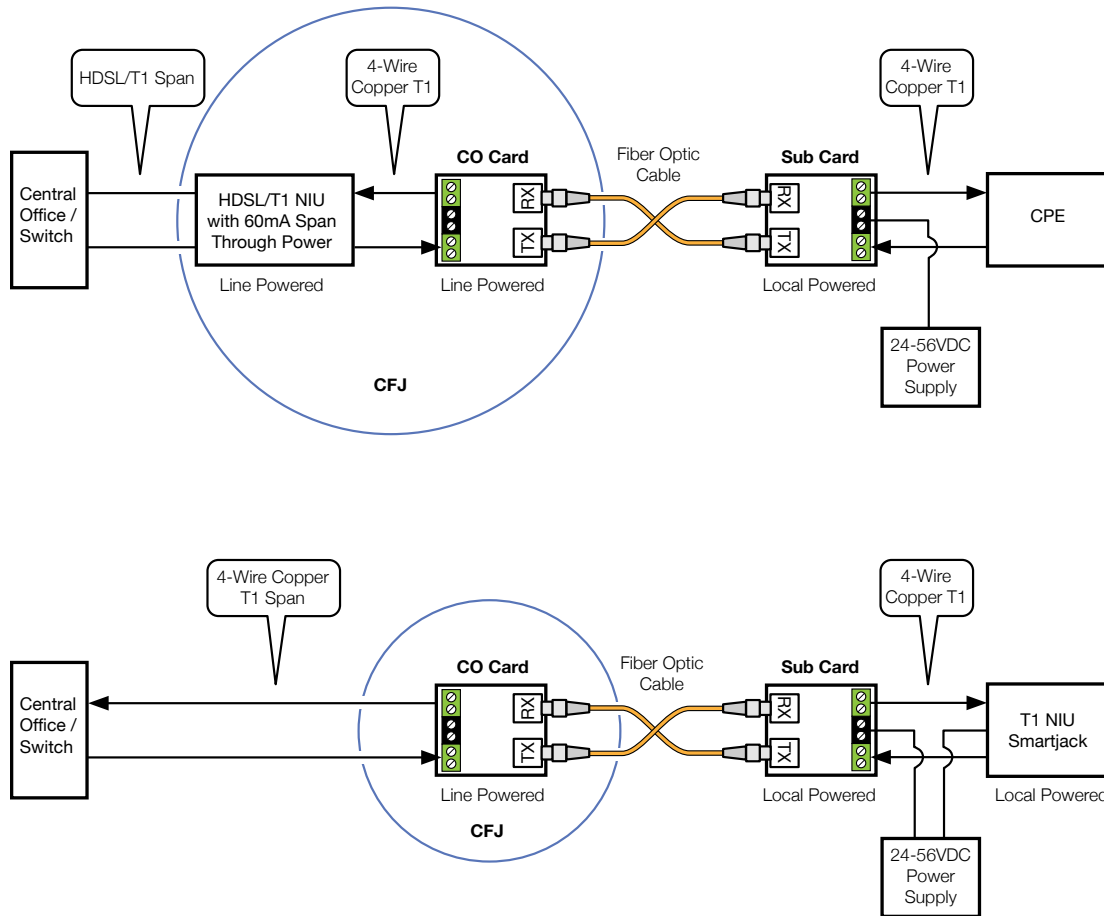
The T1 CO card is typically powered by 60mA Telco simplex current on the T1 transmit and receive pairs. The card may also be powered by an **isolated** 24-56VDC source. The card is polarity insensitive to all electrical connections.

### Sub Card Powering

The Sub card is typically powered by a 24-56VDC source. Alternately the card can be powered via 60mA simplex onto the T1 Send and Receive pairs by the Subscriber Equipment. The T1 Card is polarity insensitive to all electrical connections. The power supply on the T1 Card limits current at 64mA.

**Note:** In order to maintain high voltage isolation, Fiber Link CO and Sub cards must be powered from separate power sources.

