



U.S. Patent 7,974,093

The RuggedBackbone™ MX5000 is MIL-STD high port density routing and switching platform, designed to operate in the most demanding environments. The RuggedBackbone™ can withstand high levels of electromagnetic interference, radio frequency interference and a wide temperature range of -40°C to +85°C. This platform is designed to meet the challenging climatic and environmental demands found in military network applications.

The MX5000's superior rugged hardware design coupled with the embedded ROX™II operating system provides improved system reliability when your network needs it the most. The cyber security and networking features make it ideally suited for creating secure Ethernet networks for mission critical, real-time, control applications. The MX5000 is a scalable, hot-swappable\*, modular platform which provides its users with the ability to change the RuggedBackbone™ as their network grows or their needs change.

## Key Features and Benefits

### Ethernet Ports

- Up to 48 10/100TX MicroD
- Up to 96 10/100TX RJ45 ports
- Up to 48 100FX optical ports
- Up to 2 Gigabit Ethernet ports
- Long-haul optics allow distances up to 90km
- Multiple connector types (ST and LC)

### Serial Ports

- Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable) – DB9 connectors
- DNP, MODBUS
- Raw socket mode support allows conversion of any serial protocols

### Cyber Security Features

- Multi-level passwords
- SSH/SSL encryption
- Enable/disable ports, MAC based port security
- VLAN (802.1Q) to segregate and secure network traffic

### RuggedRated™ for Reliability in Harsh Environments

- Immunity to EMI and high voltage electrical transients
- Zero-Packet-Loss Technology
- Meets IEEE 1613 (electric utility substations)

- Exceeds IEC 61850-3 (electric utility substations)
- Exceeds IEC 61800-3 (variable speed drive systems)
- Exceeds IEC 61000-6-2 (generic industrial environment)
- -40°C to +85°C operating temperature (no fans)
- Conformal coated printed circuit boards

### MIL-STD Ratings

- MIL-STD 901D – Shock (Hard Mounted)
- MIL-STD 167 – Vibration
- MIL-STD 461 – EMI
- MIL-STD 1399 – Magnetic Field (DC Magnetic Exposure)
- MIL-STD 810 – Temperature and Humidity

### ROX™II Software Features

- Next Generation of ROX™
- Simple plug and play operation – automatic learning, negotiation, and crossover detection
- MSTP 802.1Q-2005 (formerly 802.1s)
- RSTP (802.1w) and Enhanced Rapid Spanning Tree (eRSTP™) network fault recovery (<5ms)
- Quality of Service (802.1p) for real-time traffic
- VLAN (802.1Q) with double tagging and GVRP support
- Link aggregation (802.3ad)
- Traffic prioritization
- Transaction based configuration with rollback
- GMRP and services
- Telecom style CLI

### Management Tools

- Web-based, Telecom Standard CLI management interfaces
- SNMP v1/v2
- Rich set of diagnostics with logging and alarms
- NETCONF
- Role Based Access Control

### Universal Power Supply Options

- Fully integrated, dual-redundant (optional) power supplies
- Universal high voltage ranges: 88-300VDC or 85-264VAC
- Terminal blocks for reliable maintenance free connections
- CSA/UL 60950 safety approved to 85°C

### Warranty

- 5 Year Warranty

# RuggedBackbone™ MX5000

**Modularity:**

- ▶ Hot-Swappable modules\*
- ▶ Up to 6 slots for Line Modules
- ▶ Up to 48 100TX or 48 100FX ports

**Fast Ethernet Port Types**

- ▶ Up to 48 10/100TX MicroD
- ▶ Up to 96 10/100TX RJ45 ports
- ▶ Up to 48 100FX ports
- ▶ 100FX Multi- and Singlemode

**Gigabit Port Types:**

- ▶ 2 Gigabit Ethernet Ports
- ▶ 1000SX Multimode
- ▶ 1000LX Multimode
- ▶ ST and LC connectors

**Serial Ports:**

- ▶ Up to 48 RS485, RS422, RS232



**Switch Module:**

- ▶ Provides Layer 2 or Layer 3 switching
- ▶ Supports up to 24GB of Switch throughput\*

