CrystalLink USB2.0 Fiber

USB2.0 Fiber Optic Extender

ROSE.COM

Installation
and
Operation Manual

ROSE ELECTRONICS

10707 Stancliff Road
Houston, Texas 77099

Phone: (281) 933-7673
techsupport@rose.com

LIMITED WARRANTY

Rose Electronics® warrants the CrystalLink USB2.0 Fiber Extender to be in good working order for one year from the date of purchase from Rose Electronics or an authorized dealer. Should this product fail to be in good working order at any time during this one-year warranty period, Rose Electronics will, at its option, repair or replace the Unit as set forth below. Repair parts and replacement units will be either reconditioned or new. All replaced parts become the property of Rose Electronics. This limited warranty does not include service to repair damage to the Unit resulting from accident, disaster, abuse, or unauthorized modification of the Unit, including static discharge and power surges.

Limited Warranty service may be obtained by delivering this unit during the one-year warranty period to Rose Electronics or an authorized repair center providing a proof of purchase date. If this Unit is delivered by mail, you agree to insure the Unit or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location, and to use the original shipping container or its equivalent. You must call for a return authorization number first. Under no circumstances will a unit be accepted without a return authorization number. Contact an authorized repair center or Rose Electronics for further information.

ALL EXPRESS AND IMPLIED WARRANTIES FOR THIS PRODUCT INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE, AND NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

IF THIS PRODUCT IS NOT IN GOOD WORKING ORDER AS WARRANTIED ABOVE, YOUR SOLE REMEDY SHALL BE REPLACEMENT OR REPAIR AS PROVIDED ABOVE. IN NO EVENT WILL ROSE ELECTRONICS BE LIABLE TO YOU FOR ANY DAMAGES INCLUDING ANY LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR THE INABILITY TO USE SUCH PRODUCT, EVEN IF ROSE ELECTRONICS OR AN AUTHORIZED DEALER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

DECLARATIONS OF CONFORMITY

This is to certify that, when installed and used according to the instructions in this manual, the units listed and described here are shielded against the generation of radio interferences in accordance with the application of Council Directives 2014/30/EU and 2014/30/EU, as well as these standards:

- EN 55022: 2010/AC:2011 (Class B)
- EN 55024:2010 + A1:2015
- EN 61000

This equipment has been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

The product safety of the devices is proven by their compliance with the following standards:

- CAN/CSA-ICES-003 Class B

The manufacturer complies with the EU Directive 2012/19/EU on the prevention of waste electrical and electronic equipment (WEEE). The device labels carry a respective marking.

These devices comply with Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2, RoHS II). The device labels carry a respective marking.

TABLE OF CONTENTS

Contents

Figures

Tables

Appendices

INTRODUCTION

Disclaimer

While every precaution has been taken in the preparation of this manual, the manufacturer assumes no responsibility for errors or omissions. Neither does the manufacturer assume any liability for damages resulting from the use of the information contained herein. The manufacturer reserves the right to change the specifications, functions, circuitry of the product, and manual content at any time without notice.

The manufacturer cannot accept liability for damages due to misuse of the product or other circumstances outside the manufacturer's control. The manufacturer will not be responsible for any loss, damage, or injury arising directly or indirectly from the use of this product (See limited warranty).

System Introduction

Thank you for choosing the Rose Electronics CrystalLink USB2.0 fiber extender.
The CrystalLink USB2.0 fiber has proven to be a valuable investment for any business, big or small, that has a need to access and extend their USB1.1 or 2.0 peripherals up to 6.2 miles (10Km) from a remote location.
The receiver unit's USB ports connect to your USB peripherals. The number of peripherals can be increased by using a standard USB hub.
The USB peripherals can be USB1.1 devices (low-speed or full-speed) or USB2.0 high-speed devices operating up to 480 Mb/s. The receiver unit can supply up to 1 Amp per USB port for driving high-power USB devices.
Plug-and-play installation makes the product simple and easy to use. Connect the transmitter to the computers USB port, connect the USB ports on the receiver to your USB devices, connect the transmitter to the receiver with up to 6.2 miles of industry standard fiber cable and power on the system.