## Typical T1 installation diagrams



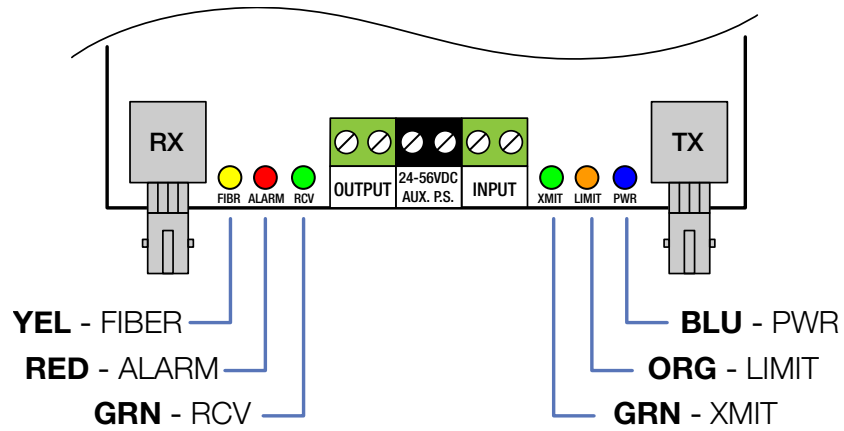
**T1 System Diagram**

## Line Powering

When an HDSL or T1 NIU is placed at the CO side of the Fiber Link it must provide span through line power to the T1 CO fiber interface card. The T1 CO card can be line powered via 60mA simplex current on the line. When line power is available no external or local power is required to operate the fiber card. An active T1 line with 60mA line power connected to the fiber interface card should measure 22-23VDC between transmit and receive pairs. If voltage is not present verify the NIU model number using the **NIU Compatibility Chart** listed in this document, or contact RLH to ensure span-through power capability.

**Note:** 24VDC must be subtracted in the calculation of Telco DC source voltage required to drive 60mA through the repeated T1 system (T1 repeaters and cable resistance).

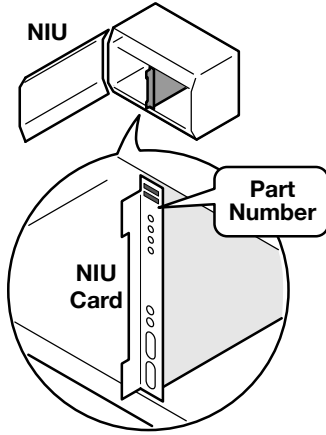
# LED status indicators



LED	Color	ON condition	OFF condition
<b>FIBR</b> (Fiber Test)	<b>YEL</b>	<ul style="list-style-type: none"> <li>• “Fiber signal” switch SW2 is ON at the far end card.</li> <li>• Fiber test signal is being received.</li> </ul>	<ul style="list-style-type: none"> <li>• Normal operation (“Fiber Signal” switch is OFF at the far end card)</li> <li>• If SW2 is ON on far end card, check fiber continuity</li> </ul>
<b>ALRM</b> (Alarm)	<b>RED</b>	Signal is below minimum operating level	Normal operation
<b>RCV</b> (Receive)	<b>GRN</b>	Signal is received from fiber	Normal operation
<b>XMIT</b> (Transmit)	<b>GRN</b>	Signal is received at copper input	Normal operation
<b>LIMIT</b>	<b>ORG</b>	Copper input signal overload	Normal operation
<b>PWR</b> (Power)	<b>BLU</b>	DC power is connected	No DC power is connected

# NIU Compatibility

Check for compatible NIU systems that supply Span Through-Power to the T1 Fiber Optic Link cards.  
 Contact RLH for T1 compatibility with systems not listed.



HDSL/T1 Span Through Power NIU Compatibility Chart			
Manufacturer	Part Number	Description and Material ID	CLEI Code
<b>HDSL1</b>			
Adtran	1246026L4	T200 HTU-R (VZ# 594993)	T1L2C8J8AA
Adtran	1246026L5	T200 HTU-R (BST# 98001580)	T1L3KD5AAA
Adtran	1245024L1	T400 HTU-R	T1L2C8J8AA
Adtran	1247026L1	T200 HTU-R,	
ADC	SPX-HLXRD11	T400 HLXR	SND1FJRAAA
<b>HDSL2</b>			
Adtran	1223024L1	H2TU-R (VZ# 11018736)	T1L6VR8B_ _
<b>HDSL4</b>			
Adtran	1223424L1	H4TU-R (VZ# 11018731)	T1L6EYHB_ _
<b>Repeated T1</b>			
Adtran	1181315L1-5B	T1 NIU, Total Access	T1L3PU0A
Hyperedge	520-10-SWI3	T200 T1 NIU (BST# 300058336)	
Westell	DNI5760LNI3	T1 NIU (VZ# NCIUV9A)	NCIUV9A4AA
Westell	A90-3128-70	T1 NIU (VZ# T1L3P96)	T1L3P96CAA
Westell	A90-3115-31	T1 NIU (VZ# T1S1AEF)	T1S1AEFAAA

# Technical Support

<b>Email:</b>	support@fiberopticlink.com
<b>24/7 technical support:</b>	Toll Free 1-855-RLH-24X7 Toll Free 1-855-754-2497

## Ordering Information

### 4 Wire T1 Cards

Each 4 Wire T1 Fiber Link Card is identified with the part number on the card.

