



Multi-Rate Ethernet Extender



This is a Class A device and is not intended for use in a residential environment.

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.



WARNING

This 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. This device can only be repaired by qualified service personnel.
- Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.
- For devices with an external power adapter, the power adapter shall be a listed Limited Power Source. 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 in compliance with local regulatory requirements.
- For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.
- For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.
- For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.
- WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as “hazardous network voltages” and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.
- Do not work on the device 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.



WARNING

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

- Always follow ESD prevention procedures when removing and replacing cards.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.
- To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis

TRADEMARKS USED IN THIS MANUAL

All applied-for and registered trademarks are the property of their respective owners.

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 librerías o gabinetes que impidan el flujo de aire por los orificios de ventilación.
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.
12. Precaución debe ser tomada de tal 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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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

- Multi-Rate Ethernet extender - Easy to configure
- Auto-MDIX Ethernet
- Configurable 10/100, Full/Half, and Auto-Negotiating Ethernet
- Extends network connections up to 5,750 ft (1.7 km) over 2-wire 24-AWG unconditioned lines
- Switch selectable line rates up to 16 Mbps
- Symmetric or asymmetric settings via DIP switch
- Transparent operation
- LED indicators for Power, Link, Ethernet Link & Activity, and Remote/Local

1.2 Description

The Black Box LB200A modems provide high-speed LAN connections between peered Ethernet LANs, remote PCs, or any other network enabled 10/100Base-T device.

Operating in pairs, one LB200A is configured as the (L) Local unit located at one end of the LAN extension and the other LB200A is configured as the (R) Remote unit at the other end. The LB200A is configured as a L or R via the switch on the bottom of the unit. These units can automatically forward LAN broadcasts, multi-casts, and frames across a 2-wire voice-grade twisted-pair link. The data is passed transparently (unmodified) through the LB200As. The LB200As automatically add and delete MAC addresses, only passing packets across the Line link that are meant for the remote peered LAN.

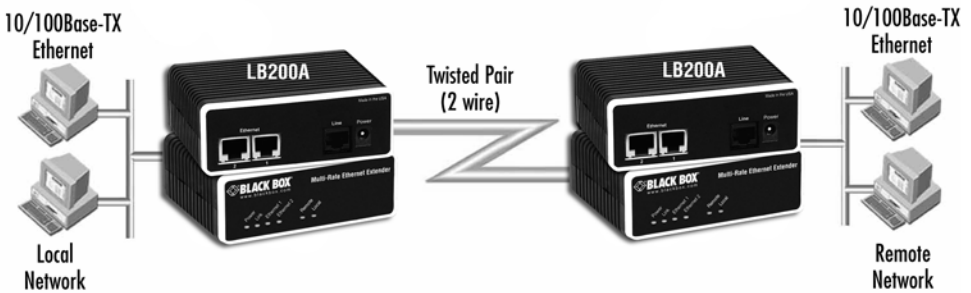


Figure 1. Typical application

The pair of LB200A models work together to create a transparent extension between two peered Ethernet LANs. Figure 1 shows a typical point-to-point application.

2. Installation



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.

To install the LB200A Ethernet Extender, do the following:

1. Connect the line interface between the units (refer to section 2.1, “Connecting the Twisted-Pair Line Interface” on page 11)

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

2. Connect the Ethernet interface (refer to section 2.2, “Connecting the 10/100Base-T Ethernet Interface” on page 12).
3. Connect the power plug (refer to section 2.3, “Connecting Power” on page 12).

