

OptikWave Media Converter MC-X101
Release 2.1

User Manual

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This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction manual, 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 own expense.

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To avoid the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment, end users of electrical and electronic equipment should
understand the meaning of the crossed-out wheeled bin symbol.
Do not dispose of WEEE as unsorted municipal waste and have to collect such WEEE separately.

Table of Contents

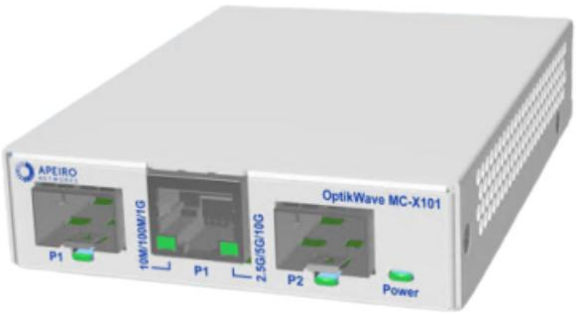
1. Introduction 4
1.1 Package Contents 4
1.2 Product Overview 6
1.3 Product Feature 7
1.4 Product Specifications 8
2. Hardware Description 9
2.1 Physical Dimensions 9
2.2 Front View & LED Indicators 9
2.3 Rear View & DIP Switches 9
2.4 Power Information 9
3. Installation 10
3.1 Stand-alone Installation 10
3.2 Wall-mount Installation 10
3.3 DIN-Rail Installation 10
3.4 Transceiver and Cable Connection 12
4. Troubleshooting 15
Appendix A: Approved SFP+ Transceivers 16
Appendix B: Networking Connection 16
B.1 Converter's RJ45 Pin Assignment 16
B.2 RJ45 Cable Pin Assignments 17

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1. Introduction

1.1 Package Contents

Thank you for purchasing Optikwave MC-X101. In the following sections, unless specified, the term “Media Converter’ mentioned in this manual refers to MC-X101. Open the box of the Media Converter and carefully unpack it. The box should contain the following items.

<table>
<tr><th colspan="2">MC-X101 Media Converter</th></tr>
<tr><td colspan="2">
</td></tr>
<tr><th>Optional DC Power Adapter
(Input: 36V~72V DC, 0.2A; Output: 5V/2A or 12V/1A)</th><th>Optional AC Power Adapter
(Input: 100V~240V AC; Output: 5V/2A or 12V/1A</th></tr>
<tr><td>
</td><td></td></tr>
<tr><th colspan="2">Optional 1G/2.5G/5G/10GBASE SFP+</th></tr>
<tr><td colspan="2"></td></tr>
</table>

Note: The MC-X101 has no built-in AC power supply and is powered through an external power adapter. The AC power adapter and the DC power adapter are optional items; please specify the adapter type when ordering. See Section 2.4 Power Information for details.

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If any of these are missing or damaged, please contact us immediately. If possible, retain the carton including the original packaging material, and use them again to repack the product in case there is a need to return it to us for repair.

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1.2 Product Overview

Overview
As the demands on optical transport continue to evolve, the extension of existing network equipment remains a significant challenge. Optikwave's Optical Transport Media Converter is engineered to address these requirements, enabling effective extensions within existing packet networks.

Key Features

Types of Conversion
- Copper to Fiber Media Converter: This unit excels in converting short distance twisted pair electrical signals into long-distance optical signals for Ethernet transmission, facilitating uninterrupted long-range connections. MC-X101 features super MTU support up to 10240Byte.
- Fiber Optic Conversion Repeater: This device converts optical signals into electrical signals and subsequently transforms them back into different optical signals, enhancing signal integrity and extending transmission distances within optical fiber networks.

Application Suitability
- Designed for use in situations where traditional Ethernet cables are inadequate, necessitating the adoption of optical solutions. It is predominantly employed in the access layer of broadband metropolitan area networks, playing an essential role in linking local area networks with broader network infrastructures.

