SIEMENS

RUGGEDCOM RMC

Installation Guide

01/2017
RC1006-EN-05

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Table of Contents

Preface

This guide describes the RUGGEDCOM RMC. 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.

CONTENTS

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.

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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.

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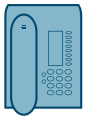
Online

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



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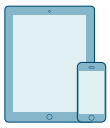
Call a local hotline center to submit a Support Request (SR). To locate a local hotline center, visit http://www.automation.siemens.com/mcms/aspa-db/en/automation-technology/Pages/default.aspx .



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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

1 Introduction

The RUGGEDCOM RMC is an industrially hardened fiber optical media converter specifically designed to operate in harsh environments such as those found in electric utility substations and factory floors. The RUGGEDCOM RMC provides industrial strength Ethernet copper-to-fiber media conversion allowing for 10Base-T to 10Base-FL and 100Base-TX to 100Base-FX over SingleMode or MultiMode fiber optics.

The RUGGEDCOM RMC is specifically designed to meet the same EMI immunity and environmental requirements as mission critical protective relaying devices in accordance with the IEC 61850-3 (2002) and IEEE 1613 (2003) standards for communications and networking equipment in electric power utility substations, as well as NEMA TS 2 (1998) EMI and environmental requirements for traffic control equipment.

The reliability of RUGGEDCOM product families exceeds those of commercial devices by having no rotating mechanical parts (i.e. no cooling fans), utilizing high temperature solid state components and incorporating the necessary transient and surge suppression circuitry required for substation and electrically harsh environments.

CONTENTS

Section 1.1

Feature Highlights

Key Features

- IEEE 802.3 (Ethernet) and IEEE 802.3u (Fast Ethernet) compliant
- Full Duplex and Half Duplex Operation (Configurable)
- Fiber Negotiation Mode Switch to support FDX, HDX or Auto-negotiation on fiber port
- Link Pass Through support
- Switch on faceplate for Uplink Configuration (Pass Through or Cross Over)
- Power Input via three position screw terminal on baseplate

Designed for Harsh Environments

- Operates over a temperature range of -40 to 85 °C (-40 to 185 °F) without the use of fans for improved reliability
- 21 AWG galvanized steel enclosure suitable for DIN or panel mounting provide secure mechanical reliability

Simple Plug and Play Operation

- Simple, externally-accessible configuration
- Transmit and receive data LED indicators for quick and easy troubleshooting

- Fully integrated power supply connects directly to power source permanently for reliable maintenance-free operation

Universal Power Supply Options

- 24VDC, 48VDC or HI (88-300VDC / 85 - 264VAC) options for worldwide operability
- Integrated high-reliability power supply eliminates the need for external power transformer
- Screw down terminal blocks ensure reliable maintenance-free connections
- All power supplies CSA/UL 60950 approved for 85 °C (185 °F) operation

Section 1.2

Description

The RUGGEDCOM RMC features various ports, controls and indicator LEDs on the display panel for connecting, configuring and troubleshooting the device. The display panel can be located on the rear, front or top of the device, depending on the mounting configuration.

