SIEMENS

RUGGEDCOM MX5000RE

Installation Guide

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2/2014
RC1060-EN-02

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Preface

This guide describes the RUGGEDCOM MX5000RE. It describes the major features of the device, installation, commissioning and important technical specifications.

It is intended for use by network technical support personnel who are responsible for the installation, commissioning and maintenance of the device. It is also recommended for use by network and system planners, system programmers, and line technicians.

Alerts

The following types of alerts are used when necessary to highlight important information.

DANGER!
DANGER alerts describe imminently hazardous situations that, if not avoided, will result in death or serious injury.

WARNING!
WARNING alerts describe hazardous situations that, if not avoided, may result in serious injury and/or equipment damage.

CAUTION!
CAUTION alerts describe hazardous situations that, if not avoided, may result in equipment damage.

IMPORTANT!
IMPORTANT alerts provide important information that should be known before performing a procedure or step, or using a feature.

NOTE
NOTE alerts provide additional information, such as facts, tips and details.

Related Documents

Other documents that may be of interest include:

- *ROX II User Guide for the MX5000RE*

Accessing Documentation

The latest Hardware Installation Guides and Software User Guides for most RUGGEDCOM products are available online at www.siemens.com/ruggedcom.

For any questions about the documentation or for assistance finding a specific document, contact a Siemens sales representative.

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1 Introduction

The RUGGEDCOM MX5000RE is a MIL-STD, high-port density routing and switching platform, designed to operate in the most demanding environments.The MX5000RE can withstand high levels of electromagnetic interference, radio frequency interference, and a wide temperature range of -40 to 85 °C (-40 to 185 °F). The MX5000RE is designed to meet the challenging climatic and environmental demands found in utility, industrial, and military network applications.

The MX5000RE 's superior hardware design, coupled with the embedded MX5000RE operating system, provides improved system reliability for the most demanding network applications. The cyber security and networking features make it ideally suited for creating secure Ethernet networks for mission critical, real-time, control applications.

The MX5000RE is a scalable, modular platform providing the ability to change the configuration as the network grows and needs change.

The enclosure is a tough, welded aluminum, hard-mount enclosure built to house Siemens networking products and provide MIL-STD ratings for shock, vibration, emissions, immunity, temperature, and humidity. Ten external patch panels with up to 64 MIL grade round connectors provide tremendous flexibility and allow the enclosure to be employed in many diverse applications. A variety of patch panel cable assemblies allow convenient and simple mapping from internal electronics to the outside world.

The enclosure is rated for IP65 ingress protection, meaning that it is dust tight and can withstand water from a nozzle in any direction. Constructed with aluminum extrusions with fins on both sides and combined with high reliability internal circulation fans, the enclosure optimizes heat transfer without the exchange of outside air and improves the MTBF for the enclosed electronics.

The MX5000 installed with the enclosure provides an extremely flexible package with MIL-STD approvals, continuing Siemens's tradition of pioneering advanced networking solutions specifically for the harsh environments found in military applications.

The following sections provide more information about the MX5000RE:

- Section 1.1, “Feature Highlights”
- Section 1.2, “Ports, Controls and Indicator LEDs”
- Section 1.3, “Patch Panels”

Section 1.1

Feature Highlights

Cyber Security Features

- Multi-level passwords
- SSH/SSL encryption
- Enable/disable ports, MAC-based port security
- Port-based network access control (802.1x)
- VLAN (802.1Q) to segregate and secure network traffic
- Integrated stateful firewall

- VPN/IPSEC
- Role-based access control

Ethernet Ports

- Up to 48 copper ports
- Up to 48 100Base-FX optical ports
- Up to 2 Gigabit Ethernet ports
- Long-haul optics allow distances up to 90 km (56 mi)
- Multiple connector types: ST, MTRJ, LC, SC

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 to 85 °C (-40 to 185 °F) operating temperature (no fans within chassis or modules)
- Conformal coated printed circuit boards (optional)

Management Tools

- Web-based, SSH and CLI management interfaces
- SNMP v1, v2 and v3
- Rich set of diagnostics with configurable logging
- NETCONF

Modularity

- Up to 6 slots for line modules
- Up to 48 10/100Base-TX or 48 100Base-FX ports

Universal Power Supply Options

- Fully integrated, dual-redundant (optional) power supplies
- Universal high voltage ranges: 88-300 VDC or 85-264 VAC
- Terminal blocks for reliable maintenance-free connections
- CSA/UL 60950-1 safety approved to 85 °C (185 °F)

Enclosure Features

- Welded 6061-T4 aluminum extrusion construction
- Welded 6061-T6 aluminum mounting brackets for MIL901D hard mounting
- Configurable patch panel allows up to 64 MIL grade circular connectors for both copper and fiber media
- Integrated cable management for strain relief
- Removable front panel with EMI glass for service and maintenance
- Hard-mounted brackets fit standard 48 cm (19 in) rack mount equipment

- Dual internal MIL grade high reliability fans minimize internal temperature gradient with no outside air exchange
- IEC 60529 IP65 rated; dust tight, water jets

Section 1.2

Ports, Controls and Indicator LEDs

The individual modules on the MX5000 feature various ports, controls and indicator LEDs for configuring and troubleshooting the device.

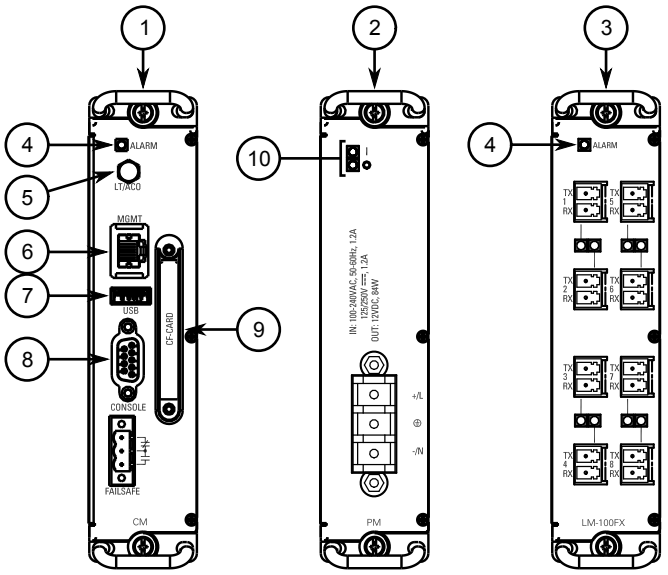

Figure 1: Modules

1. Control Module **2.** Power Module **3.** Line Module (Typical) **4.** Alarm Indicator LED **5.** Lamp Test/Alarm Cut-Off (LT/ACO) Button **6.** Management Ethernet Port **7.** Utility USB Port **8.** RS232 Serial Console Port (DB9) **9.** Compact Flash Card Port **10.** Power Module Indicator LEDs

When the MX5000RE is configured for *rack front* mounting, these ports, controls and LEDs are located on the front panel.

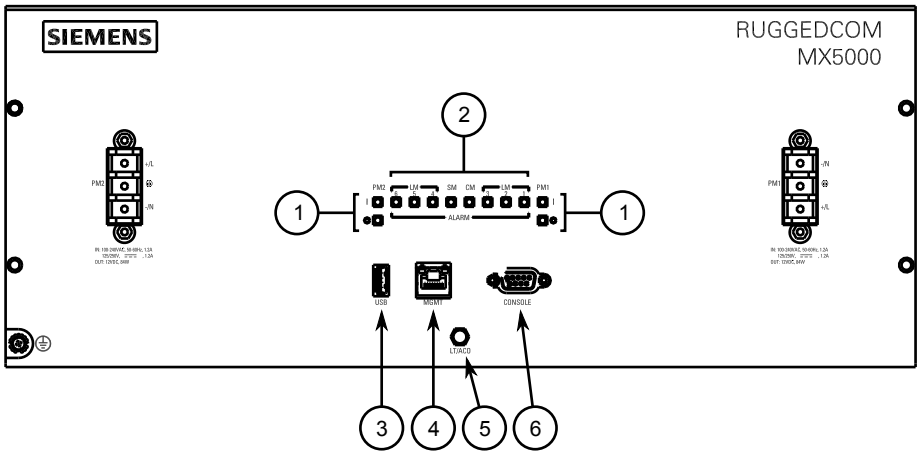

Figure 2: Front Panel

1. Power Module Indicator LEDs **2.** Alarm Indicator LEDs **3.** Utility USB Port **4.** Management Ethernet Port **5.** Lamp Test/Alarm Cut-Off (LT/ACO) Button **6.** RS232 Serial Console Port (DB9)

Power Module Indicator LEDs	These LEDs indicate the status of the power modules. • I = The power supply is receiving power • O = The power supply is supplying power
Alarm Indicator LED	The alarm indicator LED illuminates when an alarm condition exists.
Lamp Test/Alarm Cut-Off (LT/ACO) Button	This button performs two functions: • Press and hold this button to test all indicator LEDs • Press and release this button to acknowledge an active alarm
Management Port	This 10/100Base-T Ethernet port is used for system management that is out-of-band from the switch fabric.
Utility USB Port	The USB port can be used to upgrade the ROX II software or install files, such as configuration files and featurekey files.
Compact Flash Card Port	This port houses the 1 GB compact flash card which contains active and backup installations of ROX II, along with the configuration database and other system data.
RS232 Serial Console Port	This port is for interfacing directly with the device and accessing initial management functions.

Section 1.3

Patch Panels

Every module slot in the MX5000 chassis is connected to a patch panel assembly in the enclosure. Patch panels are provided pre-assembled with the appropriate ports and wiring to make installation quick and simple.

The following maps the patch panels to their associated line module slot in the MX5000 chassis.

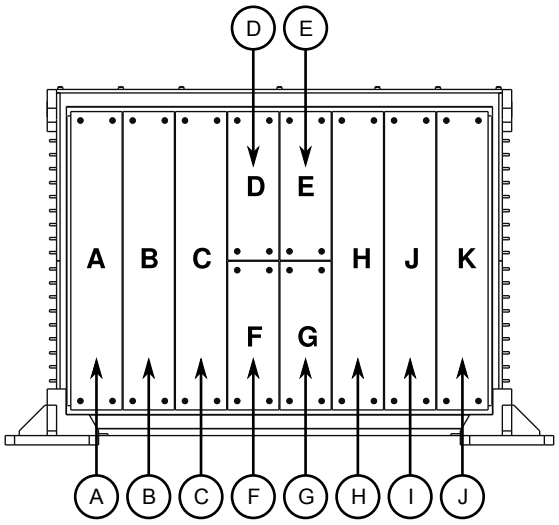

Figure 3: Patch Panels

Patch Panel	MX5000 Module Slot
A	LM1
B	LM2
C	LM3
D	CM
E	PM1
F	SM
G	PM2
H	LM4
I	LM5
J	LM6

2 Installing the Device

The following sections describe how to install the device, including mounting the device, connecting power, and connecting the device to the network.

DANGER!
Electrocution hazard – risk of serious personal injury and/or damage to equipment. Before performing any maintenance tasks, make sure all power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.

WARNING!
Burn hazard – risk of serious personal injury. Avoid contact with the surface of the unit. The metal surface may be hot due to the high allowable ambient temperature per specification.

Éviter tout contact avec la surface. La surface métallique peut être chaude a cause d'une température ambiante élevée selon les spécifications. S.V.P. se référer à la version française de ce guide pour les détails.

WARNING!
Radiation hazard – risk of serious personal injury. This product contains a laser system and is classified as a CLASS 1 LASER PRODUCT. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

IMPORTANT!
This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

Changes or modifications not expressly approved by Siemens AG could invalidate specifications, test results, and agency approvals, and void the user's authority to operate the equipment.

IMPORTANT!
This product should be installed in a restricted access location where access can only be gained by authorized personnel who have been informed of the restrictions and any precautions that must be taken. Access must only be possible through the use of a tool, lock and key, or other means of security, and controlled by the authority responsible for the location.

- Section 2.1, “Assembling the MX5000RE”
- Section 2.3, “Connecting to the Device”
- Section 2.4, “Cabling Recommendations”

Section 2.1

Assembling the MX5000RE

To assemble the MX5000 with the MX5000RE enclosure, do the following:

CAUTION!
Mechanical hazard – risk of damage to equipment. Do not apply vertical force to the handles on the modules. Damage to the handles may occur, which is not covered by warranty. Avoid resting the device on any flat surface where pressure is applied to the module handles.

1. Install the power supply patch cables. For more information, refer to Section 2.1.1, “Installing the Power Supply Patch Cables”.
2. If necessary, install the MX5000 chassis ground connection. For more information, refer to Section 2.1.2, “Installing the Chassis Ground Connection”.
3. Connect the failsafe relay and connect the patch cables. For more information, refer to Section 2.1.3, “Connecting the Failsafe Relay”.
4. Install the fan tray cables. For more information, refer to Section 2.1.4, “Installing the Fan Tray Cables”.
5. Install the mounting brackets. For more information, refer to Section 2.1.5, “Installing the Mounting Brackets”.
6. Install the EMI gaskets. For more information, refer to Section 2.1.6, “Installing the EMI Gaskets”.
7. Assemble the MX5000 with the enclosure. For more information, refer to Section 2.1.7, “Assembling the MX5000 and MX5000RE”.
8. Install the fan tray. For more information, refer to Section 2.1.8, “Installing the Fan Tray”.
9. Install the patch panels. For more information, refer to Section 2.1.9, “Installing the Patch Panels”.
10. Connect network cables to the patch panels. For more information, refer to Section 2.1.10, “Connecting the Network Cables”.
11. Install the front panel. For more information, refer to Section 2.1.11, “Installing the Front Panel”.
12. Mount the MX5000RE. For more information, refer to Section 2.1.12, “Mounting the MX5000RE”.

