# BLACK BOX®
## NETWORK SERVICES

1000 PARK DRIVE • LAWRENCE, PA 15055-1018 • 724-746-5500 • FAX 724-746-0746

# BLACK BOX®
## NETWORK SERVICES

**September 2004**

**LBH100A, AE**
**LBH100A, AE-H**
**LBH100A, AE-P**
**LBH110A, AE**
**LBH110A, AE-H**
**LBH110A, AE-P**

100Mbps          10 Mbps

# Media Converter Switches

# BLACK BOX®Series

# Media Converter Switches

LBH100-series = 100Mb fiber + 2 10/100 copper ports
LBH110-series = 10 Mb fiber + 2 10/100 copper ports

# Installation and User Guide

**Trademarks**
Ethernet is a trademark of Xerox Corporation
NEBS is a trademark of Telcordia Technologies
UL is a registered trademark of Underwriters Laboratories

> **Important:** The LBH100 and LBH110 -series 10/100 Mb/s Media Converter Switches contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with LBH 100 and 110 10/100 Mb/s Converter Switch products, consult Section 5, Troubleshooting, of this User Guide.

**Contacting Black Box Corporation**

Please use these mailing address and phone and fax numbers:

*__Black Box Corporation__*

*1000 Park Drive*

*Pittsburgh, PA 15055*

*__Phone: (724) 746-5500__*

*Fax: (724) 746-0746*

E-mail: info@blackbox.co

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FEDERAL COMMUNICATIONS COMMISSION
AND
CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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

This digital apparatus does not exceed the Class A 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 la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

**NORMAS OFICIALES MEXICANAS (NOM)**
**ELECTRICAL SAFETY STATEMENT**
**INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberan ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean reconnendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recommendado por el fabricante.

8. Servicio—El usuario no debe intentar dar sercicio al equipo eléctrico más allá a lo descrito en las instrucciones de operatión.  Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal mannera que su posición no interfiera su uso.  La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance du fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado una fuente de poder sólo del tipo descrito en el instrucivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de mal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recommendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:
   A: El cable de poder o el contacto ha sido dañado; u
   B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
   C: El aparato ha sido expuesto a la lluvia; o
   D: El aparato parece no operar normalmente o muestra un cambio en su desempeño;;o
   E: El aparato ha sido tirado o su cubierta ha sido dañada.

Certification Notice for
Equipment Used in Canada

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility—in this case, your supplier. Any repairs or alterations made by the user to this

equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION:
Users should not attempt to make such
connections themselves, but should contact
the appropriate electric inspection authority,
or electrician, as appropriate.

The LOAD NUMBER (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

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Revisions
**Rev A 01/05:** Corrections on pages 30 & 33
**Rev A 10/04:** Minor editing correction on power supply options

**Rev A 09/04:**  Initial release of this user manual for LBH100-series Media Converter Switches

**1.0     SPECIFICATIONS**

**1.1     Technical Specifications**

**Ports Performance**

When a port is operating at 100Mbps:
    Data Rate: 100Mbps

When a port is operating at 10 Mbps:
    Data Rate: 10 Mbps

**Network Standards**

100Mb:   Ethernet IEEE 802.3u, 100BASE-TX, 100BASE-FX

10 Mb:    Ethernet IEEE 802.3, 10BASE-T

Auto-sensing for speed: IEEE 802.3u

**Packet-Processing Between Domains**

Filter and Forward Rate from 100Mbps ports: 148,800 pps max

Filtering and Forwarding Rate from 10 Mbps ports: 14,880 pps max.

Processing type: Store and Forward, non-blocking

Auto-learning: 2K address table

Address buffer age-out time: 300 sec.

Packet buffers memory: 128KB, dynamically shared on all domains
Latency (not including packet time):    100 to 10 Mbps:   5μs
                                          10 to 100Mbps:   15μs

**Path Delay Value**: 50 BT on all ports

**Maximum Ethernet Segment (or Domain) Lengths**

| | |
|---|---|
| 10BASE-T (Unshielded twisted pair) | - 100 m (328 ft) |
| 100BASE-TX (CAT 5 UTP) | - 100 m (328 ft) |
| 100BASE-FX, half-duplex: (multi-mode, single-mode) | - 412 m (1350 ft) |
| 100BASE-FX, full-duplex: (multi-mode) | - 2 km (6,562 ft) |
| 100BASE-FX, full-duplex: (single-mode) | - 20 km (65,620 ft) |
| 100BASE-FX, full-duplex: (single-mode, long reach) | - 40 km (131,240 ft) |
| 10BASE-FL, Fiber optic | - 2 km (6,562 ft) |
| 10BASE-FL, Single-mode Fiber optic | - 10 km (32,810ft) |

**Operating Environment**

LBH100, LBH110  office:      32°F to 104°F (0°C to 40°C)

LBH100, LBH110: -15°F to 140°F (-25°C to 60°C) long term per agency tests (UL).
        -40°F to 185°F (-40°C to 85°C) Short term per IEC Type tests.

LBH100, LBH110:   -40°F to 167°F (-40°C to 75°C) Long term per agency tests (UL).
        -58°F to 212°F (-50°C to 100°C) Short term per IEC Type tests.

**<u>Storage Temperature</u>**,

All models:      -40°F to 185°F (-40°C to 85°C)

**<u>Cold Start</u>:**

LBH100, LBH110  to -20ºC

LBH100, LBH110 Extreme   to -40ºC

**<u>Ambient Relative Humidity</u>**: 5% to 95% (non-condensing)

**<u>Altitude</u>** (All models):      -200 to 50,000 ft. (-60 to 15,000 m)

Conformal Coating (optionally available)  for humidity protection

Note: H and P models are designed for NEBS compliance for vibration, shock and altitude.

**<u>Packaging:</u>**

Enclosure:  Rugged sheet metal (steel).
Dimensions of the Switch unit:
3.5 in H x 3.0 in W x 1.0 in D (8.9 cm x 7.6 cm x 2.5 cm)

Weight:   base unit, all models: 4.6 oz. (130g);
Power supply:   Office:  5.9 oz (170g)
              Hardened:  5.8 oz (165g)
              Extreme:  7.9 oz (225g)

### Cooling Method:

Convection on the regular model. The hardened (H) factory floor and extreme (P) temperature un-controlled location models have closed cases to withstand dirt, and use special thermal techniques to transfer heat to the outside of the case for cooling.

### POWER SUPPLY

These products are intended to be supplied by a Listed, Direct Plug-In power unit, marked "Class 2", or a Listed ITE Power Supply, marked "LPS", which has suitably rated output

voltage (i.e. 9vdc, 12vdc, 24vdc, 48vdc), and suitably rated output current (i.e. 100mA to

500mA).When connected to a 48 V centralized dc source these products shall be provided

with a Listed 5 A DC fuse in the supply circuit.

