SIEMENS

RUGGEDCOM RMC20

Installation Guide

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Table of Contents

Preface

This guide describes the RUGGEDCOM RMC20. 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.

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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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  - Submit SRs or check on the status of an existing SR
  - Find and contact a local contact person
  - Ask questions or share knowledge with fellow Siemens customers and the support community via the forum
  - And much more...

1 Introduction

The RUGGEDCOM RUGGEDCOM series of media converters are industrially hardened and specifically designed to operate reliably in electrically harsh and climatically demanding environments.

The RMC20 is a utility-grade, protocol-independent, serial-to-fiber and serial standards converter for all your serial communication requirements. The RMC20 allows RS485, RS422, or RS232 devices or networks to communicate over secure, noise immune, optically isolated, fiber optic cabling at extended distances as well convert RS232 to either RS485 or RS422 serial standards.

The RMC20 was designed specifically to provide years of maintenance free operation for all your mission-critical, real-time control applications. To provide the utmost in reliability, the RMC20 is tested to the most stringent international EMI and environmental standards for use in HV/MV electric utility substations and industrial manufacturing, process and control and intelligent transportation systems applications. All RUGGEDCOM products are packaged with a high reliability, built-in power supply (24V, 48V or HI voltage options) and enclosed in a rugged galvanized steel enclosure suitable for panel or DIN-rail mounting.

The following sections provide more information about the RMC20:

Section 1.1

Feature Highlights

Key Features

- Extend lengths of serial connections (up to 5 km or 3 mi per hop)
- Media conversation is transparent to end devices

Port Options

- Protocol independent RS485, RS422, or RS232 (user selectable) conversion to multi-mode fiber optics (ST connector only
- RS232 to RS485/422 conversion mode
- Fully EIA/TIA RS485, RS422, RS232 compliant communications
- Built-in, defeat-able, RS485/RS422 termination networks
- Point-to-point, or optical loop configurations
- Full or half duplex configurable
- Support for high-speed serial baud rates from 300 to 115200 baud

Designed for Harsh Environments

- Exceeds IEC 61850-3 and IEEE 1613 Standards for communication equipment in electric power substations
- 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

Ports, Controls and Indicator LEDs

The RMC20 features various ports, controls and indicator LEDs on the front panel for configuring and troubleshooting the device.

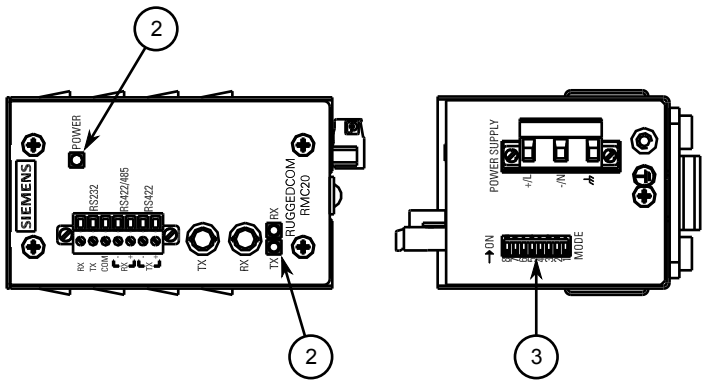

Figure 1: Front Panel

1. Power Indicator LED **2.** Port Status Indicator LEDs **3.** Mode Selector Switch

Port Status Indicator LEDs	These LEDs indicate the state of each port. For more information, refer to Chapter 3, *Communication Ports*.
Power Indicator LED	The power indicator LED illuminates when power is being supplied to the device.
Mode Selector Switch	This switch sets the device in transparent, half-duplex (HDX), full-duplex (FDX) or reserved mode. For more information, refer to Section 3.1, "Fiber Optic Ports". **IMPORTANT!** *Only use transparent mode when a 10Base-FL fiber optic port is equipped.*

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.

Section 2.1

Mounting the Device

The RMC20 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.

NOTE
For detailed dimensions of the device with either DIN rail or panel hardware installed, refer to Chapter 5, Dimension Drawings.

The following sections describe the various methods of mounting the device:

- Section 2.1.2, “Mounting the Device to a Panel”

Section 2.1.1
Mounting the Device on a DIN Rail

For DIN rail installations, the RMC20 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.