Section 2.1.1
Installing the Power Supply Patch Cables

To connect the power supply patch cables to the enclosure, do the following:

1. Remove the screws from the outer safety cover.

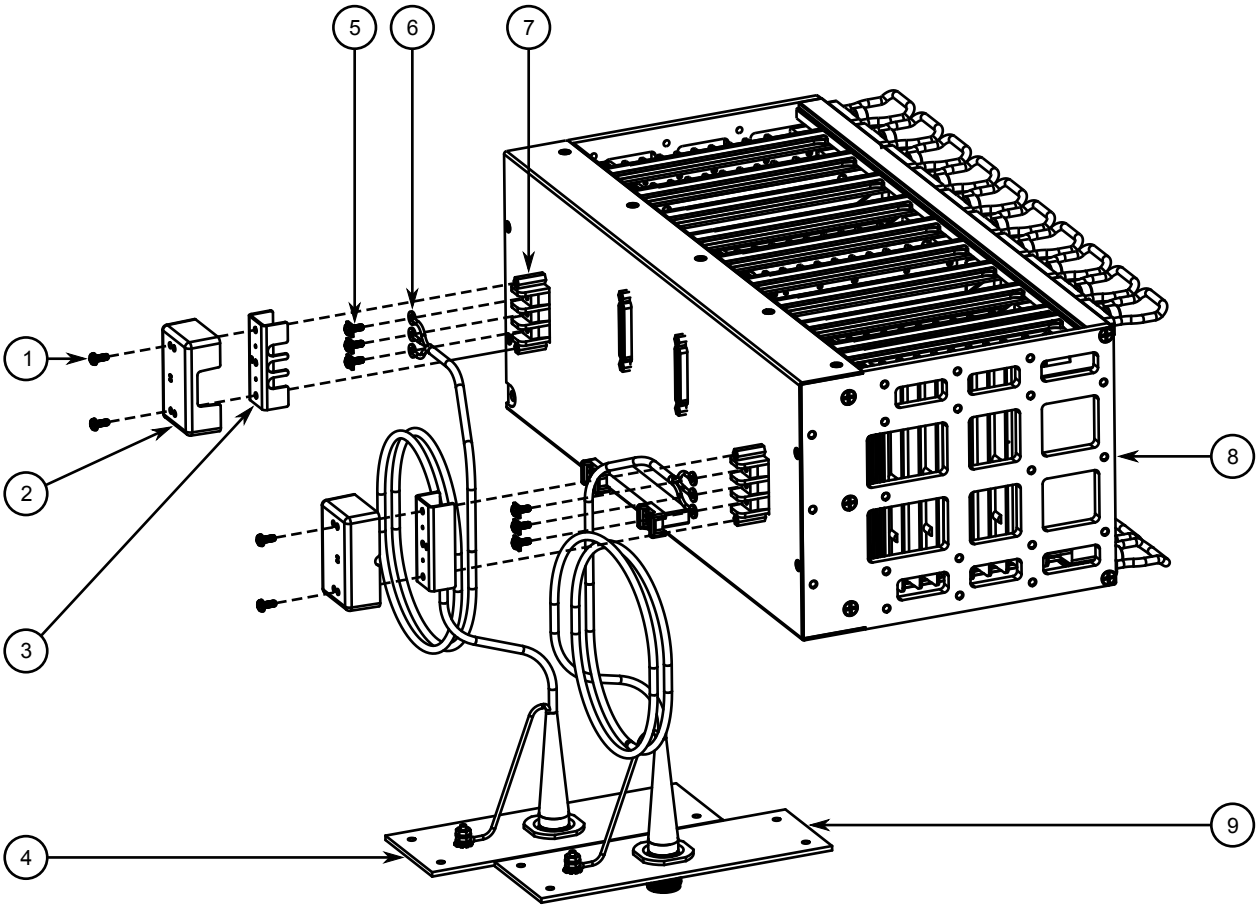

Figure 4: Power Supply Patch Cable Connections

1. #6-32×3/8" Pan Head Screw **2.** Outer Safety Cover **3.** Inner Safety Cover **4.** Terminal Lug Screws **5.** Terminal Ring Lug **6.** Terminal Block **7.** PS1 Cable Assembly **8.** MX5000 **9.** PS2 Cable Assembly

2. Remove the outer safety cover and the inner safety cover from the MX5000.
3. Remove the three terminal lug screws from the terminal block.

DANGER!
Electrocution hazard – risk of death, serious personal injury and/or damage to the device. Make sure the supplied cover is always installed over high voltage screw-type terminal blocks.

CAUTION!
Electrical hazard – risk of damage to equipment. Do not connect AC power cables to a DC power supply terminal block. Damage to the power supply may occur.

4. Connect the live (+/L) lug from the PS1 cable assembly to the live terminal on the PS1 terminal block.

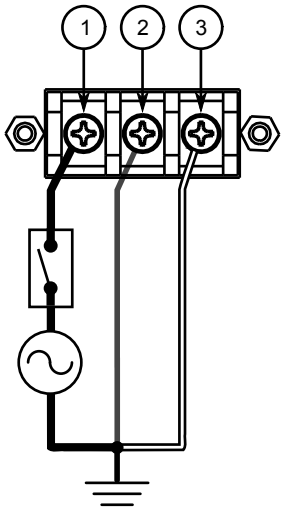

Figure 5: AC Terminal Block Wiring

1. Live Terminal **2.** Ground Terminal **3.** Neutral Terminal

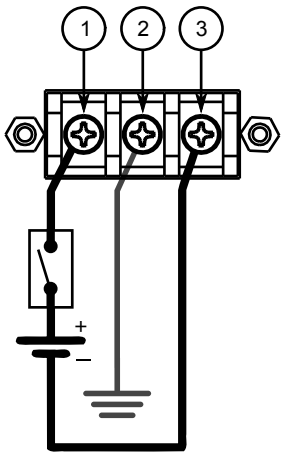

Figure 6: DC Terminal Block Wiring

1. Live Terminal **2.** Ground Terminal **3.** Neutral Terminal

5. Connect the neutral (-/N) lug from the PS1 cable assembly to the neutral terminal on the PS1 terminal block.

IMPORTANT!
If the ground terminals are not connected to safety Earth, the chassis ground connection must be connected. For more information, refer to Section 2.1.2, "Installing the Chassis Ground Connection".

6. Connect the ground (GND) lug from the PS1 cable assembly to the ground terminal on the PS1 terminal block.
7. If necessary, repeat Step 4 to Step 6 to connect the PS2 cable assembly.

8. Install the inner and outer safety covers, making sure the cables pass through the openings in the sides of the covers.
9. Secure the inner and outer supply safety covers with the screws removed in Step 1.

Section 2.1.2
Installing the Chassis Ground Connection

If the ground terminal on the power supply module(s) is not connected to safety Earth, a connection must be provided from the chassis ground terminal on the MX5000 chassis.

1. Position the grounding cable and external tooth lock washer on the MX5000.

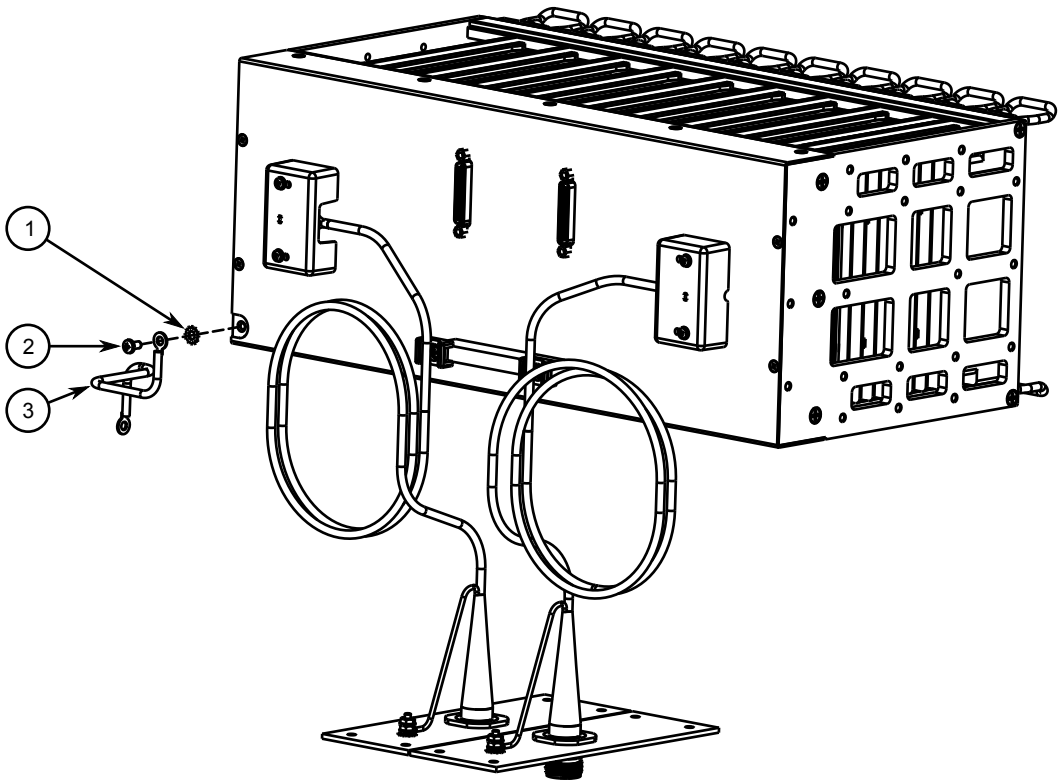

Figure 7: Chassis Ground Cable Assembly

1. External Tooth Lock Washer **2.** #8-32×5/16" Pan Head Screw **3.** Grounding Cable

2. Secure the grounding cable and external tooth lock washer to the MX5000 with one pan head screw. Torque the screw to 3.4 N·m (30 lbf·in).

NOTE
The other end of the grounding cable will be connected to the inside of the enclosure in later steps.

Section 2.1.3
Connecting the Failsafe Relay

The failsafe relay on the Control Module (CM) can be configured to latch based on alarm conditions. The NO (Normally Open) contact is closed when the unit is powered and there are no active alarms. If the device is not powered or if an active alarm is configured, the relay opens the NO contact and closes the NC (Normally Closed) contact.

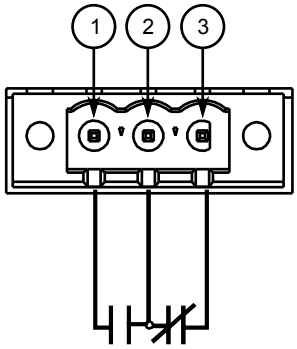

Figure 8: Failsafe Alarm Relay Wiring

1. Normally Open **2.** Common (Ground) **3.** Normally Closed

Pin	Function
NC	Normally Closed
Common	Ground
NO	Normally Open

The failsafe relay terminal is connected to the patch panel for the CM using the cable assembly provided. The connector is an Amphenol MIL-DTL 38999 size 13, code *A*. The following is the pinout for the connector:

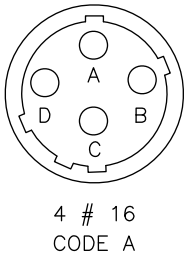

Figure 9: Failsafe Relay Alarm Panel Connector

Pin	Description
A	COM (Common)
B	NO (Normally Open)
C	NC (Normally Closed)
D	Spare

Section 2.1.4
Installing the Fan Tray Cables

1. Apply Loctite® 222 to the threads of the fan tray cable connector threads.

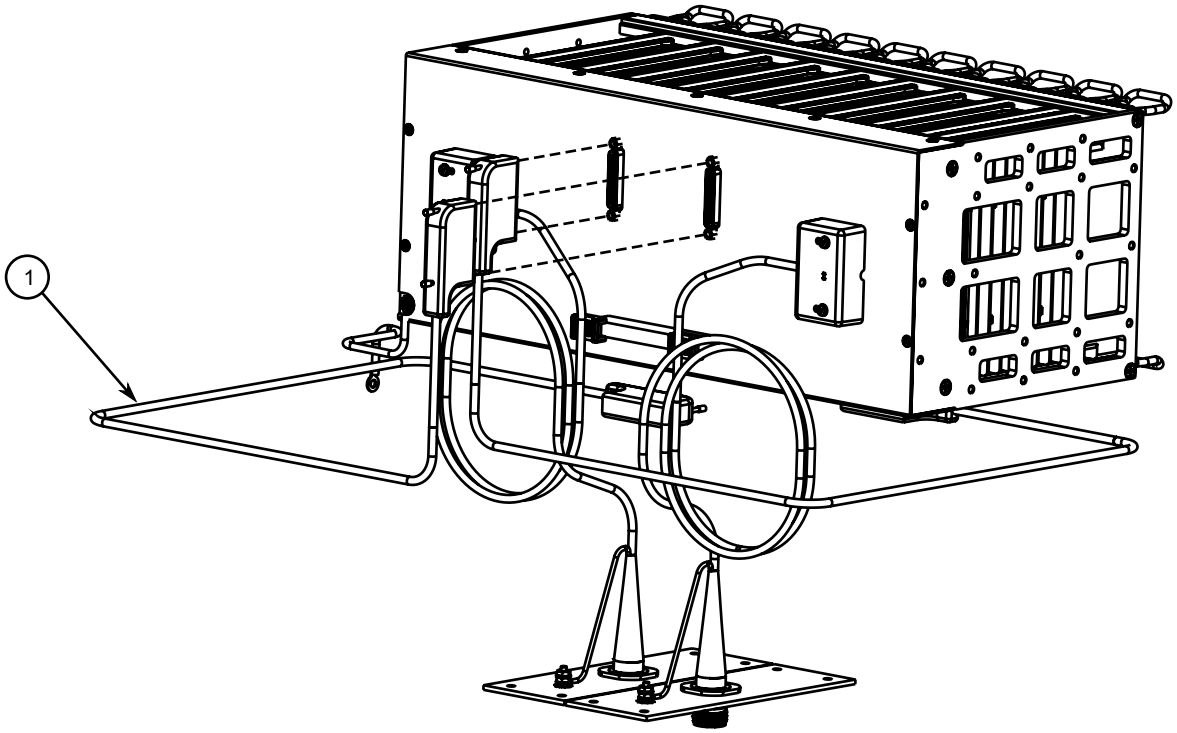

Figure 10: Fan Tray Cable Connections

1. Fan Cables

2. Attach two fan cables to the terminals on the rear of the MX5000.
3. Using two cable ties, secure the fan cables and power cables to the cable tie base on the rear of the MX5000. Make sure the cable ties are snug and the cables are unable to slide freely.

