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January2006
LP004A

Power over Ethernet (PoE) Switch

CUSTOMER SUPPORT INFORMATION

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

BLACK BOX®Series
Power over Ethernet (PoE) Switch
Installation and User Guide

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Important: The LP004A 10/100 Mb/s Power over Ethernet (PoE) Switch contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with LP004A 10/100 Mb/s PoE 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

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 01/06: Initial release of this user manual for LP004A Power over Ethernet (PoE) Switch

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)

Operating Environment :

Ambient Temperature ratings

LP004A: -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:

LP004A to -40ºC

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 cooled, using the case as a heat sink. The 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):

(OPTIONAL) LP004A 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 PoE Switch ratings.

NOTE- An external power adaptor is optional, is not included with unit, and must be ordered separately if desired for convenience such as bench-testing. It is only used for powering the unit to act as a switch, and does not provide power to any PoE devices attached for the application.

Temperature un-controlled Extreme Ratings (-40 to 75°C)

All models. Outdoor temperature rated. Unit takes -12vdc, 2Amps, 6 watts

DC POWER Input : built-in terminal block for +, -, ground, -48V DC input (range of 36 to 60V DC). The Direct DC power input floats. User may ground either "+" or "-" if desired.

Power Consumption: 6 watts for the unit, up to 60 watts (30 to 40 typical) for attached PoE devices. See Section 3.6.

Note 1: The optional 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.

Port Connectors:

Four 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.

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 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.
IEEE P1613 Env. Std for Electric Power Substations
NEMA TS-2 and TEES for traffic control equipment
Designed for UL 2043 above-the-ceiling installation
IEC61850 EMC and Operating Conditions Class C Power Substations

1.2 Summary of models and descriptions (LP004A Series):

LP004A-48VDC = four 10/100 RJ-45 ports PoE Switch., premium-rated PoE Switch, rated for un-controlled environments. All four RJ-45 ports support power source PoE per the IEEE 802.3af standard. Includes integral -48V DC terminal block for power unit.

Accessories

Optional AC power adapter as noted above

LE1505-RACK = 19" Rack-mount tray for LP004A-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 LP004A 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 LP004A-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 LP004A-Series PoE Switch Unit
0	No External AC Power Supply is included for LP004A
1 set	Metal panel mounting clips and screws, 2 each
1	User Guide, i.e., this manual

Remove the Black Box LP004A-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 (LP004A Series)

The Black Box LP004A is designed for Industrial Power over Ethernet (PoE) Switch 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. This selection of models offers the best price / value unit for each user and installation.

Black Box LP004A Switch is a versatile and handy solution, and can provide it in a convenient compact package. Designed and developed with premium-grade extended

temperature components, premium-rated LP004A switches are suitable for use in sheltered outdoor locations and temperature-uncontrolled environments with a temperature rating of –40°C to 75°C.

The Black Box LP400A PoE Switch is in fact act like a Power source Switch, combines standard 802.3af Power over Ethernet (PoE) with a small heavy duty 4-port Industrial Switch. Using an external -48vdc power source, all four of the LP004A's Ethernet ports can provide Power as well as 10/100 Mb data transmission over the inter-connecting Ethernet cables. So a single Ethernet twisted pair cable will be able to transmit voice, data and power from the attached devices.

The LP004A switches are Power Sourcing Equipment (PSE), and are fully compatible with Powered Devices (PD) (e.g wireless access points, IP phones) that comply with the IEEE 802.3af PoE standard. The LP004A switch ports have an auto-sensing algorithm, so that

they provide power only to 802.3af, PoE end devices only. **PoE is managed by a multi-stage handshake to protect equipment from damage and to manage power budgets** .The LP004A ports will discontinue supplying power when the PoE powered devices are disconnected, and support the 802.3af PoE PSE standard for over-current protection, under-current detection and fault protection.

The LP004A provides a standards-compliant way to power and connect a few small Ethernet devices at the edge of a network where AC power is not cost-effective to deploy. Since PoE is rapidly emerging as an Ethernet option in industrial, commercial, outdoor and military applications, the Black Box LP004A enables the efficient deployment of reliable VoIP and wireless access networking devices to increase the efficiency of heavy duty industrial communications. Using PoE switches like the Black Box LP004A can produce significant cost savings as well as flexibility and reliability advantages over traditional AC-powered devices. The simplicity of PoE increases reliability and reduces the overall cost of installation and operation.

Some of the popular applications where the Black Box LP004A PoE Switch can be used to provide the power and data for PoE Powered Devices, which require 12-13watts maximum.

