KTI
NETWORKS

INDUSTRIAL
Tri-segment Media Converter

KCD-302 Series

Installation Guide

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TRADEMARKS

Ethernet is a registered trademark of Xerox Corp.

FCC NOTICE

This device complies with Class B Part 15 the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received including the interference that may cause.

CE NOTICE

Marking by the symbol $C\,\epsilon$ indicates compliance of this equipment to the EMC directive of the European Community. Such marking is indicative that this equipment meets or exceeds the following technical standards:

EMC Class B
EN 50081-1/1992 : EN55022:1994/A1:1995/A2:1997 Class B
　　　　　　　　EN61000-3-2:2000
　　　　　　　　EN61000-3-3:1995/A1:2001
EN 55024:1998/A1:2001
　　　　　　　　IEC 61000-4-2:1995
　　　　　　　　IEC 61000-4-3:1995
　　　　　　　　IEC 61000-4-4:1995
　　　　　　　　IEC 61000-4-5:1995
　　　　　　　　IEC 61000-4-6:1996
　　　　　　　　IEC 61000-4-8:1993
　　　　　　　　IEC 61000-4-11:1994

Table of Contents

1. Introduction

The industrial tri-segment media converter series provides one 10/100BASE-TX Fast Ethernet port and two 100BASE-FX ports. It supports the connections to three network segments, one UTP and two fiber cables. It serves the network data transfer between any two segments in switching basis. The following figure illustrates a basic connection example:
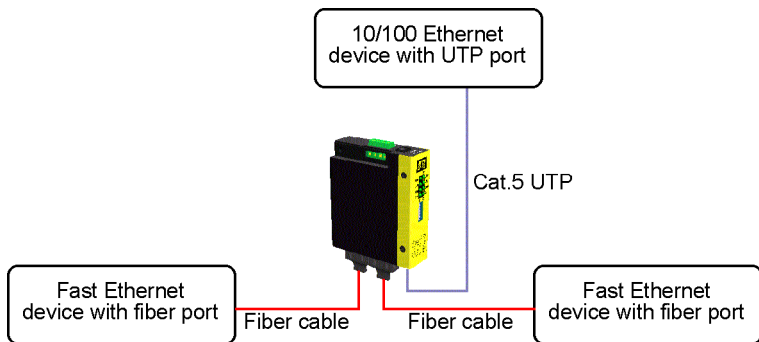
The following figure illustrates another example which deploys multiple fiber cables to connect other Ethernet devices in a daisy-chain method.
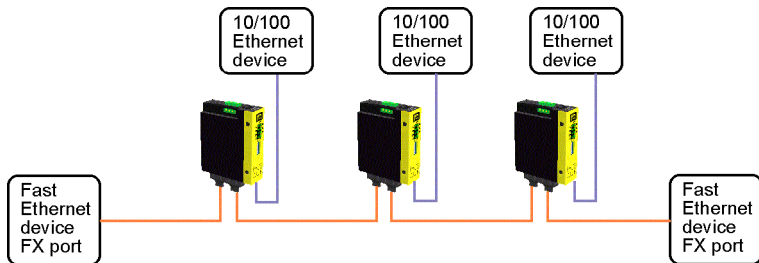
For industrial environment, the converters are designed with the following enhanced features exceeding that of commercial media converters:

- High and wide operating Temperature range

- Wide operating voltage range for DC power input

- Power input interface: Screw terminal block and DC jack for adapter

- DIN rail mounting support for industrial enclosure

- Screw panel mounting support for industrial enclosure

- Industrial-rated Emission and Immunity performance

1.1 Features

- Support network data transfer at full wire speed
- The TP port supports 10Mbps and 100Mbps connections
- Auto MDI/MDI-X detection function on the TP (copper) port
- Auto-negotiation function on the TP port
- Transparent conversion to 802.1Q VLAN tagged packets between any two segments
- Far End Fault function on FX (fiber) ports
- Support wide range of fiber options on the FX ports
- Low power consumption
- Two power interface type: screw terminal block and DC jack
- Wide operating voltage input range : +7 ~ 30VDC
- Support DIN rail mounting
- Support panel mounting
- High and wide operating temperature range : -20ºC to +70ºC