Strategic Network Enhancement
- Our converter enables substantial extension of transmission distances using fiber optic technologies. It is crucial for the expansion of broadband metro area networks, facilitating connectivity to the last mile of the fiber optic transmission line and linking metropolitan networks to external network layers.

Benefits
- Compatibility: Standard based design which operates effectively with a diverse range of packet network configurations and equipment, ensuring broad applicability across various network layers (Layer 2 or layer 3 link extensions).

- Flexible dip-switched configurable mode for different use cases (MC or repeater mode).

- Integrated loopback facilities and "link fault pass" (LFP) features for enhanced maintenance and ease of operations.

Ideal Use Cases
- Urban infrastructure enhancement projects that require simple plug-and-play integration with current packet network systems.
- Communication service providers (Telcos) aiming to provide a low-cost service demarcation point between the customers equipment to the service provider network.

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1.3 Product Feature

- Media converter 10G copper/optical to 10G optical
- Wavelength Converter 850nm/1310nm/1550nm to 1310nm/1550nm/WDM wavelength
- Combo port: Either copper or optical port (WDM SFP supported) can be used for client service
- Auto negotiation:
  - Transparent to L1/L2 signaling and traffic. Auto negotiation enabled by default. Port speed can be negotiated as 10M/100M/1G/2.5G/5G/10G.
  - Support Auto negotiation bypass mode. Ignore the auto negotiation setting in peer end. Can interoperate with Auto negotiation disable.
- Support LFP (link fault pass) function
- Support loopback per port
- Support flow control, enable or disable by DIP
- MTU size 10Kbyte
- External power adapter, DC 5V/2A or 12V/1A input to the converter. Optional AC adapter (100V~240V AC input) or optional DC adapter (36V~72V DC input)
- Power redundancy: the MC-X101-(DP) model supports 1+1 dual power input
- Power consumption: 5W
- MTBF: > 100000 hours
- EMC: CE Class A
- Fan-less, passive cooling
- Mounting application: Desktop, Din rail, Wall, and Rack

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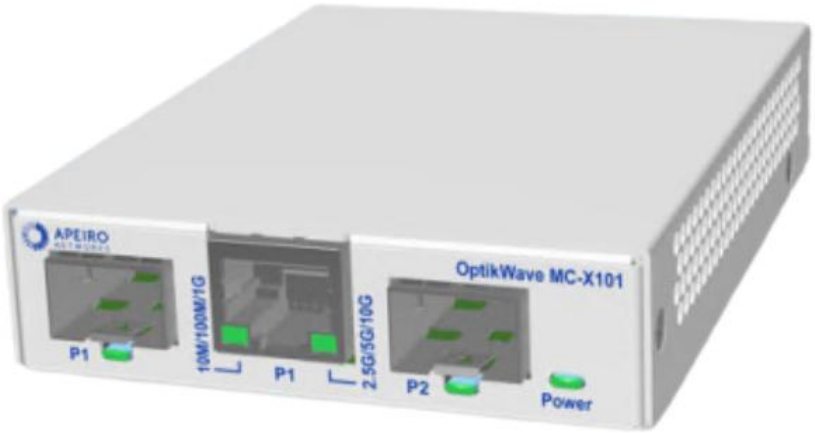
1.4 Product Specifications