**AC POWER SUPPLY ( using an external power adapter):**

All models have an (8-15)VDC output with 6ft long cord and a 2.5mm center +ve jack. The
power supplies are temperature rated to match the Media Converter Switch ratings.

**Office Ratings (0 to 40°C)**

**North America models.** Input:  wall plug,  12ovac at 60 Hz.

**International models**. Input:  240vac at 50Hz with

         IEC 320 connector for the user-supplied AC power cord.

         Output:12vdc, 1Amps

**Factory Floor  Ratings (-25 to 60°C)**

**North America(-Hd) models.** Hardened, factory floor temperature rated. Input: 6ft AC
power cord to IEC 320 connector on the 100-240vac 47-63Hz external power adapter.
Output:12vdc, 1.25Amps

**International models**. Factory floor temperature rated. Input: IEC 320 connector on the 100-240vac 47-63Hz external power adapter. Requires a user-supplied power cord.
Output:12vdc, 1.25Amps

**Temperature un-controlled Extreme  Ratings (-40 to 75°C)**
**North America(-Pd) models.** Outdoor temperature rated. Input: 6ft AC power cord to IEC 320 connector on the 100-240vac 47-63Hz external power adapter.
Output:12vdc, 2Amps

**International models**.  Outdoor temperature rated. Input: IEC 320 connector on the 100-240vac 47-63Hz external power adapter. Requires a user-supplied power cord.
Output:12vdc, 2Amps

**Internal DC POWER SUPPLY :** **built-in terminal block for +, -, ground along with 12VDC jack**

**12V DC** internal (range of 8.0 to 15V DC),.

**24V DC** internal (range of 18 to 36V DC),.

**-48V DC** internal (range of 36 to 60V DC), , -, ground.

**Power Consumption**:  See Section 3.6.

**Note 1:**  the 8-15V DC jack can be used for dual source DC input using an AC adapter and the DC terminal block. Power supply protection is provided by internal diodes.

**Note 2:** The Direct DC power floats. The user may ground either "+" or "-"  if desired.

**Port Connectors:**

Two RJ-45 Ports: support 100BASE-TX and 10BASE-T with auto-cross (MDIX). They are shielded 8-pin female connectors for shielded (STP) and unshielded (UTP) Cat 3, 4, 5 copper twisted-pair cable.
One Fiber optic port: On the LBH110 series, it is 10Base-FL with ST connector. On the LBH100 series, it is 100Base-FX with a "fiber flavor" choice of multimode SC, ST or MTRJ or single-mode SSC, SSCL, SST or SLC connectors.

For Power over Ethernet (POE) pass-through option on the RJ-45 connectors of the H and P models, request quote.

**Switches**

The Fiber Port is controlled by an "F – H" switch, provided underneath it.
"F" enables full-duplex mode and "H" enables half-duplex mode.
The default setting is "F" for 100Mb fiber models, "H" for 10 Mb fiber models.

**LED Indicators** **(Dual: front and top)**

       POWER:  Steady ON when power applied

       10/100:    Steady ON for 100Mbps; OFF for 10 Mbps

       LK/ACT: Steady ON for LINK (LK) with no traffic, BLINKING indicates

                port is transmitting / receiving (Activity).

       F/H:        Steady ON for full-duplex, OFF for half-duplex

**Mounting options**

Metal mounting clips for panel mounting:  included

DIN-Rail mounting option: Model # DIN-RAIL MC2 (see Section 3.4)

Rack-mount option:  LE1505-RACK, (see Section3.2/3.3)

Rack-mount option with group AC power supply:  LE1505P-RACK, (see Section3.2/3.3)

**Mean Time Between Failure**  **(MTBF)** – over15 years, Telcordia (Bellcore) Method

**Agency Approvals and Standards Compliance:**

UL Listed (UL 60950), cUL, CE, Emissions meets FCC Part 15 Class A.
NEBS L3 and ETSI compliant.
H and P models: IEEE P1613 Env. Std for Electric Power Substations
P models: NEMA TS-2 and TEES for traffic control equipment
P models: designed for above-the-ceiling (plenum) installation
IEC61850 EMC and Operating Conditions Class C Power Substations

**1.2     LBH100 Models (for 100Mb fiber).**

LBH100A-ff = two 10/100 RJ-45 ports + one 100 Mb "ff" Fiber port for office and wiring closet
         (0 to 40°C) using an external AC power supply.
LBH100A-H-ff = Hardened (H), two RJ-45 + one 100Mb "ff" Fiber port for factory floor
         (-25 to 60°C) using internal DC ( 8-15VDC) and/or external AC hardened power supply
LBH100A-H-ff-12VDC = Same as LBH100A-H-ff model, except AC Hardened PS is not included
LBH100A-H-ff-24VDC = Same as LBH100A-H-ff-12VDC model, except  24VDC replaces 12VDC
LBH100A-HD-ff-24VDC = Same as LBH100A-H-ff-24VDC but includes DINRAILMC2 mounting
LBH100A-H -ff-48VDC = Same as LBH100A-H-ff-24VDC model, except  -48VDC replaces 24VDC
LBH100A-P-ff  = Extreme (P), two RJ-45 + one 100Mb "ff" Fiber port for un-controlled (outdoor)
         (-40 to 75°C) using internal DC (8-15VDC) and/or external AC extreme PS
LBH100A-P-ff-12VDC = Same as LBH100A-P-ff model, except AC Extreme PS is not included
LBH100A-P-ff-24VDC = Same as LBH100A-P-ff-12VDC model, except  24VDC replaces 12VDC
LBH100A-PD-ff-24VDC = Same as LBH100A-P-ff-24VDC but includes DINRAILMC2 mounting
LBH100A-P -ff-48VDC = Same as LBH100A-P-ff-24VDC model, except  -48VDC replaces 24VDC


The "ff" field is for selection of the desired "fiber flavor" as listed below.
"SC"  = 100Base-FX-SC: multi-mode fiber optic with SC type connector, 2km.
"SSC"= 100Base-FX-SSC: single-mode fiber optic with SC type connector, 20km.
"SSCL"= 100Base-FX-SSCL: single-mode fiber optic with SC type connector, 40km.
"ST"  = 100Base-FX-ST: multi-mode fiber optic with ST type connector, 2km.

"SST" = 100Base-FX-ST: single-mode fiber optic with ST type connector, 20km.
"SLC"= 100Base-FX-SLC: single-mode fiber optic with LC type connector, 15km.
"MTRJ"= 100Base-FX-MTRJ: multi-mode fiber optic with MTRJ type connector, 2km.

