

KC-3000D, KC-3000-TF  
KC-3000-SX, KC-3000-LX  
KC-3000-FL

**Media Converter Modules  
for  
Modular Converter Center System  
KC-3600**

**Installation Guide**

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EN 55022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment. This device complies with CISPR 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.

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Marking by the symbol  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:

EN 55022: Limits and Methods of Measurement of Radio Interference characteristics of Information Technology Equipment.

EN 50082/1: Generic Immunity Standard -Part 1: Domestic Commercial and Light Industry.

EN 60555-2: Disturbances in supply systems caused by household appliances and similar electrical equipment - Part 2: Harmonics.

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# **1. Fast Ethernet Media Converter Modules**

The 10/100BASE-TX to 100BASE-FX media converter slide-in modules provide a media conversion allowing high-speed integration of fiber optic and twisted-pair segments. With 10BASE-T and 100BASE-TX support, the converters provide seamless translation between Ethernet and Fast Ethernet networks. A complete set of LEDs allows for quick status verification.

## **1.1 Module 3000D & 3000D-WDM Series**

The converter modules provide the following key features:

- Convert speed and media type
- Support full wire speed conversion
- Support 10Mbps and 100Mbps speed on TP connections
- Auto MDI/MDI-X detection function on the TP port
- Auto-negotiation function on the TP port
- Link fault pass through function
- Provide manual configuration settings for TP port to support connection to non-auto-negotiation devices
- Transparent to 802.1Q VLAN tagged packets
- Far End Fault function on FX port
- Support wide range of fiber options on the FX port
- Low power consumption

The converter series support the following configuration needs:

**Support MMF**

3000D-C	10/100BASE-TX to 100BASE-FX MM 2 km 2 SC
3000D-T	10/100BASE-TX to 100BASE-FX MM 2 km 2 ST
3000D-JM	10/100BASE-TX to 100BASE-FX MM 2 km MT-RJ
3000D-VM	10/100BASE-TX to 100BASE-FX MM 2 km VF-45

**Support Duplex SMF**

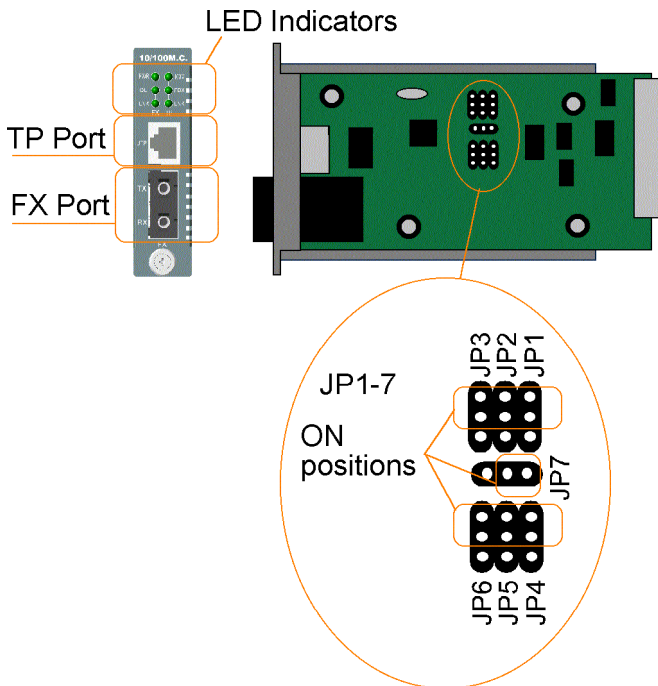
3000D-SA2	10/100BASE-TX to 100BASE-FX SM 20 km 2 SC
3000D-SL2A	10/100BASE-TX to 100BASE-FX SM 20 km 2 SC
3000D-SL4	10/100BASE-TX to 100BASE-FX SM 50 km 2 SC
3000D-SL6	10/100BASE-TX to 100BASE-FX SM 70 km 2 SC
3000D-SL9	10/100BASE-TX to 100BASE-FX SM 90 km 2 SC
3000D-SL10	10/100BASE-TX to 100BASE-FX SM 100 km 2 SC

