

## 2-Wire Digital Phone Fiber Optic Link System

4RU Plug-in card Installation Information

### Description

The 2-Wire Digital Phone Fiber Optic Link system interfaces a single line from a switch or digital PBX over fiber optic cable to a digital telephone that would otherwise be connected through a copper pair.

Electrical signals received from the copper pair are converted into optical signals and transmitted through fiber optic cable to the opposite end card. The optical signals are converted back to electrical signals and transmitted to the copper pair. Fiber optics not only provide the long distance transmission capability up to 37 miles (60km), but also provide immunity to EMI/RFI and transient surges.

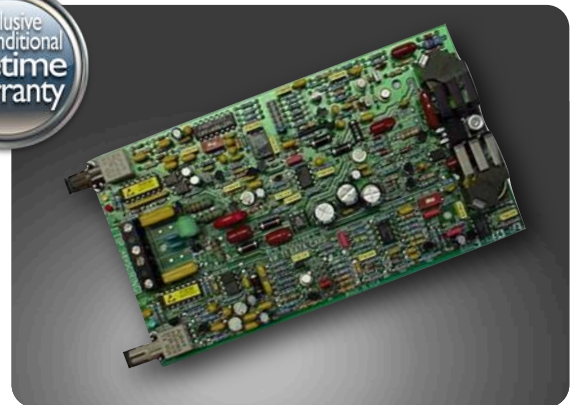
The 2 Wire Digital Phone system is compatible with any RLH 4RU card housing or shelf, is temperature hardened for tough environmental conditions, and is covered by our **Exclusive Unconditional Lifetime Warranty**.

#### 2-Wire Digital Phone CO (Central Office) Side Card

The 2-Wire Digital Phone CO Card provides the electrical-optical interface between a digital PBX 2-wire line and two fiber strands. The Tip and Ring connections to the switch or PBX provide the correct load and are recognized as a normal connection.

#### 2-Wire Digital Phone Sub (Subscriber) Side Card

The 2-Wire Digital Phone Sub Card provides the optical-electrical interface between the two fiber strands and a 2-wire line to the digital telephone handset. The Sub Card supplies power over the copper pair to the digital telephone set.



RLH 4RU 2-Wire Digital Phone

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#### Compliance Information

The RLH 2-Wire Digital Phone Fiber Optic Link System is compliant with the following industry standards:

- **FCC PART-68B**
- **IEEE-80, IEEE-367**
- **IEEE-487**
- **IEEE-1590**
- **IEEE-1615**
- **Motorola R56**
- **BR 876-310-100 BT (Telcordia)**
- **Bellcore SR-3966**
- **GR-1089**
- **GR-63**

Specifications subject to change without notice.

## General Safety Practices

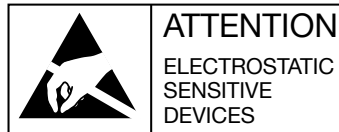
The equipment discussed in this document may require tools designed for the purpose being described. RLH recommends that service personnel be familiar with the correct handling and use of any installation equipment used, and follow all safety precautions including the use of protective personal equipment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

### Caution - Severe Shock Hazard

- Never install during a lightning storm or where unsafe high voltages are present.
- Active phone lines may carry high DC voltages. Use caution when handling copper wiring.

## Special Handling Requirements

### Be careful when handling electronic components



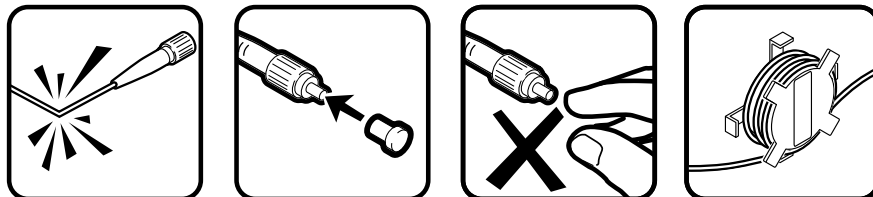
- This product contains static sensitive components.
- Handle the cards at their edges only.
- Follow proper electrostatic discharge procedures.

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.

### Warning

The intra-building port(s) of the equipment or subassembly is suitable for connection to intrabuilding 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.