Model	MC-X101
Hardware Specifications	
I/O Interface	
Power	DC input: 5V/2A or 12V/1A, via external power adapter
	Optional AC adapter: 100V~240V AC input
	Optional DC adapter: 36V~72V DC input, 0.2A
	Power consumption: 5W
	MC-X101-(DP): dual DC input, 1+1 power redundancy
Ethernet	1-Port 10M/100M/1G/2.5G/5G/10GBASE-T RJ45 (P1, combo with SFP+)
	2-Port SFP+: P1 (1G/10G, combo with RJ45), P2 (10G)
Performance	
Packet Buffer	Minimum 64K memory buffer
Jumbo Frame	10240bytes
Transfer Mode	Store and forward
MTBF	100000 hours
Standard	
Network protocol	IEEE802.3 (10Base-T)
	IEEE802.3u (100Base-TX/FX)
	IEEE802.3x (Flow control)
Optical Characteristics	Wavelength: 850/1310/1550nm to 1310/1550nm/WDM; reach up to 80KM, depending on the SFP+ module (see Appendix A)
Industry Standard	EMI: FCC Part 15 CISPR (EN55032) class A
	EMS: EN61000-4-2 (ESD)、EN61000-4-4 (EFT)
	Shock: IEC 60068-2-27
	Free Fall: IEC 60068-2-32
	Vibration: IEC 60068-2-6
Network Medium	10Base-T: Cat3, 4, 5 or above UTP(≤100m)
	100Base-TX: Cat5 or above UTP(≤100m)
Environment	
Working Environment	EMC: FCC/CE Class A
	Safety: IEC 62368-1
	ECO: ROHS & REACH Compliance
	Working Temperature: -40~65°C (with I-Temp SFP) 0~50°C (with C-Temp SFP)
	Storage Temperature: -25~75°C
	Working Humidity: 10%~90%, non-condensing
	Storage Humidity: 5%~90%, non-condensing

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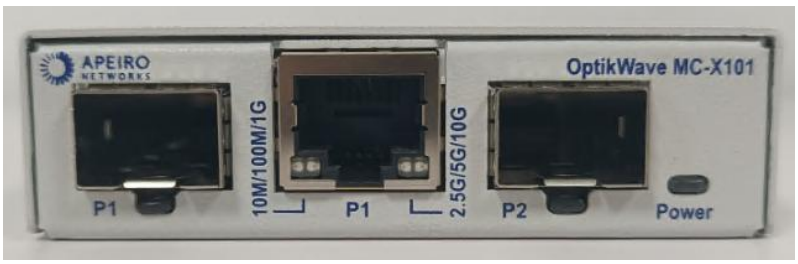
2. Hardware Description

2.1 Physical Dimensions



Media Converter's Dimensions	
Width	73.6mm
Height	20mm
Depth	103mm

2.2 Front View & LED Indicators



Front View

Port	Description
P1 (Optical)	Green: 10G; ON--LINK, BLINK--Active Orange: 1G; ON--LINK, BLINK--Active
P1 (RJ45)	**Left side LED:** Green: 1G; ON--LINK, BLINK--Active Mix: 10M; ON--LINK, BLINK—Active Orange: 100M; ON--LINK, BLINK—Active **Right side LED**: Green: 10G; ON--LINK, BLINK--Active Mix: 2.5G; ON--LINK, BLINK—Active Orange: 5G; ON--LINK, BLINK—Active
P2 (Optical)	Green: 10G; ON--LINK, BLINK--Active
Power	Green: Power on

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2.3 Rear View & DIP Switches



Rear View

The rear of the MC-X101 has one DC jack (DC IN) that accepts 5V/2A or 12V/1A DC input from the external power adapter. The MC-X101-(DP) model supports 1+1 power redundancy.

DIP #	Signal	Description
1	LFP TP	Enable LFP (Link fault pass) function on RJ45 port, If RJ45 link down, the SFP port also changed to link down
2	LFP FX	Enable LFP (Link fault pass) function on SFP port, If SFP link down, the RJ45 port also changed to link down
3	Loopback P1	Enable loopback on PORT1
4	Loopback P2	Enable loopback on PORT2
5	Flow Control	Enable or disable flow control on all ports
6	Port Speed	Select speed of P1 fiber port to 1G(1000BASE-X) or 10G(10GBASE-R)
7	ReV	Reserve for future

2.4 Power Information

The MC-X101 has one DC power input (DC jack) and is powered through an external power adapter. The unit does not contain a built-in AC power supply. Two optional power adapters are available, depending on the power source at the installation site:

