![RLH Industries, Inc. logo]

RLH Industries, Inc.

USER GUIDE

The leader in rugged fiber optic technology.

RS-232 Fiber Link Card System

SYSTEM INSTALLATION INFORMATION

SERIAL DATA OVER FIBER

RS-232 Fiber Link Card

Introduction

The RS-232 Fiber Link Card system transports a full 9-Pin RS-232 copper signal over fiber optic cable. This fiber optic isolation system is an ideal solution for extending serial data communications over long distances or near large electrical equipment. Fiber optics provide long distance communication up to 74 mi. (120km) and immunity to EMI/RFI and potential transient surges which can cause noise or damage equipment.

The system supports asynchronous serial data rates from 50 bps to 1Mbit/s and has an auto-sensing feature that eliminates the need to manually set serial data rates. A comprehensive set of LEDs on the front panel indicate power status, fiber status, and serial data activity. The card supports 24-48VDC powering. RLH card housings have optional power supplies which support a wide range of power sources.

This rugged system is designed to operate over a wide operating temperature -40 to +70°C and compatible with all RLH card housings. This rugged system is manufactured in the U.S.A, and covered by our **Limited Lifetime Warranty**.

Standard Features
Transmits a 9-Pin RS-232 Signal
Supports baud rates of 50 bps to 1Mbit/s
Selectable DTC/DCE switch for easy installation
Each Pin is Optically Isolated
Optional Breakout Cable for 3 channels of serial data
Convenient LEDs for power, fiber, and serial signals
ST and SC Connectors, Singlemode and Multimode options available
Extends communication up to 74 mi. (120km) over Fiber
DC power, fiber break, and/or system failure alarm relay
Rugged design for wide operating temperature
Limited Lifetime warranty
Made in U.S.A.

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
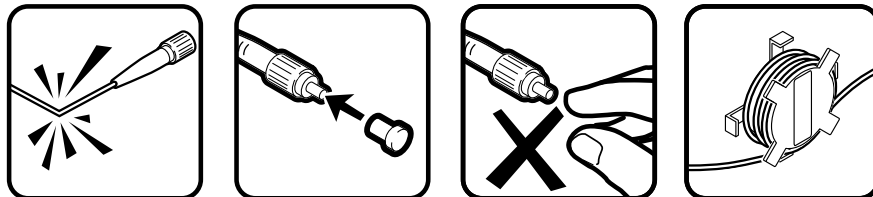
- Do not bend fiber cable sharply. Use gradual and smooth bends to avoid damaging glass fiber.
- Keep dust caps on fiber optic connectors at all times when disconnected.
- Do not remove dust caps from unused fiber.
- Keep fiber ends and fiber connectors clean and free from dust, dirt and debris. Contamination will cause signal loss.
- Do not touch fiber ends.
- Store excess fiber on fiber spools at site

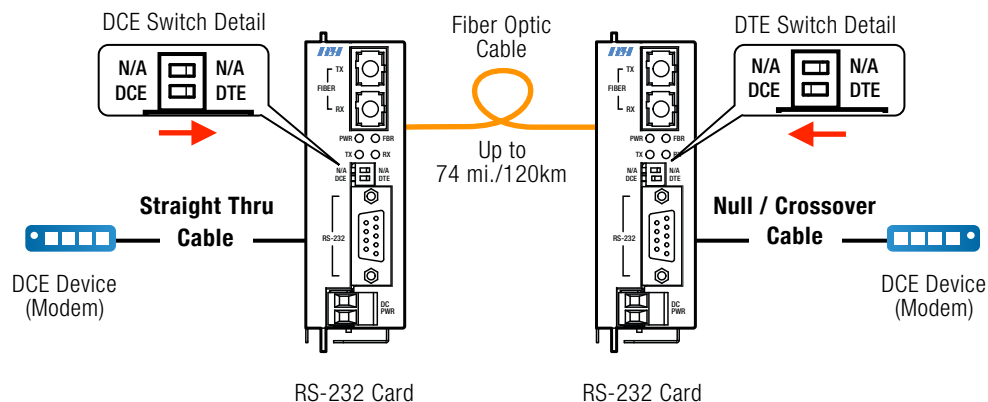# Application Diagrams

DTE Device (PC) To DCE Device (Modem)

