BLACK BOX®

AUGUST 2009

LGC5940C-R2
LGC5941C-R2
LGC5942C-R2
LGC5943C-R2
LGC5950C-R2
LGC5951C-R2
LGC5952C-R2
LGC5953C-R2

10/100/1000 L2 Gigabit SNMP-Manageable Switching Media Converter

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1000 Park Drive • Lawrence, PA 15055-1018 • 877-877-2269 • Fax 724-746-0746

CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S.: **877-877-BBOX** (outside U.S. call **724-746-5500**)
FREE technical support, 24 hours a day, 7 days a week: Call **877-877-2269** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

FCC and Industry Canada RF Interference Statements

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an experienced radio/TV technician for help.

CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

This digital apparatus does not exceed the Class B limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Safety Certifications

CE

Class 1 Laser product, Luokan 1 Laserlaite, Laser Klasse 1, Appareil A'Laser de Classe 1

European Directive 2002/96/EC (WEEE) requires that any equipment that bears this symbol on product or packaging must not be disposed of with unsorted municipal waste. This symbol indicates that the equipment should be disposed of separately from regular household waste. It is the consumer's responsibility to dispose of this and all equipment so marked through designated collection facilities appointed by government or local authorities. Following these steps through proper disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about proper disposal, please contact local authorities, waste disposal services, or the point of purchase for this equipment.

Black Box Customer Service

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Table of Contents

FCC and Industry Canada RF Interference Statements ii
About the L2 10/100/1000 Modules 1
LED Operation 2
Installing the L2 10/100/1000 Modules 3
Configuring the L2 10/100/1000 Modules 3
Auto Negotiation (TX and FX) 5
Link Fault Pass Through (LFPT) 8
Troubleshooting 9
Specifications 9
Fiber Optic Cleaning Guidelines 10
Electrostatic Discharge Precautions 10
Black Box Customer Service 11

About the L2 10/100/1000 Modules

The L2 10/100/1000 module is an SNMP-manageable, IEEE 802.3 10/100/1000 switching media converter that converts both speed and media.

The L2 10/100/1000 module provides a single conversion between one of the following:

- 10Base-T twisted pair and 1000Base-SX/LX multi-mode or single-mode fiber
- 100Base-TX twisted pair and 1000Base-SX/LX multi-mode or single-mode fiber
- 1000Base-T twisted pair and 1000Base-SX/LX multi-mode or single-mode fiber

Part Number	Description
LGC5940C-R2	L2 10/100/1000, TX/SSLX-SM1310-SC
LGC5941C-R2	L2 10/100/1000, TX/SSLX-SM1550-SC
LGC5942C-R2	L2 10/100/1000, TX/SSLX-SM1310/PLUS-SC
LGC5943C-R2	L2 10/100/1000, TX/SSLX-SM1550/PLUS-SC
LGC5950C-R2	L2 10/100/1000, TX/SX-MM850-SC
LGB5951C-R2	L2 10/100/1000, TX/LX SM1310
LGC5952C-R2	L2 10/100/1000, TX/LX SM1310/PLUS
LGC5953C-R2	L2 10/100/1000, TX/LX SM1310/LONG

Fiber Optic Cleaning Guidelines

Fiber Optic transmitters and receivers are extremely susceptible to contamination by particles of dirt or dust, which can obstruct the optic path and cause performance degradation. Good system performance requires clean optics and connector ferrules.

1. Use fiber patch cords (or connectors, if you terminate your own fiber) only from a reputable supplier; low-quality components can cause many hard-to-diagnose problems in an installation.
2. Dust caps are installed at Black Box to ensure factory-clean optical devices. These protective caps should not be removed until the moment of connecting the fiber cable to the device. Should it be necessary to disconnect the fiber device, reinstall the protective dust caps.
3. Store spare caps in a dust-free environment such as a sealed plastic bag or box so that when reinstalled they do not introduce any contamination to the optics.
4. If you suspect that the optics have been contaminated, alternate between blasting with clean, dry, compressed air and flushing with methanol to remove particles of dirt.

Electrostatic Discharge Precautions

Electrostatic discharge (ESD) can cause damage to any product, add-in modules or stand alone units, containing electronic components. Always observe the following precautions when installing or handling these kinds of products

1. Do not remove unit from its protective packaging until ready to install.
2. Wear an ESD wrist grounding strap before handling any module or component. If the wrist strap is not available, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.
3. Hold the units by the edges; do not touch the electronic components or gold connectors.
4. After removal, always place the boards on a grounded, static-free surface, ESD pad or in a proper ESD bag. Do not slide the modules or stand alone units over any surface.