Item	AC Power Adapter
Device Type	DC-to-DC Power Converter (often called a "telecom brick")
Input Voltage	**-36 Vdc to -72 Vdc** (Nominal -48 Vdc)
Input Current	0.2 A (max)
Output Voltage	**5.0 Vdc**
Output Current	1.0 A
Output Power	5.0 W
DC Connector Type	Barrel Jack (Male)
Connector Dimensions	5.5mm (OD) x 2.1mm (ID) (Standard)
Connector Polarity	Center-Positive (+) (Standard)
AC Plug Type	UK 3-Pin (Type G)
Efficiency	~73.6% (Level VI)
Protection	Overload, Overvoltage, Short Circuit

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Item	DC Power Adapter
Device Type	DC-to-DC Power Converter (often called a "telecom brick")
Input Voltage	**-36 Vdc to -72 Vdc** (Nominal -48 Vdc)
Input Current	0.2 A (max)
Output Voltage	**5.0 Vdc**
Output Current	1.0 A
Output Power	5.0 W
DC Connector Type	Barrel Jack (Male)
Connector Dimensions	Most likely **5.5mm (OD) x 2.1mm (ID)** (see details below)
Connector Polarity	Typically **Center-Positive (+)** (see details below)
Input Connection	2-wire pigtail (Red = Positive, Black = Negative)

Safety and Verification

- **Input Connection:** The pigtail wires (Red/Blue or Red/Black) need to be connected to your DC power source. **Red** indicates the **positive** input, and **Black** indicates the **negative** (or return) input.

- For the DC power adaptor connected to a customer's DC PDU, the recommended circuit breaker size is **1 A**, depending on the specific breaker characteristics and local code requirement

Choosing the power adapter: Use the AC power adapter where AC mains power is available. Use the DC power adapter where the site provides 36V~72V DC. Never connect the DC power adapter to AC mains or to a source outside 36V~72V DC, and never connect the AC power adapter to a DC source.

Power redundancy (MC-X101-(DP) only): The MC-X101-(DP) supports 1+1 power redundancy using two external power adapters, each providing DC 5V/2A or 12V/1A. If one power source fails, the other continues to power the unit.

Power consumption: 5W

Power LED: The Power LED lights green when the unit is powered. If it stays off, see Chapter 4 Troubleshooting.

Should you have an issue with the power connection, please contact your local sales representative.

MC-X101 is a power-required device, it will not work until it is powered. If your networks require it to be always active, please consider using UPS (Uninterruptible Power Supply) to prevent you from network data loss or network downtime.

In some areas, installation of a surge suppression device may also help to protect your Media Converter from being damaged by unregulated surge of current to the converter or power adapter.

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3. Installation

This section describes the functionalities of the Media Converter's components and guides you how to install it on the desktop. Basic knowledge of network is assumed, please refer to this chapter before continuing.

3.1 Stand-alone Installation

Step 1: Unpack the Media Converter

Step 2: Connect the power adapter (AC or DC type, 5V/2A or 12V/1A output) to the DC jack of MC-X101, then connect the adapter to its power source: AC mains for the AC power adapter, or a 36V~72V DC supply for the DC power adapter. Verify that the Power LED lights up (Please refer to the 2.4 Power Information section for power input.)

Step 3:

3.1: Prepare a twisted-pair, straight-through Category 5e/6/7 UTP cable for Ethernet connection.

3.2: Prepare a fiber cable for connection to the SFP+ slot, and make sure both sides of the SFP transceiver are with the same media type. **(Please refer to the 3.4 Transceiver and Cable Connection section for the type of connection.)**

Step 4:

4.1: Insert one side of Category 5e/6/7 cable into the Media Converter Ethernet port (RJ45) while the other side of Category 5e/6/7 cable into the network devices Ethernet port (RJ45), e.g., switch, PC or server. The UTP port (RJ45) LED on the Media Converter will light up when the cable is connected with the network device. (Please refer to the **Section 2.2 Front View & LED Indicators** for the functions of LED lights.)

4.2: Connect the fiber cable. Attach the duplex LC connector on the network cable to the SFP+ transceiver. Attach the fiber cable from the MC-X101 to the fiber network. TX, RX must be paired at both ends.