This system is always used in a pair. One of the cards must always be set to DTE mode via the dip switch and the other card must be set to DCE for proper operation. When connecting DCE and DTE end devices over fiber, pair the DCE end device with the card set to DTE mode, and pair the DTE end device with the card set to DCE mode. Then make the interconnections between each of the cards and the end devices with a straight through serial cable as illustrated below.
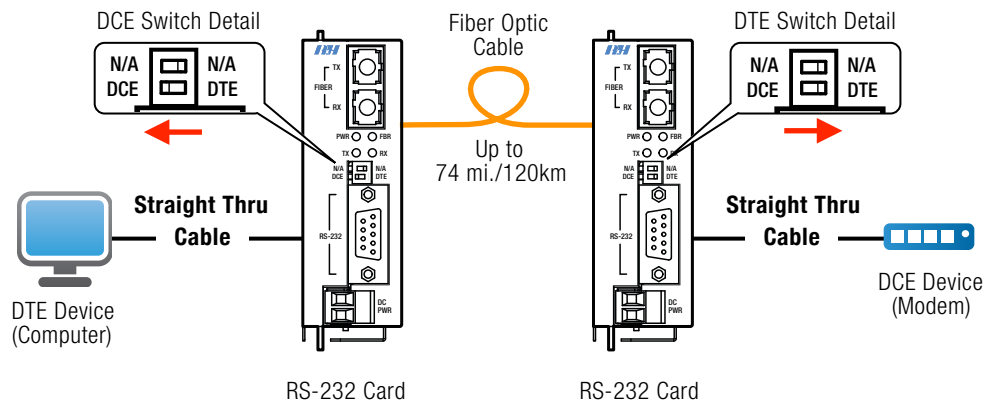
Typical Application Diagram

DCE Device To DCE Device

This system is always used in a pair. One of the card must always be set to DTE mode via the dip switch and the other card must be set to DCE for proper operation. When connecting two DCE end devices over fiber, where the DCE end device connects to the card set to DTE mode, use a straight through serial cable. Where the other DCE end device connects to the card in DCE mode use a null (crossover) serial cable. Below is an example of a system where both end devices are DCE devices and connected with the appropriate straight through and null (crossover) cables.
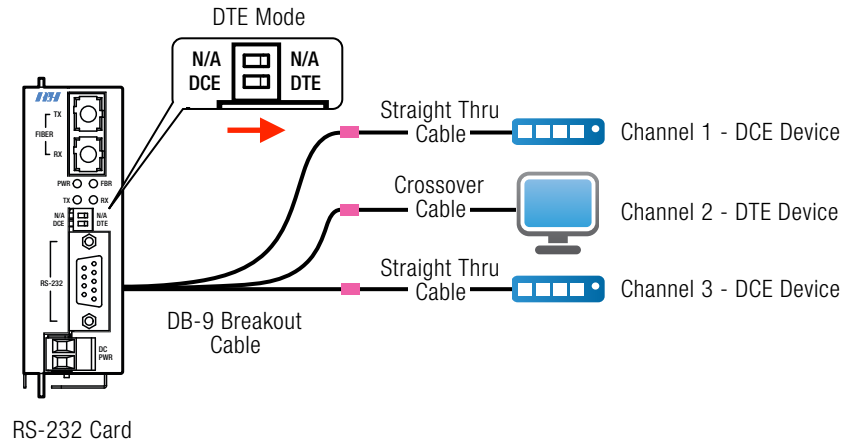

(DCE to DCE / DTE to DTE)
Same Device Type Application Diagram

DB-9 Breakout Cable (Straight Through Cable) – 3 Channel

The optional DB-9 Breakout cable will convert your 9-Pin RS-232 device to 3 separate channels of 3-Pin RS-232 serial data as illustrated below. The breakout cable is wired as a straight through cable, if the device is in DTE mode, all 3 connectors will be DTE type interfaces.

Likewise, if the Device is in DCE mode, all 3 connectors will be DCE type interfaces. If you are connecting DCE to DCE or DTE to DTE a crossover cable will need to be used on those connections.

