BLACK BOX NETWORK SERVICES

Hardened PoL PoE Ethernet Extenders

Hardened PoL PoE Ethernet Extenders

Extends Power over Ethernet up to 1.2 km over ordinary voice-grade copper wire.
Features Ethernet extension up to 2.2 km.

Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500) • FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746 • Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 • Web site: www.blackbox.com • E-mail: info@blackbox.com

Quick Start Guide

This quick start guide describes how to install and use the Hardened Ethernet Extender. This is the Hardened Ethernet Extender of choice for harsh environments constrained by space.

Installation

Transmitter: This is a PoL (Power over Link) transmitter. Data and power can be delivered at the same time through one pair copper wire to turn on and communicate with a Receiver via an RJ-11 phone jack or a 2-pin Terminal Block interface.

Receiver: This is a PoL (Power over Link) Receiver. The Receiver can be powered either by a Transmitter through one pair copper wire or power supply. The Ethernet port supports IEEE802.3at PoE/PSE for fulfilling PoE/PD application.

<Warning>
- ∞ Remove the device power before installation.
- ∞ Remove the device power before any I/O and DIP switch configuration.
- ∞ Do not connect the Transmitter and the Receiver to the same power source. Power loops back through the PoL linked via copper wire may damage devices.

PoL (Power over Link) Mode Enable Installation
- ∞ Ensure all power sources are disconnected from Transmitter and Receiver.
- ∞ Ensure that the Transmitter PoL (Power over Link) DIP switch is in **On** position (Up position).
- ∞ Set the Transmitter Type DIP switch to Per (Performance, Up position) for better Line Speed (but poor noise immunity). Or set the Transmitter's Type DIP switch to Std (Standard, Down position) for standard Line Speed (but better noise immunity).
- ∞ Check if Receiver Mode is set to Rmt on DIP switch (Remote, Up position).
- ∞ Connect one end of the one pair copper wire to RJ-11 phone jack or 2-pin Terminal Block interface of the Transmitter and the other end to RJ-11 phone jack or 2-pin Terminal Block interface of the Receiver.
- ∞ Connect a power source to Transmitter.
- ∞ Data and power can be delivered from Transmitter, and at the same time through one pair of copper wire to turn on and communicate with Receiver.

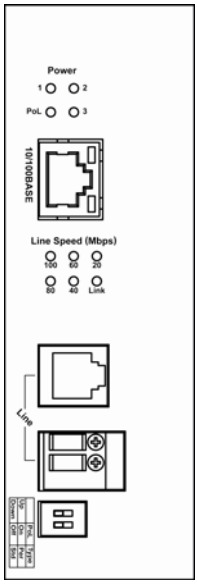
<Note> The equipment is designed for building installation and not intended to be connected to exposed (outside plant) networks, including campus environment or equivalent.

PoL (Power over Link) Mode Disable Installation
- ∞ For longer distance (e.g. over 1.4km) extension applications, the Receiver may not be able to receive power from the Transmitter. A separate power supply may be used on the Receiver.
- ∞ Ensure all power sources are disconnected from the Transmitter and the Receiver.
- ∞ Ensure that the Transmitter PoL (Power over Link) DIP switch is in **Off** position (Down position).
- ∞ Set the Transmitter Type DIP switch to Per (Performance, Up position) for better Line Speed (but poor noise immunity). Or set the Type DIP switch of Transmitter to Std (Standard, Down position) for standard Line Speed (but better noise immunity).
- ∞ Connect the power source to Transmitter.
- ∞ Check if the Receiver Mode is set to Rmt on DIP switch (Remote, Up position).
- ∞ Connect the power source to the Receiver.

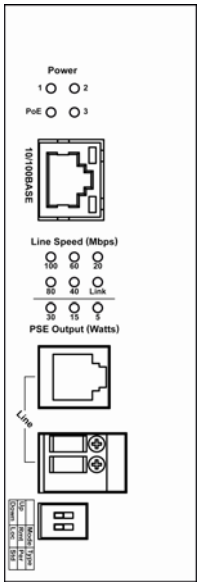
- Connect one end of the one pair copper wire to the RJ-11 phone jack or 2-pin Terminal Block interface of the Transmitter and connect the other end to RJ-11 phone jack or 2-pin Terminal Block interface of the Receiver.
- Data can be transmitted between the Transmitter and the Receiver via copper wire.