Note:
All references to fiber optic cable distances in this user manual are as follows;
Multimode fiber: Up to 1,640ft (500m) over multimode OM2 fiber or up to 902ft (275m) over OM1 multimode fiber
Singlemode fiber: Up to 10km (6.2 miles) over singlemode fiber

The instructions in this manual assume a general knowledge of computer installation procedures, familiarity with cabling requirements, and some understanding of USB device operation.

Features

- Supports transparent extension of USB 2.0 (high-speed) and USB 1.1 (low and full speed) devices
- Extends USB devices up to 6.2 miles (10Km) over fiber cable
- Four-port integrated USB2.0 hub on the receiver unit
- Standard USB hubs can be used to increase the number of connected devices up to 30.
- USB3.0 devices will work at USB2.0 speeds through the extender
- Up to 1 Amp of power is available at each USB port for high-powered USB devices
- Electrical isolation for data integrity
- Plug-and-Play installation, no configuration or set-up needed
- Operating system independent and supports all major operating systems

Package Contents

The package contents consist of the following:

- Transmitter unit
- Receiver unit
- USB2.0 cable
- 24V DC Power Adapter (1) and AC power cable (1)
- Manual

Additional Items Required

- USB compatible computer (host computer) with a USB compliant operating system
- USB compatible device(s) for remote-end connection
- Fiber optic cabling
- Two strands of multimode or singlemode fiber are required to support the extender connection. The cabling must provide a duplex connection with crossover and must be terminated with Duplex LC connectors at both ends.

Application Examples

The CrystalLink USB2.0 fiber extender is ideal for use with any USB2.0 device in an office, computer room or industrial environment where USB devices need to be connected remotely from a host PC.

- Industrial control
- Interactive whiteboard
- Medical applications
- USB extension in hazardous operating environments
- Sensor or data acquisition
- Extension of multiple USB devices including hard drivers, printer, scanner, camera control, touchscreens

Figure 1. CrystalLink USB2.0 fiber extender – front and back panels

CrystalLink USB2.0 Fiber Models

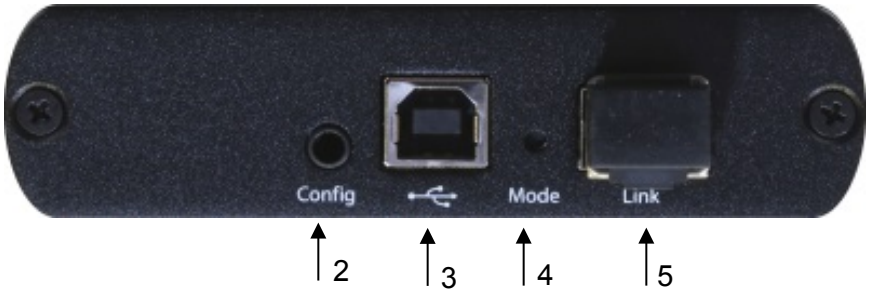
The CrystalLink USB2.0 fiber enables users to extend beyond the standard 15ft (5.0 meter) cable limit for USB peripherals by locating high-speed USB device(s) up to 6.2 miles (10Km) from the computer.

Transmitter Unit

The transmitter connects to the host device using the supplied USB cable. Power for the transmitter is provided by the host computer. Power and status LED's are conveniently located on the front panel for user reference.

Transmitter unit – front panel view

Transmitter unit – rear panel view



Item	Type	Description
1	Power LED (Blue)	LED turns on when power is supplied. LED is off when no power is supplied by the host computer.
	Link LED (Green)	Indicates a valid USB link is established between the local and remote extenders. LED turns on when link between local and remote extender is established. LED is off when there is no link between local and remote extenders. LED is slow blinking when the unit is attempting to establish a link
	Host LED (Green)	LED turns on when the extender system is properly enumerated on the host computer. LED blinks when in a suspended state.
	Activity LED (Amber)	Indicates data transmission is occurring between local and remote extenders. LED blinks intermittently with or without a USB device connected. When the local and remote extenders are in suspend mode, the LED is off.