**<u>Accessories</u>**
LE1505-RACK = 19" Rack-mount tray for LBH-series Switch models, up to 16 units
     Other Tray configurations with power supplies and power cabling included  -  see Section 3.3

DIN-RAIL-MC2 =   Metal DIN-Rail mounting bracket for one LBH-series Switch - see Section 3.4
Conformal Coating (for high humidity and "tropical" applications) -   request quote.

## 2.0     INTRODUCTION

This section describes LBH100- and LBH110-series models, including appearance, features and typical applications.

### 2.1   Inspecting the Package and the Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier immediately of any damage which you believe occurred during shipment or delivery.  Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

| | |
|---|---|
| 1 | LBH100- or LBH110-series Media Converter Switch unit, |
| 1 | External AC Power Supply, (for selected models only, see Section 1.2) |
| 1 set | Metal panel mounting clips and screws (2 each) |
| 1 | User Guide (this manual) |

Remove the LBH100A or LBH110A-series Media Converter Switch from the shipping container. Be sure to keep the shipping container should you need to ship the unit at a later date. In the event there are items missing or damaged, contact Black Box.  If you need to return the unit, use the original shipping container.  Refer to Section 5 Troubleshooting, for specific return procedures.

## 2.2 Product Description

Combine a 10 or 100 Mb Fiber Media and a two-port 10/100 copper Switch, and you have the Media Converter Switch, a flexible edge-of-the-network Ethernet product which function as both a media converter and a switch. Add in fiber port choices for all multi-mode and single-mode fiber connector types plus AC or DC input power selection and multiple application environments, and you have the Black Box's LBH100A, AE and LBH110A, AE-series Media Converter Switch family.

The LBH100A and LBH110A family of Media Converter Switches with a 100 Mb or 10Mb Fiber port built in is tough enough to withstand any application environments, with regular (office), Hardened (factory floor), and Extreme-rated (outdoor) versions. Extra features for heavy-duty and extended temperature operation ranges are included selectively in the Hardened factory-floor and Extreme-rated outdoor models. This selection of models and fiber port types offers the best price-to-value ratio for each user and installation. Where

a Media Converter might have been used, a Converter Switch offers a better value. The compact package is ideal for network edge installations, and is able to be conveniently mounted to suit any application.

The LBH100A and LBH100A Series regular-package units are for office and indoor wiring closet environments. These are the economical base units in the LBH100A and LBH100A Series Switch family. An external AC power supply for either North America (A, 115vac 60Hz) or international (AE, 230vac 50Hz) is included. The ambient temperature rating is 0°C to 40°C, office grade. A robust metal case with convection cooling is featured. Metal mounting clips are included, and rack-mount tray options are available.

The LBH100A-H and LBH110-H Series Hardened units are for factory floor applications. The LBH100A-H and LBH110A-H models are built with high-grade

components and are constructed using special thermal techniques and a metal case for heavy duty industrial jobs. In addition to a Hardened AC power option and jack, terminals for internal DC power choices at 8 to15V, 24V or -48V DC are included. The ambient temperature rating of –25 to 60C is for industrial use. No internal air flow is required for cooling, so it resists dust, dirt, moisture, smoke and insects. Mounting options include stand-alone panel-mounting, DIN-Rail, or rack-mount tray.

The LBH100A-P and LBH110A-P Series Extreme-rated units are for temperature un-controlled applications (-40 to 75C), typically located outdoors. The LBH100A-P and LBH110A-P Series models are built with extreme-grade extended temperature components, and use similar thermal techniques as the LBH100H Hardened units. In addition to a Extreme-rated AC power option and jack, terminals for internal DC power choices at 8 to15V, 24V or -48V DC are included. When used outdoors, the LBH100P should be

protected from falling rain. Mounting options include stand-alone panel-mounting, DIN-rail, or rack-mount tray.

The LBH110-series provides switching between two 10/100 auto-negotiating copper ports and one 10Mb ST fiber port and the LBH100 series provides switching between two 10/100 auto-negotiating  copper ports and one 100Mb fiber port which may be SC, ST, MTRJ or LC multi-mode or single-mode.  The plug-and-play, energy-efficient, and flavor rich fiber features make this sleek multi-purpose Switch convenient and cost-effective for the user.  The selection of various temperature ranges enable easy deployment in various environments and qualify the Media Converter Switch as a flexible option, which provides multiple solutions using very small space.  Providing the combination of Media Converter with Switch, the LBH100A and LBH110A Series is an ideal choice for edge-of–the-network applications.

The LBH100A and LBH100A Series models (as shown in Fig 2.2.a) units are for office and wiring closet environments and use an external AC power supply.  A ventilated

Fig 2.2 a

metal case for convection cooling is featured.  Ambient operating temperature is 0° to 40°C.  Storage temperature rating is -40°to 85°C.  Metal clips are included for secure panel mounting.

**Fig 2.2a  LBH100A with 100Mb ST connector**

The LBH100A-H and LBH110A-H hardened units (as shown in Fig 2.2b) are designed for factory floor/Industrial applications. Using special thermal techniques and a sealed rugged metal case for heavy duty industrial applications no air inflow is required for cooling, so the LBH100A, AE-H and LBH110A, AE-H resist dust, dirt, moisture, smoke and insects. Choices of models for external AC or internal DC power are available. Ambient operating temperature is –25°C to + 60°C depending on the power source used. Storage temperature rating is –25°C to + 85°C

Fig 2.2b

**Fig 2.2.b  LBH100A-H with**

**100Mb SC connector**

The  LBH100A-P and LBH110A-P series
(as shown in Fig. 2.2c) are extreme rated
units suitable for temperature un-controlled
outdoor applications. Specially designed
with extreme-grade extended temperature
components, the LBH100P and LBH110A-
P units use similar thermal techniques to
the LBH100A-H hardened units for
cooling. Mounting options include panel-
mounting, DIN-rail, or rack-mount tray. Choices of models for external AC or internal DC
power are available. Ambient operating temperature is between –40°C to +75°C depending
on the power source used.   Storage temperature rating is between –40°C to +85°C.

**Fig 2.2c    LBH100A-P with 100Mb SC Connector**

The front side of the unit has two twisted-pair 10/100Mb switch ports and one 10 or 100Mb fiber port.  Both the RJ-45 ports of the LBH100A and LBH110A Series Media Converter Switches support auto-cross (MDIX) operation performing the auto-cross function under auto-negotiation mode only. The 10Mb fiber (LBH110 models) are factory configured at Half-duplex, and 100Mb (LBH100 models) are factory configured at Full-Duplex.

Fig 2.2c

Two sets of LEDs to indicating the operating status of ports are mounted on the top and front (for extra viewing advantage while rack-mounted). For each port, there are Link and Activity (LK/ACT) LED's on the top indicating that the media cables are connected correctly and showing, by blinking, when there is traffic. The LK/ACT LED's are repeated on the front as LA1 (port 1), LA2 (port 2), and LA3 (port 3). There is a power (PWR) indicator on the front of the unit to validate that the unit is turned ON.

