RLH Industries, Inc.
Fiber Optic Link Gigabit Ethernet Card

Fiber Type (Distance)	Connector Type	Gigabit Card Part Number
Multimode (220/550m*)	ST	8806-1512-01
Multimode (220/550m*)	SC	8805-1512-01
Single-mode (12km)	ST	8806-1522-01
Single-mode (12km)	SC	8805-1522-01
Single-mode Long Haul (34km)	ST	8806-1522-01LH
Single-mode Long Haul (34km)	SC	8805-1522-01LH

* 62.5/125 fiber up to 220m. 50/125 fiber up to 550m.

Contents **pg.**

1. GENERAL

The RLH Fiber Optic Link Gigabit Ethernet Interface Card converts an IEEE 802.3ab compatible copper 1000BASE-T to a fiber optic 1000BASE-X transmission signal of either multimode or single-mode. Multimode and single-mode cards provide transmission of the data signals over a fiber optic facility to extend the circuit and provide electrical isolation between the network and distant connection.

1.2 Whenever this document is updated he reason will be stated here.

2. FEATURES

The Gigabit Ethernet Card provides:

- Compatibility with IEEE 802.3ab 1000BASE-T UTP, and 1000BASE-X Devices
- Extends network span up to 550m on multimode and 7 or 21 miles (12 or 34km.) on single-mode fiber.
- RJ45 UTP port with auto-crossover and Half or Full Duplex auto-negotiation
- User selectable link fault detection modes allow quick fault isolation
- Provides LED indicator for convenient visual status

3. APPLICATIONS

3.1 Telecommunication equipment in high voltage areas can be at risk due to Ground Potential Rise (GPR). A copper telephone line 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.

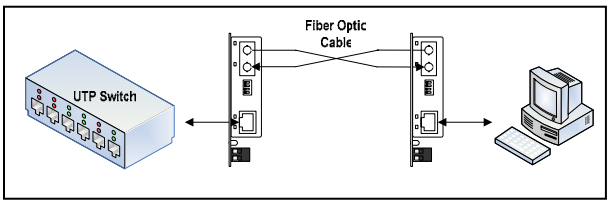

Figure 1. Ethernet System Diagram

4. INSTALLATION

4.1 Multimode and single-mode Ethernet cards are equipped with two ST or SC female optical connectors. Connect fibers to the Transmit (TX) and Receive (RX) optical connectors to other Ethernet card or any IEEE 802.3ab 1000BASE-X Ethernet device.
Note: The card Gx fiber port is always in Manual Mode, Occasionally a link-up will not occur with other devices that are set to Auto-Negotiate Mode. The device must be switched to Manual Mode.

4.2 The 1000BASE-T UTP copper connection is made via the RJ45 port located on the front of the card with. The port will automatically crossover for easy connection to hubs, switches and workstations.

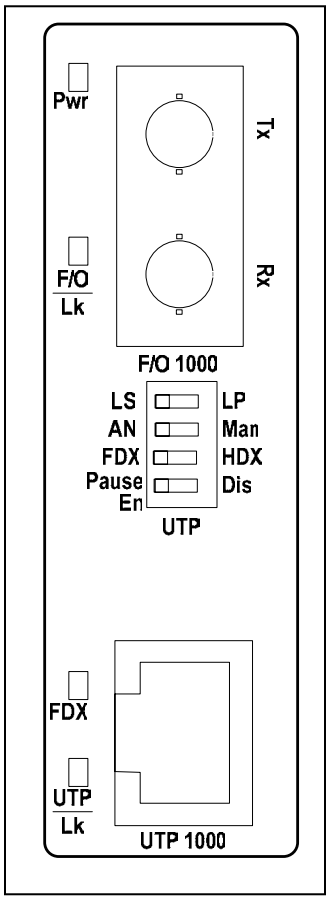

Figure 2. Front Panel

4.3 Four DIP switch option settings are located on the front of the Gigabit Ethernet card. Refer to Figure 3 for correct application settings.

