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2018 V3.0

2018 Telecom Product Catalog

CTC UNION TECHNOLOGIES

Your Reliable Partner for Transmission Solutions!

2018
TELECOM
PRODUCT CATALOG

RoHS Compliance

ISO 9001
ISO 14001

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Since 1993

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About CTC Union

Since 1993

CTC Union Technologies Co. Ltd., founded in 1993, proactively designs and manufactures telecommunications, data communications and industrial networking products for a global market. With technologies based on Ethernet and Optical transmission, CTC Union can effectively meet the requirements of voice and data carriers, enterprises, as well as industrial grade Ethernet users.

Using the latest technologies, CTC Union has stormed into the "Industrial Ethernet" marketplace with a wide range of rugged Ethernet products for public utilities, transportation and power substation deployment. With a heavy focus on reliability, certifications and new standards, this proactive thinking will allow CTC Union to continue developing solutions for today and tomorrow's industrial markets.

CTC Union's global alliance is a network of worldwide branch offices, partners and distributors on every continent. By forming partnerships with major telecom operators, Internet Service providers, and value-added resellers, CTC Union reduces costs and improves services for customers. This alliance covers Europe, Asia, the Middle East, Africa, plus North and South America. This global partnership receives direct engineering and technical support from our company headquarters, located in Taipei, Taiwan.

Environmental Policy

As a socially responsible manufacturer, CTC Union is concerned with the environment and has taken active measures to reduce carbon emissions and eliminate hazardous materials in their products. None of CTC Union products use chlorofluorocarbons (CFC) in their production process and since 2007 all electronics use non-lead soldering according to RoHS 2.0 and WEEE directives.

Our Mission & Vision

- Provide innovative last-mile optical access solutions for telecommunication markets.
- Provide customers with “on time” solutions, quick and effective customer support, and valuable products with extended service life.
- To be a trusted partner; providing creative connectivity products and solutions.
- To be a leading data transmission solution provider that meets our customer’s needs.

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Chapter 1 Management Software

Chapter 2 iAccess™ Ethernet Aggregation Platform - FRM220A

Chapter 3 iAccess™ Multi-Service Platform - FRM220

10G Muxponder

Transponder Cards (40G/16G/10G/4G/1G)

WDM Cards

Booster EDFA Card

Optical Protection Switch Cards

NID/EDD Cards

10G Media Converter Card

Ethernet Switch & Media Converter Cards

Communication
exTension
Conversion

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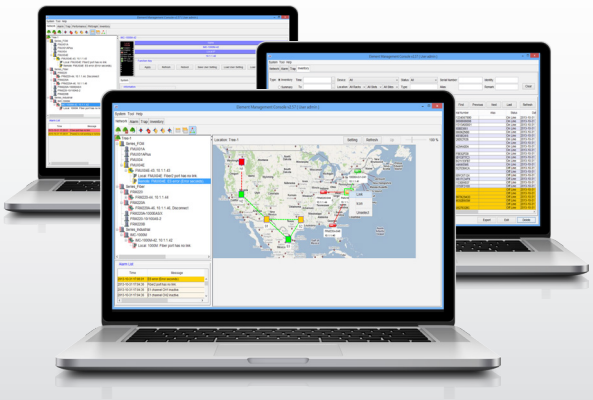
SmartView™ EMS
Central EMS

Superior Device Monitoring and Control

- **F**ault, **C**onfiguration, **A**ccounting, **P**erformance & **S**ecurity Management (FCAPS)
- 25 Administrators to Login (simultaneously)
- Central Management (up to 50 SmartView Servers)
- 25,000 Device Management
- Alarm Trap and Event Log Management
- Long Term Event Storage



Management Software

- Centralized Device Management
- Real-time visual representations and processing of alarms
- Long term event storage **(up to 1 year)**
- Easy, User-Friendly Operation Interface

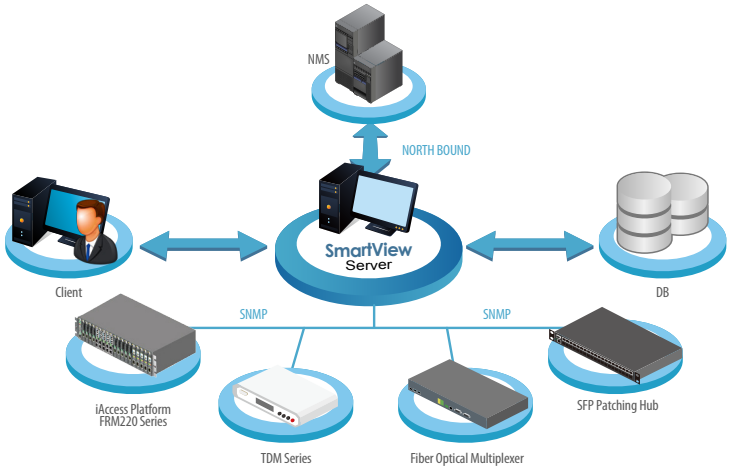
CTC Union's **SmartView™ Element Management System (EMS)** is a comprehensive management solution that monitors device performance, enables remote configuration and provisioning, and provides fault notification status.

SmartView™ EMS

(Element Management System)

- Main Functions **(FCAPS)**:
  - **F**ault Management
  - **C**onfiguration Management
  - **A**ccounting Management
  - **P**erformance Management
  - **S**ecurity Management
- Remote access control for efficient configuration
- Traffic / Performance monitoring and management
- Alarm Trap and event log management
- Auto Discovery and Device Viewer
- Allow up to 25 administrators to login

Polled Network Elements



Network Scheme Diagram

- User-Friendly Operation Interface
- Robust Client / Server architecture
- Network Monitoring and Management
- Database for persistent event storage
- Security Access Management

· Agents

The server handles connections with the network devices using SNMP protocol and is responsible for communicating of requests from management clients. SmartView™ Server collects information data from specific SNMP agents, stores the information into a persistent database and updates that information to the management clients.

· SmartView™ Server

The server handles connection with the network devices using SNMP protocol, and is responsible for communication of requests from management clients. SmartView™ Server collects the information data from specific SNMP agents, stores the information into a persistent database and updates that information to the management clients.

· Microsoft® SQL Server for Persistent Storage

SQL Server is the place where SmartView™ stores collected data, such as alarms, traps and user actions, for long term retrieval. SmartView™ requires Microsoft® SQL Server and is compatible with SQL 2008 Server, SQL 2008 Express, SQL 2014 Server and SQL 2014 Express. (The EMS installer will install the free version Microsoft® SQL 2008 Express or SQL 2014 Express under Windows 10 by default).

· Workstation-Clients

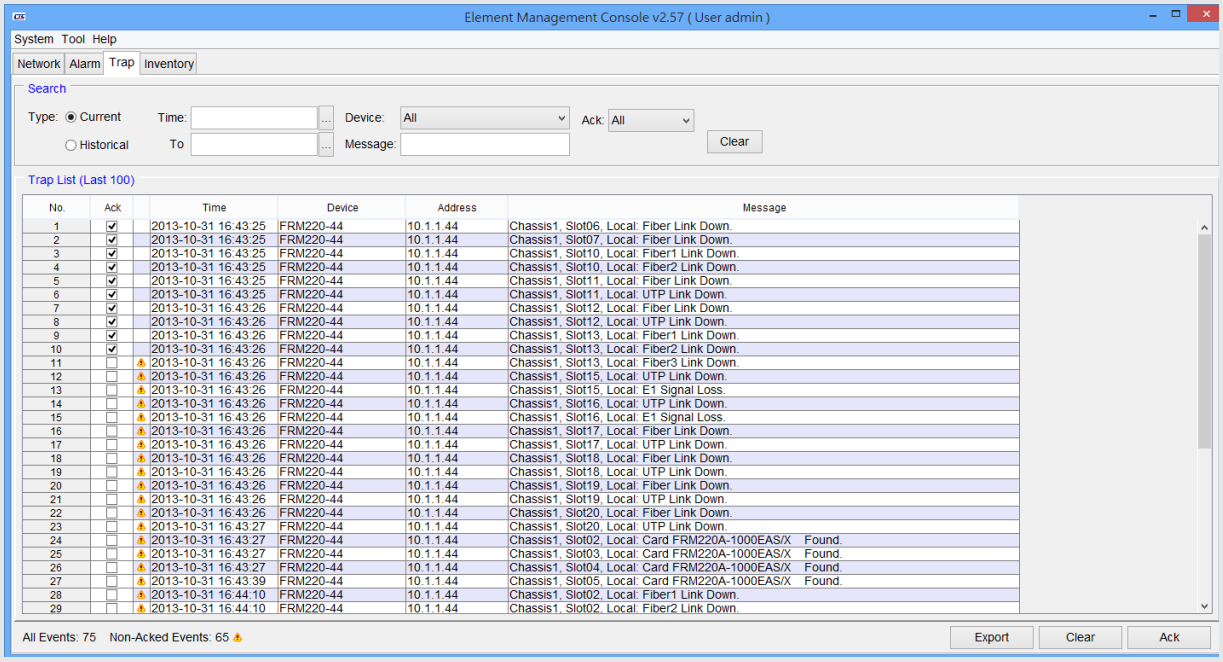
Management clients are provided with the JAVA applet GUI to monitor and control the agents at far end. They also receive the Alarm and Traps from the corresponding SNMP Agents. Multiple workstations are allowed, with a maximum of 25 concurrent logged in users.

Features at a Glance

▪ Fault Management

Trap Collection

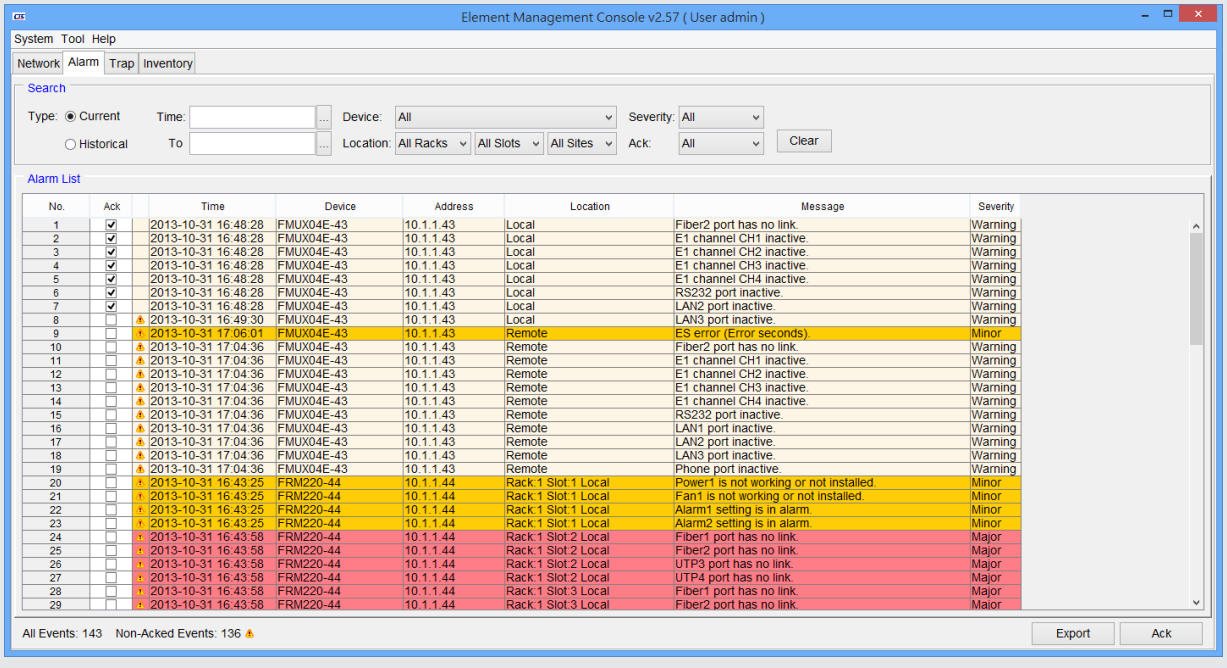
All traps will be stored in SQL database. When an SNMP agent experiences an abnormal condition it will send an SNMP trap message to SmartView™ which then receives the message, and records it in the database. Depending on preset conditions, SmartView™ may sound an audible alarm, send an email or SMS alert message or just simply flash the trap message on the administrative console screen.



Trap Messgages

Active Alarm

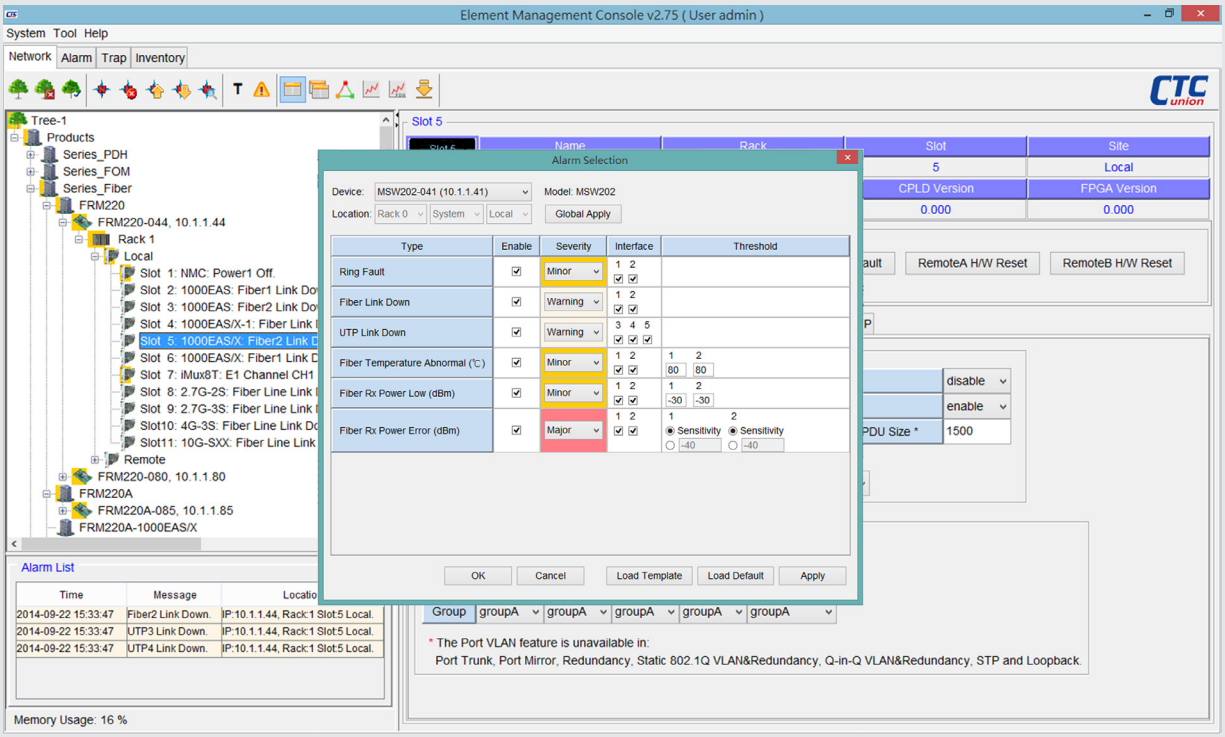
SmartView™ continuously polls all network devices under its management and will visually display all alarm conditions found. Alarms will be categorized as Major, Minor or Warning, depending on severity. Although alarms may be acknowledged, they remain actively displayed on the alarm page until there is no longer an alarm condition.



Active Warnings

Alarm Selection

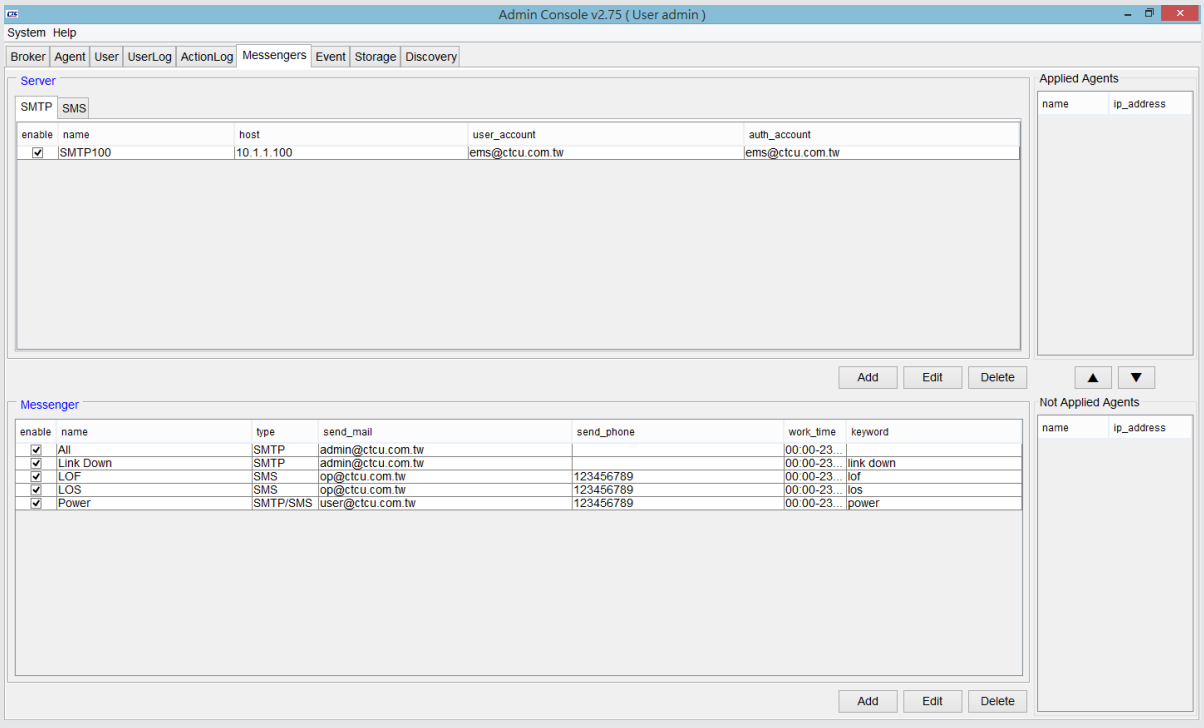
Alarm events of network element are configurable. All alarm events are warned by default, but them can be disabled to ignore warning messages.



Alarm Selection

Alarms sent by E-mail & SMS

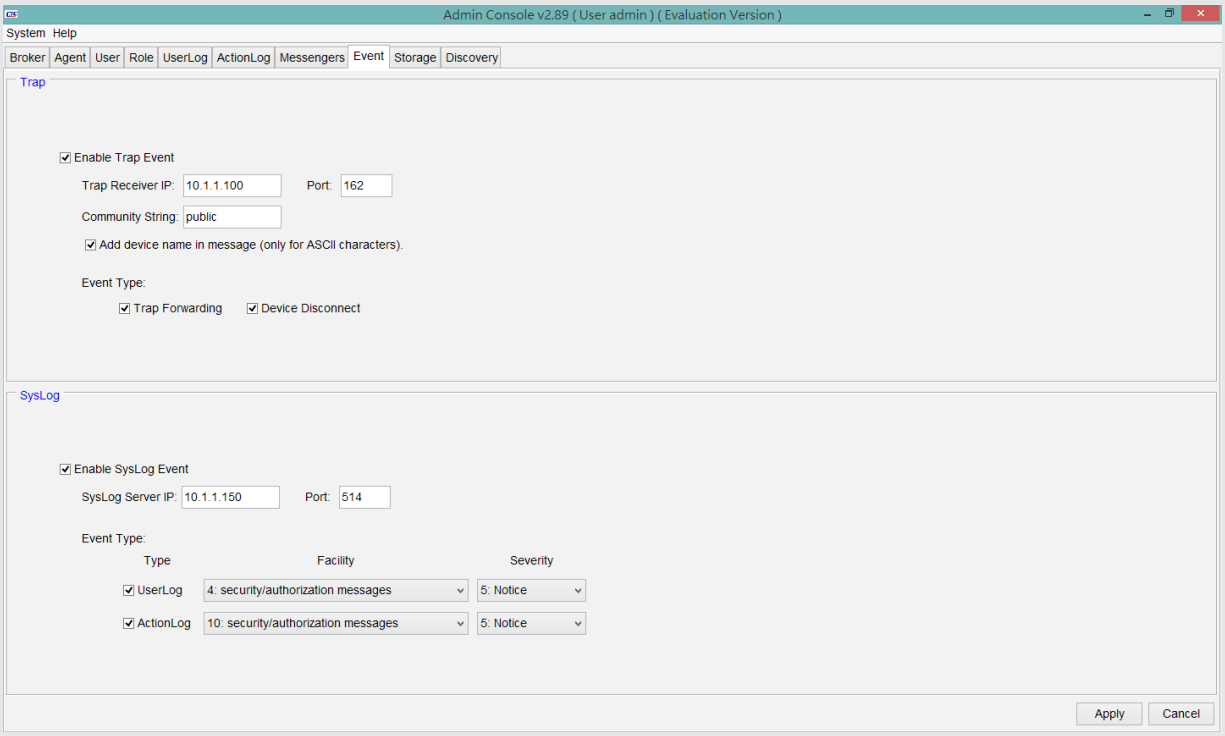
The SmartView™ is capable of sending emails and or SMS text messages to selected administrators when critical alarms occur. Prompt notification of system problems aid in getting problems in the network devices fixed in the shortest time possible.



Alarms Sent by Email & SMS

Trap Fordwarding and Syslog messages

The SmartView is capable of forwarding received traps to upper network management and sending event messages to a syslog server.

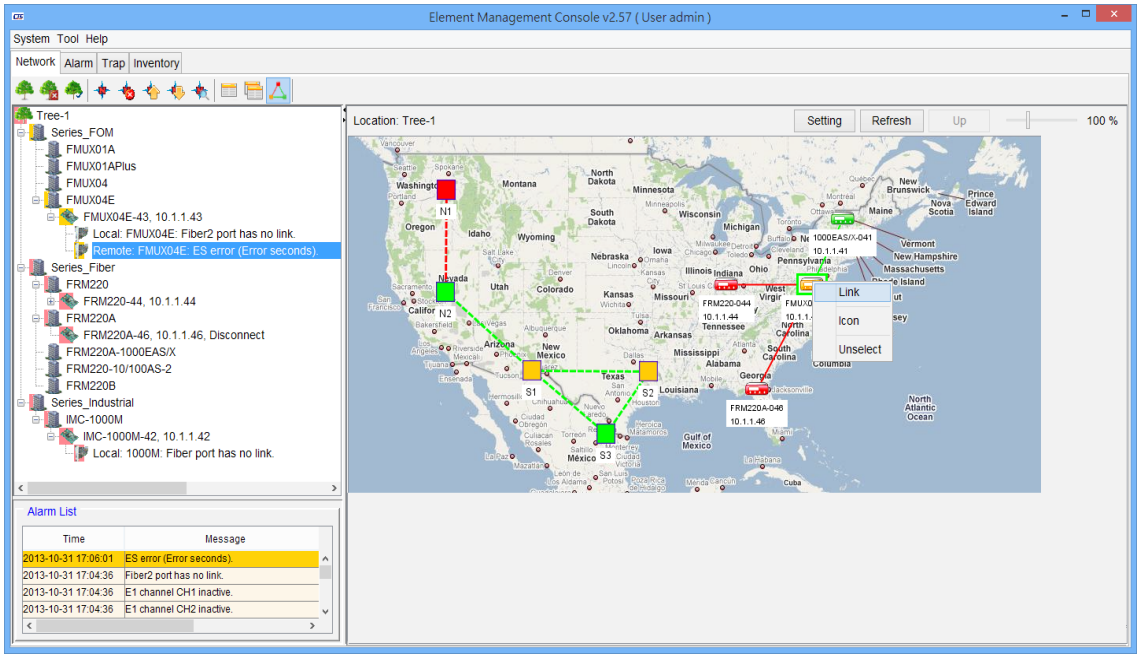


Trap Forwarding Syslog Message

• Configuration Management

Network Topology

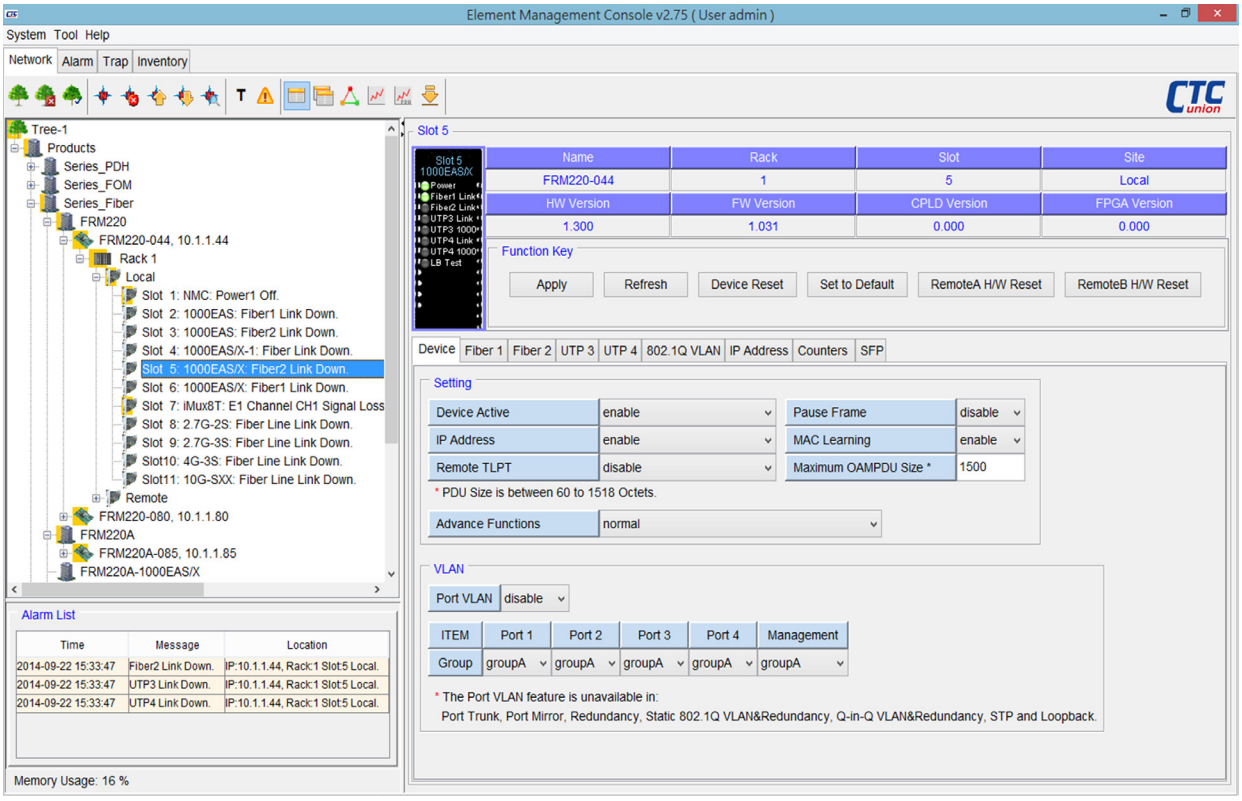
User can load maps to SQL server, load maps from SQL server or delete attached maps. Download procedure is very simple. Map area may be used to layout any objects from Root and Node panel.
Using drag-and-drop, put any object to map area. Any label or network element location name may be added to object. Objects in red color indicate some alarm condition is present in the device. Right clicking an object brings a popup window to select Telnet or http management of the device directly.



Network Topology

Network Element Configuration

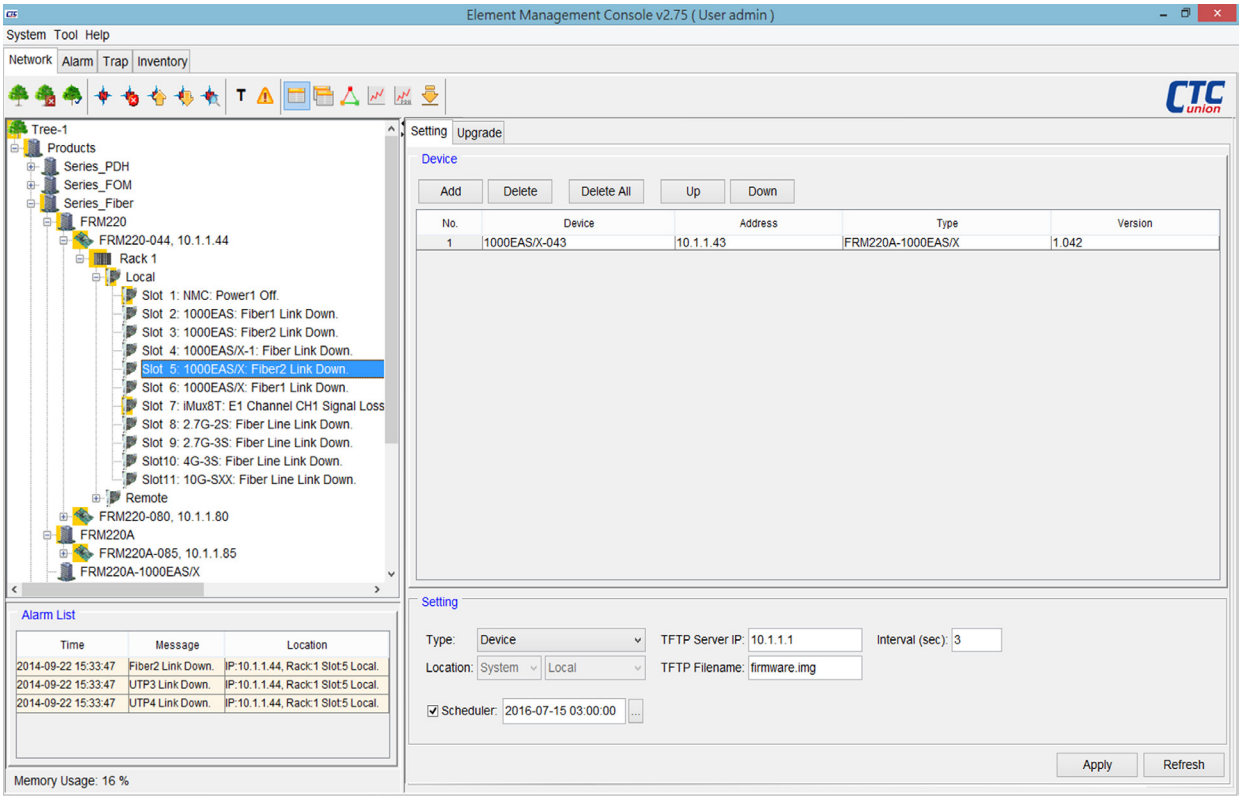
SmartView™ is able to provide a single point of configuration for the device elements. Most settings only require mouse clicks and by using a tab format, most scrolling is eliminated. Current settings and status are displayed along with hardware and firmware versions for each element.



Network Element Configuration

Network Element Firmware Upgrade

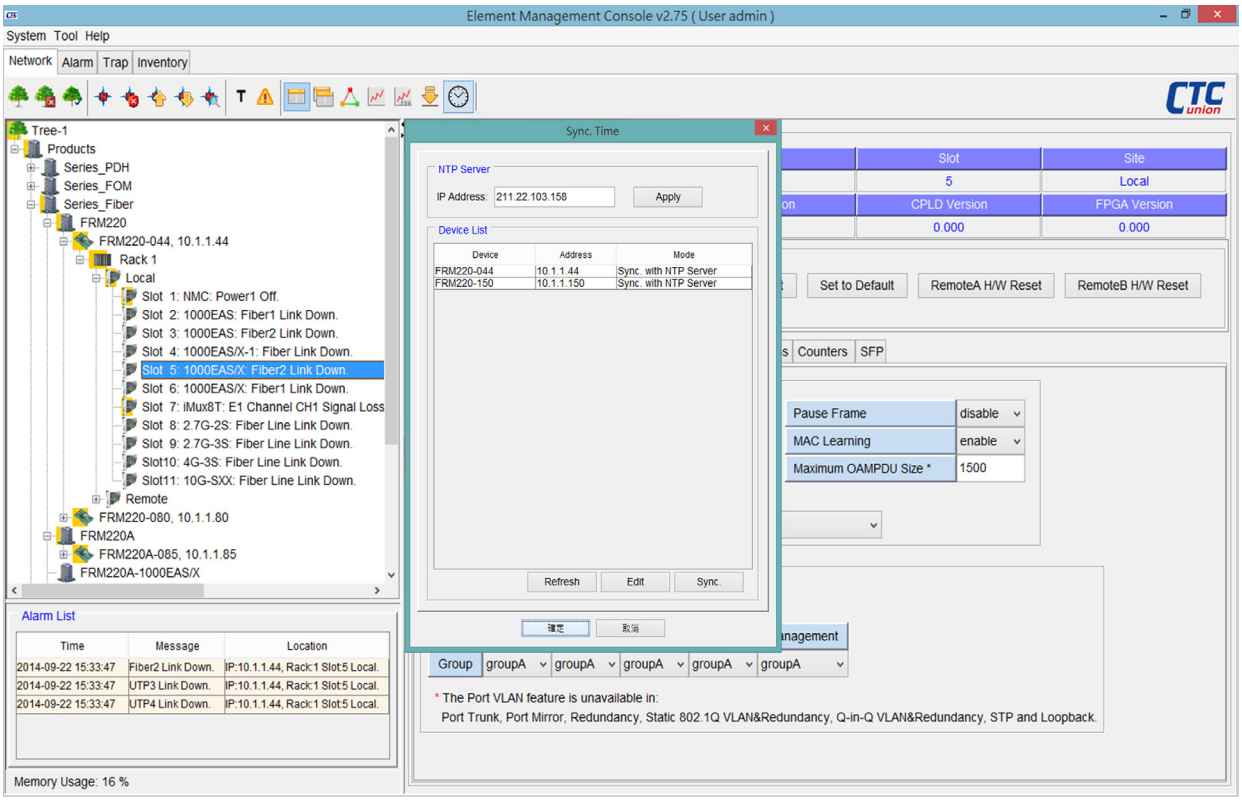
SmartView™ is able to download firmware to device elements and perform configuration backup/restore.



Network Element Firmware Upgrade

Network Element Time Synchronization

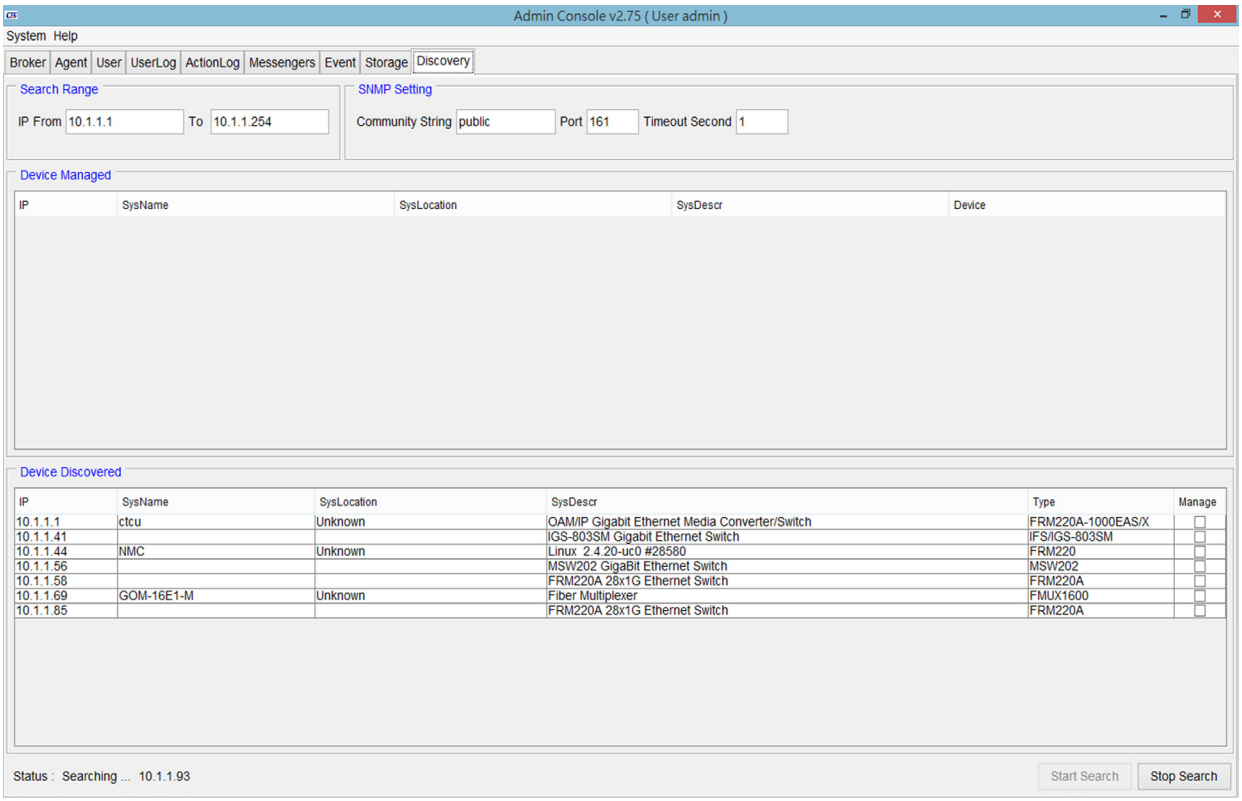
SmartView™ is able to trigger a command to network elements to perform time synchronization with Smartview or a NTP server.



Network Element Time Synchronization

Network Element Discovery

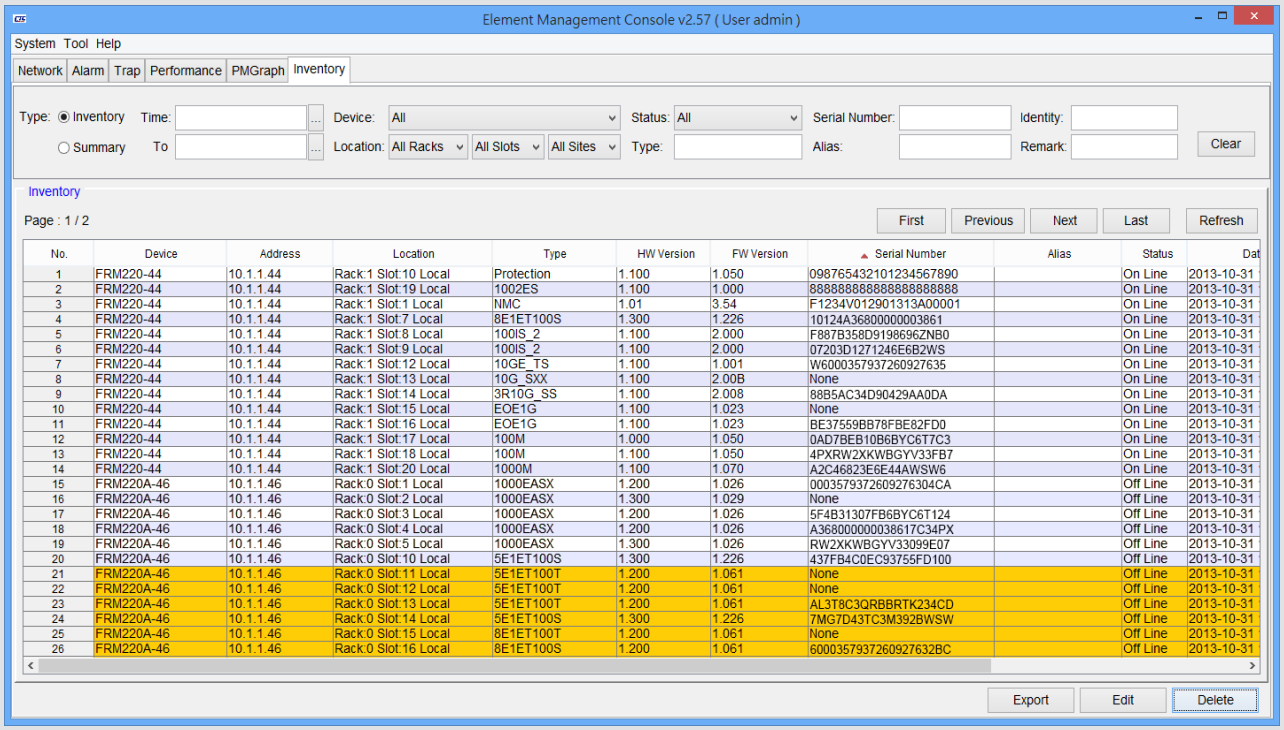
SmartView™ has a tool for automatically discovering SNMP agents on the network. Simply enter an IP address range and the discovery program will ping every IP address looking for SNMP agents. Once discovered, the agents can be selected and brought into the broker for polling.



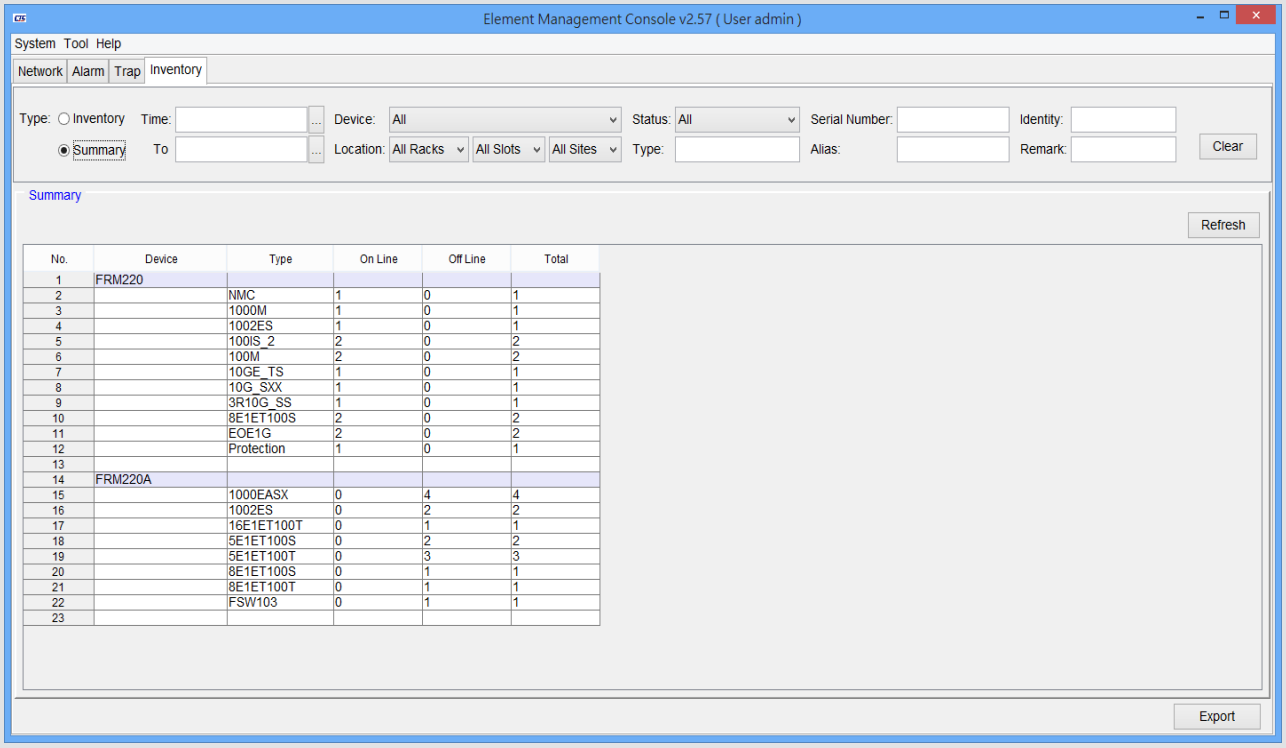
Network Element Discovery

· Accounting Management

The accounting management supports reading a factory programmed serial number specific for each line card. The location, status and serial numbers of all assets can be managed and exported.



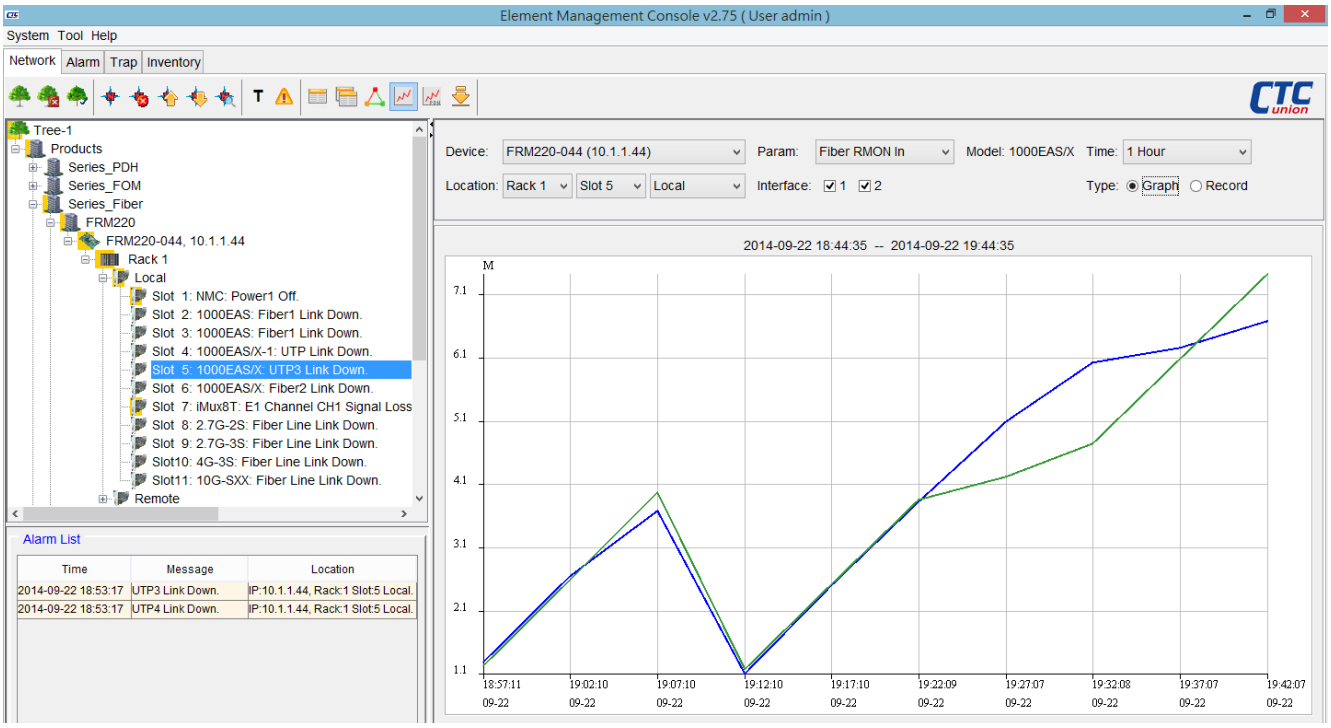
Inventory List



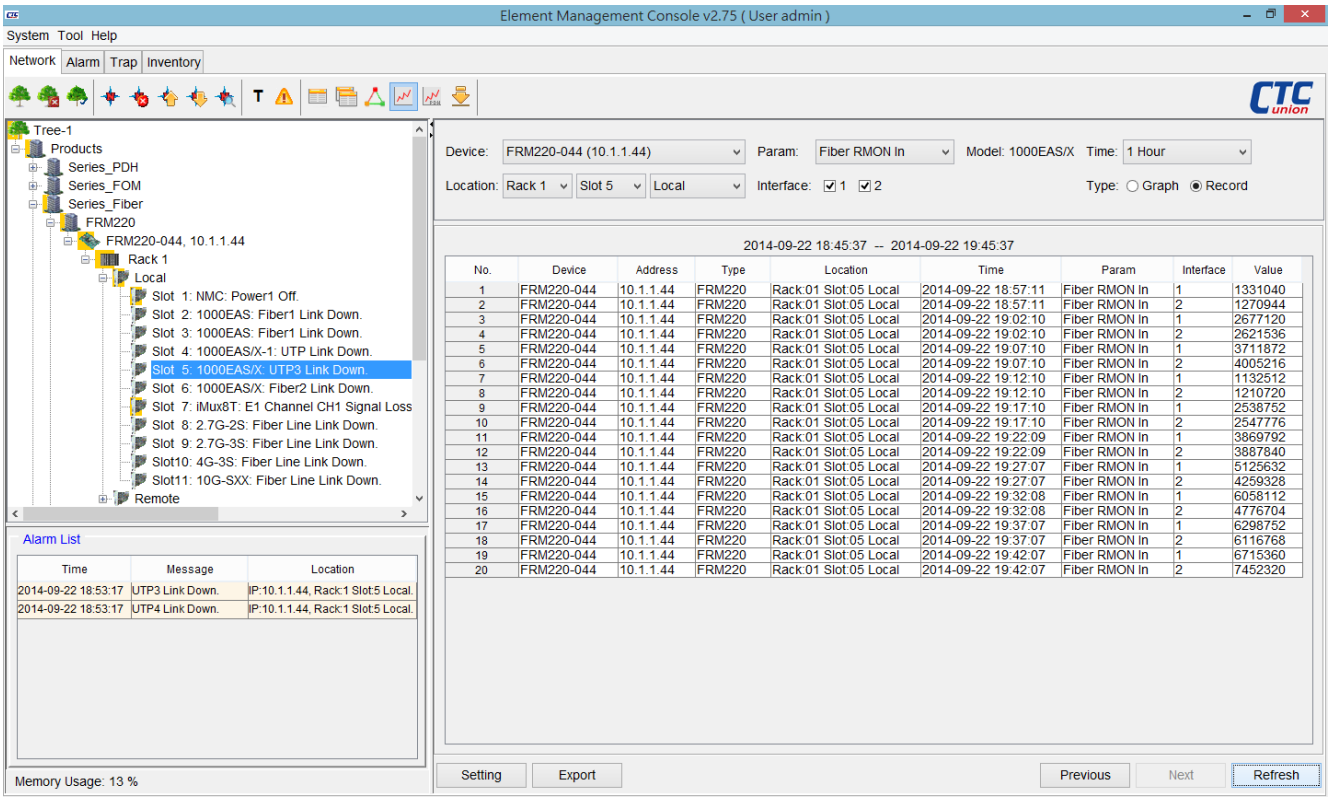
Inventory Summary

▪ Performance Management

SmartView™ is able to monitor device performance parameters through polling of specific OIDs. Graphs of performance information (for example PDH PM data such as ES, UAS, etc. as well as hardware parameters such as fan speed, temperature, optical Tx/Rx power or RMON counters) can be generated on an X Y axis showing different trend data.



Performance Graphics

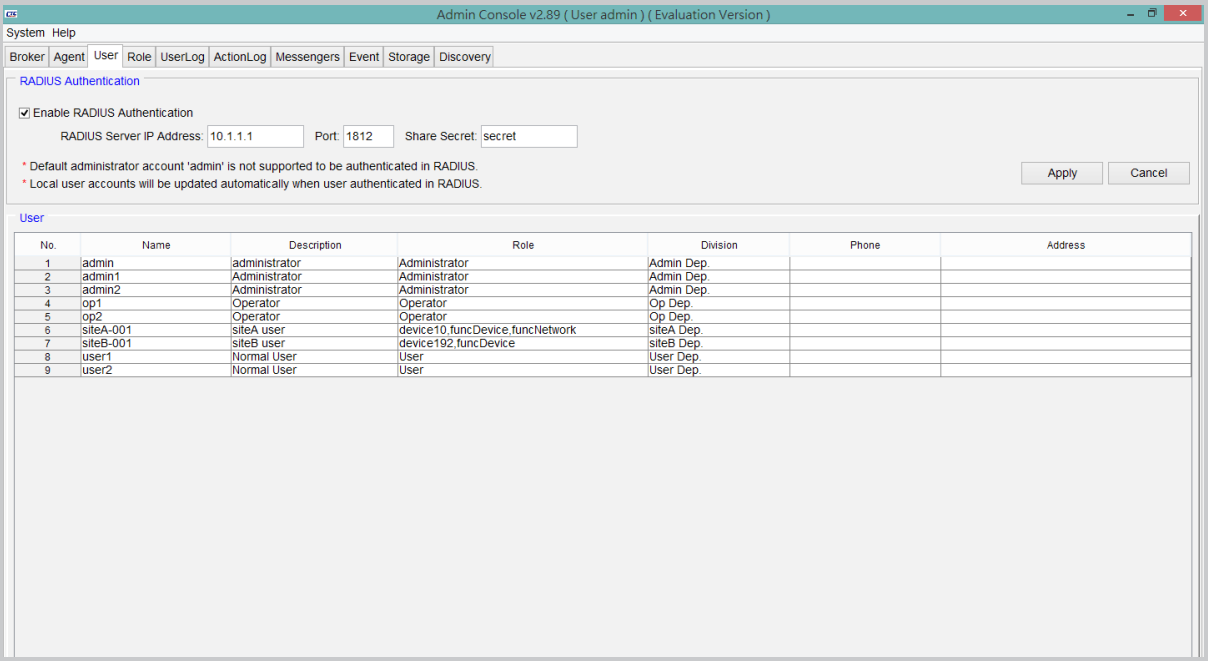


Performance Records

▪ Security Management

User Privilege

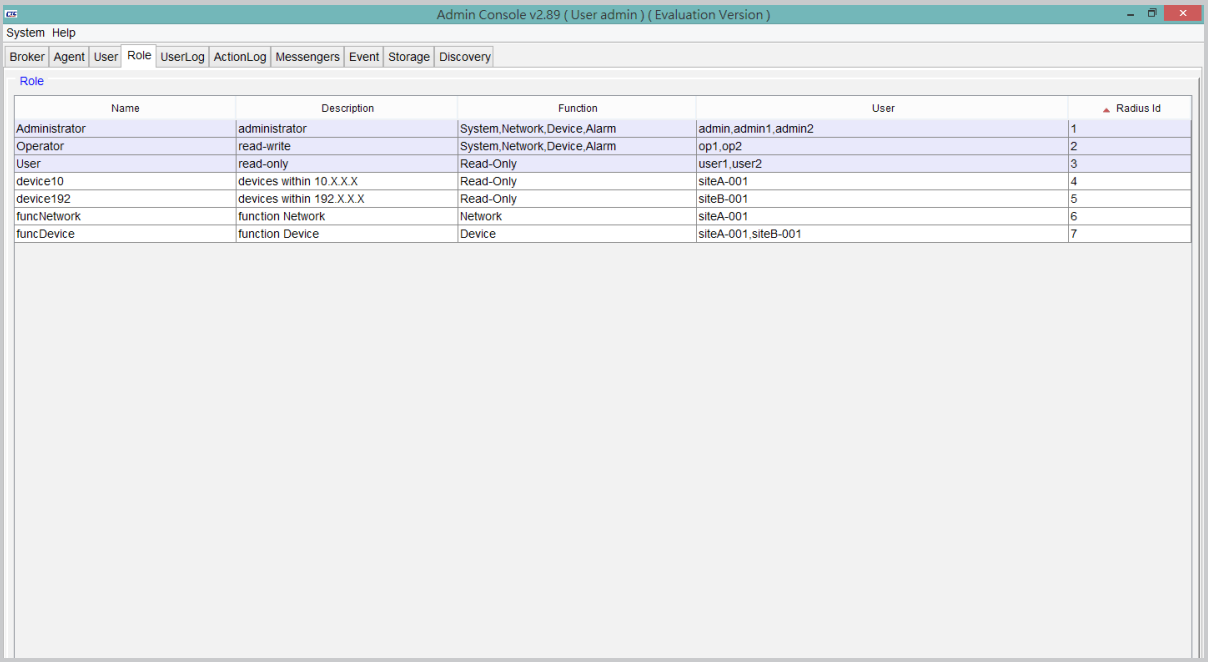
- The administrator can add necessary user logins with specific privileges, from Administrator to Operator and lastly to normal user.
- Radius Authentication. Supports authentication login provided by credentials stored on RADIUS server.



User Privilege

User Role

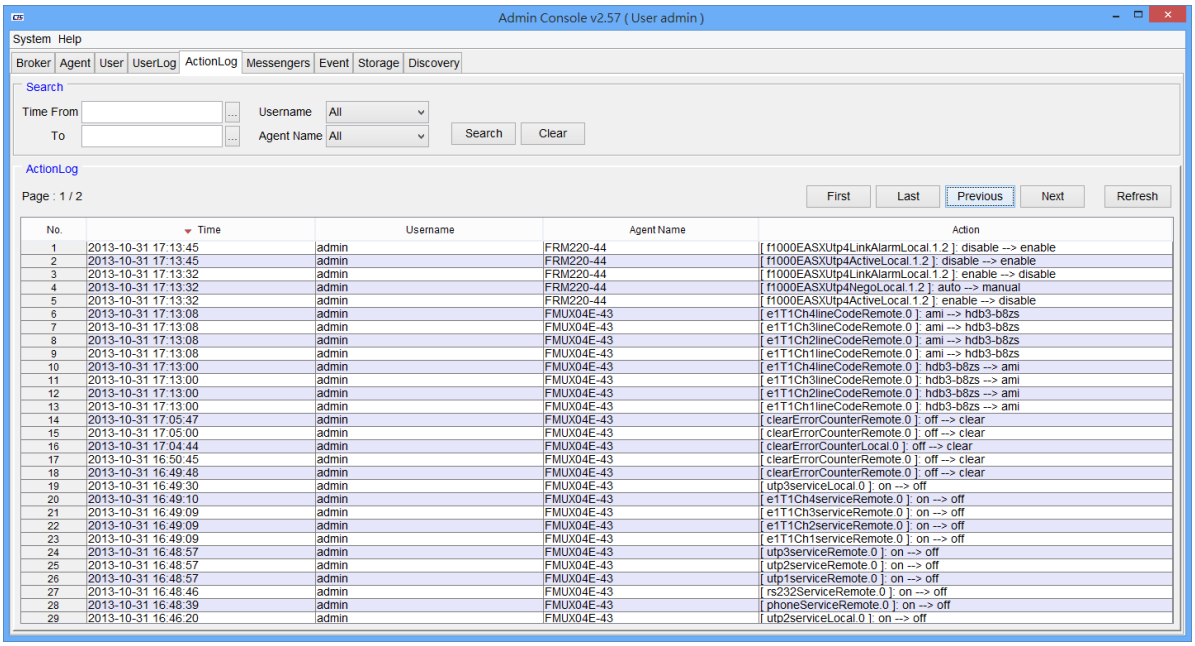
A user role is a group and defines privileges for users to perform management tasks. The access to network elements is also restricted by user role.



User Role

User Activity

Provides viewing and clearing of the user login and configuration action logs.
User client login & logouts are recorded, including the client's source IP address. All activities performed on any Device Element are logged with time-stamping, the user making changes and the changes made.



User Activity

System Requirements

SmartView™	Hardware (minimum)	Software	Operating System
SmartView™ Server	Intel Core2 or higher processor, 2GB RAM, 40GB HD	JAVA JRE. SmartView™ Kit. MS-SQL Server	Windows Server 2012/2014, Win 7/8/10
SmartView™ Clients	Intel Core2 or higher processor, 2GB RAM, 20GB HD	JAVA JRE. SmartView™ Kit.	Windows 7/8/10
All-In-One	Intel Core2 or higher processor, 4GB RAM, 80GB HD	JAVA JRE. MS-SQL Server. SmartView™ Kit. SmartView™ Server/Client	Windows Server 2012/2014, Win 7/8/10

Ordering Information

SmartView™ EMS Server for Max 2000 IP address nodes

Model Name	Description
SV1-AGT-50	SmartView™ management software with 50 nodes (by IP address)
SV1-AGT-100	SmartView™ management software with 100 nodes (by IP address)
SV1-AGT-200	SmartView™ management software with 200 nodes (by IP address)
SV1-AGT-500	SmartView™ management software with 500 nodes (by IP address)
SV1-AGT-1000	SmartView™ management software with 1000 nodes (by IP address)
SV1-AGT-1500	SmartView™ management software with 1500 nodes (by IP address)
SV1-AGT-2000	SmartView™ management software with 2000 nodes (by IP address)

Access Transmission Solution

iAccess™ Multi-Service Platform

iAccess™ Ethernet Aggregation Platform (10G uplink)

- Mobile Fronthaul & Backhaul for 4G LTE
- 40G Ethernet for Data Center
- Carrier Ethernet (NID & EDD)
- CWDM & DWDM
- Booster EDFA

iAccess™
Ethernet Aggregation Platform
-FRM220A Series
IP Based Ethernet Aggrgation Platform-FRM220A-CH20

The FRM220A series is a IP based Ethernet aggregation platform, which incorporates a 24+4 port L2 Gigabit Ethernet switch (FRM220A-GSW/SNMP) or a new 20+4 port L2 Gigabit Ethernet switch with 4x10Gigabit uplink (FRM220A-GSW/SNMP-10G). The FRM220A has a built-in Gigabit Ethernet backplane to interconnect the Ethernet access and E1 TDM based inverse multiplexer module cards with the FRM220-GSW/SNMP card. The L2 switch card supports many advanced Layer 2 switch technologies including port and tag based VLAN, QoS, LACP, RSTP to name just a few. The FRM220A chassis solution significantly lowers the OPEX for operator and service provider when deploying fiber access networks.

Specifications

Connectors	Consoles RS232 (DB9)	
	LAN 10/100Base-TX RJ45	
Physical Specifications	Dimensions	303 x 438 x 88 mm (D x W x H)
	Weight (w/o Power)	5.2kg
Power	AC	18~240VAC
	DC24	18~36VDC
	DC48	36~72VDC

Temperatures	Operating 0~60°C
	Storage -10~70°C
Humidity	5%~90% non-condensing
MTBF	65,000 hrs
Certification	FCC Class A, VCCI Class A, CE, RoHS compliant

FRM220A Module Cards

The product lists designed to be adequately to the FRM220A-CH20 Ethernet aggregation application such as Ethernet access, EDD and Ethernet over PDH are included.

Ethernet Switch

FRM220A-1002ES
2x 10/100/1000Base-T + 2x100/1000Base-X Managed Switch *(refer to page 3-31)*

FRM220A-1000EAS/X
2x 10/100/1000Base-T + 2x1000Base-X OAM/IP Managed Switch *(refer to page 3-32)*

EDD

FRM220-MSW202
2x GbE, RJ45 + 2x Dual Rate L2+ OAM Managed Switch *(refer to page 3-27)*

FRM220-MX210
2x 1G/2.5GbE SFP + 1x GbE RJ45 OAM Managed Switch *(refer to page 3-29)*

Inverse Mux

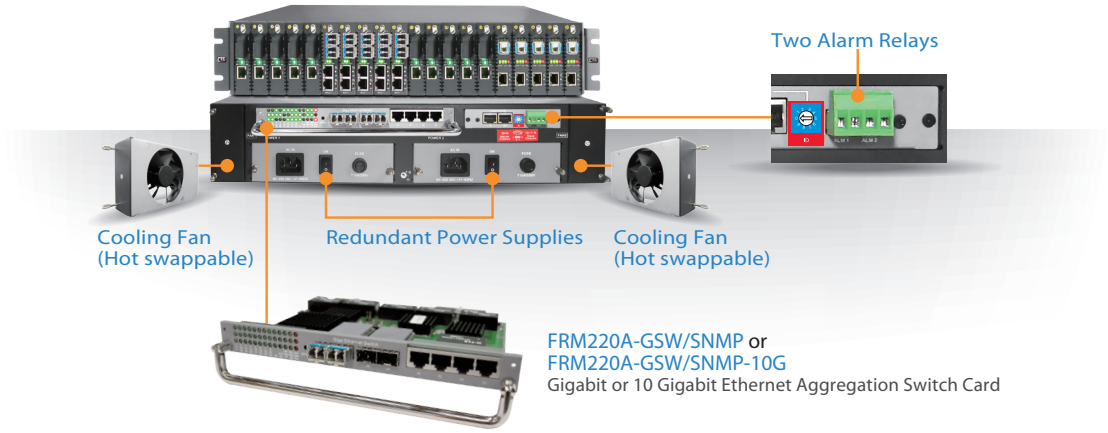
FRM220A-iMux Series
Ethernet over 4/8/16x E1 NTU *(refer to page 3-44)*

Ethernet over E1 Converters

FRM220A-Eoe1/G(S)
Ethernet Bridge over E1 (GFP) *(refer to page 3-52)*

FRM220A-Eoe1
Ethernet Bridge over E1 *(refer to page 3-53)*

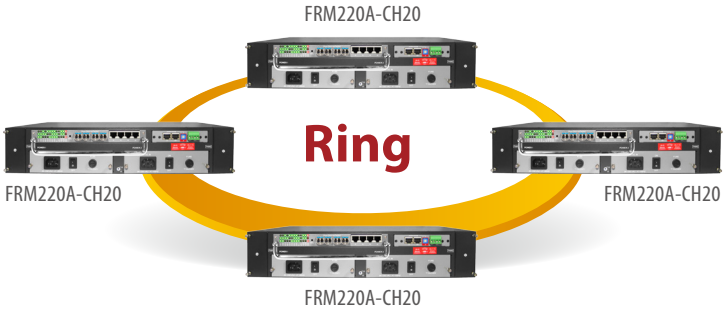
Chassis Overview



Benefit of FRM220A Chassis Platform

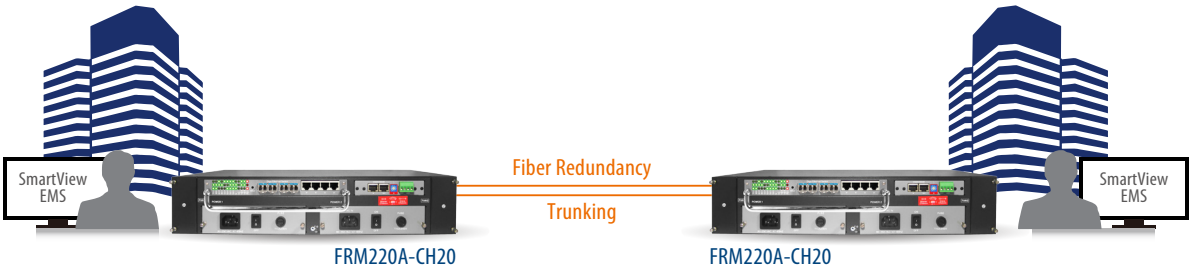
Enabling IP Transportation Protection Mechanism - *STP/RSTP Featured Ring Protection*

- Standard based but advanced fault protection systems
- Rapidly recovery path from failed connection (1-2 seconds min. recovery time)

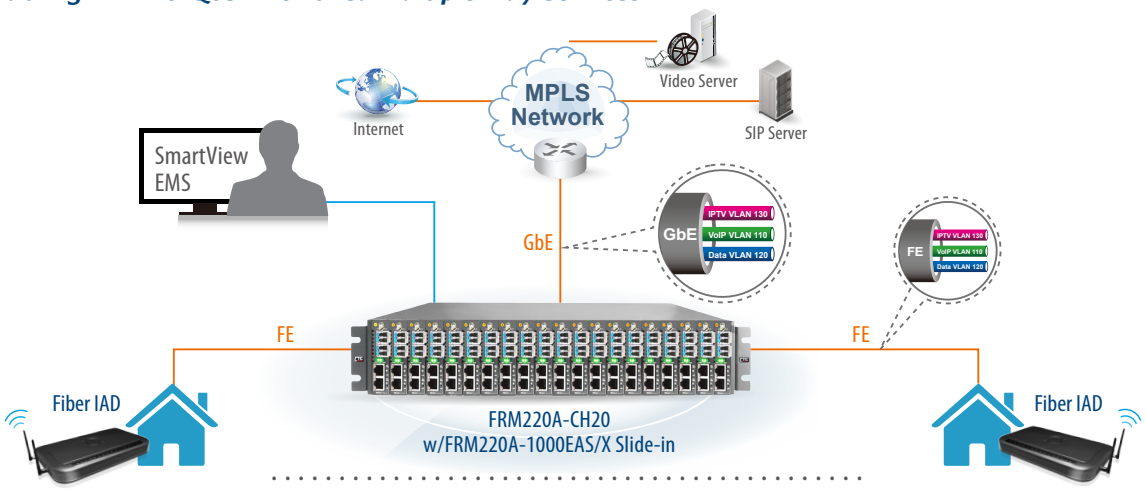


LACP Enabled Traffic Aggregation - *Fiber Redundant / Trunking Application*

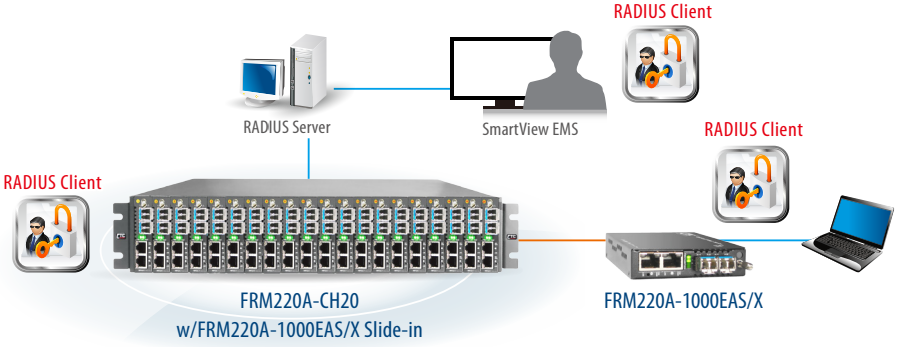
- Dynamically port aggregation or trucking to increase bandwidth between LACP peer devices
- Redundant paths to reduce network fault risk

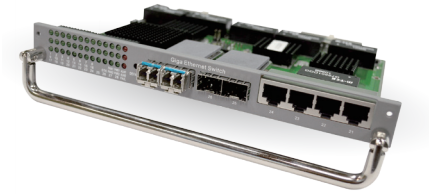


Enabling VLAN & QoS Prioritized Multiple Play Services



Secured Access Control Enhancement - *Centralized Management of Accessing the Network for user or device*

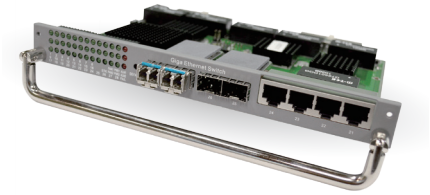




FRM220A-GSW/SNMP-10G

10G uplink Ethernet Aggregation Switch Card

The FRM220A-GSW/SNMP-10G is the next generation management module card of FRM220A chassis. It is built in gigabit Ethernet interface to connect with backplane and link to each slot of FRM220A chassis.
To aim at the Metro Ethernet application, the specifications of FRM220A-GSW/SNMP-10G fully meet the attributes of Carrier Ethernet proposed by MEF (Metro Ethernet Forum). It comply MEF 9 standard to support E-Line/E-LAN service, MEF 14 standard to enable the bandwidth profile configuration delivering SLA (Service Level Agreement) for end-to-end performance characteristics as well as MEF21 to support carrier grade service OAM management rapidly detecting and recovering from the network incidents in real time.



FRM220A-GSW/SNMP

Gigabit Ethernet Aggregation Switch Card

The FRM220A incorporates a 24+4 Gigabit Ethernet Switch. Twenty ports supply each slot of the 2U 20-slot chassis with an electrical gigabit Ethernet uplink with the remaining four electrical gigabit ports accessible via the rear of the chassis. The additional four ports are provided by SFP sockets. All eight Gigabit ports (4+4) are usable without restrictions for uplink aggregate to the Ethernet Metropolitan Area Network (E-MAN). The FRM220A-GSW/SNMP card transmits Ethernet between the subscriber equipment (bridge/modem or network interface card) and the E-MAN. The card provides a user-networking interface with Ethernet packets. This card is capable of providing high bandwidth for assembling Ethernet traffic. The FRM220A-GSW/SNMP card is not only the system aggregate/trunk module, but also the system's control module, providing OAM Management functions.

Features

- Provides chassis aggregation via 4x10Gigabit Base-X SFP+ uplink slots (FRM220A-GSW/SNMP-10G)
- Provides chassis aggregation via 4x1000Base-X SFP uplink slots (FRM220A-GSW/SNMP)
- Supports ITU-T G.8032 Ethernet ring protection (FRM220A-GSW/SNMP-10G)
- Supports IEEE 802.1p HW based 8 priority queues and L2~L4 QoS functions (FRM220A-GSW/SNMP-10G)
- Supports IEEE 802.3ah/IEEE 802.1ag/ITU-T Y.1731 Ethernet OAM features (FRM220A-GSW/SNMP-10G)
- Supports IPv6 management (FRM220A-GSW/SNMP-10G)
- Compliant to MEF 9/MEF 14 standards for E-Line, E-LAN services (FRM220A-GSW/SNMP-10G)
- Fiber optical ports supports ring or chain topology
- Built-in gigabit Ethernet interface to link with each slot of FRM220A chassis
- Provides Web, Telnet, SNMP management interface
- Supports IEEE802.1D/802.1w/802.1s for ring protection on the trunk interfaces
- Supports IEEE 802.1Q tagged VLAN and IEEE 802.1ad Q-in-Q application

Specifications

Trunk Interface	4x 10/100/1000Base-T+ 4x 1000Base-X/2500Base-X GbE switch trunk card (FRM220-GSW/SNMP)
	4x 10G Base-X + T+ 4x 1000Base-X/2500Base-X GbE switch trunk card (FRM220-GSW/SNMP-10G)
	Supports full-duplex mode for 1000Mbps (FRM220A-GSW/SNMP)
	Supports full-duplex mode for 10G Mbps (FRM220-GSW/SNMP-10G)
Capacity	Supports up to 20 service cards
Temperature	0~60°C (Operating), -10~70°C (Storage)
Humidity	5~90% non-condensing

Certification	CE, FCC, RoHS compliant	
Physical Specifications	In-band management	Provides all system OAM functions: software updates, and management system interaction through Ethernet trunk port
	Out-band management	Supports Web, Telnet and SNMP, EMS management
Indications	PWR, FAN, Alarm, STK	
Dimensions	142 x 200 x 26 mm (D x W x H)	
Weight	0.5kg	
MTBF	65,000 hrs	

Ordering Information

Model Name	Type	Description
FRM220A-CH20	Chassis	2U 20-Slot rack mount chassis with 20 line card blank plate
FRM220A-GSW/SNMP	Card	Gigabit Ethernet Aggregate switch card supports web, telnet, SNMP management interface
FRM220A-GSW/SNMP-10G	Card	10G Ethernet Aggregate switch card supports web, telnet, SNMP management interface
FRM220A-AC	Power	Chassis power module 100 ~ 240 VAC, IEC connector
FRM220A-DC24	Power	Chassis power module 18 ~ 36 VDC, 3 pin terminal block
FRM220A-DC48	Power	Chassis power module 36 ~ 72 VDC, 3 pin terminal block

FRM220A – □□□□ (Chassis)
Example: FRM220A – CH20

FRM220A – □□□ / □□□□ (Card)
Example: FRM220A – GSW/SNMP

iAccess™ Multi-Service Platform

In-Band Managed Multi-Service Platform- FRM220-CH20/08/04A

The FRM220 series is a multi-service chassis platform, which provides a reliable solution of high density media converter modules for applications such as telecom operator, enterprise, long haul transmission and factory automation. All of critical components of FRM220-CH20 and FRM220-CH08 chassis such as power modules, fans, management module and interface cards are hot swappable, allowing online field replacement. FRM220-CH04A is a fixed type AC, DC power built-in chassis. The available power options are built-in AC, DC power or built-in AC+DC, AC+AC, DC+DC redundant power.
FRM220 series is offered in three chassis densities, a 2U 20-slot (FRM220-CH20), a 1U 8-slot (FRM220-CH08), and a 1U 4-slot (FRM220-CH04A)

Features

- Supports AC/DC power module hot swappable and power redundancy (CH20 & CH08)
- Supports fixed type AC/DC power built-in and power redundancy (CH04A)
- Two alarm relays contact for critical events warning
- Interface cards are hot swappable
- Chassis backplane consists of passive components

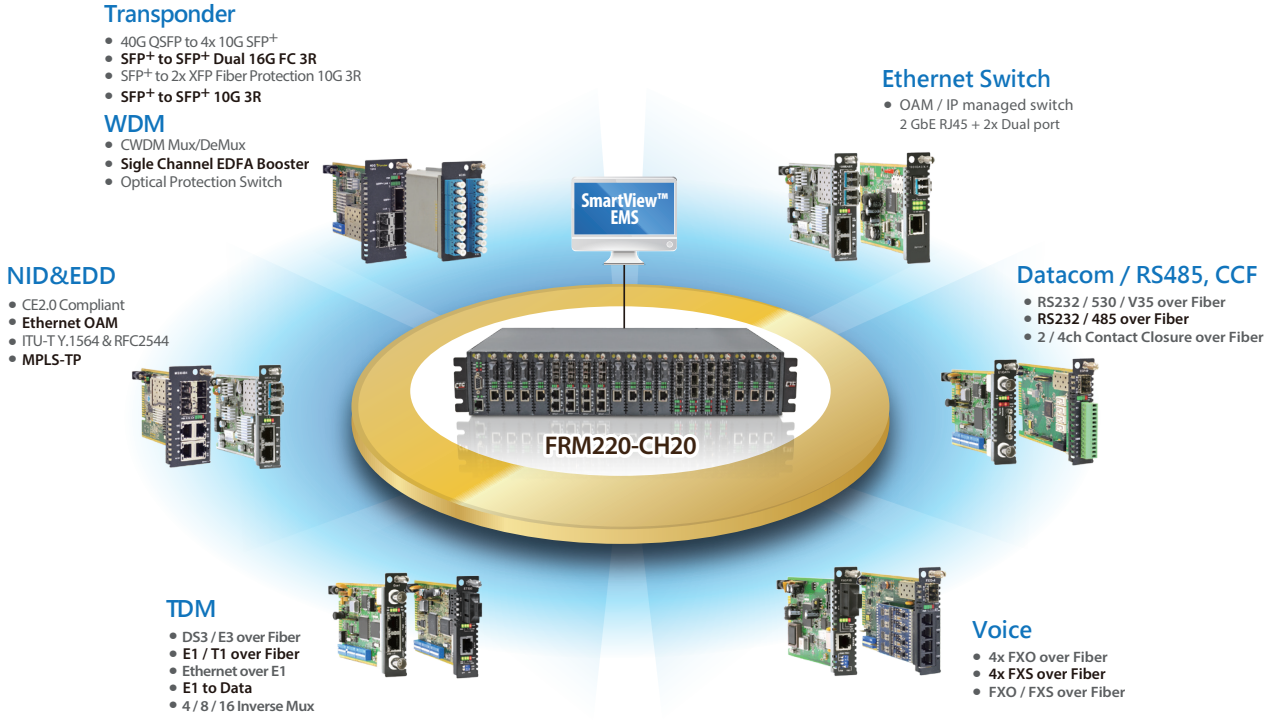
Specifications

Connectors	Console: RS232 (DB9), LAN 10/100Base-TX RJ45	
Physical Specifications	Dimensions (D x W x H)	303 x 438 x 88 mm (CH20)
		310 x 440 x 44 mm (CH08)
		170 x 310 x 44.7 mm (CH04A)
	Weight	5.2kg (CH20), 3.5kg (CH08) (w/o Power)
		1.9kg (CH04AD), 1.5kg (CH04AC/DC)
Temperatures	Operating 0~60°C, Storage -10~70°C	
Power	AC	100~240VAC (CH20/CH08)

Power	DC24	18~36VDC (CH20/CH08)
	DC48	36~75VDC (CH20/CH08)
	AC	90~264V (CH04A)
	DC	18~75V (CH04A)
Humidity	5%~90% non-condensing	
MTBF	65,000 hrs	
Certification	FCC Class A, VCCI Class A, CE	
Safety	UL 60950-1 (FRM220-CH20)	

iAccess Platform Solutions

iAsccess™ Multi-Service Platform solutions offer a full range of solutions for service provider and enterprise, including high density 40G/16G connectivity, DWDM, CWDM, distance extension, Ethernet Switch/NID, Fiber Modem, Fiber Multiplexer and Media Converter. It is a fully modular product series that integrates a wide range of optical transport modules for any interface or protocol hosted in selection of Chassis size for simple and flexible operations.



