



September 2004
LBH101A, AE
LBH101A-H, AE
LBH100A-P, AE

Convenient Switches

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BLACK BOX® Series Convenient Switches Installation and User Guide

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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.

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1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
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4. Todas las instrucciones de operación y uso deben ser seguidas.

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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..
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10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

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12. Precaución debe ser tomada de mal manera que la tierra física 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 recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
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 objetos líquidos 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: Objetos 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.

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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

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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 10/04: Minor edit on the power supply option.

Rev A 09/04: Initial release of this user manual for LBH101A Convenient 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

[illegible]

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)

Operating Environment :

Ambient Temperature ratings

LBH101A,: 32°F to 104°F (0°C to 40°C)

LBH101A-H: -13°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.

LBH101A-P: -40°F to 167°F (-40°C to 75°C) Long term per agency tests (UL).

-40°F to 212°F (-50°C to 100°C) Short term per IEC Type tests.

Storage Temperature,

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

Cold Start:

LBH101A-H to -20°C

LBH101A-P to -40°C

Ambient Relative Humidity: 5% to 95% (non-condensing)

Altitude (All models): -200 to 50000ft. (-60 – 15,000 m)

Conformal Coating (optional) for humidity protection

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

Packaging:

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: all models: 4.6 oz. (130g);

Power supply, – office: 5.9 oz (170g)

–H : 5.8 oz (165g)

–P : 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 Convenient Switch ratings.

Office Ratings (0 to 40°C)

North America models. Input: wall or power strip plug-in 120vac at 60 Hz.

Output-12vdc, 1Amps

International models. Input: 240vac at 50Hz with IEC 320 connector for the user supplied AC power cord.

Output-12vdc, 1Amps

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

North America 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(P) Ratings (-40 to 75°C)

North America 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

Direct 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 cable.

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

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 (ACT).

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 Section 3.2/3.3)

Mean Time Between Failure (MTBF) – over 15 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 UL 2043 above-the-ceiling installation

IEC61850 EMC and Operating Conditions Class C Power Substations

1.2 Summary of models and descriptions (LBH101A Series):

LBH101A, AE = four 10/100 RJ-45 ports Sw., for office and wiring closet env., ext. AC Pwr Supply

LBH101A, AE-H = Hardened, four 10/100 RJ-45 ports Switch, Factory floor, Int. 8-15VDC,

Ext. AC Hardened power supply included .

LBH101A -H-12VDC = Same as S14H model, except Ext. AC Hardened power supply not included

LBH101A-H-24VDC = Same as S14H-12VDC model, except for 24VDC power input

LBH101A-HD-24VDC = Same as S14H-24VDC model, but includes DIN-RAIL-MC2 option.

LBH101A-H-48VDC = Same as S14H-24VDC model, except for -48VDC power input.

LBH101A, AE-P = extreme rated, four 10/100 RJ-45 ports Switch, for un-controlled (outdoor) env.

Internal 8 to 15V terminal block, Ext. AC Extreme-rated Power Supply included.

LBH101A-P-12VDC = Same as S14P-Pd, Pi, except ext. AC Extreme Power Supply is not included.

LBH101A-P-24VDC = Same as S14P-12VDC model, except Ext. AC Extreme power supply not included

LBH101A-PD-24VDC = Same as S14P-24VDC model, but includes DIN-RAIL-MC2 option.

LBH101A-P-48VDC = Same as S14P-24VDC model, except for -48VDC input

MC14-TRAY = 19" Rack-mount tray for 14-series Switch models, up to 16 units

Accessories

LE1505-RACK = 19" Rack-mount tray for LBH101A-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 CLBH101A and CSN14 Series Switch,
See Section 3.4. Conformal Coating (for high humidity and “tropical” applications) - request quote.

BLACK BOX®, Corporation, reserves the right to change specifications, performance characteristics and/or model offerings without notice.

2.0 INTRODUCTION

This section describes LBH101A-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 | Black Box LBH101A-Series Convenient Switch Unit |
| 1 | Ext. Pwr Supply, for LBH101A,AE; LBH101A,AE-H; LBH101A,AE-P |

1 set Metal panel mounting clips and screws, 2 each

1 User Guide, i.e., this manual

Remove the Black Box LBH101A-Series 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 your supplier. 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 (LBH101A Series)

The Black Box family of Convenient Switches covers the full range of 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. Input power may be AC, or DC at 12V, 24V or –48V, providing a selection for office or for heavy duty industrial applications. This selection of models offers the best price / value unit for each user and installation.