Step 5: When all the connections are all set and the LED lights all show normally, the installation is complete.

3.2 Wall-mount Installation

Step 1: Please find the wall that can mount the Media Converter

Step 2: Screw two screws on the wall.

Step 3: Hang the Media Converter on the screws from the wall

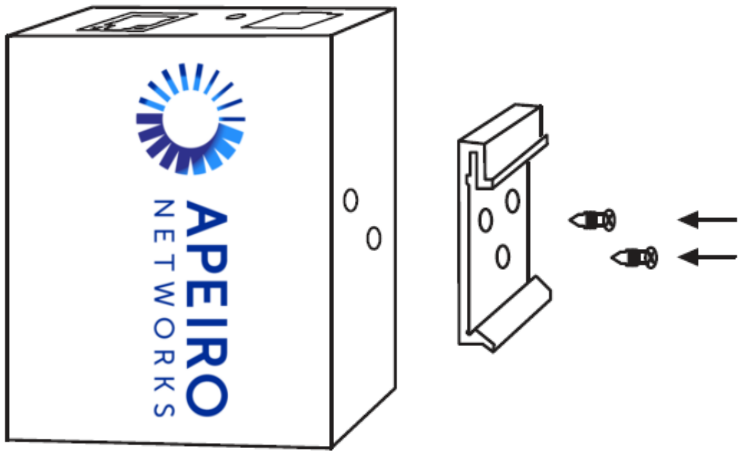
Step 4: Refer to Chapter 2.4 Power Information on power supply to the Media Converter
Before mounting the device to the wall, please check the location of the AC outlet or DC power source and the length of the Ethernet cable

3.3 DIN-Rail Installation

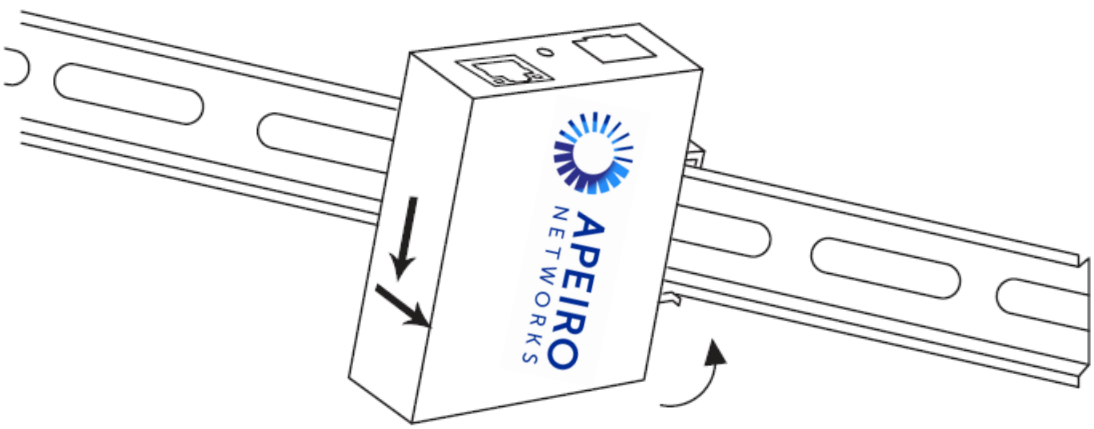
There are two DIN-rail holes on the left side of MC-X101 that allows it to be easily installed by DIN-rail mounting kit (RKE-DIN). The kit can be ordered separately. Refer to the following steps for the installation of DIN-rail mounting for MC-X101.