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Main Features

▪ Module Cards for Deployment Scenarios

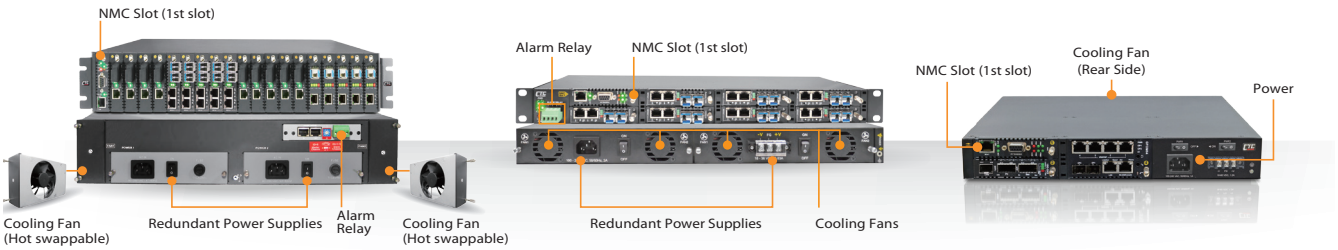
The FRM220-CH20, FRM220-CH08 and FRM220-CH04A have been designed as a Multi-service platform. This allows network administrators to deploy the chassis in a wide range of networks.
Technologies supported by the chassis include Fast/Gigabit Ethernet, E1/T1, V35/X21/RS-530, Serial RS-485/RS-422, Voice FXO/FXS, Repeater, Fiber Multiplexer, E1 Inverse Multiplexer, CWDM Mux/DeMUX EDFA Booster and 40G/16G/10G 3R Transponder

▪ Network Management

The FRM220-CH20, FRM220-CH08 and FRM220-CH04A require a NMC (Network Management Controller FRM220-NMC page: 2-3) card which must be installed into the first slot of chassis. The NMC card allows a network administrator the ability to configure and monitor the status of the blades. Management can be achieved locally over RS232, or over the network by Telnet, Web or SNMP. If the blades support Ethernet in the First Mile (IEEE 802.3ah), then the management module can also be monitored the status of a remote CPE.

Chassis Overview

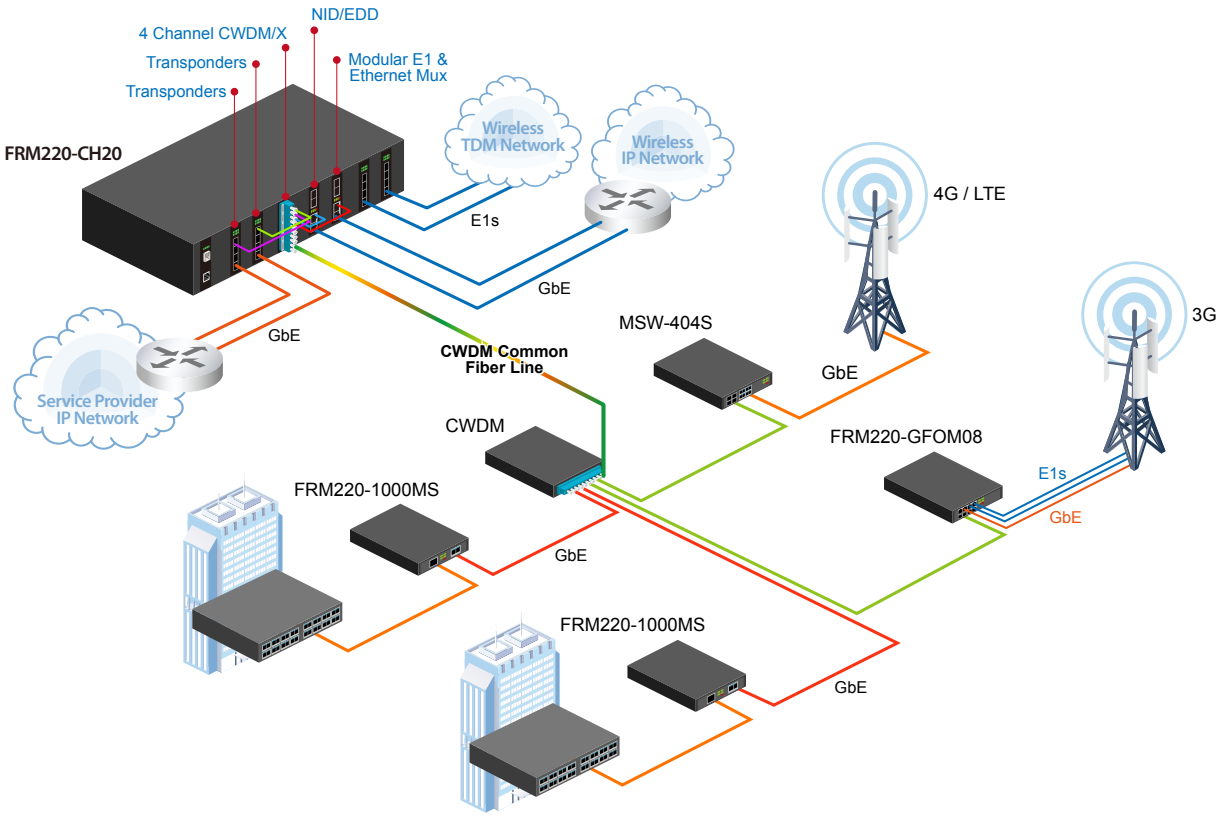
▪ ***FRM220-CH20*** (2U 19" 20 Slots) ▪ ***FRM220-CH08*** (1U 19" 8 Slots) ▪ ***FRM220-CH04A*** (1U 4 Slots)



Applications

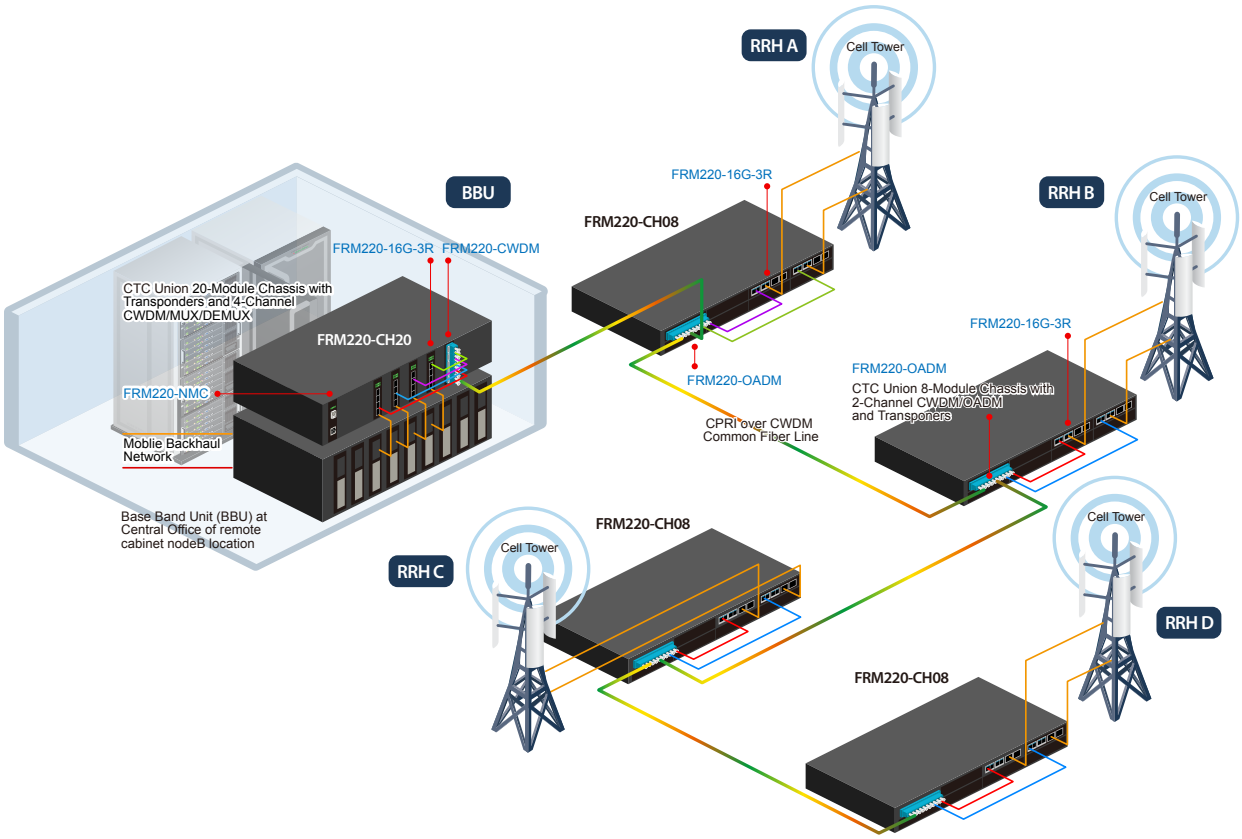
▪ CWDM Telecom Access Network

In this application, the iAccess FRM220 Multi-Service Platform enables a CWDM point-to-point access network incorporating four different services multiplexed over a single fiber link. Two FRM220-1000DS transponders, a MSW-404S NID and FRM220-GFOM08 Fiber Multiplexer are installed in a FRM220 20-slot chassis. There modules are connected with fiber patch cables to a 4-channel CWDM MUX/DEMUX that multiplexes all four channel services over a single fiber link.



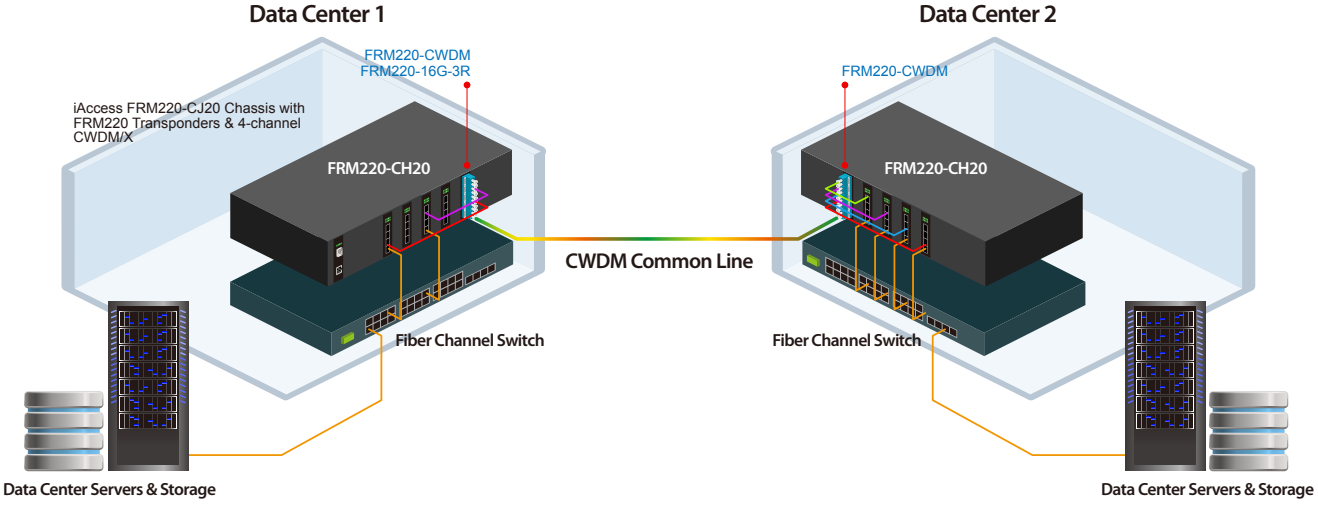
▪ CPRI over CWDM Fronthaul to Cell Towers

This C-RAN application example illustrates how to transport four CPRI (Common Public Radio Interface) channels over one fiber fronthaul link using CWDM (Coarse Wavelength Division Multiplexing). CTC CWDM Multiplexers, CWDM Add+Drop Multiplexers and 3R Transponders enable CWDM connectivity in a C-RAN over a fronthaul fiber link between Base Band Units (BBU) and Remote Radio Heads (RRH) located at two different cell towers.



▪ Data Center Fiber Channel CWDM Interconnect

Data Centers often have a cluster of Storage Area Networks (SAN) servers and storage discs connected using Fiber Channel. Data Centers require high speed connectivity to offsite SANs for transaction storage and database mirroring. To provide redundancy and disaster recovery, SAN from one Data Center can be extended to a SAN in another Data Center. This allows each Data Center to have a mirror copy of its database at each location.



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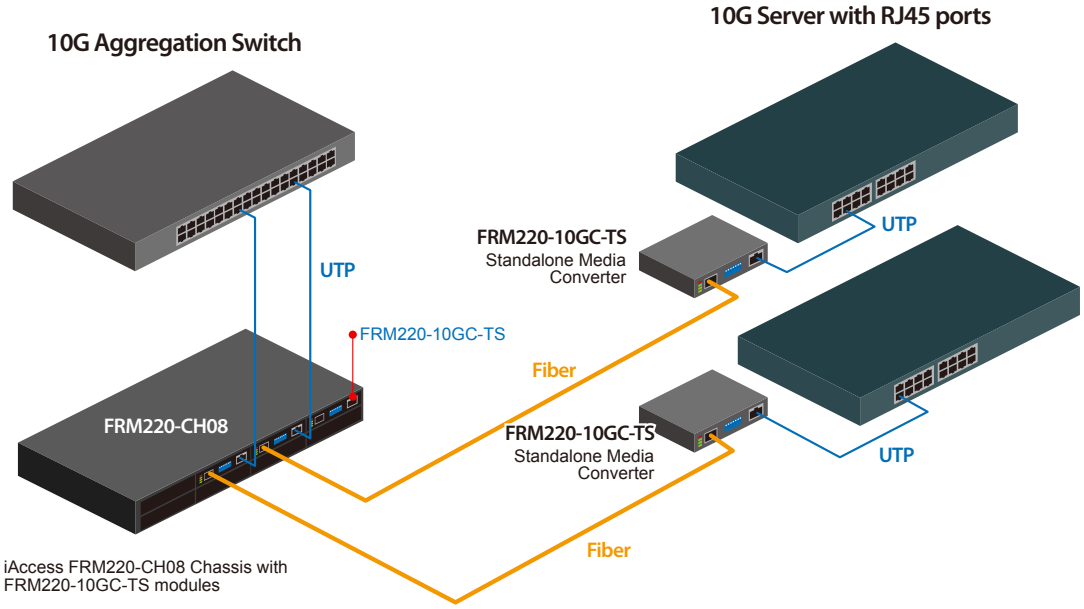
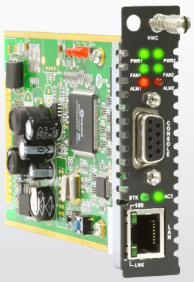
▪ 10 Gigabit Data Center Server Connectivity

CTC Union 10G Ethernet converters provide 10G data center connectivity solutions, including copper to fiber connection between rack servers and switches. In this application, fiber cabling is used to extend distances between 10G switches and servers. 8-Module chassis with 10G Ethernet converters is used to convert the CAT-6A cabling from the RJ-45 ports on the aggregation switch to fiber. The 10G Ethernet converter supports SFP+ transceiver and can achieve fiber distances of up to 80km.



Ordering Information

Model Name	Type	Description
FRM220-CH20	Chassis	2U 20-Slot rack mount chassis with 20 line card blank plate
CH20-AC	Power	Chassis power module 100 ~ 240 VAC, IEC connector
CH20-DC24	Power	Chassis power module 18 ~ 36 VDC, 3 pin terminal block, 200W
CH20-DC48	Power	Chassis power module 36 ~ 72 VDC, 3 pin terminal block, 200W
FRM220-CH08	Chassis	1U 8 slots rack mount chassis with 8 line card blank plate
CH08-AC	Power	Chassis power module 100 ~ 240 VAC, IEC connector, 180W
CH08-DC24	Power	Chassis power module 18 ~ 36 VDC, 3 pin terminal block, 200W
CH08-DC48	Power	Chassis power module 36 ~ 72 VDC, 3 pin terminal block, 200W
CH04A-AC	Power	Four slot chassis with built-in AC power, 65W
CH04A-DC	Power	Four slot chassis with built-in DC power, 50W
CH04A-AD	Power	Four slot chassis with built-in AC+DC power (65W/50W)



FRM220-NMC

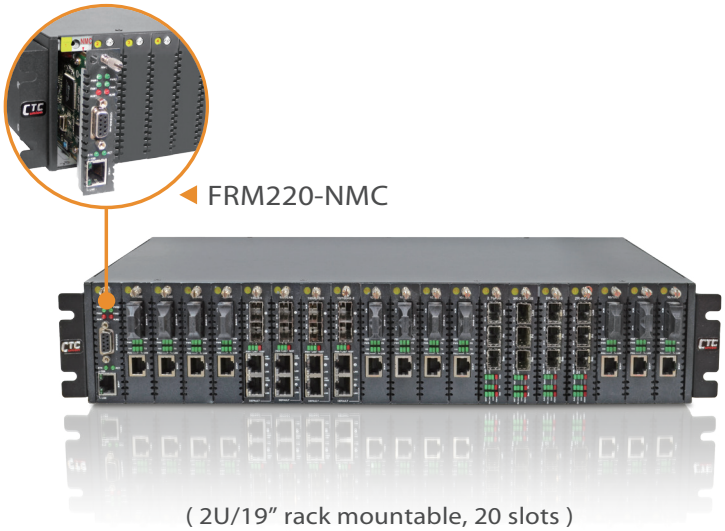
Network Management Controller

The FRM220-NMC is a Network Management Controller card that can be placed in a compatible FRM220 series chassis to provide device management functions. The management interface supports a local RS-232 serial console or remote TCP/IP management by Telnet, HTTP and SNMP protocols. The card is designed to be hot swapped so that it may be field replaced without affecting any online service of any other rack cards. The card also supports online firmware upgrade from TFTP server, using any user interface, without affecting any other inserted line card's transmissions. Support for any standard NMS is provided by the included enterprise MIB file. CTC Union also provides and maintains our own EMS (Element Management System) which is a Java based client/server manager for monitoring and maintaining a large number of network elements over a long period of time.

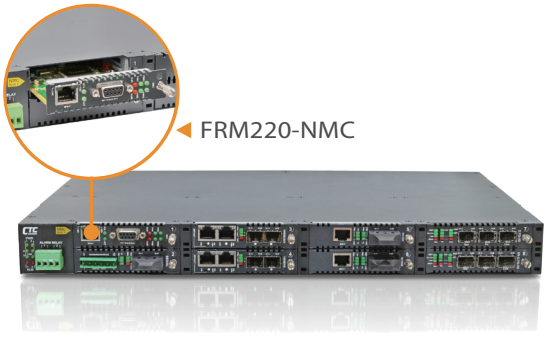
Features

NMC provides central management for FRM220-CH20, FRM220-CH08, FRM220-CH04A and CH02-NMC

- User interfaces for serial console, Telnet & Web
- Configure, monitor and provide fault management for all installed line cards
- Monitor power and fan status in chassis (CH20 & CH08 only)
- Provides upgrade feature for most line card types
- SNMP agent for complete management by enterprise software
- Running System log with time stamping for SNTP (time server)
- Parameter management for quick configuration, configuration copy/backup/restore
- Card alias and inventory by type and serial number
- Linux Kernel based for high stability and reliability



(2U/19" rack mountable, 20 slots)



(1U/19" rack mountable, 8 slots)

(1U, rack mountable, 4 slots)

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Web GUI

The local area screen (Figure 1) is also the home page for the Web management of the NMC. An overview of all installed network interface cards (NIC) is shown with real-time status of LEDs. To enter the configuration screen for a NIC, simply click on the card.

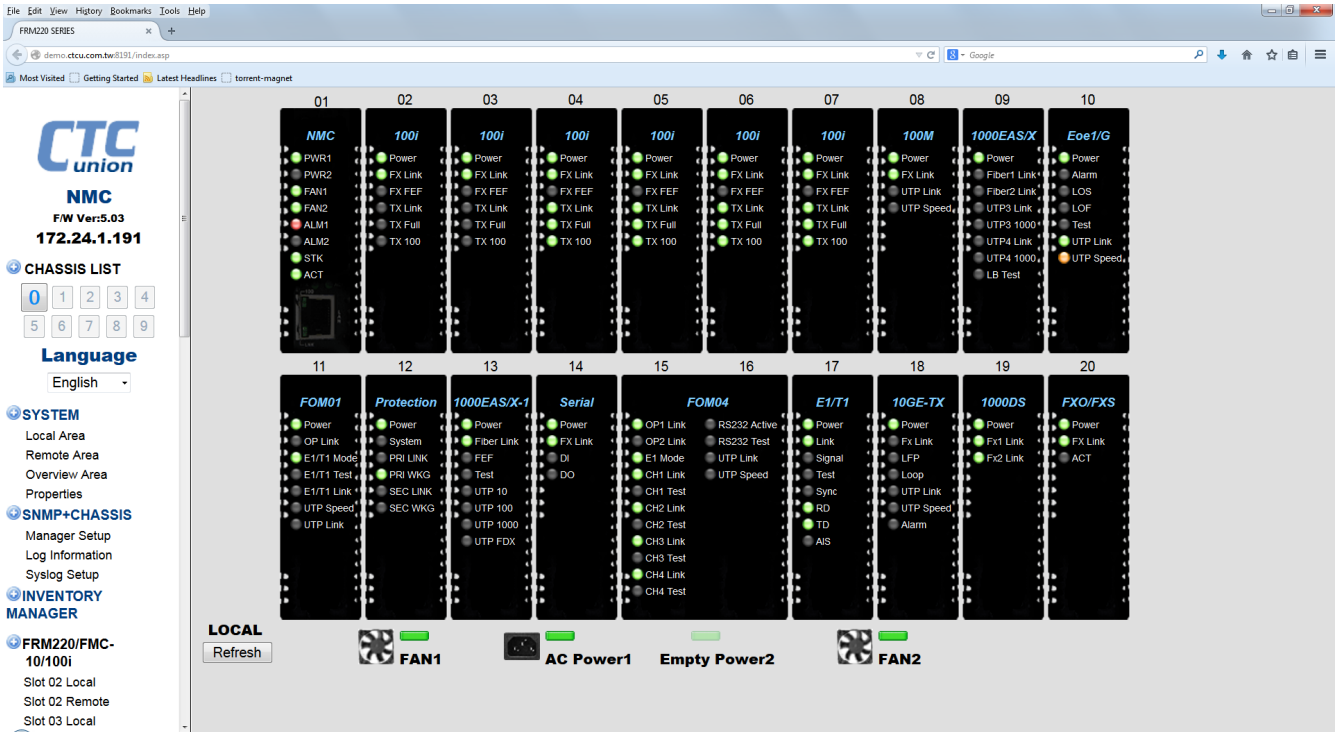

Figure 1

The SNMP+CHASSIS screen (Figure 2) gives a quick overview of the power and fan status in the chassis. This page is also used to assign the alarm conditions for the two programmable alarms. These alarms activate the electrical relays, display messages in the system log and can generate SNMP traps when a trap receiver is configured.

Figure 2

The system setting screen (Figure 3) has the functions for NMC upgrade, line card upgrade, system time and card parameter management.

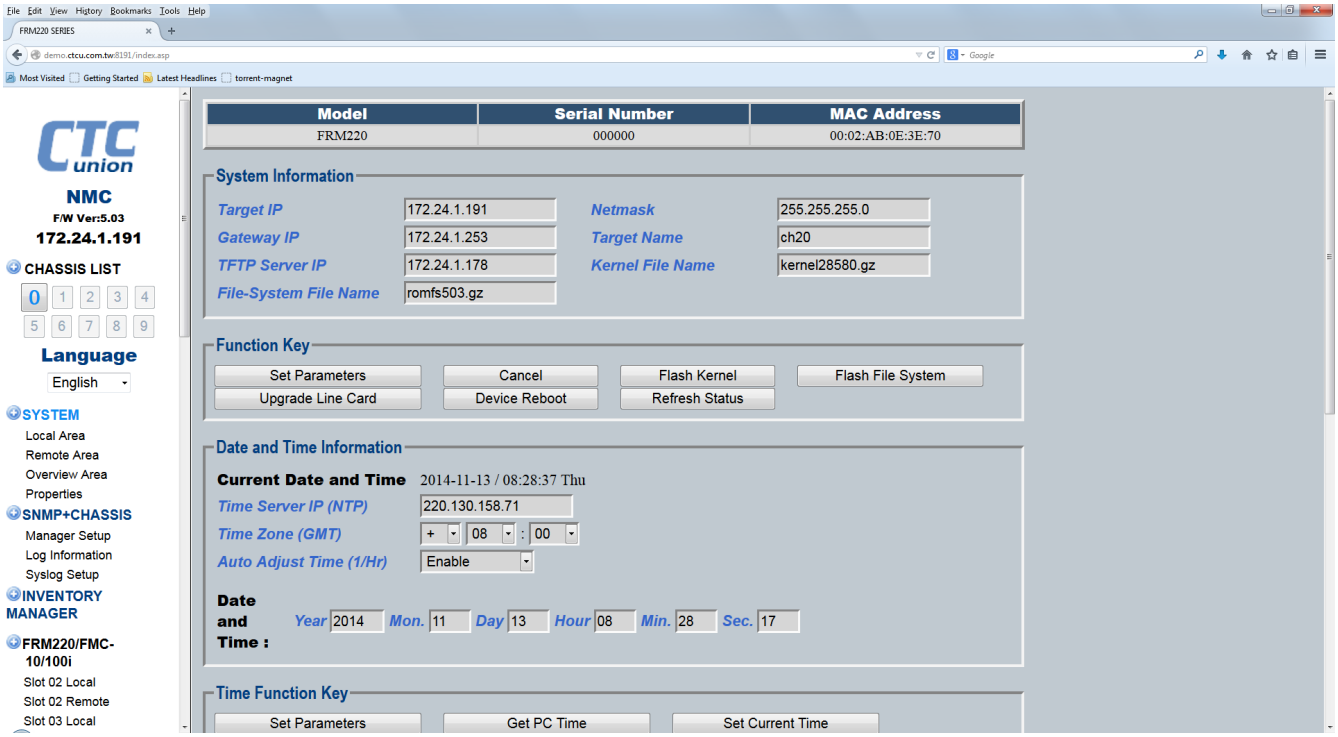

Figure 3

The management (Figure 4) can call up each line card to view detailed status and to make configuration changes to the card. By using a Web GUI, the settings can be made with simple mouse point and click actions.

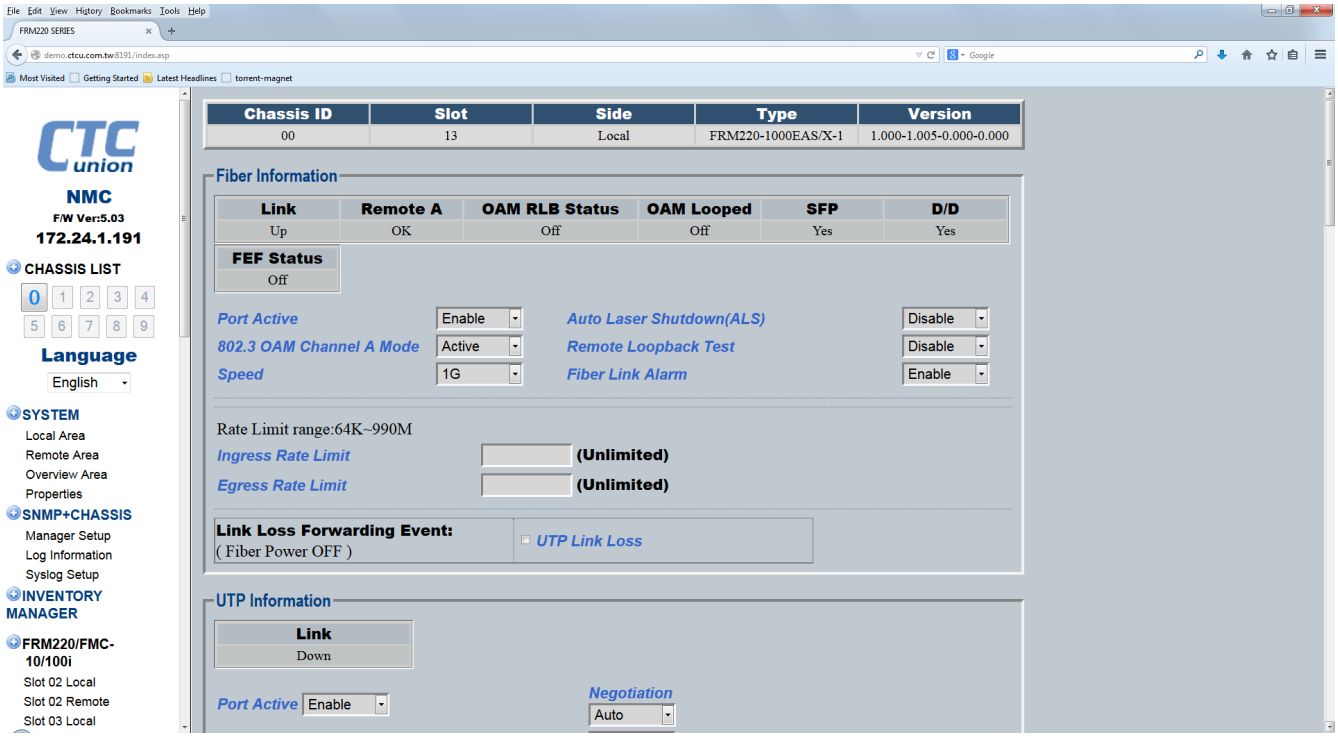

Figure 4

Ordering Information

Model Name	Type	Description
FRM220-NMC	Card	Network Management Controller card, support web, telnet, console, SNMP functions

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Standalone Chassis of FRM220/FRM220A Series

All FRM220/FRM220A series rack mount cards are hot-swappable and can be installed in a 20 slots (2U), or 8 slots (1U) rack-mountable chassis with any combination of redundant hot swappable AC, 24VDC or 48VDC power supplies, providing a scalable solution that is space-efficient and cost-effective. The rack mount cards can also be mounted in 4 slots, 2 slots, or 1 slot standalone housing with fixed AC/DC powered chassis.

The rack mount cards of FRM220/FRM220A series provide telecommunication solutions for most applications. CTC union offers a universal and cost-efficient transmission series for a variety of fiber optic technologies (Multimode, Single mode, WDM, CWDM) starting from converters and switches, to modems and extending to intelligent voice/data multiplexer systems. The products are designed as rack mount cards in combination with various chassis types. The concept is to ensure an extremely variable mixture of products at low storage costs for spares.

Power Build-in Type (1, 2 or 4 slots with optional wallmount, console / RS232, NMC(SNMP), AC/DC Power options)

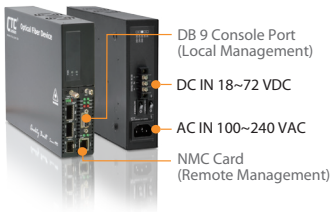
FRM220-CH01-AC(DC or AD)

FRM220-CH01M

FRM220-CH02M & CH02M-2

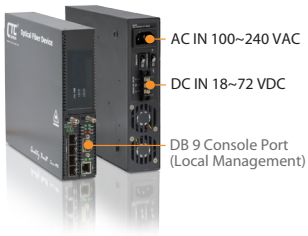
- Cooling Fan (CH02M) : 30 Watt
- Fanless (CH02M-2) : 12 Watt

FRM220-CH02/NMC

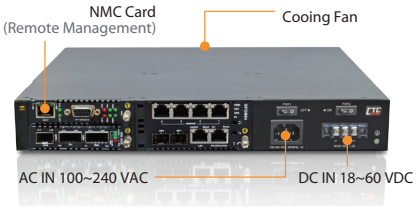


FRM220-CH02/SMT

- Power & Cooling Fan Failure Alarm Detection



FRM220-CH04A



Adapter Type (1 slot with optional wallmount)

FRM220-CH01

Features

- Fanless (CH01, CH01M, CH02M-2)
- Cooling Fan (CH02M, CH02/NMC, CH04A, CH02/SMT)
- Supports DB9 console port for local management (CH01M, CH02M, CH02M-2)
- Telnet, Web, Console, SNMP management via NMC Card (CH04A, CH02/SMT)

Power Type:

- External Power: DC12
- Internal Power: AC, DC, AD, AA or DD redundant power (option)

Specifications

Power Input (Option)	External Adapter	Input Voltage 100~240VAC 50/60Hz
		Output Voltage 12VDC 1A
	Internal Power	CH01/02 Series: AC: 100~240VAC DC: 18~72VDC
		CH04A: AC: 100~240VAC DC: 18~60VDC
Weight	0.5~0.8kg (CH01) , 0.9kg (CH01M)	
	1.3kg (CH02M), 1.2kg (CH02M-2), 1kg (CH02/NMC), 1.5kg (CH04AC/DC), 1.9kg (CH04AD)	
	1.46kg (CH02/SMT)	

Dimensions (D x W x H)	External Adapter	139x 23.2x 88mm (CH01)
	Internal Power	180x 30x 135mm (CH01)
		185x 30x 135mm (CH01M)
		222.7x 45.5x 167.4mm (CH02M, CH02M-2, CH02/NMC)
		170x 310x 44.7mm (CH04A)
		220 x 205 x 44.7 mm (CH02/SMT)

FRM220 Slide-In Card Chassis Order Information

Model Name	Description
CH01	1 Slot Chassis with 100 ~240VAC to 12VDC Adapter, Fanless
CH01-AC, DC, AD	1 Slot Chassis with AC: 100 ~240VAC DC: 18 ~72VDC or Dual Power (AC+DC), Fanless
CH01M-AC, DC, AD	1 Slot Chassis with Console port and AC: 100 ~240VAC, DC: 18 ~72VDC or Dual Power (AC+DC), Fanless
CH02M-AC, DC, AD	2 Slots Chassis with Console port and AC: 30W 100 ~240VAC, DC:30W 18 ~72VDC or Dual Power (AC+DC), with Cooling Fan
CH02M-2-AC, DC, AD	2 Slots Chassis with Console port and AC:12W 100 ~240VAC, DC:12W 18 ~72VDC or Dual Power (AC+DC), Fanless
CH02/NMC (S)-AC, DC, AD	2 Slots Chassis with NMC card and AC: 30W 100 ~240VAC, DC: 30W 18 ~72VDC or Dual Power (AC+DC), with Cooling Fan
CH02/SMT-AC, DC,AD	2 Slots Chassis with optional NMC card and AC: 30W 100~240VAC, DC: 30W 18~72VDC or Dual power (AC+DC), Cooling Fan, with **Power and Cooling Fan Failure Alarm Detection** function
CH04A-AC	4-Slot chassis with built-in AC power 65W
CH04A-DC	4-Slot chassis with built-in DC power 50W
CH04A-AD	4-Slot chassis with built-in AC+DC power (65W+50W)

Optional Accessories

Rack Mounting Ear	Description
CH01-RME01	Single unit Rack Mounting EAR for CH01 power built in and CH01M chassis
CH02-RME01	Single unit Rack Mounting EAR for CH02M and CH02/NMC chassis
CH02-RME03	Single unit Rack Mounting EAR for CH02/SMT chassis

FRM220 – □□□ – □□□□□
Example: FRM220 – CH02–RME01


CH01-RME01
Single Unit Rack Mounting EAR


CH02-RME01
Single Unit Rack Mounting EAR


CH02-RME03
Single Unit Rack Mounting EAR

Note: For CH01/AC/DC/AD, CH01M and CH02M, CH02/NMC chassis

Rack Mounting Tray	Description
CH01-RMT01	19", 3units Rack Mounting Tray for CH01 power built in and CH01M chassis
CH02-RMT01	19", 2units Rack Mounting Tray for CH02M and CH02/NMC chassis


CH01-RMT01
19", 3unit Rack Mounting Tray


CH02-RMT01
19", 2unit Rack Mounting Tray

Wall Mount Kits	Type
CH01-WMK01	Single unit Wall Mounting Kit
CH01-WMK02	Single unit Magnetic Mounting Kit


CH01-WMK01
Single Unit Wall Mounting Kit


CH01-WMK02
Single Unit Magnetic Mounting Kit

Din Rail Kits	Type
CH01-DRK02	Single unit Din Rail Kit

FRM220 – □□□ – □□
Example: FRM220 – CH01–AD


CH01-DRK02
Single Unit Din-Rail

Note: CH01-DRK02 only for Power Build-in Type

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New

FRM220-MP7G1X

7x 1 GE to 10G Muxponder

The FRM220-MP7G1X is a 7x 1GE to 10G Muxponder. Based on TDM technology, the Muxponder transports seven separate Gigabit Ethernet data streams into a 10 Gbps SFP+ Based trunk port. This solution provides significant cost reduction and excellent fiber utilization when compared to CWDM optical multiplexing. The FRM220-MP7G1X incorporates 7x 1GE SFP based access interfaces that can accommodate various types of SFP. Such as Multi-mode, Single mode and 1Gbps copper SFPs. The trunk port is a SFP+ 10Gbps permitting flexible connectivity options between the Muxponders either in a WDM system or directly between two devices. Two types of housings are available for installation in a 19" FRM220 chassis. 20 slots are provided by using the FRM220-CH20 chassis 2U while the FRM220-CH08 1U supports up to 8 modules. Both housings can be monitored and configured through SNMP, Web GUI or Telnet using a NMC management module.

Features

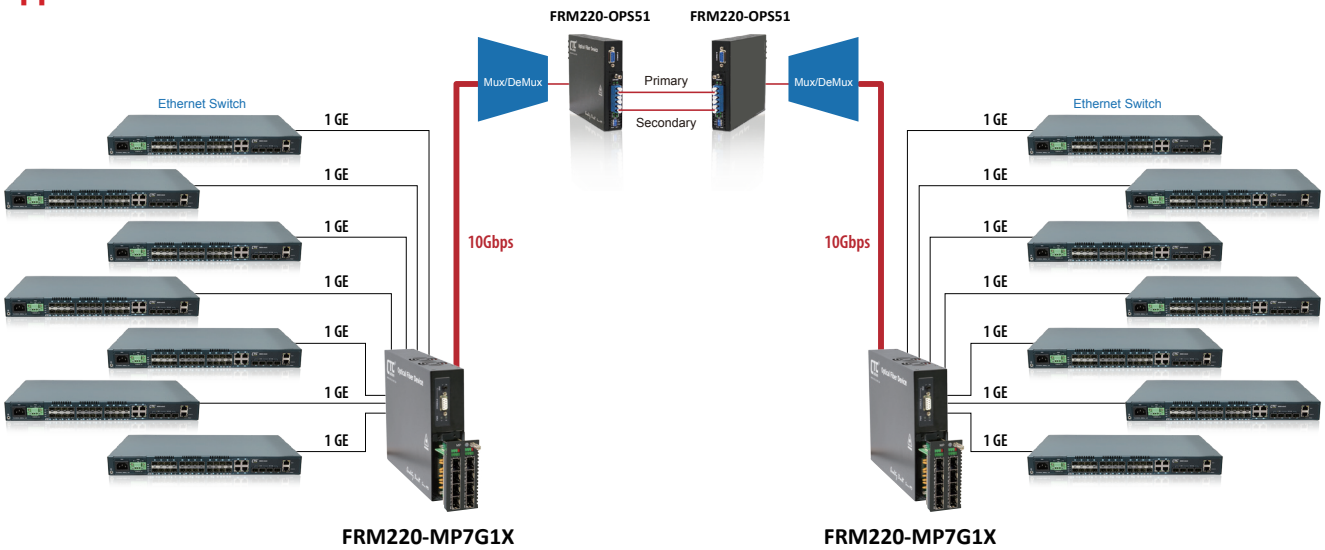
- 7x 1 GE to 10G
- 10 Gbps trunk port rate
- Network management via NMC
- Remotely activated Local or Remote Loopback
- SFP+ Digital Diagnostics monitoring
- Hot swappable
- Supports FRM220-CH02M, CH02/SMT, CH04A, CH08, CH20

Specifications

Access Data Rate	1G Ethernet
Trunk Data Rate	10Gbps
Access Type	10Gbps
Optical parameters	1.25G SFP/ 10G SFP+
Operating Temperature	0 ~ 55°C
Storage Temperature	-10 ~ 80°C

Relative Humidity	10 ~ 90% (non-condensing)
Dimension	Card: 155 x 46 x 88mm (D x W x H)
Weight	300g
Connectors	7x SFP-LC & 1x SFP+ LC
Power Consumption	12W

Application



Ordering Information

Model Name	Description
FRM220-MP7G1X	7x 1GE (SFP) to 10G (SFP+) Muxponder

Note: This card MUST be placed in CH02M chassis with fan. For SNMP management, place this card in CH04A chassis.

New

FRM220-40G-2Q

40G 3R Transponder

The FRM220-40G-2Q is a 40G QSFP+ to 40G QSFP+3R transponder that provides media conversion and distance extension for 40G Ethernet links. The FRM220-40G-2Q meets the growing need for more bandwidth for data centers and enterprises. The emergence of high-end servers and Ethernet switches with 40G Ethernet interfaces increases the need for media conversion (multi-mode to single-mode) and link range (single-mode to single mode) extension. The FRM220-40G-2Q is hot-swappable with two QSFP sockets for 40G QSFP transceivers. The installation and setup is simple plug and play. The FRM220-40G-2QP can be inserted into any powered FRM220-CH20,CH08, CH04 chassis or CH02M, CH02/SMT standalone chassis with QSFP+ transceivers required for the application.

Features

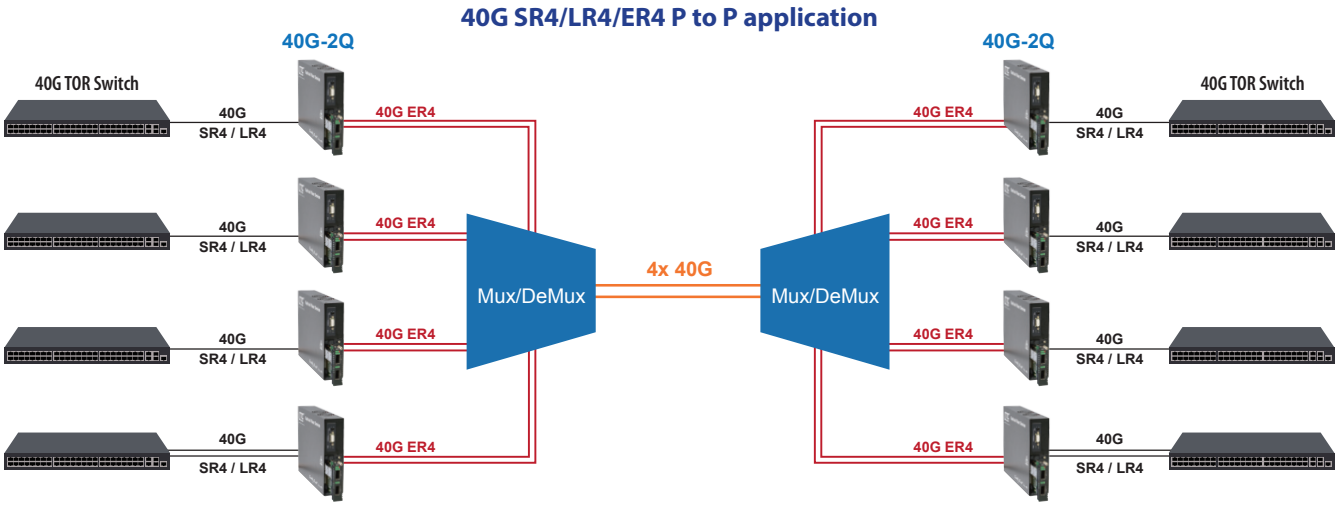
- Network management via FRM220 chassis
- Supports 40G repeater mode or Quad 10G optical multiplexer mode
- 40G link interface --Ethernet/IEEE: 802.3ba 40GE-SR4/LR4/ER4
- 40G multi-link (fiber) interfaces --Ethernet/IEEE: 802.3ba XLAUI and OIF: CEI-11G
- QSFP ports for flexibility and scalability
- Supports hot-swapping (module and interfaces)
- Supports jumbo frame
- Supports DMI function for QSFP+ fiber module
- RoHS compliant and Lead-Free
- Supports loopback test function
- 3R function (Regenerator, Reshaper, Retimer)

Specifications

Equipment function	3R Transponder (Regenerator / Reshaper / Retimer)
Protocol	Multiple functions in one module: 40G converter/repeater—Quad 10G optical multiplexer 40G link interface
	Ethernet/IEEE 802.3ba 40GE-SR4/LR4/ER4
	10G interface:9.95 ~ 11.3125Gbps
Access Type	40G Ethernet
Interface Type	QSFP+
Transmission Distance	Up to QSFP+ module

Power requirement	Power input 12VDC	
	Power consumption: ≤12W	
Work Environment	Operating Temperature	0 ~ 50°C
	Storage Temperature	-10 ~ 70°C
	Humidity	5 ~ 90% (non-condensing)
Dimension	Card: 155 x 20.8 x 88mm (D x W x H)	

Application



-Related Products : FRM220-40G-1Q4S/FRM220-16G-3R/10G-FEC/10G-SXX/10G-SS/2.7G-3S (40G, 16G, 10G FEC, 10G and 2.7G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-40G-2Q	40G 3R transponder QSFP+ to QSFP+

Note: This card MUST be placed in CH02M chassis with fan. For SNMP management, place this card in CH02/SMT chassis.

FRM220-40G-1Q4S

40G QSFP+ to 4x 10G SFP+ Transponder

The FRM220-40G-1Q4S is a 40G QSFP+ to 4x 10G SFP+ transponder that provides media conversion and distance extension for 40G over 10G links. The FRM220-40G-1Q4S meets the growing need for more bandwidth for data centers and enterprises. The emergence of high-end servers and Ethernet switches with 40G Ethernet interfaces increases the need for media conversion (multi-mode to single-mode) and link range extension. The FRM220-40G-1Q4S is a two slot wide hot-swappable card with one QSFP+ slot for QSFP+ 40G transceiver and four SFP+ slots for SFP+ 10G transceivers. The installation and setup is simple plug and play. The FRM220-40G-1Q4S can be inserted into any powered FRM220-CH20 chassis with QSFP+ and SFP+ transceivers required for the application.

Features

- Network Management via FRM220 Chassis
- Multiple functions in one module: 40G converter/repeater and Quad 10G optical multiplexer
- 40G link interface --Ethernet/IEEE: 802.3ba 40GE-LR4
- 40G multi-link (fiber) interfaces --Ethernet/IEEE: 802.3ba XLAUI and OIF: CEI-11G
- QSFP+ ports for flexibility and scalability
- Hot-swap support (module and interfaces)
- Supports 1x 40G QSFP+ and 4x 10G SFP+
- Supports DMI function for QSFP+ & SFP+ module
- Supports Loopback test function
- 3R function.

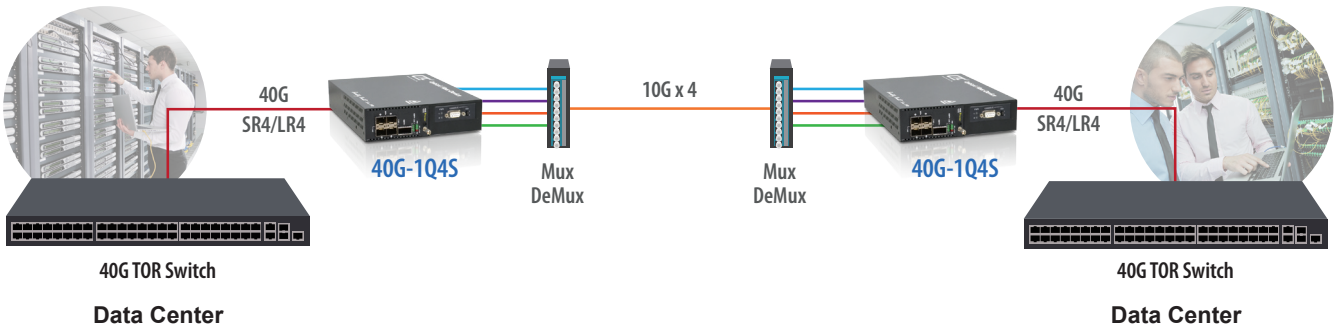
Specifications

Equipment function	3R Transponder, Regenerator, Reshaper, Retimer	
Data Rate	Aggregate Data Rate	32 - 56.8 Gbps
	Data Rate per Lane	8 - 14.2 Gbps
Protocol	CPRI x 16	
	STM - 64	
	OC - 192	
	FC8, FC10	
	10G Ethernet	
Interface Type	40Gbps : QSFP+ (1 port), 10Gbps : SFP+ (4 ports)	

Transmission Distance	depends on QSFP+ & SFP+ module	
Power requirement	Power input 12VDC	
	Power consumption: ≤12W	
Work Environment	Operating Temperature	0 ~ 50°C
	Storage Temperature	-10 ~ 70°C
	Humidity	10 ~ 90% (non-condensing)
Dimension	Card: 155 x 46 x 88mm (D x W x H)	

Application

40G SR4/LR4 P to P application



-Related Products : FRM220-16G-3R/10G-FEC/10G-SXX/10G-SS/2.7G-3S (16G, 10G FEC, 10G and 2.7G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-40G-1Q4S	40G converter/repeater, Quad 10G Optical Multiplexer module with QSFP Interfaces (optional SFP+, QSFP+)

Note: This card MUST be placed in CH02M chassis with fan. For SNMP management, place this card in CH04A chassis.

FRM220-16G-3R

16G 3R Multi-rate Transponder

The FRM220-16G-3R has 4 SFP+ slots that can be configured as a dual channel 16G 3R multi-rate transponder or in a 1-to-2 port protection mode. The device provides a flexible transmission of various protocols, such as 1G/10G Ethernet, SDH STM16/STM64, OTU1/OTU1e/OTU2/OTU2e, Fiber Channel 1/2/4/8/10/16, ODU, OBSAI, CPRI, etc. Using SFP+ ports with dedicated CWDM or DWDM wavelengths, the 16G transponder supports multi-rate functionality with optical data rates from 1Gbps up to 14Gbps. With its functionality the FRM220-16G-3R transponder is also suitable as a repeater for transmission over extended distances. In addition, the use of state of the art components greatly reduces the power requirements and heat dissipation factors over our previous transponders.

Features

- Multi-rate supports 1Gbps ~ 14Gbps
- Protocol Transparent 3R fiber Media Transponder / Repeater
- Supports 1+1 Optical Line Protection, switching time <50ms
- Supports 2 channels with different bit rate
- Supports Loopback Test
- SFP DDM Information
- Firmware Upgrade
- Setting from DIP Switch, Console, NMC
- Supports FRM220 -CH01M, CH02M, CH04A, CH08, CH20
- FRM220-CH20, Full Load (19 Slots)

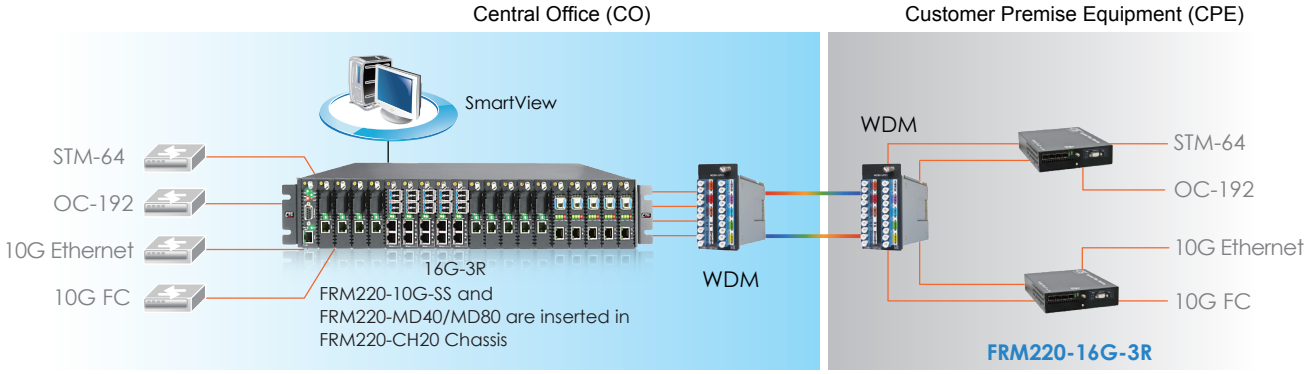
Specifications

Optical Interface	Connector	LC (SFP+, SFP)
	Wavelength	CWDM 1271 ~ 1611nm DWDM 1529.5~1565.50nm
Operation mode	Dual channel mode : Ch 1 SFP1 line / SFP2 client. Ch2 SFP3 line/ SFP4 client. Protection mode : SFP1 line / SFP2, SFP3 client	
Protocol	SONET	OC-24, OC-48, OC-192
	SDH	STM-16, STM-64
	Ethernet	1G, 2.5G, 10G
	OTU	OTU1, OTU1e, OTU2, OTU2e
	ODU	ODU1, ODU1e, ODU2, ODU2e
	OBSAI	OBSAI x1, x2, x4, x8
	CPRI	CPRI x1, x2, x4, x5, x8, x10, x16
	Fiber Channel	1/ 2/4/8/10/16 GFC
	Regeneration	Re-Amplification, Re-Shaping, Re-Timing

Indication	LED	Power, System, Mode, Test, FX1 Link, FX2 Link, FX3 Link, FX4 Link
Power	Input	12V / 1A
	Power Consumption	< 8W
Size	Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
	Weight	150g
Environment	Operating Temperature	0 ~ 50°C
	Storage Temperature	-10 ~ 70°C
	Humidity	10 ~ 90%
	Certification	CE, FCC
	MTBF	65000 hrs

Application

16G-3R CWDM P to P application



-Related Products: FRM220-40G-1Q4S/10G-FEC/10G-SXX/10G-SS/2.7G-3S (40G, 10G FEC, 10G and 2.7G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-16G-3R	2 Channels 16Gbps 3R Multi-rate transponder (optional SFP+)

Note: This card may be placed in CH02M, CH01M or CH04A chassis with fan. For SNMP management, place this card in CH02/NMC or CH04A Chassis.

FRM220-10G-FEC

10G 3R FEC Multi-rate Transponder

The FRM220-10G-FEC is a conversion module suitable for high-speed 10G signals with Forward-Error-Correction (FEC). The module supports four flexible SFP+ ports suitable for wavelength conversion and the transferring application for 10GbE and STM-64. The main field of FRM220-10G-FEC application is cost-optimized CWDM and DWDM networks. As an intelligent transponder module, the FRM220-10G-FEC converts a transparent data channel to a corresponding CWDM/DWDM wavelength. By means of the implemented 3R functionality (re-amplification, re-shaping, re-timing) for signal processing, the module is also suited for the use as a repeater. The data rates between 9.95Gbps and 11.32Gbps can be provided. Two types of housings are available for installation in a 19" FRM220 chassis. 20 slots are provided by using the FRM220-CH20 chassis 2U while the FRM220-CH08 1U supports up to 8 modules. Both housings can be monitored and configured through SNMP, Web GUI or Telnet using a NMC management module.

Features

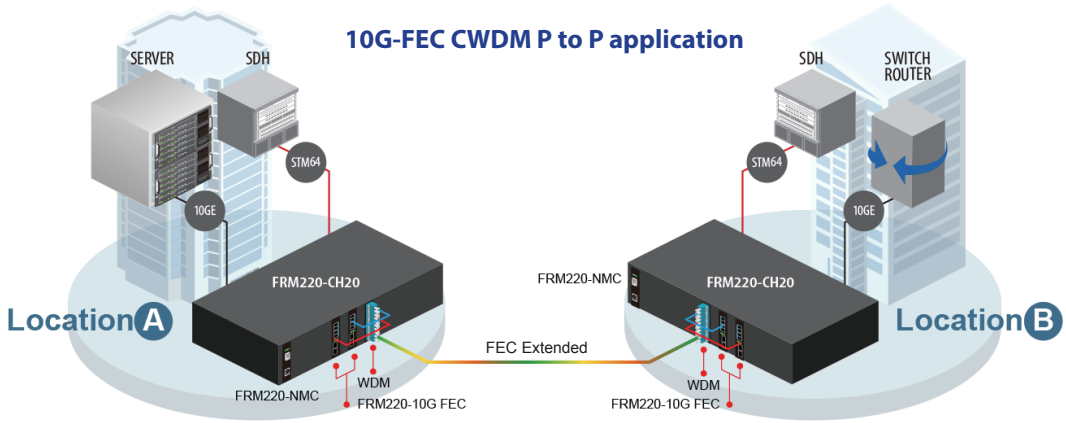
- Protocol transparent (9.95 – 11.32Gbps)
- 10Gbps signal repeating for 10GbE and STM-64
- 10Gbps conversion: Multimode, Single mode, CWDM, DWDM
- Future-proof and flexible SFP+ technology
- 3R functionality (Re-amplification, Re-shaping and Re-clocking)
- Low power consumption
- SNMP management through NMC management module
- SFP+ transceivers for flexible configuration including DWDM
- SFP+ Digital Diagnostics
- Wide range of applications
  - -Dual OTN transponder or OTN repeater
  - -Lambda conversion with FEC exchange
- Multiple clients data rate support
  - -10G Ethernet LAN/WAN PHY
  - -10G OC-192/STM-64 SONET/SDH
- Non OTN/FEC
  - -10G Ethernet LAN-PHY to LAN-PHY
  - -10G Ethernet LAN-PHY to WAN-PHY
- Per interface Forward Error Correction (FEC) encoding selection:
- Comprehensive access performance monitoring
  - -ITU-T G.709 Standard RS(255,239) (GFEC) – 6.2 dB
  - -ITU-T G.975.1 Section I.7 Ultra-strong FEC with scaled - overhead (UFEC 7%) – 8.1 dB
  - -ITU-T G.975.1 Section I.4 Ultra-strong FEC with scaled - overhead (UFEC 10%) – 8.3 dB
  - -Zero FEC (wrapper done, FEC is zero)
  - -No FEC (wrapper done, FEC is disabled)
- Comprehensive G.709 line and service performance monitoring
  - -10G Ethernet, 10G SONET/SDH
- Connection testing tools
  - -Loopback -Notification or fault propagation

Specifications

General	1-slot module for integration in a FRM220 platform	
	Operating temperature: 0°C – 40°C	
	Dimensions (D x W x H): 155 x 88 x 23mm	
Interfaces	4x SFP+ ports (1 x line, 1 x client)	
	Protocol : STM-64, 10G Ethernet	
	Data rate: 9.92Gbps –11.32Gbps depending on SFP+ type and application used	
SFP+ Types	Optical (LC)	10Gigabit Ethernet (with or without FEC) STM-64 (with or without FEC) Multi-rate for 10Gigabit, STM-64

SFP+ Types	Optical (LC)	Wavelengths: 850nm, 1310nm, 1550nm, DWDM or tunable optics
Management	SNMP, Telnet and Web management using a NMC management module	
	SFP+ management information provided by integrated DMI functions: input/output power, wavelength, bit rate, status, supported protocols, temperature	
Housing Types	FRM220-CH08 1U 8-slot chassis	
	FRM220-CH20 2U 20-slot chassis	
	FRM220-CH02M, FRM220-CH02/NMC, 2-slot chassis	

Application



-Related Products: FRM220-40G-1Q4S/16G-3R/10G-SXX/10G-SS/2.7G-3S (40G, 16G, 10G and 2.7G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-10G-FEC	10G 3R FEC Multi-rate Transponder (optional SFP+)

Note:

This card MUST be placed in CH02M chassis with fan.
For SNMP management, place this card in CH02/NMC or CH04A Chassis.

New

FRM220-10G-3R

10G 3R Multi-rate Transponder with Optical Line Protection

The FRM220-10G-3R has 4 SFP+ slots that can be configured as a dual channel 10G 3R multi-rate transponder or in a 1-to-2 port protection mode. The device provides a flexible transmission of various protocols, such as 1G/10G Ethernet, SDH STM16/STM64, OTU1/OTU1e/OTU2/OTU2e, Fiber Channel 1/2/4/8/10, OBSAI, CPRI, etc. Using SFP+ ports with dedicated CWDM or DWDM wavelengths, the 10G transponder supports multi-rate functionality with optical data rates from 1Gbps up to 10Gbps. With its functionality the FRM220-10G-3R transponder is also suitable as a repeater for transmission over extended distances. In addition, the use of state of the art components greatly reduces the power requirements and heat dissipation factors over our previous transponders.

Features

- Multi-rate supports 1Gbps ~ 10Gbps
- Protocol Transparent 3R fiber Media Transponder / Repeater
- Supports 1+1 Optical Line Protection, switching time <50ms
- Supports 2 channels with different bit rate
- Supports Loopback Test.
- SFP DDM Information
- Firmware Upgrade
- Setting from DIP Switch, Console, NMC
- Supports FRM220 -CH01M, CH02M, CH04A, CH08, CH20
- FRM220-CH20, Full Load (19 Slots)

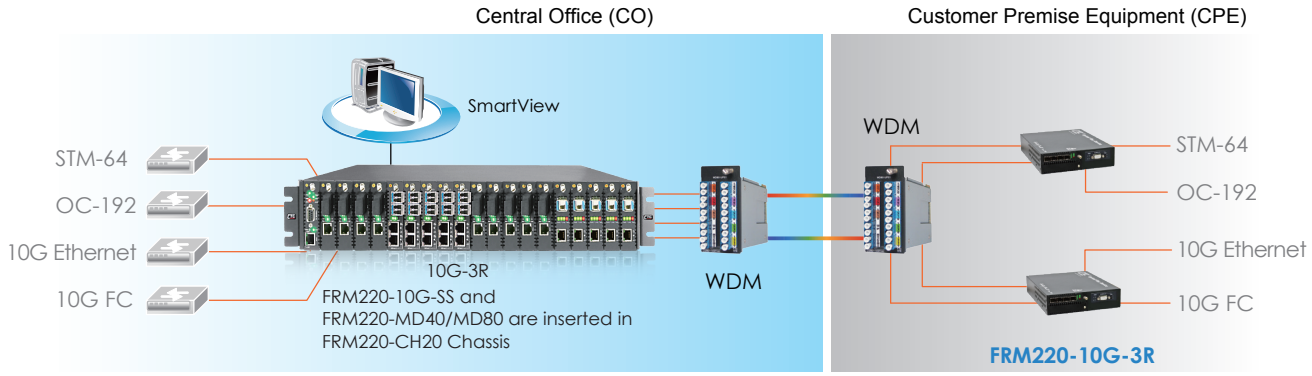
Specifications

Optical Interface	Connector	LC (SFP+, SFP)
	Wavelength	CWDM 1271 ~ 1611nm DWDM 1529.5~1565.50nm
Operation mode	Dual channel mode : Ch 1 SFP1 line / SFP2 client. Ch2 SFP3 line/ SFP4 client. Protection mode : SFP1 line / SFP2, SFP3 client	
Protocol	SONET	OC-24, OC-48, OC-192
	SDH	STM-16, STM-64
	Ethernet	1G, 2.5G, 10G
	OTU	OTU1, OTU1e, OTU2, OTU2e
	OBSAI	OBSAI x1, x2, x4, x8
	CPRI	CPRI x1, x2, x4, x5, x8, x10, x16
	Fiber Channel	1/ 2/4/8/10 GFC
	Regeneration	Re-Amplification, Re-Shaping, Re-Timing

Indication	LED	Power, System, Mode, Test, FX1 Link, FX2 Link, FX3 Link, FX4 Link
Power	Input	12V / 1A
	Power Consumption	< 8W
Size	Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
	Weight	150g
Environment	Operating Temperature	0 ~ 50°C
	Storage Temperature	-10 ~ 70°C
	Humidity	10 ~ 90%
	Certification	CE, FCC
	MTBF	65000 hrs

Application

10G-3R CWDM P to P application



-Related Products: FRM220-40G-1Q4S/10G-FEC/10G-SXX/10G-SS/2.7G-3S (40G, 10G FEC, 10G and 2.7G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-10G-3R	2 Channels 10Gbps 3R Multi-rate transponder (optional SFP+)

Note: This card may be placed in CH02M, CH01M or CH04A chassis with fan. For SNMP management, place this card in CH02/NMC or CH04A Chassis.

New

FRM220-4G-3R

4G 3R Multi-rate Transponder

The FRM220-4G-3R has 4 SFP slots that can be configured as a dual channel 4G 3R multi-rate transponder or in a 1-to-2 port protection mode. The device provides a flexible transmission of various protocols, such as 1G Ethernet, SDH STM-16, OC-24, OC48 , Fiber Channel 1/2/4, OBSAI, CPRI, etc. Using SFP ports with dedicated CWDM or DWDM wavelengths, the FRM220-4G-3R transponder supports multi-rate functionality with optical data rates from 1Gbps up to 4.25Gbps. With its functionality the FRM220-4G-3R transponder is also suitable as a repeater for transmission over extended distances. In addition, the use of state of the art components greatly reduces the power requirements and heat dissipation factors over our previous transponders.

Features

- Multi-rate supports 1Gbps ~ 4.25Gbps
- Protocol Transparent 3R fiber Media Transponder / Repeater
- Supports 1+1 Optical Line Protection, switching time <50ms
- Supports 2 channels with different bit rate
- Supports Loopback Test
- SFP DDM Information
- Firmware Upgrade
- Setting from DIP Switch, Console, NMC
- Supports FRM220 -CH01M, CH02M, CH04A, CH08, CH20

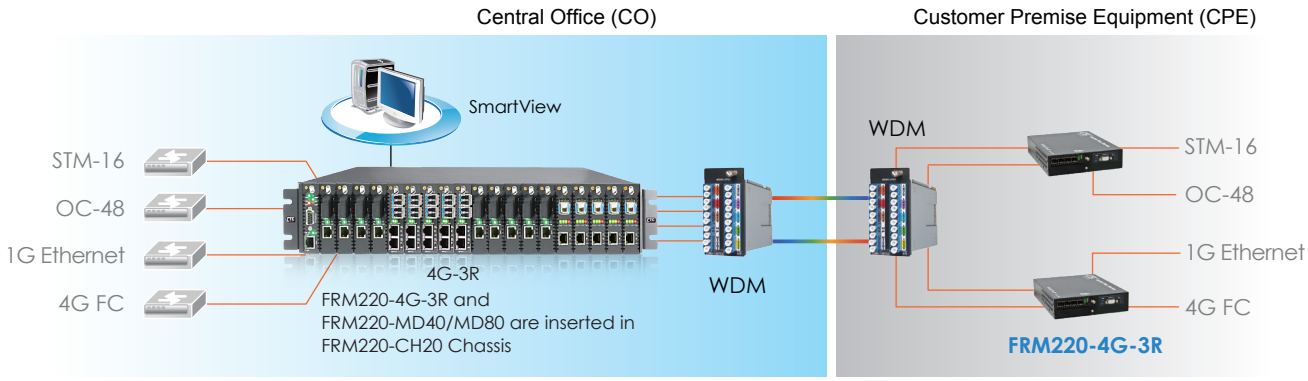
Specifications

Optical Interface	Connector	LC (SFP)
	Wavelength	CWDM 1271 ~ 1611nm DWDM 1529.5~1565.50nm
Operation mode	Dual channel mode : Ch 1 SFP1 line / SFP2 client. Ch2 SFP3 line/ SFP4 client. Protection mode : SFP1 line / SFP2, SFP3 client	
Protocol	SONET	OC-24, OC-48
	SDH	STM-16
	Ethernet	1G, 2.5G
	OBSAI	OBSAI x1, x2, x4
	CPRI	CPRI x1, x2, x4, x5
	Fiber Channel	1/ 2/4 GFC
	Regeneration	Re-Amplification, Re-Shaping, Re-Timing

Indication	LED	Power, System, Mode, Test, FX1 Link, FX2 Link, FX3 Link, FX4 Link
Power	Input	12V / 1A
	Power Consumption	< 8W
Size	Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
	Weight	150g
Environment	Operating Temperature	0 ~ 50°C
	Storage Temperature	-10 ~ 70°C
	Humidity	10 ~ 90%
	Certification	CE, FCC
	MTBF	65000 hrs

Application

4G-3R CWDM P to P application



-Related Products: FRM220-40G-1Q4S/10G-FEC/16G-3R/10G-3R (40G, 10G FEC, 10G and 4G 3R Transponder)

Ordering Information

Model Name	Description
FRM220-4G-3R	2 Channels 4Gbps 3R Multi-rate transponder (optional SFP)

Note: This card may be placed in CH02M, CH01M or CH04A chassis with fan. For SNMP management, place this card in CH02M/SMT or CH04A Chassis.

FRM220-1000DS

1G 2R Multi-rate Transponder

The FRM220-1000DS is a fiber to fiber optical media converter and repeater that allows data rates up to 1Gbps. FRM220-1000DS supports 2R regeneration, which consists of re-amplification and reshaping. This converter is compatible with fiber interfaces such as 100Mbps Fast Ethernet and 1000Mbps Gigabit Ethernet, STM-1, Fiber Channel 1 and OC3, The FRM220-1000DS works as an FRM220 slide-in card, while the FRM220-1000DS plus FRM220-CH01 work as a stand-alone fiber converter. When the FRM220- 1000DS card is placed in the FRM220-CH20 rack with SNMP management, the management can view the converter card's status, type, fiber link status and SFP DOM.

Features

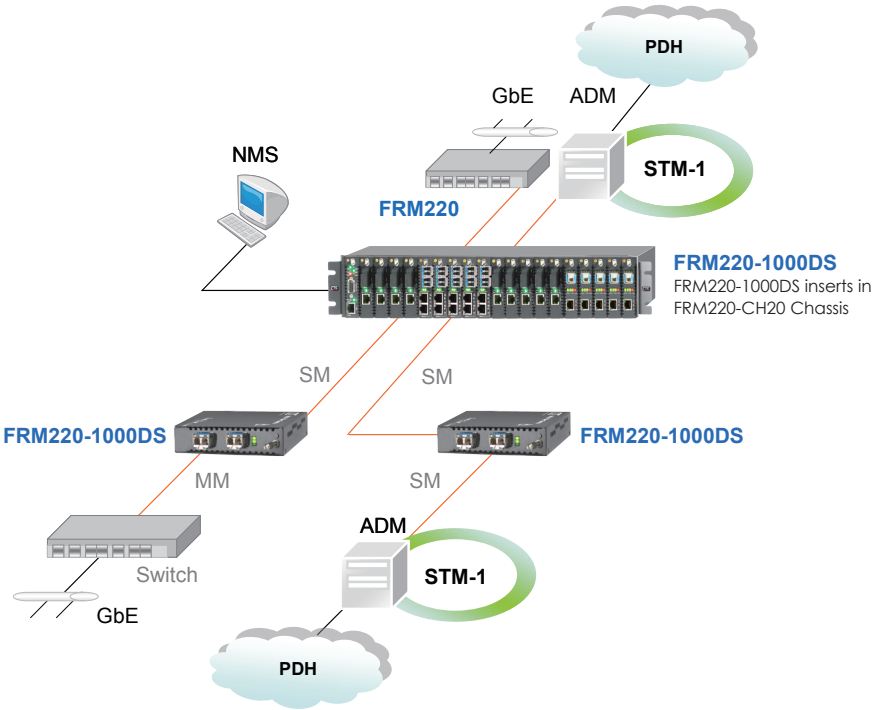
- Transparent FE or GbE fiber media converter / repeater
- Data rate up to 1G
- Network management via terminal or SNMP in FRM220 chassis
- Extend transmission from 2km to 120km over fiber
- Perform optical repeater function (Re-amplification & Reshaping)
- Digital diagnostic monitoring of SFP modules
- Supports Link Fault Pass-Through LFTP function
- Supports Auto Laser Shutdown (ALS) function

Specifications

Optical Interface	Connector	SFP LC x 2
	Data rate	Up to 1G
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm.
		SM 9/125μm
	Distance	MM 550m, 2km, SM 15/30/50/80/120km
		WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)

Indications	LED (Power, FX-Link1, FX-Link2)
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88 mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-1000DS	1000Base-X SFP to 1000Base-X SFP Media Converter (Optional SFP)

Note: This Card is suitable for use in CH01 standalone chassis

FRM220-DWDM

DWDM Mux/DeMux

CTC Union DWDM MUX DEMUX Modules, with 100GHz channel spacing, can be used to combine or separate wavelength channels at standard ITU grid. We supply the common configuration including 4, 8, 16 channels. These DWDM modules passively multiplex the optical signal outputs from 4 or more electronic devices, and send them over a single optical fiber and then de-multiplex the signals into separate, distinct signals for input into electronic devices at the other end of the fiber optic link. All the DWDM MUX DEMUX modules provide excellent optical performance and high reliability to ease of fiber handling and power saving solution.

