Bridge Module

Installation Guide and Users Reference Manual

This manual contains information to help with the installation and operation of Black Box Corporation's ***Bridge Modules*** and ***100-Mbps Modules***.

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Chapter 1
Introduction

About Bridge Modules

Black Box Corporation's ***Bridge Module*** is an IEEE 802.3 compliant, 2-port 10/100 bridge and LAN extender. ***Bridge Module*** can function as a 2-port bridge supporting all copper and fiber media types, including single-mode fiber, and as a switch allowing 10 Mbps Ethernet to be connected to 100 Mbps Fast Ethernet. ***Bridge Modules*** can also extend Ethernet limitations for cabling distance and number of hubs/repeaters by creating a new collision domain.

Bridge Modules support Half-Duplex (HDX) or Full-Duplex (FDX) and feature advanced address recognition, a self-learning mechanism and support up to 8K MAC addresses. The input buffer memory of 1 Mb permits full wire speed operation for 100 Mbps LAN extension.

The Bridge Module is designed for installation in any ***Modular Concentrator***™ hub or ***TotalSwitch*** 6™ chassis (90/240 VAC or -48 VDC) in which a second, fault-tolerant Power Supply Module can also be installed.

The following Bridge Module is available:

Bridge Module — (LB6100) includes two slots for installing two ***100-Mbps Modules***

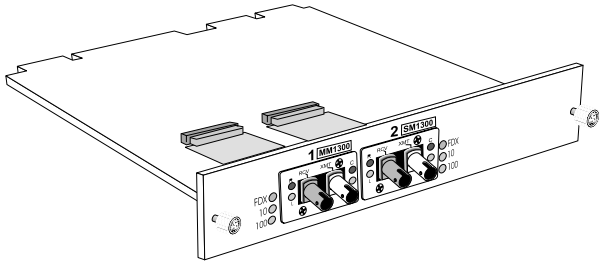

Figure 1.1 Bridge Module with Two Fiber 100-Mbps Modules

Unlike other 10/100 bridges that have a “fixed” twisted pair or thin coaxial port, Black Box Corporation’s ***Bridge Module*** allows you to configure the type (e.g. twisted pair, fiber, etc.) and speed (10 Mbps or 100 Mbps) of media at any time. For example, you may have an immediate need for converting 100 Mbps twisted pair cable to 100 Mbps fiber, but in the future, converting 100 Mbps twisted pair to long distance 100 Mbps fiber may be necessary. ***Bridge Modules*** provide this flexibility by featuring two (2) slots for installing any combination of the twisted pair and fiber ***100-Mbps Modules*** listed below. If you need to reconfigure the ***Bridge Module***, simply remove one or both of the ***100-Mbps Modules*** and install a ***100-Mbps Module*** that meets your new networking requirements.

The following twisted pair and fiber ***100-Mbps Modules*** are available for use with the ***Bridge Module***:

100-Mbps Module, TP/TX — (LB6101-TX) 10/100Base-TX twisted pair; includes one RJ-45 connector; Half- or Full-Duplex

100-Mbps Module, FX — 100Base-FX multi-mode fiber; includes one pair ST (LB6102-FX) or SC (LB6102-FXSC) connectors; Half- or Full-Duplex

100-Mbps Module, FX-SingleMode — 100Base-FX single-mode fiber; includes one pair ST (LB6103-FX) or SC (LB6103-FXSC) connectors; Half- or Full-Duplex

100-Mbps Module, FX-SingleMode/PLUS — as above with higher power budget; includes one pair ST (LB6103P-FX) or SC (LB6103P-FXSC) connectors

Chapter 2
Hardware Installation

This chapter provides configuration and installation information for ***100-Mbps Modules*** and ***Bridge Modules***.

Configuring Twisted Pair and Fiber 100-Mbps Modules

Each ***100-Mbps Module*** needs a configured address that corresponds with the port in which you install the module. Each of the two ports is labeled with its number (1 or 2). ***100-Mbps Modules*** also have to be configured for Half-Duplex or Full-Duplex. Twisted pair ***100-Mbps Modules*** have to be configured for 10 Mbps or 100 Mbps as well. For configuring twisted pair and fiber ***100-Mbps Modules*** an 8-position switch is located at position S1.

