



# Perle Standalone 1 port and 4 port Ethernet Extenders Installation Guide

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## 10/100

*eX-(1/4)S110-RJ*

*eX(1/4)-1S110-BNC*

*eX-(1/4)S110-TB*

*eX-(1/4)S110-RJ-XT*

*eX-(1/4)S110-BNC-XT*

*eX-(1/4)S110-TB-XT*

## 10/100/1000 (Gig)

*eX(1/4)S1110-RJ*

*eX(1/4)S1110-BNC*

*eX(1/4)S1110 -TB*

*eX-(1/4)S1110-RJ-XT*

*eX-(1/4)S1110-BNC-XT*

*eX-(1/4)-S1110-TB-XT*



Part# 5500330-11

# Overview

This document contains instructions necessary for the installation and operation of the Perle Gigabit and 10/100 Ethernet Extenders. These Ethernet Extenders enable Ethernet communication across a single pair of copper wires such as 2-wire twisted pair telephone wire or coax cable using VDSL2 technology. They extend Ethernet beyond the 328-foot (100-meter) limitation up to 3 kilometres (1.86 miles).

Perle Ethernet Extenders are available in 1 port or 4 port models. Models can be ordered with a RJ45, BNC or Terminal Block connector and also come in Extended Temperature models (XT).

# Installation

The default Dip switch settings (all switches in the UP position) will work for most installations, however it is recommended that one Ethernet Extender should be configured for Auto Local mode (Auto CO) and the other Ethernet Extender be configured for Remote mode (CPE).

These are the steps required to configure a pair of Perle Ethernet Extenders:

1. Set the Dip switch on each Ethernet Extender. (optional)
2. Connect a Line cable to the port labelled as **Line**. [VDSL Interfaces](#) for more information).
3. Connect Ethernet cable(s) to the port(s) labelled as **Ethernet**.
4. Connect power to the Ethernet Extenders.

# Front Panel Views

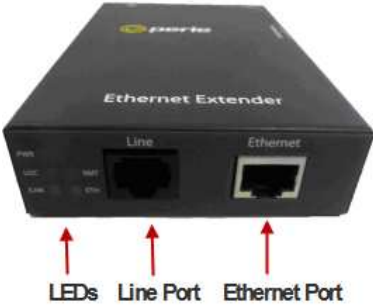


Figure 1 - Ethernet Extender 1 Port

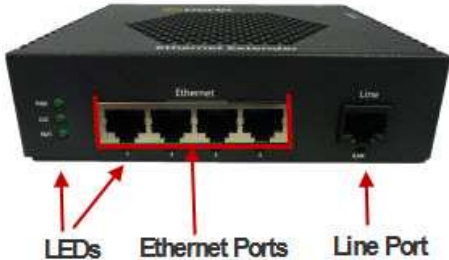
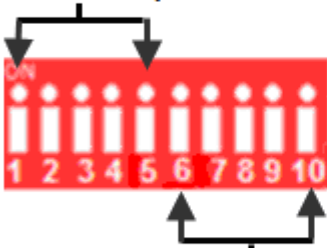


Figure 2 - Ethernet Extender 4 port (Extended Temperature)

# Dip Switches

The Dip switches are accessible through the opening in the side of the enclosure.

- 1 - Auto Local / Remote (Auto CO/CPE)
- 2 - Rate/Reach (Speed)
- 3 - Symmetric / Asymmetric
- 4 - Signal to Noise Ratio
- 5 - Line Loopback



- 6 - Ethernet AutoNeg
- 7 - Ethernet Speed
- 8 - Ethernet Duplex
- 9 - Link Mode (1 port models)
- 10 - Interlink Fault Feedback (1 port models)

**NOTE:** All switch changes take effect immediately and will result in a link reset on both the Line and the Ethernet port(s).

## Dip Switch Settings

**Auto Local (CO) / Remote (CPE) (Switch 1)**

Switch Position	Mode
On (Default)	Auto Local
Off	Remote

**NOTE:** Ethernet Extenders work in pairs. One side of the link must be set to Local / CO and the other end of the link must be set to Remote / CPE.