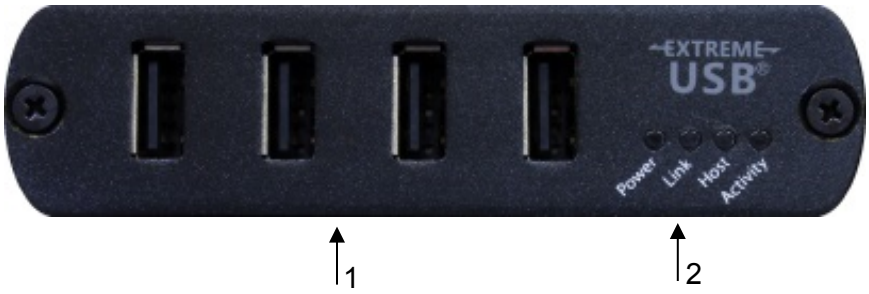
2	Config	Reserved for engineering use
3	USB Host Port	Used to connect the local extender unit to the host computer. Accepts Type B connector into the local extender unit.
4	Mode	Reserved for engineering use
5	Link Port (Duplex LC)	Extension link Duplex LC fiber connection

Figure 2. Transmitter unit – LED's and connectors

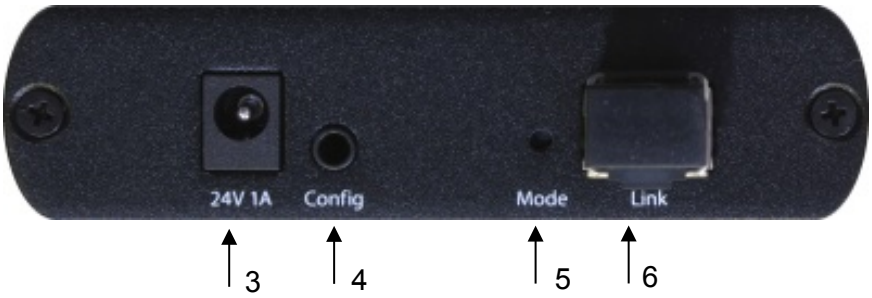
Receiver Unit

The receiver has four USB Type-A ports for connecting up to four USB devices. Additional devices may be connected by attaching a USB hub to the receiver unit. The receiver is powered directly by the included 24V power supply, delivering 600mA of current per USB port.

Receiver unit – front panel view



Receiver unit – rear panel view



Item	Type	Description
1	USB Device Ports	Accepts USB device(s) using Type A connectors
2	Power LED (Blue)	LED turns on when power is supplied, off when no power is supplied.
	Link LED (Green)	Indicates a valid USB link is established between the local and remote extenders. LED turns on when link between local and remote extenders is established. LED is off when there is no link between local and remote extenders.
	Host LED (Green)	Indicates that the RG2304 system is properly enumerated on the host computer. The LED blinks when in a suspended state.
	Activity LED (Amber)	Indicates data transmission is occurring between local and remote extenders. LED blinks intermittently with or without a USB device connected. When the local and remote extenders are in suspend mode, the LED is off.

3	DC Power Port	Connects to the AC power supply. Required at the remote extender for proper operation.
4	Config	Reserved for manufacturer use.
5	Mode	Reserved for manufacturer use.
6	Link Port (Duplex LC)	Extension link Duplex LC fiber connection

Figure 3. Receiver unit – LED's and connectors

Installation Procedure

Before beginning an installation, ensure you have all products and components ready for the installation