WARNING! Integrated circuits and fiber optic components are extremely susceptible to electrostatic discharge damage. Do not handle these components directly unless you are a qualified service technician and use tools and techniques that conform to accepted industry practices.

If a Fault occurs, then the troubleshooting LED will blink, to indicate in what direction the fault occurred. For example, with TXLL and FXLL enabled on each media converter, if the fiber segment breaks, the FXLL LED will blink.

Troubleshooting

- During installation, test the fiber and twisted pair connections with all troubleshooting features disabled. Once the physical connections have been established, the troubleshooting features of LinkLoss and FiberAlert can be enabled by using the DIP Switches or configuring them using the iView² software. However, it is important to remember that software will override hardware settings.
- Although a specific link segment, either the copper or the fiber, can be established, if the LNK LEDS do not reflect a state of active power, it is best to connect both segments.
- If a SM fiber transceiver is deployed for a short distance application, saturation may occur, contributing to loss of data or link. In such a case, add an optical attenuator to the fiber connection.

Specifications

Operating Temperature
32° - 104° F (0° - 40° C)

Storage Temperature
0° - 160° F (-20° - 70° C)

Humidity
5 - 95% (non-condensing)

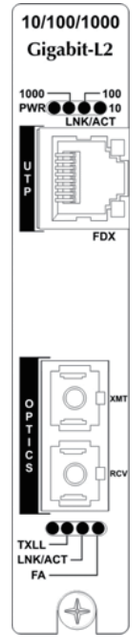
Power Consumption (typical)
Input Load 500 mA

LED Operation

Each L2 10/100/1000 module features diagnostic LEDs that provide information on features and ports.

L2 10/100/1000 w/LFPT

PWR	Glows green when powered
1000	Glows green at 1000 Mbps
100	Glows green at 100 Mbps
10	Glows amber at 10 Mbps
LNK/ACT	Glows green when a link is established Blinks green when data activity occurs (this is true for both LNK/ACT LEDs)
FDX	Glows amber in Full-Duplex mode Off in Half-Duplex mode, blinks if collisions occur
FXLL	Glows green when FX LinkLoss is enabled Blinks when FX LNK is lost
TXLL	Glows green when TX LinkLoss is enabled Blinks when TX LNK is lost
LNK/ACT	Glows green when a link is established Blinks green when data activity occurs
FA	Glows green when FiberAlert is enabled



NOTE
Blinking does not display within iView².

The twisted pair port on the L2 10/100/1000 includes AutoCross, a feature that automatically selects between a crossover workstation or pass through connection depending on the connected device.

Installing the L2 10/100/1000 Modules

The L2 10/100/1000 installs in any Black Box chassis, each requiring one slot.

Step	Action
1	To install a module, remove the blank brackets covering the slots where the module is to be installed (if present) by removing the screws on the outside edges of the bracket.
2	Slide the module into the chassis, via the card guides, until the module is seated securely in the connector.
3	Secure the module to the chassis by tightening the captive screw.
4	Save any "blanks" removed during installation for future use should the configuration requirements change.

Configuring the L2 10/100/1000 Modules

The L2 10/100/1000 may be configured with various features such as LinkLoss, FiberAlert, LinkFault Pass Through, Auto Negotiation, duplex mode and speed. The following sections include instructions for configuring both managed (via an SNMP-compatible management application such as iView²) and unmanaged modules.

Managed Modules

For a managed environment, first manually configure the desired features through DIP Switch settings to ensure this configuration is maintained if management is ever lost. After the module is installed, you can modify the SNMP enabled features for troubleshooting by using the included iView² SNMP management software. In a managed chassis, the software settings take priority configuration requirements for the installation.

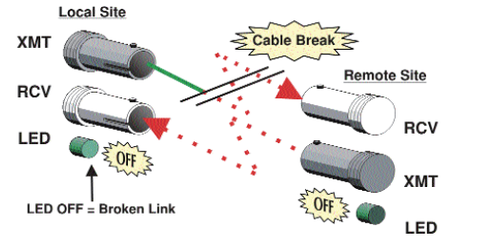
NOTE

Black Box iView² software is also available for downloading, please visit: www.blackbox.com. iView² supports the following platforms:

- *Windows 98*
- *Windows NT*
- *Windows 2000*
- *Windows XP*

In addition, there are Java versions of iView² for Java capable operating systems such as Linux.

