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

◆ **BLACK BOX**®
NETWORK SERVICES

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Notes:

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Federal Communication Commission Radio Frequency Interference Statement

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 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 the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

The use of non-shielded I/O cables may not guarantee compliance with FCC RFI limits. 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 the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe B prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

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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.

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 from Black Box that converts both speed and media. The L2 10/100/1000 modules provide a single conversion between:

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

LGC5950C	L2 10/100/1000, TX/SX-MM850-SC [300 m]
LGB5951C	L2 10/100/1000, TX/LX-SM1310-SC [10 Km]
LGC5952C	L2 10/100/1000, TX/LX-SM1310/PLUS-SC [40 Km]
LGC5953C	L2 10/100/1000, TX/LX-SM1310/LONG-SC [70 Km]
LGC5940C	L2 10/100/1000, TX/SSLX-SM1310-SC [10 Km]
LGC5941C	L2 10/100/1000, TX/SSLX-SM1550-SC [10 Km]
LGC5942C	L2 10/100/1000, TX/SSLX-SM1310/PLUS-SC [40km]
LGC5943C	L2 10/100/1000, TX/SSLX-SM1550/PLUS-SC [40 Km]

The L2 10/100/1000 modules feature one RJ-45 connector, one pair of SC or one SC (single-strand) fiber connectors and require one slot in an SNMP-manageable Black Box chassis. The L2 10/100/1000 module is part of the Black Box SNMP-manageable media converter series. Locate installation instructions for other modules in their respective documentation.

Electrostatic Discharge Precautions

Electrostatic discharge (ESD) can cause damage to the add-in modules. Always observe the following precautions when installing or handling an add-in module or any board assembly.

1) Do not remove unit from its protective packaging until installation.
2) Wear an ESD wrist grounding strap before handling any module or component. If a wrist strap is not available, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.
3) Hold boards by the edges only; 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 board over any surface.

Safety Certifications

UL/CUL: Listed to Safety of Information Technology Equipment, Including Electrical Business Equipment.

CE: The products described herein comply with the Council Directive on Electromagnetic Compatibility (89/336/EEC) and the Council Directive on Electrical Equipment Designed for use within Certain Voltage Limits (73/23/EEC). Certified to Safety of Information Technology Equipment, Including Electrical Business Equipment. For further details, contact Black Box.

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

Black Box Customer Service

Order toll-free in the U.S.: Call 877-877-BBOX
(outside U.S. call 724-746-5500)
FREE technical support, 24 hours a day, 7 days a week

Call: 724-746-5500 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

Warranty

Contact Black Box for warranty information.

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 fiber is being terminated) only from a reputable supplier; low-quality components can cause many hard-to-diagnose problems in an installation.
2) Dust caps are 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. Assure that the fiber is properly terminated, polished and free of any dust or dirt and that the location is as free from dust and dirt as possible.
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) Should it be necessary to disconnect the fiber device, reinstall protective dustcaps.
5) If the optics have been contaminated, alternate between blasting with clean, dry, compressed air and flush in with methanol to remove dirt particles.

LED Operation

The LED functions for the L2 10/100/1000 modules are as follows:

PWR Glows green when module has power.
1000 Glows green when 1000 Mbps is selected on port.
100 Glows green when 100 Mbps is selected on port.
10 Glows amber when 10 Mbps is selected on port.
LNK/ACT (on RJ-45)
  • Glows green when a link is established on port.
  • Blinks green when data activity occurs.
FDX (on RJ-45)
  • Glows amber when port is in Full-Duplex mode.
  • Blinks amber when port is operating in Half-Duplex mode and collisions occur.
FA Glows green when FiberAlert is enabled.
TX LL Glows green when TX LinkLoss is enabled.
LNK/ACT
  • Glows green when a link is established on port.
  • Blinks green when data activity occurs.
MASTER
  • Glows amber when the L2 10/100/1000 is in Master mode.
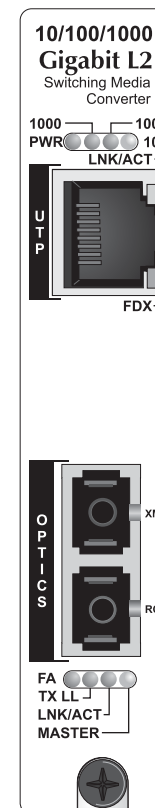
Installing the L2 10/100/1000 Modules

