



RLH Industries, Inc.

USER GUIDE

The leader in rugged fiber optic technology.

✓ Unconditional Lifetime Warranty

2011A-0923

Gigabit Ethernet Over Fiber Converter

DIN/Wall Mount

10/100/1000M

Introduction

The RLH 10/100/1000 Ethernet DIN/Wall mount module converts a copper 10/100/1000Base-T to a multimode or single-mode 1000Base-X fiber optic transmission signal. The converter transmits the data signals over fiber optic cable, permitting network extensions over long distances, and provides electrical isolation between both ends of the network.

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

Key Features

- Ideal for critical, high voltage, remote or un-manned locations that must remain operating 24/7/365
- Compatibility with IEEE 802.3/u/ab/z
- RJ45 UTP port with 10/100/1000 auto-negotiation
- DIP Switch with optional settings
- Includes link alarm and store and forward
- 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
- Covered by our Exclusive Unconditional Lifetime Warranty



RLH Gigabit 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

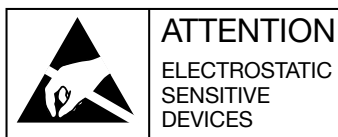
- Never install during a lightning storm or where unsafe high voltages are present.
- Active phone lines may carry high DC voltages. Use caution when handling copper wiring.

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.

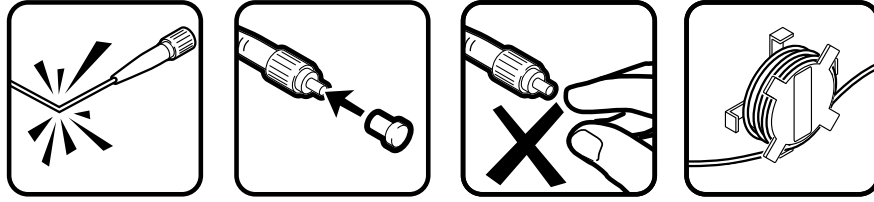
Special Handling Requirements

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.

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

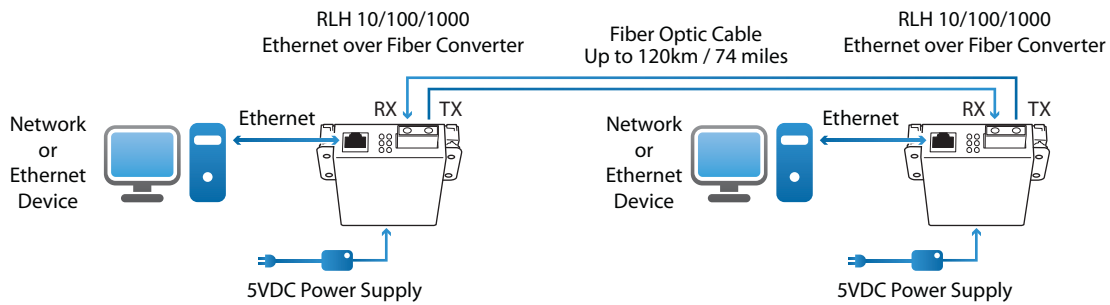
Commonly used acronyms and abbreviations

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
GRN	Green
ORG	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. 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 10/100/1000 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

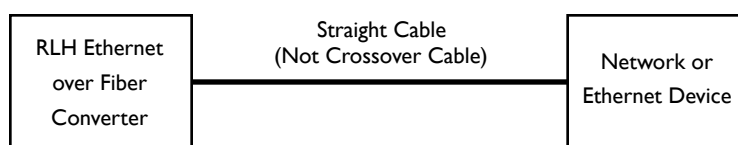
Multimode and single-mode Ethernet cards are equipped with dual ST, SC or FC female optical connectors, or a single bi-directional connector, depending on the model.

Connect fibers to the TX (Transmit) and RX (Receive) optical connectors. The other end of the fiber may be connected to another 10/100/1000 Ethernet converter or any compatible 1000SX/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.

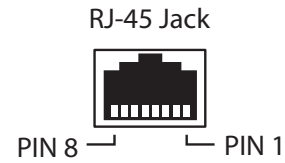
Connect Ethernet cable

The 10/100/1000Base-T 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-5e or CAT-6 Ethernet cable terminated in standard straight through configuration when connecting network equipment to the converter.



