



# Perle 10/100 Ethernet Media Converters

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## Installation Guide

*S-110-XXXXXX*

*S-110-XXXXXX-XT*



# Overview

This document contains instructions necessary for the installation and operation of the Perle 10/100 Ethernet Standalone Media Converters (S-110). These products convert a 10/100Base-T cable connection (copper) to a 100Base-X connection (fiber). The fiber connection can be either single mode (SM) or multimode (MM) and can operate over different wavelengths and distances, depending on the model selected (see table below).

| Model         | Connector | Mode - Distance      | Wavelength   |
|---------------|-----------|----------------------|--------------|
| S-110-M2xx2   | SC/ST/LC  | MM - 2 km/1.2 mi.    | 1310 nm      |
| S-110-M1SC2U  | SC        | MM - 2 km/1.2 mi.    | 1310/1550 nm |
| S-110-M1SC2D  | SC        | MM - 2 km/1.2 mi.    | 1550/1310 nm |
| S-110-S2xx20  | SC/ST/LC  | SM - 20 km/12.4 mi.  | 1310 nm      |
| S-110-S2xx40  | SC/ST/LC  | SM - 40 km/24.9 mi.  | 1310 nm      |
| S-110-S2xx80  | SC/ST/LC  | SM - 80 km/49.7 mi.  | 1550 nm      |
| S-110-S2xx120 | SC/ST/LC  | SM - 120 km/74.6 mi. | 1550 nm      |
| S-110-S1SC20U | SC        | SM - 20 km/12.4 mi.  | 1310/1550 nm |
| S-110-S1SC20D | SC        | SM - 20 km/12.4 mi.  | 1550/1310 nm |
| S-110-S1SC40U | SC        | SM - 40 km/24.9 mi.  | 1310/1550 nm |
| S-110-S1SC40D | SC        | SM - 40 km/24.9 mi.  | 1550/1310 nm |

## Extended Temperature Models

| Model            | Connector | Mode - Distance     | Wavelength   |
|------------------|-----------|---------------------|--------------|
| S-110-M2xx2-XT   | SC/ST/LC  | MM - 2 km/1.2 mi.   | 1310 nm      |
| S-110-S2xx20-XT  | SC/ST/LC  | SM - 20 km/12.4 mi. | 1310 nm      |
| S-110-S1SC20U-XT | SC        | SM - 20 km/12.4 mi. | 1310/1550 nm |
| S-110-S1SC20D-XT | SC        | SM - 20 km/12.4 mi. | 1550/1310 nm |

**Note:** Please refer to Perle's web site for the most up to date Installation guides, models and specifications:

<http://www.perle.com/>

# Installation

The default dip switch settings (all switches in the UP position) will work for most installations.

There are five steps required to configure the Perle Fast Ethernet media converter:

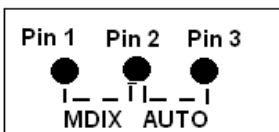
- 1) Set the Auto-MDIX jumper setting (optional).
- 2) Set the dip switch settings (optional).
- 3) Install and connect the fiber cable.
- 4) Install and connect the copper cable.
- 5) Power up the media converter.

## Auto-MDIX Jumper Settings

**NOTE:** The factory settings for Auto-MDIX will work for most installations, but in the rare case that you need to modify the settings, the procedure is below.

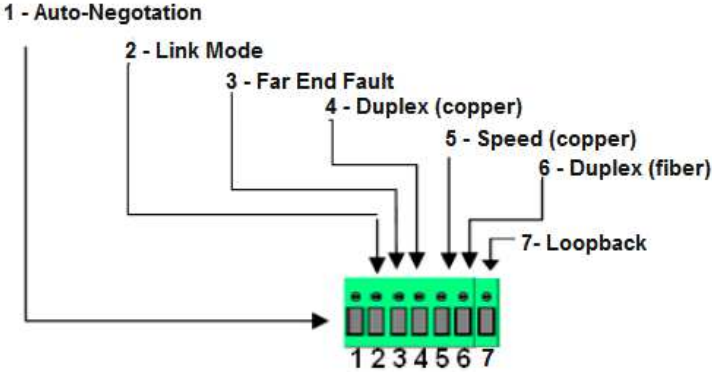
To access the Auto-MDIX jumper settings, unscrew the four side screws on the top case and remove the cover plate. Locate the MDIX AUTO jumper set as detailed below. By covering or strapping pins 1 and 2, the S-110 will operate as an MDIX device. By covering or strapping pins 2 and 3, the S-110 will automatically detect the Ethernet cable's polarity. Removing the strapping is the same as AUTO.

