

SIEMENS

RUGGEDCOM RMC30

Installation Guide

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Preface

This guide describes the RUGGEDCOM RMC30. It describes the major features of the device, installation, commissioning and important technical specifications.

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

Alerts

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



DANGER!

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



WARNING!

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



CAUTION!

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



IMPORTANT!

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



NOTE

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

Related Documents

Other documents that may be of interest include:

- *ROS User Guide for the RMC30*

Accessing Documentation

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

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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.

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- **Telephone**

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>.

- **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's extensive library of support documentation, including FAQs, manuals, and much more
- 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 RMC30 is an industrially hardened, 2-port Serial-to-Ethernet server that has been specifically designed to operate in electrically harsh and climatically demanding environments. The RMC30 allows communication with virtually any serial device via Ethernet, providing simple and reliable network connectivity.

The RMC30 is packaged in a compact, galvanized steel enclosure that allows either DIN or panel mounting for efficient use of cabinet space. It has an integrated power supply with a wide range of voltages for worldwide operability. An operating temperature range of -40 to 85°C (-40 to 185°F) without the use of internal cooling fans allows it to be placed in almost any location. The RMC30 is compliant with EMI and environmental standards for utility substations, industrial manufacturing, process and control and intelligent transportation systems applications.

The RMC30 offers both an RS232 port and a RS485/422 port simultaneously via a solid screw down terminal block. The 10Base-T Ethernet port supports both auto-negotiation and auto-crossover detection and simplifies cabling. Simple and intuitive network based configuration using either the built in Web or Telnet server makes setup a breeze. The RMC30's superior ruggedized design coupled with the Rugged Operating System™ (ROS®) provides improved system reliability making it ideally suited for creating Ethernet networks for mission critical, real-time, control applications.

The following sections provide more information about the RMC30:

- [Section 1.1, "Feature Highlights"](#)
- [Section 1.2, "Ports, Controls and Indicator LEDs"](#)

Section 1.1

Feature Highlights

Connectivity

- 1 RS232 and 1 RS422/485 port
- 1 10Base-TX port
- Fully compliant EIA/TIA RS485 and RS232 ports
- Built-In optional RS485 Termination

Serial Encapsulation

- Transmit serial data over an IP network
- Support for Modbus TCP, DNP 3, TIN serial protocols
- Baud rates up to 230 kbps
- Point to point and multi-point modes
- Convert Modbus RTU to Modbus TCP
- Support multiple Modbus masters
- Use 'Serial IP' port redirection software to support PC applications statistics and built-in *sniffer* for troubleshooting

Designed for Harsh Environments

- Exceeds IEC 61850-3 requirements for electric power substations
- Exceeds IEC 61000-6-2 for industrial environments
- Meets IEEE 1613 requirements for electric power substations 3 kV (RMS) Isolated serial ports
- 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
- Meets NEMA TS 2 (1998) Environmental Requirements for traffic control equipment

Management and Diagnostics

- Web-based, Telnet, CLI management interfaces
- SNMP v1, v2 and v3 with traps (56-bit encryption)
- Rich set of diagnostics with logging and alarms
- Ethernet and Serial LED indicators aid in field troubleshooting
- Flash memory for easy upgrades
- System watchdog with automatic reset
- Built in real time clock and SNTP time synchronization

Section 1.2

Ports, Controls and Indicator LEDs

The RMC30 features various ports, controls and indicator LEDs on the front panel for configuring and troubleshooting the device.

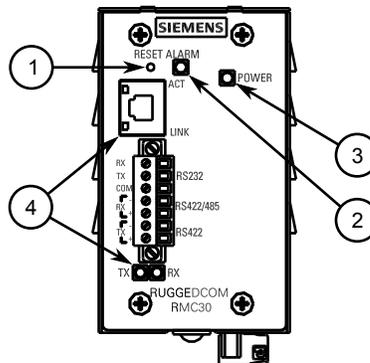


Figure 1: Front Panel

1. Reset Button 2. Alarm Indicator LED 3. Power Indicator LED 4. Port Status Indicator LEDs

Reset Button

The reset button shuts down and restarts the device.

Alarm Indicator LED

The alarm indicator LED illuminates when an alarm condition exists.

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.

