Perle Gigabit

Media Converters

Installation Guide

S-1000-XXXXXX
S-1000-SFP

Overview

This document contains instructions necessary for the installation and operation of the Perle Gigabit Standalone Ethernet Media Converters (S-1000). These products convert a 1000Base-TX cable connection (copper) to a 1000Base-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 (xx)	Mode - Distance	Wavelength (TX/RX)
S-1000-M2**xx**05	SC/ST/LC	MM - 550 m/1804 ft.	850 nm
S-1000-M1SC05U	SC	MM - 2 km/1.2 mi.	1310/1550 nm
S-1000-M1SC05D	SC	MM - 2 km/1.2 mi.	1550/1310 nm
S-1000-M2**xx**2	SC/ST/LC	MM - 2 km/1.2 mi.	1310 nm
S-1000-S2**xx**10	SC/ST/LC	SM - 10 km/6.2 mi.	1310 nm
S-1000-S1SC10U	SC	SM - 10 km/6.2 mi.	1310/1490 nm
S-1000-S1SC10D	SC	SM - 10 km/6.2 mi.	1490/1310 nm
S-1000-S1SC20U	SC	SM - 20 km/12.4 mi.	1310/1490 nm
S-1000-S1SC20D	SC	SM - 20 km/12.4 mi.	1490/1310 nm
S-1000-S2**xx**40	SC/ST/LC	SM - 40 km/25 mi.	1310 nm
S-1000-S1SC40U	SC	SM - 40 km/25 mi.	1310/1490 nm
S-1000-S1SC40D	SC	SM - 40 km/25 mi.	1490/1310 nm
S-1000-S2**xx**70	SC/ST/LC	SM - 70 km/43.5 mi.	1550 nm
S-1000-S1SC80U	SC	SM - 80 km/50 mi.	1510/1590 nm
S-1000-S1SC80D	SC	SM - 80 km/50 mi.	1590/1510 nm
S-1000-S2**xx**120	SC/ST/LC	SM - 120 km/74.6mi	1550 nm
S-1000-S1SC120U	SC	SM - 120 km/74.6 mi.	1510/1590 nm
S-1000-S1SC120D	SC	SM - 120 km/74.6 mi.	1590/1510 nm
S-1000-S2xx160	SC/ST/LC	SM - 160 km/100 mi	1550 nm
S-1000-SFP	SFP	**Note 1**	

Note 1: Fiber characteristics will depend on the SFP fiber module selected

Note 2: Please visit Perle's web site for the most up to date Installation guides, models and specifications:

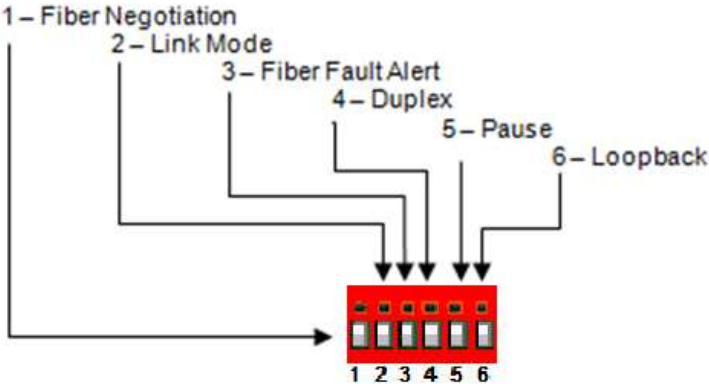**http://www.perle.com/**

Installation

These are the steps required to configure the Perle Gigabit media converter:

1. Insert SFP Module (SFP Model only)
2. Set the switch settings. (optional)
3. Install and connect the fiber cable.
4. Install and connect the copper cable.
5. Power up the media converter.

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

DIP Switches

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

1 – Fiber Negotiation
2 – Link Mode
3 – Fiber Fault Alert
4 – Duplex
5 – Pause
6 – Loopback

1 2 3 4 5 6

Note: Switch changes made when the product is powered up take effect immediately and will result in a link reset on both ports.

