



# Perle Gigabit Media Converter Module

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## Installation Guide

<b>C-1000-XXXXX</b>	<b>Unmanaged Module</b>
<b>CM-1000-XXXXX</b>	<b>Managed Module</b>
<b>C-1000-SFP</b>	<b>Unmanaged Module</b>
<b>CM-1000-SFP</b>	<b>Managed Module</b>



# Overview

This document contains instructions necessary for the installation and operation of the Perle Gigabit Ethernet Media Converter Module(s) that are used in conjunction with a Perle MCR chassis. The C-1000 are unmanaged media converter modules, and the CM-1000 are the managed versions. This product converts 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). For information on the management options of the CM-1000 module, refer to the MCR-MGT Module User's Guide.

Model	Connector (xx)	Mode - Distance	Wavelength (TX/RX)
C-1000-M2xx05 CM-1000-M2xx05	SC/ST/LC	MM - 550 m/1804 ft.	850/850 nm
C-1000-M2xx2 CM-1000-M2xx2	SC/ST/LC	MM - 2 km/1.2 mi.	1310/1310 nm
C-1000-S2xx10 CM-1000-S2xx10	SC/ST/LC	SM - 10 km/6.2 mi.	1310/1310 nm
C-1000-S1SC10U CM-1000-S1SC10U	SC	SM - 10 km/6.2 mi.	1310/1490 nm
C-1000-S1SC10D CM-1000-S1SC10D	SC	SM - 10 km/6.2 mi.	1490/1310 nm
C-1000-S1SC20U CM-1000-S1SC20U	SC	SM - 20 km/12.4 mi.	1310/1490 nm
C-1000-S1SC20D CM-1000-S1SC20D	SC	SM - 20 km/12.4 mi.	1490/1310 nm
C-1000-S2xx40 CM-1000-S2xx40	SC/ST/LC	SM - 40 km/25 mi.	1310/1310 nm
C-1000-S1SC40U CM-1000-S1SC40U	SC	SM - 40 km/25 mi.	1310/1490 nm
C-1000-S1SC40D CM-1000-S1SC40D	SC	SM - 40 km/25 mi.	1490/1310 nm
C-1000-S2xx70 CM-1000-S2xx70	SC/ST/LC	SM - 70 km/43.5 mi.	1550/1550 nm

Model	Connector (xx)	Mode - Distance	Wavelength (TX/RX)
C-1000-S1SC80U CM-1000-S1SC80U	SC	SM - 80 km/50 mi.	1510/1590 nm
C-1000-S1SC80D CM-1000-S1SC80D	SC	SM - 80 km/50 mi.	1590/1510 nm
C-1000-S2xx120 CM-1000-S2xx120	SC/ST/LC	SM - 120 km/74.6mi	1550/1550 nm
C-1000-S1SC120U CM-1000-S1SC120U	SC	SM - 120 km/74.6 mi.	1510/1590 nm
C-1000-S1SC120D CM-1000-S1SC120D	SC	SM - 120 km/74.6 mi.	1590/1510 nm
C-1000-S2xx160 CM-1000-S2xx160	SC/ST/LC	SM - 160 km/100 mi	1550/1550 nm
C-1000-SFP CM-1000-SFP	SFP	<b>Note 1</b>	

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

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

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

# Installation

This module comes equipped with a bank of DIP switches and jumpers for setting configuration. The default switch settings (all switches in the UP position) will work for most installations. See the Operations section of this guide for more details.

The following steps are used to configure the Perle Gigabit Media Converter Module:

1. Insert SFP Module (SFP Models only)
2. Set the Auto-Config jumper (CM-1000 only) (optional)
3. Set the DIP switch settings (optional).
4. Insert the Media Converter Module into the chassis.
5. Connect the fiber cable.
6. Connect the copper cable.

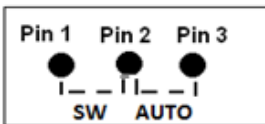
## Auto-Config Jumper (CM-1000 only)

The Auto-Config jumper (J6) is located on the upper edge, at the midpoint of the module. Refer to the diagram below for labelling.

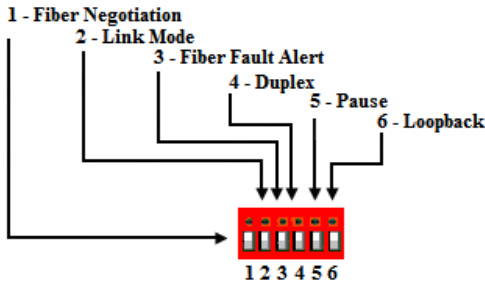
Strapping pins 1 and 2 of the jumper will set the module in SW mode and strapping pins 2 and 3 will set it in Auto Config mode (default).

**Auto:** When set to Auto the module will, at power-up, check its internal flash memory to see if configuration information has been downloaded to it from a management module. If so it will use this as its running configuration. If there is no configuration in flash it will read the settings of the DIP switches and use those as its running configuration.