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”](#)
- [Section 2.2, “Connecting Power”](#)

Section 2.1

Mounting the Device

The RMC30 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 2.1.1, “Mounting the Device on a DIN Rail”](#)
- [Section 2.1.2, “Mounting the Device to a Panel”](#)

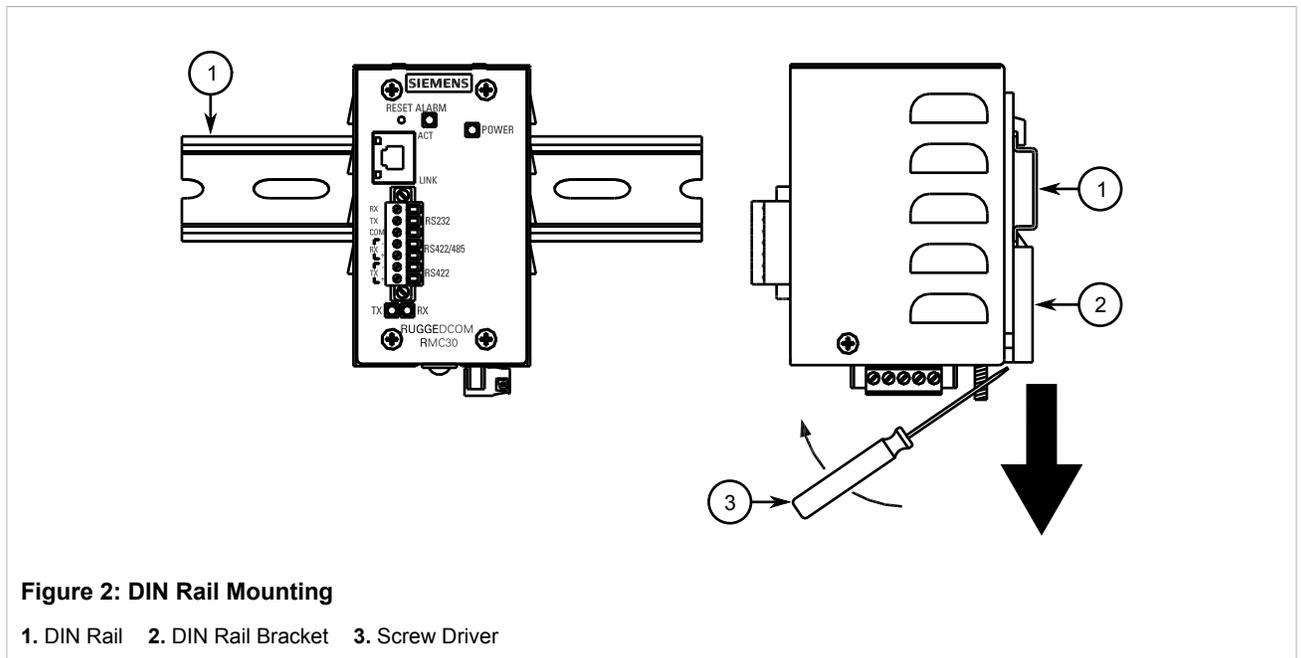
Section 2.1.1

Mounting the Device on a DIN Rail

For DIN rail installations, the RMC30 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.