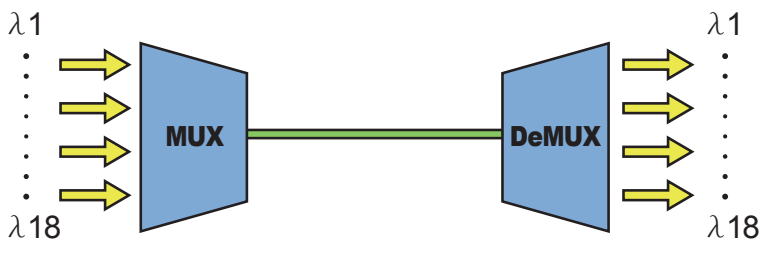
Features

- Low Optical Insertion Loss
- High channel isolation
- Low PDL
- Good channel-to-channel uniformity
- Exceptional reliability and stability
- Reliable passive WDM optical technology
- Scales easily for ring networks
- Compliance with RoHS

Specifications

Item	100GHz DWDM	
Type	Mux	DeMux
Channel No.	4 / 8 / 16	
Center Wavelength, nm	Ch 21~60 or ITU Standard (specity)	
Channel Spacing, nm	0.8	
Channel Spacing, GHz	100	
Passband @0.5dB, nm	ITU ± 0.1	
Insertion Loss, dB for 4 channel	≤2.0	
Insertion Loss, dB for 8 channel	≤3.5	
Insertion Loss, dB for 16 channel	≤4.5	
Adjacent Channel Isolation, dB	N/A	≥25
Non-adjacent Channel Isolation, dB	N/A	≥35
Uniformity, dB	≤1.5 (Mux-DeMux Pair only)	
Directivity, dB	≥45	
Optical Input Return Loss, dB	≥45	
Polarization Dependent Loss, dB	≤0.15	
Polarization Mode Dispersion (PMD), ps	≤0.1	
Thermal Stability Drift, pm/°C	≤1	
Max. Optical Power, mW	300	
Max. Tensile Load, N	5	
Storage Temperature, °C	-40~85	
Operating Temperature, °C	0~70	

Application



DWDM MUX must be used with DeMux on the other side

- Access networks
- Metro WDM systems
- Long haul WDM systems
- Enterprice networks
- Telecommunication
- Cellular Application
- Fiber Optical amplifier
- Metro Network / Access Netwok / FTTH
- CATV fiber optic links

Ordering Information

Model Name	Description
FRM220-DWab-cdef-xxxx-xxxx	ab → DX : DeMux, MX : Mux, MD : Mux/DeMux
	c → 4 : 4ch, 8 : 8ch, H : 16ch
	d → 0 : no, 1 : Monitor port, 2 : 1x Upgrade Port
	e → 1 : 100GHz
	f → A : Single Fiber A Type B : Sigle Fiber B Type Blank : Dual Fiber

FRM220-DW□□-□□□-□□□-□□□ • • •

- **DX :** DeMux, **MX :** Mux, **MD :** Mux / DeMux
- **Channel** — **4 :** 4ch, **8 :** 8ch, **H :** 16ch
- **Monitor Port** — **0 :** no, **1 :** Monitor port, **2 :** Upgrade port
- **Spacing** — **1 :** 100GHz
- **Type** — **A :** Single Fiber A Type, **B :** Single Fiber B Type, **Blank :** Dual Fiber
- **Grid Wavelength**

Order Code -100GHz Grid Wavelength (Please ✓select all the apply from below list)

Label	Frequency (THz)	Center Wavelength (nm)
☐ C21	192.1	1560.61
☐ C22	192.2	1559.79
☐ C23	192.3	1558.98
☐ C24	192.4	1558.17
☐ C25	192.5	1557.36
☐ C26	192.6	1556.55
☐ C27	192.7	1555.75
☐ C28	192.8	1554.94
☐ C29	192.9	1554.13
☐ C30	193.0	1553.33
☐ C31	193.1	1552.52
☐ C32	193.2	1551.72
☐ C33	193.3	1550.92
☐ C34	193.4	1550.12
☐ C35	193.5	1549.32
☐ C36	193.6	1548.51
☐ C37	193.7	1547.72
☐ C38	193.8	1546.92
☐ C39	193.9	1546.12
☐ C40	194.0	1545.32

Label	Frequency (THz)	Center Wavelength (nm)
☐ C41	194.1	1544.53
☐ C42	194.2	1543.73
☐ C43	194.3	1542.94
☐ C44	194.4	1542.14
☐ C45	194.5	1541.35
☐ C46	194.6	1540.56
☐ C47	194.7	1539.77
☐ C48	194.8	1538.98
☐ C49	194.9	1538.19
☐ C50	195.0	1537.40
☐ C51	195.1	1536.61
☐ C52	195.2	1635.82
☐ C53	195.3	1535.04
☐ C54	195.4	1534.25
☐ C55	195.5	1533.47
☐ C56	195.6	1532.68
☐ C57	195.7	1531.90
☐ C58	195.8	1531.12
☐ C59	195.9	1530.33
☐ C60	196.0	1529.55

Example:

FRM220 - DW M X – 4 0 1 A – C 2 1 – C 2 4

→ (DWDM, Mux, 4ch, 100GHz, Sigle Fiber A Type, 1560.61, 1558.17 Grid Wavelength)

FRM220 - DW□□–□□□□–□□□–□□□–□□□–□□□

Description

FRM220-CWDM

CWDM Mux/DeMux

The FRM220-CWDM Mux/DeMux are modular design cards that support ITU-T G.694.2 wavelengths between 1271nm to 1611nm in 20nm increments. The FRM220-CWDM modules are protocol and rate transparent allowing different services such as 10G Ethernet, 10GFC, STM-64, OC-192 to be transported across the same fiber link. The passive FRM220-CWDM Mux/DeMux modules are available in 4,8 and 16-Channel (wavelength) models, supporting a variety of wavelength combinations and port configurations. The small and compact size of the CWDM modules yields one of the highest port densities in the industry. A 2U high 19-module FRM220 chassis populated with modules can yield up to 120 channels of capacity. FRM220-CWDM modules are passive devices that require no external power. They can also be installed in an FRM220 powered chassis with a NMC management module[1] and can be managed using SmartView EMS device management software, third-party SNMP software, Telnet or a serial console port. The modules can be installed in any FRM220 chassis equipped with other FRM220 media converters and transponders to provide a multi-service platform capable of delivering Ethernet, TDM, Voice and other services across a CWDM fiber common link.

Features

- Full native mode performance
- Passive model requires no power
- Protocol transparent, no limitation
- Utilizes industry standard ITU CWDM wavelength
- Standard LC connectors
- Passive device that can be installed in a powered chassis for managed applications
- Integration with Transponder in FRM220 chassis for CWDM application

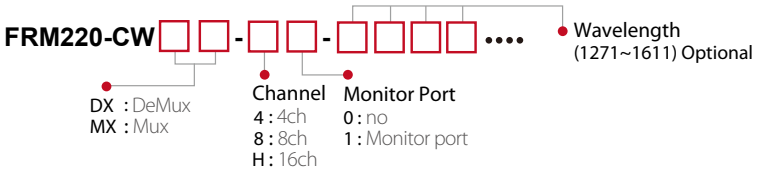
Specifications

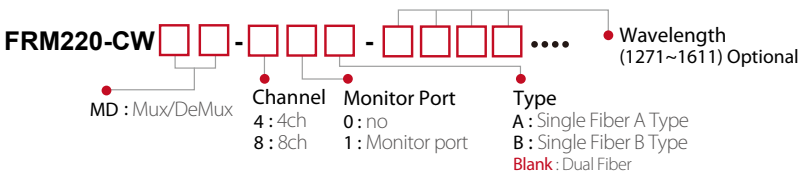
Channel	4, 8 or 16 channels
Standards	ITU-T G.694.2
Wavelength	1271 ~ 1611nm
Insertion Loss	4ch < 1.8dB, 8ch < 2.8dB, 16ch < 3.6dB
Return Loss	>45dB
Option	Upgrade port
	Wide 1310 ± 50 nm
Line Link	Single fiber or two fiber
Connector	LC / UPC

Dimension	4ch : 155x 23 x88 mm (D x W x H)
	8/16ch : 155x 42 x88 mm (D x W x H)
Weight	4ch : 200g
	8/16ch : 380g
Temperature	0 ~ 50°C (Operating)
	-40 ~ 70°C (Storage)
Humidity	0 ~95% (non-condensing)
Certification	CE, FCC

Ordering Information

Model Name	Description
FRM220-CWab-cde-xxxx	ab → DX : DeMux, MX : Mux, MD : Mux/DeMux
	c → 4 : 4ch, 8 : 8ch, H : 16ch
	d → 0 : no, 1 : Monitor port, 2 : 1x Upgrade Port
	e (only for MD Model) → A: Single Fiber A Type, B: Single Fiber B Type, Blank: Dual Fiber
	xxxx → Wavelength optional (1271~1611)





Order Code -Wavelength (Please ✓select all the apply from below list)

☐ A 1271 ☐ B 1291 ☐ C 1311 ☐ D 1331 ☐ E 1351 ☐ F 1371 ☐ G 1431 ☐ H 1451
☐ I 1471 ☐ J 1491 ☐ K 1511 ☐ L 1531 ☐ M 1551 ☐ N 1571 ☐ O 1591 ☐ P 1611

☐ Z All Wavelength(1271-1611, without1391, 1411)

☐ Q 1391 ☐ R 1411 (Water peak wavelength)

Example:

4ch : FRM220 - CW D X – 4 0 – A B C D

→ (CWDM, DeMux, 4ch, 1271, 1291, 1311, 1331 Wavelength)

FRM220 - CW ☐☐–☐☐–☐☐☐☐

16ch : FRM220 - CW M X – H 1 – Z

→ (CWDM, Mux, 16ch, Monitor port, 1271 - 1611 Wavelength)

FRM220 - CW ☐☐–☐☐–☐

4ch : FRM220 - CW M D – 4 1 – A B C D

→ (CWDM, Mux/DeMux, 4ch, Monitor port, Dual Fiber, 1271, 1291, 1311, 1331 Wavelength)

FRM220 - CW ☐☐–☐☐–☐☐☐☐

8ch : FRM220 - CW M D – 8 0 – A B C D E F G H

→ (CWDM, DeMux, 8ch, Single Fiber A Type, 1271, 1291, 1311, 1331, 1471, 1491, 1511, 1531 Wavelength)

FRM220 - CW ☐☐–☐☐–☐☐☐☐☐☐☐☐

Description

FRM220-OADM

Optical Add-Drop Multiplexer

The FRM220-OADM Optical Add/Drop Multiplexer is modular design cards that support ITU-T G.694.2 wavelengths between 1270nm to 1610nm in 20nm increments. The FRM220-OADM Optical Add/Drop Multiplexer takes a single wavelength from a trunk, pulls the signal out, and allows a new signal at the same wavelength to be inserted into the trunk at roughly the same spot. All the other wavelengths pass through the Add/Drop Multiplexer with only a small loss of power (usually < 2.5dB including connectors and adapters). An Optical Add/Drop Multiplexer (OADM) is available allowing a single wavelength to be dropped or added at specific sites in linear Add/Drop topology. FRM220-OADM modules are passive devices that require no external power. They can also be installed in an FRM220 powered chassis with a NMC management module[1] and can be managed using SmartView EMS network management software, Telnet or a serial console port. The FRM220-OADM modules can be installed in any FRM220 chassis equipped with other FRM220 media converters and transponders to provide a multiservice platform capable of delivering Ethernet, TDM, Voice and other services across a CWDM fiber common link.

Features

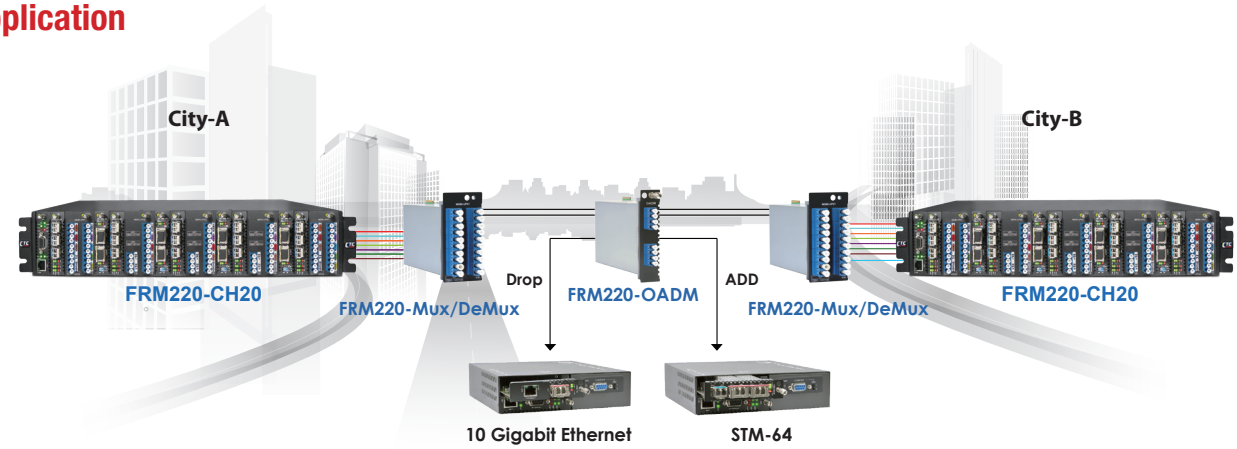
- Single Add/Drop Channel
- Operating channel : 1311,1471,1491,1511,1531,1551,1571,1591,1611nm
- Passive optical module, no power required
- Protocol transparent, no limitation
- Utilizes Industry standard ITU CWDM wavelengths
- Optical connectors : LC

Specifications

Number of channels	CWDM: 1 add/drop channel, 2 add/drop channels
Operating Channel CWDM add & drop channel	Any channels out of 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm (to be defined via order information)
Channel width: CWDM channels	>=13nm (around center wavelength)
Insertion Loss	IN-OUT >= 2.5 dB
	Add to Drop < 2.0 dB
Isolation	CWDM adjacent channel Isolation >= 30dB CWDM non-adjacent ch's at CWDM drop port >= 35dB

Optical Return Loss	>= 50dB
PDL	>= 0.1dB
Environment	Temperature : 0 ~ 50°C (Operating), -20 ~ 70°C (Storage)
Fiber Type	9 / 125 / 250um
Dimensions	162 x 220 x 25mm (W x D x H)
Weight	0.9kg
Compliance	FCC part 15 class A, CE Mark

Application



Ordering Information

Model Type	Model Name	Description	Model Name	Description
One Fiber Add Drop Module	FRM220-OADM-W5961-E6159	1ch one fiber CWDM OADM-West T59/R61 East T61/R59	FRM220-OADM-W5557-E5755	1ch one fiber CWDM OADM–West T55/R57 East T57/R55
	FRM220-OADM-W5153-E5351	1ch one fiber CWDM OADM–West 51T/53R East 53T/51R	FRM220-OADM-W4749-E4947	1ch one fiber CWDM OADM–West T47/R49 East T49/R47
	FRM220-OADM-W4345-E4543	1ch one fiber CWDM OADM–West T43/R45 East T45/R43	FRM220-OADM-W3537-E3735	1ch one fiber CWDM OADM–West T35/R37 East T37/R35
	FRM220-OADM-W3133-E3331	1ch one fiber CWDM OADM–West T31/R33 East T33/R31	FRM220-OADM-W2729-E2927	1ch one fiber CWDM OADM–West T27/R29 East T29/R27
Two Fiber Add Drop Module	FRM220-OADM-61	1ch two fiber CWDM OADM 1611nm with West/East lines	FRM220-OADM-59	1ch two fiber CWDM OADM 1591nm with West/East lines
	FRM220-OADM-57	1ch two fiber CWDM OADM 1571nm with West/East lines	FRM220-OADM-55	1ch two fiber CWDM OADM 1551nm with West/East lines
	FRM220-OADM-53	1ch two fiber CWDM OADM 1531nm with West/East lines	FRM220-OADM-51	1ch two fiber CWDM OADM 1511nm with West/East lines
	FRM220-OADM-49	1ch two fiber CWDM OADM 1491nm with West/East lines	FRM220-OADM-47	1ch two fiber CWDM OADM 1471nm with West/East lines

Note: This Card is suitable for use in CH01 standalone chassis

FRM220-OAB15

Single Channel EDFA Booster NIC

The FRM220-OAB15 is a FRM220 chassis rack managed single channel Erbium Doped Fiber Amplifier (EDFA) booster line card for C-band. It has a large dynamic range while providing excellent broadband noise performance. It provides Automatic constant output Power Control (APC) and Automatic Constant Current (ACC) via rack management or RS-232 console interface. Its fast transient suppression feature allowing the output power to be kept at a constant level when there are fast changes in input power.

Features

- Single channel EDFA with FRM220 chassis rack management
- Up to 15 dBm output power
- Output level constant control mode
- Output current constant control mode
- Low noise figure
- Low power dissipation

Applications

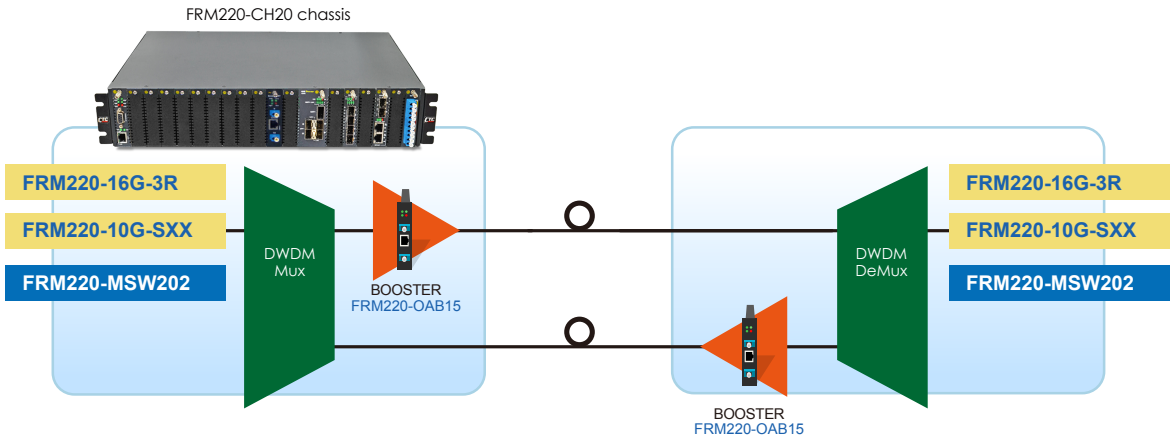
Booster Amplifier for 10Gbps, 40Gbps, and 100Gbps applications
Long haul C-band DWDM applications

Specifications

Parameter	Specifications			Remarks
	Units	Min.	Max.	
Wavelength Bandwidth	nm	1528	1562	
Input Power Range	dBm	-10	0	
Output Power Range	dBm		+15	@ Input Power = -6~0dBm
Noise Figure	dB		7.0	@ -6dBm input with 16dB gain
PDG	dB		0.5	
PMD	ps		0.5	
Power Consumption	W		2	
Operation Temperature	Degree C	-5	+70	
Storage Temperature	Degree C	-20	+70	
Transportation Temperature	Degree C	-40	+85	72 hrs max.
Dimensions	mm	155 x 88 x 23mm		

Application

EDFA booster DWDM P to P application

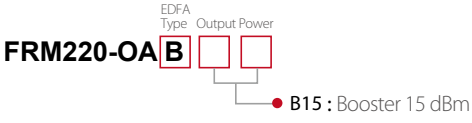


Ordering Information

Model Name	Description
FRM220-OAB15	Single Channel EDFA Booster

Note: This card may use in CH01 standalone chassis or use CH01/AC/DC for power built-in type.

Naming Rule



www.ctcu.com / sales@ctcu.com

FRM220-OPS51
FRM220-OPS52

Fiber Optical Protection Switch

The FRM220-OPS Series are able to provide fiber path redundancy on a channel by channel basis. These units are particularly well suited for protection in any type of fiber data transmission, including CWDM & DWDM links This solution includes monitoring capabilities for both the working and protected path fibers. In case of a fiber cut in the active path, traffic will be switched over to the protected path in less than 50ms (FRM220-OPS51) or 20ms (FRM220-OPS52). Monitoring is available through SNMP Management when both card is placed in FRM220 rack with SNMP management. The management can view the converter card's status, type, version, fiber link status and alarms. The card can be configured to enable or disable the port, reset the port, and configure receive threshold levels for path switching.

Features

- Latch feature, if power is lost the switch remains in its current state
- Protection transition < 50 ms (FRM220-OPS51)
- Protection transition < 20 ms (FRM220-OPS52)
- Works with any combination of 1 ~16 wavelengths
- Traffic is switched in one of three modes : revertive, non-revertive, manual
- Programmable Rx threshold setting for switch-over
- Optical Interface Type : LC connectors
- Working and protected lines are physically separated fiber

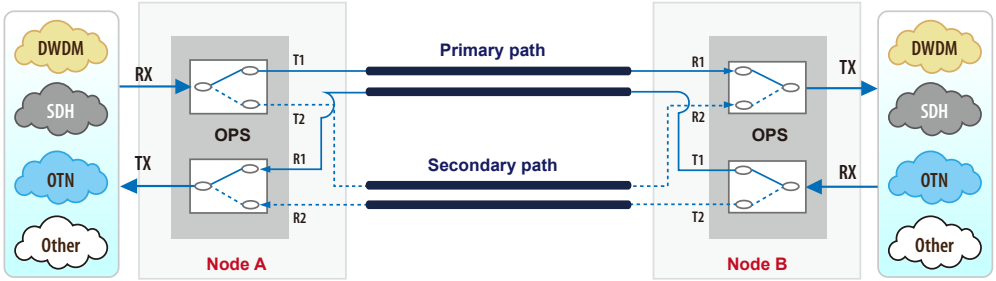
Specifications

Connecter	LC
LEDs	Power System, Working Path, Protection Path, Work mode
Power	DC 12V In
Operating Wavelength	1260 ~ 1620
Switch Type	2x1 / Latching
Input Power (Optical)	-35~5dBm
Accuracy	≤ 2dBm
Insertion Loss	≤ 3dB (Pair) (FRM220-OPS51), ≤ 5.5dB (Pair) (FRM220-OPS52)
Return Loss	≥ 45dB
Cross-talk	≥ 60dB

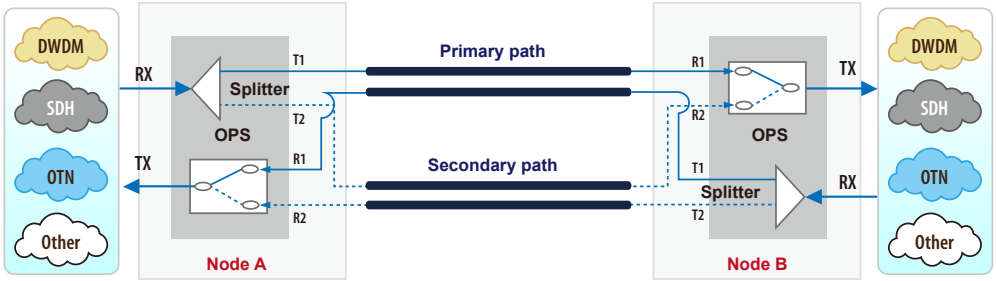
Polarization Dependent Loss (PDL)	≤ 0.1dB
Input Power Sensitivity	-35dBm
Restoration Time	≤20ms
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	5%RH to 95%RH non-condensing
Certification	CE, FCC
MTBF	65,000 hours

Application

FRM220-OPS51▶
Working Theory



FRM220-OPS52▶
Working Theory



Ordering Information

Model Name	Description
FRM220-OPS51	1:1 Optical Line Protection Switch, dual fiber on WAN port, LC/PC connector
FRM220-OPS52	1+1 Optical Line Protection Switch, dual fiber on WAN port, LC/PC connector

Note: This card must use CH01M, with serial console, to configure standalone settings.
For SNMP management, place this card in CH02/NMC or CH04A Chassis.

Naming Rule

FRM220-OPS5 □

- Optical Switch Mode
  1 : 1 : 1 OPS
  2 : 1+1 OPS

FRM220-MSW404S

4x GbE, RJ45 + 4x Dual Rate SFP
L2+ Carrier Ethernet Switch (NID) with SyncE

The FRM220-MSW404S is the new generation of carrier grade Ethernet demarcation device for business connection and mobile backhaul transportation service delivered by carriers. The FRM220-MSW404S is equipped 4 SFP slots as dual rate 100/1000Base-X and 4 ports 10/100/1000Base-T RJ45 network interfaces. It is designed to enable E-Line, E-LAN, E-Tree services which are CE (Carrier Ethernet) 2.0 compliant for Metro Ethernet network deployments.

The FRM220-MSW404S device enables carriers and service providers to delivered SLA-based network service with extensive fault detection and diagnostic capabilities which are compliant with the latest Ethernet OAM standards such as IEEE 802.3ah, IEEE 802.1ag and ITU-T Y.1731. With built-in RFC2544 and ITU-T Y.1564 feature sets, The FRM220-MSW404S also enables the service providers to perform the SLA verification anytime to ensure the quantitative latency, jitter and throughput delivery performance indexes. The CE2.0 compliant functions support EVCs and 3 colors marker QoS traffic management to enable service providers managing bandwidth and enforce SLA guaranteed. This card may be controlled and monitored via an NMC in a managed chassis or used as a completely manageable device when used stand-alone. Stand-alone management supports Telnet/SSH, HTTP/HTTPS and SNMP v1, v2C or v3.

MEF 22.1 defines the standard for how Metro Ethernet service is adopted for traffic transportation in mobile backhaul applications. Mobile service is time sensitive and requires accurate packet delivery over a clocking synchronized network to transmit packetized data from a mobile device among base stations without loss. The FRM220- MSW404S supports timing synchronization features (SyncE & IEEE 1588 v2) to fulfill the IP converged services (data, voice, video) over synchronous Ethernet aware carrier Ethernet network.

Features

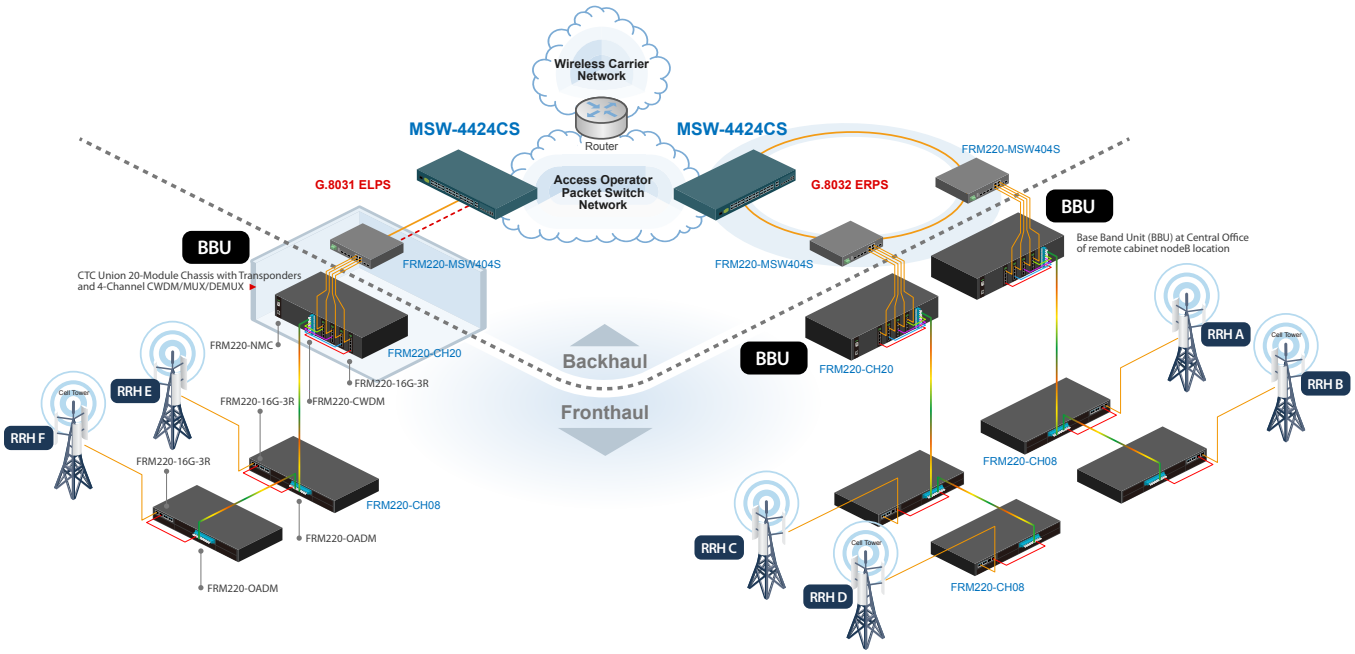
- The next generation of Ethernet demarcation device, at customer premise, fulfilling the large-scale carrier Ethernet deployment for intelligent business connection and mobile backhaul services complied to CE 2.0 standard.
- CE2.0 standards compliant product guarantees the fully interoperability with other MEF certified equipment and reduces the risks and cost of Carrier Ethernet network deployment for operators and service providers.
- Advanced clock synchronized features for carrier Ethernet network allows operators to deliver time sensitive services with optimal stability and continuity in the end-to-end connectivity.

Specifications

Interface	100/1000Mbps SFP slots x 4 + 10/100/1000Base-T RJ45 x 4
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric Capacity	16Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad
Packet Buffer	8M bits
MAC Table Size	8K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN Translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP(Max. 4 trunking group, Max. 8 ports per trunking group)

Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP
SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731, RFC2544, ITU-T Y.1564
Timing Synchronization	ITU-T G.8262, SyncE, IEEE 1588 v2
MPLS feature	MPLS-TP compliant to ITU-T G.8113.1
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -18 ~ -72VDC
Power Consumption	< 20W
Operating Temperature	0 ~ 50°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	Card: 155 x 42.1 x 88 mm (D x W x H)
Regulatory	FCC, CE

Application



- Carrier Ethernet with multiple class of service
- Traffic Synchronization
- Precisely delivery of time-sensitive service

Ordering Information

Model Name	Description
FRM220-MSW404S	4x 100/1000Base-x SFP slots + 4x 10/100/1000Base-T RJ45 Carrier Ethernet Switch with SyncE

Note: To support console Interface management, this card must be placed in CH02M chassis.

FRM220-MSW404

4x 10/100/1000Base-T + 4x 100/1000Base-X
L2+ Carrier Ethernet Switch (NID)

The FRM220-MSW404 is the new generation of carrier grade Ethernet demarcation device for business connection and mobile backhaul transportation service delivered by carriers. The FRM220-MSW404 is equipped 4 SFP slots as dual rate 100/1000Base-X and 4 ports 10/100/1000Base-T RJ45 network interfaces. It is designed to enable E-Line, E-LAN, E-Tree services which are CE (Carrier Ethernet) 2.0 compliant for Metro Ethernet network deployments.

The FRM220-MSW404 device enables carriers and service providers to delivered SLA-based network service with extensive fault detection and diagnostic capabilities which are compliant with the latest Ethernet OAM standards such as IEEE 802.3ah, IEEE 802.1ag and ITU-T Y.1731. With built-in RFC2544 feature sets, The FRM220-MSW404 also enables the service providers to perform the SLA verification anytime to ensure the quantitative latency, jitter and throughput delivery performance indexes. The CE2.0 compliant functions support EVCs and 3 colors marker QoS traffic management to enable service providers managing bandwidth and enforce SLA guaranteed. This card may be controlled and monitored via an NMC in a managed chassis or used as a completely manageable device when used stand-alone. Stand-alone management supports Telnet/SSH, HTTP/HTTPS and SNMP v1, v2C or v3.

Features

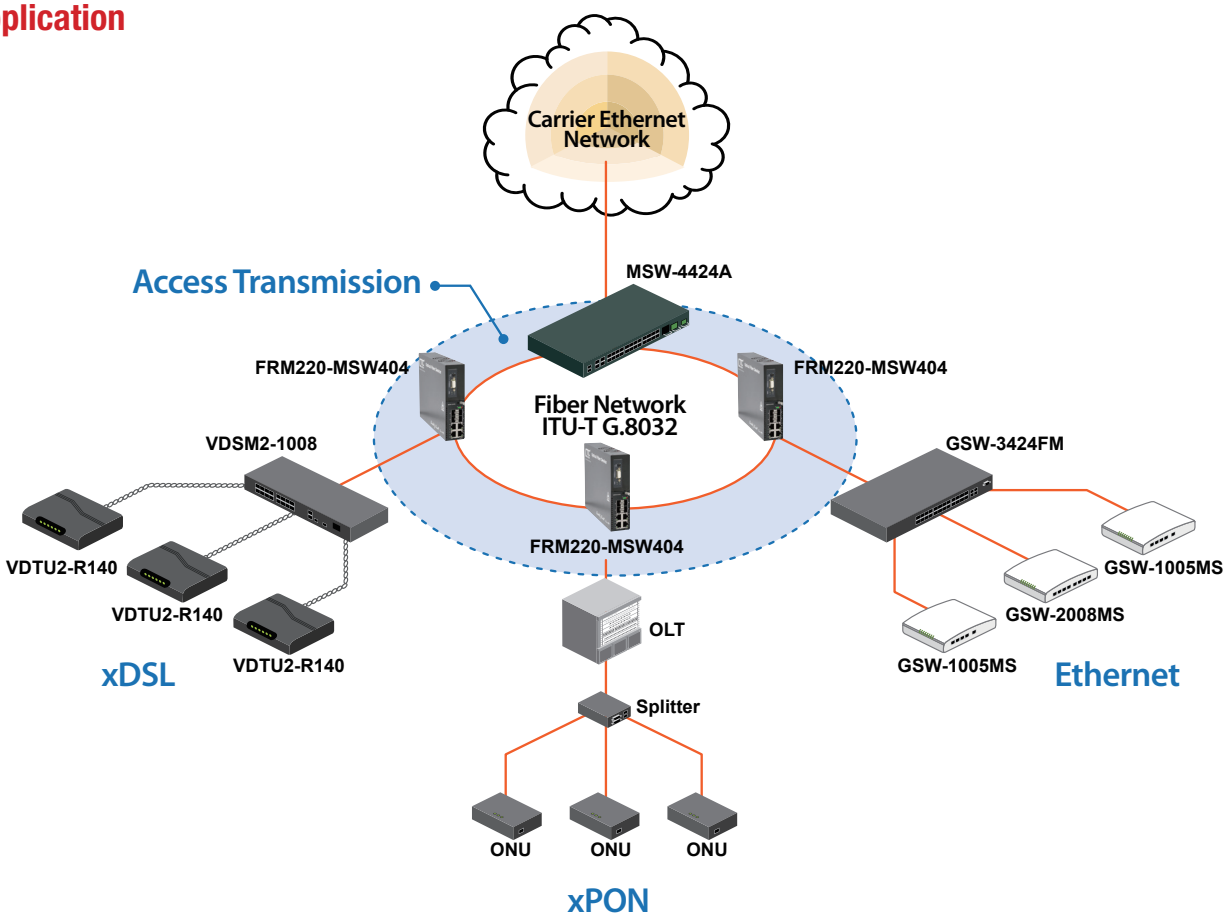
- The next generation of Ethernet demarcation device, at customer premise, fulfilling the large-scale carrier Ethernet deployment for intelligent business connection and mobile backhaul services complied to CE 2.0 standard.
- CE2.0 standards compliant product guarantees the fully interoperability with other MEF certified equipment and reduces the risks and cost of Carrier Ethernet network deployment for operators and service providers.

Specifications

Interface	100/1000Mbps SFP slots x 4 + 10/100/1000Base-T RJ45 x 4
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric Capacity	16Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad
Packet Buffer	8M bits
MAC Table Size	8K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN Translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP(Max. 4 trunking group, Max. 8 ports per trunking group)
Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression

Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP
SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731, RFC2544, ITU-T Y.1564
MPLS feature	MPLS-TP compliant to ITU-T G.8113.1
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -18 ~ -72VDC
Power Consumption	< 20W
Operating Temperature	0 ~ 50°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	Card: 155 x 42.1 x 88 mm (D x W x H)
Regulatory	FCC, CE

Application



Ordering Information

Model Name	Description
FRM220-MSW404	4 x SFP Slots in Dual Rate 100/1000Base-X and 4x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch

Note: To support console Interface management, this card must be placed in CH02M chassis.

FRM220-MSW202

2x 10/100/1000Base-T + 2x 100/1000Base-X
L2+ Carrier Ethernet Switch (EDD)

The FRM220-MSW202 is a carrier class Ethernet Demarcation Device (EDD) with 2 x 10/100/1000Base-T Ethernet ports and 2x 100/1000Base-X dual rate SFP fiber ports which enables EPL (Ethernet Private Line) & EVPL (Ethernet Virtual Private Line) services with advanced carrier Ethernet features per the Metro Ethernet Forum (MEF 9 and 14). By supporting link and service Ethernet OAM schemes, the FRM220-MSW202 also provides extensive fault detection and diagnostic capabilities to ensure that actual network use complies with pre-agreed service level agreements (SLAs). This card may be controlled and monitored via an NMC in a managed chassis or used as a completely manageable device when used stand-alone. Stand-alone management is supported by Telnet/SSH, HTTP/HTTPS and SNMP v1, v2C or v3.

Features

- Complies with MEF CE1.0
- Supports 8K MAC
- Spanning Tree 802.1D, 802.1s, 802.1w
- Supports 802.1Q / 4K active VLANs
- Double VLAN Tagging (C-tag/S-tag) (IEEE 802.1ad) support for ISP application
- Various QoS capability (MAC/port/802.1p/Diffserv)
- Port-based rate limiting
- DHCP Snooping
- IGMP Snooping
- IPv6 support
- IEEE 802.3x and IEEE 802.1x support
- Jumbo frame for up to 9.6K
- Extensive Ethernet OAM support
- IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
- SNMP v1/v2c/v3, Telnet, Web GUI
- IEEE 1588 V2 aware (Optional)

Specifications

Interface	100/1000Mbps SFP slots x 2 + 10/100/1000Base-T RJ45 x 2
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric Capacity	8Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ab, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad, IEEE802.3ah, IEEE802.1ag ITU-T Y.1731, ITU-T G.8031, ITU-T G.8032
Packet Buffer	4M bits
MAC Table Size	8K
Max. Packet Size	9.6K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP(Max. 2 trunking group, Max. 4 ports per trunking group)
Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unicast/Broadcast/Multicast storm suppression

Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP, sFlow
SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -18 ~ -72VDC
Power Consumption	< 12W
Operating Temperature	0 ~ 50°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	Card: 201 x 135 x 35 mm (D x W x H)
Regulatory	FCC, CE

Application

Ordering Information

Model Name	Description
FRM220-MSW202	2x 10/100/1000Base-T + 2x 100/1000Base-X OAM Managed Switch

Note: To support console Interface management, this card must be placed in CH01M chassis.

FRM220-MX210

10/100/1000Base-T + 3x 100/1000/2500Base-X and 100/1000Base-X L2+ Gigabit Carrier Ethernet Switch (EDD)

The FRM220-MX210 is a carrier class Ethernet Demarcation Device (EDD) with 10/100/1000Base-T Ethernet ports + 2x 100/1000/2500Base-X and 100/1000Base-X SFP fiber ports which enables EPL (Ethernet Private Line) & EVPL (Ethernet Virtual Private Line) services with advanced carrier Ethernet features per the Metro Ethernet Forum (MEF 9 and 14). By supporting link and service Ethernet OAM schemes, the FRM220-MX210 also provides extensive fault detection and diagnostic capabilities to ensure that actual network use complies with pre-agreed service level agreements (SLAs).

Features

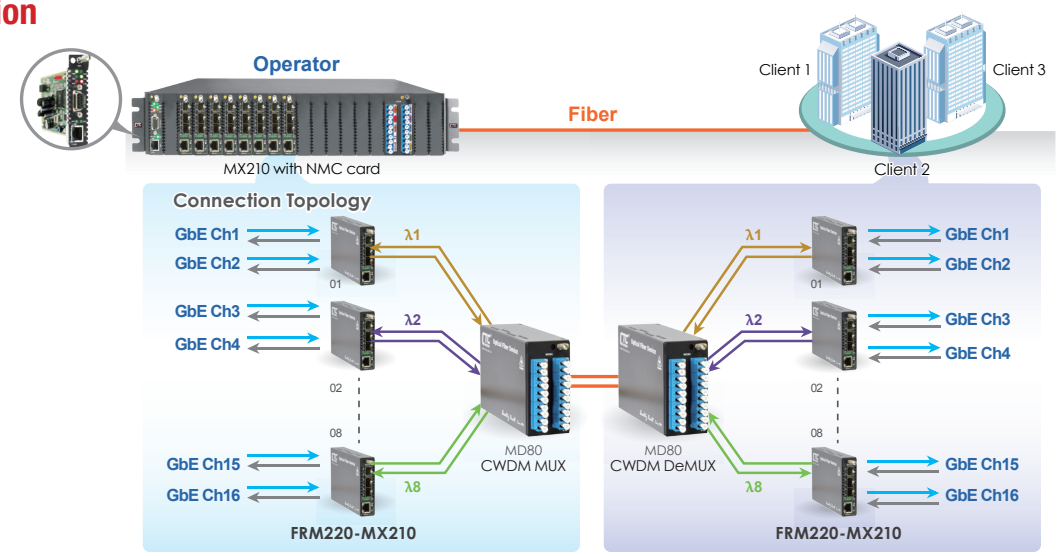
- Complies with MEF CE1.0
- Supports 8K MAC
- Spanning Tree 802.1D, 802.1s, 802.1w
- Supports 802.1Q / 256 active VLANs
- Double VLAN Tagging (C-tag/S-tag) (IEEE 802.1ad) support for ISP application
- Various QoS capability (MAC/port/802.1p/Diffserv)
- Port-based rate limiting
- DHCP Snooping
- IGMP Snooping
- IPv6 support
- IEEE 802.3x and IEEE 802.1x support
- Jumbo frame for up to 9.6K
- Extensive Ethernet OAM support
- IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
- SNMP v1/v2c/v3, Telnet, Web GUI
- IEEE 1588 V2 aware (Optional)

Specifications

Optical Interface	Port1/Port2	100Base-FX, 1000Base-X or 2500Base-X SFP-LC
	Port3	1000Base-FX or 1000Base-X SFP-LC
Electrical Interface	Port4	10/100/1000Base-T RJ45
		MDI/MDIX auto crossover
		IEEE802.3x flow control
	(Supports manual 10,100,1000Base-T, Full, Half duplex, or n-way (Auto-Negotiation) each channel)	
Standards	IEEE 802.3 10Base-T, IEEE 802.3u, 100Base-TX, 100Base-FX, IEEE 802.3z 1000Base-X, IEEE 802.3ab, 1000Base-T	
LEDs	PWR, Link (Port1, Port2, Port3) Port4: Link/Speed	
VLAN Feature	IEEE 802.1Q tagged VLAN, port based VLAN,	
	MAC based VLAN, protocol based VLAN,	
	private VLAN, IEEE 802.1ad Q-in-Q	
Qos Feature	IEEE 802.1p 8 priority queues per port, Cos based on switch port; VLAN ID; TCP/UDP port.	

Qos Feature	IEEE802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
L2 switching Protection	STP, RSTP, MSTP, ITU-T G8031/G.8032
Trunking	IEEE 802.3ad LACP
Power	12VDC
Power Consumption	< 12W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	20 ~ 80% non-condensing (Operating); 10 ~ 90% (Storage)
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-MX210	10/100/1000Base-T + 2x 100/1000/2500Base-X + 100/1000Base-X OAM Managed Switch

Note:

To support console Interface management, this card must be placed in CH01M chassis.

FRM220-10GC-TS

10G Base-T to 10G Base-R SFP+ Media Converter

The FRM220-10GC-TS is a copper to fiber 10G Ethernet media converter based on IEEE802.3an and IEEE802.3ae. With SNMP and Web-based management in the FRM220, the Network administrator can monitor, configure and control the activity of each card in the chassis. This converter uses Cat.6a/Cat 7 twisted pair cable as copper transmission media with RJ-45 and 10G optical solution with SFP+ LC connector. The data stream can be converted bi-directionally from 10G Base-T to 10G Base-R and vice versa. With full duplex wire speed forwarding capability between these two media, the FRM220-10GC-TS brings you the best and simplest solution for the 10G Ethernet conversion between copper wire and fiber.

Features

- Network Management via FRM220 Chassis
- Complies with IEEE802.3an 10GBase-T and IEEE802.3ae 10GBase-R
- Real-Time conversion between 10GBase-T and 10GBase-R
- Common used SFP+ fiber interface and RJ45 connector
- Full duplex wire speed forwarding
- Forwarding I8k bytes jumbo packet
- Loopback Test
- Link Fault Pass Through
- Fiber Fault Alert
- IEEE 802.1q VLAN pass through
- Supports manual Dip Switch for quick set up

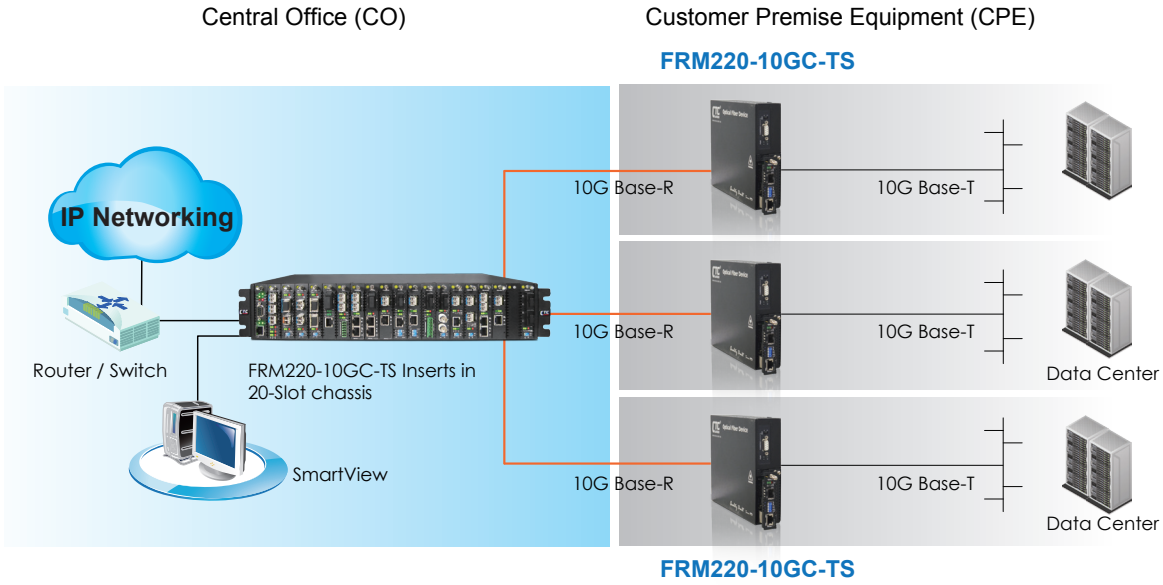
Specifications

Optical Interface	Connector	SFP+ LC
	Data rate	10.3125Gbps
	Distance	300m, 10km, 40km, 80km
	Wavelength	1550nm, 1310nm, 850nm, WDM
Electrical Interface	Connector	RJ45
	Data rate	10Gbps
	Cable type	Cat.6a, 7
	Distance	95 meters (Cat.7)
Management	Console port	RS-232 via CH01M, DIP Switch with CH01
Standards	IEEE 802.3an, IEEE 802.3ae	

LEDs	SFP+, LR, Link/Act, LBK A/B, SYS
Power	12VDC
Power Consumption	< 12W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	0 ~ 85% non-condensing
Certification	CE, FCC
MTBF	57,000 hrs

Application

10G Media Conversion application



Ordering Information

Model Name	Description
FRM220-10GC-TS	10G Base-T RJ45 to 10G Base-R SFP+, with DIP switch (optional SFP+)

Note: This Card MUST be placed in CH02M chassis. For standalone SNMP management, place this card in CH02/NMC or CH04A chassis.

FRM220A-1002ES

2x 10/100/1000Base-T + 2x 100/1000Base-X SFP GbE Switch

The FRM220A-1002ES is a dual copper and dual fiber Gigabit Ethernet switch designed to make conversion between 10/100/1000Base-T and 100/1000Base-SX/LX with SFP connector. With SNMP and Web-based management in the FRM220 or FRM220A chassis the network administrator can monitor, configure and control the activity of each FRM220A-1002ES switch card locally via the chassis management. Based on a powerful L2 switch architecture, this converter supports bandwidth control, duplex and speed configuration, VLAN tagging, Q-in-Q, QoS, jumbo frames as well as auto laser shutdown, and link fault pass through. When placed stand-alone, this card may only be managed via local serial console when placed in a CH01M single slot type chassis.

Features

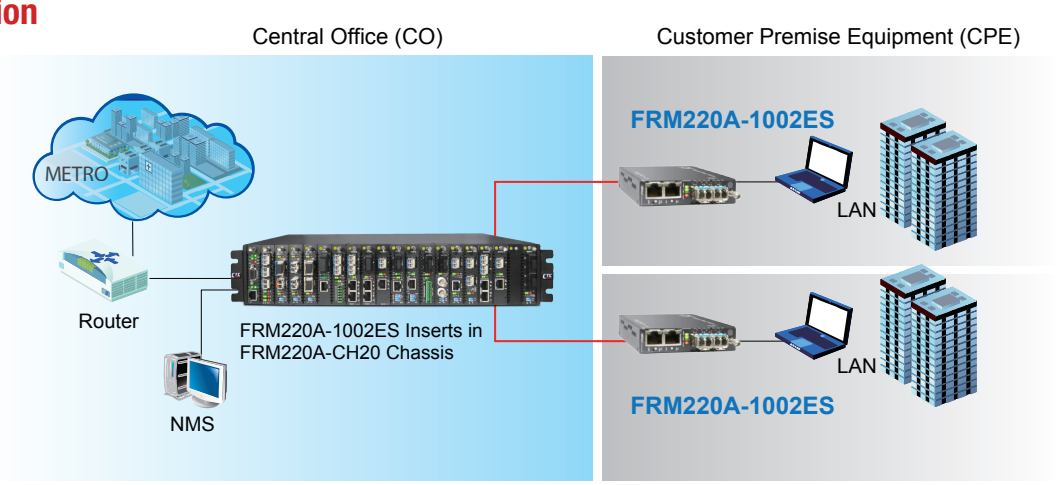
- 2-Port 10/100/1000Base-T and 2-Port 100/1000Base-X Switch
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or manual mode in TP port
- Supports flow control Enable or Disable
- Supports Jumbo Frame 10K Bytes
- Supports 16 Tag VLAN Group
- Supports Double VLAN tag (Q-in-Q)
- Supports Bandwidth control
- Supports Loop Back Test
- Supports Link Fault Pass-Through (LFPT) Function
- Supports Auto Laser Shutdown (ALS) Function
- Supports local management on FRM220A rack management.
- Console management on stand-alone.
- Supports D/D function for SFP fiber transceiver
- Provide Product information for management
- Supports the local management (Monitor or Configure status) by the SNMP manager.
- Supports FRM220A for Ethernet Aggregation

Specifications

Optical Interface	Connector	SFP LC
	Data rate	125Mbps, 1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Standards	IEEE 802.3, IEEE 802.3u, 802.3z, 802.3ab, 802.1Q, 802.3X, 802.1ad	
Indications	PWR, LNK1, LNK2, TEST, LAN Link, LAN SPEED	

Certification	FCC Part 15 Class A, CE Mark	
Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher
		1000Base-X Cat.5e or higher
Power	12VDC	
Power Consumption	< 12W	
Dimensions	Card: 155 x 20.8 x 88mm (DxWxH)	
Weight	130g	
Temperature	0~50°C (Operating), -10~70°C (Storage)	
Humidity	0 ~ 95% non-condensing	

Application



Ordering Information

Model Name	Description
FRM220A-1002ES	2-Port 10/100/1000Base-T and 2-Port 100/1000Base-SX/LX SFP GE Switch (Optional SFP)

Note: This card must use CH01M with serial console, to configure standalone settings.

FRM220A-1000EAS/X

2x 10/100/1000Base-T and 2x 100/1000Base-X SFP OAM/IP GbE Managed Switch

The FRM220A-1000EAS/X is an IEEE 802.3ah OAM compliant dual copper and dual fiber Gigabit Ethernet switch solution designed to make conversion between 10/100/1000Base-T(X) and 100/1000Base-X with SFP. With embedded SNMP and Web-based management, the network administrator can monitor, configure and control the activity of each IEEE 802.3ah series card and remotely connected OAM compliant converter. Based on a powerful L2 switch architecture, this converter supports bandwidth control, duplex and speed configuration, VLAN tagging, Q-in-Q, QoS, Spanning tree, jumbo frames as well as auto laser shutdown, link fault pass through, OAM loop back and dying gasp. This card may also be controlled and monitored via an NMC in a managed chassis.

Features

- 2-port 10/100/1000Base-T and 2-port 100/1000Base-X SFP
- Supports local / remote IEEE 802.3ah OAM / IP In-band management
- Standalone IP Based, Web GUI, Telnet, SNMP management
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Supports IEEE 802.1Q Tagged and Port based VLAN
- Supports IEEE 802.1ad Q in Q double tagging
- Forward 10K bytes Jumbo packets (max.)
- Supports Flow control (Pause)
- Supports OAM remote loopback to assist in diagnosing network problems
- RADIUS Client
- Supports bandwidth control
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI)
- Supports Link Fault Pass-Through (LFPT)
- Supports RMON counter
- D/D function for supported SFP fiber transceiver
- Auto Laser Shutdown (ALS)
- Online local / remote f/w upgrade
- Fiber Redundant mode
- Spanning Tree Protocol
- Port Trunking
- Default port and 802.1p tag priority QoS
- Fixed or weighted priority QoS
- Broadcast/Multicast/unknown unicast traffic storm control
- Loop Protection

Specifications

Optical Interface	Connector	SFP LC
	Data rate	125/1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125µm, 62.5/125µm. SM 9/125µm
	Distance	MM 550m, 2km, SM 15/30/50/80/120km WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310,1550nm WDM 1310Tx/1550Rx (type A) 1550Tx/1310Rx (type B)
Power Consumption	< 12W	
Dimensions	Card: 155 x 20.8 x 88mm (DxWxH)	
Weight	130g	

Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP 100Base-TX Cat.5, 5e or higher 1000Base-T Cat.5, 5e or higher
Standards	IEEE 802.3, IEEE 802.3u, IEEE802.1Q, IEEE 802.3ah	
Indications	LED (Power, FX-Link, Test, TX-Link, TX-SPD)	
Power Input	12VDC	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

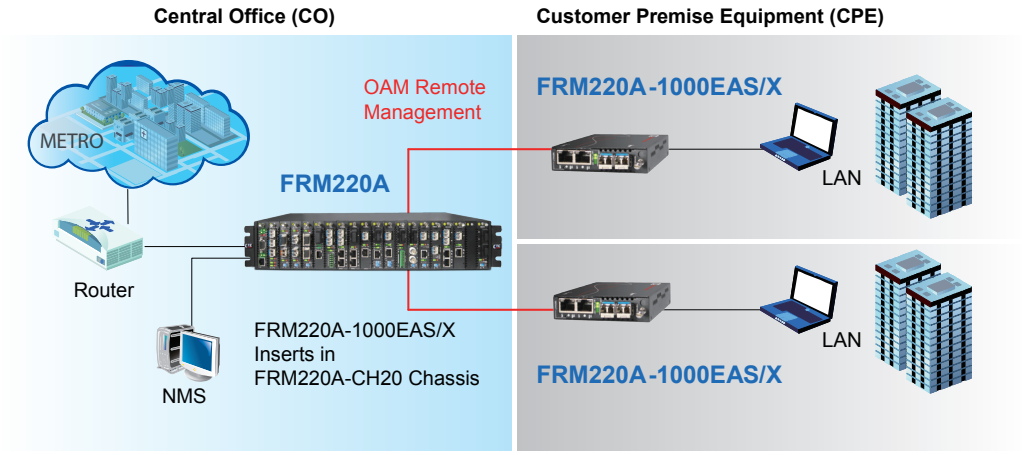
Ordering Information

Model Name	Description
FRM220A-1000EAS/X	2-Port 10/100/1000Base-T and 2-Port 100/1000Base-X with OAM/IP management, (optional SFP)

Note: This card may use CH01M to provide console for initial TCP/IP settings, or use CH01 with default IP.

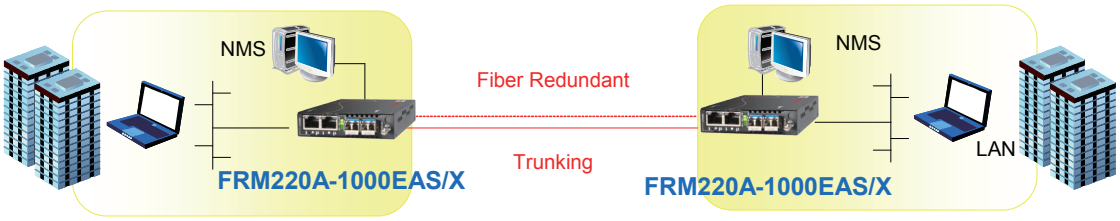
FRM220A-1000EAS/X Application

In the Centrally managed application, the main chassis, all of its cards and all fiber connected remote CPE units can be provisioned and monitored from a single management point



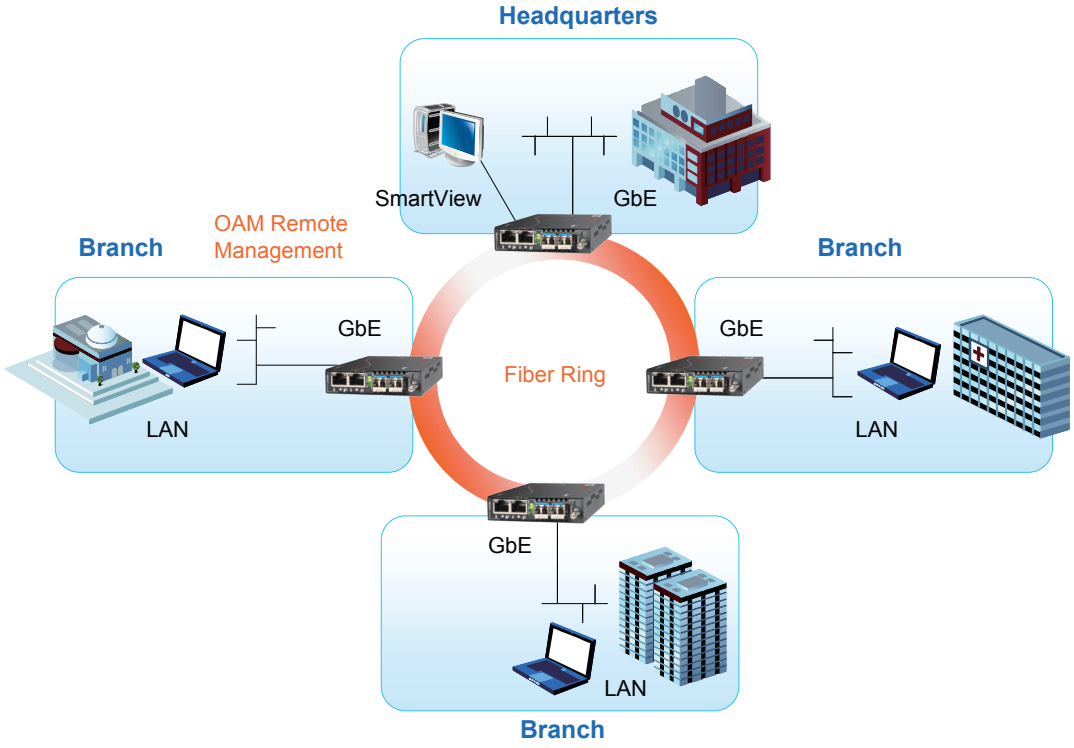
Fiber Redundant / Trunking Application

Utilizing a special trunking function, the 1000EAS/X can be deployed in stand-alone, point-to-point applications and provide 1+1 redundant fiber protection



Fiber Ring Application

In the ring or mesh topology, Spanning Tree Protocol enables a highly resilient network based on multiple 1000EAS/X units



FRM220-10/100

10/1000Base-TX to 100Base-FX Unmanaged Media Converter

The FRM220-10/100 is a Fast Ethernet 10/100Base-TX to 100Base-FX non-managed stand-alone media converter, which gives the options to choose from the most popular fiber cabling connectors, ST, SC or FC. Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber core. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status. These non-managed stand-alone converters may also be concentrated into either the FRM220-CH20 or FRM220-CH08 managed chassis.

Features

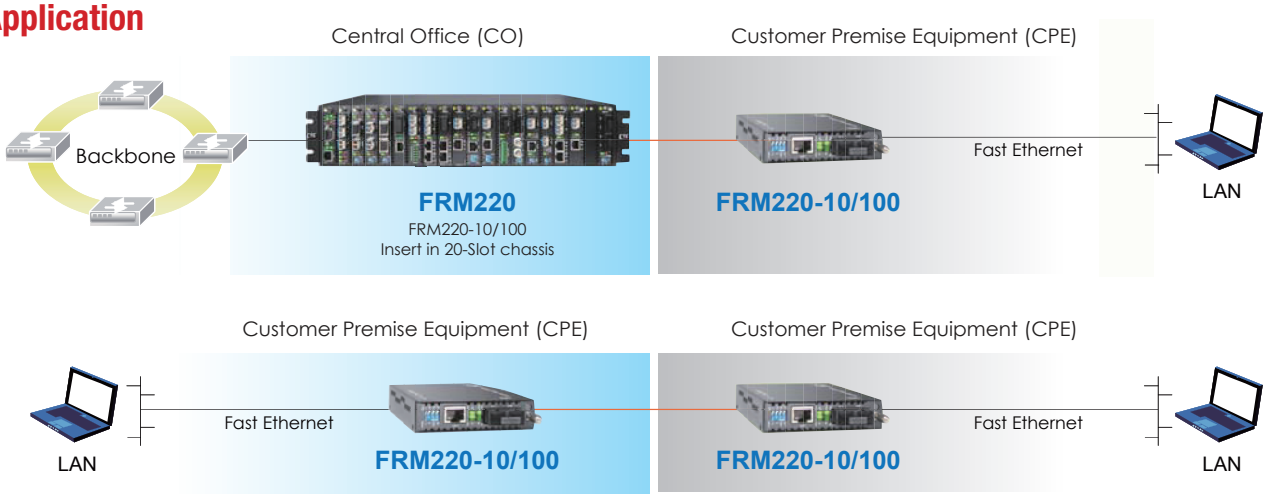
- 10/100Base-TX to 100Base-FX Converter
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Forward 1600 bytes (Max.) packets
- Supports Q in Q double tagged frame transparent
- Supports IEEE 802.1q Tag VLAN pass thru
- Support flow control (Pause)
- Supports Link Fault Pass through (LFP)
- Forward 9K jumbo packets in converter mode

Specifications

Optical Interface	Connector	1x9 (SC, ST, FC)
	Data rate	100Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Standards	IEEE 802.3, IEEE 802.3u	
Indications	LED (Power, FX Link, TX SPD, TX Link, TX Duplex, FEF)	
Certification	CE, FCC, RoHS	

Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mpbs
	Cable	10Base-T Cat.3, 4, 5, UTP,
		100Base-TX Cat.5, 5e or higher
Power	12VDC	
Power Consumption	< 4W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	
Temperature	0 ~ 60°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FRM220-10/100	10/100Base-TX to 100Base-FX unmanaged media converter

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 050: 50km 080: 80km 120:120km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type 60A: WDM 60km A type 60B: WDM 60km B type 80A: WDM 80km A type 80B: WDM 80km B type

Connector Type / Connectivity Distance

FRM220 – 10/100 – □□□□□

Example: FRM220 – 10/100 – SC002

Note: This Card is suitable for use in CH01 standalone chassis

FRM220-1000TS

1000Base-T to 1000Base-X SFP Media Converter

The FRM220-1000TS is a transparent Gigabit Ethernet 1000Base-T to 1000Base-SX/LX SFP converter with very low latency. They are managed (when installed in FRM220 with NMC) or non-managed stand-alone media converters, which give you the options to choose from a wide range of industry standard SFP modules with LC connectors. SFPs in multi-mode and single mode types are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. Because they are completely transparent to Ethernet packets, they are able to support any size frames, including undersized or jumbo packets (>9K bytes). LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status.

Features

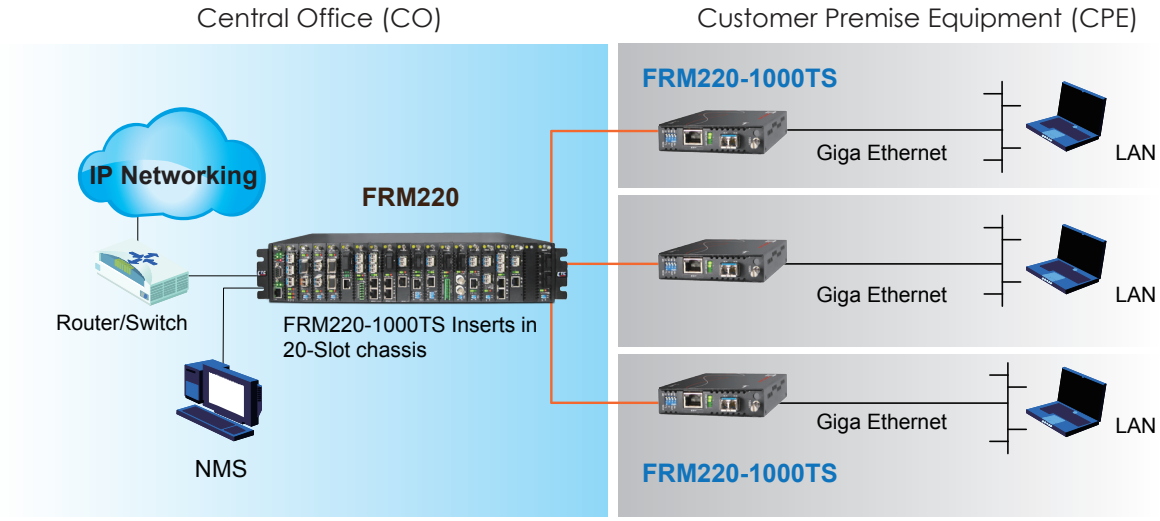
- 1000Base-T to 1000Base-SX/LX
- Network management via terminal or SNMP in FRM220 chassis
- Auto-negotiation or force mode
- Auto MDI/MDIX
- Forward > 9K bytes packets
- Supports Link Fault Pass Through (LFP) function
- Auto Laser Shutdown (ALS)
- Protocol Transparent

Specifications

Optical Interface	Connector	SFP LC
	Data rate	1000Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 550m, 2km, SM15/30/50/80/120km
		WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ45
	Data rate	1000Mbps
	Duplex mode	Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP

Standard	IEEE 802.3ab
Indications	LED (Power, FX-Link, FX Duplex, TX-SPD, TX-Duplex, TX-Link)
Power Input	Card : 12VDC
	Standalone : AC, DC options
Power Consumption	< 12W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC, LVD
MTBF	65,000 hrs (25°C)

Application



Ordering Information

Model Name	Description
FRM220-1000TS	1000Base-T to 1000Base-X SFP media converter (Optional SFP)

Note: This Card is suitable for use in CH01 standalone chassis

FRM220-1000M

Web Smart OAM Managed 10/100/1000Base-T to 1000Base-X GbE Media Converter

The FRM220-1000M is an IEEE802.3ah OAM compliant copper to fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-T and 100M/1000Base-X with SC, FC or ST connectors. With SNMP and Web-based management in the FRM220, the network administrator can monitor, configure and control the activity of each 802.3ah series card and remotely connected OAM compliant converter. Converter settings include band-width control, duplex, and speed configuration, VLAN tagging and limited Q-in-Q support. When used as stand-alone converters, the 1000M can be managed by a friendly WebSmart user interface via any web browser.

Features

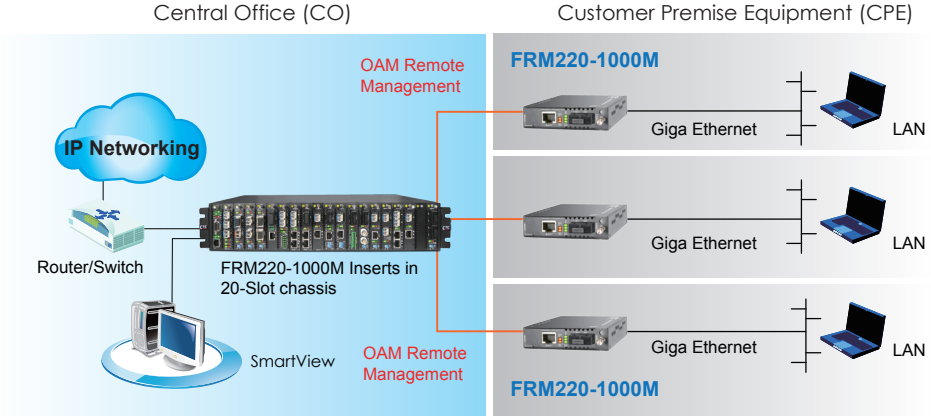
- 10/100/1000Base-T to 1000Base-X Converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or manual mode in TP port
- Supports flow control Enable or Disable
- Supports Jumbo Frame 9K Bite
- Ingress / Egress bandwidth control
- Supports IEEE 802.3ah OAM in-band management
- Firmware upgrade via Web
- Management Password Security
- Dying gasp (remote power failure detection)
- Supports Link Fault Pass-Through (LFPT) Function
- Supports Auto Laser Shutdown (ALS) Function
- Allow IP settings Web or Console management on stand-alone.
- Provide Product information for management
- Online local/remote f/w upgrade
- Supports 16 Tag VLAN Group
- RMON counters (for standalone unit only)

Specifications

Optical Interface	Connector	1x9 (SC)
	Data rate	125/1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP,
		100Base-TX Cat.5, 5e or higher

Standards	IEEE 802.3, IEEE 802.3u IEEE 802.3ab, 802.3z, 802.3ah, 802.1Q
Indications	LED (Power, FX-Link, LAN Speed, LAN Link)
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-1000M	10/100/1000Base-T to 1000Base-X, Web Smart OAM managed media converter

Connector Type	Connectivity Distance
SC	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Note: This card may use CH01M to provide console for initial TCP/IP settings, or use CH01 with default IP.

FRM220-1000MS

Web Smart OAM Managed 10/100/1000Base-T to 100/1000Base-X SFP GbE Media Converter

The FRM220-1000MS is an IEEE802.3ah OAM compliant copper to fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-T and 100/1000Base-X with SFP modules. With SNMP and Web-based management in the FRM220, the network administrator can monitor, configure and control the activity of each 802.3ah series card and remotely connected OAM compliant converter. Converter settings include bandwidth control, duplex, and speed configuration, VLAN tagging, limited Q-in-Q support and SFP DDMI. When used as stand-alone converters, the 1000M can be managed by a friendly WebSmart user interface via any web browser.

Features

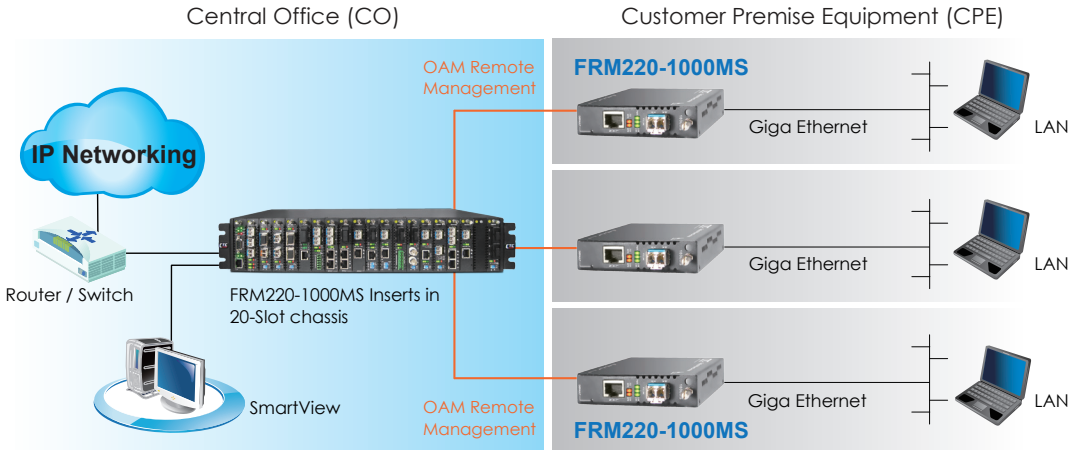
- 1-Port 10/100/1000Base-T to 100/1000Base-X Converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or manual mode in TP port
- Supports flow control Enable or Disable
- Supports Jumbo Frame 9K Packet
- Ingress / Egress bandwidth control
- Supports 802.3ah-OAM in-band management
- Firmware upgrade via Web (for standalone unit only)
- Management Password Setting (for standalone unit only)
- Dying gasp (remote power failure detection on stand-alone)
- Supports Link Fault Pass-Through (LFPT) Function
- Supports Auto Laser Shutdown (ALS) Function
- Allow IP settings web or console management
- Supports D/D function for SFP fiber transceiver
- Supports 16 Tag VLAN Group
- RMON counters (for standalone unit only)

Specifications

Optical Interface	Connector	SFP LC
	Data rate	125/1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125µm, 62.5/125µm. SM 9/125µm
	Distance	MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm WDM 1310Tx/1550Rx (type A) 1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP 100Base-TX Cat.5, 5e or higher

Standards	IEEE 802.3, 802.3u, 802.3ab, 802.3z, 802.3ah, 802.1Q
Indications	LED (Power, FX-Link, LAN Speed, LAN Link)
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-1000MS	10/100/1000Base-T to 100/1000Base-X SFP Web smart OAM managed media converter. (Optional SFP)

Note: This card may use CH01M to provide console for initial TCP/IP settings, or use CH01 with default IP.

FRM220-1000EAS/X-1

OAM/IP Managed 10/100/1000Basde-T to 100/1000Base-X SFP GbE Media Converter

The FRM220-1000EAS/X-1 is an IEEE802.3ah OAM compliant copper to fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-T and 100/1000Base-X with SFP. With stand-alone SNMP and Web-based management, the network administrator can monitor, configure and control the activity of each IEEE802.3ah series card and remotely connected OAM compliant converter. By offering IEEE802.3ah OAM in-band management, this converter can also be completely controlled and monitored from a centrally located managed rack. Based on a powerful L2 switch architecture, this converter supports bandwidth control, duplex and speed configuration, VLAN tagging, Q-in-Q, QoS, Spanning tree as well as auto laser shutdown, link fault pass through, OAM loop back and dying gasp.

Features

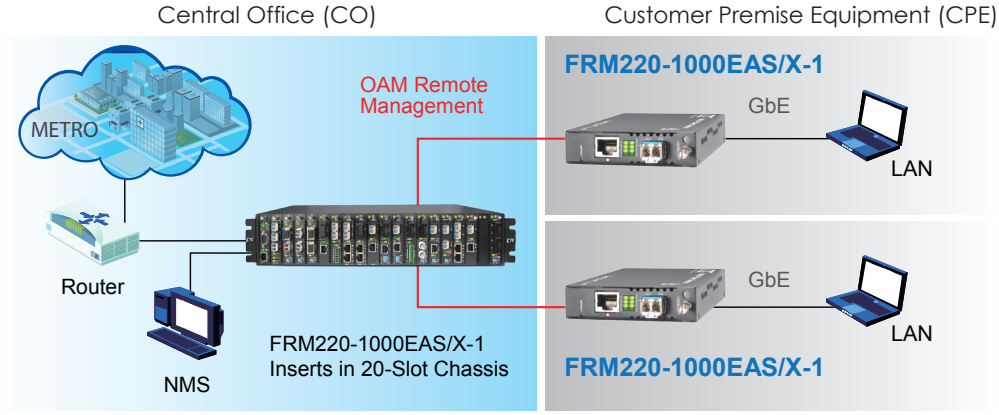
- 10/100/1000Base-T to 100/1000Base-X SFP
- Supports local / remote IEEE802.3ah OAM/ IP In-band management
- Stand-alone IP Based, Web GUI, Telnet, SNMP management
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Supports IEEE 802.1Q Tagging
- Supports Q in Q double tagging
- Forward 10K bytes Jumbo packets (max.)
- Supports Flow control (Pause)
- Supports OAM remote loopback to assist in diagnosing network problems
- Supports remote IP ping function for diagnostic purpose
- Supports bandwidth control
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI)
- Supports Link Fault Pass-Through (LFPT)
- Supports RMON counter
- D/D function for supported SFP fiber transceiver
- Auto Laser Shutdown (ALS)
- Online local / remote f/w upgrade
- Default port and IEEE802.1Q Tagging priority QoS

Specifications

Optical Interface	Connector	SFP LC
	Data rate	100/1000Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125µm, 62.5/125µm.
		SM 9/125µm
	Distance	MM 550m, 2km, SM 15/30/50/80/120km
		WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Power Consumption	< 8W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	

Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher
		1000Base-T Cat.5, 5e or higher
Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.1Q, IEEE 802.3ab, IEEE 802.3z	
Indications	LED : Power, FX-Link, FEF, TEST, Speed(10,100,1000), FULL	
Power Input	Card : 12VDC	
	Standalone : AC, DC options	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FRM220-1000EAS/X-1	10/100/1000Base-T to 100/1000Base-X with OAM/IP-Based managed GbE Media Converter, (optional SFP)

Note: This card may use CH01M to provide console for initial TCP/IP settings, or use CH01 with default IP.