**Integrated Power Supplies**

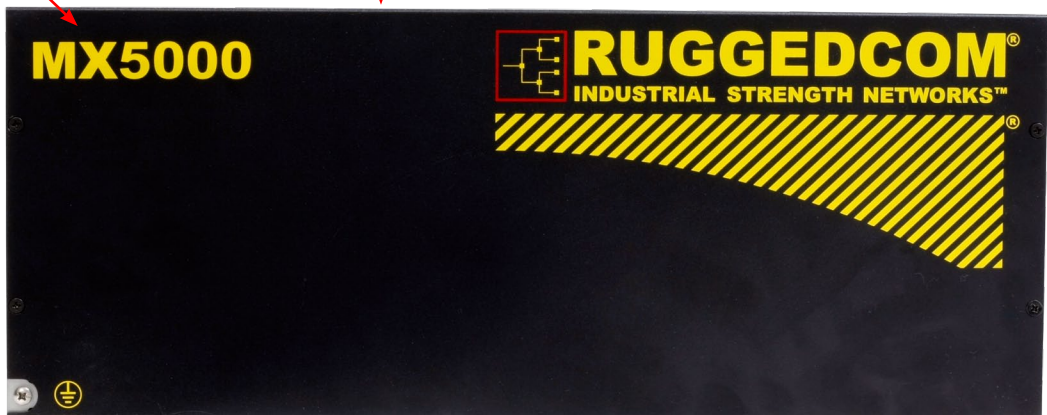
- ▶ Dual-redundant (optional) power supplies
- ▶ Universal high voltage ranges:  
88-300VDC or 85-264VAC
- ▶ Field-Replaceable

**Operating Temperature**

- ▶ -40°C to +85°C
- ▶ No Fans

**Critical Alarm Relay**

- ▶ Form-C contact ratings:  
Max Voltage 150VAC, 125VDC  
Max Current 2A@150VAC,  
2A@30VDC



\*Coming soon

## Hardware Features

### MIL-STD Testing

The MX5000 assembly and all of its modules have been rigorously tested to meet or exceed the following tests.

- MIL-STD 901D – Shock (Hard Mounted)
- MIL-STD 167 – Vibration
- MIL-STD 461 – EMI
- MIL-STD 1399 – Magnetic Field (DC Magnetic Exposure)
- MIL-STD 810 – Temperature and Humidity

### Improved Shock and Vibration Performance

The MX5000 is built to meet or exceed military standards for shock and vibration. Each module and the chassis are equipped with improved connectors with a thicker gold plating of 50um.

### Improved Temperature Performance

Tight tolerances on internal heat transfer plates allows the MX5000 to dissipate more heat. For our customers this benefit allows RuggedCom to produce the highest density ruggedized platform. Improved temperature performance increases the life of components and results in better MTBF.

### Conformal Coating

RuggedCom fully expects the MX5000 to operate under some of the worst conditions imaginable for electronic equipment. Conformal Coating offers another layer of protection for the MX5000 against humidity and corrosive gases. This feature is found standard on all MX5000 modules and the chassis.

### Power Supply

Dual redundant, hot swappable power supplies is an option on all of RuggedCom's 19" MIL-STD rack mount units. The supplies are load sharing and either can power the entire MX5000 with no interruption of service on failures. They include power factor correction, integrated surge suppression and high grade EMI line filters. The MX5000 intelligent power supplies monitor secondary voltage rails, can distinguish between insufficient input voltage and power supply failure, can detect health of surge suppression, and bias the load to either supply under user control. In addition, ROX™ software can generate alarms and issue SNMP traps on any power supply problems. These features will provide MX5000 customers with the tools needed to minimize outages caused by power failure one of the leading causes of downtime.

### Enhanced Protection through the RuggedEnclosure™

Sold separately, the RuggedEnclosure™ is a tough aluminum enclosure built to improve the MX5000's already impressive shock and vibration performance and even further reduce, the already low, electronic emissions from the MX5000. The RuggedEnclosure™ uses EMI Glass and provides a patch panel with EMI gaskets to keep emissions at a minimum. This hard mounted enclosure when coupled with the MX5000 continues RuggedCom's tradition of pioneering advanced networking solutions specifically for the harsh environments found in Military applications.

## ROX™II Features



### ROX™II Software Features

- Enhanced Security/Reliability through Data and Control path separation
- Simple plug and play operation – automatic learning, negotiation, and crossover detection
- Telecom Standard Command Line Interface (CLI)
- Single File Configuration Automation ensures easy installation & Configuration control
- Automatic Rollback in the event of configuration errors (Configurable)
- NETCONF configuration interface supports powerful remote configuration and status features.
- VLAN (802.1Q) with double tagging
- Port Rate and Broadcast Storm Limiting
- Port configuration, status, statistics, mirroring
- NTP time synchronization (client and server)
- MSTP 802.1Q-2005 (formerly 802.1s)
- RSTP (802.1w) and Enhanced Rapid Spanning Tree (eRSTP™) network fault recovery
- Quality of Service (802.1p) for real-time traffic
- Traffic Prioritization
- SNMP v1 and v2c