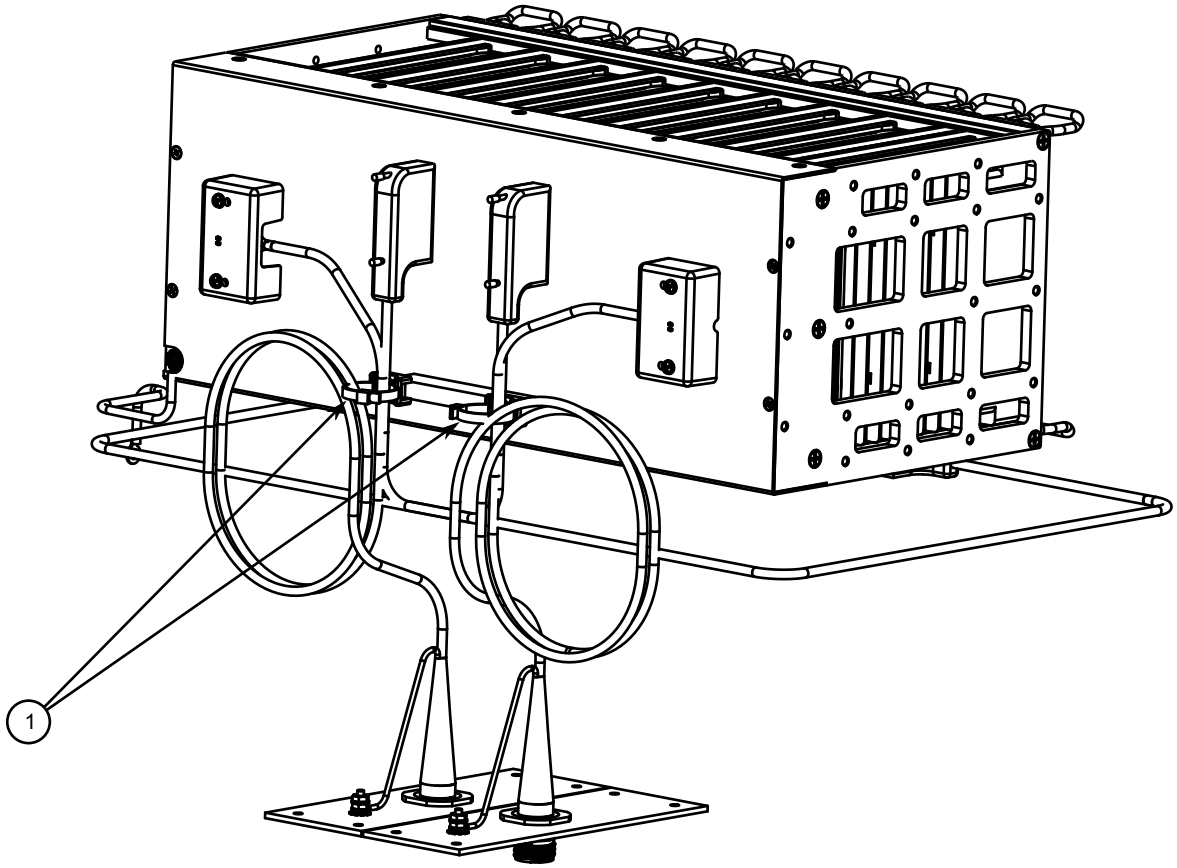

Figure 11: Power and Fan Tray Cable Ties

1. Cable Ties

4. After tightening the cable ties, trim and remove any excess length.

Section 2.1.5
Installing the Mounting Brackets

1. Position one of the mounting brackets on one side of the MX5000.

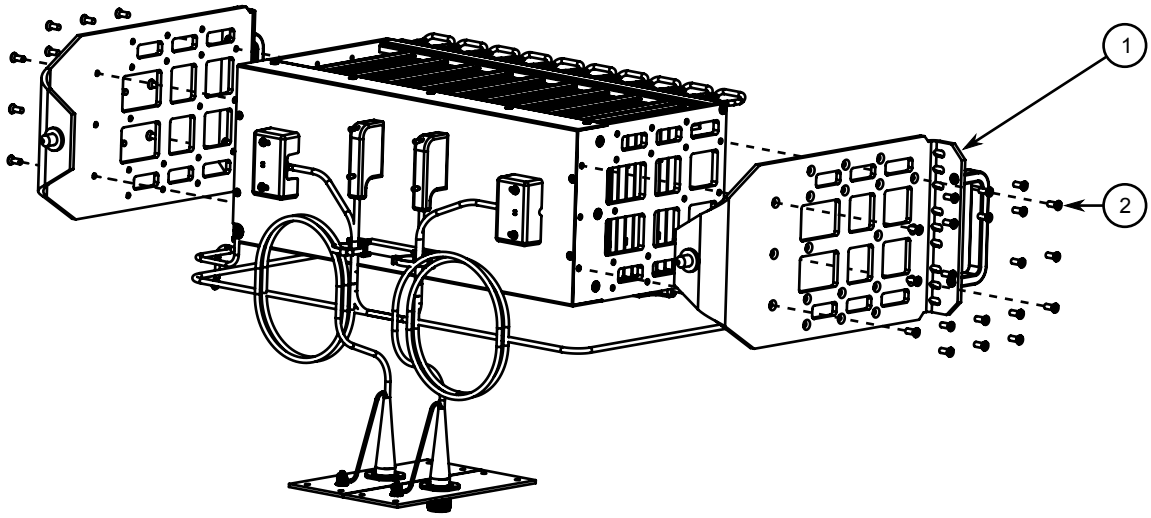

Figure 12: Mounting Brackets

1. Mounting Bracket **2.** #10-32×1/2" Flat Head Hex Socket Screw

2. Secure the mounting bracket with 20 flat head hex socket screws. Hand tighten each screw and make sure each screw head is flush with the surface of the mounting bracket.
3. Repeat Step 1 and Step 2 for the mounting bracket on the opposite side of the MX5000.

Section 2.1.6

Installing the EMI Gaskets

The material for the EMI (Electro-Magnetic Interference) gaskets is provided in two lengths for the two different sizes of patch panel openings in the MX5000:

EMI Gasket Material Length	Patch Panel Opening
19.5"	D, E, F and G
35.5"	A, B, C, H, J and K

To install the EMI gaskets, do the following:

1. Make sure the groove surrounding each panel opening is free of dust, dirt or liquid.
2. Inspect each gasket for signs of twisting, cracking, wear or damage. If the gaskets need to be replaced, cut and discard the them.

IMPORTANT!

- *Do not stretch the gasket material. Stretching the gasket material will degrade performance. If gasket material is inadvertently stretched, remove it from the patch panel groove and allow it to sit for 8 hours before attempting to install it again. The material will return to its original length.*
- *Do not cut the gasket to length before assembly.*

3. Starting at the overlapping section of a patch panel groove, gently press a length of gasket material into the groove. Work around the groove until the gasket is seated all around the opening and in the overlapping section. Make sure the gasket material is loose and is not stretched during installation.

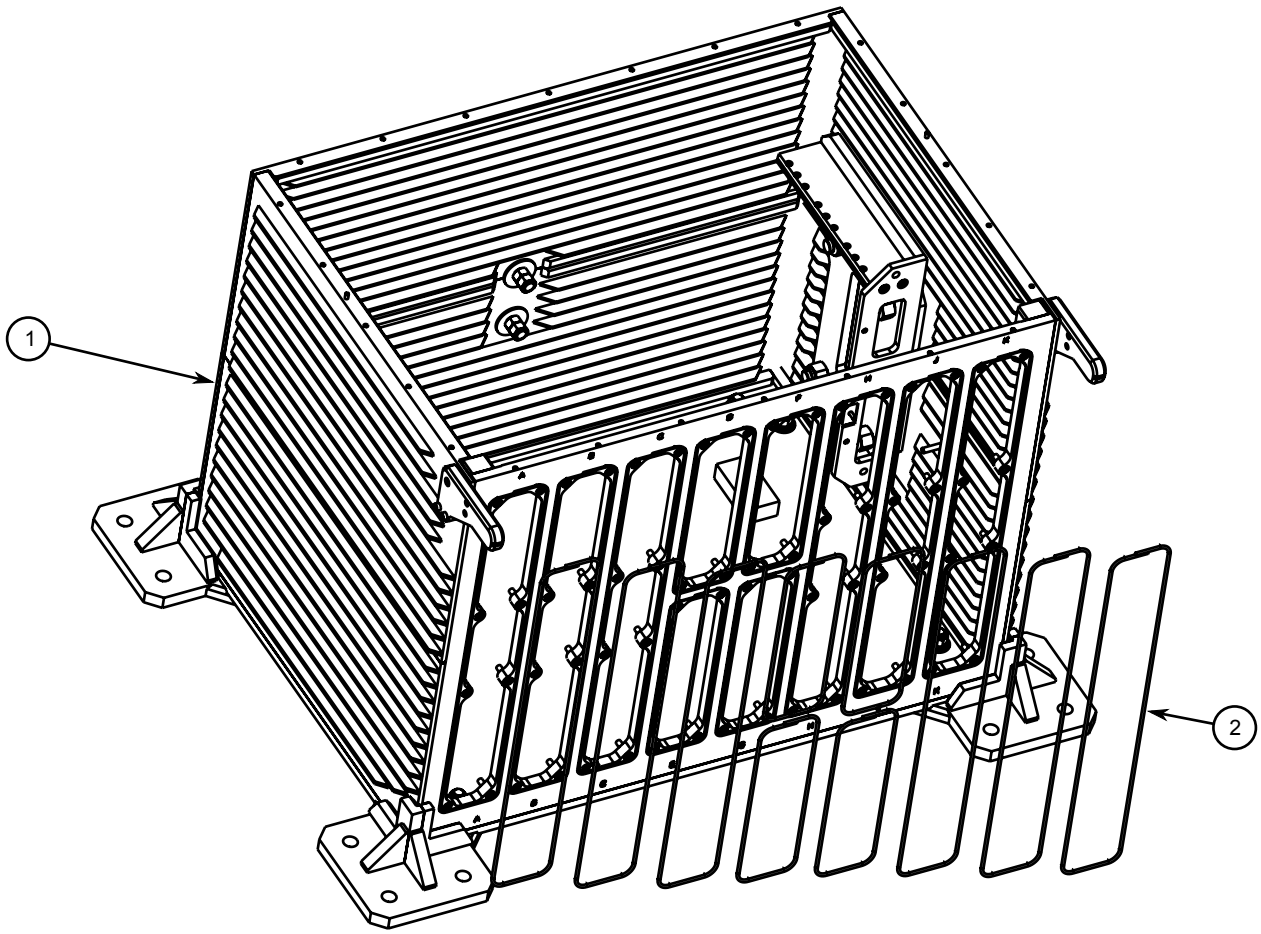

Figure 13: EMI Gasket Installation

4. Trim the gasket material to length.
5. Repeat Step 3 and Step 4 for each patch panel opening.

Section 2.1.7

Assembling the MX5000 and MX5000RE

To install the MX5000 in the MX5000RE, do the following:

1. Position the MX5000RE with the front opening facing up.

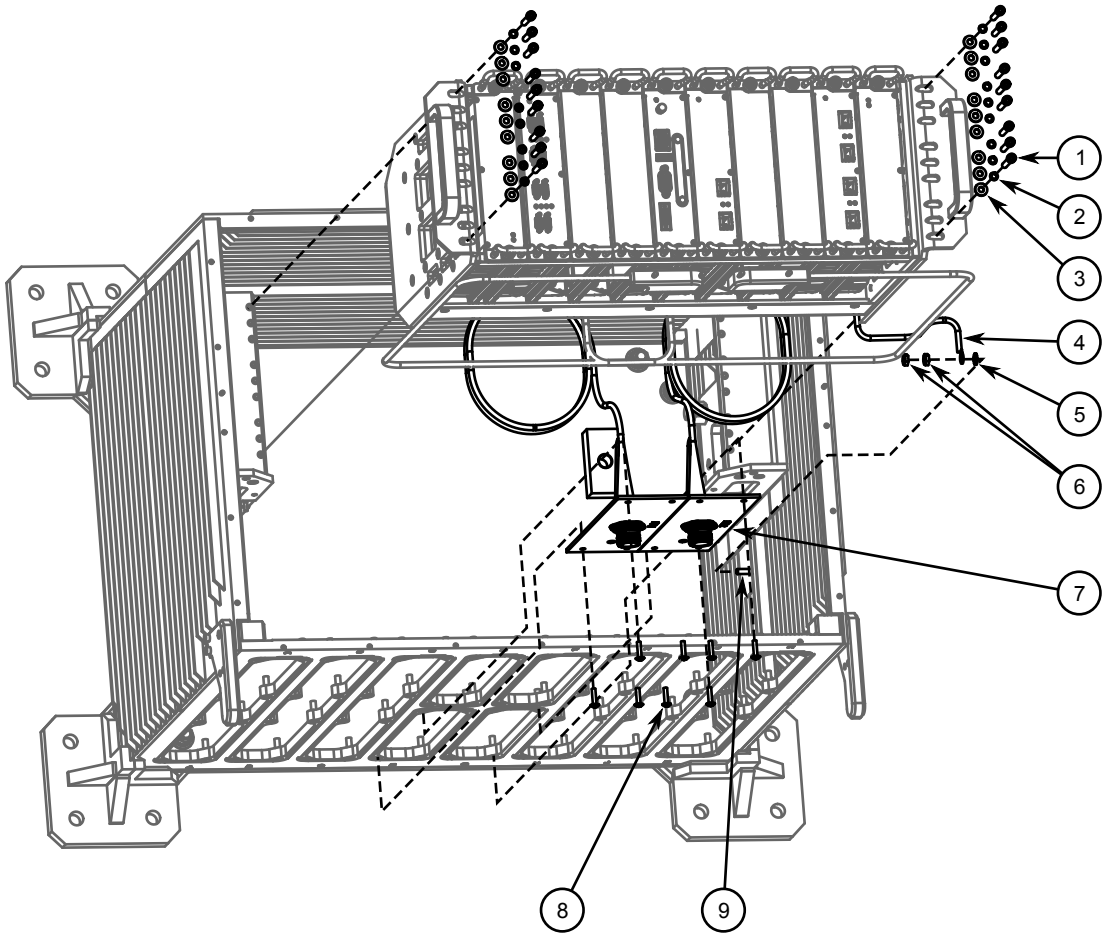

Figure 14: MX5000 and MX5000RE Assembly

1. #10-32×1" Screw **2.** #10 Split Lockwasher **3.** #10 Flat Washers **4.** Grounding Cable **5.** #10 Exterior Tooth Lockwasher **6.** #10-32 Hex Nut **7.** Power Supply Cable Assemblies **8.** #6-32×3/8" SS304 Truss Head Philips Drive Screw **9.** Inside Grounding Stud

WARNING!
Crushing hazard – risk of serious injury or damage to equipment. Make sure the device is properly supported at all times. It is highly recommended to employee the assistance of another technician.

2. Have an assistant hold the attached cables and patch panel clear of the MX5000RE sides.
3. Hold the MX5000 by both mount bracket handles and lower it into the MX5000RE.
4. Lower the MX5000 unit until the mount bracket flanges are supporting the unit on the inner mount bracket surfaces. If the MX5000 does not lower far enough, make sure the support pins on the back of the mount brackets are properly aligned with the alignment holes inside the MX5000RE.
5. Secure the MX5000 to the MX5000RE using 18 screws, flat washers and split lockwashers. Make sure each screw is assembled with two flat washers, one split lockwasher and then the screw.
6. Place one exterior tooth lockwasher on the inside grounding stud found on the right side of the MX5000RE.
7. Attach the free end of the grounding cable to the inside grounding stud using two hex nuts.

8. Carefully pass the PS1 power supply cable assembly through opening E on the bottom of the MX5000RE.
9. Carefully pass the PS2 power supply cable assembly through opening G on the bottom of the MX5000RE.

> **NOTE**
> *When aligning the patch panels, the inside grounding stud should be toward the back of the MX5000RE.*

10. Apply Loctite® 242 to four SS304 truss head philips drive screws.
11. Secure both patch panels to the MX5000RE with four SS304 truss head philips drive screws.

Section 2.1.8
Installing the Fan Tray

To intall the fan tray, do the following:

1. Position the fan tray the DB25 connectors facing forward when the fan tray is in the MX5000RE.

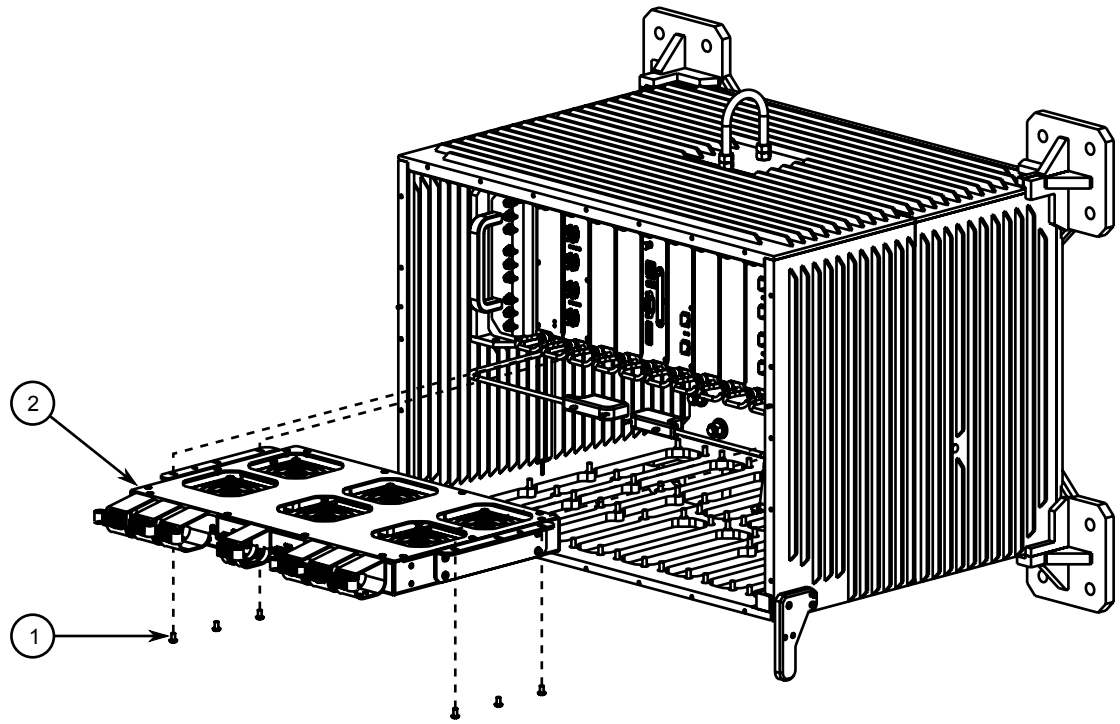

Figure 15: Fan Tray Installation

1. #8-32×5/16" Pan Head Screw **2.** Fan Tray

2. Align the fan tray with the pins on the bottom of the internal mounting brackets inside the MX5000RE.
3. Slide the fan tray onto the locating pins until the fan tray mount brackets touch the MX5000RE inner mount brackets.
4. Secure the fan tray using six (6) screws. Use Loctite® 242 on all screws.
5. Take the free ends of the fan control cables and straighten the cables side by side.

6. Take the right side fan control cable and thread it through the three (3) loops on the left side of the fan tray.
7. Connect the fan control cable to the left side DB25 connector.
8. Repeat Step 6 and Step 7 using the left side fan control cable.
9. Apply Loctite® 222 on the DB25 plug screws. Tighten the DB25 connector screws moderately.

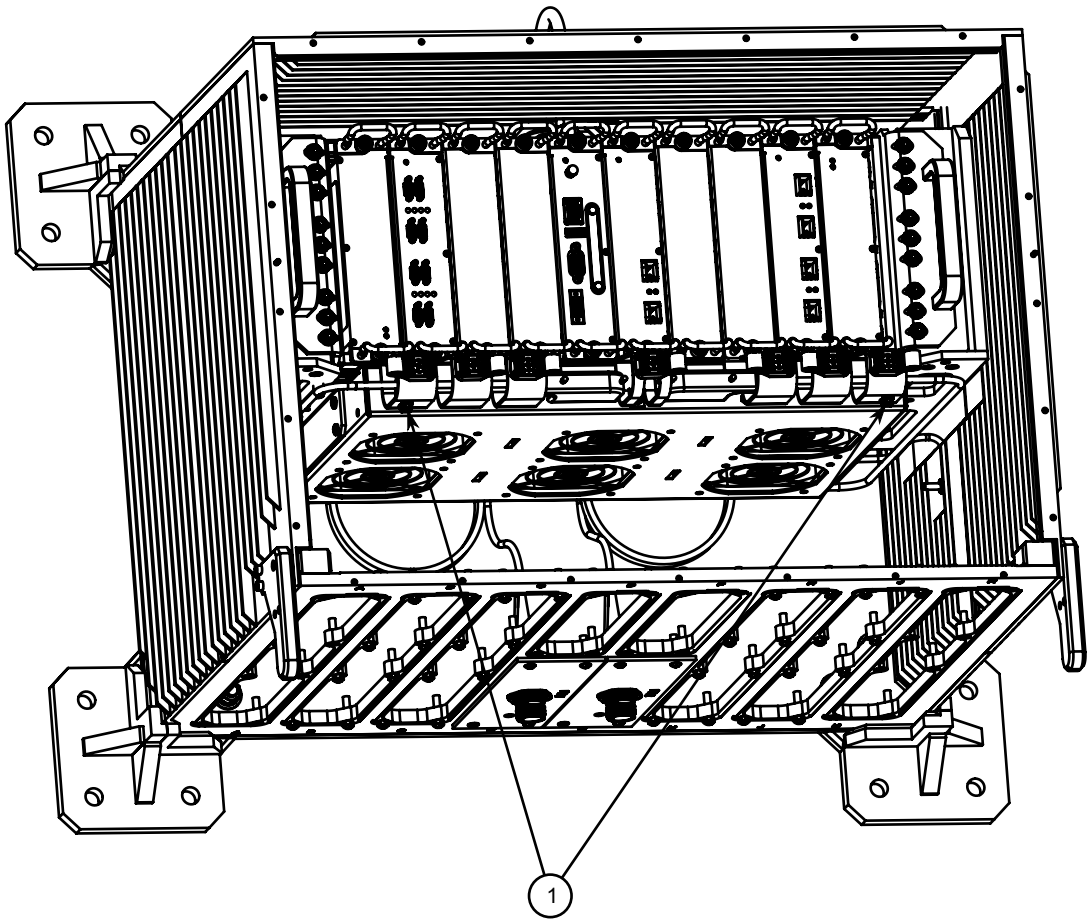

Figure 16: Fan Tray Cable Clips

1. Cable Clip

10. Secure the cables using two (2) cable ties through the slots on the outermost cable clips on the fan tray. Make sure the cables are held snug and are unable to slide freely.
11. After tightening the cable ties, trim and remove any excess length.

Section 2.1.9

Installing the Patch Panels

To install a patch panel, do the following:

NOTE
The following procedure also applies for blank patch panels.

1. From the bottom of the enclosure, feed the patch panel cables through the appropriate opening. For more information about which patch panels correspond to which openings, refer to Section 1.3, “Patch Panels”.