For any user who needs a small chunk of Ethernet connectivity, a 4-port “go anywhere” Black Box LBH101A Switch is a versatile and handy solution, and can provide it in a convenient compact package.

Fig2.1a. Black Box LBH101A, Front view (three RJ-45 ports on Front side of the unit, as shown in Fig



Fig2.2a. Black Box LBH101A, Rear view (one RJ-45 port on rear side)

Fig 2.2a

LBH101A shown above in regular-package units are for office and wiring closet environments, uses an external AC power supply. A metal case with convection cooling is featured. Operation may be in 0° to 50°C ambient temperature. The units can be mounted securely on a closet wall or metal cabinet, or by using the metal panel mounting clips included.

The Black Box LBH101A-H as shown above in Fig 2.2c, are hardened units designed for factory floor and other industrial applications. The LBH101A-H models are built with high-grade components and use special thermal techniques and a rugged metal case for extended temperature industrial applications. The LBH101A-H Hardened unit features a sealed metal case which is also used as a heat sink. No air inflow is required for cooling, so the LBH101A-H resists dust, dirt, moisture, smoke and insects, and is

above-the-ceiling (plenum) rated. Choices of models for external AC or internal DC power are available. Ambient temperature rating is up to -25°C to $+60^{\circ}\text{C}$ for any of the power input types, AC or DC.

Fig 2.2c- Black Box LBH101A-H, Front view (three RJ-45 ports on Front side of the unit, as shown in Figure 2.2c



Fig. 2.2c



Figure 2.2d. Black Box LBH101A-H. Rear view (one RJ-45 port and DC option

on rear side) as shown in Fig 2.2d.

Fig 2.2d

The Black Box LBH101A-P, as shown in Fig. 2.2e, is an extreme rated unit suitable for temperature un-controlled outdoor applications. Specially designed with extreme-grade extended temperature components, the LBH101A-P uses similar thermal techniques as the LBH101A-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 powers are available. Ambient temperature rating is -40°C to $+75^{\circ}\text{C}$ for any of the power input types, AC or DC.

2.3 Black Box LBH101A-Series, with four (RJ-45) Copper ports

The Black Box LBH101A-Series chassis houses one main PC board. The power supply is an external AC unit or internal DC via a screw terminal block. The front side of the chassis has three twisted-pair switched ports and one port is provided on the rear side. All the four ports of the LBH101A-Series convenient switch support auto-cross (MDIX), and perform the auto-cross in the auto-negotiation mode only.

Dual LEDs indicate operating status of ports may be viewed from any direction, and are mounted on the top as well as end for convenience. There are power (PWR) indicators for the unit to validate that the unit is turned ON. For each port, there are Link and Activity (LK/ACT) LEDs indicating traffic and mounted on the top of the unit,

Fig. 2.2e

whereas the end LEDs mounted next to ports indicate (LK/Act) as LA1, LA2, LA3, LA4 for each of the four ports. 10/100 (ON for 100Mbps), and full/half duplex (F/H is ON for full duplex) indicators for port # 2.

The external DC power plug connector or “jack” is in the right rear of the chassis. The internal DC input terminal block is also provided on the rear side of the unit.

Port #2 has the capability to configure that port as “FF” Full-Fixed for connecting the 100Mb Full Duplex ports, or “A” to connect with an auto-negotiating port. Port #2 is controlled by the manually-selectable slide-switch (FF-A), mounted underneath the port. Use care in changing the switch position as the switch is small and fragile. See section 4.4.

2.4 Frame Buffering and Latency

The Black Box LBH101A-Series Convenient 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., are good packets. This eliminates the 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 there is no way to filter frames with a bad CRC (the entire frame must be present in order for CRC to be calculated), the result of indiscriminate cut-through forwarding is greater traffic congestion, especially at peak activity. 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.

When the 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 additional details.

Another feature implemented in Black Box LBH101A-Series Convenient 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.

The latency (the time the frame spends in the Switch before it is sent along or forwarded to its destination) of the LBH101A-Series Convenient Switches varies with the port-speed types, and the length of the frame is a variable here as it is with all store-and-forward switches. For 10 Mb-to-10 Mb or 10 Mb-to-100Mb or 100Mb-to-10 Mb

forwarding, the latency is 15 microseconds plus the packet time at 10 Mb. For 100Mb-to-100Mb forwarding, the latency is 5 microseconds plus the packet time at 100Mb.