Optics	Distance	Fiber	Description	Part Number	CLEI
Multimode ST	2.5km / 1.5 mi.	62.5µm	CO Card	<b>8806-1315-02</b>	NPIFEJ01AA
			SUB Card	<b>8806-1325-02</b>	NPIFGJ01AA
Multimode SC	2.5km / 1.5 mi.	62.5µm	CO Card	<b>8805-1315-02</b>	NPIFEJA1AA
			SUB Card	<b>8805-1325-02</b>	NPIFGJA1AA
Single-mode ST	15km / 9 mi.	8~9µm	CO Card	<b>8806-1300-02</b>	NPIFEDA1AA
			SUB Card	<b>8806-1310-02</b>	NPIFFD01AA
Single-mode SC	15km / 9 mi.	8~9µm	CO Card	<b>8805-1300-02</b>	NPIFEDA1AA
			SUB Card	<b>8805-1310-02</b>	NPIFFDA1AA
Long Haul Single-mode ST	60km / 37mi.	8~9µm	CO Card	<b>8806-1300-02-LH</b>	-
			SUB Card	<b>8806-1310-02-LH</b>	-
Long Haul Single-mode SC	60km / 37mi.	8~9µm	CO Card	<b>8805-1300-02-LH</b>	-
			SUB Card	<b>8805-1310-02-LH</b>	-

► Add **-RJ** to part number to include RJ adapter with the card.

### RJ-48C Adapters

RJ-48C adapters must be ordered for the card type that they will be applied to.

Description	Part Number
RJ-48C Adapter for CO 4 Wire T1 Card	<b>RLH-RJT1-CO</b>
RJ-48C Adapter for SUB 4 Wire T1 Card	<b>RLH-RJT1-SUB</b>

► Please contact your RLH sales representative for pricing and delivery information.

## General Specifications

The Fiber Optic Link T1 Model 2 (backwards compatible with the Model 1) System processes incoming bipolar signals (9.0V P-P Max) within a bandwidth of 100 KHz to 10 MHz T1 (1.544Mbps) or (CCITT 2.048Mbps). It optically transmits these signals via fiber optic cable and converts the signal to the original electrical signal.

Output to the copper line is automatically maintained at a nominal level. The Fiber Optic Link system is compatible with European E1.

### Standard specifications

<b>Transmission method</b>	Amplitude modulated light via two optical fibers Multimode: 850nm (Tx level: -16dB +/- 1dB) Single-mode: 1310nm (Tx level: -23dB +/- 1dB) Single-mode Long Haul: 1310nm (Tx level: -8dB +/- 2dB)
<b>Maximum Fiber Attenuation / Distance</b>	Multimode: 10dB / 1.5 miles (2.5 km) Single-mode: 8dB / 9 miles (15 km) Single-mode Long Haul: 26dB / 37 mi. (60 km), Required min. loss 8dB *Note: Distances equated using industry standard fiber and connector attenuation. Fiber condition, splices and connectors may affect actual range.
<b>Fiber Type</b>	(ST or SC connectors) Multimode: 62.5/125µm, 50/125µm Single-mode: 8-9/125µm
<b>Temperature Limits</b>	-40°F to +158°F (-40°C to +70°C)
<b>Humidity</b>	95% non-condensing
<b>Bandwidth</b>	100 kHz to 10 MHz
<b>Signal to Noise</b>	>45 dB for line attenuation up to 30 dB at 772 kHz
<b>Digital Data Type</b>	Bipolar digital data stream with no DC reference
<b>Maximum Data Rate</b>	3.152 Mbps
<b>BER</b>	<10 <sup>-9</sup>
<b>Input (Receive) Level - CO Side</b>	0.19V P-P to 9.0V P-P (-30dB to +6dB)
<b>Output (Transmit) Level - Sub Side</b>	0.19V P-P to 9.0V P-P (-30dB to +6dB) - See Note
<b>Surge Protection</b>	Fuses, thyristors, PTC thermistors, zeners, and MOVs
<b>Power Requirements</b>	CO/ Sub Cards: 24-56 VDC, 57-66mA
<b>Powering Method</b>	Line power simplex on Send and Receive pairs, or an isolated DC power source connected to AUX. P.S. input.
<b>RJ-45 Adapter</b>	Rx Pair                      Pins 1,2 Tx Pair                      Pins 4,5
<b>Warranty</b>	Limited Lifetime    Visit <a href="http://www.fiberopticlink.com">www.fiberopticlink.com</a> for warranty details

**Note:** Please refer to the User Guide for output level setting.

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