### Cyber Security

Cyber security is an urgent issue in many industries where advanced automation and communications networks play a crucial role in mission critical applications and where high reliability is of paramount importance. Key ROX™II features that address security issues at the local area network level include:

**Passwords** - Multi-level user passwords secures switch against unauthorized configuration

**SSH / SSL** - Extends capability of password protection to add encryption of passwords and data as they cross the network

**Enable / Disable Ports** - Capability to disable ports so that traffic can not pass

**802.1Q VLAN** - Provides the ability to logically segregate traffic between predefined ports on switches

### Enhanced Rapid Spanning Tree Protocol (eRSTP™)

RuggedCom eRSTP™ allows the creation of fault-tolerant ring and mesh Ethernet networks that incorporate redundant links that are 'pruned' to prevent loops. eRSTP™ yields worst-case fault recovery<sup>1</sup> of 5ms times the 'bridge diameter' and allows rings of up to 160 switches. For example, a ring of ten switches will have fault recovery times under 50ms. eRSTP™ implements both STP and RSTP to ensure interoperability with commercial switches unlike other proprietary 'ring' solutions.

### Quality of Service (IEEE 802.1p)

Some networking applications such as real-time control or VoIP (voice over IP) require predictable arrival times for Ethernet frames. Switches can introduce latency in times of heavy network traffic due to the internal queues that buffer frames and then transmit on a first come first serve basis. ROX™II supports 'Class of Service' in accordance with IEEE 802.1p that allows time critical traffic to jump ahead to the front of the queue thus minimizing latency and reducing jitter to allow such demanding applications to operate correctly. ROX™II allows priority classification by port, tags, MAC address, and IP type of service (ToS). A configurable "weighted fair queuing" algorithm controls how frames are emptied from the queues.

### VLAN (IEEE 802.1Q)

Virtual local area networks (VLAN) allow the segregation of a physical network into separate logical networks with independent broadcast domains. A measure of security is provided since hosts can only access other hosts on the same VLAN and traffic storms are isolated. ROX™II supports 802.1Q tagged Ethernet frames and VLAN trunks. Port based classification allows legacy devices to be assigned to the correct VLAN. GVRP support is also provided to simplify the configuration of the switches on the VLAN.

A feature of SNMP supported by ROX™II is the ability to generate "traps" upon system events. RuggedNMS™, the RuggedCom management solution, can record traps from multiple devices providing a powerful network troubleshooting tool. It also provides a graphical visualization of the network and is fully integrated with all RuggedCom products.

### NETCONF Configuration Interface

The NETCONF configuration interface will allow administrators to set device parameters and receive device updates through the use of XML based commands. This standard, supported by multiple vendors, makes it possible to greatly simplify the task of network management.

<sup>1</sup> eRSTP fault recovery times may be approximated as follows:

For 100 Mbps, fault recovery performance is <5ms/hop

For 1,000 Mbps, fault recovery performance is <5ms/hop + 20ms

## ROX™II Features

### **NTP (Simple Network Time Protocol)**

NTP automatically synchronizes the internal clock of all ROX™II devices on the network. This allows for correlation of time stamped events for troubleshooting.

### **Port Rate Limiting**

ROX™II supports configurable rate limiting per port to limit unicast and multicast traffic. This can be essential to managing precious network bandwidth for service providers. It also provides edge security for denial of service (DoS) attacks.

### **Broadcast Storm Filtering**

Broadcast storms wreak havoc on a network and can cause attached devices to malfunction. This could be disastrous on a network with mission critical equipment. ROX™II limits this by filtering broadcast frames with a user-defined threshold.

### **Port Mirroring**

ROX™II can be configured to duplicate all traffic on one port to a designated mirror port. When combined with a network analyzer, this can be a powerful troubleshooting tool.

### **Port Configuration and Status**

ROX™II allows individual ports to be 'hard' configured for speed, duplex, auto-negotiation, flow control and more. This allows proper connection with devices that do not negotiate or have unusual settings. Detailed status of ports with alarm and SNMP trap on link problems aid greatly in system troubleshooting.

### **Port Statistics**

ROX™II provides continuously updating statistics per port that provide both ingress and egress packet and byte counters as well as detailed error figures.

### **HTML User Interface**

ROX™II provides a simple, intuitive user interface for configuration and monitoring via a standard graphical web browser or via standard telcom UI. All system parameters include detailed on-line help to make setup a breeze. ROX™II presents a common look and feel and standardized configuration process allowing easy migration to other RuggedCom managed products.

