



Multi-Rate Ethernet Extender

Provides high-speed LAN connections between peered Ethernet LANs, remote PCs, or any other network-enabled 10/100BASE-T device.

Operates in pairs: local and remote units.



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Information**

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Summary Table of Contents

- 1. About This Guide7
- 2. General information 11
- 3. Installation 13
- 4. Configuration..... 17
- 5. Operation21
- A. Compliance Information23
- B. Specifications25
- C. Interface Pin Assignment 27
- D. Line Rate & Reach Chart29

Table of Contents

1.	About This Guide	7
1.1	Structure.....	7
1.2	Precautions	7
1.3	Safety When Working With Electricity	9
2.	General information	11
2.1	Description	12
3.	Installation	13
3.1	Connecting the Line Interface	14
3.2	Connecting the Line Interface for LB200A-R4	15
3.3	Connecting the 10/100Base-T Ethernet Interface.....	15
3.4	Connecting Power.....	16
4.	Configuration	17
4.1	Accessing the DIP Switches	18
4.2	Configuring DIP Switch S1	19
	Switch S1-1: Local/Remote Configuration	19
	Switches S1-2 and S1-3: Symmetric/Asymmetric Operation	19
	Switch S1-5: General Protection (Signal to Noise Ratio)	20
5.	Operation	21
5.1	Front Panel LED Status Monitors.....	22
A.	Compliance Information	23
A.1	Regulatory Information	24
	EMC Directive	24
	Low-Voltage Directive (Safety)	24
	PSTN	24
A.2	Radio and TV Interference (FCC Part 15)	24
A.3	CE Declaration of Conformity	24
B.	Specifications	25
B.1	Line Connector	26
B.2	LAN Connectors	26
B.3	Transmission Line	26
B.4	LED Status Indicators	26
B.5	Power Supply	26
	External AC option	26
B.6	Physical	26
	Operating Temperature Range	26
	Humidity	26
	Dimensions	26
C.	Interface Pin Assignment	27
C.1	10/100Base-T Interface	28
	RJ-45	28
C.2	Line Interface	28
	RJ-45	28

- D. Line Rate & Reach Chart29**
- D.1 Line Rate & Reach Chart Based on 24 AWG (0.5 mm)30

List of Figures

1	Typical applications	12
2	LB200A-R4 rear panel	14
3	LB200A-R4(RJ-45) twisted pair line interface.	15
4	LB200A-R410/100Base-T RJ-45 Connector Pin-out.	15
5	Removing protective cover	18
6	DIP switch orientation	18
7	LB200A-R4 front panel	22
8	LB200A-R410/100Base-T RJ-45 Connector Pin-out.	28
9	LB200A-R4 RJ-45 Twisted-Pair Line Interface Connector Pin-out	28

List of Tables

1	S1 Summary	19
2	Local/Remote Unit Configuration	19
3	Symmetric/Asymmetric Selection Chart	19
4	Signal to Noise Ratio	20
5	Front panel LED description	22
6	Line Rate & Reach Chart Using Twisted-Pair (Long Range)	30
7	Line Rate & Reach Chart Using Twisted-Pair (High Speed)	30

1. ABOUT THIS GUIDE

This guide describes the Black Box Model LB200A-R4 hardware, installation, and basic configuration.

1.1 AUDIENCE

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

1.2 STRUCTURE

This guide contains the following chapters and appendices:

- [Chapter 2](#), on page 11 provides information about LB200A-R4 features and capabilities
- [Chapter 3](#), on page 13 provides information about installing the LB200A-R4 interfaces
- [Chapter 4](#), on page 17 provides information about the LB200A-R4 configuration
- [Chapter 5](#), on page 21 provides information about the LB200A-R4 operation
- [Appendix A](#), on page 23 provides compliance information for the LB200A-R4
- [Appendix B](#), on page 25 provides specifications for the LB200A-R4
- [Appendix C](#), on page 27 provides diagrams of detailed pin assignments
- [Appendix D](#), on page 29 provides a line range and reach chart for the LB200A-R4

For best results, read the contents of this guide *before* you install the Black Box LB200A-R4.

