RLH Industries, Inc.

## **USER GUIDE**

## The leader in rugged fiber optic technology.

U-087 2014A-0910

# RLH 10/100 Ethernet **DIN Fiber Link System**

COMPACT. RUGGED & TEMPERATURE HARDENED



### Introduction

The RLH 10/100 Ethernet DIN Fiber Link system is a rugged, full featured media converter. It converts copper Ethernet to fiber, and may be used to extend a copper Ethernet network up to 74 miles (120km) over fiber optic cable.

This system is designed to transport critical communications where reliability is paramount. It is environmentally hardened to operate in a wide temperature range and is standards compliant. Advanced features

include link fault pass thru, IEEE 802.1q VLAN pass thru, and the ability to configure the copper ports speed and duplex settings.

This Fiber Link system pairs up well with our industrial switch line where extending multiple Ethernet drops over fiber is required. Both dual and single fiber optics are available.

The 10/100 Ethernet DIN Fiber Link system is designed and made in the USA and covered by our Lifetime Warranty.



RLH 10/100 Ethernet DIN Fiber Link

#### **Standard Features**

Rugged design - Extreme operating temperature rating

Fiber break alarm contact

Convenient LEDs for power, fiber, speed, and duplex status

Auto negotiate port speed and duplex settings

User friendly switch to manually set copper/fiber port speed

Link Fault Pass Through

Supports far end fault detection when used in pairs

Pass-Through mode - low latency applications

#### Auto MDI-X

Supports Single Mode and Multimode Fiber

Dual and single fiber models available

Extends network span up to 120KM over fiber

Redundant power Inputs

IEEE 802.1q VLAN traffic pass through

Made in the U.S.A. - Lifetime warranty



## General Safety Practices

#### **Intended Audience**

This guide is intended for use by knowledgeable installation, operation and repair personnel. Every effort has been made to ensure the accuracy of the information in this guide. 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.
- Copper wires may carry high voltages. Use caution when handling.
- Do not open the enclosure, there are no user serviceable parts.

#### 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 fiber spools at site

## **Application Diagrams**

#### **Paired Systems**

Copper Ethernet is limited to 100m/328ft without extenders. Fiber optic cable provides long distance service up to 120km/74mi. 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 high voltage power sources, electrical motors, and radio communication equipment.



#### **Point to Point Application Diagram**



**Extend Ethernet to Multiple Locations** 

#### Link Fault Pass Through

In this paired scenario, Link Fault Pass Through is enabled on both RLH Ethernet DIN Fiber Links. Both devices monitor Links **A**, **B**, & **C**. If a failure in any of the links occur, the RLH 10/100 media converters will shut down their fiber ports and their copper Ethernet ports until the failed link is restored.

Note: The router and switch ports will no longer report an active status, and fail over routing and switching can take place.



Link Fault Pass Through - Paired

In the below stand alone scenario, Link Fault Pass Through is enabled on the RLH Ethernet DIN Fiber Link. If a failure in link **A** occurs the media converter will shut down Link **B** to ensure the end device (in this case the router) is notified the link is down. Alternatively, if link **B** fails the system will shut down Link **A** so the switch recognizes that the end device (router) has been disconnected.

**Note:** Link Fault Pass Through is essential for critical circuits that are monitored and have redundant paths. By using Link Fault Pass Through both the switch and router are sure to have an accurate link status of each other and behave as if the media converter was not there.



Link Fault Pass Through - Stand Alone

### Installation

Prior to installation:

- Check for shipping damage.
- Check the contents to ensure correct model.
- Make sure you have the correct fiber type and power available.
- Have a clean, dry installation environment ready.

Required for installation:

- Suitable wall, panel, or DIN rail space.
- Local power source (24~48VDC or 125VDC depending on model).
- Flat head screwdriver.



#### **Physical Information**

#### **DIN Rail Mounting**

The DIN clip for mounting the system is mounted onto the rear panel. Hook the DIN clip on the top flange of the DIN rail and rotate to the locked position. To remove pull up to press down the spring release latch and pull out to remove from the DIN rail.



**DIN Rail Mounting** 

#### Wall Mounting

The system can be easily wall mounted by attaching the provided wall mount ears and hardware. Attach the wall mount ears by following the instructions below.



#### Wall Mounting

#### **Connect Optical Fiber Cable**

The optical ports may be equipped with ST or SC fiber connectors. A fiber pair is required for operation with dual fiber models, TX is the signal output side and RX is the signal input side. Single fiber models (bi-directional) combine input and output by using different wavelengths over the fiber.

Connect fiber cables to correct TX and RX ports. On dual fiber models, verify that the TX fiber at one module is connected to the RX port on the opposite end. Single fiber systems use an **A** and **B** side. The **A** side must connect to the **B** side.

Do not remove fiber cable caps until you connect fiber to the unit, watch for dust and contamination. Fiber cables should be routed loosely avoiding tight bends to prevent excessive signal loss.

#### **Dip Switch Settings - SW1**

Use the front panel DIP switches to set optional modes. The factory default is OFF for all switches.

