

# FIBER MEDIA CONVERTERS

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3U Series  
4U Series

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FIB Series  
FIB1 Series  
FIB2 Series

▶ *Fiber Optic Multiplexer* p24

FMUX01  
FIBER FMUX01 SNMP GUI  
Application

# N.M.S. (Network Management System)

## What do network managers really want ?

Minimal setup, maximum uptime and optimum security are the goals of every network manager.

To achieve these goals, network management systems must support various important functions :

1) Fault management - correlates fault management data from all network devices, isolates faults and initiates recovery actions.

2) Configuration management

3) Performance management

CTC Union develops a perfect solution for the above managements. The intelligent NMS provides the support that the network manager needs. It consists of three parts :

1) **Terminal mode: Configuration by local RS-232 serial port; Maintenance & alarm**

2) **MIB file SNMP: Configuration by RJ-45 10/100 Ethernet port; Complies with MIB-II standard**

3) **GUI SNMP: Configuration by RJ-45 10/100 Ethernet port; Real time monitoring & trap alarm in Window<sup>®</sup> graphic mode**

The management information base (MIB), includes the standard MIB and the enterprise specific MIB, which is defined by product manufacturers for management of their specific equipment. All CTC Union FRM series products provide the option for embedded SNMP agents which allow communication with standard SNMP management software or with our proprietary GUI SNMP manager software. This provides for powerful and efficient network element configuration and monitoring.

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*****
*** CTC UNION TECHNOLOGIES CO., LTD ***
*** FRM-301 NMS Terminal Mode V1.00 ***
*****
Optic Fiber Media Converent Rack Managent Main Menu :

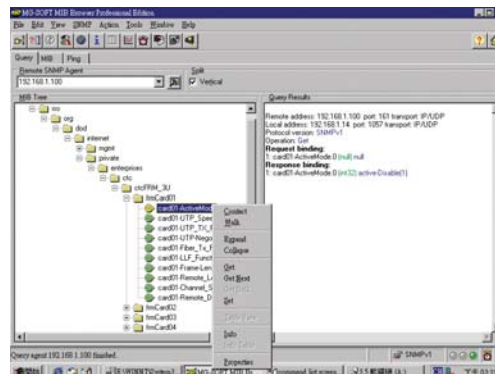
0:SNMP card IP setup
1:Slot #1 >> Active <<      |||      9:Slot #9 >> Active <<
2:Slot #2 >> Active <<      |||      A:Slot #10>> Active <<
3:Slot #3 >> Active <<      |||      B:Slot #11>> Active <<
4:Slot #4 >> Active <<      |||      C:Slot #12>> Active <<
5:Slot #5 >> Active <<      |||      D:Slot #13>> Active <<
6:Slot #6 >> Active <<      |||      E:Slot #14>> Empty <<
7:Slot #7 >> Active <<      |||      F:Slot #15>> Active <<
8:Slot #8 >> Active <<      |||      G:Slot #16>> Active <<
H:Set NMS Terminal Mode Password
I:Show Fan Power status

Command Function key :
'-' : Previous Item      '+' : Next Item
'Enter' : Accept         'Esc' : Previous menu
'R' : Refresh Status    'Numeric' : Select Item