The single fiber port on the LBH110's is multi-mode with an ST connector and , on the LBH100's, it is an SC, ST or small form-factor connector (MTRJ multi mode or LC single-mode). The Full Duplex/Half Duplex ("F- H") manual switch provided underneath the fiber port allows the user to fix the fiber port at Full or Half Duplex mode as required.

The external DC power plug connector and/or "jack" and the internal DC input terminal is provided on the rear of the unit.

### 2.3 Frame Buffering and Latency

The LBH100A and LBH110A Series Media Converter Switches are store-and-forward switches. Each frame (or packet) is loaded into the Switch's memory and inspected before forwarding can occur. This technique ensures that all forwarded frames are of a valid length and have the correct CRC, i.e. they are good packets. This eliminates propagation of bad packets, enabling all of the available bandwidth to be used for valid information.

While other switching technologies such as "cut-through" or "express" impose minimal frame latency, they will also permit bad frames to propagate out to the Ethernet segments connected. The "cut-through" technique permits collision fragment frames, which are a result of late collisions, to be forwarded to add to the network traffic. Since collisions and bad packets are more likely when traffic is heavy, the result of store-and-forward operation is that more bandwidth is available for good packets when the traffic load is greatest.

To minimize the possibility of dropping frames on congested ports, each LBH100A and LBH110A Series Media Converter Switch dynamically allocates buffer space from 128Kb memory pool, ensuring that heavily used ports receive very large buffer space for packet storage. (Many other switches have their packet buffer storage space divided evenly across all ports, resulting in a small, fixed number of packets to be stored

per port.  When the port buffer fills up, dropped packets result.) This dynamic buffer allocation provides the capability for the maximum resources of the LBH100A and LBH110A Series unit to be applied to all traffic loads, even when the traffic activity is unbalanced across the ports.  Since the traffic on an operating network is constantly varying in packet density per port and in aggregate density, the LBH100A and LBH110A Series Media Converter Switches are constantly adapting internally to provide maximum network performance with the least dropped packets.

When the Converter Switch detects that its free buffer queue space is low, the Switch sends industry standard (full-duplex only) PAUSE packets out to the devices sending packets to cause "flow control". This tells the sending devices to temporarily stop sending traffic, which allows a traffic catch-up to occur without dropping packets.  Then, normal packet buffering and processing resumes.  This flow-control sequence occurs in a small fraction of a second and is transparent to an observer.  See Section 4.6 for details.

Another feature implemented in LBH100A and LBH110A Series Media Converter Switches is a collision-based flow-control mechanism (when operating at half-duplex only). When the Switch detects that its free buffer queue space is low, the Switch prevents more frames from entering by forcing a collision signal on all receiving half-duplex ports in order to stop incoming traffic.

**2.4 Features and Benefits**

■ **Full 100Mb or 10 Mb switching services for high performance LANs**
LBH100A and LBH110A Series Switches provide Fast Ethernet switching
on all ports.  They perform high speed filter/forward operations on the
traffic, giving each port's segment a full 100Mb (or 10 Mb) of bandwidth.

■ **Reduces Network Costs and provide economical solution**

LBH100A and LBH110A Series Switches offer the ideal solution to
efficiently and inexpensively connect a Twisted Pair and fiber network with
10Mb or 100Mb and help to expand the Ethernet network in a very
convenient and economical way.

■ **Choice of 10 or 100Mb Fiber option, more efficient than media
converter** Designed as a multi-purpose media converter and Switch, the 10
or 100Mb fiber port allows the user to convert the media from copper to
fiber and the other RJ-45 port can be used as diagnostic port or for more
connectivity.

■ **Installation is "Plug and Play", operation is transparent to software**
The LBH100A and LBH110A Series Switches operate as hardware switches, only forwarding those packets from each domain that are needed on the other domains.  Internal address tables are self-learning, enabling users to change port connections or 10/100 domains without affecting operations.

■ **Two sets of LEDs for viewing status from any angle.**
Each LBH100A and LBH110A Series Converter Switch is equipped with two sets (front and top) of LEDs to provide status information when viewed at almost any angle or mounting arrangement whether rack (MC14- Tray) or wall-mounted**.**

■ **Rugged metal case, Industrial grade**
LBH100A and LBH110A Series have a robust design and are packaged in a rugged sheet metal enclosure to ensure high reliability and durability even when placed in industrial or outdoor applications.

■ **Qualified to use for temperature un-controlled "outdoor" application**

      The LBH100A-P and LBH110A-P Extreme rated versions of Media Converter Switches have an ambient temperature rating between –40C to +75C for DC models and qualify for temperature un-controlled "outdoor" application.

■ **Efficient Compact design, for all purpose convenient mounting**

Featuring a compact steel case with an external AC  and internal DC power supply, LBH100A and LBH110A Series of Media Converter Switches can be installed in small spaces in cabinets, on table tops, in racks, wall or DIN rail mounted and in trays such as the LE1505-RACK.

■ **MDIX ports  to eliminate cross-over cable while cascading**

All the LBH100A and LBH110A Series Switches are featured with MDIX (auto-cross), which easily allow cascading with other Switch Hubs or media converters, without using the cross-over cable.

**2.5   Applications for LBH100A and LBH110A Series Media Converter Switches**

Enriched with the three tier  hardness rating flavors   "office", "Hardened", and "Extreme" (outdoor), the multifunctional, multi-media and multi-environmental, LBH100A and LBH110A Series Media Converter Switches fit very well in almost any environment enabling users to scale their networks quickly and cost effectively. The edge-of-the-network connectivity solutions offered by Media Converter Switches are focused on providing easier, more economical and ultra-reliable industrial application products.  The compactly designed LBH100A and LBH110A Series act as very useful tools in the modern life of fast expanding network requirements. The Dual-Speed and Dual-media functions support a mixed environment of 10 Mbps and 100Mbps users with copper and fiber media. The switched full / half duplex capability on fiber ports provides high bandwidth performance. The up-link choice of 10 or 100Mb fiber on Port# 1 enables easy expansion for the on-going demand of Ethernet networks. The 10/100Mbps auto-negotiating copper ports together with the 10 or 100Mbps fiber port choices and the availability of all of the

industry standard fiber connectors, enable easy interfacing with existing cable plant and equipment.

The LBH100Ps and LBH110Ps fit very well in high temperature locations experiencing a need to scale the LAN quickly and cost effectively. With its half / full duplex switching capability on fiber port # 1, the LBH100Ps provide a very economical high bandwidth solution at each cable user access point of copper, and also easily solve long distance requirements.   The ruggedness of the LBH100P's steel case and the high reliability of the design compliments the temperature controlled packaging to provide an exceptional Ethernet product.

