



Perle Advanced Powered Ethernet Extenders Installation Guide

10/100

10/100/1000(Gigabit)

eXP-xS110L

eXP-xS1110L

eXP-xS110E

eXP-xS1110PE

eXP-xS1110E



Part# 5500332-11

Overview

This document contains instructions necessary for the installation and operation of the Perle 10/100 and Gigabit (10/100/1000) Advanced Powered 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 for extended distances.

The Perle Advanced Power Ethernet Extenders are available in L and E models such as the eXP-1S110E and the eXP-1S110L. In order to use the advanced power functions, an L model must always be used in conjunction with an E model. These Ethernet Extenders can also be used with other Perle Ethernet Extenders if advanced power functionality is not required.

In a typical installation the L model would be at a central site and the E model at a remote site and the L model would power the E model via the VDSL line.

L Models Characteristics

The L models, such as the eXP-4S1110L-RJ are typically used in the central location and have the following characteristics.

- Can provide power over the VDSL line and communicate with a remote Extender (E or PE model) over the same VDSL line.
- Can communicate with any other Perle Ethernet Extender if remote powering is not required.
- Can draw power from the Terminal Block connector, Barrel connector or from the Ethernet port 1 (if connected to a compatible PoE Power Sourcing Device (PSE) such as a switch).

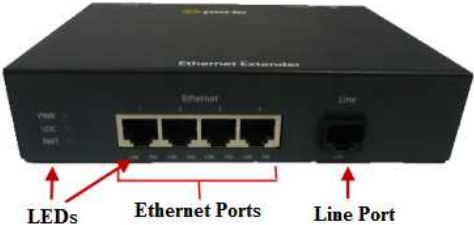
E and PE Models Characteristics

The E or PE models such as the eXP-4S110E-RJ are typically used in the remote location and have the following characteristics.

- Can be powered by and communicate with an L model over the VDSL line. Alternatively, they can draw power from the Terminal Block or Barrel connector.
- They can communicate with any other Perle Ethernet Extender if power by VDSL link is not required
- Can act as a PSE to power equipment connected to the Ethernet port.

Installation

Front Panel View



Back Panel View



Installation

These are the steps required to configure a pair of Advanced Power Ethernet Extenders.

1. Set the Dip switches on each Ethernet Extender (if needed). [See Bank 1 - Dip Switches](#) for more information.
2. Set Power Sourcing Jumpers (If needed) (E and PE models only).
3. Connect Line cables to the Line ports. See [Connecting to the Line Port](#) for more information. If using VDSL Line Power see [Remote Powering Using VDSL Line Power](#)
4. Connect the Ethernet cables to the Ethernet ports.
5. Connect the Power Cord relief clip (if needed).
6. Connect the Grounding Lug (if needed).

Warning: Never plug a powered VDSL cable into any Ethernet port. This may cause damage to the unit.

Dip Switches

The default Dip Switch settings (all UP) 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 for Remote mode (CPE).

The Dip switches are accessible through an opening on the back of the unit.

- 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
- Only affects port 1



- 1 - LPT
 - 2 - Interlink FF
- applies to 1 port models only
- 3 - PSE Power 1
 - 4 - PSE Power 2
 - 5 - PD Power Reset
- available on eXP-xS110E and eXP-xS1110PE

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

Bank 1 - Dip Switches

Auto Local (CO) / Remote (CPE)

Switch Position	Mode
On (Default)	Auto Local
Off	Remote

NOTE: Ethernet Extenders work in pairs. One side of the link must take on the VDSL role of Local or CO device and the other side the role of Remote or CPE device.

Auto Local: If both units are set to Auto Local, the Auto Connect feature will be activated and the two units will automatically negotiate with each other and assume a role (Local for one and

Remote for the other) and establish a connection. Since VDSL2 is not completely symmetrical, it is usually preferable to set (via this Dip switch) one unit to Auto Local and one unit to Remote, thus forcing the roles on each unit. This will guarantee the higher bandwidth in the desired direction and may result in slightly faster training times.

Remote: This Ethernet Extender is forced to assume the Remote role of operation.

NOTE: This switch only affects the role that each Ethernet Extender will play in the VDSL communications and has no relationship to which Ethernet Extender will be providing power over the VDSL link. Providing power over the VDSL link can only be done by an L model.

