



Installation Guide for GigaBit Media Converters



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No licenses, express or implied, are granted with respect to any of the technology described in this manual. Net Optics retains all intellectual property rights associated with the technology described in this manual. This manual is intended to assist application in installing Net Optics products into your network.

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Additional Information

Net Optics, Inc. reserves the right to make changes in specifications and other information contained in this document without prior notice. Every effort has been made to ensure that the information in this document is accurate.

Introduction

Thank you for purchasing the most versatile media converter available today. Net Optics GigaBit Media Converters enable conversion between GigaBit Fiber signals.

Key Features

Technology

- Net Optics GigaBit Media Converters support transparent conversion of optical signals for data rates at 1000 Mbps.
- Includes automatic Link Fault Signaling. Link Fault Signaling alerts each host (router, switch, server) attached to a Net Optics GigaBit Media Converter, if any of the intermediate links that separate them have failed. If one link fails, or is not connected, the converter automatically disables the forward link to the next device, until the unit is connected or the link is repaired.
- Includes Clock and Data Recovery (CDR) capability for superior performance. This ensures that the overall jitter budget is not exceeded when deploying pairs of converters.
- Fully RoHS compliant

Ease of Use

- All network connections are front-mounted for easy installation and operation. Only the power connectors are side-mounted.
- Multiple LED indicators confirm link status.
- Compatible with all major manufacturer's network equipment.

Support

- Throughout the lifetime of your purchase, Net Optics offers free technical support (and has done so since our start in 1996!) Our technical support team is available from 8 am to 5 pm Pacific Time, Monday through Friday at +1 (408) 737-7777 and via email at ts-support@netoptics.com. FAQs are also available on Net Optics website at www.netoptics.com.

About this Guide

This guide covers the installation and use of the following models:

Part Number	Description
FMC-LX/SX-R	GigaBit Fiber Mode Converter, Rack-mount
FMC-LX/SX	GigaBit Fiber Mode Converter, Stand-alone

Product Diagrams

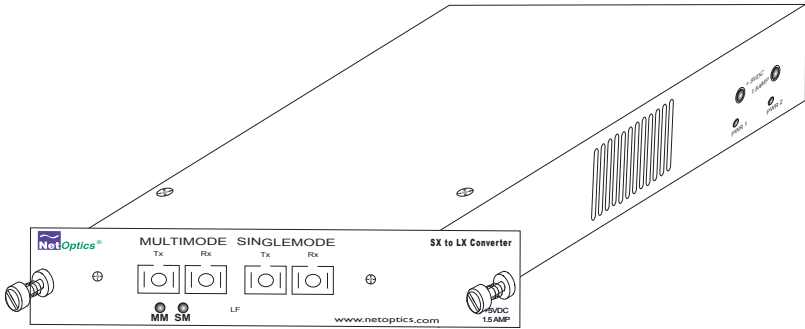


Figure 1. Rack mount model

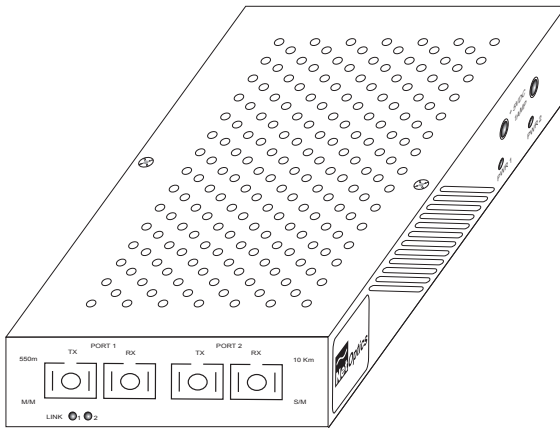


Figure 2. Stand alone model

Connecting to the Network

1. Unpack the GigaBit Media Converter, verify that you have all components, and obtain the required cables needed to successfully install the unit.
2. Multimode Ports: Using a duplex multimode cable, connect the appropriate switch, server, or router to the GigaBit Media Converter's Multimode Port.
3. Singlemode Ports: Using a duplex singlemode cable, connect the appropriate switch, server, or router to the GigaBit Media Converter's Singlemode Port.
4. Supply power to the GigaBit Media Converter using the power supply included with the unit.
5. Compare the LEDs on the Media Converter to the chart below to verify correct setup.
 - **PWR:** Power.
Power LED (in side of unit) illuminates green when device is powered on.
 - **MM:** Multimode Fiber Link.
This LED illuminates green when a good fiber optic link is established.
 - **SM:** Singlemode Fiber Link.
This LED illuminates green when a good fiber optic link is established
 - **LF:** Link Fault.
This LED illuminates yellow when a link fault is present.