NOTE: 3 Channel DB-9 Breakout Cables split the cables 9 wires into three DB-9 ports using only the 3 pins for sending the RS-232 Signal. See DB-9 Breakout Cable section for more pin and cable details.

DTE Mode

N/A DCE   N/A DTE

Straight Thru Cable — Channel 1 - DCE Device

Crossover Cable — Channel 2 - DTE Device

Straight Thru Cable — Channel 3 - DCE Device

DB-9 Breakout Cable

RS-232 Card

Breakout Cable Application Diagram
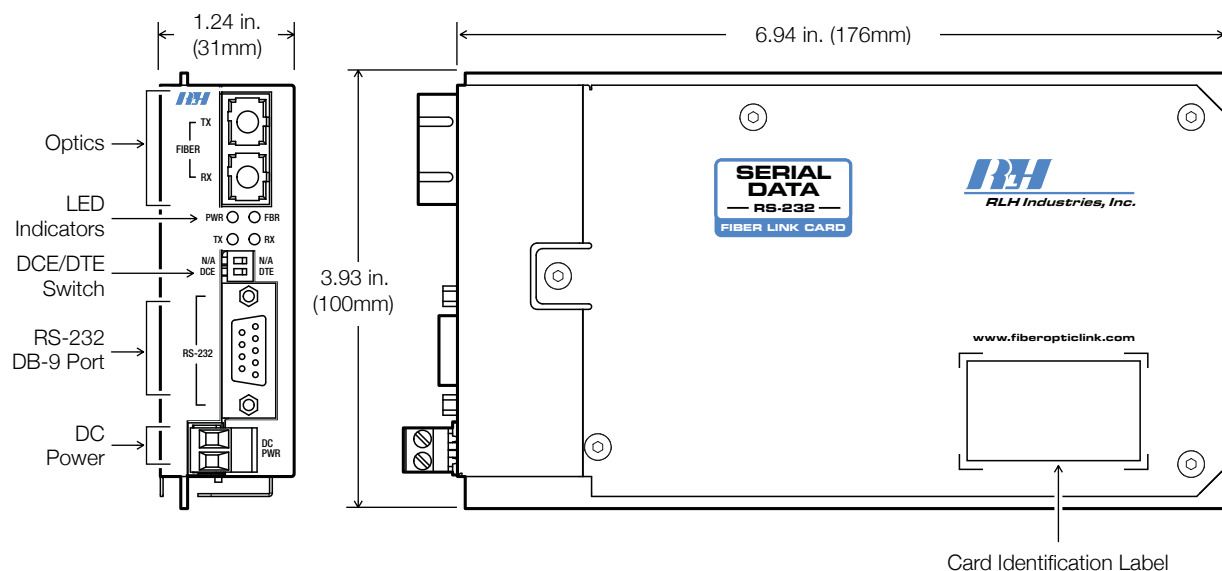
Installation

Prior to installation:

