

Edition

11/2022

Installation Manual

SIMATIC NET

Rugged Ethernet Switches

RUGGEDCOM RMC8388

<https://www.siemens.com/ruggedcom>

SIEMENS

SIMATIC NET

Rugged Ethernet Switches RUGGEDCOM RMC8388

Installation Manual

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Legal Information

Warning Notice System

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.

 WARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

 NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper Use of Siemens Products

Note the following:

 WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Canada Ltd.. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

This guide describes the RUGGEDCOM ROS. 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.

Related Documents

Other documents that may be of interest include:

Document Title	Link
RUGGEDCOM ROS Configuration Manual	https://support.industry.siemens.com/cs/ww/en/view/109737241

SIMATIC NET Glossary

The SIMATIC NET Glossary describes special terms that may be used in this document.

The glossary is available online via Siemens Industry Online Support (SIOS) at:

<https://support.industry.siemens.com/cs/ww/en/view/50305045>

Accessing Documentation

The latest user documentation for RUGGEDCOM RMC8388 is available online at <https://support.industry.siemens.com>. To request or inquire about a user document, contact Siemens Customer Support.

Registered Trademarks

RUGGEDCOM™ and ROS™ are trademarks of Siemens Canada Ltd..

Other designations in this manual might be trademarks whose use by third parties for their own purposes would infringe the rights of the owner.

Warranty

Siemens warrants this product for a period of five (5) years from the date of purchase, conditional upon the return to factory for maintenance during the warranty term. This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. The warranties set forth in this article are exclusive and are in lieu of all other warranties, performance guarantees and conditions whether written or oral, statutory, express or implied (including all warranties and conditions of merchantability and fitness for a particular purpose, and all warranties and conditions arising from course of dealing or usage or trade). Correction of nonconformities in the manner and for the period of time provided above shall constitute the Seller's sole liability and the Customer's exclusive remedy for defective or nonconforming goods or services whether claims of the Customer are based in contract (including fundamental breach), in tort (including negligence and strict liability) or otherwise.

For warranty details, visit <https://www.siemens.com> or contact a Siemens customer service representative.

Training

Siemens offers a wide range of educational services ranging from in-house training of standard courses on networking, Ethernet switches and routers, to on-site customized courses tailored to the customer's needs, experience and application.

Siemens' Educational Services team thrives on providing our customers with the essential practical skills to make sure users have the right knowledge and expertise to understand the various technologies associated with critical communications network infrastructure technologies.

Siemens' unique mix of IT/Telecommunications expertise combined with domain knowledge in the utility, transportation and industrial markets, allows Siemens to provide training specific to the customer's application.

For more information about training services and course availability, visit <https://www.siemens.com> or contact a Siemens Sales representative.

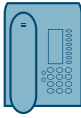
Customer Support

Customer support is available 24 hours, 7 days a week for all Siemens customers. For technical support or general information, contact Siemens Customer Support through any of the following methods:

Online

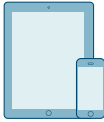


Visit <http://www.siemens.com/automation/support-request> to submit a Support Request (SR) or check on the status of an existing SR.



Telephone

Call a local hotline center to submit a Support Request (SR). To locate a local hotline center, visit https://w3.siemens.com/aspa_app/?lang=en.



Mobile App

Install the Industry Online Support app by Siemens AG on any Android, Apple iOS or Windows mobile device and be able to:

- Access Siemens' extensive library of support documentation, including FAQs and manuals
- Submit SRs or check on the status of an existing SR
- Contact a local Siemens representative from Sales, Technical Support, Training, etc.
- Ask questions or share knowledge with fellow Siemens customers and the support community

Contacting Siemens

Address	Siemens Canada Ltd. Digital Industries Process Automation 300 Applewood Crescent Concord, Ontario Canada, L4K 5C7
Telephone	Toll-free: 1 888 264 0006 Tel: +1 905 856 5288 Fax: +1 905 856 1995
E-Mail	info.ruggedcom@siemens.com
Web	https://www.siemens.com

Introduction

The RUGGEDCOM RMC8388 is a rugged, small form factor time converter designed to operate in electrically harsh environments with widely varying climatic and environmental conditions such as those found in utility substations. Designed and verified to withstand extreme temperatures, vibrations and shock, the RUGGEDCOM RMC8388 offers exceptional reliability.

Three variants of the RUGGEDCOM RMC8388 are available:

- **RUGGEDCOM RMC8388 A**
Converts IEEE 1588 to IRIG-B TTL OUT
- **RUGGEDCOM RMC8388 B**
Converts IEEE 1588 to IRIG-B AM OUT
- **RUGGEDCOM RMC8388 C**
Converts IRIG-B AM to IEEE 1588

The primary benefits offered by the RUGGEDCOM RMC8388 include:

- **Time Conversion**
Provide or receive IRIG-B time signals to be converted from or to PTP (IEEE 1588)
- **Form Factor**
Space saving design allows easy integration into existing equipment cabinets
- **Migration Path**
Allows migration to newer technology and still support existing equipment with no performance degradation
- **Rugged Design**
Withstands harsh environments allowing installation in almost any environment

1.1 Feature Highlights

Rugged Rated for Reliability in Harsh Environments

- Immunity to EMI and heavy electrical surges
- Zero-Packet-Loss Technology
- Meets IEEE 1613 Class 2 (electric utility substations)
- Exceeds IEC 61850-3 (electric utility substations)
- Exceeds IEC 61000-6-2 (generic industrial)
- -40° C to 85° C operating temperature (fanless)

- Conformal coated printed circuit boards (optional)

Extreme Flexibility

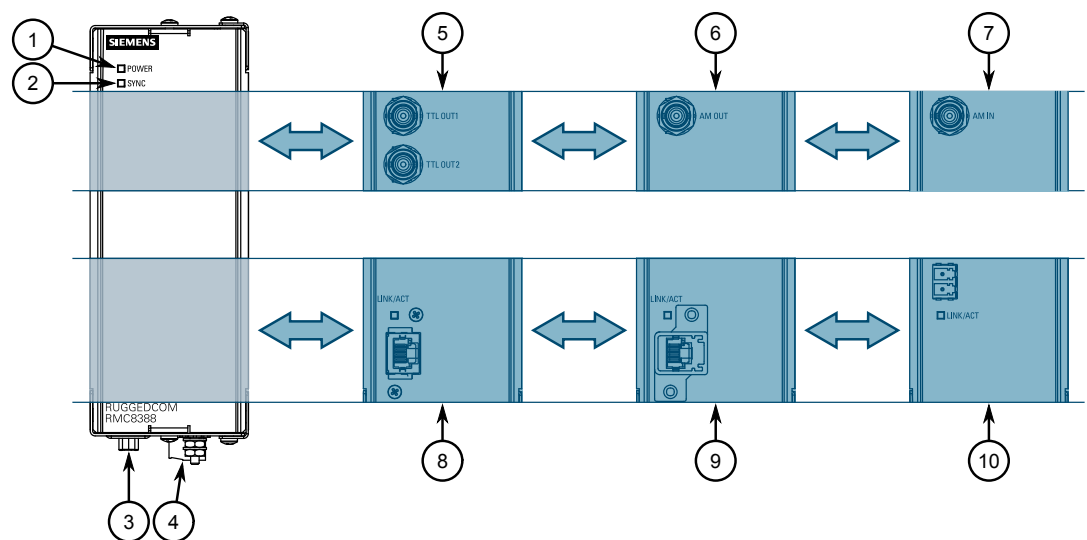
- Support for a fiber or copper Ethernet port
- Galvanized Steel enclosure
- [Optional] Supports Siemens FastConnect™ RJ-45 cabling system

Cyber Security

- Multilevel user passwords
- Secure File Transfer Protocol (SFTP) using Secure Shell (SSH)
- Web-based management using Secure Sockets Layer (SSL)
- Remote Authentication Dial In User Service (RADIUS) authentication service for device management
- 1024-bit RSA encryption for key management and key exchange

1.2 Description

The RUGGEDCOM RMC8388 features various ports, controls and indicator LEDs for connecting, configuring and troubleshooting the device. The final device configuration is determined during the ordering process. The following describes the major options available.