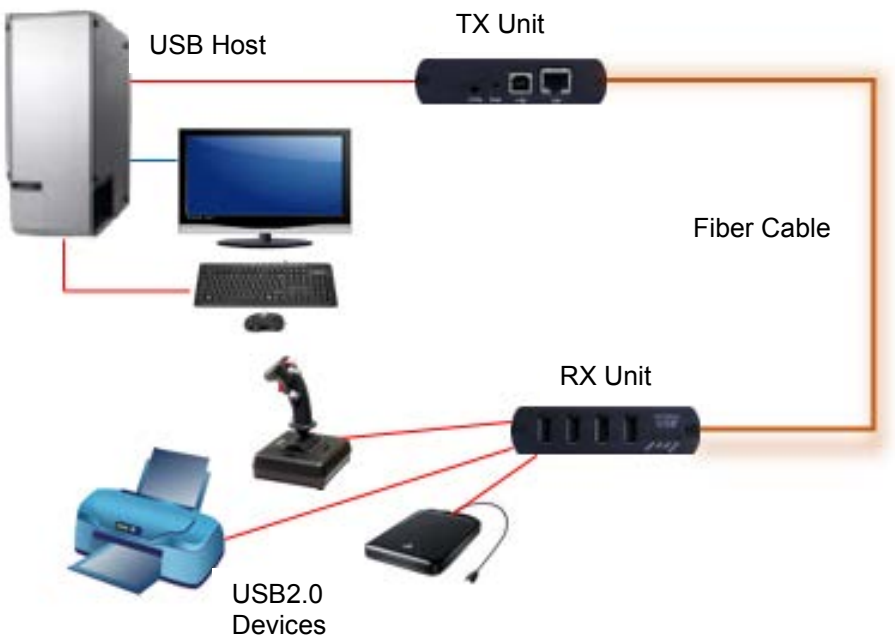


Figure 4. CrystalLink USB2.0 fiber extender – standard installation

- Determine where the computer is to be located and set up the computer.
- Determine where you want to locate the remote USB device(s).
- Remember the product supports a maximum distance of 6.2 miles (10Km) for transparent USB devices. If using patch (stranded) cables or premise wiring, the achievable extension distance may be less.
- Avoid potential sources of interference such as electrical wiring, fluorescent lighting and radio communications equipment.

Ensure that the fiber cable is terminated with Duplex LC type matching connectors. Two strands of multimode fiber cabling are required for the multimode extender up to 1,640ft (500m) using 50/125µm or up to 902ft (275m) using 62.5/125µm fiber optic cable.

Installation Using Premise Wiring

If you are using premise cabling, ensure fiber cabling is installed between the two locations, with fiber premise outlets located near both the computer and the USB devices.

Installing the Transmitter Unit

- Place the transmitter unit near the computer.
- Install the supplied USB cable between the transmitter and USB port on the host computer.

Installing the Receiver Unit

Place the receiver unit near the USB device(s) in the desired remote location.

Connecting the Transmitter to Receiver

To ensure optimum operation, it is recommended to use Duplex LC fiber cabling to connect the transmitter and receiver units.

Connection Using Surface Cabling

- Plug one end of the fiber cabling (not included) into the Link port on the transmitter unit.
- Plug the other end of the fiber cabling into the Link port on the receiver unit.

Connection Using Premise Cabling

- Plug one end of a fiber patch cord (not included) into the Link port on the transmitter unit.
- Plug the other end of the patch cord into the fiber information outlet near the host computer.
- Plug one end of the second fiber patch cord (not included) into the Link port on the receiver unit.
- Plug the other end of the second patch cord into the fiber information outlet near the USB device.

Connecting a USB Device

- Install any software required to operate the USB device(s). Refer to the documentation for the USB device(s), as required.
- Connect the USB device to the device port on the remote extender.
- Check that the device is detected and installed properly in the operating system.

Checking the Installation

Check that the Power, Link, Host, and Activity LEDs are on at each end. If the Host or Link LEDs are permanently off, then the cabling between the local and remote extenders may not be installed properly or is defective.

For Windows users (XP, 7, 8, 10), open the Device Manager to confirm that the CrystalLink Extender has installed correctly. Expand the entry for Universal Serial Bus controllers. If the CrystalLink Extender has been installed correctly, you should find it listed as a “Generic USB Hub”.

For Mac OS X users, open the System Profiler (*open the Finder, select Applications, open the Utilities folder and select System Profiler)* to confirm that the CrystalLink Extender has installed correctly. In the left-hand column under Hardware, select “USB” and inspect the right-hand panel. If the CrystalLink Extender has been installed correctly, you should find it listed as a “Hub” under the USB High-Speed Bus/USB Bus.

Compatibility

The CrystalLink USB2.0 fiber extender complies with USB 1.1 and USB 2.0 specifications governing the design of USB devices. However, it is not possible to guarantee that all USB devices or hosts will be compatible as there are a number of different characteristics that may impact the operation of USB devices over extended distances.