1.2 Specifications

This figure shows the important components of the converter:
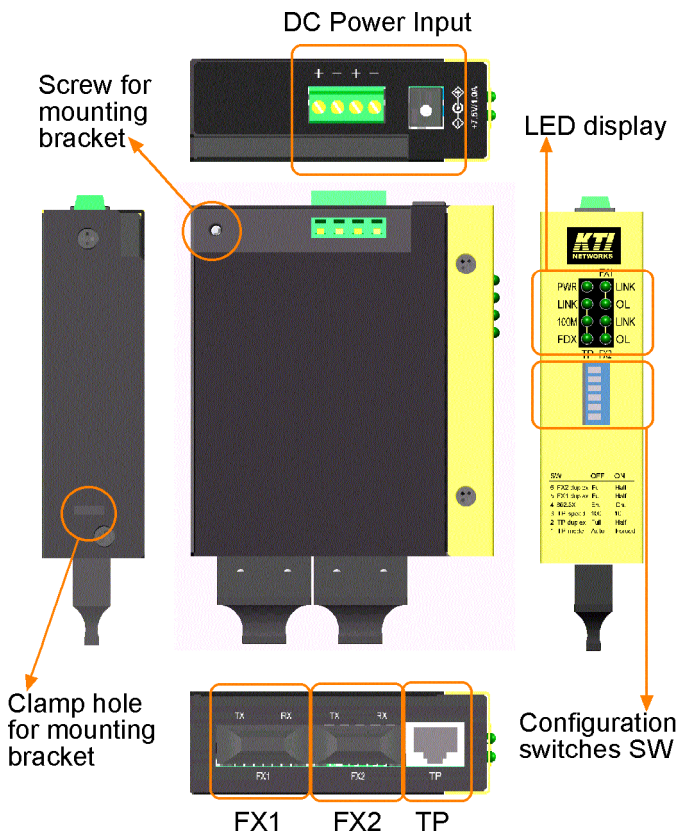
Twisted-Pair Interface (TP Port, or called copper Port)

Connector	Shielded RJ-45
Pin Assignments	Auto MDI/MDI-X detection
Signal Compliance	IEEE 802.3 10BASE-T, 802.3u 100BASE-TX
Data Speed	10Mbps or 100Mbps
Duplex Mode	Half-duplex or Full-duplex
Configuration	Auto-negotiation capable and optional forced manual settings
Cable Types	10Mbps - Category 3, 4, or 5 UTP 100Mbps - Category 5 UTP
Supported Link Distance	Up to 100 meters

Fiber Optic Interfaces (FX1 Port, FX2 Port)

Signal Compliance	IEEE 802.3u 100BASE-FX
Connector	SC, ST, or Single SC (model dependent)
Data Speed	100Mbps
Duplex Mode	Full-duplex and optional half duplex
Cable Types	Multimode (MMF) - 50/125, 62.5/125 Single mode (SMF) - 9/125
Supported Link Distance	MMF up to 2km SMF, single SMF (model dependent)
Eye Safety compliance	IEC825 Class 1

Refer to Section 1.3 for detailed optical specifications.

Configuration Setting Switches (SW)

NO.	FUNCTION	SETTINGS	
SW1	TP Port mode	OFF	Auto-negotiation (default)
		ON	Forced mode
SW2	TP Port Duplex	OFF	Full duplex (default)
		ON	Half duplex
SW3	TP Port Speed	OFF	100Mbps (default)
		ON	10Mbps
SW4	802.3x function	OFF	Enable (default)
		ON	Disable
SW5	FX1 port duplex	OFF	Full duplex mode (default)
		ON	Half duplex mode
SW6	FX2 port duplex	OFF	Full duplex mode (default)
		ON	Half duplex mode