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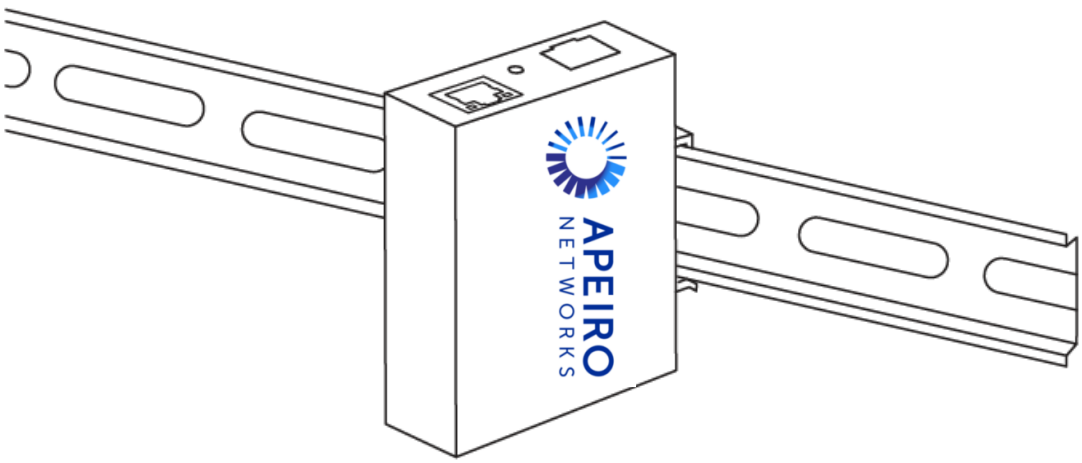
Step 1: Screw the DIN rail on MC-X101



Step 2: Now slide the DIN rail into the rack



Step 3: Check whether the DIN rail is tightly on the track



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Caution

You must use the screws supplied with the mounting brackets. Damage caused to the parts by using incorrect screws would void the warranty.

3.4 Transceiver and Cable Connection

The section describes how to insert an SFP+ transceiver into a SFP+ slot.

The SFP+ transceiver is hot-swappable and hot-pluggable. You can plug in and out the transceiver to/from any SFP+ slot without having to power down the Media Converter.



Note

It is recommended to use the compatible transceivers on the Media Converter. If you insert an SFP+ transceiver that is not supported, the Media Converter will not recognize it.

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10GBASE-X-SR/LR

Before connecting the other switches, workstation or Media Converter, please do the following:

1. Make sure both sides of the SFP+ transceiver are with the same media type; for example, 10GBASE-SR to 10GBASE-SR, 10GBASE-LR to 10GBASE-LR.

2. Check whether the fiber type matches the SFP+ transceiver model.
   a) To connect to 10GBASE-SR SFP+ transceiver, use duplex multi-mode fiber with LC connector type
   b) To connect to 10GBASE-LR SFP+ transceiver, use duplex single-mode fiber with LC connector type

Connecting the fiber

1. Connect duplex fiber with LC connector to the SFP+ transceiver.
2. Connect the other end of fiber to a device such as switch with SFP+ installed, workstation with fiber NIC or a Media Converter

Fiber Technical Specifications

	10G Base-SR	10G Base-LR
Connector type	LC	LC
Fiber type	Multi-mode	Single-mode
Wavelength	850nm	1310nm
Max Distance	<300M	10Km
Min TX PWR	-6.0dBm	-8.2dBm
Max TX PWR	-1.0dBm	-0.5dBm
Sensitivity	< -11dBm	< -14.4dBm
Link Budget	5.0dBm	6.2dBm

	10G Base-ER	10G Base-ZR
Connector type	LC	LC
Fiber type	Single-mode	Single-mode
Wavelength	1550nm	1550nm
Max Distance	40Km	80Km
Min TX PWR	-4.7dBm	0dBm
Max TX PWR	4dBm	5dBm
Sensitivity	< -15.8dBm	< -23dBm
Link Budget	11.1dBm	23.0dBm

Removing the Transceiver Module

1. Make sure there is no network activity by consulting or checking with the network administrator, or through the management interface of the switch/converter (if available), disable the port in advance.
2. Remove the fiber gently
3. Turn the lever of the MTB module to a horizontal position.
4. Pull out the module gently through the lever.

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Note

Never pull out the module without pulling the lever or the push bolts on the module. Directly pulling out the module may damage the module and the SFP+ module slot in the Media Converter.