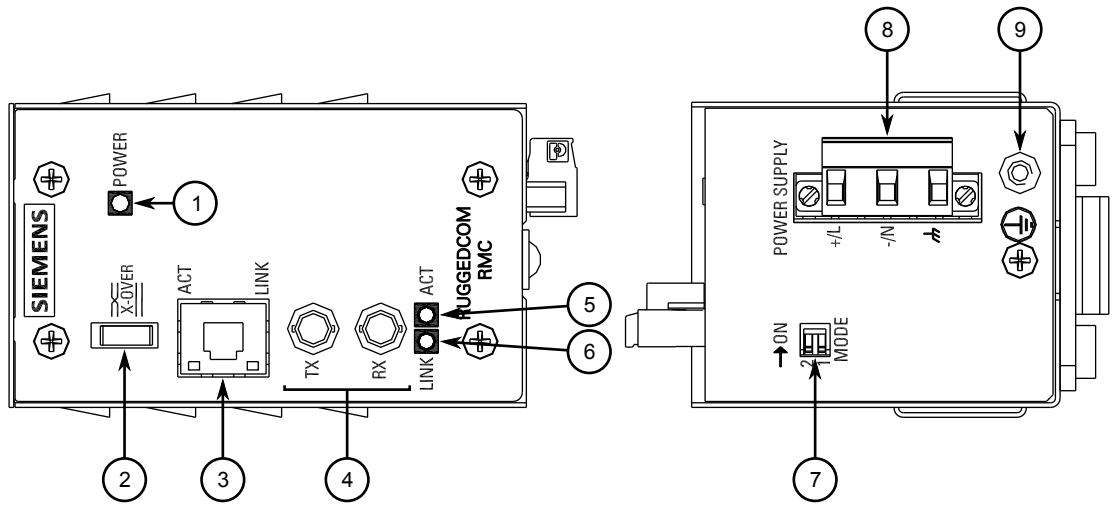

Figure 1: RUGGEDCOM RMC

1. POWER LED **2.** X-Over Switch **3.** Copper Ethernet Port with LEDs **4.** Fiber Optic Ethernet Ports **5.** ACT LED **6.** LINK LED **7.** MODE Switch **8.** Power Terminal Block **9.** Chassis Ground Terminal

POWER LED

Illuminates when power is being supplied to the device.

State	Description
Green	Power is on
Off	Power is off

LINK/ACT LEDs

Indicate the connection status of the fiber optic Ethernet ports.

LED	State	Description
LINK	Green (Solid)	Link is established

	LED	State	Description
	ACT	Green (Blinking)	Port activity
Power Supply Terminal	A pluggable terminal. For more information, refer to: • Section 2.2, "Connecting Power" • Section 4.1, "Power Supply Specifications"		
X-Over Switch	Allows the use of crossover CAT-5 cables. For more information, refer to Section 3.1, "Copper Ethernet Ports" .		
MODE Switch	Sets the operating mode for the device. For more information, refer to Section 2.3, "Setting the Operating Mode" .		
Communication Ports	Receive and transmit data. For more information about the various ports available for the RUGGEDCOM RMC, refer to Chapter 3, *Communication Ports* .		

2 Installing the Device

The following sections describe how to install the device, including mounting the device, installing/removing modules, 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.*

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 Canada Ltd 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.*

CONTENTS

Section 2.1

Mounting the Device

The RUGGEDCOM RMC 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.

IMPORTANT!
Heat generated by the device is channeled outwards to 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 convectional 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 *Chapter 5, Dimension Drawings* .

CONTENTS

Section 2.1.1

Mounting the Device on a DIN Rail

For DIN rail installations, the RMC can be equipped with a DIN rail bracket pre-installed on the back of the chassis. The bracket allows the device to be slid onto a standard 35 mm (1.4 in) DIN rail.

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

1. Align the slot in the bracket with the DIN rail.

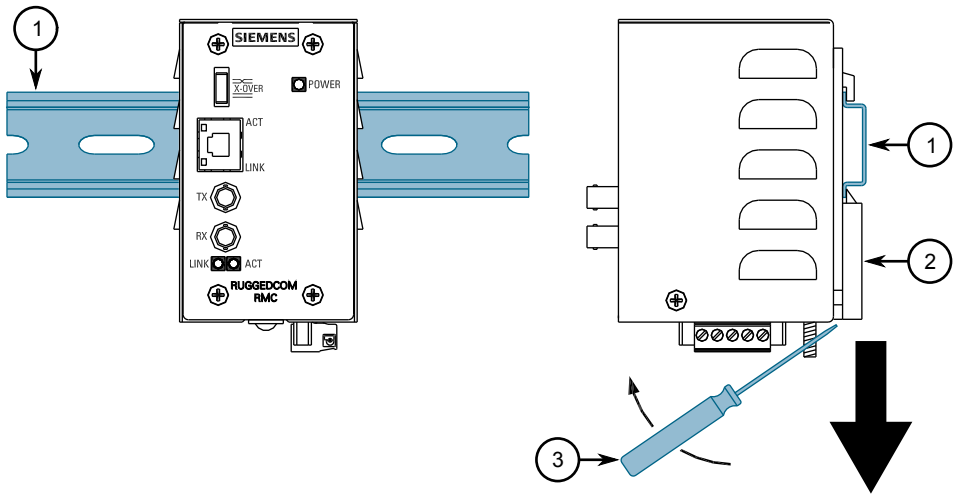

Figure 2: DIN Rail Mounting

1. DIN Rail **2.** DIN Rail Bracket **3.** Screw Driver

2. Pull the release on the bracket down and slide the device onto the DIN rail. If necessary, use a screw driver to unlock the release. Let go of the release to lock the device in position.