Note:

The use of singlemode or multimode cabling is determined by the GigaBit Media Converter model. The 1000BaseSX multimode ports or 1000BaseLX singlemode ports must be connected via 50/125 μ m, 62.5/125 μ m, or 100/140 μ m fiber.

Connecting to the Network

When installing the GigaBit Media Converter, care must be taken in choosing the appropriate cabling to avoid Differential Mode Delay (DMD) effects. DMD is caused by singlemode, (1310 nanometer) laser point sources launching into multimode cable. Optical power is concentrated in the center of the fiber core, propagating in less than 5% of possible modal paths. This can result in reduced bandwidth and/or the appearance of individual data pulses, refracting into multiple, overlapping, light pulses at the receiver end, causing CRC errors.

The connection requires a Mode Conditioning patch cable to provide the **Conditioned Launch** necessary to prevent (DMD) effects. Mode Conditioning patch cables are not used with short wave length (850 nanometer) lasers. Note that fiber cable is typically certified for a particular bandwidth using light emitting diodes (LEDs) that provide the “Overfilled Launch” condition i.e. illuminate all possible modes and fibers.

For additional details see the [Restricted Launch Specification](#) defined by the Telecommunications Industry Association. The TIA FO-2.2.1 Committee has released two standards: (1) FOTP-203: Launched Power Distribution Measurement Procedure for Graded-Index Multimode Fiber Transmitters, and (2) FOTP-204: Measurement of Bandwidth on Multimode Fiber.

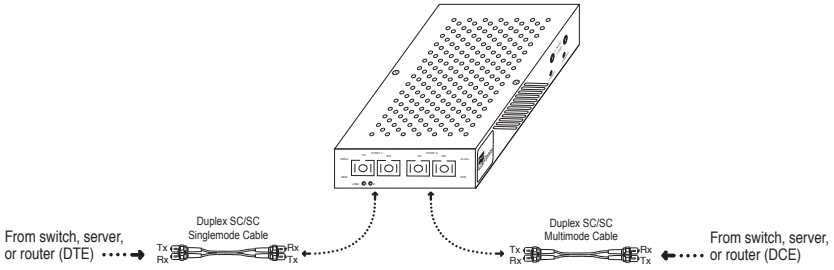


Figure 3. Connecting to the Network

Configuration Guidelines for Link Fault Signaling (LFS) Operation

Link Fault Signaling (LFS) circuitry provides visual indication of link condition on both segments, as well as alerting each end host device when a remote link (segment) is down. If either segment experiences a link failure, the good segment port LED will remain lit. BUT, the Link idle signal going to the next, remaining device on the GOOD segment, is instantly disabled, turning off its Link LED. The converter detects the loss of link on one segment and turns off the link signal to the next segment, even though the second segment is intact.

The missing link signal alerts the end device(s) that a fault has occurred. Either end can then establish an alternate connection path, using Spanning Tree protocol. Once the original fault is corrected, all segment links are re-established and the Link LEDs function in the normal manner.

All connections between the converter and end devices must be made before a good end-to-end link can be established. A normal good link on both segments will be indicated by both link LEDs lit.

At least one end device must provide a link signal to initiate a link across all segments. If one link segment is broken, the associated link LED will no longer be lit. The good (unbroken) segment's link LED will remain lit and the Link Idle signal to the next segment will turn off.

When the converter loses a link signal from either of the two devices attached to it, the converter turns off (ceases to forward) the port link signal to the NEXT segment (device). When the fault is corrected, all links will be automatically re-established.

Safety Notes on Laser Singlemode and Multimode-type Connectors

The FMC-LX/SX uses one 850nm laser (Multimode Port) and one 1310 nm laser (Singlemode Port) connector.

Observe caution when deploying equipment using laser optics. **Non**-eye safe laser devices may be inadvertently connected to cabling that is intended to be attached to eye-safe 850nm or 1310 nm laser driven equipment. This poses a risk for eye and equipment damage. All fiber optic cables (connectors) that are or may be connected to a laser source should be clearly labeled and **assumed** to be connected to non-eye safe laser optics.