Physical Description

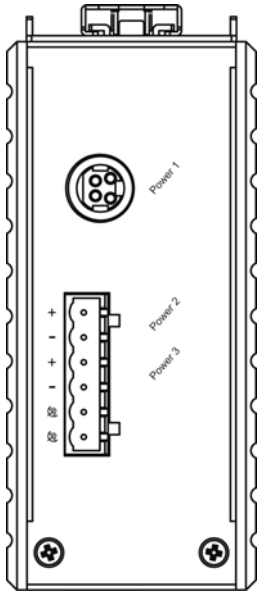
The Port Status LEDs and Power Inputs



Transmitter



Receiver



- DC Terminal Block Power Inputs: 2.5A @ 48VDC (Peak current 3.26A). Two pairs of power inputs can be used to power up this Ethernet Extender. The redundant power supplies function is supported. You only need to have one power input connected to run the Ethernet Extender.
- DC JACK Power input: 2.5A @ 48VDC (Peak current 3.26A).

Power Input Assignment			
Power1		48VDC	DC Jack
Power2	+	T:46-57V / R:46-57V DC	Terminal Block
	−	Power Ground	
Power3	+	T:46-57V / R:46-57V DC	
	−	Power Ground	
⏚		Earth Ground	

DIP Switch	Down	Up
Transmitter		
PoL	Disable Power over Link	Enable Power over Link
Type	Std (Standard) Standard line speed Better noise immunity	Per (Performance) Better line speed Poor noise immunity
Receiver		
Mode	Loc (Local) Set Receiver to Local Mode	Rmt (Remote) Set Receiver to Remote Mode
Type	Std (Standard) Standard line speed Better noise immunity	Per (Performance) Better line speed Poor noise immunity

LEDs	State	Indication	
Power 1/2/3	Steady	Power received	
	Off	Power off	
PoL	Steady	Power Ethernet extension interface function is enabled	
	Off	No power is transmitted over Ethernet extension interface	
PoE	Steady	Powered device (PD) is connected	
	Off	Powered device (PD) is disconnected	
Link	Steady	A valid Extender connection is established	
	Fast Flashing	Data is being transmitted or received	
	Slow Flashing	Extender port under negotiation mode	
	Off	Extender interface connection is not established	
Line Speed	Steady	Displays the link speed in Mbps	
PSE Output	Steady	PoE power can be transmitted for PD	
	All off	No PoE power can be transmitted for PD	
[redacted]	Green	Steady	A valid Ethernet connection established
		Flashing	Data transmitted or received
		Off	Non-Ethernet connection is established
	Yellow	Steady	Link speed at 100Mbps
		Off	Link speed at 10Mbps

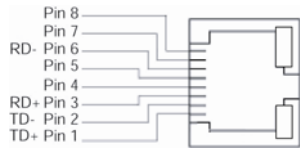
Power over Link (PoL) Enabled		
Distance	Data Rate	Receiver PoE Output
300M	100Mbps	30.0W
400M	90Mbps	15.4W
600M	60Mbps	14.0W
800M	45Mbps	9.5W
1000M	35Mbps	7.0W
1200M	20Mbps	5.0W

Power over Link (PoL) Disabled Power Supply Applied on Receiver		
Distance	Data Rate	Receiver PoE Output
1400M	15Mbps	30.0W
1600M	10Mbps	30.0W
1800M	3Mbps	30.0W
Up to 2200M	1Mbps	30.0W

<Note> The Reference Performance is tested on 24AWG Telephone wire (0.5mm diameter, 1-pair wire, Cable impedance: 100ohm).

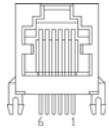
10/100Base-TX and Ethernet Extender Connectors

10/100Base-TX Connection
The following table lists the pinouts of the 10/100Base-TX RJ-45 port.



Pin	Regular Port	PoE Port
1	Output Transmit Data +	Output Transmit Data +
2	Output Transmit Data -	Output Transmit Data -
3	Input Receive Data +	Input Receive Data +
4		Positive (VCC+)
5		Positive (VCC+)
6	Input Receive Data -	Input Receive Data -
7		Negative (VCC-)
8		Negative (VCC-)

Ethernet Extender Connection
The RJ-11 and Terminal Block port pinouts:
Pin 3: Tip, Pin 4: Ring.
Use a telephone line to connect two RJ-11 or Terminal Block ports between two Hardened Ethernet Extenders.