1.3 PRECAUTIONS

Notes and cautions, which have the following meanings, are used throughout this guide to help you become aware of potential Router modem problems. **Warnings** relate to personal injury issues, and **Cautions** refer to potential property damage.

A note presents additional information or interesting sidelights.



The alert symbol and IMPORTANT heading calls attention to important information.



The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.



The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.



The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.



The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.

1.4 SAFETY WHEN WORKING WITH ELECTRICITY



- 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.



This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.



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



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.

2. GENERAL INFORMATION

Chapter contents

2.	General information.....	11
2.1	Features	12
2.2	Description	12

2.1 FEATURES

- Variable rate Black Box Ethernet extender—Easy to configure
- Auto-MDIX Ethernet
- Configurable 10/100, Full/Half, and Auto-Negotiating Ethernet
- Extends up to 1 or 2 10/100Base-TX Ethernet beyond 328-foot (100-meter) limitation over a single twisted-pair, Cat 5e/6/7, or coaxial cable
- Variable line rate settings via DIP switch
- Transparent operation
- LED indicators for Power, Line, Local, Remote, Ethernet 0 and 1 (Eth 0 and Eth 1), and Ethernet Link/Activity

2.2 DESCRIPTION

BlackBox LB200A-R4 Ethernet extenders 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-R4 is configured as the (L) Local unit located at one end of the LAN extension and the other LB200A-R4 is configured as the (R) Remote unit at the other end. The LB200A-R4 is configured as an L or R via the switch on the bottom of the unit. These units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade twisted-pair or BNC link. The data is passed transparently (unmodified) through the LB200A-R4. The LB200A-R4s automatically add and delete MAC addresses, only passing packets across the Line link that are meant for the remote peered LAN.

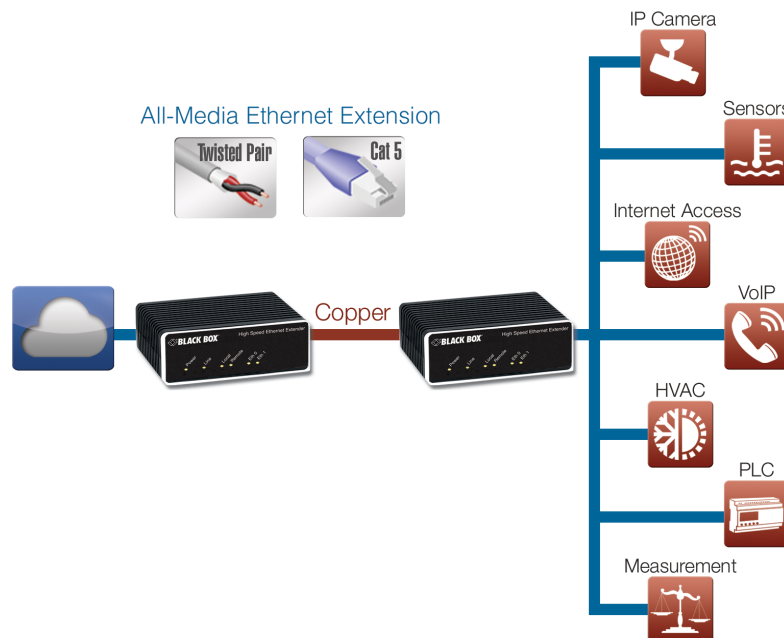


Figure 1. Typical applications

The pair of LB200A-R4 models work together to create a transparent extension between two peered Ethernet LANs using twisted pair (2-wire) or Cat5+. [Figure 1](#) shows typical applications.