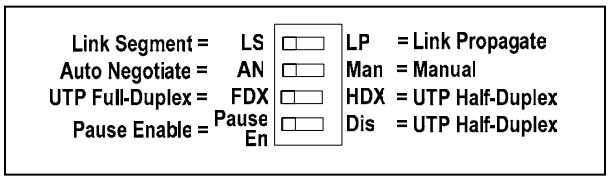

Figure 3. Front Panel Switch

Link Segment/Link Propagate "LS/LP" Switch:
This switch controls Link Segment or Link Propagate modes. When in the "LS" position, Link Segment mode is enabled (factory setting). When in the "LP" position, Link Propagate mode is enabled. See section 4.4 for Link Mode descriptions.

UTP Auto/Manual Negotiate "AN/MAN" Switch:
When the UTP Auto/Manual Negotiate switch is in the "AN" Auto-Negotiate position (factory setting), the card auto-negotiates and matches duplex mode of the connecting auto-negotiating device. When in the UTP "MAN" Manual position, the card does not auto-negotiate and operates in the mode selected by the UTP Full/Half Duplex switch.

UTP Full/Half Duplex "FDX/HDX" Switch:
When the UTP Auto/Manual Negotiate switch is in the "MAN" Manual position, the UTP Full/Half Duplex switch selects the duplex mode of the UTP port. When the switch is set to the "FDX" Full-Duplex (factory setting) position, the UTP port operates in Full-Duplex mode. When set to the "HDX" Fiber Half-Duplex position, the fiber port operates in Half-Duplex. Set the duplex mode to match the connecting device and check for link status.
Note: Half-Duplex must be used when connecting to a hub. Full-Duplex can be used when connecting to a switch or a Full-Duplex capable workstation.

Pause Enable/Disable Switch:
Setting this switch to Pause Enable (factory setting) allows the UTP port to auto-negotiate to Symmetrical and Asymmetrical Pause. Setting the switch to Pause Disable forces the UTP port to auto-negotiate only to No Pause. Pause frames are passed through the card.

4.4 Link Modes
In order to accommodate different user needs, the RLH Gigabit Ethernet Card supports three different linking modes: Link Segment, Link Propagate, and Remote Fault Detect. Refer to Figure 4 for correct application settings.

Link Segment, sometimes referred to as Normal mode, a UTP or Fiber port will transmit a Link signal independently of any received Link signal. It is recommended to use Link Segment mode during initial installation.

Link Propagate will transmit a Link signal only when receiving a Link at its other port.

Remote Fault Detect + Link Segment will transmit a Fiber Link signal only when a Link

signal is received at the Fiber port. As a result, fiber faults are looped-back and can be reported to the network core.

Remote Fault Detect + Link Propagate will transmit a Link signal from the UTP port only when receiving a Link signal at the Fiber port. The Fiber port will transmit a Link signal only when a Link signal is received at both the UTP and Fiber ports. As a result, fiber faults are looped-back and can be reported to the network core.

Remote Fault Detect "RFD" Switch:

A DIP switch S2 (not shown) has RFD option setting. When the "RFD" Remote Fault Detect switch is in the UP position, the RFD mode is selected. When in the DOWN position (factory setting), the RFD mode is disabled.

Note: Connecting two cards both set to enabled RFD mode will cause a lockup condition.