**Support Single SMF (WDM)**

3000D-W320A	10/100BASE-TX to 100BASE-FX SM 30 km 1 SC
3000D-W520A	10/100BASE-TX to 100BASE-FX SM 30 km 1 SC
3000D-W340	10/100BASE-TX to 100BASE-FX SM 40 km 1 SC
3000D-W540	10/100BASE-TX to 100BASE-FX SM 40 km 1 SC

The following figure illustrates the module example which provides 2 SC connectors. All available models are similar except the fiber transceiver equipped. The figure shows the some important components as follows:

- Twisted-Pair Interface (TP Port)
- Fiber Interface (Fiber Port)
- Configuration Jumpers (JP1-JP7)
- LED Indicators



## 1.11 Specifications

### **Twisted-Pair Interface (TP 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 Interface (FX Port)**

Signal Compliance	IEEE 802.3u 100BASE-FX
Connector	SC, ST, MT-RJ, VF-45 or Single SC
Data Speed	100Mbps
Duplex Mode	Full-duplex and optional half duplex
Cable Types	Multimode (MMF) - 50/125, 62.5/125 mm Single mode (SMF) - 9/125 mm
Supported Link Distance	MMF up to 2km SMF up to 100km Single SMF WDM up to 40km
Eye Safety compliance	IEC825 Class 1

### **Basic Information**

Forwarding Throughput	Full wire speed at 100M full duplex 10Mbps - 14,880 pps at 64-byte packets 100Mbps - 148,800pps at 64-byte packets
Packet Types	Transparent and no modification for - IEEE 802.3 standard packets - IEEE 802.1Q VLAN tagged packets
Packet Length	Up to 1522 bytes at store-and-forward mode No limit at smart-forward mode 100to100
Flow Control	Back-pressure for half-duplex mode 802.3x pause-frame base for full duplex mode

### Configuration Jumpers (JP1-JP7)

<b>NO.</b>	<b>SETTING</b>	<b>STATE</b>	<b>FUNCTION</b>
JP1	TP Port Configuration	ON	Auto-negotiation (default)
		OFF	Forced mode
JP2	TP Port Speed	ON	100Mbps (default)
		OFF	10Mbps
JP3	TP Port Duplex	ON	Full duplex (default)
		OFF	Half duplex
JP4	FX port duplex	ON	Full duplex mode (default)
		OFF	Half duplex mode
JP5	Forwarding mode	ON	Store-and-forward (default)
		OFF	Smart-forward mode
JP6	Link Fault Pass Through	ON	Disable (default)
		OFF	Enable
JP7	802.3x function	ON	Enable (default)
		OFF	Disable

### LED Indicators

<b>LED</b>	<b>DISPLAY</b>	<b>STATE</b>	<b>INTERPRETATION</b>
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
FX LINK	FX port link status	ON	Link up and no traffic
		OFF	Link fault
		Blink	Rx/Tx activities
FX OL	FX port optical link	ON	Optical signal is detected
		OFF	No optical signal



## 1.12 Fiber Optic Specifications

### Duplex Fiber Series

<u>Model</u>	<u>Port</u>	<u>Fiber</u>	<u>Wavelength</u>	<u>Tx Power</u>	<u>Sensitivity</u>	<u>Distance</u>
3000D-T	ST	MMF	1310nm	-19 ~ -14dBm	-33dBm	2km
3000D-C	SC	MMF	1310nm	-19 ~ -14dBm	-33dBm	2km
3000D-JM	MT-RJ	MMF	1310nm	-19 ~ -14dBm	-33dBm	2km
3000D-VM	VF-45	MMF	1310nm	-20 ~ -14dBm	-33dBm	2km
3000D-SA2	SC	SMF	1310nm	-15 ~ -8dBm	-31dBm	20km
3000D-SL2A	SC	SMF	1310nm	-15 ~ -3dBm	-30dBm	20km
3000D-SL4	SC	SMF	1310nm	-5 ~ 0dBm	-34dBm	50km
3000D-SL6	SC	SMF	1310nm	-3 ~ +3dBm	-37dBm	70km
3000D-SL9	SC	SMF	1310nm	0 ~ +5dBm	-37dBm	90km
3000D-SL10	SC	SMF	DFB1550nm	-3 ~ 3dBm	-37dBm	100km

