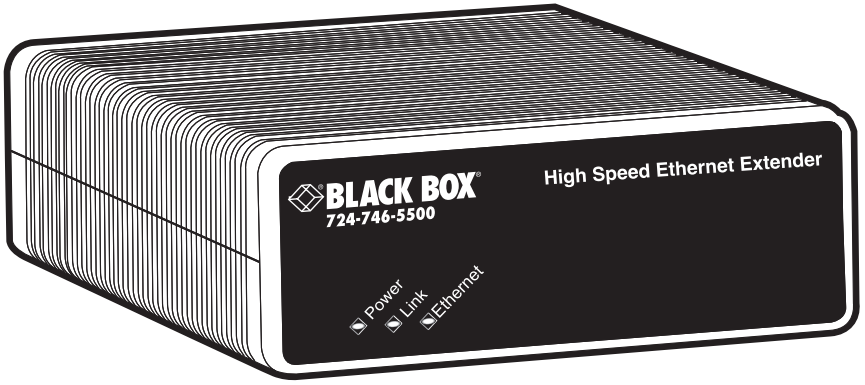
BLACK BOX®
NETWORK SERVICES

DECEMBER 2006
LB400A

High Speed Ethernet Extender



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

CE NOTICE

The CE symbol on your Black Box equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

RADIO AND TV INTERFERENCE

The High Speed Ethernet Extender generates and uses 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 and television reception. The High Speed Ethernet Extender has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Ethernet Extender does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

WARNING

Theis device is NOT intended nor approved to be connected to the PSTN. It is intended only for connection to customer premise equipment.

WARNING

• This device contains no user serviceable parts. The equipment shall be returned to Black Box for repairs, or repaired by qualified service personnel.

• The external power adapter should be a listed Limited Power Source. Ensure that the power cable used meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker.

• Do not work on the system or connect or disconnect cables during periods of lightning activity.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

TRADEMARKS USED IN THIS MANUAL

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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 deberán 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 recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera 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 de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal 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 recomendaciones 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.

CONTENTS

1. General Information

Thank you for your purchase of this Black Box product. If any questions arise during installation or use of the unit, contact Black Box Tech Support at (724) 746-5500.

1.1 Features

- Variable rate ethernet extender - Easy to configure
- Auto-MDIX Ethernet
- Configurable 10/100, Full/Half, and Auto-Negotiating Ethernet
- Extends network connections up to 6,000 ft (1.8 km) over 2-wire 24-AWG unconditioned lines
- Switch selectable line rates up to 50 Mbps
- 6 symmetric or asymmetric settings via DIP switch
- Transparent operation
- LED indicators for Power, Link, and Ethernet Link & Activity
- Surge suppression up to 20 kA (8/20 µs)
- Made in the USA

1.2 Description

The Black Box LB400A Ethernet Extenders provide high-speed LAN connections between peered Ethernet LANs, remote PC's, or any other network enabled 10/100Base-T devices.

Operating in pairs, one LB400A is configured as the (L) Local unit located at one end of the LAN extension and the other LB400A is configured as the (R) Remote unit at the other end. The LB400A is configured as a L or R via the switch on the rear panel. These units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade twisted-pair link. The data is passed transparently (unmodified) through the high speed ethernet extenders. The LB400A automatically adds and deletes MAC addresses, only passing packets across the line that is meant for the remote peered LAN.

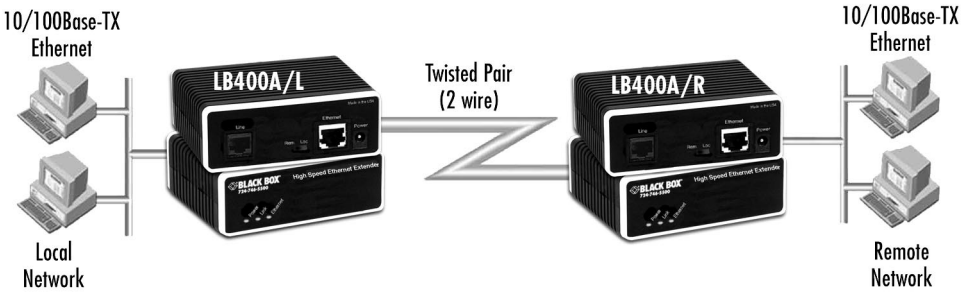

Figure 1. Typical application

The pair of LB400A models work together to create a transparent extension between two peered Ethernet LANs. Figure 1 shows a typical point-to-point application.

2. Installation

2.1 Installing the High Speed Ethernet Extender

CAUTION

The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Do the following:

1. Connect the line interface between the units (refer to section 2.2, “Connecting the Twisted-Pair Line Interface” on page 10)

   Note See Figure 2 for the standalone unit’s rear panel arrangements.