3. INSTALLATION

Chapter Contents

3.	Installation	13
3.1	Planning the Installation	14
3.2	Connecting the Line Interface	14
3.3	Connecting the Line Interface for LB200A-R4	15
3.4	Connecting the 10/100Base-T Ethernet Interface	15
3.5	Connecting Power	16

3.1 PLANNING THE 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-R4 Ethernet Extender, do the following:

1. Connect the line interface between the units (refer to “[Connecting the Line Interface](#)” on page 14)

Note See [Figure 2](#) for the LB200A-R4’s rear panel.

2. Connect the Ethernet interface (refer to “[Connecting the 10/100Base-T Ethernet Interface](#)” on page 15).
3. Connect the power plug (refer to “[Connecting Power](#)” on page 16).



Figure 2 LB200A-R4 rear panel

3.2 CONNECTING THE LINE INTERFACE



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 LB200A-R4 supports communication between two peer Ethernet LAN sites over a distance of up to 10,000 ft (3 km) over 24 AWG (0.5 mm) twisted-pair wire, Cat5+, or 75-ohm BNC.

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 LB200A-R4 interfaces.

Note The LB200A-R4 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.

3.3 CONNECTING THE LINE INTERFACE FOR LB200A-R4

1. To function properly, the two LB200A-R4s 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 LB200A-R4 is equipped with an RJ-45 interface jack (Figure 3)

The RJ-45 connector on the LB200A-R4's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 3.

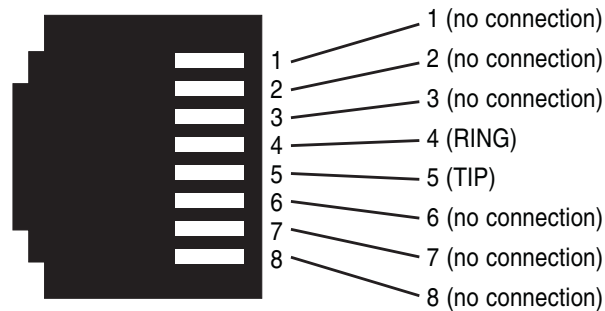


Figure 3 LB200A-R4(RJ-45) twisted pair line interface.

3.4 CONNECTING THE 10/100BASE-T ETHERNET INTERFACE



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 RJ-45 ports labeled *Eth 0* and *Eth 1* are Auto-MDIX 10/100Base-T interfaces. These ports are designed to connect directly to a 10/100Base-T device or 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.

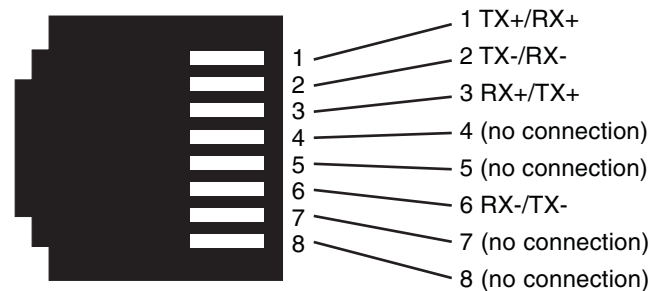


Figure 4 LB200A-R410/100Base-T RJ-45 Connector Pin-out.

3.5 CONNECTING POWER



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 LB200A-R4 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 LB200A-R4. No configuration is necessary for the power supply.

DC power (supplied via the power supply jack to the LB200A-R4) must meet the following requirements; DC power supplied must be regulated 5 VDC \pm 5%, 1.0A minimum. Center pin is +5 V. The barrel type plug has 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

4. CONFIGURATION

Chapter contents

4.	Configuration	17
4.1	Introduction	18
4.2	Accessing the DIP Switches	18
4.3	Configuring DIP Switch S1	19
	Switch S1-1: Local/Remote Configuration	19
	Switches S1-2 and S1-3: Symmetric/Asymmetric Operation	19
	Switch S1-5: General Protection (Signal to Noise Ratio)	20

4.1 INTRODUCTION

The LB200A-R4 has eight DIP switches (S1) for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

4.2 ACCESSING THE DIP SWITCHES

1. Using a small flat-tip screwdriver, remove the protective cover located on the underside of the LB200A-R4 (see [Figure 5](#)).