DIP Switch Settings

Fiber Negotiation (Switch 1)

Switch Position	Mode
Up (default)	Auto
Down	Off

Auto: In this mode of operation the media converter will negotiate Ethernet parameters on both the copper and the fiber connection. This will ensure the most optimal connection parameters will be in effect. If connecting to another Perle Gigabit Media Converter, this parameter should be set to Auto.

Off: Fiber Negotiation should only be turned off, if the fiber link partner does not support fiber link negotiations.

When the Fiber Negotiation switch is set to the OFF position, the media converter will negotiate the Ethernet parameters with the copper link partner. The parameters used in this negotiation by the media converter will be determined by the Duplex (switch 4) and Pause (switch 5) switch settings.

Link Mode (Switch 2)

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

Standard Mode: In this mode (if Fiber Negotiation is set to OFF), 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 link or copper link can take place without affecting the other connection.

However, if the Fiber Negotiation (switch 1) is set to Auto, then a loss of link on the copper side will result in a loss of link on the fiber side.

Smart 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 setup for Smart 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.

Fiber Fault Alert (Switch 3)

Switch Position	Mode
Up (default)	Enabled
Down	Disabled

Enabled: If the media converter detects a loss of fiber signal on the fiber receiver, it will immediately disable its fiber transmitter signal. This, in effect, notifies the fiber link partner that an error condition exists on the fiber connection.
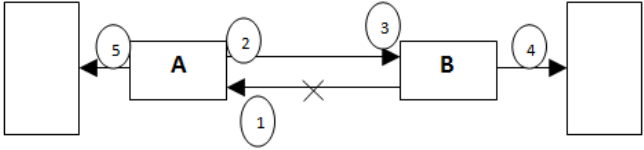
If the remote media converter is set up for Fiber Fault Alert (FFA) Enabled and the local media converter is set up with Smart Link Pass-Through, a loss of fiber link on either the transmit or receive line will be passed through to the local copper connection thus notifying the connected device.

If the media converter has been set to Smart Link Pass-Through mode, the effect will be the same as FFA, 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: This feature only takes effect if Fiber Negotiation has been turned off.

Disabled: The media converter will not monitor for fiber fault.

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

(A) – Remote Media Converter setup for Fiber Fault Alert Enabled, Fiber Negotiation – OFF and Link Mode – Normal.

(B) – Local Media Converter setup for Smart Link Pass-Through and Fiber Negotiation - OFF

(A) loses fiber connection on its receiver

(A) disables fiber transmitter

(B) detects loss of link in its fiber receiver

(B) drops link on copper connection through Smart Link Pass-Through

(A) Link on copper connection is not affected.

Duplex (Switch 4)

Switch Position	Mode
Up (default)	Auto
Down	Half

Auto: When Fiber Negotiation has been turned off (SW 1), the media converter will use this Duplex setting for its Ethernet parameter negotiation on the copper connection. In the Auto position, the media converter will advertise support for both Full and Half Duplex mode. The resultant negotiation will provide in the most optimum connection.

Half: The media converter will force the negotiation to Half Duplex mode.

Note: The Duplex parameter has no direct effect on the operation of the media converter. These are provided so that the attached device (near end) can negotiate its Ethernet parameters as if it was negotiating directly with the far end device. These parameters on the media converter should match those of the far end device.

Pause (Switch 5)

Switch Position	Mode
Up (default)	Enabled
Down	Disabled

Enabled: When Fiber Negotiation has been turned Off (SW 1), the media converter will use this setting for its Ethernet parameter negotiation on the copper connection. With this Pause switch in the Enabled position, the media converter will advertise support for Symmetrical and Asymmetrical Pause.

Disable: The media converter will not advertise support for the Pause feature.