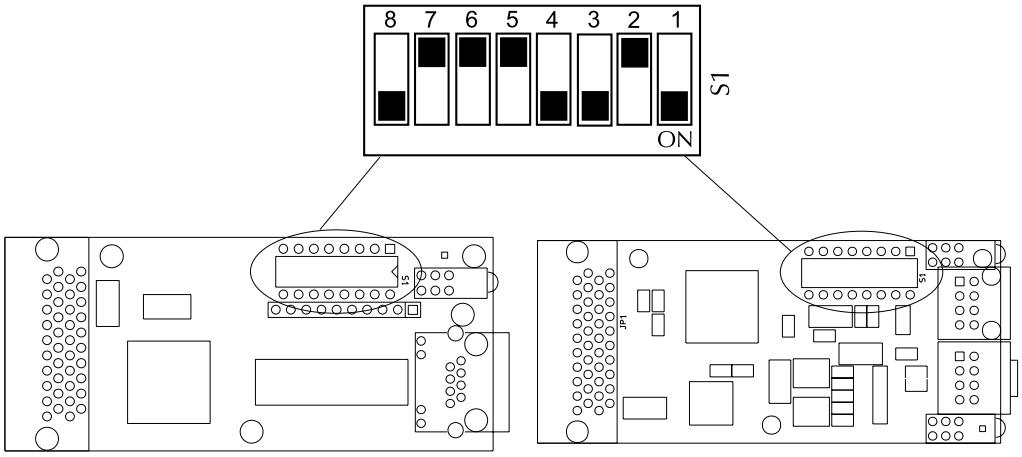

Figure 2.1 8-Position Switch for Configuring Twisted Pair (l.) and Fiber (r.) 100-Mbps Modules

Use the settings for the respective Port the ***100-Mbps Module*** is installed in (i.e. 1 or 2) to configure the proper address. The following table provides the switch settings for twisted pair and fiber ***100-Mbps Modules***.

Switch Settings for *LIM TX* and *LIM FX*

Switch	Description	Port 1	Port 2	Comments
1	Address	OFF	ON	
2	Address	ON	OFF	
3	Address	ON	ON	Do not change
4	Address	ON	ON	Do not change
5 (FX)	Default	OFF	OFF	Do not change
5 (TX)	10/100 Mbps	ON (10 Mbps) OFF (100 Mbps)	ON (10 Mbps) OFF (100 Mbps)	
6	Default	OFF	OFF	Do not change
7	HDX/FDX	ON (HDX) OFF (FDX)	ON (HDX) OFF (FDX)	
8	Default	ON	ON	Do not change

Port 1 settings are the default settings for both twisted pair and fiber ***100-Mbps Modules***. The default setting for switch #5 on twisted pair ***100-Mbps Modules*** is OFF. Half-Duplex is the default setting for switch #7 on both twisted pair and fiber ***100-Mbps Modules.***

> ***NOTE: Half-Duplex/Full-Duplex also needs to be configured on the Bridge Module's PCB. Please refer to the "Half-Duplex/Full-Duplex Selection on the Bridge Module" section later in this chapter for more information.***

Installing a 100-Mbps Module

Once a ***100-Mbps Module*** is configured, it is ready to be installed in a ***Bridge Module***. ***100-Mbps Modules*** can be installed into either port. ***100-Mbps Modules*** may be safely installed or removed with power on (i.e. ***100-Mbps Modules*** are "hot-swappable").

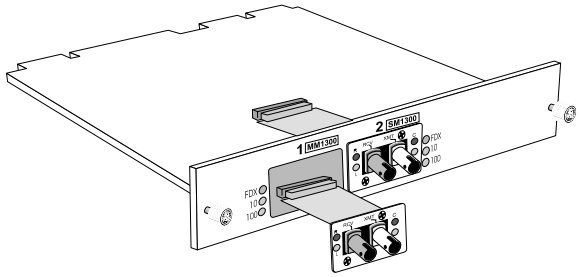

Figure 2.2 Installing a 100-Mbps Module

Bridge Modules come with blank brackets covering the slots where the ***100-Mbps Modules*** are to be installed. To install a ***100-Mbps Module***, remove the blank bracket by removing the screws located on the outside edge of the bracket. Slide the ***100-Mbps Module*** into the ***Bridge Module,*** via the cardguides, until the ***100-Mbps Module*** is

seated securely in the connector. Secure the module to the chassis by tightening the screws.