### Single SMF WDM Series (with single SC connector)

<u>Model</u>	<u>Wavelength</u>	<u>Tx Power</u>	<u>Sensitivity</u>	<u>Distance</u>
3000D-W320A	Tx 1310nm Rx 1550nm	-14 ~ -8dBm	-33dBm	30km
3000D-W520A	Tx DFB1550nm Rx 1310nm	-14 ~ -8dBm	-33dBm	30km
3000D-W340	Tx 1310nm Rx 1550nm	-8 ~ -3dBm	-33dBm	40km
3000D-W540	Tx DFB1550nm Rx 1310nm	-8 ~ -3dBm	-31dBm	40km

## 1.13 Special Functions

### Smart-Forward Mode

On smart-forward mode, the converter can change to direct conversion automatically when it detects same speed on both TP port and FX port. Direct conversion method converts the signal between TP port and FX port without storing the received packet on one port then forwarding to another port. The media converter operates with the minimum latency.

### Far End Fault Function

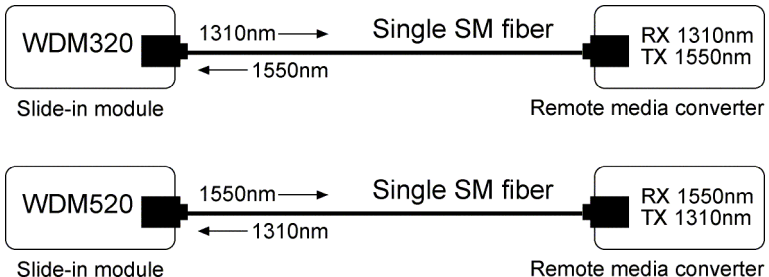
The FX port is facilitated with this function, which conforms to IEEE 802.3u 100BASE-FX specifications. When the FX port detects a link failure on its receiving circuitry, it will send out an FEFI (Far End Fault Indication) signal to the remote connected device to indicate a remote fault is detected. 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.

### Link Fault Pass Through Function

When this function is enabled, a link fault detected on the TP port will force a link down on the FX port. Similarly, a link fault detected on the FX port will also force a link down on the TP port. This function allows to pass TP link fault to the remote link partner and makes the converter like a TP cable extender.

## 1.14 Making Single Fiber Connection

Since the single fiber media converter modules use different wavelengths for transmission and receiving respectively, the link partner device located on the remote end of the single fiber should match the wavelength used on the slide-in module. The following two figures illustrate two connection examples:



## 1.2 Module 3000-TF & 3000-WDM Series

The converter modules also provide the following key features:

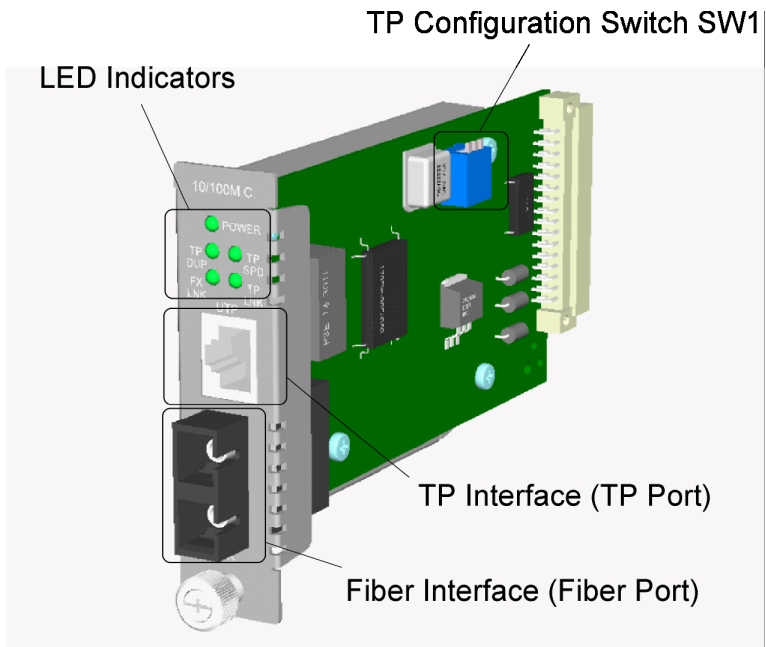
- Store-and-forward switching to improve overall network performance by buffering packets during times of heavy congestion and to prevent dropping packets and forwarding of corrupted packets
- High-performance switching engine that performs forwarding and filtering at full wire speed.
- Built-in flow control mechanism to prevent heavy data congestion and degrading system performance
- Auto-negotiation function built in twisted-pair port that allows to auto sense the speed and duplex configuration when connecting to an auto-negotiation capable device.
- Auto speed sensing that allows to sense the connection speed of either 10Mbps or 100Mbps when connecting to an auto-negotiation incapable devices