**Auto Local:** This Ethernet extender is set to Auto Local mode of operation. If **both** units are set to Auto Local, the Auto Connect feature will be activated and the two units will automatically determine their role (Local or Remote) and establish a connection. It is preferable to set (via this Dip switch) one unit to Auto Local and one unit to Remote since this may result in slightly faster training times and direct control over their roles.

**Remote:** This Ethernet Extender is set to Remote mode of operation.

### ***Rate/Reach (Speed) (Switch 2)***

<b>Switch Position</b>	<b>Mode</b>
Up (default)	High Speed
Down	Long-Range

**High Speed:** In this mode, the VDSL connection will be optimized for speed and the effective bidirectional data rate will be up to 100 mbps in each direction. This setting also enables VDSL Fast Mode.

**Long Range:** In this mode, the VDSL connection will be optimized for distance and the achievable distance will be up to 3 km.

***NOTE: The actual distance and rates may vary depending on the environment and type/gauge of wire used. There will always be a compromise between speed and range.***

For information on hardware specifications, range and reach see the Perle website at [www.perle.com](http://www.perle.com).

### ***Symmetric/Asymmetric (Switch 3)***

<b>Switch Position</b>	<b>Mode</b>
Up (default)	Symmetric
Down	Asymmetric

**Symmetric:** Set this switch to Symmetric if your network data needs are almost equal for uploads and downloads (both directions).

**Asymmetric:** Set this switch to Asymmetric if your network data needs are primarily for downloads. (Data direction is towards the remote Ethernet Extender).

#### ***Signal to Noise Ratio (Switch 4)***

Switch Position	Mode
Up (default)	9dB
Down	6dB

This switch is used to configure the Signal to Noise Ratio Margin (SNR). The Ethernet Extender will attempt to maintain the desired SNR value by adjusting line settings. A larger dB number will result in less line errors and a more stable connection, but may result in slower speeds.

**Signal to noise ratio 9dB:** This setting is recommended if Rate (switch 2) has been set to High Speed.

**Signal to noise ratio 6dB:** This setting is recommended if Rate (Switch 2) has been set to Long Range.

#### ***Line Loopback (Switch 5)***

Switch Position	Mode
Up (default)	Loopback mode off
Down	Loopback mode on

**Line Loopback Mode off:** The Line loopback feature is off. This is default position for normal operation. The switch must be set to this position in order for data to pass through the Ethernet Extender.

**Line Loopback Mode on:** This is a test mode. All data received on the Line connection is internally looped back and retransmitted back over the Line. This mode will override Ethernet and Link Mode switch settings.

#### ***Ethernet Auto Negotiation (AutoNeg) (Switch 6)***

Switch Position	Mode
Up (default)	AutoNeg On

Down	AutoNeg Off
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**NOTE: AutoNeg should only be turned off if fixed settings are required by the Ethernet copper link partner.**

**Ethernet AutoNeg On:** When enabled, the Ethernet Extender will negotiate with its link partner to determine the most optimal parameters for the Ethernet connection(s). The Ethernet Extender will advertise capabilities of 10,100 (for eX-S110 models) and 10,100,1000 Mbps (for eX-S1110 models), full and half duplex as well as pause, and remote fault capabilities to the link partner.

**Ethernet AutoNeg Off:** When the Auto Negotiation switch is set to the OFF position, the Ethernet Extender will not negotiate the Ethernet parameters with the Ethernet link partner. The parameters used by the Ethernet Extender Module will be determined by the Ethernet Speed (Switch 7) and Ethernet Duplex (Switch 8) Dip switch settings.