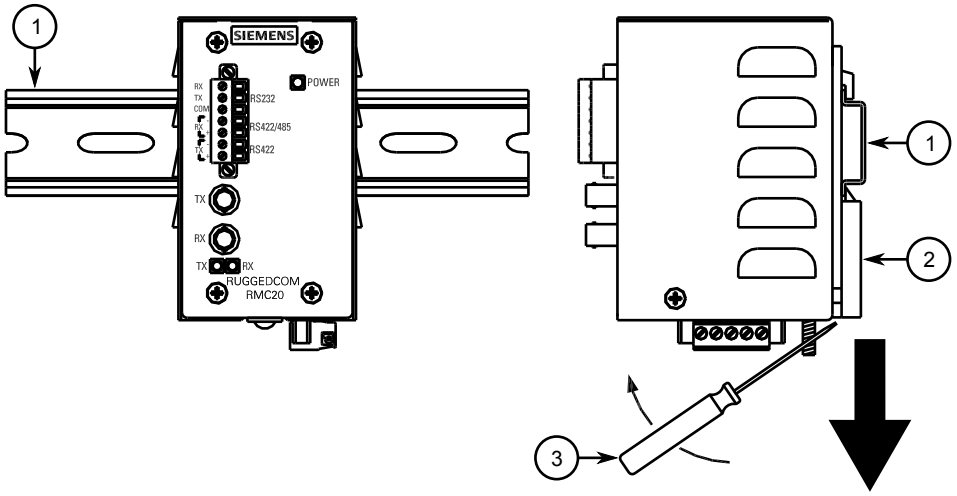

Figure 2: DIN Rail Mounting

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.

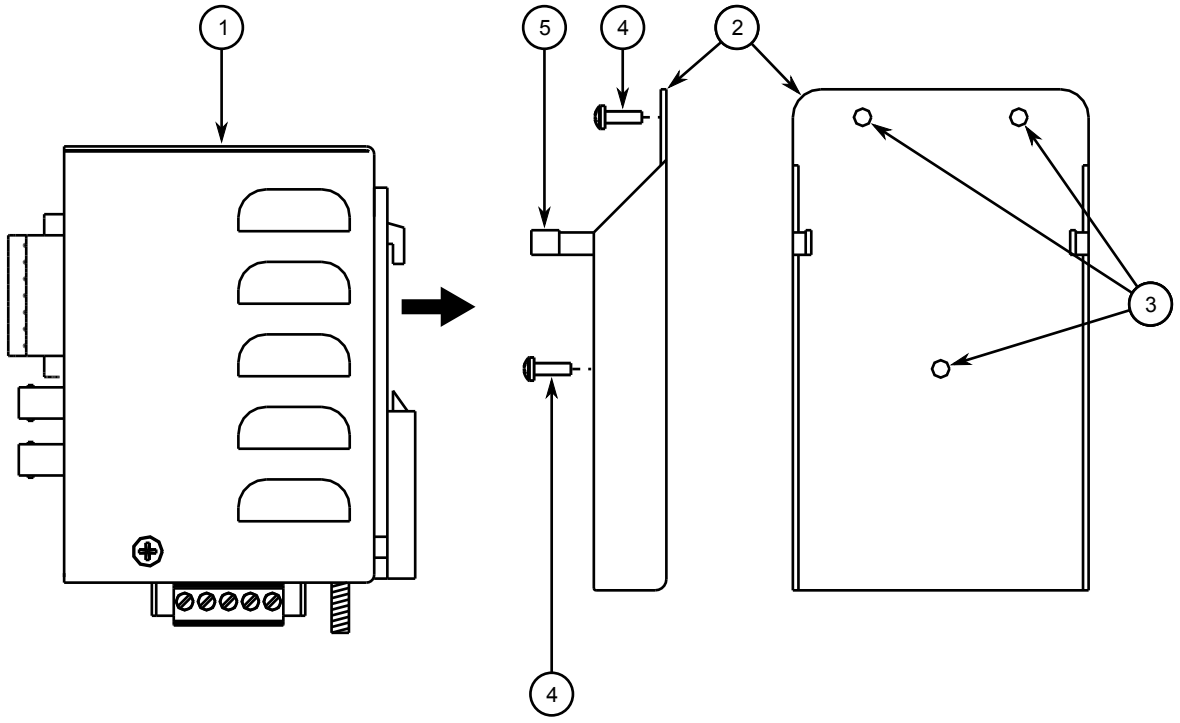

Figure 3: Panel Mounting

1. RMC20 **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 RMC20 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*

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

- Section 2.2.1, “Connecting AC Power”
- Section 2.2.2, “Connecting DC Power”

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.