LED Indicators

LED	DISPLAY	STATE	INTERPRETATION
PWR	Power status	ON	Power on
		OFF	Power off
TP LINK	TP port link status	ON	Link up and no traffic
		OFF	Link fault
		BLINK	Rx/Tx activities
TP 100M	TP port speed status	ON	100Mbps
		OFF	10Mbps
TP FDX	TP port duplex status	ON	Full duplex
		OFF	Half duplex
		BLINK	Collisions on half duplex
FX1 LINK	FX1 port link status	ON	Link up and no traffic
		OFF	Link fault
		BLINK	Rx/Tx activities
FX1 OL	FX1 port optical link	ON	Optical signal is detected
		OFF	No optical signal
FX2 LINK	FX2 port link status	ON	Link up and no traffic
		OFF	Link fault
		BLINK	Rx/Tx activities
FX2 OL	FX2 port optical link	ON	Optical signal is detected
		OFF	No optical signal

DC Power Input

Interface	Screw-type terminal block
	(2 sets for power wire cascading)
	DC Jack (-D 6.3mm / + D 2.0mm)
Operating Input Voltages	+7V ~ +30V(+5%)
Power consumption	2.7W max. @7.5VDC input
	2.9W max. @24VDC input
	3.0W max. @+30VDC input

Basic Information

MAC Addresses Entries	1K
Forwarding Throughput	Full wire speed at 100M full duplex
	10Mbps - 14,880 pps at 64-byte packets
	100Mbps - 148,800pps at 64-byte packets
Forwarding Packet Types	Transparent and no modification for
	- IEEE 802.3 standard packets
	- IEEE 802.1Q VLAN tagged packets
Packet Length	Up to 1536 bytes at store-and-forward mode
Flow Control	Back-pressure for half-duplex mode
	802.3x pause-frame base for full duplex mode
Far End Fault Function	Supported on both FX ports

Mechanical

Dimension (base)	W 28mm x D 82mm x H 95mm
Housing	Enclosed metal with no fan
Mounting Support	DIN-rail mounting, Panel mounting
Weight	250g

Environmental

Operating Temperature	Typical -20°C ~ 70°C (model dependent)
Storage Temperature	-20°C ~ 85°C
Relative Humidity	5% ~ 90%

Certificate

FCC	Part 15 Class B
CE/EMC	EMI EN50081-1 Class B
	EMS EN55024
CE/LVD Safety	EN 60950

EN 50081-1/1992 :

EN55022:1994/A1:1995/A2:1997	CISPR Class B
EN61000-3-2:2000	Device <75W
EN61000-3-3:1995/A1:2001	Clause 5

EN 55024:1998/A1:2001

IEC 61000-4-2:1995	ESD Test
IEC 61000-4-3:1995	RS Test
IEC 61000-4-4:1995	EFT/BURST Test
IEC 61000-4-5:1995	Surge Test
IEC 61000-4-6:1996	CS Test
IEC 61000-4-8:1993	Magnetic Field
IEC 61000-4-11:1994	Volatge Int. Dips

1.3 Model Specifications

The media converter series provides the following fiber options:

KCD-302-xxx Model Ext.	FX Connectors	WaveL. (nm)	Reference Fiber Distance	Operating Temperature
-2T	FX1 : ST MMF	1310	2 km	-10 ~ 70ºC
	FX2 : ST MMF	1310	2 km	-10 ~ 70ºC
-2C	FX1 : SC MMF	1310	2 km	-10 ~ 70ºC
	FX2 : SC MMF	1310	2 km	-10 ~ 70ºC
-2C1	FX1 : SC MMF	1310	2 km	-20 ~ 70ºC
	FX2 : SC MMF	1310	2 km	-20 ~ 70ºC
-C1SL2	FX1 : SC MMF	1310	2 km	-20 ~ 70ºC
	FX2 : SC SMF	1310	20 km	-20 ~ 70ºC
-2SA2	FX1 : SC SMF	1310	20 km	-20 ~ 70ºC
	FX2 : SC SMF	1310	20 km	-20 ~ 70ºC
-2SL2	FX1 : SC SMF	1310	20 km	-20 ~ 70ºC
	FX2 : SC SMF	1310	20 km	-20 ~ 70ºC
-2SL3	FX1 : SC SMF	1310	30 km	-20 ~ 70ºC
	FX2 : SC SMF	1310	30 km	-20 ~ 70ºC
-2SL4	FX1 : SC SMF	1310	40-50 km	-20 ~ 70ºC
	FX2 : SC SMF	1310	40-50 km	-20 ~ 70ºC