**SW:** When set to SW (Switch), the module will, at power-up, read the settings of the DIP Switches and use those as its running configuration. It will ignore any configuration information in its flash memory



# DIP Switches



## 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 Module will negotiate the Ethernet parameters with the copper link partner. The parameters used in this negotiation will be determined by the Duplex (switch 4) and Pause (switch 5) switch settings.

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

<b>Switch Position</b>	<b>Mode</b>
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.

If the installation has a Media Converter on both ends of the fiber link and both are setup for Smart Link Pass-Through, 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 resemble a direct copper connection.

## ***Fiber Fault Alert (Switch 3)***

<b>Switch Position</b>	<b>Mode</b>
Up (default)	Enabled
Down	Disabled

**Disabled:** The Media Converter Module will not monitor for fiber fault.

**Enabled:** If the Media Converter Module detects a loss of fiber signal on the fiber receiver, it will immediately disable its fiber transmitter signal. This notifies the fiber link partner that an error condition exists on the fiber connection.

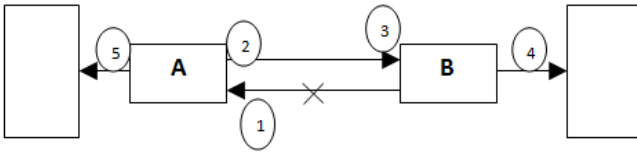
If the remote Media Converter is set up for Fiber Fault Alert (FFA) Enabled and the local Media Converter is set up with Smart Link

Pass-Through enabled, 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 Module 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.

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 - Enabled and Fiber Negotiation - OFF

1. – **(A)** loses fiber connection on its receiver
2. – **(A)** disables fiber transmitter
3. – **(B)** detects loss of link in its fiber receiver
4. – **(B)** drops link on copper connection through Smart Link Pass-Through
5. – **(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 Module 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 the most optimum connection.

**Half:** The Media Converter Module 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 Module 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 Module 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 Module will not advertise support for the Pause feature.

**Note:** The Media Converter Module 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 Module should match the capabilities of the far end device.

### ***Loopback (Switch 6)***

<b>Switch Position</b>	<b>Mode</b>
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 Module.

**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.

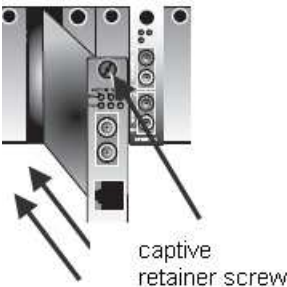
# Installing or Replacing Media Converter Modules

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

The Perle Media Converter Modules can be installed in any available slot and in any order within the chassis.

## *Installing or Replacing a Media Converter Module*

1. Remove the Module from its packaging.
2. Using a cross-head screwdriver, remove the screw holding the face plate to the Chassis to reveal the slot opening.
3. Set the jumpers and DIP switches on the Media Converter Module to the desired operating mode.
4. Locate the top and bottom alignment guides inside the MCR Chassis.
5. Using the module alignment guides 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 cause damage. If there is resistance, remove the module and check the module connector for damaged or incorrectly aligned pins. If these are not damaged, retry module insertion.



6. Tighten the captive retainer screw to ensure the Media Converter Module is locked in place.
7. Remove the dust cap from the fiber connector and connect the fiber and copper cables.

## ***Removing Media Convert Modules***

1. Loosen the captive retainer screw on the front of the Media Converter Module and gently pull the module out.
2. If not inserting a replacement Media Converter Module then cover the opening slot with a face plate and secure the screw.

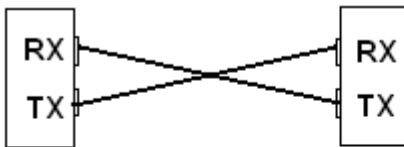
## ***Installing the SFP Fiber Module***

C-1000-SFP and CM-1000-SFP require an SFP fiber module.

1. Locate appropriate fiber module and insert into opening.
2. Ensure the SFP module is properly seated.
3. SFP module may be inserted before or after the Media Converter module is inserted into the chassis.
4. Proceed with cable connections.

## ***Installing the Duplex Fiber Cable***

- Locate a 1000Base-X compliant duplex (2 strands) fiber cable with appropriate connectors.
- Connect the fiber cables from one Converter to the other Converter/switch/fiber device ensuring that the RX and TX are reversed at the opposite end.



Perle Media  
Converter  
Module

Perle Media  
Converter  
Module

## Installing the Copper Cable

- Locate a 1000Base-X compliant simplex (1 strand) fiber cable with appropriate connectors.
- Connect the fiber cable from one Converter to the other Converter/switch/fiber device.

## Installing the Copper Cable

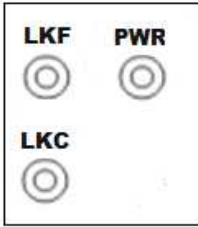
- Locate 1000Base-TX compliant copper cables with male, RJ-45 connectors installed at both ends.
- Connect the RJ-45 cable between the Perle Media Converter Module and the device.

**Note:** Since the Media Converter Module supports Auto-MDIX, either a straight-through or cross over Ethernet cable may be used.