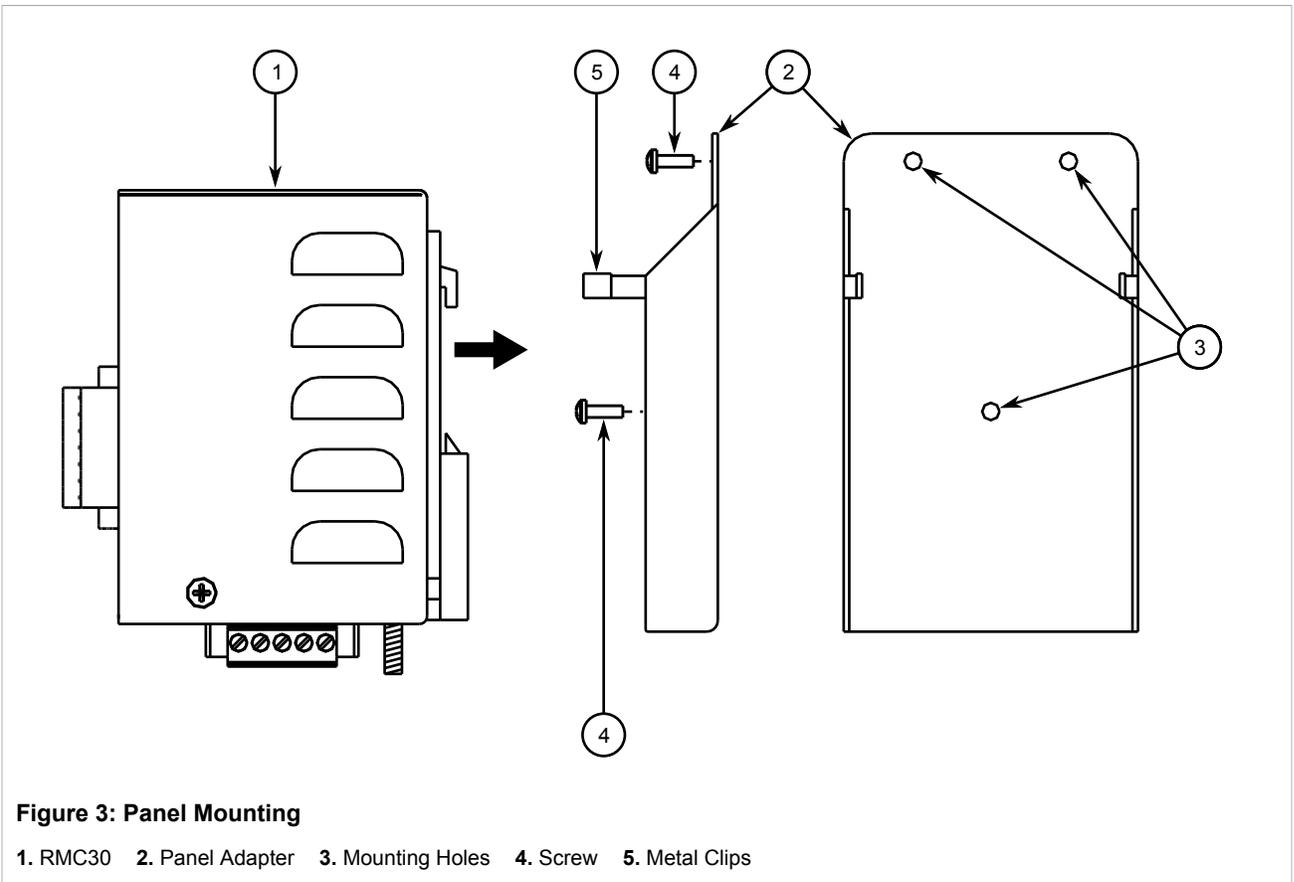
2. Pull the release on the bracket down and slide the device onto the DIN rail. If necessary, use a screw driver to unlock the release. Let go of the release to lock the device in position.

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.



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

Section 2.2

Connecting Power

The RMC30 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, 8x20 μ s 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.