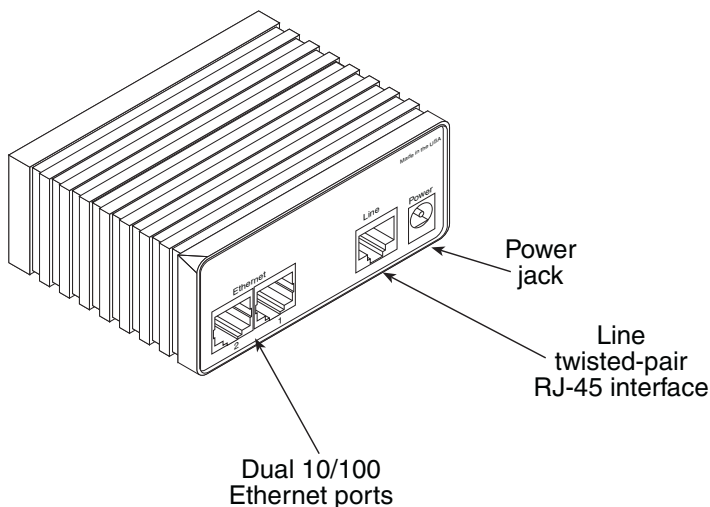


Figure 2. Multi-Rate Ethernet Extender rear panel

2.1 Connecting the Twisted-Pair Line Interface

The Multi-Rate Ethernet Extender supports communication between two peer Ethernet LAN sites over a distance of up to 5,750 ft (1.7 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 Ethernet Extender interfaces.

Note The Ethernet Extender units work in pairs. One of the units must be configured as a L (Local) unit, and the other unit must be configured as a R (Remote) unit.

1. To function properly, the two Ethernet Extenders 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 Ethernet Extender is equipped with an RJ-45 interface jack that can be used on the Line interface. The Line interface is a two-wire interface. Observe the signal/pin relationships on the Line interface jack.

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

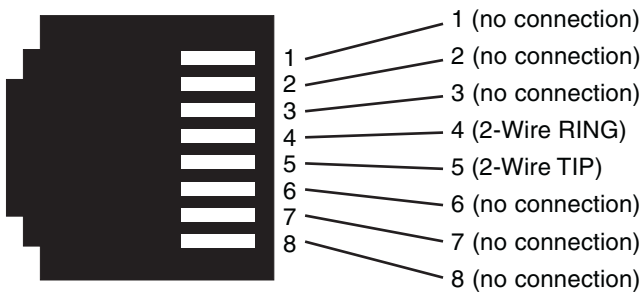


Figure 3. (RJ-45) twisted pair line interface.

2.2 Connecting the 10/100Base-T Ethernet Interface

The shielded RJ-45 ports labeled *Ethernet* are the Auto-MDIX10/100Base-T interface. These ports are 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.

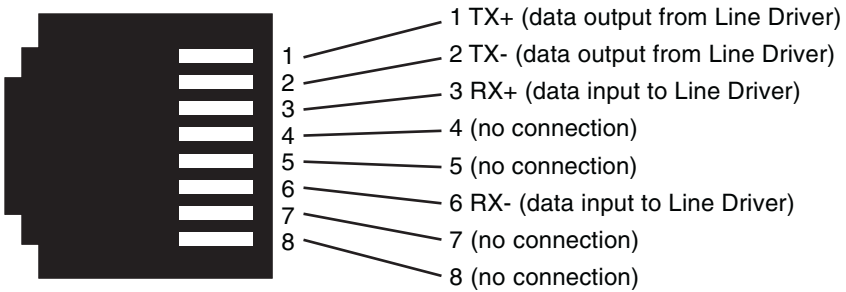


Figure 4. Ethernet Extender 10/100Base-T RJ-45 Connector Pinout

2.3 Connecting Power

The Ethernet Extender 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 Ethernet Extender. No configuration is necessary for the power supply.

DC power (supplied via the power supply jack to the Ethernet Extender) must meet the following requirements; DC power supplied must be regulated +5VDC $\pm 5\%$, 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 Ethernet Extender has four DIP switches (S1) 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).