Optical Specifications

KCD-302-xxx Model Ext.	FX Connectors	WaveL. (nm)	TX Power (dBm)	Rx Sens. (dBm)	Rx max. (dBm)
-2T	FX1 : ST MMF	1310	-19 ~ -14	-31 max.	-14 min.
	FX2 : ST MMF	1310	-19 ~ -14	-31 max.	-14 min.
-2C	FX1 : SC MMF	1310	-19 ~ -14	-31 max.	-14 min.
	FX2 : SC MMF	1310	-19 ~ -14	-31 max.	-14 min.
-2C1	FX1 : SC MMF	1310	-20 ~ -14	-31 max.	0 min.
	FX2 : SC MMF	1310	-20 ~ -14	-31 max.	0 min.
-C1SL2	FX1 : SC MMF	1310	-20 ~ -14	-31 max.	0 min.
	FX2 : SC SMF	1310	-15 ~ -8	-30 max.	-7 min.
-2SA2	FX1 : SC SMF	1310	-15 ~ -8	-31 max.	-7 min.
	FX2 : SC SMF	1310	-15 ~ -8	-31 max.	-7 min.
-2SL2	FX1 : SC SMF	1310	-15 ~ -8	-30 max.	-7 min.
	FX2 : SC SMF	1310	-15 ~ -8	-30 max.	-7 min.
-2SL3	FX1 : SC SMF	1310	-15 ~ -8	-34 max.	0 min.
	FX2 : SC SMF	1310	-15 ~ -8	-34 max.	0 min.
-2SL4	FX1 : SC SMF	1310	-5 ~ 0	-35 max.	-3 min.
	FX2 : SC SMF	1310	-5 ~ 0	-35 max.	-3 min.

WaveL. : Wavelength, Rx Sens. : Rx sensitivity, Rx max. : Maximum Rx power

# 1.4 Special Functions

Auto MDI/MDI-X Function

This function allows the TP port to auto-detect the twisted-pair signals and adapts itself to form a valid MDI to MDI-X connection with the remote connected device automatically.

Auto-negotiation Function

When TP port is set on Auto-negotiation mode (SW1:ON), it is featured with auto-negotiation function and full capability. It performs a negotiation process for the speed and duplex configuration with the connected device automatically when each time a link is being established.

Far End Fault Function

The FX ports are facilitated with this function, which conforms to IEEE 802.3u 100BASE-FX specifications. When the FX port detects a link failure on its receiving circuitry, it will send out an FEFI (Far End Fault Indication) signal to the remote connected device to indicate a remote fault is detected. It also is capable to receive FEFI signal sent from the remote link partner. Upon receiving an FEFI signal, it indicates a link failure occurred on the transmitting path. This function allows the converter to report a fiber link fault even when a link failure occurred on transmitting fiber cable.

1. Detect Rx link failure.

Rx
Tx
FX port

2. Send FEFI signal

Rx Tx
FX port

3. FX link fault   3. FX link fault
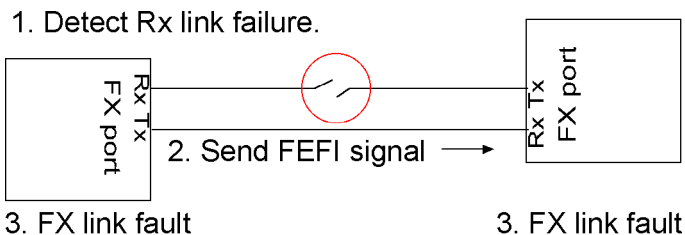
2. Installation

2.1 Unpacking

Check that the following components have been included:

- Information CD
- The product unit
- DIN-rail mounting bracket

If any item is found missing or damaged, please contact your local reseller for replacement.