Section 2.1.2
Mounting the Device to a Panel

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

1. Place the panel adapter against the panel and secure it with screws.

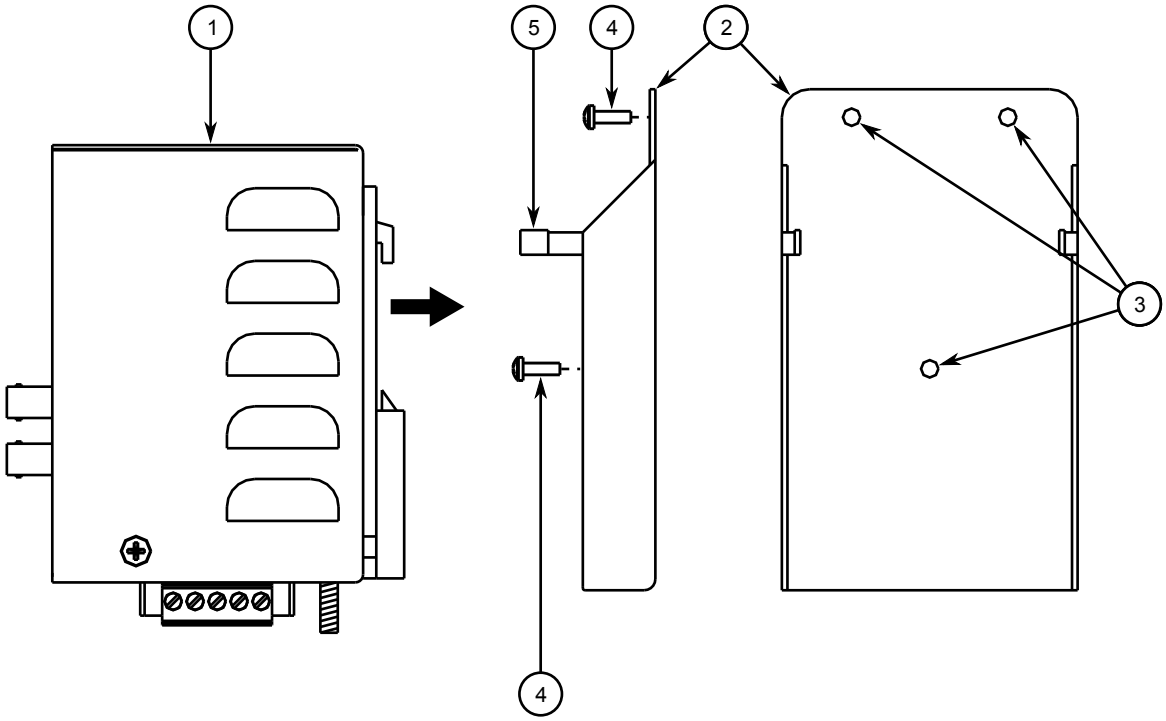

Figure 3: Panel Mounting

1. RUGGEDCOM RMC **2.** Panel Adapter **3.** Mounting Holes **4.** Screw **5.** Metal Clips

2. Insert the device into the adapter. Make sure the device is secured between the two metal clips.

Section 2.2
Connecting Power

The RUGGEDCOM RMC supports a single integrated high AC/DC or low DC power supply

NOTE

- *For 110/230 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.*
- *Use only #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.*

IMPORTANT!
Siemens requires the use of external surge protection in VDSL applications where the line may be subject to surges greater than that for which the device is rated. Use the following specifications as a guide for VDSL external surge protection:

- *Clamping Voltage: 50 V to 200 V*
- *Insertion Loss: < 0.1 dB at 10 MHz*
- *Peak Surge Current: 10 kA, 8x20µs waveform*

CONTENTS

Section 2.2.1

Connecting AC Power

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

CAUTION!
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. Connect the positive wire from the power source to the positive/live (+/L) terminal on the terminal block.