The converter series support the following configuration needs:

3000-TFMC	10/100BASE-TX to 100BASE-FX MM 2Km 2 SC
3000-TFS20	10/100BASE-TX to 100BASE-FX SM 20Km 2 SC
3000-TFS40	10/100BASE-TX to 100BASE-FX SM 40Km 2 SC
3000-WDM320	10/100BASE-TX to 100BASE-FX SM 20Km 1 SC
3000-WDM520	10/100BASE-TX to 100BASE-FX SM 20Km 1 SC

The following figure illustrates the module example which provides 2 SC connectors. All available models are similar except the fiber transceiver equipped. The figure shows the some important components as follows:

- Twisted-Pair Interface (TP Port)
- Fiber Interface (Fiber Port)
- TP Configuration Switch (SW1)
- LED Indicators



## 1.21 Specifications

### Twisted-Pair Interface

Connector	Shielded RJ-45
Pin Assignments	MDI (Ver.A) Auto MDI/MDI-X detection (Ver.B)
Compliance	IEEE 802.3 10BASE-T, 802.3u 100BASE-TX
Data Speed	10Mbps or 100Mbps
Duplex Mode	Half-duplex or Full-duplex
Cable Type	10Mbps - Category 3, 4, or 5 UTP 100Mbps - Category 5 UTP
Supported Link Length	100 meters

### Fiber Optic Interface

Compliance	IEEE 802.3u 100BASE-FX
Connector	Duplex SC or Single SC
Laser safety	Class 1 FDA and IEC-825 compliant
Data Speed	100Mbps
Duplex Mode	Full-duplex
Cable Types	Multimode (MM) - 50/125, 62.5/125 mm Single mode (SM) - 8.7/125, 9/125, 10/125 mm

### General Information

Forwarding & Filtering	10Mbps - 14,880 pps (full wire speed) 100Mbps - 148,800pps (full wire speed)
MAC Address Table	4K entries
Frame Types Supported	IEEE 802.3 Std. 64Bytes ~ 1518Bytes frames & VLAN tagged frames (4 bytes tag)
TP Configuration Switch	Enable/Disable Auto-negotiation mode 10M/100M Speed setting for non-auto mode Full/Half duplex setting for non-auto mode
LED Indications	Power, TP Link/Activity, TP Speed, TP duplex, FX Link/Activity

## 1.22 Fiber Optic Specifications

<u>Model</u>	<u>Fiber</u>	<u>Wavelength</u>
3000-TFMC	Duplex MM 2 SC	1310nm
3000-TFS20	Duplex SM 2 SC	1310nm
3000-TFS40	Duplex SM 2 SC	1310nm
3000-WDM320	Single SM 1 SC	Tx 1310nm/Rx 1550nm
3000-WDM520	Single SM 1 SC	Tx 1550nm/Rx 1310nm

<u>Model</u>	<u>Tx Optic Power</u>	<u>Rx Sensitivity</u>	<u>Support Distance</u>
3000-TFMC	-19dBm	-32.5dBm	2 km
3000-TFS20	-15dBm	-31dBm	20 km
3000-TFS40	-5dBm	-34dBm	40 km
3000-WDM320	-14dBm	-33dBm	20 km
3000-WDM520	-14dBm	-33dBm	20 km

## 1.23 Configuration Switch Settings for TP Interface

The configuration switch SW1 located on the module is used for configuring the TP interface as follows:

<u>SW1</u>	<u>Setting</u>	<u>Function</u>
SW1-1	On	Enable auto-negotiation function
	Off	Disable auto-negotiation (manual mode)
SW1-2	On	100M speed for manual mode
	Off	10M speed for manual mode
SW1-3	On	Full duplex for manual mode
	Off	Half duplex for manual mode