### **Command Line Interface (CLI)**

A command line interface used in conjunction with remote shell to automate data retrieval, configuration updates, and firmware upgrades. A powerful Telecom Standard style Command Line Interface (CLI), which will be familiar to users of Cisco XR, allows expert users the ability to selectively retrieve or manipulate any parameters the device has to offer.

### **OSPF (Open Shortest Path First)**

OSPF is a routing protocol that determines the best path for routing IP traffic over a TCP/IP network based on link states between nodes and several quality parameters. OSPF is an interior gateway protocol (IGP), which is designed to work within an autonomous system. It is also a link state protocol, meaning that the best route is determined by the type and speed of the inter-router links, not by how many router hops they are away from each other (as in Distance-Vector routing protocols, i.e. Rip and RIP II).

### **BGP (Border Gateway Protocol)**

BGPv4 is a path vector routing protocol where routing decisions are made based on the policies or rules laid out by the network administrator. It is typically used where networks are multihomed between multiple Internet Service Providers, or in very large internal networks where internal gateway protocols do not scale sufficiently.

## Software Options

| Feature                            | Layer 2 Standard Edition | Layer 3 Standard Edition | Layer 3 Security Options |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| VLANs ( 802.1Q)                    | ✓                        | ✓                        | ✓                        |
| QoS (802.1p )                      | ✓                        | ✓                        | ✓                        |
| MSTP (802.1Q-2005) formerly 802.1s | ✓                        | ✓                        | ✓                        |
| RSTP                               | ✓                        | ✓                        | ✓                        |
| eRSTP                              | ✓                        | ✓                        | ✓                        |
| SNTP                               | ✓                        | ✓                        | ✓                        |
| Port Rate Limiting                 | ✓                        | ✓                        | ✓                        |
| Broadcast Storm Filtering          | ✓                        | ✓                        | ✓                        |
| Port Mirroring                     | ✓                        | ✓                        | ✓                        |
| SNMP v1/v2/v3                      | ✓                        | ✓                        | ✓                        |
| RMON                               | ✓                        | ✓                        | ✓                        |
| CLI                                | ✓                        | ✓                        | ✓                        |
| HTML User Interface                | ✓                        | ✓                        | ✓                        |
| Firewall                           |                          | ✓                        | ✓                        |
| OSPF                               |                          | ✓                        | ✓                        |
| BGP                                |                          | ✓                        | ✓                        |
| RIP v1/v2                          |                          | ✓                        | ✓                        |
| Traffic Prioritization             |                          | ✓                        | ✓                        |
| VPN                                |                          |                          | ✓                        |
| IPSec                              |                          |                          | ✓                        |

# EMI and Environmental Type Tests

| IEC 61850-3 EMI TYPE TESTS |                             |                    |   |                 |
|----------------------------|-----------------------------|--------------------|---|-----------------|
| TEST                       | Description                 |                    | Test Levels   | Severity Levels |
| IEC 61000-4-2              | ESD                         | Enclosure Contact  | +/- 8kV   | 4               |
|                            |                             | Enclosure Air      | +/- 15kV  | 4               |
| IEC 61000-4-3              | Radiated RFI                | Enclosure ports    | 20 V/m  | Note 1          |
| IEC 61000-4-4              | Burst (Fast Transient)      | Signal ports       | +/- 4kV @ 2.5kHz  | Note 1          |
|                            |                             | D.C. Power ports   | +/- 4kV   | 4               |
|                            |                             | A.C. Power ports   | +/- 4kV   | 4               |
|                            |                             | Earth ground ports | +/- 4kV   | 4               |
| IEC 61000-4-5              | Surge                       | Signal ports       | +/- 4kV line-to-earth, +/- 2kV line-to-line             | 4               |
|                            |                             | D.C. Power ports   | +/- 2kV line-to-earth, +/- 1kV line-to-line             | 3               |
|                            |                             | A.C. Power ports   | +/- 4kV line-to-earth, +/- 2kV line-to-line             | 4               |
| IEC 61000-4-6              | Induced (Conducted) RFI     | Signal ports       | 10V   | 3               |
|                            |                             | D.C Power ports    | 10V   | 3               |
|                            |                             | A.C. Power ports   | 10V   | 3               |
|                            |                             | Earth ground ports | 10V   | 3               |
| IEC 61000-4-8              | 8 Magnetic Field            | Enclosure ports    | 40 A/m continuous, 1000 A/m for 1 s<br>1000 A/m for 1 s | Note 1<br>5     |
| IEC 61000-4-29             | Voltage Dips & Interrupts   | D.C. Power ports   | 30% for 0.1s, 60% for 0.1s, 100% for 0.05s              | N/A             |
| IEC 61000-4-11             |                             | A.C. Power ports   | 30% for 1 period, 60% for 50 periods                    | N/A             |
|                            |                             |                    | 100% for 5 periods, 100% for 50 periods                 | N/A             |
| IEC 61000-4-12             | Damped Oscillatory          | Signal ports       | 2.5kV common, 1kV diff. mode@1MHz                       | 3               |
|                            |                             | D.C. Power ports   | 2.5kV common, 1kV diff. mode@1MHz                       | 3               |
|                            |                             | A.C. Power ports   | 2.5kV common, 1kV diff. mode@1MHz                       | 3               |
| IEC 61000-4-16             | Mains Frequency Voltage     | Signal ports       | 30V Continuous, 300V for 1s                             | 4               |
|                            |                             | D.C. Power ports   | 30V Continuous, 300V for 1s                             | 4               |
| IEC 61000-4-17             | Ripple on D.C. Power Supply | D.C. Power ports   | 10%   | 3               |
| IEC 60255-5                | Dielectric Strength         | Signal ports       | 2kVac (Fail-Safe Relay output)                          | N/A             |
|                            |                             | D.C. Power ports   | 2kVac   | N/A             |
|                            |                             | A.C. Power ports   | 2kVac   | N/A             |
| IEC 60255-5                | H.V. Impulse                | Signal ports       | 5kV (Fail-Safe Relay output)                            | N/A             |
|                            |                             | D.C. Power ports   | 5kV   | N/A             |
|                            |                             | A.C. Power ports   | 5kV   | N/A             |