2.5 Features and Benefits

■ Small 4-port 10/100 Switch unit for edge-of-network applications

Where a small chunk of Ethernet connectivity is needed to connect edge devices into the LAN, the LBH101A-Series Switches provide 10/100 switching in a convenient and compact package that fits right into the site.

■ Three models for three application environments

- LBH101A for the office and wiring closet
- LBH101A-H, Hardened for the factory floor.
- LBH101A-P, extreme rated for un-controlled temperatures, outdoors

■ Installation is “Plug and Play”, operation is transparent to software

The Black Box LBH101A-Series Switches operate as a LAN switch, only forwarding those packets from each domain that are needed on the other domains. Internal address tables are self-learning. All ports are auto-cross.

■ Two sets of LEDs for viewing status from any angle

Each LBH101A-Series Convenient Switch is equipped with two sets (front and side) of LEDs to provide status information when viewed at any angle or mounting arrangement, rack-mount, DIN-Rail, or panel-mount.

■ **Rugged metal case, Industrial grade**

LBH101A-Series are packaged in a rugged sheet metal enclosures to ensure durability and noise immunity, even when placed in extended temperature environments or high EMI noise sites; e.g industrial or outdoor applications.

■ **AC and DC Power Supplies with extended temperature ratings**

LBH101A-Series power input may be a variety of types, external AC and internal DC at 12V, 24V, or -48VDC. AC may be at extreme temperatures.

■ **DC-input models can operate as dual-source**

The 12V DC jack is present on DC-input models, so that the unit can operate from an external AC PS, or from DC applied to the terminal block, either or both present. Dual-source power may increase availability, or be convenience to move the unit from a test lab out to the factory floor.

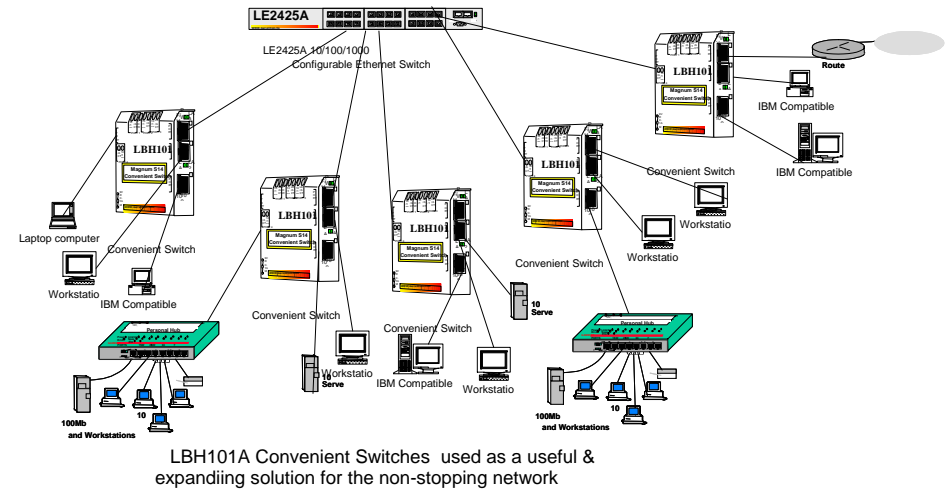
■ **Efficient Compact design, for all-purpose convenient mounting**

Featuring a compact metal case, Black Box LBH101A-Series can be installed in minimal space in rack-mount MC14-TRAY, on DIN-Rail (optional), or panel-mounted.

2.6 Applications for LBH101A Series Convenient Switches

With the three tier hardness ratings, as “office”, “Hardened”, and “extreme rated (outdoor)”, the LBH101A Convenient Switch unit fits in any environment where users need to add a few RJ-45 ports to a LAN quickly and cost effectively. The edge-of-the-network connectivity product makes challenging industrial applications easier, more economical and more-reliable. The compact LBH101A-series 10/100 Mbps switch functions support a mixed environment of 10 Mbps and 100Mbps users, and the switching full / half duplex capability on all four ports provides bandwidth for high performance. Port #1 (on the back end) is typically Used for an up-stream connection. When expansion is needed, add another LB1001A and connect it into port #1 with twisted pair cabling, to add 3 more ports.