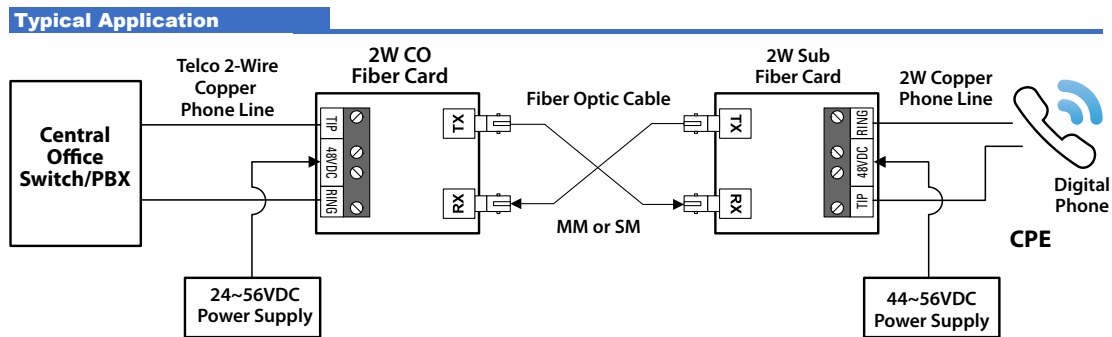
### Guidelines for handling terminated fiber cable



- 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

## Installation

After unpacking the card, immediately inspect it for shipping damage. If damage is discovered file a claim immediately with the carrier, then contact RLH customer service. The Fiber Optic Link 2-wire digital phone card can be installed into any RLH card housing. All electrical and fiber optic connection are made directly onto the card.



### Connect fiber optic cable

Fiber Optic Link Cards are equipped with two optical connectors. Connect fiber to the transmit and receive terminals marked “TX” and “RX”. For example, if fiber #1 is connected to “TX” on the CO Card, fiber #1 must be connected to “RX” on the Sub Card. Fiber cable should always be routed loosely avoiding tight bends.

The copper pair is protected by thermistors and a gas discharge tube connected between tip and ring. Transients appearing on the power input are limited by thermistors and a varistor.

### Connect 2-wire copper pair

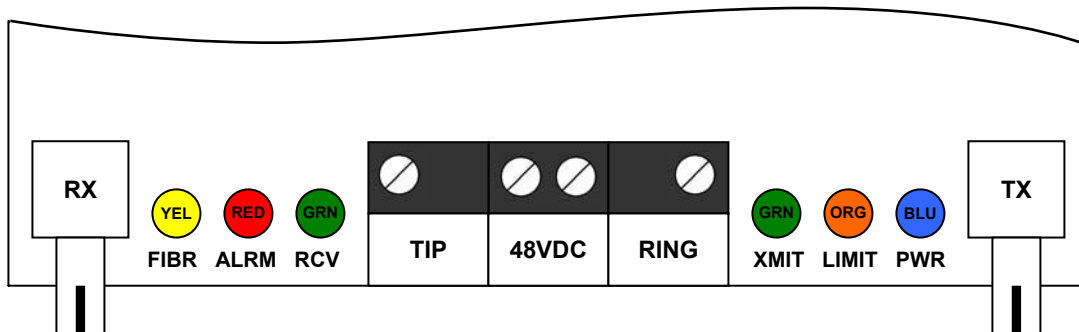
The copper pair from the PBX connects to the black “Tip” and “Ring” screw-down terminals on the CO Card. The copper pair from the telephone connects to the black “Tip” and “Ring” screw-down terminals on the Sub Card.

The copper pair is protected by thermistors and a gas discharge tube connected between tip and ring. Transients appearing on the power input are limited by thermistors and a varistor.

### Connect Power

Connect a 24-56 VDC (70mA minimum) power source to the 48VDC terminal on the CO Card. Connect a 44-56 VDC (90mA minimum) power source to the “48VDC” terminal on the Sub Card. The power input is not polarity sensitive.

**Note:** The cards are not polarity sensitive. However, if your digital phone set is polarity sensitive, you may have to switch the leads on the Sub card power terminals if your handset is unresponsive.



**4-Wire Data Card Connectors and LEDs**

LED	Color	On*	Off
Fiber (FIBR)	Yellow	Fiber is connected between CO and SUB Cards	No fiber continuity. Switch SW2 is Off on far end.
Alarm (ALRM)	Red	Loss of Signal	Normal operation
Receive (RCV)	Green	Signal is received from Fiber	Low Level or No Signal is received from Fiber
Transmit (XMIT)	Green	Signal received at Copper Input	Low Level or No Signal received at Copper Input
Limit	Orange	Copper Input Signal Overload	Copper Input Signal Level not in Overload
Power (PWR)	Blue	DC Power Connected	No DC Power Connected

\* All LED's will be on for approximately 5 seconds following power up.

### Set system Level

CO and Sub optic transmit levels are set by the GAIN SELECT jumper on the Cards by observing the "XMIT" and "LIMIT" L.E.D.s to indicate the optimum setting.