Transmitter and Receiver Mounting Options

The bottom of the chassis includes four pre-drilled holes for optional mounting. Based on your requirements, choose from two available mounting options:

- USB Extender Mounting Kit (Purchased separately - USB Mounting Kit - Black)
- USB Extender Direct Surface Mounting (Using your own rack-shelf or tray)

Option 1: CrystalLink USB2.0 Fiber Extender Mounting Bracket Kit

Contents:

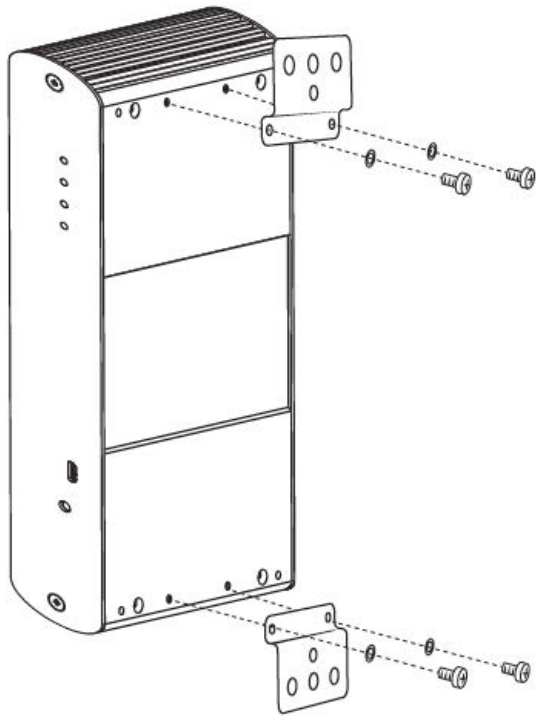
2 mounting brackets
4 (M3.0) locking washers
4 (M3.0 x 5mm) Phillips screws
Mounting bracket installation guide *(see diagram below)*

1 kit required to mount per transmitter chassis or receiver chassis
Using a Phillips screwdriver, fasten and secure the provided screws, locking washers and brackets into place.

Option 2: CrystalLink USB2.0 Fiber Extender Mounting Plate

(using your own rack-shelf or rack-tray) The bottom of the enclosure features four pre-drilled holes for optional surface mounting.
Note: Do not exceed a screw depth of 0.4" (10mm) into the chassis or damage may occur

CrystalLink USB2.0 Mounting Bracket Illustration



CrystalLink USB2.0 Mounting Plate Holes

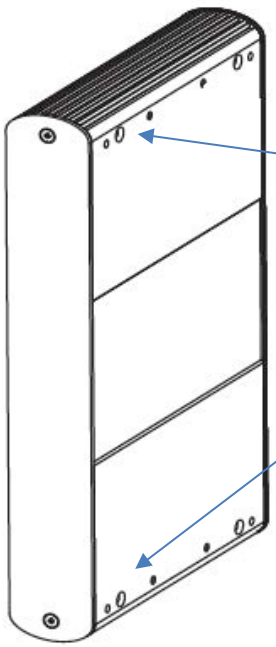


Figure 5. Chassis mounting options

Troubleshooting Guide

The following table provides troubleshooting tips. The topics are arranged in the order in which they should be executed in most situations. If you are unable to resolve the problem after following these instructions, please contact Technical Support for further assistance.