- Wireless LAN access points and WLAN Mobility system
- VOIP phones
- Remote Security Camera
- SNTP Clock
- Factory floor and building control monitoring

  (Temperature, Smoke, Heat and other environmental sensors).
- Fire alarms
- Security devices, like retinal scanners or fingerprint readers.
- Lighting control.
- Home automation systems

Because of the existence of the 802.3af PoE standard, the RJ-45 Ethernet jack will become the first worldwide standard power plug, the futuristic applications. PoE is emerging as a convenient item and is destined to be ever more widely used. It can provide power to Notebook computers, Cell Phone chargers, and PDA games through the PoE devices.

The efficient LP004A has special thermal techniques designed for extended temperatures, hardened and rugged enclosures. It qualifies easily as a multi-purpose choice for all PoE device applications and is a very convenient source to meet their requirements with a wide choice of options, providing a very convenient and handy PoE solution.

The Black Box LP004A provides edge access Ethernet ports in a convenient and compact package. For fiber connectivity or additional non- PoE ports, simply add a Black Box LBH100A- Converter Switch (two RJ-45 and a 10 or 100Mb fiber port) or a heavy duty Edge Switches (six ports with Fiber options) to meet the Fiber requirement. All LP004A

Power Source PoE Switch models comes with two (2) sets of LED indicators. One set is mounted in the end adjacent to three of the RJ-4 ports, and one set is at the beveled edge for easy viewing when DIN-Rail or panel mounted.

Black Box LP004A Power Source Switch requires ***a heavy-duty power supply of -48VDC 1.4Amps (66 watts total consumption) to provide a 13-15w power on each port to the PoE unit.*** The 8-15vdc is also present, but only should be used to power the LP004A unit when no PoE devices are attached.

2.3 Black Box LP004A with four (RJ-45) Copper ports

The Black Box LP004A 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 PoE Switch support auto-cross (MDIX), and perform the auto-cross in the auto-negotiation mode only.

Dual LEDs indicating 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.

Fig2.1a. Black Box LP004A, Front view (three RJ-45 ports on Front side of the unit, as shown in Fig

Fig 2.1a

For each port, there are Link and Activity (LK/ACT) LEDs indicating traffic and mounted on the top of the unit, 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 LED is ON for full duplex and OFF for Half duplex).

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.

Figure 2.1b. BlackBox LP004A. Rear view (one RJ-45 port (not shown) and DC terminal and power adaptor option on rear side) as shown in Fig 2.1b.

The Black Box LP004A, as shown in is an extreme rated unit suitable for temperature un-controlled outdoor applications. Specially designed with extreme-grade extended temperature components, the LP004A uses thermal techniques

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°C for any of the power input types, AC or DC.

2.4 Black Box LP004A-Series, with four (RJ-45) Copper ports

The Black Box LP004A-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 LP004A-Series PoE switch supports auto-cross (MDIX), and perform the auto-cross in the auto-negotiation mode as well as fixed mode.

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, 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 (for optional AC PS) or "jack" is in the right rear of the chassis (not included with the unit). The internal DC input terminal block is also provided on the rear side of the unit.

2.5 Frame Buffering and Latency

The Black Box LP004A-Series Power over Ethernet (PoE) Switch 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 LP004A-Series Power over Ethernet (PoE) Switch 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 LP004A-Series Power over Ethernet (PoE) Switch 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.

2.6 Features and Benefits

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

Whenever Power Source for Ethernet connectivity is needed to connect edge devices into the LAN, the LP004A extreme rated for un-controlled temperatures, outdoor Switch provide 10/100 switching along with power source in a convenient and compact package.

- **Installation is "Plug and Play", operation is transparent to software**

The Black Box LP004A-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 LP004A-Series PoE 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**

  LP004A-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.

- **DC Power input for LP004A PoE Switch**

  The 802.3af PoE standard LP004A power source switch required 1.4Amps-48VDC to provide the enough power of 13-15watts on each RJ-45 ports.

  Terminal block for -48V DC input (range of 46V to 60V DC)

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

  Featuring a compact metal case, Black Box LP004A-Series can be installed in minimal space in rack-mount LE1505-RACK, on DIN-Rail (optional), or panel-mounted.