##> [Slot #1 ]

```

**Terminal Mode**



**MIB Browser**

## Features

CTC Union develops enhanced management software which allows customers to monitor, configure, and control their media converters using SNMP management. The design allows a network administrator to connect up to 250 chassis using only one primary management workstation.

### Basic Features

- View which type of cards occupy the chassis
- Full Read/ Write capabilities
- Change individual card settings
- Enable/Disable individual cards or channels
- Monitor power module and fan assemblies in the unit
- Alarm detection for each card, power module & fan assemble
- Poll readings
- Cards maintain their configuration even if the Management Module fails
- Fully compliant SNMP interface with Windows<sup>®</sup> 95/NT/98/2000 GUI (Graphical User Interface)
- Configuration settings up or download to/from management PC

### Advanced Features

- Link-loss forwarding
- Loop-back test capability
- Get CPE status of remote side
- Pass through QoS & TAG-VLAN frames selectable

# N.M.S. Main Screen

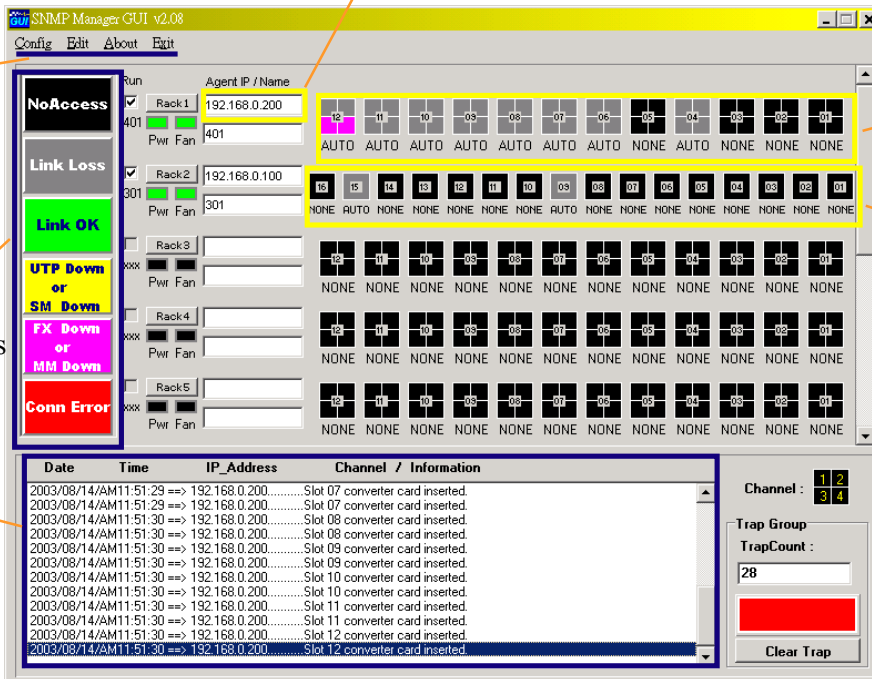
## GUI SNMP Manager Main Screen

IP Address for Each Chassis

Command Bar

Colored-status Meanings

Trap Message Window



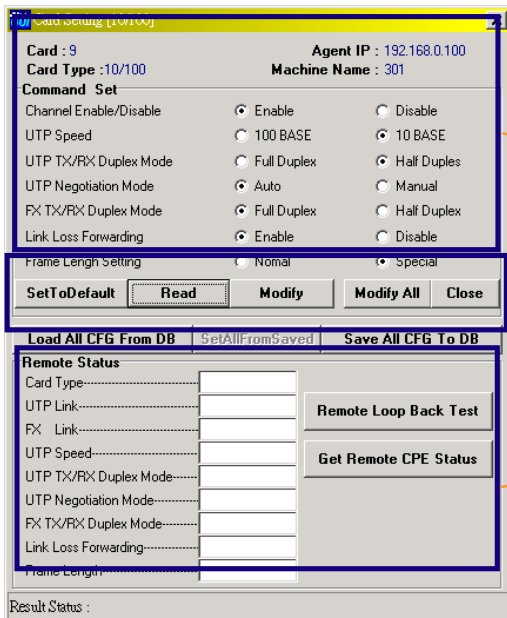
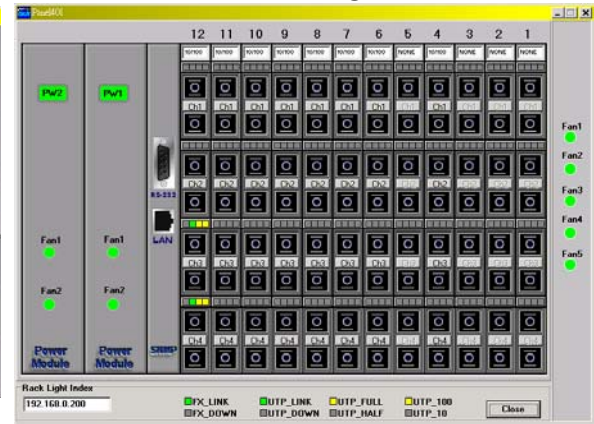
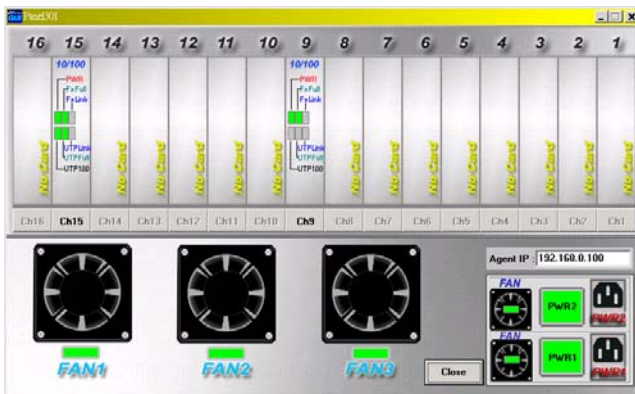
4U Chassis

3U Chassis

## GUI SNMP Manager Chassis Screen

### 3U Chassis Detail-Setting Screen

### 4U Chassis Detail-Setting Screen



Local Side Status Detail Section

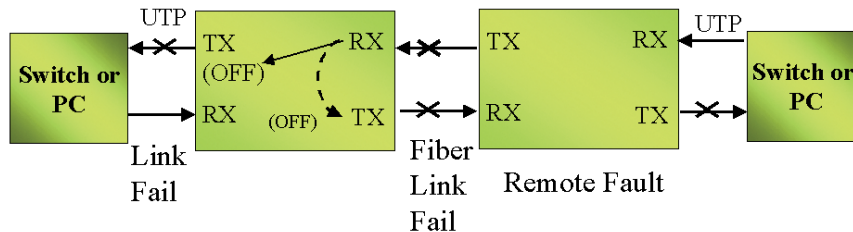
Command Section

Results of Get CPE Status from Remote Side

# Advanced Features

## Link-Loss Forwarding

This media converter incorporates a Fiber Link Forwarding feature which allows indirect sensing of a Fiber Link Loss via the 100 Base-TX UTP connection. Whenever the media converter detects a Link Loss condition on the Receive fiber (Fiber LNK OFF), it disables its UTP transmitter so that a Link Loss condition will be sensed on the receive UTP port. (See the following figure) The link loss can then be sensed and reported by a Network Management agent at the remote UTP port host equipment.



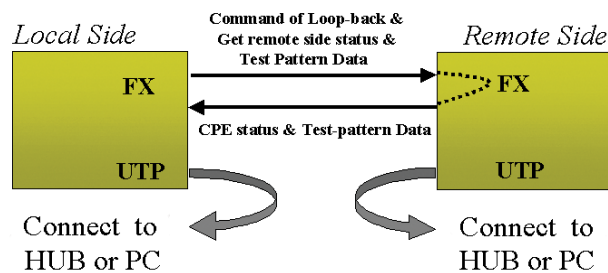
This feature has no effect on the media converters UTP LNK LED, which continues to function normally, independent of the state of the Fiber LNK LED and the UTP transmitter.

## Loop-Back Test & Get Remote CPE Status

( While these features are operating the Fiber side transmission will be halted )

This media converter incorporates a Fiber Loop-back Testing feature which allows the system to confirm that the fiber or Ethernet circuit loop is complete or not. The local-side unit will send out a detect message which includes both command and test-pattern data to the remote-side unit and a request for an answer. When the remote-side unit receives the message, it will first try to recognize the command. After the remote-side unit recognizes the command message, it will deliver the received test-pattern data back to the local-side unit. In this way, the circuit loop is complete and verified. This feature is enabled by the DIP switch #2 on the front panel or via SNMP command.

The get remote side status feature allows the system (available for both FIB1 & FRM301 and FRM401 series application) to monitor the remote side status. The unit will first send out a message which includes a command to the remote side unit and request for an answer. When the remote side unit receives the message, first it will try to recognize the command. After the remote side unit recognizes the command message, it will delivery its status back to the rack mount unit. In this way, the rack mount unit can easily monitor every remote side unit. The remote side status message includes the fiber side link status and duplex status, the UTP side link status, duplex status, speed status, the power status, transmission status and fiber (Tx side) failure status.



## Frame Length Selectable

Ethernet Frame length : 64~1518 (Normal, no VLAN Tag); 64~1536 (Special for VLAN Tag)

**What can you do with Advanced Features?**

**"SAVE" Manpower & Money with GUI**

**ISP Operator**      **End-User**

How to find out the problem ??????????

Can't Access Internet ??????????

Fiber

**Solution :**

- 1) Use Link-Loss Forwarding function to check if the fiber or UTP connection is active
- 2) Use "Loop-Back Testing" function to check the fiber link is complete or not
- 3) Use "Get CPE Status" function to check the customer's settings are correct or not

**Advanced Features available in which models ?**

**Standalone Type ▶**

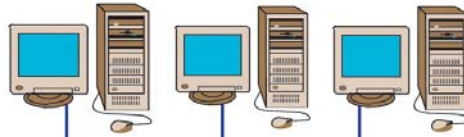


**Rack-mount Type ▶**



# Application

## CTC Union's Fiber



**Controllers**



Multi mode  
up to 2Km

Multi mode  
up to 2Km

Multi mode  
up to 4Km

FRM301

3U Rack  
(up to 16 Line Cards)

WDM up to 40Km  
Single mode up to 120Km  
Single mode up to 120Km



**FIB-232ip**

**FIB-422**

**FIB1-485**

RS-232

RS-442

RS-485

**FIB1-10/100W**

**FIB2-10/100**  
(AC or DC powered)

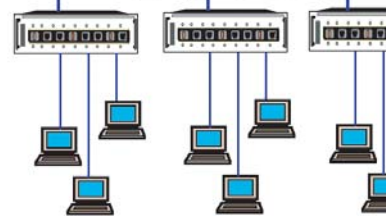
10/100Base

10/100Base

10/100Base



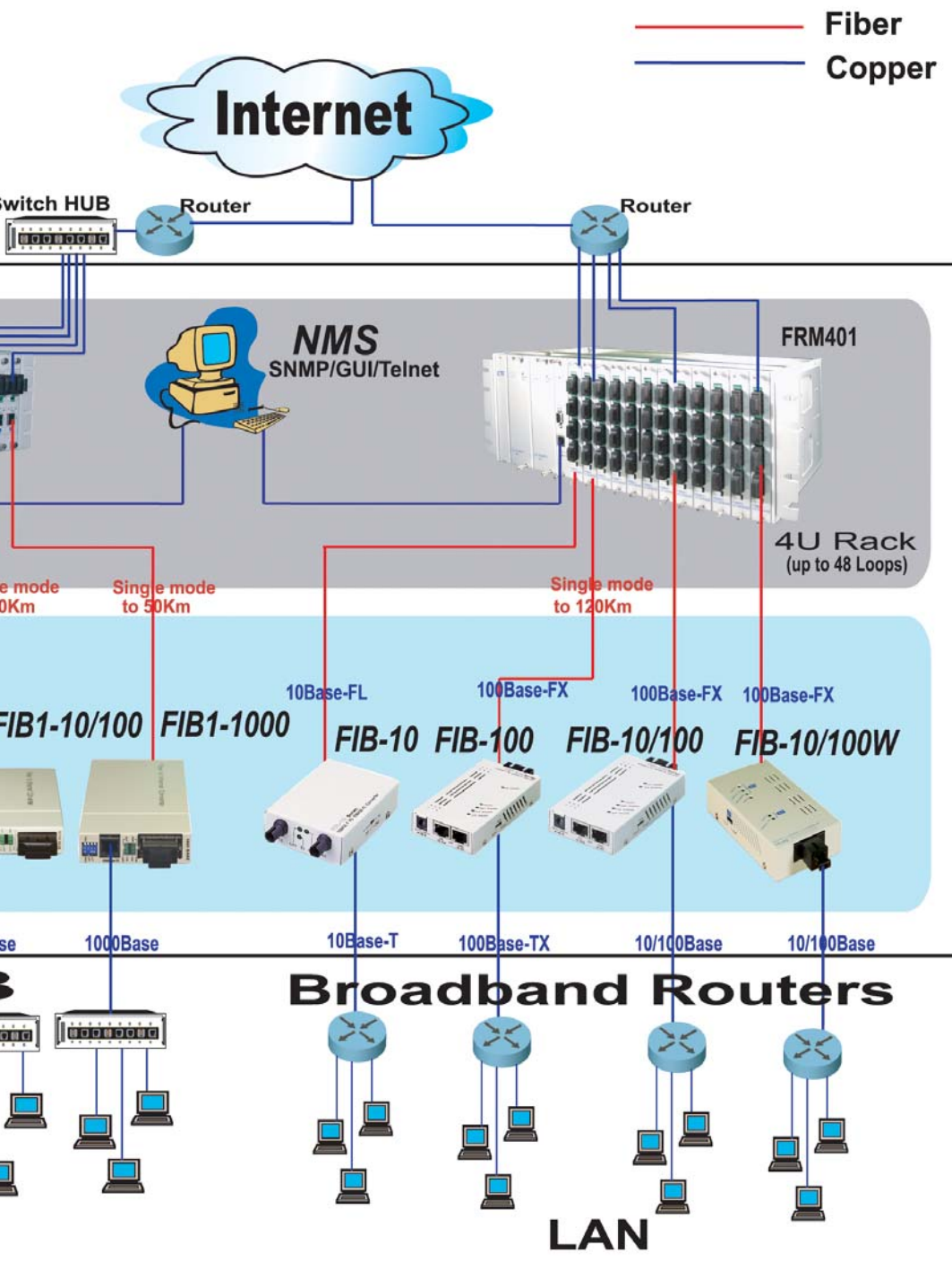
**Alarms/  
Remote Control**



**HUB**

**LAN**

# Media Converters



# FRM301

## 3U Series

The **FRM301** is a standard 3U, 19 inch rack mountable, Platform Media Converter that features 16 line card capacity. Currently supported line cards include Ethernet to fiber converters for 10/100 (auto), 100Base-TX, or 1000Base-TX over multimode fiber (up to 2KM), single mode fiber (up to 120KM) or utilizing WDM (up to 40KM). WDM (Wave Division Multiplexing) converts each input-output data stream into separate wavelengths of light and transmits/receives these channels through the same optical fiber. Future **FRM301** line cards will be announced to support G.703 and various data communication interfaces over fiber.

The **FRM301** supports optional redundant power and SNMP management. Another unique feature of the **FRM301** is line cards which make use of a common PCB card which may either be placed in the rack (**FRM301** Series line card) or used as a standalone converter (**FIB1** Series). Manufacturing costs are reduced as well as the inventory of spares required by distributors, installers, and end users.

Because NMS (Network Management System) offers the power of centralized management, network engineers will benefit from the advanced features of the **FRM301**'s SNMP. The benefits include remote configuration and management of converter modules, status and performance monitoring, and link loss detection.

The NMS option includes an SNMP card (agent) and standard MIB-II file for importation into any network management software, thus allowing remote configuration and system monitoring. An additional proprietary SNMP manager with GUI (Graphical User Interface) is also available which provides standalone management under any Windows® NT/9X/ME/2K/XP computer.



**FRM301**



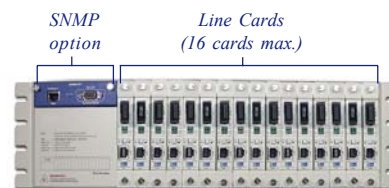
**FIB1 Series  
Stand Alone Model**



**FRM301 Series Line Card**

### LAN Interface Specifications

- One RJ-45 female connector for straight or cross-over connection
- Supports Ethernet 10Base-T, 100Base-T, 10/100Base-T (Auto-Negotiation)
- Supports Full, Half duplex and auto selections
- Transmission Packet Rate for 10Base-T/100Base-TX : 14880 per second/148800 per second



**FRM301 Front Panel View**

### FRM301 Line Card Types

The FRM301 media converter rack is designed to accept all of the FIB1 series converters as line cards within the rack. Please refer to the FIB1 series catalog for specifications and features of the line cards.

### General Specifications for FRM301 Series - Rack Mount Type

#### Environment

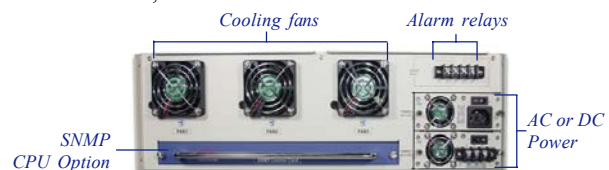
Temperature	0-50°C (Operating); 0-70°C (Storage)
Humidity	20-80% non condensing (Operating) 10-90% (Storage)
Dimensions	440mm x 280mm x 130.6mm (LxWxH)
Weight	17.3lbs (7.875kgs) (include 1 AC power modules & two ear panels for rack-mounting)

#### Power Module Specification

AC Power Module	Input: Universal 90 ~ 264 VAC; Frequency: 47~ 63 Hz Output: DC 12V, 8.5A
DC Power Module	Input: -18~ -56 VDC Output: DC 12V, 8.5A

### Features for FRM301 Series - Rack Mount Type

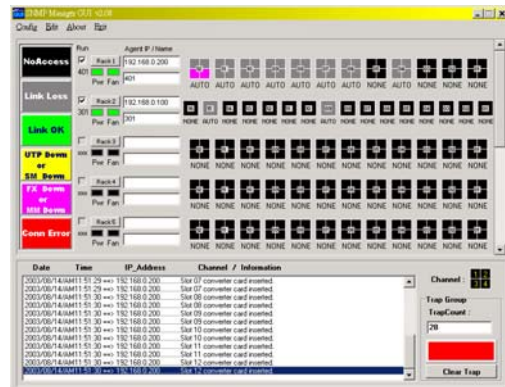
- 3U high, 19 (or 23) inch RACK with convertible standalone units, RACK accommodates up to 16 units.
- RACK with Dual power modules designed for redundant power application, AC and/or DC, cooling FANs included..
- Once the converter is installed, it is hot-swappable to avoid any other network downtime. Also, the power does not have to be off when inserting another converter
- Supports an auto recovery function, the system can restore all functions back to normal working status when the power or the connection is resumed.
- 10/100Base auto negotiation capability.
- Emission Compliance: FCC part 15 class A, CE Mark
- MTBF: 38,000 hours minimum



**FRM301 Rear Panel View**

## Features for NMS

- The NMS provides three modes:
  - 1) Terminal mode: Configuration by local RS-232 serial craft port connected to terminal or PC. This mode supports maintenance, setting & alarm. Operation is based on the menu-driven list.
  - 2) MIB file SNMP: Configuration by RJ-45 10/100 Ethernet port complies with MIB-II standard. Supports the community string, community authority, trap IP and SNMP configuration.
  - 3) GUI SNMP Manager: Configuration by RJ-45 10/100 Ethernet port. Supports real time monitoring and polling report & trap alarm via a Windows® based application program.
- The system polling report and alarm message can be displayed through each type of the NMS mode in the connected PC terminal.
- Able to read and set or modify the configuration at the same time.
- The NMS enables the administrator to load the default setting configuration.
- The configuration menu for each FRM series includes: Ethernet duplex status, Ethernet duplex status, fiber duplex status and auto-negotiation via each type of NMS mode.
- Alarm display function includes:
  - Link Status (Link OK/Link Down)
  - Power Fail Alarm/Power Fan Detector
  - Cooling FAN Fail Alarm
- Support for Telnet to operate from remote site in terminal mode. TFTP function to upgrade firmware.
- Card configuration can be saved for recall later or for use on replacement line cards.
- The SNMP control card can store the system configuration and default settings for sudden power shutdown.



**GUI SNMP Manager Main Display**

## Ordering Information

<p><b>FRM301-Chassis</b>  <b>Power Cards</b>  <b>FRM301-AC1</b>  <b>FRM301-AC2</b>  <b>FRM301-DC1</b>  <b>FRM301-DC2</b></p>	<p>Rack-Mount Chassis for both AC &amp; DC type</p> <p>Single AC power plug-in module</p> <p>Redundant AC power plug-in module</p> <p>Single DC -48V power plug-in module</p> <p>Redundant DC -48V power plug-in module</p>
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<p><b>Optional SNMP Card</b>  <b>FRM301-SNMP</b>  <b>FRM301-GUI SNMP Manager</b></p>	<p>SNMP plug-in card, Terminal mode and MIBs file</p> <p>Windows® based GUI program</p>
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### FRM301-XXXX X / XX XXX X

<b>Ethernet Type</b>	<b>Fiber Type</b>	<b>Connector Type</b>	<b>Distance</b>	<b>Connectivity</b>	<b>Advanced Features</b>
100:	S: Single Mode	ST: ST/PC	002: 2Km [multi-mode only]	(Power Budget >13dB)	F: /)Link-Loss-Forwarding 2)Loop-Back test 3)Remote monitor status 4)Two Frame lengths
10/100:	M: Multi-Mode	SC: SC/PC	015: 15Km (Power Budget >17dB)		
	W: WDM	LC: LC Type	030: 30Km (Power Budget >26dB)		
			050: 50Km (Power Budget >34dB)		
			120:120Km (Power Budget >39dB)		
			*20A:20Km [WDM only](Power Budget >17dB)		
			*20B:20Km [WDM only](Power Budget >26dB)		
			*40A:40Km [WDM only](Power Budget >17dB)		
			*40B:40Km [WDM only](Power Budget >26dB)		
			*020A must be coupled with 020B		
			*040A must be coupled with 040B		






**Example:**

<p><b>FRM301-10/100S/ST030F</b>  <b>FRM301-10/100M/SC002F</b>  <b>FRM301-10/100W/ST20AF</b></p>	<p><b>Single Mode, ST Type Connector, 30 Km with Advanced Features</b></p> <p><b>Multi-mode, SC Type Connector, 2 Km with Advanced Features</b></p> <p><b>WDM, ST Type Connector, 20 Km with Advanced Features and must be coupled with FRM301-10/100W/ST20BF</b></p>
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\*Special note for WDM : Because WDM utilizes different wave lengths on the same physical fiber cable, the WDM units must be matched in pairs (which we designate as A and B). Failure to match in pairs (A unit to B unit) will not allow any transmission on the fiber link as the transmit wavelength of one unit in the pair must match the receive wavelength of the other unit in the pair.

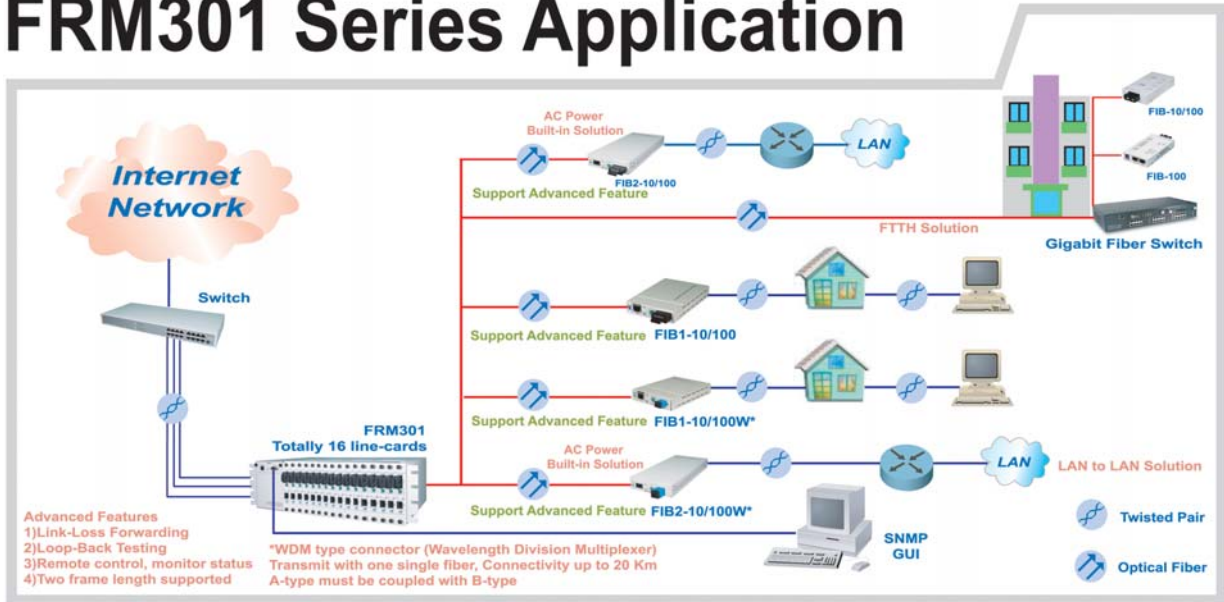
# Because your network needs to be everywhere.

## Media Converter Module Specification Comparison

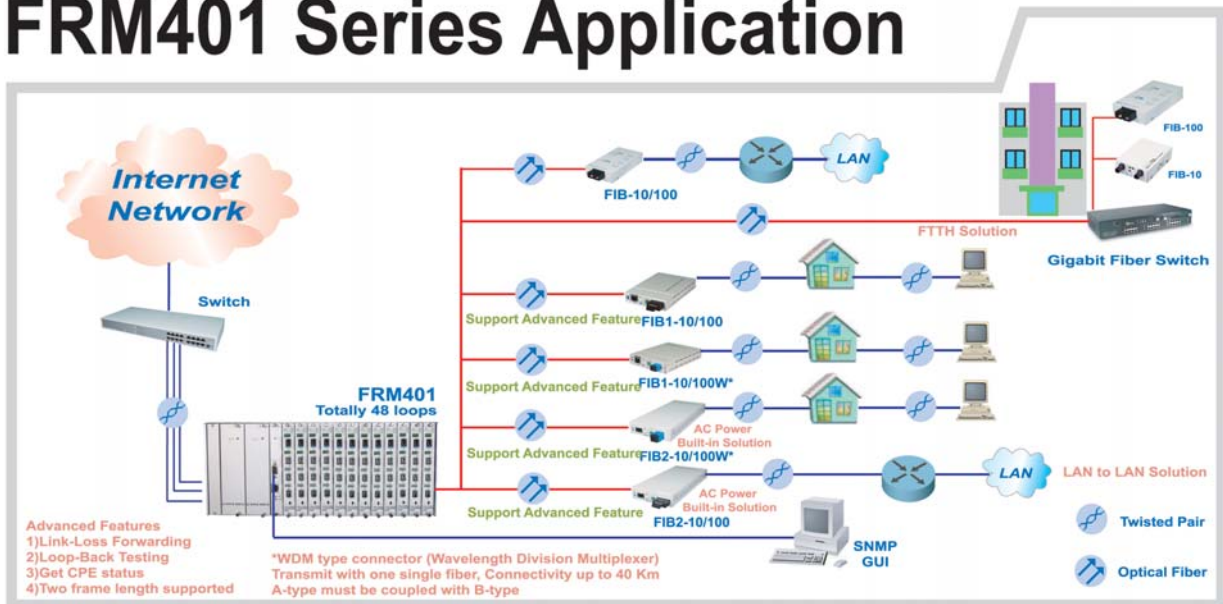
Model No.	FRM301-100		FRM301-10/100		FRM301-10/100WA		FRM301-10/100WB		FRM301-1000	
										
Available Connectors	ST	✓	ST	✓	ST		ST			
	SC	✓	SC	✓	SC	✓	SC	✓	SC	✓
	LC	✓	LC	✓	LC		LC		LC	✓
	MT-RJ	✓	MT-RJ	✓	MT-RJ		MT-RJ		GBIC-SC	✓
	FC	✓	FC	✓	FC		FC		SFP-LC	✓
Fiber	Multi/Single-mode		Multi/Single-mode		Single Fiber (Bi-directional)		Single Fiber (Bi-directional)		Multi/Single-mode	
Transmission distance	MM	2Km	MM	2Km	SM	20 Km	SM	20 Km	MM	550Km
	SM	15Km	SM	15Km					SM	10Km
	SM	30 Km	SM	30 Km	SM	40 Km	SM	40 Km	SM	40Km
	SM	50 Km	SM	50 Km					SM	80Km
	SM	120Km	SM	120Km						
Wavelength (nm)	MM-2Km	1310	MM-2Km	1310	SM-20Km	TX: 1310 RX: 1550	SM-20Km	TX: 1550 RX: 1310	MM-550m	850
	SM-15Km	1310	SM-15Km	1310					SM-10Km	1310
	SM-30Km	1310	SM-30Km	1310	SM-40Km	TX: 1310 RX: 1550	SM-40Km	TX: 1550 RX: 1310	SM-40Km	1310
	SM-50Km	1310	SM-50Km	1310					SM-80Km	1550
	SM-120Km	1550	SM-120Km	1550						
Protocol	IEEE802.3u		IEEE802.3/802.3u		IEEE802.3/802.3u		IEEE802.3/802.3u		IEEE802.3z	
Diagnostic LEDs	PWR, FX DPLX, FX LNK, TP LNK TP DPLX		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, DPLX, FX LNK, TP LNK LBT, LLF	
Duplex mode	Full or Half duplex		Full or Half duplex		Full or Half duplex		Full or Half duplex		Full or Half duplex	
Frame Per Second (Min-1536 B/F)	8033fps		803/8033fps		803/8033fps		803/8033fps		80330fps	
Frame Per Second (Max-64 B/F)	148810fps		14881/148810fps		14881/148810fps		14881/148810fps		1488100fps	
MTBF(hour)	60949		60949		60949		60949		60949	
Bit Error Ratio (BER)	Less than10e-10		Less than10e-10		Less than10e-10		Less than10e-10		Less than10e-10	
Buffer memory	NA		128KB		128KB		128KB		NA	
MDI / MDX	switchable		switchable		switchable		switchable		automatic	
Sensitivity	M02	-31dBm	M02	-31dBm	SM (20Km)	-32dBm	SM (20Km)	-32dBm	M0.55	-17dBm
	S15	-32dBm	S15	-32dBm					S10	-19dBm
	S30	-35dBm	S30	-35dBm	SM (40Km)	-32dBm	SM (40Km)	-32dBm	S40	-23dBm
	S50	-36dBm	S50	-36dBm					S80	-22dBm
	S120	-35dBm	S120	-35dBm						
Output Optical Power	M02	-20dBm	M02	-20dBm	SM-20Km	≥ -15dBm	SM-20Km	≥ -18dBm	M0.55	-9.5dBm
	S15	-20dBm	S15	-20dBm					S10	-9.5dBm
	S30	-15dBm	S30	-15dBm	SM-40Km	≥ -7dBm	SM-40Km	≥ -10dBm	S40	-3dBm
	S50	-8dBm	S50	-8dBm					S80	-3dBm
	S120	-7dBm	S120	-7dBm						
Power Margin	M02	11dBm	M02	11dBm	SM-20Km	17dB	SM-20Km	14dB	M0.55	7.5dB
	S15	12dBm	S15	12dBm					S10	9.5dB
	S30	20dBm	S30	20dBm	SM-40Km	25dB	SM-40Km	22dB	S40	20dB
	S50	28dBm	S50	28dBm					S80	20dB
	S120	28dBm	S120	28dBm						
Return Loss	-12dBm		-12dBm		-14dBm		-14dBm			
Dimensions (mm)	122.6 x 85.6 x 20(LxWxH)		122.6 x 85.6 x 20(LxWxH)		122.6 x 85.6 x 20(LxWxH)		122.6 x 85.6 x 20(LxWxH)		122.6 x 85.6 x 20(LxWxH)	
Weight	155g		155g		155g		155g		155g	
Ambient Temperature	0~70°C		0~70°C		0~70°C		0~70°C		0~50°C	
Humidity	10%~90%		10%~90%		10%~90%		10%~90%		10%~90%	
Power	+9V / 1A		+9V / 1A		+9V / 1A		+9V / 1A		+12V / 1A	
Power Consumption	<2W		<2W		<2W		<2W		<4W	
EMI	FCC Class A/CE		FCC Class A/CE		FCC Class A/CE		FCC Class A/CE		FCC Class A/CE	
Supports SNMP	✓		✓		✓		✓		✓	

MM: Multi-Mode ; SM: Single-Mode W: WDM (A type must be coupled with B type)

# FRM301 Series Application



# FRM401 Series Application



The **FRM401** is an Ethernet to Fiber Media Converter chassis that fits in a 19 or 23 inch rack and occupies 4U (7 inch) of rack space. The Hot Swappable Line Cards for the FRM401 are available in 100Base-TX or 10/100Base (auto) Ethernet standard to fiber (100Base-FX) connection for multi-mode (up to 2Km) or single mode (up to 120Km) with all the popular connector types such as SC, ST, FC, or MT-RJ. Line Cards are also available with the latest WDM (Wave Division Multiplexing) technology (up to 40Km and must be coupled) which converts the transmit and receive data streams into separate wavelengths and allows bi-directional transport through a single fiber strand.

Each Line Card contains four separate and identical media converters and may include optional features such as Link-loss forwarding, loop back testing, get remote status and adjustable frame length to support VLAN and QOS transmissions. A chassis, fully loaded with 12 Line Cards, can provide a total of 48 loops in a high-density configuration especially suited for applications such as FTTH (Fiber to the Home).

Optional features include the addition of a power sharing supply to reduce downtime due to single point of failure. The NMS option includes an SNMP card (agent) and standard MIB-II file for importation into any network management software, thus allowing remote configuration and system monitoring. An additional proprietary SNMP manager with GUI (Graphical User Interface) is also available which provides standalone management under any Windows® NT/9X/ME/2K/XP computer.

### General Specifications for FRM401 10/100 Line Card Type

- Complies with IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards.
- 4 diagnostic LEDs display
  - LAN 100 : 100M active (light) or 10M active (off)
  - LAN Full : UTP port with Full Duplex (light) or Half Duplex (off)
  - F/Link : Fx port link success (light), fail (off) or receive data (flash)
  - U/Link : UTP port link success (light), fail (off) or receive data (flash)