The following are available optional accessories:

- Panel Mounting Bracket
  The bracket is used for mounting the converter on a panel surface.
- Commercial-rated AC power adapters:
  Rated AC120V/60Hz DC7.5V 1A
  Rated AC230V/50Hz DC7.5V 1A
  Rated AC100V/50-60Hz DC7.5V 1A
  Rated AC240V/50Hz DC7.5V 1A

  The adapters are used for supplying DC power to the converter via DC power jack interface.

2.2 DIN-Rail Mounting

In the product package, a DIN-rail bracket is provided for mounting the converter in a industrial DIN-rail enclosure.
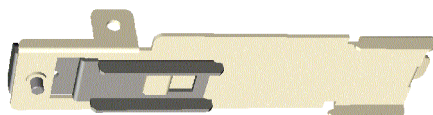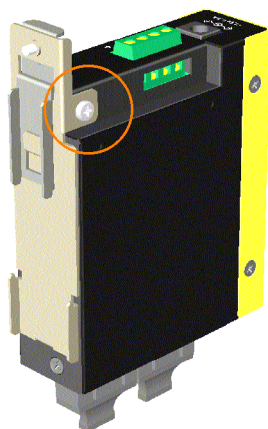

The steps to mount the device onto a DIN-rail are:

1. Clamp the bracket into the rear of the device. Align the bracket with the rear face of the device and screw it onto the device unit.
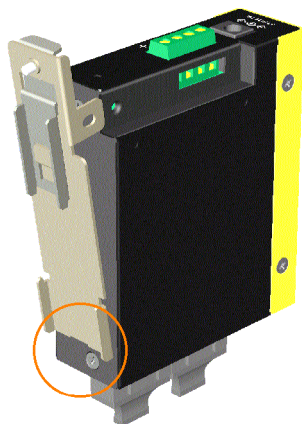
Clamp to the hole   Screw the bracket
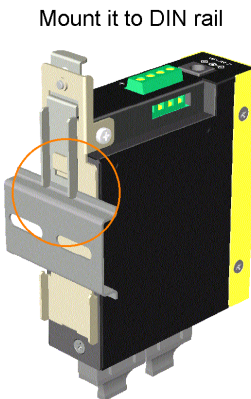   on the device

2. Unscrew and loose the mounting clamp plate of the bracket. Mount the bracket with the device onto the DIN rail.
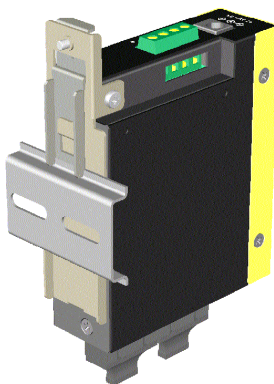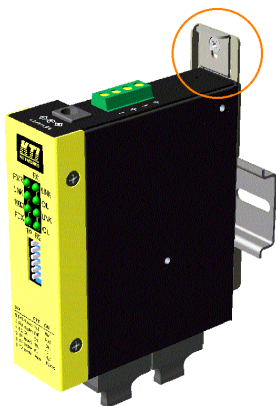
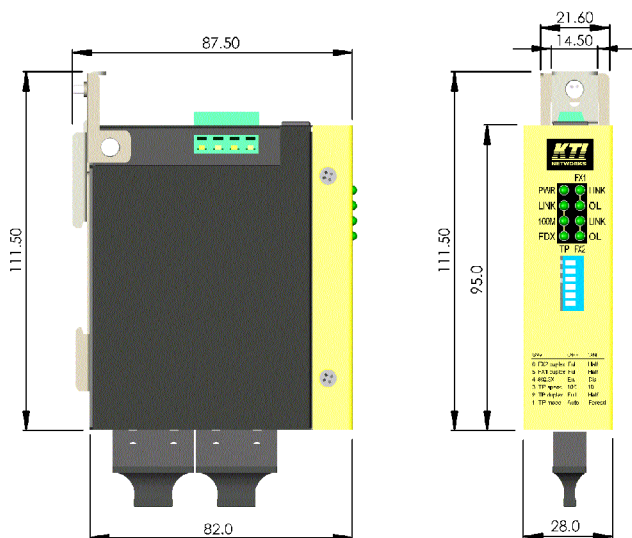Unscrew clamp plate   Mount it to DIN rail

