



# Perle 10/100/1000 Ethernet Extender Modules

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## 10/100

*eX-1C/CM110-RJ*

*eX-1C/CM110-BNC*

*eX-1C/CM110-TB*

## 10/100/1000 (Gigabit)

*eX-1C/CM1110-RJ*

*eX-1C/CM1110-BNC*

*eX-1C/CM1110 -TB*



Part# 5500331-11

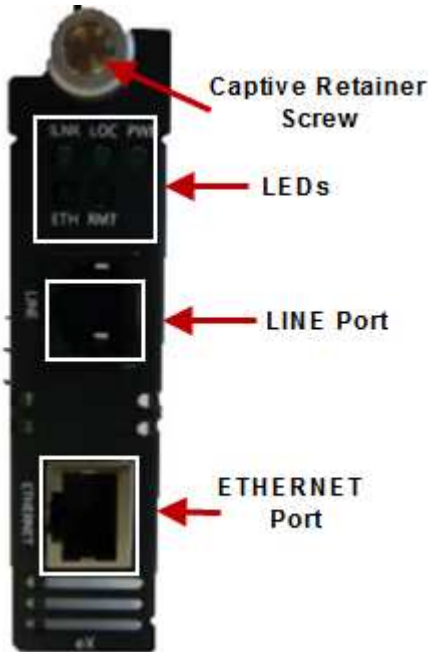
# Overview

This document contains instructions necessary for the installation and operation of the Perle Gigabit and 10/100 Ethernet Extender modules. These Ethernet Extender modules 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).

Models can be ordered with an RJ-45, BNC or Terminal Block connector.

## Getting to know your eX-C/CM110/eX-C/CM1110 Module

### Front View



# 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).

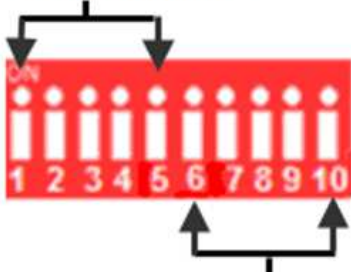
These are the steps required to configure a pair of Perle Ethernet Extender Modules.

1. Obtain a pair of Perle Ethernet Extender modules and a pair of Perle Media converter chassis.
2. Set the Dip switch settings on each Ethernet Extender module. (optional)
3. Install the modules in the chassis. See [Installing Modules](#) for more information.
4. Connect a Line cables to the port labelled as **LINE**. (See [VDSL Interfaces](#) for more information).
5. Connect Ethernet cables to the ports labelled as **ETHERNET**.

# 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
- 10 - Interlink Fault Feedback

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

## Dip Switch Settings

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

Switch Position	Mode
On (Default)	Auto Local
Off	Remote

**NOTE:** Ethernet Extender modules 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** Ethernet Extenders are set to Auto Local, the Auto Connect feature will be activated and the two Ethernet Extenders will automatically determine their role (Local or Remote) and establish a connection. It is preferable to set (via this Dip switch) one Ethernet Extender to Auto Local and one Ethernet Extender 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)**

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. 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)**

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. (Data direction is towards the remote Ethernet Extender module).

#### **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

**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 connections. The Ethernet Extender will advertise capabilities of 10,100 (for eX-1C110 models) and 10,100,1000 Mbps (for eX-1C1110 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 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 module 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 module will use this Duplex setting for its Ethernet connections.

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

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

**Link Mode (Switch 9)**

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

**Standard Mode:** In this mode, the Ethernet Extender module 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.

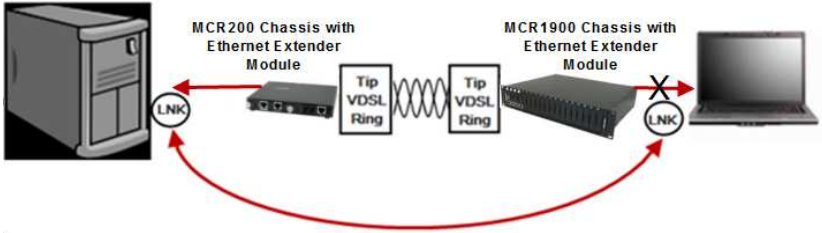
**Link Pass-Through:** In this mode, the Ethernet Extender will pass the state of the Ethernet interface across the Line connection to its peer. If link is lost on the Ethernet connection, then the peer Ethernet connection will be brought down by the remote Ethernet Extender. This is accomplished by 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 one module's Ethernet link goes down, the peer module's Ethernet link will be brought down.



## Interlink Fault Feedback (Switch 10)

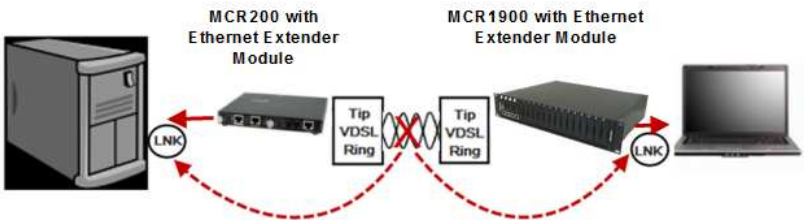
Switch Position	Mode
Up (default)	Standard Mode
Down	Interlink Fault Feedback

**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.



# Installing Modules

1. Set any DIP switches on the module to the desired operating mode. See [Dip Switches](#) for more information.
2. Gently slide the module into the slot until it becomes flush with the front of the chassis. Light pressure may be needed to seat the module. Do not force the module as you might damage the module. If there is resistance, remove the module and check the module's backplane connector for damage to the pins. If the module's backplane connector is not damaged, try to reinsert the module again
3. Tighten the Captive retainer screw to ensure the module is locked in place.

**Caution:** *Observe electrostatic discharge precautions when installing or removing the module(s) from the Chassis. Failure to observe this caution could result in damage to the module(s) and/or chassis.*

## Connecting to the Ethernet Port

1. Locate 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 ETHERNET on the front of the Ethernet Extender module. 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 RJ-45 connector

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

## **Models supplied with a BNC connector**

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

## **Models supplied with a Terminal Block Connector**

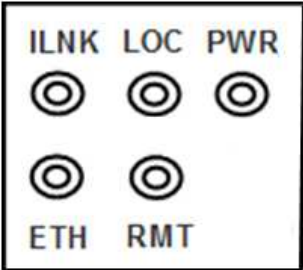
1. Strip insulator sheathing from both wires 5mm (3/16<sup>th</sup> inch) to expose copper conductor wire.
2. Loosen the terminal block screws and connect one wire to the left terminal. Connect the other wire to the right terminal. Tighten the terminal screws (0.22Nm-0.25Nm torque).

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

# Operation

## Status LED

Perle Ethernet Extender modules have single color status LEDs located on the front panel of the card.



<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>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 Extender module may switch roles in order to connect with a peer. The Local/ Remote LEDs will reflect the current mode/role.</i></p>	<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>ETH</b>  <b>On</b> – Link detected.  <b>Off</b> – No Link detected.  <b>Blinking</b> –The Ethernet link is present and receiving data.</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>	

# 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 Extender.

# 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 ETHERNET LED should be lit to indicate a good connection. If the ETHERNET 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 Extender for Loopback Mode.
2. Set (SW 5) on one of the Ethernet Extender 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	9-30 VDC
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	0.33 kg (0.73 lbs)
Dimensions	203 x 38 x 152mm, 8 x 1.5 x 6 inches
Operating Temperature	0°C to 50°C (32°F to 122°F)
Storage Temperature	-25°C to 70°C (-13°F to 158°F)

## 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

## **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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