10/100 Ethernet

Ethernet to Fiber Isolation Card

The RLH 10/100 Ethernet fiber link card converts a 10/100BaseT RJ45 port to an optical signal for transmission over either multimode or singlemode fiber optic cable.

With half or full duplex operation, it also features Auto MDI/MDI-X so a straight through or crossover cable can be used regardless of end device. The card provides Link Loss Pass-through (LFP), and has an informative LED display for status monitoring.

This product is IEEE 802.3 10Base-T, 100Base-Tx and 100Base-Fx compliant, and is interoperable with other 10/100 BaseT and Base-FX devices. Both dual fiber (single direction) and single fiber (bidirectional) models are available. Please refer to the optics configuration table below.

This fiber link card is designed to be installed into any of the RLH Fiber Link Card Housings, and occupies a single card slot.

10/100 Ethernet

Key Features

- Provides 10/100 Ethernet over fiber
- Connects directly to RJ45 connector
- IEEE 10/100 standards compliant
- Auto MDI/MDI-X
- Half or full duplex operation
- User selectable link fault detection mode (Link Fault Pass-through) allows quick fault isolation
- Extends network span up to 120km/74 miles (singlemode)
- Bidirectional communication over a single fiber is available
- Environmentally rugged with wide operating temperature range
- Utilizes ultra-reliable 1x9 fiber optic modules
- On board LED status display
- Utilizes 24~56VDC power source
- Available in singlemode and multimode
- Available with ST, SC or FC connectors
- Compatible with a wide variety of RLH Card Housings
- Limited Lifetime Warranty
- Made in USA

General Safety Practices

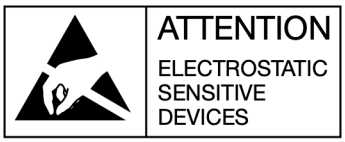
The equipment discussed in this document may require tools designed for the purpose being described. RLH recommends that service personnel be familiar with the correct handling and use of any installation equipment used, and follow all safety precautions including the use of protective personal equipment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

CAUTION - SEVERE SHOCK HAZZARD

- Never install during a lightning storm or where unsafe high voltages are present
- Use caution when handling copper wiring and follow appropriate safety regulations

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

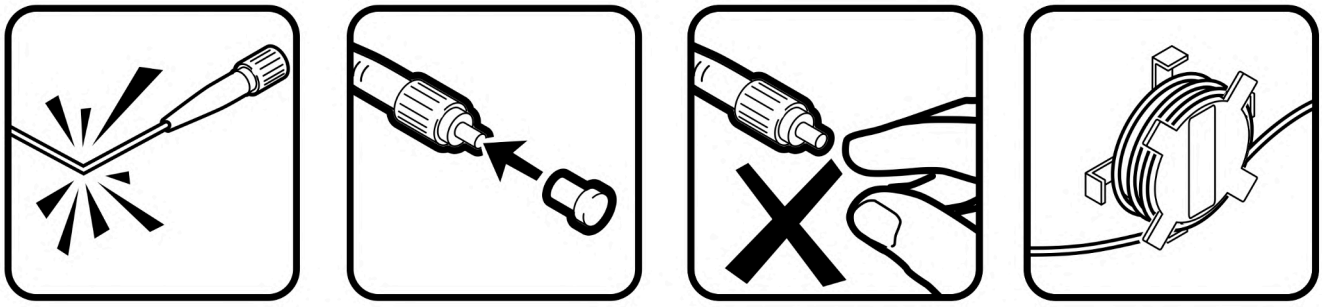
This card utilizes circuitry that can be damaged by static electricity. When transporting the card, carry it in an ESD safe container such as the antistatic bag provided with the card. Before handling cards, discharge yourself of static electricity by physical bodily contact with earth ground. When handling 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.

General Safety Practices (cont'd)

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

Commonly Used Acronyms & Abbreviations

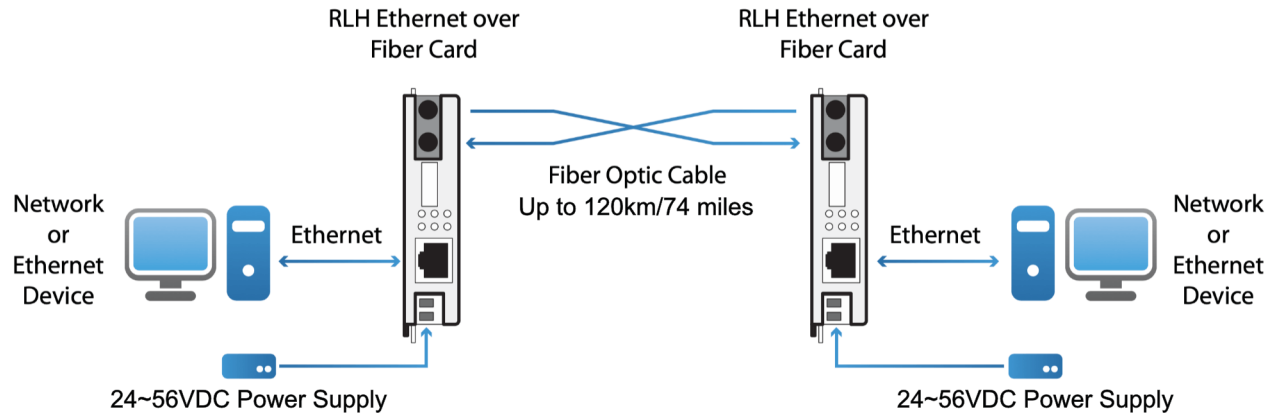
Name	Description
UTP	Unshielded Twisted Pair (commonly used in Ethernet networks)
TP	Twisted Pair (same as UTP)
LFP	Link Fault Passthrough
TX	Transmit
RX	Receive
MAN	Manual
AN	Auto Negotiating
HDX	Half Duplex
FDX	Full Duplex
LS	Link Fault Passthrough Suspend
LP	Link Fault Passthrough Pass