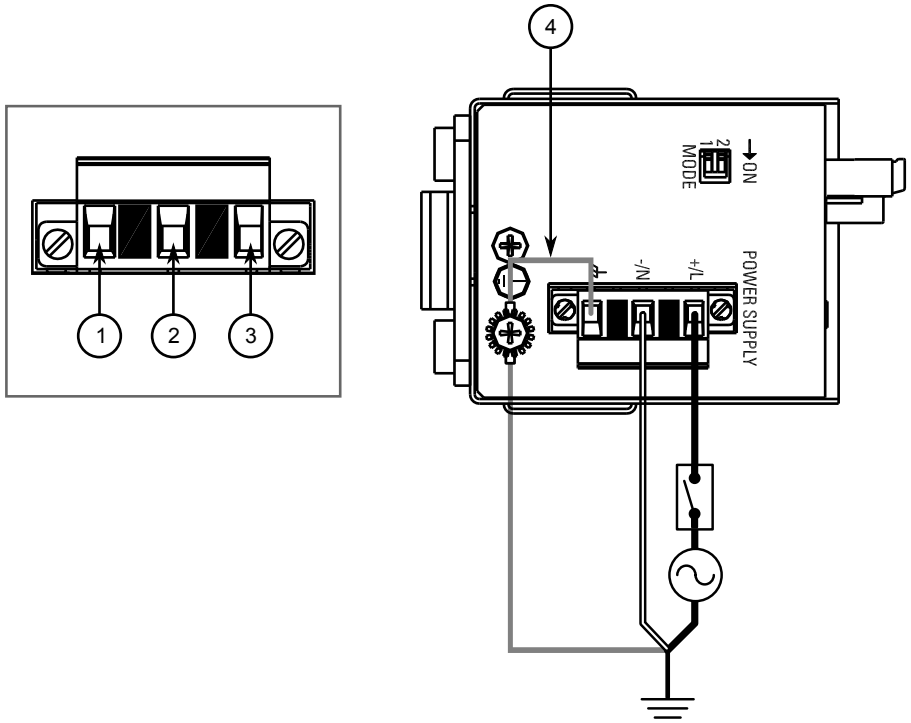

Figure 4: Terminal Block Wiring

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

2. Connect the negative wire from the power source to the negative/neutral (-/N) terminal on the terminal block.
3. 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.
4. Connect the ground terminal on the power source to the chassis ground terminal on the device.

Section 2.2.2

Connecting DC Power

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

CAUTION!
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. Connect the positive wire from the power source to the positive/live (+/L) terminal on the terminal block.