- ① POWER LED
- ② SYNC LED
- ③ RS-232 Console Port
- ④ Power Supply Terminal

- ⑤ BNC Ports – TTL OUT1/2
- ⑥ BNC Port – AM OUT
- ⑦ BNC Port – AM IN
- ⑧ Copper Ethernet Port with LINK/ACT LED
- ⑨ Copper FastConnect Ethernet Port with LINK/ACT LED
- ⑩ Fiber Optic Ethernet Port with LINK/ACT LED

Figure 1.1 RUGGEDCOM RMC8388

POWER LED	<p>Illuminates when power is being supplied to the device.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>Device is ready</td> </tr> <tr> <td>Red</td> <td>Device is booting up</td> </tr> <tr> <td>Off</td> <td>No power</td> </tr> </tbody> </table>	State	Description	Green	Device is ready	Red	Device is booting up	Off	No power		
State	Description										
Green	Device is ready										
Red	Device is booting up										
Off	No power										
SYNC LED	<p>Indicates the status of the supplied timing signal.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>Signal locked</td> </tr> <tr> <td>Amber/Yellow</td> <td>Holdover</td> </tr> <tr> <td>Red</td> <td>Error</td> </tr> <tr> <td>Off</td> <td>No signal detected</td> </tr> </tbody> </table>	State	Description	Green	Signal locked	Amber/Yellow	Holdover	Red	Error	Off	No signal detected
State	Description										
Green	Signal locked										
Amber/Yellow	Holdover										
Red	Error										
Off	No signal detected										
LINK/ACT LED	<p>Indicates the state of the copper or fiber optic Ethernet port.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">State</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Green (Solid)</td> <td>Link established</td> </tr> <tr> <td>Green (Blinking)</td> <td>Link activity</td> </tr> <tr> <td>Off</td> <td>No link detected</td> </tr> </tbody> </table>	State	Description	Green (Solid)	Link established	Green (Blinking)	Link activity	Off	No link detected		
State	Description										
Green (Solid)	Link established										
Green (Blinking)	Link activity										
Off	No link detected										
RS232 Serial Console Port	<p>For interfacing directly with the device and accessing initial management functions. For information about connecting to the device via the serial console port, refer to "Connecting to the Device" (Page 19).</p>										
Power Supply Terminal	<p>A pluggable terminal. For more information, refer to:</p> <ul style="list-style-type: none"> • "Connecting Power" (Page 14) • "Power Supply Specifications" (Page 25) 										
BNC Port(s)	<p>Transmits/receives timing signals from one protocol to another. For more information about the individual BNC ports, refer to "BNC Ports" (Page 21).</p>										
Fiber Optic or Copper Ethernet Port	<p>Receives and transmits IEEE 1588 v2 messages, as well as provides remote Web access to the RUGGEDCOM ROS operating system. For more information, refer to:</p> <ul style="list-style-type: none"> • "Connecting to the Device" (Page 19) • "Copper Ethernet Port (If Equipped)" (Page 23) • "Fiber Optic Ethernet Port (If Equipped)" (Page 22) 										

1.3 Required Tools and Materials

The following tools and materials are required to install the RUGGEDCOM RMC8388:

Tools/Materials	Purpose
AC or DC power cord (16 AWG)	For connecting power to the device.
Shielded coaxial cables	For connecting the device to the network.
Flathead screwdriver	For mounting the device to a DIN rail.
Phillips screwdriver	For mounting the device to a panel.
4 x #6-32 screws	For mounting the device to a panel.
Braided or equivalent ground wire	For grounding the device.

1.4 Decommissioning and Disposal

Proper decommissioning and disposal of this device is important to prevent malicious users from obtaining proprietary information and to protect the environment.

Decommissioning

This device may include sensitive, proprietary data. Before taking the device out of service, either permanently or for maintenance by a third-party, make sure it has been fully decommissioned.

For more information, refer to the associated "Configuration Manual".

Recycling and Disposal

For environmentally friendly recycling and disposal of this device and related accessories, contact a facility certified to dispose of waste electrical and electronic equipment. Recycling and disposal must be done in accordance with local regulations.

1.5 Supported Fiber Optic Cables

The following fiber optic cable types are supported under the stated conditions.

Cable Type	Wavelength (nm)	Modal Bandwidth (MHz-km)	Distance (m)		
			100Base-FX	1000Base-SX	10GBase-SR
OM1 (62.5/125)	850	200	—	275	33
	1300	500	2000	—	—
OM2 (50/125)	850	500	—	550	82
	1300	500	2000	—	—
OM3 (50/125) ^a	850	1500	—	550	300
	1300	500	2000	—	—
OM4 (50/125) ^a	850	3500	—	550	400

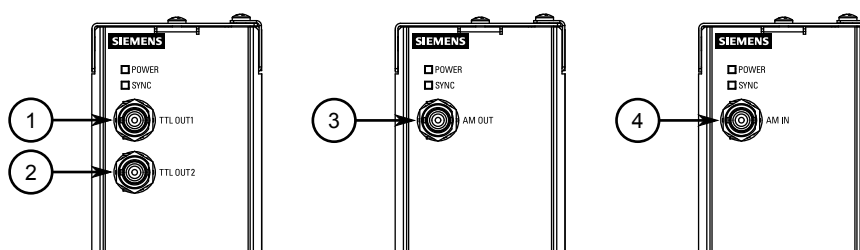
Cable Type	Wavelength (nm)	Modal Bandwidth (MHz·km)	Distance (m)		
			100Base-FX	1000Base-SX	10GBase-SR
	1300	500	2000	—	—

^a Laser optimized.

1.6 Precision Time Protocol (PTP) Support

The RUGGEDCOM RMC8388 can provide time synchronization via Ethernet using the Precision Time Protocol (PTP) and Network Time Protocol (NTP), and to synchronize with an external IRIG-B source.

The RUGGEDCOM RMC8388 features BNC ports for AM IN, OUT and TTL OUT. It also includes a **SYNC** LED to indicate when synchronization has been achieved.



- ① TTL OUT1 Port
- ② TTL OUT2 Port
- ③ AM OUT Port
- ④ AM IN Port

Figure 1.2 BNC Ports for PTP Function

For more information about the BNC ports, refer to ["BNC Ports" \(Page 21\)](#).

1.6.1 Supported Time Synchronization Sources

RUGGEDCOM RMC8388 is sold in three versions with different time synchronization capability and sources. Versions A and B are designed as slave devices, C version is designed as a master device. The following time synchronization sources are supported:

- **NTP**
NTP (Network Time Protocol) is supported by all versions of RUGGEDCOM RMC8388. It is the standard for synchronizing the clocks of computer systems throughout the network and is suitable for systems that require accuracy in the order of 1 ms.
- **IEEE 1588 v2**
IEEE 1588 v2 provides networked, packet-based time synchronization between different networking nodes (PTP devices). The RUGGEDCOM RMC8388 supports PTP v2, which is defined in the IEEE 1588-2008 standard. IEEE 1588 v2 is

designed to fill a niche not well served by either of the two older, dominant protocols, NTP and IRIG-B. IEEE 1588 v2 is also designed for applications that cannot bear the cost of a GPS receiver at each node or for which GPS signals are inaccessible.