FRM220-100AS-1

OAM/IP Managed 10/100Base-TX to 100Base-FX Media Converter

FRM220-10/100AS-2

2x 10/100Base-TX + 2x 100Base-FX OAM / IP Managed Switch

The FRM220-100AS-1and FRM220-10/100AS-2 are an IEEE802.3ah OAM compliant copper to fiber Fast Ethernet solution designed to make conversion between 10/100Base-TX and 100Base-FX with SFP. With stand-alone SNMP and Web-based management, the network administrator can monitor, configure and control the activity of each IEEE802.3ah series card and remotely connected OAM compliant converter. By offering IEEE802.3ah OAM in-band management, this converter can also be completely controlled and monitored from a centrally located managed rack. Based on a powerful L2 switch architecture, this converter supports bandwidth control, duplex and speed configuration, VLAN tagging, Q-in-Q, QoS, Spanning tree as well as auto laser shutdown, link fault pass through, OAM loop back and dying gasp.

Features

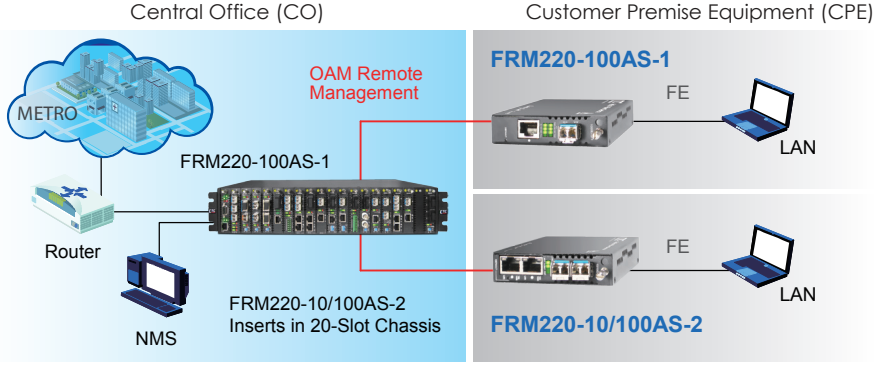
- 10/100Base-TX to 100Base-FX SFP (100AS-1)
- 2x 10/100Base-TX + 2x 100Base-FX SFP (10/100AS-2)
- Supports local / remote IEEE802.3ah OAM/IP In-band management
- Stand-alone IP Based, Web GUI, Telnet, SNMP management
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Supports IEEE 802.1Q Tagging
- Supports Q in Q double tagging
- Max. MTU size 10K bytes (100AS-1), 1536 bytes (10/100AS-2)
- Supports Flow control (Pause)
- Supports OAM remote loopback to assist in diagnosing network problems
- Supports bandwidth control
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI)
- Supports Link Fault Pass-Through (LFPT)
- Supports remote loopback
- D/D function for supported SFP fiber transceiver
- Auto Laser Shutdown (ALS)
- Online local / remote f/w upgrade
- Default port and IEEE802.1Q Tagging priority QoS
- SNMP trap and LED alarm for loss of light and loss of signal

Specifications

Optical Interface	Connector	SFP LC
	Data rate	100Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm. SM 9/125μm
	Distance	MM 550m, 2km, SM15/30/50/80/120km WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310, 1550nm WDM 1310Tx/1550Rx (type A) 1550Tx/1310Rx (type B)
Power Consumption	< 12W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	
Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex

Electrical Interface	Cable: 10Base-T Cat.3, 4, 5, UTP 100Base-TX Cat.5, 5e or higher
Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.1Q, ITU-T G.664
Indications	LED : Power, FX-Link, FEF, TEST, Speed(10,100), FULL
Power Input	Card : 12VDC Standalone : AC, DC options
Temperature	Storage conditions Temperature range : -5~+45°C Relative Humidity : 5~95% Rh Absolute Humidity : 1~25g H2O/m^3 Operation conditions Temperature range : -5~+45°C Relative Humidity : 5~95% Rh Exist conditions for condensation and icing Absolute Humidity : 1~29g H2O/m^3
Certification	CE, FCC, EN60950 LVD compliant
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-100AS-1	10/100Base-TX to 100Base-FX with OAM/IP-Based managed FE Media Converter (optional SFP)
FRM220-10/100AS-2	2x 10/100Base-TX + 2x 100Base-FX with OAM/IP Based Managed FE Switch (optional SFP)

Note: This card may use CH01M to provide console for initial TCP/IP settings, or use CH01 with default IP.

FRM220-10/100i

10/100Base-TX to 100Base-FX
In-Band Managed Converter

The FRM220-10/100i is a 10/100Base Ethernet to 100Base-FX fiber slide-in card converter designed for central and remote applications. With advanced features like bandwidth control, this media converter is targeted for customer premises equipment in metro LAN, campus, enterprise and FTTx applications. By offering in-band management, this converter can be completely controlled and monitored from a centrally located managed rack controlling all converter settings including bandwidth control, duplex, and speed configuration. This media converter is completely transparent to Layer 2 and Layer 3 protocols including IEEE 802.1q, VLAN tag, Q in Q, STP, IPX, IP, etc. When used stand-alone, this converter has no access to management functions except to force Ethernet connection and apply Link Fault Pass-thru via setting of a 4-pole DIP switch.

Features

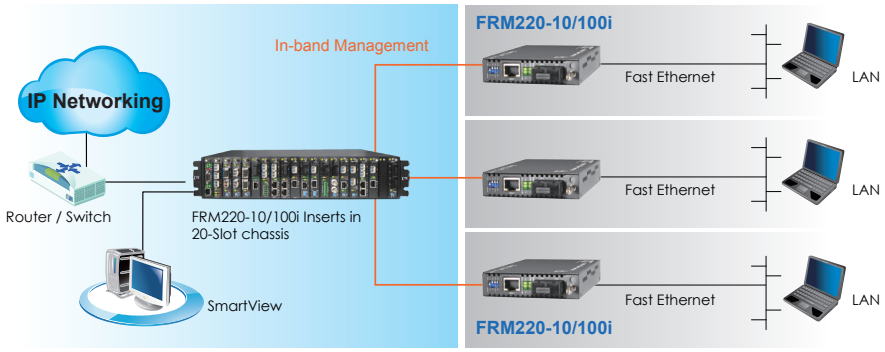
- 1-Port 10/100Base-TX to 100Base-FX Converter
- Auto-Negotiation or forced mode
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI)
- Supports Link Fault Pass-Through (LFPT)
- Supports Loop Back Test
- Supports RMON counter
- Auto Laser Shutdown (ALS)
- Auto MDI/MDIX
- Forward 2046 bytes (max.) packets in switch mode
- Forward 9K jumbo packets in converter mode
- Supports Q in Q double tagged frame transparent
- Supports IEEE 802.1q Tag VLAN pass thru
- Supports local / remote In-band management (Monitor and Configure) by the SNMP manager.
- Bandwidth control (Nx32Kbps or Nx512Kbps)
- Supports IEEE 802.3x flow control (Pause)
- Fiber Hardware Reset (FHR)
- Online local / remote f/w upgrade

Specifications

Optical Interface	Connector	1 x 9 (SC, ST, FC)
	Data rate	125Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ45
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher

Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, TS-1000
Indications	LED (Power, FEF, FX-Link, TX-SPD, TX-Duplex, TX-Link)
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-10/100i	10/100Base-TX to 100Base-FX In-band managed converter

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Connector Type / Connectivity Distance

FRM220 – 10/100i – □□□□□

Example: FRM220 – 10/100i – SC002

Note: This card must use CH01M, with serial console, to configure standalone settings.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-10/100iS-2

Dual Channels 10/100Base-TX to 100Base-FX
In-Band Managed Converter

The FRM220-10/100iS-2 is a dual (2 in 1) 10/100Base Ethernet to 100Base-FX fiber slide-in card converter based on the popular FRM220-10/100i. With advanced features like bandwidth control, this media converter is targeted for customer premises equipment in metro LAN, campus, enterprise and FTTx applications. By offering in-band management, this converter can be completely controlled and monitored from a centrally located managed rack controlling all converter settings including band-width control, duplex, and speed configuration. By offering two completely isolated converters on one card, this card can effectively double the conversion capacity of a rack.

Features

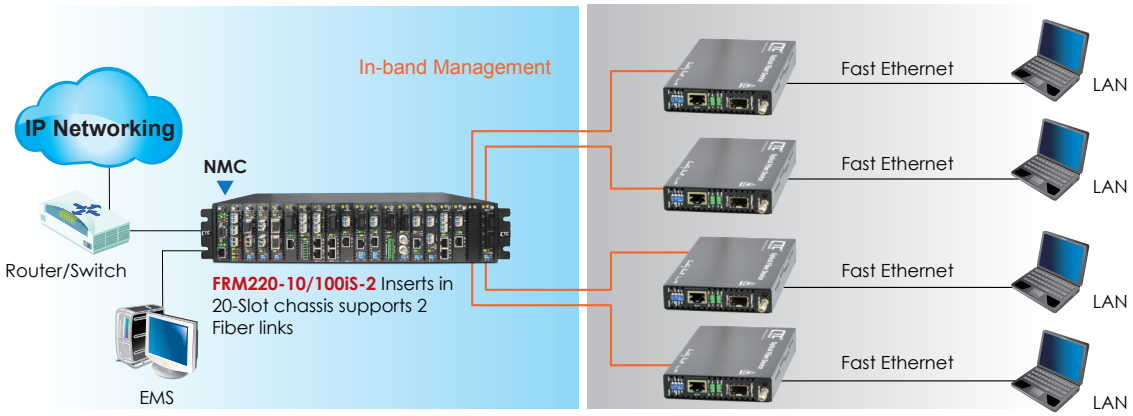
- Dual independent converters 10/100Base-TX to 100Base-FX
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Forward 2046 bytes (max.) packets in switch mode
- Supports IEEE 802.1Q Tag VLAN pass thru
- Supports Q in Q double tagged frame transparent
- Forward 9K jumbo packets in converter mode
- Supports local / remote In-band management (Monitor and Configure) by the SNMP manager
- Bandwidth control (Nx32Kbps or Nx512Kbps) & flow control (Pause)
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI) and Link Fault Pass-Through (LFPT)
- Supports Loop Back Test and RMON counter
- D/D function for supported SFP fiber transceiver
- Auto Laser Shutdown (ALS) and Fiber Hardware Reset (FHR)
- Online local / remote f/w upgrade

Specifications

Optical Interface	Connector	SFP LC
	Data rate	125 Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm. SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm WDM 1310Tx/1550Rx (type A) 1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP 100Base-TX Cat.5, 5e or higher

Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, TS-1000
Indications	LED (Power, FEF, FX-Link, TX-SPD, TX-Duplex, TX-Link)
Power Input	12VDC
Power Consumption	< 4W
Dimensions	155 x 88 x 23mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC, RoHS compliant
MTBF	65,000 hrs

Application



FRM220-10/100iS

Ordering Information

Model Name	Description
FRM220-10/100iS-2	Dual converter 10/100Base-TX to 100Base-FX SFP with In-band management, (optional SFP)

Note: The Card is suitable for use in CH01 standalone chassis.

FRM220-FXO-4
FRM220-FXS-4

4x FXO over fiber & 4x FXS over fiber

FRM220-FXO-4/FXS-4 are 4 channel POTS (Plain Old Telephone System) over fiber converter/extender. The four POTS connection uses standard RJ-11C modular connectors for each copper pair connection. A pair of FRM220-FXO-4/FXS-4 is required to implement an end to end system. FXO type unit connects to a telephone line (PSTN) or PBX station line and has ability to detect ringing voltages and to act as a telephone. FXS type unit is the reciprocal unit and has ability to act as PSTN and connects to a telephone device. Two FXS cards may be connected back-to-back to provide a private "hot line".
When the FRM220-FXO-4/FXS-4 cards are placed in the FRM220 rack with SNMP management, in-band management allows configuring and viewing the card and remote converter's status, type, version, fiber link status, on hook status and alarms. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switch.

Features

- Extend telephone voice transmission up to 120km over fiber
- Network management via terminal, web or SNMP in FRM220 chassis
- Supports telephone voice transmission
- Supports FXS to FXS hot line
- Supports caller ID Pass-Through

Specifications

Optical Interface	Connector	SFP-LC
	Fiber	MM 62.2/125μm, 50/125μm, SM 9/125μm
		Rate: 155Mbps
	Distance	MM 2km, SM 15/30/50km, WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Indications	LED (Power, FX Link, Phone Act, Test)	
Power Input	12VDC	
Power Consumption	< 6W (FRM220-FXO-4)	
	< 12W (FRM220-FXS-4)	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Electrical Interface	Connector	RJ-11
	FXO modle	Impedance : 600 ohms
		Coding : 16 bits liner
		Loop Current : 10~100mA
		Ring Frequency : Acceptable 20 ~50Hz
		Insertion Loss: 0.0 ± 1.0dB at 1000Hz
		Impedance : 600 ohms
		Level Gain : TX 0dB, RX -3dB
	FXS modle	Coding : 16 bits liner
		Dial: DTMF and Dial Pulse
		Provides 48VDC ± 4V to FXO
		Ringing Waveform : Sine wave
		Ringing Frequency : 20/25/30/35/40/45/50 Hz selectable
		Ring Cadence: FXS to FXS : On / 1 sec, Off / 2 sec
		FXO to FXS; Reproduces the cadence detected by FXO
		Insertion Loss 0.0 ± 1.0dB at 1000Hz
		REN: 4.0B(Ring Equivalence Number)
		Level Gain : TX 0dB, RX -3dB

Application

Figure 1 : Automatic Ring down hotline

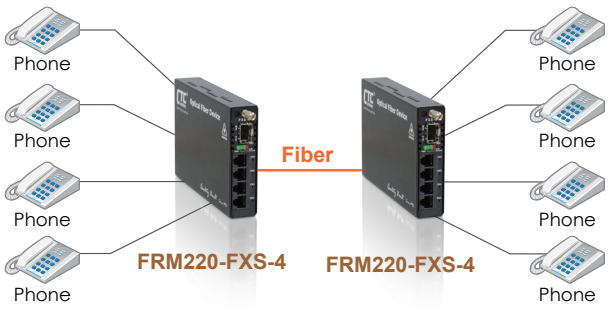
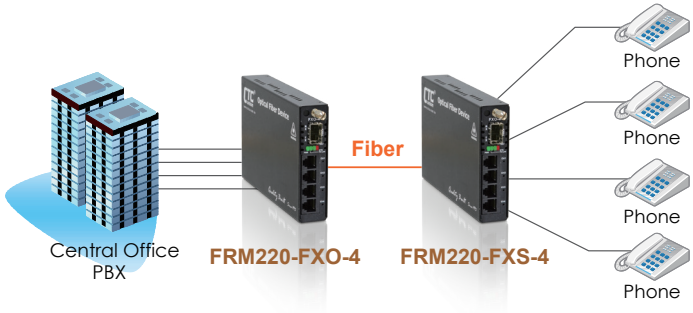


Figure 2 : Voice transmission from 2km to 120km over fiber



Ordering Information

Model Name	Description
FRM220-FXO-4	4-port FXO fiber converter SFP-LC
FRM220-FXS-4	4-port FXS fiber converter SFP-LC

Note: This card may be set by DIP switch and placed in CH01 standalone chassis. When connected as a remote to a managed central chassis, this card supports in-band management.

FRM220-FXO/FXS

Single port FXO/FXS Fiber Converter

The FRM220-FXO/FXS is a POTS (Plain Old Telephone System) over fiber converter/extender. The POTS connection uses a standard RJ-11C modular connector for one copper pair connection. A pair of FRM220-FXO/FXS is required to implement an end to end system. FXO mode connects to a telephone line (PSTN) or PBX station line and has ability to detect ringing voltages and to act as a telephone. FXS mode is the reciprocal unit and has ability to act as PSTN and connects to a telephone device. When the FRM220-FXO/FXS card is placed in the FRM220 rack with SNMP management, in-band management allows configuring and viewing the card and remote converter's status, type, version, fiber link status, on hook status and alarms. Both card and remote can be configured to enable or disable the port, reset the port and set the FXO or FXS mode. When configured in an FXS to FXS fashion, a private "hot line" or direct line is created. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switch.

Features

- Extend telephone voice transmission up to 120km over fiber
- Network management via terminal, web or SNMP in FRM220 chassis
- Supports caller ID Pass-Through
- Selectable FXO or FXS mode
- Supports FXS to FXS hot line

Specifications

Optical Interface	Connector	1x9 (SC)
	Fiber	MM 62.2/125μm, 50/125μm, SM 9/125μm
		Rate: 155Mbps
	Distance	MM 2km, SM 15/30/50km, WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Indications	LED (Power, FX Link, Phone Act, Test)	
Power Input	12VDC	
Power Consumption	< 6W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Electrical Interface	Connector	RJ-11
	FXO modle	Impedance : 600 ohms
		Coding : 16 bits liner
		Loop Current : 10~100mA
		Ring Frequency : Acceptable 20 ~50Hz
		Insertion Loss: 0.0 ± 1.0dB at 1000Hz
		Impedance : 600 ohms
		Level Gain : TX 0dB, RX -3dB
	FXS modle	Coding : 16 bits liner
		Dial: DTMF and Dial Pulse
		Battery Source: 48VDC ± 4V
		Ringing Waveform : Sine wave
		Ringing Frequency : 20/25/30/35/40/45/50 Hz selectable
		Ring Cadence: FXS to FXS : On / 1 sec, Off / 2 sec
		FXO to FXS; Reproduces the cadence detected by FXO
		Insertion Loss 0.0 ± 1.0dB at 1000Hz
		REN: 4.0B(Ring Equivalence Number)
		Level Gain : TX 0dB, RX -3dB

Application

Figure 1 : Automatic Ring down hotline

Figure 2 : Voice Transmission from 2km to 120km over fiber

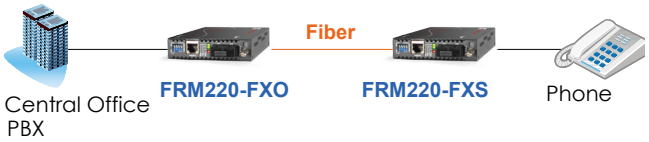
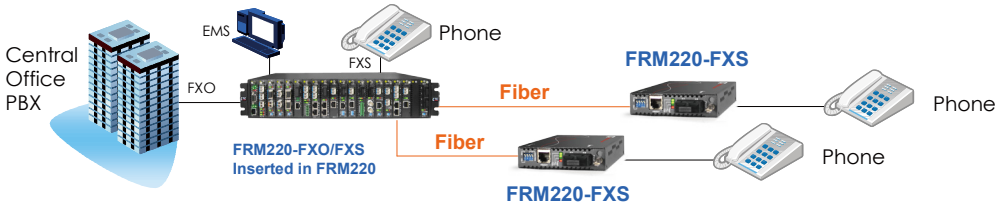


Figure 3 : Selectable FXO or FXS mode



Ordering Information

Model Name	Description
FRM220-FXO/FXS	FXO / FXS fiber converter

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Connector Type / Connectivity Distance

FRM220 – FXO/FXS – □□□□□

Example: FRM220 – FXO/FXS– SC002

Note: This card may be set by DIP switch and placed in CH01 standalone chassis. When connected as a remote to a managed central chassis, this card supports in-band management.

FRM220A-iMux16
FRM220A-iMux8
FRM220A-iMux4

Ethernet over Bonded E1 NTU

The FRM220A-iMux is an E1 inverse multiplexer capable of bundling 4E1/ 8E1/16E1 lines for cost-effective connection of 10/100Base-TX LANs over multiple E1 transports. The FRM220A- iMux transmits 7.93Mbps (iMUX4)/ 15.87Mbps(iMUX8)/ 31.74Mbps(iMUX16) Ethernet bridge channel (GFP-F encapsulated) over multiple E1 links. The FRM220A-iMux bridges the gap between E1 and E3, allowing bridges to operate at faster rates. It also provides high speed access to SDH/SONET backbones where the only access services available are E1 lines. The FRM220A-iMux supports E1 attenuation of up to 43 dB on twisted pair or coax cable. This provides an approximate operating range up to 2km (using 22AWG). The FRM220A-iMUX fully comply the E1 specifications including ITU-T G.703 and G.823. The FRM220A-iMux features diagnostic capabilities for performing remote loopback The operator at either end of the line may test both FRM220A-iMux NTU and the line in the digital loopback mode. The Ethernet copper interface supports auto-negotiation and auto MDI/MDIX, allowing plug-and-play Ethernet connection without any additional configuration.

Features

- The FRM220A - iMUX connects one Fast Ethernet over 1-4 E1 links (1.984Mbps to 7.93Mbps) for iMUX4, over 1- 8 E1 links (1.984Mbps to 15.87Mbps) for iMUX8, over 1- 16 E1 links (1.984Mbps to 31.74Mbps) for iMUX16
- Built-in GFP bridge operates at WAN rate
- Maximum 220ms delay variance between E1 link
- Unbalanced E1/BNC or balanced E1/RJ45
- Fully compatible with FRM220A chassis
- SNMP management with FRM220A chassis
- LED Alarm indication & Auto-Negotiation
- Standalone RS232 console management via CH01M for iMUX4/iMUX8, CH02M for iMUX16
- Support MTU 1916 bytes

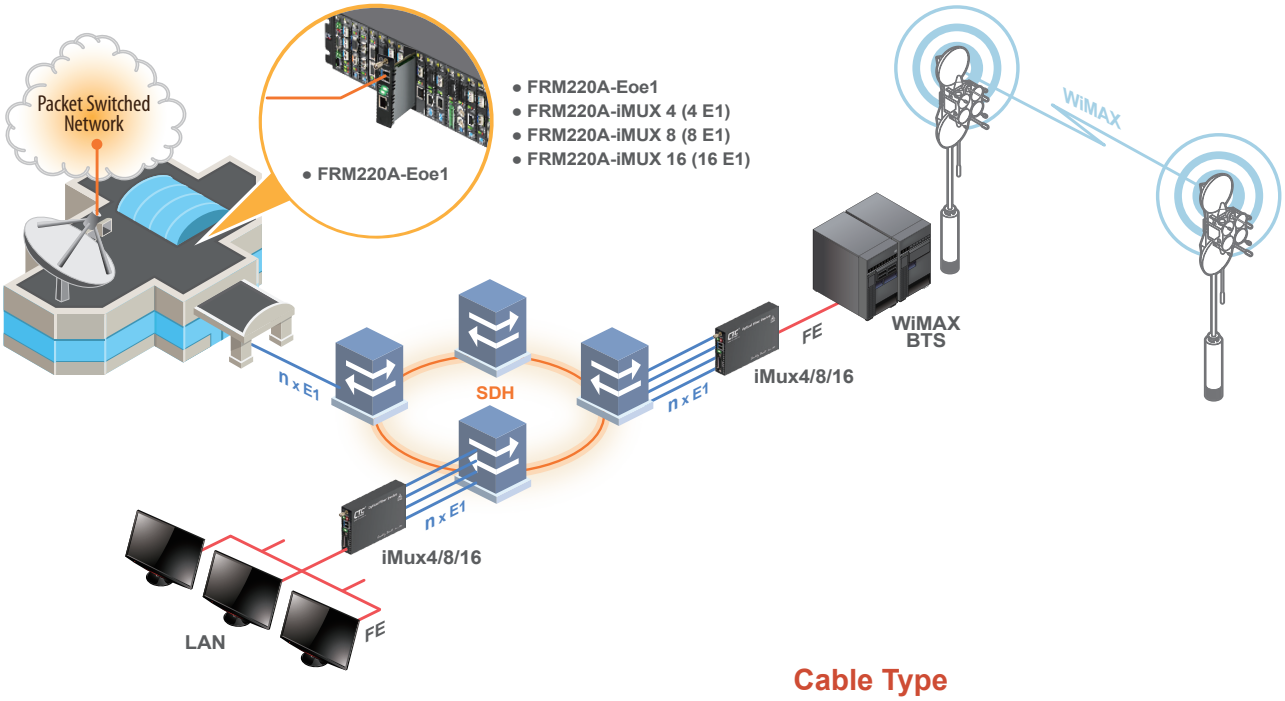
Specifications

E1 Interface	Framing	CCS+CRC (Framed)
	Standard	ITU-T G.703/G.704/G.706 & G.732, G.823
	Encapsulation Protocol	VCAT & LCAS (ITU-T G.7042) GFP-F (ITU-T G.7041)
	Bit rate	2.048Mbps± 50ppm (up to 5E1)
	Line code	HDB3
	Clock setting	Internal OSC or recovery clock
	Receive level	-43dB
	Line impedance	75 ohm (BNC) / 120 ohm (RJ45)
	Jitter Performance	Complies with ITU-T G.823
	Pulse Mask	Complies with ITU-T G.703
	Pulse amplitude	Nominal 2.37V ± 10%
	Delay Variance	220ms
	Connector	RJ45, BNC
	Diagnostics	Digital remote loopback
Ethernet Interface	Standards	IEEE 802.3, 802.3u, 802.1q VLAN, 802.1d bridging
	Mac Address	1K
	Data rate	10/100Base-TX, Half/Full duplex
	Connector	RJ45 10/100Base-TX
		Power, ALM, E1 signal loss
Indications	Power, ALM, E1 signal loss, E1 Alarm(AIS, LOF, RAI, LOMF), LAN link /ACT, 10/100M, SD (100Base-FX)	

Power Input	12VDC
Power Consumption	< 12W
Dimensions	Card: 155 x 42.1 x 88mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% RH (non-condensing)
Certifications	CE, FCC
MTBF	65,000 hrs

Application

Fiber
Ethernet
E1



Ordering Information

Model Name	Description
FRM220A-iMux16T-R	10/100Base-TX to 16 E1 mux card with 16E1 RJ45 cable
FRM220A-iMux16T-B	10/100Base-TX to 16 E1 mux card with 16E1 BNC cable
FRM220A-iMux8T-R	10/100Base-TX to 8 E1 mux card with 8 E1 RJ45 cable
FRM220A-iMux8T-B	10/100Base-TX to 8 E1 mux card with 8 E1 BNC cable
FRM220A-iMux4T-R	10/100Base-TX to 4 E1 mux card with 4E1 RJ45 cable
FRM220A-iMux4T-B	10/100Base-TX to 4 E1 mux card with 4E1 BNC cable

Cable Type

RJ45 Cable

BNC Cable

FRM220A – iMux [nx E1] – [Cable Type]

Example: FRM220A – iMux16T – R

Note: This card may be locally configured by its own console when placed in CH02M with fan.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH02 chassis.

FRM220-GFOM08

8x E1/T1 + GbE Fiber Multiplexer

The FRM220-GFOM08 is an 8 channel E1/T1 fiber multiplexer with an additional Gigabit Ethernet trunk, plus order wire and clear channel RS-232, constructed as a two slot wide card for the FRM220 series. When the FRM220-GFOM08 card is placed in the FRM220 rack with NMC, the management can view the converter card's status, type, version, fiber link status and alarms. Remote, fiber connected standalone card, can also be managed through in-band management via the chassis NMC. The card can be configured to enable or disable the port, reset the port, and provide local or remote diagnostic loopback. The 1+1 redundant optical aggregate of this multiplexer employs industry standard pluggable optics (SFP) operating at 1.25Gbps data rates. The SFP modules can be chosen to support single-mode, multi-mode, single fiber bi-directional or Coarse and Dense Wave Division Multiplexing (CWDM).

Features

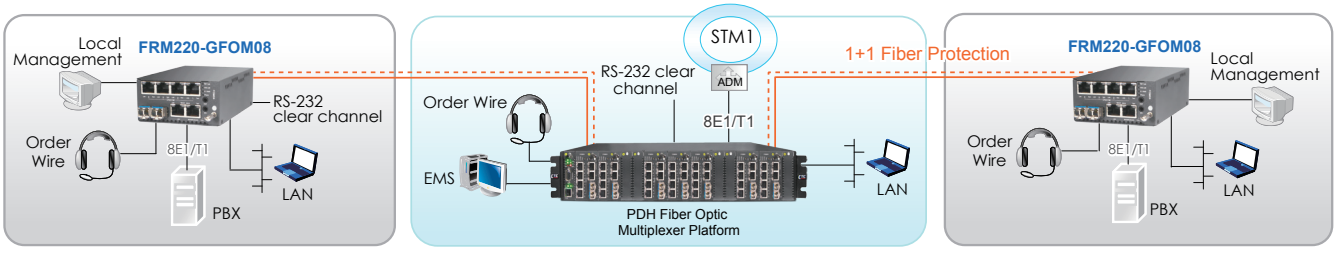
- 8 channels unframed E1/T1 (transparent)
- 10/100/1000Base-T Ethernet
- Auto MDI/MDIX & Auto-Negotiation or Force Mode
- Supports flow control 802.3x & 9K jumbo packets
- Supports link fault Pass-Through for Ethernet
- One clear channel RS232 up to 250Kbps(Async)
- 1+1 fiber protection, switching time < 50ms
- Supports Digital Diagnostics Monitoring Interface (DDMI) SFP
- AIS on signal loss on E1/T1 and fiber port
- Loopback test on E1/T1, RS232, fiber ports
- Supports local or remote In-band management (Monitor or Configure status) by SNMP manager and console port
- Supports Order wire Ear / Microphone port
- Supports On-Line F/W upgrade & Dying Gasp

Specifications

E1/T1 ports	Framing	Unframed (transparent)
	Bit Rate	E1:2.048 Mb/s , T1: 1.544Mb/s
	Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
	Line Impedance	E1: Unbalanced 75 ohms (BNC)
		E1: Balanced 120 ohms (RJ-45)
		T1: Balanced 100 ohms (RJ-45)
	Receiver sensitivity	Short haul
	"Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms
		Nominal 3.00V+/-10% for 120 ohms
	"Zero" Amplitude	+/-0.3V
	Internal Timing	+/-30 ppm
	Jitter Performance	According to ITU-T G.823
	Performance monitoring	According to ITU-T G.821
	Standards	ITU-T G.703, G.704, G.706 and G.732
	Interface Connectors	RJ-45
E1/T1 ports	Test Loops	LLB (Local Loop Back)
		NELB (Near End Loop Back)
E1/T1 ports	Test Loops	RLB (Remote Loop Back)
		RRLB (Request Remote Loop Back)
Fiber	Connector	SFP LC
	Data Rate	1.25 Gbps
Ethernet	Interface Type	10/100/1000Base-T
	Connector	RJ-45
	Standards	IEEE 802.3, 802.3u, 802.3ab
	Duplex modes	full/half
Indications	FX1 Link, FX2 link, E1/T1 Mode/Link/Loopback test, Order wire phone indicator, LAN Link/Speed.	
Power Input	12VDC	
Power Consumption	< 12W	
Dimensions	Card: 155 x 42.1 x 88mm (D x W x H)	
Weight	200g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC	
MTBF	65,000hrs	

Application

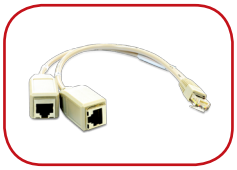
Managed 8E1/T1 + Gigabit Ethernet Fiber Optical Multiplexer applicaiton



-Related Products: FRM220-GFOM04/FOM04 (4E1/T1 + GbE/FE FOM), FRM220-FOM01 (E1/T1+ FE FOM)

Ordering Information

Model Name	Description
FRM220-GFOM08-SR	8x E1/T1 RJ45 and 1000Mbps Ethernet Fiber Mux with 4x2E1 RJ45 cable (optional SFP module, Model : SFS-70xx-xx)
FRM220-GFOM08-SB	8x E1 BNC and 1000Mbps Ethernet Fiber Mux with 4x2E1 BNC cable (optional SFP module, Model : SFS-70xx-xx)



2E1 RJ45 cable

Note: This card may be locally configured by its own console when placed in CH02M with fan.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH02M chassis.

FRM220-GFOM04

4x E1/T1 + GbE Fiber Multiplexer

The FRM220-GFOM04 is a 4 channel E1/T1 fiber multiplexer with an additional Gigabit Ethernet trunk, plus order wire and clear channel RS-232, constructed as a two slot wide card for the FRM220 series. When the FRM220-GFOM04 card is placed in the FRM220 rack with NMC, the management can view the converter card's status, type, version, fiber link status and alarms. Remote, fiber connected standalone card, can also be managed through in-band management via the chassis NMC. The card can be configured to enable or disable the port, reset the port, and provide local or remote diagnostic loopback. The 1+1 redundant optical aggregate of this multiplexer employs industry standard pluggable optics (SFP) operating at 1.25Gbps data rates. The SFP modules can be chosen to support single-mode, multi-mode, single fiber bi-directional or Coarse and Dense Wave Division Multiplexing (CWDM and DWDM).

Features

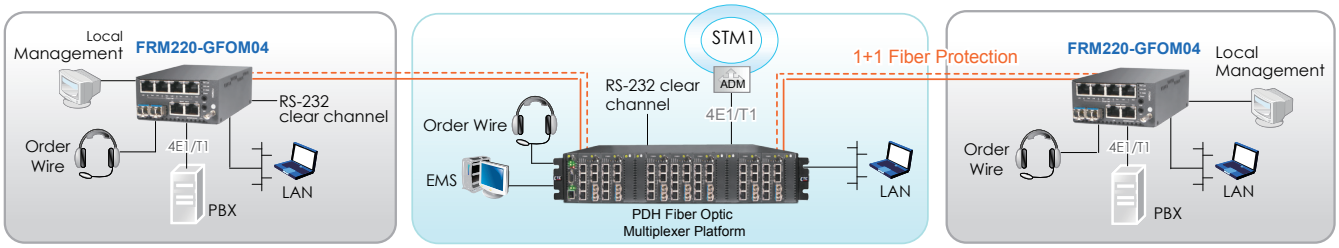
- 4 channels unframed E1/T1 (transparent)
- 10/100/1000Base-T Ethernet
- Auto MDI/MDIX & Auto-Negotiation or Force Mode
- Supports flow control 802.3x & 9K jumbo packets
- Supports link fault Pass-Through for Ethernet
- One clear channel RS232 up to 250Kbps(Async)
- 1+1 fiber protection, switching time < 50ms
- Supports Digital Diagnostics Monitoring Interface (DDMI) SFP
- AIS on signal loss on E1/T1 and fiber port
- Loopback test on E1/T1, RS232, fiber ports
- Supports local or remote In-band management (Monitor or Configure status) by SNMP manager and console port
- Supports Order wire Ear / Microphone port
- Supports On-Line F/W upgrade & Dying Gasp

Specifications

E1/T1 ports	Framing	Unframed (transparent)
	Bit Rate	E1:2.048 Mb/s , T1: 1.544Mb/s
	Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
	Line Impedance	E1: Unbalanced 75 ohms (BNC)
		E1: Balanced 120 ohms (RJ-45)
		T1: Balanced 100 ohms (RJ-45)
	Receiver sensitivity	Short haul
	"Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms
		Nominal 3.00V+/-10% for 120 ohms
	"Zero" Amplitude	+/-0.3V
	Internal Timing	+/-30 ppm
	Jitter Performance	According to ITU-T G.823
	Performance monitoring	According to ITU-T G.821
	Standards	ITU-T G.703, G.704, G.706 and G.732
	Interface Connectors	RJ-45
E1/T1 ports	Test Loops	LLB (Local Loop Back)
		NELB (Near End Loop Back)
E1/T1 ports	Test Loops	RLB (Remote Loop Back)
		RRLB (Request Remote Loop Back)
Fiber	Connector	SFP LC
	Data Rate	1.25 Gbps
Ethernet	Interface Type	10/100/1000Base-T
	Connector	RJ-45
	Standards	IEEE 802.3, 802.3u, 802.3ab
	Duplex modes	full/half
Indications	FX1 Link, FX2 link, E1/T1 Mode/Link/Loopback test, Order wire phone indicator, LAN Link/Speed.	
Power Input	12VDC	
Power Consumption	< 12W	
Dimensions	Card: 155 x 42.1 x 88mm (D x W x H)	
Weight	200g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC	
MTBF	65,000hrs	

Application

Managed 4E1/T1 + Gigabit Ethernet Fiber Optical Multiplexer applicaiton



-Related Products: FRM220-GFOM08 (8E1/T1 + GbE FOM), FRM220-FOM04/FOM01 (4 or 1x E1/T1+ FE FOM)

Ordering Information

Model Name	Description
FRM220-GFOM04-SR	4 x E1/T1 RJ-45 and 10/100/1000Base-T Ethernet Fiber Optic Multiplexer (optional SFP module)
FRM220-GFOM04-SB	4x E1 BNC and 10/100/1000Base-T Ethernet Fiber Optic Multiplexer (optional SFP module)

Connector Type

FRM220 – GFOM04 – ☐☐

Example: FRM220 – GFOM04 – SR

Note: This card may be locally configured by its own console when placed in CH02M with fan.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH02M chassis.

FRM220-FOM04

4x E1/T1 + FE Fiber Multiplexer

The FRM220-FOM04 is a 4 channel E1/T1 fiber multiplexer with an additional wire speed 100M Ethernet trunk, plus order wire and clear channel RS-232, constructed as a two slot wide card for the FRM220 series. When the FRM220-FOM04 card is placed in the FRM220 rack with NMC, the management can view the converter card's status, type, version, fiber link status and alarms. Remote, fiber connected standalone card, can also be managed through in-band management via the chassis NMC. The card can be configured to enable or disable the port, reset the port, and provide local or remote diagnostic loopback. The 1+1 redundant optical aggregate of this multiplexer employs industry standard pluggable optics (SFP) operating at OC3/STM- 1 data rates (155M). The SFP modules can be chosen to support single-mode, multi-mode, single fiber bi-directional or Coarse and Dense Wave Division Multiplexing (CWDM and DWDM).

Features

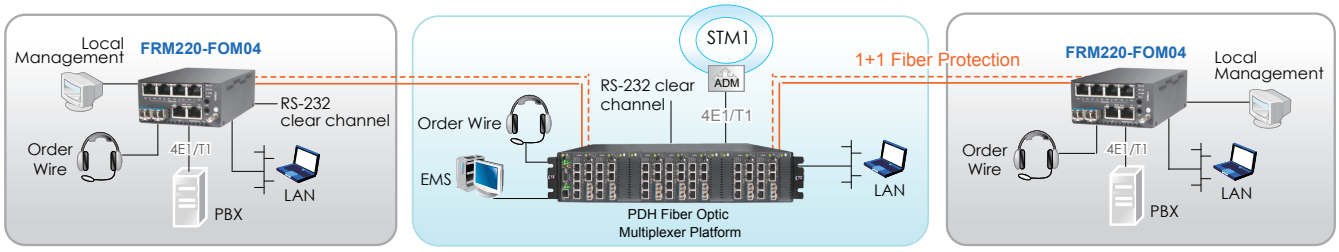
- 4 channels unframed E1/T1 (transparent)
- 10/100Base-TX Ethernet (100M wirespeed)
- Auto MDI/MDIX & Auto-Negotiation or Force Mode
- Supports flow control 802.3x & 9K jumbo packets
- Supports link fault Pass-Through for Ethernet
- One clear channel RS232 up to 250Kbps(Async)
- 1+1 fiber protection, switching time < 50ms
- Supports Digital Diagnostics Monitoring Interface (DDMI) SFP
- AIS on signal loss on E1/T1 and fiber port
- Loopback test on E1/T1, RS232, fiber ports
- Supports local or remote In-band management (Monitor or Configure status) by SNMP manager and console port
- Supports Order wire Ear / Microphone port
- Supports On-Line F/W upgrade & Dying Gasp

Specifications

E1/T1 ports	Framing	Unframed (transparent)
	Bit Rate	E1:2.048 Mb/s , T1: 1.544Mb/s
	Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
	Line Impedance	E1: Unbalanced 75 ohms (BNC cable)
		E1: Balanced 120 ohms (RJ-45)
		T1: Balanced 100 ohms (RJ-45)
	Receiver sensitivity	Short haul
	"Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms
		Nominal 3.00V+/-10% for 120 ohms
	"Zero" Amplitude	+/-0.3V
	Internal Timing	+/-30 ppm
	Jitter Performance	According to ITU-T G.823
	Performance monitoring	According to ITU-T G.821
	Standards	ITU-T G.703, G.704, G.706 and G.732
	Interface Connectors	RJ-45
E1/T1 ports	Test Loops	LLB (Local Loop Back)
		NELB (Near End Loop Back)
E1/T1 ports	Test Loops	RLB (Remote Loop Back)
		RRLB (Request Remote Loop Back)
Fiber	Connector	SFP LC
	Data Rate	155 Mbps
Ethernet	Interface Type	10/100Base-TX
	Connector	RJ-45
	Standards	IEEE 802.3, 802.3u
	Duplex modes	full/half
Indications	FX1 Link, FX2 link, E1/T1 Mode/Link/Loopback test, Order wire phone indicator, LAN Link/Speed.	
Power Input	12VDC	
Power Consumption	< 7W	
Dimensions	Card: 155 x 42.1 x 88mm (D x W x H)	
Weight	200g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC	
MTBF	65,000hrs	

Application

Managed 4E1/T1 + Fast Ethernet Fiber Optical Multiplexer applicaiton



-Related Products: FRM220-GFOM08/GFOM04 (8 or 4x E1/T1 + GbE FOM), FRM220-FOM01 (E1/T1+ FE FOM)

Ordering Information

Model Name	Description
FRM220-FOM04-SR	4 x E1/T1 RJ-45 and 100Mbps Ethernet Fiber Optic Multiplexer(optional SFP module)
FRM220-FOM04-SB	4x E1 BNC and 100Mbps Ethernet Fiber Optic Multiplexer(optional SFP module)

Connector Type

FRM220 – FOM04 – □□

Example: FRM220 – FOM04 – SR

Note: This card may be locally configured by its own console when placed in CH02M with fan.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH02M chassis.

FRM220-FOM01

E1/T1 + FE Fiber Multiplexer

The FRM220-FOM01 is a single channel E1/T1 fiber multiplexer with an additional wire speed 100M Ethernet trunk, plus clear channel RS-232, for placement the FRM220 series. When the FRM220-FOM01 card is placed in the FRM220 rack with NMC, the management can view the converter card's status, type, version, fiber link status and alarms. Remote, fiber connected standalone card, can also be managed through in-band management via the chassis NMC. The card can be configured to enable or disable the port, reset the port, and provide local or remote diagnostic loopback. The optical aggregate of this multiplexer employs either a fixed transceiver or industry standard pluggable optics (SFP) operating at OC3/STM-1 data rates (155M). The SFP modules can be chosen to support single-mode, multi-mode, single fiber bi-directional or Coarse and Dense Wave Division Multiplexing (CWDM and DWDM).

Features

- 1 channel unframed E1/T1 (transparent)
- 10/100Base-TX Ethernet (100M wirespeed)
- Auto MDI/MDIX & Auto-Negotiation or Force Mode
- Supports flow control & 9K jumbo packets
- Supports link fault Pass-Through for Ethernet
- Supports Digital Diagnostics Monitoring Interface (DDMI) SFP
- Loopback test on E1/T1, fiber ports
- Supports local or remote In-band management by SNMP manager
- Local management by console port via FRM220-CH01M chassis
- Supports On-Line F/W upgrade & Dying Gasp

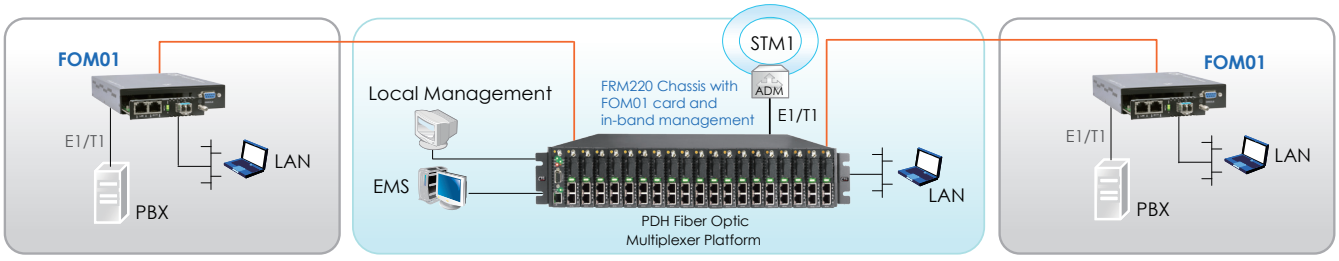
Specifications

E1/T1 ports	Framing	Unframed (transparent)
	Bit Rate	E1:2.048 Mb/s, T1: 1.544Mb/s
	Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
	Line Impedance	E1: Unbalanced 75 ohms (BNC)
		E1: Balanced 120 ohms (RJ-45)
		T1: Balanced 100 ohms (RJ-45)
	Receiver sensitivity	Short haul
	"Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms
		Nominal 3.00V+/-10% for 120 ohms
		+/-0.3V
	"Zero" Amplitude	w/external clock card option
	Internal Timing	+/-30 ppm
	Jitter Performance	According to ITU-T G.823
	Performance monitoring	According to ITU-T G.821
	Standards	ITU-T G.703, G.704, G.706 and G.732
E1/T1 ports	Interface Connectors	RJ-45
	Test Loops	LLB (Local Loop Back)
		RLB (Remote Loop Back)

Fiber	Connector	SFP LC
	Data Rate	155 Mbps
Ethernet	Interface Type	10/100Base-TX
	Connector	RJ-45
	Standards	IEEE 802.3, 802.3u
	Duplex modes	full/half
Indications	Power FX Link, E1/T1 Mode/Link/Loopback test, LAN Link/ Speed	
Power Input	12VDC	
Power Consumption	< 4W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	130g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC	
MTBF	57,000hrs	

Application

Managed E1/T1 + Fast Ethernet Fiber Optical Multiplexer Applicaiton



-Related Products: FRM220-GFOM08/GFOM04 (8 or 4x E1/T1 + GbE FOM), FRM220-FOM04 (4x E1/T1+ FE FOM)

Ordering Information

Model Name	Description
FRM220-FOM01-SR	E1/T1 RJ-45 and 100Mbps Ethernet Fiber Optic Multiplexer (optional SFP module)
FRM220-FOM01-SB	E1 BNC and 100Mbps Ethernet Fiber Optic Multiplexer (optional SFP module)

Connector Type

FMC220 – FOM01 – □□

Example: FMC220 – FOM01 – SR

Note: This card must use CH01M with serial console, to configure standalone settings.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-FTEC

E1/T1 Cross Rate Converter

The FRM220-FTEC is a T1 (US Standard) /E1 (European Standard) converter and timeslot cross connect which enables conversion between one T1 signal and one E1 signal. T1 and E1 signals with framing employ u-Law and A-Law compander encoding principles respectively and encode those analog (voice) signals into 64kbits digital data. The T1 interface supports D4(SF) or ESF frame formats with B8ZS or AMI line code. The E1 interface supports CCS (PCM31) or CAS (PCM30) framing without CRC-4 and framing with CRC-4. The line coding is HDB3.
Tests and diagnostics can easily be performed from the local console interface or via Web based management of the FRM220. Diagnostics include T1 local/remote and E1 local/remote loop back. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switches.

Features

- Converts between T1 and E1 data and signaling
- Enable equipment to operate at T1 and E1 rates
- Supports G.802 Annex B (T1 over E1)
- Configures A-law/μ-law and signaling conversion
- Transparent conversion at 64kbps timeslot level
- Controlled slip for buffer over or under flow
- 24 time slots of T1 Nx64 can be inserted into E1 Nx64, 30/CAS or 31/CCS timeslots

Specifications

E1 Interface	Framing	CAS/PCM30 or CCS/PCM31 selectable
	Bit rate	2.048Mbps
	Line Code	HDB3
	Line Impedance	75 ohm (BNC) / 120 ohm (RJ-45)
		Voice channel sample rule A-Law
	CRC check	CRC-4 enable/disable
	Pulse amplitude	Nominal 2.37V ±10% for 75ohm
		Nominal 3.00V ±10% for 120ohm
	Zero amplitude	± 0.1V
	Connector	RJ-45
T1 Interface	Framing	D4, ESF selectable
	Bit rate	1.544Mbps
	Line Code	B8ZS / AMI
	Equalization	0 ~ 655 feet settable
		Voice channel sample rule μ-Law
	CRC check	CRC-6 when ESF
	Line Impedance	100 ohms
	Transmit Pulse level	3.0V ±10%,
	Receive signal level	0 ~ -10dB
	Connector	RJ-45

LEDs	PWR, Sys, Test, T1/E1
Standard	ITU-T G.703, G.704, G.706, G.823, G.824, ANSI T1.403
Power	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	57,000 hrs

Application

Ordering Information

Model Name	Description
FRM220-FTEC	E1/T1 Cross rate converter

Note: This card must use CH01M, with serial console, to configure standalone settings.
For standalone SNMP management, place this card in CH02/NMC chassis.

FRM220-E1/DATA

E1 to Data

The FRM220-E1/Data is a single port G.703/704 Fractional E1 DSU/CSU card for the FRM220/220A Series Platform Media Converter Rack. The converter supports Unframed, PCM31, PCM31+CRC4, PCM30, and PCM30+CRC4 framing modes. The clock source may be selected internally, recovered from received E1 signal, externally from the Data port or transparent. The data port interface utilizes a single hi-density 26pin connector. Cable solutions are provided for RS-530/449, X.21, V.35 and RS-232. The unit can recognize the cable type attached and automatically self-configure the interface circuits. Choosing from one of two model types, the E1 connection is either unbalanced 75 ohm with two BNC connectors or balanced 120 ohm with one RJ-45 connector. When the FRM220-E1/Data card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, E1 link status and alarms. The card can be configured to enable or disable the port, reset the card, set clocking, frame mode, interface type and provide analog or digital diagnostic loopbacks. A unique feature of the FRM220-E1/Data is the use of a common card design which may either be inserted in the FRM220-CH01 single slot chassis as a stand-alone modem or as a card when placed in the FRM220-CH20 managed rack.

Features

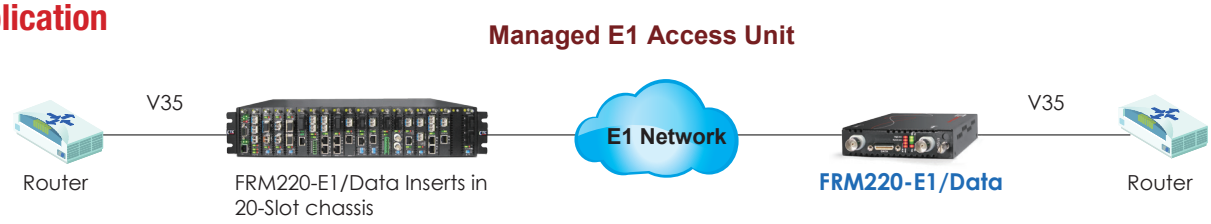
- Supports Fractional E1 and Unframed E1 services with V.35/X21/RS530 adapter cable
- I/O connectors all located on front panel
- Multiple clock source selection and remote loopback (Internal or External: E1 recovery, DTE or DCE)
- Unbalanced E1/BNC or balanced E1/RJ45
- Fully compatible with FRM220-CH20 and FRM220A chassis
- SNMP management with FRM220-CH20 chassis
- LED Alarm indication
- Standalone RS232 console management via CH01M

Specifications

E1 Interface	Framing	Framed/Unframed
	Standards	ITU-T G.703/G.704/G.706 & G.732, G.823
	Bit rate	2.048Mbps± 50ppm
	Line code	HDB3
	Clock setting	Internal OSC or recovery clock
	Receive level	-43dB
	Line impedance	75 ohm (BNC) / 120 ohm (RJ45)
	Jitter Performance	Complies with ITU-T G.823
	Pulse Mask	Complies with ITU-T G.703
	Pulse amplitude	Nominal 2.37V ± 10%
	Delay Variance	8ms
	Connector	BNC / RJ-45
	Diagnostics	Digital remote loopback

Serial Interface	Standards	ITU-T, E1A
	Data rate	Nx56 / Nx64
	Connector	HDB26F w/ adapter cable for Data
LEDs	Power, TD, RD, RTS, DCD, TX Clock loss, Signal loss, Sync loss, Alarm, test error	
Power	12VDC	
Power Consumption	< 6W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	130g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70 °C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC	
MTBF	65,000 hrs	

Application



Ordering Information

Cable Type

FRM220 – □□ / □□□ – □

Example: FRM220 – E1/V35 – R

Model Name	Description
FRM220-E1/V35-R	V35 to framed E1 RJ-45 with HP26M to MB34F cable
FRM220-E1/V35-B	V35 to framed E1 BNC with HP26M to MB34F cable
FRM220-E1/X21-R	X21 to framed E1 RJ-45 with HP26M to DB15M cable
FRM220-E1/X21-B	X21 to framed E1 BNC with HP26M to DB15M cable
FRM220-E1/RS530-R	RS530 to framed E1 RJ-45 with HP26M to DB25M cable
FRM220-E1/RS530-B	RS530 to framed E1 BNC with HP26M to DB25M cable
FRM220-E1/RS449-R	RS449 to framed E1 RJ-45 with HP26M to DB37M cable
FRM220-E1/RS449-B	RS449 to framed E1 BNC with HP26M to DB37M cable
FRM220-E1/RS232-R	RS232 to framed E1 RJ-45 with HP26M to DB25M cable
FRM220-E1/RS232-B	RS232 to framed E1 BNC with HP26M to DB25M cable

Interface Cable Adapters

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis. For standalone SNMP management, place this card in CH02/NMC chassis.

FRM220A-Eoe1/G(S)

Ethernet Bridge over E1 (GFP)

- HDLC & GFP
- MTU 2046bytes
- Unframed E1

The FRM220A-Eoe1/G(S) is an Ethernet over E1 Bridge for cost-effective connection of 10/100Base-TX or 100Base-FX LANs over a single E1 transport. By using GFP (Generic Framing Procedure) or standard HDLC encapsulation, the FRM220A-Eoe1/G(S) is able to transmit up to a 2M bits Ethernet over an E1 link. The FRM220A-Eoe1/G(S) supports an E1 attenuation of up to 43 dB on twisted pair or coax cable, which provides an approximate operating range up to 2km (using 22AWG). The FRM220A-Eoe1/G(S)fully meets E1 specifications including ITU-T G.704 and G.823. The Ethernet copper interface supports auto-negotiation and auto MDI/MDIX, allowing plug-and-play Ethernet connection without any additional configuration. When placed in FRM220A system, the Ethernet may be aggregated to the chassis's built in Ethernet switch. When placed in a single slot chassis and used standalone without management, the card may be configured by serial terminal.

Features

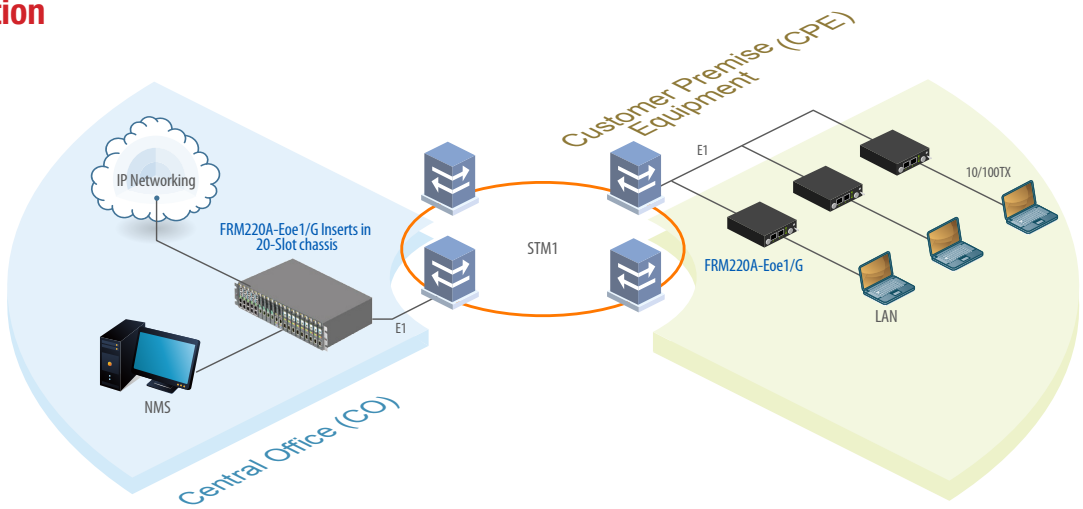
- Connects one Fast Ethernet over E1 links (2.048Mbps)
- Built-in GFP bridge operates at WAN rate
- Auto-Negotiation
- Unbalanced E1/BNC or balanced E1/RJ45
- Fully compatible with FRM220A and FRM220 chassis
- SNMP management with FRM220A and FRM220 chassis
- LED Alarm indication
- Standalone RS232 console management via CH01M

Specifications

E1 Interface	Framing	Unframed
	MTU	2046bytes
	Standard	ITU-T G.703/G.704/G.706 & G.732, G.823
	Bit rate	2.048Mbps± 50ppm
	Line code	HDB3
	Clock setting	Internal OSC or recovery clock
	Receive level	-43dB
	Line impedance	75 ohm (BNC) / 120 ohm (RJ-45)
	Jitter Performance	Complies with ITU-T G.823
	Pulse Mask	Complies with ITU-T G.703
	Pulse amplitude	Nominal 2.37V ± 10%
	Delay Variance	220ms
	Connector	RJ-45, BNC
Ethernet Interface	Diagnostics	Digital remote loopback
	Standards	IEEE 802.3, 802.3u

Ethernet Interface	Data rate	10/100Base-TX or 100Base-FX Half/Full duplex
		Encapsulation GFP (G.7041)
Connector	RJ45	10/100Base-T
	SFP-LC	100Base-FX
Indications	Power, ALM,E1 signal loss ,E1 Alarm (AIS, LOF, RAI, LOMF), LAN link /ACT, 10/100M , SD (100Base-FX)	
Power Input	12VDC	
Power Consumption	< 6W	
Dimensions	155 x 88 x 24 mm (D x W x H)	
Weight	DC12 : 280g AC/DC 48/AD : 580g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC, RoHS compliant	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FRM220A-Eoe1/G	10/100Base-TX to E1 GFP bridge operates at WAN
FRM220A-Eoe1/GS	100Base-FX SFP to E1 GFP bridge operates at WAN (Optical SFP module)

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220A-Eoe1

Ethernet Bridge over E1

- HDLC
- MTU 1522bytes
- Framed / Unframed E1

The FRM220A-Eoe1 is an Ethernet over E1 Bridge for cost-effective connection of 10/100Base-TX or 100Base-FX LANs over a single E1 transport. By using standard HDLC encapsulation, the FRM220A-Eoe1 is able to transmit up to a 2M bits Ethernet over an E1 link. The FRM220A-Eoe1 supports an E1 attenuation of up to 43 dB on twisted pair or coax cable, which provides an approximate operating range up to 2km (using 22AWG). The FRM220A-Eoe1 fully meets E1 specifications including ITU-T G.703 and G.823. The FRM220A-Eoe1 features diagnostic capabilities for performing remote loopback. The operator at either end of the line may test both the FRM220A-Eoe1 and the line in the digital loopback mode. The Ethernet copper interface supports auto-negotiation and auto MDI/MDIX, allowing plug-and-play Ethernet connection without any additional configuration. When placed in FRM220A system, the Ethernet may be aggregated to the chassis's built in Ethernet switch. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switch.

Features

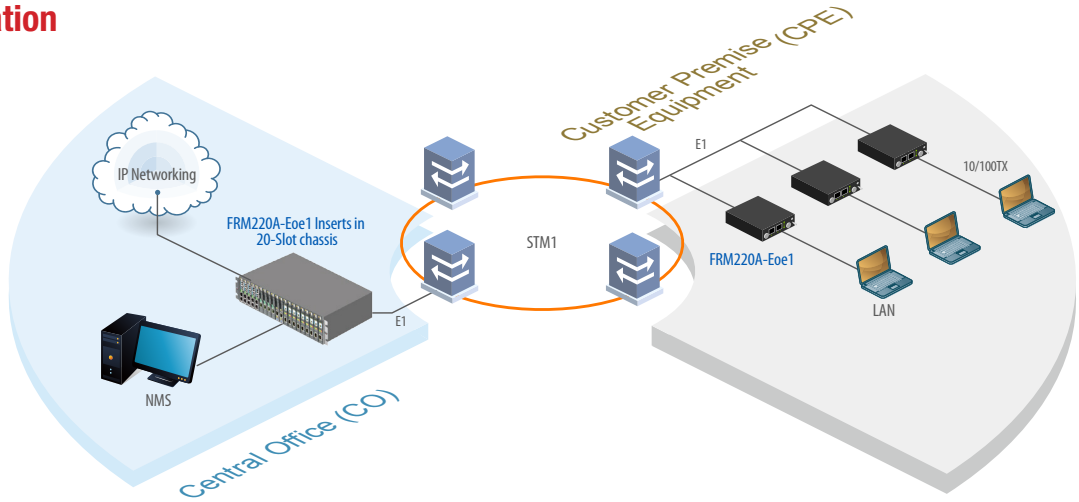
- Connects one Fast Ethernet over E1 links (64k~2048Kbps)
- Built-in HDLC bridge operates at WAN rate
- Auto-Negotiation
- Unbalanced E1/BNC or balanced E1/RJ45
- Fully compatible with FRM220A and FRM220 chassis
- SNMP management with FRM220A and FRM220 chassis
- LED Alarm indication
- Standalone RS232 console management via CH01M

Specifications

E1 Interface	Framing	Framed / Unframed
	MTU	1522bytes (Max.)
	Standard	ITU-T G.703/G.704/G.706 & G.732, G.823
	Bit rate	2.048Mbps± 50ppm
	Line code	HDB3
	Clock setting	Internal OSC or recovery clock
	Receive level	-43dB
	Line impedance	75 ohm (BNC) / 120 ohm (RJ45)
	Jitter Performance	Complies with ITU-T G.823
	Pulse shape	Complies with ITU-T G.703
	Pulse amplitude	Nominal 2.37V ± 10%
	Delay Variance	220ms
	Connector	RJ-45, BNC
	Diagnostics	Digital remote loopback

Ethernet Interface	Standards	IEEE 802.3, 802.3u
	Data rate	10/100Base-TX, Half/Full duplex
	Connector	RJ-45 10/100Base-TX
Indications	Power, ALM, E1 signal loss, E1 Alarm (AIS, LOF, RAI, LOMF), LAN link /ACT, 10/100M , SD (100Base-FX)	
Power Input	12VDC	
Power Consumption	< 6W	
Dimensions	155 x 88 x 24mm (D x W x H)	
Weight	130g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC, RoHS compliant	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FRM220A-Eoe1	10/100Base-TX to E1 HDLC bridge

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-DS3/E3

DS3/E3 over Fiber

The FRM220-DS3/E3 is a fiber modem that works in pairs to transparently extend DS3, E3 or STS-1 transmissions over optical fiber. By utilizing pluggable SFP transceivers (155Mbps), these converters may be easily deployed on multimode or single mode fiber, at a distance up to 120km, or over a single core fiber using BiDi (WDM) SFP modules. The DS3/E3 connections utilize industry standard BNC connections for transmit and receive via coaxial cables. When the FRM220-DS3/E3 card is used standalone in a single slot chassis, DIP switches may be used for configuration and loopback control. When placed in a single slot chassis with console port, an easy to maneuver user menu is available via terminal to configure, monitor, and run diagnostic loop back functions. The EOC (embedded operations channel) allows in-band management to control the remotely connected modem over a working fiber link. When the FRM220-DS3/E3 card is placed in the FRM220 rack with SNMP management, the management can configure and view the local and remote converter cards' status, type, version, fiber link status and alarms.

Features

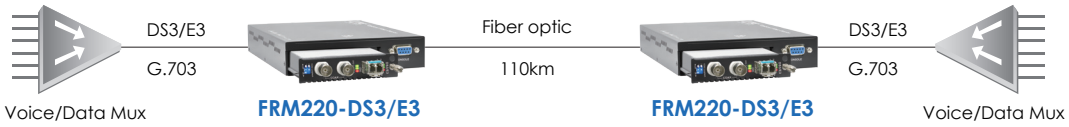
- In-band network Managed via Terminal, web or SNMP in FRM220 chassis
- DS3/E3 Coax (BNC) to Fiber SFP fiber modem
- Supports AIS (Alarm Indication Signal)
- User selectable E3 or DS3 setting
- Electrical and optical Loop back tests
- Standalone RS232 console management via CH01M

Specifications

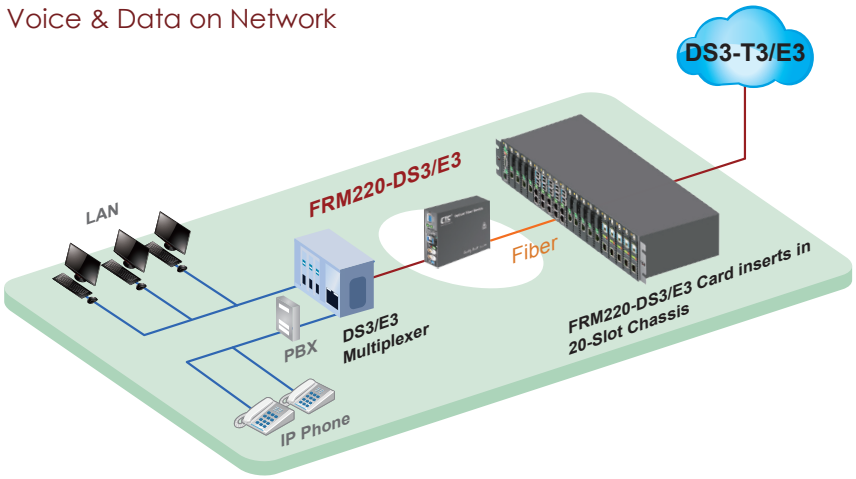
Optical Interface	Connector	SFP : LC (Uses standard 100Base-X/OC-3 SFP)
	Data Rate	DS3/T3 = 44.7 Mbps; E3 = 34.4 Mbps
Line Coding	Distance	MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
	Wavelength	1310nm, 1550nm, CWDM 1471nm ~ 1611nm
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	120g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Certification	CE, FCC	

Electrical Interface	Connector	75 ohm Coax, TX output min: +2.5dBm max : +9.1dBm
		RX input min: -9.7dBm, max +10.5dBm
	Standards	ANSI, ITU-TS, ETSI, AT&T, G.703, G.921 & G.955
	Indications	Power, Coax link, coax loop-back, AIS on coax link; FX link, fiber loop-back ,AIS on FX link
Power Input	12VDC	
Power Consumption	< 6W	

Application



Integrate Voice & Data on Network



Ordering Information

Model Name	Description
FRM220-DS3/E3	DS3/E3 Coax (BNC) to Fiber SFP fiber media converter

Note: This card must use CH01M, with serial console, to configure standalone settings.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-E1/T1

E1/T1 over Fiber

The FRM220-E1/T1 is a fiber media transport for G.703 E1/T1 transmissions designed for point-to-point use. The BNC model provides unbalanced 75 Ohm coaxial E1 connections while the RJ-45 model provides switchable balanced 120 Ohm E1 or 100 Ohm T1 connections over twisted pair wiring. When the FRM220-E1/T1 card is placed in the FRM220 rack with in-band management, the card status, type, version, fiber link status, E1 or T1 link status and alarms for both local card and remote unit can all be displayed. When set for E1 mode, the FRM220-E1/T1 also supports fractional (structured) E1 when connected to a remote FRM220-Data, synchronous data communications converter. In an E1 transmission network where end connection requires synchronous data communication such as V.35 or RS-530 (X.21, RS-449), these units eliminate the need for an extra CSU/DSU. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switches.

Features

FRM220-E1R & FRM220-E1B

- RJ-45 (USOC RJ48C) or BNC (coaxial) to fiber converter
- Supports HDB3 or AMI Line coding
- Supports Nx64k connection to FRM220-DATA

FRM220-T1

- RJ-45 (USOC RJ48C) to fiber converter
- Supports B8ZS or AMI Line coding
- Supports unframed to FRM220-DATA

Common Features

- In-band management via terminal, web, SNMP when in managed FRM220 chassis
- Electrical and optical loop back tests
- Standalone RS232 console (when placed in CH01M)

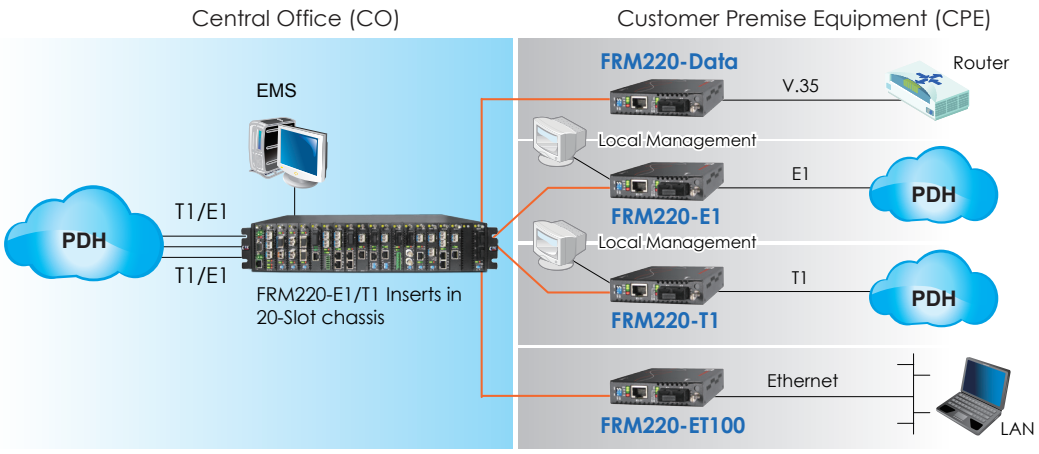
Specifications

Optical Interface	Connector	SFP-LC / 1x9 (SC, ST, FC)
	Data rate	36.864Mbps
	Line coding	Scrambled NRZ
	Bit Error Rate	Less than 10-10
	Distance	MM 2km, SM 15/30/50km
		WDM 20/40km
	Wavelength	1310nm, 1550nm
Electrical Interface	**E1**	Connector: E1R: RJ-45(1) 120 Ω E1B: BNC(2) 75 Ω
		Data Rate: 2.048Mpbs
		Line Code: HDB3/AMI
	T1	Connector: RJ-45(1) 100 Ω
		Data Rate: 1.544Mbps
		Line Code: B8ZS/AMI
	Cable type	Cat.3 or higher Twisted-Pair cable

Standards	E1 ITU-T G.703, G.704, G.706, G.732, G.823
	T1 ITU-T G.703, G.704, AT&T, TR-62411, ANSI T1.403
Indications	Power, FX-Link, E1/T1 SIG, Test, SYN, RD, TD, AIS
	(E1/T1R) Power, FX-Link, E1 SIG, Test(E1B)
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application

In-band Managed PDH Fiber Modem



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Ordering Information

Model Name	Description
FRM220-E1R	E1 RJ-45 to fiber card
FRM220-E1B	E1 BNC to fiber card
FRM220-E1R-SFP	E1 RJ-45 to fiber card (SFP module not included)
FRM220-E1B-SFP	E1 BNC to fiber card (SFP module not included)
FRM220-T1R	T1 RJ-45 to fiber card
FRM220-T1R-SFP	T1 RJ-45 to fiber card (SFP module not included)

Connector Type / Connectivity Distance

FRM220 – □□□ – □□□□□

Example: FRM220 – E1R – SC002

Connector Type / Connectivity Distance

FRM220 – □□□ – □□□□□

Example: FRM220 – T1R – SC015

Connector Type	Connectivity Distance
SC, ST, FC (Not Applicable for SFP Type)	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Note: This card may placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-DATA

RS232/530/V35 over Fiber

The FRM220-DATA is a fiber modem for high-speed (up to 8.192Mbps) synchronous or low speed synchronous and asynchronous data transmissions (V.35, RS-232, RS-530, X.21 or RS-449) over fiber optical media. When the FRM220-DATA card is placed in the FRM220 rack with SNMP management, in-band management allows viewing the card and remote converter's status, type, version, fiber link status, data link status and alarms. Both card and remote can be configured to enable or disable the port, reset the port, set the data rate, modify the clock mode, and initiate local or far end loop back tests. The FRM220-Data fiber modem may also be paired with the FRM220-E1/T1 for Nx64K transmissions. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switches.

Features

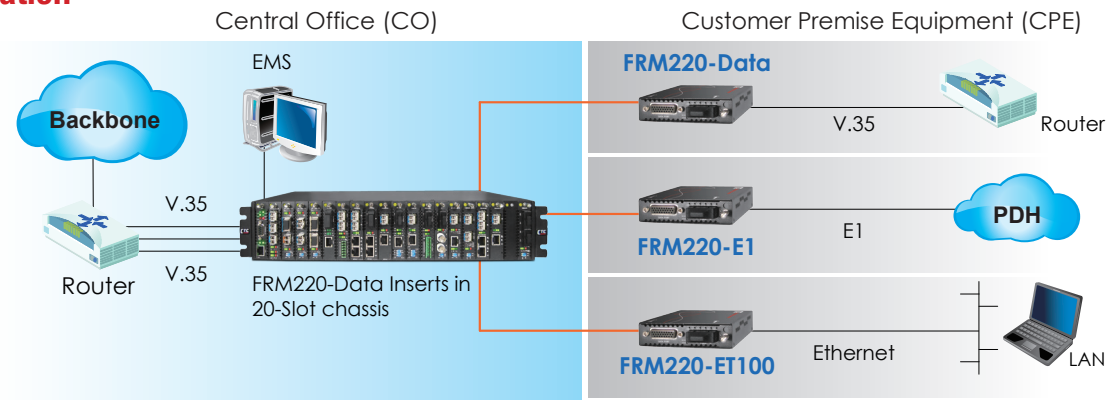
- Synchronous or Asynchronous data over fiber
- In-band network management via terminal, web or SNMP in FRM220 chassis
- Selectable I/F, V.35, X.21, RS-530, RS-449, RS-232
- Selectable DCE or DTE mode
- Data rate n x 64kbps, up to 9Mbps
- Multiple clock setting
- Electrical and optical loop back tests
- Compatible with FRM220-E1 on same fiber link for N x 64k
- Standalone RS232 console management via CH01M

Specifications

Optical Interface	Connector	SFP LC / 1x9 (SC, FC, ST)
	Data rate	36.864Mbps
	Line coding	Scrambled NRZ
	Bit Error Rate	Less than 10-10
	Distance	MM 2km, SM 15/30km, WDM 20/40km
	Wavelength	1310nm, 1550nm
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	130g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Electrical Interface	Connector	HDB26F w/ adapter cable for V35 X21, RS530, RS449,RS232
	Line Code	NRZ
	Baud Rate	RS-232 up to 384K async V.35/RS-530 up to 9152k sync where n=1 to 143 (64K ~ 9152KKbps)
	Clock source	Internal, Recovery, External
Standard	ITU-T	
Indications	LED (Power, FX Link, RTS, Test , TD, RD, CTS, DCD)	
Power Input	12VDC	
Power Consumption	< 6W	

Application



Ordering Information

Model Name	Description
FRM220-V35	V.35 to fiber card with HD26M to MB34F cable (1m)
FRM220-X21	X.21 to fiber card with HD26M to DB15M cable (1m)
FRM220-RS530	RS530 to fiber card with HD26M to DB25M cable (1m)
FRM220-RS449	RS449 to fiber card with HD26M to DB37M cable (1m)
FRM220-RS232	RS232 to fiber card with HD26M to DB25M cable (1m)
FRM220-V35-SFP	V.35 to fiber card with HD26M to MB34F cable (1m) (SFP module not included)
FRM220-X21-SFP	X.21 to fiber card with HD26M to DB15M cable (1m) (SFP module not included)
FRM220-RS530-SFP	RS530 to fiber card with HD26M to DB25M cable (1m) (SFP module not included)
FRM220-RS449-SFP	RS449 to fiber card with HD26M to DB37M cable (1m) (SFP module not included)
FRM220-RS232-SFP	RS232 to fiber card with HD26M to DB25M cable (1m) (SFP module not included)

Interface Type / Connector Type / Connectivity Distance

FRM220 – □□□ – □□□□□

Example: FRM220 – V35 – SC002

Interface Cable Adapters


V35


X21


RS530


RS449


RS232

Connector Type	Connectivity Distance
SC, ST, FC (Not Applicable for SFP Type)	002: 2km 015: 15km 030: 30km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-Serial

RS232/485 over Fiber

The FRM220-Serial provides a fiber modem solution to extend asynchronous RS-232, RS-422 or RS-485 transmission distance up to 2km over multimode fiber or up to 120km over single mode fiber. The converter is equipped with multiple interface circuits for connection to RS-232 or RS485/422 (2 or 4 wire, full or half duplex). The FRM220-Serial secures data transmission over EMI resistant fiber at speeds up to 256kbps for RS-232 or up to 1024kbps for RS485/422. When the FRM220-Serial/485 card is placed in the FRM220 rack with SNMP management, in-band management allows configuring and viewing the card and remote converter's status, type, version, fiber link status, data link status and alarms. When placed in a single slot chassis and used standalone without management, the card may be configured by DIP switches.