Configuring the Bridge Module

Bridge Modules have several jumpers on the PCB. Jumpers for selecting Half- or Full-Duplex may have to be configured while three additional jumpers are factory configured and should not be changed.

Half-Duplex/Full-Duplex Selection

Each twisted pair and fiber ***100-Mbps Module*** installed in a ***Bridge Module*** can operate in either Half- or Full-Duplex mode. The settings for the Duplex mode on the ***Bridge Module*** must match those on the ***100-Mbps Modules***. ***Bridge Modules*** are shipped from the factory with Half-Duplex selected on each port. Settings on the ***Bridge Module*** as well as on the ***100-Mbps Modules*** may have to be configured.

NOTE: Refer to "Config-uring 100-Mbps Modules" in this chapter for details on setting the Duplex mode on 100-Mbps Modules.

Located at position JP5 and JP6 on the PCB are two 3-pin jumper blocks labeled "0" for Port 1 and "1" for Port 2. To select Half- or Full-Duplex for a specific port, the shunt on the 3-pin jumper block for the corresponding port must be repositioned. Half-Duplex is selected when the shunt is on the bottom two pins. Full-Duplex is selected when the shunt is on the top two pins.

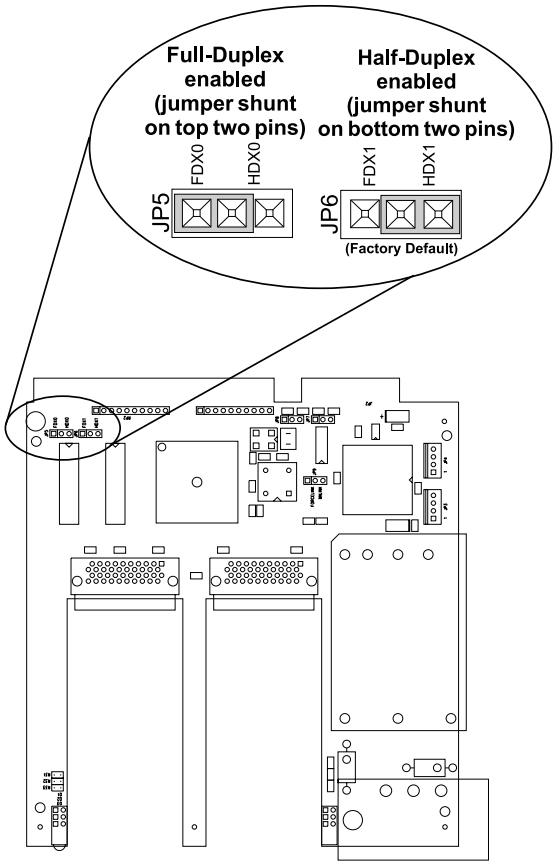

Figure 2.3 HDX/FDX Jumpers

NOTE: To change the settings on a Bridge Module once it is installed, remove the module from the chassis. Refer to "Installing a Bridge Module" later in this chapter for more information.

Factory Configured Jumpers

In addition to the jumpers for selecting Half-Duplex and Full-Duplex, there are three jumper blocks, located at positions JP7, JP8 and JP9, which are factory configured and should not be changed. For each of these jumper blocks, the default setting is with the shunt positioned over the bottom two pins.