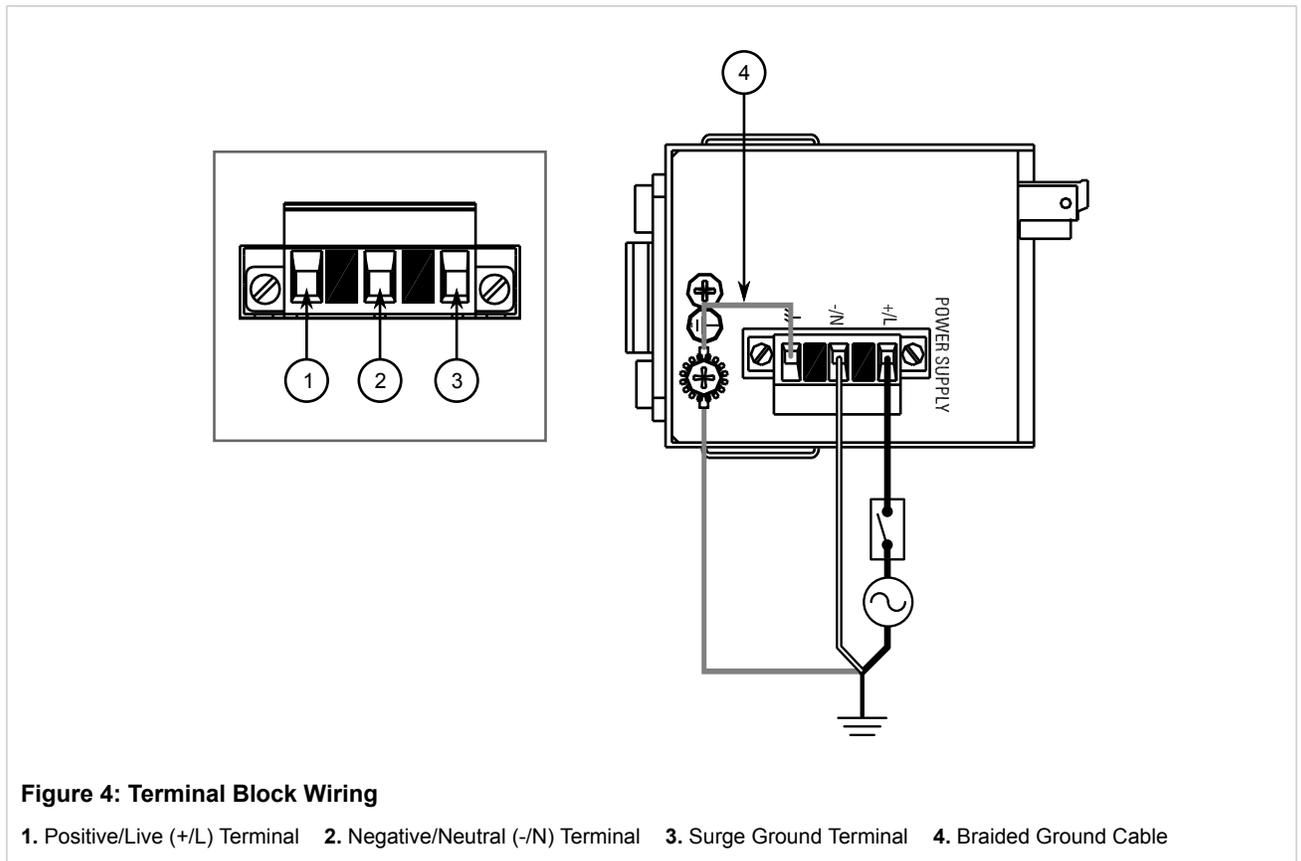


Figure 4: Terminal Block Wiring

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

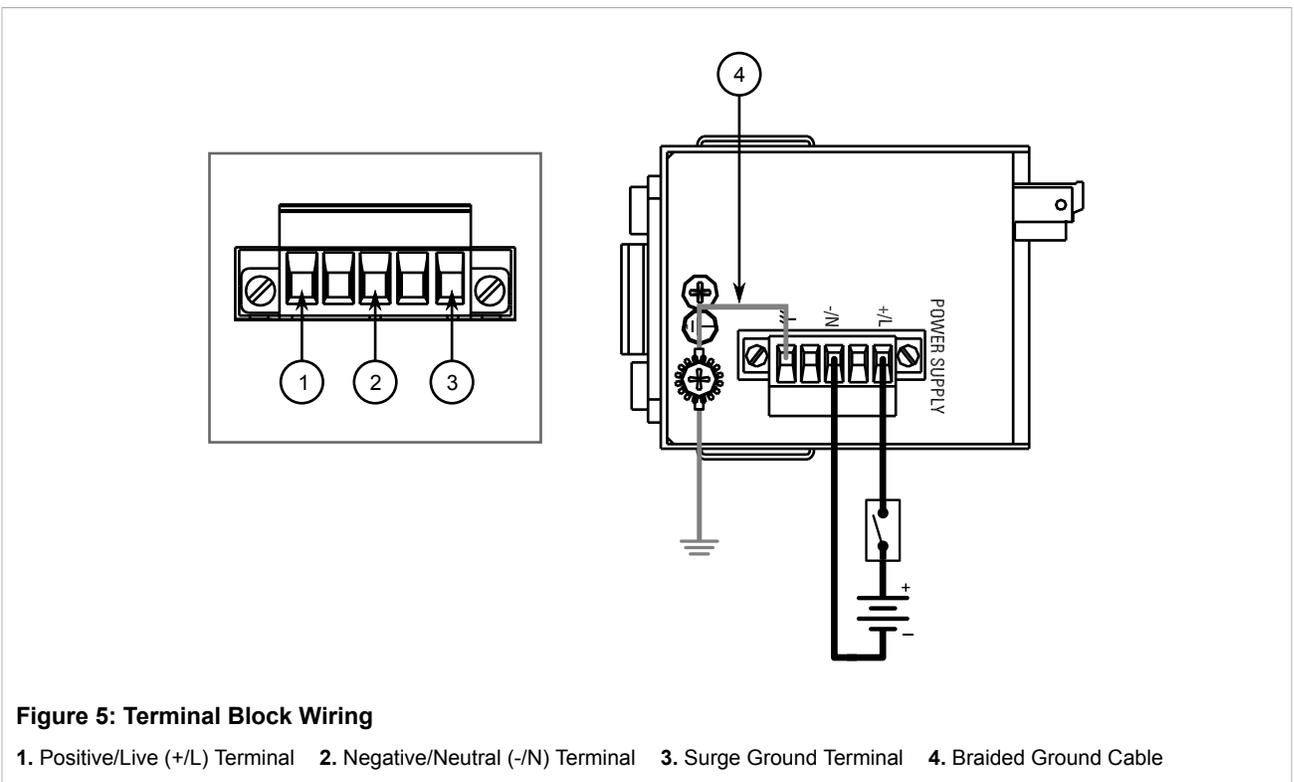
To connect a high or low DC power supply to the device, do the following:



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.



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.

3 Communication Ports

The RMC30 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 ROS. For more information on how to access the factory data file, refer to the *ROS User Guide* for the RMC30.

Each communication port type has a specific place in the RMC30 chassis.

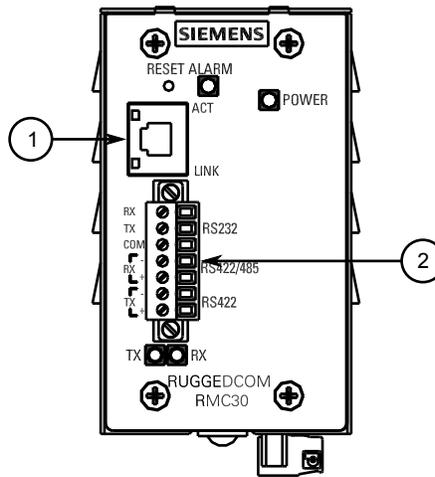


Figure 6: Port Assignment

1. Port 1 2. Port 2

Port	Type
1	Fast Ethernet Port (10/100Base-TX)
2	RS232/RS485/RS422 Serial Terminal

The following sections describe the available ports:

- [Section 3.1, “Copper Ethernet Ports”](#)
- [Section 3.2, “Serial Terminal”](#)

Section 3.1

Copper Ethernet Ports

The RMC30 supports several 10/100Base-TX Ethernet ports that allow connection to standard Category 5 (CAT-5) unshielded twisted-pair (UTP) cables with RJ45 male connectors. The RJ45 receptacles are directly connected to the chassis ground on the device and can accept CAT-5 shielded twisted-pair (STP) cables.



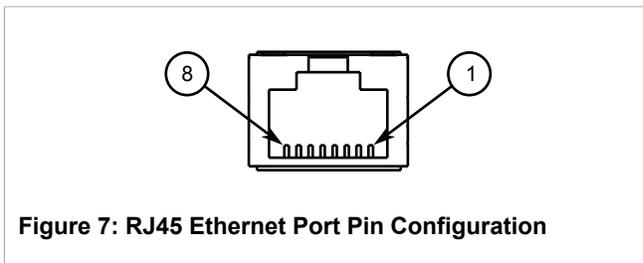
WARNING!

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.