Features

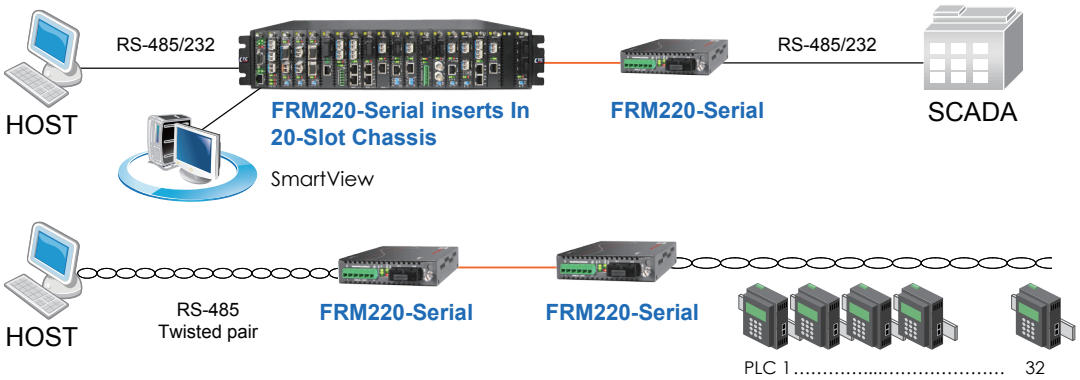
- Extend asynchronous serial transmission up to 120km over fiber
- In-band network management via terminal, Web or SNMP in FRM220-CH20 chassis
- Selectable data interface for RS-232/ 485
- RS232/Async. 3W or 5W up to 256Kbps
- RS485/Async. 2W (half duplex) or 4W (full duplex) up to 1Mbps
- Standalone RS232 console management via CH01M
- Software selectable two wires (half duplex) or four wires (full duplex) RS-485

Specifications

Optical Interface	Connector	SFP LC
	Data rate	36.864Mbps
	Line coding	Scrambled NRZ
	Bit Error Rate	Less than 10-10
	Fiber	MM 62.2/125μm, 50/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Standards	EIA/TIA RS-485, RS-232	
LEDs	Power, FX Link, DI, DO, Test	
Power Input	12VDC	

Electrical Interface	Connector	6 pins Terminal block
	Data Signal Formats	RS-485 2-wire
		RS-232 RTS/CTS 5-wire
		RS-232 3-wire
	Baud Rate	RS-422, RS-485 up to 1024kbps
		RS-232 up to 256kbps
	Bit Error Rate	Less than 10-10
Power Consumption	< 6W	
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)	
Weight	130g	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FRM220-Serial	RS-232/485 fiber converter
FRM220-Serial-SFP	RS-232/485 fiber converter (SFP module not included)

Connector Type	Connectivity Distance
SC, ST, FC (Not Applicable for SFP Type)	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Connector Type / Connectivity Distance

FRM220 – Serial – □□□□□

Example: FRM220 – Serial – SC002

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-ET100

10/100Base-TX Ethernet overE1 Fiber

The FRM220-ET100 is a single port Fiber WAN (TDM) card with built-in HDLC Ethernet Bridge for the FRM220 Series. The converter supports Nx 64 data rates from 64Kbps up to 2.048Mbps when linked by fiber to FRM220-Data or FRM220-E1/ T1 cards. The clock source may be selected internally or recovered from received fiber signal. The Ethernet port utilizes a single RJ- 45 connector. When the FRM220-ET100 card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, Ethernet link status and alarms. The card can be configured to enable or disable the port, reset the card, set clocking, data rate and provide digital diagnostic loopbacks. A unique feature of the FRM220-ET100 is the use of a common card design which may either be inserted in the FRM220-CH01 single slot chassis as a stand-alone modem or as a card when placed in the FRM220-CH20 managed rack.

Features

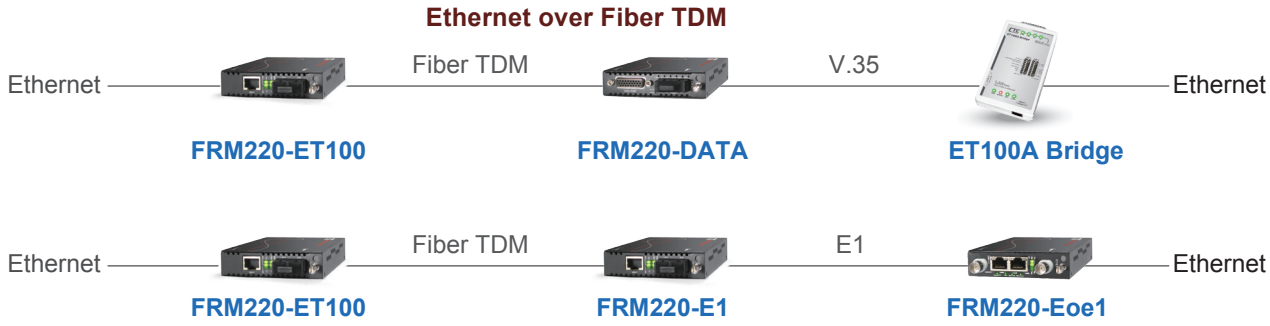
- 1-Port Ethernet to HDLC (fiber) converter
- P2P Fiber link compatible with FRM220-E1/T1 and FRM220-Data
- Clock source (internal or external)
- Nx64k data rate (64kbps~2048kbps)
- Ethernet encapsulated with ISO 13239 standard HDLC
- Loop Back with integral BERT & LED indicators
- Firmware upgradeable, when placed in managed FRM220 chassis
- Interface connectors, RJ-45 for 10/100 Base-Tx
- Fixed optical for SC or ST, 2km(MM) to 120km(SM)

Specifications

TDM (fiber) Interface	Connector	1 x 9 (SC, ST, FC)
	Data rate	64~2048kb/s(nx64)
	Distance	MM 2km, SM 15/30/50km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Ethernet Interface	Standards	IEEE 802.3u, IEEE 802.3
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex
	Connector	RJ-45
Tests	E1 Loops	Remote Loop back

Indications	PWR, TD/RD Act, Test, Sys, Alarm, Error
Power Input	12VDC
Power Consumption	< 6W
Dimensions	Card: 155 x 20.8 x 88mm (D x W x H)
Weight	130g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% RH (non-condensing)
Certifications	CE, FCC
MTBF	75,000 hrs

Application



Ordering Information

Model Name	Description
FRM220-ET100	10/100Base-TX to E1 fiber modem

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Connector Type / Connectivity Distance

FRM220 – ET100 – □□□□□

Example: FRM220 – ET100 – SC002

Note: This card may be set by DIP switch and placed in CH01 chassis, or set by serial console if placed in CH01M chassis.
When connected as a remote to a managed central chassis, this card supports in-band management and only needs a CH01 chassis.

FRM220-CCF40
4ch Contact Closure Fiber Converter

FRM220-CCF20
2ch Contact Closure Fiber Converter

The FRM220-CCF contact closure fiber converter provides the transmission of contact closure over a single fiber optic link. With SFP socket on fiber ports, the FRM220-CCF gives you the fiber cabling connector SFP-LC, both multi-mode and single-mode are available as well as BiDi which allows bi-directional transmission using only a single fiber cable. The FRM220-CCF has a contact input and a 0.5 amp contact output. The contact closure module has two relay outputs and two relay input. The relay output follows the "relay input" at the remote end. When the remote "relay input" is shorted, the local relay output is closed and vice-versa. The second relay output is closed when "carrier" is detected from the remote end, this indicates that the optical fiber is connected and that the remote end has power and is operating.

Features

- Transmits a single contact closure in one or two directions
- Distances up to 120km
- 30 VDC, 0.5 amp relay N.O. (Normally Open)
- Point-to-Point transmission architecture
- Plug-and-play design ensures ease of installation requiring no electrical or optical adjustments
- Relay contact for Carrier Detect, N.C. (Normally Close)
- Indicating LEDs are provided for confirming equipment operating status

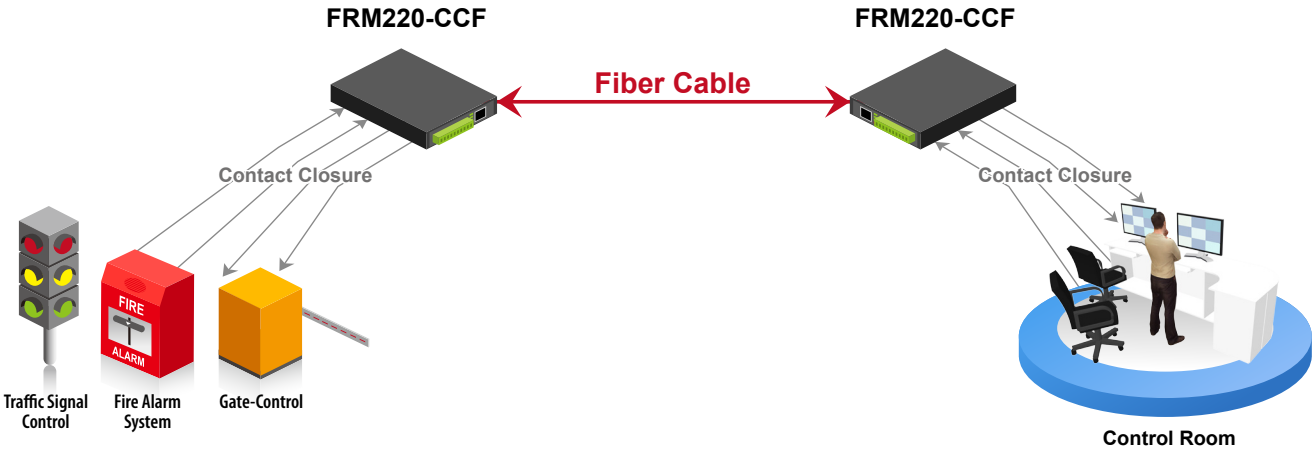
Specifications

Contacts	Contact Interface Response Time : 4 msec
	Input Dry Contact Closure
	Output SPST Relay, 30 VDC @ 0.5 A, Resistive loads only. 0.5 A Contact Rating - normally open
Number of Fibers	x1
Connectors	Optical SFP-LC, Contact, Terminal Block
LED Indicators	Contact Relay, Carrier Detect
Power	Operating Voltage Range 8 to 15 VDC
	Power Consumption 4W Max

Electrical & Mechanical	Current Protection Automatic Resettable Solid-State Current Limiters
	Circuit Board Meets IPC Standard
Dimension	155 x 208 x 88mm (D x W x H)
Weight	200g
MTBF	>100,000 hours
Operating Temperture	0°C to +50°C
Storage Temperture	-10°C to +85°C
Relative Humidity	0% to 95% (non-condensing)[1]

Application

- Alarm Event Triggering
- Fire and Alarm Systems
- PIR Signal Transmission
- Building Automation and Environmental Control Systems
- Gate Control
- Traffic Signal Control Equipment



Ordering Information

Model Name	Description
FRM220-CCF40	4ch Contact closure fiber converter
FRM220-CCF20	2ch Contact closure fiber converter

New

iMux4A-100
Ethernet to 4E1 Multiplexer

iMux8A-100
Ethernet to 8E1 Multiplexer

The iMux4A/iMux8A is an E1 inverse multiplexer capable of bundling up to 4E1/8E1 lines for cost-effective connection of 10/100Base-TX or 100Base- FX LANs over multiple E1 transports. The iMux4A/iMUX8A inverse multiplexer transmits up to a 9.92Mbps/15.87Mbps Ethernet bridge channel (GFP-F encapsulated) over 4E1/8E1 links. The iMux4A/iMUX8A bridges the gap between E1 and E3, allowing bridges to operate at faster rates. It also provides high speed access to SDH/SONET backbones where the only access services available are E1 lines. The iMux4A/iMux8A supports an E1 attenuation of up to 43 dB on twisted pair or coax cable. This provides an approximate operating range up to 2km (using 22AWG). The iMux4A/iMUX8A fully meets E1 specifications including ITU-T G.703 and G.823. The iMux4A/iMux8A features diagnostic capabilities for performing remote loopback. The operator at either end of the line may test both the iMux4A/iMUX8A and the line in the digital loopback mode. The Ethernet copper interface supports auto-negotiation and auto MDI/MDIX, allowing plug-and-play Ethernet connection without any additional configuration.

Features

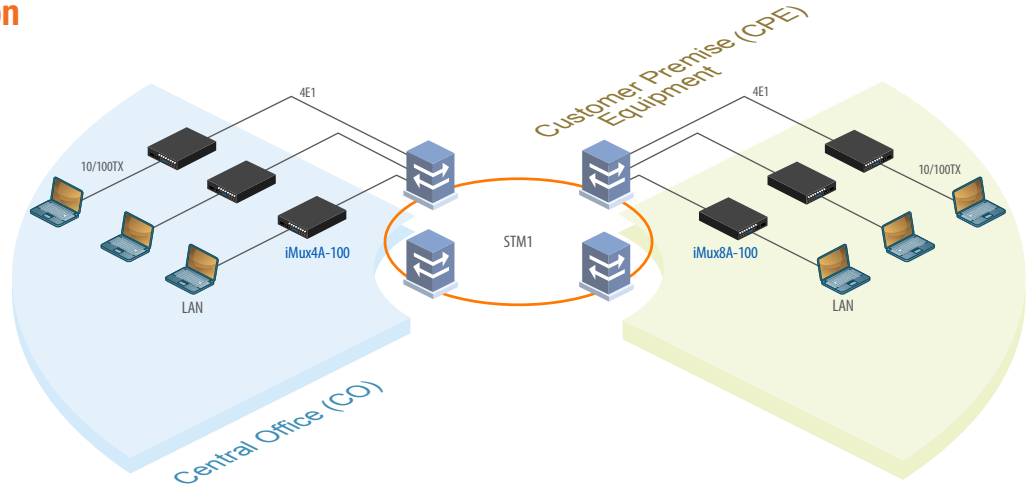
- Connects one Fast Ethernet over 1-4 E1 links (1.984 ~ 9.92Mbps) (iMUX4A-100)
- Connects one Fast Ethernet over 1-8 E1 links (1.984 ~ 15.87Mbps) (iMUX8A-100)
- Built-in GFP bridge operates at WAN rate
- Auto-Negotiation
- Unbalanced E1/BNC or balanced E1/RJ45
- LED Alarm indication
- Supports RS232 console management

Specifications

E1 Interface	Framing	CCS+CRC
	Standard	ITU-T G.703/G.704/G.706 & G.732, G.823
	Bit rate	2.048Mbps± 50ppm (up to 4E1/8E1)
	Line code	HDB3
	Clock setting	Internal OSC or recovery clock
	Receive level	-43dB
	Line impedance	75 ohm (BNC) / 120 ohm (RJ45)
	Jitter Performance	Complies with ITU-T G.823
	Pulse Mask	Complies with ITU-T G.703
	Pulse amplitude	Nominal 2.37V ± 10%
	Delay Variance	220ms
	Connector	RJ45, BNC
	Diagnostics	Digital remote loopback

Ethernet Interface	Standards	IEEE 802.3, 802.3u
	Data rate	10/100Base-TX, Half/Full duplex
Ethernet Interface	Connector RJ45 10/100Base-TX	
Indications	Power, ALM, E1 signal loss, E1 Alarm (AIS, LOF, RAI, LOMF), LAN link /ACT, 10/100M, SD (100Base-FX)	
Power Input	AC 100~240VAC, DC 18~60VDC	
Power Consumption	< 6W	
Dimensions	210 x 128.8 x 43.8mm (D x W x H) (iMux04A)	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% RH (non-condensing)	
Certifications	CE, FCC, RoHS Compliant	
MTBF	75,000 hrs	

Application



Ordering Information

Model Name	Description
iMux4A-100AD	10/100Base-TX to 4 E1 RJ45 +BNC mux with built-in AC+DC Power
iMux4R-100AD	10/100Base-TX to 4 E1 RJ45 mux with built-in AC+DC Power
iMux4B-100AD	10/100Base-TX to 4 E1 BNC mux with built-in AC+DC Power
iMux8A-100AD	10/100Base-TX to 8 E1 RJ45 +BNC mux with built-in AC+DC Power
iMux8R-100AD	10/100Base-TX to 8 E1 RJ45 mux with built-in AC+DC Power
iMux8B-100AD	10/100Base-TX to 8 E1 BNC mux with built-in AC+DC Power

CWMD-180

1U Rack Mount, LC/UPC

New

The CWMD-180 is 18 channel Dual Fiber CWDM MUX/DEMUX, 1U Rack Mount design for CWDM wavelengths from 1271nm to 1611nm. When fiber availability is limited, the CWMD-180 CWDM Mux/Demux can increase the bandwidth on the existing fiber infrastructure. By using 18ch CWDM Mux Demux, up to 180 Gbps could be supported on a fiber pair. The 18 channel MUX/DEMUX rack provides the primary wave division and combination functions for CWDM. Line side wave lengths require translation to client side equipment via a transponder card or direct connection to CWDM wavelength SFP modules.

Features

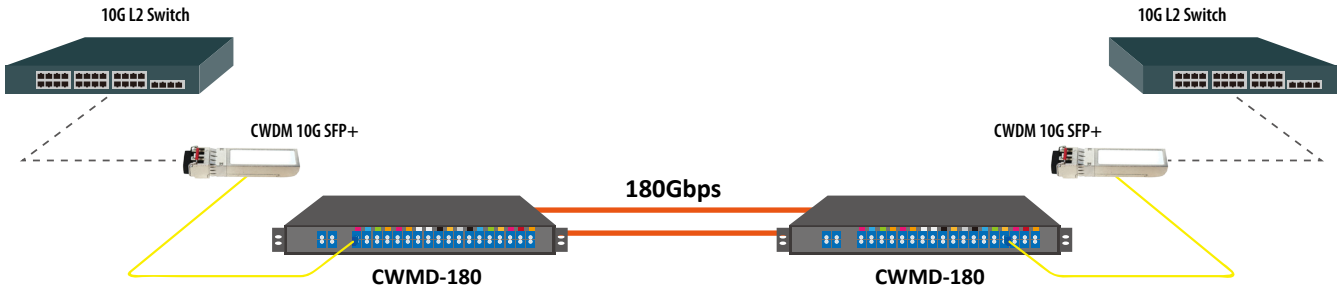
- Full native mode performance
- Optical connectors
- Passive model requires no power
- Protocol transparent, no limitation
- Utilizes industry standard ITU CWDM wavelength

Specifications

Number of Channels	18
Wavelength	1271-1611nm
Channel Spacing	20nm
Technology	Thin-Film Filter
Special Port	Monitor Port
Connectors	Duplex LC/UPC
Insertion Loss	< 4.9 dB
Return Loss	> 45 dB
Operating Temperature	-10°C ~ +70°C

Storage Temperature	-40°C ~ +80°C
Housing	1RU Rack Mount Chassis
Dimensions	485mm x 245mm x 44mm (L X D X H)

Application



Ordering Information

Model Name	Description
CWMD-180	18-Ch CWDM Mux/Demux (1271 ~ 1611nm), LC/UPC
CWMD-181	18-Ch CWDM Mux/Demux (1271 ~ 1611nm) with Monitor port, LC/UPC

New

MXP-8G1E

8x 1GE Muxponder

The MXP-8G1E is a 8x 1GE to 10GE Muxponder. Based on TDM technology, the Muxponder transports eight separate Gigabit Ethernet data streams into a 10 Gbps SFP+ Based trunk port. This solution provides significant cost reduction and excellent fiber utilization when compared to CWDM optical multiplexing. The MXP-8G1E incorporates 8 SFP based access interfaces that can accommodate various types of SFP. Such as Multi-mode, Single mode and 1Gbps copper SFPs. The trunk port is a SFP+ 10Gbps permitting flexible connectivity options between the Muxponders either in a WDM system or directly between two devices. The MXP-8G1E is manageable with local RS-232 console port or remotely by Telnet, SNMP, or GUI management as well as using the CTC SmartView EMS management platform.

Features

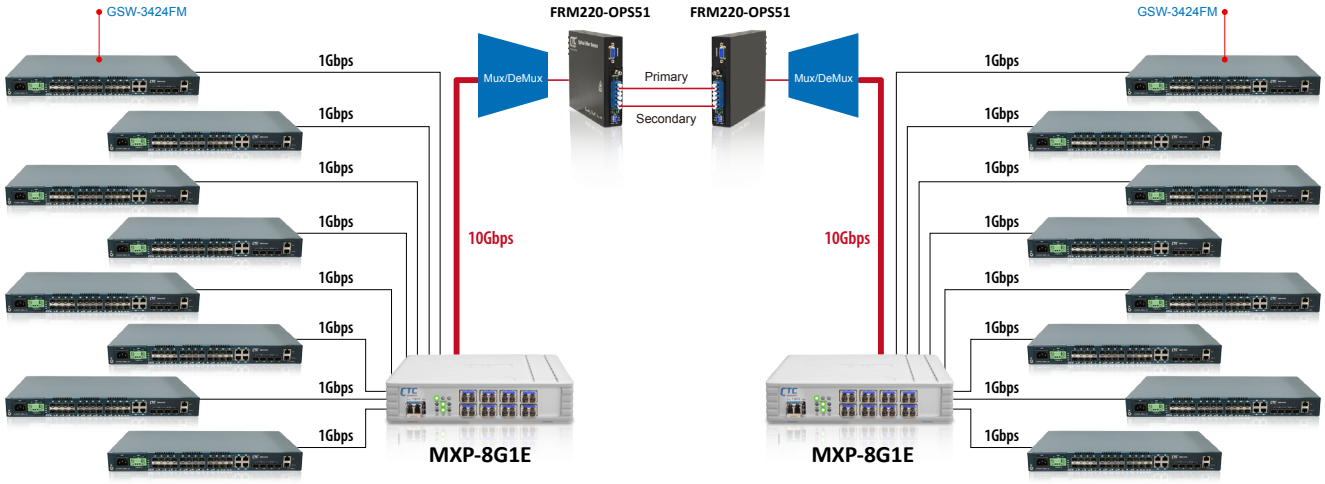
- 10 Gbps trunk port rate
- Flexible connectivity options
- Remotely activated Local or Remote Loopback
- SFP+ Digital Diagnostics monitoring
- Hot swappable

Specifications

Access Data Rate	1G Ethernet
Trunk Data Rate	10G Ethernet
Optical parameters	1G SFP/ 10G SFP+
Operating Temperature	0 ~ 50°C
Storage Temperature	-10 ~ 80°C
Relative Humidity	10 ~ 90% non-condensing

Dimension (D x W x H)	201 x 135 x 35mm
Weight	580g
Connectors	8x SFP-LC & 1x SFP+ LC
Storage Temperature	-40°C ~ +80°C
Power Consumption	12W

Application



Ordering Information

Model Name	Description
MXP-8G1E-AC/DC/AD	8x GE (SFP) to 10G (SFP+) Muxponder, optional SFP and SFP+ and built-in AC, DC, AC+DC power

PHB-200M
PHB-200

20x 100/1000Base-T to 20x 100/1000Base-X SFP Patching Hub

PHB-200M is a 20-channel Managed SFP patching hub that converts Ethernet copper 100/1000Base-TX to SFPs working at 100Mbps and 1000Mbps. PHB-200M can connect to any RJ-45 Ethernet switch and supports any third-party standard SFP module from any SFP vendor. PHB-200M can also be used as an Ethernet copper-to-fiber media converter. With different kinds of fiber optic media, both multi-mode and single mode fiber are available as well as BiDi which allows bi-directional transmissions using only a single fiber to extend the distance of Fast Ethernet and Gigabit Ethernet networks. With SNMP and Web-based management, the network administrator can monitor, configure and control the activity of PHB-200M remotely.

Features

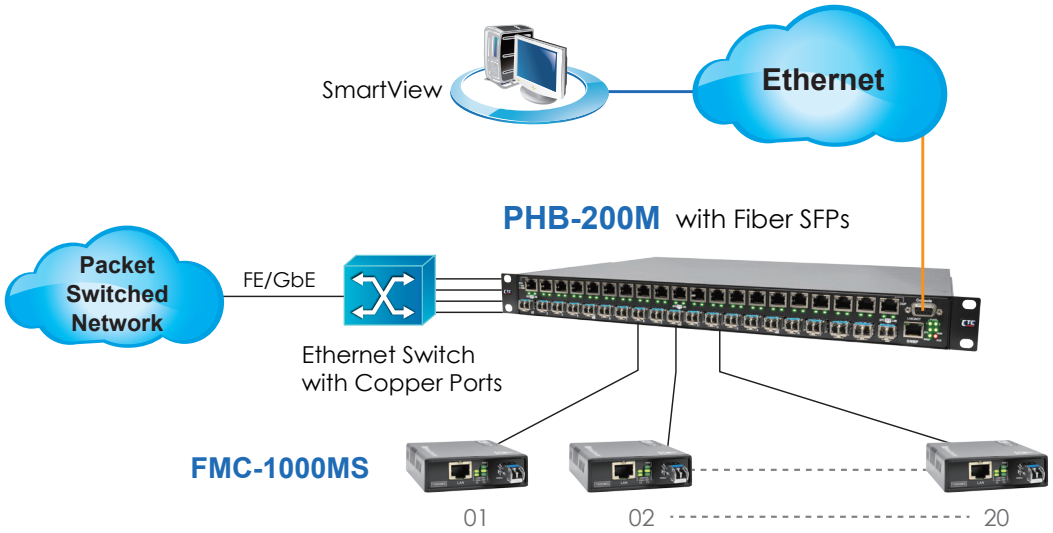
- 1U" Height 19" 20 channels Managed SFP patching hub
- 20-port 100/1000Base-T to 20-port 100/1000Base-X SFP
- Auto MDI/MDIX in TP port
- Auto-Negotiation in TX port
- Supports hot-swappable SFPs working at 100 Mbps and 1000 Mbps
- Supports Web, Telnet, SNMP Management (PHB-200M)
- Local configuration via DB9 port
- Supports Link Pass-Through & Link loss Alarm
- Supports any third-party standard SFP module
- Supports SFP DDMI
- Layer 1 wire-speed conversion with fully transparent function
- Available in 3 types : power built-in AC, DC, AC+DC

Specifications

Optical Interface	Connector	SFP LC
	Number of port	20
	Data rate	100/1000Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125um, 6.25/125um, SM 9/125um
	Distance	MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
	Wavelength	1310nm, 1550nm, CWDM 1471nm ~ 1611nm
Management	Console, Web, Telnet, SNMP	
Control Port	RS-232 DCE, DB-9, female	
Standards	IEEE 802.3, 802.3u, 802.3ab, 802.3z, 802.3x	
Indications	Power FX-Link, Duplex, TX-Link/Act, TX-Speed	

Electrical Interface	Connector	RJ-45
	Number of port	20
	Data rate	10/100/1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat. 3, 4, 5 UTP
		100/1000Base-T Cat.5, 5e or higher
Power	100 ~ 240VAC, 36~60 VDC	
Power Consumption	65W	
Dimensions	180 x 440 x 44mm (D x W x H)	
Weight	3.4kg	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Certification	CE, FCC	

Application



Ordering Information

Model Name	Description
PHB-200M-AC, DC, AD	Managed 20-port 100/1000-TX to 20-port 100/1000-X SFP, built-in AC, DC or AD (AC+DC) Power
PHB-200-AC, DC, AD	20-port 100/1000-TX to 20-port 100/1000-X SFP, built-in AC, DC or AD (AC+DC) Power

Power Type

PHB – 200 □ – □□

Example: PHB – 200M – DC

www.ctcu.com / sales@ctcu.com

FMC-CH17

Simple Converter Cheassis

The FMC-CH17 is a 2U high 19" 17 slots chassis. The chassis provides an economic solution in low density fiber converter installations where no management features are required. Each FMC or VDTU2A-301 converter is an independent Ethernet to fiber or Ethernet to copper media converter that may be used as a stand-alone converter or placed in the FMC-CH17 chassis. With two power supplies, the FMC-CH17 chassis supports redundant power from any of two power options. The AC supplies operate from (100-240VAC) and DC supplies operate from 36-60VDC. The built in cooling fan ensures that the temperatures in the rack remain within the tolerated working range.

Features

- FMC-CH17, 2U, 19", 17-Slot chassis with single or dual built-in power for AC or DC
- Cross flow cooling fan built-in.
- Designed for 19" Rack mounting
- FMC units are hot swappable

Specifications

Power Input	AC : 100 ~240V or DC : 36 ~ 60V
Power Consumption	<60W
Dimensions	199 x 476 x 88 mm (D x W x H)
Weight	7.9Kg

Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application

Easy to install or remove without any tools

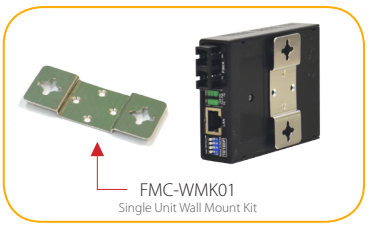
FMC-CH17 Front view

FMC Option Converters
- Fast Ethernet
- Gigabit Ethernet
- VDSL2 LAN Extender

17-Slot

FMC-CH17 Back view

Note: Each FMC Card can be placed in the FMC-CH17 chassis, also can use the wall mount kit for rack mount installation.



FMC-WMK01 (Single Unit Wall Mounting Kit)

Ordering Information

Model Name	Description
FMC-CH17-AC, DC, AD, AA, DD	2U, 19", 17-Slot FMC Converter Chassis with AC, DC, AD, AA or DD power

Optional Accessories

Wall Mount Kits	Type
FMC-WMK01	Single Unit Wall Mounting Kit

FMC-1001S

10/100/1000Base-T to 100/1000Base-X SFP Media Converter

The FMC-1001S family are Gigabit Ethernet 10/100/1000Base-T to 100/1000Base-X non-managed stand-alone media converters, which give you the fiber cabling connectors, LC with SFP module. Pluggable SFP are available in both multi-mode and single mode types as well as BiDi which allows bi-directional transmissions using only a single fiber cable. Auto-negotiation will automatically tailor to convert full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed and Link status FX port speed and Link status.

Features

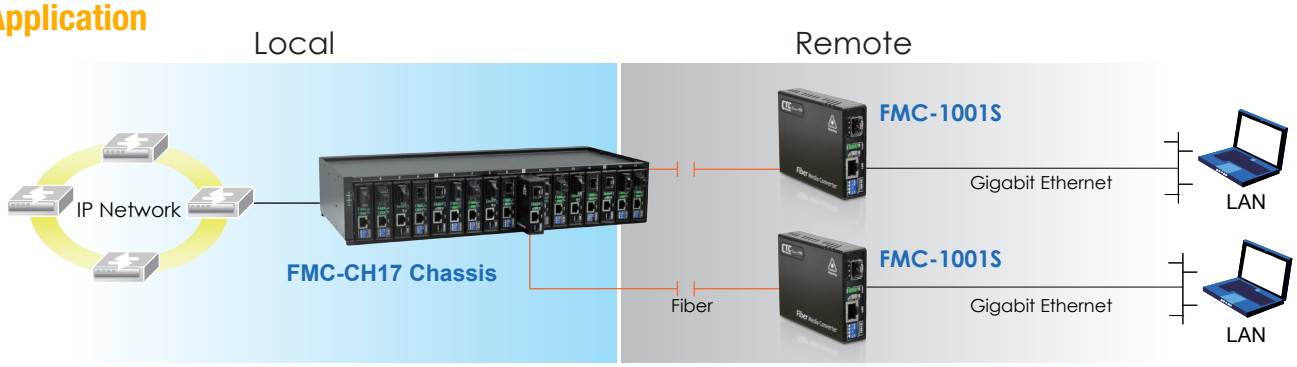
- 10/100/1000Base-T to 100/1000Base-X Converter
- Auto-Negotiation
- Auto MDI/MDIX
- Forward 2048 bytes (Max.) packets in switch mode (copper & fiber port in different speed)
- Forward 9k bytes in connector mode (fiber & copper port at the same speed)
- Provides DIP switch to set function
  -Select fiber speed (100/1000M)
  -Select LPF enable / disable
  -Flow control enable / disable
- Supports Q in Q double tagged frame transparent
- Supports IEEE 802.1Q Tag VLAN pass thru
- Concentrated into FMC-CH17 chassis

Specifications

Optical Interface	Connector	SFP LC
	Data rate	1.25G / 125M
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm SM 9/125μm
	Distance	MM 2km, SM 15/30km WDM 20/40km
	Wavelength	MM 1310nm, SM 1310,1550nm WDM 1310Tx/1550Rx (Type A) 1550Tx/1310Rx (Type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Full duplex
	Cable	100Base-TX Cat.5, 5e or higher 1000Base-T Cat.5, 5e or higher
DIP Switch	Fiber Speed	100M/1000M
	LFP Fiber	Enable/Disable
	LFP Copper	Enable/Disable
	Flow Control	On/Off

Standards	IEEE 802.3, 802.3u, 802.3x, 802.3Z, 802,3ab
Indications	LED (Power, FX Link, FX SPD, TX SPD, TX Link)
Power Input	Adapter Type: DC 12V Power Built-in Type : AC 100 ~ 240V Power Built-in Type: DC 18 ~ 60V
Power Consumption	< 3W
Dimensions (D x W x H)	Adapter Type:108 x 23 x 73.4mm Power Built-in Type : 135 x 23 x 73.4mm
Weight	Adapter Type : 120g Power Built-in Type : 140g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FMC-1001S	10/100/1000Base-T to 100/1000Base-X SFP Non-managed Media Converter Adapter Type

FMC-10/100

10/100Base-TX to 100Base-FX Media Converter

The FMC-10/100 family are Fast Ethernet 10/100Base-TX to 100Base-FX non-managed stand-alone media converters, which give you the options to choose from the most popular fiber cabling connectors, ST, SC or FC. Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. Auto-negotiation will automatically tailor to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status.

Features

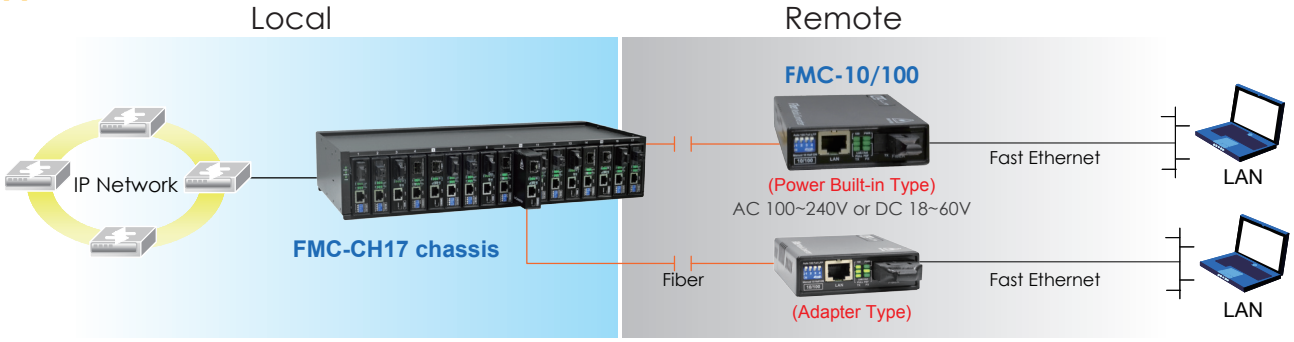
- 10/100Base-TX to 100Base-FX Converter
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Forward 1600 bytes (Max.) packets
- Supports flow control (Pause)
- Supports Link Fault Pass-Through (LFPT)
- Supports Far End Fault Indication (FEFI)
- Forward 9K jumbo packets in converter mode (100M/Full)
- Concentrated into FMC-CH17 chassis (FMC-10/100 Adapter type only)

Specifications

Optical Interface	Connector	1x9 (SC, ST, FC)
	Data rate	125Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (Type A)
		1550Tx/1310Rx (Type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mpbs
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, cat.6
		100Base-TX Cat.5, 5e or cat.6

Standards	IEEE 802.3, IEEE 802.3u
Indications	LED (Power, FX Link, TX SPD, TX Link, TX Duplex, FEF)
Power Input	Adapter Type: DC 12V
	Power Built-in Type: AC 100 ~ 240V
	Power Built-in Type: DC 18 ~ 60V
Power Consumption	< 2W
Dimensions (D x W x H)	Adapter Type: 108 x 23 x 73.4mm
	Power Built-in Type: 135 x 23 x 73.4mm
Weight	Adapter Type: 120g
	Power Built-in Type: 140g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FMC-10/100	10/100Base-TX to 100Base-FX Non-Managed Media Converter Adapter Type
FMC-10/100-AC	10/100Base-TX to 100Base-FX Non-Managed Media Converter with AC Power
FMC-10/100-DC	10/100Base-TX to 100Base-FX Non-Managed Media Converter with DC Power

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km
	20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type
	80A: WDM 80km A type 80B: WDM 80km B type 120A: WDM 120km A type 120B: WDM 120km B type

Power Type

FMC – 10/100 – □□

Example: FMC – 10/100 – AC

FMC-1000MS

10/100/1000Base-T to 100/1000Base-X SFP
Web Smart OAM Managed Converter

The FMC-1000MS family are Gigabit Ethernet 10/100/1000Base-T to 100/1000Base-X Web Smart OAM/IP managed fiber media converters, which provide simple control and setting function on each Ethernet port through out of band network via a Web browser. The FMC-1000MS media converters give you the fiber cabling connector, SFP-LC Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. Auto-negotiation will automatically tailor to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status.

Features

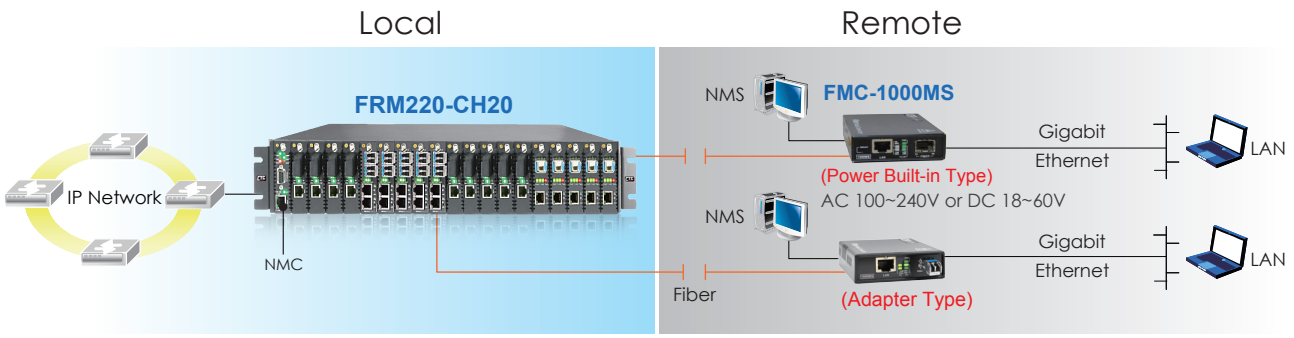
- 10/100/1000Base-T to 100/1000Base-X Converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or Manual mode in TP port
- Supports flow control Enable or Disable
- Supports Jumbo Frame 9K Packet
- Ingress/Egress Bandwidth control
- Supports IEEE802.3ah OAM management
- Firmware upgrade via Web
- Digital Diagnostic (DOM) SFP Support
- Management Password Setting
- Dying gasp (remote power failure detection)
- Supports Link Fault Pass-Through (LFPT) Function
- Supports Auto Laser Shutdown (ALS) Function
- Web management on stand-alone.
- Supports D/D function for SFP fiber transceiver
- Supports On-Line F/W upgrade (local) by the Web manager
- Supports 16 Tag VLAN Group
- RMON counters

Specifications

Optical Interface	Connector	SFP LC
	Data rate	125/1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (Type A)
		1550Tx/1310Rx (Type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher

Standards	IEEE 802.3, IEEE 802.3u IEEE 802.3ab, 802.3z, 802.1Q
Indications	LED (Power, FX-Link, LAN Speed, LAN Link)
Power Input	Adapter Type: DC 12V
	Power Built-in Type : AC 100 ~ 240V
	Power Built-in Type : DC 18 ~ 60V
Power Consumption	< 3W
Dimensions (D x W x H)	Adapter Type : 108 x 23 x 73.4mm
	Power Built-in Type : 135 x 23 x 73.4mm
Weight	Adapter Type : 120g
	Power Built-in Type : 140g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FMC-1000MS	10/100/1000Base-T to 100/1000Base-X SFP Web Smart Managed Media Converter (optional SFP module) Adapter Type
FMC-1000MS-AC,DC	10/100/1000Base-T to 100/1000Base-X SFP Web Smart Managed Media Converter (optional SFP module) with AC or DC Power

Power Type
FMC – 1000MS – □□
Example: FMC – 1000MS – DC

FMC-1000M

10/100/1000Base-T to 1000Base-X
Web Smart OAM Managed Converter

The FMC-1000M family are Gigabit Ethernet 10/100/1000Base-T to 1000Base-X Web Smart OAM/IP based managed fiber media converters, which provide simple control and setting function on each Ethernet port through out of band network via a Web browser. The FMC-1000M media converters give you the fiber cabling connector, Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. Auto-negotiation will automatically tailor to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status.

Features

- 10/100/1000Base-T to 1000Base-X Converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or Manual mode in TP port
- Supports flow control Enable or Disable
- Web management on stand-alone.
- Supports 802.3ah-OAM/IP in-band management
- Supports Jumbo Frame 9K Packet, Ingress/Egress Bandwidth control
- Supports Link Fault Pass Through (LFP) and Auto Laser Shutdown (ALS)
- Firmware upgrade via Web, Dying gasp (remote power failure detection)
- Supports 16 Tag VLAN Group

FMC-1000M-AD

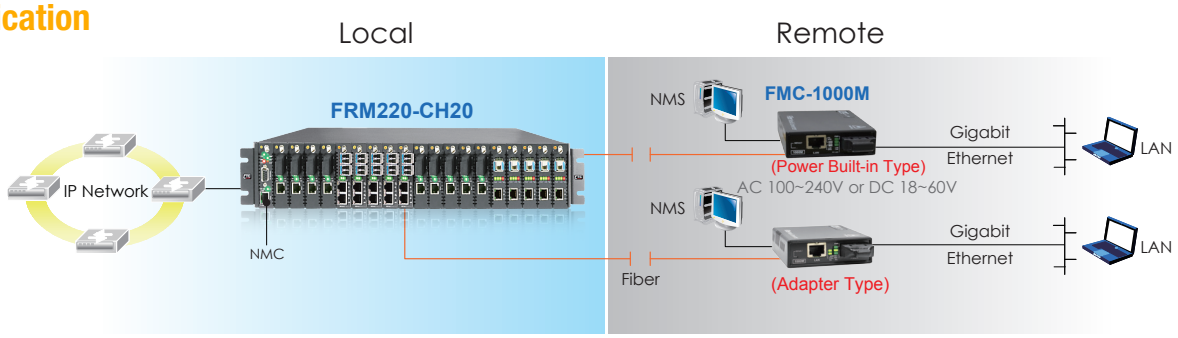
- Metal Chassis
- Power built-in type: AC + DC
- Dimension: 201 x 35 x 135mm (DxWxH)

Specifications

Optical Interface	Connector	1x9 (SC)
	Data rate	1000Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 550m, SM 20/40km
		WDM 20/40km
	Wavelength	MM 1310nm, SM 1310, 1550nm
		WDM 1310Tx/1550Rx (Type A)
		1550Tx/1310Rx (Type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher
Standards	IEEE 802.3, IEEE 802.3u IEEE 802.3ab, 802.3z, 802.1Q	

Indications	LED (Power, FX-Link, FX Speed, LAN Speed, LAN Link)
Power Input	Adapter Type: DC 12V
	Power Built-in Type : AC 100 ~ 240V, DC 18 ~ 60V
Power Consumption	< 4W
Dimensions (D x W x H)	Adapter Type : 108 x 73.4 x 23mm (FMC-1000M)-Plastic
	Power Built-in Type : 135 x 23 x 73.4mm (FMC-1000M-AC or DC)-Plastic 201 x 35 x 135mm (FMC-1000M-AD)-Metal
Weight	Adapter Type : 120g (FMC-1000M)
	Power Built-in Type : 140g (FMC-1000M-AC or DC) 1.2kg (FMC-1000M-AD)
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FMC-1000M	10/100/1000Base-T to 1000Base-X Web Smart OAM/IP Managed Media Converter Adapter Type
FMC-1000M-AC,DC	10/100/1000Base-T to 1000Base-X Web Smart OAM/IP Managed Media Converter with AC or DC Power
FMC-1000M-AD	10/100/1000Base-T to 1000Base-X Web Smart OAM/IP Managed Media Converter with AC + DC Power

Connector Type	Connectivity Distance
SC	001: 550m 002: 2km S/M 010: 10km 020: 20km 040: 40km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Power Type
FMC – 1000M – □□
Example: FMC – 1000M – DC

FMC-100M

10/100Base-TX to 100Base-FX
Web Smart OAM Managed Converter

The FMC-100M family are Fast Ethernet 10/100Base-TX to 100Base-FX Web Smart OAM/IP based managed fiber media converters, which provide simple control and setting function on each Ethernet port through out of band network via a Web browser. The FMC-100M media converters give you the options to choose from the most popular fiber cabling connectors, ST, SC, FC, or SFP-LC. Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status. These stand-alone converters may also be concentrated into either the FMC-CH08 or FMC-CH17 chassis.

Features

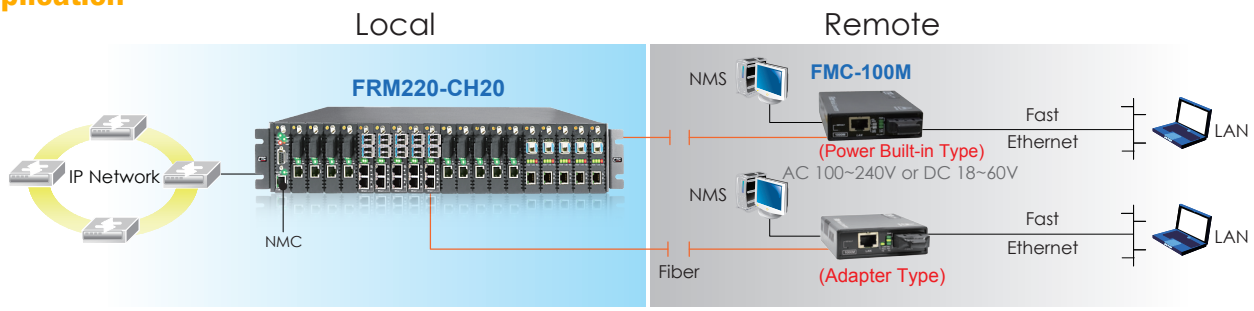
- 10/100Base-TX to 100Base-FX Converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or Manual mode in TP port
- Supports flow control Enable or Disable
- Web management on stand-alone
- Supports 802.3ah-OAM/IP in-band management
- Supports Jumbo Frame 9K Packet, Ingress/Egress Bandwidth control
- Supports Link Fault Pass Through (LFP) and Auto Laser Shutdown (ALS)
- Firmware upgrade via Web, Dying gasp (remote power failure detection)
- Supports 16 Tag VLAN Group

Specifications

Optical Interface	Connector	1x9 (SC, ST, FC)
	Data rate	100Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	WDM 1310Tx/1550Rx (Type A)
		1550Tx/1310Rx (Type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP
		100Base-TX Cat.5, 5e or higher
Standards	IEEE 802.3, IEEE 802.3u, 802.1Q	

Indications	LED (Power, FX-Link, LAN Speed, LAN Link)
Power Input	Adapter Type: DC 12V In
	Power Built-in Type : DC 18 ~ 60W, AC: 100~240V
Power Consumption	< 4W
Dimensions (D x W x H)	Adapter Type : 108 x 73.4 x 23mm (FMC-100M)-Plastic
	Power Built-in Type : 135 x 73.4 x 23mm (FMC-100M-AC or DC)-Plastic
Weight	Adapter Type : 120g (FMC-100M)
	Power Built-in Type : 140g (FMC-100M-AC or DC)
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC, RoHS compliant
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
FMC-100M	10/100Base-TX to 100Base-FX Web Smart OAM/IP Managed Media Converter Adapter Type
FMC-100M-AC, DC	10/100Base-TX to 100Base-FX Web Smart OAM/IP Managed Media Converter with AC or DC Power

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Power Type

FMC – 100M – □□

Example: FMC – 100M – DC

FMC-10/100i

10/100Base-TX to 100Base-FX In-Band Managed Converter

The FMC-10/100i family are Fast Ethernet 10/100Base-TX to 100Base-FX In-band managed media converters, which give you the options to choose from the most popular fiber cabling connectors, ST, SC or FC. With advanced features like bandwidth control, this media converter is targeted for customer premises equipment in metro LAN, campus, enterprise and FTTx applications. By offering in-band management, this converter can be completely controlled and monitored from a centrally located managed rack controlling all converter settings including band-width control, duplex, and speed configuration. This media converter is completely transparent to Layer 2 and Layer 3 protocols including IEEE 802.1q, VLAN tag, Q in Q, STP, IPX, IP, etc.

Features

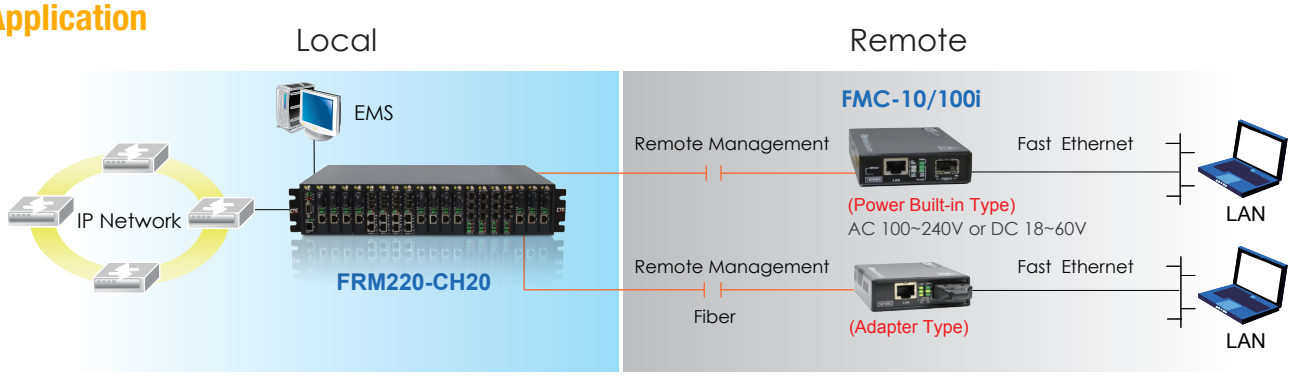
- 10/100Base-TX to 100Base-FX Converter
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Forward 2046 bytes (Max.) packets in switch mode
- Forward 9K jumbo packets in converter mode
- Supports Q in Q double tagged frame transparent
- Supports IEEE 802.1q Tag VLAN pass thru
- Supports local / remote In-band management (Monitor and Configure) by the SNMP manager with FRM220-10/100i
- Bandwidth control (Nx32K or Nx512Kbps)
- Supports flow control (Pause)
- Supports remote CPE power fail detect (dying gasp)
- Supports Far End Fault Indication (FEFI)
- Supports Link Fault Pass-Through (LFPT)
- Supports Loop Back Test
- Supports RMON counter
- Auto Laser Shutdown (ALS)
- Fiber Hardware Reset (FHR)
- Online local / remote f/w upgrade

Specifications

Optical Interface	Connector	1x9 (SC, ST, FC)
	Data rate	125Mbps
	Duplex mode	Full duplex
	Fiber	MM 62.2/125μm, 50/125μm. SM 9/125μm
	Distance	MM 2km, SM 15/30km WDM 20/40km
	Wavelength	MM 1310nm, SM 1310,1550nm WDM 1310Tx/1550Rx (Type A) 1550Tx/1310Rx (Type B)
Standards	IEEE 802.3, IEEE 802.3u	
Power Input	Adapter Type : DC 12V	
	Power Built-in Type : AC 100 ~ 240V	
	Power Built-in Type : DC 18 ~ 60V	
LEDs	Power, FX Link, TX SPD, TX Link, TX Duplex, FEF	

Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mpbs
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP 100Base-TX Cat.5, 5e
	Distance	100 meters
Power Consumption	< 3W	
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Dimensions (D x W x H)	Adapter Type : 108 x 23 x 73.4mm	
	Power Built-in Type : 135 x 23 x 73.4mm	
Weight	Adapter Type : 120g	
	Power Built-in Type : 140g	
Certification	CE, FCC	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FMC-10/100i	10/100Base-TX to 100Base-FX In-band managed Media Converter Adapter Type
FMC-10/100i-AC,DC	10/100Base-TX to 100Base-FX In-band managed Media Converter with AC or DC Power

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

Power Type
FMC – 10/100i – □□
Example: FMC – 10/100i – DC

FMUX1001

Modularized 16E1/T1 + 4x GbE Managed Fiber Multiplexer

FMUX101

Modularized 16E1/T1 + 4x FE Managed Fiber Multiplexer

The FMUX1001/FMUX101 is a 1U, 19" rack mountable, PDH fiber optic multiplexer that transmits up to 16 channels plus a 10/100/1000Base-T (FMUX1001) / 10/100Base-TX (FMUX101) Ethernet channel over a single fiber optic link. The FMUX1001/FMUX101 chassis supports redundant power and hot swappable design. The AC supplies operate from 100~240VAC while DC supplies operate from 18~60VDC. From the rear of the chassis, one to four hot swappable quad E1 or T1 line cards, serial data communications (V.35, X.21, RS-530) or FXO/FXS voice cards are supported. The standard FMUX1001 configuration may be viewed or set via the front panel LCD/menu keys, serial VT-100 terminal connection, Telnet, web HTTP or SNMP.

Features

- 1U, 19 (23)" 4-slot chassis
- 16 E1 (2.048Mb/s) Multiplexer with 100/1000Mbps Ethernet and RS-232 data (async) Interface (FMUX1001)
- 16 E1 (2.048Mb/s) Multiplexer with 10/100Mbps Ethernet and RS-232 data (async) Interface (FMUX101)
- RS-232 port for system console
- One alarm output port, one Order Wire port
- 4x 10/100/1000Base-T Ethernet ports (FMUX1001)
- 4x 10/100/1000Base-T Ethernet ports (FMUX101)
- SNMP management
- LCD plus menu keys for local configuration
- Port based VLAN, tag based VLAN & bandwidth control
- Telnet and web based remote configuration
- 2 plug-in SFP slot for optical SFP module
- Forward 1024K byte packets on Ethernet port

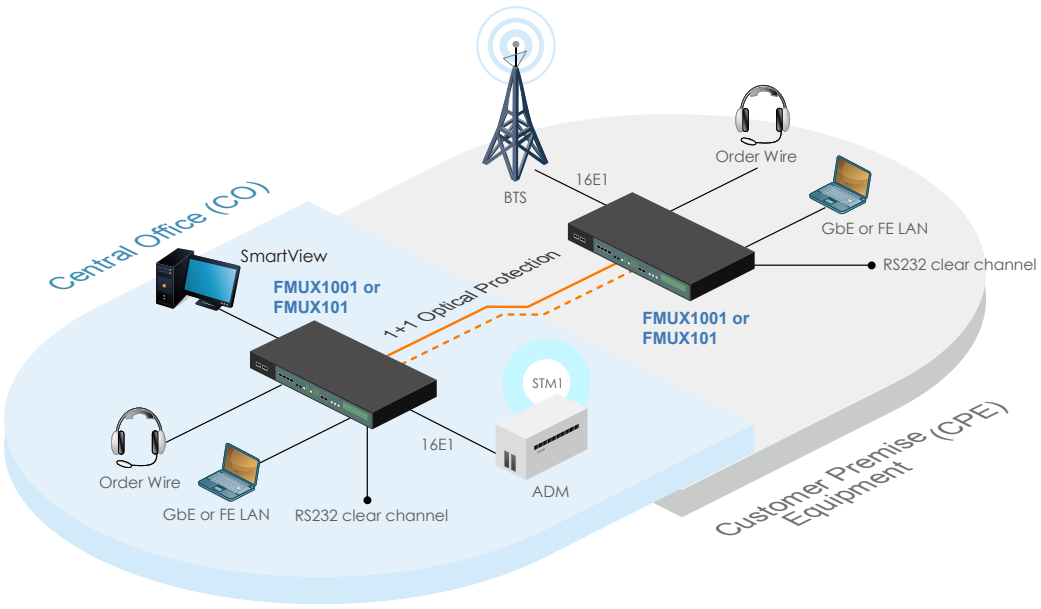
Specifications

Optical Interface	Connector	SFP - LC
	Data rate	1.25G (FMUX1001), 155M (FMUX101)
	Bit Error Rate	Less than 10^{-11}
	Fiber	MM 62.2/125μm, 50/125μm
		SM 9/125μm
	Distance	MM 2km. SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	1310, 1550nm
Electrical Interface	Console, SNMP	RJ45
	Ethernet	4x RJ45
	Alarm	RJ45

Standards	E1:ITU-T, T1:ITU-T, AT&T, ANSI, Ethernet: IEEE802.3x
Indications	PWR, Alarm, Phone, ACO, Port, Channels
Power Input	AC module IN : AC 90 ~ 264V, Out : DC 12V DC module IN : DC 18 ~ 72V, Out : DC 12V
Power Consumption	< 25W
Dimensions	250 x 438 x 43mm (D x W x H)
Weight	3.58 kg
Temperature	0 ~ 50°C (Operating), 0 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	50,000 hrs

Application

Remote 3G BTS connection Application



-Related Products: FMUX101, FMUX1600/160, FMUX04E (16x E1/T1 + 4x GbE/FE FOM,4E1/T1 + 3x FE FOM)

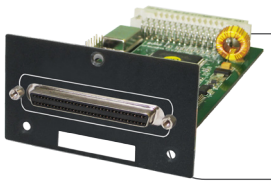
FMUX1001 & FMUX101 Interface Module

4x E1/T1 RJ45 I/F

Standards	ITU-T G.703, G.704, AT&T TR-62411,ANSI T1.403
Ports	4 ports
Framing	Unframed (clear channel)
E1	Data rate: 2.048 Mbps ±50 ppm
	Line code: HDB3 / AMI
	Line impedance: 120 ohms ±5%, 75ohms ±5%
T1	Data rate: 1.544 Mbps ±50 ppm
	Line code: B8ZS / AMI
	Line impedance: 100 ohms ±5%
Receive Level	Short haul - 15dB
Connector	RJ-45

4x E1 BNC I/F

Standards	ITU-T G.703, G.704, G.706, G.732
Ports	4 ports
Framing	Unframed (clear channel)
Data rate	E1 2.048 Mbps ± 50 ppm
Line code	E1 HDB3/AMI
Receive Level	Short haul - 15dB
Line impedance	E1 75 ohms ± 5%
Connector	BNC 75 ohms



Relative Cables *(Please see order information for more details)*

4x Data Com I/F

Standards	ITU-T, E1A
Card Type	V.35/ RS-530 (Include X.21 and RS-449)/ RS-232 I/F
Bit rate	n x 64K, n = 1 to 32
	V.35 & RS-530 up to 2Mbps
	RS-232 up to 115.2Kbps (ASYNC)
Line code	NRZ
Clock Mode	Transparent, Recovery, External (From data port ETC)
	Internal (From oscillator)

Control Signal	CTS always On or follows RTS
	DSR constantly ON, except during test
	loops (RS-530 DSR always connect to DTR)
	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

4x FXO I/F

Standards	G.711 A-law (separate modules for FXO)
Distance	2km
Bandwidth	64K voice channel
Connector	RJ45 x 4 (4 voice channel /per unit)

4x FXS I/F

Standards	G.711 A-law (separate modules for FXS)
Distance	2km
Bandwidth	64K voice channel
Connector	RJ45 x 4 (4 voice channel /per unit)

Ordering Information

Model Name	Description
FMUX1001-CH	1U 19"4-Slot Rack Mount Chassis
FMUX101-CH	1U 19"4-Slot Rack Mount Chassis
FMUX-AC	Chassis Power Module 90~264VAC
FMUX-DC	Chassis Power Module 18~72VDC
FMUX-4E1/T1-RJ45	4ch E1/T1 RJ45 interface card
FMUX-4E1/T1-Wire	4ch E1/T1 Wire Wrap interface card
FMUX-4E1/BNC	4ch G.703 E1 BNC interface card
FMUX-V35	V35 interface card with HD68M to 4 x MB34F cable (30cm)
FMUX-530	RS-530 interface card with HD68M to 4 x DB25F cable (30cm)
FMUX-449	RS-449 interface card with one HD68M to 4 x DB37F cable (30cm)
FMUX-X21	X.21 interface card with one HD68M to 4 x DB15F cable (30cm)
FMUX-232/Sync	RS-232 Sync card with one HD68M to 4 x DB9F cable (30cm)
FMUX-232/Async	RS-232 Async card with one HD68M to 4 x DB9F cable (30cm)
FMUX-4FXO	4 x FXO interface card
FMUX-4FXS	4 x FXS interface card
FMUX-Phone-2W	2 Wires order Wire (connect to analogue Telephone set)
FMUX-Phone-4W	4 Wires order Wire (connect to Ear-Mic set)
FMUX-EXT/CLK	External clock interface card

Example:

Chassis/Power/Line card Only

FMUX [1][0][0][1] - CH
- 1001 : GbE Fiber Multiplexer
- 101 : FE Fiber Multiplexer

FMUX [A][C]
- Power Module

FMUX [V][3][5]
- I/F Line Card

Whole Set

FMUX [1][0][0][1] - [A][C] - [2][W] - [A][B][C][D]

- 1001 : GbE
- 101 : FE

Power Type
- AC
- DC
- AA : AC + AC
- DD : DC + DC
- AD : AC + DC

Order Wire
- 2W : 2 Wire Phone
- 4W : 4 Wire Phone

Card Type
- A : 4x E1 BNC
- B : 4x E1/T1 RJ45
- C : 4x E1/T1 Wire
- D : 4x V.35
- E : 4x RS-232/Async
- F : 4x RS-530
- G : 4x X.21
- H : 4x RS-449
- I : 4x FXO
- J : 4x FXS
- L : EXT/CLK
- M : 4x RS232/Sync

FMUX1600
FMUX800

16 or 8x E1/T1 + 4x GbE, Managed Fiber Multiplexer

The FMUX1600/FMUX800 is 1U 19"rack mountable, PDH fiber optical Multiplexer that transmits up to 16/8 E1/T1 + 4 x 10/100/1000Base-T Gigabit Ethernet over a single fiber optic link. The FMUX1600/FMUX800 chassis in available in three different power configurations; single AC, single DC, or AC+DC. The AC supplies operate from 90 ~ 240VAC while DC supplies operate from 18~60VDC. On the rear of the chassis, the BNC model provides 32/16 unbalanced 75 Ohm coaxial connections with BNC connectors while the RJ-45 model provides 16/8 balanced 120 Ohm connections over twisted pair wiring with RJ45 connectors . With two SFP sockets on fiber ports, the FMUX1600/FMUX800 gives you the fiber cabling connector SFP-LC, both multi-mode and single-mode are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. 1+1 Automatic optical line protection is also supported for the aggregate fiber ports. The standard FMUX1600/FMUX800 configuration may be viewed or set via serial VT-100 terminal connection or SNMP card with web, telnet, and SNMP management

Features

- Provides 16/8 E1/T1 G.703 transparent transmission over fiber
- Provides 4x 10/100/1000 Mbit/s Ethernet Ports and 1x RS232 ch.
- Provides one RS232 channel
- Loopback test on E1/T1 fiber port
- Provides one hotline channel (order-wire)
- Supports full/half duplex, 10M/100M/1000M, auto-Negotiation
- Forward 10K byte jumbo packets on Ethernet port
- Supports 1+1 fiber line protection. Less than 50ms
- Complete alarm function and can monitor remote device status
- Power combination AC220V and DC-48V for redundant options
- Supports RS232 local management; Supports on-line f/w upgrade
- Supports Web, Telnet, SNMP management (optional)

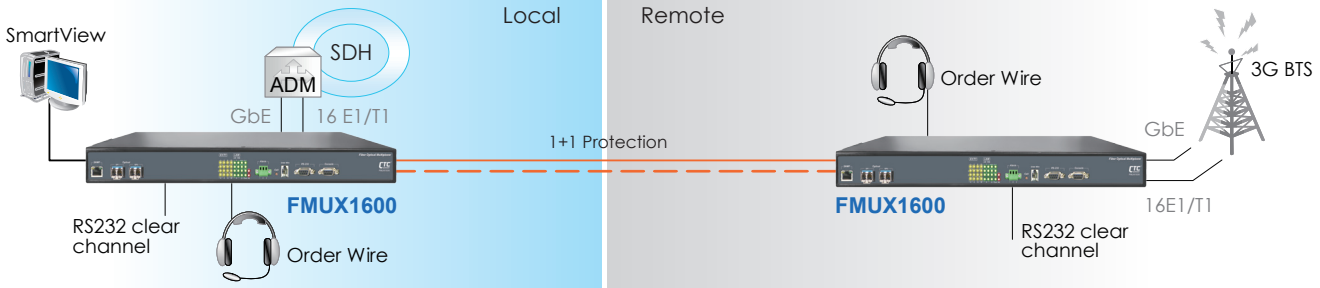
Specifications

Optical Interface	Connector	SFP- LC
	Data rate	1.25Gbps
	Bit Error Rate	Less than 10^{-11}
	Distance	MM 2km, SM 15/30/50/80/120km
	Wavelength	WDM 20/40/60/80km
Electrical Interface	Connector	Console : RS232 / SNMP : RJ45
		Ethernet : RJ45 (4-port)
		Alarm : RS232 / Order wire : RJ11
E1 Interface	Standards	ITU-T G.703, G.704, G.706, G.732
	Ports	8/16 ports
	Data Rate	2.048 Mbps ± 50 ppm
	Line Code	HDB3/AMI
	Connector	RJ-45 for 120 ohms BNC for 75 ohms
T1 Interface	Standards	ITU-T G.703, G.704, AT&T TR-62411, ANSI T1.403
	Ports	8/16 ports

T1 Interface	Data Rate	1.544 Mbps ±50 ppm
	Line Code	B8ZS / AMI
	Connector	RJ-45 for 100 ohms
Certification	CE, FCC, RoHS compliant	
Standards	ITU-T G.703, G.823 and G.742, ANSI, AT&T, IEEE803.2, IEEE802.3u, IEEE802.3ab	
Indications	Power, Alarm, LBK, RD, LCK, RNG, ACO, Port, channel	
Power Input	90 ~ 240VAC, 18~60VDC	
Power Consumption	<25W	
Dimensions	250 x 438 x 43mm (D x W x H)	
Weight	3.58kg	
Temperature	0 ~ 60°C (Operating), -10 ~ 70°C (Storage)	
MTBF	50,000 hrs	

Application

Remote 3G BTS connection Application



-Related Products: FMUX1001/101, FMUX160, FMUX04E (16x E1/T1 + 4x GbE/FE FOM,4E1/T1 + 3x FE FOM)

Ordering Information

Model Name	Description
FMUX1600B-AD	16x E1 BNC + 4 x 10/100/1000Base-T Ethernet Fiber Multiplexer, build-in AC + DC Power
FMUX1600R-AD	16x E1/T1 RJ-45 + 4 x 10/100/1000Base-T Ethernet Fiber Multiplexer, build-in AC + DC Power
FMUX800B-AD	8x E1 BNC + 4 x 10/100/1000Base-T Ethernet Fiber Multiplexer, build-in AC + DC Power
FMUX800R-AD	8x E1/T1 RJ-45 + 4 x 10/100/1000Base-T Ethernet Fiber Multiplexer, build-in AC + DC Power
FMUX1600-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX800-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX-Phone-2	2 Wires Order Wire
FMUX-Phone-4	4 Wires Order Wire

Option Models

Model Name	Description
FMUX1600-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX800-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX-Phone-2	2 Wires Order Wire
FMUX-Phone-4	4 Wires Order Wire

Note: SNMP option only required in one unit of paired link

E1 Connector Type / Power Type

FMUX1600–□–□□
Example: FMUX1600– B – DC

FMUX–Phone–□
Example: FMUX–Phone – 2

FMUX160
FMUX80

16 or 8x E1/T1 + 4x FE, Managed Fiber Multiplexer

The FMUX160/FMUX80 is 1U 19" rack mountable, PDH fiber optical Multiplexer that transmits up to 16/8 E1/T1 + 4 x 10/100Base-TX Fast Ethernet over a single fiber optic link. The FMUX160/FMUX80 chassis in available in three different power configurations; single AC, single DC, or AC+DC. The AC supplies operate from 90 ~ 240VAC while DC supplies operate from 18~60VDC. On the rear of the chassis, the BNC model provides 32/16 unbalanced 75 Ohm coaxial connections with BNC connectors while the RJ-45 model provides 16/8 balanced 120 Ohm connections over twisted pair wiring with RJ45 connectors. the FMUX160/FMUX80 gives you the fiber cabling connector ST SC FC, both multi-mode and single-mode are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. 1+1 Automatic optical line protection is also supported for the aggregate fiber ports. The standard FMUX160/FMUX80 configuration may be viewed or set via serial VT-100 terminal connection or SNMP card with web, telnet, and SNMP management.

Features

- Provides 16/8 E1/T1 G.703 transparent transmission over fiber
- Provide 4x 10/100 Mbit/s Ethernet Ports (100Mbps aggregate)
- Provides one RS232 channel
- Loopback test on E1/T1 fiber port
- Provides one hotline channel (order-wire)
- Supports full/half duplex, 10M/100M, auto-Negotiation
- Forward 1792 byte packets on Ethernet port
- Supports 1+1 fiber line protection. Less than 50ms
- Complete alarm function and can monitor remote device status
- Power combination AC220V and DC-48V for redundant options
- Supports RS232 local management ; Supports on-line f/w upgrade
- Supports Web, Telnet, SNMP management (optional)

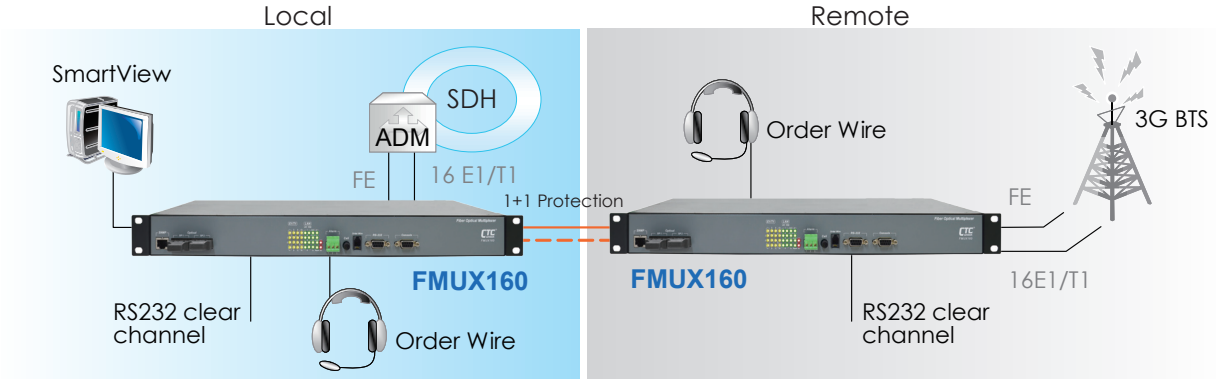
Specifications

Optical Interface	Connector	ST, SC, FC
	Data rate	155.52Mbps
	Bit Error Rate	Less than 10^{-11}
	Distance	MM 2km, SM 15/30/50/80/120km WDM 20/40/60/80km
	Wavelength	1310nm, 1550nm, CWDM 1471nm~1611nm
Electrical Interface	Connector	Console : RS232 / SNMP : RJ45
		Ethernet : RJ45 (4-port)
		Alarm : RS232 / Order wire : RJ11
E1 Interface	Standards	ITU-T G.703, G.704, G.706, G.732
	Ports	8/16 ports
	Data Rate	2.048 Mbps ± 50 ppm
	Line Code	HDB3/AMI
	Connector	RJ-45 for 120 ohms BNC for 75 ohms

T1 Interface	Standards	ITU-T G.703, G.704, AT&T TR-62411, ANSI T1.403
	Ports	8/16 ports
	Data Rate	1.544 Mbps ±50 ppm
	Line Code	B8ZS / AMI
	Connector	RJ-45 for 100 ohms
Certification	CE, FCC, RoHS compliant	
Standards	ITU-T G.703, G.823 and G.742, ANSI, AT&T, IEEE803.2, IEEE802.3u	
Indications	Power, Alarm, LBK, RD, LCK, RNG, ACO, Port, channel	
Power Input	90 ~ 240VAC, 18~60VDC	
Power Consumption	<25W	
Dimensions	250 x 438 x 43mm (D x W x H)	
Weight	3.58kg	
Temperature	0 ~ 60°C (Operating), -10 ~ 70°C (Storage)	
MTBF	75,000 hrs	

Application

Remote 3G BTS connection Application



-Related Products: FMUX1001/101, FMUX1600, FMUX04E (16x E1/T1 + 4x GbE/FE FOM,4E1/T1 + 3x FE FOM)

Ordering Information

Two Fiber model

Model Name	Description
FMUX160B-AD-2SC002	16x E1 BNC + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with two MM 2km SC fiber, AC+DC Power
FMUX160R-AD-2SC002	16x E1/T1 RJ45 + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with two MM 2km SC fiber, AC+DC Power
FMUX80B-AD-2SC002	8x E1 BNC + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with two MM 2km SC fiber, AC+DC Power
FMUX80R-AD-2SC002	8x E1/T1 RJ45 + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with two MM 2km SC fiber, AC+DC Power

One Fiber model

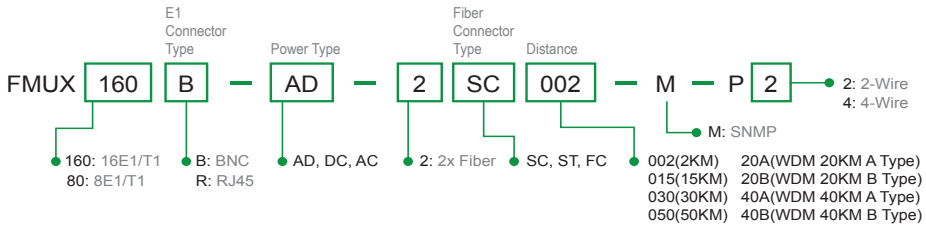
Model Name	Description
FMUX160B-AD-SC002	16x E1 BNC + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with one MM 2km SC fiber, AC+DC Power
FMUX160R-AD-SC002	16x E1/T1 RJ45 + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with one MM 2km SC fiber, AC+DC Power
FMUX80B-AD-SC002	8x E1 BNC + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with one MM 2km SC fiber, AC+DC Power
FMUX80R-AD-SC002	8x E1/T1 RJ45 + 4 x 10/100Base-T Ethernet Fiber Multiplexer, with one MM 2km SC fiber, AC+DC Power

Optional modules

Model Name	Description
FMUX160-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX80-SNMP	SNMP Card with 10/100Base-TX Ethernet Port
FMUX-Phone-2	2 Wires Order Wire with RJ9 to RJ11 cable
FMUX-Phone-4	4 Wires Order Wire

Note: SNMP option only required in one unit of paired link

Example:



FMUX04E

4E1/T1 +3x FE Fiber Multiplexer

FMUX04E is a fixed design for 4xE1 + Fast Ethernet multi-service to dual strand fiber PDH multiplexer. FMUX04E provides E1 transmission transparently and pure 100Mbps Fast Ethernet simultaneously. The fiber optic line is based on SFP technology that allows the flexible use of Multimode or Single mode lines and enables support for different wavelengths and distances. The use of bi-directional SFPs maximizes the utilization of fiber optic line and results in saving line costs. The multiplexer can be equipped with optional AC and DC power supplies for redundant operation. With SNMP and Web-based management in the FMUX04E, the Network administrator can monitor, configure and control the activity remotely.