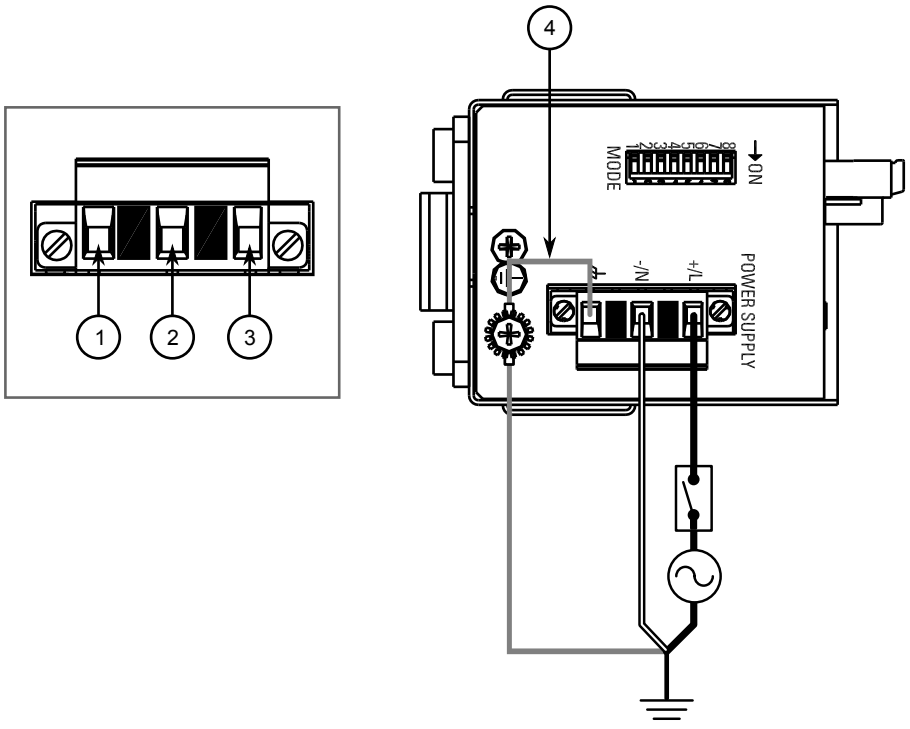

Figure 4: Terminal Block Wiring

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.

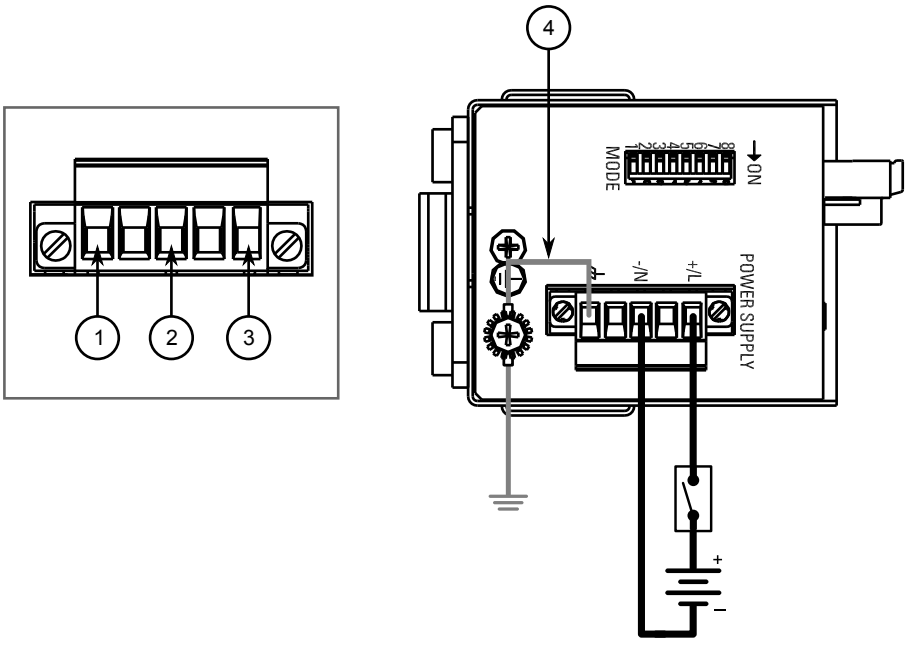

Figure 5: Terminal Block Wiring

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

Configuring the Device

The RMC20 can be configured using the **Mode** DIP switch located at the bottom of the enclosure. The DIP switches are shown in Figure 8. Using the switches one can change the operating mode of the RMC20.

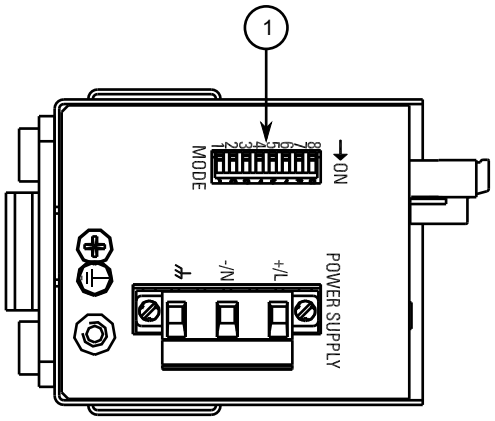

Figure 6: Mode DIP Switch

1. DIP Switch

The configuration settings are as follows:

Position	ON	OFF
1	RS232 to fiber mode	RS485/422 to fiber mode
2	RS232 to RS485/422 conversion mode	Serial (RS232/485/422) to fiber mode
3	Full Duplex Serial (RS232/RS422)	Half Duplex Serial (RS485)
4	Fiber Repeat ON	Fiber Repeat OFF
5	RESERVED	
6	> 57600 baud	300 – 2400 baud
7	19200 – 57600 baud	
8	4800 – 14400 baud	

The RMC20 is equipped to provide conversion from serial (RS232, RS485, or RS422) to fiber optics, or between serial standards (RS232 to RS485 / RS422). Serial to fiber optic conversion connections can be further implemented in point-to-point, as well as optical loop configurations.

The following sections describe the available working modes in more detail:

- Section 2.3.1, “Serial-to-Fiber Conversion: Point-to-Point”
- Section 2.3.2, “Serial Standard Conversion”
- Section 2.3.3, “Serial-to-Fiber Conversion: Loop Topology”

Section 2.3.1

Serial-to-Fiber Conversion: Point-to-Point

The following illustrates the serial-to-fiber conversion mode of operation.

