



RLH Industries, Inc.

# USER GUIDE

The leader in rugged fiber optic technology.

✓ Unconditional Lifetime Warranty

2010C-1012

## Ethernet Over Fiber Converter

# 10/100M

### Introduction

The RLH Ethernet Over Fiber system is a multifunction converter that supports 10/100M Ethernet communications over fiber optic cable. Fiber optics not only provide the long distance Ethernet transmission capability up to 24.8 Miles (40km), but also provide immunity to EMI/RFI and transient surges. They are ideal for data communications near large electrical equipment or where radio interference can be an issue.

The compact unit may be DIN rail or wall mounted, and It is powered by an external 5VDC power supply that plugs into the back. Low cost power supplies are available for 115VAC, 24VDC or 48VDC sources. To power multiple units, of for additional powering options, see our DIN mount power supply products.

### 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 10/100M auto-sensing
- Extends network span up to 1.2 miles (2km) on multimode and up to 74 miles (120km) on single-mode fiber
- Convenient LED status indicators
- Dual and Single (bi-directional) fiber models available
- Environmentally hardened to operate in -40°F to +158°F (-40°C to +70°C) environments
- DIN rail and wall mount with brackets included
- CE, FCC Certified
- Covered by our Exclusive Unconditional Lifetime Warranty



RLH Ethernet over fiber converter with DIN rail mount

## ETHERNET OVER FIBER

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Specifications subject to change without notice.

# 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

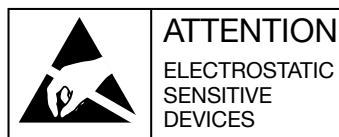
- Never install during a lightning storm or where unsafe high voltages are present.
- Active phone lines may carry high DC voltages. Use caution when handling copper wiring.

## Warning

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

## Special handling requirements

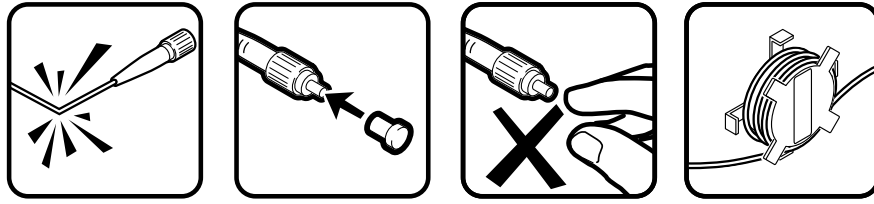
### Be careful when handling electronic components



- This product contains static sensitive components.
- Do not open the enclosure, there are no user serviceable parts.
- Follow proper electrostatic discharge procedures.

This product utilizes circuitry that can be damaged by static electricity. Before installing, discharge static electricity on your body by physically making contact with earth ground. Failure to follow ESD precautions may cause damage to the unit 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

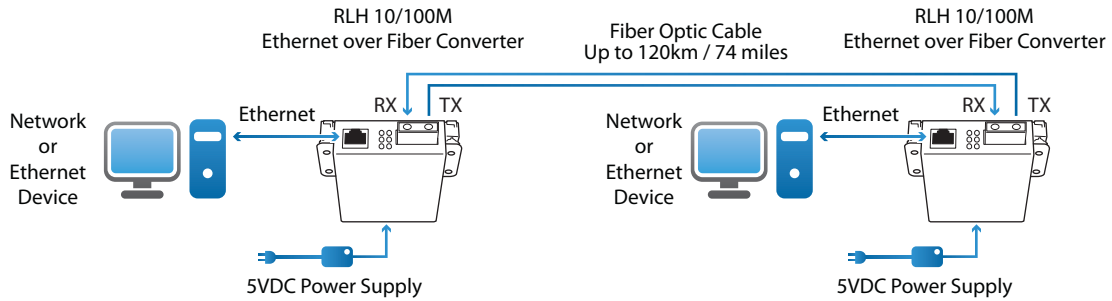
Commonly used acronyms and abbreviations

Acronym/Abbreviation	Description
UTP	Unshielded Twisted Pair (commonly used in Ethernet networks)
TP	Twisted Pair (same as UTP)
TX	Transmit
RX	Receive
PWR	Power
LED	Light Emitting Diode

## 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. Use 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 converter 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 120km/74mi. without any additional equipment. Optical 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, DIN rail or wall mount installation environment ready

Required for installation:

- 115VAC local power source

The 10/100 Ethernet converter uses the 115VAC to 5VDC power supply provided.

**Note:** In order to maintain high voltage isolation, Units at each end must be powered from separate isolated power sources.