Features

- 4 channels unframed E1/T1
- 3-CH 10/100Base-TX Ethernet
- Auto MDI/MDIX
- Auto-Negotiation or Force mode
- Supports flow control
- Supports 1552 packets (max)
- One clear channel RS232 up to 250Kbps(Async)
- 1+1 fiber protection, less than 50ms
- Supports Digital Diagnostics Monitoring Interface (DDMI)
- AIS on signal loss on E1/T1 and fiber port
- Port based VLAN function
- Loopback test on E1/T1, RS-232, fiber ports
- Supports Dying Gasp
- Supports local or remote In-band management
- Optional SNMP management
- Supports Order wire Ear / Microphone port.
- Supports On-Line F/W upgrade (local or remote) by the SNMP manager

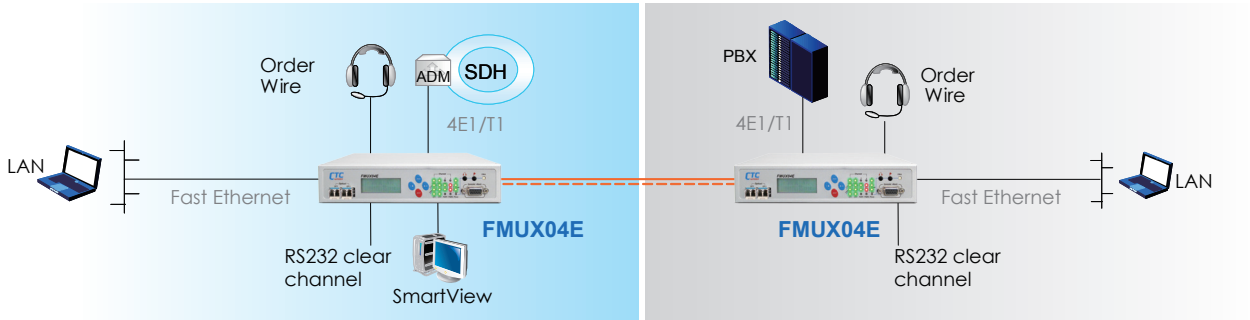
Specifications

E1/T1	Framing: Unframed (transparent)	
	Bit Rate: E1:2.048 Mb/s , T1: 1.544Mb/s	
	Line Code: E1:AMI/HDB3, T1: AMI/B8ZS	
	Line Impedance:	
	E1: Unbalanced 75 ohms (BNC)	
	E1: Balanced 120 ohms (RJ-45)	
	T1: Balanced 120 ohms (RJ-45)	
	Receiver sensitivity: Short haul	
	Jitter Performance: According to ITU-T G.823	
	Standard: ITU-T G.644, G.703, G.704, G.706 and G.732	
	Interface Connectors: RJ-45, BNC	
	Test Loops:	LLB (Local Loop Back)
		RLB (Remote Loop Back)
		RRLB (Request Remote Loop Back)
Optical Interface	Bandwidth in optical Line: 155 Mbps	
	Optical Connector: LC (SFP module)	
	Distance: 20/40/80 Km	

Optical Interface	Optical Wavelength: 1310nm, 1550nm, WDM Tx1310/Rx1550nm (Type A), WDM Tx1550/Rx1310nm (Type B)
Ethernet	Interface Type: 10/100Base-TX
	Connector: 3x RJ-45
	Standard: IEEE 802.3, 802.3u
	Duplex modes: full/half
Indication	FX1 Link, FX2 link , E1/T1 Mode/Link/Loopback test, Order wire phone indicator , LAN Link/Speed
Power Input	AC : 100~240VAC, DC : 18-75 VDC
Dimensions	248 x 215 x 43mm (D x W x H)
Operating Temperature	0 ~ 50°C (Operating)
	-10 ~ 20°C (Storage)
Humidity	10 ~ 90% non-condensing
Certifications	CE, FCC, RoHS compliant
MTBF	75,000 hrs

Application

4E1/T1+FE over fiber p to p connection Application



-Related Products: FMUX1001/101,FMUX1600/160, FMUX04E (16x E1/T1 + 4x GbE/FE FOM,4E1/T1 + 3x FE FOM)

Ordering Information

Model Name	Description
FMUX04E-AC, DC, AD	Standalone FOM with built-in AC, DC or AD (AC+DC) Power, optional SNMP
FMUX04E-SNMP	SNMP management card, support web, telnet, SNMP functions

Note: SNMP option only required in one unit of paired link

IPM-1SE/V35

E1/V.35 over Ethernet Access Unit

IPM-1SE/V35 is designed as a multi-service access platform for PDH and V.35 over Ethernet applications. Structured/unstructured E1 and V.35 data can be mapped/de-mapped into/from Ethernet packets. An adaptive clock recovery method for Ingress PDH (PSN -> TDM) clock generation is implemented to support E1 (ITU-T G.824) Jitter performance.

Cost-effective LAN deployment (PDH and V.35 over ethernet)

IPM-1SE/V35 provides cost-effective applications of traditional circuit-switched system over Ethernet. With IPM-1SE/V35, it is easy to interconnect with existing phone systems and V.35 over Ethernet that are used to carry data, voice and video.

Transparent transmission

IPM-1SE/V35 can transparently transport proprietary signaling that are required to support PBX features, including call conference, call forwarding and SS7. Customer can easily apply and enjoy better integration of TDM, V.35 and Ethernet devices with lower network expense.

Bypass international toll

With a pair of IPM-1SE/V35 and guaranteed internet bandwidth, it is sure to save cost dramatically, and to ensure the QoS of voice based on interconnections of TDM telecommunications equipment.

Features

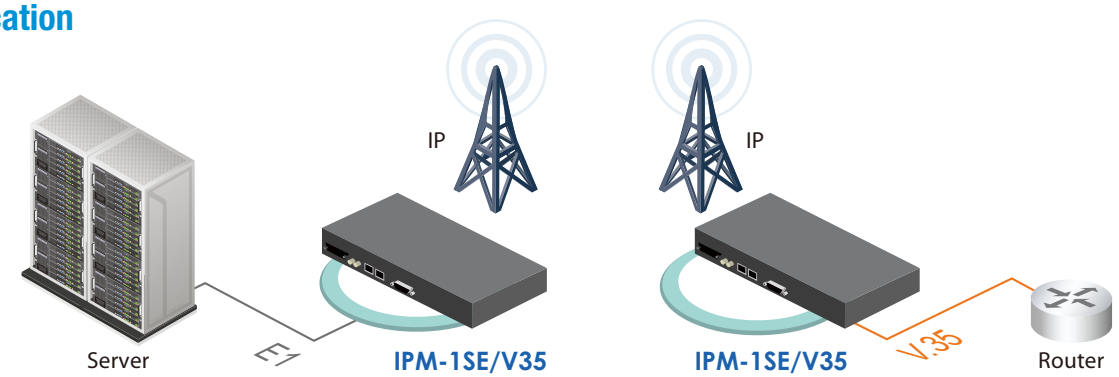
- Supports IEFT RFC4533 Structure-Agnostic TDM over Packet (SAToP), Metro Ethernet Forum MEF8.
- One E1 NRZ Serial Interface with LOS/AIS detection.
- One V.35 (Nx64K) interface.
- Use Raw Encapsulation method for PDH payload over Ethernet packet.
- Supports Circuit Emulation Service over Ethernet (CESoE) transport over Ethernet networks.
- Comply with IEFT draft standard for CESoPSN and SAToP; Metro Ethernet Forum MEF8 IA.
- Supports both Point-to-Point and Point-to-Multipoint operation.
- Supports Adaptive Clock recovery block for Ingress PDH (PSN -> TDM) clock generation. Recovered clock jitter is compliant to ITU-T G.824 (E1 Jitter Control).
- Configurable jitter buffer depth to compensate up to 40ms of Packet Delay Variation.
- Lost packets processing/compensation via PW (Pseudo Wire) control field Sequence Number.
- Provides Subscriber side data traffic bandwidth control to guarantee enough TDM payload bandwidth.
- PDH LOS detection triggered PW L field or payload AIS generation at Egress direction (TDM -> PSN).
- Configurable IEEE 802.3 DA/SA assignment.

Specifications

Line interface (CPE side)	Port: One E1 (ITU-T G.703) and one V.35. Interface: RJ-48c (120 Ohm), BNC (75 Ohm) and M/34 female (V.35, DCE). E1 Line Coding: HDB3
Ethernet interface (CPE/CO side)	Port: two 100 Base-T Ethernet. One is for downlink and the other is for uplink Interface: RJ-45
Dimensions	44 x 370 x 215 mm (D x W x H)

Power	AC: 110 ~ 240V @ 47 ~ 65Hz DC: -72V ~ -36V
Environment	Ambient temperature: 0°C ~ 50°C (0°C ~ 65°C, optional) Storage temperature: 0°C~ 85°C Relative humidity: 5 ~ 95% non condensing
Management	Console port (CLI) or SNMP-based / Web GUI management

Application



Ordering Information

Model Name	Description
IPM-1SE/V35-AD	E1/V35 over Ethernet access unit with AC+DC Power

IPM-E1
IPM-4E1

1/4x E1 over Ethernet

IPM-E1/4E1 is designed as a multi-service access platform for PDH over IP applications. E1 frames can be mapped/de-mapped into/from IP packets. An adaptive clock recovery method for Ingress PDH (PSN->TDM) clock generation is implemented to support E1 (ITU-T G.823) Jitter performance.

IPM-E1/4E1 provides cost-effective applications of traditional circuit-switched system over IP. It is easy to interconnect existing phone systems over IP that are used to carry data, voice and video. With high precision clock recovery technology, IPM-E1/4E1 is capable of supporting 2G/3G/4G backhaul and provides smooth services. IPM-E1/4E1 can transparently transport proprietary signaling that are required to support PBX features, including call conference, call forwarding and SS7. Customer can easily apply and enjoy better integration of TDM and IP devices with lower network expense. With a pair of IPM-E1/4E1 and guaranteed internet bandwidth, it is sure to save cost dramatically, and to ensure the QoS of voice based on interconnections of TDM equipment.

Features

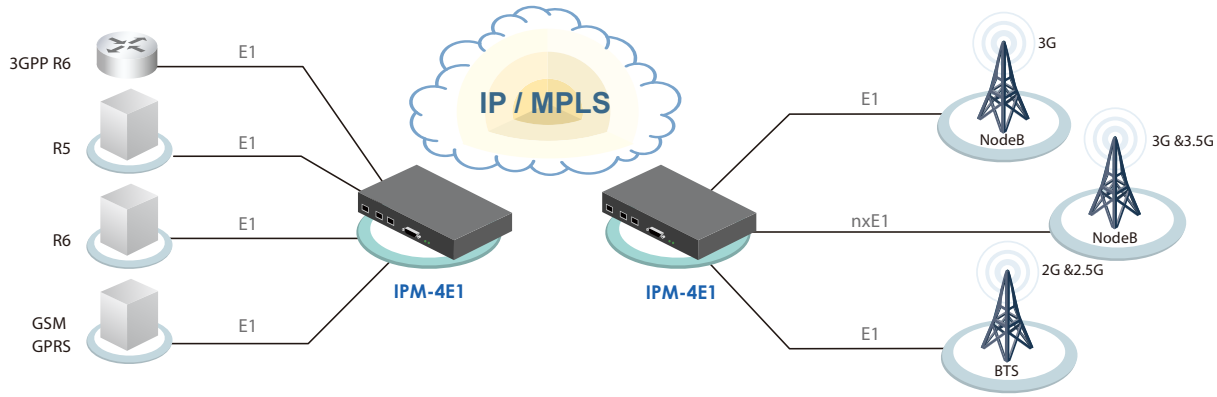
- Supports Web Management
- Supports IETF RFC4553 Structure-Agnostic TDM over Packet (SAToP), Metro Ethernet Forum MEF8
- Use Raw Encapsulation method for PDH payload over Ethernet packet
- Supports Circuit Emulation Service over Ethernet networks
- Comply with IETF draft standard for CESoPSN and SAToP; Metro Ethernet Forum MEF8 IA
- Supports both Point-to-Point and Point-to-Multipoint operation
- Supports Adaptive Clock recovery block for Ingress PDH (PSN -> TDM) clock generation. Recovered clock jitter is compliant to ITU-T G.823 (E1 Jitter Control)
- Configurable jitter buffer depth to compensate PDV (Packet Delay Variation) with the flexible setting of 11ms, 23ms, 40ms, 75 ms
- Lost packets processing / compensation via PW (Pseudo Wire) control field Sequence Number
- Provide Subscriber side Data traffic bandwidth control to guarantee enough TDM payload bandwidth
- PDH LOS detection triggered PW L field or payload AIS generation at Egress direction (TDM->PSN)
- Configurable IEEE 802.3 DA/SA assignment
- LED alarm display for E1 Power failure status
- E1 NRZ Serial Interface with LOS/AIS detection

Specifications

E1 Interface	Standards	ITU-T G.703, G.704, G.706, G.732
	Ports	1 or 4-Port
	Data Rate	2.048Mbps ±50ppm
	Connector	RJ-48c for 120 ohm
	Line Coding	HDB3
Ethernet Interface	WAN Port	100 Base-TX Ethernet
	Interface	RJ-45
	LAN port	100 Bases-TX Ethernet
	Interface	RJ-45

Dimensions	125 x 320 x 44 mm (D x W x H)
Power	AC: 85 ~ 264V @ 47 ~ 63Hz
	DC: -72V ~ -36V
Environment	Ambient temperature: 0° ~ 50°
	Storage temperature: 0°~ 85°
	Humidity: 5 ~ 95% non-condensing
Management	Console or Telnet / Web / SNMP management (via Ethernet)

Application



Ordering Information

Model Name	Description
IPM-E1-AD	E1 over Ethernet with built-in AC+DC Power
IPM-4E1-AD	4E1 over Ethernet with built-in AC+DC Power

Port Number Power Type

IPM – □□□ – □□

Example: IPM – 4E1 – AD

IPM-8E1
IPM-16E1

8/16x E1 over Ethernet

IPM-8E1 & IPM-16E1 is designed as a multi-service access platform for PDH over IP applications. E1 frames can be mapped/de-mapped into/from IP packets. An adaptive clock recovery method for Ingress PDH (PSN->TDM) clock generation is implemented to support E1 (ITU-T G.823) Jitter performance.

IPM-8E1 & IPM-16E1 provides cost-effective applications of traditional circuit-switched system over IP. It is easy to interconnect existing phone systems over IP that are used to carry data, voice and video. With high precision clock recovery technology, IPM-8E1 & IPM-16E1 is capable of supporting 2G/3G/4G backhaul and provides smooth services. IPM-8E1 & IPM-16E1 can transparently transport proprietary signaling that are required to support PBX features, including call conference, call forwarding and SS7. Customer can easily apply and enjoy better integration of TDM and IP devices with lower network expense. With a pair of IPM-8E1 & IPM-16E1 and guaranteed internet bandwidth, it is sure to save cost dramatically, and to ensure the QoS of voice based on interconnections of TDM equipment.

Features

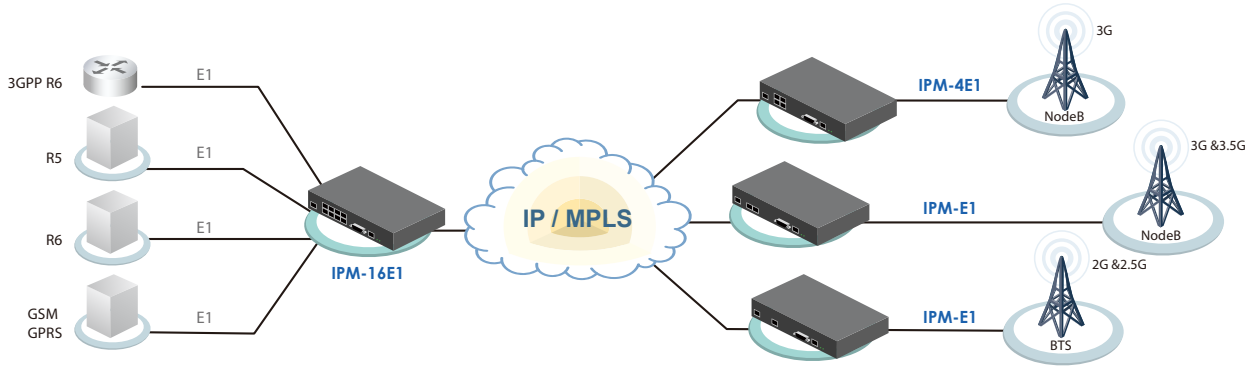
- Supports Web Management
- Supports IETF RFC4553 Structure-Agnostic TDM over Packet (SAToP), Metro Ethernet Forum MEF8
- 8 /16 x E1 NRZ Serial Interface with LOS/AIS detection
- Use Raw Encapsulation method for PDH payload over IP packet
- Supports Circuit Emulation Service over IPE
- Comply with IETF draft standard for CESoPSN and SAToP; Metro Ethernet Forum MEF8 IA
- Supports both Point-to-Point and Point-to-Multipoint operation
- Configurable IEEE 802.3 DA/SA assignment
- Supports 8/16 independent Adaptive Clock recovery block for Ingress PDH (PSN->TDM) clock generation. Recovered clock jitter is compliant with ITU-T G.823 (E1 Jitter Control)
- Independent configurable jitter buffer depth to compensate up to 250ms of Packet Delay Variation
- Lost packets processing / compensation via PW (Pseudo Wire) control field Sequence Number
- PDH LOS detection triggered PW L field or payload AIS generation at Egress direction (TDM->PSN)
- LED alarm display for E1 Power failure status

Specifications

E1 Interface	Standards	ITU-T G.703, G.704, G.706, G.732
	Ports	8 or 16-Port
	Data Rate	2.048Mbps ±50ppm
	Connector	RJ-45 for 120 ohm
	Line Coding	HDB3
Ethernet Interface	WAN Port	1 x 100Base-TX Ethernet
	Interface	RJ-45
Dimensions	268 x 290 x 44 mm (D x W x H)	

Power	AC: 85 ~ 264V @ 47 ~ 63Hz
	DC: -72V ~ -36V
Environment	Ambient temperature: 0° ~ 50°
	Storage temperature: 0°~ 85°
	Humidity: 5 ~ 95% non-condensing
Management	Console port or Telnet/ Web / SNMP-based management via NMS port

Application



Ordering Information

Model Name	Description
IPM-8E1-AD	8E1 over Ethernet with built-in AC+DC Power
IPM-16E1-AD	16E1 over Ethernet with built-in AC+DC Power

Port Number Power Type

IPM – □□□□ – □□

Example: IPM – 16E1– AD

STE100A-232

RS232 Serial Server

STE100A-Serial

RS485/232 Serial Server

The IP Device Server provides the serial device server for hosts to control RS-232, 2 or 4 wire asynchronous RS-422/485 serial devices located virtually anywhere through a TCP/IP or UDP/IP connection. The Device Server has the DB9 port connection on one side, and a 10/100 Mbps Ethernet connection on the other side. It connects serial devices such as PLC, alarm sensors and PTZ camera control to IP networks. Applications include industrial/factory automation, public safety and surveillance systems. The IP Device Server Windows driver is designed to control the IP Serial Server devices. The driver installs a virtual COM on Windows which maps the virtual COM port to the IP address of the IP Serial Server device across the network, enabling the Windows applications to access remote serial devices over Ethernet. IP Device Server can function as a UDP or a server or client for TCP connection. The application scenarios are direct IP mode, virtual COM mode, and paired mode.

Features

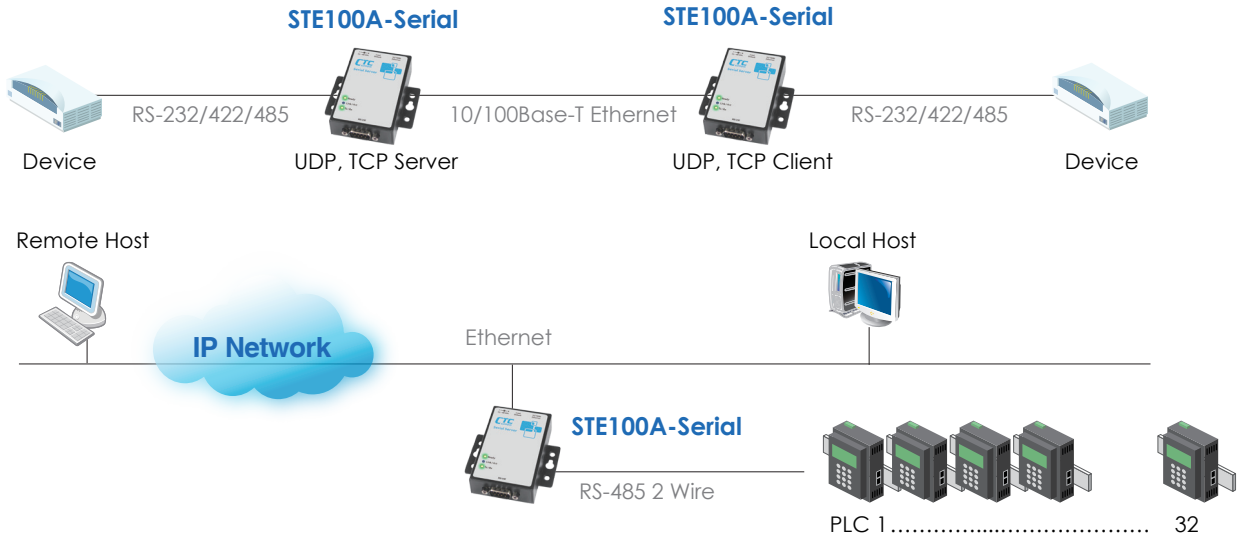
- Supports Web Management
- Supports IETF RFC4553 Structure-Agnostic TDM over Packet (SAToP), Metro Ethernet Forum MEF8
- 8 /16 x E1 NRZ Serial Interface with LOS/AIS detection
- Use Raw Encapsulation method for PDH payload over IP packet
- Supports Circuit Emulation Service over IPE
- Comply with IETF draft standard for CESoPSN and SAToP; Metro Ethernet Forum MEF8 IA
- Supports both Point-to-Point and Point-to-Multipoint operation
- Configurable IEEE 802.3 DA/SA assignment
- Supports 8/16 independent Adaptive Clock recovery block for Ingress PDH (PSN->TDM) clock generation. Recovered clock jitter is compliant with ITU-T G.823 (E1 Jitter Control)
- Independent configurable jitter buffer depth to compensate up to 250ms of Packet Delay Variation
- Lost packets processing / compensation via PW (Pseudo Wire) control field Sequence Number
- PDH LOS detection triggered PW L field or payload AIS generation at Egress direction (TDM->PSN)
- LED alarm display for E1 Power failure status

Specifications

General	LED	Ready, TP Link/Act, Data TX/RX
	OS supported	Windows XP / 2000 / 2003 / 2008 / VISTA / WIN7 / WIN8
Serial Interface	STE100A-Seria l : RS-232/422/485 STE100A-232 : RS-232	
Serial Connector	DB9 Male	
Baudrate	110 to 230.4Kbps	
Data bits	5, 6, 7, 8	
Stop bits	1, 1,5 for Data bits 5 mode; 1, 2 for data bits 6, 7, 8 mode	
Parity	None, Even, Odd	
Flow Control	None or RTS / CTS for RS-232 Full Duplex(4-Wire) or Half Duplex(2-Wire) for RS-422/485	
Data Packing Delimiter	1,2	

LAN Interface	RJ-45 connector, IEEE802.3 10/100Base-TX
Communication Modes	TCP Server, TCP Client, Virtual COM mode, UDP
Protocols	TCP, UDP, IP, ARP, ICMP, HTTP, DHCP
Management	Web pages, Firmware upgrade
Security	Password Access
Power	12VDC
Operating Temperature	0 ~ 60°C
Storage Temperature	-10 ~ 70°C
Humidity	0 – 90% non-condensing
DIN rail mount	Yes
Panel mount	Yes
Dimensions	85.8 x 84.2 x 22mm (D x W x H) with DIN-Rail Mounting Kit
Certifications	CE, FCC

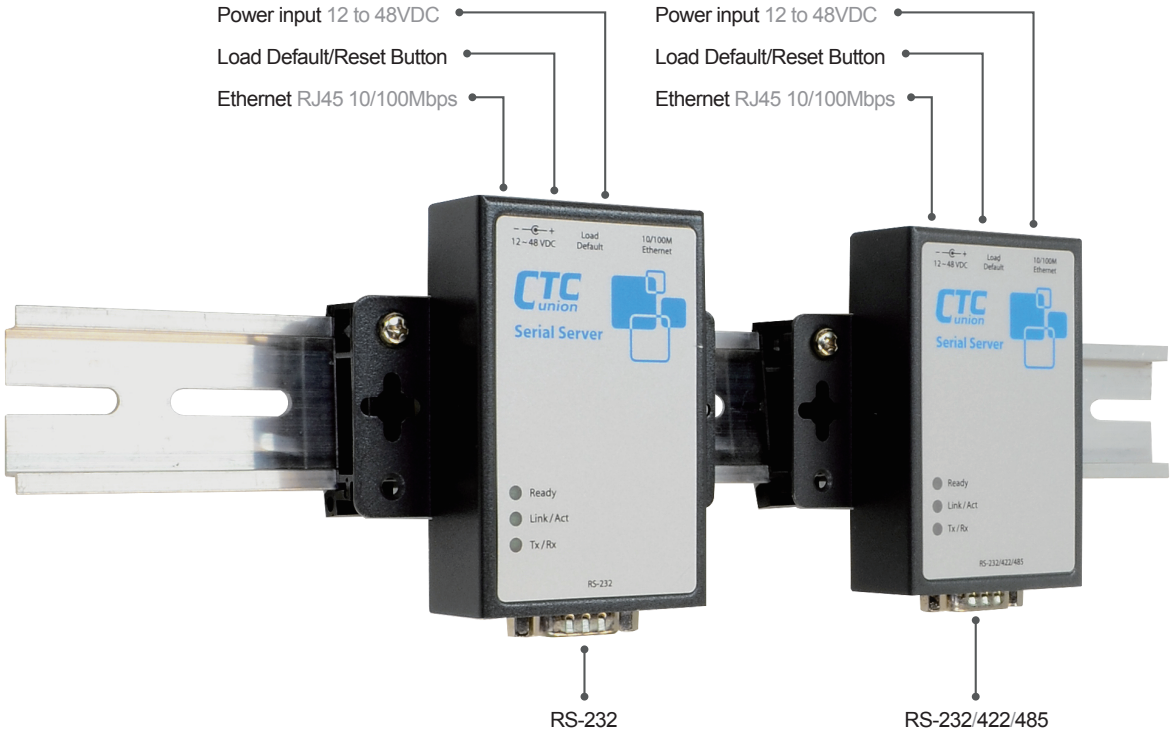
Application



www.ctcu.com / sales@ctcu.com

Appearance

STE100A-232

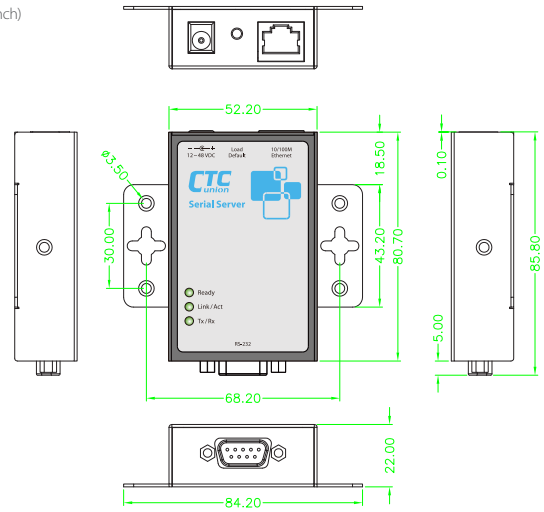


STE100A-Serial

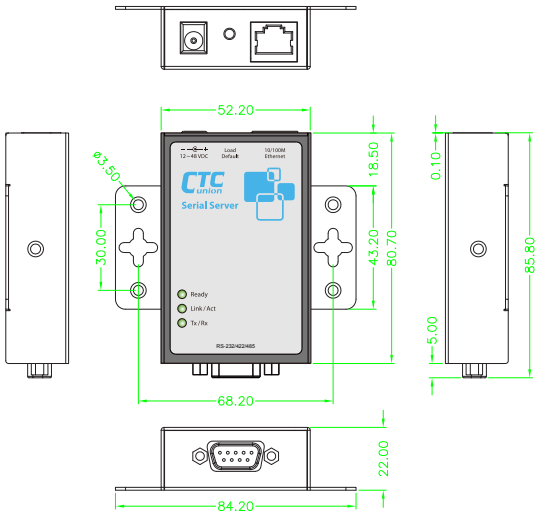
Dimensions

STE100A-232

Unit: mm (inch)

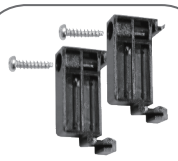


STE100A-Serial



Ordering Information

Model Name	Description
STE100A-232	1-port RS232 device server with AC power adapter
STE100A-Serial	1-port RS232/422/485 device server with AC power adapter
Optional accessories	
STE100A-Serial-WT	STE100A-Serial DB9 wiring terminal
STE100A/DRK01	STE100A/RS232,STE100A/Serial DIN-Rail Mounting Kit
Optional Power	
DC-APT/12V	-48VDC to 12VDC Adapter - 0.83 Amp, 10 Watts , Output 12 VDC, Input -48VDC



Din-Rail Mounting Kit
STE100A/DRK01

DB9 Wiring Terminal
STE100A-Serial-WT
(only for STE100A-Serial)

ICR-4103

4G LTE + 3x 10/100Base-T(X) Router

New

The ICR-4103 series are high-performance industrial grade 4G-LTE cellular routers. It is designed to offer the fast connectivity over cellular network for industrial applications. ICR-4103's Ethernet ports can allow up to 3 Ethernet devices link to the cellular network, provides dual SIM cards and 1 Ethernet WAN port can automatic re-connecting and auto-switching for offering the cellular network redundancy to ensure uninterrupted connectivity. The ICR-4103 cellular router is integrated with WAN, LAN, SIM, VPN, Firewall, built-in DI/DO and Serial port services. In addition, ICR-4103 uses the highest level of industrial grade design for connected in the most demanding environments, is ideal solution for Industrial Internet of Things (IIoT) and M2M(Machine-to-Machine)applications, such as remote control and monitoring, bus ticketing collection system, CCTV, SCADA, digital signage, kiosk and intelligent traffic systems.

Features

- Supports multi-band connectivity with FDD 4G LTE/ TDD 4G LTE/ 3G WCDMA/2G GSM/ LTE Cat4
- 2 SIM card, 4G LTE antenna, 1x WAN (10/100Base-TX) + 3x LAN (10/100Base-TX UTP), 2x DI + 1x DO, 3x Serial port (2x RS232, 1x RS485)
- GPS, GNSS to get your location on earth, and obtains map information using Google Map (Optional)
- Highly reliable and secure for mission-critical cellular communications
- Provide flexible options to configure LAN/ WAN ports
- Built-in dual SIM for network redundancy / failover/ roaming over/ back up
- Integrated dual detachable antenna against radio interference
- 4G LTE and WAN port for seamless connection and redundancy
- Supports 3x Serial port (1x RS484, 2x RS232) for IoT and automation application, ModBus RTU and ModBus/TCP gatway, MQTT
- Supports Routing/Firewall, NAT, Virtual Server, DMZ, Port filtering, MAC Filter, URL Filter, IP Filter, VLAN, Static Routing and RIP 1 & 2, VRRP, OSPF V2 & V3
- Supports VPN, OpenVPN, IPSec (3DES, AES128, AES196, AES256, MD5, SHA-1, SHA256)
- IPv6/IPv4 dual stack and all applications are IPv6 ready
- Supports DHCP server and client, PPPoE, Static IP, SNTP, DNS Proxy, DDNS, QoS, Virtual Com, UPnP
- Supports Alarm message : DO, SNMP Trap, E-mail
- Supports SNMP, TR069,Web, Telnet, CLI for management
- Supports dual Image firmware upgrade by Web
- CE, FCC, Rail Traffic EN50121-4 certified
- Heavy industrial grade EMS, EMI, EN61000-6-2, EN61000-6-4 certified
- Rugged metal, IP30 protection & Fanless design
- Wide operating temperature -40 ~ 75°C

Specifications

Standard	Cellular MobilComm standard: (Please see order information for optional band) 4G LTE: FDD-LTE, TDD-LTE 3G: WCDMA 2G: GSM/EDGE GPS: GNSS	
	IEEE 802.3	10Base-T 10Mbit/s Ethernet
	IEEE 802.3u	100Base-TX Fast Ethernet
	IEEE 802.1Q	Virtual LANs (VLAN)
	IEEE 802.3x	Flow control for Full Duplex
Connector	**Cellular MobilComm and WAN:** Built-in dual SIM card for network redundancy / failover/ roaming over/ back up 2 SMA (female) connrctor for Antenna (Please see order information for optional band) 1x 10/100Base-TX RJ45 for WAN port **LAN:** 3x 10/100Base-TX RJ45 **Serial:** 1x RS485 and 2x RS232 (one of RS232 could be configured for console) **Programable DI/DO:** 2xDI and 1x DO	
LTE data rate	Cat 4 ,Max download 150Mbps, Max upload 50 Mbps	
Removable terminal block	Provides for Power input, DO, DI1, DI2, COM2 (RS232), COM3 (RS485)	
Power Supply	Input 12/24 VDC (8.4~30VDC), removable terminal block	
Power consumption	<3W	

LED	System status (Green) VPN (Green) Cell signal Strong / Weak, 2 LED (Green)
DIP SW for RS485 port	DIP 1 Pull Low : OFF: Disable, ON: Enable DIP 2 Pull High : OFF: Disable, ON: Enable DIP 3 120 ohm terminal resistor : OFF: Disable, ON: Enable
Alarm message	DO for alarm message, with current capacity of 500mA/50VDC maximum SNMP trap, E-mail, SMS, Alarm trigger by DI, VPN or WAN disconnection
Operation Temperature	-40~75°C
Housing	Rugged Metal, Fanless , IP30 grade housing protection
Dimensions (D x W x H)	106 x 62.5 x 135mm
Weight	0.74kg
Installation	Mounting Wall mounting, or DIN Rail mounting (Optional)
MTBF	296,306 Hours (MIL-HDBK-217)
Warranty	5 years

Software Specifications

Network Protocols	IPv4, IPv6, IPv4/IPv6 dual stack, DHCP server and client, DNS Proxy, PPPoE, Static IP, SNTP, VRRP, OSPF V2, OSPF V3, MQTT
Modbus TCP, Modbus RTU	Gatway between Ethernet and COM3 (RS485) port
Routing/Firewall	NAT, Virtual Server, DMZ, Port filtering, MAC Filter, URL Filter, IP Filter, VLAN, Static Routing and RIP 1, RIP 2
VPN	OpenVPN, IPSec (3DES, AES128, AES196, AES256, MD5, SHA-1, SHA256)
MobilComm Connectivity	Two SIM for failover/ roaming over/ back up Seamless multi WAN connections switch (2x SIM and 1x Ethernet WAN)

Others	DDNS, UPnP, QoS
	Virtual Com for serial COM port
Alarm message	Sent by DO, SMS, SNMP Trap, E-mail
Management	Web GUI for remote and local management
	CLI
	Dual Image firmware upgrade by Web GUI
	Syslog monitor
	SNMP
	TR069: TR098 model
	Remote management via Telnet, SSH v2, HTTPS
	Local management via Telnet, SSH v2, HTTP/HTTPS

Application

Figure 1 : Application for Outdoor Digital Signage

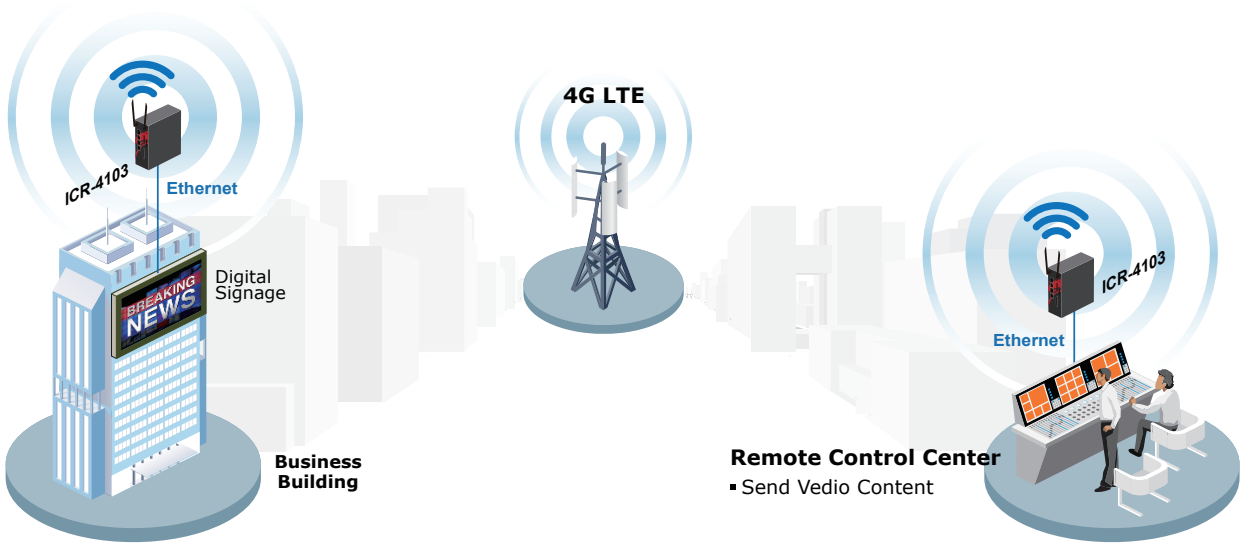
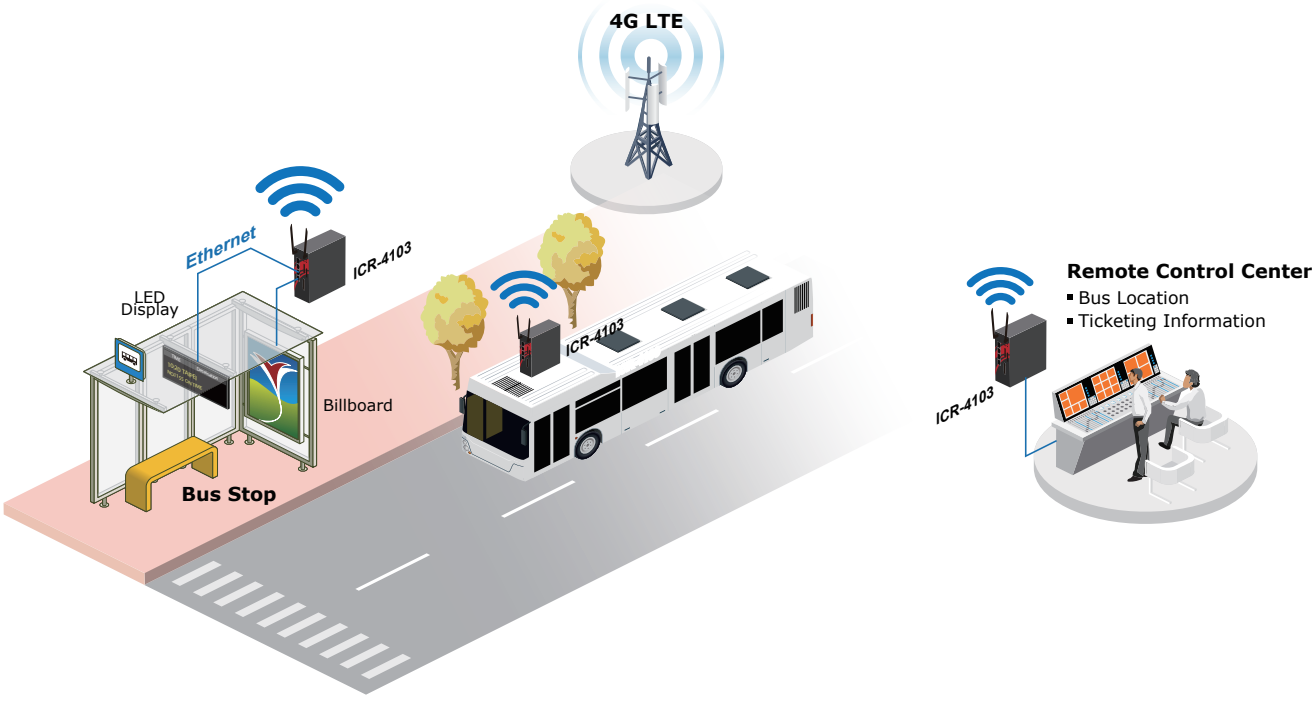
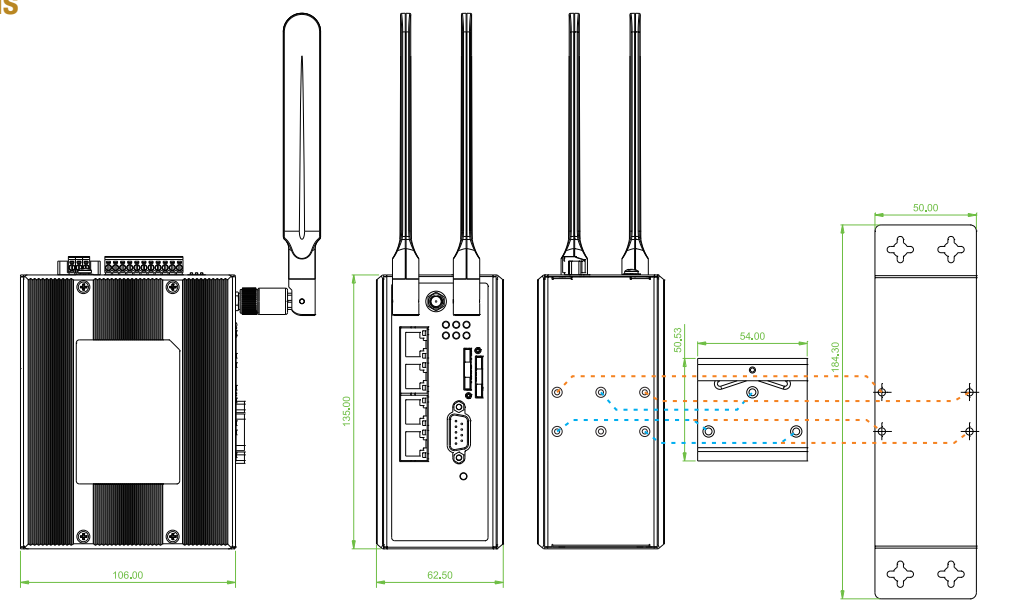


Figure 2 : Application for Transportation/Bus Communication



Dimensions



Side View | Front View | Rear View | DIN-Rail Kit View | Wall-Mount Kit View

Ordering Information

Model Name	Managed	WAN		Local Port			Certification		
		Cellular MobilComm band (2 SIM for Redundant)	10/100Base-TX	10/100Base-TX	RS232	RS485 (ModBus)	Railway EN50121-4	EN61000-6-2 EN61000-6-4	CE, FCC
ICR-4103-EU	V	see Region code table EU	1	3	2	1	V	V	V
ICR-4103-A	V	see Region code table A	1	3	2	1	V	V	V
ICR-4103-AU	V	see Region code table AU	1	3	2	1	V	V	V
ICR-4103-J	V	see Region code table J	1	3	2	1	V	V	V

Model Naming Rule

ICR - 4 1 03 - EU

- ICR: Industrial Cellular Router
- 4: 4G LTE
- 1: 1x WAN
- 03: 3x LAN
- EU, A, AU, J: Region code (see below table for more detail)

MobilComm region Code Optional

	4G LTE		3G	2G	Region
Region Code	FDD LTE	TDD LTE	WCDMA	GSM / EDGE	
EU	B1(2100) , B3(1800), B5(850), B7(2600), B8(900), B20(800)	B38(2600), B40(2300), B41(2500)	B1(2100), B5(850), B8(900)	B3(1800), B8(900)	Europe, Africa, Middle East, Korea,Thailand, India
A	B2(1900), B4(1700), B12(700)		B2(1900), B4(1700), B5(850)		USA (AT&T, T-Mobil)
AU	B1(2100), B2(1900), B3(1800), B4(1700), B5(850), B7(2600), B8(900), B28(700)	B40(2300)	B1(2100), B2(1900), B5(850), B8(900)	B2(1900), B3(1800), B5(850), B8(900)	ANZ, South America, Taiwan
J	B1(2100), B3(1800), B8(900), B18(850), B19(850), B26(850)	B41(2500)	B1(2100), B6(850), B8(900), B19(850)		Japan

Optional Accessories

Wall mount kit accessories

IND-WMK02	Wall Mount kit for Industrial product (Wide) (184 x 50mm)

ICR-W403

4G LTE, WiFi ac/b/g/n 2T2R Gateway

The ICR-W403 is a high-performance industrial grade wireless gateway. combines IEEE802.11b/g/n/ac WLAN and 4G LTE cellular technologies to provide flexible wireless network connectivity.It is designed to offer the flexible connectivity over cellular and Wireless LAN for industrial applications. ICR-W403's Ethernet ports can allow up to 3 Ethernet devices link, provides dual SIM cards for failover redundancy to ensure uninterrupted connectivity. ICR-W403 with support for secure VPN communications, GPS, static and dynamic IP routing of RIP1/2 and OSFP, NAT, port forwarding, Firewall, built-in DI/DO and Serial port services. In addition, ICR-W403 uses the highest level of industrial grade design for connected in the most demanding environments, is ideal solution for Industrial Internet of Things (IIoT) and M2M(Machine-to-Machine) applications, such as remote control and monitoring, bus ticketing collection system, CCTV, SCADA, digital signage, kiosk and intelligent traffic systems.

Features

- 4G LTE, GPS, IEEE 802.11b/g/n/ac WiFi, 2x SIM card, 3x GbE RJ45 LAN/WAN + 2x DI + 1x DO, 1x RS232 com port
- Supports multi-band connectivity with FDD 4G LTE/ TDD 4G LTE/ 3G WCDMA/2G GSM
- Supports concurrent dual band WiFi With 802.11n 2T2R (2.4GHz), and 802.11ac 2T2R (5GHz)
- Supports 4G LTE/ WiFi/ UTP port to configure WAN ports for failover redundant
- Supports GPS and GNSS for location tracking
- Built-in NAT/Port Forward/Routing/IPv6 are compatible with existing IP networks
- Builid-in various VPN protocols for security, Firewall & IPS, ACL & Authentication by MAC/User to enhance access security
- IEEE 802.11 a/b/g/n/ac, multiple SSID, captive portal for WiFi hotspot
- Web, CLI ,SNMP, TR069, SMS for management and configuration
- Events triggered by pre-defined, and notification sent by SMS, SNMP trap, or e-mail
- Supports USB for log storage
- EN-60950-1, CE, FCC, Rail Traffic EN50121-4 certified
- Heavy industrial grade EMS, EMI, EN61000-6-2, EN61000-6-4 certified
- Rugged metal, IP30 protection & Fanless design

Specifications

Standard	Cellular MobilComm standard: (Please see order information for optional band) 4G LTE: FDD-LTE, TDD-LTE 3G: WCDMA 2G: GSM/EDGE GPS: GNSS	
	IEEE 802.3	10Base-T 10Mbit/s Ethernet
	IEEE 802.3u	100Base-TX Fast Ethernet
	IEEE 802.3ab	1000Base-T Gbit Ethernet over twisted pair
	IEEE 802.1Q	Virtual LANs (VLAN)
	IEEE 802.3x	Flow control for Full Duplex
	IEEE 802.1p	LAN Layer 2 QoS for Traffic Prioritization
	IEEE 802.1X	Port based and MAC based Network Access Control, Authentication
Interface	WAN	1x 3G/4G LTE (Please see order information for detail optional mobil band)
		Built-in dual SIM card for network redundancy / failover/ roaming over/ back up
		IEEE802.11ac (5G Hz)
		1x GbE UTP (WAN or LAN configureable)
	LAN	Concurrent WiFi 2.4G/5G with IEEE802.11ac 2T2R (5GHz), and IEEE802.11b/g/n 2T2R (2.4GHz)
		3x 10/100/1000Base-T UTP port, port 1 could be WAN or LAN configureable
	COM port	1x RS232
	DI/DO	2x DI, 1x DO, 1x IGN (Ignition Sense for Vehicle)
	GPS	1x GNSS receiver
	Log Storage	1x USB 2.0

Connector	2x 2.3dBi LTE Antenna and connector 2x 5dBi WiFi Antenna and connector 1x SMA Female connector for GPS antenna (Antenna optional) 2 SIM card socket 1x USB 2.0 socket 3 RJ45 for GbE LAN/WAN 1x Removable Terminal block (Input power, 1x GN, 2x DI, 1x DO, RS232)
4G LTE data rate	Cat 4 , Maxium 150Mbps download, upload 50Mbps
Power Supply	12/24 VDC (9~36VDC)
Power consumption	<14W
LED	Power (Green), GPS (Green)
	2.4G (Green), 5G (Green)
	Sim 1 (Green), Sim 2 (Green)
	LTE signal High (Green), LTE signal Low (Green)
	WAN/LAN LNK/ACT (Green)
Alarm message Handling	Events triggered by pre-defined, and notification sent by SMS, SNMP trap, or e-mail
Operation Temperature	-30~ 75°C
Housing	Rugged Metal, IP30 Protection, Fanless
Dimensions (D x W x H)	TBD
Weight	TBD
Installation	Wall mounting
MTBF	TBD (MIL-HDBK-217)
Warranty	5 years

Certification	
EMC	CE (EN55024, EN55032)
EMI	FCC Part 15 Subpart B Class A, CE EN55022 Class A
Railway Traffic	EN50121-4
Immunity for Heavy Industrial Environment	EN61000-6-2
Emission for Heavy Industrial Environment	EN61000-6-4

EMS (Electromagnetic Susceptibility) Protection Level	EN61000-4-2 (ESD) Level 3, Criteria B
	EN61000-4-3 (RS) Level 3, Criteria A
	EN61000-4-4 (Burst) Level 3, Criteria A
	EN61000-4-5 (Surge) Level 3, Criteria B
	EN61000-4-6 (CS) Level 3, Criteria A
	EN61000-4-8 (PFMF, Magnetic Field) Field Strength: 300A/m, Criteria A
Safety	EN60950-1
Shock	IEC 60068-2-27
Freefall	IEC 60068-2-32
Vibration	IEC 60068-2-6

Software Specifications

Routing	Static routing , Dynamic routing, RIP1/RIP2, OSPF, BGP
Security	Firewall: SPI Firewall with Stealth Mode, IPS
	VPN Tunneling: IPSec, OpenVPN, PPTP, L2TP, GRE; Tunneling with Full Tunnel, Tunnel Failover
	VPN Scenario: Site to Site, Site to Host, Host to Site, Host to Host, Hub and Spoke, Dynamic VPN
	Port Forwarding: Virtual Server/ Computer, DMZ Host,Special AP & APG, VPN Pass-through
	Access control: Packet Filter, URL Blocking, MAC Filter, Content Filter, Application Filter
	Authentication: Captive Portal, MAC Authentication
VLAN	Port-based VLAN, Tag-based VLAN
QoS	Policy-based Bandwidth Control and Packet Flow Prioritization
Management	Web, CLI, Telnet, SNMP V3, TR069
IPV6	Dual Stack
Upgrade F/W	Support
Backup & Restore Configuration file	Support

Others	
System Time Information	NTP client
DHCP	Server and Client
Cellular toolkit	SIM PIN, USSD, Network Scan, SMS, Data Usage
Alarm message Handling	DI, DO, SMS, Syslog, SNMP Trap, Email Alert, Reboot
Location Tracking	GNSS
Diagnostic	Packet Analyzer, Diagnostic tools
Power Control	Ignition Sense for delay OFF
MobilComm Connectivity	Two SIM for muti ISP failover/ back up Seamless
Multi WAN connections	4G LTE , 1xWiFi IEEE802.11ac and 1x Ethernet WAN for failover/ back up Seamless
WiFi mode	AP Router, WDS, WDS Hybrid
WiFi Security	WEP, WPA, WPA2, WPA-PSK, WPA2-PSK, IEEE802.1X
Virtual COM	TCP Client, TCP Server, UDP, RFC2217
Others DDNS, UPnP, QoS	
Remote management via Telnet, SSH v2, HTTPS	
Local management via Telnet, SSH v2, HTTP/HTTPS	
Syslog monitor	

Application

Figure 1 : Application of Wireless Transmission in Logistics Center

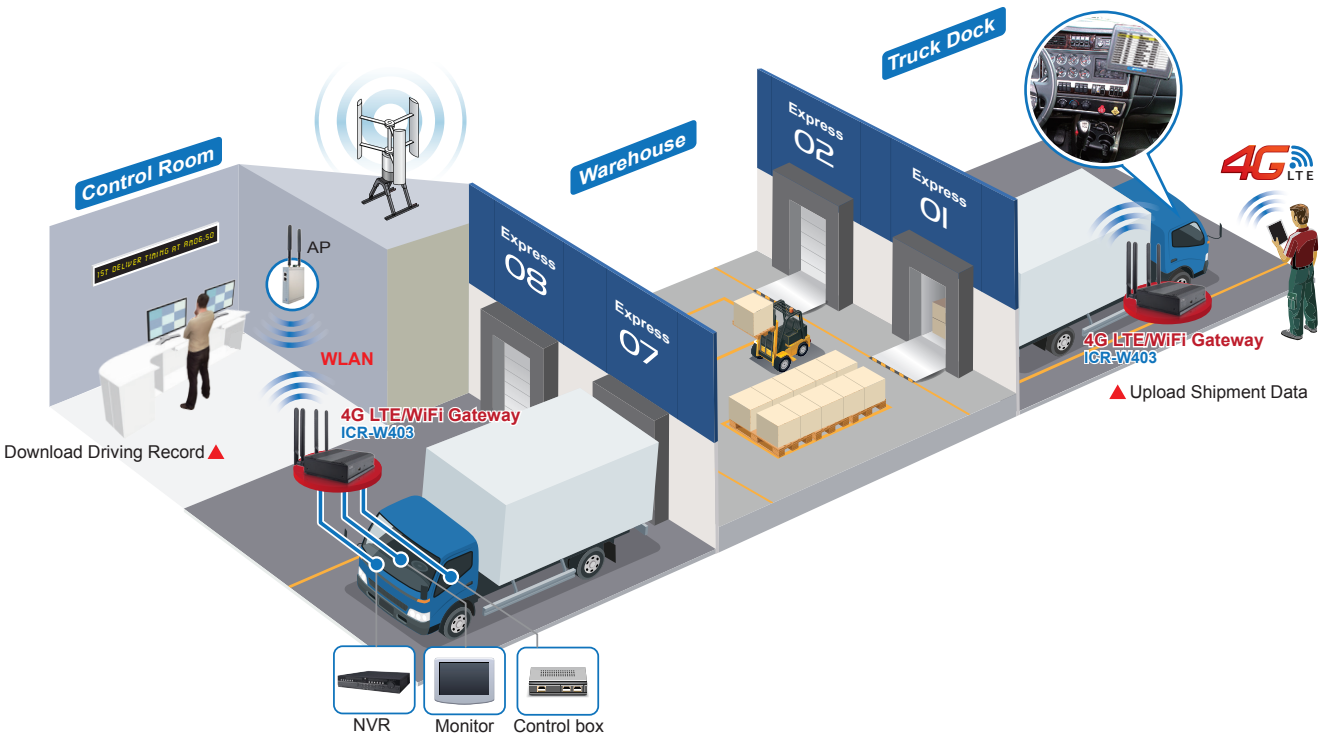
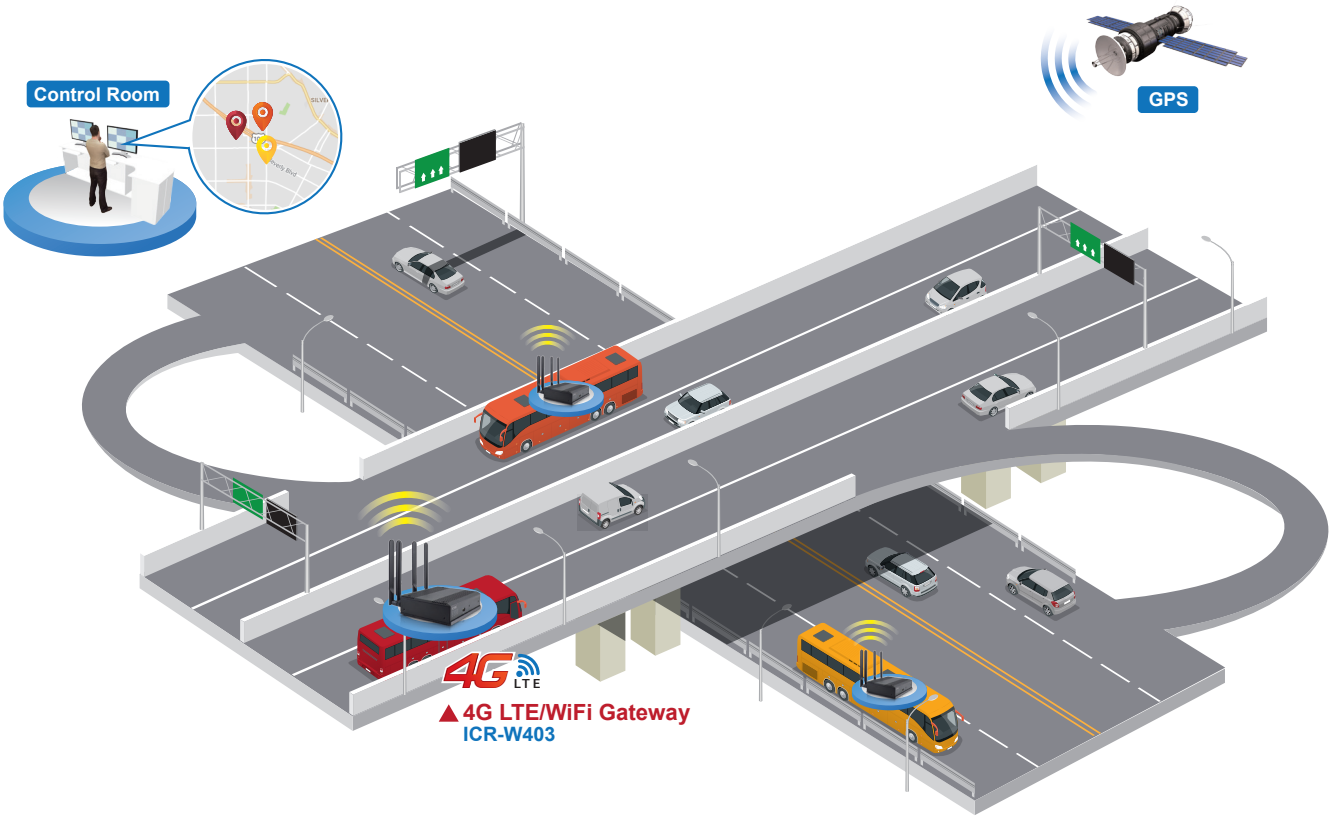


Figure 2 : Application of Vehicle Location Tracking System



Ordering Information

Model Name	WAN		WAN/LAN		Local Port		Certification			
	Cellular Mobil Band (2 Sim for Redundant)	GPS (Ant. Optional)	WiFi	UTP 10/100/1000Base-T	DI, DO	RS232	Safety EN60950-1	RailWay EN50121-4	EN61000-6-2 EN61000-6-4	CE, FCC
ICR-W403-EU	see Region code table EU	1x GNSS	IEEE802.11ac/b/g/n (LAN) or IEEE802.11ac (WAN)	2x(LAN) +1x (LAN or WAN)	2xDI, 1xDO	1	V	V	V	V
ICR-W403-A	see Region code table A	1x GNSS	IEEE802.11ac/b/g/n (LAN) or IEEE802.11ac (WAN)	2x(LAN) +1x (LAN or WAN)	2xDI, 1xDO	1	V	V	V	V
ICR-W403-AU	see Region code table AU	1x GNSS	IEEE802.11ac/b/g/n (LAN) or IEEE802.11ac (WAN)	2x(LAN) +1x (LAN or WAN)	2xDI, 1xDO	1	V	V	V	V
ICR-W403-C	see Region code table C	1x GNSS	IEEE802.11ac/b/g/n (LAN) or IEEE802.11ac (WAN)	2x(LAN) +1x (LAN or WAN)	2xDI, 1xDO	1	V	V	V	V

Model Naming Rule

ICR – W 4 03 – EU

- ICR: Industrial Cellular Router
- W: WiFi
- 4: 4G LTE
- 03: 3x GbE UTP Ethernet
- EU, A, AU, C: Region code (see below table for more detail)

MobilComm region Code Optional

Region Code	4G LTE		3G	2G	GNSS	Region
	FDD LTE	TDD LTE	WCDMA	GSM / EDGE		
EU	B1(2100) , B3(1800), B7(2600), B8(900), B20(800)		B1(2100), B8(900)	B3(1800), B8(900)	Yes	Europe, Africa, Middle East, Korea,Thailand, India
A	B2(1900), B4(1700), B12(700)		B2(1900), B4(1700), B5(850)		Yes	USA (AT&T, T-Mobil)
AU	B1(2100), B2(1900), B3(1800), B4(1700), B5(850), B7(2600), B8(900), B28(700)	B40(2300)	B1(2100), B2(1900), B5(850), B8(900)	B2(1900), B3(1800), B5(850), B8(900)	Yes	ANZ, South America, Taiwan
C	B1(2100), B3(1800)	B38(2600), B39 (1900), B40(2300), B41(2500)	B1(2100), B2(1900), B5(850), B8(900)	B2(1900), B3(1800), B5(850), B8(900)	Yes	China

Optional Accessories

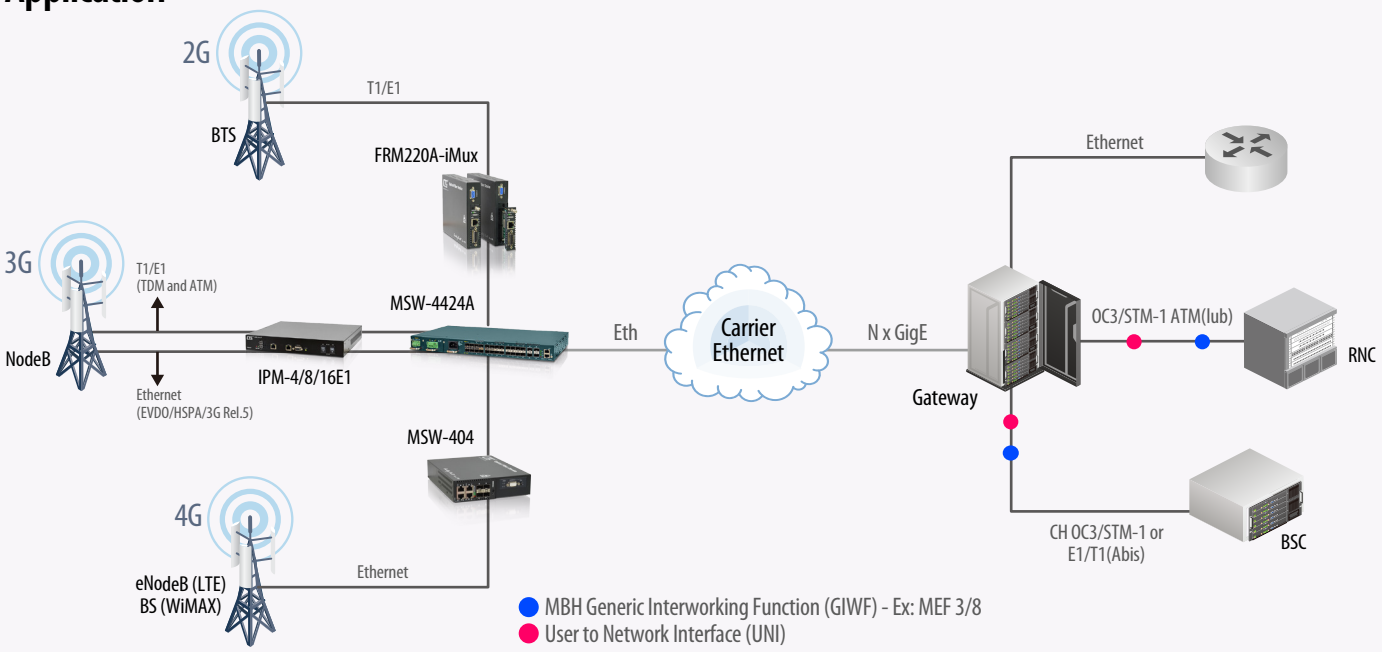
Antenna accessories

ANT-GPS-01	Antennas for GNSS

Why SyncE & IEEE 1588 v2 ?

With the adoption of 4G LTE/LTE-A by the mobile operators world-wide, mobile backhaul transportation has become one topic of significance as it directly influences the operators mobile service quality. The mobile backhaul is the transport segment that links the cell sites to their mobile switching and control centers. Existing legacy PDH/SDH networks have not been able to fulfill the very high transport speeds of increasing bandwidth requirements. Therefore, most mobile operators are gradually considering adopting all IP network as the architecture of mobile backhaul for 4G LTE/LTE-A.

Application

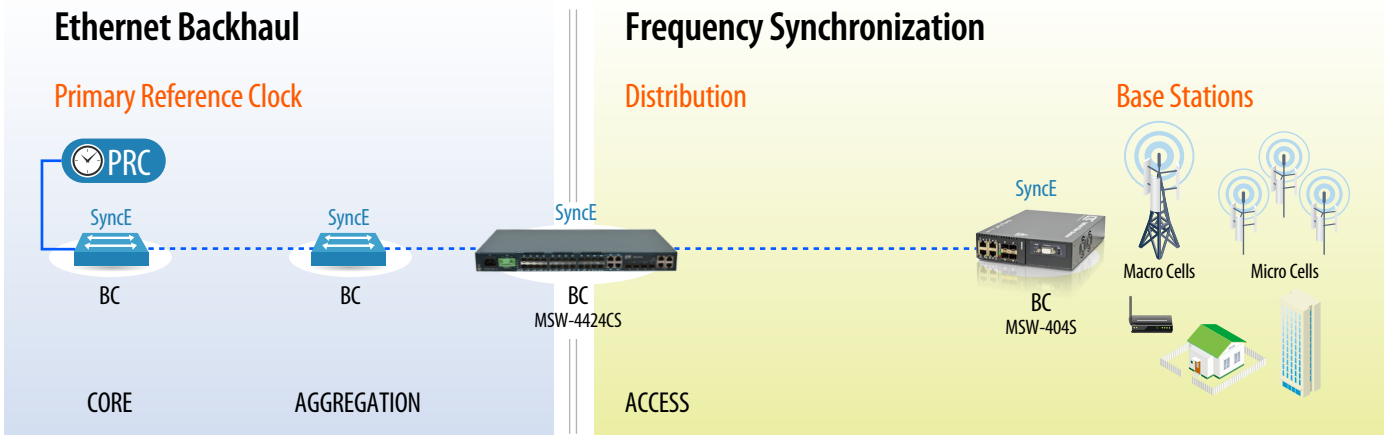


The timing synchronization of the base stations in frequency and time/phase is a very important requirement of mobile communication technology. The following table summarizes why timing synchronization is important.

Appliction	Why You Need to Comply	Impact of Non-compliance
LTE(FDD)	Call Initiation	Call Interference Dropped calls
LTE(TDD)	Time slot alignment	Packet loss/collisions Spectral efficiency
LTE MBSFN	Proper time alignment of video signal dcoding from multiple BTSs	Video broadcast interruption
LTE-A MIMO/COMP	Coordination of signals to/ from multiple base stations	Poor signal quality at edge of cells, LBS accuracy
LTE-A eICIC	Interference coordination	Spectral inefficiency & Service degradation

CTC Union offers a solution for access networks and Ethernet demarcation which are fully compliant to MEF proposed mobile backhaul application for 4G LTE services.

Application



MSW-4428X

24x 100/100Base-X SFP + 4x GbE (RJ-45) with 4x 1G/10G (SFP+) L2+ Carrier Ethernet Switch

The MSW-4428X is positioned as a layer 2+ Gigabit access switch solution. It is equipped with 24 100Base-FX/1000Base-X dual speed SFP slots, 4 ports GbE (10/100/1000Base-T) ports and 4 1000Base-X/10GBase-X dual speed SFP+ uplink slots. The MSW-4428X offers the best flexibility and scalability for operators or service providers to deploy their Metro Ethernet network. With the deployment of MSW-4428X, operators or service providers can flexibly provision the bandwidth of either 100Mbps or 1000Mbps as well as uplink connection of Gigabit or 10G speed upon their service applications. The MSW-4428X has built-in dual power supplies to enable power redundancy and enhance high network availability.

Aimed at Metro Ethernet applications, the specifications of MSW-4428X fully meet the attributes of Carrier Ethernet proposed by MEF (Metro Ethernet Forum). It complies with CE2.0 standard to support E-Line/E-LAN/E-Tree/E-Access service and enables the bandwidth profile configuration delivering SLA (Service Level Agreement) for end-to-end performance characteristics as well as Ethernet OAM functionality to support carrier grade service OAM management rapidly detecting and recovering from the network incidents in real time.

Features

Fully dual rate architecture of fiber link port

Completely dual speed ports of fiber link to offer the scalable physical connection of Metro Ethernet network for operators

Fully Ethernet OAM enabled

Enabling Ethernet OAM features (IEEE 802.3ah/802.1ag/ITU-T Y.1731) to rapidly detect and recover network fault and save the OPEX for operators as well as increase customer satisfaction

MEF standards compliant solution

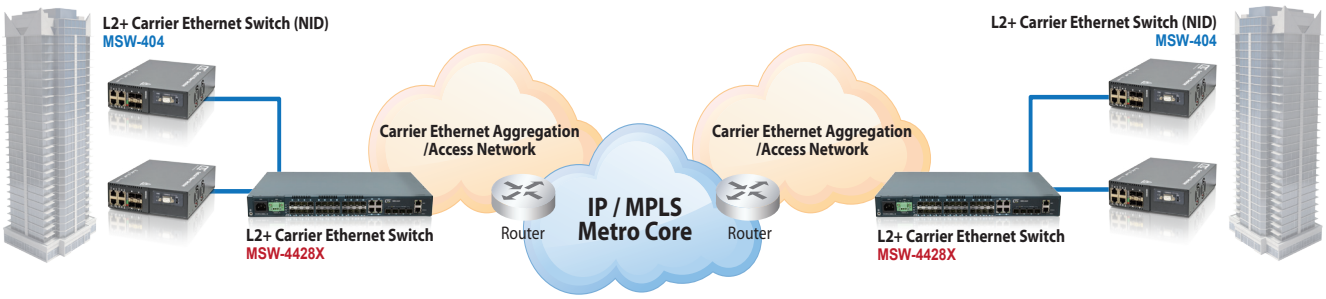
CE2.0 compliant product to guarantee the compatibility with other MEF certified equipment and reduce the risk and cost for Metro Ethernet network deployment of operators

Specifications

Interface	100/1000Mbps SFP slots x 24 + 10/100/1000Base-T RJ45 x 4 + 1/10Gbps SFP+ slot x 4
Console Port	RJ-45 console port x 1
Management Port	10/100/1000Base-T RJ45 x 1
Switching fabric capacity	138Gbps
Packet Forwarding capacity	102Mpps
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps, 14880000pps at 10Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae
	IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1d
	IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad
	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
Packet Buffer	32M bits
Mac Table Size	32K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN
	private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port
	IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
	3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching Protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032
Trunking	IEEE 802.3ad LACP (Max. 16 trunking group, Max. 8 ports per trunking group)

Security	IEEE 802.1x port based access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering, TACACS+
	IP source guard, DHCP snooping/relay option 82
	ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave
	IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface
	Web/CLI authentication, SSH v2, HTTPs, port mirroring
	syslog, IPv6 management, NTP, SNTP
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah/IEEE 802.1ag/ITU-T Y.1731, RFC2544, ITU-T Y.1564
MPLS feature	MPLS-TP compliant to ITU-T G.8113.1
LED display	Power, System, Console, Link/Act, Speed
Power input	100V ~ 240V AC, -36 ~ -60V DC
Build in power module combination	AC, DC, AD (AC+DC), AA (AC+AC) or DD (DC+DC)
Power Consumption	< 60W
Operating Temperature	-10 ~ 60°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250x 440x 43.5mm (DxWxH)
Certification	FCC, CE

Application



Ordering Information

Model Name	Description
MSW-4428X-AC	L2+ 10G Fiber Access Switch and build-in single AC power module
MSW-4428X-DC	L2+ 10G Fiber Access Switch and build-in single DC power module
MSW-4428X-AA	L2+ 10G Fiber Access Switch and build-in dual AC power module
MSW-4428X-DD	L2+ 10G Fiber Access Switch and build-in dual DC power module
MSW-4428X-AD	L2+ 10G Fiber Access Switch and build-in AC + DC power module

Power Type

MSW – 4428X – □□

Example: MSW – 4428X – AC

Accessories

10G SFP+ Transceiver Module

SFM-1000-SR85	10G SFP+ SR/SW MMF 300m, 850nm VCSEL, 10G Ethernet/FC/SDH/SONET
SFS-1010-LR31	10G SFP+ LR/LW SMF 10km, 1310nm DFB DML, 10G Ethernet/FC/SDH/SONET
SFS-1040-ER55	10G SFP+ ER/EW SMF 40km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET
SFS-1080-ZR55	10G SFP+ ZR/EW SMF 80km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET

MSW-4424A

24x GbE, SFP + 4x 10GE (SFP+)
L2+ Carrier Ethernet Switch

MSW-4424A layer 2+ managed Gigabit Ethernet switches are positioned as a Carrier Ethernet access switch solution. They are equipped with 24 SFP based 100Base-FX/1000Base-X dual speed optical ports and 4 10G Base-X SFP+ or 1000Base-X SFP uplink ports. The MSW-4424A offers the best flexibility and scalability for operators and service providers to deploy their Metro Ethernet networks. Aimed specifically at Metro Ethernet deployment, the specifications of MSW-4424A fully meet the attributes of Carrier Ethernet proposed by the Metro Ethernet Forum. The switches comply with MEF 9 standard to support E-Line/E-Access services and MEF 14 standard to enable the bandwidth profile configuration for delivering SLA (Service Level Agreement) with predictable end-to-end performance characteristics. MSW-4424A also supports advanced service OAM management to rapidly detect and recover from the network incidents in real time.