The L2 10/100/1000 modules install in either a 1 or 2-slot Desktop chassis, Multi-Power chassis, or any High-Density Media Converter System II family chassis. Each module requires one slot in the chassis. To install a module, remove any blank brackets covering the slots where the module is to be installed by removing the screws on the outside edges of the bracket. Slide the module into the chassis, via the card guides, until the module is seated securely in the connector. Secure the module to the chassis by tightening the captive screw. Save any "blanks" removed during installation for future use should configuration requirements change.

Installation Troubleshooting

- During installation, test the fiber and twisted pair connections with all troubleshooting features disabled, then enable these features, if desired, just before final installation. This will reduce the features' interference with testing.
- LEDs will only function after both twisted pair and fiber are connected.
- If using a high powered device (which is designed for long distance installations) for a short distance installation, the fiber transmitters may overdrive the receivers and cause data loss. In such a case, add an optical attenuator to the connection.

Configuring the L2 10/100/1000 Modules

The L2 10/100/1000 modules may be configured for various features, such as LinkLoss, FiberAlert, Auto-Negotiation, duplex mode and speed (see the *DIP Switch Settings for the L2 10/100/1000* chart for information). The following sections include instructions for configuring both managed (via an SNMP-compatible management application like iView²) and unmanaged modules.

Managed Modules

To manage one or more modules, the chassis must have an SNMP agent. In a managed environment, install the module first, then configure using the management software. Within iView² for Media Converters, configure features and troubleshooting functions in the Module Detail section under the picture of the module. See the iView² online help file for more information.

N O T E
Management software will override any hardware settings (e.g., jumper, switch, etc.), so you MUST configure a module that will be managed via the software. Until a module installed in a managed chassis is configured via the software, the module (and its LEDs) may not work properly.

Unmanaged Modules

Before installing, configure the L2 10/100/1000 modules for desired features. Please refer to the following illustration/chart for the DIP Switch location and settings.

I N S T A L L A T I O N   T I P
The L2 10/100/1000 modules should first be tested in an unmanaged environment. To do this, turn the SNMP management switch to **OFF** or remove the management module depending on the type of chassis. Follow the unmanaged configuration instructions, then install the module, connect the cables and test the LEDs. When finished, reactivate management and configure the unit via the software.

Using LinkLoss and FiberAlert

For a typical main site to remote site media conversion setup, enable the media converters' troubleshooting features as follows:

- Enable **TX LinkLoss** at the Main Site
- Enable **FiberAlert** at the Remote Site Only.

Contact Black Box customer service for more information about enabling these features.

N O T E
Enable FiberAlert on only ONE side of a media conversion; enabling it on both sides would keep both transmitters off indefinitely. FiberAlert is not available/applicable on single-strand versions of the L2 10/100/1000.

AutoCross Feature for Twisted Pair Connections

The L2 10/100/1000 module's twisted pair port includes *AutoCross*, a feature which automatically selects between a crossover or pass-through connection, depending on the connected device.

Specifications

Operating Temperature:
32° to 122°F (0° to +50°C)**;** 5% to 90% (non-condensing), 0 – 10,000 ft. altitude

Storage Temperature:
-13° to +158°F (-25° to +70°C)

Humidity:
5 to 90% (non-condensing)

Power Consumption (Typical)
Input Load: 500 **mA**

Fiber Optic Specifications
For fiber optic specifications, please contact Black Box.

Troubleshooting Features

The L2 10/100/1000 modules includes the TX LinkLoss and FiberAlert troubleshooting features.

About Link Integrity

During normal operation, link integrity pulses are transmitted by all point-to-point Ethernet devices. When a 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 aforementioned troubleshooting features allow this information to be obtained, even when physical access to a remote device (and its link integrity LED) is not available.