**Example1. Indoor Office LBH100A or LBH110A**

In this example, the indoor office location is a Data Mining function with an ongoing demand to grow the network. This need can be easily met using the economical LBH100A or LBH110A Converter Switch.  Additional functionality includes the ability to transfer

data across large distances with multi- or single–mode fiber while securing the LAN from

EMI and wire tapping.
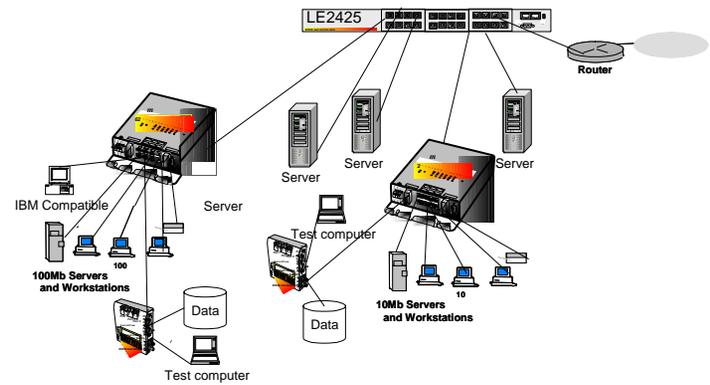


Media Converter Switches provided a secure dependable,
reliable solution for un-controlled temp. environment

**Example 2: LBH100A-H and LBH110A-H**
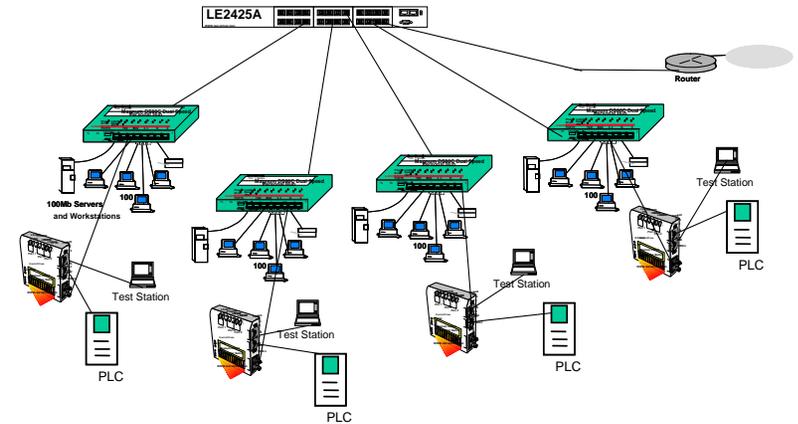


LBH100A-H Converter Switches provided a secure economical
solution for expanding Industrial network

In this application, where in expanding an industrial network environment, the new PLC units are deployed on an existing network and each needs one (or two for redundancy) Ethernet ports to carry status and control data to the control center the hardened version of LBH100A-H or LBH110A-H is typically used. . The Fiber port on the Media Converter Switches is ideal for secure data communications over long distances that may be encountered in this edge of network application. Built with high-grade components, efficient cooling techniques and having no openings for dirt to enter, the LBH100A and LBH110A Series Media Converter Switches provide the very effective solution for this need.

**Example 3: LBH100A-P or LBH110A-P**
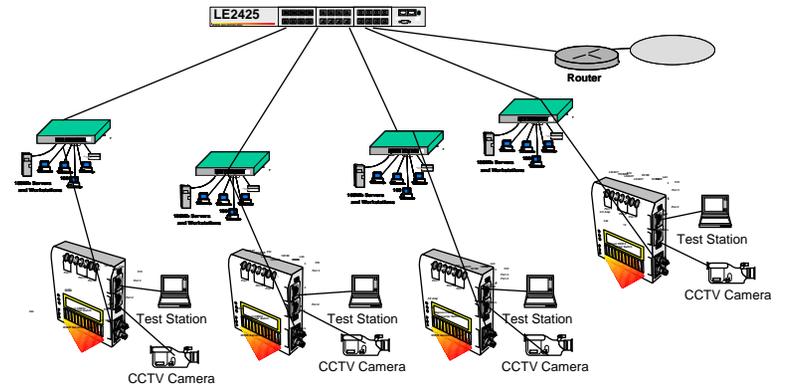
In this example, the LBH100A-P or LBH110A-P Series extreme Media Converter Switches are deployed to serve as a secure corporate or transportation surveillance system. CCTV cameras may be spread out over many miles in temperature un-controlled locations and with pan, tilt and zoom (PTZ) controlled through an Ethernet copper port .The extreme Media Converter Switches are ideally suited to providing copper to fiber media conversion for secure long distance (2-40km) communication while being installed in temperature un-controlled cabinets and allowing a full range of AC and DC power options.  The second copper port at the remote location provides access for other Ethernet equipment such as motion detectors or will act as a test port for maintenance personnel with up-link for access to a central LAN and central file servers.

**3.0     INSTALLATION**

     This section describes the installation of the LBH100A and LBH110A Series Media Converter Switches, including location, mountings, power supply options and media connection.

**3.1   Locating the Converter Switch Unit**

     The compact and lightweight design of the LBH100A and LBH110A Series allows it to be easily installed in almost any location. Metal mounting clips and screws are included for a rugged and secure mounting in any orientation. Alternatively, a Velcro strip may



**Secure attachment of mounting clips for panel - mounting**

be used for mounting the unit on a vertical surface such as a wall or cabinet, or for securing the unit on a table-top or shelf.

Installation of the LBH100A and LBH110A Series Media Converter Switches is a simple procedure.  The installation location is dependent upon the physical layout of the Ethernet network and associated cabling.  Make sure the unit is installed in a location that is easily accessible to an AC power outlet or the appropriate DC source and where cooling is not inhibited. The green Power (PWR) LED must turn ON when power is applied.

**3.2  LE1505-RACK for Rack Mounting of LBH100A and LBH110A Series Switches**

For 19" rack-mounting of LBH100A and LBH110A series Media Converter Switches, a rack-mount tray is available, the LE1505-RACK. The Media Converter Switches are
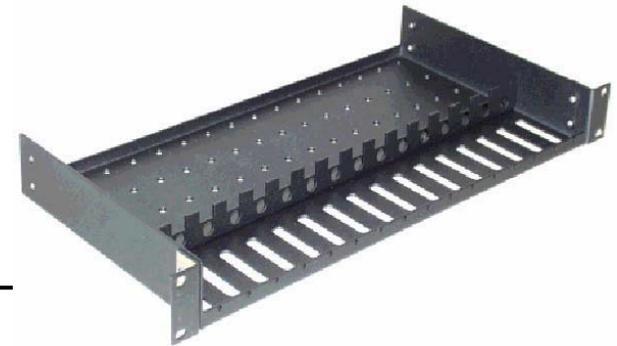
mounted with the DC power jack in the back, with the fiber and the RJ-45 connectors in the front.  Any mix of the Media Converter Switches and/or Media Converters may be placed on a tray, up to a maximum of 16 units. (The mounting spaces of the LE1505-RACK are specific to the products and will not permit other models to be properly mounted).