Applications

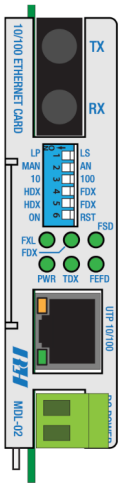
Network equipment in high voltage areas can be at risk due to Ground Potential Rise (GPR). A copper network cable referenced to a remote ground can become a path for high voltages during a ground fault. Placement of all-dielectric fiber optic cable (instead of copper) completely eliminates the presence of a remote ground, which dramatically increases safety of personnel and reliability of equipment. By utilizing fiber optic cable, the Ethernet FIber Link Card provides absolute electrical isolation between both ends of the network.

Copper twisted pair Ethernet is limited to 100m/328ft without extenders. Fiber optic cable provides long distance service (up to 120km/74 miles) 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.

System Diagram



Ethernet Fiber Link Card Front Panel



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
- Ensure that the fiber type at the site matches the system type

Required for installation:

- 24~56VDC (3W minimum) power source
- RLH Fiber Link Card housing

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

Connect Fiber Optic Cable

Multimode and single-mode Ethernet cards are equipped with either two ST or SC female optical connectors, or a single SC bi-directional connector. Connect fiber cable to the Transmit (TX) and Receive (RX) optical connectors. The other end of the fiber may be connected to another Ethernet fiber link card or any 100BASE-FX Ethernet device.

The TX connector of each card must be connected to the RX connector at the other end. For bi-directional, single fiber models, there is only a single SC connector used for both transmitting and receiving. Always route fiber optic cable loosely avoiding tight bends.

Connect Ethernet Cable

The TP (RJ-45) Ethernet port will auto-sense for 10Base-T or 100Base-TX connections.

The port is auto MDI/MDIX, which means that the card can connect to another card, switch or workstation without changing straight through or crossover cabling.

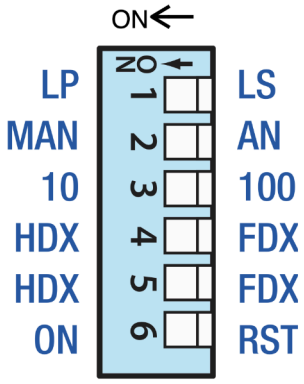
Connect Power

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.

Installation (cont'd)

DIP Switch Settings

The front panel DIP switches may be set for optional modes. The factory default is **OFF** for all switches.



Switch	Description	Setting	Function
1	Link Fault Pass-Through	LP LS	LFP Enabled LFP Disabled (default)
2	TP Port Mode	AN MAN	TP is auto negotiating (default) Force TP at 10M or half duplex
3	TP Port Speed	100 10	TP at 100M (default) TP at 10M when TP Port Mode is set to MAN (Force 10M)
4	TP Port Duplex	FDX HDX	TP at full duplex (default) TP at half duplex when Port Mode at Force
5	Fiber Port Duplex	FDX HDX	Fiber port at full duplex (default) Fiber port at half duplex
6	Reset	On RST	Power on Recycle power (default) (See note below)

- After changing any of the DIP switches, recycle the power to the card by flipping switch 6 (Reset) from RST to ON then back to RST
- DIP switch 2 must be set to MAN (ON) when switches 3 and 4 are set to 10 and HDX respectively

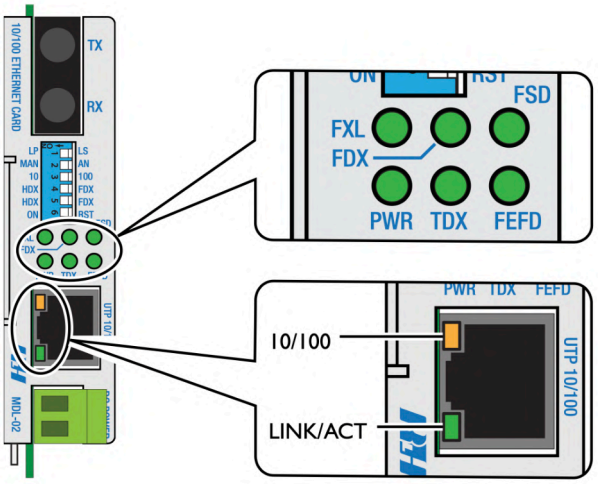
Note: Connecting an auto-negotiating device to a non-auto-negotiating device may result in an unpredictable port setting with poor link performance. When operating in Manual mode, both mating ports must be set to the same data rate and duplex mode.