- Check for shipping damage. (If so, file claim immediately with the carrier, then contact RLH customer service.)
- 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 RLH Fiber Link Card Housing with available mounting slot.
- Local power source for each card (24~48VDC).
- Multimeter
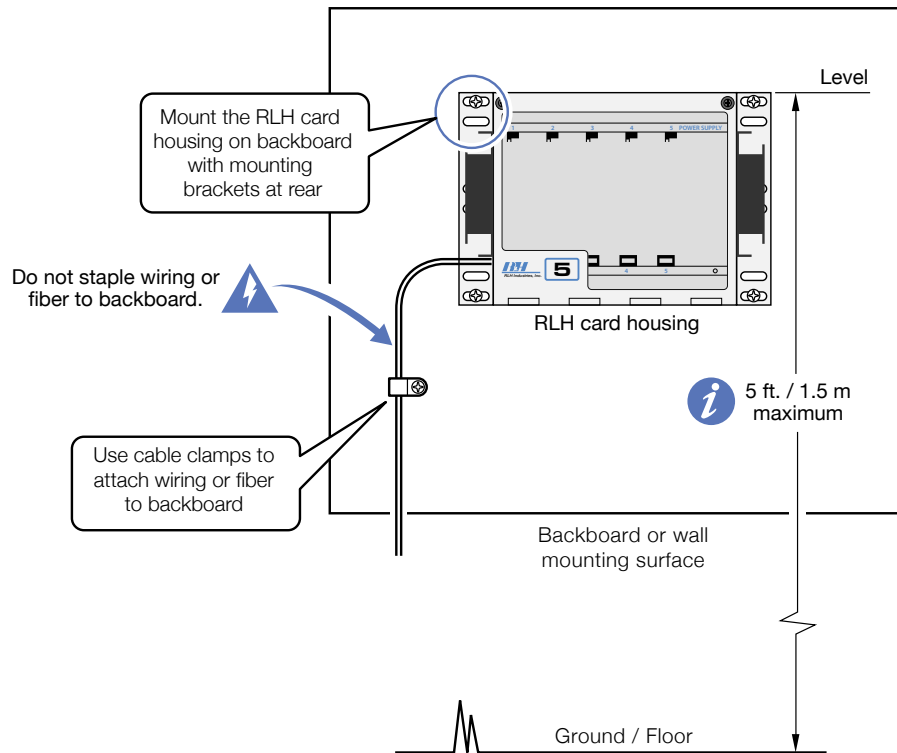- Flat head screwdriver for connecting wiring.

Measure the DC voltage of the power source to ensure that it is 24-48VDC. All electrical and fiber optic connections are made directly onto the card.

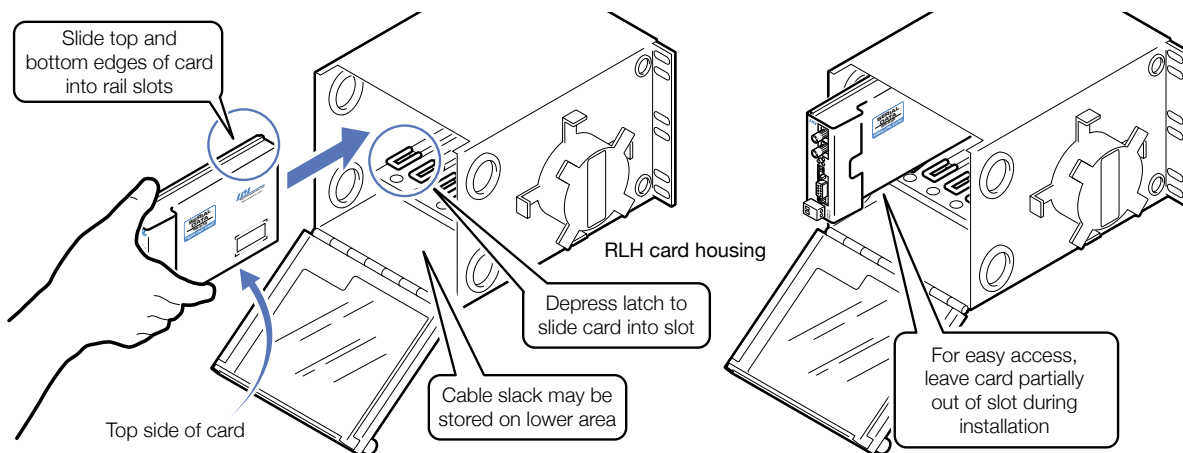## Physical Layout

Card Identification Label

Mount housing in equipment rack or attach to backboard.

When installing an RLH card housing, leave room for the door to open and provide enough slack in wiring and fiber to allow for card access.

Mount the RLH card housing on backboard with mounting brackets at rear

Do not staple wiring or fiber to backboard.

Use cable clamps to attach wiring or fiber to backboard

RLH card housing

Level

5 ft. / 1.5 m maximum

Backboard or wall mounting surface

Ground / Floor

Note card orientation in housing during installation

Handle card by edges. Install in slot 1 or next available card slot. Install card into housing before connecting fiber or copper wiring.