**NOTE:** The default jumper setting is AUTO



# DIP Switches

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



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

# DIP Switch Settings

## Auto Negotiation (Switch 1)

| Switch Position | Mode |
|-----------------|------|
| Up (default)    | Auto |
| own             | Off  |

**NOTE:** Auto negotiation should only be turned off, if the copper link partner does not support Auto Negotiation or fixed settings are required by the copper link partner.

**Auto:** In this mode of operation the media converter will negotiate Ethernet parameters on the copper connection. This will ensure that the most optimal connection parameters will be used. If the copper link partner does not support Auto negotiation, the S-110 will parallel detect to 10 or 100 Mbps and force Half Duplex mode as per IEEE specifications.

**Off:** When the Auto Negotiation switch is set to the OFF position, the media converter will not negotiate the Ethernet parameters with the copper link partner. The parameters used by the media converter will be determined by the Duplex (switch 4) and Speed (switch 5) dip switch settings.

### **Link Mode (Switch 2)**

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

**Link Pass-Through:** In this mode, the link state on one connection is directly reflected through the media converter to the other connection. If link is lost on one of the connections, then the other link will be brought down by the media converter.

If the installation has a media converter on both ends of the fiber link and both are set-up for Link Pass-Through, then a loss of copper link on the far end device will propagate through both media converters and will result in a loss of link at the near end device. This would, therefore, resemble a direct copper connection.

**Standard Mode:** In this mode, the links on the fiber and copper sides can be brought up and down independently of each other. A loss of link on either the fiber or copper port can occur without affecting the other connection.

### **Far End Fault (Switch 3)**

| Switch Position | Mode     |
|-----------------|----------|
| Up (default)    | Enabled  |
| Down            | Disabled |

**Enabled:** If the media converter detects a loss of signal on the fiber receiver, it will transmit a FEF signal to the remote media converter. This, in effect, notifies the fiber link partner that an error condition exists on the fiber connection.

If the remote media converter is set up for Far End Fault (FEF) and the local media converter is set up with Link Pass-Through, a loss of fiber link on either the transmit or receive line will be

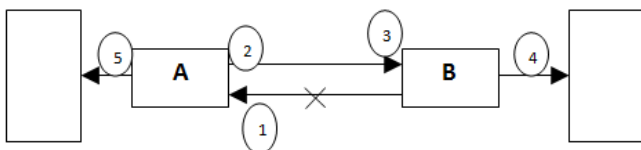
passed through to the local copper connection thus notifying the connected device.

If the media converter has been set to Link Pass-Through mode, the effect will be the same as FEF, since the link loss on the fiber receiver will result in bringing down the copper link, which will in turn cause the transmit fiber link to be brought down.

**NOTE:** To generate or detect the FEF signal switch 3 needs to be enabled.

**Disabled:** The media converter will not monitor for or generate Far End Fault.

The following diagram is an illustration of the operation of this feature.



**(A)** – Remote Media Converter setup for Far End Fault Enabled, Auto Negotiation – OFF and Link Mode – Standard.

**(B)** – Local Media Converter setup for Far End Fault enabled, Link Pass-Through On and Auto Negotiation - OFF

- 1) **(A)** Loses fiber connection on its receiver.
- 2) **(A)** Sends FEF.
- 3) **(B)** Detects FEF signal and shuts down the fiber link.
- 4) **(B)** Drops link on copper connection because Link Pass-Through is configured.
- 5) **(A)** Link on copper connection is not affected because Link Mode is set to Standard.

### **Duplex (copper) (Switch 4)**

| Switch Position | Mode |
|-----------------|------|
| Up (default)    | Full |
| Down            | Half |

**NOTE:** When Auto Negotiation (SW1) is set to Off, the media converter will use this Duplex setting for its copper connection.

**Full** In the Up switch position; the media converter will be set to Full Duplex mode.

**Half:** The media converter will be set to Half Duplex mode.

### **Speed (Switch 5)**

| Switch Position | Mode |
|-----------------|------|
| Up (default)    | 100  |
| Down            | 10   |

**NOTE:** When Auto Negotiation (SW1) is set to Off, the media converter will use this Speed setting for its Ethernet copper connection.