10G/5G/2.5G/1G/100BASE-T

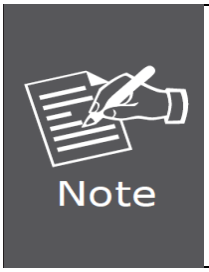
The 10G/5G/2.5G/1G/100BASE-T port comes with auto-negotiation capability. It automatically supports 100BASE-TX, 1GBASE-T, 2.5GBASE-T, 5GBASE-T and 10GBASE-T networks.Users only need to plug a working network device into the 10G/5G/2.5G/1G/100BASE-T port, and then turn on the Media Converter. The port will automatically run at 100Mbps, 1000Mbps, 2500Mbps or 5000Mbps and 10000Mbps after the negotiation with the connected device.

Connecting the UTP Cable

The 10G/5G/2.5G/1G/100BASE-T port uses RJ45 socket --similar to phone jack -- for connection of unshielded twisted-pair cable (UTP). The 802.3/802.3ab/802.3bz/802.3ae Ethernet standard requires Category 5 UTP for 100Mbps 100BASE-TX. 10G/5G/2.5G/1G/100BASE-T uses Cat5e/6/6A/7 UTP (see table below). Maximum distance is 100 meters (328 feet).

Standard	Transfer Speed	Cable Requirement (100m)
10GBASE-T	10000Mbit/s	Cat 6A/7
5GBASE-T	5000Mbit/s	Cat 6/6A/7
2.5GBASE-T	2500Mbit/s	Cat 5e/6/6A/7
1000BASE-T	1000Mbit/s	Cat 5e/6/6A/7
100BASE-T	100Mbit/s	Cat 5/5e/6/6A/7

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Ensure that the connected network devices support MDI/MDI-X. If it does not support, please use crossover Cat 5e/6/6A/7 cable.

4. Troubleshooting

This chapter contains information to help you solve issues. If the Media Converter is not functioning properly, make sure the Media Converter is set up according to instructions in this manual.

The Power LED is not lit
Solution: Check that the power adapter is firmly plugged into the DC jack of the Media Converter and connected to its power source. Make sure the adapter type matches the power source (AC power adapter: 100V~240V AC; DC power adapter: 36V~72V DC), that the source is switched on, and that the DC connections are not reversed. For the MC-X101-(DP), check both power inputs. If the Power LED stays off, try another Optikwave-approved power adapter or contact your local sales representative.

The port LED is not lit
Solution: Check the cable connection of the Media Converter.

Performance is bad
Solution: Check the speed duplex mode of the partner device. The Media Converter usually runs in auto-negotiation mode. If the partner is set to half duplex, the performance will be poor.

The port LED is lit, but the traffic is irregular
Solution: Check that the attached device is not set to dedicate full duplex. Some devices use a physical or software switch to change duplex modes. Auto-negotiation may. not recognize this type of full-duplex setting.

Why the Media Converter doesn't connect to the network
Solution: Check the port LED on the Media Converter. Make sure the cable is installed properly. Make sure the cable is the right type. Turn off the power. After a while, turn on the power again.

Can I install MTB-TSR or the other industrial-grade SFP+ module with non-wide temperature feature into the SFP+ slot of Media Converter?
Solution: Yes, you can. The operating temperature of the MC-X101 depends on the transceiver fitted: −40~65°C with an I-Temp SFP/SFP+ module, or 0~50°C with a C-Temp SFP/SFP+ module. Although MTB-TSR and MTB-TLR are rated −40~75°C, the operating range of the Media Converter (up to 65°C) applies when they are installed. Do not operate the unit outside these limits.

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Appendix A: Approved SFP+ Transceivers

Optikwave Media Converter supports 100/1000 dual mode with both single-mode and multi-mode SFP+ transceivers. The follow list of approved SFP+ transceivers is correct at the time of publication.