***Ethernet Speed (Switch 7)***

Switch Position	Mode
Up (default)	100 Mb
Down	10 Mb

***Ethernet Speed Up:*** 100 Mb for all models

***Ethernet Speed Down:*** 10 Mb for all models

***Note: When AutoNeg (SW6) is set to Off, the Ethernet Extender will use this Speed setting for its Ethernet connection.***

***Ethernet Duplex (Switch 8)***

Switch Position	Mode
Up (default)	Full Duplex
Down	Half Duplex

***Note: When AutoNeg (SW6) is set to Off, the Ethernet Extender will use this Duplex setting for its Ethernet connection(s).***

***Ethernet Duplex Up:*** Full Duplex mode.

***Ethernet Duplex Down:*** Half Duplex mode.



### Link Mode (Switch 9) (1 port models)

Switch Position	Mode
Up (default)	Standard Mode
Down	Link Pass-through

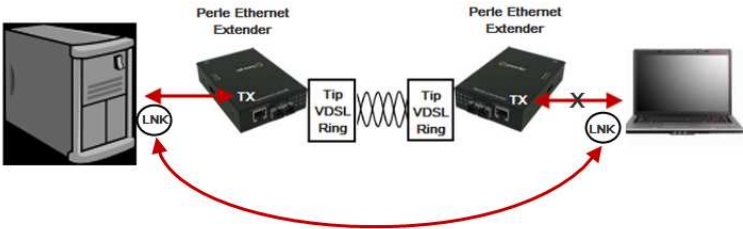
**Standard Mode:** In this mode, the Ethernet Extender will not pass the state of the Ethernet interface across the Line connection to its peer. A loss on the Ethernet interface can occur without affecting the peer connection.

**Link Pass-Through:** In this mode, the Ethernet Extender will pass the state of the Ethernet interface across the Line connection to its peer. If link is lost on the Ethernet connection, then the peer Ethernet connection will be brought down by the remote Ethernet Extender. This is accomplished by signalling Link Pass-Through across the VDSL line without bringing down the link.

**NOTE: Link Pass-Through will need to be enabled on both the Local and Remote Ethernet Extender.**

### Link Pass-Through

If the Ethernet link is broken, its state is reflected on the peer's Ethernet link.



### Interlink Fault Feedback (Switch 10) (1 port models)

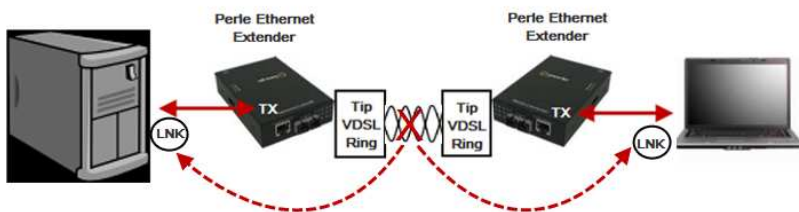
Switch Position	Mode
Up (default)	Standard Mode
Down	Interlink Fault Feedback

**Standard Mode:** The status of the VDSL interface will not be passed to its Ethernet interface

**Interlink Fault Feedback:** The status of the VDSL interface will be passed to its Ethernet interface. If the VDSL line link is lost the Ethernet link will be brought down.

## Interlink Fault Feedback

The 10/100/1000 ports (LNK) on each of the links will be turned off if the VDSL link is broken.



## Connecting to the Ethernet Port

1. Locate 1 Gigabit or 10/100Base-T compliant copper cables with male, RJ-45 connectors installed at both ends.
2. Connect the RJ-45 cable directly to the RJ-45 port labelled ETH on the front of the Ethernet Extender. The other end of this cable can be connected directly to a hub, switch or PC using a straight through or crossover cable that is less than 328ft in length.

**NOTE:** The Perle Ethernet Extender supports *Auto-MDIX* which allows the use of a straight-through or cross-over Ethernet cable.

# Connecting to the Line Port

## Models supplied with RJ45 connector

Connect a RJ-45 or RJ-11 cable directly into the RJ-45 port labelled as **Line** on the front of the Ethernet Extender.

## Models supplied with a BNC connector

Connect a male BNC cable directly to the port labelled as **Line** on the front of the Ethernet Extender.