**100:** Switch 5 in the Up position will try to establish the copper link connection at 100 Mbps.

**10:** The media converter will try to establish the copper connection at 10 Mbps.

### **Duplex (fiber) (Switch 6)**

| Switch Position | Mode |
|-----------------|------|
| Up (default)    | Full |
| Down            | Half |

**Full:** The media converter's fiber link will be set to Full Duplex Mode.

**Half:** The media converter's fiber will be set to Half Duplex Mode.

### **Loopback (Switch 7)**

| Switch Position | Mode     |
|-----------------|----------|
| Up (default)    | Disabled |
| Down            | Enabled  |

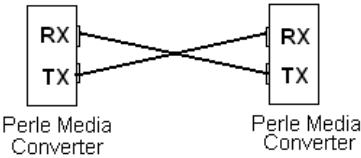
**Disabled:** The loopback feature is disabled. This is default position for normal operation. The switch must be set to this position in order for data to pass through the media converter.

**Enabled:** This is a test mode. All data received on the receive (RX) fiber connection is looped back to the transmit (TX) fiber connection. The state of the copper link is not relevant since no data is passed through to the copper side. This mode will override all other switch settings.



## Installing the Duplex Fiber Cable

- Locate a 100Base-X compliant duplex (2 strands) fiber cable with appropriate connectors.
- Connect the fiber cables from one media converter to the other media converter/switch/fiber device ensuring that the RX and TX are reversed (crossed) at the opposite end.



## Installing the Simplex Fiber Cable

- Locate a 10/100Base-X compliant simplex (1 strand) fiber cable with appropriate connectors.
- Connect the fiber cable from one media converter to the other media converter/switch/fiber device.

## Installing the Copper Cable

- Locate 10/100Base-T compliant copper cables with male, RJ-45 connectors installed at both ends.
- Connect the RJ-45 cable between the Perle media converter and the device.

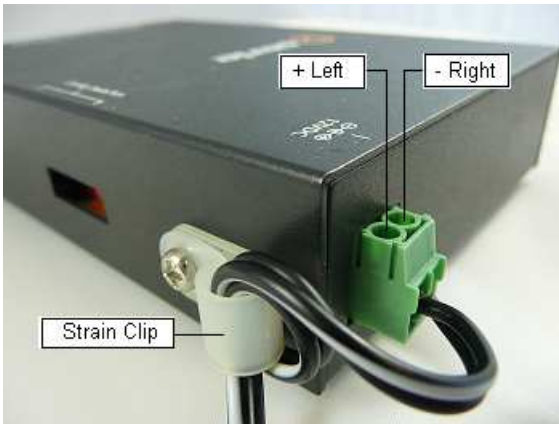
**NOTE:** The S-110 supports Auto-MDIX which allows a straight-through or cross-over Ethernet cable. See page three in this guide for jumper positions.

## Powering up the Perle Media Converter

- Connect the Perle supplied power adapter to the media converter.
- Connect the power adapter to a power source.
- Check that the PWR LED light is lit.

### Extended Temperature models supplied with a Terminal Block

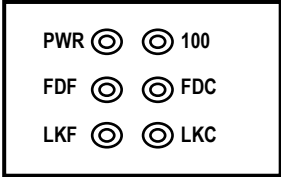
- Ensure the Power Source is off prior to connection.
- Strip both wires 5mm (3/16<sup>th</sup> inch)
- Loosen the terminal block screws and connect Positive (+) wire to the left terminal. Connect the Negative (-) wire to the right terminal. Tighten Terminal screws (0.22Nm-0.25Nm torque).
- Turn on power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

The Perle 10/100 Ethernet Media converters have six single color status LEDs located on the front panel of the unit.



|  |   |
|--|---|
| <p><b>PWR</b><br/><b>On</b> – Power is applied to the unit.<br/><b>Blinking (slow)</b> – The unit is in Loopback mode.<br/><b>Blinking (fast)</b> – The unit has a hardware failure.</p> <p><b>FDF (fiber)</b><br/><b>On</b> – Full Duplex Mode.<br/><b>Off</b> – Half Duplex Mode.</p> <p><b>LKF (fiber )</b><br/><b>On</b> – The fiber link is present<br/><b>Off</b> – No fiber link is present.<br/><b>Blinking (fast)</b> – The fiber link is present and receiving data.</p> | <p><b>100</b><br/><b>On</b> – 100 Mbps on copper link.<br/><b>Off</b> – 10 Mbps on copper link.</p> <p><b>FDC (copper)</b><br/><b>On</b> – Full Duplex Mode.<br/><b>Off</b> – Half Duplex Mode.</p> <p><b>LKC (copper)</b><br/><b>On</b> – The copper link is present.<br/><b>Off</b> – No copper link present.</p> |
|--|---|