The RUGGEDCOM RMC8388 supports the ordinary clock mode. An ordinary clock can be configured as either a Grandmaster Clock (GM) or a Slave Clock (SC) within the master-slave hierarchy.

Every Ethernet port on the RUGGEDCOM RMC8388 supports IEEE 1588 v2. For more information, refer to ["IEEE 1588 Support" \(Page 6\)](#).

- **IRIG-B IN**
IRIG-B IN is supported only by the C variant of RUGGEDCOM RMC8388. It inputs IRIG Standard 200-04 compliant signals from synchronized external devices.

1.6.2 IEEE 1588 Support

RUGGEDCOM RMC8388 supports various IEEE 1588 time synchronization capabilities.

Supported Clock Types


Variant	Clock Type
A and B	Slave Clock
C	Grandmaster Clock (GMC)

Supported IEEE 1588 Profiles

- Power Profile (C37.238-2011)
- Power Profile v2 (C37.238-2017)
- Utility Profile Level 1 (IEC/IEEE 61850-9-3)
- Default P2P Profile (IEEE 1588-2008)
- Default E2E Profile (IEEE 1588-2008)
- Custom Profile (user defined standard)

1.6.3 AM and TTL Outputs

The **AM OUT** port supports the IRIG-B modulated IRIG-B format, while the **TTL OUT** port supports unmodulated IRIG-B and PPS formats. Enabling/disabling the output ports and – in the case of TTL OUT – selecting the signal format is controlled through the RUGGEDCOM ROS operating system.

 NOTICE
The input impedance of third-party AM inputs must be 100 Ω minimum.

The number of devices that can be connected to the AM OUT and TTL Out ports depends on the cabling type and length, as well as the input impedance of the devices. The following simplified circuit schematic shows the interface between an IRIG-B source and connected devices.

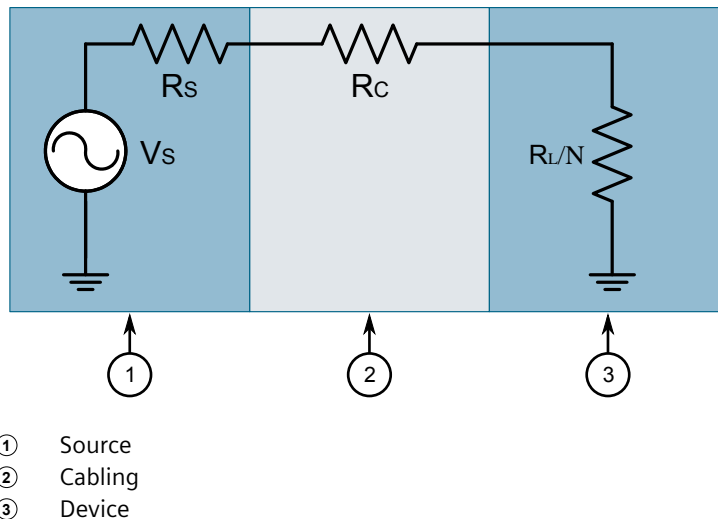


Figure 1.3 IRIG-B Simplified Circuit Schematic

Determine the maximum number of devices (N) that can be connected to the source by checking if the source current (I_S) required to drive the connected devices is less than the maximum drive current the source can provide, and verifying that the load voltage (V_L) the connected devices see is greater than the minimum required voltage.

Installing the Device

This chapter describes 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

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.



⚠ CAUTION

Burn hazard – risk of personal injury

The surface of the device may be hot during operation, or as a result of the ambient air temperature.

Wear appropriate personal protective equipment and use caution when working with or around the device.

⚠ NOTICE

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 Canada Ltd. could invalidate specifications, test results, and agency approvals, and void the user's authority to operate the equipment.

⚠ NOTICE

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.

2.1 General Procedure

The general procedure for installing the device is as follows:

 NOTICE

The user is responsible for the operating environment of the device, including maintaining the integrity of all protective conductor connections and checking equipment ratings. Make sure to review all operating and installation instructions before commissioning or performing maintenance on the device.

1. **Review the relevant certification information for any regulatory requirements.**

For more information, refer to ["Approvals" \(Page 31\)](#).

2. **Unpack and inspect the device.**

For more information, refer to ["Unpacking the Device" \(Page 10\)](#).

3. **Mount the device.**

For more information, refer to ["Mounting the Device" \(Page 10\)](#).

4. **Connect power and ground the device.**

For more information, refer to ["Connecting Power" \(Page 14\)](#).

5. **Configure the device.**

For more information, refer to ["Configuring the Device" \(Page 20\)](#).

2.2 Unpacking the Device

When unpacking the device, do the following:

1. Inspect the package for damage before opening it.
2. Visually inspect each item in the package for any physical damage.
3. Verify all items are included.

Note

If any item is missing or damaged, contact Siemens for assistance.

2.3 Mounting the Device

The RUGGEDCOM RMC8388 is designed for maximum mounting and display flexibility. It can be equipped with connectors that allow it to be installed in a 35 mm (1.4 in) DIN rail or directly on a panel.

⚠ NOTICE

Heat generated by the device is channeled outwards from the enclosure. As such, it is recommended that 2.5 cm (1 in) of space be maintained on all open sides of the device to allow for some convectational airflow.

Forced airflow is not required. However, any increase in airflow will result in a reduction of ambient temperature and improve the long-term reliability of all equipment mounted in the rack space.

Note

For detailed dimensions of the device with either DIN rail or panel hardware installed, refer to "[Dimension Drawings](#)" (Page 27).

2.3.1 Mounting the Device on a DIN Rail

The RUGGEDCOM RMC8388 can be ordered with a DIN rail adapter preinstalled on the back of the chassis. Use the adapter to mount the device to a standard 35 mm (1.4 in) IEC/EN 60715 or TS35 DIN rail.

To mount the device to a DIN rail, do the following:

Mounting the Device

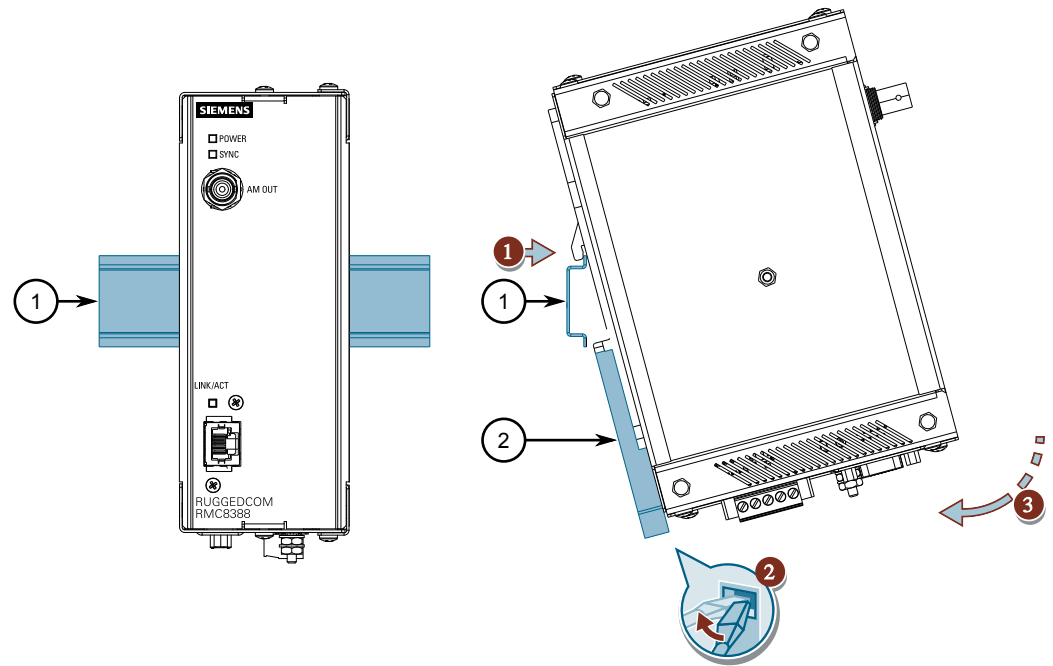
To mount the device to a DIN rail, do the following:

1. Hook the top teeth of the adapter onto the DIN rail.

Note

The adapter features a sliding release with a slot at the bottom for a flathead screwdriver.