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

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



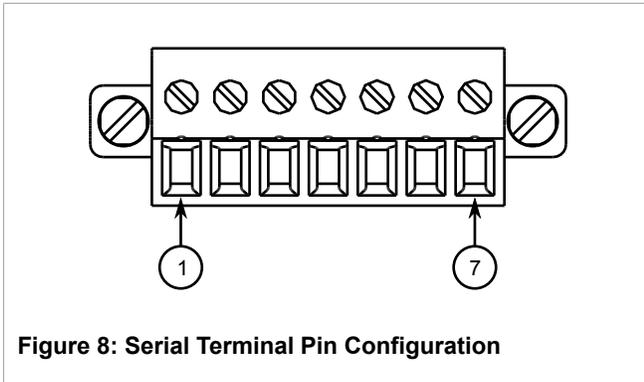
Pin	Name	Description
1	RX+	Receive Data+
2	RX-	Receive Data-
3	TX+	Transmit Data+
4		Reserved (Do Not Connect)
5		Reserved (Do Not Connect)
6	TX-	Transmit Data-
7		Reserved (Do Not Connect)
8		Reserved (Do Not Connect)

For specifications on the available copper Ethernet ports, refer to [Section 4.2, “Copper Ethernet Port Specifications”](#).

Section 3.2

Serial Terminal

The RMC30 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:



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).



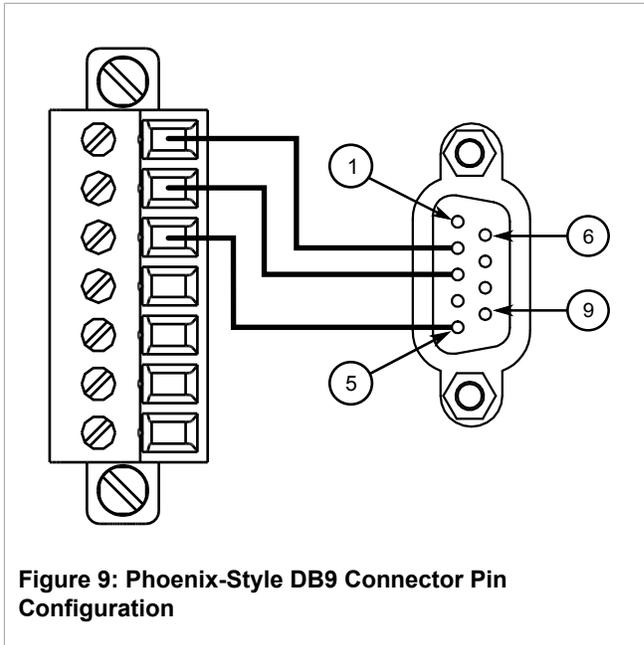
IMPORTANT!

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



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.

