

# Gigabit Ethernet Fiber Link Card System

## SYSTEM INSTALLATION INFORMATION

### Introduction

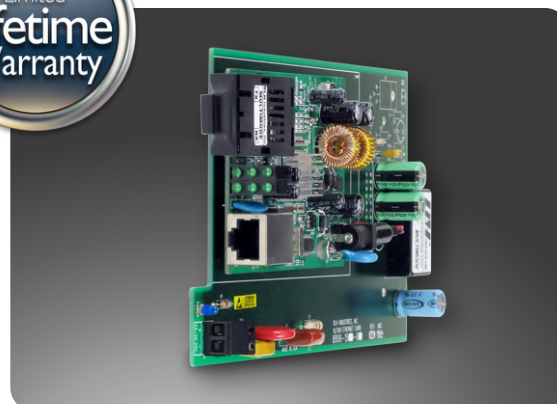
The 10/100/1000 Ethernet Fiber Link Card system converts a copper 10Base-T or 100/1000Base-TX to a 1000Base-SX/LX fiber optic transmission signal of either multimode or single-mode. The cards transmit the data signals over fiber optic cable which allow for network extension over long distances, and provide electrical isolation between both ends of the network.

The Ethernet Fiber Link Card may be used as a system, with a card at each end, or the fiber optic cable may be connected directly to any 1000Base-SX/LX compatible device.

This hardened, rugged system is covered by our **Limited Lifetime Warranty**.

### Key Features

- Ideal for critical, high voltage, remote or un-manned locations that must remain operating 24/7/365
- Compatibility with IEEE 802.3/AB
- RJ45 UTP port with 10/100/1000 auto-negotiation
- Extends network span up to 1,804 feet (550m) on multimode, and up to 62 miles (100km) on single-mode fiber
- Convenient LED status indicators
- Link alarm function for status monitoring
- Dual and Single (bi-directional) fiber models available
- Operating temperature of 32°F to 122°F (0°C to +50°C) environments
- Standard RLH Fiber Link Card form factor
- Covered by our **Limited Lifetime Warranty**



Gigabit Ethernet Fiber Link Card

ETHERNET  
OVER FIBER

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# General Safety Practices

## Intended Audience

This guide is intended for use by knowledgeable telco/network installation, operation and repair personnel. Every effort has been made to ensure the accuracy of the information in this guide is accurate. However, due to constant product improvement, specifications and information contained in this document are subject to change without notice.

## Conventions

Symbols for notes, attention, and caution are used throughout this manual to provide readers with additional information, advice when special attention is needed, and caution to prevent injury or equipment damage.

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

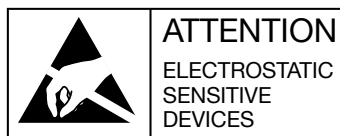
- Never install during a lightning storm or where unsafe high voltages are present.
- Active phone lines may carry high DC voltages. Use caution when handling copper wiring.

## 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 metalically 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 metalically to OSP wiring.

# Special Handling Requirements

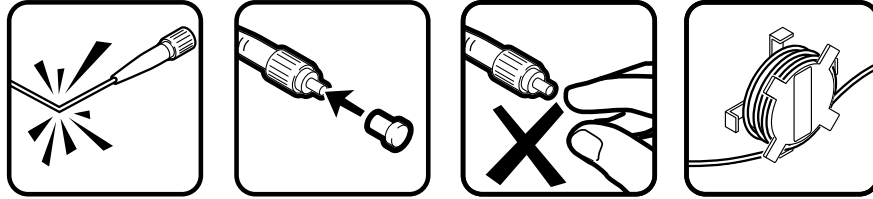
## Be careful when handling electronic components



- This product contains static sensitive components.
- Handle Fiber Optic Link 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

## Acronyms

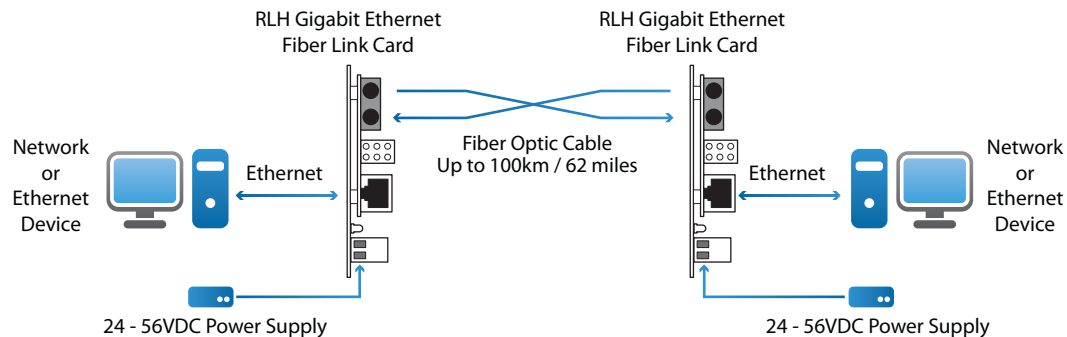
Commonly used acronyms and abbreviations

Acronym/Abbreviation	Description
<b>UTP</b>	Unshielded Twisted Pair (commonly used in Ethernet networks)
<b>TP</b>	Twisted Pair (same as UTP)
<b>FO</b>	Fiber Optic
<b>TX</b>	Transmit
<b>RX</b>	Receive
<b>PWR</b>	Power
<b>GRN</b>	Green
<b>ORG</b>	Orange

## Applications

Network equipment in high voltage areas can be at risk due to Ground Potential Rise (GPR). A copper network cable 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) completely eliminates the presence of a remote ground, which dramatically increases safety of personnel and reliability of equipment. By utilizing fiber optic cable, the 10/100/1000 Ethernet over fiber card provides absolute electrical isolation between both ends of the network.