Slide top and bottom edges of card into rail slots

RLH card housing

Depress latch to slide card into slot

Top side of card

Cable slack may be stored on lower area

For easy access, leave card partially out of slot during installation

Connect Serial Port

The RS-232 Fiber Link Card system transports all 9-Pins of RS-232 copper serial data over fiber optic cable. Serial connections are made to the provided female DB-9 serial port. Please refer to the below pinouts to ensure the appropriate connections are being made.

Detail of Serial Data DB-9 Port
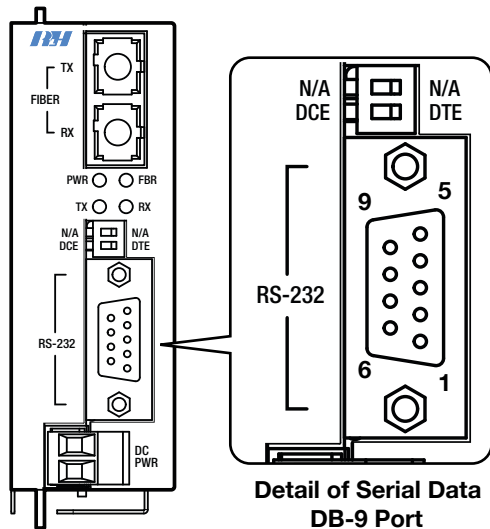
DB-9 Port Pinouts		
Pin	Name	Function
1	**DCD**	Data Carrier Detect
2	**RXD**	Receive Data
3	**TXD**	Transmit Data
4	**DTR**	Data Terminal Ready
5	**GND**	Ground Signal
6	**DSR**	Data Set Ready
7	**RTS**	Request to Send
8	**CTS**	Clear to Send
9	**RI**	Ring Indicator

DCE / DTE Selection Switch

This DIP switch is used to determine the flow of data to and from the device. When set to the DTE Position the card's DB-9 Serial Port will behave as a DTE type device. When Set to the DCE position the card's DB-9 Serial Port will behave as a DCE type device.

This system is always used in a pair, one card must always be set to DTE and the other card must be set to DCE. Please use null or straight thru cables to appropriately connect to end devices. Consult our application diagrams for deployment examples.

DIP Switches on Front Panel

RS-232 DB-9 Switch	
Setting	Switch Position
DCE	←
DTE	→

Straight Through 9-Pin Serial Cable

A Straight Through or One-to-One cable is used to connect a DTE device (PC) to a DCE device (modem or other communications device). The transmit and receive lines are not cross-connected in this case, hence the name.

DTE Device			STRAIGHT THROUGH CABLE			DCE Device	
Function	Name	Pin	Signal Direction	Pin	Name	Function	
Data Carrier Detect	DCD	1	←	1	DCD	Data Carrier Detect
Receive Data	RXD	2	←	2	RXD	Receive Data
Transmit Data	TXD	3	→	3	TXD	Transmit Data
Data Terminal Ready	DTR	4	→	4	DTR	Data Terminal Ready
Ground Signal	GND	5	—	5	GND	Ground Signal
Data Set Ready	DSR	6	←	6	DSR	Data Set Ready
Request to Send	RTS	7	→	7	RTS	Request to Send
Clear to Send	CTS	8	←	8	CTS	Clear to Send
Ring Indicator	RI	9	←	9	RI	Ring Indicator

Null (Crossover) 9-Pin Serial Cable

A Null Modem or Crossover cable is used to connect a pair of the same devices, DTE to DTE devices or DCE to DCE devices, together. For this to work, the Transmit (TXD) pin of one device needs to be connected to the Receive (RXD) pin of the other device, and vice versa.

To enable handshaking between the two devices, the Request to Send (RTS) pin of one device must be connected to the Clear to Send (CTS) pin of the other device, and the Data Set Ready (DSR) pin is connected to the Data Terminal Ready (DTR) pin of the other.