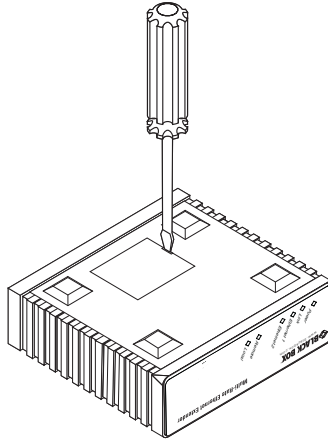


Figure 5. Removing protective cover

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

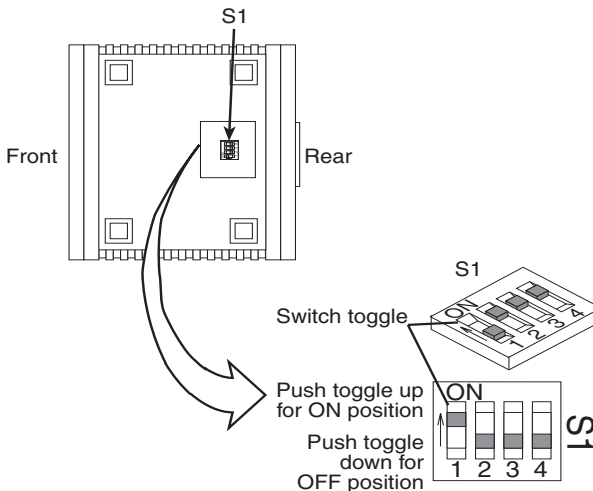


Figure 6. DIP switch orientation

3.1 Configuring DIP Switch S1

DIP switch S1 is where you configure the line rate. The following tables describe the configuration for the Ethernet Extender.

Table 1: Firmware Configuration

Position	S1-1	S1-2	S1-3	S1-4
	Master/ Slave	Rate		
ON	Slave (CPE)	4/1, 9/1, 16/2, 6/6, 10/10, 15/15 Rate Control (See table below).		
OFF	Master (CO)			

S1-2	S1-3	S1-4	Rate (DS/US)*
OFF	OFF	OFF	4/1
ON	OFF	OFF	9/1
OFF	ON	OFF	16/2
ON	ON	OFF	6/6
OFF	OFF	ON	10/10
ON	ON	ON	15/15

*, DS = Downstream, US = Upstream

4. Operation

Once the Multi-Rate 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 Ethernet Extender, review section 2.3, “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 Ethernet Extender features six front panel LEDs that monitor power, the Ethernet signals, the line connection, and the remote/local setting. Figure 7 shows the front panel location of each LED. Table 2 describes the LED functions.

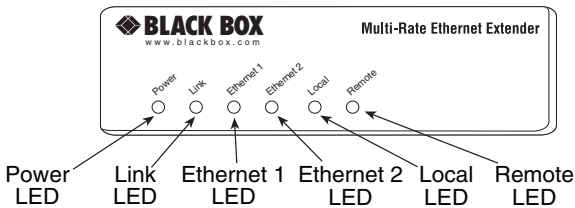


Figure 7. Ethernet Extender front panel

Table 2: Front panel LED description

LED	Status	Description
Power	Green	The device is powered on.
	Off	The device is powered off.
Link	Green	The port is connected.
	Blinking Green	Data transceiving.
	Off	No valid link on this port.
Ethernet	Green	The port is connected.
	*Blinking Green	Data transceiving.
Local	Green	The device acts in Local mode.
	Off	Local mode is off.
Remote	Green	The device acts in Remote mode.
	Off	Remote mode is off.

- *. Once the unit connects to a power source, the Link LED will blink as the Extender automatically looks for the other unit in the pair.

A. Specifications

A.1 LAN Connection

- Two 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 Multi-Rate Ethernet Extender Line Rate

- Line Rate: 15/15 Mbps, upstream/downstream. Additional five line rates are available via DIP switch settings.
- Distance: 5,750 ft (1.7 km) at 1 Mbps upstream/4 Mbps downstream

Note Distances depend on selected line rate and line conditions. See Appendix D on page 19 for details.

A.4 LED Status Indicators

- Power (Green)
- Line: Link (Green)
- Ethernet: Link (Green) & Activity (Flashing Green)
- Remote (Green)
- Local (Green)

A.5 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: 860mA at 5V

A.6 Temperature Range

0–40°C

A.7 Humidity

Up to 90% non-condensing.

A.8 Dimensions

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

B. 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)

Rate	Distance in Feet (km)	Throughput at Max Distance (megabits per second)
4/1	5,500 (1.6 km)	4.00 (DS) 1.00 (US)
9/1	5,750 (1.7 km)	8.98 (DS) 1.0 (US)
16/2	4,700 (1.4 km)	15.92 (DS) 2.0 (US)
6/6	5,500 (1.6 km)	5.98 (DS) 5.98 (US)
10/10	5,000 (1.5 km)	9.99 (DS) 9.99 (US)
15/15	4,250 (1.2 km)	14.96 (DS) 14.96 (US)

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

Note DS = downstream, US = upstream