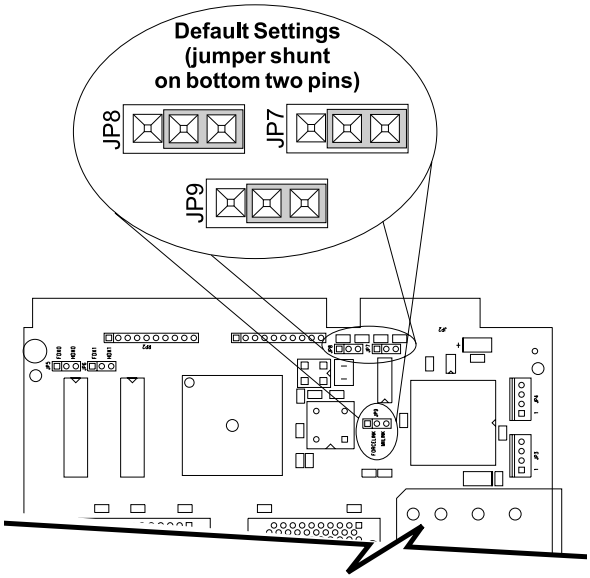

Figure 2.4 Factory Configured Jumpers

Installing Bridge Modules

Bridge Modules require two ***100-Mbps Modules*** for operation and can be installed in either of the two bottom slots on the left side of a ***TotalSwitch 6*** chassis or into any available slot in any ***Modular Concentrator*** hub (e.g.: ***Modular Concentrator/2, Modular Concentrator/5*** and ***Modular Concentrator/12***).

To install a ***Bridge Module*** in a ***TotalSwitch 6*** or ***Modular Concentrator*** hub, remove the blank bracket covering the slot where the module is to be installed by removing the two screws located closest to the outside edge of the bracket.

> ***NOTE: Do not install a Bridge Module into a chassis when power is on — Bridge Modules are NOT "hot-swappable".***
> ***NOTE: Bridge Modules cannot be installed in Slot 1 on managed Modular Concentrator hubs; this disables SNMP for the Modular Concentrator NMS.***

Next, slide the module into the chassis, via the cardguides, until it is seated securely in the connector on the backplane and then secure the module to the chassis by tightening the thumbscrews.

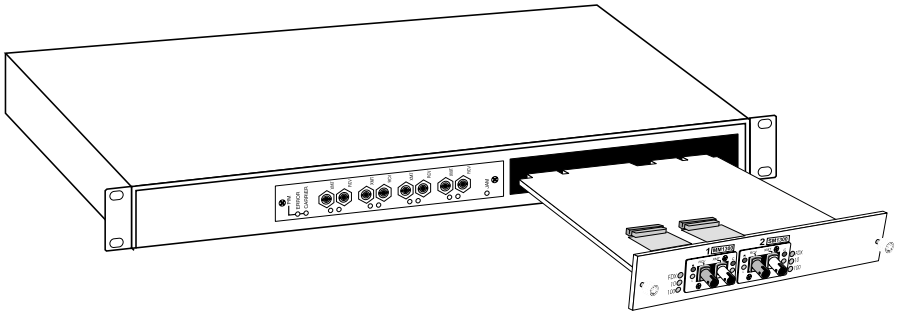

Figure 2.5 Installing a Bridge Module in a Modular Concentrator/2

To complete the installation, please refer to the installation manual included with your ***Modular Concentrator*** hub or ***TotalSwitch 6*** for specific installation and operation information on those devices.

LED Operation

Bridge Modules feature diagnostic LEDs. LEDs for each port are located both on the ***Bridge Modules*** and on the installed ***100-Mbps Modules***.

LEDs on the Bridge Module

The following LEDs are located on the ***Bridge Module*** and function the same regardless of the type of ***100-Mbps Modules*** that are installed.

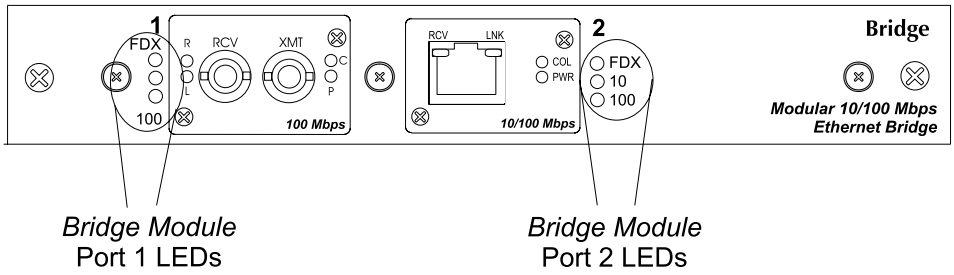

Figure 2.6 Bridge Module LEDs

FDX	Glows yellow when Full-Duplex is selected on the port
10	Glows green when running 10 Mbps on the port
100	Glows green when running 100 Mbps on the port

LEDs on 100-Mbps Modules

LEDs for each port are also located on the ***100-Mbps Modules***.