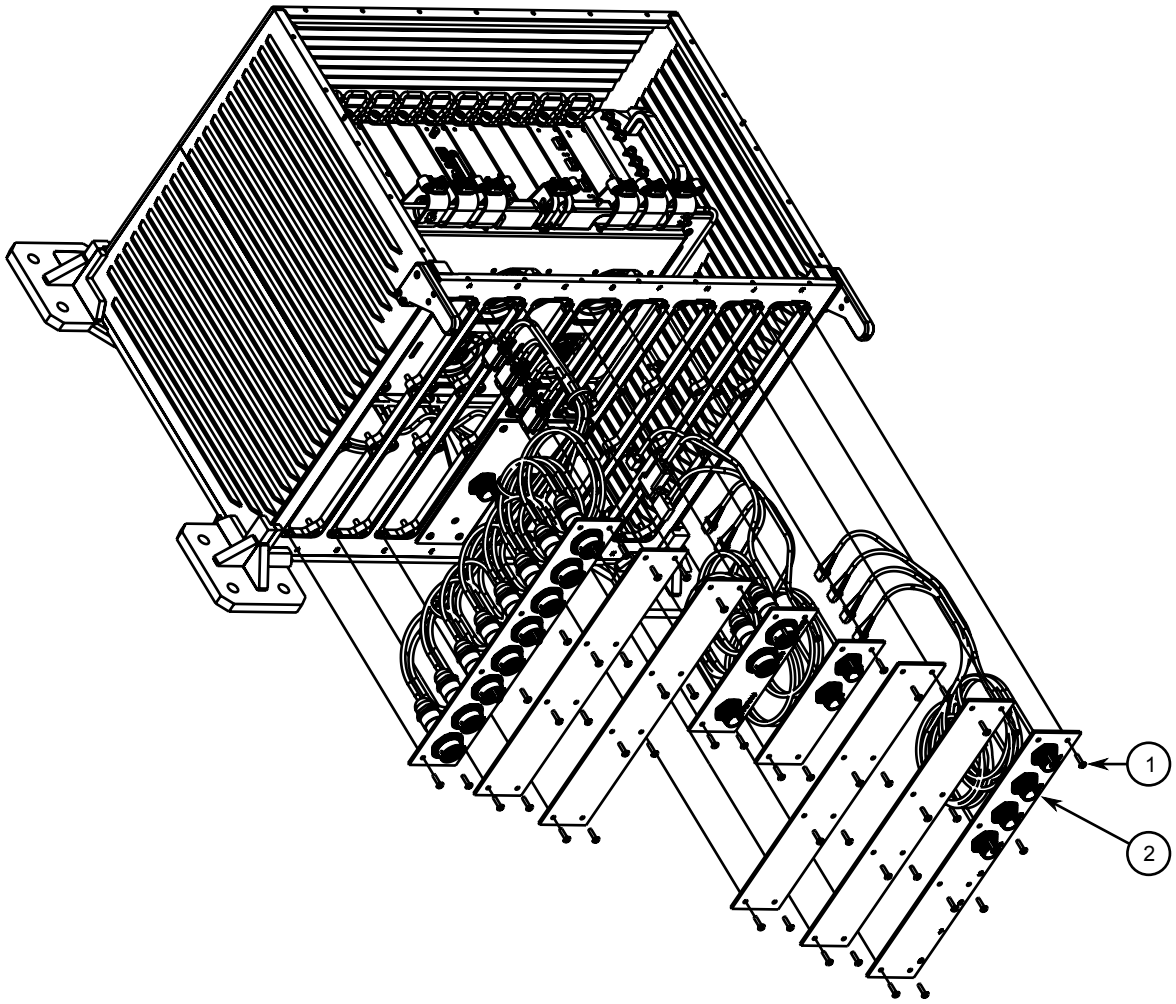

Figure 17: Patch Panel Installation

1. #6-32×5/8" SS304 Truss Head Philips Drive Screw **2.** Patch Panel

2. Align the patch panel with the screw holes surrounding the patch panel opening.
3. Apply Loctite® 242 to each screw.
4. Secure the patch panel to the enclosure with eight (8) screws for large panels, or four (4) for small panels. Hand-tighten the screws evenly in a cross pattern. There should be no visible gap between the patch panel and the enclosure's bottom plate when properly tightened. Pay careful attention to avoid damaging the cables and gaskets.

Section 2.1.10
Connecting the Network Cables

To connect network cables to the patch panels, do the following for each patch panel:

Connecting Micro-D Cables

1. Connect each cable in the patch panel bundle to the appropriate port. Make sure the cable and port have identical numbers.
2. Secure the bundled cables to an available cable tie base using one (1) cable tie. Tighten the cable tie until the bundled cables are held securely.
3. Install additional cable ties where necessary.

Connecting Ethernet Cables

1. Carefully remove the dust caps from one connector at a time.
2. Insert the uncapped connector into the appropriate transceiver on the MX5000. Make sure the cable and port have the same number, and the transmit and receive fibers are plugged in to the correct side of the transceiver.
3. Repeat Step 1 and Step 2 for all remaining fiber cables.
4. Secure all fiber cables with the provided Velcro® straps. Wrap the Velcro® cable strap around the fiber cables tightly, making sure the fiber cables are held securely.

Section 2.1.11
Installing the Front Panel

To install the front panel for the , do the following:

1. Position the MX5000RE with the front opening facing up.

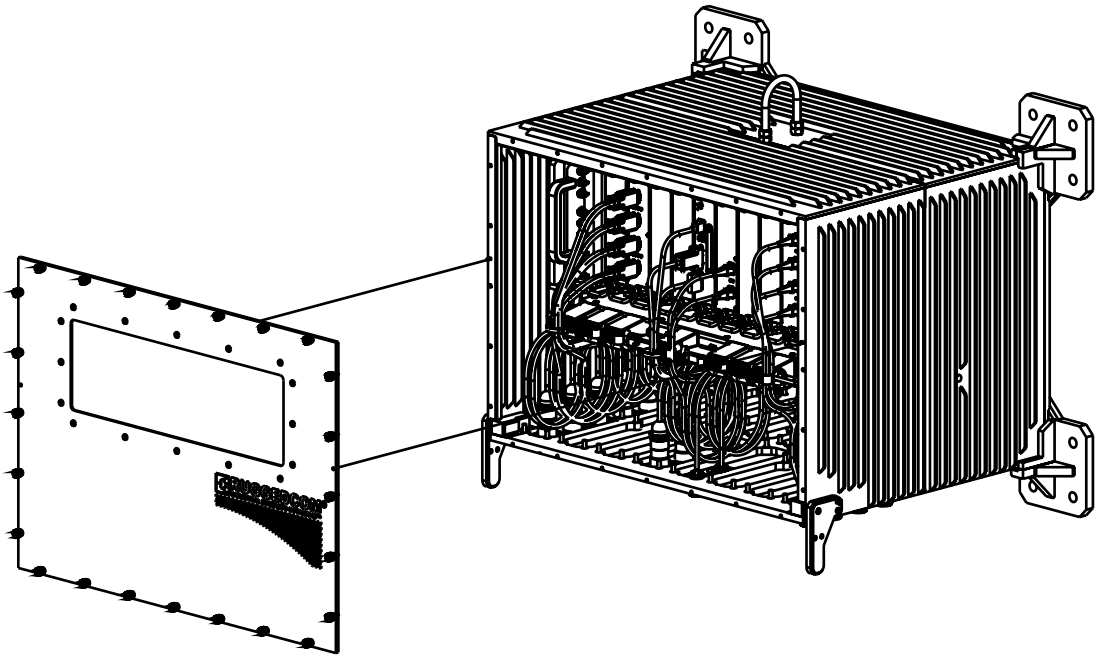

Figure 18: Front Panel Installation

WARNING!
Crushing hazard – risk of serious injury or damage to equipment. Make sure the front panel is properly supported at all times. It is highly recommended to employee the assistance of another technician.

2. Position the front panel over the MX5000RE opening, aligning the panel with the two (2) locating pins on the front face.
3. Secure the front panel with 24 screws. Hand-tighten the screws evenly in a cross pattern.

Section 2.1.12
Mounting the MX5000RE

To mount the fully assembled MX5000RE to its final mounting surface, do the following:

1. Make sure the mounting surface is flat within a tolerance of 0.254 mm (0.010 in).
2. Position the enclosure with the lifting ring facing up.

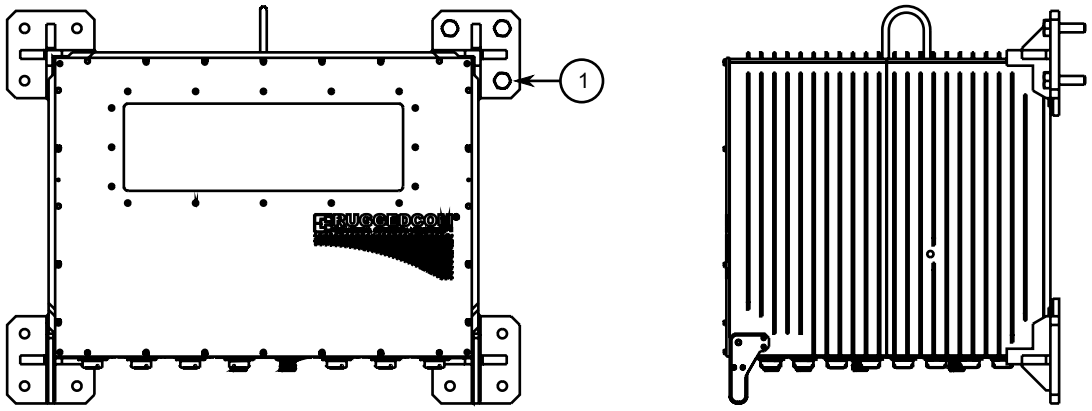

Figure 19: Mounting the MX5000RE

1. Screw

WARNING!
Crushing hazard – risk of serious injury or damage to equipment. Make sure the front panel is properly supported at all times. It is highly recommended to employee the assistance of another technician.

3. Secure the MX5000RE to a wall or mounting bracket using screws. Torque each screw evenly to 61 N·m (45 lbf·ft) in a cross pattern.

Section 2.2

Connecting Power

The MX5000RE supports dual redundant AC and/or DC power supplies that can be installed in any combination. The use of two power modules is recommended to provide redundancy and load balancing.

The MX5000 is equipped with a screw-type terminal block, which provides power to both power supplies. The terminal block is installed using Philips screws and compression plates, allowing either bare wire connections or crimped terminal lugs. Use #6 size ring lugs for secure, reliable connections under severe shock or vibration.

IMPORTANT!

- *In an AC/DC power arrangement, the placement of the AC and DC power supplies is not slot-dependent. Either power module slot can be used for AC or DC power.*
- *For maximum redundancy in a dual power supply configuration, use two independent power sources.*
- *Use only #16 gage copper wiring when connecting terminal blocks.*
- *For 125/230 VAC rated equipment, an appropriately rated AC circuit breaker must be installed.*
- *For 125/250 VDC rated equipment, an appropriately rated DC circuit breaker must be installed.*
- *It is recommended to provide a separate circuit breaker for each power supply module.*
- *Equipment must be installed according to applicable local wiring codes and standards.*

The following sections describe how to connect power to the device:

- Section 2.2.1, “Installing/Removing Power Supplies”
- Section 2.2.2, “Connecting Power to the Enclosure”

Section 2.2.1
Installing/Removing Power Supplies

The MX5000 supports dual redundant AC and/or DC power supplies that can be installed in any combination. Slots for the removable power modules are located on the rear panel of the device.

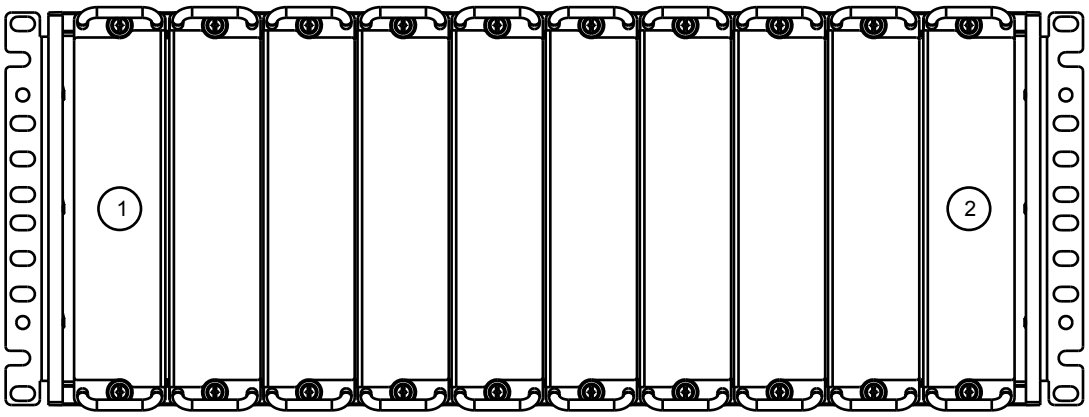

Figure 20: Power Module Slots

1. Slot PS1 **2.** Slot PS2

DANGER!
Electrocution hazard – risk of serious personal injury or death. The device may have two power supplies equipped, which may be connected to separate power sources. Make sure all power sources are isolated before servicing the power supplies.

The following sections describe how to install, remove and connect the power supplies:

- Section 2.2.1.1, “Installing a Power Supply”
- Section 2.2.1.2, “Removing a Power Supply”

Section 2.2.1.1
Installing a Power Supply

To install a power supply, do the following:

NOTE
The power supplies are hot swappable. It is not necessary to disconnect power to the device before installing or removing a power supply.

1. Remove the blank power module assembly or, if equipped, the currently installed power supply. For information about removing a power supply, refer to Section 2.2.1.2, “Removing a Power Supply”.

2. Insert the power supply into the empty slot. When power is supplied to the device, the top and bottom LEDs on the power supply should be green, indicating that power is being received and supplied to the device.

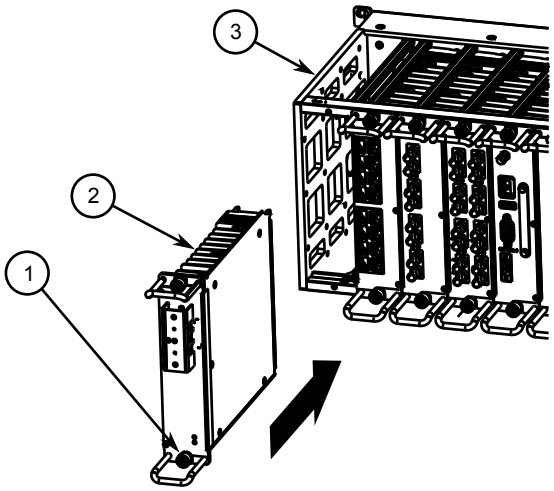

Figure 21: Installing a Power Supply

1. Screws **2.** Power Supply **3.** Chassis

3. Hand-tighten the screws to secure the power supply.

Section 2.2.1.2

Removing a Power Supply

To remove a power supply, do the following:

NOTE
The power supplies are hot swappable. It is not necessary to disconnect power to the device before Removing or removing a power supply.