Problem	Cause	Solution
ALL LEDs are OFF on the transmitter.	▪ The transmitter is not receiving power from the USB port.	▪ Ensure that the host computer is connected to the transmitter. ▪ Move the USB connector to another USB port on the host computer.
ALL LEDs are OFF on the receiver.	▪ The transmitter is not receiving power from the AC adapter.	▪ Ensure that the host computer is connected to the AC adapter. ▪ Check the AC adapter is connected to a live source of electrical power. Check that the POWER LED on the receiver is illuminated.
LINK LEDs on the transmitter and receiver are OFF.	▪ There is no connection between the transmitter and receiver.	▪ Ensure that fiber cabling is connected between the transmitter and receiver. ▪ Connect a short fiber patch cable between the transmitter and receiver. Recheck the link status. If the LINK LED is now SOLID ON, the previous cable is defective or not capable of supporting the link.
LINK LED on the transmitter is ON, HOST LED on the transmitter is OFF.	▪ The host computer is not powered on. ▪ The transmitter is not connected to a computer. ▪ The host computer does not support USB Hubs. ▪ The unit is malfunctioning.	▪ Disconnect all USB devices from the receiver. ▪ Disconnect transmitter from the host computer. ▪ Disconnect AC adapter from the receiver. ▪ Reconnect the transmitter to the host computer. ▪ Reconnect the AC adapter to the receiver. ▪ Check that the extender has enumerated as a USB hub in Windows Device Manager, MacOS System Profiler or using "Isusb" command in a Linux Terminal. ▪ If the problem is not resolved, contact Technical Support.
Both extenders were working, but then the Host LED on remote extender unit is suddenly blinking.	• The remote extender is in suspend mode. The operating system may put the extender in suspend mode when the computer is put into a suspend/standby state or when no USB device(s) are attached.	• Recover/resume the operating system from suspend/standby mode (see your operating system's documentation). • Attach a new USB device to the extender.

Problem	Cause	Solution
All LEDs on both the local and remote extenders are on, but the USB device does not operate correctly, or is detected as an "Unknown Device" in the operating system.	• The USB device is malfunctioning. • The computer does not recognize the USB device. • The application software for the device is not operating. • The extender is malfunctioning.	• Disconnect the extender from the computer. • Connect the USB device directly to the USB port on the computer. • If the device does not operate properly, consult the user documentation for the device. • Update your system BIOS, chipset or USB Host controller drivers from your System/Mother board manufacturer's website. • If the device operates properly when directly connected to the computer, connect another device (of a different type) to the extender. • Connect the extender to the computer. • If the second device does not operate, the extender system may be malfunctioning. • Contact technical support for assistance. • If the second device does operate properly, the first device may not be compatible with the extender.
USB device is attached to remote extender's USB port, but remote extender device LED is off.	A USB device must have the appropriate driver installed on the computer operating system.	• Install the required USB device driver on the computer operating system prior to attaching the USB device to the remote extender. Please see your USB device manufacturer's website for details. • Consult your USB device documentation and power your USB device with the additional, USB device manufacturer supplied, power supply (if available).
Device LED is orange and units are no longer functioning.	Overcurrent condition has occurred because USB device draws more power than can be supplied per USB specification (1 Amp).	• Power cycle remote extender.
LED Host and LINK LEDs on local and remote extenders blink intermittently.	Firmware mismatch between the local and remote extenders.	• Use a different local and remote extender pair which have the same firmware revision. • Upgrade the local and remote extender firmware, contact technical support for assistance.

Table 1. Troubleshooting procedures

PRODUCT SAFETY

Safety

The CrystalLink USB2.0 fiber extender, like all electronic equipment, should be used with care. To protect yourself from possible injury and to minimize the risk of damage to the Unit, read and follow these safety instructions.

- Follow all instructions and warnings marked on this Unit.
- Except where explained in this manual, do not attempt to service this Unit yourself.
- Do not use this Unit near water.
- Assure that the placement of this Unit is on a stable surface.
- Provide proper ventilation and air circulation.
- Keep connection cables clear of obstructions that might cause damage to them.
- Use only power cords, power adapter and connection cables designed for this Unit.
- Keep objects that might damage this Unit and liquids that may spill, clear from this Unit. Liquids and foreign objects might come in contact with voltage points that could create a risk of fire or electrical shock.
- Do not use liquid or aerosol cleaners to clean this Unit. Always unplug this Unit from the power source before cleaning.

Remove power from the unit and refer servicing to a qualified service center if any of the following conditions occur:

- The connection cables are damaged or frayed.
- The Unit has been exposed to any liquids.
- The Unit does not operate normally when all operating instructions have been followed.
- The Unit has been dropped or the case has been damaged.
- The Unit exhibits a distinct change in performance, indicating a need for service.