Functional Description

- Meets EN61000-6-2 & EN61000-6-4 EMC Generic Standard Immunity for industrial environment.
- Ethernet port: Supports IEEE802.3/802.3u/802.3x. Auto-negotiation: 10/100Mbps, full/half-duplex; Auto MDI/MDIX.
- Auto data rate negotiation for the Ethernet extension interface.
- Supports six speeds with speed indicator LEDs on the front panel of the unit, up to 100Mbps @ about 300 meters (984 ft.), down to 1Mbps @ about 2,200 meters (7,218 ft.).
- Supports Power over Ethernet applications up to 1,200meters (3,937ft.) for Max. 5 watts power consumed PoE powered devices.
- Power consumption:
  - **Enable** Power over Link (PoL) function: Max. 65 Watts
  - **Disable** Power over Link (PoL) function: Transmitter: Max. 5 W. Receiver: Max. 35 W with PoE output, Max. 5 W without PoE output.
- Power Supply: Redundant T:46-57V / R:46-57V DC Terminal Block power inputs and 48 VDC Latched DC JACK interface.
- Operating temperature range @ -40□ to 75□ (-40℉ to 167℉). Tested for functional operation @ -40□ to 85□ (-40℉ to 185℉).
- Supports Din-Rail or Panel Mounting installation.

Preface

This manual describes how to install and use the Hardened Ethernet Extender. The Hardened Ethernet Extender introduced here provides one channel for Ethernet over existing voice grade copper wire.

The Hardened Ethernet Extender fully complies with IEEE802.3 10Base-T and IEEE802.3u 100Base-TX standards.

In this manual, you will find:

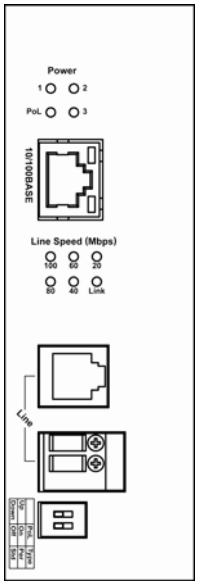
- Product overview
- Features on the Hardened Ethernet Extender
- Illustrative LED functions
- Installation instructions
- Specifications

Table of Contents

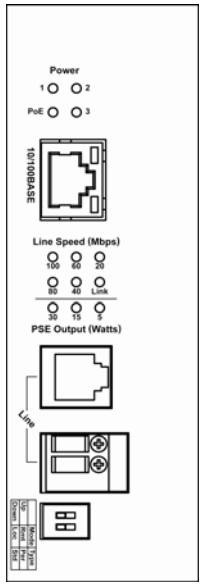
Introduction

The Hardened Ethernet Extender provides one channel for Ethernet over existing voice grade copper wire. This Hardened Ethernet Extender solution works in industrial applications or rugged environments.

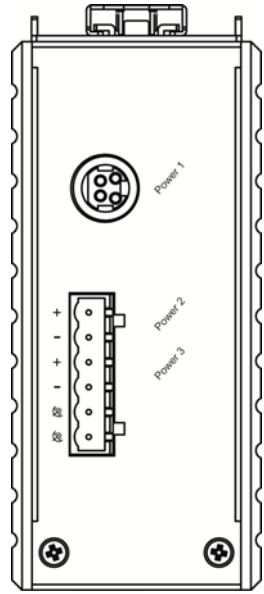
Product Overview



Transmitter



Receiver



Product Features

- Meets EN61000-6-2 & EN61000-6-4 EMC Generic Standard Immunity for industrial environment.
- Ethernet port: Supports IEEE802.3/802.3u/802.3x. Auto-negotiation: 10/100Mbps, full/half-duplex; Auto MDI/MDIX.
- Auto data rate negotiation for Ethernet extension interface.
- Support six speeds with speed indicator LEDs on front panel of unit, up to 100Mbps @ about 300 meters (984 ft.), down to 1Mbps @ about 2,200 meters (7,218 ft.).

- Supports Power over Ethernet applications up to 1,200 meters (3,937ft.) for Max. 5 watts of power consumed by PoE powered devices.
- Power consumption:
  - **Enable** Power over Link (PoL) function: Max. 65Watts
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- Supports Din-Rail or Panel Mounting installation.