### Connect fiber optic cable

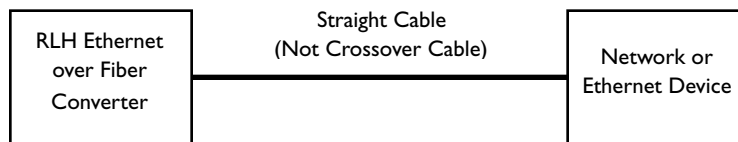
Multimode and single-mode Ethernet cards are equipped with dual ST, SC or FC female optical connectors, or a single bi-directional connector, depending on the model.

Connect fibers to the TX (Transmit) and RX (Receive) optical connectors. The other end of the fiber may be connected to another 10/100 Ethernet converter or any compatible 100SX/LX Ethernet device. For dual fiber models, the TX connector must go to the RX connector on the unit at the other end. For bi-directional, single fiber models, there is only one connector used for transmitting and receiving.

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

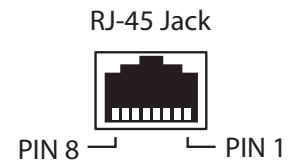
### Connect Ethernet cable

The 10/100 UTP connection is made via the RJ45 port located next to the status LEDs. The TP port is auto-negotiating and requires no additional settings. Use a standard CAT-5 or better Ethernet cable terminated in standard straight through configuration when connecting network equipment to the converter.



**Ethernet Connection Diagram**

RJ-45 Pin No.	10Base-T Signal 100Base-TX Signal
1	Transmit+
2	Transmit-
3	Receive+
4	Unused
5	Unused
6	Receive-
7	Unused
8	Unused

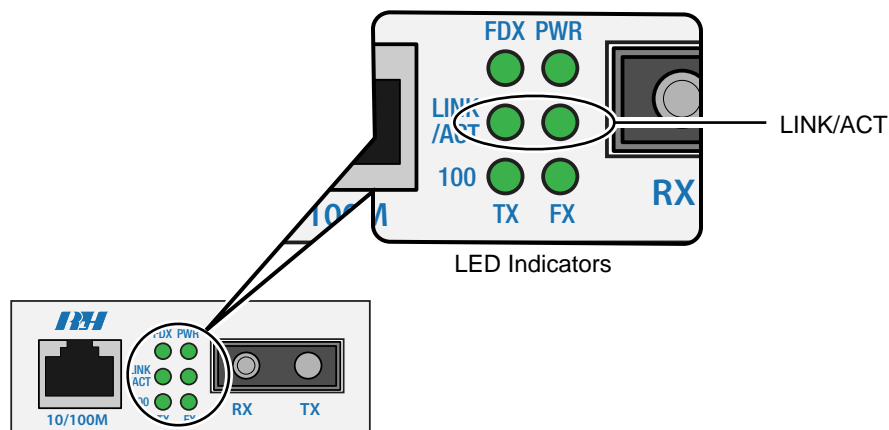


10/100 Ethernet Pin Diagram

### Connect Power

Connect the included 5VDC power supply to the power input port, then connect the AC plug to a 115VAC power source.

### LED Indicators



Indicator	Color	LED	Description
FDX	GRN	ON	TP port is full duplex
		OFF	TP port is half duplex
		Blinking	TP port collisions are present
PWR	GRN	ON	Fiber/TP port power is OK
		OFF	Fiber/TP port power FAIL
LINK/ACT	GRN (2 LEDs)	Blink alternating	Fiber link FAIL
		Blink together	Fiber link OK
FX	GRN	ON	Fiber signal is good
		Blinking	Fiber signal collisions are present
100 TX	GRN	ON	TP port speed is 100M
		OFF	TP port speed is 10M

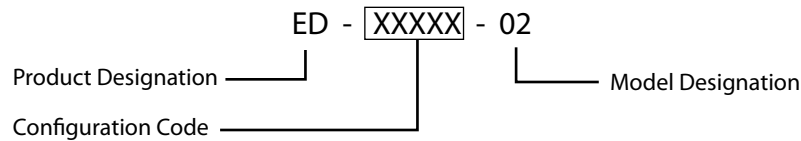
## Troubleshooting

If trouble is encountered, verify all copper and fiber connections. Refer to the LED Indicators on of the unit. They show availability of power, modes of operation, and data being received by the fiber and TP ports.