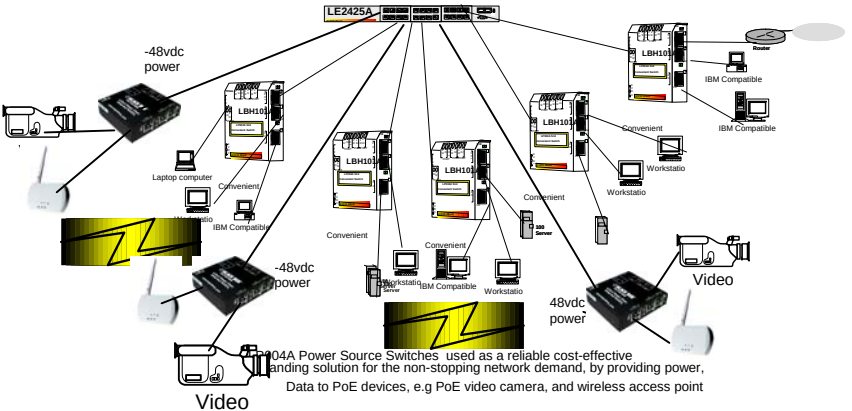
2.7 Applications for LP004A Series Power Over Ethernet Switch(PoE)

Example 4a. LP004A (Power Source Switch) for PoE device only

In an Industrial application, where the expansion of their factory network being done to expand the capacity and make it more secure through CCTV camera to monitor the day-to day manufacturing process. The blue tooth wireless was also implemented to eliminate the cable wiring between the LP004A switches to provide a neat network setup. The un-controlled temperature and providing the electric wiring was the big challenge to meet this requirement.

Black Box LP004A Power source switch is an effective and convenient solution for remote locations where providing power through wire is not only difficult but expensive too. The cost-effective and efficient LP004A with the robust enclosure provide a very economical solution through its 4-PoE RJ-45 ports. The Power Source Switch with PoE ports are capable to carry data, power and voice over RJ-45 cable using LP004A unit.

The diagram below is one of the multi-purpose application of LP004A Power over Ethernet switch, which provide the power to video camera, wireless device effectively via Ethernet ports.

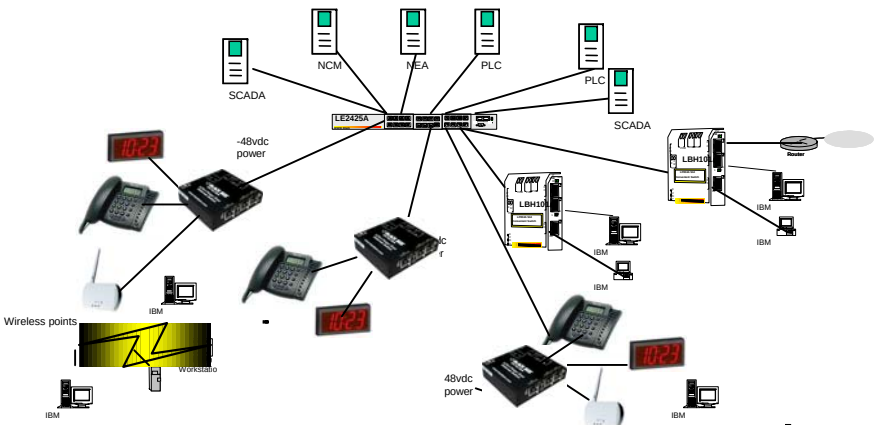


Example 4b. LP004A (Power Source Switch) for PoE device only

In an another application for Industrial floor, The requirement is to provide the complete floor with wireless point to avoid more cabling mess and connect all the status delivery joint with VOIP phone. The cost-cutting is the primary concern to make the factory more efficient flow all along.

The LP004A is being recommended to fulfill the edge point requirement, to make it more cost-effective and avoid another electrical cable expansion un-necessasary. The sleek industrial proof PoE device, LP004A with its power Source Switch capability, easily meets this demand requirement to provide the power through its RJ-45 cable, and provide a very neat Network setup.

The Black Box LP004A is enabling the efficient deployment of reliable VoIP and wireless networking tools to increase the efficiency of communication across the enterprise. Furthermore, using PoE device like LP004A has significant cost savings, flexibility and reliability advantages over traditional AC power, it reduces the overall cost of network ownership. The PoE device used for this industrial application, VOIP for voice, Wireless points for wi-fi connection,PoE Clock to synchronize the time with SNTP server for every second correct timings.



LP004A Power Source Switches used as a reliable cost-effective solution for providing Data, Power and Voice over RJ-45 Ports for Industrial application

Data to PoE devices, e.g PoE Clock, VOIP phone and wireless access point

3.0 INSTALLATION

This section describes the installation of the LP004A Series Power over Ethernet (PoE) Switch, including location, mountings, power supply options and media connection.

3.1 Locating the PoE Switch Unit

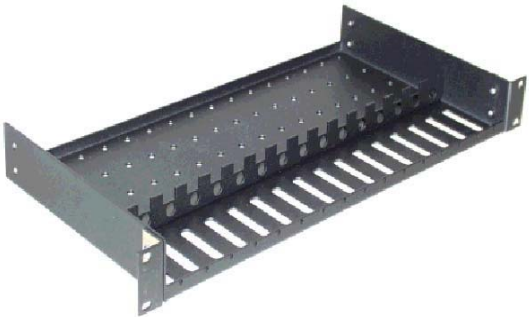
All the LP004A Series Switches operate in transparent half-and full-duplex mode. The store and forward switch easily takes care of network traffic and can be used as a useful, economical tool to expand an existing network.