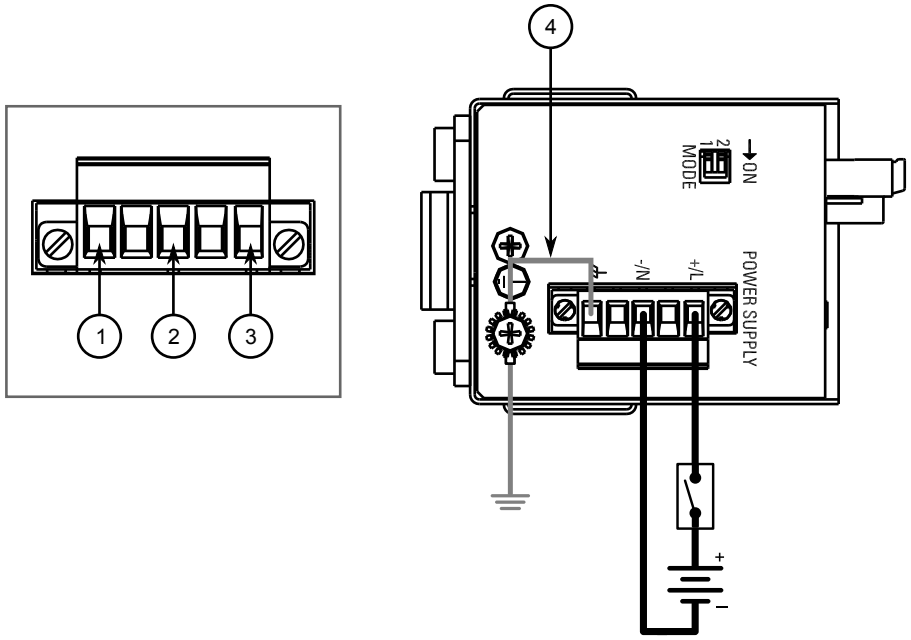

Figure 5: Terminal Block Wiring

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

2. Connect the negative wire from the power source to the negative/neutral (-/N) terminal on the terminal block.
3. 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.
4. Connect the ground terminal on the power source to the chassis ground terminal on the device.

Section 2.3

Setting the Operating Mode

To accommodate a wide array of fiber optic devices, the RUGGEDCOM RMC is equipped with a **MODE** switch located on the bottom of the device. The switch configures the RUGGEDCOM RMC to accommodate different fiber partners that operate at various duplex modes and speeds. Choose the appropriate operating mode according to the fiber link partner.

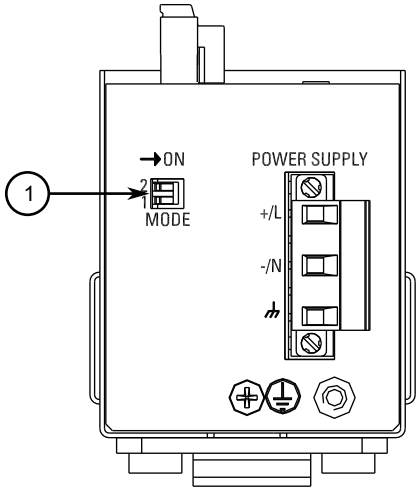

Figure 6: MODE Switch

1. MODE Switch

Configuration	MODE Switch Position		Description
	SW1	SW2	
Transparent Mode[a]	OFF	OFF	10/100 Auto-negotiating transparent mode
HDX Mode	OFF	ON	Half-Duplex fiber partner
FDX Mode	ON	OFF	Full-Duplex fiber partner (default)
Reserved	ON	ON	

[a] *Should ONLY be used on 10FL series RUGGEDCOM RMC products.*

The transparent mode can be utilized when BOTH the copper side and fiber side devices are capable of auto-negotiating duplex mode and speed as per TIA/EIA-785. When both partners are capable of negotiation, the RUGGEDCOM RMC can support 100Base-TX to 100Base-SX, full duplex and copper-to-fiber media conversion on 10FL standard electronics and fiber media. The TIA/EIA-785 standard allows for 10FL communication lines that are less than 300m in length to be upgraded to 100 Mb/s communication links.

The HDX and FDX modes exist to accommodate fiber link partners that are operating in the forced mode. Due to the high number of forced full duplex fiber optical devices available, the factory default is the FDX, full duplex, mode.

Section 2.4

Using Straight Through or Crossover Copper Wiring

To accommodate signals from end devices and network switching equipment, the RUGGEDCOM RMC is equipped with an **X-Over** switch. This switch allows for the proper connection regardless of the cable type configuration.

CAT-5 network cabling can be constructed in two possible configurations: Straight through and crossover (X-over). Straight through cabling involves a pin-to-pin connection, while crossover cabling matches the transmitting differential pair to the receiving differential pair. The following summarizes the two possible configurations:

TIA 568B Straight Through Pin-Out

Device 1		Device 2	
Pin	**Colour**	**Pin**	**Colour**
1	White/Orange	1	White/Orange
2	Orange	2	Orange
3	White/Green	3	White/Green
6	Green	6	Green

TIA 568B Crossover Wiring Pin-Out

Device 1		Device 2	
Pin	**Colour**	**Pin**	**Colour**
1	White/Orange	1	White/Green
2	Orange	2	Green
3	White/Green	3	White/Green
6	Green	6	Green

When connecting to end devices, the **X-Over** switch should be selected to reflect the type of cabling used. Specifically, straight through should be selected when using straight through cabling, and crossover should be selected when using crossover cabling.