DCE Device			NULL / CROSSOVER CABLE			DCE Device	
Function	Name	Pin	Signal Direction	Pin	Name	Function	
Data Carrier Detect	DCD	1		1	DCD	Data Carrier Detect
Receive Data	RXD	2	⤬	2	RXD	Receive Data
Transmit Data	TXD	3	⤬	3	TXD	Transmit Data
Data Terminal Ready	DTR	4	⤬	4	DTR	Data Terminal Ready
Ground Signal	GND	5	⤬	5	GND	Ground Signal
Data Set Ready	DSR	6	⤬	6	DSR	Data Set Ready
Request to Send	RTS	7	⤬	7	RTS	Request to Send
Clear to Send	CTS	8	⤬	8	CTS	Clear to Send
Ring Indicator	RI	9		9	RI	Ring Indicator

DB-9 Breakout Cable (Straight Thru Cable) – 3 Channels

The optional DB-9 Breakout cable will convert your 9-PIN RS-232 device to 3 separate channels of 3-PIN RS-232 serial data as illustrated below. The break-out cable is wired as a straight through cable, if the device is in DTE mode, all 3 connectors will be DTE type interfaces. Likewise, if the Device is in DCE mode, all 3 connectors will be DCE type interfaces. If you are connecting DCE to DCE or DTE to DTE a crossover cable will need to be used on those connections.
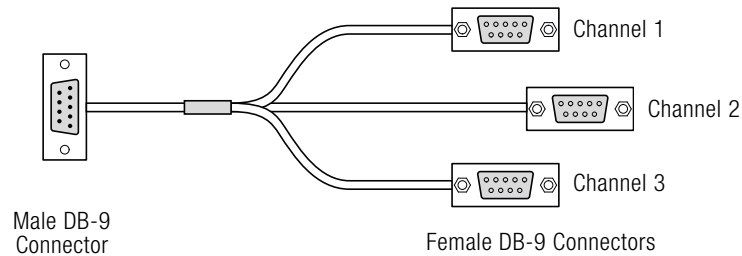
RS-232 DB-9 Breakout Cable

Breakout	Channel 1			Channel 2			Channel 3		
DB-9 Pins	2	3	5	2	3	5	2	3	5
	RXD	TXD	GND	RXD	TXD	GND	RXD	TXD	GND

Connect Power

The system has a 2 position power terminal that accommodates 24-48VDC powering. Follow these steps when connecting wires to power terminals located on the front of the card.

- Check that DC power source voltage matches the accepted voltage range of the card to avoid damage.

- Disconnect power from the DC power source prior to connecting to the card.

- Connect the DC power cables to the terminal pairs. The system is not polarity sensitive.

- Connect the power source. The PWR LED will then turn ON indicating that the system has power.
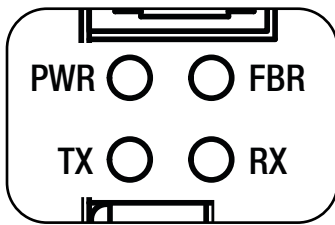
Detail of LED Indicators

Indicator	Color	LED	Description
POWER	Green	OFF	System has NO power
		ON	System has power
FIBER	Green	OFF	No Fiber Link detected
		ON	Fiber Link detected
TX	Green	OFF	No activity
		ON/BLINKING	Copper signal transmitting
RX	Green	OFF	No activity
		ON/BLINKING	Copper signal receiving

Troubleshooting

The RLH RS-232 Fiber Link Card system is fully tested prior to shipping. If problems do occur, please follow the troubleshooting steps below prior to contacting support.

POWER LED Indicator OFF

- Check power supply voltage and rated device voltage.
- If correct, check connections at the power terminals.

FIBER LED Indicator Off

- Optic port connection may be incorrect.
- Make sure fiber cable from the TX optic is connected to the RX optic on both ends of the system.
- Make sure single-mode equipment is using single-mode fiber and multimode equipment is using multimode fiber.
- Check to ensure the fiber path is within the dB Loss and distance specifications of the model being installed.

TX and RX LED Indicators Off

- Verify serial data pinouts of each end device.
- The fiber optic media converters must always be set to DTE on one side, and DCE on the other.
- Null or straight through cables will need to be appropriately used to connect to the end devices.

If all connections and indicators has been verified please contact the RLH support team for further assistance.

Ordering Information

RS-232 Fiber Link Cards

Each card is identified with a part number.