Available 10Gbps Module	
MTB-RJ	10GBASE-T SFP+ Copper Fiber Optic Module - 30m
MTB-SR	10GBASE-SR mini-GBIC module - 300m
MTB-LR	10GBASE-LR mini-GBIC module - 10km
MTB-TSR	10GBASE-SR mini-GBIC module - 300m (-40~75 degrees C)
MTB-TLR	10GBASE-LR mini-GBIC module - 10km (-40~75 degrees C)
MTB-LA20	10GBASE-LX (WDM,TX:1270nm) mini-GBIC module - 20km
MTB-LB20	10GBASE-LX (WDM,TX:1330nm) mini-GBIC module - 20km
MTB-LA40	10GBASE-LX (WDM,TX:1270nm) mini-GBIC module - 40km
MTB-LB40	10GBASE-LX (WDM,TX:1330nm) mini-GBIC module - 40km
MTB-LA60	10GBASE-LX (WDM,TX:1270nm) mini-GBIC module - 60km
MTB-LB60	10GBASE-LX (WDM,TX:1330nm) mini-GBIC module - 60km

Appendix B: Networking Connection

B.1 Converter's RJ45 Pin Assignment

1G, 2.5G, 5G, 10GBASE-T

PIN NO.	MDI	MDI-X
1	BI_DA+	BI_DB+
2	BI_DA-	BI_DB-
3	BI_DB+	BI_DA+
4	BI_DC+	BI_DD+
5	BI_DC-	BI_DD-
6	BI_DB-	BI_DA-
7	BI_DD+	BI_DC+
8	BI_DD-	BI_DC-

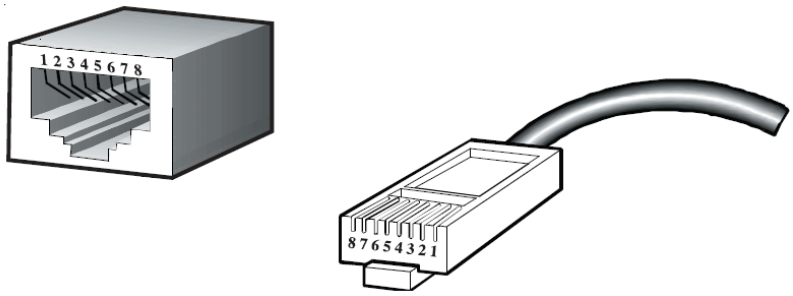
100Mbps, 100BASE-TX

RJ45 Connctor Pin Assignment		
Contact	MDI	MDI-X
1	Tx +	Rx +
2	Tx -	Rx -
3	Rx +	Tx +
4,5	Not used	
6	Rx -	Tx -
7,8	Not used	

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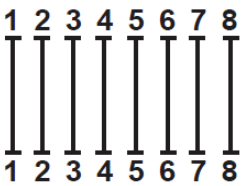
B.2 RJ45 Cable Pin Assignments

There are 8 wires on a standard UTP/STP cable and each wire is color-coded. The following shows the pin allocation and color of straight cable and cross-over cable connections.



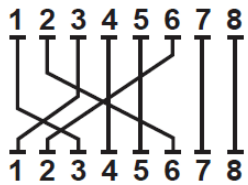
Standard RJ45 receptacle/connector

Straight Cable



	SIDE 1	SIDE 2
SIDE 1	1 = White/Orange	1 = White/Orange
	2 = Orange	2 = Orange
	3 = White/Green	3 = White/Green
	4 = Blue	4 = Blue
	5 = White/Blue	5 = White/Blue
SIDE 2	6 = Green	6 = Green
	7 = White/Brown	7 = White/Brown
	8 = Brown	8 = Brown

Crossover Cable



	SIDE 1	SIDE 2
SIDE 1	1 = White/Orange	1 = White/Green
	2 = Orange	2 = Green
	3 = White/Green	3 = White/Orange
	4 = Blue	4 = Blue
	5 = White/Blue	5 = White/Blue
SIDE 2	6 = Green	6 = Orange
	7 = White/Brown	7 = White/Brown
	8 = Brown	8 = Brown

Please make sure your connected cables are with the same pin assignment and color as the above diagram before deploying the cables to your networks.

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