In a typical installation, the LE1505-RACK, 19" rack-mount tray will hold a few (three to eight) LBH100A and LBH110A Series Media Converter Switches, with their power supplies plugged into power strips (not included) in the rear area of the tray.  Metal mounting screws in the bottom-front hold the Media Converter Switches firmly in place. The beveled-top edge of the units permits the LEDs of each unit to be viewed for operational status, even when the units are very close together.

**3.3  LH1505P-RACK for Rack Mounting Media Converter Switches**

The LH1505P -RACK is another option available for Rack Mounting the mix-match of LBH100A and LBH110A Series Media Converter Switches together in 19" rack-mount tray. The LH1505P-RACK model comes with built-in common universal AC power supply rated at 40 watts at 50C ambient, 12VDC output, and supporting up to 10 MC units. (Six tray positions for MC's are not wired for power).  Typically, 3 to 8 MC units are in use with a LH1505P-RACK, with expansion space left available.

The LH1505P-RACK holds up to 10 mix-match of 10Mbps and 100Mbps Black Box Media Converter Switches. (The MC mounting spaces of the LH1505P-RACK are specific to the 10Mb "LBH110A"- series and the 100Mbps "LBH100A" series, and do not permit other models or other sizes to be put in the tray).

The side-view picture shown here is an example of an installation of the model LH1505P-RACK, 19" rack-mount tray, holding a few 10 and 100Mbps Media Converter Switches, each with their power input plugged into the built-in common AC power supply in the rear area of the tray. (PS units that come with the MC's are not used)..

Metal mounting screws in the bottom-front hold each of the media converters and converter Switches secure in the tray, separately removable for service. The dual LEDs permit viewing operating status of the Media Converters and Converter Switches from any angle.

### 3.4  DIN-Rail mounting option

The LBH100A and LBH100A Series Media Converter Switches, designed for use in "Factory Floor" Industrial Ethernet environments, are also available for DIN-Rail mounting in an enclosure having DIN Rails.

**An LBH100 is shown alongside the DIN-Rail-MC2 bracket**

The metal DIN-Rail mounting hardware is optional and needs to be ordered as a separate item, e.g. Model #DIN-RAIL-MC2.

It comes with four screws to attach the bracket to the MC unit. The rail clip is spring-loaded with a pull-up latch at the top for easy "snap-on" attachment and removal.

The LBH100A and LBH100A Series models with "HR" have 24VDC power, and have the DIN-Rail-MC2 bracket included and assembled with the MC unit at the factory.

**3.5  Power Requirements, Power Supply Types for LBH100A and LBH110A Series**

LBH100A and LBH110A Series Switches are power-efficient and can work with an external AC power supply.  LBH100A and LBH110A Series require a nominal 12VDC input version.  The extended temperature (H and P) versions are used for heavy duty industrial applications.

The 12V DC power input has a plug of 2.5mm, center +ve , with 6 ft. cord. All the AC power supply info detail is provided in Technical Specifications Section 1.1.

The LBH100A and LBH110A Series are designed to be used with UL listed Class II power supplies. The LBH100 hardened Media Converter Switches provide reliable operation, withstand higher temperature environments, and provide the DC power choices to the user to deploy in uncontrolled temperature environments.

**12VDC**                          **24VDC**                          **-48VDC**

The Direct DC (Internal) 12V DC (8 – 15V DC) has a built-in terminal block for +, -, ground. The 9V DC jack is also present. Detail information about the 12 VDC, the 24V DC and the –48V DC is provided in the Technical Specifications Section 1.1.

The various models of DC power type and extended ambient temperature power supplies are numerous and your choice needs to be called out on your order.

*Note: When connected to a - 48 V centralized dc source, these products are to be installed only in Restricted Access Areas (dedicated equipment rooms, electrical closets or the like).*

### 3.6 Powering the LBH-series (DC internal) with 12V, 24V or –48VDC power input

Many models of the LBH100-Series MC's are equipped with an internal DC power supply, and have built-in screw terminals for secure attachment of the power leads.

Three models support a range of power input types. The three model choices are for use with 12VDC, 24VDC or - 48VDC power.  DC power input may be chosen for high-availability.



The extended temperature capability of the DC-powered hardened LBH100's can go temperature uncontrolled environments, rated at –40`C to +75`C.  If indoors, the DC jack is also present and optionally can be used with an external AC power supply.

**DC Power Terminals**: "+", "-", gnd

**GND**:  Terminal for "earth" or ground wire connection to the LBH100 chassis

**Input Voltage**:      8 - 15V DC (12V DC)

                       18 – 36V DC (24V DC)

                       36 – 60V DC (-48V DC)

**Input current**:      0.8 amp.(12V DC)

                       0.4 amp max.(24V DC)

                       0.2 amp max.(-48V DC)

**Power Consumption**: 4.8 watts typical, 6 watts max.

### 3.7 LBH100H and P Series , DC-powered, -48VDC, 24VDC and 12VDC Installation

This section describes the proper connection of the -48VDC leads (or 24VDC, 12VDC leads) to the DC power terminal block on the LBH100 hardened media converter (as shown in Figure ). The DC terminal block on the  LBH100H

is located on the left side of the unit and is equipped with three (3) screw-down lead posts. The power terminals are identified as positive (+) and negative (-), and they are floating inside the unit so that either of the terminal may be grounded by the user if desired.  The chassis is "earth" or ground (GND).

The connection procedure is straightforward. Simply insert the DC leads to the LBH100H's power terminals, positive (+) and negative (-) screws. The use of Ground (GND) optional; it connects to the LBH100H chassis. Ensure that each lead is securely tightened from the top, as shown here.

*NOTE: Always use a voltmeter to measure the voltage of the incoming power supply and figure out the +ve potential lead or -ve potential lead. The more +ve potential lead will connect to the post labeled "+ve" and the rest to the "-ve".*

*The GND can be hooked up at the last.*

When power is applied, the green PWR LED will illuminate.