If trouble persists, replace the unit and retest. If technical assistance is required, contact the RLH Industries, inc. technical support department:

800-877-1672 (6 am to 6 pm- PST),  
or call our 24/7 Technical/Customer Service: (714) 366-2503 or (714) 457-5740

## Ordering Information



Code	Multimode	Single Mode	Single Fiber Bi-Directional	Dual Fiber	SC Connector	ST Connector	FC Connector	1.25mi./2km range	12.4 mi./20km range	24.9 miles/40km range	37 mi./60km range	74 mi./120km range	TX Side	RX Side	Either Side
MBSC	●		●		●			●					●		
MBSCR	●		●		●			●						●	
MMSCD	●			●	●			●							●
MMSTD	●			●		●		●							●
MMFCD	●			●			●	●							●
S1SCT		●	●		●				●				●		
S1SCR		●	●		●				●					●	
S3SCT		●	●		●					●			●		
S3SCR		●	●		●					●			●	●	
S1STT		●	●			●			●				●		
S1STR		●	●			●			●					●	
S3STT		●	●			●				●			●		
S3STR		●	●			●				●				●	
S1FCT		●	●				●		●				●		
S1FCR		●	●				●		●					●	
S3FCT		●	●				●			●			●		
S3FCR		●	●				●			●				●	
S2SCD		●		●	●				●						●
S4SCD		●		●	●						●				●
S5SCD		●		●	●							●			●
S2STD		●		●		●			●						●
S4STD		●		●		●					●				●
S5STD		●		●		●						●			●
S2FCD		●		●			●		●						●
S4FCD		●		●			●				●				●
S5FCD		●		●			●					●			●

- ▶ Bidirectional single fiber models require a TX unit and a RX unit for a complete system
- ▶ Please contact your RLH sales representative for pricing and delivery information

Specifications subject to change without notice.

## General Specifications

<b>Protocols</b>	100BASE-SX/LX, 10BASE-T, or 100BASE-TX				
<b>Copper Connector</b>	RJ45 UTP				
<b>Copper Distance</b>	100m / 328 feet				
<b>Fiber Connector</b>	ST, SC OR FC*				
	Dual fiber or single bidirectional fiber connectors				
<b>Dual Fiber Optics</b>	<b>Fiber Type</b>	<b>Multimode</b>		<b>Single-mode</b>	
	<b>Wavelength TX/RX (nm)</b>	1310	1310	1310	1310
	<b>Distance</b>	2km / 1.2 mi.	20km / 12 mi.	60km / 36 mi.	120km / 74 mi.
	<b>Min. TX PWR (dBm)</b>	-18	-15	-6	0
	<b>Max. TX PWR (dBm)</b>	-10	-8	-3	+5
	<b>RX Sensitivity (dBm)</b>	-31	-34	-34	-34
	<b>Link Loss Budget (dBm)</b>	13	19	28	34
	<b>Single Fiber Optics (Bi-directional)</b>	<b>Fiber Type</b>	<b>Multimode</b>		<b>Single-mode</b>
<b>Wavelength (nm)</b>		1550	1550	1550	-
<b>Distance</b>		2km / 1.2 mi.	20km / 12 mi.	40km / 25 mi.	-
<b>Min. TX PWR (dBm)</b>		2-17	-14	-9	-
<b>Max. TX PWR (dBm)</b>		-10	-8	-5	-
<b>RX Sensitivity (dBm)</b>		-31	-34	-34	-
<b>Link Loss Budget (dBm)</b>		14	20	25	-
<b>LED Indicators</b>	<b>FDX</b>	TP port full duplex - ON: full duplex, OFF: half, Blink: collisions			
	<b>PWR</b>	Fiber/TP power - ON: power OK, OFF: no power			
	<b>LINK/ACT</b>	Fiber port link - Blink together: Link OK, Blink alternating: link fail			
	<b>FX</b>	Fiber signal - ON: fiber signal is OK, Blink: collisions			
	<b>100</b>	10/100 TP port speed - ON: 1000m, OFF: 10/100M			
<b>Power Input</b>	115VDC to 5VDC @ 3W, power supply included				
<b>Dimensions</b>	H3.7" x W2.8" x 1.1" not including DIN/wall mount bracket				
<b>Temperature</b>	<b>Operating</b>	-40°F to +176°F (-40°C to +80°C)			
	<b>Storage</b>	-40°F to +194°F (-40°C to +90°C)			
<b>Humidity</b>	5~95% non-condensing				

\* Multimode bidirectional fiber optics available with SC connectors only

## 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**.

RLH will replace this product, or part thereof, if it fails FOR ANY REASON, provided the defective part is returned to RLH Freight prepaid. This warranty is UNCONDITIONAL and valid even when this product has been abused, mishandled, or damaged as a result of a natural disaster. This warranty will reduce your costs and simplify your maintenance activities. Not all RLH products are covered by this warranty.

**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 hours</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) 366-2503 (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>	<a href="mailto:info@fiberopticlink.com">info@fiberopticlink.com</a>
<b>Web site</b>	<a href="http://www.fiberopticlink.com">www.fiberopticlink.com</a>



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