2.3.1 Mounting the Device on a DIN Rail



- ① DIN Rail
- ② DIN Rail Adapter

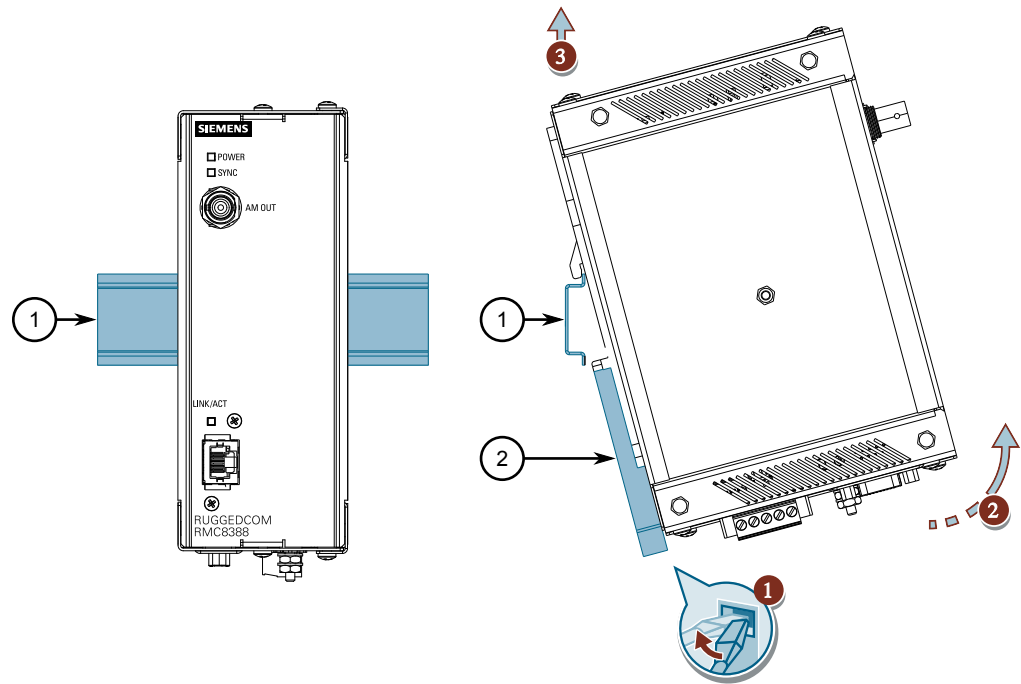
Figure 2.1 Mounting the Device to a DIN Rail

2. Insert a flathead screwdriver into the slot of the sliding release and move it down.
3. Push the device against the bottom of the DIN rail, then let go of the sliding release to latch the device.

Removing the Device

To remove the device from a DIN rail, do the following:

1. Insert a flathead screwdriver into the slot of the sliding release and move it down.



- ① DIN Rail
- ② DIN Rail Adapter

Figure 2.2 Removing the Device from a DIN Rail

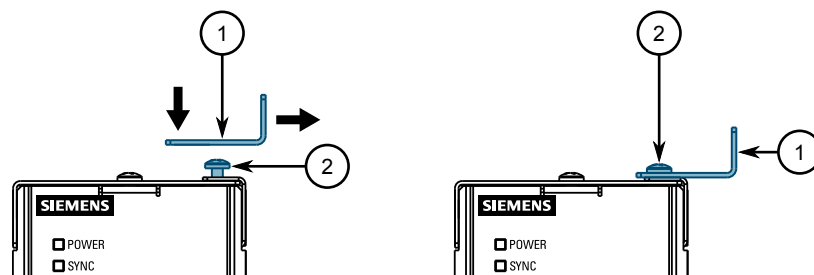
2. Swing the bottom of the device away from the DIN rail.
3. Lift the device off the DIN rail.

2.3.2 Mounting the Device to a Panel

For panel installations, the RUGGEDCOM RMC8388 can be equipped with panel adapters that allow the device to be attached to a panel using screws.

To mount the device to a panel, do the following:

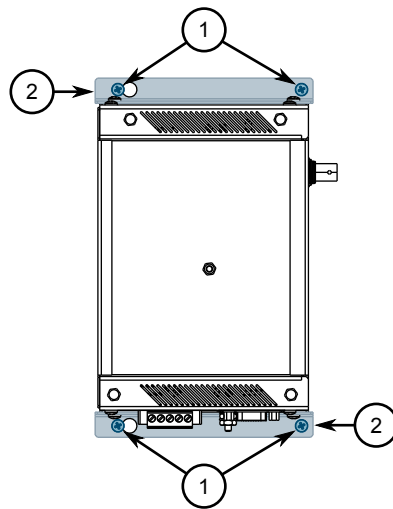
1. Loosen the screws for the panel adapters located at the top and bottom of the device.



- ① Panel Adapter
- ② Screw

Figure 2.3 Installing the Panel Adapters

2. For both adapters, align the slots with the screws and then slide the adapters onto the device.
3. Tighten the screws to secure the adapters.
4. Place the device against the panel and align the adapters with the mounting holes.



- ① Screw
- ② Panel Adapter

Figure 2.4 Panel Mounting

5. Using two #6-32 screws for each adapter, secure the device to the panel.

2.4 Connecting Power

The RUGGEDCOM RMC8388 supports a single integrated high AC/DC power supply, a 48 V low DC power supply, and a 24 V low DC power supply.

NOTICE

Before installing the device, note the following:

- An appropriately rated AC or DC circuit breaker must be installed.
- Use minimum #16 gage copper wiring when connecting terminal blocks.
- Equipment must be installed according to applicable local wiring codes and standards.

- All line-to-ground transient energy is shunted to the Surge Ground terminal. In cases where users require the inputs to be isolated from ground, remove the ground braid between Surge and Chassis Ground. Note that all line-to-ground transient protection circuitry will be disabled.

2.4.1 Connecting High AC/DC Power

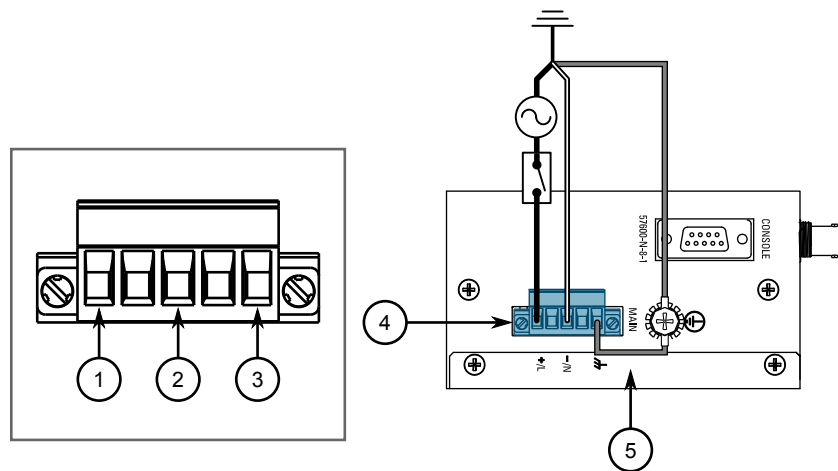
To connect a high AC/DC power supply to the device, do the following:

⚠ NOTICE

Electrical hazard – risk of damage to equipment

Before testing the dielectric strength (HIPOT) in the field, remove the braided ground cable connected to the surge ground terminal and chassis ground. This cable connects transient suppression circuitry to chassis ground and must be removed in order to avoid damage to transient suppression circuitry during testing.