5. Screw the clamp with the bracket and make sure the device is properly fixed on the DIN rail.
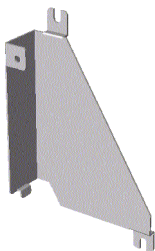
Make sure that there are proper heat dissipation from and adequate ventilation around the device.

The final mechanical dimensions after installing DIN rail mounting bracket are:

2.3 Mounting on a Panel Surface

An optional mounting bracket, as shown below is also available for mounting the device on a panel surface such as a wall, a wood board, or a metal plate in an industrial enclosure.
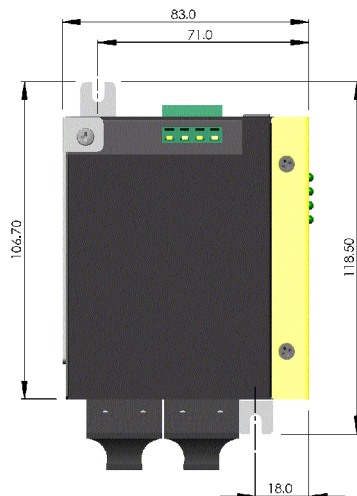

To mount the device on a panel surface, the steps are:

1. Clamp the bracket into the device and align the bracket with the bottom surface of the device and screw it on the converter firmly as shown below:
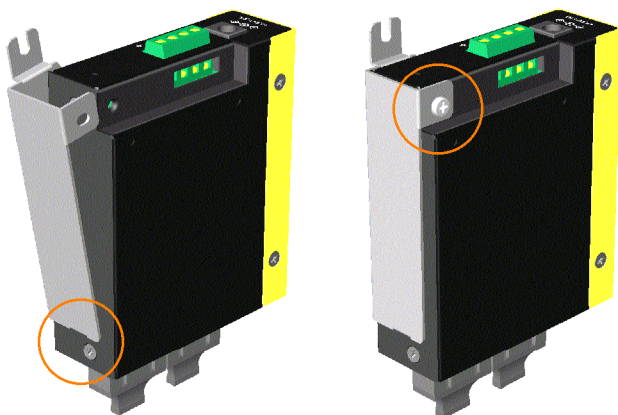
2. Mount and screw the device on the target surface. The final dimension after bracket installation is also shown below:

Make sure that there are proper heat dissipation from and adequate ventilation around the device. Do not place heavy objects on the device.

2.4 Applying Power

The product provide two types of power interfaces, terminal block and DC power jack for receiving DC power input from external power supply.

Power terminal block   DC power jack
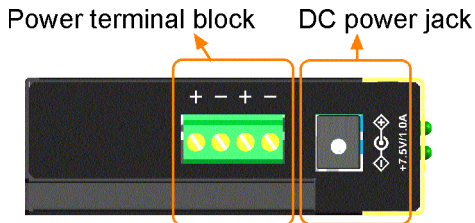
DC Power Input Specification

Operating Voltage	+7~+30VDC
Power Consumption	Max. 3.0W @30VDC

DC Power Terminal Block

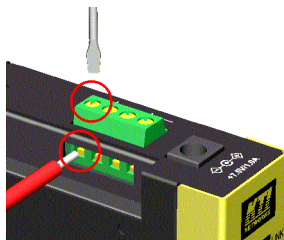|	
Connectors	Screw-type Terminal block (2 sets)
Pin Assignments	DC1+ - Positive (+) Negative (-) terminals
	DC2+ - 2nd Positive (+) Negative (-) terminals
Power wires	24~12AWG (IEC 0.5~2.5mm^2)

The steps to install power wires to the terminal block are:

1. Loose the terminal screw to open the contact for power wire insertion. Insert power wire into the contact.


2. Screw the terminal and make sure power wire is fixed securely.

DC2 + and DC2 - can be installed with another power-pair for delivering the main power input to next converter in a cascading way.