		Switch	Description	Setting	Function
LFP-E MAN 10 C-HDX F-HDX	SW1 LFP-D AUTO U U C-FDX F-FDX ON	1	Link Fault Pass Through	LFP-D	LFP disabled (Default)
				LFP-E	LFP enabled
		2	Copper Port Mode	AUTO	Copper port is auto negotiating (Default)
				MAN	Force Copper port at 10Mbps or half duplex
		3	Copper Port Speed	100	Copper port at 100Mbps (Default)
				10	Copper port at 10Mbps *
		4	Copper Port Duplex	C-FDX	Copper port at full duplex (Default)
0FF				C-HDX	Copper port at half duplex *
L		5	Fiber Port Duplex	F-FDX	Fiber port at full duplex (Default)
				F-HDX	Fiber port at half duplex *
		6	Reset -	ON	Power on (Default)
				OFF	Recycle power (See note)

- After changing any of the DIP switches, recycle the power to the card by flipping switch 6 (Reset) from ON to OFF then back to ON.
- ▶ \* DIP switch 2 must be set to MAN (ON) when switches 3, 4, and/or 5 are set to ON.

**Note:** Connecting an auto-negotiating device to a device that is not auto-negotiating may result in an unpredictable port setting with poor link performance. When operating in Manual mode, both mating ports must be set to the same data rate and duplex mode.



#### **Switch Setting Examples**

To activate the new setting the device must be reset. Flip switch 6 to the left (ON), then back to the right (OFF).



**Reset - Activate Settings** 

#### **Connect Ethernet Cable**

The RJ-45 Ethernet port will auto-sense for 10Base-T or 100Base-TX connections by default. The port is auto MDI/MDIX, which means that the device can connect to another device, switch, or workstation without changing your cat 5/6 cable to straight through or crossover.

#### **Connect Power**

The system has redundant power terminals that accommodates a backup power supply in the event of an outage. Follow these steps when attaching wires to power terminals located on the top of the module.

- Check that DC power source voltage matches the accepted voltage range of the device to avoid damaging the unit.
- Disconnect power from the DC power source prior to connecting to the Fiber Link.
- Connect the DC power cables to the terminal pairs. The system is not polarity sensitive.
- Energize the power source. The PWR LED will be ON indicating that the system has power.

#### **Connect Alarm**

Attach wiring from monitoring equipment to the alarm terminals located on the top next to the power terminals. Alarm changes state when the systems has a power failure or the fiber connection is broken.

#### **Front Panel LED Indicators**



Indicator	Color	LED	Description		
		On	Fiber port link OK		
FBR	Green	Blinking	Fiber port link OK and activity is present		
		Off	Fiber port link fail		
		On	Fiber port at full duplex		
FDX	Green	Blinking	Fiber port at half duplex / collisions occurring		
		Off	Fiber port at half duplex		
EQD	Orean	On	Fiber signal detected		
FGD	Green	Off	Fiber disconnected		
	Orean	On	Card power is ON		
PVN	Green	Off	Card power is OFF		
		On	Port at full duplex		
CDX	Green	Blinking	Port at half duplex / collisions occurring		
		Off	Port at half duplex		
	Green	Off	Normal operation		
		Blinking	Far end fault detected		
	Green		On	Port link OK	
LNK		Blinking	Port link OK and activity is present		
		Off	Port link not present		
ACT	Orange	On	Port speed is 100Mpbs		
AUT	Orange	Off	Port speed is 10Mpbs		

### Troubleshooting

The RLH 10/100 Ethernet Fiber Link system is fully tested prior to shipping. If problems do occur, please follow the troubleshooting steps prior to contacting support. Review the list below:

#### **FBR LED Indicator OFF**

- Make sure fiber cable from the TX optic is connected to the RX optic on the other end.
- Make sure single-mode equipment is using single-mode fiber and multimode equipment is using multimode fiber.

#### FDX LED Indicator BLINKING

• Check the fiber equipment to ensure the Fiber Link is communicating at the same duplex setting (half / full).

#### **CDX LED Indicator BLINKING**

• Check the fiber equipment to ensure the Fiber Link is communicating at the same duplex setting (half / full).

#### **PWR LED Indicators OFF**

- Check power supply voltage and rated device voltage.
- Check connections of the power terminals.

#### LNK Indicator OFF

- Check remote device to ensure copper port is activated (enabled).
- Replace copper patch cord.