Example 1. LBH101A's-In this example, the LBH101A Convenient Switch is used to serve a small office in a factory with multi-servers, print server, internet access and mixed-

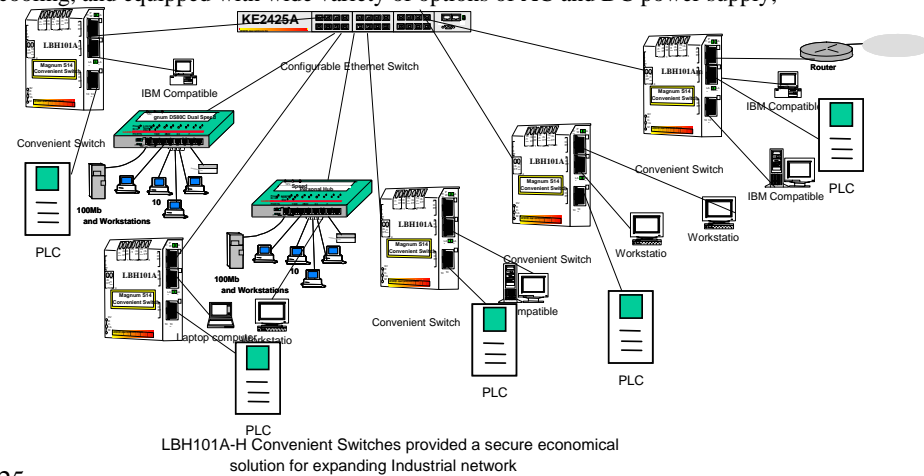


speed requirements. The users operate at 100Mb as well as at 10 Mb, and utility devices (such as print servers) run at 10 Mbps. High performance users need a high bandwidth up-link for access to a central LAN and central file servers. Any attached node can change speed at any time without affecting network operation or impacting other users. The multi-functional LBH101A Convenient switches provide this solution very efficiently and economically. Various features included MDIX, plug-n-play, Din-Rail mountings and dual LEDs make this compact and convenient switch a very effective solution for this requirement.

Example 2. LBH101-Hs: In this application of Industrial environments, where in a expanding of Industrial network environment, the new PLC units are deployed on all the present network and need a Ethernet port to carry the data to the main workstation for being controlled by the Industrial Engineering crews. The hardened version of LBH101A-Hs are typically used where 10/100BASE-T networking equipment is being installed in

BLACK BOX® Series Convenient Switches Installation and User Guide

highly controlled temp environment and required a effective and economical solution to satisfy this need. Built with high-grade components and efficient thermal techniques of cooling, and equipped with wide variety of options of AC and DC power supply,

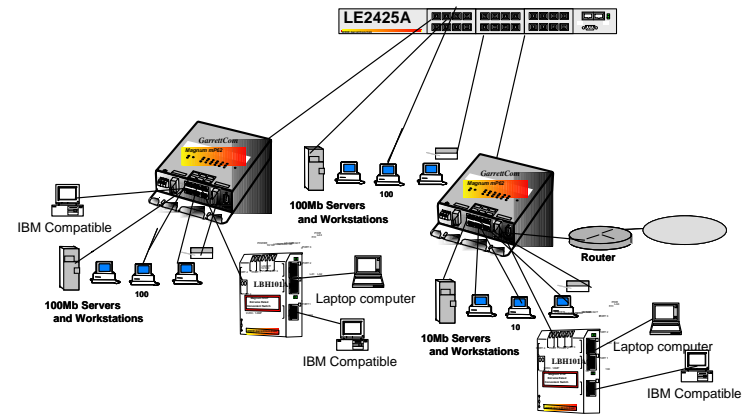


the cost-effective LBH101-Hs Convenient Switches easily qualified to use in highly controllable industrial applications. The Convenient Switches act as a network edge connectivity unit to satisfy ongoing needs very efficiently and economically.

Example 3: LBH101A-Ps

The LBH101A-Ps fits very well in high temperature locations (control rooms) experiencing a need to scale its LAN quickly and cost effectively. With its half / full duplex switching capability, the LBH101A-Ps provides a very economical high bandwidth solution at each copper-cable user-access point. The 10/100 dual-speed functions to support a mixed environment of 10 Mbps and 100Mbps users and devices un-conditionally. The switching capability on all ports provides bandwidth for high performance. The ruggedness of the LBH101A-Ps steel case and the high reliability of the design compliments the temperature controlled packaging to provide an exceptional Ethernet product.