What Is TX LinkLoss?

TX LinkLoss is another 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. This results in a loss of link on the device connected to the fiber port.

What Is FiberAlert?

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 a signal or

Local Site

XMT
RCV
LED

Cable Break

Remote Site

RCV
XMT
LED

LED OFF = Broken Link

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

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.
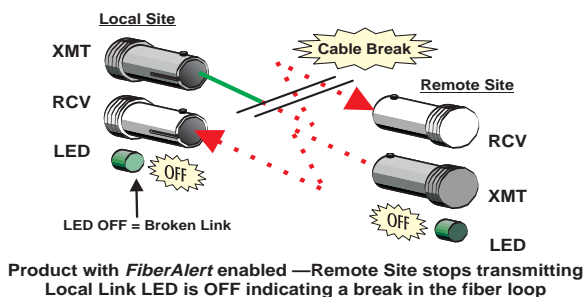
To configure troubleshooting features:

• Enable TX LinkLoss by setting DIP Switch 5 to the **ON** position.
• Enable FiberAlert by setting DIP Switch 6 to the **ON** position.

DIP Switch Location and Configuration Settings
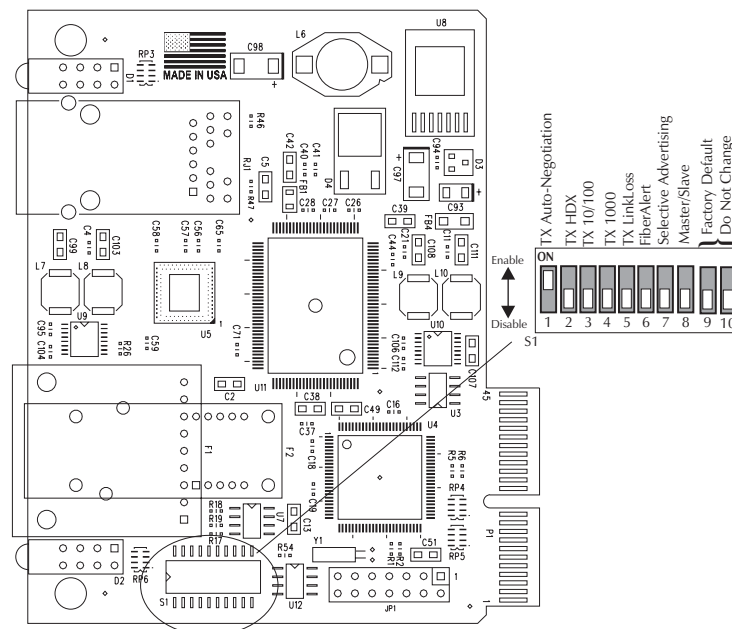
Auto-Negotiation, Duplex Mode and Speed

The twisted pair port on the L2 10/100/1000 modules auto-negotiates for speed and duplex mode. These modules also provide the option of manually setting the speed and duplex mode if the con-

Dip Switch Settings for L2 10/100/1000		
S1	**Function**	**Default**
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	OFF
6	FiberAlert	OFF
7	Selective Advertising	OFF
8	Master (ON) or Slave (OFF)	OFF
9	FX Negotiation	OFF
10	Factory Configured– Do not change	--

nected devices do not have the ability to auto-negotiate, or when Auto-Negotiation is not preferred. The fiber port always operates at 1000 Mbps Full-Duplex.

Auto-Negotiation

The L2 10/100/1000 module ships from Black Box with Auto-Negotiation enabled on the twisted pair port. In this mode, the twisted pair port negotiates for speed and duplex (i.e. the module autosenses 10 Mbps Full-Duplex, 10 Mbps Half-Duplex, 100 Mbps Full-Duplex, 100 Mbps Half-Duplex with Flow Control, 1000 Mbps Full-Duplex or 1000 Mbps Half-Duplex with Flow Control). Configure Auto-Negotiation on this module by adjusting the DIP switch (for unmanaged modules) or via the management software.