When auto-negotiation function is enabled, the final configuration is dependent on the link partner device of the TP port as follows:

<u>TP Link Partner</u>	<u>Speed / Duplex used</u>
Auto-negotiation device	Determined by negotiation
10M Non-auto-negotiation device	10M, Half duplex
100M Non-auto-negotiation device	100M, Half duplex

## 1.24 LED Indications

The module provides five green LEDs to indicate the following status:

<b><u>LED</u></b>	<b><u>Function</u></b>	<b><u>State</u></b>	<b><u>Interpretation</u></b>
PWR	Power status	On	The power is on.
		Off	The power is off.
TPSPD	TP Speed	On	100Mbps connection speed
		Off	10Mbps connection speed
TPDUP	TP Duplex	On	Full duplex
		Off	Half duplex
TPLNK	TPLink/Act.	On	TP port link up
		Off	TP port link down
		Blink	TP port Tx/Rx activities
FXLNK	FX Link/Act.	On	Fiber port link up
		Off	Fiber port link down
		Blink	TP port Tx/Rx activities

## **2. Gigabit Ethernet Media Converter Modules**

The 1000BASE-T to 1000BASE-SX/LX media converter modules provide a media conversion allowing Gigabit integration of fiber optic and copper (twisted-pair) segments. It is used to extend the connection distance between two copper Gigabit Ethernet devices via fiber optic cable transparently with no performance degradation.

The converters also provide the following key features:

- Compliance with IEEE 802.3ab 1000BASE-T and IEEE 802.3z 1000BASE-SX, 1000BASE-LX standard
- Auto-negotiation function built in twisted-pair port that allows to operate at optimal configuration connecting to an auto-negotiation capable device
- Auto MDI/MDI-X crossover configuration and receiving polarity error correction on twisted-pair interface
- Supporting low cost multimode fiber and single mode fiber cable when long reach connection is needed
- Extending network span up to 10Km over duplex single mode fiber cabling
- Setting switch to enable or disable auto-negotiation function of the fiber port when connecting non-auto legacy 1000BASE-X device
- Full LED indicators for monitoring port and connection status

The converter module series support the following configuration needs:

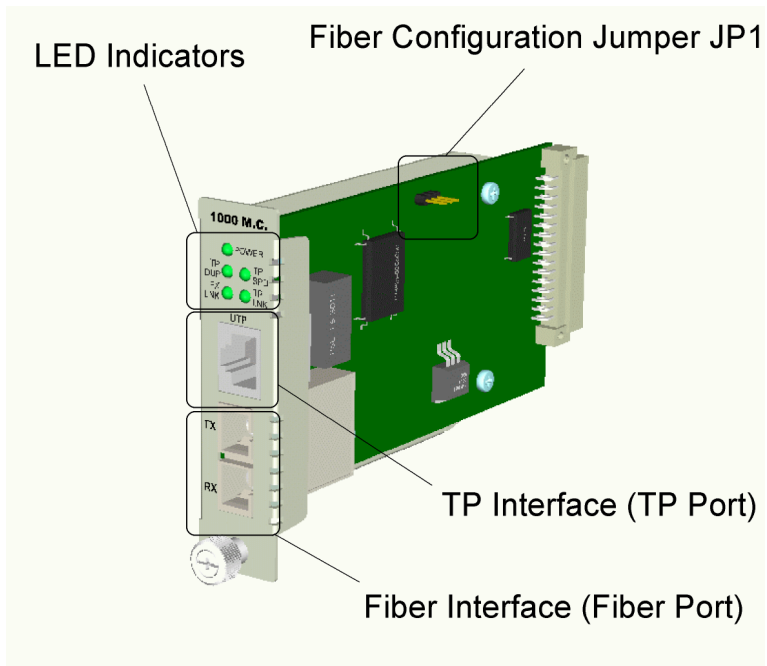
### **1000BASE-T to 1000BASE-SX / LX**

<b>3000-SXC</b>	Copper to SX fiber SC
<b>3000-LXC</b>	Copper to LX fiber SC
<b>3000-LXC40</b>	Copper to LX fiber SC long reach