1. Remove the screws that secure the power supply.
2. Pull the power supply from the chassis.

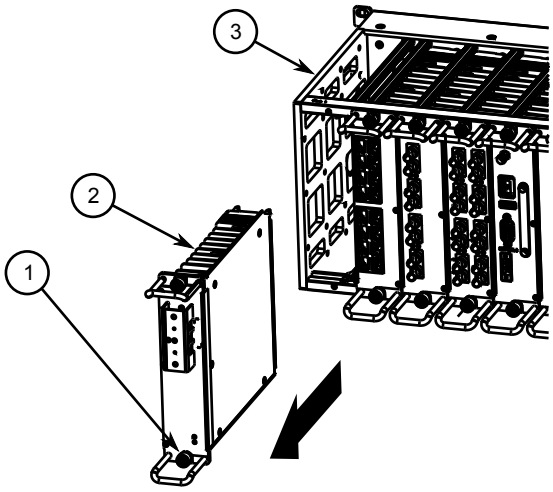

Figure 22: Removing a Power Supply

1. Screws **2.** Power Supply **3.** Chassis

3. Install the blank power module assembly into the empy slot to prevent the ingress of dust and dirt.

Section 2.2.2

Connecting Power to the Enclosure

To complete the power circuit, connect an external power supply to the PS1 and/or PS2 patch panels using male Amphenol MIL-DTL 389999 size 13, code N connectors.

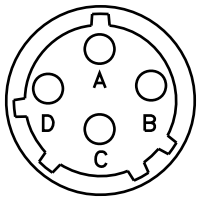

Figure 23: Power Supply Panel Connector

Pin	Description
A	PS LIve/+
B	Spare
C	PS Neutral/-
D	Spare

Section 2.3

Connecting to the Device

The following describes the various methods for accessing the ROX II console and Web interfaces on the device. For more detailed instructions, refer to the *ROX II User Guide* for the RX5000.

Serial Console and Management Ports

Connect a PC or terminal directly to the serial console or management ports to access the boot-time control and ROX II interfaces. The serial console port provides access to ROX II 's console interface, while the management port provides access to ROX II's console and Web interfaces.

IMPORTANT!

The serial console and management (MGMT) ports are intended to be used only as temporary connections during initial configuration or troubleshooting.

The serial console port implements RS232 DCE (Data Communication Equipment) on a DB9 connector. The following is the pin-out for the port:

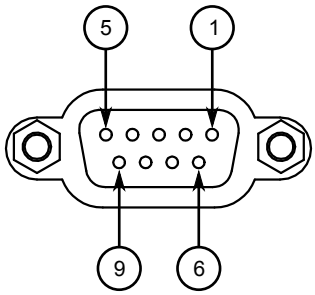

Figure 24: Serial DB9 Console Port

Pin	Name	Description
1	DCD	Data Carrier Detect
2	RX	Receive Data
3	TX	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear To Send
9	Reserved (Do Not Connect)	

The management port is a 10/100Base-TX copper Ethernet port with an RJ45 connector. The following is the pin-out for the management port:

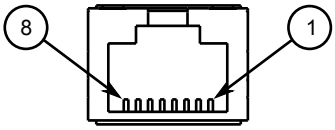

Figure 25: RJ45 Management Port

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	Reserved (Do Not Connect)	
5	Reserved (Do Not Connect)	
6	RX-	Receive Data-
7	Reserved (Do Not Connect)	
8	Reserved (Do Not Connect)	

Communication Ports

Connect any of the available Ethernet ports on the device to a management switch and access the ROX II console and Web interfaces via the device's IP address. For more information about available ports, refer to Chapter 3, *Communication Ports*.

Section 2.4
Cabling Recommendations

Before connecting the device, be aware of the recommendations and considerations outlined in the following sections:

- Section 2.4.1, “Protection On Twisted-Pair Data Ports”
- Section 2.4.2, “Gigabit Ethernet 1000Base-TX Cabling Recommendations”

Section 2.4.1
Protection On Twisted-Pair Data Ports

Siemens does not recommend the use of copper cabling of any length for critical, real-time substation automation applications. All copper Ethernet ports on RUGGEDCOM products include transient suppression circuitry to protect against damage from electrical transients and conform with IEC 61850-3 and IEEE 1613 Class 1 standards. This means that during a transient electrical event, communications errors or interruptions may occur, but recovery is automatic.

Siemens also does not recommend using copper Ethernet ports to interface with devices in the field across distances that could produce high levels of ground potential rise (i.e. greater than 2500 V), during line-to-ground fault conditions.

Section 2.4.2
Gigabit Ethernet 1000Base-TX Cabling Recommendations

The IEEE 802.3ab Gigabit Ethernet standard defines 1000 Mbit/s Ethernet communications over distances of up to 100 m (328 ft) using all 4 pairs in category 5 (or higher) balanced, unshielded twisted-pair cabling. For wiring guidelines, system designers and integrators should refer to the Telecommunications Industry Association (TIA) TIA/EIA-568-A wiring standard that characterizes minimum cabling performance specifications required for proper Gigabit Ethernet operation. For reliable, error-free data communication, new and pre-existing communication paths should be verified for TIA/EIA-568-A compliance.

The following table summarizes the relevant cabling standards:

Cabling Category	1000Base-TX Compliant	Required Action
< 5	No	New wiring infrastructure required.
5	Yes	Verify TIA/EIA-568-A compliance.
5e	Yes	No action required. New installations should be designed with Category 5e or higher.
6	Yes	No action required.
> 6	Yes	Connector and wiring standards to be determined.

Follow these recommendations for copper data cabling in high electrical noise environments:

- Data cable lengths should be as short as possible, preferably 3 m (10 ft) in length. Copper data cables should not be used for inter-building communications.
- Power and data cables should not be run in parallel for long distances, and should be installed in separate conduits. Power and data cables should intersect at 90° angles when necessary to reduce inductive coupling.

- Shielded/screened cabling can be used when required. Care should be taken to avoid the creation of ground loops with shielded cabling.

3 Communication Ports

The MX5000 can be equipped with various types of communication ports to enhance its abilities and performance. Each set of communication ports is part of a field replaceable module that makes switching ports fast and easy.

Use the ROX II software to determine which ports are equipped on the device. For more information, refer to the *ROX II User Guide* for the RX5000.

Each type of module has a specific location in the MX5000 chassis.

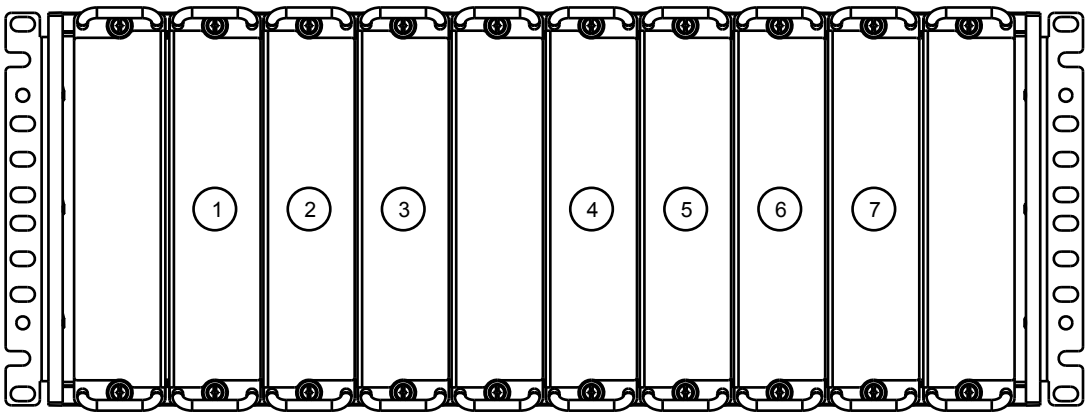

Figure 26: Module Assignment

1. Ethernet Module Slot (LM1) **2.** Ethernet Module Slot (LM2) **3.** Ethernet Module Slot (LM3) **4.** Switch Module (SM) **5.** Ethernet Module Slot (LM4) **6.** Ethernet Module Slot (LM5) **7.** Ethernet Module Slot (LM6)

Slot Type	Description
SM	The *Switch Module* contains the chassis-wide Ethernet switch fabric that interconnects Ethernet ports on all installed line modules.
LM1 through LM6	One to six Ethernet Line Modules can be installed in the MX5000RE.

CAUTION!
Mechanical hazard – risk of damage to equipment. Do not apply vertical force to the handles on the modules. Damage to the handles may occur, which is not covered by warranty. Avoid resting the device on any flat surface where pressure is applied to the module handles.

The following sections describe the available modules and how to install/remove them:

- Section 3.1, “Serial Ports”
- Section 3.2, “Switch Ports”
- Section 3.3, “Copper Ethernet Ports”
- Section 3.4, “Fiber Optic Ethernet Ports”
- Section 3.5, “SFP Optic Ethernet Ports”

- Section 3.6, “Installing/Removing Modules”
- Section 3.7, “Connecting Multiple RS485 Devices”

Section 3.1

Serial Ports

The MX5000RE supports DB9 serial ports, which can be run in RS232, RS485 or RS422 mode.

NOTE
On power-up, all serial ports default to RS485 mode. Each port can be individually set to RS232, RS485 or RS422 mode through ROX II. For more information, refer to the ROX II User Guide for the RX5000.

All serial ports feature an LED that indicates the current state of the port.

State	Description
Green	Link activity detected
Off	No link detected

For specifications on serial ports, refer to Section 4.5, “Serial Port Specifications”.

For information about how to connect devices configured to run in RS485 mode, refer to Section 3.7, “Connecting Multiple RS485 Devices”.

The following are the pin-outs for the DB9 connectors:

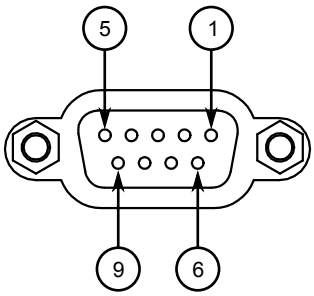

Figure 27: DB9 Serial Port

Pin	Function		
	RS232 Mode	RS422 Mode	RS485 Mode
1		RX-	
2	RX	TX+	TX+/RX+
3	TX	RX+	
4	IRIG_B_Out		
5	COM (Isolated GND)		
6	COM (Isolated GND)		
7		TX-	TX-/RX-
8			
9	COM (Isolated GND)		
Body	Chassis GND[a]		
Screws	Chassis GND[a]		

[a] *Connected internally.*

Section 3.2
Switch Ports

The MX5000RE supports a single Layer 2 or Layer 3 switch module that can operate at 8 or 88 Gbps. The switch module supports either RJ45, LC (Lucent Connector), SC (Standard or Subscriber Connector) or SFP (Small Form-factor Pluggable) connectors.

The following are the pin-out descriptions for the RJ45, LC and SC connectors:

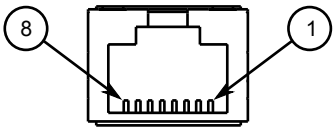

Figure 28: RJ45 Ethernet Port Pin Configuration

Pin	Name		Description
	10/100Base-TX	1000Base-TX	
1	RX+	BI_DB+	Receive Data+ or Bi-Directional
2	RX-	BI_DB-	Receive Data- or Bi-Directional
3	TX+	BI_DA+	Transmit Data+ or Bi-Directional
4	Reserved (Do Not Connect)		
5	Reserved (Do Not Connect)		
6	TX-	BI_DA-	Transmit Data- or Bi-Directional
7	Reserved (Do Not Connect)		
8	Reserved (Do Not Connect)		

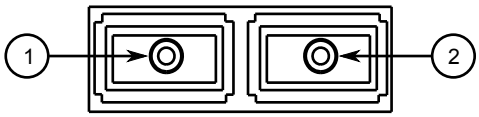

Figure 29: SC Port

1. Tx Connector **2.** Rx Connector

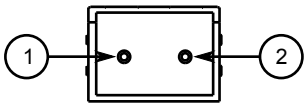

Figure 30: LC Port

1. Tx Connector **2.** Rx Connector

For specifications on the available fiber optic Ethernet ports, refer to Section 4.3, “Copper Ethernet Port Specifications” or Section 4.4, “Fiber Optic Ethernet Port Specifications”.

Section 3.3
Copper Ethernet Ports

The MX5000RE supports several 10/100/1000Base-TX Ethernet ports that allow connection to standard Category 5 (CAT-5) unshielded twisted-pair (UTP) cables with either RJ45 or Micro-D male connectors. The RJ45 and Micro-D connectors are directly connected to the chassis ground on the device.

WARNING!
Electric shock hazard – risk of serious personal injury and/or equipment interference. If shielded cables are used, make sure the shielded cables do not form a ground loop via the shield wire and the

RJ45 receptacles at either end. Ground loops can cause excessive noise and interference, but more importantly, create a potential shock hazard that can result in serious injury.

Each RJ45 port features a **Speed** and **Link** LED that indicates the state of the port.