LEDs on Twisted Pair 100-Mbps Modules

The following illustration shows where the LEDs are located on twisted pair ***100-Mbps Modules***. LED functions for twisted pair ***100-Mbps Modules*** are as follows:

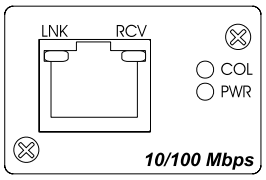

Figure 2.7 100-Mbps Module, TX

RCV Flickers yellow when port is receiving data

LNK Glows green when a link is established

COL Flickers red during normal operation indicating normal collisions are being detected

PWR Glows green during normal operation indicating the ***100-Mbps Module*** is receiving power

LEDs on Fiber Optic 100-Mbps Modules

The following illustration shows where the LEDs are located on fiber ***100-Mbps Modules***. LED functions for fiber optic ***100-Mbps Modules*** are as follows:

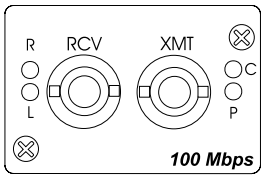

Figure 2.8 100-Mbps Module, FX

R Flickers yellow when port is receiving data

L Glows green when a link is established

C Flickers red during normal operation indicating normal collisions are being detected

P Glows green during normal operation indicating the ***100-Mbps Module*** is receiving power

Chapter 3
User Guidelines

This chapter provides examples of how ***Bridge Modules*** can be used in a network.

As discussed earlier, ***Bridge Modules*** are 2-port 10/100 Bridges, LAN extenders and HDX/FDX converters.

The following are three basic applications for ***Bridge Modules***:

1) Use a ***Bridge Module*** to create a new Ethernet collision domain. By creating a new collision domain, some of the limitations associated with Fast Ethernet (e.g.: cascade length, repeater count, etc.) are eliminated.

2) Use a ***Bridge Module*** to convert Half-Duplex Ethernet to Full-Duplex Ethernet. Running Ethernet in Full-Duplex mode eliminates the distance limitations imposed on fiber cabling.

3) Use a ***Bridge Module*** to connect an existing 10 Mbps LAN to a "new" 100 Mbps LAN. Quite often, applications such as e-mail and WAN access may be situated on only one of the LANs, but users on other LANs require access to these services as well.

Creating a New Collision Domain

A new collision domain is created for each installed ***Bridge Module***. The following two examples illustrate when creating a new collision domain is beneficial.

Problem: You have two or more networks using Fast Ethernet repeaters. The networks need to be connected but are located in different departments of the same building. The flexibility of Fast Ethernet is limited by the IEEE 802.3 standard which allows a maximum cascade length of 5m between repeaters. See Figure 3.1.

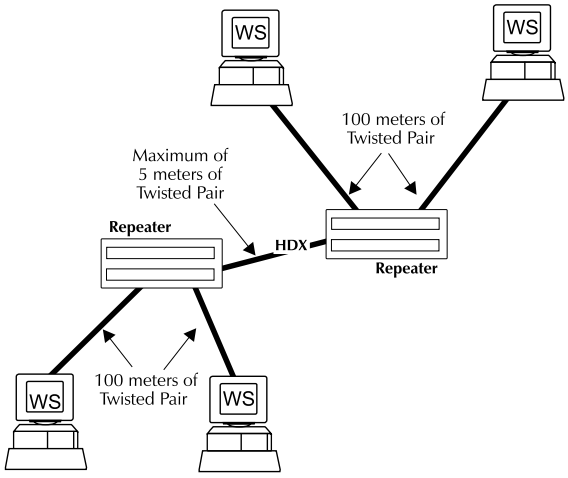

Figure 3.1

Solution: In order to make a connection beyond the IEEE 802.3u specification, a new collision domain needs to be created. This can be done by connecting the repeater in each network to a ***Bridge Module***. By using a ***Bridge Module***, you can make longer distances (up to 100m of twisted pair). See Figure 3.2.