- DIP Switch Setting : FX port Duplex setting, Full or Half
- Environment : Temperature 0°C-70°C (Storage)  
0°C-50°C (Operating)  
Humidity 10-90% (Storage)  
20-80% non condensing(Operating)
- Dimensions: 122.6mm x 85.6mm x 20mm (LxWxH)
- Weight: 510g

#### LAN Interface Specification

- One RJ-45 female connector for straight or cross-over connection (located on the rear side of the chassis)
- Supports Ethernet 10Base-T, 100Base-TX, 10/100Base-TX (Auto-Negotiation)
- Supports Full, Half duplex and auto selections
- Transmission Packet Rate for 10Base-T/100Base-TX :  
14880 per second/148800 per second

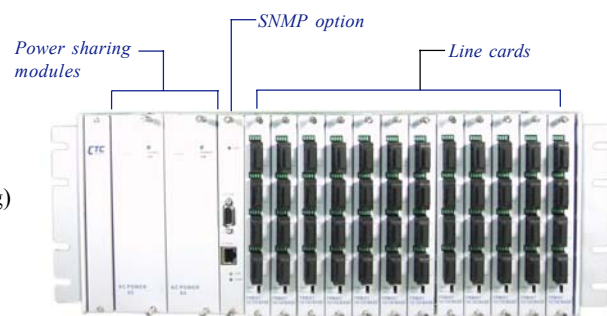
#### Optical Interface Specification

- Transceiver Connector Types: ST, SC or FC
- Wavelength (typical): multi-mode:1310nm;  
single mode (≤50Km): 1310nm (single mode 120Km: 1550nm)  
WDM: 1310/1550nm
- Supports Full, Half duplex selections
- Supports auto-adjustment function, no extra attenuators needed

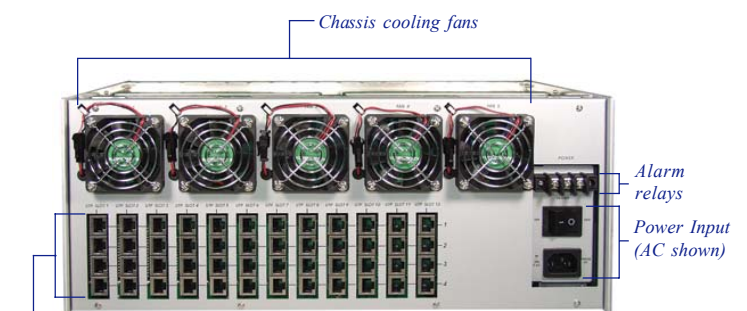


### Features for FRM401 10/100 Line Card Type

- High-density design
- Utilizes WDM technology to provide TX and RX on a bi-directional fiber cable. (WDM only)
- Fiber connectivity up to 120Km for single-mode.
- ST, SC or FC connectors accommodate single mode fiber optic cable size 9/125μm, multimode size 62.5/125μm.
- N-Way Auto-Negotiation or manual configuration.
- Advanced Features:
  - 1) Supports Link-Loss-Forwarding function, provides an internal jumper to enable or disable LLF function.
  - 2) Supports Loop-Back test & remote monitor status via internal panel DIP switch.
  - 3) Supports non-standard frame length, .....64~1518/1522 bytes for Normal, .....64~1536 bytes for Special
- Supports Tag VLAN, Spanning Tree Fail-over links



Front View



Rear View

RJ-45 LAN Connections

## General Specifications for FRM401 Series - Rack Mount Type

### Environment

- Temperature 0-50°C (Operating);  
0-70°C (Storage)
- Humidity 20-80% non condensing (Operating)  
10-90% (Storage)

### Power Module Specification

- AC Power Module Input: Selectable 110/220 VAC;  
Frequency: 50~60 Hz  
Output: DC 48V, 8.5A  
Weight: 0.66Kg
- DC Power Module Input: -42~-60 VDC  
Output: DC 48V, 8.5A  
Weight: 0.66Kg

### Chassis Specifications

- Dimensions 438mm x 285mm x 180mm  
(LxWxH)
- Weight 790g (empty chassis plus ear-panel)
- Emission Compliance FCC part 15 class A, CE Mark
- MTBF 38,000 hours minimum

## Features for FRM401 Series - Rack Mount Type

- 4U high, 19 (or 23) inch RACK. Chassis accommodates up to 12 line cards (each converter card provides four complete fiber converters), or 48 loops maximum.
- RACK with Dual power modules designed for power sharing application, cooling FANs included.
- Once the converter is installed, it is hot-swappable to avoid any other network downtime. Also, the power does not to be off to insert another converter.
- Supports auto recovery function, the system can restore all the functions back to normal working status when the power or the connection is resumed.
- 10/100Base auto negotiation capability.

## Ordering Information

<b>FRM401-AC-Chassis</b>	Ethernet Fiber Optical Converter Rack, Standard 4U, 19"rack with AC mainboard, including fans
<b>FRM401-DC-Chassis</b>	Ethernet Fiber Optical Converter Rack, Standard 4U, 19"rack with DC mainboard, including fans
<b>Power Cards</b>	
<b>FRM4-AC</b>	Fiber Converter Rack, AC Universal Power Board
<b>FRM4-48</b>	Fiber Converter Rack, DC/-24~ -48V power board
<b>Optional SNMP Card</b>	
<b>FRM401-SNMP</b>	SNMP plug-in card, MIB file and manual

### Line Card Options

#### FRM401-10/100X/XX XX F

Fiber Type	Connector Type	Distance	Connectivity	Advanced Features
S: Single Mode	ST: ST/PC	002: 2Km [multi-mode only]		F: 1)Link-Loss-Forwarding
M: Multi-Mode	SC: SC/PC	015: 15Km		2)Loop-Back test
W: WDM	**FC	030: 30Km		3)Remote monitor status
	available upon request	050: 50Km		4)Two Frame lengths
		120: 120Km		
		*20A: 20Km [WDM, SC only]		
		*20B: 20Km [WDM, SC only]		
		*40A: 40Km [WDM, SC only]		
		*40B: 40Km [WDM, SC only]		
		*A type must be coupled with B type		

#### Example:

<b>FRM401-10/100S/ST030F</b>	<b>Single Mode, ST Type Connector, 30 Km with Advanced Features</b>
<b>FRM401-10/100M/ST002</b>	<b>Multi-mode, ST Type Connector, 2 Km without Advanced Features</b>
<b>FRM401-10/100W/SC20A</b>	<b>WDM, SC Type Connector, 20 Km without Advanced Features and must be coupled with FIB1-10/100W/ST20B</b>

\*Special note for WDM : Because WDM utilizes different wave lengths on the same physical fiber cable, the WDM units must be matched in pairs (which we designate as A and B). Failure to match in pairs (A unit to B unit) will not allow any transmission on the fiber link as the transmit wavelength of one unit in the pair must match the receive wavelength of the other unit in the pair.

*FIB-232Ip/ST FIB-422*

*FIB-10 FIB-10/100 FIB-10/100W*

The FIB-XX Series are standalone fiber media converters available in models for 10Base-T, 100Base-TX, 10/100 Ethernet, RS-232 data port or RS-422 data port. The FIB-10, and FIB10/100 models of Ethernet Fiber Converters give you the options to choose from the two most popular fiber cabling connectors, ST or SC. Both multi-mode and single mode converter models are available as well as WDM (wave division multiplexing) which allows Tx and Rx to use a single fiber cable. The Ethernet connections are all provided by shielded RJ-45 jacks and incorporate either a connector pair or a selector switch to allow connection to either HUB or PC equipment. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex Ethernet signals, depending on your specific network needs. LED indicators signal the power status of the converter, UTP port speed, duplex status and Link/Rx and FX port Link/Rx and duplex status. The data port models FIB-232 and FIB-422 provide transparent connection of their respective interface type over multi-mode cable up to 2Km without the need for any software drivers.



**FIB-232Ip/ST**

### FIB-232Ip/ST

**RS-232 to Fiber ST Converter**  
(Single mode available upon request)

#### FEATURES

- Compact design.
- RS-232 at rates up to 115.2K Baud.
- Extends RS-232 up to 2Km.
- ST connector accommodates multi-mode fiber optic cable size 62.5/125µm.
- Interface powered, power adapter optional.
- Secure data transmissions over fiber.
- Full Duplex bi-directional transmissions.
- Transparent operation, no drivers required.



**FIB-422**

### FIB-422

**RS-422 to Fiber ST Converter**  
(Single mode available upon request)

#### FEATURES

- Compact design
- Extends RS-422 up to 2Km.
- RS-422 at rates up to 115.2K Baud.
- ST connector accommodates multi-mode fiber optic cable size 62.5/125µm.
- Secure data transmissions over fiber.
- Provides electromagnetic immunity.
- Full Duplex, bi-directional operation.
- Transparent operation.
- DC powered from AC adapter.



**FIB-10**

### FIB-10

**10Base-T to 10Base-FL Fiber SC Converter**

#### FEATURES

- Complies with IEEE 802.3 10Base-FL standards.
- Fiber connectivity up to 2Km. (multi-mode)
- ST/SC connector can accommodate multi-mode size of 62.5/125µm
- RJ-45 straight/ crossed selector switch
- 5 diagnostic LEDs

**FIB-10/100****FIB10/100****Fiber 10/100 Mbps/ST or SC Converter****FEATURES**

- Complies with IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards.
- Fiber connectivity up to 120Km for single-mode.
- ST or SC connector can accommodate single-mode size of 9/125 $\mu$ m, multimode size 62.5/125 $\mu$ m.
- Two RJ-45 for straight or cross-over connection.
- Full-Duplex, Half-Duplex or Auto selectable
- 6 diagnostic LEDs

**FIB-10/100W****FIB-10/100W****Fiber 10/100 Mbps WDM /ST or SC Converter (single-mode)****FEATURES**

- Complies with IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards.
- Utilizes WDM technology to provide TX and RX on a single fiber cable.
- Fiber connectivity up to 20Km for single-mode.
- ST or SC connector can accommodate single-mode size of 9/125 $\mu$ m.
- Two RJ-45 for straight or cross-over connection.
- Full-Duplex, Half-Duplex or Auto selectable
- 6 diagnostic LEDs

## Ordering Information

● <b>FIB-232Ip/ST</b>	RS-232 to Fiber Converter, ST, Multi-mode, 2Km
● <b>FIB-422/ST</b>	RS-422 to Fiber Converter, ST, Multi-mode, 2Km
● <b>FIB-10M/ST2</b>	10 Base-T to fiber converter, multi mode, ST, 2Km
● <b>FIB-10M/SC2</b>	10 Base-T to fiber converter, multi mode, SC, 2Km
● <b>FIB-10/100S/ST30</b>	10/100 Base-TX to fiber converter, single mode, ST, 30Km
● <b>FIB-10/100S/SC30</b>	10/100 Base-TX to fiber converter, single mode, SC, 30Km
● <b>FIB-10/100S/ST50</b>	10/100 Base-TX to fiber converter, single mode, ST, 50Km
● <b>FIB-10/100S/SC50</b>	10/100 Base-TX to fiber converter, single mode, SC, 50Km
● <b>FIB-10/100S/ST120</b>	10/100 Base-TX to fiber converter, single mode, ST, 120Km
● <b>FIB-10/100S/SC120</b>	10/100 Base-TX to fiber converter, single mode, SC, 120Km
● <b>FIB-10/100M/ST2</b>	10/100 Base-TX to fiber converter, multi mode, ST, 2Km
● <b>FIB-10/100M/SC2</b>	10/100 Base-TX to fiber converter, multi mode, SC, 2Km