Note: Only up to four device units can be cascaded to receive power from one main power input source.

DC Power Jack

Connector: Jack D 6.3mm $-$ $-\!\!\!-\!\!\!\bullet\!\!\!-\!\!\!-$ $+$ D 2.0mm

AC Power Adapters: Optional commercial rated adapters are available for purchasing.
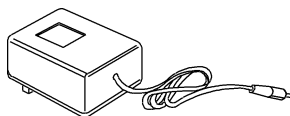
Rated AC120V/60Hz DC7.5V 1A
Rated AC230V/50Hz DC7.5V 1A
Rated AC100V/50-60Hz DC7.5V 1A
Rated AC240V/50Hz DC7.5V 1A

Steps to apply the power to the device are:

1. Connect power adapter DC plug to the DC power jack of the converter before connecting to the AC outlet.

2. Connect the power adapter to the AC outlet.

Note: Before you begin the installation, check the AC voltage of your area. The AC power adapter which is used to supply the DC power for the unit should have the AC voltage matching the commercial power voltage in your area.

2.5 Making TP Port Connection

TP port (copper)
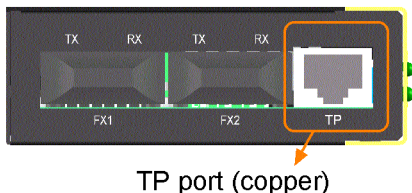
TP port is featured to support connection to :

- Auto-negotiation devices
- Auto-negotiation incapable 10BASE-T devices
- Auto-negotiation incapable 100BASE-TX devices

Network Cables

10BASE-T: 2-pair UTP Cat. 3,4,5 , EIA/TIA-568B 100-ohm STP
100BASE-TX: 2-pair UTP Cat. 5, EIA/TIA-568B 100-ohm STP
Link distance: Up to 100 meters

Note: The TP port is featured with auto MDI/MDI-X crossover detection and configuration function. No matter a straight through cable or crossover cable is connected, the TP port can sense the receiving pair automatically and configure itself to match the rule for MDI to MDI-X connection.

Configuration Setup

To make a proper connection to different devices, the following configuration settings are recommended:

Link partner of TP port	SW1	SW2	SW3
Auto-negotiation device	Off: auto	Off: full duplex	Off: 100M
Fixed 10M half duplex device	On: forced	On: half duplex	On: 10M
Fixed 100M half duplex device	On: forced	On: half duplex	Off: 100M
Fixed 10M full duplex device	On: forced	Off: full duplex	On: 10M
Fixed 100M full duplex device	On: forced	Off: full duplex	Off: 100M

2.6 Making FX Port Connections
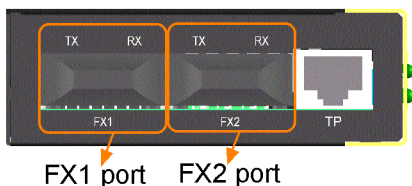
FX1 port and FX2 port operate on 100Mbps and full duplex (factory default).

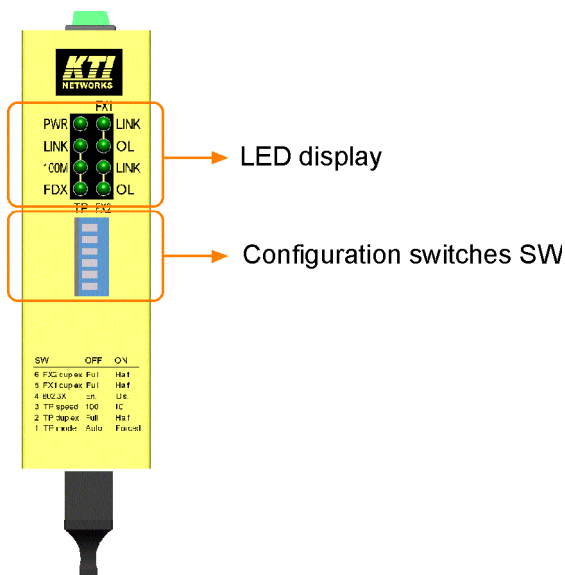A variety of fiber options is provided as listed in Section 1.3.