The following figure illustrates the module example which provides 2 SC connectors. All available models are similar except the fiber transceiver equipped. The figure shows the some important components as follows:

- Twisted-Pair Interface (TP Port)
- Fiber Interface (Fiber Port)
- Fiber Configuration Jumper (JP1)
- LED Indicators



## 2.1 3000-SX 3000-LX Specifications

### Twisted-Pair Interface

Compliance	IEEE 802.3ab 1000BASE-T
Connector	Shielded RJ-45 jack
Pin assignments	Auto-crossover for MDI and MDI-X
Data speed	1000Mbps
Duplex mode	Auto-negotiation for half-duplex or full-duplex
Cable type	4-pair Category 5 UTP
Supported cable length	100 meters

### Fiber Optic Interface

Compliance	IEEE 802.3z 1000BASE-SX or LX
Connector	Duplex SC
Data speed	1000Mbps
Duplex mode	Forced full-duplex or auto-negotiation (by Auto SW)
Auto SW	Auto-negotiation Enable/Disable switch
Cable types	Multimode (MM) - 50/125, 62.5/125 mm Single mode (SM) - 8.7/125, 9/125, 10/125 mm
Optical	Class 1 FDA and IEC-825 laser safety compliant.

### General Information

Frame Types Supported	IEEE 802.3 Std. 64Bytes ~ 1518Bytes frames VLAN tagged frames ( plus 4 bytes tag) Jumbo packets (up to 9K bytes)
LED Indications	Power, TP Link, TP Transmit, TP Receive, FXLink

## 2.2 Functions

### Functions of 1000BASE-T Port (Twisted-Pair Interface)

- Auto-negotiation support for connecting to auto-negotiation devices
- Supports both of half duplex and full duplex operations
- Auto MDI/MDI-X crossover configuration and receiving polarity correction for UTP connection

Pin Assignments	<b>Pin</b>	<b>MDI</b>	<b>MDI-X</b>
	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-

### Functions of 1000BASE-X Fiber Port (Fiber Optic Interface)

- Full data rate of 1000Mbps for full duplex operation
- Configuration Jumper JP1 is used to enable or disable auto negotiation function as follows:

**NON-AUTO** Disable auto negotiation function  
(and forced full duplex)

**AUTO** Enable auto negotiation function

Note:

1. For connecting to early 1000BASE-X devices which do not provide auto negotiation capability, you might need to set the SW to NON-AUTO position to prevent unexpected link failure occurrence.
2. In most of the cases, setting AUTO would make the link worked.
3. When installing two of these converters on both ends of a fiber connection, set the switch to NON-AUTO (forced full duplex mode) to achieve the best performance.

## 2.3 Supported Fiber Cables

<u>Model</u>	<u>Fiber</u>	<u>Wavelength</u>	<u>Output power</u>	<u>Input Sensitivity</u>
3000-SXC	SX	850nm	-9.5~ -4dBm	-12.5dBm max.
3000-LXC	LX	1310nm	-9.5~ -3dBm	-14.4dBm max.
3000-LXC40	LX	1310nm	-5~ 0dBm	-22dBm max.

<u>Model</u>	<u>Fiber Used</u>	<u>Supported Distance</u>
3000-SXC	MM 62.5/125mm	220 meters
	MM 50/125mm	500 meters
3000-LXC	MM 62.5/125mm	550 meters
	MM 50/125mm	550 meters
	SM 9/125mm	10 km
3000-LXC40	SM 9/125mm	40 km

Remark: MM:Multimode, SM: Single mode

## 2.4 LED Indicators

<u>Name</u>	<u>Status</u>	<u>State</u>	<u>Interpretation</u>
PWR	Power status	On	Power on
		Off	Power off
TP-LNK	UTP link status	On	TP Link up
		Off	TP Link down
TP-RX	UTP Rx status	On	TP Receiver in operation
		Off	TP no receiving operation
TP-TX	UTP Tx status	On	TP Transmitter in operation
		Off	TP no transmission
FX-LNK	Fiber link status	On	Fiber link up
		Off	Fiber link down

### **3. 10M Ethernet Media Converter Modules**

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The 10BASE-T to 10BASE-FL media converter modules provide a media conversion allowing integration of 10BASE-FL fiber optic and 10BASE-T (twisted-pair) segments. It is used to extend the connection distance between two Ethernet devices via fiber optic cable transparently with no performance degradation.