| IEEE 1613 (C37.90.x) EMI IMMUNITY TYPE TESTS <sup>2</sup> |                     |                                 |                                   |  |
|---|---------------------|---------------------------------|-----------------------------------|--|
| Test  | Description         |                                 | Test Levels                       |  |
| IEEE C37.90.3   | ESD                 | Enclosure Contact               | +/-2kV, +/-4kV, +/- 8kV           |  |
|   |                     | Enclosure Air                   | +/-4kV, +/-8kV, +/-15kV           |  |
| IEEE C37.90.2   | Radiated RFI        | Enclosure ports                 | 35 V/m                            |  |
| IEEE C37.90.1   | Fast Transient      | Signal ports                    | +/- 4kV @ 2.5kHz                  |  |
|   |                     | D.C. Power ports                | +/- 4kV                           |  |
|   |                     | A.C. Power ports                | +/- 4kV                           |  |
|   |                     | Earth ground ports <sup>3</sup> | +/- 4kV                           |  |
| IEEE C37.90.1   | Oscillatory         | Signal ports                    | 2.5kV common mode @1MHz           |  |
|   |                     | D.C. Power ports                | 2.5kV common, 1kV diff. mode@1MHz |  |
|   |                     | A.C. Power ports                | 2.5kV common, 1kV diff. mode@1MHz |  |
| IEEE C37.90   | H.V. Impulse        | Signal ports                    | 5kV (Fail-Safe Relay output)      |  |
|   |                     | D.C. Power ports                | 5kV                               |  |
|   |                     | A.C. Power ports                | 5kV                               |  |
| IEEE C37.90   | Dielectric Strength | Signal ports                    | 2kVac                             |  |
|   |                     | D.C. Power ports                | 2kVac                             |  |
|   |                     | A.C. Power ports                | 2kVac                             |  |

| Environmental Type Tests |                              |         |                                       |  |
|--------------------------|------------------------------|---------|---------------------------------------|--|
| Test                     | Description                  |         | Test Levels                           |  |
| IEC 60068-2-1            | Cold Temperature             | Test Ad | -40°C, 16 Hours                       |  |
| IEC 60068-2-2            | Dry Heat                     | Test Bd | +85°C, 16 Hours                       |  |
| IEC 60068-2-30           | Humidity (Damp Heat, Cyclic) | Test Db | 95% (non-condensing), 55°C , 6 cycles |  |
| IEC 60255-21-1           | Vibration                    |         | 2g @ (10 - 150) Hz                    |  |
| IEC 60255-21-2           | Shock                        |         | 30g @ 11mS                            |  |

Notes: 1. RuggedCom specified severity levels  
2. Meets Class 2 requirements for an all fiber configuration. Class 1 for copper ports.