Rate/Reach (Speed) (Switch 2)

Switch Position	Mode
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. For information on hardware specifications, range and reach see the Perle website at www.perle.com.*

Symmetric/Asymmetric (Switch 3)

Switch Position	Mode
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. (Larger bandwidths will be available in the direction of the Remote/CPE 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)	Off
Down	On

Line Loopback Mode off: This is default position for normal operation.

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) (affects Port 1)

Switch Position	Mode
Up (default)	AutoNeg On
Down	AutoNeg Off

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

Ethernet AutoNeg allows you to control of the Ethernet communications parameters on Ethernet Port 1. If the Ethernet device to be connected on port 1 cannot operate with conventional Ethernet Auto negotiation, then switches 7 and 8 can be used to specify these parameters.

Ethernet AutoNeg On: When enabled, the Ethernet Extender will Auto-negotiate Ethernet Link parameters with its link partner. It will advertise capabilities of 10,100 Mbps or 10, 100, 1000 Mbps (depending on the model), full and half duplex, pause and remote fault.

Ethernet AutoNeg Off: When this switch is set to the Off position, the Ethernet Extender will use the Ethernet Speed (Switch 7) and Ethernet Duplex (Switch 8) Dip switch settings.

Ethernet Speed (Switch 7) (affects Port 1 only)

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

NOTE: This switch is only used if Auto-negotiation has been turned off (Switch 6).

Ethernet Duplex (Switch 8) (affects Port 1 only)

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

NOTE: This switch is only used if Auto-negotiation has been turned off (Switch 6).

Bank 2

Link Mode (Switch 1) (1 port models only)

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

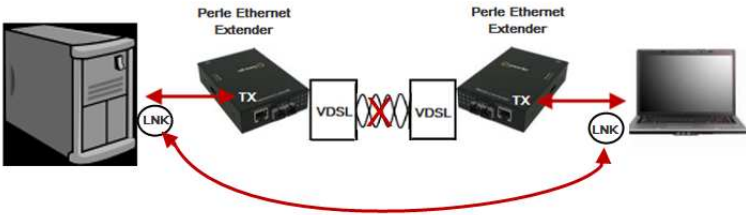
connection to its remote connection. A loss of link on the Ethernet interface can occur without affecting the remote connection.

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 Ethernet connection on the remote Ethernet Extender will be brought down. This is accomplished by signalling Link Pass-Through across the VDSL line without bringing down the VDSL 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 2) (1 port models)

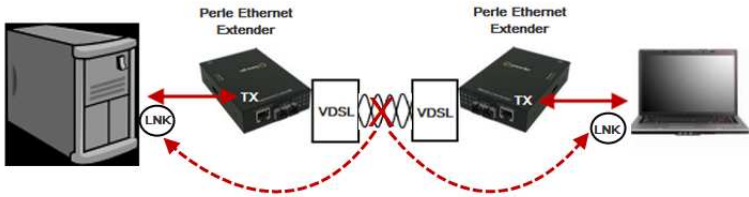
Switch position	Mode
Up (default)	Standard Mode
Down	Interlink Fault Feedback

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



PSE Power (Switch 3, 4) (applies to port 1 on eXP-xS110E/1110/P/E models)

These switches are used on the E and PE models to indicate the type of device detection required when connecting a PD to port 1 of the Ethernet Extender. In most circumstances or if the device type is unknown, the default (Normal) should be used as per IEEE802.3af/at standards.

Switch Position 3	Switch Position 4	Type
Up (default)	Up (default)	Normal
Up	Down	High capacitance
Down	Up	Legacy device
Down	Down	Normal

PD Power Reset (Switch 5) (Port 1 E/PE models)

Switch Position	Mode
Up (default)	Disabled
Down	Enabled

Enabled: When enabled, the Ethernet Extender will upon loss of link on the VDSL line port or Link-Passthrough, turn off PSE output power to the PD device (attached to port 1) for 2 seconds then turn the power back on. The power will then remain on until the VDSL link transitions from link up to link down state.

Disabled: Power is maintained to the PD.

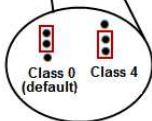
POE Power from PSE

In order to power an L model Ethernet Extender using PoE, Port 1 of the Ethernet Extender, you will need to be connected to a compliant PSE device. The Ethernet Extender can be strapped as either a Class 0 (PoE) or a Class 4 (PoE+) type PD device using Jumper (J4).