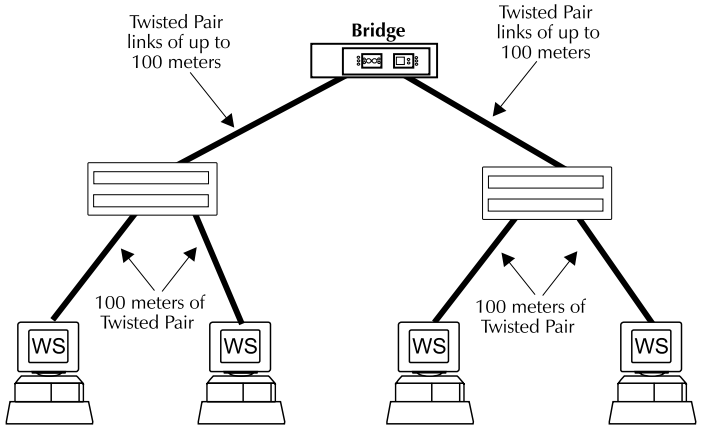

Figure 3.2

Problem: Your company is growing and you need to add more workgroups but the IEEE 802.3 specification limits the number of Fast Ethernet repeaters you can use (e.g.: no more than two Class II repeaters in any collision domain). See Figure 3.3.

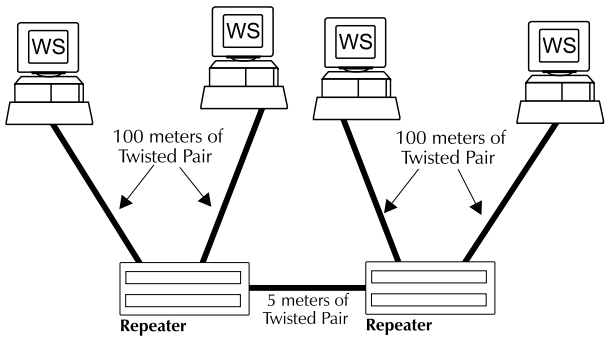

Figure 3.3

Solution: To connect two or more workgroups and still adhere to the IEEE 802.3 specification, a new collision domain needs to be created. This can be done by connecting the repeaters of each workgroup to a ***Bridge Module***. By using a ***Bridge Module***, you create a new collision domain which allows you to use additional repeaters. See Figure 3.4.

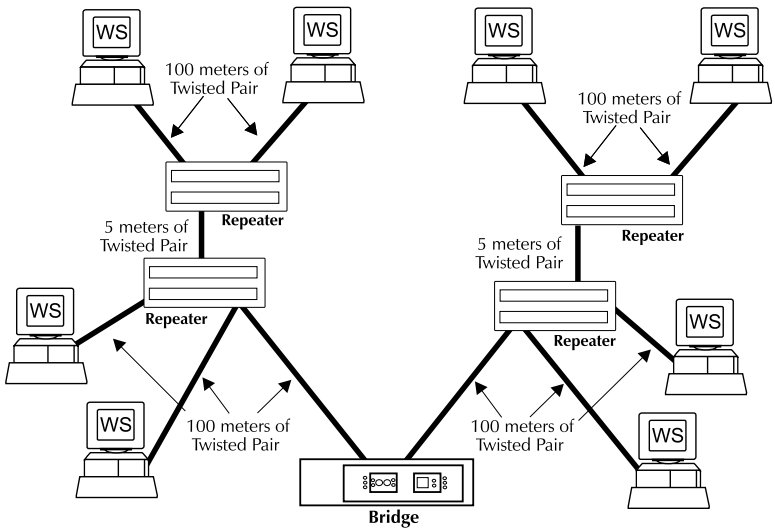

Figure 3.4

Making Longer Connections by Using Full-Duplex Ethernet

Problem: You need to connect two 100 Mbps networks located in different buildings. The distance between the buildings is greater than the cable distances supported by Half-Duplex Fast Ethernet.