Note: The media converter will not act on, or generate any Pause Ethernet messages, but will pass them through to the end device. This switch setting is provided so that the attached device (near end) can negotiate its Ethernet parameters as if it was negotiating directly with the far end device. The Pause switch setting on the media converter should match the capabilities of the far end device.

Loopback (Switch 6)

Switch Position	Mode
Up (default)	Disabled
Down	Enabled

Disabled: The loopback feature is disabled. This is the normal position for regular 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 is not relevant and no data or link status is passed through to the copper side.

Installing the SFP Fiber Module

The S-1000-SFP requires an SFP fiber module.

1. Locate the appropriate fiber module and insert the module into the opening.

2. Ensure the SFP module is properly seated.

3. The SFP module may be inserted before or after applying power to the media converter.

4. Proceed with cable connections.

Installing the Duplex Fiber Cable

- Locate a 1000Base-X compliant duplex (2 strands) fiber cable with male connections.

- Connect the fiber cables from one media converter to the other media converter/switch/fiber device ensuring that the RX and TX are reversed at the opposite end.

Perle Media Converter   Perle Media Converter
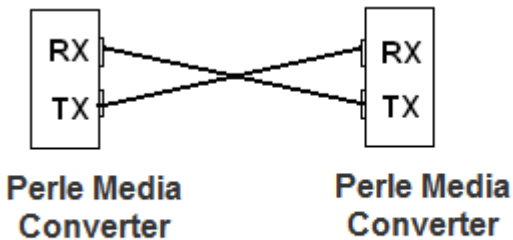
Installing the Simplex Fiber Cable

Locate a 1000Base-X compliant simplex (1 strand) fiber cable with male connections.

Connect the fiber cable from one media converter to the other media converter/switch/fiber device.

Installing the Copper Cable

- Locate 1000Base-TX 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 Perle media converter supports Auto-MDI-X, either a straight-through or cross over Ethernet cable may be used.
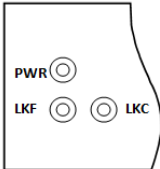
Powering up the Perle Media Converter

1. Connect the Perle supplied power adapter to the media converter.

2. Turn on the power at source.

3. Check that the PWR LED light is lit.

Operation

Status LED

The Perle Gigabit Media converters have three single color status LEDs located on the front panel of the unit.

PWR - Power/Test
- **On**: Power is on and the unit is in normal operation mode.
- **Blinking** *slowly*: the unit is in loopback mode.
- **Blinking** *quickly*: the unit has a hardware error.

LKF - Fiber Link/Activity
- **On**: Fiber link present.
- **Blinking** *quickly*: Fiber link present and receiving data.
- **Blinking** *slowly*: Fiber link disabled because the copper link went down.
- **Off**: No fiber link present.

LKC - Copper Link/Activity
- **On***: Copper link is present.*
- **Blinking** *quickly:* Copper link present and receiving data.
- **Blinking** *slowly:* Copper link disabled because the fiber link went down.
- **Off***:* No copper link present**.**

Other Features

Default Operating Mode:

In the default operating mode (all switches up), the media converter will auto-negotiate on both the fiber and the copper links at the same time, thus achieving the best end-to-end Ethernet operating parameters. If the fiber link is not present, it will still permit the copper link to be established, but will not negotiate a fiber link if the copper link is not present. Therefore the device attached to the media converter will not see a loss of link if the fiber connection is lost.

Auto-MDI-X with Skew Correction:

Auto-MDI-X (automatic medium-dependant interface crossover) detects the signalling on the 1000BASE-T interface to determine the type of cable connected (straight-through or crossover) and automatically configures the connection. The media converter can also correct for wires swapped within a pair.

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.

Example: If two converters are setup for FFA. The detection of a fiber link failure (RX) will cause one media converter to disable its fiber transmitter (TX). This in turn will cause the other to do the same, and a deadlock condition has been created. The media converter will periodically turn on its transmitter (TX) to re-start the link and see if the original failure has been resolved. If not the TX is once again turned off.