### 3.8 Connecting Ethernet Media

The LBH100A and LBH110A-series Media Converter Switches can be connected to two media types i.e. fiber and copper (RJ-45) types, runt at 100BASE-TX, 10BASE-T and 100BASE-FX, or 10BASE-FL.  CAT 5 cables should be used when making 100BASE-

TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used.  In either case, the maximum distance for unshielded twisted pair cabling is 100 meters (328 ft). For fiber port 10BASE-FL or 100BASE-FX multi-mode, 50/125 or 62.5/125 microns cabling can be used, whereas for single-mode, 9/125 microns cabling should be used. Fiber cabling supports much longer cable distance and higher bandwidths as compared to copper wiring.

| Media | IEEE Standard | Connector |
|---|---|---|
| Twisted Pair (CAT 3 or 5) | 10BASE-T | RJ-45 |
| Twisted Pair (CAT 5) | 100BASE-TX | RJ-45 |
| Fiber (Multi-mode, Single -mode) | 10BASE-FL | ST |
| Fiber (Multi-mode) | 100BASE-FX | ST, SC |
| Fiber (Single-mode) | 100BASE-FX | SC, LC |
| Fiber (Multi-mode) | 100BASE-FX | MTRJ |

**NOTE :** *It is recommended that high quality CAT. 5 cables (which work for both 10 Mbps and 100Mbps) be used whenever possible in order to provide flexibility in a mixed-speed network, since P80-series switch ports are auto-sensing for either 10 and 100Mbps. Note that the auto-cross function does not operate, if the port is fixed or not supporting auto-negotiation.*

### 3.8.1    Connecting Twisted Pair (RJ-45, CAT 3 or CAT 5, Unshielded or Shielded)

The following procedure describes how to connect a 10BASE-T or 100BASE-TX twisted pair segment to the RJ-45 port.  The procedure is the same for both unshielded and shielded twisted pair cables.

1.  Using standard twisted pair media, insert either end of the cable with a RJ-45 plug into  the RJ-45 connector of the port. Note that, even though the connector is shielded, either   unshielded or shielded cables and wiring may be used.
2.  Connect the other end of the cable to the corresponding device.
3.  Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established. If this does not help, ensure that the cable is connected properly and that the device on the other end is powered and is not defective.

4. For Port # 1 or 1SW, if the LINK LED is not illuminated, move the switch which has a cross-over or up-link for linking to another hub or Switch.

### 3.8.2 Connecting Fiber Optic <u>ST-type</u>, "twist-lock"

The following procedure applies to installations using ST-type fiber connectors. This procedure applies to ports using multi-mode ST fiber connectors.

1. Before connecting the fiber optic cable, remove the protective dust caps from the tips of the fiber connectors. Save these dust caps for future use.

2. Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

   **Note:** *<u>One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.</u>*

3. Connect the Transmit (TX) port (light colored post) on the Fiber port to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection.

4. Connect the Receive (RX) port (dark colored post) to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.

5. The LINK LED on the front of the fiber connector will illuminate when a proper connection has been established at both ends (and when power is ON in the unit). If

LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the fiber connector to remedy this situation.

### 3.8.3    Connecting Fiber Optic <u>SC-type</u>, "Snap-In"

The following procedure applies to installations using SC-type fiber connectors, i.e., using multi-mode SC and SC single-mode. While connecting fiber media to SC connectors, simply snap on the two square male connectors into the SC female jacks of the Fiber connector until it clicks and secures.

### 3.8.4    Connecting <u>Single-Mode</u> Fiber Optic

When using single-mode fiber cable, be sure to use single-mode fiber port connectors. Single-mode fiber cable has a smaller diameter than multi-mode fiber cable (9/125 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode where xx/xx are the diameters of the core and the core plus the cladding respectively). Single-mode fiber allows full bandwidth at longer distances, about 20Km with the multi-mode SC.

The same procedures as for multi-mode fiber apply to single-mode fiber connectors. Follow the steps listed in Section 3.8.2 above.

### 3.8.5 Power Budget Calculations for LBH100A and LBH110A Series, Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using products, the following equations should be used:

OPB (Optical Power Budget) = $P_T$(min) - $P_R$(min)

where $P_T$ = Transmitter Output Power, and $P_R$ = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the "Cable Loss" for 62.5/125 and 50/125μm (m.m.) is 2.8 dB/km,

and the "Cable Loss" for 100/140 (Multi-mode) is 3.3 dB/km,

and the "Cable Loss" for 9/125 (Single-mode) is 0.5 dB/km

The following data has been collected from component manufacturer's (HP's, and Siemens') web sites and catalogs to provide guidance to network designers and installers

| Fiber Port Module | Speed, Std. | Mode | Std. km fdx (hdx) | Wavelength nm | Cable Size μm | X'mitr Output $P_T$, dB | R'cvr Sens. $P_R$, dB | Worst OPB, dB | Worst* distance Km, fdx | typical OPB, dB | typical* distance Km, fdx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LBH100-MST, MSC | 100Mb FX | Multi-mode | 2 (0.4) | 1300 | 62.5/125 | -20 | -31 | 9.0 | 2.5 | 14 | 5 |
|  |  |  |  |  | 50/125 | -23.5 | -31 | 5.5 | 2.0 | 12 | 4 |
| LBH100-SSC | 100Mb FX | Single-mode | 20 (0.4) | 1300 | 9/125 | -15 | -31 | 14 | 28 | 17.5 | 35 |
| LBH100-MTRJ | 100Mb FX | Multi-mode | 2 (0.4) | 1300 | 62.5/125 | -20 | -31 | 9.0 | 3.0 | 15.8 | 5.5 |
|  |  |  |  |  | 50/125 | -23.5 | -31 | 5.5 | 2.0 | 12.2 | 4.0 |
| Long Reach | 100Mb FX | Single-mode | 40 (0.4) | 1300 | 9/125 | -5 | -34 | 27 | 54 | 32.5 | 65 |
| LBH110-MST | 10 Mb FL | Multi-mode | 2 (2) | 850 | 62.5/125 | -15.0 | -31 | 14 | 5 | 17 | 6 |
|  |  |  |  |  | 100/140 | -9.5 | -31 | 19.5 | 5.9 | 23.5 | 7 |
|  |  |  |  |  | 50/125 | -19.5 | -31 | 9.5 | 3.4 | 13.5 | 4.8 |
| LBH110-single-mode | 10 Mb FL | Single-mode | 10 (5) | 1300 | 9/125 | -30 | -39 | 7 | 14 | 13 | 26 |

*** Not*e: The use of either multi-mode or single-mode fiber to operate at 100Mbps speed over long distances (i.e., over approx. 400 meters) can be achieved **<u>only</u>** if the following factors are both applied:*

- *The 100Mb fiber segment must operate in full-duplex (FDX) mode, and*
- *The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.*

*(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)*

### 3.8.6     Connections to NICs which support Auto-Negotiation, RJ-45 ports

The copper ports of LBH100-Series Media Converter Switches will function properly with NICs (Network Interface Cards) which support Auto-Negotiation, and the Fast Link Pulse (FLP) coding for the 100BASE-TX signaling system.  When connecting a NIC to the LBH100-Series, it may be necessary to reload the NIC drivers on the user device if the NIC has been communicating with a protocol other than 100BASE-TX (such as 10BASE-T).  When 100Mb operation is agreed and in use, the 10/100 LED is illuminated steady ON and  is OFF if 10 Mbps traffic.