Selective Advertising

Selective Advertising, when used in combination with Auto-Negotiation, advertises only the configured speed and duplex mode for the twisted pair port. When Selective Advertising and Auto-Negotiation are both switched **ON**, the twisted pair port's speed (10, 100 or 1000 Mbps) and Duplex mode (FDX or HDX) can be separately configured. (See the *Selective Advertising Configuration* chart below for optional configurations using these features.)

Selective Advertising, rather than Force Mode, should be used when connecting to devices that ONLY auto-negotiate.

Selective Advertising Configuration					
Desired Speed/Duplex	**S1-1 Auto-Negotiation**	**S1-7 Selective Advertising**	**S1-3 Speed**	**S1-4 Speed**	**S1-2 Duplex**
1000 Mbps FDX	ON	ON	OFF	ON	OFF
1000 Mbps HDX	ON	ON	OFF	ON	ON
100 Mbps FDX	ON	ON	ON	OFF	OFF
100 Mbps HDX	ON	ON	ON	OFF	ON
10 Mbps FDX	ON	ON	OFF	OFF	OFF
10 Mbps HDX	ON	ON	OFF	OFF	ON
N O T E					
Selective Advertising is not an option when Auto-Negotiation is disabled.					

Forcing the Duplex Mode

The L2 10/100/1000 module's twisted pair port can be configured manually for either Half- or Full-Duplex operation. Before manually setting the duplex mode, disable Auto-Negotiation (Set DIP Switch 1 on S1 to **OFF**.)

- Configure the twisted pair port for Full-Duplex by setting DIP Switch 2 to the **OFF** position (Default).

- Configure the twisted pair port for Half-Duplex by setting DIP Switch 2 to the **ON** position.

Forcing the Speed

The L2 10/100/1000 module's twisted pair port can also be manually configured for 10, 100 or 1000 Mbps operation. (The fiber port always operates at 1000 Mbps). Before manually setting the speed, disable Auto-Negotiation (Set DIP Switch 1 on S1 to the **OFF** position.)

- Configure the twisted pair port for 10 Mbps operation by setting DIP Switch 3 to the **OFF** position and DIP Switch 4 to **OFF**.

- 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 Negotiation

The L2 10/100/1000 modules also include an FX Negotiation feature, which negotiates duplex mode and also helps ensure the link with the connected device. This feature is disabled by default. FX Negotiation must be enabled or disabled on both ends of the connection; otherwise, establishing a link may be difficult. If the device connecting to the L2 10/100/1000 module does not support this feature, disable the feature on the L2 10/100/1000 module. The following table shows various configurations and the resulting link status:

FX Negotiation on a Switch or L2 10/100/100 Modules	FX Negotiation on L2 10/100/100 Modules	Link Status
L2 10/100/1000 - (S1-9) OFF	(S1-9) - OFF	Link
L2 10/100/1000 - (S1-9) ON	(S1-9) - ON	Link
L2 10/100/1000 - (S1-9) OFF	(S1-9) - ON	No Link
Switch - ON	(S1-9) - OFF	No Link
Switch - ON	(S1-9) - ON	Link
Switch - OFF	(S1-9) - OFF	Link
Switch - OFF	(S1-9) - ON	Link

Master/Slave Mode

The Master/Slave mode feature determines which clock will be used between the L2 10/100/1000 and the device connected (a switch, NIC, Gigabit module, another L2 10/100/1000, etc.). Slave mode is the default setting. In Slave mode, the L2 10/100/1000 will receive and use the clock of the connected device. Master mode uses L2 10/100/1000 module's clock. The Master/Slave mode is only valid for the twisted pair link. This feature is hardware configurable ONLY.

- Enable Slave mode by setting DIP Switch 8 to the **OFF** position.
- Enable Master mode by setting DIP Switch 8 to the **ON** position.

Flow Control

The L2 10/100/1000 modules include Flow Control which is used to throttle the END device to avoid dropping packets during network congestion. Full-Duplex Flow Control will Advertise ONLY in Full-Duplex Mode. Full-Duplex Flow Control functions ONLY if the link partner (end device) also has Flow Control. Half-Duplex Flow Control DOES NOT Advertise.