The converters also provide the following key features:

- Compliance with IEEE 802.3 10BASE-T and 10BASE-FL standard
- Supporting low cost multimode fiber and single mode fiber cable when long reach connection is needed
- Extending network span up to 12 km over duplex single mode fiber cabling
- Full LED indicators for monitoring port and connection status

The converter module series support the following configuration needs:

#### **10BASE-T to 10BASE-FL**

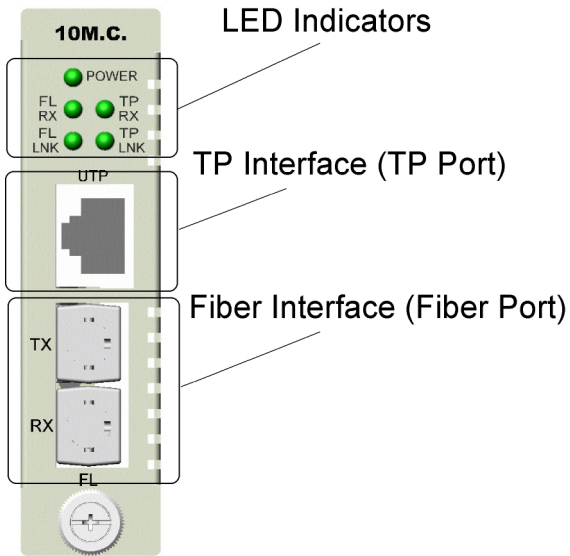
**3000-FLC** Copper to MM fiber SC

**3000-FLT** Copper to MM fiber ST

**3000-FLS12** Copper to SM fiber ST up to 12 km

The following figure illustrates the front panel of the module. The figure shows the some important components as follows:

- Twisted-Pair Interface (TP Port)
- Fiber Interface (Fiber Port)
- LED Indicators



## 3.1 3000-FL Specifications

### Twisted-Pair Interface

Compliance	IEEE 802.3 10BASE-T
Connector	Shielded RJ-45 jack
Pin assignments	MDI-X type
Data speed	10Mbps
Duplex mode	full-duplex (transparent conversion)
Cable type	2-pair Category 3,4, 5 UTP
Supported cable length	100 meters

### Fiber Optic Interface

Compliance	IEEE 802.3 10BASE-FL
Connector	Duplex SC or Duplex ST
Data speed	10Mbps
Duplex mode	Full-duplex (transparent conversion)
Cable types	Multimode (MM) - 50/125, 62.5/125 mm Single mode (SM) - 8.7/125, 9/125, 10/125 mm
Optical	AEL Class 1 and IEC-825-1 safety compliant.

### General Information

Frame Types Supported	Transparent conversion with no frame limit IEEE 802.3 Std. 64Bytes ~ 1518Bytes frames VLAN tagged frames ( plus 4 bytes tag) Jumbo packets (up to 9K bytes)
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LED Indications	<u>POWER</u> Power status
	<u>TPLNK</u> TP port link status
	<u>TPRX</u> TP port receiving status
	<u>FLLNK</u> Fiber port link status
	<u>FLRX</u> Fiber port receiving status

## 3.2 Fiber Optic Specifications

<u>Model</u>	<u>Fiber</u>	<u>Wavelength</u>
3000-FLC	Duplex MM 2 SC	Typ. 820nm
3000-FLT	Duplex MM 2 ST	Typ. 820nm
3000-FLS12	Duplex SM 2 ST	Typ. 1310nm

<u>Model</u>	<u>Tx Optical Power</u>	<u>Rx Sensitivity</u>	<u>Support Distance</u>
3000-FLC	Typ. -15.2dBm	Typ. -34.4dBm	MMF 2 km
3000-FLT	Typ. -15.2dBm	Typ. -34.4dBm	MMF 2 km
3000-FLS12	Avg. -30dBm	Avg. -39dBm	SMF 12 km

## 3.3 Making Connections

The following figure illustrates a connection example. The module performs signal conversion transparently. For the best throughput, make sure both link partners individually connected to the TP port and Fiber port are operating in same duplex mode.