## Other Features

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

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

### ***Error Recovery:***

In certain configurations, and under specific conditions where the media converter brings down a link to convey status, there is potential for a deadlock. Recovery is achieved by momentarily restoring the link to see if the original failure has been resolved. If it has not, the link will be forced down again, however if the original problem has been resolved, the link will be restored.

### ***Pause (IEEE 802.3xy):***

Integrated Pause signalling is an IEEE feature that temporarily suspends data transmission between two devices in the event that one of the devices becomes overwhelmed. The Perle media converter can generate and respond to Pause messages.

## Troubleshooting

### ***General***

- Ensure power is supplied to the media converter – use of the supplied power adapters is highly recommended.
- Ensure the remote device's fiber connection type is compatible with the media converter. If using a simplex fiber connection, ensure that you have both an Upstream (U) and Downstream (D) media converter.
- Ensure all cabling is of the correct type and is in good working order.
- For duplex fiber connections, ensure the RX and TX has been reversed between the 2 media converters.

## ***No connectivity***

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

### **Method 1**

- 1) Set the Link mode to Standard (SW2 – Down) on both media converters. Leave all other switches in the Up position.
- 2) Connect the near end device to the copper connection. The LKC LED indicates good copper connection. If the LKC LED is not lit, then check the copper cable and the attached device.
- 3) Repeat for the far end media converter.
- 4) Connect the fiber cable to both media converters. The LKF LED indicates good fiber connection. If no LKF LED then check the fiber cabling.
- 5) Return units to desired configuration.

### **Method 2:**

The fiber connection can also be verified by configuring the remote media converter for loopback mode. The LKF LEDs on both media converters should be lit. Data should pass through the local converter, over the fiber connection to the remote media converter. At the remote media converter, the data will be looped back and passed through the fiber, back to the local converter and passed to the copper link.

# **Technical Specifications**

|                                  |                                |
|----------------------------------|--------------------------------|
| <b>Power Input/Consumption</b>   | 12V DC / 2.1 W                 |
| <b>Operating Humidity:</b>       | 5% to 90% non-condensing       |
| <b>Storage Humidity:</b>         | 5% to 95% non-condensing       |
| <b>Operating Altitude:</b>       | Up to 3,048 m (10,000 ft)      |
| <b>Weight:</b>                   | 0.3 kg (0.66 lbs)              |
| <b>Dimensions:</b>               | 80 mm x 120 mm x 26 mm         |
| <br>                             |                                |
| <b>Operating Temperature:</b>    | 0°C to 50°C (32°F to 122°F)    |
| <b>Storage Temperature:</b>      | -25°C to 70°C (-13°F to 158°F) |
| <b>MTBF:</b>                     | 598,371 hours                  |
| <b>MTBF (with power supply):</b> | 333,769 hours                  |

**The following applies to all Extended Temperature S-110XT media converters:**

|                               |                                |
|-------------------------------|--------------------------------|
| <b>Operating Temperature:</b> | -40°C to 75°C (-40°F to 167°F) |
| <b>Storage Temperature:</b>   | -40°C to 85°C (-40°F to 185°F) |
| <b>MTBF:</b>                  | 607,001 hours                  |

## **Fiber Cabling Requirements:**

|            |                                    |
|------------|------------------------------------|
| <b>MM:</b> | 50/125 microns or 62.5/125 microns |
| <b>SM:</b> | 9/125 microns                      |