● <b>FIB-10/100W/SC20A</b>	10/100 Base-TX to WDM fiber converter, SC connector, 20Km (Matches with FIB-10/100W/SC20B)
● <b>FIB-10/100W/SC20B</b>	10/100 Base-TX to WDM fiber converter, SC connector, 20Km (Matches with FIB-10/100W/SC20A)
● <b>FIB-10/100W/SC40A</b>	10/100 Base-TX to WDM fiber converter, SC connector, 40Km (Matches with FIB-10/100W/SC40B)
● <b>FIB-10/100W/SC40B</b>	10/100 Base-TX to WDM fiber converter, SC connector, 40Km (Matches with FIB-10/100W/SC40A)

\*Special note for WDM : Because WDM utilizes different wave lengths on the same physical fiber cable, the WDM units must be matched in pairs (which we designate as A and B). Failure to match in pairs (A unit to B unit) will not allow any transmission on the fiber link as the transmit wavelength of one unit in the pair must match the receive wavelength of the other unit in the pair.

# FIB1 Series

## Standalone Type

What is a fiber optical media converter? Simply speaking, it is a type of converter using optical fiber as the physical media and converting signal from Ethernet to fiber and back. The FIB1 Series are standalone optical fiber converters available in models for 10/100 Ethernet and provide NMS function for Link-Loss-Forward, Remote-Monitoring-Status, and Loop-Back-Test. These optional features are especially useful when the standalone units are linked to one of our Rack type units with optional SNMP management. The FIB1-10/100 Ethernet Fiber Converters give you the options to choose from the most popular fiber cabling connectors, ST, SC, FC, LC or MT-RJ. Both multi-mode and single mode converter models are available and well as WDM (wave division multiplexing which allows TX and RX to use a single fiber cable). The Ethernet connections are all provided by shielded RJ-45 jacks and incorporate a selector switch to allow connection to either HUB or PC equipment. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, depending on your specific network needs. LED indicators signal the power status of the converter, UTP port speed, duplex status and Link/RX and FX port Link/RX and duplex status. Another unique feature of the **FIB1** converter is the use of a common PCB card which may either be placed in the rack (FRM301 series line card) or used as a standalone converter (FIB1 series). Manufacturing costs are thereby reduced as well as the inventory of spares required by installers and end-users. The **FIB1** allows network engineers to get greater functionality through advanced SNMP features. When installed in an FRM301 rack with SNMP, network administrators are able to manage any converter module from anywhere on the network, detect any loss and maintain each loop.



**FIB1-10/100**



**FIB1-10/100W**



**FIB1-1000**

### General Specification for FIB1-10/100 Series

- Complies with IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards.
- 6 diagnostic LEDs display.
  - PWR : Power on (light) or SNMP active (light or flash).
  - U/100 : 100M active (light) or 10M active (off).
  - F/Full : Fx port with Full Duplex (light) or Half Duplex (off).
  - U/Full : UTP port with Full Duplex (light) or Half Duplex (off).
  - F/Link : Fx port link success (light), fail (off) or receive data (flash).
  - U/Link : UTP port link success (light), fail (off) or receive data (flash).
- 2 DIP Switch Setting
  - SW1 : Fx port Duplex setting.
  - SW2 : Loop-Back test function setting.

\*When SW2 is on, the front panel LED will display (flash) the Remote CPE unit status.
- Temperature: 0 - 50°C (Operating); 0 - 70°C (Storage).
- Humidity: 20-80% non condensing (Operating); 10-90% (Storage).
- Power: Input: 110VAC+/-, 57~63Hz ; Output : 9V /1A maximum, DC.
- Dimensions: 122.6mm x 85.6mm x 20mm (LxWxH).
- Weight: 340g.
- Emission Compliance: FCC part 15 class A, CE Mark.
- MTBF: 38,000 hours minimum.

#### LAN Interface Specification

- One RJ-45 female connector for straight or cross-over connection.
- Supports Ethernet 10Base-T, 100Base-T, 10/100Base-TX (Auto-Negotiation).
- Supports Full, Half duplex and auto selections.
- Transmission Packet Rate for 10Base-T/100Base-TX : 14880 per second/148800 per second.

#### Optical Interface Specification

- Transceiver Connector Types : ST, SC, (WDM, bi-directional) LC & MT-RJ.
- Wavelength (typical): multi-mode:1310nm ; single mode(≤50Km):1310nm(single mode 120Km:1550nm) ; WDM:1310/1550nm.
- Supports Full, Half duplex selections.
- Supports auto-adjustment function, no extra attenuators needed.

### Features for FIB1-10/100 Series

- Compact design.
- Utilizes WDM technology to provide TX and RX on a bi-directional fiber cable. (optional)
- Fiber connectivity up to 120Km for single-mode.(except WDM to 40km)
- ST, SC, FC, LC or MT-RJ connectors accommodate single mode fiber optic cable size 9/125µm, multi-mode size 62.5/125µm.
- N-Way Auto-Negotiation.
- Advanced Features: 1) Supports Link-Loss-Forwarding function, provides an internal jumper to enable or disable LLF function.  
2) Supports with the Loop-Back test via front panel DIP switch.  
3) Supports remote monitor status via front panel DIP switch.  
4) Supports two Frame length,  
.....64~1518/1522 bytes for Normal,  
.....64~1536 bytes for Special
- Supports Tag VLAN, Fail links & store and forward.

### Features for FIB1-1000 Series

- Complies with IEEE 802.3ab 1000Base-TX, IEEE 802.3z 1000Base-SX/LX Gigabit Ethernet Standards.
- Provides one 1000Base-TX port, one 1000Base-SX/LX port, supports 4 connectors type (SC, GBIC, LC & LC-SFP).
- Supports full-duplex and half-duplex mode for the fiber port.
- Automatic MDI/MDX crossover function.
- 6 diagnostic LEDs for Power, TX link/transmit, FX link/transmit, Full/Half duplex mode, Pause, LLF.
- Advanced Features: 1) Supports Link-Loss-Forwarding function, provides an internal jumper to enable or disable LLF function.  
2) Support for the Loop-Back test via front panel DIP switch.  
3) Supports remote monitor status via front panel DIP switch.

## Ordering Information

**FIB301-XXXX X / XX XXX X (FRM301 Rack use)**

**FIB1-XXXX X / XX XXX X (Stand alone model)**

Ethernet Type	Fiber Type	Connector Type	Distance	Connectivity	Advanced Features
100:	S: Single Mode	ST: ST/PC	002: 2Km [multi-mode only]		F:1)Link-Loss-Forwarding
10/100:	M: Multi-Mode	SC: SC/PC	(Power Budget >13dB)		2)Loop-Back test
1000:	W: WDM	LC: LC/PC	015: 15Km (Power Budget >17dB)		3)Remote monitor status
	L: LC Type	GB: Gigabit/LC	030: 30Km (Power Budget >26dB)		4)Two Frame lengths
		SL: Gigabit/SFP	050: 50Km (Power Budget >34dB)		
		GB & SL only for the FIB1-1000 & FRM301-1000	120:120Km (Power Budget >39dB)		
			*20A:20Km [WDM only](Power Budget >17dB)		
			*20B:20Km [WDM only](Power Budget >26dB)		
			*40A:40Km [WDM only](Power Budget >17dB)		
			*40B:40Km [WDM only](Power Budget >26dB)		
			*020A must use couple with 020B		
			*040A must use couple with 040B		

**Example:**

<b>FIB1-10/100S/ST030F</b>	<b>Single Mode, ST Type Connector, 30 Km with Advanced Features</b>
<b>FIB1-10/100M/SC002F</b>	<b>Multi-mode, SC Type Connector, 2 Km with Advanced Features</b>
<b>FIB1-10/100W/ST20AF</b>	<b>WDM, ST Type Connector, 20 Km with Advanced Features and must use couple with FIB1-10/100W/ST20BF</b>

\*Special note for WDM : Because WDM utilizes different wave lengths on the same physical fiber cable, the WDM units must be matched in pairs (which we designate as A and B). Failure to match in pairs (A unit to B unit) will not allow any transmission on the fiber link as the transmit wavelength of one unit in the pair must match the receive wavelength of the other unit in the pair.

# FIB1-1000

## Gigabit Fiber Converters

The **FIB1-1000** is a standalone optical fiber media converter for 1000Base Ethernet to fiber that also provides NMS functions for Link-Loss-Forwarding, Remote-Monitoring-Status, and Loop-Back-Test. These optional features are especially useful when the standalone units are linked to one of our rack type units with SNMP management. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, depending on your specific network needs. Another unique feature of the **FIB1-1000** converter is the use of a common PCB card which may either be placed in the rack (FRM301 series line card) or used as a standalone converter (FIB1 series). When installed in an FRM301 rack with SNMP, network administrators are able to manage any converter module from anywhere on the network, detect any loss and maintain each loop.



### Features

- Complies with IEEE 802.3ab, 1000Base-TX, IEEE 802.3z, 1000Base-SX/LX Gigabit Ethernet Standards.
- Provides one 1000Base-TX port, one 1000Base-SX/LX port, voltage 3.3V {SX-Multi-mode, LX-Single-mode}
- Three versions supports fixed SC or LC connector types, GBIC socket with SC, or SFP with LC. Sockets allow easy replacement of the snap-out transceiver modules.
- Supports Full-duplex and Half-duplex mode for the Fiber and LAN ports.
- Automatic MDI/MDIX crossover function.
- 6 diagnostic LEDs for Power, TX link/transmit, FX link/transmit, Full/Half Duplex mode, LLF and LBT.