LED	State	Description
Speed	Yellow	The port is operating at maximum speed (100 or 1000 Mbps)
	Off	The port is not operating at maximum speed
Link	Yellow (Solid)	Link established
	Yellow (Blinking)	Link activity
	Off	No link detected

The following are the pin-out descriptions for the RJ45 and Micro-D connectors:

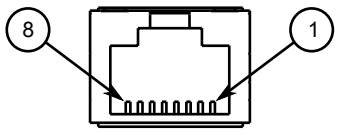

Figure 31: RJ45 Ethernet Port Pin Configuration

Pin	Name		Description
	10/100Base-TX	1000Base-TX	
1	RX+	BI_DB+	Receive Data+ or Bi-Directional
2	RX-	BI_DB-	Receive Data- or Bi-Directional
3	TX+	BI_DA+	Transmit Data+ or Bi-Directional
4	Reserved (Do Not Connect)		
5	Reserved (Do Not Connect)		
6	TX-	BI_DA-	Transmit Data- or Bi-Directional
7	Reserved (Do Not Connect)		
8	Reserved (Do Not Connect)		

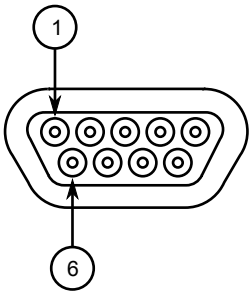

Figure 32: Micro-D 10/100Base-TX Port Pin Configuration

Pin	10/100Base-TX	1000Base-TX
1	TX+	B+
2	Reserved (Do Not Connect)	D+
3	Reserved (Do Not Connect)	
4	Reserved (Do Not Connect)	C+
5	RX+	A+
6	TX-	B-
7	Reserved (Do Not Connect)	D-
8	Reserved (Do Not Connect)	C-
9	RX-	A-

For specifications on the available copper Ethernet ports, refer to Section 4.3, “Copper Ethernet Port Specifications”.

Section 3.4
Fiber Optic Ethernet Ports

Fiber optic Ethernet ports are available with either MTRJ (Mechanical Transfer Registered Jack), LC (Lucent Connector), SC (Standard or Subscriber Connector) or ST (Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

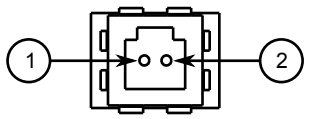

Figure 33: MTRJ Port

1. Tx Connector **2.** Rx Connector

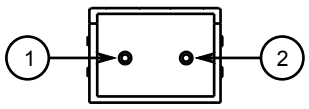

Figure 34: LC Port

1. Tx Connector **2.** Rx Connector

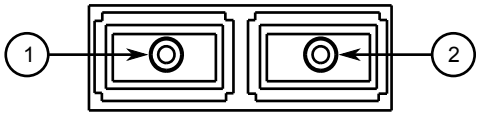

Figure 35: SC Port

1. Tx Connector **2.** Rx Connector

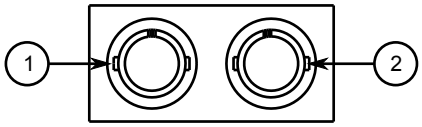

Figure 36: ST Port

1. Tx Connector **2.** Rx Connector

For specifications on the available fiber optic Ethernet ports, refer to Section 4.4, “Fiber Optic Ethernet Port Specifications”.

Section 3.5
SFP Optic Ethernet Ports

SFP (Small Form-Factor Pluggable) optic Ethernet ports are available with LC (Lucent Connector) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

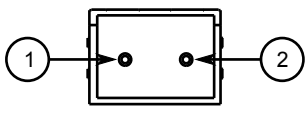

Figure 37: LC Port

1. Tx Connector **2.** Rx Connector

NOTE
SFP modules, as well as their optical ports, can be safely inserted and removed while the chassis is powered and operating.

The following sections describe how to install and remove SFP optical ports:

- Section 3.5.1, “Installing an SFP Optical Port”
- Section 3.5.2, “Removing an SFP Optical Port”

Section 3.5.1

Installing an SFP Optical Port

To install an SFP optical port, do the following:

CAUTION!
Electrical hazard – risk of damage to equipment. Use only components certified by Siemens with RUGGEDCOM products. Damage to the module and device may occur if compatibility and reliability have not been properly assessed.

CAUTION!
Electrical hazard – risk of damage to equipment. Make sure all electrostatic energy is dissipated before installing or removing components from the device. An electrostatic discharge (ESD) can cause serious damage to the component once it is outside the chassis.

1. Make sure all potential electrostatic build-up has been properly discharged to prevent electrostatic discharges (ESD). This can be accomplished by wearing an ESD wrist strap or by touching Earth or the chassis ground.
2. Remove the dust cover from the port opening in the module.

   CAUTION!
   Mechanical hazard – risk of component damage. SFP optical ports are designed to insert in only one orientation. Do not force the port into the module.
3. Remove the port from its packaging.
4. Insert the port into the module and swing the bail-latch up to lock it in place.

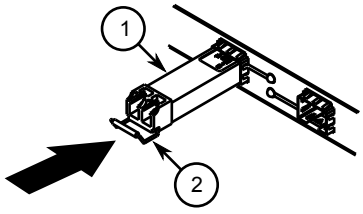

Figure 38: Installing an SFP Optical Port (Typical)

1. SFP Optical Port **2.** Metal Bail-Latch

5. Remove the dust cover from the port.
6. Connect a cable to the port and test the connection.

Section 3.5.2

Removing an SFP Optical Port

To remove an SFP optical port, do the following:

CAUTION!
Electrical hazard – risk of damage to equipment. Make sure all electrostatic energy is dissipated before performing installing or removing components from the device. An electrostatic discharge (ESD) can cause serious damage to the component once it is outside the chassis.

1. Make sure all potential electrostatic build-up has been properly discharged to prevent electrostatic discharges (ESD). This can be accomplished by wearing an ESD wrist strap or by touching Earth or the chassis ground.
2. Disconnect the cable from the port.
3. Swing the metal bail-latch down and pull the port from the module.

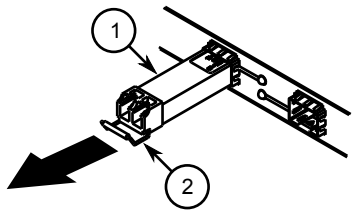

Figure 39: Removing an SFP Optical Port (Typical)

1. SFP Optical Port **2.** Metal Bail-Latch

4. Store the port in an ESD-safe bag or other suitable ESD-safe environment, free from moisture and stored at the proper temperature (-40 to 85 °C or -40 to 185 °F).
5. Insert a plug in the empty port opening to prevent the ingress of dust and dirt.

Section 3.6

Installing/Removing Modules

The following sections describe how to install and remove modules:

- Section 3.6.1, “Installing a Module”
- Section 3.6.2, “Removing a Module”

Section 3.6.1

Installing a Module

Upon installing a new module in the device, all the features associated to the module are available in the operating system. For more information, refer to the *ROX II User Guide* for the RX5000.

To install a module, do the following:

1. Make sure power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.
2. If the device is installed in a rack, remove it from the rack.
3. Remove the current module from the slot. For more information, refer to Section 3.6.2, “Removing a Module”.
4. Insert the new module into the slot.

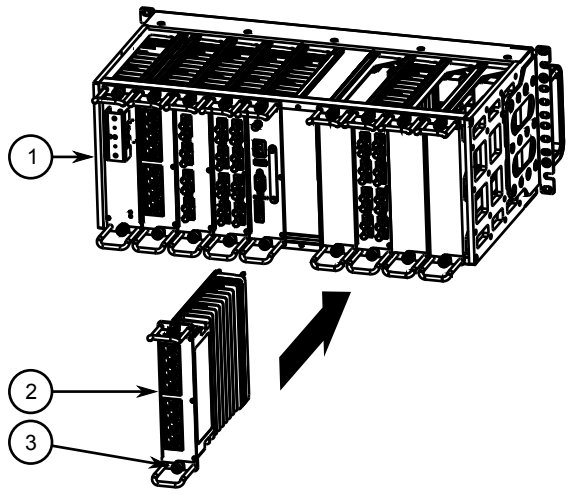

Figure 40: Installing a Module

1. Chassis **2.** Module **3.** Screw

5. Tighten the screws to secure the module.
6. If necessary, install the device in the rack.
7. Connect power to the device.

Section 3.6.2

Removing a Module

Once a module is removed, all the features associated with the module are hidden or disabled in the operating system.

To remove a module, do the following:

1. Make sure power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.
2. If the device is installed in a rack, remove it from the rack.
3. Loosen the screws that secure the module.
4. Pull the module from the chassis to disconnect it.

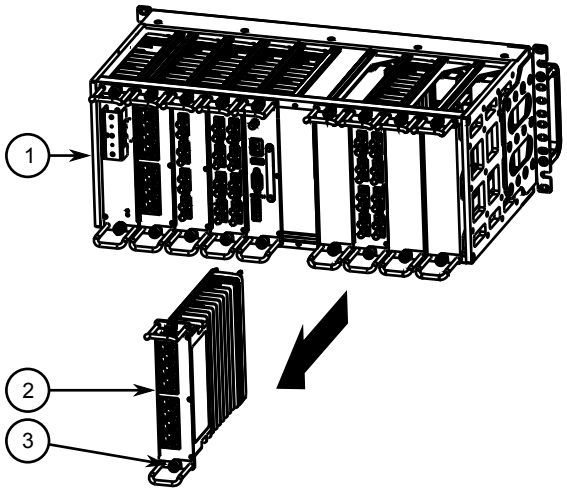

Figure 41: Removing a Module

1. Chassis **2.** Module **3.** Screw

5. Install a new module or a blank module (to prevent the ingress of dust and dirt). For more information, refer to Section 3.6.1, “Installing a Module”.
6. If necessary, install the device in the rack.
7. Connect power to the device.

Section 3.7

Connecting Multiple RS485 Devices

Each RS485 port can communicate with multiple RS485 devices by wiring devices together in sequence over a single twisted pair with transmit and receive signals on the same two wires (half duplex). For reliable, continuous communication, adhere to the following guidelines:

- To minimize the effects of ambient electrical noise, use shielded cabling.
- The correct polarity must be observed throughout a single sequence or ring.
- The number of devices wired should not exceed 32, and total distance should be less than 1219 m (4000 ft) at 100 kbps.
- The Common terminals should be connected to the common wire inside the shield.
- The shield should be connected to earth ground at a single point to avoid loop currents.
- The twisted pair should be terminated at each end of the chain.

The following shows the recommended RS485 wiring.

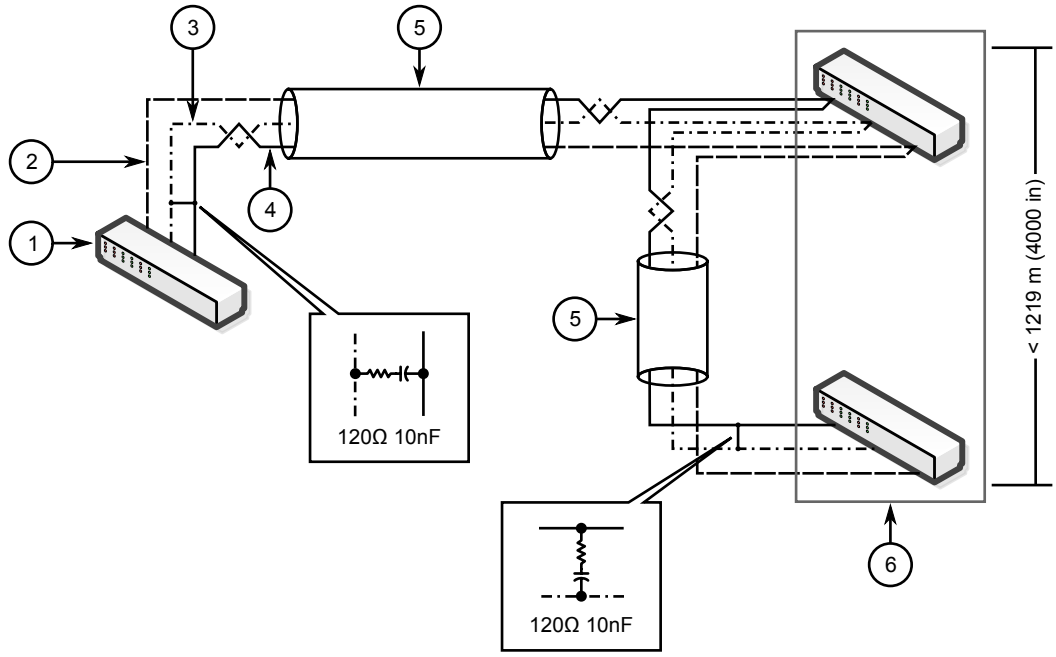

Figure 42: Recommended RS485 Wiring

1. MX5000RE Device **2.** Common (Isolated Ground) **3.** Negative **4.** Positive **5.** Shield to Earth (Connected At a Single Point)
6. RS485 Devices (32 Total)

4 Technical Specifications

The following sections provide important technical specifications related to the device and available modules:

- Section 4.1, “Power Supply Specifications”
- Section 4.2, “Failsafe Relay Specifications”
- Section 4.3, “Copper Ethernet Port Specifications”
- Section 4.4, “Fiber Optic Ethernet Port Specifications”
- Section 4.5, “Serial Port Specifications”
- Section 4.6, “Operating Environment”
- Section 4.7, “Mechanical Specifications”

Section 4.1

Power Supply Specifications

Power Supply Type	Input Range		Internal Fuse Rating	Max. Power Consumption[a]
	Min	Max		
HI (125/250 VDC)[b]	88 VDC	300 VDC	6.3 A, 250 V(T)[c]	84 W[d]
HI (110/230 VAC)[b]	85 VAC	264 VAC		

[a] *Power consumption varies based on the device configuration. Each 10/100Base-Tx port consumes roughly 1 W less than a fiber optic port.*

[b] *The HI power supply is the same power supply for both AC and DC.*

[c] *(T) denotes time-delay fuse. Internal fuse is not user-replaceable.*

[d] *Rating at 85 °C (185 °F) ambient temperature at worst-case load.*

Section 4.2

Failsafe Relay Specifications

Parameter	Value (Resistive Load)
Maximum Switching Voltage	250 VAC, 125 VDC
Rated Switching Current	2 A @ 250 VAC, 2 A @30 VDC

Section 4.3

Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the MX5000RE.