Solution: In order to make a connection beyond the IEEE 802.3 specification, the link must be run in Full-Duplex mode, which eliminates the cable length limitations of Half-Duplex Fast Ethernet. By installing a ***Bridge Module*** in each building you can make long distance, Full-Duplex, 100 Mbps Ethernet fiber connections between buildings. See Figure 3.5.

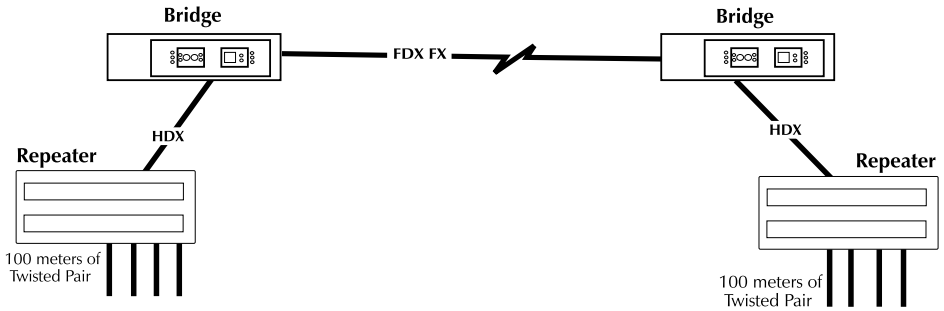

Figure 3.5

Problem: You have a similar situation but you need to connect a 100 Mbps network to an existing 100 Mbps switch already in use, but the new network and the existing switch are located in different buildings. The buildings are farther apart than the IEEE 802.3 specification allows.

Solution: As in the solution to the previous problem, you can use a ***Bridge Module*** to convert from Half-Duplex to Full-Duplex. By installing a ***Bridge Module*** between the switch and the rest of the network you can make long distance (up to 40+ km in the case of Single-Mode/PLUS), Full-Duplex, 100 Mbps Ethernet connections and avoid the collisions that are inherent in Half-Duplex. See Figure 3.6.

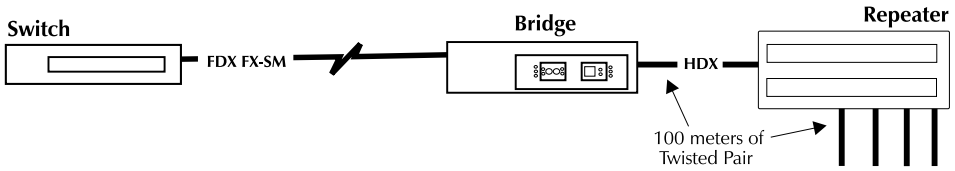

Figure 3.6

Connecting 10 Mbps LANs to 100 Mbps LANs

Problem: A new 100 Mbps workgroup has been installed for users requiring more server bandwidth. However, existing legacy services (e.g.: e-mail, WAN access, etc.) are resident on an existing 10 Mbps LAN. A simple, cost effective way to connect these two LANs is needed.

Solution: Connect the two LANs with a ***Bridge Module.*** The 10 Mbps LAN can be connected to the ***Bridge Module*** by using a twisted pair ***100-Mbps Module*** (10 or 100 Mbps). The 100 Mbps LAN can be connected to the ***Bridge Module*** by using any fiber ***100-Mbps Module***. See Figure 3.7.