**4.0      OPERATION**

**4.1   Dual-Speed Functionality, and Switching**

The LBH100A and LBH110A Series Media Converter Switches provide four switched ports (three ports in the front and one on the rear). The architecture supports a dual speed switching environment, with standard auto-negotiation capability.

The switched RJ-45 ports are full- or half-duplex auto-sensing for mode and speed, and auto-cross for plug polarity. (See Section 2.2). When the connected device is 10 Mbps, the LBH100s obeys all the rules of 10 Mbps Ethernet configurations. The 10 Mbps users can "communicate" with 100Mbps users as well as other 10 Mbps users through the switch. Similarly, the 100Mbps traffic obeys the rules of 100Mbps Ethernet, and can communicate with 10 Mb and 100Mb users.

LBH100A and LBH110A Series units are plug-and-play devices. There is no software configuring to be done at installation or for maintenance. The only hardware configuration settings is user options for port #2, to configure it FF/AN. The internal functions of both are described below.

**Switching, Filtering and Forwarding**

Each time a packet arrives on one of the switched ports, the decision is taken to either filter or to forward the packet.  Packets whose source and destination addresses on the same port segment will be filtered, constraining them to one port and relieving the rest of the network from processing them.  A packet whose destination address is on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed.  Packets needed for maintaining the operation of the network (such as occasional multi-cast packets) are forwarded to all ports. The LBH100A and LBH110A Series Media Converter Switches operate in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

**Switching, Address Learning**

       The LBH100A and LBH110A Series units have address table capacity of 2K node addresses, and are suitable for use in large networks. They are self-learning, so that as nodes are added or removed or moved from one segment to another, the LBH100- and LBH110- Series switch automatically keeps up with node locations.

       An address-aging algorithm causes least-used addresses to fall out in favor of new frequently-used addresses.  To reset the address buffer, cycle power down-and-up.

### 4.2  Auto-cross (MDIX), Auto-negotiation and Speed-sensing

       The RJ-45 ports independently support auto-cross (MDI or MDIX) in auto-negotiation mode. No cross-over cable is needed. The ports do the auto-cross selection only during auto-negotiation, and it will not take effect if the port is in fixed mode (port #2 can be fixed to FDX on some models). Operation is according to the IEEE 802.3u standard.

       When an RJ-45 cable connection is made, and each time a LINK is enabled, auto-negotiation takes place. The LBH100A and LBH110A Series advertises its capability for

10 or 100 Mbps speed and F/H duplex mode, and the device at the other end of the cable should similarly advertise / respond and both sides will agree to the speed and mode being used.  Depending upon the device connected, this will result in agreement to operate at either 10 Mbps or 100Mbps speed, full- or half-duplex mode.

**4.3  (F- H) Switch, Full-Duplex or Half-Duplex options for Fiber port # 1**

       The (F–H) manual switch has been provided for fiber port #1, for fixing that port at Full or Half Duplex as per the requirements. The (F-H) manual switch is being located underneath the fiber port. The Fiber port with 10Mb is being set at Half-Duplex, and the 100Mb being set at Full-Duplex as default from the factory. The port can be set at the required mode, by sliding the manual switch position to "F" or "H".

**4.4  Dual LEDs, Front-panel and side-panel   (LBH100A and LBH100A Series)**

**LED**      <u>**Description**</u>

**PWR**      Illuminates GREEN to indicate power applied.

**LK/ ACT**    Steady ON for LINK with no traffic, blinking for activity per port. LINK will turn off in the event connectivity is lost between the ends of the twisted pair segment or a loss of power occurs in the unit or remote device. The Link ports are also represented by the LEDs LA1, LA2, LA3. (Steady On or Steady Off indicates no Receive Activity).

**10/100**    **Steady ON for 100Mb speed, OFF for 10Mb speed per port**

**F/H**    Steady ON for Full duplex mode, OFF for half duplex per port

**5.0      TROUBLESHOOTING**

    All **BLACK BOX®**Ethernet products are designed to provide reliability and consistently high performance in all network environments.  The installation of  LBH100A and LBH110A Series 10/100 Mb/s Switches is a straightforward procedure (see INSTALLATION, Section 3.0); the operation is also straightforward and is discussed in Section 4.

    Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems.  Please follow the suggestions listed below prior to contacting your supplier.  However, if you are unsure of the procedures described in this section or if the LBH100A and LBH110A Series 10/100 Mb/s Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact BLACK BOX Customer Support.

**5.1 Before Calling for Assistance**

1.       If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.

2.       Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)

3.       Make sure that an AC power cord is properly attached to each LBH100A and LBH110A Series unit. Be certain that the AC power cord is plugged into a functioning electrical outlet. Use the PWR LEDs to verify each unit is receiving power.

4.     If the problem is isolated to a network device other than the LBH100 and
    LBH110 Series 10/100 Mb/s switch product, it is recommended that
the problem device is replaced with a known good device.  Verify whether or
not the problem is corrected.  If not, go to Step 5 below.  If the problem is
corrected, the LBH100A and LBH110A Series Switch and its associated
cables are functioning properly.

5.     If the problem continues after completing Step 4 above, contact your supplier
    of the  LBH100A and LBH110A Series 10/100 Mb/s Switch unit or if
    unknown, contact BLACK BOX, Inc by phone at (724) 746-5500 or by
    other appropriate method

**5.2 When Calling for Assistance**

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:

   a. The nature and duration of the problem;
   b. Situations when the problem occurs;
   c. The components involved in the problem;
   d. Any particular application that, when used, appears to create the problem;

2. An accurate list of BLACK BOX product model(s)involved, with serial

   number(s).  Include the date(s) that you purchased the products from BLACK

   BOX.

3. It is useful to include other network equipment models and related hardware, including Convenient computers, workstations, terminals and printers; plus, the various network media types being used.

4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

**5.3     Return Material Authorization (RMA) Procedure**

### 5.3.1     Shipping and Packaging Information

Should you need to ship the unit back to Black Box Corporation, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. ( You may retain all connectors and this Installation Guide.)

**CAUTION** : **Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.**

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.

3. Black Box Corporation is not responsible for your return shipping charges.

4. Ship the package to:

> **Black Box Corporation**
> **1000 Park Drive**
> **Lawrence, PA 15055**
> **Phone:**   **(724) 746-5500**
> **Fax:**      **(724) 746-0746**