- Advanced Features:
  - 1) Supports Link-Loss-Forwarding function via front panel DIP switch.
  - 2) Support for the Loop-Back test via front panel DIP switch.
  - 3) Supports remote monitor status via front panel DIP switch.

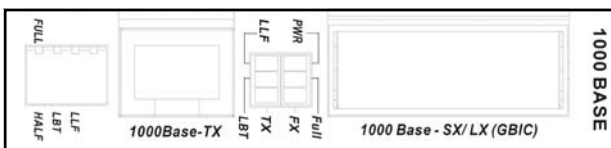
### Specifications

#### Environment

Temperature	0 - 50°C (Operating); 0 - 70°C (Storage)
Humidity	20-80% non condensing (Operating) 10-90% (Storage)
Dimensions	122.6mm x 85.6mm x 20mm (LxWxH)
Weight	340g (110z)

#### Power Adaptor Specification

AC Power Module Input :	Universal 100 ~ 240 VAC; Frequency : 50~60 Hz Output : DC 12V, 1A
Emission Compliance:	FCC part 15 class A, European standard EN55022:1994/A1:1995/A2:1997 Class A, EN61000-3-2:1995, EN61000-3-3:1995 and EN50082-1:1997
Power Consumption :	< 4W



## Ordering Information




**FIB301-1000-X / XX XXX F (FRM301 Rack use)**  
**FIB1-1000-X / XX XXX F (Standalone model)**

Fiber Type	Connector Type	Distance	Connectivity
S: Single Mode	SC: SC/PC	055: 550m [multi-mode only]	(Power Margin >7.5dB)
M: Multi-Mode	GB: GBIC-SC	010: 10Km (Power Margin >9.5dB)	
	LC: LC	040: 40Km (Power Margin >20dB)	
	SL: SFP-LC	080: 80Km (Power Margin >19dB)	

#### Example:

<b>FIB1-1000S/SC040F</b>	<b>Single Mode, SC Type Connector, 40 Km with Advanced Features</b>
<b>FIB1-1000M/GB055F</b>	<b>Multi-mode, GBIC Type Connector, 550 m with Advanced Features</b>
<b>FIB1-1000S/SL80F</b>	<b>Single Mode, SFP-LC Type Connector, 80 Km with Advanced Features</b>

## Media Converter Module Specification Comparison

Model No.	FIB1-100		FIB1-10/100		FIB1-10/100WA		FIB1-10/100WB		FIB1-1000	
										
Available Connectors	ST	√	ST	√	ST		ST			
	SC	√	SC	√	SC	√	SC	√	SC	√
	LC	√	LC	√	LC		LC		LC	√
	MT-RJ	√	MT-RJ	√	MT-RJ		MT-RJ		GBIC-SC	√
	FC	√	FC	√	FC		FC		SFP-LC	√
Fiber	Multi/Single-mode		Multi/Single-mode		Single Fiber (Bi-directional)		Single Fiber (Bi-directional)		Multi/Single-mode	
Transmission distance	MM	2Km	MM	2Km	SM	20 Km	SM	20 Km	MM	550m
	SM	15Km	SM	15Km					SM	10Km
	SM	30Km	SM	30Km	SM	40 Km	SM	40 Km	SM	40Km
	SM	50Km	SM	50Km					SM	80Km
	SM	120Km	SM	120Km						
Wavelength (nm)	MM-2Km	1310	MM-2Km	1310	SM-20Km	TX: 1310 RX: 1550	SM-20Km	TX: 1550 RX: 1310	MM-550m	850
	SM-15Km	1310	SM-15Km	1310					SM-10Km	1310
	SM-30Km	1310	SM-30Km	1310	SM-40Km	TX: 1310 RX: 1550	SM-40Km	TX: 1550 RX: 1310	SM-40Km	1310
	SM-50Km	1310	SM-50Km	1310					SM-80Km	1550
	SM-120Km	1550	SM-120Km	1550						
Protocol	IEEE802.3u		IEEE802.3/802.3u		IEEE802.3/802.3u		IEEE802.3/802.3u		IEEE802.3z	
Diagnostic LEDs	PWR, FX DPLX, FX LNK, TP LNK TP DPLX		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, FX DPLX, FX LNK, TP LNK TP DPLX, TP Speed		PWR, DPLX, FX LNK, TP LNK LBT, LLF	
Duplex mode	Full or Half duplex		Full or Half duplex		Full or Half duplex		Full or Half duplex		Full or Half duplex	
Frame Per Second (Min-1536 B/F)	8033fps		803/8033fps		803/8033fps		803/8033fps		80330fps	
Frame Per Second (Max-64 B/F)	148810fps		14881/148810fps		14881/148810fps		14881/148810fps		1488100fps	
MTBF(hour)	60949		60949		60949		60949		60949	
Bit Error Ratio (BER)	Less than10e-10		Less than10e-10		Less than10e-10		Less than10e-10		Less than10e-10	
Buffer memory	NA		128KB		128KB		128KB		NA	
MDI / MDX	switchable		switchable		switchable		switchable		automatic	
Sensitivity	M02	-31dBm	M02	-31dBm	SM (20Km)	-32dBm	SM (20Km)	-32dBm	M0.55	-17dBm
	S15	-32dBm	S15	-32dBm					S10	-19dBm
	S30	-35dBm	S30	-35dBm	SM (40Km)	-32dBm	SM (40Km)	-32dBm	S40	-23dBm
	S50	-36dBm	S50	-36dBm					S80	-22dBm
	S120	-35dBm	S120	-35dBm						
Output Optical Power	M02	-20dBm	M02	-20dBm	SM-20Km	≥-15dBm	SM-20Km	≥-18dBm	M0.55	-9.5dBm
	S15	-20dBm	S15	-20dBm					S10	-9.5dBm
	S30	-15dBm	S30	-15dBm	SM-40Km	≥-7dBm	SM-40Km	≥-10dBm	S40	-3dBm
	S50	-8dBm	S50	-8dBm					S80	-3dBm
	S120	-7dBm	S120	-7dBm						
Power Margin	M02	11dB	M02	11dB	SM-20Km	17dB	SM-20Km	14dB	M0.55	7.5dB
	S15	12dB	S15	12dB					S10	9.5dB
	S30	20dB	S30	20dB	SM-40Km	25dB	SM-40Km	22dB	S40	20dB
	S50	28dB	S50	28dB					S80	20dB
	S120	28dB	S120	28dB						
Return Loss	-12dBm		-12dBm		-14dBm		-14dBm			
Dimensions (mm)	122.6 x 85.6 x 20 (LxWxH)		122.6 x 85.6 x 20 (LxWxH)		122.6 x 85.6 x 20 (LxWxH)		122.6 x 85.6 x 20 (LxWxH)		122.6 x 85.6 x 20 (LxWxH)	
Weight	300g		300g		300g		300g		300g	
Ambient Temperature	0~70° C		0~70° C		0~70° C		0~70° C		0~50° C	
Humidity	10%~90%		10%~90%		10%~90%		10%~90%		10%~90%	
Power	+9V / 1A		+9V / 1A		+9V / 1A		+9V / 1A		+12V / 1A	
Power Consumption	<2W		<2W		<2W		<2W		<4W	
EMI	FCC Class A/CE		FCC Class A/CE		FCC Class A/CE		FCC Class A/CE		FCC Class A/CE	

MM: Multi-Mode ; SM: Single-Mode W: WDM (A type must be coupled with B type)

# FIB1-485

RS-232 / 423/ 485/422  
to fiber converter

The **FIB1-485** provides a fiber converter solution to extend RS-485 transmission distance up to 4Km over multimode fiber. The converter is equipped with multiple interface circuits, for connection to RS-232, RS-423, or RS-485/422 (2 or 4-wire). The **FIB1-485** secures data transmissions over EMI resistant fiber at speeds up to 256kbps for RS-232, or up to 1024kbps for RS-422/485. The **FIB1-485** may also be placed in the FRM-301 Platform Media Converter Rack.

## Features

- Selectable data I/F for RS-232/423/485/TTL.
- Selectable for two or four wire RS-485/422.
- Speeds up to 256kbps for RS-232 and RS-423.
- Speeds up to 1024kbps for RS-485/422.
- Extend transmission distance up to 4Km.
- Supply +5V (60mA) output for external device.

## Specifications

### OPTICAL Specifications

<b>Wavelength:</b>	850nm
<b>Optical Mode:</b>	Multimode
<b>Operating Distance:</b>	4Km
<b>Fiber Type:</b>	50/ 125um, 62.5/ 125um
<b>Power Margin:</b>	14dB
<b>Transmitter Power:</b>	-15dBm
<b>Receiver Sensitivity:</b>	-29dBm

### DATA SIGNAL Specifications

<b>Data Formats:</b>	RS-485/ 422 2-Wire (Half Duplex)
	RS-485/ 422 4-Wire (Full Duplex)
	RS-232 + RTS/ CTS 5-Wire
	RS-232 3-Wire
	RS-423 + RTS/ CTS 5-Wire
<b>Baud Rate:</b>	RS-485 1024k
	RS-232 256k
	RS-423 256k
<b>Bit Error Rate:</b>	TTL 1024k
	<10 <sup>-10</sup>

### Electrical Specifications

<b>Input voltage:</b>	12-18VDC
<b>Current Requirement:</b>	300mA
<b>Power Consumption:</b>	5Watts

### Connectors Specifications

<b>Optical:</b>	ST type
<b>Data:</b>	6-Position detachable screw terminal

### Mechanical Specifications

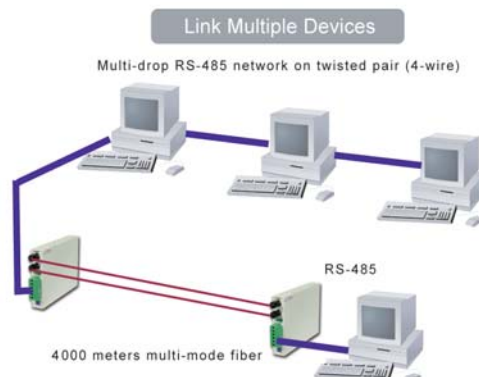
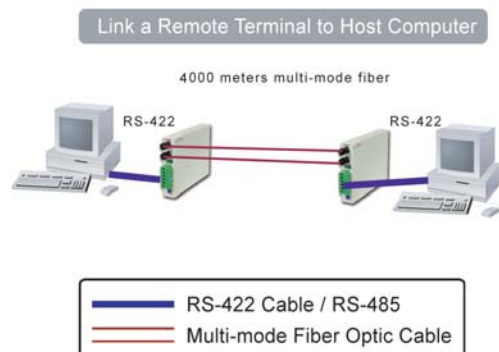
<b>Dimensions:</b>	Length:	138mm
	Width:	86mm
	Height:	20mm
	Weight:	660g
<b>MBTF:</b>	402253 hours	
<b>Temperature</b>	0 - 50°C (Operating);	
	0 - 70°C (Storage)	
<b>Humidity</b>	20-80% non condensing	
	(Operating)	
	10-90% (Storage)	

### Ordering Information

**FIB1-485/ST** RS-232, RS-423, and RS-485/422 to ST type multi-mode optical fiber converter with AC power adapter



## Application



# Gigabit Ethernet Single Mode to Multi-mode Converter **FIB1-1000MS**

The **FIB1-1000MS** are gigabit Ethernet single mode to multi-mode fiber converters designed as standalone converters in the FIB1 Series or as line cards for the FRM301 Media Converter Rack. The **FIB1-1000MS** fully complies with the requirements for 1000Base-SX to 1000Base-LX conversion. The FIB1-1000MS has two separate sub-models, the **FIB1-1000MS-S** and the **FIB1-1000MS-L**. Both have one fixed 1000Base-SX multi-mode transceiver with either SC or LC type connectors for 62.5/125um fiber cable. The **FIB1-1000MS-S** has a GBIC-SC 1000Base-LX single mode transceiver module with SC type connectors for 9/125um fiber cable. The **FIB1-1000MS-L** has a SFP-LC 1000Base-LX single mode transceiver module with LC type connectors for 9/125um fiber cable. The actual GBIC-SC and SFP-LC transceiver modules are options.



## Features

- Extend a Gigabit Ethernet backbone connection up to 80 km for MAN (metropolitan area network) applications
- Save money by purchasing Gigabit Ethernet devices with lower cost multimode fiber interfaces and use converters to introduce single mode fiber only where you need it
- Optional GBIC Modular Design on 1000Base-LX side (FIB1-1000MS-S)
- Optional SFP Modular Design on 1000Base-LX side (FIB1-1000MS-L)
- Converts Multimode to Single Mode (and vice versa)
- Converts Single mode to Single Mode or Multi-mode to Multi-mode
- Increases Distance Between Nodes
- Cross Connects Fiber Types
- Performs Optical Repeater Function (with 1000Base-SX GBIC or SFP modules)
- Small Outline, wall-mountable

## Specification

### Optical Specifications

Optical Mode: Single mode ; Multi-mode  
 Wavelength: 1310/1550nm (single mode), 850nm (multi-mode)  
 Fiber Type: 9/125um (single mode), 50/125um, 62.5/125um (multi-mode)

Distance \ Type	SC		LC		GBIC SC		SFP LC	
	Power	Sensitivity	Power	Sensitivity	Power	Sensitivity	Power	Sensitivity
M/M, 850, 550m	-9.5dBm	-18dBm	-9.5dBm	-18dBm	/		/	
S/M, 1310, 10Km	/		/		-9.5dBm	-20dBm	-9.5dBm	-20dBm
S/M, 1550, 30Km	/		/		-4dBm	-22dBm	-15dBm	-34dBm
S/M, 1550, 50Km	/		/		-4dBm	-23dBm	-4dBm	-23dBm
S/M, 1550, 80Km	/		/		-0dBm	-23dBm	0dBm	-23dBm

LEDs	PWR (power), M/M Link (Multi-mode link) S/M Link (single mode link)	AC Input :	Universal 90 ~ 264 VAC; Frequency : 47~63 Hz Output : DC 12V +/- 5%, 1A