Gain is set in 6dB increments by selecting the highest numbered position that will keep the green XMIT LED on, but will not turn on the orange LIMIT LED.

**Note:** If the LIMIT LED is on, the XMIT LED will also be on.

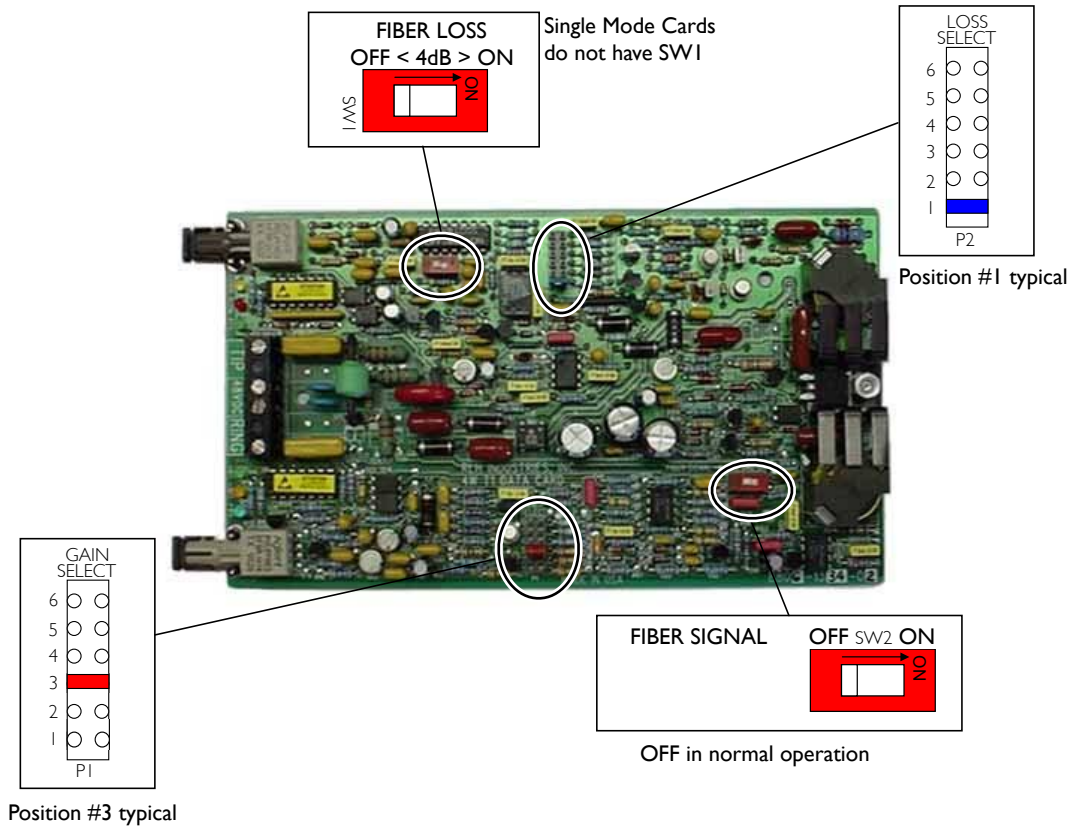
The LIMIT LED indicates signal overload. If the XMIT LED is not on, move the jumper to a higher number position until the LIMIT LED is on, then set the jumper to the next lower numbered position. The LOSS SELECT jumper should remain at position 1. Repeat with the other card in the opposite direction.

### Switch SW1

A single position dip switch used for Multimode fiber Cards to increase margin. The switch SW1 is typically set in the "OFF" position. A minimum of 4dB loss or 4,000 foot distance on multimode is needed for proper operation in the "ON" position. Single mode fiber Cards do not have SW1.

### Switch SW2

A single position dip switch used to turn on and off a fiber test signal that will light the yellow fiber (FIBR) L.E.D. on the far end card when fiber is connected between both cards. Set SW2 to the "OFF" position for normal operation.



**Adjustment settings location on PCB (CO PBX Card shown)**

## Troubleshooting

If trouble is encountered, verify all installer connections, signal and voltage levels. If trouble persists, replace the unit and retest. If technical assistance is required, contact RLH Industries, Inc. Technical support department.

## Ordering Information

RLH Fiber Optic Link products are available directly through RLH Industries, Inc. or its distributors nationwide. Each 4W Data card is identified with the part number. Please call RLH customer service for ordering assistance.