In this example, the extended temperature rated LBH101A-Ps takes care of the LAN connectivity requirement in a harsh temperature environment, mounted above the

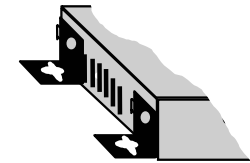


LBH101A-P Convenient Switches provided a secure dependable, reliable solution for un-controlled temp. environment

ceiling in the building. The ongoing demand of growing network can be easily met by this sleek designed convenient Switch. The steel enclosure and wide selections of DC power input qualifies the LBH101A-Ps to provide a dependable, reliable and economical solution for any temperature un-controlled location environments.

3.0 INSTALLATION

This section describes the installation of the LBH101A Series Convenient Switches, including location, mountings, power supply options and media connection.



3.1 Locating the Convenient Switch Unit

All the LBH101A Series Switches operate in transparent half-and full-duplex mode. The store and forward switch easily takes care of network traffic and can be used as a useful, economical tool to expand an existing network.

Secure attachment of mounting clips for panel - mounting

The compact and lightweight design of the LBH101A Series allows it to be easily installed in almost any location. A Velcro strip may 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. Alternatively, metal mounting clips and screws are included for a rugged and secure mounting in any orientation.

Installation of the LBH101A Series Convenient 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 LBH101A Series Switches

For 19" rack-mounting of LBH101A series Convenient Switches, a rack-mount tray is available, the LE1505-RACK. The Convenient 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 Convenient Switches and/or 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) LBH101A Series Convenient 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 Convenient 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 Convenient Switches

The LH1505P -RACK is another option available for Rack Mounting the mix-match of LBH101A Series Convenient 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.

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The LH1505P-RACK holds up to 10 mix-match of 10Mbps(converter) and 100Mbps Black Box Convenient Switches. (The MC mounting spaces of the LH1505P-RACK are specific to the 10Mb “LBH100A”- series and the 100Mbps “LBH101A” 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 Convenient 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 Converters and Convenient Switches secure in the tray, separately removable for service. The dual LEDs permit viewing operating status of the Converters and Convenient Switches from any angle.

3.4 DIN-Rail mounting option

The LBH101A Series Convenient Switches, designed for use in “Factory Floor” Industrial Ethernet environments, are also available for DIN-Rail mounting in an enclosure having DIN Rails.

A LBH101A 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 LBH101A Series models with “D” 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 LBH101A Series Switches

LBH101A Series Switches are power-efficient and can work with an external AC power supply. LBH101A 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 LBH101A Series are designed to be used with UL listed Class II power supplies. The LBH101A hardened Convenient 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 LBH101A Series (DC internal) with 12V, 24V or –48VDC power input

Some models (Hardened and extreme rated) of the LBH101A-Series are reliably 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 LBH101A'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 LBH101A 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 maxm.

3.7 LBH101A-H 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 LBH101A-H hardened Convenient (as shown in Figure). The DC terminal block on the LBH101A-H 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 LBH101AH’s power terminals, positive (+) and negative



(-) screws. The use of Ground (GND) optional; it connects to the LBH101AH 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 LBH101A Series Convenient Switch can be connected to only one media types i.e. copper (RJ-45) types, run at 100BASE-TX, 10BASE-T. 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).

<u>Media</u>	<u>IEEE Standard</u>	<u>Connector</u>
Twisted Pair (CAT 3 or 5)	10BASE-T	RJ-45
Twisted Pair (CAT 5)	100BASE-TX	RJ-45

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.
- 5.

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

The copper ports of LBH101A-Series Convenient 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 LBH101A-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 LBH101A Series Convenient 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. When the connected device is 10 Mbps, the LBH101As 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.

LBH101A Series units are plug-and-play devices. There is no software configuring to be done at installation or for maintenance. The internal functions is 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 LBH101A Series Convenient 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 LBH101A 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 LBH101A- 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. 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 LBH101A 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 Dual LEDs, Front-panel and side-panel (LBH101A Series)**LED** **Description**

PWR Illuminates GREEN to indicate power applied.

LK/ ACT Steady ON for LINK w/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 LA1, LA2, LA3, LA4 (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 LBH101A 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 LBH101A 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 LBH101A 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 LBH101A 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 LBH101A Series Switch and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your supplier of the LBH101A 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

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**