Packing List

Your package should contain the following items. IIf anything is missing or damaged, contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

- The Hardened Ethernet Extender
- User's Manual
- AC to DC Power Adapter and Power Cable (optional)

One-Channel Hardened Ethernet Extender

Ports

The Hardened Ethernet Extender provides TX ports and one Ethernet Extender port.
For the TX ports, it uses RJ-45 connectors and auto senses the speed of 10/100 Mbps.
For the Ethernet Extender port, it uses RJ-11 and Terminal Block connectors and auto senses the speed of Link (below 20)/20/40/60/80/100Mbps.

Ethernet Extender Mode Settings

Ethernet Extender mode settings are simple using a DIP (Dual Inline Package) switch on the top panel of the Hardened Ethernet Extender.

DIP Switch

DIP Switch	Down	Up
Transmitter		
PoL	Disable Power over Link	Enable Power over Link
Type	Std (Standard) Standard line speed Better noise immunity	Per (Performance) Better line speed Poor noise immunity
Receiver		
Mode	Loc (Local) Set Receiver to Local Mode	Rmt (Remote) Set Receiver to Remote Mode
Type	Std (Standard) Standard line speed Better noise immunity	Per (Performance) Better line speed Poor noise immunity

Front Panel & LEDs

LED Indicators

The LED indicators give you instant feedback on the status of the Hardened Ethernet Extender:

LEDs	State	Indication	
Power 1/2/3	Steady	Power received	
	Off	Power off	
PoL	Steady	Power Ethernet extension interface function is enabled	
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Link	Steady	A valid Extender connection established	
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Power over Link (PoL) Disabled Power Supply Applied on Receiver		
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Up to 2200M	1Mbps	30.0W

<Note> The Reference Performance is tested on 24 AWG Telephone wire (0.5 mm diameter, 1-pair wire, Cable impedance: 100 ohm).

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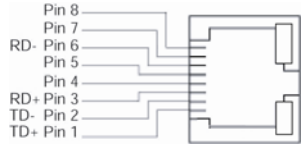

Pin	Regular Port	PoE Port
1	Output Transmit Data +	Output Transmit Data +
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3	Input Receive Data +	Input Receive Data +
4		Positive (VCC+)
5		Positive (VCC+)
6	Input Receive Data -	Input Receive Data -
7		Negative (VCC-)
8		Negative (VCC-)

Ethernet Extender Connection
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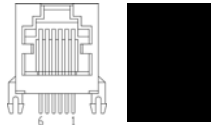
Pin 3: Tip, Pin 4: Ring.
Use a telephone line to connect two RJ-11 or Terminal Block ports between two Hardened Ethernet Extenders.



Installation

This chapter gives step-by-step installation instructions for the Hardened Ethernet Extender.

Selecting a Site for the Equipment

As with any electric device, you should place the equipment where it will not be subjected to extreme temperatures, humidity, or electromagnetic interference. Specifically, the site you select should meet the following requirements:

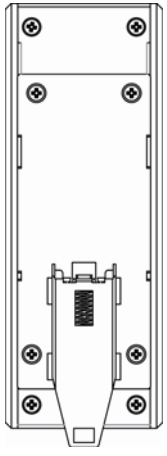
- The Surrounding Air temperature should be between -40 to +167 degrees Fahrenheit (-40 to +75 degrees Celsius).
- The relative humidity should be less than 95 percent, non-condensing.
- Surrounding electrical devices should not exceed the electromagnetic field (RFC) standards.
- Make sure that the equipment receives adequate ventilation. Do not block the ventilation holes of the equipment.
- The power outlet should be within 6 feet (1.8 meters) of the product.

DIN Rail Mounting

Fix the DIN rail attachment plate to the back panel of the Hardened Ethernet Extender.

Installation: Place the Hardened Ethernet Extender on the DIN rail from above using the slot. Push the front of the Hardened Ethernet Extender toward the mounting surface until it audibly snaps into place.

Removal: Pull out the lower edge and then remove the Hardened Ethernet Extender from the DIN rail.



Connecting to Power

Redundant DC Terminal Block Power Inputs or 48-VDC DC Jack:

Redundant DC Terminal Block Power Inputs

Two pairs of power inputs can be used to power up this device. You only need to have one power input connected to run the Hardened Ethernet Extender.