2. Connect the Ethernet interface (refer to section 2.3, “Connecting the 10/100Base-T Ethernet Interface” on page 11).

3. Connect the power plug (refer to section 2.4, “Connecting Power” on page 12).

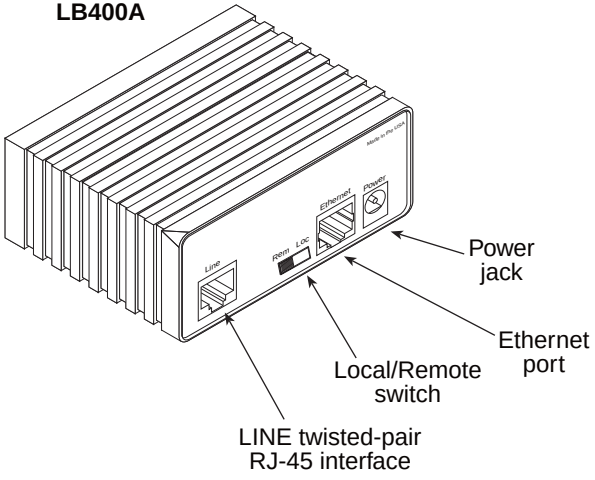

Figure 2. High Speed Ethernet Extender rear panel

2.2 Connecting the Twisted-Pair Line Interface

The High Speed Ethernet Extender supports communication between two peer Ethernet LAN sites over a distance of up to 6,000 ft (1.83 km) over 24 AWG (0.5 mm) twisted-pair wire.

Note Actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Follow the steps below to connect the High Speed Ethernet Extender interfaces.

Note The LB400A works in pairs. One of the units must be a L (Local), and the other unit must be a R (Remote). It does not matter which end is the L and which is the R. The link is always initiated by the Remote. As long as the Local is powered on, the Remote can establish a link by being powered on or by having its power reset.

1. To function properly, the two LB400As must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.

2. The LB400A is equipped with an RJ-45 interface jack that to be used for the LINE interface. This LINE interface is a two-wire interface. Observe the signal/pin relationships on the LB400A's LINE jack.

The RJ-45 connector on the LB400A's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 3.

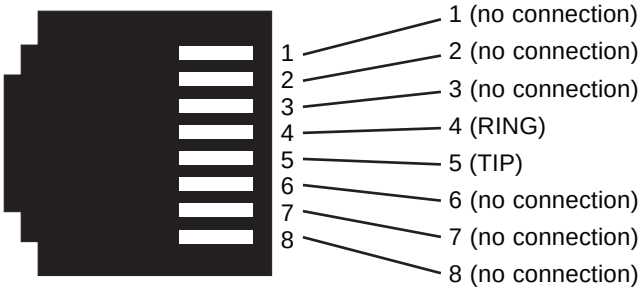

Figure 3. (RJ-45) twisted pair line interface.

2.3 Connecting the 10/100Base-T Ethernet Interface

CAUTION

The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The shielded RJ-45 port labeled Ethernet is the Auto-MDIX10/100Base-T interface. This port is designed to connect directly to a 10/100Base-T network. Figure 4 shows the signal/pin relationships on this interface. You may connect this port to a hub or PC using a straight through or crossover cable that is up to 328 ft long.

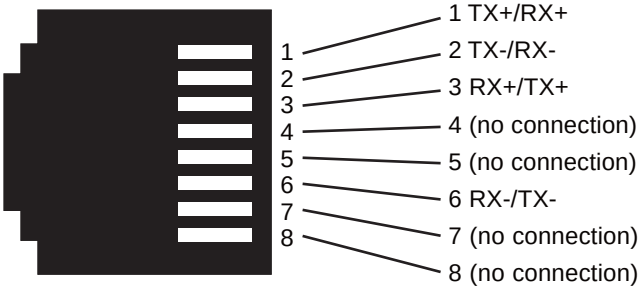

Figure 4. 10/100Base-T RJ-45 Connector Pinout.

2.4 Connecting Power

CAUTION

The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The LB400A does not have a power switch, so it powers up as soon as it is plugged in.

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the LB400A. No configuration is necessary for the power supply (See Appendix B for domestic and international power supply and cord options).

DC power (supplied via the power supply jack to the LB400A) must meet the following requirements; DC power supplied must be regulated +5VDC ±5%, 1.0A minimum. Center pin is +5V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

3. Configuration

The LB400A has eight DIP switches for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

Using a small flat-tip screwdriver, remove the protective cover located on the underside of the Ethernet Extender (see Figure 5).