NOTE
In this example, the distance between the two RMC20 devices is less than 5 km (3.1 mi).

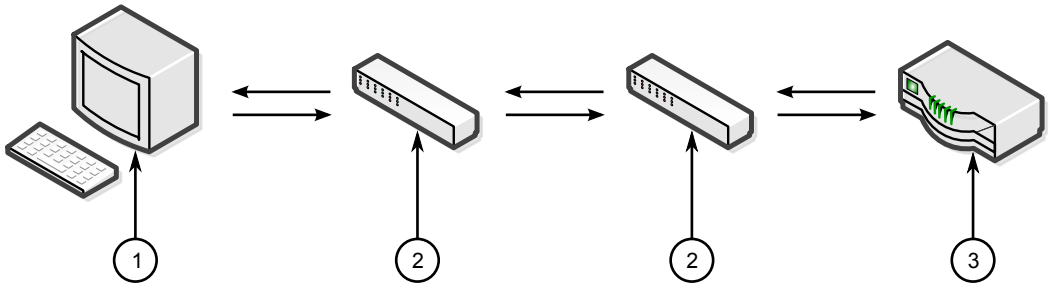

Figure 7: Serial-to-Fiber Point-to-Point Topology

1. RS232 Device **2.** RMC20 **3.** RS485 Device/Network

RS232 Device

Position	State	Notes
1	ON	RS232 <-> Fiber
2	OFF	Serial-to-Fiber Mode
3	ON	Full Duplex
4	OFF	Fiber repeat OFF

RS422 Device/Network

Position	State	Notes
1	OFF	RS422 <-> Fiber
2	OFF	Serial-to-Fiber Mode
3	ON	Full Duplex
4	OFF	Fiber repeat OFF

n this mode serial data is converted directly into light impulses, and transmitted over multi-mode fiber optics. The serial standard is selected by position 1 of the DIP switches: OFF (default) is for RS485/RS422, and ON is for RS232. Position 2 should be OFF for serial to fiber conversion. Position 6-8 should be configured if RS485 communications are used, in order to have the appropriate turn-around timer shown below selected. Positions 6-8 do not impact communications in full-duplex mode.

NOTE
A baud rate lower than 1200 bps is not supported in half-duplex or RS485 mode.

Baud Rate (bps)	DIP6	DIP7	DIP8	Turn-Around Time[a]
1200-2400	OFF	OFF	OFF	9.5 ms
4800-14400	OFF	OFF	ON	2.3 ms
19200-57600	OFF	ON	OFF	0.58 ms
>57600	ON	OFF	OFF	0.10 ms

[a] *Turn-around time is the amount of time after the start bit was transmitted and before the transceiver changed back to receiver mode.*

Section 2.3.2
Serial Standard Conversion

The following illustrates the connections for conversion between RS232 and RS485/422 devices.

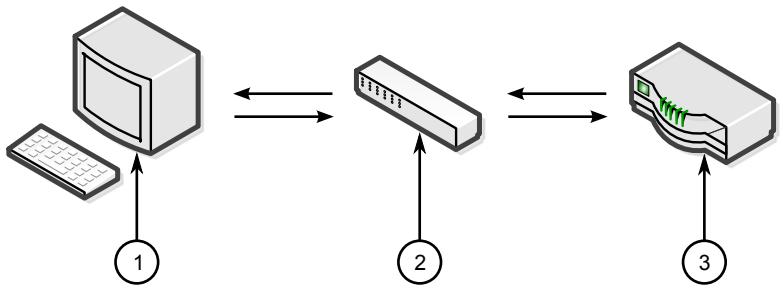

Figure 8: RS232 to RS485/422 Topology

1. RS232 Device **2.** RMC20 **3.** RS485 Device/Network

Position	State	Notes
2	ON	Serial Conversion Mode
3	OFF	Half Duplex
4	OFF	Fiber repeat OFF
6	OFF	9600 Baud
7	OFF	
8	ON	

In this mode of operation, RS232 voltage levels are converted to the appropriate RS485 or RS422 signalling levels depending on the DIP switch configuration. In this mode of operation position 2 of the DIP switches must be in the ON position. The topology depicted in Figure 8 illustrates an RS232 device, connected to an RS485 device or network. Since RS485 requires automatic turn-around, position 3 must be set to the OFF state, and position 6 – 8 of the DIP switches must reflect the proper operating baud rate.

NOTE
In this mode of operation, no isolation is provided between RS232 device and the RS485/422 network – both devices share the same common terminal. It should be noted that the common terminal on RS232 devices are connected to ground. In some instances (i.e. when connecting to large RS485 networks), it may be preferential for the user to leave the RS485/RS422 shield terminal unconnected to the RMC20 in this mode.

Section 2.3.3
Serial-to-Fiber Conversion: Loop Topology

The following illustrates the optical loop topology that utilizes the RMC20 repeat mode function.