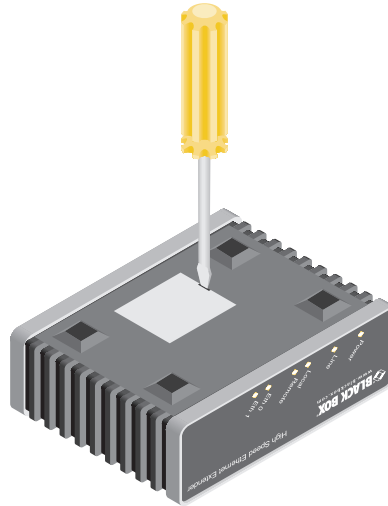


Figure 5. Removing protective cover

2. The DIP switches are externally accessible from the underside of the LB200A-R4. [Figure 6](#) shows the orientation of the DIP switches in the On and Off positions.

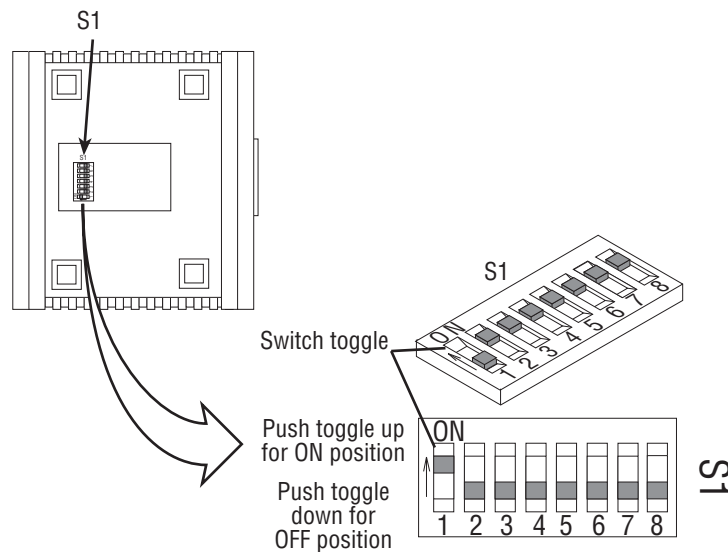


Figure 6. DIP switch orientation

4.3 CONFIGURING DIP SWITCH S1

DIP switch S1 is where you configure the Line interface. The following tables describe the configuration for the LB200A-R4.

Table 1. S1 Summary

Position	Description
S1-1	Local/Remote Configuration
S1-2	Line Rate/Symmetry
S1-3	Line Rate/Symmetry
S1-4	Reserved
S1-5	SNR Margin
S1-6	Reserved
S1-7	Reserved
S1-8	Reserved

Switch S1-1: Local/Remote Configuration

Use switch S1-1 to configure the unit as Remote or Local in the LB200A-R4pair.

Table 2. Local/Remote Unit Configuration

S1-1	Setting
ON	CPE/Remote
OFF	CO/Local

Switches S1-2 and S1-3: Symmetric/Asymmetric Operation

Use switches S1-2 and S1-3 to configure the line rate type and operation.

Table 3. Symmetric/Asymmetric Selection Chart

S1-2	S1-3	Setting
OFF	OFF	High-Speed "Symmetric"
OFF	ON	High-Speed "Asymmetric"
ON	OFF	FastPath High-Speed "Asymmetric"
ON	ON	Long-Range "Asymmetric"

Note See "Line Rate & Reach Chart Based on 24 AWG (0.5 mm)" on page 30 for line rate distances.

Switch S1-5: General Protection (Signal to Noise Ratio)

Use switch S1-5 to configure line noise protection.