Features

Front access and hot swappable design

All of the system modules are front accessible, the hot swappable power and FAN module are designed to keep high network availability without service interruption when components fail

Fully dual rate architecture of fiber link port

Dual speed fiber ports offer scalable physical connections for Metro Ethernet network operators

Fully Ethernet OAM enable

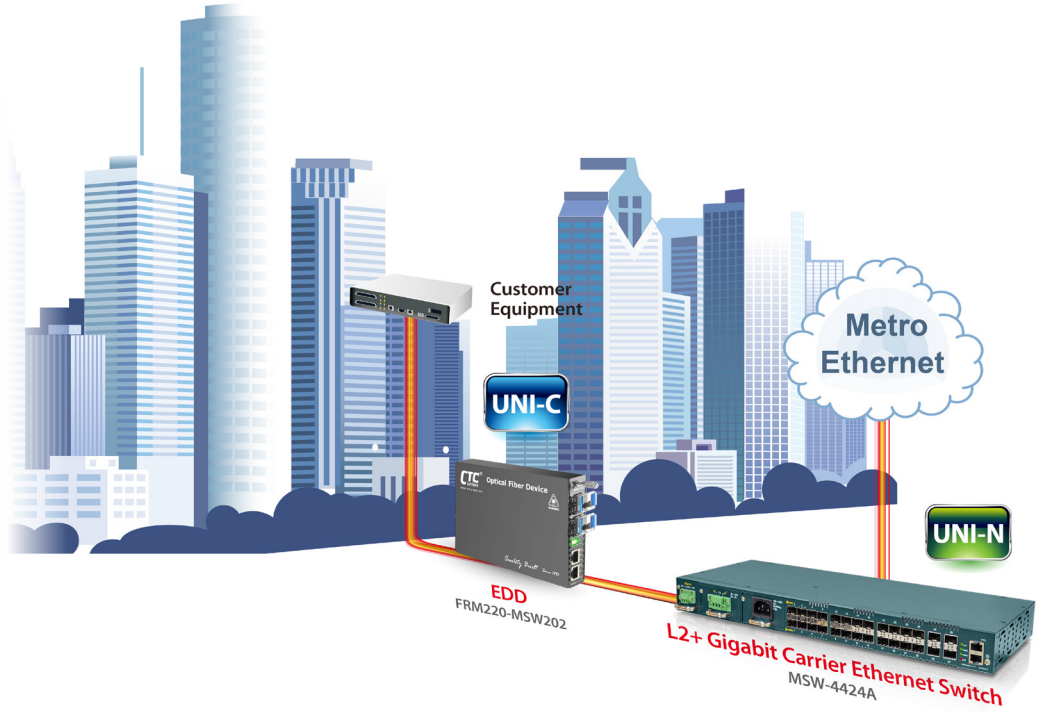
Ethernet OAM features (IEEE 802.3ah/802.1ag/ITU-T Y.1731) help to rapidly detect and recover network faults and save OPEX for operators as well as increase customer satisfaction

Specifications

Interface	100/1000Mbps SFP slots x 24 + 1G/10Gbps SFP+ slot x 4
Console Port	RJ-45 console port x 1
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps, 14880000pps at 10Gbps
Switching Capacity	128Gbps
Packet Forwarding Capacity	95Mpps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.1p
	IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w
	IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad, IEEE 802.3ah
	IEEE 802.1ag, ITU-T Y.1731
Packet Buffer	32M bits
Mac Table Size	32K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN,
	private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port,
	IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
	3 colors marker-CIR/EIR/Burst bandwith control
L2 switching Protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032
Trunking	IEEE 802.3ad LACP (Max. 14 trunking group, Max. 8 ports per trunking group)

Security	IEEE 802.1x port based access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering, TACACS+
	IP source guard, DHCP snooping/relay option 82
	ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave
	IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface, Web/CLI
	authentication, SSH v2, HTTPs, port mirroring
	syslog, IPv6 management, NTP, SNTP
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP / HTTP
Ethernet OAM	IEEE 802.3ah / IEEE 802.1ag / ITU-T Y.1731
LED display	Power, System, Console, Link/Act, Speed
Power input	100V ~ 240VAC
	-30~-60VDC (-48VDC Power)
	-18 ~ -60VDC (-24VDC Power)
Power Consumption	< 60W
Operating Temperature	-10 ~ 60°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	270.3 x 437.5 x 43.5 mm (D x W x H)
Certification	FCC, CE

Application



Ordering Information

Model Name	Description
MSW-4424A-AC	L2+ 10G Fiber Access Switch and build-in single AC power module
MSW-4424A-DC	L2+ 10G Fiber Access Switch and build-in single DC power module
MSW-4424A-AA	L2+ 10G Fiber Access Switch and build-in dual AC power module
MSW-4424A-DD	L2+ 10G Fiber Access Switch and build-in dual DC power module
MSW-4424A-AD	L2+ 10G Fiber Access Switch and build-in AC + DC power module

Power Type

MSW – 4424A – □□

Example: MSW – 4424A – AC

Accessories

10G SFP+ Transceiver Module

SFM-1000-SR85	10G SFP+ SR/SW MMF 300m, 850nm VCSEL, 10G Ethernet/FC/SDH/SONET
SFS-1010-LR31	10G SFP+ LR/LW SMF 10km, 1310nm DFB DML, 10G Ethernet/FC/SDH/SONET
SFS-1040-ER55	10G SFP+ ER/EW SMF 40km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET
SFS-1080-ZR55	10G SFP+ ZR/EW SMF 80km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET

www.ctcu.com / sales@ctcu.com

MSW-4424CS

20x GbE, SFP + 4x GbE Combo + 4x 10GE(SFP+)
L2+ Managed Carrier Ethernet Switch w/ SyncE

The MSW-4424CS is positioned as a layer 2+ Gigabit access switch solution. It is equipped with 20 100Base-FX/1000Base-X dual speed SFP slots, 4 ports GbE combo (10/100/1000Base-T or 100/1000Base-X SFP) ports and 4 1000Base-X/10G Base-X dual speed SFP+ uplink slots. The MSW-4424CS offers the best flexibility and scalability for the operators or service providers to deploy their Metro Ethernet network. With the deployment of MSW-4424CS, the operators or service providers can flexibly provision the bandwidth for either 100Mbps or 1000Mbps as well as uplink connection of Gigabit or 10G speed upon their service applications. The MSW-4424CS has built-in dual power supplies to enable power redundancy function and enhance the high network availability.
Aimed at Metro Ethernet applications, the specifications of MSW-4424CS fully meet the attributes of Carrier Ethernet proposed by MEF (Metro Ethernet Forum). It complies with MEF 9 standard to support E-Line/E-Access service and MEF 14 standard to enable the bandwidth profile configuration delivering SLA (Service Level Agreement) for end-to-end performance characteristics as well as Ethernet OAM functionality to support carrier grade service OAM management rapidly detecting and recovering from the network incidents in real time. MSW-4424CS supports timing synchronization features (SyncE & IEEE 1588v2) to enhance and migrate a carrier grade network for mobile backhaul applications.

Features

Fully dual rate architecture of fiber link port

Completely dual speed ports of fiber link to offer the scalable physical connection of Metro Ethernet network for operators.

Fully Ethernet OAM enabled

Enabling Ethernet OAM features (IEEE 802.3ah/802.1ag/ITU-T Y.1731) to rapidly detect and recover network fault and save the OPEX for operators as well as increase customer satisfaction.

Timing synchronization

Advanced synchronization features such as SyncE or IEEE 1588v2 to allow operators delivering service with optimal stability and continuity in the end-to-end connectivity.

MEF standards compliant solution

CE2.0 compliant product to guarantee the compatibility with other MEF certified equipment and reduce the risk and cost for Metro Ethernet network deployment of operators.

Specifications

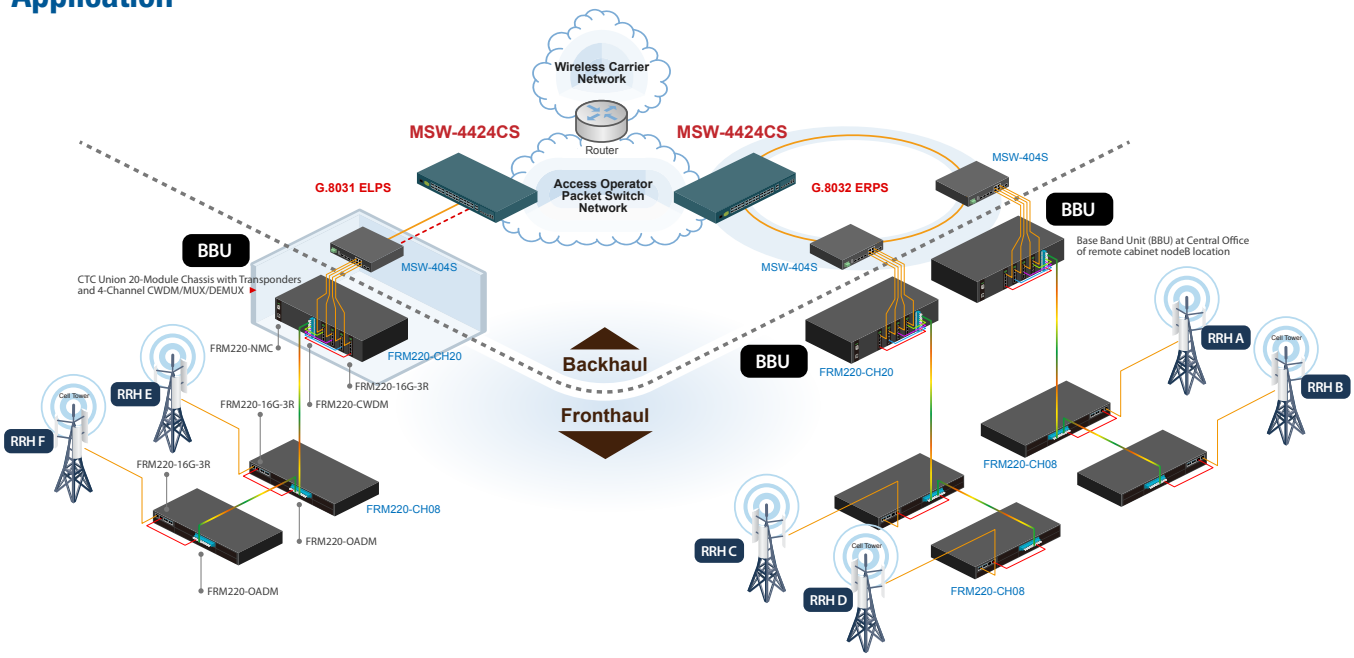
Interface	100/1000Mbps SFP slots x 20 + GbE combo port (10/100/1000Base-T or 100/1000Mbps SFP slot) x 4 + 1/10Gbps SFP+ slot x 4
Console Port	RJ-45 console port x 1
1PPS/ToD port	RJ45 x 2
Management Port	10/100/1000Base-T RJ45 x 1
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps, 14880000pps at 10Gbps
Switching Capacity	128Gbps
Packet Forwarding Capacity	95Mpps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.1p
	IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1d,IEEE 802.1w
	IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad, IEEE 802.3ah,
	IEEE 802.1ag, ITU-T Y.1731, ITU-T G.8262, IEEE 1588 v2
Packet Buffer	32M bits
Mac Table Size	32K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN

VLAN Feature	private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port
	IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
	3 colors marker-CIR/EIR/Burst bandwith control
L2 switching Protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032
Trunking	IEEE 802.3ad LACP (Max. 14 trunking group, Max. 8 ports per trunking group)
Security	IEEE 802.1x port based access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering, TACACS+
	IP source guard, DHCP snooping/relay option 82
	ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave
	IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface,
	Web/CLI authentication, SSH v2, HTTPs, port mirroring
	syslog, IPv6 management, NTP, SNTP
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah/IEEE 802.1ag/ITU-T Y.1731

Timing synchronization	ITU-T G.8262, SyncE, IEEE 1588 v2
LED display	Power, System, Console, Link/Act, Speed
Power input	100V ~ 240V AC, -36 ~ -60V DC
Build in power module combination	AC, DC, AD (AC+DC), AA (AC+AC) or DD (DC+DC)
Power Consumption	< 60W

Operating Temperature	-10 ~ 60°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250x 440x 43.5mm (DxWxH)
Certification	FCC, CE

Application



- Carrier Ethernet with multiple class of service
- Traffic Synchronization
- Precisely delivery of time-sensitive service

Ordering Information

Model Name	Description
MSW-4424CS-AC	L2+ 10G Fiber Access Switch with SyncE and build-in single AC power module
MSW-4424CS-DC	L2+ 10G Fiber Access Switch with SyncE and build-in single DC power module
MSW-4424CS-AA	L2+ 10G Fiber Access Switch with SyncE and build-in dual AC power module
MSW-4424CS-DD	L2+ 10G Fiber Access Switch with SyncE and build-in dual DC power module
MSW-4424CS-AD	L2+ 10G Fiber Access Switch with SyncE and build-in AC + DC power module

Power Type

MSW – 4424CS – □□

Example: MSW – 4424CS – AC

Accessories

10G SFP+ Transceiver Module

SFM-1000-SR85	10G SFP+ SR/SW MMF 300m, 850nm VCSEL, 10G Ethernet/FC/SDH/SONET
SFS-1010-LR31	10G SFP+ LR/LW SMF 10km, 1310nm DFB DML, 10G Ethernet/FC/SDH/SONET
SFS-1040-ER55	10G SFP+ ER/EW SMF 40km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET
SFS-1080-ZR55	10G SFP+ ZR/EW SMF 80km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET

MSW-4424C

20x GbE, SFP + 4x GbE Combo + 4x 10GE(SFP+)
L2+ Managed Carrier Ethernet Switch

The MSW-4424C is positioned as a layer 2+ Gigabit access switch solution. It is equipped with 20 100Base-FX/1000Base-X dual speed SFP slots, 4 ports GbE combo (10/100/1000Base-T or 100/1000Base-X SFP) ports and 4 1000Base-X/10G Base-X dual speed SFP+ uplink slots. The MSW-4424C offers the best flexibility and scalability for operators or service providers to deploy their Metro Ethernet network. With the deployment of MSW-4424C, operators or service providers can flexibly provision the bandwidth for either 100Mbps or 1000Mbps as well as uplink connection of Gigabit or 10G speed in their service applications. The MSW-4424C has built-in dual power supplies to enable power redundancy and enhance the high network availability.

Aimed at Metro Ethernet applications, the specifications of MSW-4424C fully meet the attributes of Carrier Ethernet proposed by MEF (Metro Ethernet Forum). It complies with MEF 9 standard to support E-Line/E-Access service and MEF 14 standard to enable the bandwidth profile configuration delivering SLA (Service Level Agreement) for end-to-end performance characteristics as well as Ethernet OAM functionality to support carrier grade service OAM management rapidly detecting and recovering from the network incidents in real time.

Features

Fully dual rate architecture of fiber link port

Completely dual speed ports of fiber link to offer the scalable physical connection of Metro Ethernet network for operators

Fully Ethernet OAM enabled

Enabling Ethernet OAM features (IEEE 802.3ah/802.1ag/ITU-T Y.1731) to rapidly detect and recover network fault and save the OPEX for operators as well as increase customer satisfaction

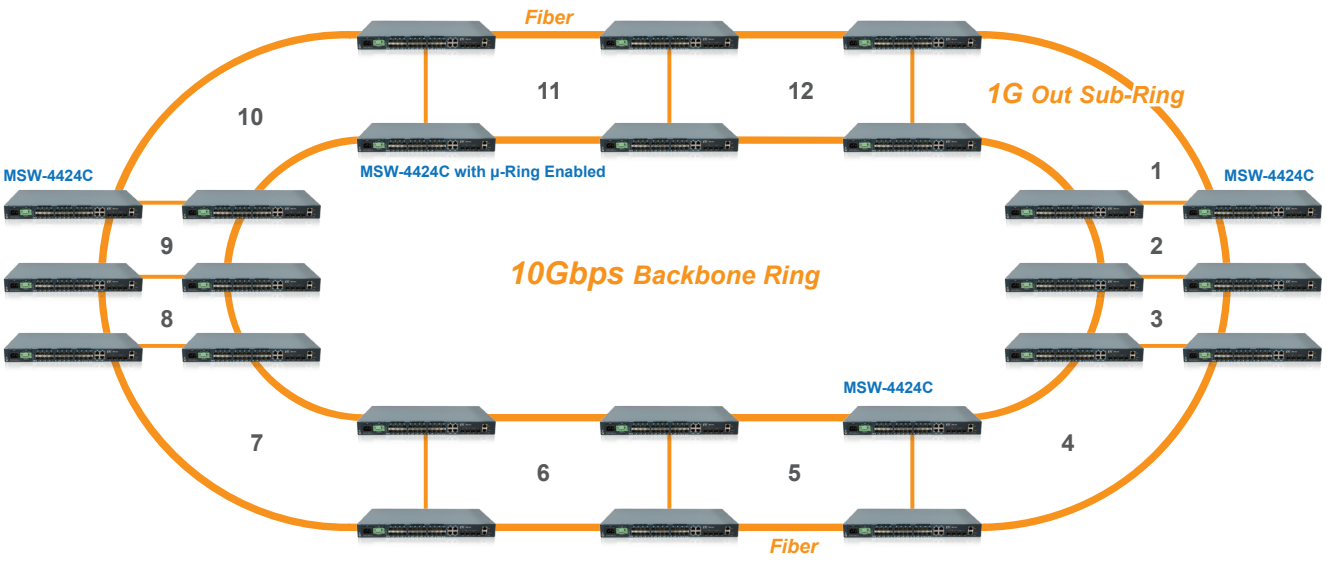
MEF standards compliant solution

CE2.0 compliant product to guarantee the compatibility with other MEF certified equipment and reduce the risk and cost for Metro Ethernet network deployment of operators

Specifications

Interface	100/1000Mbps SFP slots x 20 + GbE combo port (10/100/1000Base-T or 100/1000Mbps SFP slot) x 4 + 1/10Gbps SFP+ slot x 4
Console Port	RJ-45 console port x 1
Management Port	10/100/1000Base-T RJ45 x 1
Filter & Forward Rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps, 14880000pps at 10Gbps
Switching Capacity	128Gbps
Packet Forwarding Capacity	95Mpps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.1p
	IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1d, IEEE 802.1w
	IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad, IEEE 802.3ah
	IEEE 802.1ag, ITU-T Y.1731
Packet Buffer	32M bits
Mac Table Size	32K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN
	private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port
	IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
	3 colors marker-CIR/EIR/Bursts bandwith control
L2 switching Protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032
Trunking	IEEE 802.3ad LACP (Max. 14 trunking group, Max. 8 ports per trunking group).
Security	IEEE 802.1x port based access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering, TACACS+
	IP source guard, DHCP snooping/relay option 82
	ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave
	IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface,
	Web/CLI authentication, SSH v2, HTTPs, port mirroring
	syslog, IPv6 management, NTP, SNTP
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah/IEEE 802.1ag/ITU-T Y.1731
LED display	Power, System, Console, Link/Act, Speed
Power input	100V ~ 240V AC, -36 ~ -60V DC
Build in power module combination	AC, DC, AD (AC+DC), AA (AC+AC) or DD (DC+DC)
Power Consumption	< 60W
Operating Temperature	-10 ~ 60°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250 x 440 x 43.5mm (DxWxH)
Certification	FCC, CE

Application



Ordering Information

Model Name	Description
MSW-4424C-AC	L2+ 10G Fiber Access Switch with build-in single AC power module
MSW-4424C-DC	L2+ 10G Fiber Access Switch with build-in single DC power module
MSW-4424C-AA	L2+ 10G Fiber Access Switch with build-in dual AC power module
MSW-4424C-DD	L2+ 10G Fiber Access Switch with build-in dual DC power module
MSW-4424C-AD	L2+ 10G Fiber Access Switch with build-in AC + DC power module

Power Type

MSW – 4424C – □□

Example: MSW – 4424C – AC

Accessories

10G SFP+ Transceiver Module

SFM-1000-SR85	10G SFP+ SR/SW MMF 300m, 850nm VCSEL, 10G Ethernet/FC/SDH/SONET
SFS-1010-LR31	10GSFP+ LR/LW SMF 10km, 1310nm DFB DML, 10G Ethernet/FC/SDH/SONET
SFS-1040-ER55	10G SFP+ ER/EW SMF 40km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET
SFS-1080-ZR55	10G SFP+ ZR/EW SMF 80km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET

GSW-3424FM

24x GbE, SFP + 4x GbE RJ45 + 4x 1G/10G, SFP+
L2+ Managed Ethernet Switch

GSW-3424FM is an SNMP manageable Gigabit Ethernet switch for FTTx deployment or Gigabit Ethernet fiber aggregation that is equipped with 24 dual rate 100/1000Base-X SFP ports, 4 10/100/1000Base-T RJ45 ports and 4 1G/10Gbps dual rate SFP+ slots. With advanced layer 2 and QoS features, this switch is targeted at multi-service operators (MSO) with a desire to deploy provisioned triple play services via active Ethernet FTTx network infrastructures. Fiber based network infrastructures offer the data rates required by triple play services such as high speed internet access, VoIP and HD IPTV. The GSW-3424FM Ethernet access switch provides VLAN, QoS and IGMP L2 feature sets as well as robust security management to facilitate service provider's build out of a manageable and secure FTTx access network.

Features

- IPv6 management
- 8 priority queues are supported on each port for QoS application
- Port-based VLAN, 802.1Q VLAN, Voice VLAN and Q-in-Q(double tagging) function
- Protected Port and Loop Detection function
- IEEE 802.1x security function, and VLAN assignment, Guest VLAN functions
- Static Mac address access limit and Dynamic Mac address number on port
- IEEE802.1d & 802.1w & 802.1s
- DHCP Client / DHCP Option 82 Relay / DHCP Snooping function
- DHCP Snooping Database agent to upload DHCP Snooping table to external TFTP Server.
- ACL function for L2 ~ L4 packet control, Ingress/Egress rate control on port
- IP Multicast with IGMP snooping / query / fast leave / filtering / group limited /MVR
- Broadcast/Multicast/Unknown Unicast storm control
- ARP inspection / IP source guard
- RMON 1,2,3,9
- SFP Transceiver DDMI function
- Remote port configuration setting and statistics monitoring
- Text based CLI configuration download and upload
- IEEE 802.3az power management / Green Ethernet

Specifications

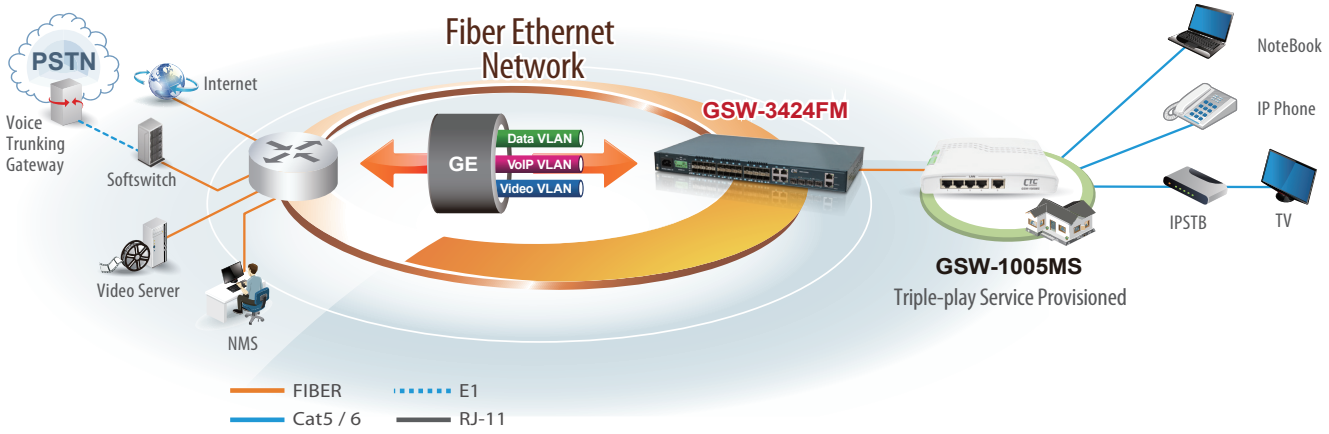
System		
100/1G SFP Port	24	
10/100/1000 Base-T RJ45	4	
1G/10G Uplink Port	4	
Memory	Flash : 16MB / RAM: 128MB	
Packet buffer	32M bits	
MAC Table size	32K	
Max Packet Size	10K	
Transmission Method	Store and Forward Switching	
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps, 14880000pps at 10Gbps	
Non-blocking Switching Fabric capacity	136Gbps	
Packet Forwarding capacity	102Mpps	
FAN Design	Yes	
Console port	RJ-45	
19" Rack-Mount	Yes, with kits	
SFP DDMI	Yes	
Dimension	250x 440x 43.5mm (DxWxH)	
Operating Temperature	0 ~ 50°C	
Storage Temperature	-25 ~ 70°C	
Humidity	10% ~ 90% (non-condensing)	
LED Display	Per Port : Link/Act (Green: Gigabit, Yellow:10/100M) Per Device : Power and System	
Power Consumption	<60W Max.	
Power Input	AC Power input (100V~240V); -36~-60VDC	
LED		
Power	Lights(Green)	System is receiving power
System	Lights(Green)	System is ready
Link / Act	Lights	Link is ready 1000Mbps : Green 100Mbps : Amber
	Flashing	Data packets being received or sent

Software	
Port Control	Port speed, duplex mode, and IEEE 802.3x flow control Port Auto MDI/MDI-X Port frame size (jumbo frames), Maximum ingress frame size (10056 bytes) Port state (administrative status) Port status (link monitoring) Port statistics (MIB counters) Port VeriPHY (cable diagnostics)
L2 Switching	Auto MAC address learning/aging and MAC addresses (static) IEEE 802.1Q static VLAN(4096 entries Max.), Voice VLAN, Port isolation, Private VLAN, MAC based VLAN protocal based VLAN IP subnet based VLAN IEEE 802.1D STP/802.1w RSTP/802.1s MSTP IEEE 802.3ad Link Aggregation, static and LACP BPDU guard and restricted role, Error Disable Recovery DHCP client, DHCP snooping, DHCP option 82 relay ARP inspection(256 entries Max.) Port mirroring, RSPAN
Layer 2 Multicast	IGMP snooping v1,v2, v3 snooping, (1024 groups) IGMP snooping Fast and Immediate leave IGMP throttling, filtering, and leave proxy MVR and MVR profile IPv6 MLD v1 snooping
QoS	IEEE 802.1p 8 Priority Queues per Port Port Based priority Scheduler priority QoS Control List(256 entries Max.) Storm control for UC, MC, and BC Policing and shaping per port and per queue Ingress Policing Egress Shaping DiffServ (RFC 2474) remarking Tag remarking

Security	Port-based 802.1X, Single 802.1X, Multiple 802.1X MAC-based authentication, VLAN assignment, QoS assignment, Guest VLAN RADIUS accounting MAC address limit TACACS+ Web and CLI authentication and authorization Authorization ACL rules based on L2~L4 information IP source guard
Synchronization	NTPv4 Client
SFP DDMI	Yes

Management	HTTP server CLI console port Telnet Management access filtering SSHv2 and HTTPS IPv6 Management Syslog Software upload through Web and TFTP SNMPv1/v2c/v3 Agent RMON Group 1, 2, 3, and 9 IEEE 802.1AB-2005 Link Layer Discovery, LLDP Text Configuration download or upload Daylight Saving

Application



Ordering Information

Model Name	Description
GSW-3424FM-AC	24x GbE SFP slots + 4x GbE RJ45 + 4x 1G/10Gbps SFP+ slots uplink with single AC power supply
GSW-3424FM-DC	24x GbE SFP slots + 4x GbE RJ45 + 4x 1G/10Gbps SFP+ slots uplink with single DC power supply (-48V)
GSW-3424FM-AA	24x GbE SFP slots + 4x GbE RJ45 + 4x 1G/10Gbps SFP+ slots uplink Dual AC power supply
GSW-3424FM-DD	24x GbE SFP slots + 4x GbE RJ45 + 4x 1G/10Gbps SFP+ slots uplink Dual DC power supply (-48V)
GSW-3424FM-AD	24x GbE SFP slots + 4x GbE RJ45 + 4x 1G/10Gbps SFP+ slots uplink AC & DC (-48V) power supply

Power Type

GSW – 3424FM – □□

Example: GSW – 3424FM – AD

Accessories

10G SFP+ Transceiver Module

SFM-1000-SR85	10G SFP+ SR/SW MMF 300m, 850nm VCSEL, 10G Ethernet/FC/SDH/SONET
SFS-1010-LR31	10G SFP+ LR/LW SMF 10km, 1310nm DFB DML, 10G Ethernet/FC/SDH/SONET
SFS-1040-ER55	10G SFP+ ER/EW SMF 40km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET
SFS-1080-ZR55	10G SFP+ ZR/EW SMF 80km, 1550nm DFB EML, 10G Ethernet/FC/SDH/SONET

GSW-3424M1

20x GbE, RJ45 + 4x GbE Combo (SFP or RJ45)
L2+ Managed Ethernet Switch

GSW-3424M1 is a cost-effect, high performance, managed L2 Ethernet with 20x 10/100/1000Base-T ports and 4x Gigabit Ethernet combo (10/100/1000Base-T or 1000Base-X) ports. This switch supports remote management by SNMP, HTTP(HTTPS) and Telnet(SSH) interfaces along with local management by console interface. GSW-3424M1 supports many L2 switch management functions, including 802.1Q VLAN, 802.1x Port Security, Rate Control, Port Configuration, Port Mirroring, Port Statistics, QoS functions, Spanning tree and more.

Features

- 20x RJ45 ports, with 10/100/1000Mbps, Full/Half duplex auto-negotiation and Auto-MDIX functions
- 4x Dual Speed SFP sockets, shared with TX ports of Port 21~24 ;
- auto-detect TX/SFP connection
- CISCO-like command line interface, IPv6 management
- 8 priority queues are supported on each port for QoS application
- Port-based VLAN, 802.1Q VLAN, Voice VLAN and Q-in-Q (double tagging) function
- Protected Port and Loop Detection function
- IEEE 802.1x security function, and VLAN assignment, Guest VLAN functions
- Static Mac address access limit and Dynamic Mac address number on port
- IEEE802.1D & 802.1w & 802.1s (spanning tree)
- IP Multicast with IGMP snooping / query / fast leave / filtering / group limited /MVR
- DHCP Client / DHCP Option 82 Relay / DHCP Snooping function
- ACL function for L2 ~ L4 packet control, Ingress/Egress rate control on port
- Broadcast/Multicast/Unknown Unicast storm control
- ARP inspection / IP source guard, RMON 1, 2, 3, 9
- SFP Transceiver DDMI function / Dual Speed SFP Ports (100/1000Mbps)
- Remote port configuration setting and statistics monitoring
- Text based CLI configuration download and upload
- IEEE 802.3az power management / FANless / Green Ethernet

Specifications

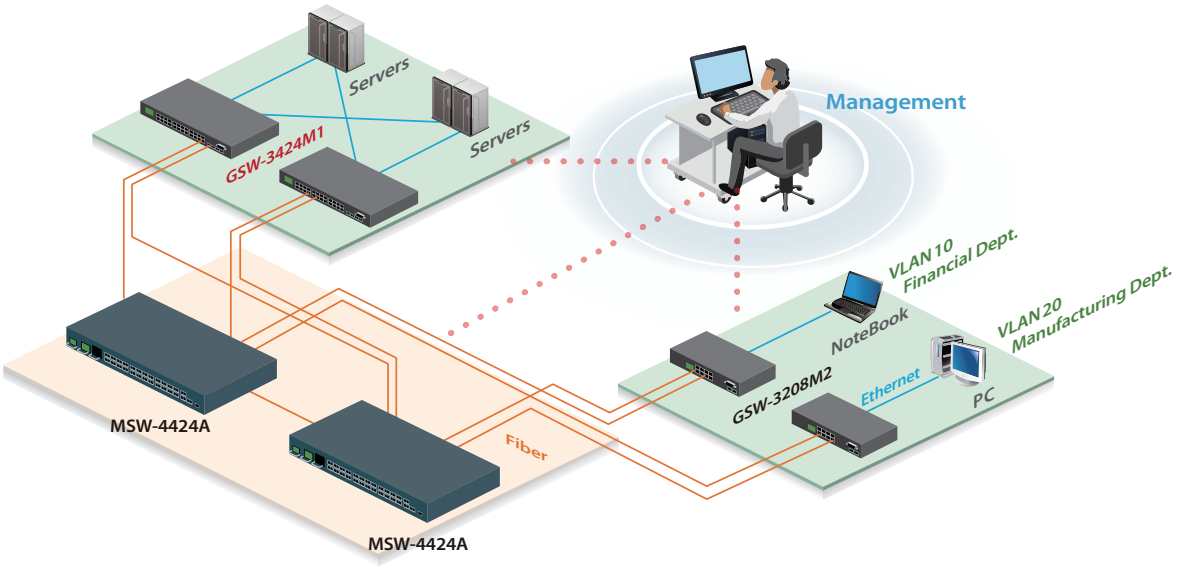
System	
10/100/1000 Base-T	20
100/1G SFP Slot	4 UTP/SFP Combo (Port 21~24)
Packet buffer	512KB
MAC Table size	8K
Max Packet size	9600 Bytes
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric capacity	48Gbps
Packet Forwarding capacity	35.7Mpps
FAN Design	FAN less
Console port	D-Sub 9
19" Rack-Mount	Yes, with kits
SFP DDMI	Yes
Dimensions	330 x 204 x 44 mm (W x D x H)
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	10% ~ 90% (non-condensing)
LED Display	Per Port : Link/Act (Green: Gigabit, Yellow:10/100M) Per Device : Power and System
Power Consumption	18 Watt Max.
Power Input	AC Power input (100V~240V)
Software	
Port Control	Port speed, duplex mode, and flow control Port frame size (jumbo frames), Maximum ingress frame size (9600 bytes) Port state (administrative status) Port status (link monitoring) Port statistics (MIB counters) Port VeriPHY (cable diagnostics), Power Control

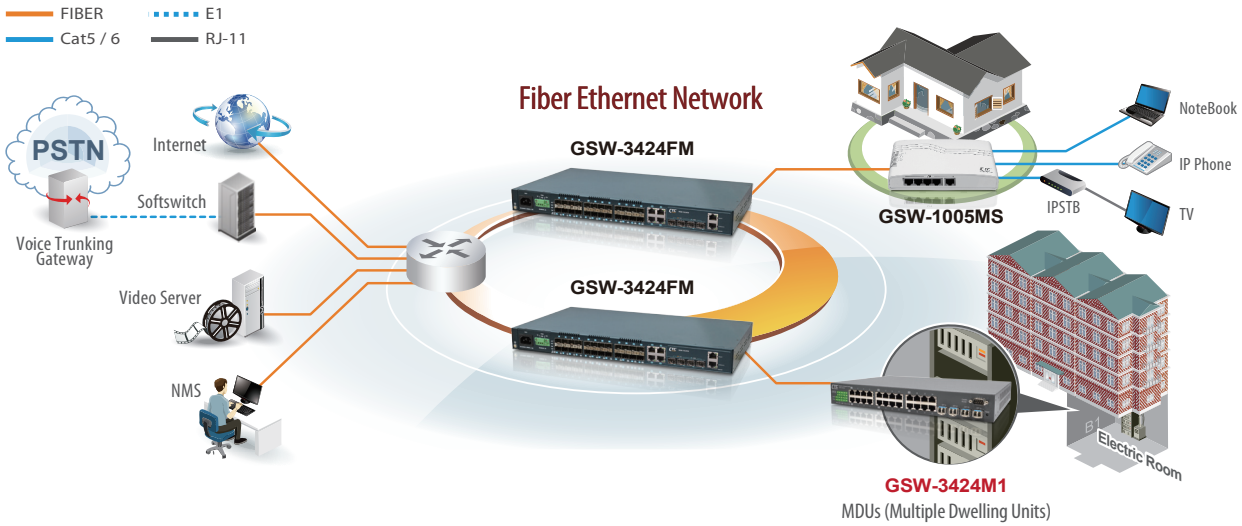
L2 Switching	Auto MAC address learning/aging and MAC addresses (static) IEEE 802.1Q static VLAN(Max. 4K VLAN groups), Voice VLAN, Port isolation, Port Based VLAN, IEEE 802.1ad Provider Bridge IEEE 802.1D STP/802.1w RSTP/802.1s MSTP IEEE 802.3ad Link Aggregation, static and LACP BPDU guard and restricted role, BPDU transparency DHCP client, DHCP snooping, DHCP option 82 relay ARP inspection, Port mirroring, IP MAC binding
Layer 2 Multicast	IGMP snooping v1,v2, v3 snooping, (1024 groups) IGMP snooping Fast and Immediate leave IGMP throttling, filtering, and leave proxy IGMP proxy mode and snooping mode selection MVR, IPv6 MLD snooping
QoS	8 Priority Queues per Port Port Based priority, Scheduler priority, QoS Control List Storm control for UC, MC, and BC Policing and shaping per port and per queue Ingress Policing : (100-1000000 when the "Unit" is "kbps" or "fps" and 1-3300 when the "Unit" is "Mbps" or "kfps") Egress Shaping : (100-1000000 when the "Unit" is "kbps", and 1-3300 when the "Unit" is "Mbps".) DiffServ (RF 2474) remarking, Tag remarking
Security	Port-based 802.1X, Single 802.1X, Multiple 802.1X MAC-based authentication, VLAN assignment, QoS assignment, Guest VLAN, RADIUS accounting, MAC address limit TACACS+, Web and CLI authentication and authorization Authorization (3 levels) ACLs for filtering(256 entries), policing, and port copy IP source guard
Synchronization	NTPv4 Client
Power Saving	ActiPHY, PerfectReach, Ethernet Energy Efficient power management(EEE)
SFP DDMI	Yes

Management	HTTP server, CLI console port, Telnet, Management access filtering, SSHv2 and HTTPS IPv6 Management, System Syslog Software download through Web

Management	SNMPv1/v2c/v3 Agent RMON Group 1, 2, 3, and 9 IEEE 802.1AB-2005 Link Layer Discovery, LLDP Text Configuration download or upload, sFlow, Daylight Saving

Application





Ordering Information

Model Name	Description
GSW-3424M1-AC	20x 10/100/1000Base-T + 4x GbE Combo with AC power supply
GSW-3424M1-DC48	20x 10/100/1000Base-T + 4x GbE Combo with DC 48V power supply

Power Type

MSW – 3424M1 – □□□□

Example: MSW – 3424M1 – DC48

GSW-3208M2-BC

8x GbE, RJ45 + 2x GbE, SFP L2+ Managed Ethernet Switch with External Battery Charging

New

GSW-3208M2-BC is positioned as a layer 2 managed switch solution for high speed connectivity with popular traffic priority and management capabilities for small and medium businesses. It features 8-port 10/100/1000Base-T RJ45 and 2-100/1000Base-X SFP based fiber optics. The GSW-3208M2-BC is designed with a high-performance switching architecture and offers wire-speed transportation capability for bandwidth-intensive applications of enterprises. More and more corporations are adapting new IT technologies over the network such as voice over IP, video conference to improve productivity and save operation expenditure. The GSW-3208M2-BC also supports features such as VLAN, QoS, IGMP for multicast applications and network management to fulfill SMB requirements. The GSW-3208M2-BC delivers a cost effective Gigabit Ethernet solution to meet the converged applications for enterprise customer's networks.

The GSW-3208M2-BC is built-in the external battery charging function to prevent the power outage from interrupting internet access service. With this battery charging feature, the GSW-3208M2-BC can automatically switch the modes to charge the external battery when AC power is normally supplied or be discharged from the battery as the AC power is outage.

Features

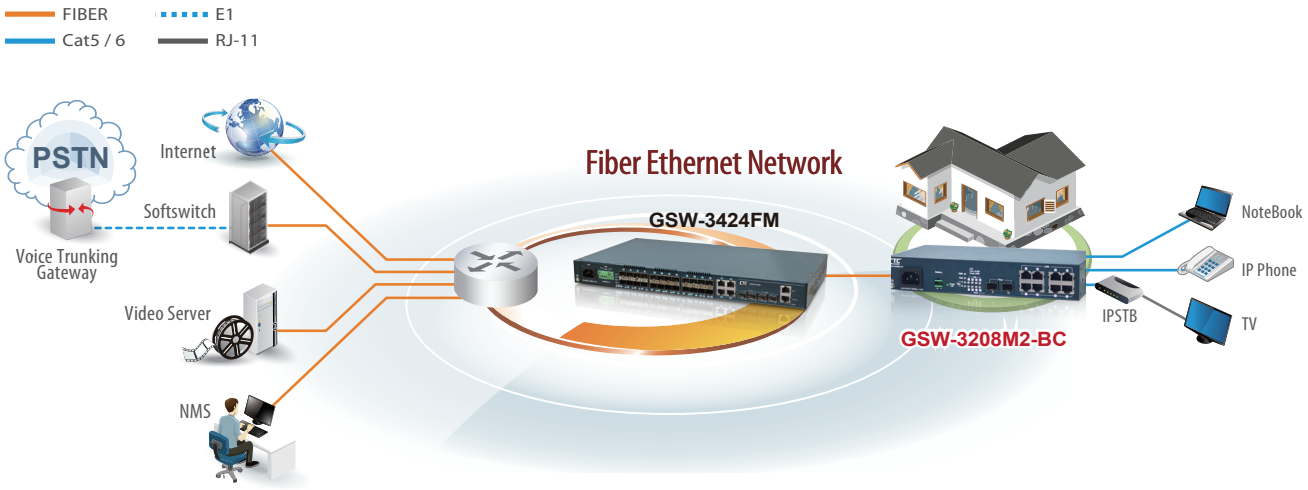
- 8-port 10/100/1000Base-T RJ45 + 2 uplink 100/1000Base-X SFP slot
- Supports 9K Bytes jumbo frame
- Supports IEEE 802.1Q tagged VLAN & Q-in-Q VLAN stacking
- Supports IEEE 802.1p priority queue
- Supports IGMP snooping v1/v2/v3
- Supports dying gasp
- Supports power redundancy (optional)
- Supports Cisco® like CLI
- Built-In DC terminal block to support battery charging function

Specifications

Interface	8x 10/100/1000Base-T(X) RJ-45 with 2x 100/1000Base-X SFP
Console port	D-Sub 9
FAN design	Fanless
19" rack mountable	Yes, with kits (optional)
Switching fabric capacity	20Gbps
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Transmission method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1x, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.3ad, IEEE 802.1ab
Packet buffer	4M bits
MAC table size	8K
Jumbo frame size	9600 Bytes
VLAN feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups)
	MAC based VLAN
	Protocol based VLAN
	Private VLAN for port isolation
	IP subnet based VLAN, Voice VLAN
	GVRP VLAN translation, IEEE 802.1ad Q-in-Q
L2 switching protection	STP, RSTP, MSTP
Trunking	IEEE 802.3ad LACP
QoS feature	IEEE 802.1p 8 priority queues per port, Port Default Priority, User Priority, Input priority mapping, QoS Control List (QCL Mode), Storm control for UC, BC and Unknown Port policers, Global/VCAP (ACL) policers, Port egress shaper, Queue egress shapers, DiffServ (RFC2474) remarking, Tag remarking, Scheduler mode

Security	Port based/single/multiple IEEE 802.1x access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering
	TACACS+, IP source guard
	DHCP snooping/relay option 82
	ARP inspection
IP multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, system syslog, IPv6 management, NTP, text based CLI configuration upload or download, IEEE 802.1ab LLDP, DHCP auto provisioning
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9, Multiple trap destinations
Software upgrade	TFTP/HTTP
Power input	100 ~ 240VAC -18 ~ -60VDC (-48VDC)
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250 x 117 x 43.8 mm
Certification	FCC, CE

Application



Ordering Information

Model Name	Description
GSW-3208M2-BC	8x 10/100/1000Base-T + 2x GbE SFP slot L2 Managed Switch with battery charging function

Accessories

GSW-3208M2-RMK	19" rack mount kit of GSW-3208M2

Remark: SFP Transceiver not included

GSW-3208M2

8x GbE, RJ45 + 2x GbE, SFP
L2+ Managed Ethernet Switch

GSW-3208M2 is positioned as a layer 2 managed switch solution for high speed connectivity with popular traffic priority and management capabilities for small and medium businesses. It features 8-port 10/100/1000Base-T RJ45 and 2-100/1000Base-X SFP based fiber optics. The GSW-3208M2 is designed with a high-performance switching architecture and offers wire-speed transportation capability for bandwidth-intensive applications of enterprises. More and more corporations are adapting new IT technologies over the network such as voice over IP, video conference to improve productivity and save operation expenditure. The GSW-3208M2 also supports features such as VLAN, QoS, IGMP for multicast applications and network management to fulfill SMB requirements. The GSW-3208M2 delivers a cost effective Gigabit Ethernet solution to meet the converged applications for enterprise customer's networks.

Features

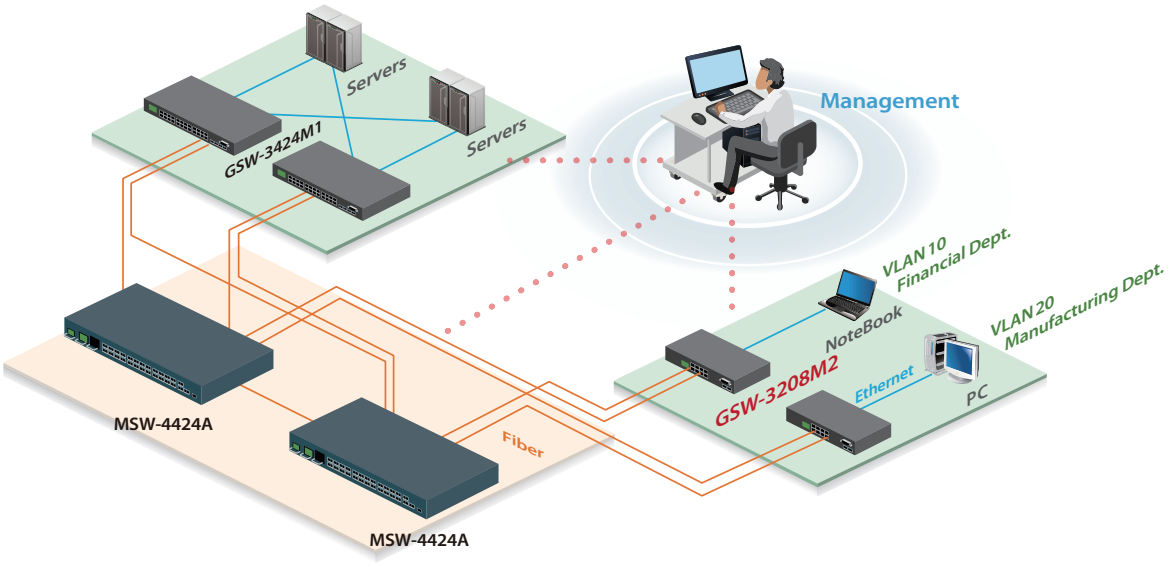
- 8-port 10/100/1000Base-T RJ45 + 2 uplink 100/1000Base-X SFP slot
- Supports 9K Bytes jumbo frame
- Supports IEEE 802.1Q tagged VLAN & Q-in-Q VLAN stacking
- Supports IEEE 802.1p priority queue
- Supports IGMP snooping v1/v2/v3
- Supports dying gasp
- Supports power redundancy (optional)
- Supports Cisco® like CLI

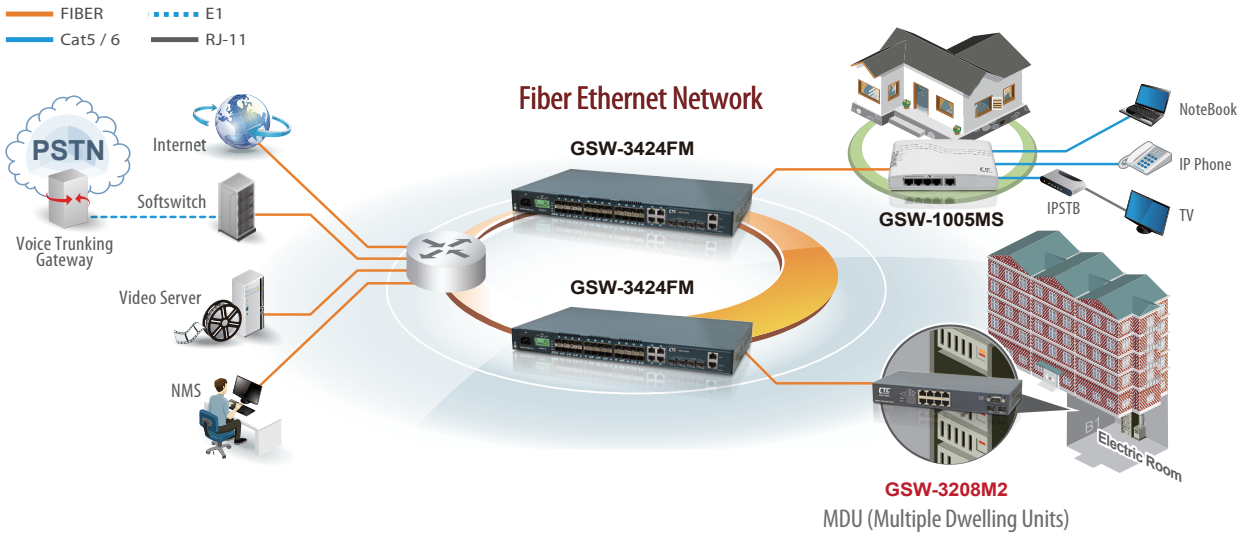
Specifications

Interface	8x 10/100/1000Base-T(X) RJ-45 with 2x 100/1000Base-X SFP
Console port	D-Sub 9
FAN design	Fanless
19" rack mountable	Yes, with kits (optional)
Switching fabric capacity	20Gbps
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Transmission method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1x, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.3ad, IEEE 802.1ab
Packet buffer	4M bits
MAC table size	8K
Jumbo frame size	9600 Bytes
VLAN feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups)
	MAC based VLAN
	Protocol based VLAN
	Private VLAN for port isolation
	IP subnet based VLAN, Voice VLAN
	VLAN translation, IEEE 802.1ad Q-in-Q
L2 switching protection	STP, RSTP, MSTP
Trunking	IEEE 802.3ad LACP
QoS feature	IEEE 802.1p 8 priority queues per port, Port Default Priority, User Priority, Input priority mapping, QoS Control List (QCL Mode), Storm Control for UC, BC and Unknown Port policers, Global/VCAP (ACL) policers, Port egress shaper, Queue egress shapers, DiffServ (RFC2474) remarking, Tag remarking, Scheduler mode

Security	Port based/single/multiple IEEE 802.1x access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering
	TACACS+, IP source guard
	DHCP snooping/relay option 82
	ARP inspection
IP multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, system syslog, IPv6 management, NTP, text based CLI configuration upload or download, IEEE 802.1ab LLDP, DHCP auto provisioning
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9, Multiple trap destinations
Software upgrade	TFTP/HTTP
Power input	100 ~ 240VAC -18 ~ -60VDC (-48VDC)
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250 x 117 x 43.8 mm
Certification	FCC, CE

Application





Ordering Information

Model Name	Description
GSW-3208M2-AC	8x 10/100/1000Base-T + 2x GbE SFP slot L2 Managed Switch with AC power supply
GSW-3208M2-DC48	8x 10/100/1000Base-T + 2x GbE SFP slot L2 Managed Switch with DC 48V power supply

Power Type
GSW – 3208M2 – □□□□
Example: GSW – 3208M2 – DC48

Accessories

GSW-3208M2-RMK	19" rack mount kit of GSW-3208M2

Remark: SFP Transceiver not included

MSW-404S

4x GbE, RJ45 + 4x Dual Rate SFP L2+ Carrier Ethernet Switch (NID) with SyncE

The MSW-404S is the new generation of carrier grade Ethernet demarcation device for business connection and mobile backhaul transportation service delivered by carriers. The MSW-404S is equipped 4 SFP slots as dual rate 100/1000Base-X and 4 ports 10/100/1000Base-T RJ45 network interfaces. It is designed to enable E-Line, E-LAN, E-Tree services which are CE (Carrier Ethernet) 2.0 compliant for Metro Ethernet network deployments.

The MSW-404S device enables carriers and service providers to delivered SLA-based network service with extensive fault detection and diagnostic capabilities which are compliant with the latest Ethernet OAM standards such as IEEE 802.3ah, IEEE 802.1ag and ITU-T Y.1731. With built-in RFC2544 and ITU-T Y.1564 feature sets, The MSW-404S also enables the service providers to perform the SLA verification anytime to ensure the quantitative latency, jitter and throughput delivery performance indexes. The CE2.0 compliant functions support EVCs and 3 colors marker QoS traffic management to enable service providers managing bandwidth and enforce SLA guaranteed. This card may be controlled and monitored via an NMC in a managed chassis or used as a completely manageable device when used stand-alone. Stand-alone management supports Telnet/SSH, HTTP/HTTPS and SNMP v1, v2C or v3.

MEF 22.1 defines the standard for how Metro Ethernet service is adopted for traffic transportation in mobile backhaul applications. Mobile service is time sensitive and requires accurate packet delivery over a clocking synchronized network to transmit packetized data from a mobile device among base stations without loss. The MSW-404S supports timing synchronization features (SyncE & IEEE 1588 v2) to fulfill the IP converged services (data, voice, video) over synchronous Ethernet aware carrier Ethernet network.

Features

- The next generation of Ethernet demarcation device, at customer premise, fulfilling the large-scale carrier Ethernet deployment for intelligent business connection and mobile backhaul services complied to CE 2.0 standard.
- CE2.0 standards compliant product guarantees the fully interoperability with other MEF certified equipment and reduces the risks and cost of Carrier Ethernet network deployment for operators and service providers.
- Advanced clock synchronized features for carrier Ethernet network allows operators to deliver time sensitive services with optimal stability and continuity in the end-to-end connectivity.

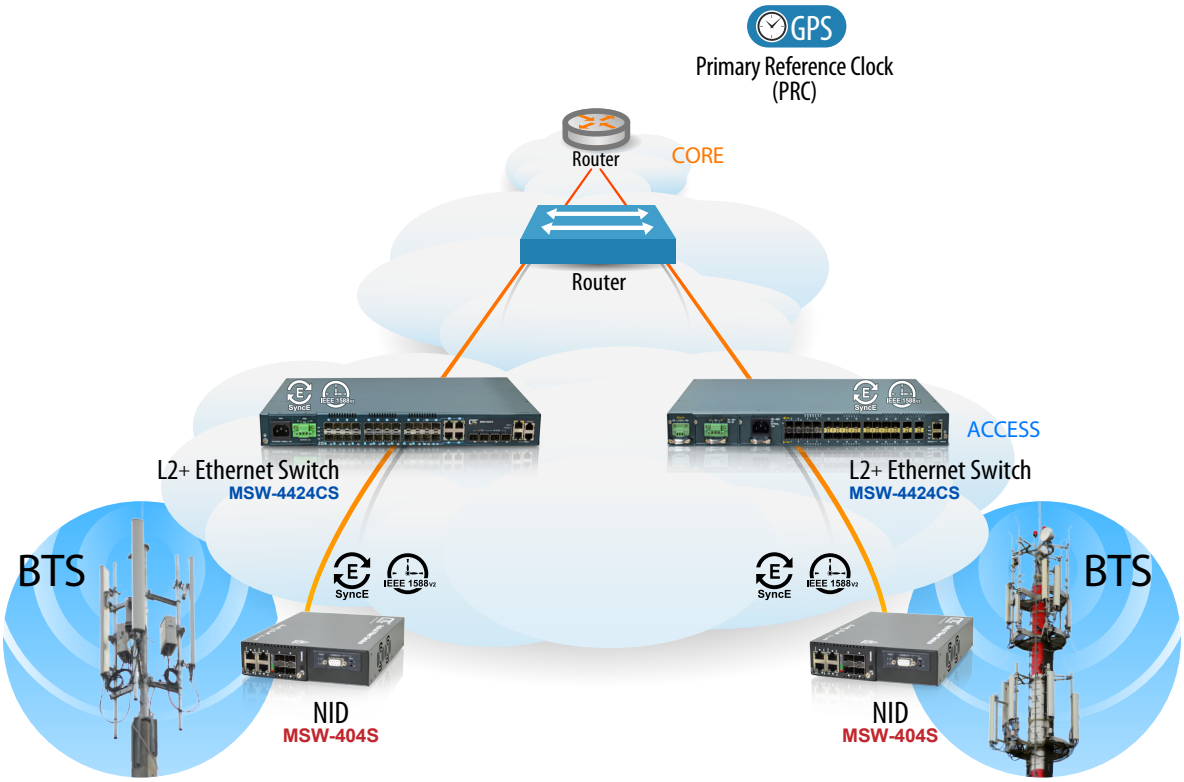
Specifications

Interface	100/1000Mbps SFP slots x 4 + 10/100/1000Base-T RJ45 x 4
Console Port	RJ-45 console port x 1
Management port	10/100/1000Base-T RJ45 x 1
Switching Fabric capacity	16Gbps
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad
Packet Buffer	8M bits
MAC Table Size	8K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN Translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP (Max. 4 trunking groups, Max. 8 ports per trunking group)

Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP
SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731, RFC2544 ITU-T Y.1564
Timing Synchronization	ITU-T G.8262 Synchronous Ethernet, IEEE 1588v2
MPLS feature	MPLS-TP compliant to ITU-T G.8113.1
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -36 ~ -60VDC
Power Consumption	< 20W
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	250 x 218 x 44 mm (D x W x H)
Regulatory	FCC, CE

Application

Mobile backhaul application



- Carrier Ethernet with multiple class of service
- Traffic Synchronization
- Precisely delivery of time-sensitive service

Ordering Information

Model Name	Description
MSW-404S-AC	4x 100/1000Base-x SFP slots + 4x 10/100/1000Base-T RJ45 Carrier Ethernet Switch with SyncE & single AC power supply built-in
MSW-404S-DC	4x 100/1000Base-x SFP slots + 4x 10/100/1000Base-T RJ45 Carrier Ethernet Switch with SyncE & single DC power supply built-in
MSW-404S-AD	4x 100/1000Base-x SFP slots + 4x 10/100/1000Base-T RJ45 Carrier Ethernet Switch with SyncE & AC & DC power supply built-in

Power Type

MSW – 404S- □□

Example: MSW – 404S-AC

MSW-404

4x GbE, RJ45 + 4x Dual Rate SFP
L2+ Carrier Ethernet Switch (NID)

MSW-404 is a new generation of carrier grade Ethernet demarcation device for business connection and mobile backhaul transportation service delivered by carriers. The MSW-404 is equipped 4 SFP slots as dual rate 100/1000Base-X and 4 ports 10/100/1000Base-T RJ45 network interfaces. It is designed to enable E-Line, E-LAN, E-Tree services which are CE (Carrier Ethernet) 2.0 compliant for Metro Ethernet network deployments.

The MSW-404 device enables carriers and service providers to delivered SLA-based network service with extensive fault detection and diagnostic capabilities which are compliant with the latest Ethernet OAM standards such as IEEE 802.3ah, IEEE 802.1ag and ITU-T Y.1731. With built-in RFC2544 and ITU-T Y.1564 feature sets, the MSW-404 also enables the service providers to perform the SLA verification anytime to ensure the quantitative latency, jitter and throughput delivery performance indexes. The CE2.0 compliant functions support EVCs and 3 colors marker QoS traffic management to enable service providers management of bandwidth and to enforce SLA guarantees.

Features

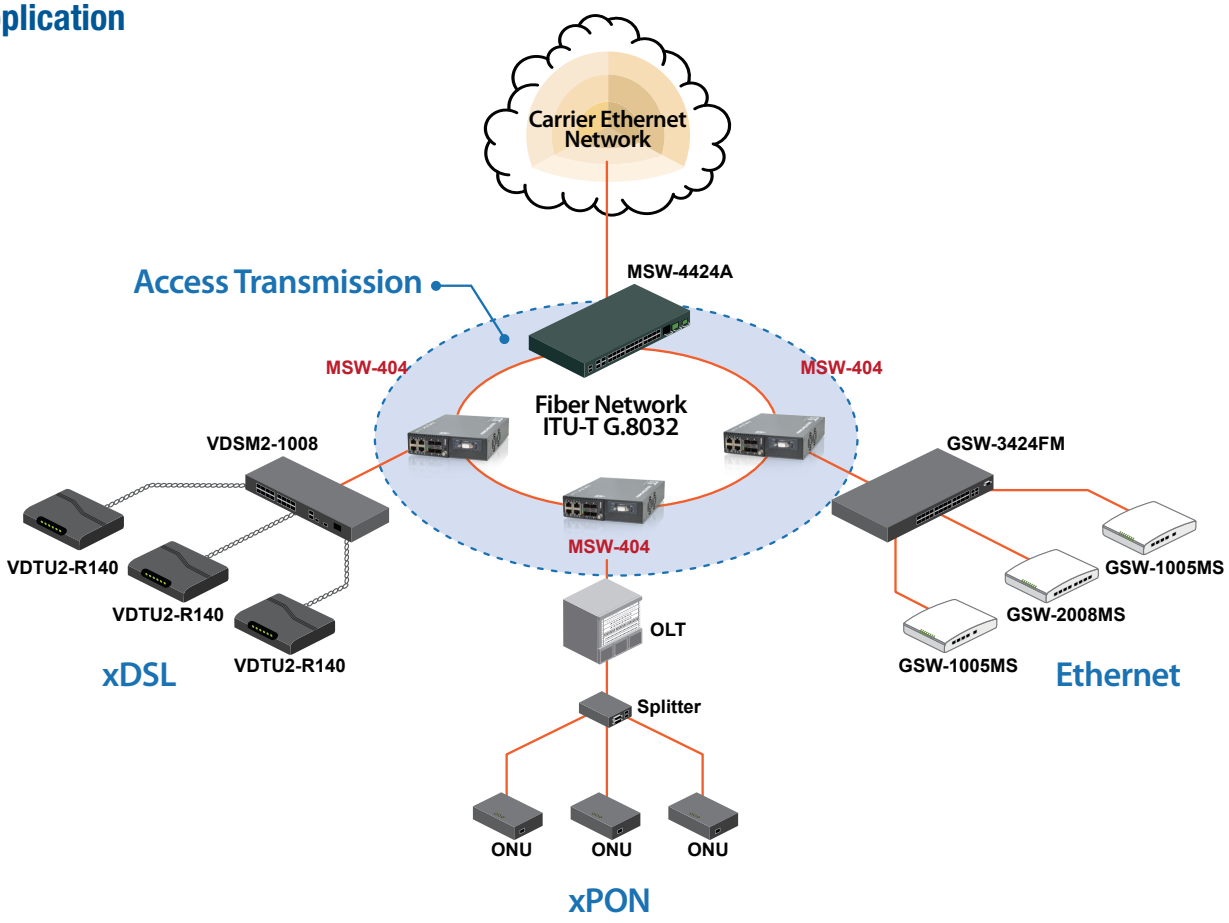
- The next generation of Ethernet demarcation device, at customer premise, fulfilling the large-scale carrier Ethernet deployment for intelligent business connection and mobile backhaul services complied to CE 2.0 standard.
- CE2.0 standards compliant product guarantees the fully interoperability with other MEF certified equipment and reduces the risks and cost of Carrier Ethernet network deployment for operators and service providers.

Specifications

Interface	100/1000Mbps SFP slots x 4 + 10/100/1000Base-T RJ45 x 4
Switching Fabric capacity	16Gbps
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Capacity	16Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad
Packet Buffer	8M bits
MAC Table Size	8K
Max. Packet Size	10K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN, port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP(Max. 4 trunking groups, Max. 8 ports per trunking group)
Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP

SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731, RFC2544 ITU-T Y.1564
MPLS feature	MPLS-TP compliant to ITU-T G.8113.1
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -18 ~ -75VDC
Power Consumption	< 20W
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	222.7 x 167.4 x 45.5 mm (D x W x H) (with CH02M Chassis)
Regulatory	FCC, CE

Application



Ordering Information

Model Name	Description
MSW-404-AC	4x SFP Slots in Dual Rate 100/1000Base-X and 4x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with single AC power supply
MSW-404-DC	4x SFP Slots in Dual Rate 100/1000Base-X and 4x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with single DC power supply
MSW-404-AD	4x SFP Slots in Dual Rate 100/1000Base-X and 4x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with AC & DC power supply

Power Type

MSW – 404 - □□

Example: MSW – 404 - AC

MSW-202

2x GbE, RJ45 + 2x Dual Rate SFP L2+ Carrier Ethernet Switch (EDD)

MSW-202 is a carrier class Ethernet Demarcation Device (EDD) with 2x 10/100/1000Base-T Ethernet ports and 2 x 100/1000/2500Base-X triple rate SFP fiber ports which enables EPL (Ethernet Private Line) & EVPL (Ethernet Virtual Private Line) services with advanced carrier Ethernet features per the Metro Ethernet Forum (MEF 9 and 14). By supporting link and service Ethernet OAM schemes, the MSW-202 also provides extensive fault detection and diagnostic capabilities to ensure that actual network use complies with pre-agreed service level agreements (SLAs).

Features

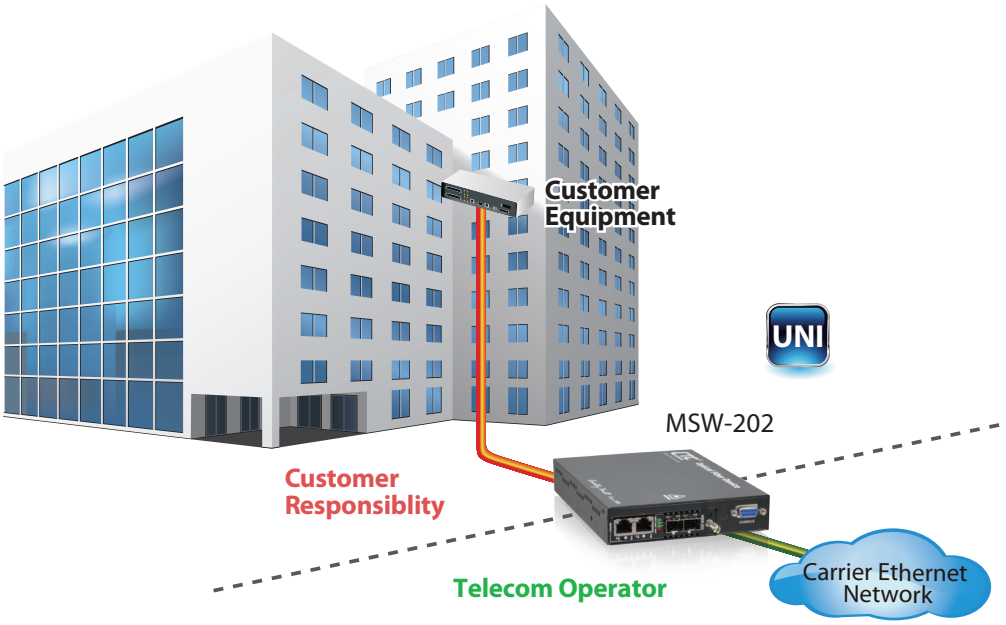
- Complies with MEF CE1.0
- Supports 8K MAC
- Spanning Tree 802.1D, 802.1s, 802.1w
- Supports 802.1Q / 256 active VLANs
- Double VLAN Tagging (C-tag/S-tag) (IEEE 802.1ad) support for ISP application
- Various QoS capability (MAC/port/802.1p/Diffserv)
- Port-based rate limiting
- DHCP Snooping
- IGMP Snooping
- IPv6 support
- IEEE 802.3x and IEEE 802.1x support
- Jumbo frame for up to 9.6K
- Extensive Ethernet OAM support
- IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
- SNMP v1/v2c/v3, Telnet, Web GUI
- IEEE 1588 V2 aware (Optional)

Specifications

Interface	100/1000Mbps SFP slots x 2 + 10/100/1000Base-T RJ45 x 2
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric Capacity	8Gbps
Transmission Method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ab, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.1x, IEEE 802.3ad, IEEE802.3ah, IEEE802.1ag ITU-T Y.1731, ITU-T G.8031, ITU-T G.8032
Packet Buffer	4M bits
MAC Table Size	8K
Max. Packet Size	9.6K Bytes
VLAN Feature	IEEE 802.1Q tagged VLAN(Max. 4K VLAN groups), port based VLAN, MAC based VLAN, protocol based VLAN, private VLAN, IEEE 802.1ad Q-in-Q, VLAN translation, GVRP
QoS Feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port, IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit 3 colors marker-CIR/EIR/Burst bandwidth control
L2 switching protection	STP, RSTP, MSTP, ITU-T G.8031/G.8032 Ethernet ring protection
Trunking	IEEE 802.3ad LACP(Max. 2 trunking groups, Max. 4 ports per trunking group)
Security	IEEE 802.1x port based access control, MAC based access control authentication, RADIUS authentication, limited MAC address learning, IP/MAC binding, ACL rule based filtering, TACACS+, IP source guard, DHCP snooping/relay option 82, ARP inspection
IP Multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1/v2
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI/SNMP/console interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, syslog, IPv6 management, NTP, SNTP, sFlow

SNMP Agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software Upgrade	TFTP/HTTP
Ethernet OAM	IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731
LED Display	Power, System, Console, Link, Speed/Act
Power Input	100V ~ 240VAC, -18 ~ -75VDC
Power Consumption	< 12W
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	201 x 135 x 35 mm (D x W x H) (with CH01M Chassis)
Regulatory	FCC, CE

Application



Ordering Information

Model Name	Description
MSW-202-AC	2x SFP Slots in Dual Rate 100/1000Base-X and 2x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with single AC power supply
MSW-202-DC	2x SFP Slots in Dual Rate 100/1000Base-X and 2x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with single DC power supply
MSW-202-AD	2x SFP Slots in Dual Rate 100/1000Base-X and 2x 10/100/1000Base-T RJ45 OAM Managed Carrier Ethernet Switch with AC & DC power supply

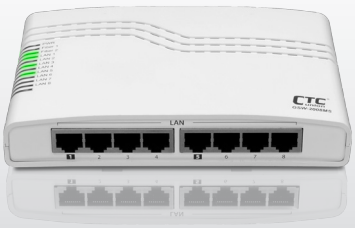
Power Type

MSW – 202 - □□

Example: MSW – 202 - AC

GSW-2008MS

8x GbE, RJ45 + 2x Dual Rate SFP
L2 Managed Ethernet Switch



GSW-2008MS is a managed Gigabit Ethernet CPE switch positioned as a layer 2 managed switch solution for high speed connectivity with popular traffic priority and management capabilities for small and medium businesses. It features 8-port 10/100/1000Base-T RJ45 and 2-100/1000Base-X SFP based fiber optics. The GSW-2008MS is designed with a high-performance switching architecture and offers wire-speed transportation capability for bandwidth-intensive applications of enterprises. More and more corporations are adapting new IT technologies over the network such as voice over IP, video conference to improve productivity and save operation expenditure. The GSW-2008MS also supports features such as VLAN, QoS, IGMP for multicast applications and network management to fulfill SMB requirements. The GSW2008 delivers a cost effective Gigabit Ethernet solution to meet the converged applications for enterprise customer's networks.

Features

- 8-port 10/100/1000Base-T RJ45 + 2 uplink 100/1000Base-X SFP slot
- Supports 9K Bytes jumbo frame
- Supports IEEE 802.1Q tagged VLAN & Q-in-Q VLAN stacking
- Supports IEEE 802.1p priority queue
- Supports IGMP snooping v1/v2/v3
- Supports dying gasp
- Fiber Cable Tray (optional)

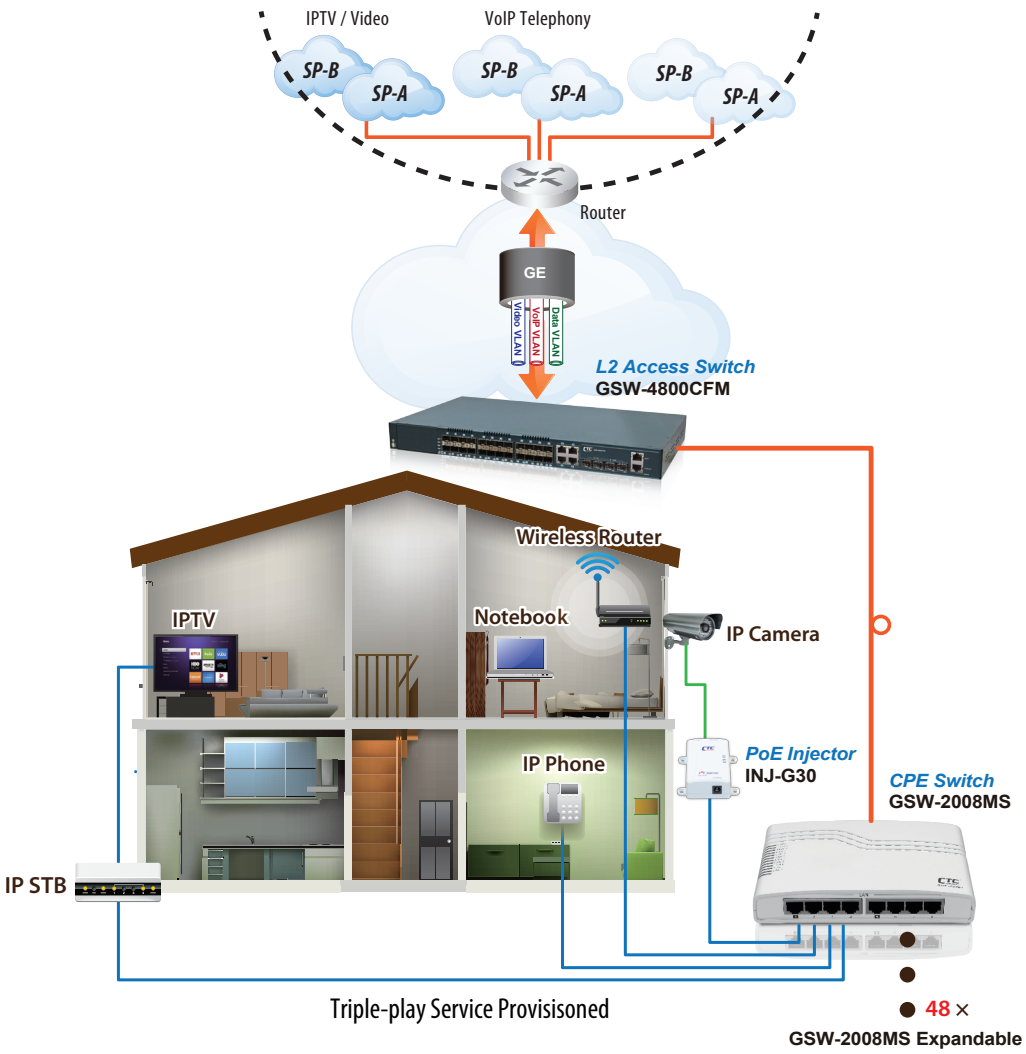
Specifications

Interface	8x 10/100/1000Base-T RJ-45 with 2x 100/1000Base-X SFP
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric capacity	20Gbps
Transmission method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1x, IEEE 802.1D, IEEE 802.1w, IEEE 802.1s, IEEE 802.3ad, IEEE 802.1ab
Packet buffer	4M bits
MAC table size	8K
Jumbo frame size	9600 Bytes
VLAN feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups)
	MAC based VLAN
	Protocol based VLAN
	Private VLAN for port isolation
	IP subnet based VLAN, Voice VLAN
	VLAN translation, IEEE 802.1ad Q-in-Q
L2 switching protection	STP, RSTP, MSTP
Trunking	IEEE 802.3ad LACP
QoS feature	IEEE 802.1p 8 priority queues per port, Port Default Priority, User Priority, Input priority mapping, QoS Control List (QCL Mode), Port policers, Global/VCAP (ACL) policers, Port egress shaper, Queue egress shapers, DiffServ (RFC2474) remarking, Tag remarking, Scheduler mode
Security	Port based/single/multiple IEEE 802.1x access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering
Security	TACACS+, IP source guard
	DHCP snooping/relay option 82
	ARP inspection

IP multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI interface, Web/CLI authentication, SSH v2, HTTPs, port mirroring, system syslog, IPv6 management, NTP, text based CLI configuration upload or download, IEEE 802.1ab LLDP, Cisco discovery filtering (CDP), DHCP auto provisioning
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP/HTTP
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	170 × 120 × 35mm (D x W x H)
Certification	FCC, CE

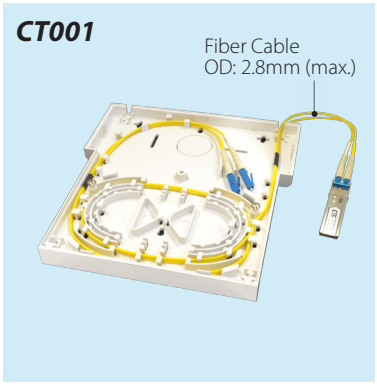
Application

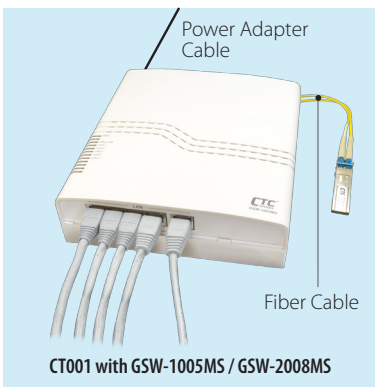
Fiber to the Home Triple-Play Application

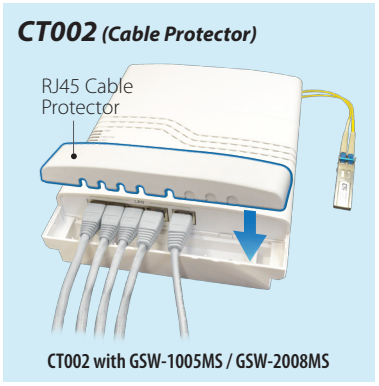


Cable Tray Assembly

CT001/CT002 is an optional fiber tray and mounting hardware for deploying GSW-1005/2008 for residential fiber to the home applications. CT001/CT002 tray options is wall mounted, allowing secure termination of fiber leads.







Ordering Information

Model Name	Description
GSW-2008MS	8-port 10/100/1000 Base-T to 2-port100/1000 Base-X Managed GbE Switch (cable tray optional)

Accessories

CT001	Cable Tray for GSW-1005MS/GSW-2008MS
CT002	Cable Tray & LAN cable protection cover for GSW-1005MS/2008MS

Dimensions (mm)

CT001

CT002

GSW-1005MS

5x GbE, RJ45 + 1x Dual Rate SFP
L2 Managed Ethernet Switch

GSW-1005MS is a managed Gigabit Ethernet CPE switch designed 5-Ports 10/100/1000Base-T RJ45 and 1 port 100/1000Base-X SFP based fiber optics. The traditional transmission distance of Gigabit Ethernet over RJ45 copper can be extended up to 100km over a fiber optics interface. GSW-1005MS has a optional cable tray that allows the installer to enclose the excess fiber within the unit, thus providing protection for the sensitive fiber at subscriber side. LEDs provide visual monitoring of Ethernet connected devices such as Ethernet home gateways, wireless access points or PC/laptop via 10/100/1000Base-T twisted pair RJ45 ports on GSW-1005MS. When GSW-1005MS is deployed as a stand-alone solution, it incorporates an easy to use Web user interface for operation, administration and maintenance both locally and remotely. All of the enabled Layer 2 features and functions of GSW-1005MS can be configured and monitored via web, CLI or SNMP management. GSW- 1005MS is particularly suitable for deploying and provisioning active Ethernet FTTX service of multi-service operators (MSO).