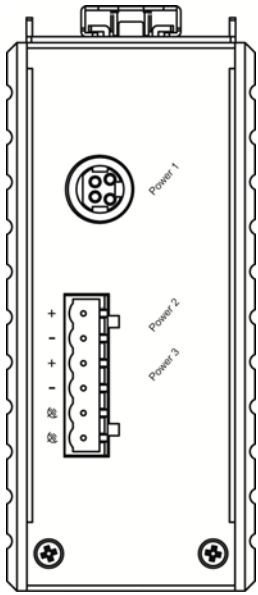
Step 1: Connect the DC power cord to the pluggable terminal block on the Hardened Ethernet Extender, and then plug it into a standard DC outlet.

Step 2: Disconnect the power cord if you want to shut down the Hardened Ethernet Extender.

48VDC DC Jack

Step 1: Connect the supplied AC to DC power adapter to the receptacle on the top side of the Hardened Ethernet Extender.

Step 2: Connect the power cord to the AC to DC power adapter and attach the plug to a standard AC outlet with the appropriate AC voltage.



Power Input Assignment			
Power1		48VDC	DC Jack
Power2	+	T:46-57V / R:46-57V DC	Terminal Block
	−	Power Ground	
Power3	+	T:46-57V / R:46-57V DC	
	−	Power Ground	
⏚		Earth Ground	

Specifications

Applicable Standards	IEEE802.3 10Base-T, IEEE802.3u 100Base-TX
Fixed Ports	10/100Mbps Ethernet ports with RJ-45 connectors 1 x Ethernet Extender port with RJ-11 and Terminal Block connectors
Speed 10Base-T 100Base-TX Ethernet Extender	 10/20Mbps for half/full-duplex 100/200Mbps for half/full-duplex Link (Below 20), 20, 40, 60, 80, 100Mbps
Switching Method	Store-and-Forward
Forwarding rate	14,880/148,810pps for 10/100Mbps
Cable 10Base-T 100Base-TX Ethernet Extender	 4-pair UTP/STP Cat. 3, 4, 5 up to 100m 4-pair UTP/STP Cat. 5 up to 100m Telephone wires
LED Indicators	Per Unit (3 LEDs)- Power1, Power2, Power3
	Transmitter- PoL; Line Speed (Mbps): Link, 20, 40, 60, 80, 100 Receiver- PoE; Line Speed (Mbps): Link, 20, 40, 60, 80, 100; PSE Output (Watts): 5, 15, 30
Dimensions	50mm (W) × 110mm (D) x 135mm (H) (1.97” (W) x 4.33” (D) x 5.31” (H))
Weight	0.77Kg (1.7lbs.)
Power	Terminal Block: T:46-57V / R:46-57V DC DC Jack: 48VDC, External AC/DC required Terminal Block & DC Jack Power Inputs: 2.5A @ 48VDC (Peak current 3.26A)
Power Consumption	Enable PoL: Max. 65Watts Disable PoL: Transmitter: Max. 5W Receiver: Max. 35W with PoE output Max. 5W without PoE output

Operating Temperature	-40℃ ~ 75℃ (-40℉ ~ 167℉) Tested for functional operation @ -40℃ ~ 85℃ (-40℉ ~ 185℉)
Storage Temperature	-40℃ ~ 85℃ (-40℉ ~ 185℉)
Humidity	5 ~ 95%, non-condensing
EMI	FCC Part 15, Class A EN61000-6-4: EN55022, EN61000-3-2, EN61000-3-3
EMS	EN61000-6-2: EN61000-4-2 (ESD Standard) EN61000-4-3 (Radiated RFI Standards) EN61000-4-4 (Burst Standards) EN61000-4-5 (Surge Standards) EN61000-4-6 (Induced RFI Standards) EN61000-4-8 (Magnetic Field Standards)
Environmental Test Compliance	IEC60068-2-6 Fc (Vibration Resistance) IEC60068-2-27 Ea (Shock) IEC60068-2-32 Ed (Free Fall)

About Black Box

Black Box provides an extensive range of networking and infrastructure products. You'll find everything from cabinets and racks and power and surge protection products to media converters and Ethernet switches all supported by free, live 24/7 Tech support available in 30 seconds or less.

LBPS310A-KIT, version 1