Note:

*Do not connect **non**-eye safe laser devices to eye-safe class equipment. **Non**-eye safe laser driven devices, besides damaging eye sight, can permanently damage eye-safe (low-power laser) rated equipment. Such damage will **not** be covered by warranty. Net Optics, Inc. disclaims all liability for damages arising from mis-use or incorrect installation of laser driven equipment.*

CAUTION: NEVER ATTEMPT TO VERIFY ANY FIBER OPTIC CONNECTION BY LOOKING DIRECTLY INTO A FIBER-OPTIC PORT OR CABLE. IF THE LIGHT SOURCE IS A NON-EYE SAFE, LASER EMITTER, PERMANENT EYE DAMAGE MAY RESULT.

NEVER LOOK INTO THE BORE OF A FIBER OPTIC CONNECTOR!

GigaBit Ethernet Connection Distances

1000BASE-SX (850 nm laser)

Fiber Core Diameter	Type	Fiber Bandwidth Mhz/km	Distance
62.5 μm	Multimode	160 Mhz/km	2 to 220 m
62.5 μm	Multimode	200 Mhz/km	2 to 275 m
50.0 μm	Multimode	400 Mhz/km	2 to 500 m
50.0 μm	Multimode	500 Mhz/km	2 to 550 m

1000BASE-LX (1310 nm laser)

Fiber Core Diameter	Type	Fiber Bandwidth Mhz/km	Distance
8.5 μm	Singlemode	n/a	up to 10 Km

1000BASE-ZX (1550 nm laser)

Fiber Core Diameter	Type	Fiber Bandwidth Mhz/km	Distance
8.5 μm	Singlemode	n/a	up to 70 Km

Specifications

Environmental

Operating Temperature: 0°C to 55°C

Storage Temperature: -10°C to 70°C

Relative Humidity: 10% min, 95% max, non-condensing

Power Supply

Input: 100-240 VAC, 0.6A, 50-60 Hz

(AC100-125V~30VA, 50-60 Hz, for Japan)

Output: 5V, 2A (5V, 2.4A for UK and Japan)

Mechanical

Dimensions: 1.0" high x 5.3" deep x 2.0" wide

Connectors

(2) Duplex SC connectors

Optical Interface

Transceiver: Class I, eye-safe, laser emitter type. These Class I Lasers conform to the applicable requirements per US 21 CFR (J) and EN 60825-1, also UL 1950 applications.

Multimode:

Fiber Type: Multimode Corning 62.5 μ m, wavelength 850nm

Optical Transmitter Wave Length: 850 nm nominal

Output Power: -9.5 dB min, -4.0 dB max

Optical Receiver Input Sensitivity: 0.0 dB min, -18.5 dB typical, -17.0 dB max

Singlemode:

Fiber Type: Singlemode Corning 8.5 μ m, wavelength 1310/1550 nm

Optical Transmitter Wave Length: 1310 nm nominal

Output Power: -10.0 dB min, -3.0 dB max

Optical Receiver Input Sensitivity: -3.0 dB min, -20.0 dB max

Specifications

Certifications

- Gigabit Ethernet series converters comply with all applicable IEEE 802.3u specifications. Net Optics' converters are designed to comply with all the following safety, emissions and susceptibility specifications: UL 1950, CSA-C22.2 No. 950-93, CE Mark EN60950 and EN55022, and FCC Class A.
- Fully RoHS compliant

Limitations on Warranty and Liability

Net Optics offers a limited warranty for all its products. IN NO EVENT SHALL NET OPTICS, INC. BE LIABLE FOR ANY DAMAGES INCURRED BY THE USE OF THE PRODUCTS (INCLUDING BOTH HARDWARE AND SOFTWARE) DESCRIBED IN THIS MANUAL, OR BY ANY DEFECT OR INACCURACY IN THIS MANUAL ITSELF. THIS INCLUDES BUT IS NOT LIMITED TO LOST PROFITS, LOST SAVINGS, AND ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OR INABILITY TO USE THIS PRODUCT, even if Net Optics has been advised of the possibility of such damages. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Net Optics, Inc. warrants this GigaBit Media Converter to be in good working order for a period of ONE YEAR from the date of purchase from Net Optics or an authorized Net Optics reseller.

Should the unit fail anytime during the said ONE YEAR period, Net Optics will, at its discretion, repair or replace the product. This warranty is limited to defects in workmanship and materials and does not cover damage from accident, disaster, misuse, abuse or unauthorized modifications.

If you have a problem and require service, please call the number listed at the end of this section and speak with our technical service personnel. They may provide you with an RMA number, which must accompany any returned product. Return the product in its original shipping container (or equivalent) insured and with proof of purchase.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, EXPRESS OR IMPLIED. No Net Optics reseller, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Net Optics is always open to any comments or suggestions you may have about its products and/or this manual.

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