Order Code	Speed[e]	Connector	Duplex[e]	Cable Type[f]	Wiring Standard[g]	Maximum Distance[h]	Isolation[i]
M16TX01	10/100Base-TX	RJ45	FDX/HDX	> Category 5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV
M8TX02	10/100Base-TX	Micro-D	FDX/HDX	> Category 5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV
M4CG01	10/100Base-TX	Micro-D	FDX/HDX	> Category 5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV

[e] *Auto-negotiating.*

[f] *Shielded or unshielded.*

[g] *Auto-crossover and auto-polarity.*

[h] *Typical distance. Dependent on the number of connectors and splices.*

[i] *RMS 1 minute.*

Section 4.4

Fiber Optic Ethernet Port Specifications

The following sections detail fiber optic specifications for ports that can be equipped on the MX5000RE . The user determines the type of optics at the time of ordering, and can determine the ports installed on a particular unit by reading the factory data file via the ROX II user interface. The specifications are organized by order code. Module order codes are contained within each unit when it is assembled and configured at the factory. For information about obtaining factory configuration data, refer to the *ROX II User Guide* for the RX5000.

- Section 4.4.1, “Fast Ethernet (100 Mbps) Optical Specifications”
- Section 4.4.2, “Gigabit Ethernet (1 Gbps) Optical Specifications”

Section 4.4.1

Fast Ethernet (100 Mbps) Optical Specifications

Order Code	Mode	Connector Type	Cable Type (µm)	Tx λ (typ.) (nm)	Tx min. (dBm)	Tx max. (dBm)	Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (typ.) (km)	Power Budget (dB)
FX01	MM	ST	62.5/125	1300	-19	-14	-31	-14	2	12
			50/125		-22.5					8.5
FX02	MM	SC	62.5/125	1300	-19	-14	-31	-14	2	12
			50/125		-22.5					8.5
FX03	MM	MTRJ	62.5/125	1300	-19	-14	-31	-14	2	12
			50/125		-22.5					8.5
FX04	SM	ST	9/125	1310	-15	-8	-32	-3	20	17
FX05	SM	SC	9/125	1310	-15	-8	-31	-7	20	16
FX06	SM	LC	9/125	1310	-15	-8	-34	-7	20	19

Order Code	Mode	Connector Type	Cable Type (µm)	Tx λ (typ.) (nm)	Tx min. (dBm)	Tx max. (dBm)	Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (typ.) (km)	Power Budget (dB)
FX07	SM	SC	9/125	1310	-5	0	-34	-3	50	29
FX08	SM	LC	9/125	1310	-5	0	-35	3	50	30
FX09	SM	SC	9/125	1310	0	5	-37	0	90	37
FX10	SM	LC	9/125	1310	0	5	-37	0	90	37
FX11	MM	LC	62.5/125	1300	-19	-14	-32	-14	2	13

Section 4.4.2

Gigabit Ethernet (1 Gbps) Optical Specifications

Order Code	Mode	Connector Type	Cable Type (µm)	Tx λ (typ.) (nm)	Tx min. (dBm)	Tx max. (dBm)	Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (typ.) (km)	Power Budget (dB)
SM04	MM	LC	50/125 62.5/125	850	-9	-2.5	-20	0	0.5	11
SM05	SM	SC	9/125	1310	-10	-3	-20	-3	10	10
SM06	SM	LC	9/125	1310	-9.5	-3	-21	-3	10	11.5
SM07	SM	SC	9/125	1310	-5	0	-20	-3	25	15
SM08	SM	LC	9/125	1310	-7	-3	-24	-3	25	17

Section 4.5

Serial Port Specifications

Order Code	Baud Rate	Connector	Isolation
MS01	1200 to 230400 kbps	DB9	2.5 kV

Section 4.6

Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85 °C (-40 to 185 °F)	Measured from a 30 cm (12 in) radius surrounding the center of the enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85 °C (-40 to 185 °F)	

Section 4.7

Mechanical Specifications

Parameter	Value
Dimensions	Refer to Chapter 5, *Dimension Drawings*.
Weight (MX5000)	14-16 kg (30-35 lbs)
Weight (Enclosure)	68 kg (150 lbs)
Ingress Protection (MX5000)	IP40
Ingress Protection (Enclosure)	IP65
Chassis Material (MX5000)	Aluminum
Chassis Material (Enclosure)	Aluminum alloy

5 Dimension Drawings

NOTE
All dimensions are in millimeters, unless otherwise stated.

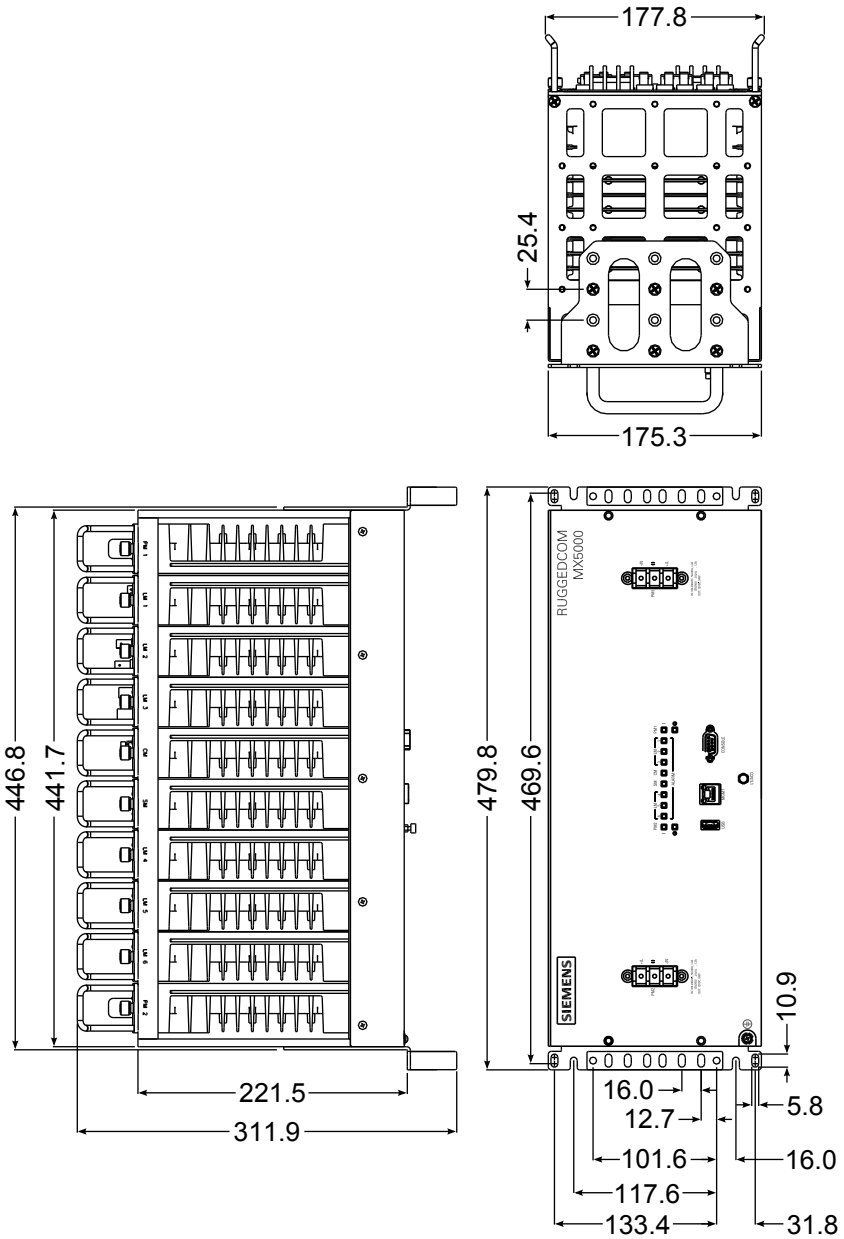

Figure 43: MX5000 Overall Dimensions

6 Certification

The MX5000RE device has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

- Section 6.1, “Agency Approvals”
- Section 6.3, “FCC Compliance”
- Section 6.4, “Industry Canada Compliance”
- Section 6.5, “EMI and Environmental Type Tests”

Section 6.1

Agency Approvals

The MX5000RE has received approval from various agencies.

Agency	Standards	Comments
TUV	CAN/CSA C22.2 No. 60950-1-07, UL 60950-1:2007	Approved
CE	EN 60950-1, EN 61000-6-2, EN 55022, EN 50581, EN 60825-1	CE Compliance is claimed via Declaration of Self Conformity Route
FCC	FCC Part 15, Class A	Approved
FDA/CDRH	21 CFR Chapter I, Sub-chapter J	Approved
ISO	ISO9001:2008	Designed and manufactured using a ISO9001:2008 certified quality program

Section 6.2

MIL-STD Ratings

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

Section 6.3
FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference on his own expense.

Section 6.4
Industry Canada Compliance

CAN ICES-3 (A) / NMB-3 (A)

Section 6.5
EMI and Environmental Type Tests

The MX5000RE has passed the following EMI and environmental tests.

IEC 61850-3 EMI Type Tests

Test	Description		Test Levels	Severity Levels
IEC 61000-4-2	ESD	Enclosure Contact	+/- 8 kV	4
		Enclosure Air	+/- 15 kV	4
IEC 61000-4-3	Radiated RFI	Enclosure Ports	20 V/m	Note[a]
IEC 61000-4-4	Burst (Fast Transient)	Signal ports	+/- 4 kV @ 2.5 kHz	Note[a]
		DC Power ports	+/- 4 kV	4
		AC Power ports	+/- 4 kV	4
		Earth ground ports	+/- 4 kV	4
IEC 61000-4-5	Surge	Signal ports	+/- 4 kV line-to-earth, +/- 2 kV line-to-line	4
		DC Power ports	+/- 2 kV line-to-earth, +/- 1 kV line-to-line	3
		AC Power ports	+/- 4 kV line-to-earth, +/- 2 kV line-to-line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10 V	3
		D.C Power ports	10V	3
		AC Power ports	10V	3

Test	Description		Test Levels	Severity Levels
		Earth ground ports	10V	3
IEC 61000-4-8	Magnetic Field	Enclosure Ports	40 A/m, continuous, 1000 A/m for 1 s	Note[a]
			1000 A/m for 1 s	5
IEC 61000-4-29	Voltage Dips & Interrupts	DC Power ports	30% for 0.1 s, 60% for 0.1 s, 100% for 0.05 s	
		AC Power ports	30% for 1 period, 60% for 50 periods	
IEC 61000-4-11	Voltage Dips & Interrupts	AC Power ports	100% for 5 periods, 100% for 50 periods	
IEC 61000-4-12	Damped Oscillatory	Signal ports	2.5 kV common, 1 kV differential mode @1 MHz	3
		DC Power ports	2.5 kV common, 1 kV differential mode @1MHz	3
		AC Power ports	2.5 kV common, 1 kV differential mode @1MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	30 V Continuous, 300 V for 1 s	4
		DC Power ports	30 V Continuous, 300 V for 1 s	4
IEC 61000-4-17	Ripple on DC Power Supply	DC Power ports	10%	3
IEC 60255-5	Dielectric Strength	Signal ports	2 kVAC (Fail-Safe Relay output)	
		DC Power ports	1.5 kVDC	
		AC Power ports	2 kVAC	
	HV Impulse	Signal ports	5 kV (Fail-Safe Relay output)	
		DC Power ports	5 kV	
		AC Power ports	5 kV	

[a] *Siemens-specified severity levels*

IEEE 1613 (C37.90.x) EMI Immunity Type Tests

NOTE
The MX5000RE meets Class 2 requirements for an all-fiber configuration and Class 1 requirements for copper ports.

Test	Description		Test Levels
IEEE C37.90.3	ESD	Enclosure Contact	+/-2 kV, +/-4 kV, +/- 8 kV
		Enclosure Air	+/-4 kV, +/-8 kV, +/-15 kV
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m
IEEE C37.90.1	Fast Transient	Signal ports	+/- 4 kV @ 2.5 kHz
		DC Power ports	+/- 4 kV
		AC Power ports	+/- 4 kV

Test	Description		Test Levels
		Earth ground ports	+/- 4 kV
IEEE C37.90.1	Oscillatory	Signal ports	2.5 kV common mode @1 MHz
		DC Power ports	2.5 kV common, 1 kV differential mode @ 1 MHz
		AC Power ports	2.5 kV common, 1 kV differential mode @ 1 MHz
	HV Impulse	Signal ports	5 kV (Fail-Safe Relay output)
		DC Power ports	5 kV
		AC Power ports	5 kV
Dielectric Strength	Signal ports	2 kVAC	
		DC Power ports	2 kVDC
		AC Power ports	2 kVAC

Environmental Type Tests

Test	Description		Test Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40 °C (-40 °F), 16 Hours
IEC 60068-2-2	Dry Heat	Test Bd	85 °C (185 °F), 16 Hours
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55 °C (131 °F), 6 cycles
IEC 60255-21-1	Vibration		2 g @ 10 - 150 Hz
IEC 60255-21-2	Shock		30 g @ 11 mS