3 Communication Ports

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

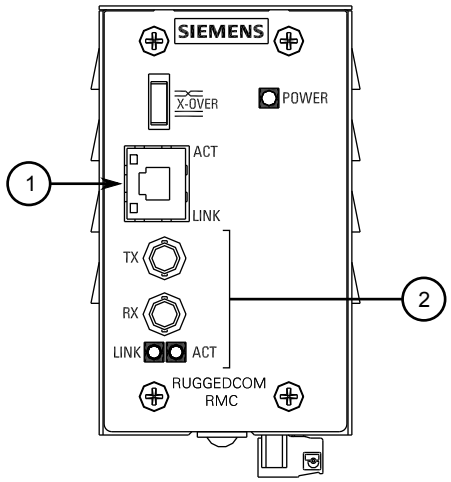

Figure 7: Port Assignment

1. Port 1 **2.** Port 2

Port	Type
1	Copper Ethernet Port
2	Copper Ethernet Port

CONTENTS

Section 3.1

Copper Ethernet Ports

The RUGGEDCOM RMC supports a single 10/100Base-TX Ethernet port that allows connection to a standard Category 5 (CAT-5) unshielded twisted-pair (UTP) cable with an RJ45 male connector. The RJ45 receptacles are directly connected to the chassis ground on the device and can accept CAT-5 shielded twisted-pair (STP) cables.

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.

IMPORTANT!
For substation applications, do not use the copper Ethernet port to interface with field devices across distances that could produce high levels of ground potential rise (i.e. greater than 2500 V) during line-to-ground fault conditions.

LEDs

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

LED	State	Description
Speed	Yellow	The port is operating at 100 Mbps
	Off	The port is operating at 10 Mbps
Link	Yellow (Solid)	Link established
	Yellow (Blinking)	Link activity
	Off	No link detected

Pin-Out

The following is the pin-out for the RJ45 male connectors:

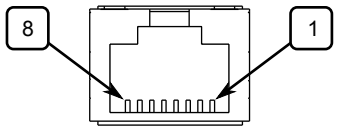

Figure 8: RJ45 Ethernet Port Pin Configuration

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)	

Specifications

For specifications on the available copper Ethernet ports, refer to Section 4.2, “Copper Ethernet Port Specifications” .

Section 3.2

Fiber Optic Ethernet Ports

Fiber optic Ethernet ports are available with either MTRJ (Mechanical Transfer Registered Jack), LC (Lucent 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.

Available Ports

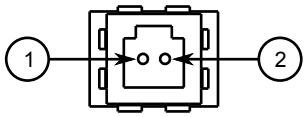

Figure 9: MTRJ Port

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

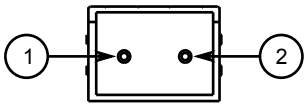

Figure 10: LC Port

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

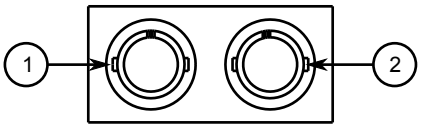

Figure 11: ST Port

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

Specifications

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

4 Technical Specifications

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

CONTENTS

Section 4.1

Power Supply Specifications

Power Supply Type	Minimum Input	Maximum Input	Internal Fuse Rating[a]	Max. Power Consumption
24 VDC	18 VDC	36 VDC	3.15A (T)	3 W
48 VDC	36 VDC	59 VDC		
HI[b]	88 VDC	300 VDC		
	85 VAC	264 VAC		

[a] *(T) denotes time-delay fuse.*

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

Section 4.2

Copper Ethernet Port Specifications

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

Speed[c]	Connector	Duplex[c]	Cable Type[d]	Wiring Standard[e]	Maximum Distance[f]	Isolation[g]
10/100Base-TX	RJ45	FDX/HDX	> CAT-5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV

[c] *Auto-negotiating.*

[d] *Shielded or unshielded.*

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

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

[g] *RMS 1 minute.*

Section 4.3
Fiber Optic Ethernet Port Specifications

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

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	Mode	Connector Type	Cable Type (µm)	Tx λ (nm)[h]	Tx (dBm)	Rx Sensitivity (dBm)	Distance (km)[h]	Power Budget (dB)
10Base-T to 10Base-FL	MM	ST	62.5/125	820	-135/-7.6	-34.4	2	22
10Base-T to 10Base-FL	SM	ST	-9/125	1310	-23/-15	-38	15	18
100Base-TX to 100Base-FX	MM	MTRJ	62.5/125	1300	-16/-11	-33.5	2	17
100Base-TX to 100Base-FX	MM	LC	62.5/125	1300	-16/-11	-33.5	2	17
100Base-TX to 100Base-FX	SM	LC	-9/125	1310	-15/-8	-31	15	16.5

[h] *Typical.*

Section 4.4
Supported Networking Standards

IMPORTANT!
The RUGGEDCOM RMC features Link Pass Through support. When loss of link is detected on either the fiber side or the copper side, link pulses are no longer transmitted on any of the RUGGEDCOM RMC ports. This feature allows for prompt loss of link detection and user correction.

Parameter	10Base-FL	100Base-FX	Notes
IEEE 802.3	Yes		10Base-T
IEEE 802.3u		Yes	100Base-TX/100Base-FX

Section 4.5
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 4.6
Mechanical Specifications

Dimensions	Refer to Chapter 5, *Dimension Drawings*
Weight	0.68 kg (1.5 lbs)
Ingress Protection	IP40 (1 mm or 0.04 in objects)
Enclosure	21 AWG Galvanized Steel

5 Dimension Drawings

NOTE
All dimensions are in millimeters, unless otherwise stated.