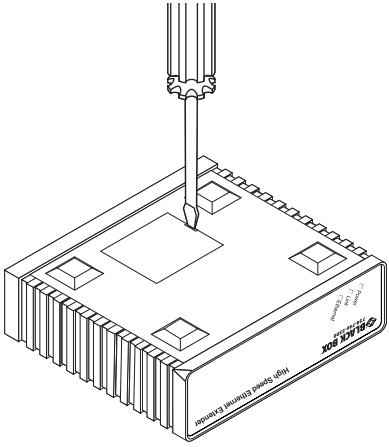

Figure 5. Removing protective cover

Figure 6 shows the orientation of the DIP switches in the On and Off positions.

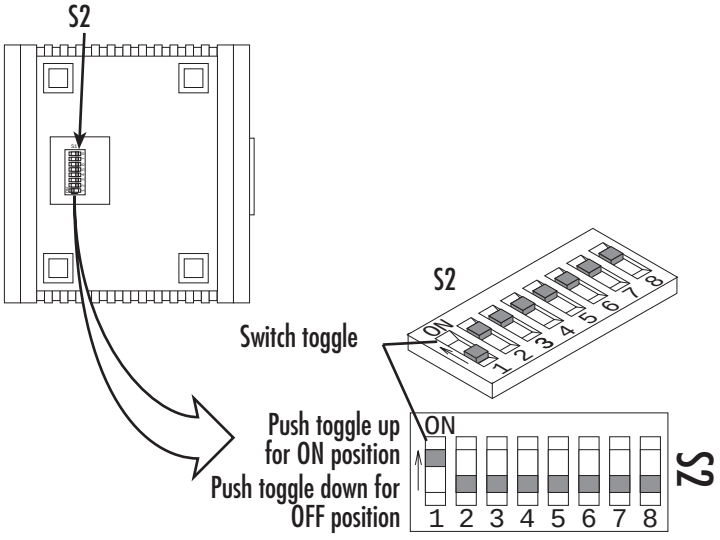

Figure 6. DIP switch orientation

3.1 Configuring DIP Switch S1

DIP switch S1 is where you configure the High-speed Ethernet Extender's line rate, symmetric or asymmetric, Ethernet, and Ethernet Shutdown. Table 1 summarizes default positions of DIP switches S2-1 through S2-8. Detailed descriptions of each switch follow the table.

Table 1: S2 Summary

Position	Description
S2-1	Symmetric/Asymmetric
S2-2	Line Rate
S2-3	Line Rate
S2-4	Ethernet configuration
S2-5	Ethernet configuration
S2-6	Ethernet configuration
S2-7	Ethernet Shutdown
S2-8	Remote Configuration

3.1.1 Switch S2-1: Symmetric/Asymmetric Operation

Use switch S2-1 to configure the unit for symmetric or asymmetric operation..

Table 2: Symmetric/Asymmetric Settings

S2-1	Setting
ON	Symmetric Operation
OFF	Asymmetric Operation

3.1.2 Switches S2-2 and S2-3: Data Rate

Use switches S2-1, S2-2 and S2-3 to configure the line rates.

Table 3: Symmetric Line Rates Selection Chart

S2-2	S2-3	Symmetric Line Rate
OFF	ON	50 Mbps
ON	OFF	25 Mbps
OFF	OFF	10 Mbps

Table 4: Asymmetric Line Rates Selection Chart

S2-2	S2-3	Asymmetric Line Rates DS/US
ON	ON	50 Mbps/2 Mbps
ON	OFF	16 Mbps/2 Mbps
OFF	OFF	4 Mbps/1 Mbps

3.1.3 Switches S2-4, S2-5 and S2-6: Ethernet Configuration

Use switches S2-4, S2-5 and S2-6 to configure Ethernet settings.

Table 5: Ethernet configurations

S2-4	S2-5	S2-6	Ethernet Configurations
ON	ON	ON	Auto-Negotiate
ON	ON	OFF	100Mb Full Duplex
ON	OFF	ON	100Mb Half Duplex
ON	OFF	OFF	10Mb Full Duplex
OFF	ON	ON	10Mb Half Duplex

3.1.4 Switch S2-7: Ethernet Shutdown

Use switch S2-7 to enable or disable Ethernet Shutdown. When Ethernet Shutdown is enabled, the LB400A will disable the Ethernet interface when there is no link detected. When Ethernet Shutdown is disabled, the Ethernet interface will always be enabled.

Table 6: Ethernet Shutdown

S2-7	Description
ON	Ethernet Shutdown Enabled
OFF	Ethernet Shutdown Disabled

3.1.5 Switch S2-8: Remote Configuration

Use switch S2-8 to enable or disable Remote Configuration.

Table 7: Ethernet Shutdown

S2-8	Description
ON	Remote Configuration Enabled
OFF	Remote Configuration Disabled

Note The S2-8 switch applies to the R unit only. If enabled, the R will follow the dip switch configuration of the L unit. If disabled, the R unit will use its own dip switch setting to determine its Ethernet operating mode and Ethernet Shutdown mode configuration. The S2-8 switch does not affect the data rate. The data rate will always follow the L configuration.