Features

- 5-Port 10/100/1000Base-T + 100/1000Base-X SFP uplink
- Supports 9.6K Bytes jumbo frame
- Supports IEEE 802.1Q tagged VLAN & Q-in-Q VLAN stacking
- Supports IEEE 802.1p priority queue
- Supports IGMP snooping v1/v2/v3
- Supports DHCP auto provisioning
- Supports dying gasp
- Fiber cable tray(optional)

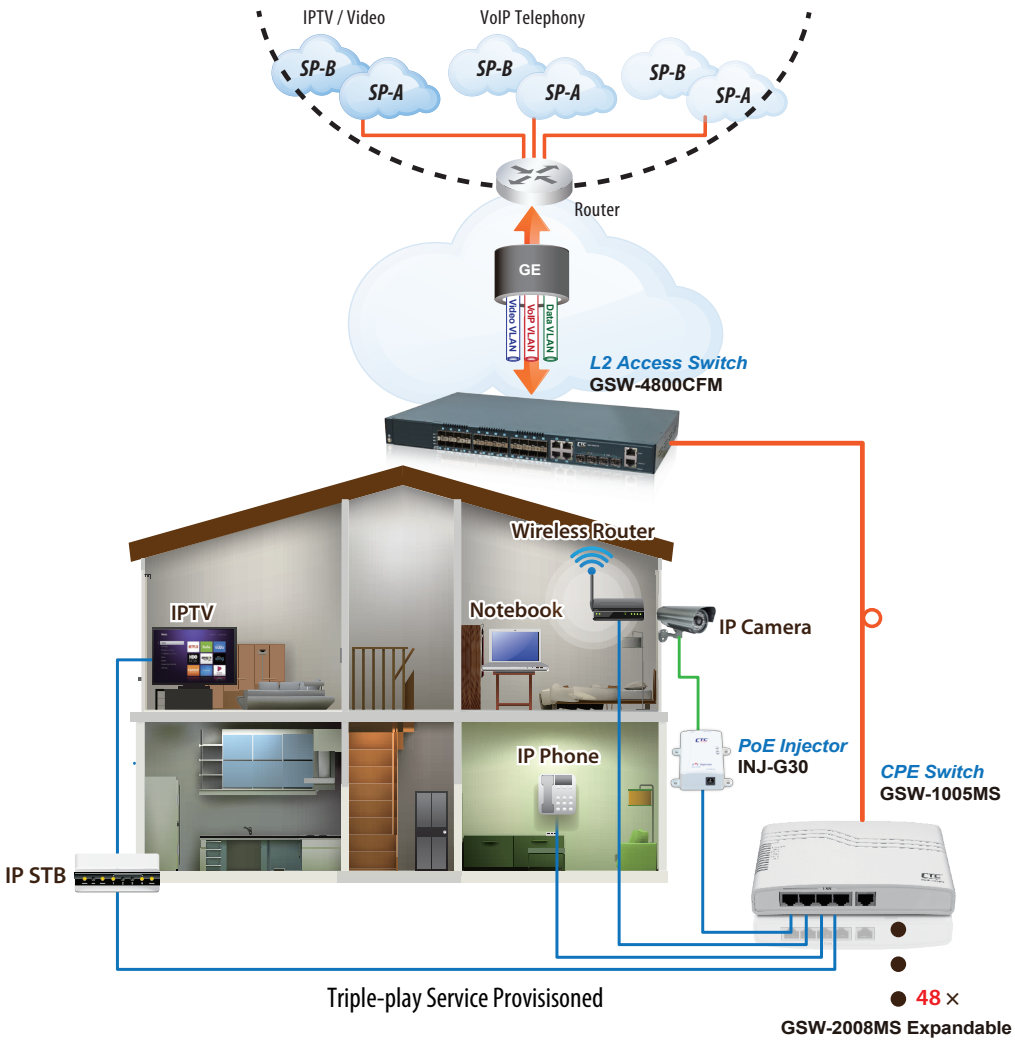
Specifications

Interface	5x 10/100/1000Base-T RJ-45 with 1x 100/1000Base-X SFP
Switching fabirc capacity	12Gbps
Packet forwarding capacity	8.928Mpps
Filter & Forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Transmission method	Store and Forward Switching
Standard	IEEE 802.3u, IEEE 802.3z, IEEE 802.3ae, IEEE 802.3x, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1x, IEEE 802.1ab, IEEE 802.3az
Packet buffer	4M bits
MAC table size	8K
Jumbo frame size	9600 Bytes
VLAN feature	IEEE 802.1Q tagged VLAN (Max. 4K VLAN groups)
	MAC based VLAN
	Protocol based VLAN
	Private VLAN for port isolation
	IP subnet based VLAN, Voice VLAN
	VLAN translation, IEEE 802.1ad Q-in-Q
QoS feature	IEEE 802.1p 8 priority queues per port, CoS based on switch port; VLAN ID; DSCP; TCP/UDP port
	IEEE 802.1p priority tag remarking, DSCP remarking, Port based ingress/egress rate limit
Security	Port based/single/multiple IEEE 802.1x access control
	MAC based access control authentication
	RADIUS authentication, limited MAC address learning
	IP/MAC binding, ACL rule based filtering
	TACACS+, DHCP snooping/relay option 82
	ARP inspection, IP source guard
IP multicasting	IGMP throttling, IGMP filtering, IGMP fast leave, IGMP snooping v1/v2/v3, MVR, MLD snooping v1
Storm Control	Unknown Unicast/Broadcast/Multicast storm suppression
Management	Web/Telnet CLI interface Web/CLI authentication SSH v2 HTTPs port mirroring

Management	system syslog IPv6 management NTP text based configuration upload or download, IEEE 802.1ab LLDP DHCP auto provisioning
SNMP agent	SNMP v1/v2c/v3, RMON Group 1,2,3 and 9
Software upgrade	TFTP/HTTP
Power Input	100v~240VAC power adapter
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	5% ~ 90% (non-condensing)
Dimensions	170 × 120 × 35mm (D x W x H)
Certification	FCC, CE

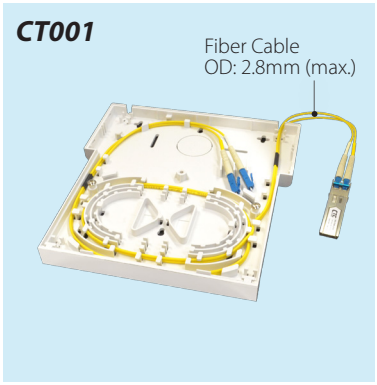
Application

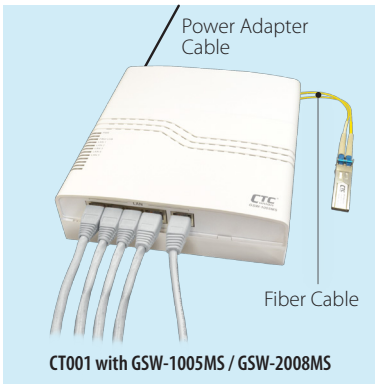
Fiber to the Home Triple-Play Application



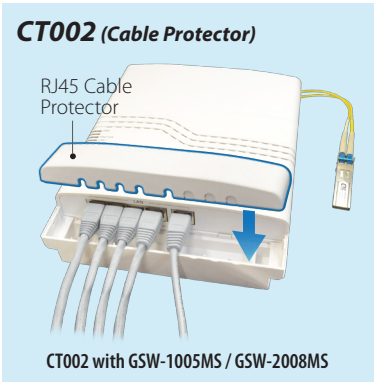
Cable Tray Assembly

CT001/CT002 is an optional fiber tray and mounting hardware for deploying GSW-1005/2008 for residential fiber to the home applications. CT001/CT002 tray options is wall mounted, allowing secure termination of fiber leads.





CT001 with GSW-1005MS / GSW-2008MS



CT002 with GSW-1005MS / GSW-2008MS

Ordering Information

Model Name	Description
GSW-1005MS	5-port 10/100/1000 Base-T to 100/1000 Base-X Managed GbE Ethernet Switch (cable tray optional)

Accessories

CT001	Cable Tray for GSW-1005MS/GSW-2008MS
CT002	Cable Tray & LAN cable protection cover for GSW-1005MS/2008MS

Dimensions (mm)

CT001

CT002

FSW-2104

4x FE, RJ45 + 1 or 2 x FE, Fiber Switch with AC Adapter

The FSW-2104 provides a low cost solution for non-managed Ethernet fiber switches. The FSW-2104 is a 4-port 10/100Base-TX plus 1-port 100Base-FX Fast Ethernet switch. FSW-2104 is designed for small workgroup applications that require a long distance connection to the backbone, such as between buildings, offices, or within a campus location. FSW-2104 provides full-duplex capability on each auto-negotiating port, for enhanced performance. A wide range of transceiver selection provides fiber connection with SC type connectors in multimode or single mode and at distance from 2 to 120km as well as BiDi (single fiber) at distances of 20, 40, 60, or 80km.

Features

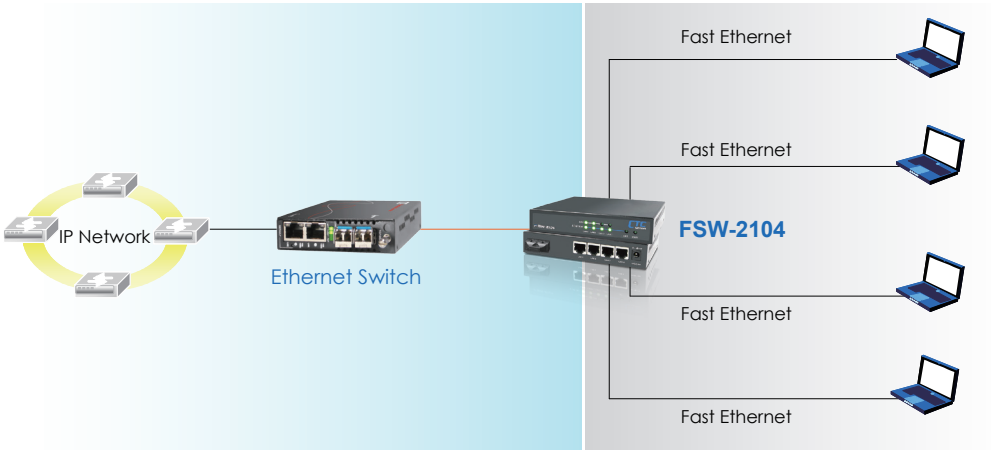
- 4x 10/100Base-TX and 1x 100Base-FX Switch
- Auto-Negotiation
- Auto MDI/MDIX
- Foward 1552 bytes (Max.) packets
- Supports 1K MAC address
- 512k bits packets buffer memory
- Supports broadcast storm protection

Specifications

Optical Interface	Connector	1x9 (SC)
	Data rate	100Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Standards	IEEE802.3, IEEE802.3u	
Indications	LED (FX-Link, TX SPD, TX-Link/Act)	
Power Consumption	< 4W	

Dimensions	138 x 77 x 28mm (D x W x H) (FSW-2104) 215 x 91.3 x 29mm (D x W x H) (FSW-2104-AD)	
Weight	450g (FSW-2104), 550g (FSW-2104-AD)	
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP,
		100Base-TX Cat.5, 5e or higher
Power Input	AC	100~240VAC
	DC	18~60VDC
Temperature	0 ~ 50°C (Operating), 0 ~ 70°C (Storage)	
Humidity	10 ~ 90% non-condensing	
Certification	CE, FCC	
MTBF	65,000 hrs	

Application



Ordering Information

Model Name	Description
FSW-2104	4x 10/100Base-TX and 100Base-FX Switch with AC Power Adapter
FSW-2104-AD	4x 10/100Base-TX and 100Base-FX with AC+DC Built-in Power

Connector Type	Connectivity Distance
SC	002: 2km 015: 15km 030: 30km

Connector Type / Connectivity Distance

FSW – 2104 – □□□□□ – AD

Example: FSW – 2104 – SC002 - AD

GW-732FW

Gigabit Fiber IAD with IEEE 802.11ac WiFi

The GW-732FW is a new generation single mode Fiber and VoIP-based IAD (Internet Access Device), which is designed to interoperate with end-to-end fiber from major vendors to meet the worldwide market requirements of triple-play services. It is Class 1 laser product complying with EN 60825-1. The integrated Ethernet switch features automatic crossover-correction and auto-negotiation for easy connection to user's PCs or LAN environment. The GW-732FW model also features a built-in IEEE 802.11ac WiFi which brings relief to troublesome home network wirings. Two lines of telephony service are provided using VoIP technology with SIP signaling protocol.

Features

Voice Features

- G.711 a/μ-law, G.729A/B, G.726, G.723.1
- DTMF Detection and Generation
- Silence Suppression & Detection
- Comfort Noise Generation (CNG)
- Voice Activity Detection (VAD)
- Echo Cancellation (G.165/G.168)
- Dynamic Jitter Buffer
- Call progress tone generation (FXS)
- Programmable Gain Control
- Inbuilt Local Mixer

SIP Method Support

- ACK, BYE, CANCEL, INFO, INVITE, MESSAGE, NOTIFY,OPTIONS, PING,
- PRACK, PUBLISH, REFER, REGISTER, SUBSCRIBE, UPDATE

SIP Call Features

- Peer to Peer Call
- Call Hold / Retrieve
- Call Waiting
- Call Pick Up
- Call Park / Retrieve (SIP Server Required)
- Call Forward - unconditional, busy, no answer
- Call Transfer - attended, unattended
- Do Not Disturb
- Speed Dialing
- Repeat Dialing
- Three-way Calling
- MWI (RFC-3842)
- Hot Line and Warm Line

IPTV Application

- IGMP Snooping
- Virtual LAN (VLAN)
- Quality of Service (QoS)

SIP Call Management

- Support Outbound Proxy
- SIP Registration Failover Mechanism
- Group Hunting
- Privacy Mechanism / Private Extensions to SIP
- Session Timers (Update / Re-invite)
- DNS SRV Support
- Call Types: Voice / Modem / FAX
- User Programmable Dial Plan Support
- Automatic Calling Number Manipulation
- CDR Client
- Manual Peer Table (for P2P calls)
- E.164 Numbering, ENUM support

SIP Account Management

- By port registration
- By device registration (share account)
- Mixed mode (Hunt number for inbound, by port number for outbound)
- Invite with Challenge
- Register by SIP Server IP Address or Domain Name
- Support RFC3986 SIP URI format

Telephony Specifications

- In-Band DTMF, Out-of-Band DTMF Relay (RFC2833 or SIP INFO)
- DTMF / PULSE Dial Support
- Caller ID Generation / Detection:
  - DTMF
  - FSK-Bellcore Type 1 & 2
  - FSK-ETSI Type 1 & 2
  - FSK-NTT
  - FSK: Calling Name, Number, Date and Time, vMWI
- FXS metering pulse:
  - Polarity Reversal
  - 12kHz calling tone
  - 16kHz calling tone
- Polarity Reversal Generation (FXS)
- T.30 FAX Bypass to G.711, T.38 Real Time FAX Relay
- ROH Tone (Receiver Off-Hook Tone @ 480 Hz)
- Loop Current Suppression

Wireless

- Compliant with IEEE802.11b/g/n/ac, 2.4G/5G concurrent operation
- Operating frequency 2.4 G/5 GHz
- Auto rate adaptive
- Multi-SSID
- Broadcast SSID control
- 64 / 128 bits WEP supported for encryption
- Wireless Security with WPA-PSK / WPA2-PSK
- WDS repeater function
- Wi-Fi Multi-Media (WMM) for AP mode
- WPS (Wi-Fi Protected Setup) for easy setup

Physical interface

- Combo WAN : GbE Ethernet copper or fiber SFP
- LAN : 4-Port RJ-45 10/100/1000 Ethernet
- Antenna : 2 x 2dBi detachable antenna
- Telephone:2-port FXS
- Factory default reset button, WPS push button, Power jack, Power switch
- USB 2.0 Host interface x2

LED Indicators

- Power, Provision/Alarm, Register, WAN, WLAN, LAN1~LAN4, USB, Phone off-hook 1~2, WPS

Network Security Specifications

- DIGEST Authentication
- MD5 Encryption
- DoS Protection (configurable)
- Firewall: MAC filter, IP/Port filter, URL filter

Device Management

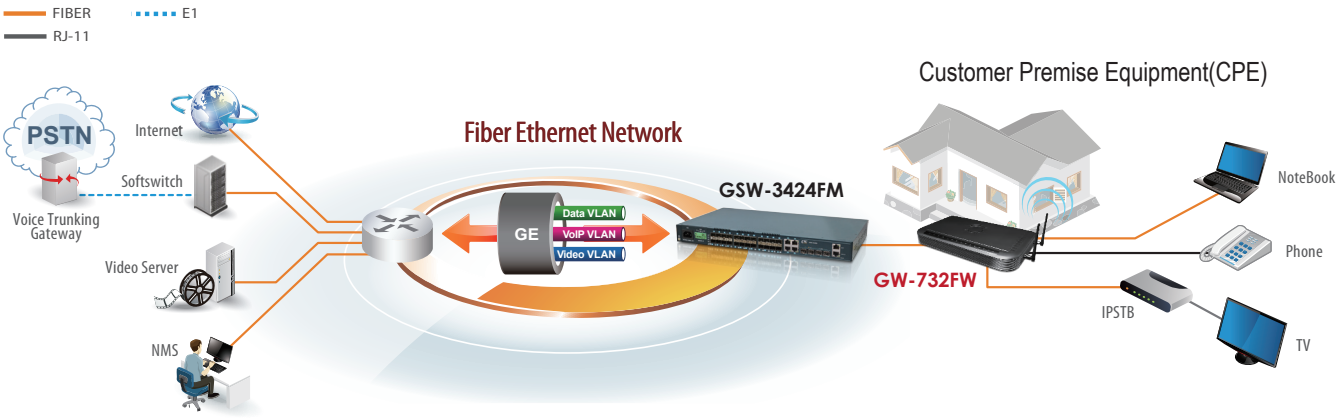
- WEB, TELNET
- TR-069, TR-098, TR-104, TR-111
- ACS info via DHCP options
- Two levels WEB login account
- WEB languages: English, TC
- System Information
- Per call RTP packet summary
- PING inquiry
- Syslog

Specifications

Protocol	SIP (RFC3261)
Model	2FXS
Combo WAN	GbE Ethernet copper or fiber (SFP)
LAN	4-port RJ-45 10/100/1000M Ethernet
Wi-Fi	IEEE 802.11b/g/n/ac, 2.4G/5G concurrent operation
Telephony Interface	RJ-11 connector
Power	AC 100~240V 50/60Hz input, DC 12V/2A output

Power Consumption	< 15W
Dimensions	155 x 226 x 80mm(D x W x H)
Weight	480g
Temperature	0 ~ 45°C (Operating), -25~ 75°C (Storage)
Humidity	Up to 90% RH, non-condensing
Certification	CE, FCC
MTBF	57,000 hours

Application



Ordering Information

Model Name	Description
GW-732FW	Fiber IAD Gateway with IEEE 802.11ac Wi-Fi

New

GSW-3224MP

24x GbE, RJ45+ 2 Dual Rate SFP
L2 Managed PoE Switch

The GSW-3224MP is 24-port 10/100/1000M PoE + 2 Gigabit SFP/RJ45 Copper Combo Ports L2+ Full Managed Switch that is designed for small or medium network environment to strengthen its network connection. The 24 PoE ports support IEEE 802.3at/af PoE technology up to 30W per port and maximum 100m transmission distance. The switch equipped with AC to DC power module to support 450W power budget for PoE power. The added 2 SFP/RJ45 combo ports support 100M and Gigabit Fiber transceiver for long distance transmission. The switch also supports Layer 2+ full management software features. These features are powerful to provide PoE Control, Network Control, Management, Monitor and Security features' requests. It is the best choice to boost your network with better performance, efficiency and high PoE power consumption.

When the function called "PD alive check" is enabled, GSW-3224MP will detect a network PoE powered device (for example, an IP CAM) with a set of IP address periodically. If the switch doesn't get any replies from the network PoE powered device, GSW-3224MP will do a power cycle (PoE power OFF, and PoE power ON) to the port that connects the network PoE powered device, allowing that device to reboot. You can set the frequency of detecting, number of times of detecting, and the time period to perform power cycle when there's no reply via the switch's PoE configuration web page.

Features

- 24-port 10/100/1000M PoE + 2 Gigabit SFP/RJ45 Copper Combo Ports
- IEEE 802.3at/af PoE, up to 30W per port
- Layer 2+ Full Managed Software Features with MSTP, LACP, LLDP, sFlow, 802.1X, TACACS+, and ACL
- DHCP Server/Relay/Snooping
- PD Alive Check
- Automatically adjust Fan speed function

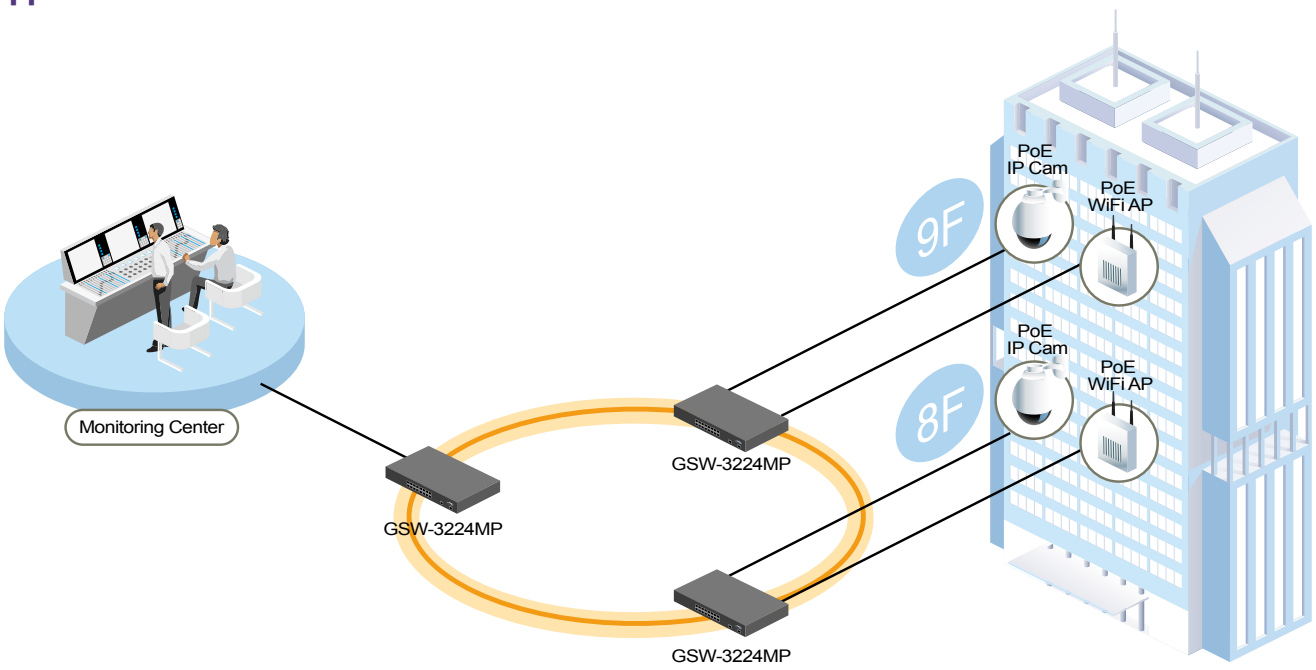
Specifications

Interface	
10/100/1000 Base-T	24
100/1000Base-X SFP & 1000M RJ45 Combo Port	2
Console Port for CLI Management	1
System Performance	
Packet buffer	4M bits
MAC Table size	8K
Switching Capacity	52Gbps
Forwarding Rate	38.688Mbps
PoE Features	
IEEE802.3 af/at	IEEE802.3af & IEEE802.3at
Number of PoE Ports	24
Max. Power Budget	450Watts
Max. System Power Consumption	70Watts
Max. Totoal Power Consumption	520Watts
External/Internal Power	Internal Power
Power Feeding Detecting Capabillity on PD	
PD Alive Check	
PD Classification	
Power Management (Per Port)	Enable/Disable PoE Per Port
	Priority Setting Per Port
	Power Level Setting Per Port
	Overloading Protection
L2 Features	
Auto-Negotiation	
Auto MDI/MDIX	
Flow Control (Duplex)	802.3x (Full)
	Back-Pressure (Half)

Spanning Tree	IEEE802.1D (STP)
	IEEE802.1W (RSTP)
	IEEE802.1S (MSTP)
VLAN	VLAN Group : 4K
	Tagged Based
	Port Based
	Voice VLAN : Voice VLAN with OUI
Link Aggregation	IEEE 802.3ad with LACP
	Static Trunk
	MAX. LACP Link Aggregation Group
	Max. Port Per Link Aggregation Group
IGMP Snooping	IGMP Snooping v1/v2/v3 : Supports 1024 IGMP groups
	IGMP Static Multicast Addresses : Supports 1024 Static Multicast addresses
	IPv6 MLD Snooping : Supports 1024 NLD group
	MLD Static Multicast Addresses : Supports 1024 Static Multicast addresses
	Querier Immediate Leave
Storm Control (Broadcast/Multi-cast/UnKnow Unicast)	
Jumbo Frame Support	9.6KB
Qos Features	
Number of Priority Queue	8 queue/port
Rate Limiting	Ingress : Yes, 1KBps/1pps
	Egress : Yes, 1KBps/1pps
Diffserv (RFC2474 Remarking)	
Scheduling (WRR, Strict, Hybrid)	
CoS	IEEE 802.1p
	IP Tos Precendence, IP DSCP

Security	
Management System User Name/Password Protection	
User Previllege	Set User Previllege up to 15 level
Port Security (MAC-based)	
IEEE 802.1x Port-based Access Control	
ACL (L2/L3/L4)	
IP Source Guard	
RADIUS (Authentication, Authorization, Accounting)	
TACACS+	
HTTP & SSL (Secure Web)	
SSH v2.0 (Secured Telnet Session)	
MAC/IP Filter	
Management	
Command Line Interface (CLI)	
Web Based Management	
Telnet	
Access Management Filtering	SNMP/Web/SSH/Telnet
Firmware Upgrade via HTTP	
Dual Firmware Images	
Configuration Download/Upload	
SNMP (v1/v2c/v3)	
RMON (1,2,3 & 9 groups)	
DHCP (Client/Relay/Option82/Snooping)	
System Event/Error Log	
NTP/LLDP	
Cable Diagnostics	
IPv6 Configuration	
Port Mirroring	One to One or Many to One
Mechanical	
Power Input	100~240VAC
Dimension	44 x 440 x 331mm (H x W x D)
LED	Power, PoE, Link/Act, SFP
Operating Temperture	0~45°C
Storage Temperture	-20~80°C
Operating Humidity	5~90% (non-condencing)
Weight	4.8kg
Certification	VCCI, CE, FCC Class A

Application



Ordering Information

Model Name	Description
GSW-3224MP	24 ports 10/100/1000Base-T + 2 ports GbE Combo (SFP or RJ45) L2+ Managed PoE Switch

GSW-3216MP

16x GbE, RJ45+ 2 Dual Rate SFP
L2 Managed PoE Switch

The GSW-3216MP is a cost-effect high performance Gigabit L2 PoE+ switch with 16x 10/100/1000Mbps TX ports and 2x SFP ports. This switch supports remote management by SNMP, Http/Https or Telnet/SSH, and local management by console interface. Console interface is supported for some basic settings using CLI commands. The GSW-3216MP supports many L2 switch functions, e.g. 802.1Q VLAN, 802.1x Port Security, Rate Control, Port Configuration, Port Mirroring, Port Statistics, QoS functions, etc. Auto-MDIX function is supported for every TX port of the switch for easy cable connection. The GSW-3216MP is compliant with IEEE802.3af and 802.3at. The 16x 10/100/1000Mbps TX ports are selectable to provide up to 15.4 or 30 watts power to connect PoE supported devices.

Features

- 16x RJ45 ports, with 10/100/1000Mbps
- 2x Dual Speed SFP sockets, Port17 and Port18
- Port 1 ~ Port 16 support PSE function
- IPv6 management
- 8 priority queues are supported on each port for QoS application
- Private VLAN, 802.1Q VLAN, Voice VLAN and Q-in-Q(double tagging) function
- Protected port and Loop Detection function
- IEEE 802.1x security function, and VLAN assignment, Guest VLAN functions
- Static Mac address access limit and Dynamic Mac address number on port
- IEEE802.1d & 802.1w & 802.1s
- IP Multicast with IGMP snooping / query / fast leave / filtering / group limited /MVR
- DHCP Client / DHCP Option 82 Relay / DHCP Snooping function
- ACL function for L2 ~ L4 packet control
- Ingress/Egress rate control on port
- Broadcast/Multicast/Unknown Unicast storm control
- ARP inspection / IP source guard
- RMON 1,2,3,9
- SFP Transceiver DDMI function / Dual Speed SFP Ports(100/1000Mbps)
- Remote port configuration setting and statistics monitoring
- Text based CLI configuration download and upload
- IEEE 802.3az power management

Specifications

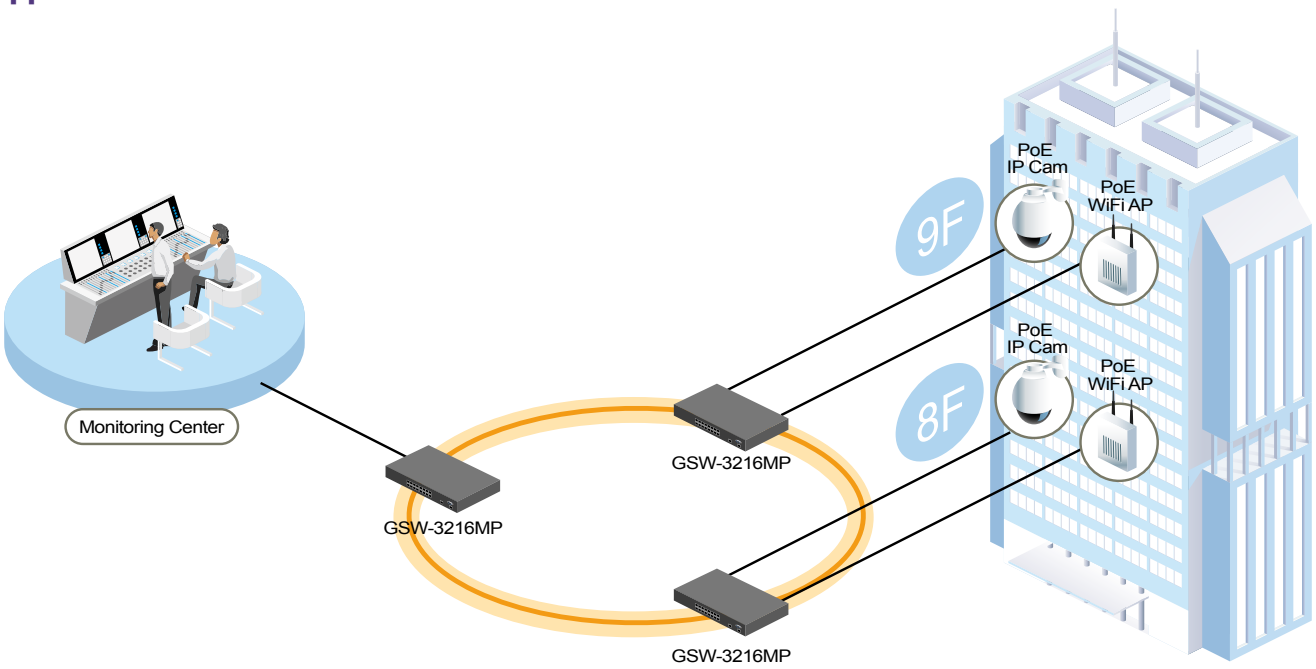
System	
10/100/1000 BASE-T	16
100/1G SFP Slot	2 (Port 17, Port 18)
CPU	416MHz MIPS 24KEc CPU as the main processor which integrated on switch controller
Memory	Flash : SPI 16MB / RAM:DDRII 128MB
Packet buffer	4M bits
MAC Table size	8K
Filter & forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric capacity	36Gbps
PoE Standard	IEEE802.3af & IEEE802.3at
PoE Ports	16 Ports(Port 1 ~ Port 16) Per Port 56V DC, 350mA . Max. 15.4Watts Per Port 56V DC, 600mA . Max. 30Watts
PoE Power Budget	150Watts
Power PIN Assignment	1/2(-), 3/6(+)
Console port	D-Sub 9
19" Rack-Mount	Yes, with kits
SFP DDMI	Yes
Dimension	330mm x 204mm x 44mm
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	10% ~ 90% (non-condensing)
LED Display	Per Port : Link/Act , PoE Act Per Device : Power, System
Power Input	AC Power input (100V~240V)

Software	
Port Control	Port speed, duplex mode, and flow control Port Auto MDI/MDI-X Port frame size (jumbo frames), Maximum ingress frame size (10056 bytes) Port state (administrative status) Port status (link monitoring) Port statistics (MIB counters)
L2 Switching	Auto MAC address learning/aging and MAC addresses (static) DHCP snooping ARP inspection Port Mirroring Flow mirroring
L3 Switching	DHCP option 82 relay IPv4 Unicast: Static routing
VLANs	IEEE 802.1Q static VLAN(4096 entries Max.), Voice VLAN, Port isolation, Private VLAN Static, MAC based VLAN, Protocol based VLAN, IP subnet based VLAN, GVRP
Spanning Tree	IEEE 802.1s MSTP(Multiple spanning tree) IEEE 802.1w RSTP(Rapid spanning tree) IEEE 802.1D STP(Spanning tree) BPDU Guard & Restricted Role
Link Aggregation	Static and LACP
IP Multicast	IGMP v2 and v3 snooping MLD v1 snooping IGMP filtering profile IPMC throttling, filtering, leave proxy MVR and MVR profile

QoS	Traffic Classes (8 active priorities) Port Default Priority, User Priority, Input priority mapping QoS Control List (QCL Mode) Storm Control for UC, BC and Unknown unicast Port policers Global/VCAP (ACL) policers Port egress shaper Queue egress shapers DiffServ (RFC2474) remarking Tag remarking Scheduler mode
Security	Port-Based 802.1X, Single 802.1X, Multiple 802.1X, MAC-Based Authentication VLAN Assignment , QoS Assignment, Guest VLAN RADIUS Accounting MAC Address Limit IP MAC binding, IP/MAC binding dynamic to static TACACS+ Web & CLI Authentication Authorization (15 user levels) ACLs for filtering/policing/port copy IP source guard

Synchronization	NTPv4 Client
SFP DDMI	Yes
Management	DHCP Client, DNS client, proxy HTTP Server CLI - Console Port & Telnet Text Configuration download or upload Management access filtering HTTPS SSHv2 IPv6 Management System Syslog Software Upload via web SNMP v1 / v2c / v3 Agent RMON (Group 1, 2, 3 & 9) RMON alarm and event(CLI,web) SNMP multiple trap destinations IEEE 802.1AB-2005 Link Layer Discovery LLDP Cisco Discovery filtering - CDP sFlow Daylight Saving

Application



Ordering Information

Model Name	Description
GSW-3216MP	16 ports 10/100/1000Base-TX + 2 ports GbE SFP slot L2+ Managed PoE Switch

GSW-3208MP

8x GbE, RJ45+ 2 Dual Rate SFP
L2 Managed PoE Switch

The GSW-3208MP is a cost-effect high performance Gigibit L2 PoE+ switch with 8x10/100/1000Mbps TX ports and 2x SFP ports. This switch supports remote management by SNMP, Http/Https or Telnet/SSH, and local management by console interface. Console interface is supported for some basic settings using CLI commands. The GSW-3208MP supports many of L2 switch functions, e.g. 802.1Q VLAN, 802.1x Port Security, Rate Control, Port Configuration, Port Mirroring, Port Statistics, QoS functions, etc. Auto-MDIX function is supported for every TX port of the switch for easy cable connection. The GSW-3208MP is compliant with IEEE802.3af and 802.3at. The 8x10/100/1000Mbps TX ports are selectable to provide up to 15.4 or 30 watts power to connect PoE supported devices.

Features

- 8x RJ45 ports, with 10/100/1000Mbps
- 2x Dual Speed SFP sockets, Port 9 and Port 10
- Port 1 ~ Port 8 support PSE function
- IPv6 management
- 8 priority queues are supported on each port for QoS application
- Private VLAN, 802.1Q VLAN, Voice VLAN and Q-in-Q(double tagging) function
- Protected port and Loop Detection function
- IEEE 802.1x security function, and VLAN assignment, Guest VLAN functions
- Static Mac address access limit and Dynamic Mac address number on port
- IEEE802.1D & 802.1w & 802.1s
- IP Multicast with IGMP snooping / query / fast leave / filtering / group limited /MVR
- DHCP Client / DHCP Option 82 Relay / DHCP Snooping function
- ACL function for L2 ~ L4 packet control
- Ingress/Egress rate control on port
- Broadcast/Multicast/Unknown Unicast storm control
- ARP inspection / IP source guard
- RMON 1,2,3,9
- SFP Transceiver DDMI function / Dual Speed SFP Ports(100/1000Mbps)
- Remote port configuration setting and statistics monitoring
- Text based CLI configuration download and upload
- IEEE 802.3az power management

Specifications

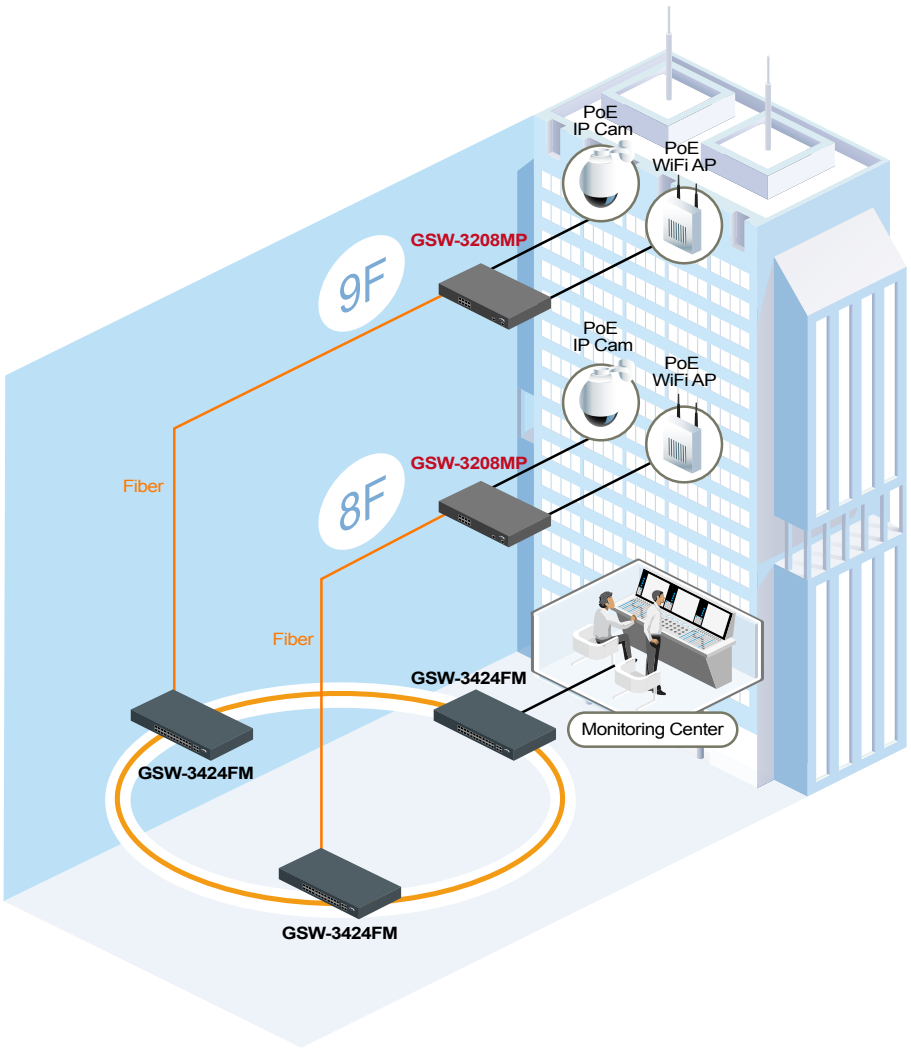
System	
10/100/1000 BASE-T	8
100/1G SFP Slot	2 (Port 9, Port 10)
CPU	416MHz MIPS 24KEc CPU as the main processor which integrated on switch controller
Memory	Flash : SPI 16MB / RAM:DDRII 128MB
Packet buffer	4M bits
MAC Table size	8K
Filter & forward rate	14880pps at 10Mbps, 148800pps at 100Mbps, 1488000pps at 1Gbps
Switching Fabric capacity	20Gbps
PoE Standard	IEEE802.3af & IEEE802.3at
PoE Ports	8 Ports(Port 1 ~ Port 8) Per Port 56V DC, 350mA . Max. 15.4Watts Per Port 56V DC, 600mA . Max. 30Watts
PoE Power Budget	150Watts
Power PIN Assignment	1/2(-), 3/6(+)
Console port	D-Sub 9
19" Rack-Mount	Yes, with kits
SFP DDMI	Yes
Dimension	330mm x 204mm x 44mm
Operating Temperature	0 ~ 50°C
Storage Temperature	-25 ~ 70°C
Humidity	10% ~ 90% (non-condensing)
LED Display	Per Port : Link/Act , PoE Act Per Device : Power, System
Power Input	AC Power input (100V~240V)

Software	
Port Control	Port speed, duplex mode, and flow control Port Auto MDI/MDI-X Port frame size (jumbo frames), Maximum ingress frame size (10056 bytes) Port state (administrative status) Port status (link monitoring) Port statistics (MIB counters)
L2 Switching	Auto MAC address learning/aging and MAC addresses (static) DHCP snooping ARP inspection Port Mirroring Flow mirroring
L3 Switching	DHCP option 82 relay IPv4 Unicast: Static routing
VLANs	IEEE 802.1Q static VLAN(4096 entries Max.), Voice VLAN, Port isolation, Private VLAN Static, MAC based VLAN, Protocol based VLAN, IP subnet based VLAN, GVRP
Spanning Tree	IEEE 802.1s MSTP(Multiple spanning tree) IEEE 802.1w RSTP(Rapid spanning tree) IEEE 802.1D STP(Spanning tree) BPDU Guard & Restricted Role
Link Aggregation	Static and LACP
IP Multicast	IGMP v2 and v3 snooping MLD v1 snooping IGMP filtering profile IPMC throttling, filtering, leave proxy MVR and MVR profile

QoS	Traffic Classes (8 active priorities) Port Default Priority, User Priority, Input priority mapping QoS Control List (QCL Mode) Storm Control for UC, BC and Unknown unicast Port policers Global/VCAP (ACL) policers Port egress shaper Queue egress shapers DiffServ (RFC2474) remarking Tag remarking Scheduler mode
Security	Port-Based 802.1X, Single 802.1X, Multiple 802.1X, MAC-Based Authentication VLAN Assignment , QoS Assignment, Guest VLAN RADIUS Accounting MAC Address Limit IP MAC binding, IP/MAC binding dynamic to static TACACS+ Web & CLI Authentication Authorization (15 user levels) ACLs for filtering/policing/port copy IP source guard

Synchronization	NTPv4 Client
SFP DDMI	Yes
Management	DHCP Client, DNS client, proxy HTTP Server CLI - Console Port & Telnet Text Configuration download or upload Management access filtering HTTPS SSHv2 IPv6 Management System Syslog Software Upload via web SNMP v1 / v2c / v3 Agent RMON (Group 1, 2, 3 & 9) RMON alarm and event(CLI,web) SNMP multiple trap destinations IEEE 802.1AB-2005 Link Layer Discovery LLDP Cisco Discovery filtering - CDP sFlow Daylight Saving

Application



Ordering Information

Model Name	Description
GSW-3208MP	8 ports 10/100/1000Base-TX + 2 ports GbE SFP slot L2+ Managed PoE Switch

FMC-1000S-PH

10/100/1000Base-T to 100/1000Base-X SFP with PoE+ (PSE) Fiber Converter

FMC-1000S-PH is an unmanaged Gigabit Ethernet media converters that support conversion between electrical 10/100/1000Base-T and optical 1000Base-X Ethernet and as PSE (Power Source Equipment) provide PoE+ power over Ethernet. FMC-1000S-PH provides an SFP cage for 100/1000Base-X compatible SFP modules.

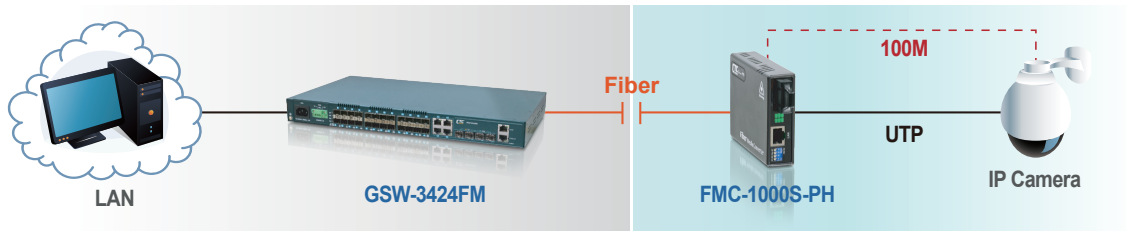
Features

- Conversion between 10/100/1000Base-T and 100/1000Base-X
- Supports dual rate (100/1000) SFP for selectable Fast or Gigabit speed on fiber
- PoE output voltage upto 55VDC
- Supports IEEE802.3at/af PoE, output 30Watts Power Budget
- Supports LFPT (Link Fault Pass Through)
- Supports DIP SW for setting LFPT, Switch or Converter mode, SFP speed
- Wall Mount and compact size for easy installation
- Supports Jumbo frame 9K bytes packet

Specifications

Standard	IEEE802.3 10Base-T, IEEE802.3u 100Base-T(X) IEEE802.3u 100Base-FX, IEEE802.3ab 1000Base-T(X) IEEE802.3z 1000Base-SX/LX IEEE802.3x Flow Control and Back pressure IEEE802.3at Power over Ethernet + PoE+ IEEE802.3af Power over Ethernet, PoE
RJ45 Ports	10/100/1000Base-T
Fiber Ports	100/1000Base-X SFP
Data process Architecture	Store and Forward mode or Pass through mode set by DIP SW
Jumbo Frame	9K bytes
Fiber parameters	Fiber Cable (Multi-mode): 50/125um,62.5/125um Fiber Cable (Single-mode):9/125um Wavelength: 1310nm (Multi-mode/Single-mode) Available distance: 500M (Multi-mode SX) 20/40KM (Single-mode) SFP, Distance depend on plug-in Fiber Transceiver
Link Fault Pass through (LFPT)	TX-- Fiber: If TX port link down, the media converter will force Fiber port to link down Fiber--TX: If Fiber port link down, the media converter will force TX port to link down
DIP Switch	Off : LFPT Disable On: LFPT Enable Data process Architecture Off : Store and Forward Switch mode On : Pass through mode Fiber Mode: Off: Auto On: Force SFP Fiber Speed Off: 1000BaseX On: 100Base X
Connector and Pin assignment	SFP Slot RJ-45 Socket: CAT-3/5 (10/100Mbps) Twisted Pair cable Auto MDI/MDI-X and Auto-Negotiation Function Support
Connector and Pin assignment	RJ-45 port support IEEE 802.3at/af End-Span, Alternative A mode. Positive (V+): RJ-45 pin 1, 2 Negative (V-): RJ-45 pin 3, 6 Data : 1, 2, 3, 6, 4, 5, 7, 8
LED	Per Unit: Power (Green) Fiber LNK/ACT (Green) RJ-45 port: 100LK/Act (Green), 1000LK/Act (Green) Dup/Col (Green) PoE Status (Green): Flash: PoE Fault (Over-load or short) On: PoE normal working Off : PoE No Power output
Power Input	48V~57VDC Input (Ship with 56VDC Power Adapter)
Power Apapter	Input 100/110/120/220/240 VAC (Wide Range) Output 36W, 56VDC
PoE output voltage	55VDC
PoE Power Budget	30W (Maximum)
Power Consumption	Maximum 35.4W (include PoE power budget 30W)
Operating Humidity	10 ~ 90% non-condensing
Operating Temperature	0°C ~ 50°C
Storage Temperature	-40°C ~ 85°C
Housing	Plastic
Dimension	108 x 23 x 74mm (D x W x H)
Weight	80g
Installation	Desk top or Wall Mounting (Optional)
EMC	FCC Class A, CE
MTBF	749556

Application



Ordering Information

Model Name	Description
FMC-1000S-PH	10/100/1000Base-T to 100/1000Base-X SFP With PoE+ (PSE) Fiber Converter (30W)
FMC-1000S-PH-WM	10/100/1000Base-T to 100/1000Base-X SFP With PoE+ (PSE) Fiber Converter (30W) with wall mount kit

Wall-Mount Type

Non Wall-Mount Type

FMC – 1000S-PH- (Wall-Mount Kits) □□ – (Connect Type) □□□□

Example: FMC – 1000S-PH- WM – SC002

IFC-1000PSE/A

100/1000Base-T to 1000Base-X SFP
PoE PSE Converter with Adapter

The IFC-1000PSE/A is a copper to fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-T to 1000Base-SX/LX with SFP LC connector. The IFC-1000PSE complies with IEEE802.3af Power Over Ethernet standard with external AC power adapter or internal AC power build-in. This PoE media converter is a Power Sourcing Equipment (PSE) which combines data received over a TP link with 48VDC power, providing power to IEEE802.3af powered device (PD) over the existing CAT5 UTP cable. Other features include Link fault Pass-Through (LFPT), Store and Forward Switching, auto or forced mode setting for copper Ethernet as well as auto laser shutdown.

Features

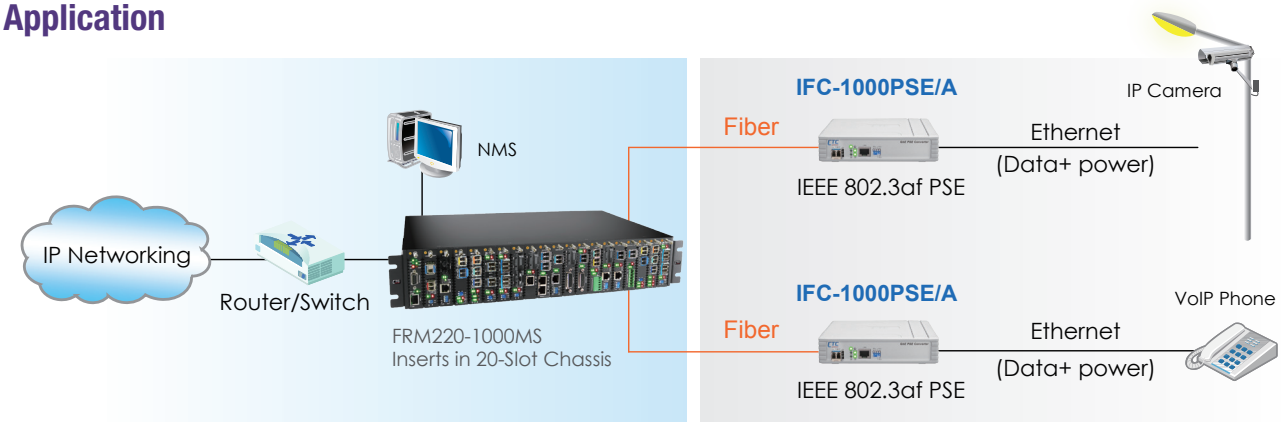
- 10/100/1000Base-T to 1000Base-SX/LX SFP
- IEEE 802.3af Compliant PSE (power sourcing equipment)
- Auto-negotiation or forced mode
- Auto MDI/MDIX
- Store and Forward Switching Mechanism
- Supports 4K MAC address
- Supports 256K Byte Packet Buffer
- Forward 1632 bytes (max.) packets
- Supports Link fault Pass-Through (LFPT) function

Specifications

Optical Interface	Connector	SFP LC
	Data rate	1250Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm.
		SM 9/125μm
	Distance	MM 550m, 2km, SM 15/30/50/80/120km
		WDM 20/40/60km
	Wavelength	MM 1310nm, SM 1310,1550nm
		WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mbps, 1000Mbps
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat 3, 4, 5, UTP
		100Base-TX Cat 5, 5e or higher
		1000Base-T Cat 5, 5e or higher

PSE Output Power	Class 0: 15.4w Class 1: 4w Class 2: 7w Class 3: 15.4w
Standards	IEEE 802.3, 802.3u, 802.3ab, 802.3z, 802.3af,802.3x
Indications	LED (Power, FX-Link, FX Duplex, TX-SPD, TX-Duplex, TX-Link)
Power Input	100 ~ 240VAC, -48VDC
Power Consumption	< 5W (w/o PSE Output Power)
Dimensions	201 x 135 x 35mm (D x W x H)
Weight	0.58kg
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	75,000 hrs

Application



Ordering Information

Model Name	Description
IFC-1000PSE/A	GE PoE PSE media converter with DC 48V in AC adapter
IFC-1000PSE-AC	GE PoE PSE media converter with built-in AC power 100 ~240V
IFC-1000PSE-DC	GE PoE PSE media converter with built-in DC Power -48V

IFC – □□□□□□□ – □□ (Interface / Power Type)

Example: IFC – 1000PSE– AC

IFC-100PD

10/100Base-TX to 100Base-FX PoE PD Media Converter

The IFC-100PD is Power over Ethernet 10/100Base-TX to 100Base-FX non-managed PD(Power Device) Fiber converter, which give you the options to choose from the most popular fiber cabling connectors, ST, SC, FC. Both multi-mode and single mode converter models are available as well as BiDi which allows bi-directional transmissions using only a single fiber cable. With Power over Ethernet (PoE) feature, IFC-100PD takes power supply over Ethernet cable from PoE Ethernet Switch and may work without external power adapter. When auto-negotiation is selected, these units will automatically tailor themselves to convert both half-duplex and full-duplex signals, according to IEEE802.3u standards. LED indicators signal the power status of the converter, UTP port speed, Link, and duplex status, FX port Link and duplex status. The stand-alone converter may also be concentrated into either the FMC-CH08 or FMC-CH17 non-managed chassis.

Features

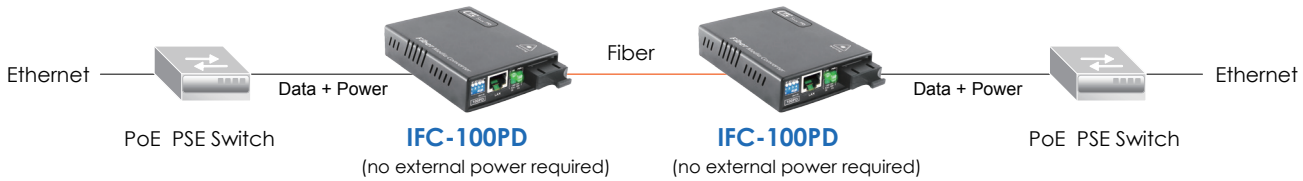
- 10/100Base-TX to 100Base-FX Converter
- Auto-Negotiation or forced mode
- Auto MDI/MDIX
- Forward 1600 bytes (Max.) packets
- Supports Q in Q double tagged frame transparent
- Supports IEEE 802.1Q Tag VLAN pass thru
- Supports flow control (Pause)
- Supports Link Fault Pass-Through (LFPT)
- Forward 9K jumbo packets in converter mode
- Supports IEEE802.3af Power over Ethernet

Specifications

Optical Interface	Connector	1x9 (SC, ST, FC)
	Data rate	125Mbps
	Duplex mode	Full duplex
	Fiber	MM 50/125μm, 62.5/125μm
		SM 9/125μm
	Distance	MM 2km, SM 15/30/50/80/120km
		WDM 20/40/60/80km
	Wavelength	WDM 1310Tx/1550Rx (type A)
		1550Tx/1310Rx (type B)
		1550Tx/1310Rx (type B)
Electrical Interface	Connector	RJ-45
	Data rate	10Mbps, 100Mpbs
	Duplex mode	Half / Full duplex
	Cable	10Base-T Cat.3, 4, 5, UTP,
		100Base-TX Cat.5, 5e or higher
		1000Base-T Cat 5, 5e or higher
	PD Input Power	48VDC

Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3af
Indications	LED (Power, FX Link, TX SPD, TX Link, TX Duplex, FEF)
Power Input	FMC: DC 12V In
Power Consumption	< 4W
Dimensions	108 x 74 x 23mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC
MTBF	65,000 hrs

Application



Ordering Information

Model Name	Description
IFC–100PD	10/100Base-TX to 100Base-FX PoE PD media converter

Connector Type	Connectivity Distance
SC, ST, FC	002: 2km 015: 15km 030: 30km 050: 50km 20A: WDM 20km A type 20B: WDM 20km B type 40A: WDM 40km A type 40B: WDM 40km B type

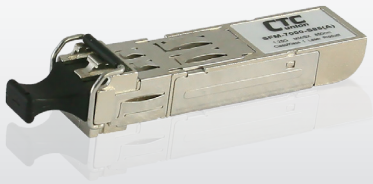
Connector Type / Connectivity Distance

IFC – 100PD – □□□□□

Example: IFC – 100PD – SC002

SFP Fiber Tansceiver

Hot-Pluggable Fiber Transceiver Modules



SFP+ and QSFP+ Transceivers are high performance, multi-purpose modules for optical data communications applications specified for multi-mode or single mode at 10Gbps/40Gbps. They operate with +3.3V/5V power supplies and are intended for single mode or multi-mode fiber, operating at a nominal wavelength of 850nm, 1310nm and 1550nm or CWDM/DWDM wavelength. Each SFP+ Transceiver consists of a transmitter optical subassembly, a receiver optical subassembly and an electrical subassembly. SFP+ Transceivers are duplex LC transceiver designed for use in 10Gbps / 40G bps short or long reach applications.

Features

- Compliant to SFF-8436 QSFP+ MSA (40G QSFP)
- Single 3.3V power supply
- Duplex or Simplex LC receptacle connector
- Built-in digital diagnostic function
- Single 3.3V power supply
- RoHS compliant
- Lower power dissipation
- Hot Pluggable

10Gbps SFP+

• Dual Fiber SFP+ / 10G Ethernet, SONET OC192, SDH STM-64

Model Name	Wavelength(nm)	Media	Optical Power(dBm)	Sensitivity(dBm)	Power Budget(dB)	Distance	DDMI
SFM-1000-SR85	850	MMF	-1 ~ -7.1	-9.9	2.8	300m	✓
SFS-1010-LR31	1310	SMF	+0.5 ~ - 6	-14.4	8.4	10km	✓
SFS-1020-LR31	1310	SMF	+0.5 ~ - 3	-15	12	20km	✓

• BiDi SFP+ / 10G Ethernet, SONET OC192, SDH STM-64

Model Name	Wavelength(nm)	Media	Optical Power(dBm)	Sensitivity(dBm)	Power Budget(dB)	Distance	DDMI
SFS-1010-WA	T1270/R1330	BiDi SMF	-4 ~ +1	-14	10	10km	✓
SFS-1010-WB	T1330/R1270	BiDi SMF	-4 ~ +1	-14	10	10km	✓
SFS-1020-WA	T1270/R1330	BiDi SMF	-2 ~ +2	-14	12	20km	✓
SFS-1020-WB	T1330/R1270	BiDi SMF	-2 ~ +2	-14	12	20km	✓

• CWDM Dual Fiber SFP+ 10G Ethernet, SONET OC192, SDH STM-64

Model Name	Wavelength(nm)	Media	Optical Power(dBm)	Sensitivity(dBm)	Power Budget(dB)	Distance	DDMI
SFS-1030-CXX-DD	1270 ~ 1450nm	SMF	+4 ~ -1	< -15	14	30km	✓

10Gbps XFP

• Dual Fiber XFP / 10G Ethernet, SONET OC192, SDH STM-64

Model Name	Wavelength(nm)	Media	Optical Power(dBm)	Sensitivity(dBm)	Power Budget(dB)	Distance	DDMI
XFM-1000-SR85	850	MMF	-1 ~ -7.1	< -9.9	2.8	300m	✓
XFS-1010-LR31	1310	SMF	- 1 ~ - 6	< -14.4	8.4	10km	✓
XFS-1020-LR31	1310	SMF	+0.5 ~ - 3	< -15	12	20km	✓

• BiDi XFP / 10G Ethernet, SONET OC192, SDH STM-64

Model Name	Wavelength(nm)	Media	Optical Power(dBm)	Sensitivity(dBm)	Power Budget(dB)	Distance	DDMI
XFS-1010-WA	T1270/R1330	BiDi SMF	0 ~ -5	< -14	11	10km	✓
XFS-1010-WB	T1330/R1270	BiDi SMF	0 ~ -5	< -14	11	10km	✓
XFS-1020-WA	T1270/R1330	BiDi SMF	+3 ~ -2	< -14	12	20km	✓
XFS-1020-WB	T1330/R1270	BiDi SMF	+3 ~ -2	< -14	12	20km	✓

16Gbps SFP+

• Dual Fiber SFP+ / (LC Type) FC16/8/4G

Model Name	Wavelength(nm)	Media	FC	16G FC	Package	Distance	Temp.
SFM-3000-85	850nm VCSEL	MMF	16G/ 8G/4G	1600-SN	SFP+ with DMI	35/100/120m	0~ 70 ℃
SFS-3010-31	1310nm DFB	SMF	16G/ 8G/4G	1600-SN	SFP+ with DMI	10km	0~ 70 ℃

• CWDM Dual Fiber SFP+ / (LC Type) FC16/8/4G

Model Name	Wavelength(nm)	Media	FC	16G FC	Package	Distance	Temp.
SFS-3010-Cxx	1270~1330nm	SMF	16G/ 8G/4G	1600-SN	SFP+ with DMI	10km	0~ 70℃
SFS-3010-Cxx	1470~1610nm	SMF	16G/ 8G/4G	1600-SN	SFP+ with DMI	10km	0~ 70℃

40Gbps QSFP+

• QSFP+ MPO

Model Name	Wavelength(nm)	Media	Bit Rate	40G Base	Package	Distance	Temp.
QSFP-000-SR4	850nm VCSEL	MMF	40 Gb/S	SR4	QSFP+ with DMI	100m	0~ 70℃
QSFP-000-eSR4	850nm VCSEL	MMF	40 Gb/S	eSR4	QSFP+ with DMI	300m	0~ 70℃
QSFP-001-PSM-IR4	1310nm FP	SMF	40 Gb/S	PSM-IR4	QSFP+ with DMI	1.4km	0~ 70℃
QSFP-010-PSM-LR4	1310nm DFB	SMF	40 Gb/S	PSM-LR4	QSFP+ with DMI	10km	0~ 70℃
QSFP-002-LX4	1300-CWDM DFB	MMF	40 Gb/S	LX4	QSFP+ with DMI	MM 150m, SM 2km	0~ 70℃
QSFP-002-IR4	1300-CWDM DFB	SMF	40 Gb/S	IR4	QSFP+ with DMI	2km	0~ 70℃
QSFP-010-LR4	1300-CWDM DFB	SMF	40 Gb/S	LR4	QSFP+ with DMI	10km	0~ 70℃

Appendix

- Power Type vs Standalone Chassis Compatible Table

Model Name	Slot	NMC Card Slot	Console Port	Adapter Type	Power Built-In Type					Cooling Fan	Fan-less	Power Module
				100~240VAC to 12VDC	100~240VAC	18~72VDC	18~60VDC	Dual Power 100~240VAC & 18~60VDC	Dual Power 100~240VAC & 18~72VDC			
CH01	1			✓							✓	12W
CH01-AC	1				✓						✓	12W
CH01-DC	1					✓					✓	12W
CH01-AD	1								✓		✓	12W/12W
CH01M-AC	1		✓		✓						✓	12W
CH01M-DC	1		✓			✓					✓	12W
CH01M-AD	1		✓						✓		✓	12W/12W
CH02M-AC	2		✓		✓					✓		30W
CH02M-DC	2		✓			✓				✓		30W
CH02M-AD	2		✓						✓	✓		30W/30W
CH02M-2-AC	2		✓		✓						✓	12W
CH02M-2-DC	2		✓			✓					✓	12W
CH02M-2-AD	2		✓						✓		✓	12W/12W
CH02/NMC-AC	2	✓			✓					✓		30W
CH02/NMC-DC	2	✓				✓				✓		30W
CH02/NMC-AD	2	✓							✓	✓		30W/30W
CH02/SMT-AC	2	✓			✓					✓		30W
CH02/SMT-DC	2	✓				✓				✓		30W
CH02/SMT-AD	2	✓							✓	✓		30W/30W
CH04A-AC	4	✓			✓					✓		65W
CH04A-DC	4	✓					✓			✓		50W
CH04A-AD	4	✓						✓		✓		65W/50W

Ordering Information

- DIP Switch Configuration Order : CH01
- Local Console Management Order : CH01M, CH02M and CH02M-2 "M" means the chassis with Console Management.
- Remote Web / SNMP Management Order : CH02 / NMC, CH02/SMT and CH04A
- Power Type : AD = AC + DC Power

Appendix

- Slide-in Card vs Standalone Chassis Compatible Table

Card Name	Product Name	Page	FRM220-CH20	FRM220A-CH20	CH08 CH08A	CH04A	CH02/NMC
FRM220-NMC	Network Management Controller		✓		✓	✓	✓
FRM220A-GSW/SNMP-10G	Gigabit Ethernet Aggregate Switch Card			✓			
FRM220A-GSW/SNMP	Gigabit Ethernet Aggregate Switch Card			✓			
FRM220-40G-1Q4S	40G QSFP to 4x10G SFP+ Transponder		✓		✓	✓	✓
FRM220-16G-3R	16G Multi Rate Transponder (3R)		✓		✓	✓	✓
FRM220-10G FEC	SFP+ STM-64/10G Ethernet FEC Transponder		✓		✓	✓	✓
FRM220-10G-3R	10G 3R Transponder SFP+ to XFP Fiber Protection		✓		✓	✓	✓
FRM220-4G-3R	4G 2R Multi-Rate 2R Transponder (with protection for 3S model)		✓		✓	✓	✓
FRM220-DWDM	4 and 8-ch DWDM Mux/DeMux		✓		✓	✓	
FRM220-CWDM	4 and 8-ch CWDM Mux/DeMux		✓		✓	✓	
FRM220-OADM	Optical Add-Drop Multiplexer		✓		✓	✓	
FRM220-OAB15	Single Channel EDFA Booster NIC		✓		✓	✓	
FRM220-OP552	1+1 Fiber Optical Protection Switch		✓		✓	✓	✓
FRM220-OPS51	1:1 Fiber Optical Protection Switch		✓		✓	✓	✓
FRM220-MSW404S	4x GbE, RJ45 + 4x Dual Rate L2+ OAM Managed Switch with SyncE						
FRM220-MSW404	4x GbE, RJ45 + 4x Dual Rate L2+ OAM Managed Switch						
FRM220-MSW202	2x GbE, RJ45 + 2x Dual Rate L2+ OAM Managed Switch		✓		✓	✓	✓
FRM220-MX210	2-Port Gigabit Ethernet Multiplexer		✓		✓	✓	✓
FRM220-10GC-TS	10G Ethernet Converter 10G Base-T to SFP+		✓		✓	✓	✓
FRM220A-1002ES	2x 10/100/1000Base-T + 2x 100/1000Base-X SFP GbE Switch		✓	✓	✓	✓	✓
FRM220A-1000EAS/X	2-Port 10/100/1000Base-T + 2-Port 1000Base-X OAM/IP Managed Switch		✓	✓	✓	✓	✓
FRM220-10/100	10/100Base-TX to 100Base-FX Media Converter		✓		✓	✓	
FRM220-1000DS	1000Base-X to 1000Base-X SFP media converter		✓		✓	✓	✓
FRM220-1000TS	1000Base-T to 1000Base-X SFP Media Converter		✓		✓	✓	✓
FRM220-1000M	10/100/1000Base-T to 1000Base-X Web Smart OAM/IP Managed Converter		✓		✓	✓	✓
FRM220-1000MS	10/100/1000Base-T to 100/1000Base-X SFP Web Smart OAM/IP Managed Converter		✓		✓	✓	✓
FRM220-1000EAS/X-1	OAM/IP-Based Managed Gigabit Ethernet Media Converter		✓		✓	✓	✓
FRM220-100AS-1	10/100Base-TX to 100Base-FX Media Converter		✓		✓	✓	
FRM220-10/100i	10/100Base-TX to 100Base-FX In-band Managed Converter		✓		✓	✓	✓
FRM220-10/100iS-2	Dual Channels 10/100Base-TX to 100Base-FX In-Band Managed Converter		✓		✓	✓	✓
FRM220-FXO-4&FXS-4	4xPOTS over Fiber		✓		✓	✓	✓
FRM220-FXO/FXS	POTS over Fiber		✓		✓	✓	✓
FRM220A-iMux16	Ethernet to 16 E1 Mux NIC		✓	✓	✓	✓	✓
FRM220A-iMux8	Ethernet to 8 E1 Mux NIC		✓	✓	✓	✓	✓
FRM220A-iMux4	Ethernet to 4 E1 Mux NIC		✓	✓	✓	✓	
FRM220-GFOM08	8-Port E1/T1+10/100/1000M Ethernet Fiber Multiplexer		✓		✓	✓	✓
FRM220-GFOM04	4-Port E1/T1+10/100/1000M Ethernet Fiber Multiplexer		✓		✓	✓	✓
FRM220-FOM04	4-Port E1/T1+100M Ethernet Fiber Multiplexer		✓		✓	✓	✓
FRM220-FOM01	E1/T1+100M Ethernet Fiber Multiplexer		✓		✓	✓	✓
FRM220-FTEC	E1/T1 Cross Rate Converter		✓		✓	✓	✓
FRM220-E1/Data	E1 to Data		✓		✓	✓	✓
FRM220-Eoe1/G(S)	Ethernet Bridge over E1 (GFP)		✓		✓	✓	✓
FRM220A-Eoe1	Ethernet Bridge over E1		✓	✓	✓	✓	✓
FRM220-DS3/E3	DS3/E3 over Fiber		✓		✓	✓	✓
FRM220-E1/T1	E1/T1 Fiber Modem		✓		✓	✓	✓
FRM220-Data	V.35/X.21/RS530/449/232 Fiber Modem		✓		✓	✓	✓
FRM220-Serial	RS485/232 Media Converter		✓		✓	✓	✓
FRM220-ET100	Ethernet over E1 Fiber Modem		✓		✓	✓	✓
FRM220-CCF	2ch/4ch Contact Closure Fiber Converter		✓		✓	✓	✓

- Power Type vs Standalone Chassis Compatible Table

Power Type (option)	AC: AC Power DC: DC Power AD: AC+DC Power AA: AC+AC Power DD: DC+DC Power	AC, DC AD, AA, DD	AC, DC AD, AA, DD	AC, DC AD, AA, DD

Appendix

- Slide-in Card vs Standalone Chassis Compatible Table

Card Name	Product Name	Page	CH02M	CH02M-2	CH02/SMT	CH01M	CH01
FRM220-NMC	Network Management Controller						
FRM220A-GSW/SNMP-10G	Gigabit Ethernet Aggregate Switch Card						
FRM220A-GSW/SNMP	Gigabit Ethernet Aggregate Switch Card						
FRM220-40G-1Q4S	40G QSFP to 4x10G SFP+ Transponder		✓		✓		
FRM220-16G-3R	16G Multi Rate Transponder (3R)		✓		✓	✓	✓
FRM220-10G FEC	SFP+ STM-64/10G Ethernet FEC Transponder		✓		✓		
FRM220-10G-3R	10G 3R Transponder SFP+ to XFP Fiber Protection		✓		✓		
FRM220-4G-3R	4G 2R Multi-Rate 2R Transponder (with protection for 3S model)		✓		✓	✓	
FRM220-DWDM	4 and 8-ch DWDM Mux/DeMux						✓
FRM220-CWDM	4 and 8-ch CWDM Mux/DeMux						✓
FRM220-OADM	Optical Add-Drop Multiplexer						✓
FRM220-OAB15	Single Channel EDFA Booster NIC						✓
FRM220-OP552	1+1 Fiber Optical Protection Switch					✓	✓
FRM220-OPS51	1:1 Fiber Optical Protection Switch					✓	✓
FRM220-MSW404S	4x GbE, RJ45 + 4x Dual Rate L2+ OAM Managed Switch with SyncE		✓		✓		
FRM220-MSW404	4x GbE, RJ45 + 4x Dual Rate L2+ OAM Managed Switch		✓		✓		
FRM220-MSW202	2x GbE, RJ45 + 2x Dual Rate L2+ OAM Managed Switch		✓		✓	✓	✓
FRM220-MX210	2-Port Gigabit Ethernet Multiplexer		✓		✓	✓	✓
FRM220-10GC-TS	10G Ethernet Converter 10G Base-T to SFP+		✓		✓		
FRM220A-1002ES	2x 10/100/1000Base-T + 2x 100/1000Base-X SFP GbE Switch		✓		✓	✓	✓
FRM220A-1000EAS/X	2-Port 10/100/1000Base-T + 2-Port 1000Base-X OAM/IP Managed Switch		✓		✓	✓	✓
FRM220-10/100	10/100Base-TX to 100Base-FX Media Converter						✓
FRM220-1000DS	1000Base-X to 1000Base-X SFP media converter		✓		✓	✓	✓
FRM220-1000TS	1000Base-T to 1000Base-X SFP Media Converter		✓		✓		✓
FRM220-1000M	10/100/1000Base-T to 1000Base-X Web Smart OAM/IP Managed Converter					✓	✓
FRM220-1000MS	10/100/1000Base-T to 100/1000Base-X SFP Web Smart OAM/IP Managed Converter					✓	✓
FRM220-1000EAS/X-1	OAM/IP-Based Managed Gigabit Ethernet Media Converter		✓		✓	✓	✓
FRM220-100AS-1	10/100Base-TX to 100Base-FX Media Converter		✓		✓	✓	✓
FRM220-10/100i	10/100Base-TX to 100Base-FX In-band Managed Converter					✓	✓
FRM220-10/100iS-2	Dual Channels 10/100Base-TX to 100Base-FX In-Band Managed Converter		✓		✓	✓	✓
FRM220-FXO-4&FXS-4	4xPOTS over Fiber					✓	✓
FRM220-FXO/FXS	POTS over Fiber					✓	✓
FRM220A-iMux16	Ethernet to 16 E1 Mux NIC		✓	✓	✓		
FRM220A-iMux8	Ethernet to 8 E1 Mux NIC					✓	
FRM220A-iMux4	Ethernet to 4 E1 Mux NIC					✓	
FRM220-GFOM08	8-Port E1/T1+10/100/1000M Ethernet Fiber Multiplexer		✓	✓	✓		
FRM220-GFOM04	4-Port E1/T1+10/100/1000M Ethernet Fiber Multiplexer		✓	✓	✓		
FRM220-FOM04	4-Port E1/T1+100M Ethernet Fiber Multiplexer		✓	✓	✓		
FRM220-FOM01	E1/T1+100M Ethernet Fiber Multiplexer					✓	✓
FRM220-FTEC	E1/T1 Cross Rate Converter					✓	
FRM220-E1/Data	E1 to Data					✓	✓
FRM220-Eoe1/G(S)	Ethernet Bridge over E1 (GFP)					✓	✓
FRM220A-Eoe1	Ethernet Bridge over E1					✓	✓
FRM220-DS3/E3	DS3/E3 over Fiber					✓	✓
FRM220-E1/T1	E1/T1 Fiber Modem					✓	✓
FRM220-Data	V.35/X.21/RS530/449/232 Fiber Modem					✓	✓
FRM220-Serial	RS485/232 Media Converter					✓	✓
FRM220-ET100	Ethernet over E1 Fiber Modem					✓	✓
FRM220-CCF	2ch/4ch Contact Closure Fiber Converter					✓	✓

- Power Type vs Standalone Chassis Compatible Table

Power Type (option)	DC12: AC Adapter AC: AC Power DC: DC Power AD: AC+DC Power AA: AC+AC Power DD: DC+DC Power						
		AC, DC, AD	AC, DC, AD	DC12	DC12, AC, DC, AD, AA, DD	AC, DC, AD