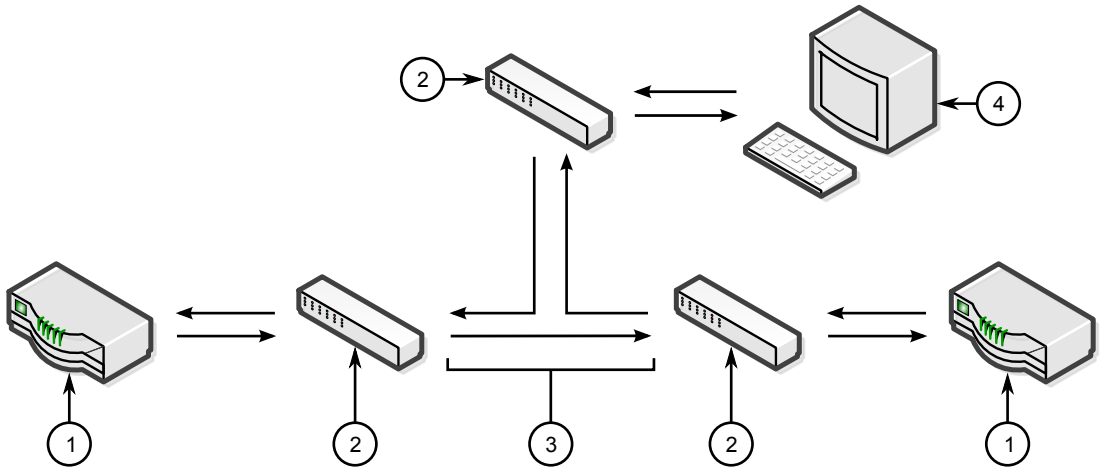

Figure 9: Serial-to-Fiber Conversion in Example Optical Loop Topology

1. RS85 Slave (Repeat = ON) **2.** RMC20 **3.** Multiple RMC20 Devices **4.** RS85 Master (Repeat = OFF)

Position	State	Notes
1	OFF	RS85/422 <-> Fiber
2	OFF	Serial-to-Fiber Mode
3	OFF	Half Duplex
4	OFF	Fiber repeat: Refer to Figure 9
6	OFF	9600 Baud
7	OFF	
8	ON	

The repeat function will optically re-transmit any data received on the optical receiver, in addition to any connected serial devices. As a result, any data transmitted from the master, will be re-transmitted optically to all the slaves. This mode of operation requires that the master device tolerate receiving echoes of transmitted data since any transmissions will be received once again via the optical ring.

This topology can be used for RS232, RS485 or RS422 multi-drop networks. In all cases, all slaves have the repeat function (DIP position 4) ON, while the master is configured with the repeat function OFF. This topology can allow for the mixture of RS232, RS485 and RS422 devices, operating on the same baud rate, on a single optical serial network because the RMC20 utilizes a common optical signalling protocol for all serial standards.

3 Communication Ports

The RMC20 can be equipped with various types of communication ports to enhance its abilities and performance. To determine which ports are equipped on the device, refer to the factory data file available through . For more information on how to access the factory data file, refer to the *User Guide* for the RMC20.

Each communication port type has a specific place in the RMC20 chassis.

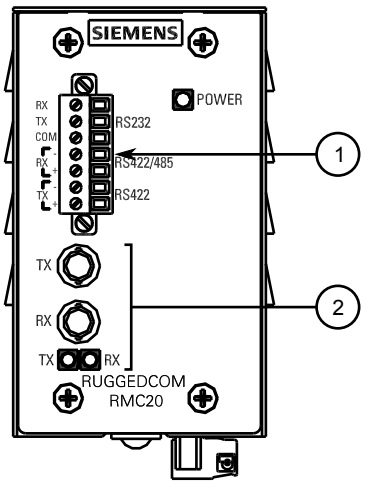

Figure 10: Port Assignment

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

Port	Type
1	RS232/RS485/RS422 Serial Terminal
2	Multi-Mode Fiber Optic Port

The following sections describe the available ports:

- Section 3.1, “Fiber Optic Ports”
- Section 3.2, “Serial Terminal”

Section 3.1

Fiber Optic Ports

Fiber optic ports are available with 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.

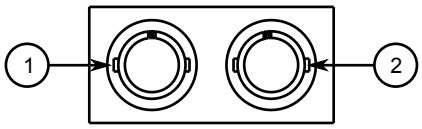

Figure 11: ST Port

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

For specifications on the available fiber optic ports, refer to Section 4.2, “Fiber Optic Port Specifications”.

To accommodate a wide array of fiber optical devices, the RMC20 is equipped with a mode selector switch located on the bottom of the device. The mode selector switch configures the RMC20 to accommodate different fiber partners that operate at various duplex modes and speeds. Choose the appropriate operating mode according to the fiber link partner.