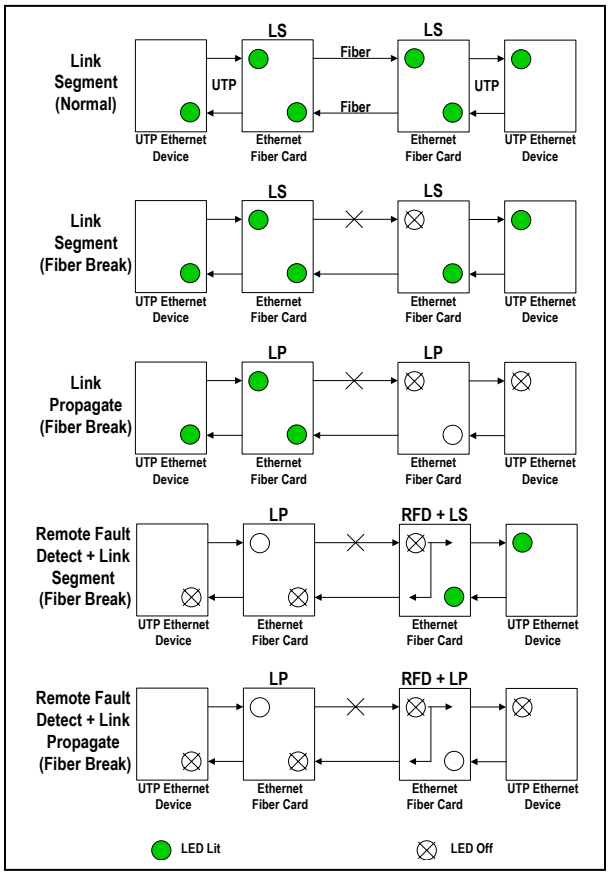

Figure 5. Link Modes Diagram

5. TESTING

5.1 If signal is not present, replace card and retest. If card is determined to be defective, then contact RLH for replacement or repair, see section 7.

The RLH Gigabit Ethernet Card provides LED Indicators on the front panel of the PCB. LED's show availability of power, the mode of operation, and data being received by the fiber and UTP ports. See figure 2.

6. SPECIFICATIONS

Protocols:	1000BASE-SX/LX, 1000BASE-T
Copper connector:	RJ45 UTP
Copper distance:	100m / 328 feet
Fiber connector:	ST or SC
Fiber types:	
Multimode:	62.5/125, 50/125
Single-mode:	8-9/125 µm
Fiber Distances:	
Multimode:	62.5/125: 220m 50/125: 550m
Single-mode:	12 km / 7 miles
Single-mode Long Haul:	34 km / 21 miles
Fiber Transmission:	
Multimode:	Wavelength: 850nm Min. Tx level: -10dB Link Loss Budget: 7dB
Single-mode:	Wavelength: 1310nm Min. Tx level: -9.5dB Link Loss Budget: 10dB
Single-mode Long Haul:	Wavelength: 1310nm Min. Tx level: -5dB Link Loss Budget: 18dB* *required -3dB attenuation
LED Indicators:	
Power:	Amber, Power applied
F/O/Lk:	Green, On – Link / Blink - Activity
FDX (UTP):	Green, On – Full-Duplex
UTP/Lk:	Green, On – Link / Blink - Activity
Power Input:	24-56VDC @ 5W
Dimensions:	7.0"x4.0"x1.0"
Temperature:	Operating: -40° to +60°C Storage: -40° to +80°C
Humidity:	5-95% (non-condensing)

7. REPAIR AND RETURN

7.1 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.

7.2 This warranty is UNCONDITIONAL and is valid even when the 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.

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. In the event that a Card requires repair, contact RLH Industries for a RMA (return material authorization) number and send the Card with a description of the problem to:

RLH Industries, Inc.
Attn: Repair and Return
936 N. Main Street
Orange, CA 92867

8.0 ORDERING INFORMATION

8.1 To place an order for RLH Industries, Inc. equipment, call or Fax inside sales at (800)-877-1672, (714) 532-1885

8.2 To order the RLH Gigabit Ethernet Card, please indicate the appropriate model number listed below and the quantity required:

Card Part Numbers:
8806-1512-01, Multimode ST (220/550m)
8805-1512-01, Multimode SC (220/550m)
8806-1522-01, Single-mode ST (12km/7mi.)
8805-1522-01, Single-mode SC (12km/7mi.)
8806-1522-01LH, Single-mode Long Haul ST (34km/21mi.)
8805-1522-01LH, Single-mode Long Haul SC (34km/21mi.)