Troubleshooting

General

- Ensure power is supplied to the media converter – use of the supplied power adapter is highly recommended.
- Ensure both devices on either end of the fiber are compatible. If using a single 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 operating condition.
- For dual-stranded 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. Turn off Fiber Negotiation (SW1 Down) on both media converters. Leave all other switches UP.
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 device.
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, once again, to pass through the local converter to the copper link.

Technical Specifications

The following applies to all S-1000 media converters:

Power Input/Consumption	12V DC / 3.0 W
Operating Temperature:	0°C - 50°C (32°F - 122°F)
Storage Temperature:	-25°C - 70°C (-13°F - 158°F)
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:	0.3 kg (0.66 lbs)
MTBF: S-1000	609,432 hours
(with power supply)	337,182 hours
S-1000-SFP	745,242 hours (without SFP)
(with power supply):	374,991 hours (without SFP)
Dimensions:	80 mm x 120 mm x 26 mm

Fiber Optic Specifications:

Model	Mode	Wavelength (nm)	TX Power (dB)	RX Power (dB)	Budget (dB)
S-1000-M2xx05	MM	TX: 850 RX: 850	Min: -9.5 Max: -4	Min: -17 Max: -3	7.5
S-1000-M1SC05U	MM	TX: 1310 RX: 1550	Min: -8 Max: 0	Min: -18 Max: 0	10
S-1000-M1SC05D	MM	TX: 1550 RX: 1310	Min: -8 Max: 0	Min: -18 Max: 0	10
S-1000-M2xx2	MM	TX: 1310 RX: 1310	Min: -6 Max: 0	Min: -17 Max: 0	11
S-1000-S2xx10	SM	TX: 1310 RX: 1310	Min: -9.5 Max: -3	Min: -20 Max: -3	10.5
S-1000-S1SC10U	SM	TX: 1310 RX: 1490	Min: -9 Max: -3	Min: -20 Max: -3	11
S-1000-S1SC10D	SM	TX: 1490 RX: 1310	Min: -9 Max: -3	Min: -20 Max: -3	11
S-1000-S1SC20U	SM	TX: 1310 RX: 1490	Min: -8 Max: -3	Min: -22 Max: -3	14
S-1000-S1SC20D	SM	TX: 1490 RX: 1310	Min: -8 Max: -3	Min: -22 Max: -3	14
S-1000-S2xx40	SM	TX: 1310 RX: 1310	Min: -3 Max: 5	Min: -23 Max: -3	20

Model	Mode	Wavelength (nm)	TX Power (dB)	RX Power (dB)	Budget (dB)
S-1000-S1SC40U	SM	TX: 1310 RX: 1490	Min: -3 Max: 2	Min: -23 Max: -3	20
S-1000-S1SC40D	SM	TX: 1490 RX: 1310	Min: -3 Max: 2	Min: -23 Max: -3	20
S-1000-S2xx70	SM	TX: 1550 RX: 1550	Min: 0 Max: 5	Min: -23 Max: -3	23
S-1000-S1SC80U	SM	TX: 1510 RX: 1590	Min: -2 Max: 3	Min: -26 Max: -3	24
S-1000-S1SC80D	SM	TX: 1590 RX: 1510	Min: -2 Max: 3	Min: -26 Max: -3	24
S-1000-S2xx120	SM	TX: 1550 RX: 1550	Min: 0 Max: 5	Min: -32 Max: -9	32
S-1000-S1SC120U	SM	TX: 1510 RX: 1590	Min: -3 Max: 2	Min: -34 Max: -9	31
S-1000-S1SC120D	SM	TX: 1590 RX: 1510	Min: -3 Max: 2	Min: -34 Max: -9	31
S-1000-S2xx160	SM	TX: 1550 RX: 1550	Min: 2 Max: 5	Min: -34 Max: -9	32

Fiber Cabling Requirements:

MM: 50/125 microns or 62.5/125 microns
SM: 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/

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 A

WARNING This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EN 55024 Class A

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

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