Ethernet Connection Block Diagram

RJ-45 Pin No.	10/100Base-T Signal	1000Base-T Signal
1	Transmit+	BI_DA+
2	Transmit-	BI_DA-
3	Receive+	BI_DB+
4	Unused	BI_DC+
5	Unused	BI_DC-
6	Receive-	BI_DB-
7	Unused	BI_DD+
8	Unused	BI_DD-

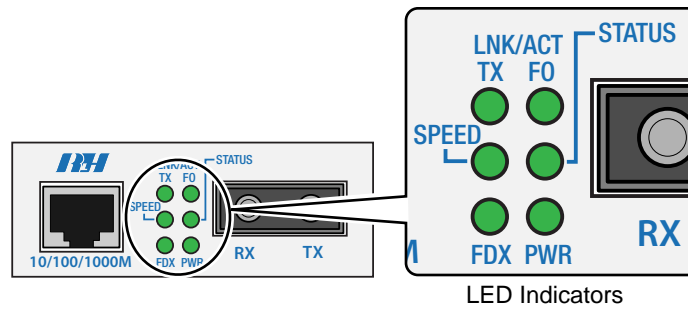


10/100/1000M Ethernet Pin Diagram

Connect Power

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

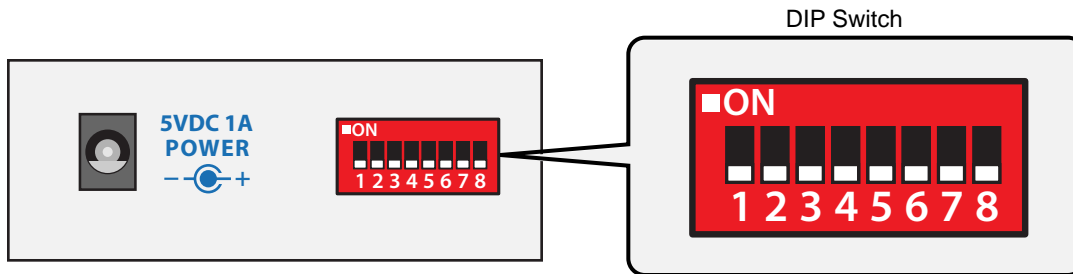
LED Indicators



Indicator	Color	LED	Description
TX LNK/ACT	GRN	OFF	No remote device detected on TP port
		ON	TP connection with remote device is OK
		Blinking	TP traffic is present
FO LNK/ACT	GRN	OFF	No remote device detected on fiber optic port
		ON	Fiber optic connection with remote device is OK
		Blinking	Fiber optic port traffic is present
SPEED	GRN	OFF	TP port is operating at 10M or there is no link
		ON	TP port is operating at 100M
	ORG	ON	TP port is operating at 1000M
STATUS	GRN	ON	TP or fiber optic link is up
	ORG	ON	TP or fiber optic link is down
FDX	GRN	ON	TP port is full duplex
		OFF	TP port is half duplex
PWR	GRN	ON	Power is OK

Indicator	Color	LED	Description
PWR	GRN	OFF	No power is present

DIP Switch Settings



Switch No.	Function	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	Fiber Optic Mode	Force	Auto
7	Link Alarm	Disable	Enable
8	Transmission Mode	Store & Forward	Pass-Through

Note:

- Before changing TP speed, duplex mode or flow control setting, set switch 1 to OFF.
- When setting TP speed manually to 10M or 100M with switch 2, switch 3 must be OFF.
- The 1000Mbps speed supports full duplex mode only.
- When switch 8 set to ON, the TP speed is forced to 1000M, and full duplex and flow control are disabled.