Standards	IEEE 802.3 for 10BaseT, IEEE 802.3u for 100BaseT(X) & 100BaseFX						
Copper Connector	RJ45						
Copper Distance	100m / 328 feet						
Transmission method	Frequency modulated light via two optical fibers						
	Multimode 1310nm						
	Single-mode	1310nm/	1550nm				
Maximum Fiber	Single Fiber	Multimod	e (62.5/125µm):	1.25 mi. / 2km range			
Attenuation / Distance*	* (Bi-directional)	Multimod	e (50/125µm)	1.25 mi. / 2km range			
		Single-mode (9/125µm):		12.4 mi. / 20km range			
				37 mi. / 60km range			
	Dual Fiber	Multimod	e (62.5/125µm):	1.25 mi. / 2km range			
		Multimod	e (50/125µm)	1.25 mi. / 2km range			
		Single-m	ode (9/125µm):	12.4 mi. / 20km range			
				37 mi. / 60km range			
				74 mi. / 120km range			
	* Note: Distances equated using industry standard fiber and connector attenuation of 3dB/Km. Fiber condition						
	splices and connectors may affect actual range.						
Connector Type	ST or SC Multimode	9					
	ST or SC Single-mo	de					
Power Margin	8-10dB(2Km, M/M)	12dB ~ 35dB	(20 ~ 120Km, S/M	)			
LED Indicators	FBR (Fiber)	Fiber port link - ON: link OK, OFF: link fail, Blink: activity					
	FDX (Fiber)	Fiber port full duplex - ON: full, OFF: half, Blink: half & collisions					
	FSD	Fiber signal detect - ON: signal detected, OFF: fiber disconnected					
	FEFD	Far end fault detection - OFF: normal operation, Blinking: far end fault detected					
	CDX	Copper port full duplex - ON: full, OFF: half, Blink: half & collisions					
	PWR	Power - ON: power applied, OFF: no power					
	10/100	Copper port speed - ON: 100, OFF: 10					
	LINK/ACT	Copper port link - ON: link OK, OFF: no link, Blink: activity					
DIP Switch (SW1)	Switch 1	Link Fault Pass Through (Enable / Disable)					
	Switch 2	Copper Port Mode (Auto / Manual)					
	Switch 3	Copper Port Speed Select (10 / 100)					
	Switch 4	Copper Port Duplex Select (Half / Full)					
	Switch 5	Fiber Port Duplex Setting (Half / Full)					
	Switch 6 Reset						
Redundant Power	24~48VDC / 125VDC						
Power Consumption	150mA @ 24VDC or 3.6 Watt						
DC Input Isolation	1.5KV						
Fiber Alarm Contact	3 position terminal block (Normally Open / Normally Closed / Common)						
Protection	Voltage Reversal Will operate with V+ or		with V+ or V- in eit	her power terminal			
	Over Current	1.0A (Auton	natic Recovery)				
Temperature	<b>Storage</b> -40°C ~ 80°C (-40°F ~ 176°F)						
	<b>Operating</b> -40°C ~ 70°C (-40°F ~ 158°F)						
Construction	Powder coated galvanized steel, IP30 Protection						
Dimensions/Mounting	H 4.93" x W 1.20" x D 3.939" (not including DIN clip)						
	standard T-35 DIN rail mounting or wall mount						
Warranty	Lifetime						

# **General Specifications**

## Ordering Information

Connector	Side	Distance	Wavelength	Fiber	Part Number
Dual Fiber Multimode SC	-	2km / 1.2 mi.	1310nm	62.5/50µm	EFD-03-2
Dual Fiber Multimode ST	-	2km / 1.2 mi.	1310nm	62.5/50µm	EFD-04-2
Single Fiber	А	2km / 1.2 mi.	Tx 1310nm Rx 1550nm	62.5µm	EFD-01-2
Multimode SC	В	2km / 1.2 mi.	Tx 1550nm Rx 1310nm	62.5µm	EFD-02-2
	А	20km / 12.4 mi.	Tx 1310nm Rx 1550nm	8~9µm	EFD-10-2
Single Fiber	В	20km / 12.4 mi.	Tx 1550nm Rx 1310nm	8~9µm	EFD-11-2
Single-mode SC	A	60km / 37 mi.	Tx 1310nm Rx 1550nm	8~9µm	EFD-14-2
	В	60km / 37 mi.	Tx 1550nm Rx 1310nm	8~9µm	EFD-15-2
	-	20km / 12.4 mi.	1310nm	8~9µm	EFD-40-2
Dual Fiber Single-mode SC	-	60km / 37 mi.	1310nm	8~9µm	EFD-41-2
-	-	120km / 74 mi.	1550nm	8~9µm	EFD-45-2
	-	20km / 12.4 mi.	1310nm	8~9µm	EFD-50-2
Dual Fiber Single-mode ST	-	60km / 37 mi.	1310nm	8~9µm	EFD-51-2
-	_	120km / 74 mi.	1550nm	8~9µm	EFD-55-2

Add -A to the end of the part number for 125VDC input power option.

Single fiber models require an **A** Side and **B** Side unit for a complete system.

> Optic wavelength may be special ordered. Contact an RLH sales representative for availability.

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

### Warranty

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

### We can offer this warranty because:

- 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

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**

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

### Contact Information

Corporate Headquarters:	RLH Industries, Inc.
	936 N. Main Street
	Orange, CA 92867 USA
Phone:	(714) 532-1672
	Toll Free 1-800-877-1672
	Toll Free 1-866-DO-FIBER
Fax:	(714) 532-1885
Email:	info@fiberopticlink.com
Web site:	www.fiberopticlink.com



RLH Industries, Inc. 936 N. Main Street, Orange, CA 92867 USA T: (714) 532-1672 F: (714) 532-1885 Please contact your RLH sales representative for pricing and delivery information.

Specifications subject to change without notice.