## Models supplied with a Terminal Block Connector

1. Strip insulator sheathing from both wires 5mm (3/16<sup>th</sup> inch) to expose copper conductor wire.
2. Loosen the terminal block screws and connect one wire to the left terminal. Connect the other wire to the right terminal. Tighten the terminal screws (0.22Nm-0.25Nm torque).

***NOTE: Refer to the Technical Specifications section at the back of this guide for pin/cabling requirements.***

# Powering up the Ethernet Extender using the supplied Power Adapter

1. Connect the Perle supplied power adapter to the Ethernet Extender.
2. Connect the power adapter to a power source.
3. Check that the PWR LED light is lit.

## Terminal Block Connector

1. Ensure the Power Source is off prior to connection.
2. Strip insulator sheathing from both wires 5mm (3/16<sup>th</sup> inch) to expose the copper conductor wire.
3. Loosen the terminal block screws and connect Positive (+) wire to the left terminal. Connect the Negative (-) wire to the right terminal. Tighten Terminal screws (0.22Nm-0.25Nm torque).
4. Turn on power source.
5. Check that the PWR LED light is lit.

***NOTE: Any physical connection to the barrel connector will disengage the Terminal Block connector. Do not connect***

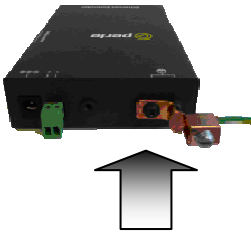
***power to the barrel power connector if you want to use powered Terminal Block.***

## **Attaching the Grounding Lug**

*If your installation requires additional grounding the following procedure can be followed.*

*Grounding the chassis requires the following items:*

- *One grounding lug. (not provided)*
- *One 18-12AWG wire. (not provided)*
- *Cross-head screwdriver (not provided)*



1. Attach the grounding lug to one end of an 18-12 AWG wire.
2. Attach the grounding lug to the chassis and secure with the grounding screw(s).

***Note: For your safety, when installing this equipment, always ensure that the chassis ground connection is installed first and disconnected last.***

## **Attaching the Power cord strain relief clip**

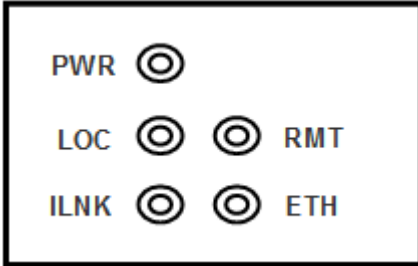
For extra power cable strain relief, attach the strain clip to the case as shown below, and thread the power cable through the clip in either one or two loops.



# Operation

## Status LED

Perle Ethernet Extenders have single color status LEDs located on the front panel of the unit.



<p><b>PWR</b>  <b>On</b> – Power is applied to the unit.  <b>Blinking (slow)</b> – The unit is in Loopback mode.  <b>Blinking (fast)</b> – The unit has a hardware failure.  <b>Off</b> – No Power to the unit.</p>	
<p><b>LOC/CO</b>  <b>On</b> – Unit is configured for Local (CO) mode.  <b>Off</b> – Unit is configured for RMT (CPE) mode.   <i>Note: In Auto Local mode, the Ethernet Extenders may switch roles in order to connect with a peer. The Local/ Remote LEDs will reflect the current mode/role.</i></p>	<p><b>RMT/CPE</b>  <b>On</b> – Unit is configured for Remote (CPE) mode.  <b>Off</b> – Unit is configured for Local (CO) mode.</p>
<p><b>ILNK</b>  <b>On</b> – VDSL link is up  <b>Off</b> – VDSL link is down.  <b>Blinking</b> – The link is training (trying to establish a link) or data is being received.</p>	<p><b>ETH (1, 2, 3,4)</b>  <b>On</b> – Link detected.  <b>Off</b> – No Link detected.  <b>Blinking</b> – The Ethernet link is present and receiving data.</p>

# Other Features

## ***Auto-MDIX:***

Auto-MDIX (automatic medium-dependant interface crossover) detects the signalling on the 10/100/1000BASE-T interface to determine the type of cable connected (straight-through or crossover) and automatically configures the connection.