Configuration	Mode Selector Positioning		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 RMC20 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 RMC20 can support 100Base-TX to 100Base-SX, full duplex, 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 3.2

Serial Terminal

The RMC20 is equipped with a seven-terminal Phoenix-style connector. This connector can accommodate one RS232 connection, and one RS485/422 connection. The following is the pin-out for the serial terminal:

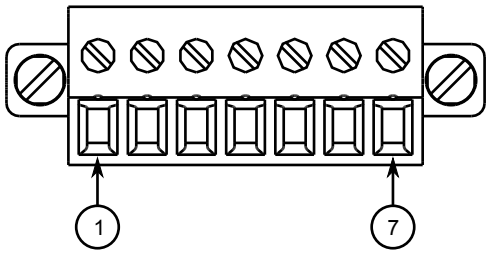

Figure 12: Serial Terminal Pin Configuration

Pin	Name	Mode	Description
1	Rx	RS232	Receive data
2	Tx	RS232	Transmit data
3	COM	Shared common	
4	-Rx	RS422/485	Receive data-
5	+Rx	RS422/485	Receive data+
6	-Tx	RS485	Transmit data-
7	+Tx	RS485	Transmit data+

The following sections describe how to use the different modes available:

- Section 3.2.1, “RS232 Data Ports”
- Section 3.2.2, “RS485/422 Data Ports”

Section 3.2.1

RS232 Data Ports

The serial terminal includes a single EIA/TIA RS232 compliant port, consisting of three terminals: Transmit (Tx), Receive (Rx) and Common (COM).

IMPORTANT!
The RS232 port is intended for point-to-point applications only.

The EIA/TIA guidelines for RS232 communications include (but are not limited to) the following:

- To minimize the effects of ambient electrical noise, shielded cabling is recommended.
- Reliable communications within 15 m (49 ft). Greater distances are possible.
- Communications of up to 120 kbaud signal rate.

The RS232 port does not use an industry standard DB9 connector, but rather a Phoenix-style compression connector. The following is the pin-out for the DB9 connector

.

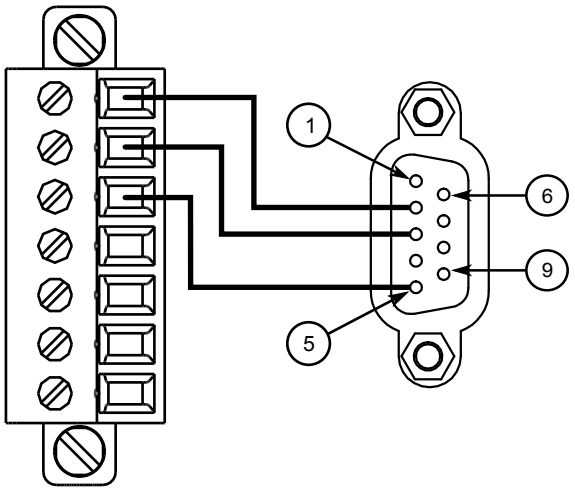

Figure 13: Phoenix-Style DB9 Connector Pin Configuration

Pin	Name	Description
1		
2	RD	Receive Data
3	TD	Transmit Data
4		
5	SGND	Signal Ground
6		
7		
8		
9		

The RS232 data port has two modes of operations, but only one mode is active at any given time:

- Communications with IEDs (intelligent electronic devices such as PLC, RTU, etc.)
- Console configuration of the device.

To activate console configuration mode, press and hold **Ctrl+Z** for approximately 10 seconds during power up. To deactivate console mode, reset the device.

Section 3.2.2

RS485/422 Data Ports

The serial terminal includes a single RS485/RS422 data port. In half duplex mode, the RS485 connections (Rx+, Rx-, COM) should be connected. In full-duplex mode, the RS422 connections (Rx+, Rx-, Tx+, Tx-, COM) should be connected. Both RS485 and RS422 can accommodate multi-drop networks, for master-slave serial network communications. For both RS485/RS422 connections, the following general guidelines should be followed:

- 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 (typically with a 120 Ohm resistor and a 10nF capacitor in series across the twisted pair).

Both data terminal pairs (Rx +/- and Tx +/-) are terminated by default from the factory. To remove termination: Open the cover and remove jumper JP1 and/or JP2 (JP1 for Rx+, Rx terminals, JP2 for Tx+, Tx- terminals) depending on which port termination is NOT required. Termination provided is a 120 Ohm resistor in series with a 10nF capacitor as per the ModBus 1.0 specification. In general termination should be left in place unless it is detrimental to communications.

NOTE
Transient protection is provided on all terminals. Lightning strikes and ground surge currents can cause large momentary voltage differences between ends of communication links. To ensure maximum reliability of the entire link, all equipment should have similar transient protection installed.

The following shows the recommended RS485 wiring.

