

SIEMENS

RUGGEDCOM RMC41

Installation Guide

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Preface

This guide describes the RUGGEDCOM RMC41. 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.

Accessing Documentation

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

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

Training

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

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

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

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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 RMC41 is a 2-port, unmanaged Ethernet switch that provides both copper-to-fiber media conversion as well as 10 Mbps to 100 Mbps speed conversion. Specifically designed to operate reliably in electrically and climatically harsh environments, it is well suited for use in mission critical Ethernet networking applications.

The RMC41 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 RMC41 is compliant with EMI and environmental standards for utility substations, industrial manufacturing, process and control and intelligent transportation systems applications.

The versatility and wide selection of fiber optics allows the RMC41 to be used in a variety of applications. It can be used in place of traditional copper-to-fiber media converters with the added ability to convert speed from 10Mbps to 100Mbps.

The following sections provide more information about the RMC41:

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

Section 1.1

Feature Highlights

4-Ethernet Ports with Optional Dual Fiber Optics

- 1 10/100Base-TX ports + 1 100Base-FX port (SC/ST)
- Multi-mode and single-mode optical transceivers
- Industry standard fiber optical connectors: SC, ST
- Long haul optics allow distances from 20 to 90 km (12 to 56 mi)

Designed for Harsh Environments

- Exceeds IEC 61850-3 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

- Automatic learning of up to 2048 MAC addresses
- Auto-negotiation on 10/100Base-TX ports simplifies setup
- Auto-MDI/MDIX on all 10/100Base-TX ports eliminates need for crossover cables
- LED indicators for link, activity, and speeds LED aids in field trouble-shooting

High Performance Ethernet Switching

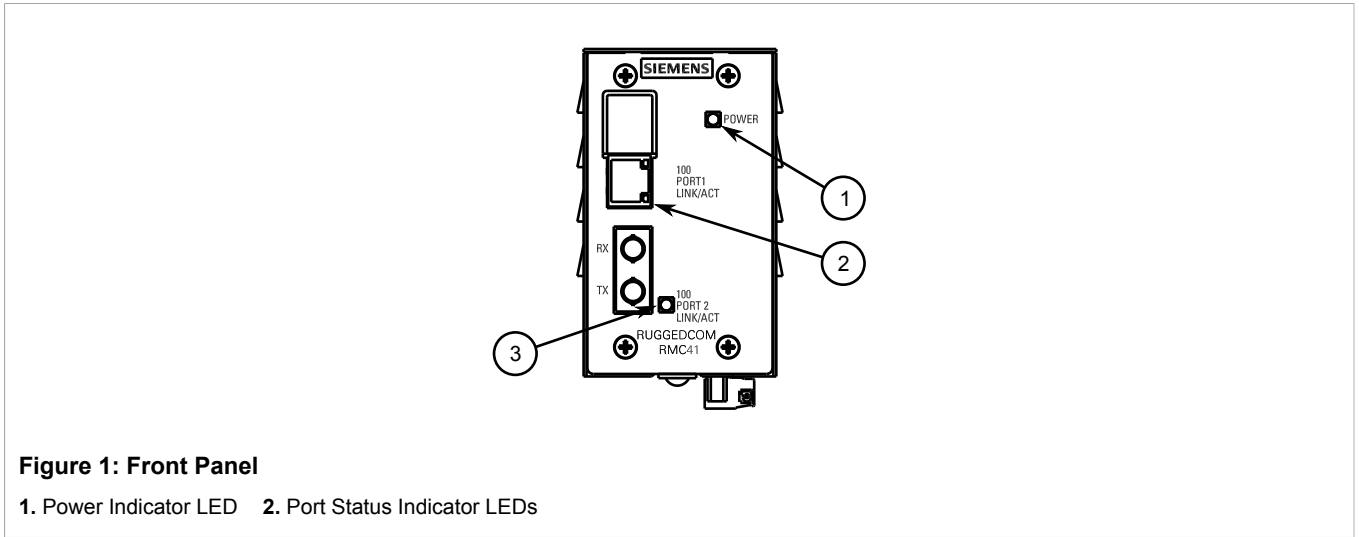
- Full compliance with IEEE 802.3 and IEEE 802.3u Ethernet standards for universal interoperability

- Non-blocking, store and forward switching with only 10 us latency means high network throughput
- Full duplex operation results in no collisions and deterministic network response and flow control via IEEE 802.3x pause frames results in no collisions or dropped packet

Section 1.2

Ports, Controls and Indicator LEDs

The RMC41 features various ports, controls and indicator LEDs on the front panel for configuring and troubleshooting the device.



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 RMC41 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”](#)