Optics	Side	Distance	Wavelength	Fiber	Part Number
Dual Fiber Multimode ST	-	2 km/1.2 mi	1310nm	50/62.5 μm	**SE4-04-2**
Single Fiber Single-mode SC	A	20km/12.4mi.	Tx 1310nm Rx 1550nm	8~9 μm	**SE4-10-2**
	B	20km/12.4mi.	Tx 1550nm Rx 1310nm	8~9 μm	**SE4-11-2**
	A	60km / 37mi.	Tx 1310nm Rx 1550nm	8~9 μm	**SE4-14-2**
	B	60km / 37mi.	Tx 1550nm Rx 1310nm	8~9 μm	**SE4-15-2**
Dual Fiber Single-mode SC	-	20km/12.4mi.	1310nm	8~9 μm	**SE4-40-2**
	-	60km / 37mi.	1310nm	8~9 μm	**SE4-41-2**
	-	120km / 74 mi.	1550nm	8~9 μm	**SE4-45-2**
Dual Fiber Single-mode ST	-	20km/12.4mi.	1310nm	8~9 μm	**SE4-50-2**
	-	60km / 37mi.	1310nm	8~9 μm	**SE4-51-2**
	-	120km / 74 mi.	1550nm	8~9 μm	**SE4-55-2**

▶ Bi-directional single fiber models require an **A** Side and **B** Side card for a complete system.

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

DB-9 Serial Cables

Description	Length	Connector Ends	Part Number
Straight Through Cable (DB-9 Serial)	6 Feet	Male / Male	**DB9-S-MM-06FT**
		Male / Female	**DB9-S-MF-06FT**
		Female / Female	**DB9-S-FF-06FT**
Null / Crossover Cable (DB-9 Serial)	6 Feet	Male / Female	**DB9-X-MF-06FT**
		Female / Female	**DB9-X-FF-06FT**
DB-9 Breakout Cable	4 Feet	Male / 3 Female	**DB9-BREAKOUT-MF-04FT**
DB-9 Gender Changer (M/M)	N/A	Male to Male	**DB9-GENDER-MM**

▶ See *DB-9 Serial Cables* section for more information.

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

General Specifications

Transmission method	Frequency modulated light via two optical fibers		
	Multimode	1310nm	
	Single-mode	1310nm/1550nm	
Maximum Fiber Attenuation / Distance*	**Single Fiber**	Single-mode (8~9/125μm):	Up to 37 mi./60km range
	Dual Fiber	Multimode (50/62.5/125μm):	1.25mi./2 km range
		Single-mode (9/125μm):	Up to 74 mi./120km range
	***Note**: Distances equated using industry standard fiber and connector attenuation. Fiber condition, splices and connectors may affect actual range.*		
Connector Type	ST or SC Multimode or Single-mode		
Power Margin	11dB(2Km, M/M), 12dB ~ 35dB (20 ~ 120Km, S/M)		
Protocols	RS-232		
DB-9 Port (Female)	RS-232	DCD, RXD, TXD, DTR, GND, DSR, RTS, CTS, RI	
Signal Isolation	Optical Isolation 3000 Vrms		
Baud Rates	50bps-1Mbit/s Automatic Detection		
DIP Switches	DCE / DTE	Specifies the DB-9 Ports Operational Mode (DCE or DTE)	
LED	POWER	DC Power OK	
	FIBER	Fiber Connection OK	See *Front Panel LED Indicators* section in User Guide for more detailed information.
	TX	RS-232 Copper Transmit	
	RX	RS-232 Copper Receive	
Power Input	24~48VDC		
Power Consumption	150mA @ 24VDC or 3.6 Watt		
DC Input Isolation (In/Out)	1.5KV		
Voltage Reversal Protection	Will operate with V+ or V- in either power terminal		
Over Current Protection	1.0A (Automatic Recovery)		
Temperature	Storage	-40℃ to +85℃ (-40℉ to +185℉)	
	Operating	-40℃ to +70℃ (-40℉ to +158℉)	
Dimensions/Mounting	H 3.93" x W 1.24" x D 6.94"		
	Standard RLH Fiber Link Card Form Factor		
Warranty	Limited Lifetime		

Technical Support

Email:	support@fiberopticlink.com
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	Toll Free 1-855-754-2497

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