Temperature	0 - 50°C (Operating); 0 - 70°C (Storage)	Power Consumption :	< 4W
Humidity	20-80% non condensing (Operating) 10-90% (Storage)	EMI :	FCC Class A, CE (EN55022), (EN60950)
Dimensions	122.6mm x 85.6mm x 20mm (LxWxH)		
Weight	340g (110z)		

## Ordering Information

**For more detailed information regarding ordering Information, please contact our Sales department directly.**

# FIB2 Series

*Standalone Type  
Built-in power supply*

The **FIB2** Series are standalone optical fiber converters, with AC or DC power supplies built-in, that are available in models for 10/100 Ethernet, and provide NMS functions for Link-Loss-Forwarding, Remote-Monitoring-Status, Loop-Back-Test, and frame length selection. These optional features are especially useful when the standalone units are linked to one of our Rack type units with optional SNMP management. The FIB2-10/100 Ethernet Fiber Converters give you the option to choose from the most popular fiber cabling connectors, ST, SC, LC or MT-RJ. Both multimode and single mode converter models are available as well as WDM (wave division multiplexing which allows TX and RX to use a single fiber cable). The Ethernet connections are all provided by shielded RJ-45 jacks and incorporate a selector switch to allow connection to either HUB or PC equipment. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, depending on your specific network needs. LED indicators signal the power status of the converter, UTP port speed, duplex status and Link/RX and FX port Link/RX and duplex status. The **FIB2** allows network engineers to get greater functionality through advanced SNMP features. When linked to our FRM301 with SNMP, the network administrator can manage any converter module from anywhere on the network, detect any link loss and maintain each loop.



**FIB2-10/100**



**FIB2-10/100W**



**90~260VAC  
AC Model**



**24~48VDC  
DC Model**

## General Specification for FIB2-10/100 Series

- Complies with IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX standards.
- 6 diagnostic LEDs display
  - PWR : Power on (light) or SNMP active (light or flash)
  - U/100. : 100M active (light) or 10M active (off)
  - F/Full : FX port with Full Duplex (light) or Half Duplex (off)
  - U/Full : UTP port with Full Duplex (light) or Half Duplex (off)
  - F/Link : FX port link success (light), fail (off) or receive data (flash)
  - U/Link : UTP port link success (light), fail (off) or receive data (flash)
- 2 DIP Switch Settings
  - SW1 : FX port Duplex setting
  - SW2 : Loop-Back test function setting
  - \*When SW2 is on, the front panel LED will display (flash) the Remote CPE unit status.
- Temperature : 0 - 50°C (Operating); 0 - 70°C (Storage)
- Humidity : 20-80% non condensing (Operating); 10-90% (Storage)
- Power:
  - AC mode supports 90~260 VAC ±10%, 50~60Hz <2W
  - DC mode supports 24~48 VDC <2W
- Dimensions: 191.7mm x 85.6mm x 30mm (LxWxH)
- Weight: AC model: 500g / DC model: 515g
- Emission Compliance: FCC part 15 class A, European standard EN55022:1994/A1:1995/A2:1997 Class A, EN61000-3-2:1995, EN61000-3-3:1995 and EN50082-1:1997
- MTBF: 38,000 hours minimum.

### LAN Interface Specification

- One RJ-45 female connector for straight or cross-over connection
- Supports Ethernet 10Base-T, 100Base-TX, 10/100Base-T/TX (Auto-Negotiation)
- Supports Full, Half duplex and auto selections
- Transmission Packet Rate for 10Base-T/100Base-TX: 14880 per second/148800 per second

### Optical Interface Specification

- Transceiver Connector Types: ST, SC (WDM, bi-directional), LC & MT-RJ
- Wavelength (typical): multi-mode: 1310nm; single mode (≤50Km) :1310nm (single mode 120Km:1550nm); WDM: 1310/1550nm
- Supports Full, Half duplex selections
- Supports an auto-adjustment function, no extra attenuators needed

## Features for FIB2-10/100 Series

- Built-in Universal AC or DC-DC power supply, depending on model.
- Compact design.
- Utilizes WDM technology to provide TX and RX on a bi-directional fiber cable (WDM model only).
- Fiber connectivity up to 120Km for single-mode (Except WDM model up to 40Km).
- ST, SC, LC or MT-RJ connectors accommodate single mode fiber optic cable size 9/125µm.
- N-Way Auto-Negotiation of Ethernet (10-100, Full-Half)
- Advanced Features: 1) Supports Link-Loss-Forwarding function, provides an internal jumper to enable or disable LLF function.  
2) Support for Loop-Back test via front panel DIP switch.  
3) Supports remote monitor status via front panel DIP switch.  
4) Supports two Frame lengths,  
.....64~1518/1522 bytes for Normal,  
.....64~1536 bytes for Special
- Supports Tag VLAN, Fail links & Store and forward

## Ordering Information

FIB2-XXXX X / XX XXX X- XX					
Ethernet Type	Fiber Type	Connector Type	Distance Connectivity	Advanced Features	Power
100: 10/100:	S :Single Mode M:Multi-Mode W: WDM	ST: ST/PC SC: SC/PC LC: LC/PC	002: 2Km [multi-mode only] (Power Budget >13dB) 015: 15Km (Power Budget >17dB) 030: 30Km (Power Budget >26dB) 050: 50Km (Power Budget >34dB) 120:120Km (Power Budget >39dB) *20A:20Km [WDM only](Power Budget >17dB) *20B:20Km [WDM only](Power Budget >26dB) *40A:40Km [WDM only](Power Budget >17dB) *40B:40Km [WDM only](Power Budget >26dB) *020A must use couple with 020B *040A must use couple with 040B	F:1)Link-Loss-Forwarding 2)Loop-Back test 3)Remote monitor status 4)Two Frame lengths	AC:90~260VAC DC:24~48VDC

**Example:**

**FIB2-10/100S/ST030F-DC**      **Single Mode, ST Type Connector, 30 Km with Advanced Features, DC Type**  
**FIB2-10/100M/SC002F-AC**      **Multi-mode, SC Type Connector, 2 Km with Advanced Features, AC Type**  
**FIB2-10/100W/ST20AF-AC**      **WDM, ST Type Connector, 20 Km with Advanced Features and must use couple with FIB1-10/100W/ST20BF, AC Type**

\*Special note for WDM : Because WDM utilizes different wave lengths on the same physical fiber cable, the WDM units must be matched in pairs (which we designate as A and B). Failure to match in pairs (A unit to B unit) will not allow any transmission on the fiber link as the transmit wavelength of one unit in the pair must match the receive wavelength of the other unit in the pair.

## Fiber Optical E1/T1, Datacom & Ethernet Multiplexer



The **FMUX01** is a single unit (1U), 19" rack mountable, E1/T1, Datacom & Ethernet Bridge multiplexer that transmits over a single fiber optic link. The **FMUX01** features a modular design that provides a wide variety of customized user configurations. The optical fiber interface module is available in a number of standard fiber connections and with standard or optional redundant optical connections. The **FMUX01** chassis is available in five different power configurations : single AC, single DC, dual AC, dual DC or AC+DC. The AC supplies operate from 90~260VAC while DC supplies operate from 20~60VDC. From the rear of the chassis, one to four quad E1 or T1 line cards, datacom (V.35, X.21, RS-530), or Ethernet Bridge cards are supported. All line cards provide completely transparent transmission of E1, T1, datacom, or Ethernet regardless of frame mode or timeslot assignment. Optional hardware cards are also available for external clock and SNMP. The standard **FMUX01** configuration may be viewed or set via the front panel LCD/menu keys, serial VT-100 terminal connection or Telnet/SNMP with SNMP option.

### Features

- Channel Capacity : 4,8,12 or 16 channels
- Auto Laser Shutdown (ALS) to prevent hazardous laser radiation to personnel
- Real Time Clock (RTC) run by backup battery to avoid time setting loss caused by power disruption.
- Configuration data can be stored into flash buffer to avoid any loss caused by power disruption.
- System performance : Less than 1 error in  $10^9$  bits
- Modularized interface : G.703 E1 and T1  
Datacom (V.35/RS-449,530/X.21)  
Ethernet Bridge 10/100Base-T
- Alarm relay contacts provided which can offer major and minor alarms with audible and visible alarm output.
- TFTP remote software upgradable (for SNMP option)
- Local and Remote Loop-Back Functions.
- Redundant Fiber 1+1 Protection. (Optional)
- Management : Local side can be managed via Keypad, Terminal and Telnet ; Remote side can be managed via Inband Terminal, Telnet & optional SNMP

### Specifications

#### E1/T1 Interface (x4)

Bit rate	(E1) 2.048Mbps+/-50ppm (T1) 1.544Mbps+/-50ppm
Line Code	(E1) HDB3/AMI (T1) B8ZS/AMI
Line Impedance	(E1) 120 Ohms/ 75Ohms+/-5% (T1) 100 Ohms+/-5%
Jitter Performance	(E1) complies with G.823 (T1) complies with G.824
Pulse Mask	Complies with ITU-T G.703
Connector	RJ-45 (E1 120 Ohms/T1 100 Ohms) BNC (75 Ohms E1)

#### Ethernet Interface (x1)

Compliance:	IEEE 802.3/802.3u
Connector:	Shielded RJ-45
Data Rate:	10/100Mbps; Half Duplex (20/200Mbps; Full duplex)
Filtering and Forwarding:	WAN wire speed
Delay:	1 frame
WAN Protocol:	HDLC
WAN Speed:	8.192Mbps
Frame Buffer:	340 frames
MAC Table:	256 MAC addresses

#### Datacom Interface (x4)

Card Type	V.35 interface RS-530 interface (Include X.21 and RS-449) RS-232 interface