1. Secure a European-style terminal block (or Euroblock) to the terminal.
2. Connect the positive wire from the power source to the positive/live (+/L) terminal on the terminal block.



- ① Positive/Live (+/L) Terminal
- ② Negative/Neutral (-/N) Terminal
- ③ Surge Ground Terminal
- ④ Power Supply Terminal
- ⑤ Braided Ground Cable

Figure 2.5 Terminal Block Wiring

3. Connect the negative wire from the power source to the negative/neutral (-/N) terminal on the terminal block.
4. Using a braided wire or other appropriate grounding wire, connect the surge ground terminal to the chassis ground connection. The surge ground terminal

is used as the ground conductor for all surge and transient suppression circuitry internal to the unit.

5. Connect the ground terminal on the power source to the chassis ground terminal on the device.

2.4.2 Connecting Low DC Power

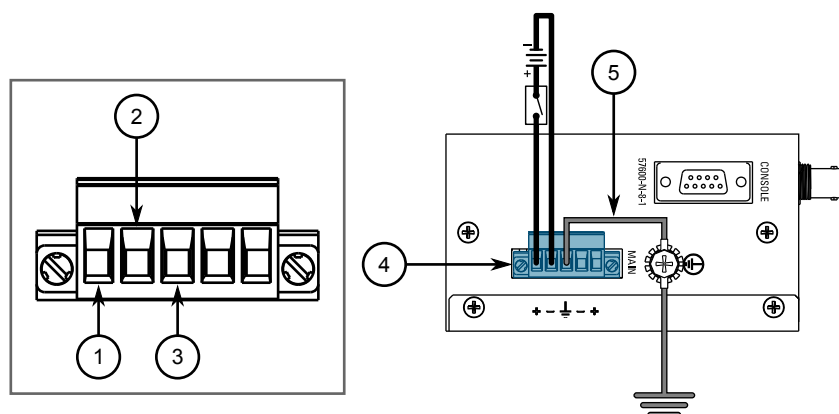
The RUGGEDCOM RMC8388 supports a single low DC power supply with dual power supply inputs. The use of both power supply inputs is recommended to provide input power redundancy.

To connect a low DC power supply to the device, do the following:

<p>⚠ NOTICE</p> <p>Electrical hazard – risk of damage to equipment</p> <p>Do not connect AC power cables to terminals for low DC power. Damage to the power supply may occur.</p>

<p>⚠ NOTICE</p> <p>Electrical hazard – risk of damage to equipment</p> <p>Before testing the dielectric strength (HIPOT) in the field, remove the braided ground cable connected to the surge ground terminal and chassis ground. This cable connects transient suppression circuitry to chassis ground and must be removed in order to avoid damage to transient suppression circuitry during testing.</p>

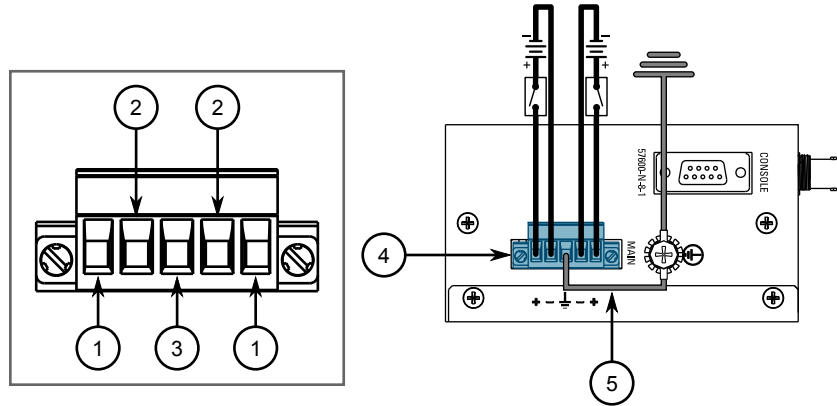
1. Secure a European-style terminal block (or Euroblock) to the terminal.
2. Connect the positive wire from the power source to the positive terminal on the terminal block.



- ① Positive Terminal
- ② Negative Terminal
- ③ Surge Ground Terminal
- ④ Power Supply Terminal

⑤ Braided Ground Cable

Figure 2.6 Terminal Block Wiring – Single DC Power Supply Input



- ① Positive Terminal
- ② Negative Terminal
- ③ Surge Ground Terminal
- ④ Power Supply Terminal
- ⑤ Braided Ground Cable

Figure 2.7 Terminal Block Wiring – Dual Redundant DC Power Supply Inputs

3. Connect the negative wire from the power source to the negative terminal on the terminal block.
4. Using a braided wire or other appropriate grounding wire, connect the surge ground terminal to the chassis ground connection. The surge ground terminal is used as the ground conductor for all surge and transient suppression circuitry internal to the unit.
5. Connect the ground terminal on the power source to the chassis ground terminal on the device.

Device Management

This section describes how to connect to and manage the device.

3.1 Connecting to the Device

The following describes the various methods for accessing the RUGGEDCOM RMC8388 console and Web interfaces on the device. For more detailed instructions, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RMC8388.

Serial Console Port

Connect a PC or terminal directly to the serial console port to access the boot-time control and RUGGEDCOM ROS console interface.

NOTICE

The serial console port is intended to be used only as temporary connections during initial configuration or troubleshooting.

The serial console port implements RS-232 DCE (Data Communication Equipment) on a female DB9 connector. The following is the pin-out for the port:

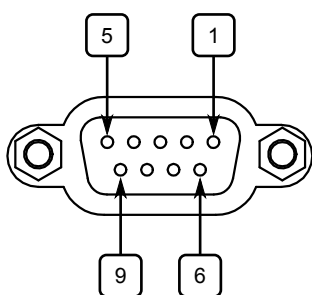


Figure 3.1 Serial DB9 Console Port

Pin	Name
1 ^a	Reserved (Do Not Connect)
2	Output Signal
3	Input Signal
4 ^a	Reserved (Do Not Connect)
5	Ground
6 ^a	Reserved (Do Not Connect)
7 ^a	Reserved (Do Not Connect)
8	Reserved (Do Not Connect)
9	Reserved (Do Not Connect)

^a Connected internally.

Communication Ports

Connect any of the available Ethernet ports on the device to a management switch and access the RUGGEDCOM ROS console and Web interfaces via the

device's IP address. The factory default IP address for the RUGGEDCOM RMC8388 is <https://192.168.0.1>.

For more information about available ports, refer to "[Communication Ports](#)" (Page 21).

3.2 Configuring the Device

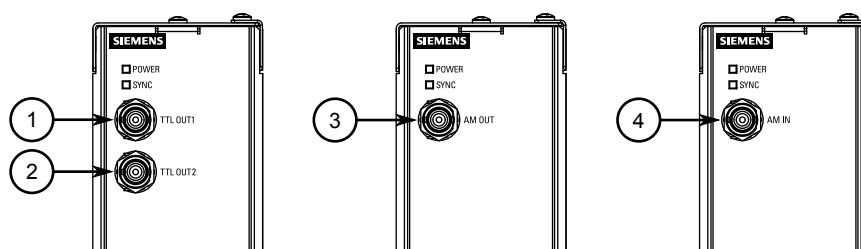
Once the device is installed and connected to the network, it must be configured. All configuration management is done via the RUGGEDCOM ROS interface. For more information about configuring the device, refer to the "RUGGEDCOM ROS Configuration Manual" associated with the installed software release.