The compact and lightweight design of the LP004A 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 LP004A Series Power over Ethernet (PoE) Switch 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 LP004A Series Switches

For 19" rack-mounting of LP004A series Power over Ethernet (PoE) Switch, a rack-mount tray is available, the LE1505-RACK. The Power over Ethernet (PoE) Switch 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 Power over Ethernet (PoE) Switch 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) LP004A Series Power over Ethernet (PoE) Switch, 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 Power over Ethernet (PoE) Switch 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 the Power Over Ethernet Switch(PoE)

The LH1505P -RACK is another option available for Rack Mounting the mix-match of LP004A Series Power over Ethernet (PoE) Switch 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 10 or 100Mbps (converter) and 100Mbps Black Box Power Over Ethernet Switch(PoE). (The MC mounting spaces of the LH1505P-RACK are specific to the 10Mb "LBH100A"- series and the 100Mbps "LP004A" 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 Power over Ethernet

(PoE) Switch, 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 Power over Ethernet (PoE) Switch secure in the tray, separately removable for service. The dual LEDs permit viewing operating status of the Converters and Power over Ethernet (PoE) Switch from any angle.

3.4 DIN-Rail mounting option

The LP004A Series Power Over Ethernet Switch(PoE), designed to use in "Factory Floor" Industrial Ethernet environments, are also available for DIN-Rail mounting in an enclosure having DIN Rails.

A LP004A 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 LP004A Series models with "D" have 24VDC power, and have the DIN-Rail-MC2 bracket included and assembled with the MC unit at the factory.

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3.5 Power Requirement for Black Box LP004A Power Source Switch

POWER INPUT: Total Power Consumption: 66 watts max. (1.4A @48VDC)
Terminal block for -48v DC input (range of 46 to 60V dc), built in for +, - , ground.
NOTE:The 8-15V DC option is also present, but can only be used to power the LP004A unit when no PoE devices are attached. (Optional)

POWER OUTPUT:
PoE available on all four RJ-45 ports via Ethernet twisted pair cabling on port pins using spare pairs 4,5(+) 7,8(-), not the data pair 1,2(-), 3,6(+)
802,3af Power Consumption: 61.6 watts max. (15.4(max)/port)
PoE Ports Output voltage: 44 to 57 VDC
Over Current Protection, per port: re-settable fuse

Power Consumption: Typical 3 watts, 4 watts max.

3.6 Powering the LP004A Series (DC internal) with –48VDC power input

Some models (Hardened and extreme rated) of the LP004A-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 -48VDC power. DC power input may be chosen for high-availability.

The extended temperature capability of the DC-powered hardened LP004A'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 LP004A chassis

Input Voltage: 36 – 60V DC (-48V DC)

Input current: 0.2 amp max.(-48V DC)

Power Consumption of the unit:

3 watts typical, 4 watts max.

3.7 LP004A , DC-powered, -48VDC Installation

This section describes the proper connection of the -48VDC leads to the DC power terminal block on the LP004A hardened PoE (as shown in Figure). The DC terminal block on the LP004A 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 LP004A's power terminals, positive (+) and negative (-) screws. The use of Ground (GND) optional; it connects to the LP004A 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 LP004A Series PoE Switch can be connected to only one media types i.e. copper (RJ-45) types, runt 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).

Media	IEEE Standard	Connector
Twisted Pair (CAT 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.

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

The copper ports of LP004A-Sereis Power over Ethernet (PoE) Switch 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 LP004A-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 LP004A Series Power over Ethernet (PoE) Switch 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 LP004As 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.

LP004A Series units are plug-and-play devices. There is no software configuring to be done at installation or for maintenance. The internal function 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 LP004A Series Power Over Ethernet (PoE) Switch 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 LP004A 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 LP004A- 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 of LP004A POE Switch independently support auto-cross (MDI or MDIX) in auto-negotiation mode and will work properly with all the other connected devices with RJ-45 port whether it supports Auto-negotiation or not (e.g 10Mb Hub, media converter) or fixed mode at 10Mb or 100Mb Half/Full Duplex(managed switch). No cross-over cable is required while using the 6K8's copper port to other devices. Operation is according to the IEEE 802.3u standard.

When a RJ-45 cable connection is made, and each time a LINK is enabled, auto-negotiation takes place. The LP004A 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 (LP004A 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 for Link 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 LP004A 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 LP004A 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 LP004A 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 LP004A 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 LP004A Series Switch and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your supplier of the LP004A 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