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

Part Number: RLH - EGD - XX -3

Use Configuration Code

	Config. Code 	Single Fiber Bi-Directional	Dual Fiber	Connector			Wavelength					Range						
				SC	ST	FC	850nm	1310nm	1550nm	(A) Tx 1310nm Rx 1550nm	(B) Tx 1550n Rx 1310nm	2km/1.25 mi.	20km/12.4 mi.	40km/24.9 mi.	60km/37 mi.	120km/74 mi.		
Multimode	01	•		•							•							
	02	•		•								•						
	03		•	•				•										
	04		•	•	•			•										
	05		•	•		•			•									
	06		•	•	•		•											
	07		•	•		•		•										
	08		•	•		•		•										
Single Mode	10	•		•							•				•			
	11	•		•								•			•			
	12	•		•								•				•		
	13	•		•									•			•		
	14	•		•								•				•		
	15	•		•									•			•		
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	22	•				•							•			•		
	23	•				•							•			•		
	24	•				•							•			•		
	25	•				•							•			•		
	30	•					•						•			•		
	31	•											•			•		
	32	•					•						•			•		
	33	•					•						•			•		
	34	•					•						•			•		
	35	•					•						•			•		
	40		•		•				•						•			
	41		•		•				•						•			
	42		•		•				•						•		•	
	43		•		•					•					•			
	44		•		•					•					•			
	45		•		•					•					•		•	
	50		•			•			•						•			
	51		•			•			•						•			
	52		•			•			•						•		•	
	53		•			•				•					•			
54		•			•				•					•				
55		•			•				•					•		•		
60		•				•		•						•			•	
61		•				•		•						•			•	
62		•				•		•						•			•	
63		•				•			•					•			•	
64		•				•			•					•			•	
65		•				•			•					•			•	

- ▶ Bidirectional single fiber models require 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.

Specifications subject to change without notice.

General Specifications

Protocols	1000BASE-SX/LX, 10BASE-T, or 100/1000BASE-TX					
Standards	IEEE 802.3, 802.3u , 802.3ab &802.3z					
Copper Connector	RJ45 UTP, Auto Negotiation, MDI/MDIX Auto-Crossover supported					
Copper Distance	100m / 328 feet					
Fiber connector	100BaseFX ports, ST, SC or FC connectors, single or multi mode Dual fiber or single fiber (bi-directional) connectors (multimode single fiber is SC only)					
Dual Fiber Optics	Fiber Type	Multimode		Single-mode		
	Wavelength TX/RX (nm)	1310	850	1310~1550	1310~1550	1310~1550
	Distance	2km / 1.2mi.	2km / 1.2mi.	20km / 12mi.	60km / 36mi.	120km / 74mi.
	Min. TX PWR (dBm)	-18	-15	-15	-6	0
	Max. TX PWR (dBm)	-10	-5	-8	-3	+5
	RX Sensitivity (dBm)	-31	-27	-34	-34	-34
	Link Loss Budget (dB)	13	10	19	28	34
	Single Fiber Optics (Bi-directional)	Fiber Type	Multimode		Single-mode	
Wavelength TX/RX (nm)		1310/1550		1310/1550	1310/1550	1310/1550
		1550/1310		1550/1310	1550/1310	1550/1310
Distance		2km / 1.2mi.		20km / 12mi.	40km / 25mi.	60km / 36mi.
Min. TX PWR (dBm)		-18		-10	-5	-3
Max. TX PWR (dBm)		-8		-3	0	+2
RX Sensitivity (dBm)		-38		-38	-38	-38
Link Loss Budget (dB)		20		28	33	35
LED Indicators	TX LNK/ACT	GRN/ON-TP port connected, OFF-no connection, Blink-traffic detected				
	FO LNK/ACT	GRN/ON-Fiber optic port connected, OFF-no connection, Blink-traffic detected				
	SPEED	GRN/ON-TP port at 100, OFF-TP port at 10M or no connection ORG/ON-TP port at 1000M				
	STATUS	GRN/ON-TP or fiber ports are up ORG/ON-TP or fiber ports are down				
	FDX	GRN/ON-TP port at full duplex, OFF-TP port at half duplex				
	PWR	GRN/ON-Power is OK, OFF-Power is down				
Power Input	115VDC to 5VDC @ 3W, power supply included					
Dimensions	H3.7" x W2.8" x 1.1" not including DIN/wall mount bracket					
Temperature	Operating	-40°F to +176°F (-40°C to +80°C)				
	Storage	-40°F to +194°F (-40°C to +90°C)				
Humidity	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**.

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

Normal technical support: (Mon - Fri 6am - 6pm PST)	Local (714) 532-1672 Toll Free (800) 877-1672 Toll Free (866) DO-FIBER
24/7 Technical support:	(714) 366-2503 (714) 396-8982 (714) 457-5740

Contact Information

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

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

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