Communication Ports

The RUGGEDCOM RMC8388 can be equipped with various types of communication ports to enhance its abilities and performance.

4.1 BNC Ports

The RUGGEDCOM RMC8388 features one or more BNC ports depending on the configuration of the device.



- ① TTL OUT1 Port
- ② TTL OUT2 Port
- ③ AM OUT Port
- ④ AM IN Port

Figure 4.1 Available BNC Ports

- **TTL OUT1/TTL OUT2**

Dual **TTL OUT** ports convert an IEEE 1588 v2 timing signal into two IRIG-B timing signals with either IRIG-B, IEEE 1344, C37.118.2005, or C37.118.2011 extensions, or interval configurable PPS. Both IRIG-B out and PPS out are supported at the same time.

Both ports provide IRIG-B Pulse Width Modulation (PWM), Pulse Per Second (1PPS), or Siemens' Pulse Per X (PPX) output. PPX allows users to set the pulse interval, pulse width and start time.

The signal format is independently configurable for each port via RUGGEDCOM RUGGEDCOM RMC8388.

- **AM OUT**

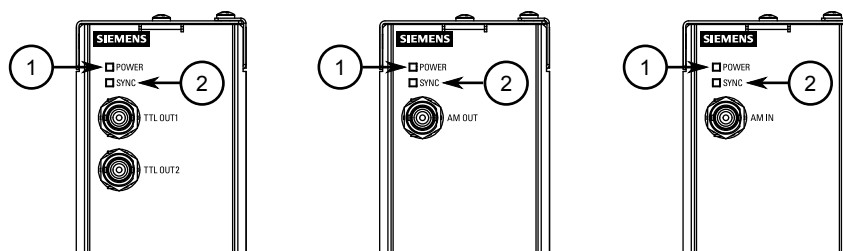
The **AM OUT** port converts an IEEE 1588 v2 timing signal into an IRIG-B AM timing signal with either IRIG-B, IEEE 1344, C37.118.2005, or C37.118.2011 extensions.

- **AM IN**
The **AM IN** port converts an IRIG-B AM timing signal into an IEEE 1588 v2 timing signal with either IRIG-B, IEEE 1344, C37.118.2005, or C37.118.2011 extensions.

For technical specifications related to the BNC ports, refer to "[IRIG-B Specifications](#)" (Page 26).

4.2 LEDs

The RUGGEDCOM RMC8388 has two LEDs on the front panel. The **POWER LED** indicates the status of the device:



- ① POWER LED
- ② SYNC LED

Figure 4.2 LEDs

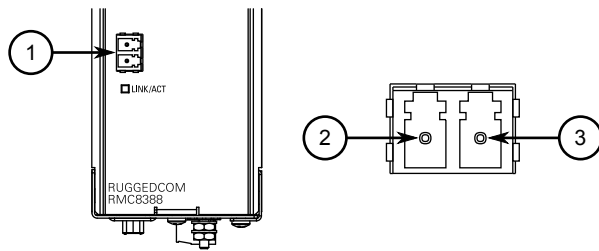
- **Green** – Device is ready
- **Red** – Device is booting up
- **Off** – No power

When the device is ready, the color of the **SYNC LED** indicates the status of the incoming timing signal:

- **Green** – Signal locked
- **Amber/yellow** – Holdover (IRIG-B AM lock has been achieved, but the receiver no longer sees the IRIG-B AM signal)
- **Red** – Error
- **Off** – No signal detected

4.3 Fiber Optic Ethernet Port (If Equipped)

The 100Base-FX fiber optic Ethernet port uses an LC (Lucent Connector) connector. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.



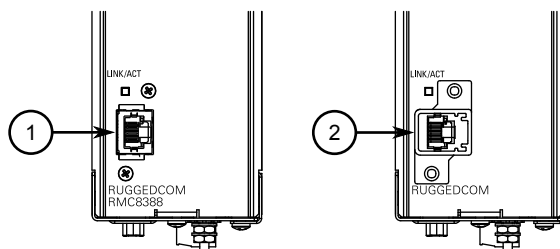
- ① LC Port
- ② Tx Connector
- ③ Rx Connector

Figure 4.3 LC Port

For technical specifications on the available fiber optic Ethernet ports, refer to ["Fiber Optic Ethernet Port Specifications" \(Page 26\)](#).

4.4 Copper Ethernet Port (If Equipped)

The 100Base-TX copper Ethernet port features a standard RJ-45 connector or Siemens's FastConnect RJ-45 connector, both of which are directly connected to the chassis ground. Standard Category 5 (CAT-5) unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cables can be used to connect to this port.



- ① Standard RJ-45 Connector
- ② Siemens FastConnect RJ-45 Connector

Figure 4.4 Copper Ethernet Port Options

⚠ 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 RJ-45 connectors 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.

⚠ NOTICE

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.

Note

For more information about Siemens's FastConnect cabling system, visit <https://www.siemens.com>.

The following is the pin-out for the standard and FastConnect RJ-45 connector options:

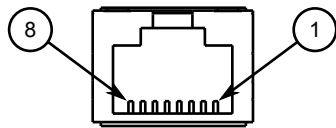


Figure 4.5 RJ-45 and FastConnect RJ-45 Ethernet Port Pin Configuration

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


For technical specifications on the copper Ethernet port, refer to "[Copper Ethernet Port Specifications](#)" (Page 25).

Technical Specifications

This section provides important technical specifications related to the device and available modules.

5.1 Power Supply Specifications

The RUGGEDCOM RMC8388 includes one of the following internal power supplies:

 NOTICE
Electrical hazard – risk of damage to the device
Do not exceed the maximum input voltage specified for the 24 or 48 VDC power supplies.

Power Supply Type	Minimum Input	Maximum Input	Internal Fuse Rating ^a	Maximum Power Consumption
HI ^b	88 VDC	300 VDC	3.15 A(T)	7 W
	85 VAC	264 VAC		
48 VDC	38 VDC	72 VDC		
24 VDC	11 VDC	36 VDC		

^a (T) denotes time-delay fuse.

^b Same power supply for both AC and DC.

5.2 Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the RUGGEDCOM RMC8388.

Speed ^a	Interface	Connector	Duplex ^a	Cable Type ^b	Wiring Standard ^c	Maximum Distance ^d	Isolation ^e
100	TX	RJ45	Full Duplex	> CAT-5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV
100	TX	FastConnect RJ45	Full Duplex	> CAT-5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV

^a Auto-negotiating.

^b Shielded or unshielded.

^c Auto-crossover and auto-polarity.

^d Typical distance. Dependent on the number of connectors and splices.

^e RMS 1 minute.

5.3 Fiber Optic Ethernet Port Specifications

The following details the specifications for fiber optic Ethernet ports that can be ordered with the RUGGEDCOM RMC8388.

Note

- All optical power numbers are listed as dBm averages. To convert from average to peak add 3 dBm. To convert from peak to average, subtract 3 dBm.
- Maximum segment length is greatly dependent on factors such as fiber quality, and the number of patches and splices. Consult a Siemens Sales associate when determining maximum segment distances.

Speed (Mbit/s)	Interface	Mode ^a	Connector Type	Cable Type (μm)	Tx/Rx λ (nm) ^b	Tx min (dbm)	Tx max (dBm)	Rx Sensitivity (dBm)	Distance (km) ^b	Power Budget (dB)
100	FX	MM	LC	62.5/125	1310	-19	-14	-32	2	13
				50/125						

^a MM = Multi-Mode

^b Typical.