Network Cables
Multimode (MMF) - 50/125, 62.5/125
Single mode (SMF) - 9/125

3 Configuration Switches & LED Indicators

The following figure shows the locations of the configuration switches and LED indicators:

LED display

Configuration switches SW

Refer to the following sections for the related functions.

3.1 Configuration Switches

SW	FUNCTION	SETTING & STATE	
SW1	TP Port mode	OFF	Auto-negotiation (default)
		ON	Forced mode
SW2	TP Port Duplex	OFF	Full duplex (default)
		ON	Half duplex
SW3	TP Port Speed	OFF	100Mbps (default)
		ON	10Mbps
SW4	802.3x function	OFF	Enable (default)
		ON	Disable
SW5	FX1 port duplex	OFF	Full duplex mode (default)
		ON	Half duplex mode
SW6	FX2 port duplex	OFF	Full duplex mode (default)
		ON	Half duplex mode

3.1.1 TP Port Settings SW1-SW3

SW1, SW2, SW3 are used for configuring the TP port especially when connecting to a link partner port which is not auto-negotiation capable. Refer to section 2.5 for details.

3.1.2 802.3x Function Setting SW4

IEEE 802.3x function is the flow control method used for full duplex operation on the TP port and FX ports under store and forward mode. This method uses pause frames for one port to stop further transmission from its link partner.

3.1.3 FX Port Duplex Settings SW5 SW6

This settings are used to set the duplex mode of the FX1 port and FX2 port individually. It is recommended to use full duplex mode for FX connection unless its link partner is a fixed half duplex device. Half duplex mode will shorten the connection distance. The following table lists the maximum **MMF** cable length connecting to different devices:

Link Partner of FX Port	Distance (MMF cable)
Network card half-duplex fiber port	400 m
Network card full-duplex fiber port	2 km
Class I hub half-duplex fiber port	160 m
2 Class II hub half-duplex fiber port	112 m
Switched half-duplex fiber port	400 m
Switched half-duplex fiber port	2 km

Note: For SMF connection, be sure the link partner is a full duplex device and set SW5 SW6 to full duplex mode for the FX ports.

3.1.4 Factory Default Settings

The factory default settings are as follows:

SW1	OFF	TP port mode - auto-negotiation
SW2	OFF	TP port - full duplex
SW3	OFF	TP port - 100Mbps
SW4	OFF	Enable IEEE 802.3x flow control function
SW5	OFF	FX1 port - full duplex
SW6	OFF	FX2 port - full duplex

3.2 LED Indicators

LED	DISPLAY	STATUS & INTERPRETATION	
PWR	Power status	ON	Power on
		OFF	Power off
TP			
LINK	TP port link status	ON	Link up and no traffic
		OFF	Link fault
		Blink	Rx/Tx activities
100M	TP port speed status	ON	100Mbps
		OFF	10Mbps
FDX	TP port duplex status	ON	Full duplex
		OFF	Half duplex
		Blink	Collisions on half duplex
FX1			
LINK	FX1 port link status	ON	Link up and no traffic
		OFF	Link fault
		Blink	Rx/Tx activities
OL	FX1 port optical link	ON	Optical signal is detected
		OFF	No optical signal is detected
FX2			
LINK	FX2 port link status	ON	Link up and no traffic
		OFF	Link fault
		Blink	Rx/Tx activities
OL	FX2 port optical link	ON	Optical signal is detected
		OFF	No optical signal is detected