4. Operation

Once the High Speed Ethernet Extenders are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

4.1 Power Up

Before applying power to the LB400A, review section 2.4, "Connecting Power" on page 12 to verify that the unit is connected to the appropriate power source.

4.2 Front Panel LED Status Monitors

The LB400A features five front panel LEDs that monitor power, the Ethernet signals, and the Line connection. Figure 7 on page 17 shows the front panel location of each LED. Table 8 on page 18 describes the LED functions.

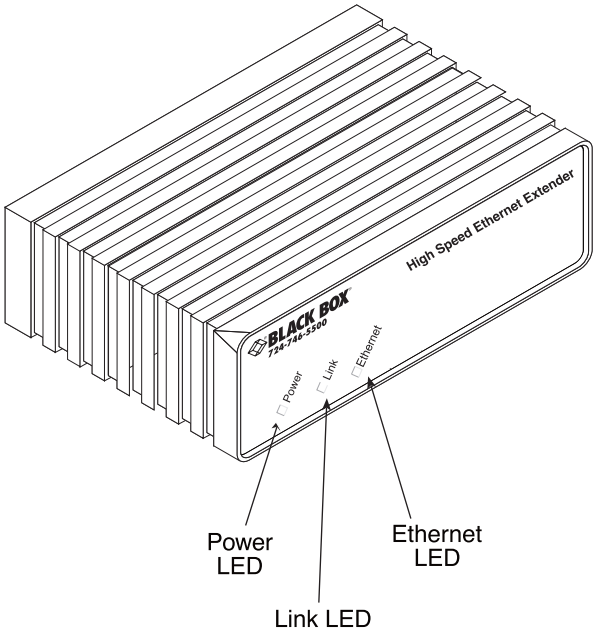

Figure 7. LB400A front panel

Table 8: Front panel LED description

LED	Description
Power	Solid GREEN to indicate the unit is powered on.
Link	Solid GREEN (ON) to indicate that the end-to-end link between the LB400As is established. The Link LED is OFF when the link is down.
Ethernet	Solid GREEN indicates that 10/100Base-T Ethernet link has been established. Flashes to indicate activity.

A. Specifications

A.1 LAN Connection

- Shielded RJ-45, 10/100Base-T, IEEE 802.3 Ethernet
- Line Connection: RJ-45

A.2 Transmission Line

Two-wire unconditioned twisted pair.

A.3 Line Rate and Distance

- Line Rate: 50 Mbps, symmetric upstream/downstream. Additional symmetric and asymmetric rates are available via DIP switch settings.
- Distance: 6,000 ft (1.8 km) at 1 Mbps upstream/4 Mbps downstream

Note Distances depend on selected line rate and line conditions. See Appendix C. on page 22 for details.

A.4 Surge Suppressor

SIDACTOR with maximum current surge: 20 kA (8/20 µs).

A.5 LED Status Indicators

- Power (Green)
- Link (Green)
- Ethernet: Link (Green) & Activity (Flashing Green)

A.6 Power Supply

External AC and DC options:

- AC: 120 VAC, 220 VAC, and UI (120–240 VAC)
- DC: 12 VDC, 24 VDC and 48 VDC
- Power consumption: 450 mA at 5 VDC

A.7 Temperature Range

0–50°C

A.8 Humidity

Up to 90% non-condensing.

A.9 Dimensions

1.58H x 4.16W x 3.75D in. (10.6H x 4.1W x 8.8D cm)

B. High Speed Ethernet Extender Interface Pin Assignment

B.1 10/100Base-T Interface

RJ-45

- Pin 1: TX+
- Pin 2: TX-
- Pin 3: RX+
- Pin 6: RX-
- Pins 4, 5, 7, 8: no connection

B.2 Line Interface

RJ-45

- Pin 4: RING
- Pin 5: TIP
- Pins 1, 2, 3, 6, 7, 8: no connection

C. Distance Chart, Based on 24 AWG (0.5 MM)

Symm Line Rate	Distance in feet (km)	Throughput at Max Distance
50 Mbps	800 (0.25 km)	48
25 Mbps	2,000 (0.61 km)	24.5
10 Mbps	4,000 (1.22 km)	10

Asymm Line Rate (DS/US)	Distance in feet (km)	Throughput at Max Distance (DS/US)
50 Mbps/2 Mbps	2,000 (0.61 km)	48/2
16 Mbps/2 Mbps	4,000 (1.22 km)	15/2
4 Mbps/1 Mbps	6,000 (1.82 km)	3.75/1

Note The actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Note DS = downstream, US = upstream

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