5.4 IRIG-B Specifications

For full information about the PTP capabilities of RUGGEDCOM devices, refer to the PTP Reference Manual: <https://support.industry.siemens.com/cs/ww/en/view/109780448>.

The following details the Precision Time Protocol (PTP) specifications for the available BNC ports for RUGGEDCOM RMC8388 devices:

PPS Output Specifications for TTL OUT Ports

Output Current (I _s)	30 mA
Output Voltage (V _s)	TTL-Compatible
Output Impedance (R _s)	50 Ω

IRIG-B AM Output Specifications for the AM OUT Port

Carrier Frequency	1 kHz
Modulation Depth	3:1±10%
Output Current (I _s)	15 mA
Output Impedance (R _s)	50 Ω
Output Voltage (V _s)	6 V _{p-p}

IRIG-B AM Input Specifications for the AM IN Port

Input Voltage Range	2 to 7 V _{p-p}
Input Impedance	> 3.5 kΩ
Carrier Frequency	1 kHz
Modulation Depth	3:1±10%

5.5 Operating Environment

The RUGGEDCOM RMC8388 is rated to operate under the following environmental conditions.

Ambient Operating Temperature ^a	-40 to 85 °C (-40 to 185 °F)
Ambient Storage Temperature	-40 to 85 °C (-40 to 185 °F)
Ambient Relative Humidity ^b	5% to 95%
Maximum Altitude	2000 m (6562 ft)

^a Measured from a 30 cm (12 in) radius surrounding the center of the enclosure.

^b Non-condensing.

5.6 Mechanical Specifications

Weight	1.1 kg (2.4 lbs)
Ingress Protection	IP30 (2.5 mm or 0.1 in objects)
Enclosure	21 AWG Galvanized Steel

5.7 Dimension Drawings

Note

All dimensions are in millimeters, unless otherwise stated.

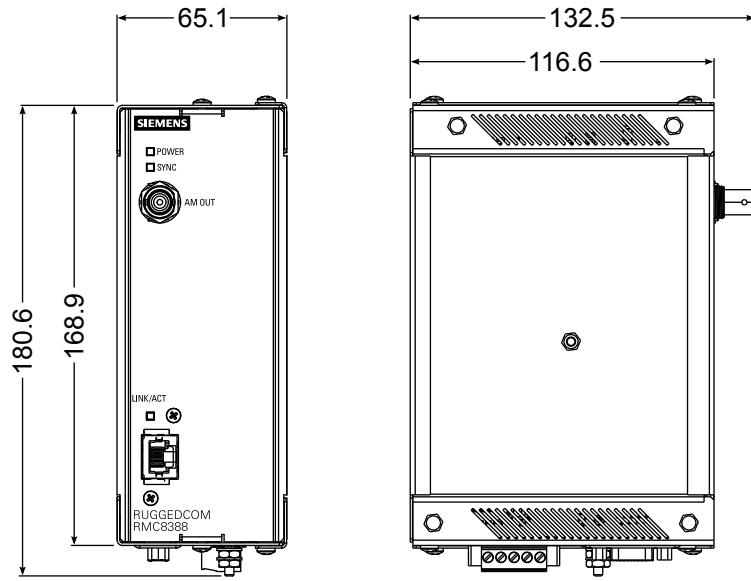


Figure 5.1 Overall Dimensions

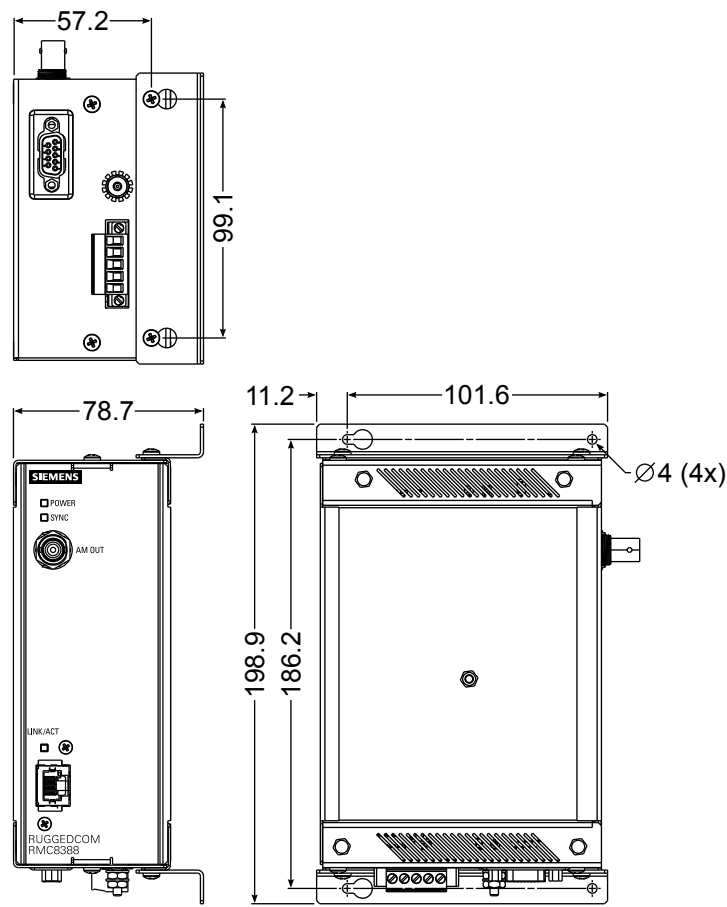


Figure 5.2 Panel Mount Dimensions

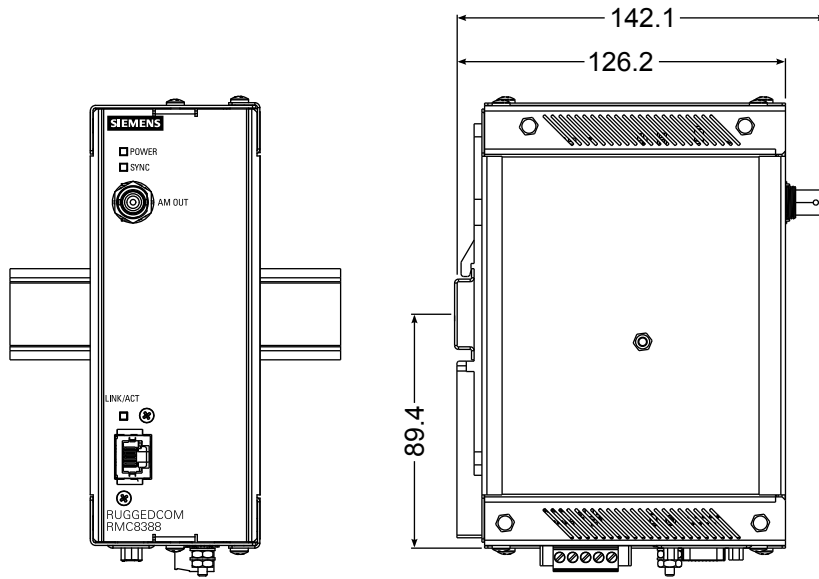


Figure 5.3 DIN Rail Mount Dimensions

Certification

The RUGGEDCOM RMC8388 device has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

6.1 Approvals

This section details the standards to which the RUGGEDCOM RMC8388 complies.

Note

All relevant certificates and test reports are available on [Siemens Industry Online Support \[https://support.industry.siemens.com\]](https://support.industry.siemens.com).