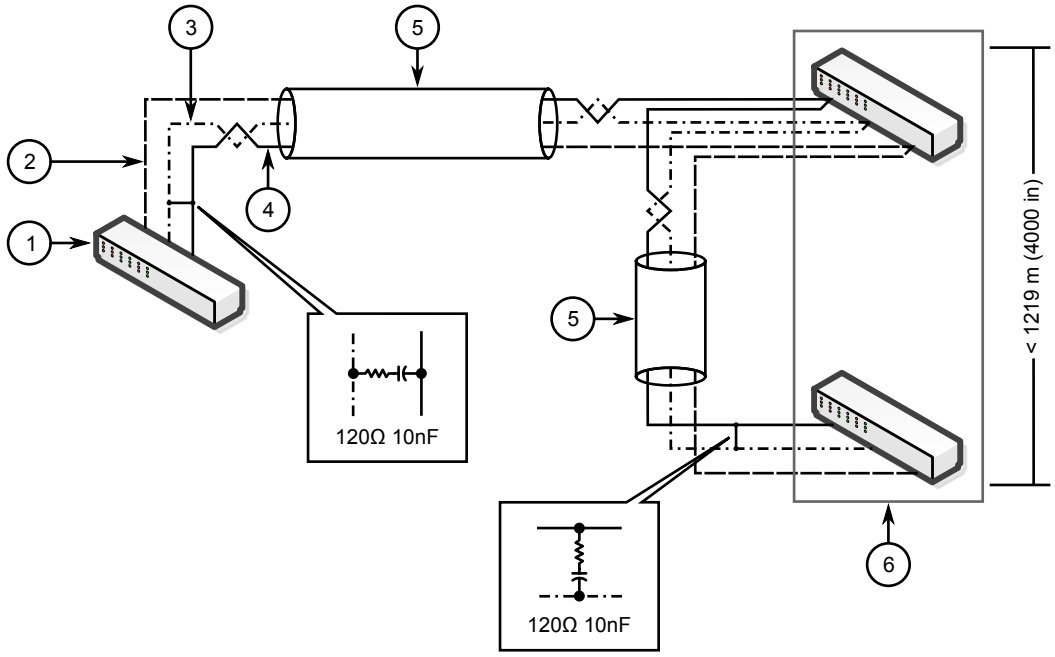

Figure 14: Recommended RS485 Wiring

1. RMC20 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 4.3, “Operating Environment”
- Section 4.4, “Mechanical Specifications”

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	72 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

Fiber Optic Port Specifications

The following details the specifications for fiber optic ports that can be ordered with the RMC20.

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.*

Mode	Connector Type	Cable Type (µm)	Tx λ (nm)[c]	Tx (dBm)	Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[c]	Power Budget (dB)
MM	ST	50/125	820	-13	-33.5	-11	5	17.5
		62.5/125						

[c] *Typical.*

Section 4.3
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 4.4
Mechanical Specifications

Parameter	Value
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.