## ***Packet Size:***

The maximum frame size supported is 1522 bytes.

## ***Auto Connect:***

If both Perle Ethernet Extenders are configured for Auto Local mode, a proprietary method of detection is implemented for each attempt to synchronize the local and remote Perle Ethernet Extenders.

# Troubleshooting

If unable to get full connectivity with all Dip switches in the UP position, this procedure is recommended for troubleshooting.

## **Check Ethernet Connection**

1. Ensure Link mode (SW9) and Interlink Fault Feedback (SW10) are set to the UP position on both Ethernet Extenders.
2. Connect the near end device to an Ethernet hub or device. The ETH LED should be lit to indicate a good connection. If the ETH LED is not lit, then check the Ethernet cable and the attached device for faults.
3. Repeat for the far end Ethernet Extender.

## **Check VDSL Connection**

1. The VDSL connection can also be verified by configuring the Ethernet Extenders for Loopback Mode.
2. Set (SW 5) on one of the Ethernet Extenders to the down position (loop back mode). Data should pass through the local Ethernet Extender over the VDSL link to the remote Ethernet Extender. The ILNK LEDs should be flashing on both Ethernet Extenders to indicate receive activity.

## Technical Specifications

Power Input Consumption	9-30V DC
Operating Humidity	5% to 90% non-condensing
Storage Humidity	5% to 95% non-condensing
Operating Altitude	Up to 3,048 m (10,000 ft)
Weight – 1 port Weight – 4 port	0.30 kg (0.66 lbs) 0.44 kg (0.97 lbs)
Dimensions 1 port Dimensions 4 port	80 mm x 120 mm x 26 mm 115 mm x 130 mm x 26 mm
Operating Temperature	0°C to 50°C (32°F to 122°F)
Storage Temperature	-25°C to 70°C (-13°F to 158°F)
MTBF – 1 port / 4 port	468,351 hrs. / 365,542 hrs.
MTBF – 1 port / 4 port (with Power Supply)	289,015 hrs. / 207,212 hrs.

## Extended Temperature Specifications

Operating Temperature	-40°C to 75°C (-40°F to 167°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Dimensions – 1 port Dimensions – 4 port	80 mm x 120 mm x 36 mm 115 mm x 130 mm x 36 mm
Weight – 1 port Weight – 4 port	0.33 kg (0.66 lbs) 0.47 kg (1.03 lbs)
MTBF 1 port / 4 port	466,861 hrs. / 365,077 hrs.

## Ethernet Copper Cabling Requirements:

- Category 5 UTP or STP
- 24-22 AWG
- Straight through or Ethernet crossover

## VDSL Interfaces

### *RJ-45 Connector*



### *BNC Connector*



### *Pin*   *Signal*

1	No connection
2	No connection
3	No connection
4	Ring
5	Tip
6	No connection
7	No connection
8	No connection

### **Block Terminal Connector**





## **Safety**

IEC 60950-1 2<sup>nd</sup> edition

UL 60950-1

## **EMI /EMC**

EN 55022 / CISPR 22

EN 55024

*Warning: If this unit is to be installed in a location where the ambient temperature exceeds 50C, the case temperature may exceed safe levels. For this reason, this unit should be installed in a restricted access location where access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.*

## **Warranty / Registration**

Perle's standard Lifetime Warranty provides customers with return to factory repairs for Perle products that fail under the conditions of the warranty coverage. Details can be found at:

[http://www.perle.com/support\\_services/warranty.shtml](http://www.perle.com/support_services/warranty.shtml)

## **Contacting Technical Support**

Contact information for the Perle Technical Assistance Center (PTAC) can be found at the link below. A Technical Support Query may be made via this web page.

[http://www.perle.com/support\\_services/support\\_request.shtml](http://www.perle.com/support_services/support_request.shtml)

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