SERVICE AND MAINTENANCE

Maintenance and Repair

This Unit does not contain any internal user-serviceable parts. In the event a Unit needs repair or maintenance, you must first obtain a Return Authorization (RA) number from Rose Electronics or an authorized repair center. This Return Authorization number must appear on the outside of the shipping container.

See Limited Warranty for more information.

When returning a Unit, it should be double-packed in the original container or equivalent, insured and shipped to:

Rose Electronics

Attn: RA _____

10707 Stancliff Road

Houston, Texas 77099 USA

Technical Support

If you are experiencing problems, or need assistance installing your product consult the appropriate section of this manual. If, however, you require additional information or assistance, please contact the Rose Electronics Technical Support Department at:

Phone: (281) 933-7673

E-mail: TechSupport@rose.com

Web: www.rose.com

Technical Support hours are from: 8:00 am to 6:00 pm CST (USA), Monday through Friday.

Please report any malfunctions in the operation of this Unit or any discrepancies in this manual to the Rose Electronics Technical Support Department.

Appendix A — Specifications

Part Number	Description
CLK-4U2FMB-500M	USB 2.0 Multimode Fiber Extender. 4 USB ports. Transmitter & Receiver Kit
CLK-4U2FSB-10KM	USB 2.0 Singlemode Fiber Extender. 4 USB ports. Transmitter & Receiver Kit
CAB-USBAB006	USB-AB cable, 6ft (2.0m)
CAB-USBAB010	USB-AB cable, 6ft (3.0m)

Chassis Dimensions (W x D x H)		
Transmitter and Receiver chassis	3.9” x 3.0” x 1.0” (100 x 76 x 26 mm)	
Power Requirements		
Power source	Transmitter: Powered via USB cable from host computer Receiver: 100-240VAC, AC input, 24V 1A DC output	
Maximum current for USB devices	Receiver: Up to 1 Amp output per USB port. 2.5 Amps total shared	
Interconnect Cable Requirements		
Fiber Duplex LC	1 x SFP Duplex LC connector at each end	
Cable Distances		
Fiber cable	Up to 1,640ft (500m) over OM2+ 50/125µm multimode fiber Up to 902ft (275m) over OM1 62.5/125µm multimode fiber Up to 10KM (6.2 miles) over singlemode fiber Use of patch cable may reduce the operating distance	
USB Support		
USB Device Support	High-speed devices (USB 2.0) at 480Mbps, backwards compatible Full-speed devices (USB 1.1), 12Mbps, backwards compatible	
USB Hub Support	Up to 30 USB devices connected using powered USB hubs. The extension distance may be reduced with each hub added to the system.	
USB Host Support	EHCI (USB 2.0) and OHCI/UHCI (USB 1.1)	
Connectors and LED’s		
	Transmitter unit	Receiver unit
USB connector	1 x USB2.0 Type B	4 x USB2.0 Type A female
Link cable connector	1 x Duplex LC Link	1 x Duplex LC Link
LED’s	Power, Link, Host, Activity	Power, Link, Host, Activity
	Nil	1 x 24VDC power jack
Environmental		
Operating Temp	32°F to 122°F (0°C to 50°C)	
Storage Temp	-4°F to 158°F (-20°C to 70°C)	
Operating Humidity	20% to 80% relative, non-condensing	
Storage Humidity	10% to 90% relative, non-condensing	
Approvals	FCC Part 15 Class B, CE Class B, ICES-003, EMC EN55022, EN55024, and EN61000, RoHS2 (CE), WEEE	

Appendix B — Fiber Cable Termination

Duplex LC

When a crossover fiber-optic cable is called for, the cable has the transmit signal on one end connected to the receive signal at the other end.

Figure 6. Fiber cable termination (Duplex LC)

ROSE.COM

WWW.ROSE.COM ▪ sales@rose.com ▪ (800) 333-9343

Rose Electronics ▪ 10707 Stancliff Road ▪ Houston, Texas 77099
Rose USA (281) 933-7673 ▪ Rose Europe +49 (0) 2454 969442
Rose Asia +65 6324 2322 ▪ Rose Australia +61 (0) 421 247083

ROSE ELECTRONICS

WWW.ROSE.COM