Table 4. Signal to Noise Ratio

S1-5	Setting
ON	6dB
OFF	9dB

- **6dB:** Original line noise protection with 6dB SNR
- **9dB:** Better line noise protection with SNR up to 9dB

5. OPERATION

Chapter contents

5.	Operation	21
5.1	Introduction	22
5.2	Front Panel LED Status Monitors.....	22

5.1 INTRODUCTION

Once the LB200A-R4s are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

Before applying power to the LB200A-R4, please review “Connecting Power” on page 16 to verify that the unit is connected to the appropriate power source.

5.2 FRONT PANEL LED STATUS MONITORS

The LB200A-R4 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 5 on page 22 describes the LED functions.

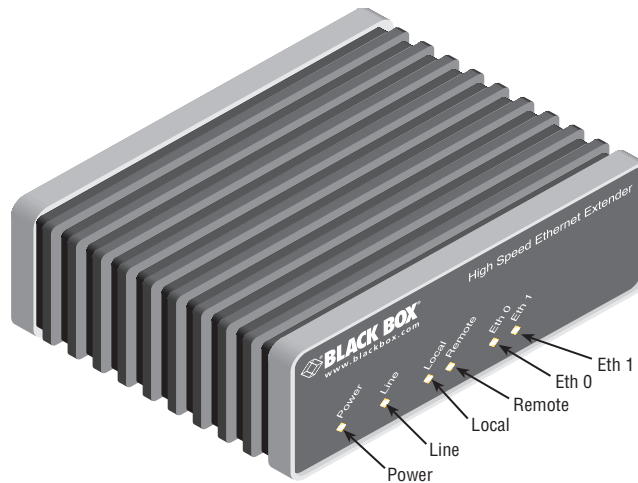


Figure 7 LB200A-R4 front panel

Table 5. Front panel LED description

LED	Status	Description
Power	Green	The device is powered on.
	Off	The device is powered off.
Line	Green	The port is connected.
	Blinking Green	Data transceiving.
	Off	No valid link on this port.
Eth 0 and Eth 1	Green	The port is connected.
	^a 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.

- a. Once the unit connects to a power source, the LED will blink as the LB200A-R4 automatically looks for the other unit in the pair.

A. Compliance Information

Chapter contents

A. Compliance Information	23
A.1 Regulatory Information	24
EMC Directive	24
Low-Voltage Directive (Safety)	24
PSTN	24
A.2 Radio and TV Interference (FCC Part 15)	24
A.3 CE Declaration of Conformity	24

A.1 REGULATORY INFORMATION

EMC DIRECTIVE

- FCC Part 15, Class A
- EN55022, Class A
- EN55024
- EN50581

LOW-VOLTAGE DIRECTIVE (SAFETY)

- IEC/EN60950-1, 2nd Edition
- UL60950-1/CSA C22.2 No. 60950-1

PSTN

- This device is not intended nor approved for connection to the PSTN

A.2 RADIO AND TV INTERFERENCE (FCC PART 15)

This device 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 device 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 device 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).

A.3 CE DECLARATION OF CONFORMITY

This device is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC relating to electromagnetic compatibility and Directive 2006/95/EC relating to electrical equipment designed for use within certain voltage limits. The Declaration of Conformity may be obtained from ROHS@blackbox.com.

The safety advice in the documentation accompanying this device shall be obeyed. The conformity to the above directive is indicated by CE mark on the device.

B. Specifications

Chapter contents

- B. Specifications 25**
- B.4 LAN Connectors 26
- B.5 Transmission Line 26
- B.6 LED Status Indicators 26
- B.7 Power Supply 26
 - External AC option 26
- B.8 Physical 26
 - Operating Temperature Range 26
 - Humidity 26
 - Dimensions 26

B.1 LINE CONNECTOR

- RJ-45

B.2 LAN CONNECTORS

- 2 RJ-45, 10/100Base-T, IEEE 802.3 Ethernet

B.3 TRANSMISSION LINE

- Two-wire unconditioned twisted pair

B.4 LED STATUS INDICATORS

- Power (Green)
- Line (Green)
- Local (Green)
- Remote (Green)
- Ethernet (Green when linked; flashing green when transceiving data)

B.5 POWER SUPPLY

External AC option

- UI (120–240 VAC)
- Power consumption: 1 A at 5 VDC

B.6 PHYSICAL

Operating Temperature Range

- 32 to 122°F (0 to 50°C)

Humidity

- Up to 90% non-condensing.