Troubleshooting

If trouble is encountered, verify all copper and fiber connections and settings. If any of the DIP switches were changed, recycle the power to the card by flipping switch 6 (Reset) from RST to ON then back to RST. Refer to the LED Indicators on the front panel, they show availability of power, modes of operation, and data being received by the fiber and TP port.

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

*Tech support contact info is at the end of this document



Indicator	Color	LED	Description
FXL	GRN	ON Blinking OFF	Fiber port link OK Fiber port link OK and activity is present Fiber port link fail
FDX	GRN	ON OFF Blinking	Fiber port at full duplex Fiber port at half duplex Fiber port at half duplex and collisions occurring
FSD	GRN	ON OFF	Fiber signal detected Fiber disconnected
FEFD	GRN	OFF Blinking	Normal operation Far end fault detected
TDX	GRN	ON OFF Blinking	TP port at full duplex TP port at half duplex TP port at half duplex and collisions occurring
PWR	GRN	ON OFF	Card power is ON Card power is OFF
10/100	ORG	ON OFF	TP port speed is 100M TP port speed is 10M
LINK/ACT	GRN	ON Blinking OFF	TP port link OK TP port link OK and activity is present TP port link not present

Ordering Information

Mode	Connector	Distance	Fibers	Wavelength	Part Number
Multimode	ST	2km/1.2 miles	Dual Fiber	1310nm	EF4-04-2
Singlemode	SC	20km/12.4 miles	Dual Fiber	1310nm	EF4-40-2
Singlemode	SC	60km/37 miles	Dual Fiber	1310nm	EF4-41-2
Singlemode	SC	120km/74 miles	Dual Fiber	1550nm	EF4-45-2
Singlemode	ST	20km/12.4 miles	Dual Fiber	1310nm	EF4-50-2
Singlemode	ST	60km/37 miles	Dual Fiber	1310nm	EF4-51-2
Singlemode	ST	120km/74 miles	Dual Fiber	1550nm	EF4-55-2
Singlemode	SC	20km/12.4 miles	Single Fiber - Side A	T-1310/R-1550	EF4-10-2
Singlemode	SC	20km/12.4 miles	Single Fiber - Side B	R-1310/T-1550	EF4-11-2
Singlemode	SC	60km/37 miles	Single Fiber - Side A	T-1310/R-1550	EF4-14-2
Singlemode	SC	60km/37 miles	Single Fiber - Side B	R-1310/T-1550	EF4-15-2

- Optics are dual fiber unless identified as Bi-Di
- Bi-directional single fiber models require both an A Side and B Side unit for a complete system
- This card is designed to be installed into a Card Housing

Key Specifications

Protocols:	100BASE-FX, 10BASE-T, or 100BASE-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:**	Mulitmode	Singlemode	Singlemode	Singlemode
	Wavelength TX/RX:	1310nm	1310nm	1310nm	1550nm
	Distance:	2km/1.2 miles	20km/12 miles	60km/36 miles	120km/74 miles
	Min. TX PWR :	-18 dBM	-15 dBM	-6 dBM	0 dBM
	Max. TX PWR:	-10 dBM	-8 dBM	-3 dBM	+5 dBM
	RX Sensitivity:	-31 dBM	-34 dBM	-34 dBM	-34 dBM
	Link Loss Budget:	13 dBM	19 dBM	28 dBM	34 dBM
Single Fiber Optics (bi-directional):	**Fiber Type:**	Mulitmode	Singlemode	Singlemode	
	Wavelength TX/RX:	1310/1550nm	1310/1550nm	1310/1550nm	
	Distance:	2km/1.2 miles	20km/12 miles	60km/36 miles	
	Min. TX PWR :	2-17 dBM	-14 dBM	-9 dBM	
	Max. TX PWR:	-10 dBM	-8 dBM	-5 dBM	
	RX Sensitivity:	-31 dBM	-34 dBM	-34 dBM	
	Link Loss Budget:	14 dBM	20 dBM	25 dBM	
Power Input:	24~56VDC @ 3W				
Operating Temperature:	-40°C to +70°C (-40° to +158°F), 95% non-condensing				
Storage Temperature:	-40°C to +80°C (-40° to +176°F), 95% non-condensing				
Dimensions:	7” x 4” x 1” (178mm x 102mm x 26mm) (Standard RLH Fiber Link Card Form Factor)				
Warranty:	Limited Lifetime				

Contact

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