# Operation

## Status LED

The Perle Gigabit Media Converter Modules have three single color status LEDs located on the face plate of the module.



### PWR - Power/Test

- **On:** Power is on, module is operating normally
- **Blinking *slowly*:** the module is in loopback mode.
- **Blinking *quickly*:** the module 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 due to loss of copper link.
- **Off:** No fiber link

### LKC - Copper Link/Activity

- **On:** Copper link present.
- **Blinking *quickly*:** Copper link present and receiving data.
- **Blinking *slowly*:** Copper link disabled due to loss of fiber link.
- **Off:** No copper link.

## Other Features

### ***Default Operating Mode:***

In the default operating mode (all switches up), the Media Converter Module 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 Module will not see a loss of link if the fiber connection is lost.

### ***Auto-MDIX with Skew Correction:***

Auto-MDIX (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 Module can also correct for wires swapped within a pair.

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

In certain configurations, and under specific conditions where the Media Converter Module 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 Media 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 the module is securely seated in the chassis. The PWR LED on the module should be on solid.
- Ensure both devices on either end of the fiber are compatible. If using a simplex fiber connection, ensure that you have both an Upstream (U) and Downstream (D) Media Converters.
- 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 two Media Converters.

## **No connectivity**

If unable to get full connectivity with all DIP switches in the UP position, these methods are recommended for troubleshooting.

### **Method 1**

1. If the Module is a CM-1000, set the Auto-Config jumper (J6) to SW so that switches are being read.
2. Turn off Fiber Negotiation (SW1 Down) on both Media Converters. Leave all other switches UP.
3. 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. 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 media converter to the 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 converter. At the remote converter, the data will be looped back and passed through the fiber, once again, to pass through the local converter to the copper link.

**Note:** If troubleshooting a CM-1000, setting the Auto-Config jumper (J6) to SW will ensure the DIP switches are being read.



# Technical Specifications

<b>Power Input/Consumption</b>	12V DC / 3.0 W
<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>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>MTBF (C-1000)</b>	588,182 hours
<b>(C-1000-SFP)</b>	713,711 hours (without SFP)
<b>(CM-1000)</b>	571,557 hours
<b>(CM-1000-SFP)</b>	689,380 hours (without SFP)

## Fiber Optic Specifications:

Model	Mode	Wavelength (nm)	TX Power (dB)	RX Power (dB)	Budget (dB)
C-1000-M2xx05 CM-1000-M2xx05	SM	TX: 850 RX: 850	Min: -9.5 Max: -3	Min: -17 Max: -3	7.5
C-1000-M2xx2 CM-1000-M2xx2	MM	TX: 1310 RX: 1310	Min: -6 Max: 0	Min: -17 Max: -3	11
C-1000-S2xx10 CM-1000-S2xx10	SM	TX: 1310 RX: 1310	Min: -9.5 Max: -3	Min: -20 Max: -3	10.5
C-1000-S1SC10U CM-1000-S1SC10U	SM	TX: 1310 RX: 1490	Min: -9 Max: -3	Min: -20 Max: -3	11
C-1000-S1SC10D CM-1000-S1SC10D	SM	TX: 1490 RX: 1310	Min: -9 Max: -3	Min: -20 Max: -3	11
C-1000-S1SC20U CM-1000-S1SC20U	SM	TX: 1310 RX: 1490	Min: -8 Max: -3	Min: -22 Max: -3	14
C-1000-S1SC20D CM-1000-S1SC20D	SM	TX: 1490 RX: 1310	Min: -8 Max: -3	Min: -22 Max: -3	14
C-1000-S2xx40 CM-1000-S2xx40	SM	TX: 1310 RX: 1310	Min: -3 Max: 5	Min: -23 Max: -3	20
C-1000-S1SC40U CM-1000-S1SC40U	SM	TX: 1310 RX: 1490	Min: -3 Max: 2	Min: -23 Max: -3	20
C-1000-S1SC40D CM-1000-S1SC40D	SM	TX: 1490 RX: 1310	Min: -3 Max: 2	Min: -23 Max: -3	20

C-1000-S2xx70 CM-1000-S2xx70	SM	TX: 1550 RX: 1550	Min: -0 Max: 5	Min: -23 Max: -3	23
C-1000-S1SC80U CM-1000-S1SC80U	SM	TX: 1510 RX: 1590	Min: -2 Max: 3	Min: -26 Max: -3	24
C-1000-S1SC80D CM-1000-S1SC80D	SM	TX: 1590 RX: 1510	Min: -2 Max: 3	Min: -26 Max: -3	24
C-1000-S2xx120 CM-1000-S2xx120	SM	TX: 1550 RX: 1550	Min: 0 Max: 5	Min: -32 Max: -9	32
C-1000-S1SC120U CM-1000- S1SC120U	SM	TX: 1510 RX: 1590	Min: -3 Max: 2	Min: -34 Max: -9	31
C-1000-S1SC120D CM-1000- S1SC120D	SM	TX: 1590 RX: 1510	Min: -3 Max: 2	Min: -34 Max: -9	31
C-1000-S2xx160 CM-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 models and 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](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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