FiberAlert (FA)



Product with *FiberAlert* enabled —Remote Site stops transmitting Local Link LED is OFF indicating a break in the fiber loop

When Auto Negotiation is not supported or selected, then FiberAlert minimizes the problems associated with the loss of one strand of fiber. If a strand is unavailable, the Black Box device at the receiver end notes the loss of link. The device will then stop transmitting data and the link signal until signal or link pulse is received. The result is that the link LED on BOTH sides of the fiber connection will go out indicating a fault somewhere in the fiber loop. Using FiberAlert, a local site administrator is notified of a fault and can quickly determine where a cable fault is located.

WARNING

Enable FiberAlert on one side of a media conversion only. Enabling it on both sides would keep both transmitters off indefinitely.

Using FiberAlert and LinkLoss

Modules ship from the factory with troubleshooting features disabled. Refer to the help file to enable/disable this feature.

Link Fault Pass Through (LFPT)

Link Fault Pass Through (LFPT) is a troubleshooting feature that combines TX and FX LinkLoss from both the local and remote L2 10/100/1000 modules. LFPT is enabled by turning on both FX and TX LinkLoss on both modules. This feature allows either end of the conversion to detect a link fault occurring at the other end of the media conversion chain. FiberAlert can also be enabled at the main site.

1. A cable fault occurs on the remote twisted pair.
2. TX LinkLoss detects the fault and disables the OPTICS (or UPLINK) port.
3. FX LinkLoss detects the fiber loss and disables the DATA port.

The link fault is passed through the media conversion and is observed at each end. It acts just like it would if the devices were directly connected.

Link Integrity

During normal operation, link integrity pulses are transmitted by all point-to-point Ethernet devices. When an Black Box media converter receives valid link pulses, it knows that the device to which it is connected is up and sending pulses, and that the copper or fiber cable coming from that device is intact. The appropriate "LNK" (link) LED is lit to indicate this.

The Black Box media converter also sends out link pulses from its copper and fiber transmitters, but normally has no way of knowing whether the cable to the other device is intact and the link pulses are reaching the other end. The combination of FiberAlert and LinkLoss allows this information to be obtained, even when physical access to a remote device (and its link integrity LED) is not available.

FX LinkLoss (FXLL)

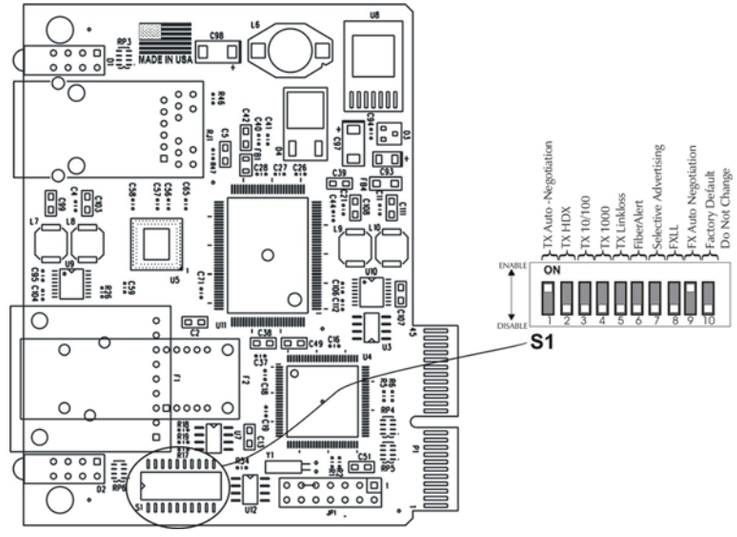
FX LinkLoss is a troubleshooting feature. When a fault occurs on the fiber segment of a conversation, FX LinkLoss detects the fault and passes this information to the twisted pair segment. If a media converter is not receiving a fiber link, FX LinkLoss disables the transmitter on the media converter's twisted pair port. This results in a loss of link on the device connected to the twisted pair port. FXLL LED will then blink, to indicate the fiber port has lost link.

TX LinkLoss (TXLL)

TX LinkLoss is a troubleshooting feature. When a fault occurs on the twisted pair segment of a conversion, TX LinkLoss detects the fault and passes this information to the fiber segment. If a media converter is not receiving a twisted pair link, TX LinkLoss disables the transmitter on the media converter's fiber port. The result is in a loss of the link on the device connected to the fiber port. TXLL LED will then blink, and to also indicate that the copper port has lost link.