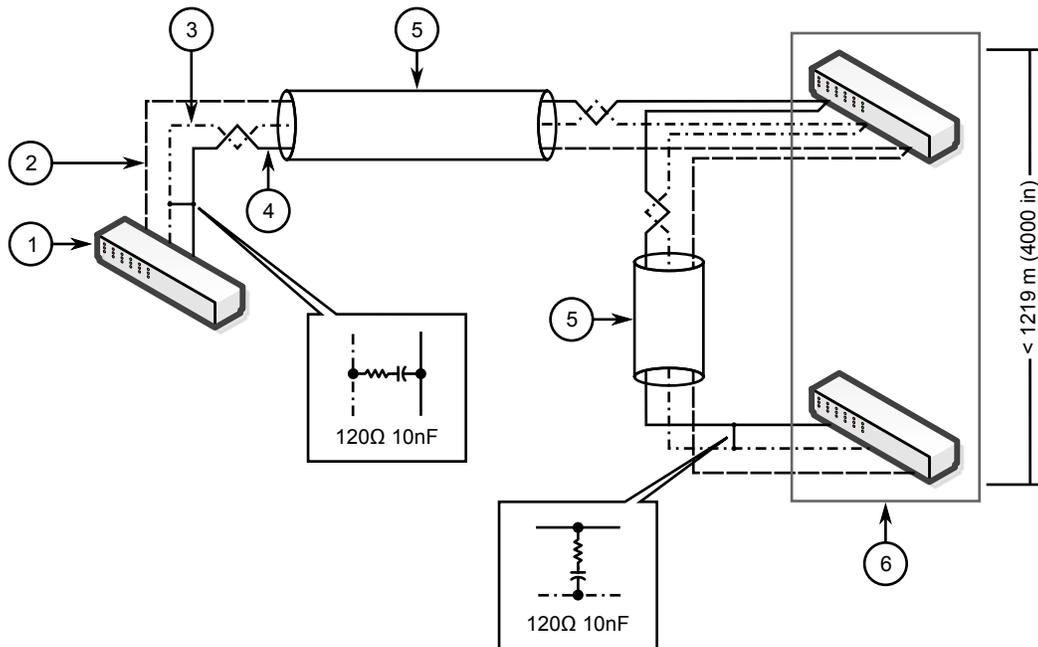


Figure 10: Recommended RS485 Wiring

1. RMC30 Device 2. Common (Isolated Ground) 3. Negative 4. Positive 5. Shield to Earth (Connected At a Single Point) 6. RS485 Devices (32 Total)

4 Technical Specifications

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

- [Section 4.1, “Power Supply Specifications”](#)
- [Section 4.2, “Copper Ethernet Port Specifications”](#)
- [Section 4.3, “Supported Networking Standards”](#)
- [Section 4.4, “Operating Environment”](#)
- [Section 4.5, “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

Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the RMC30.

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

Supported Networking Standards

Parameter	10Base-FL	100Base-FX	Notes
IEEE 802.3	Yes		10Base-T
IEEE 802.3x	Yes	Yes	Full Duplex, Flow Control

Section 4.4

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 4.5

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.