Strap 1-2: Class 0 device (default)

Strap 2-3: Class 4 device

NOTE: If power over VDSL is required, the Ethernet Extender should be powered from a POE+ PSE and the strapping should be set to Class 4 to ensure sufficient power availability.



Remote Powering Using VDSL Line Power

There are 3 strapping options to select the method of providing power over the VDSL as listed below on Jumpers J7 and J8.

2 Wire: This is the default setting and provides power over a single pair of wires shared with the data.

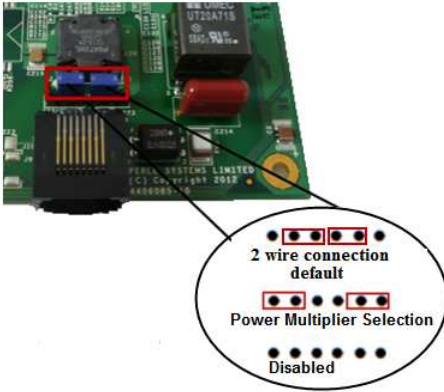
Power Multiplier: If you are using a 4-pair cable such as CAT5 on the VDSL interlink port, this setting can be used. Power is provided over 3 of the 4 pairs and data is transported over the 4th pair. This setting effectively triples the distances that can be achieved when powering over VDSL.

Disabled: If the remote unit is not taking power from the VDSL line, this setting may be used. Although it is not a requirement to

disable power, doing so may help achieve longer data connection distances.

NOTE: The Local and Remote Ethernet Extenders must be strapped the same.

Jumper Settings



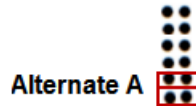
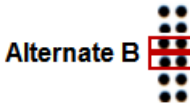
Providing PoE Power to a PD

NOTE: The factory settings will work for most installations. Compliant PD's will detect and operate with the default PoE option. However, follow this procedure in the rare case that the settings need to be modified.

All Ethernet ports on the E and PE models will connect to a PD using Alternate A. These other connection options are available on Port 1.

Jumper Settings

To access these jumper settings, unscrew the six side screws on the case and remove the cover plate. Locate the **J6** jumper set located near the front LEDs and strap the option pins as detailed below.



NOTE: Refer to the interface descriptions at the back of this guide for pin outs.

Connecting to the Ethernet Ports

Connect Ethernet compliant RJ-45 cables directly to the RJ-45 ports labelled Ethernet on the front of the Ethernet Extender.

NOTE: Perle Ethernet Extenders support Auto-MDIX which allows the use of a straight-through or cross-over Ethernet cable.

Connecting to the Line Port

Warning: Never plug a powered VDSL cable into any Ethernet port. This may cause damage to the unit.

Models supplied with RJ-45 connector

Connect a RJ-45 cable directly into the RJ-45 port labelled **Line**.

Models supplied with a BNC connector

Connect a male BNC cable directly to the port labelled as **Line**.

Models supplied with a Terminal Block connector

- Strip insulator sheathing from both wires 5mm (3/16th inch) to expose copper conductor wire.
- 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 with supplied Power Adapter

- Connect the Perle supplied power adapter to the Ethernet Extender and an appropriate AC power source.
- Check that the PWR LED light is lit.

Terminal Block Connector

- Ensure the Power Source is off prior to connection.

- Strip insulator sheathing from both wires 5mm (3/16th inch) to expose the copper conductor wire.
- 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).
- Turn on power source.
- Check that the PWR LED light is lit.

NOTE: Inserting a plug into the barrel connector disengages the Terminal Block connector.

Attaching the Power cord strain relief clip

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

Attaching the Grounding Lug

If additional grounding is required the following procedure should be followed.

- Attach the grounding lug to one end of an 18-12 AWG wire.
- 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.

Operation

Status LEDs

Perle Ethernet Extenders have multicolor LEDs located on the front panel of each unit.