Unmanaged Modules

Configure the L2 10/100/1000 for desired features before installing it in an unmanaged chassis.



DIP Switch on S1	Feature	Default Setting
1	TX Auto Negotiation	ON
2	TX Port-HDX (ON) or FDX (OFF)	OFF
3	TX Port-100 (ON) or 10 (OFF)	OFF
4	TX Port-1000	OFF
5	TX LinkLoss (TXLL)	OFF
6	FiberAlert	OFF
7	Selective Advertising	OFF
8	FX LinkLoss (FXLL)	OFF
9	FX Auto Negotiation	ON
10	Factory Configured—Do Not Change	OFF

Auto Negotiation (TX and FX)

Auto Negotiation (TX Port)

The L2 10/100/1000 ships from the factory with Auto Negotiation enabled on the twisted pair port. In this mode, the twisted pair port negotiates for speed and duplex, autosensing 10 Mbps Full-Duplex, 10 Mbps Half-Duplex, 100 Mbps Full-Duplex, 100 Mbps Half-Duplex, or 1000 Mbps Full-Duplex with Flow Control. Configure Auto Negotiation by setting the DIP Switch (for unmanaged modules) or via the management software.

Selective Adverting (TX Port)

Selective Advertising, when used in combination with Auto Negotiation, advertises only the configured speed and duplex mode for the twisted pair port. This allows configuration of both the twisted pair port's speed (10, 100 or 1000 Mbps) and Duplex mode (FDX or HDX).
Selective Advertising (Switch 7) functions only with Auto Negotiation (Switch 1) enabled.

Selective Advertising Configuration			
Desired Speed/Duplex	*Switch 2: Duplex*	*Switch 3: Speed*	*Switch 4: Speed*
1000 Mbps FDX	ON	OFF	ON
100 Mbps FDX	ON	ON	OFF
100 Mbps HDX	OFF	ON	OFF
10 Mbps FDX	ON	OFF	OFF
10 Mbps HDX	Off	OFF	OFF

Forcing the Duplex Mode

The twisted pair port on the L2 10/100/1000 can be set to either Half- or Full-Duplex operation in 10/100 Mbps (1000 Mbps is always FDX). Before manually setting the duplex mode, disable Auto Negotiation by setting DIP Switch 1 to **OFF**.

- The twisted pair port is configured for Full-Duplex by default, which is the **ON** position on DIP Switch 2.
- Configure the twisted pair port for Half-Duplex by setting DIP Switch 2 to the **OFF** position.

Forcing the Speed (TX Port)

The speed on the twisted pair port (10, 100, or 1000 Mbps) can also be set to forced mode. Before manually setting the speed mode, disable Auto Negotiation by setting DIP Switch 1 to **OFF**.

- Configure the twisted pair port for 10 Mbps operation by setting both DIP Switches 3 and 4 to the **OFF** position.
- Configure the twisted pair port for 100 Mbps operation by setting DIP Switch 3 to the **ON** position and DIP Switch 4 to **OFF**.
- Configure the twisted pair port for 1000 Mbps operation by setting DIP Switch 4 to the **ON** position. (When **ON**, Switch 4 overrides Switch 3).

FX Auto Negotiation (FX Port)

The L2 10/100/1000 includes the FX Negotiation feature, which allows Auto Negotiation or a Force Mode on the Gigabit fiber link. Enabled by default, it must be enabled or disabled on both ends of the connection to establish a link. Only enable this feature if the connecting device supports it. When FX Auto Negotiation is enabled, Fiber Alert does not need to be enabled

Flow Control

Flow Control is used to throttle the END device to avoid dropping packets during network congestion. Flow Control is enabled by Default, through iView^2 when the module is installed in a managed chassis.

LinkLoss, FiberAlert and Link Fault Pass Through

The L2 10/100/1000 includes such troubleshooting features as FiberAlert, FX LinkLoss, and TX LinkLoss, which can help locate "silent failures" on the network. This section explains how FiberAlert and LinkLoss work, and how they will react in a network configuration, which should be understood before attempting to enable any of these features.

** WARNING **
Installing modules without understanding the effects of LinkLoss and FiberAlert can cause functioning units to appear flawed or even non-functional.