Copper twisted pair Ethernet is limited to 100m/328ft without extenders. Using fiber optic cable provides long distance service (up to 100km/62 mi.) without any additional equipment. Fiber is immune to EMI/RF interference, ground loops, and high voltage surges from lightning or ground faults, and is ideal in electrically noisy environments such as near large power sources, electrical motors, and radio communications equipment.



**Typical Ethernet System Diagram**

## Installation

Prior to installation:

- Check for shipping damage
- Check the contents to ensure correct model and fiber type
- Have a clean, dry installation environment ready

Required for installation:

- 24-56VDC (3W minimum) power source
- RLH card housing

Measure the DC voltage of the source power to ensure that it is 24-56VDC (3W minimum). All electrical and fiber optic connection are made directly onto the card. The Ethernet over fiber card is designed to be installed into any RLH card housing.

**Note:** In order to maintain high voltage isolation, Fiber Link side A and Side B cards must be powered from separate isolated power sources.

### Connect fiber optic cable

Multimode and single-mode Ethernet cards are equipped with either two ST or SC female optical connectors, or a single bi-directional connector (SC only). Connect fibers to the Transmit (TX) and Receive (RX) optical connectors. The other end of the fiber may be connected to another 10/100/1000 Ethernet card or any 1000SX/LX Ethernet device. For bi-directional, single fiber models, there is only one SC connector used for transmitting and receiving.

**Note:** Fiber cable should always be routed loosely avoiding tight bends.

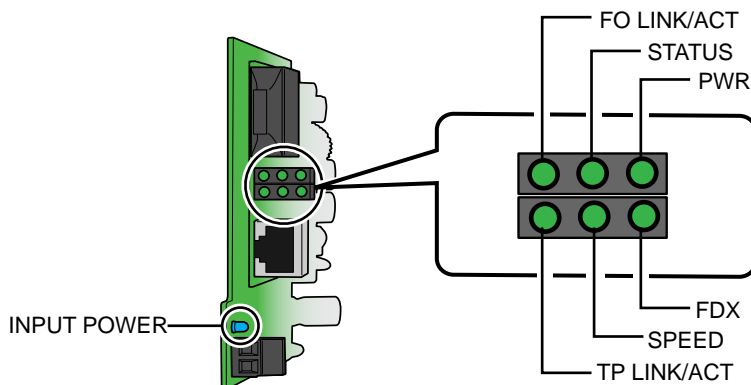
### Connect Ethernet cable

The 10/100/1000Base-T copper connection is made via the RJ45 port located on the front of the card with. The TP port is auto-negotiating and requires no special settings.

### Connect Power

Connect a 24-56VDC (200mA minimum) power source to the screw-down terminal on the Ethernet card. The power input is not polarity sensitive. The terminal unplugs from the card to make wiring easier

## LED Indicators



Indicator	Color	LED	Description
<b>PWR</b>	GRN	ON	Fiber/TP port power is OK
		OFF	Fiber/TP port power FAIL
<b>TP LINK/ACT</b>	GRN	ON	TP connection with remote device is good
		Blinking	TP traffic is present
<b>FO LINK/ACT</b>	GRN	ON	Fiber connection with remote device is good
		Blinking	Fiber optic traffic is present
<b>FDX</b>	GRN	ON	TP port is full duplex
		OFF	TP port is half duplex
<b>SPEED</b>	GRN	ON	TP port speed is 10M or no link is present
		OFF	TP port is speed is 100M
	ORG	ON	TP port is speed is 1000M
<b>STATUS</b>	GRN	ON	TP and Fiber link are up
	ORG	ON	TP and Fiber link are down

## DIP Switch



Switch No.	Description	OFF	ON
1	TP Auto Negotiation	Disable	Enable
2	Manual TP Speed	10M	100M
3	Manual TP Speed	N/A	1000M
4	Duplex Mode	Half	Full
5	Flow Control	Disable	Enable
6	F/O Alarm	Force	Auto
7	Link Alarm	Disable	Enable
8	Transmission Mode	Store and Forward	Pass-through

### Notes:

- Default PIN 1, PIN 6 **ON**
- Before changing TP Speed, Duplex Mode and Flow Control setting, set switch 1 to OFF.
- When manually setting TP speed to 10M or 100M, set switch 3 to OFF.
- 1000M throughput supports full duplex only.
- When switch 8 is ON, TP speed is forced to 1000M and full duplex and flow control are disabled.
- Power reset must be performed after changing any DIP switch setting.