<p>PWR</p> <p>On – Power good. Blinking (slow) – Loopback mode. Blinking (fast) – Hardware failure detected. Off – Power Off.</p>	<p>PSE</p> <p>On (solid Green) – PSE Active – Supplying power over the Ethernet. On (solid Yellow) – PSE not active. Possible causes:</p> <ul style="list-style-type: none"> • PD not compliant • PD reset in progress <p>Off – No PD connected.</p>
<p>LOC/CO</p> <p>On – Local (CO) mode. Off – RMT (CPE) mode.</p> <p><i>Note: In Auto Local mode, the Ethernet Extenders may switch roles during the negotiation process.</i></p>	<p>RMT/CPE</p> <p>On – Remote (CPE) mode. Off – Local (CO) mode.</p>
<p>ILNK</p> <p>On – VDSL link is up Off – VDSL link is down. Blinking – Link training or Link activity.</p>	<p>LNK (1, 2, 3, 4)</p> <p>On – Ethernet Link Up. Off – Ethernet Link Down. Blinking – Ethernet activity.</p>

Troubleshooting

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

Check Ethernet Connection

- Ensure Link mode (SW9) and Interlink Fault Feedback (SW10) are set to the UP position on both Ethernet Extenders.
- Connect the near end device to an Ethernet hub or device and verify that the link is established on the Ethernet connection. If not, then check the Ethernet cable and the attached devices for faults.
- Repeat for the far end Ethernet Extender.

Check VDSL Connection

- Set one Ethernet Extender to Local mode and the other to Remote mode.
- If VDSL link is not established after 1 minute, verify the VDSL connections and/or retest with shorter distances.

Check VDSL Connection using Loopback

- Set (SW 5) on the far end Ethernet Extender to the down position (loopback mode). Once data is injected via an Ethernet connection on the near end Ethernet Extender, it should pass through this Ethernet Extender over the VDSL link to the remote Ethernet Extender and the back. Activity will be visible on the Ethernet Link LEDs.

Technical Specifications

Power Input	eXP-S110/S1110L (includes XT Models)	eXP-S110E/PE eXP-S1110E/PE (includes XT Models)
Barrel Connector Terminal Connector	23-57VDC	46-57VDC
PoE Output (will vary by model: See www.perle.com for details).	n/a	46-57VDC Max 0.65A (when using DC 57V input)
From PoE Input	37-57VDC Max 0.65A	n/a
VDSL Output	57VDC Max 0.65A	n/a
From VDSL Line	n/a	23-57VDC Max 0.65A
Current Draw	2.3A Max 1.1A @48VDC	2.7A Max 2.2A @56VDC 2.5A@48VDC
Operating Temperature		
Commercial model	-0°C to 50°C (-32°F to 122°F)	-0°C to 50°C (-32°F to 122°F)
XT model	-40°C to 75°C (-40°F to 167°F)	-40°C to 75°C (-40°F to 167°F)
Storage Temperature		
Commercial model	-25°C to 70°C (-13°F to 158°F)	-25°C to 70°C (-13°F to 158°F)
XT model	-40°C to 85°C (-40°F to 185°F)	-40°C to 85°C (-40°F to 185°F)
Operating Humidity	5% to 90% non-condensing	5% to 90% non-condensing

Storage Humidity	5% to 95% non-condensing	5% to 95% non-condensing
Operating Altitude	Up to 3,048 m (10,000 ft)	Up to 3,048 m (10,000 ft)

Ethernet Copper Cabling Requirements:

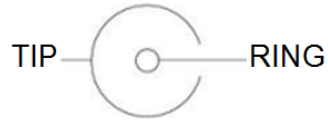
- Category 5e, 6, 7 UTP or STP
- 24-22 AWG
- Straight through or Ethernet crossover

VDSL Interfaces

RJ-45 Connector



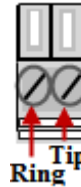
BNC Connector



Pin Signal

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

Terminal Block Connector



Ethernet Interfaces

RJ-45	PoE Option		
	Alternative A	Alternative B	Legacy
1	positive		
2	positive		
3	negative		
4		positive	negative
5		positive	negative
6	negative		
7		negative	positive
8		negative	positive

Safety

IEC 60950-1 2nd edition

UL 60950-1

EMI / EMC

EN 55022 / CISPR 22

EN 55024 / CISPR 24

This equipment is not intended nor approved for connection into a telephone network.

If this equipment is used with an external power adapter, it must be a Class II, double insulated power supply/adapter.

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

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

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