6.1.1 UKCA

This device is certified for use in Great Britain and bears the United Kingdom Certified Assessed (UKCA) marking. The marking is printed on the body of the device, along with the identification number of the notified body.



6.1.2 TÜV SÜD

This device is certified by TÜV SÜD to meet the requirements of the following standards:

- **CAN/CSA-C22.2 NO. 62368-1:2014/A1:2011-12**
Information Technology Equipment – Safety – Part 1: General Requirements (Bi-National standard, with UL 62368-1)
- **UL 62368-1:2014/R1:2011-12**
Information Technology Equipment – Safety – Part 1: General Requirements

A copy of the TUV Certificate is available via Siemens Industry Online Support at <https://support.industry.siemens.com/cs/ww/en/view/109756584>.

6.1.3 European Union (EU)

This device is declared by Siemens Canada Ltd. to comply with essential requirements and other relevant provisions of the following EU directives:

- **EN 62368-1**
Information Technology Equipment – Safety – Part 1: General Requirements
- **EN 61000-6-2**
Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments
- **EN 60825-1**
Safety of Laser Products – Equipment Classification and Requirements
- **EN 63000**
Technical Documentation for the Assessment of Electrical and Electronic Products with Respect to the Restriction of Hazardous Substances
- **CISPR 32/EN 55032**
Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements

The device is marked with a CE symbol and can be used throughout the European community.



6.1.4 FDA/CDRH

This device meets the requirements of the following U.S. Food and Drug Administration (FDA) standard:

- Title 21 Code of Federal Regulations (CFR) – Chapter I – Sub-chapter J – Radiological Health

6.1.5 ISED

This device is declared by Siemens Canada Ltd. to meet the requirements of the following ISED (Innovation Science and Economic Development Canada) standard:

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

6.1.6 ISO

This device was designed and manufactured using a certified ISO (International Organization for Standardization) quality program that adheres to the following standard:

- **ISO 9001:2015**
Quality management systems – Requirements

6.1.7 ACMA

This device meets the requirements of the following Australian Communications and Media Authority (ACMA) standards under certificate ABN 98 004 347 880:

- Radiocommunications (Compliance Labelling – Devices) Notice 2014 made under Section 182 of the Radiocommunications Act 1992
- Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2008 made under Section 182 of the Radiocommunications Act 1992
- Radiocommunications (Compliance Labelling – Electromagnetic Radiation) Notice 2003 made under Section 182 of the Radiocommunications Act 1992
- Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice 2001 made under Section 407 of the Telecommunication Act 1997

The device is marked with an RCM symbol to indicate compliance when sold in the Australian region.



A copy of the Declaration of Conformity is available via Siemens Industry Online Support at <https://support.industry.siemens.com/cs/ww/en/view/89855782>.

6.1.8 RoHS

This device is declared by Siemens Canada Ltd. to meet the requirements of the following RoHS (Restriction of Hazardous Substances) directives for the restricted use of certain hazardous substances in electrical and electronic equipment:

- **China RoHS 2**
Administrative Measure on the Control of Pollution Caused by Electronic Information Products

A copy of the Material Declaration is available online at <https://support.industry.siemens.com/cs/ww/en/view/109738831>.

6.1.9 Other Approvals

This device meets the requirements of the following additional standards:

- **IEEE 1613**
IEEE Standard Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations
- **IEC 61850-3**
Communications Networks and Systems for Power Utility Automation – Part 3: General Requirements
- **IEC 61000-6-2**
Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments

6.2 EMC and Environmental Type Tests

The RUGGEDCOM RMC8388 has passed the following EMC and environmental tests.

IEC 61850-3 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
		DC Power Ports	10 V	3
		AC Power Ports	10 V	3
		Earth Ground Ports	10 V	3

6.2 EMC and Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 61000-4-8	Magnetic Field	Enclosure Ports	100 A/m continuous for 1 min, 1000 A/m for 1 s	Note ^a
			1000 A/m for 1 s	5
IEC 61000-4-9	Pulsed Magnetic Field	Enclosure Ports	300 A/m	4
IEC 61000-4-29	Voltage Dips and 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			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 @ 1 MHz	3
		AC Power Ports	2.5 kV Common, 1 kV Differential Mode @ 1 MHz	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 61000-4-18	Damped Oscillatory Wave	Slow Damped	2.5 kV Common @ 100 kHz and 1 MHz for AC/DC Power and Signal Ports	3
			1 kV Differential @ 100 kHz and 1 MHz for AC/DC Power Ports	
IEC 60225-27	Dielectric Strength	Signal Ports	2 kVAC (Fail-Safe Relay Output)	
		DC Power Ports	1.5 kVDC	
		AC Power Ports	2 kVDC	
	HV Impulse	Signal Ports	5 kV (Fail-Safe Relay Output)	
		DC Power Ports	5 kV	
		AC Power Ports	5 kV	

^a Siemens specified severity level.

IEEE 1613 EMC Immunity Type Tests

Note

RUGGEDCOM products meet Class 1 requirements for copper Ethernet configurations and Class 2 for fiber Ethernet configurations. Class 1 allows for temporary communication loss, while Class 2 requires error-free and interrupted communications.

Description		Test Levels
ESD	Enclosure Contact	± 2 kV, ± 4 kV, ± 8 kV
	Enclosure Air	± 4 kV, ± 8 kV, ± 15 kV
Radiated RFI	Enclosure Ports	35 V/m
Fast Transient	Signal Ports	± 4 kV @ 2.5 kHz
	DC Power Ports	± 4 kV
	AC Power Ports	± 4 kV
	Earth Ground Ports	± 4 kV
Oscillatory	Signal Ports	2.5 kV Common mode @ 1MHz
	DC Power Ports	2.5 kV Common, 1 kV Differential Mode @ 1MHz
	AC Power Ports	2.5 kV Common, 1 kV Differential Mode @ 1MHz
HV Impulse	Signal Ports	5 kV (Failsafe Relay)
	DC Power Ports	5 kV
	AC Power Ports	5 kV
Dielectric Strength	Signal Ports	2 kVAC
	DC Power Ports	2.8 kVDC
	AC Power Ports	2 kVAC

Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Operation	Test Ad	16 hours at -40 °C (-40 °F)	
	Cold Storage	Test Ab	16 hours at -40 °C (-40 °F)	
IEC 60068-2-2	Dry Heat Operation	Test Bd	16 hours at 85 °C (185 °F)	
	Dry Heat Storage	Test Bb	16 hours at 85 °C (185 °F)	
IEC 60068-2-14	Change of Temperature		5 cycles at -40 to 85 °C (-40 to 185 °F) and 3 hour dwells at rate of 1 °C/min (1.8 °F/min)	
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	6 cycles at 55 °C (131 °F) and 95% relative humidity (non-condensing)	
IEC 60068-2-31	Free Fall		Procedure 1, 2 falls from a height of 250 mm (9.8 in)	

6.2 EMC and Environmental Type Tests

Test	Description	Test Levels	Severity Levels
IEC 60068-2-78	Humidity (Damp Heat, Steady State)	10 days at 55 °C (131 °F) and 93% relative humidity (non-condensing)	
IEC 60255-21-1	Vibration	2 g @ 10-150 Hz	Class 2
IEC 60255-21-2	Shock	30 g @ 11 ms	Class 2
IEC 60255-21-3	Seismic	Level 2	Method A
IEC 60870--2-2	Static Load	5 kPa for 1 min	

For more information

Siemens RUGGEDCOM

<https://www.siemens.com/ruggedcom>

Industry Online Support (service and support)

<https://support.industry.siemens.com>

Industry Mall

<https://mall.industry.siemens.com>

Siemens Canada Ltd.

Digital Industries

Process Automation

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Canada

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