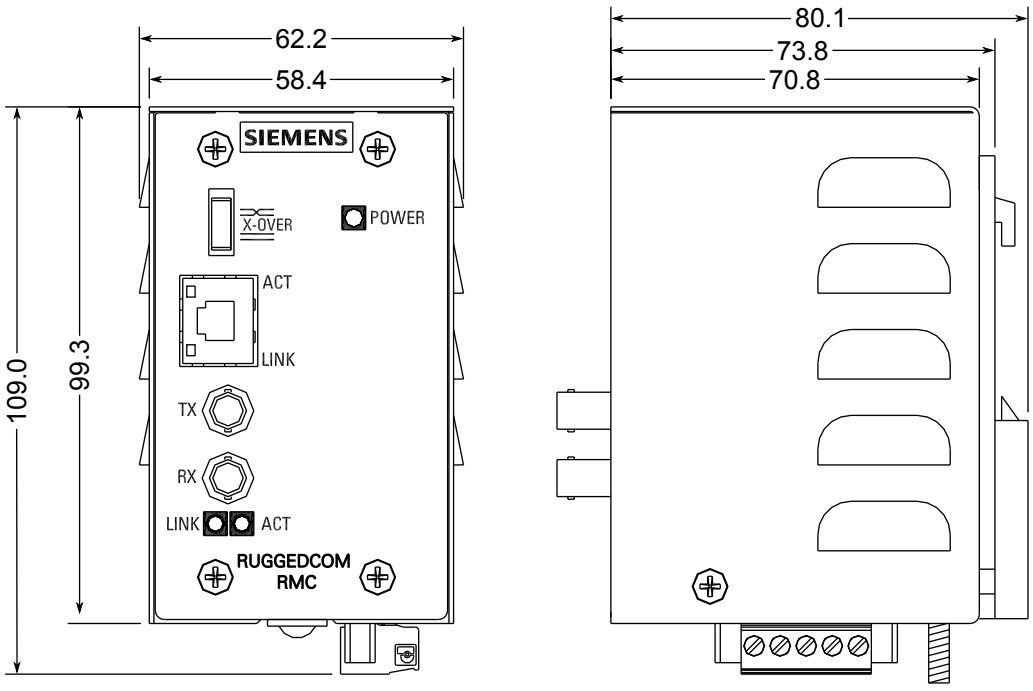

Figure 12: Overall Dimensions

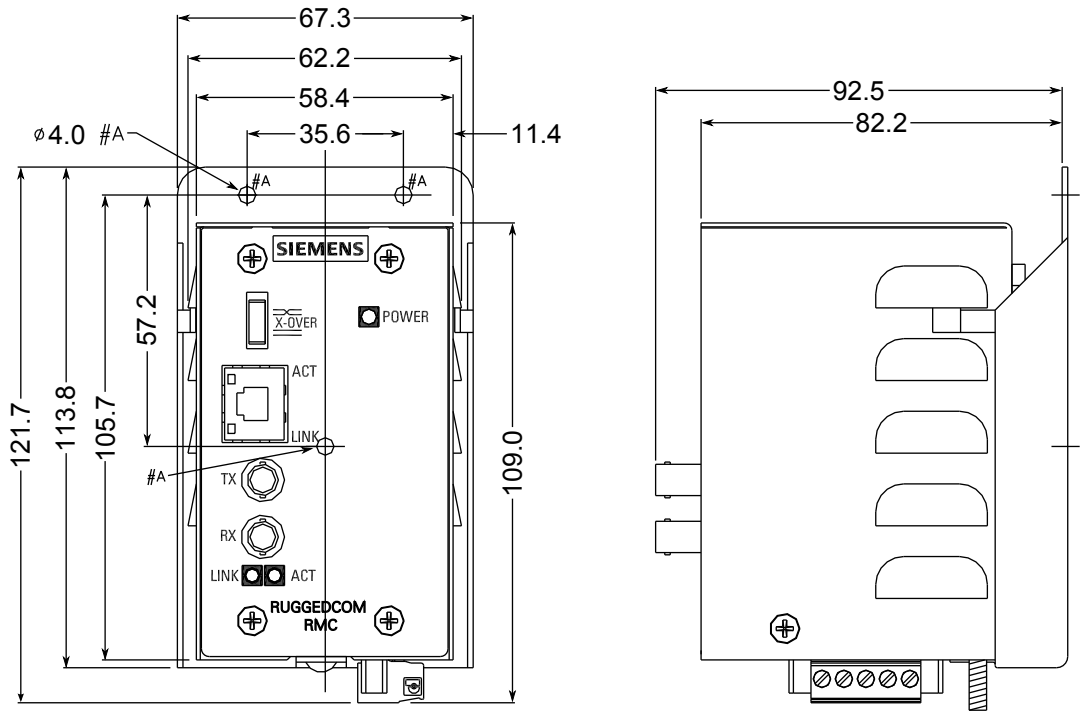

Figure 13: Panel Mount Dimensions

6 Certification

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

CONTENTS

Section 6.1

Approvals

This section details the approvals issued for the RUGGEDCOM RMC.

CONTENTS

Section 6.1.1

CSA

This device is certified by the CSA Group to meet the requirements of the following standards:

- **CSA-C22.2 NO. 60950-1**
  Information Technology Equipment – Safety – Part 1: General Requirements (Bi-National standard, with UL 60950-1)
- **UL 60950-1**
  Information Technology Equipment – Safety – Part 1: General Requirements)

Section 6.1.2
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 60950-1**
  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 55022**
  Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement

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

CE

A copy of the CE Declaration of Conformity is available from Siemens Canada Ltd. For contact information, refer to "Contacting Siemens " .

Section 6.1.3
FCC

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 6.1.4
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

Section 6.1.5
Industry Canada

This device is declared by Siemens Canada Ltd to meet the requirements of the following Industry Canada standard:

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

Section 6.1.6
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
- **NEMA TS-2**
  Traffic Controller Assemblies with NTCIP Requirements

Section 6.2
EMC and Environmental Type Tests

The RUGGEDCOM RMC 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

Test	Description		Test Levels	Severity Levels
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 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 60255-5	Dielectric Strength	Signal Ports	2 kV (Fail-Safe Relay output)	
		DC Power Ports	1.5 kV	
		AC Power Ports	2 kV	
	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
The RUGGEDCOM RMC meets Class 2 requirements for an all-fiber configuration and Class 1 requirements for copper ports.

Description		Test Levels
ESD	Enclosure Contact	± 8 kV
	Enclosure Air	± 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 kV
	DC Power Ports	1.5 kV

Description		Test Levels
	AC Power Ports	2 kV

Environmental Type Tests

Test	Description		Test Levels	Severity 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	Class 2
IEC 60255-21-2	Shock		30 g @ 11 ms	Class 2