Dimensions

- 4.13 W x 1.5 H x 3.75 D in. (105 W x 38.1 H x 95.3 D mm)

C. Interface Pin Assignment

Chapter contents

C. Interface Pin Assignment	27
C.1 10/100Base-T Interface	28
RJ-45	28
C.2 Line Interface	28
RJ-45	28

C.1 10/100BASE-T INTERFACE

RJ-45

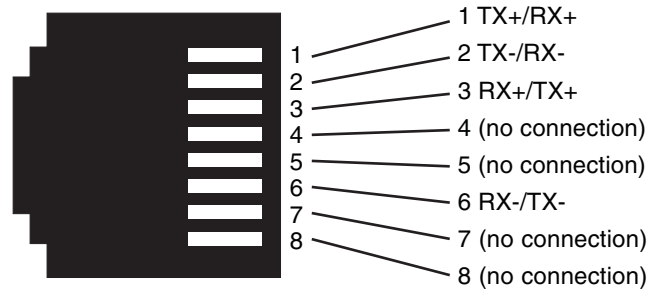


Figure 8. LB200A-R410/100Base-T RJ-45 Connector Pin-out.

C.2 LINE INTERFACE

RJ-45

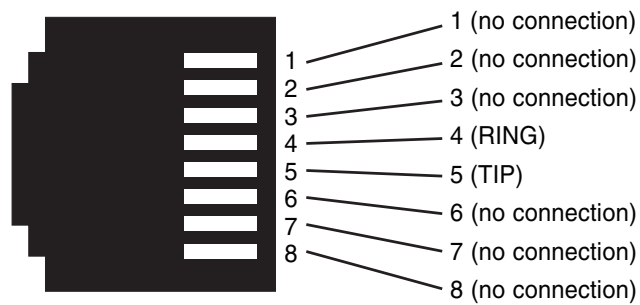


Figure 9. LB200A-R4 RJ-45 Twisted-Pair Line Interface Connector Pin-out

D. Line Rate & Reach Chart

Chapter contents

D. Line Rate & Reach Chart 29
D.1 Line Rate & Reach Chart Based on 24 AWG (0.5 mm) 30

D.1 LINE RATE & REACH CHART BASED ON 24 AWG (0.5 MM)

Table 6. Line Rate & Reach Chart Using Twisted-Pair (Long Range)

Mode (Long Range)	Distance in Feet		Mbps	
	ft	m/km	DS	US
Asymmetric S1-2 ON S1-3 ON	250 ft	76 m	67	16
	1000 ft	305 m	59	16
	2,000 ft	610 m	45	11
	3,000 ft	914 m	31	5
	5,000 ft	1.5 km	17	682 kbps
	10,000 ft	3 km	4	263 kbps

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

Note DS = downstream, US = upstream

Table 7. Line Rate & Reach Chart Using Twisted-Pair (High Speed)

Mode (High Speed)	Distance in Feet		Mbps		
	ft	m/km	DS	US	
Symmetric S1-2 OFF S1-3 OFF	250 ft	76 m	121	144	
	1000 ft	305 m	73	103	
	2,000 ft	610 m	45	37	
	3,000 ft	914 m	46	10	
	3,500 ft	1 km	30	4	
Asymmetric S1-2 OFF S1-3 ON S1-2 ON S1-3 OFF	Standard	250 ft	76 m	168	95
		1000 ft	305 m	126	54
	FastPath	2,000 ft	610 m	60	21
		3,500 ft	1 km	35	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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