## Technical Specifications

### Power Supply

- Power Consumption: 100W Max
- HI Voltage AC/DC: 88-300VDC or 85-264VAC

### Critical Alarm Relay

- Form-C contact ratings:
- Max Voltage 150VAC, 125VDC
- Max Current 2A@150VAC, 2A@30VDC

### Physical

- Height: 6.9"
- Width: 17.9"
- Depth: 11.89"
- Weight: Dependent upon module selection
- Ingress Protection: IP40 (1mm objects)
- Mounting: rack mounted, panel mounted

### Switch Properties

- Switching method: Store & Forward
- Switching latency: 10.5  $\mu$ s
- Switching bandwidth: 88<sup>†</sup> Gbps
- MAC addresses: 98304\*
- MAC address table size: 64 kbytes
- Priority Queues: 4
- Frame buffer memory: 2 Mbit
- Simultaneous VLANs: 255
- VLAN ID Range: 1 to 4094
- IGMP multicast groups: 256
- Port rate limiting
- No head of line blocking

### Approvals

- ISO: Designed and manufactured using a ISO 9001 certified quality program
- ISO: Environmental Management System is certified ISO 14001
- CE Marking
- Emissions: FCC Part 15 (Class A), EN55022 (CISPR22 Class A)
- Safety: cTUVus (Compliant to UL 60950-1:2007; CAN/CSA-C22.2 No. 60950-1-07; EN 60950-1:2006)
- Laser Eye Safety (FDA/CDRH): Complies with 21 CFR Chapter 1, Subchapter J.

### Warranty

- 5 Years—Applicable to design and manufacturing related product defects.

### Network Management

- HTTP graphical web-based
- SNMP v1, v2c,
- SSH, VT100
- Command Line Interface (CLI)

### EMI Immunity and Environmental Compliance

- IEC 61000-6-2 Industrial (Generic)
- IEC 61800-3 Industrial (Variable Speed Drive Systems)
- IEC 61850-3 Electric Utility Substations
- IEEE 1613 Electric Utility Substations
- NEMA TS 2 Traffic Control Equipment

### IEEE Compliance

- 802.3-10BaseT
- 802.3u-100BaseTX, 100BaseFX
- 802.3x-Flow Control
- 802.3z-1000BaseLX
- 802.3ab-1000BaseTX
- 802.3ad-Link Aggregation
- 802.1d-MAC Bridges
- 802.1d-Spanning Tree Protocol
- 802.1p-Class of Service
- 802.1Q-VLAN Tagging
- 802.1w-Rapid Spanning Tree Protocol
- 802.1Q-2005 (formerly 802.1s) MSTP

### IETF RFC Compliance

- RFC768-UDP
- RFC783-TFTP
- RFC791-IP
- RFC792-ICMP
- RFC793-TCP
- RFC826-ARP
- RFC854-Telnet
- RFC894-IP over Ethernet
- RFC1112-IGMP v1
- RFC1519-CIDR
- RFC1541-DHCP (client)
- RFC2030-SNTP
- RFC2068-HTTP
- RFC2236-IGMP v2
- RFC2475-Differentiated Services

### IETF SNMP MIBS

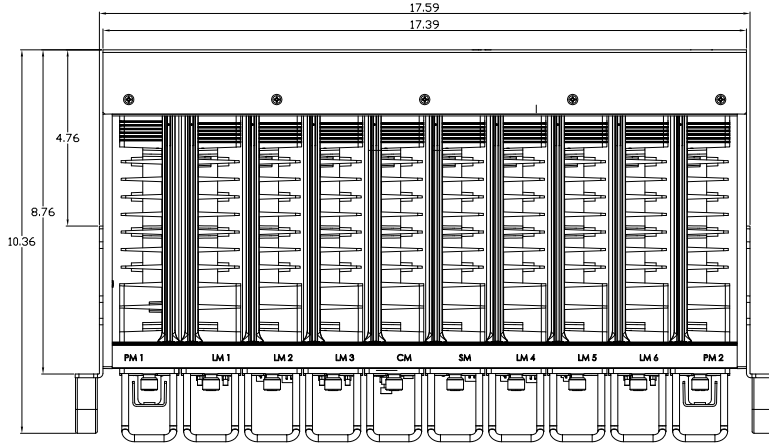
- RFC1493-BRIDGE-MIB
- RFC1907-SNMPv2-MIB
- RFC2012-TCP-MIB
- RFC2013-UDP-MIB
- RFC2578-SNMPv2-SMI
- RFC2579-SNMPv2-TC
- RFC2863-IF-MIB
- draft-ietf-bridge-rstpmib-03-BRIDGE-MIB
- draft-ietf-bridge-bridgemib-smiv2-03-RSTP-MIB
- IANAifType-MIB