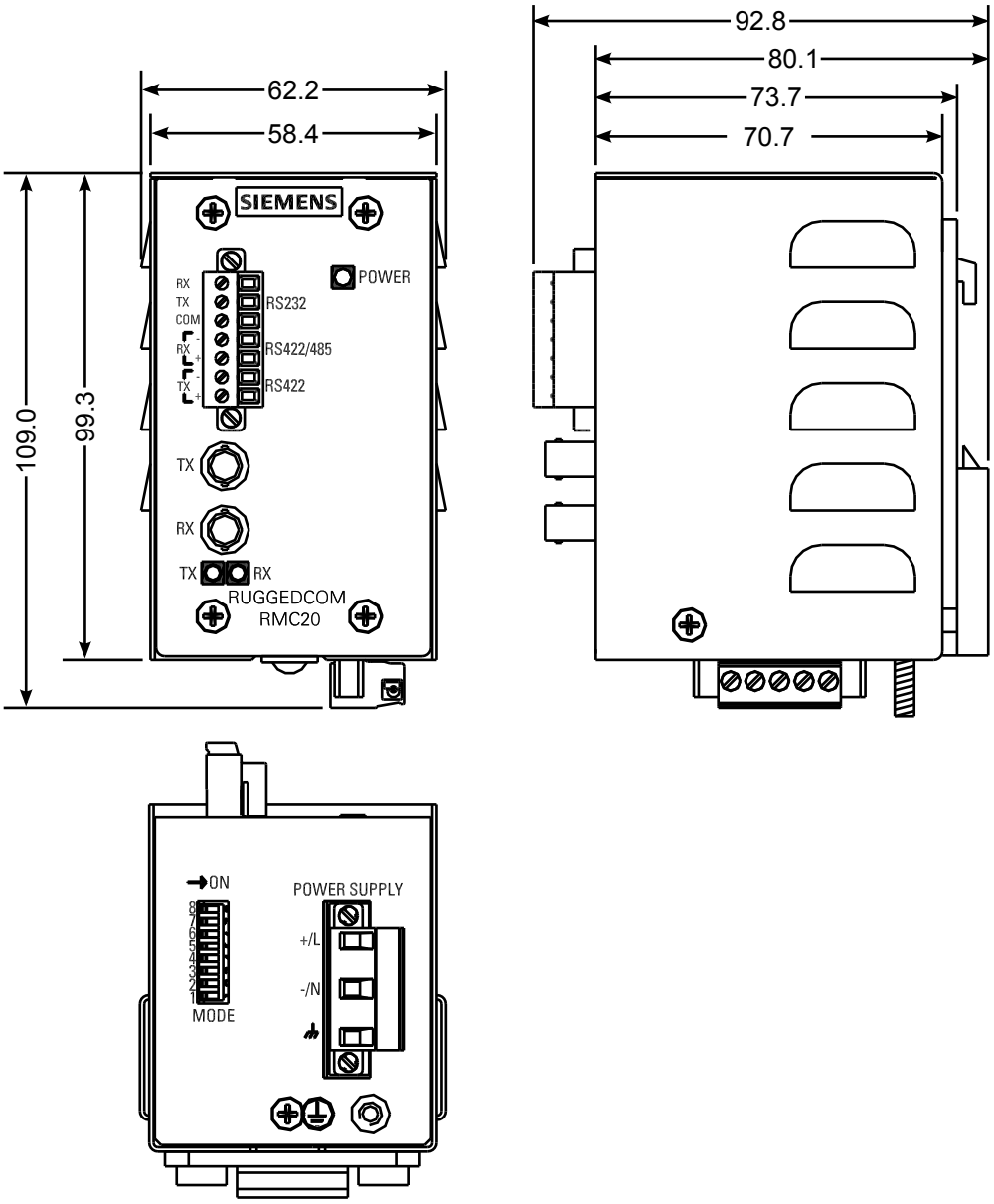

Figure 15: Overall Dimensions

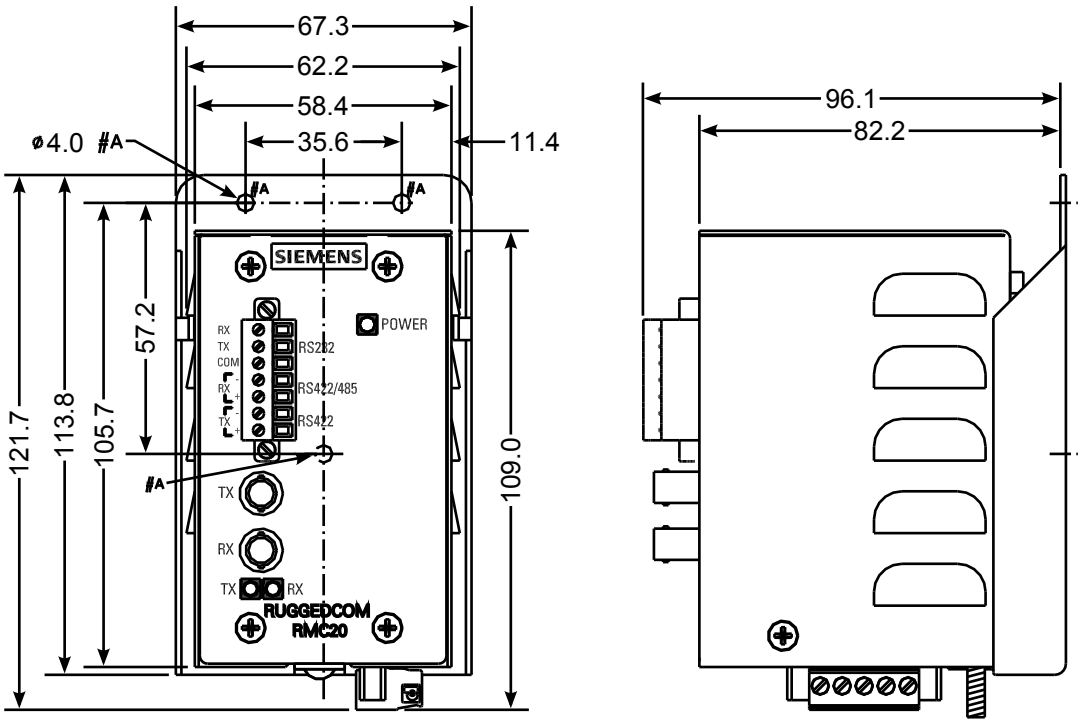

Figure 16: Panel Mount Dimensions

6 Certification

The RMC20 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

Agency	Standards	Comments
CSA	CSA C22.2 No. 60950-1, UL 60950-1	Approved
CE	EN 60950-1, EN 61000-6-2, EN 55022 Class A, 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 1, Sub-chapter J	Compliant

Section 6.2

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 6.3

Industry Canada Compliance

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

Section 6.4

EMI and Environmental Type Tests

The RMC20 has passed the following EMI 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
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 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

Test	Description		Test Levels	Severity Levels
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 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 (C37.90.x) EMI Immunity Type Tests

NOTE
The RMC20 meets Class 2 requirements for an all-fiber configuration and Class 1 requirements for copper ports.

IEEE Test	IEEE 1613 Clause	Description		Test Levels
C37.90.3	9	ESD	Enclosure Contact	+/- 2 kV, +/- 4 kV, +/- 8 kV
			Enclosure Air	+/- 4 kV, +/- 8 kV, +/- 15 kV
C37.90.2	8	Radiated RFI	Enclosure ports	35 V/m
C37.90.1	7	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
C37.90	6	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	1.5 kVDC
			AC Power ports	2 kVAC

Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40 °C (-40 °F), 16 Hours	

Test	Description		Test Levels	Severity Levels
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