Fiber Type	Part Number	
	4W Data CO (PBX) Card	4W Data Sub (Tel Set) Card
Multimode ST *	8806-1334-02	8806-1344-02
Multimode SC *	8805-1334-02	8805-1344-02
Single-mode ST	8806-1361-02	8806-1371-02
Single-mode SC	8805-1361-02	8805-1371-02

▶ \* 62.5µm multimode fiber compatibility is standard, add **-50** to part number for 50µm fiber compatibility

## General Specifications

<b>Transmission method</b>	Amplitude modulated light via two optical fibers
	Multimode: 850nm
	Single-mode: 1310nm
	SM Short Haul: 650nm
<b>Maximum Fiber Loss / Distance*</b>	Multimode: 10dB / 1.5 miles (2.5km)
	Single-mode: 8dB / 9 miles (15km)
	SM Long Haul: 26dB / 37 miles (60km)
	*Note: Length of system limited by digital PBX maximum allowable delay. Distances equated using industry standard fiber and connector attenuation of 3dB/Km. Fiber condition, splices and connectors may affect actual range.
<b>Fiber Type</b>	Multimode: 62.5/125µm, 50/125µm; Single-mode: 9/125µm
<b>Fiber Connector Types</b>	ST or SC
<b>Wire Connector</b>	Screw clamp, 12-26 AWG
<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>Transmit Level (with Loss Select at position 1)</b>	2.5V P-P Nominal at 20°C (68°F) 2.0V P-P to 3.1V P-P from -40°C to 70°C (-40°F to +158°F)
<b>Surge Protection</b>	PTC thermistors, gas tube and varistors
<b>Power Requirements</b>	CO Card: 24-56VDC, 70mA, Sub Card: 44-56VDC 90mA
<b>Powering Method</b>	DC power source connected to "48VDC" input
<b>Operating Temperature</b>	-40° to +158° F (-40° to +60° C)
<b>Humidity</b>	95% non-condensing

Specifications subject to change without notice.

## Warranty

RLH is recognized throughout the U.S. and offers the only **UNCONDITIONAL LIFETIME WARRANTY** in the telecommunications industry. We are very proud of our warranty which simply states that our Fiber Optic Link Assemblies are warranted to be free of defects in material and workmanship for the **LIFE OF THE PRODUCT**.

### We can offer this warranty because:

- We believe our customers shouldn't have to incur additional costs due to failure or damage
- We engineer and manufacture our Fiber Optic Links in the USA, with total confidence in our quality
- We understand how safety and reliability impact the total cost of ownership
- We know that customer support extends beyond the initial sale, so **we stand behind our products**

RLH will replace any product, or part thereof, that fails **FOR ANY REASON**, provided the defective part is returned to RLH Freight prepaid. This warranty is **UNCONDITIONAL** and valid even when RLH Fiber Optic Link Assemblies have been abused or mishandled, where unauthorized repairs have been attempted or performed, or product has been damaged as a result of a natural disaster. Compare this warranty to our competitors and see how our warranty will reduce your costs and simplify your maintenance activities.

**To make a warranty claim, or schedule repair or replacement of your RLH product, please contact us for an RMA number.** You will be promptly assisted by one of our warranty specialists. All returns must have an RMA number before we can receive any items.

## Technical Support

<b>Normal technical support:</b> (Mon - Fri 6am - 6pm PST)	Local (714) 532-1672 Toll Free (800) 877-1672 Toll Free (866) DO-FIBER
<b>24/7 Technical support:</b>	(714) 396-8982 (714) 457-5740

## Contact Information

<b>Corporate Headquarters:</b>	RLH Industries, Inc. 936 N. Main Street Orange, CA 92867 USA
<b>Phone:</b>	Local (714) 532-1672 Toll Free (800) 877-1672 Toll Free (866) DO-FIBER
<b>Fax:</b>	(714) 532-1885
<b>Email:</b>	info@fiberopticlink.com
<b>Web site:</b>	www.fiberopticlink.com

# RLH FIBER OPTIC LINK

RLH Industries, Inc., The Leader in Fiber Optic Telecom Isolation Technology

LIFETIME

## UNCONDITIONAL WARRANTY

RLH INDUSTRIES, INC. FIBER OPTIC LINK assemblies are warranted to be free of defects in materials and workmanship for the life of the product. This lifetime warranty is effective for RLH products sold from February 2, 1988, to the present, with the exception of fiber optic cable assemblies which are warranted only to be free of defects in manufacturing and batteries, which carry a 5-year unconditional replacement warranty.

RLH Industries, Inc. will repair or replace any product, or part thereof, that fails for any reason, provided the defective part is returned to RLH, freight prepaid.

This warranty is UNCONDITIONAL and is valid even when RLH Fiber Optic Link assemblies have been abused or mishandled, where unauthorized repairs have been attempted or performed, or product has been damaged as a result of a natural disaster.

Authorized by:



J. RANDALL MEARS, Vice President, Engineering



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

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