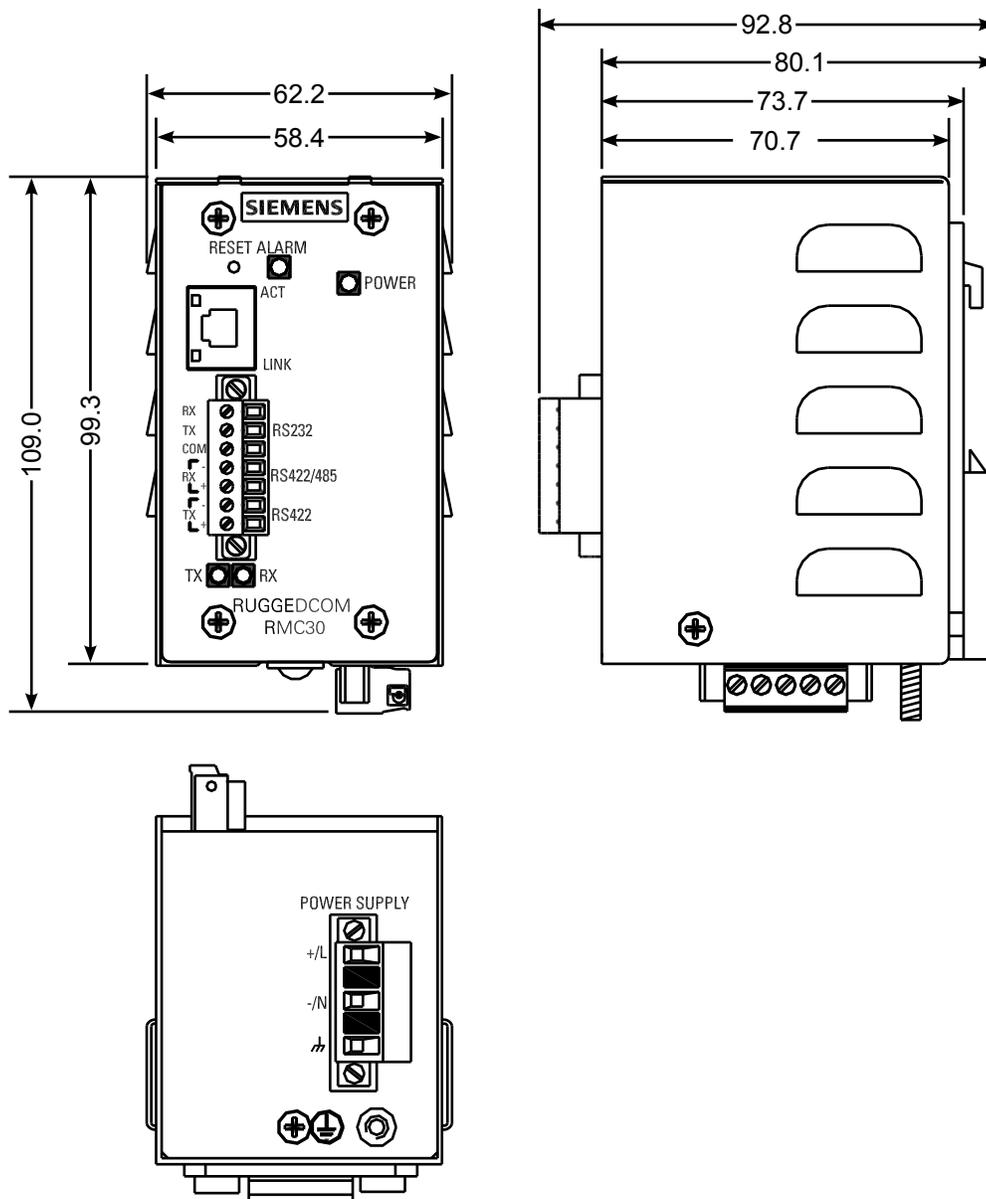


Figure 11: Overall Dimensions

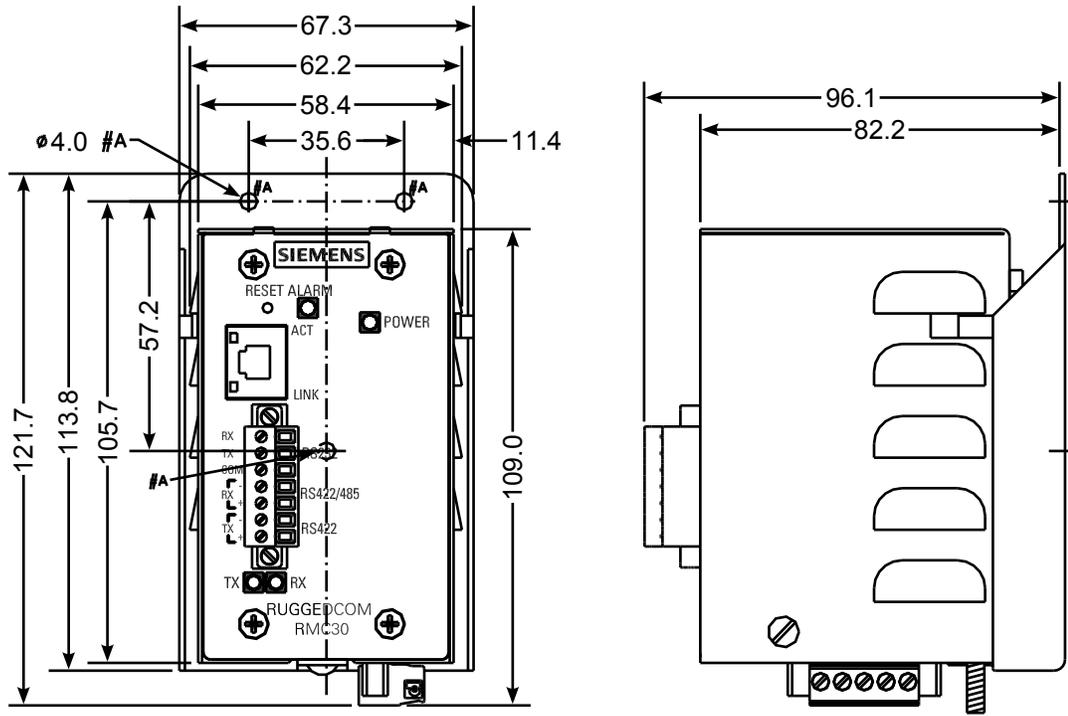


Figure 12: Panel Mount Dimensions

6 Certification

The RMC30 device has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

- [Section 6.1, “Agency Approvals”](#)
- [Section 6.2, “FCC Compliance”](#)
- [Section 6.3, “Industry Canada Compliance”](#)
- [Section 6.4, “EMI and Environmental Type Tests”](#)

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 RMC30 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	
IEC 61000-4-11		AC Power ports	30% for 1 period, 60% 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 RMC30 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	+/- 8 kV
			Enclosure Air	+/- 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
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