### Notes:

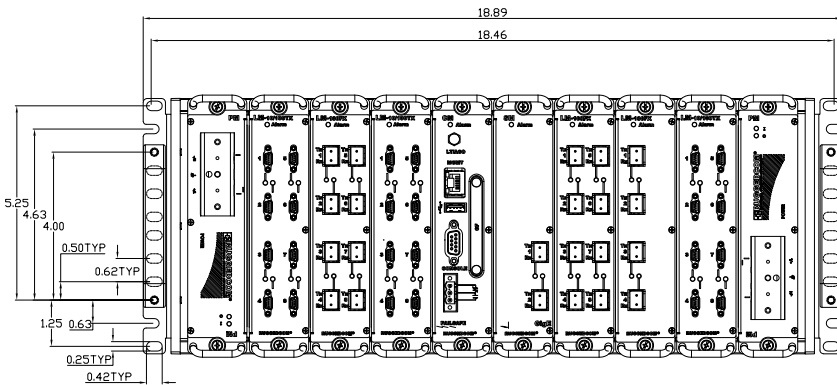
<sup>†</sup>Switching Bandwidth is dependant on Switch Module selected

\* Dependent on line modules selected

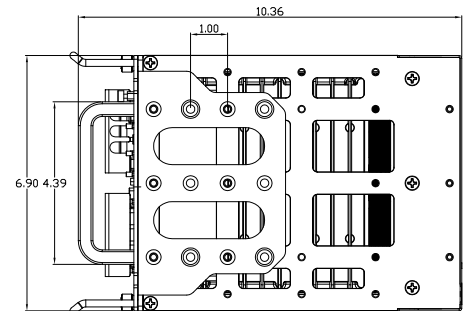
# Mechanical Drawing



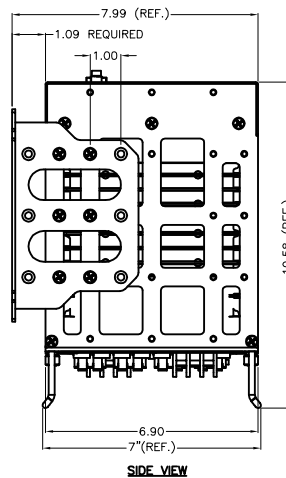
DATA SHEET AND INSTALLATION GUIDE  
PANEL MOUNT



DATA SHEET AND INSTALLATION GUIDE  
RACK REAR MOUNT

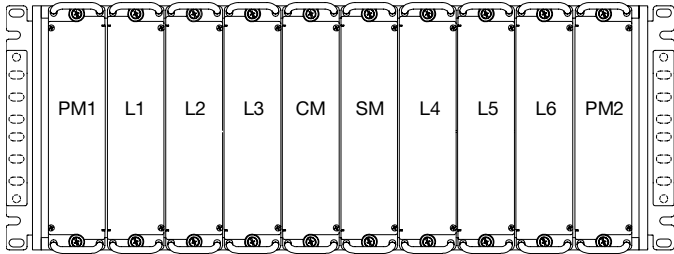


# Mechanical Drawing – Example of Panel Mount



## Order Codes

MX5000 - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_  
 MAIN MNT PM1 PM2 SM CM SFT L1 L2 L3 L4 L5 L6



### MAIN: Ethernet and Power Connectors

- MR = Front Panel Blank no interfaces/LEDs<sup>1</sup>
- MR1 = Front panel with Fan Controller and Power Terminal Blocks
- MR2 = Front Panel with Power Terminal Blocks

### MNT: Mounting Options

- PM = Panel Mount Kit
- RM = 19" Rack Mount Kit
- 00 = No Mounting Option

### PM1 and PM2: Power Modules 1 and 2†

#### Power Modules for MAIN type: MR

- MHI = 88- 300VDC or 85 - 264VAC screw terminal block<sup>1</sup>
- XX = Blank Module

#### Power Modules for MAIN type: MR1 and MR2

- MHIF = 88- 300VDC or 85 - 264VAC supports Terminal Block on Front
- XX = Blank Module

### SM: Switch Module

#### Layer 2 /8 Gigabit Throughput Switch Module Options

- MSM01 = no uplink ports
- MSM04 = 2x 1000SX Multimode 850nm LC 500m
- MSM06 = 2x 1000LX Singlemode 1310nm LC 10km
- MSM08 = 2x 1000LX Singlemode 1310nm LC 25km