## Link Alarm

The link alarm feature allows users to easily identify and diagnose the link status for TP and fiber optic segments. When link alarm is enabled, TP and F/O ports will link up only when both TP and F/O segment linking conditions are good.

If either TP or F/O segment is down during operation, the other port will also shut down the link to alert users and avoid packet loss. When the link alarm is disabled, the TP and F/O port will link up based on their own segment linking condition. For example, if the F/O segment is down during operation, this device will not shut down the TP port link to the segment and vice versa.

## Troubleshooting

If trouble is encountered, verify all 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. Refer to the contact information at the end of this document.

## General Specifications

Protocols	1000BASE-SX/LX, 10BASE-T, or 100/1000BASE-TX				
Copper Connector	RJ45 UTP				
Copper Distance	100m / 328 feet				
Fiber Connector	ST or SC (Dual fiber or single fiber (bi-directional) connectors)				
Dual Fiber Optics	Fiber Type	Multimode	Single-mode		
	Wavelength TX/RX (nm)	1310	1310	1310	1550
	Distance	550 m/1804 ft.	20km / 12 mi.	60km / 36 mi.	100km / 62 mi.
	Min. TX PWR (dBm)	-18	-15	-6	0
	Max. TX PWR (dBm)	-10	-8	-3	+5
	RX Sensitivity (dBm)	-31	-34	-34	-34
	Link Loss Budget (dBm)	13	19	28	34
	Single Fiber Optics (Bi-directional)	Fiber Type	Multimode	Single-mode	
Wavelength (nm)		1310/1550	1310/1550	1310/1550	-
Distance		550 m/1804 ft.	20km / 12 mi.	60km / 36 mi.	-
Min. TX PWR (dBm)		2-17	-14	-5	-
Max. TX PWR (dBm)		-10	-8	-3	-
RX Sensitivity (dBm)		-31	-34	-34	-
Link Loss Budget (dBm)		14	20	29	-
LED Indicators	LINK/ACT	Fiber port link - Blink together:Link OK / Blink alternating: link fail			
	FX (Fiber)	Fiber signal - ON: fiber signal is OK / Blink: collisions			
	10/100/1000	TP port speed - ON: 1000m / OFF: 10/100M			
	FDX	TP port full duplex - ON: full duplex / OFF: half, Blink: collisions			
	PWR	Fiber/TP power - ON: power OK / OFF: no power			
	INPUT POWER	Card power - ON: power OK / OFF: no power			
Power Input	24~56VDC @ 3W				
Dimensions	7.0" x 4.0" x 1.0"				
Temperature	Operating	32°F to +122°F (0°C to +50°C)			
	Storage	-40°F to +194°F (-40°C to +90°C)			
Humidity	5~95% non-condensing				
Warranty	Limited Lifetime	Visit <a href="http://www.fiberopticlink.com">www.fiberopticlink.com</a> for warranty details			

## Ordering Information

Optics	Side	Distance	Wavelength	Fiber	Part Number
Multimode ST	-	550m/1804 ft.	1310 nm	62.5/50 µm	<b>EG4-04-1</b>
Bi-Directional Multimode SC	A	550m/1804 ft.	Tx 1310 nm / Rx 1550 nm	62.5 µm	<b>EG4-01-1</b>
	B	550m/1804 ft.	Tx 1550 nm / Rx 1310 nm	62.5 µm	<b>EG4-02-1</b>
Single-mode ST	-	20km/12.4mi.	1310 nm	8~9 µm	<b>EG4-50-1</b>
	-	60km / 37mi.	1310 nm	8~9 µm	<b>EG4-51-1</b>
	-	100km / 62 mi.	1550 nm	8~9 µm	<b>EG4-55-1</b>
Single-mode SC	-	20km/12.4mi.	1310 nm	8~9 µm	<b>EG4-40-1</b>
	-	60km / 37mi.	1310 nm	8~9 µm	<b>EG4-41-1</b>
	-	100km / 62 mi.	1550 nm	8~9 µm	<b>EG4-45-1</b>
Bi-Directional Single-mode SC	A	20km/12.4mi.	Tx 1310 nm / Rx 1550 nm	8~9 µm	<b>EG4-10-1</b>
	B	20km/12.4mi.	Tx 1550 nm / Rx 1310 nm	8~9 µm	<b>EG4-11-1</b>
	A	60km / 37mi.	Tx 1310 nm / Rx 1550 nm	8~9 µm	<b>EG4-14-1</b>
	B	60km / 37mi.	Tx 1550 nm / Rx 1310 nm	8~9 µm	<b>EG4-15-1</b>

- Bidirectional single fiber models require both an **A** Side and **B** Side unit for a complete system.
- Bidirectional optic wavelength may be special ordered. Contact factory for availability.
- Please contact your RLH sales representative for pricing and delivery information.

## 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

## Contact Information

<b>Corporate Headquarters:</b>	RLH Industries, Inc. 936 N. Main Street Orange, CA 92867 USA
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