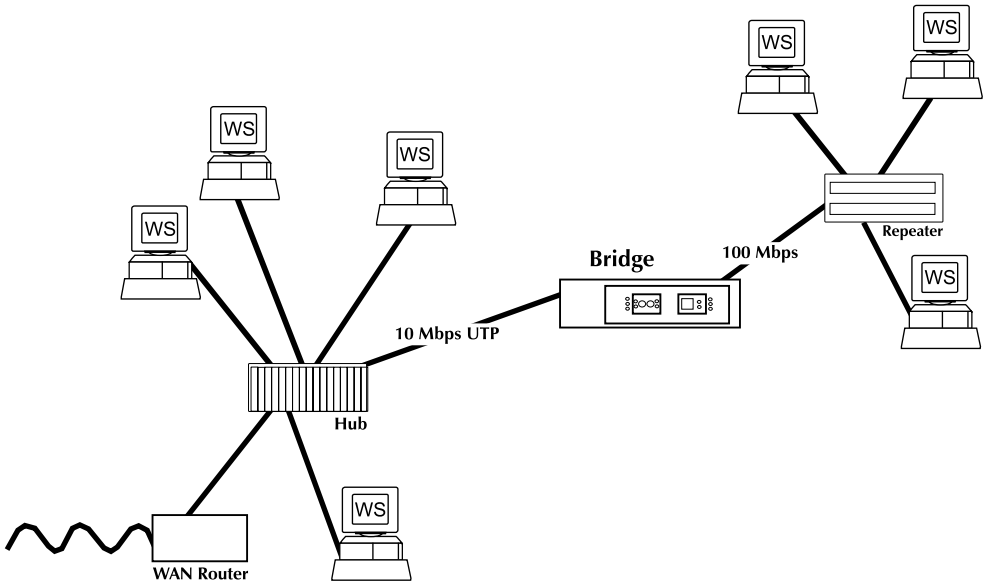

Figure 3.7

Chapter 4
Technical Specifications

Fiber Optic Specifications

The maximum distance between any two fiber optic devices is determined by a number of factors, including the ***100-Mbps Modules*** used in the configuration. The following table shows the specifications for each of the available fiber ***100-Mbps Module*** and will assist in determining which is best for your installation.

Description	MAX. Fiber Segment Distance[1] (Km)		Wavelength (nm)	Fiber Transmitter Average Power[2]		
	HDX	FDX		Avg. Launch Power (dBm)	Avg. Sensitivity (dBm)	Avg. Power Loss Budget (dB)
100-Mbps Module, FX	.4	4	1300	-18.0	-31.0	13.0
100-Mbps Module, FX-SingleMode	.4	20	1300	-18.0	-31.0	13.0
100-Mbps Module, FX-SingleMode/PLUS	.4	40	1300	-15.0	-31.0	16.0

[1] Distances listed are estimates and can vary with application. Distance limitations are determined by a combination of fiber characteristics, number of splices and other physical parameters. Subtract 3 dB from Power Loss Budget for 50/125µ multi-mode fiber.

[2] Values are averages and have been determined under factory conditions. Actual field application values may vary.

[3] Half-Duplex (HDX) distances are limited by IEEE specifications.

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 the factory 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 the protective dust caps.

5) 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 your 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 you are ready to install it.

2) Wear an ESD wrist grounding strap before handling any module or component. If you do not have a wrist strap, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.

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.

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.

Specifications

Environmental

Operating Temperature: 32° - 122° F (0° - 40° C)
Storage Temperature: 22° - 160° F (-6° - 71° C)
Humidity: 5 - 95% non-condensing

Power (including two 100-Mbps Modules)

AC Input Load: 95/240V ~ 50/60 Hz, 0.3/.15A
Heat generated: 85 BTU/hr

Chapter 5
General Information

Customer Service Information

Call: (724) 746-5500 Phone orders 24 hours a day, 7:00 AM Monday to midnight Friday; 8:00 AM to 4:00 PM Saturday (EST)

Fax: (724) 746-0746 or in North America 1-800-321-0746

Mail order: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018

Technical Support and fax orders 24 hours a day

Warranty

Contact Black Box Corporation for warranty information.

Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A 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 chassis 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.

Safety Certifications

UL: Listed to UL1950 and CSA 22.2, No. 950, Safety of Information Technology Equipment, Including Electrical Business Equipment.

TUV/GS: Certified to EN 60 950, 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). For further details, contact IMC Networks.

NOTE: Modules are FCC approved and UL, TUV/GS and CE certified when installed in a Black Box chassis only.

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