### CM: Control Module

- MCM01: Control Module

### SFT: Software

- L2SE = Layer 2 Standard Edition
- L3SE = Layer 3 Standard Edition
- L3SEC = Layer 3 Security Edition

### L1 through L6: Line Modules

#### Blank Module

- XX = Blank Module

#### Serial Line Module

- S01 = 8x RS232/RS422/RS485 via DB9

#### 10/100 BaseTX modules

- M16TX01 = 16x 10/100 BaseTX RJ45
- M8TX02 = 8x 10/100 BaseTX MicroD

#### 100FX modules with 8 Ports

- M8FX01 = 8x 100FX Multimode 1310nm ST 2km
- M8FX11 = 8x 100FX Multimode 1310nm LC 2km
- M8FX04 = 8x 100FX Singlemode 1310nm ST 20km
- M8FX06 = 8x 100FX Singlemode 1310nm LC 20km
- M8FX08 = 8x 100FX Singlemode 1310nm LC 50km
- M8FX10 = 8x 100FX Singlemode 1310nm LC 90km

#### 100FX modules with 4 Ports

- M4FX01 = 4x 100FX Multimode 1310nm ST 2km
- M4FX11 = 4x 100FX Multimode 1310nm LC 2km
- M4FX04 = 4x 100FX Singlemode 1310nm ST 20km
- M4FX06 = 4x 100FX Singlemode 1310nm LC 20km
- M4FX08 = 4x 100FX Singlemode 1310nm LC 50km
- M4FX10 = 4x 100FX Singlemode 1310nm LC 90km

† PM1 must not be blank  
 1 Consult Factory for availability

**Example Order Codes:**

**MX5000-MR-RM-MHI-MHI-MSM04-MCM01-L2SE-M8TX02-M8TX02-M8FX02-M8FX02-M8FX02-M4FX04**

The MX5000 is 19" Rack Mounted and has the following; dual HI power supplies, one control module, an 8 Gigabit throughput layer 2 switch module with 2-Ports Gigabit multimode interfaces, running Layer 2 Standard Edition Software, 2 (two) 8-Port 10/100BaseTX line modules, 3 (three) 8-Port 1000FX multimode line modules, and 1 (one) 4-Port 20km line module.

All Ethernet and Power connectors are at the rear.

**Accessories/Options:**

43-10-0007 = Power cable  
(North America three prong connector)

**Gigabit SFPs**

- 99-25-0111 = 1000SX SFP Multimode LC 850nm 500m
- 99-25-0100 = 1000LX SFP Singlemode LC 1310nm 10km
- 99-25-0101 = 1000LX SFP Singlemode LC 1310nm 25km
- 99-25-0109 = 1000LX SFP Singlemode LC 1550nm 70km

**Bidirection SFPs**

- 99-25-0206 = 1000BX SFP Singlemode LC 1310Tx 1490Rx 10km
- 99-25-0207 = 1000BX SFP Singlemode LC 1490Tx 1310Rx 10km
- 99-25-0208 = 1000BX SFP Singlemode LC 1310Tx 1490Rx 40km
- 99-25-0209 = 1000BX SFP Singlemode LC 1490Tx 1310Rx 40km

**Modules, Power, Control, Switch & Line Modules:**

Power, Switch or Line Modules, may be ordered as individual parts. An empty chassis and brackets may also be ordered as single pieces.

**MX5000PN - \_\_\_\_ - \_\_\_\_**  
**PT MOD**

**PT: Individual Part to be ordered**

The Part may be chosen from MNT or any module from the MX5000 order code page.

By specifying a module you are selecting a line module that may be seated into the MX5000 unit without any cabling.

By specifying a MAIN option you are selecting an empty chassis.

By specifying a MNT option you are selecting brackets for the MX5000

**Additional Part numbers used for Software Upgrades:**

- SFTUP1 = Layer 2 Standard Edition to Layer 3 Standard Edition
- SFTUP2 = Layer 2 Standard Edition to Layer 3 Security Edition
- SFTUP3 = Layer 3 Standard Edition to Layer 3 Security Edition

**Control Modules:**

Control Modules may be ordered as ordered as individual parts. The order code is below:

**MX5000PN - MCM01 - XX - \_\_\_\_**  
**PT MOD SFT**

**PT: Individual Part to be ordered**

- MCM01 = Control Module

**MOD: Hardware Modifications**

- XX = None

**SFT: Software**

- L2SE = Layer 2 Standard Edition
- L3SE = Layer 3 Standard Edition
- L3SEC = Layer 3 Security Edition

**Example Order Code:**

**MX5000PN-MHI**

This is one HI power supply module

\*Coming Soon.

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