## **Ethernet Copper Cabling Requirements:**

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

**NOTE:** Please refer the product page on the Perle website for the most up to date specifications.

<http://www.perle.com/>

## Fiber Optic Specifications:

| Model              | Mode | Wavelength (nm)      | TX Power (dB)        | RX Power (dB)        | Budget (dB) |
|--------------------|------|----------------------|----------------------|----------------------|-------------|
| S-110-M2SC2 (XT)   | MM   | TX: 1310<br>RX: 1310 | Min: -20<br>Max: -12 | Min: -31<br>Max: -14 | 11          |
| S-110-M1SC2U       | MM   | TX: 1310<br>RX: 1550 | Min: -15<br>Max: 0   | Min: -28<br>Max: -8  | 13          |
| S-110-M1SC2D       | MM   | TX: 1550<br>RX: 1310 | Min: -15<br>Max: 0   | Min: -28<br>Max: 8   | 13          |
| S-110-M2ST2 (XT)   | MM   | TX: 1310<br>RX: 1310 | Min: -20<br>Max: -12 | Min: -31<br>Max: -14 | 11          |
| S-110-M2LC2 (XT)   | MM   | TX: 1310<br>RX: 1310 | Min: -20<br>Max: -12 | Min: -30<br>Max: -14 | 10          |
| S-110-S2SC20 (XT)  | SM   | TX: 1310<br>RX: 1310 | Min: -18<br>Max: -7  | Min: -32<br>Max: -3  | 14          |
| S-110-S2ST20 (XT)  | SM   | TX: 1310<br>RX: 1310 | Min: -15<br>Max: -8  | Min: -32<br>Max: -3  | 17          |
| S-110-S2LC20 (XT)  | SM   | TX: 1310<br>RX :1310 | Min: -15<br>Max: 0   | Min: -34<br>Max: -5  | 19          |
| S-110-S2SC40       | SM   | TX: 1310<br>RX :1310 | Min: -5<br>Max: 0    | Min: -34<br>Max: -3  | 29          |
| S-110-S2ST40       | SM   | TX: 1310<br>RX :1310 | Min: -5<br>Max: 0    | Min: -34<br>Max: -3  | 29          |
| S-110-S2LC40       | SM   | TX: 1310<br>RX :1310 | Min: -5<br>Max: 0    | Min: -34<br>Max: -3  | 29          |
| S-110-S2SC80       | SM   | TX: 1550<br>RX: 1550 | Min: -5<br>Max: 0    | Min: -34<br>Max: -3  | 29          |
| S-110-S2ST80       | SM   | TX: 1550<br>RX: 1550 | Min: -5<br>Max: 5    | Min: -34<br>Max: -3  | 29          |
| S-110-S2LC80       | SM   | TX: 1550<br>RX: 1550 | Min: -5<br>Max: 0    | Min: -34<br>Max: -3  | 29          |
| S-110-S2SC120      | SM   | TX: 1550<br>RX: 1550 | Min: 0<br>Max: 5     | Min: -35<br>Max: -3  | 35          |
| S-110-S2ST120      | SM   | TX: 1550<br>RX: 1550 | Min: 0<br>Max: 5     | Min: -35<br>Max: 0   | 35          |
| S-110-S2LC120      | SM   | TX: 1550<br>RX: 1550 | Min: 0<br>Max: 5     | Min: -35<br>Max: -3  | 35          |
| S-110-S1SC20U (XT) | SM   | TX: 1310<br>RX: 1550 | Min: -14<br>Max: -8  | Min: -32<br>Max: -3  | 18          |
| S-110-S1SC20D (XT) | SM   | TX: 1550<br>RX:1310  | Min: -14<br>Max: -8  | Min: -32<br>Max: -3  | 18          |
| S-110-S1SC40U      | SM   | TX: 1310<br>RX:1550  | Min: -8<br>Max: -3   | Min: -33<br>Max: -3  | 25          |
| S-110-S1SC40D      | SM   | TX: 1550<br>RX:1310  | Min: -8<br>Max: -3   | Min: -33<br>Max: -3  | 25          |

# Compliance Information

## FCC

This product has been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

## EN 55022, Class B

## EN 55024, Class A

Note: When used with a power adapter providing low conducted emissions, the S-110 will comply with Class B requirements.

## Laser Safety – IEC 60825-1:2007

This product meets Class I Laser safety requirements per IEC-60825-1:2007 standard and complies with FDA/CDRH 21 CFR1040.10 and 21 CFR1040.11.

**WARNING:** Visible and invisible laser radiation may be present when cables are not connected. Do not stare into the beam or view the beam directly with optical instruments. Failure to observe this warning could result in an eye injury or blindness.

**WARNING:** Use of controls, adjustments or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

## 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.

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

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