Bit rate	n x 64K, n = 1 to 32 V.35 & RS-530 up to 2Mbps RS-232 up to 128Kbps (SYNC)
Line Code	NRZ
Clock Mode	Transparent, Recovery, External (From data port) Internal (From oscillator)
Control Signal	1.CTS always On or follows RTS 2.DSR constantly ON, except during test loops (RS-530 DSR always connect to DTR) 3. DCD constantly ON, except during fiber signal loss
Test Loops	Local loop back, Remote loop back, V.54
Connector Type	Uses HD-68 pin D type Female with adapter cables

## Specifications (cont.)

### Datacom Interface

Optional Cables	HD-68 to four V.35 (MB34) male/female connector
	HD-68 to four X.21 (DB15) male/female connector
	HD-68 to four RS-530 (DB25) male/female connector
	HD-68 to four RS-232 (DB25) male/female connector
	HD-68 to four RS-449 (DB37) male/female connector



Interface Cable

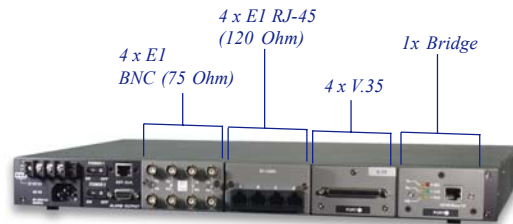
### Power

(May be single/dual DC or single/dual AC in one set or one AC plus one DC in one set)

DC	20 ~ 60VDC
AC	90 ~ 260VAC@47-63Hz
Consumption	40VA
MTBF Figure	65,181 hours

### Craft interface

Interface	RS-232C Asynchronous
Bit rate	19200, 8, N,1



rear view

### SYSTEM

Emission Compliance	FCC, Part 15, Sub B (Class A), European standard EN55022:1994/A1:1995/A2:1997 Class A, EN61000-3-2:1995, EN61000-3-3:1995 and EN50082-1:1997
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Alarm	4 relay contacts
Temperature	0~60°C, 32~140°F (operating)
Humidity	Up to 95% (non-condensing)
Dimensions	45 x 436 x 257 mm (HxWxD) 1.75 x 17 x 10.125 inch (HxWxD)

### Optical interface

Optical Specifications (redundant fiber has identical specifications as primary)

		Standard Types					WDM Types*			
Type		M-M	S-M	S-M	S-M	S-M	S-M	S-M	S-M	S-M
Distance (Km)		2	15	30	50	120	20(A)*	20(B)*	40(A)*	40(B)
Wavelength (nm)		1310	1310	1310	1310	1550	Tx:1310	Tx:1550	Tx:1310	Tx:1550
							Rx:1550	Rx:1310	Rx:1550	Rx:1310
BER		<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-10</sup>	<10 <sup>-11</sup>
Sensitivity		-31dBm	-32dBm	-35dBm	-36dBm	-35dBm	-32dBm	-32dBm	-32dBm	-32dBm
Output Power		-20dBm	-20dBm	-15dBm	-8dBm	-7dBm	-15dBm	-18dBm	-7dBm	-10dBm
Power Margin		11dBm	12dBm	20dBm	28dBm	28dBm	17dB	14dB	25dB	22dB
Return Loss		-12dBm	-12dBm	-12dBm	-12dBm	-12dBm	-14dBm	-14dBm	-14dBm	-14dBm
Conn. Types	ST	v	v	v	v	v				
	SC	v	v	v	v	v	v	v	v	v
	LC	v	v	v	v	v				
	MT-RJ	v	v	v	v	v				
	FC	v	v	v	v	v				

M-M: multi-mode S-M: single-mode

\* WDM types must match (A) with (B) in pairs

# Ordering Information

## FMUX01-XXX / XXXX / X XX XXX

### Power Module Type

AC	one AC module
DC	one DC module
AC2	two AC modules
DC2	two DC modules
AD	one AC & one DC module

### Line Card I/F Type

0	Empty slot
A	Quad E1 BNC I/F
B	Quad E1 RJ-45 I/F
C	Quad T1 RJ-45 I/F
D	Quad V.35 I/F
E	Quad RS-232 I/F
F	Quad RS-530 I/F (also support X.21 & RS-449 I/F)
G	Single Port Fast Ethernet 10/100 I/F

### Distance Connectivity

002:	2Km [multi-mode only]
015:	15Km
030:	30Km
050:	50Km
120:	120Km
*20A:	20Km [WDM only]
*20B:	20Km [WDM only]
*40A:	40Km [WDM only]
*40B:	40Km [WDM only]
*020A must be coupled with 020B	
*040A must be coupled with 040B	

### Connector Type

SC	SC Type
ST	ST Type
FC	FC Type
LC	LC Type
MT	MT-RJ Type

### Fiber Redundant Type

S:	Standard
R:	Redundant

### Examples

FMUX01-AC2/AABB/SSC120

FMUX01 unit with dual AC power, 8-port E1 BNC & 8-port E1 RJ-45 connectors, one single mode 120 Km, SC type connector optical interface

FMUX01-AD/ADG0/RSC2

FMUX01 unit with AC & DC power modules, 4-port E1 BNC connectors, 4-port V.35 DTE module & single port Ethernet bridge, dual multi-mode 2 Km, SC type connector optical interface for redundant use

### For Individual Purchasing for the Extra Module

#### E1/T1 Interface Card

FMUX01-E1/BNC I/F	4 Channel 75 ohm E1 Port Card
FMUX01-E1/RJ45 I/F	4 Channel 120 ohm E1 Port Card
FMUX01-E1/BNC I/F	4 Channel 100 ohm T1 Port Card

#### Ethernet Interface Card

FMUX01-Ethernet I/F	Single Channel Fast Ethernet Bridge Card
---------------------	--

#### Datacom Interface Card

FMUX01-V35 I/F	4 Channel V.35 Port Card
FMUX01-232 I/F	4 Channel RS-232 Port Card
FMUX01-X21 I/F	4 Channel X.21 Port Card
FMUX01-449 I/F	4 Channel RS-449 Port Card
FMUX01-530 I/F	4 Channel RS-530 Port Card

### Optical Transceiver Interface

## FMUX01-X / XX XXX

### Fiber Redundant Type

S:	Standard
R:	Redundant

### Connector Type

SC	SC Type
ST	ST Type
FC	FC Type
LC	LC Type
MT	MT-RJ Type

### Distance Connectivity

002:	2Km [multi-mode only]
015:	15Km
030:	30Km
050:	50Km
120:	120Km
*20A:	20Km [WDM only]
*20B:	20Km [WDM only]
*40A:	40Km [WDM only]
*40B:	40Km [WDM only]
*020A must be coupled with 020B	
*040A must be coupled with 040B	

### Example:

FMUX01-S/SC002

Optical I/F SC type, Multi-Mode 2Km

FMUX01-R/ST050

Optical I/F ST type, Single mode, 50Km, Redundant

### External Clock

FMUX01-EXT/CLK I/F      Optional external clock I/F

### SNMP Management

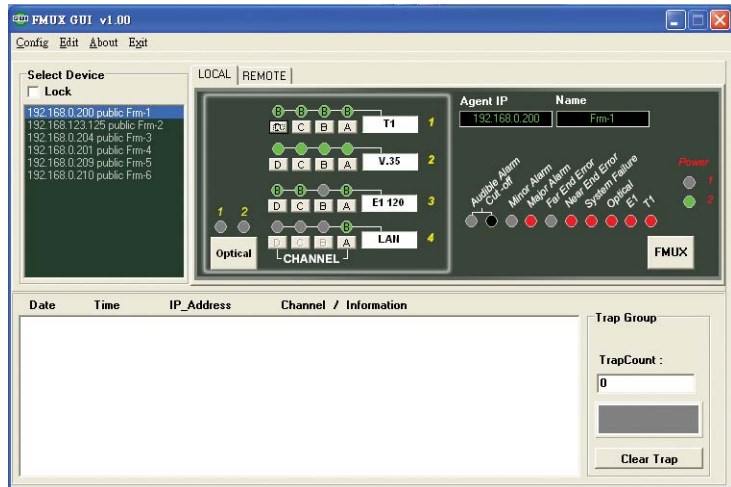
FMUX01-SNMP I/F      Optional SNMP management

### GUI Management S/W

FMUX01-GUI S/W management software      Optional MS-Window(r) Based GUI (Graphic User Interface)

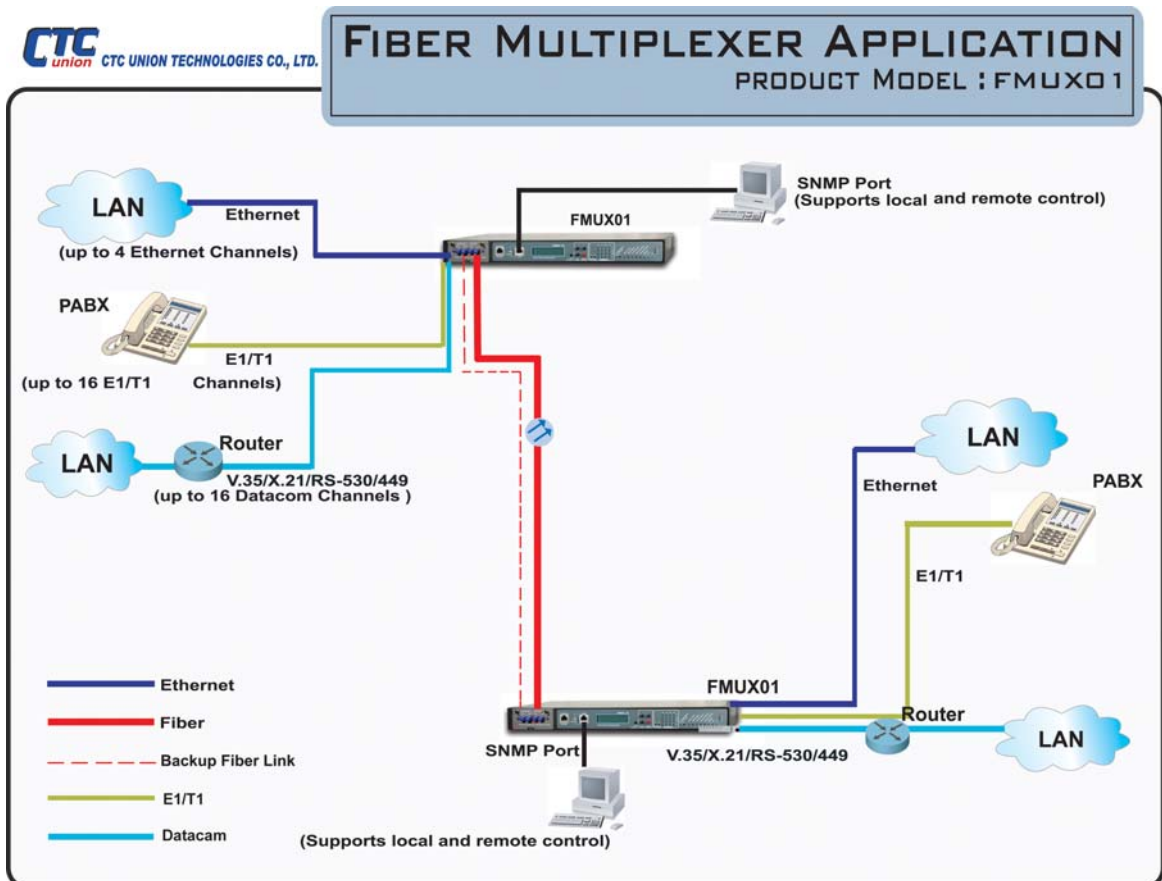
# FMUX01 SNMP GUI

FMUX GUI Optional MS-Windows(r) Based  
SNMP Manager





\*Requires SNMP option plus optional Windows<sup>R</sup> software




## Application





**Selection Table for FRM301/401 & FMUX01**

Model Name		FRM301	FRM401	FMUX01	
Physical Type		3U Rack Mountable	4U Rack Mountable	1U Rack Mountable	
Product Photo					
Fiber Interface	Number of Fiber Port		16	48	1+1 redundant
	Fiber Mode	Single Mode	•	•	•
		Multimode	•	•	•
		WDM	•	•	•
	Wave Length (nm)		850/1310/1550	850/1310/1550	850/1310/1550
	Connector	SC	•	•	•
		ST	•	•	•
FC				•	
SC(WDM)		•	•	•	
Redundant Fiber				•	
User Interface	Ethernet	Number of Port	up to 16	up to 48	up to 4
		LAN Rate	10/100 Base (Auto)	10/100 Base (Auto)	10/100 Base (Auto)
		Duplex Mode	Full/Half (Auto)	Full/Half (Auto)	Full/Half (Auto)
		Connector	RJ-45	RJ-45	RJ-45
	E1/T1	Number of Port	N/A	N/A	up to 16
		Frame			Transparent Unframed
		Bit Rate			2.048 Mbps (E1) 1.544 Mbps (T1)
		Connector			E1: RJ-45(120Ω) BNC (75Ω) T1: RJ-45 (100Ω) (with DB25 adapter)
	Datacom (V.35,X.21,R S449/530,RS 232)	Number of Port	N/A	N/A	up to 16
		Bit Rate			N x 64 Kbps (N=1~32)
		Line Code			NRZ
		Loopback			Local/Remote/V.54
		Connector			MB-34 (with DB25 adapter)
	Power		AC/DC	AC/DC	AC/DC
	Redundant Power		2 AC/2 DC/AC+DC	2 AC/2 DC	2 AC/2 DC/AC+DC
LCD Display				•	
Config. Setting	DIP/Switch	•	•		
	LCD			•	
	Terminal	•	•	•	
	Telnet	•		•	
Network Management System (NMS)	Console Port	•	•	•	
	SNMP Port (Optional)	•	•	•	
	SNMP GUI (Optional)	•	•	•	
Alarm Relay		•	•	•	
SNMP Software Upgradable		•	•	•	
Modular Design		•	•	•	
Dimension (L x W x H inch)		17.32x11.02x5.14	17.32x11.02x7.09	17.17x10.12x1.77	
		1. Advanced Functions Link loss forwarding Loopback test Getting remote status Frame length selection		1. Multi-interface for E1,T1, and datacom	
		2. Tag VLAN		2. Multi-optical transceiver	
		3. N-way (auto negotiation)		3. In-band remote control on fiber side	
				4. Auto laser shut down (ALS)	

## Fiber Media Converter -- Standalone Type

Model Name		FIB Family	FIB1 Family	FIB2 Family	
Product Photo					
Fiber Interface	Fiber Mode	Single Mode	√ (up to 120Km)	√ (up to 120Km)	√ (up to 120Km)
		Multimode	√ (up to 2Km)	√ (up to 4Km)	√ (up to 2Km)
		WDM	√ (up to 40Km)	√ (up to 40Km)	√ (up to 40Km)
	Wave Length (nm)		1310/1550	1310/1550	1310/1550
	Connector Type	SC	√	√	√
		ST	ST	√	√
FC/PC		√	√	√	
Gigabit			√		
Other Available Interface	Ethernet I/F		√	√	√
	DataCom Connector I/F	RS-485		√	
		RS-422	√	√	
		RS-232	√	√	
S/M Converter to M/M			√		
Fiber Speed	10Base-FL		√		
	100Base-FX		√	√	√
	1000Base-FX			√	
Ethernet Speed	10Base-T		√	√	√
	100Base-TX		√	√	√
	1000Base-TX			√	
Accommodated Fiber Cable	Single Mode		9/125 μm	9/125 μm	9/125 μm
	Multi-mode		62.5/125 μm	62.5/125 μm	62.5/125 μm
Power	AC		External AC adapter	External AC adapter	Built-in AC Power Supply
	DC		External DC-DC available	External DC-DC available	Power Module Built-In
Front Panel	DIP Switch		√	√	√
	Push Button		√	√	√
	Diagnostic LEDs		√	√	√
Auto Half/Full Duplex Negotiation		√	√	√	
Wall-mounting design			√	√	
Modular Design			√		
Point to Point Application		√	√	√	
Advanced	Link-loss forwarding			√	√
	Loopback testing/Get remote				
Advanced Features	Link-loss forwarding			√	√
	Loopback testing/Get remote side status			√	√
	Frame Length Selectable			√	√
Regulatory	Safety		√	√	√
	Emissions		√	√	√
Special Features			Remove the upper panel can be the line card used in FRM301		

## Fiber Media Converter Relationship Between CPE & CO

Model Name		FRM401	FRM301
Product Photo			
FIB Family	FIB-10	A	A
	FIB-10/100	A	A
	FIB-10/100W	A	A
FIB1 Family	FIB1-10/100	C	C
	FIB1-10/100W	C	C
	FIB1-1000	*	C
	FIB1-1000MS	*	A
	FIB1-485	A	A
FIB2 Family	FIB2-10/100	C	C
	FIB2-10/100W	C	C
Remark		A = Basic Function ; B = Basic Function + Advanced Feature C = Basic Function + Advanced Features + NMS Features ; D = Basic Function + NMS Features ; * = still under develop	