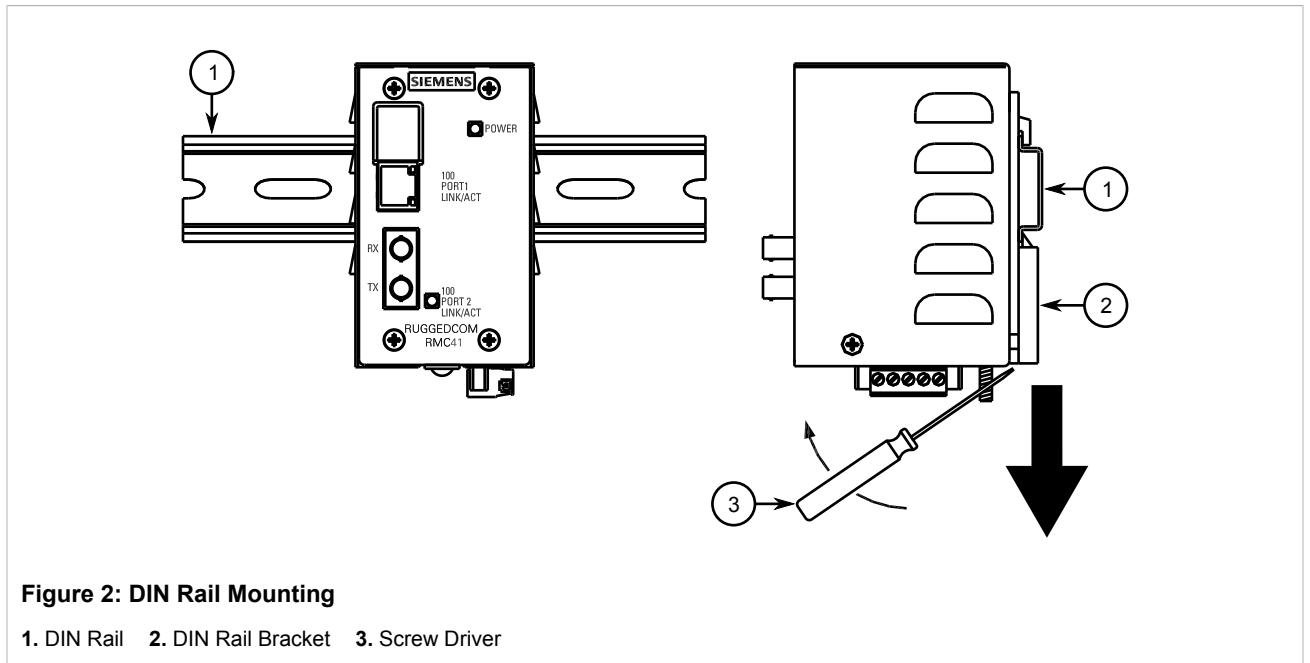
Section 2.1.1

Mounting the Device on a DIN Rail

For DIN rail installations, the RMC41 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.



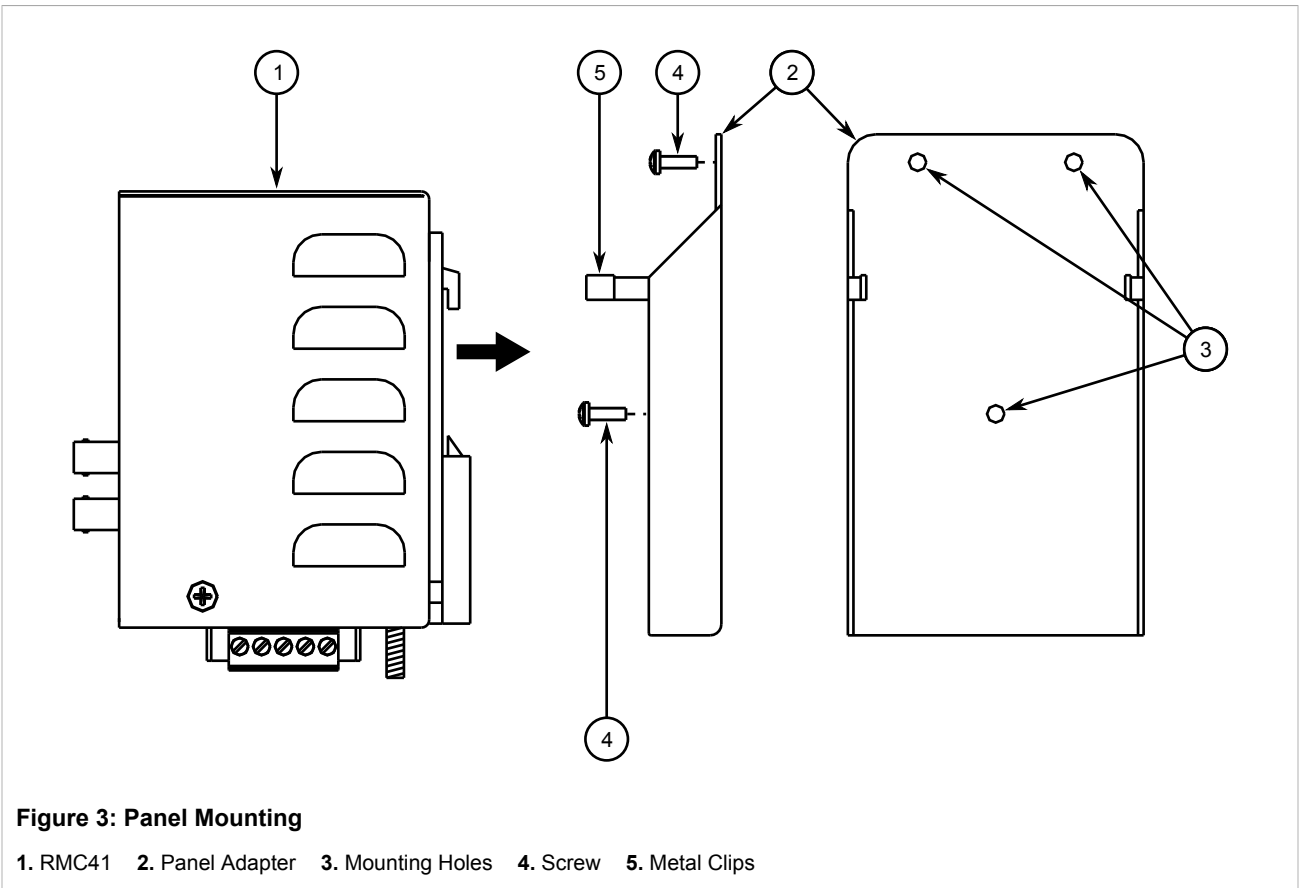
2. Pull the release on the bracket down and slide the device onto the DIN rail. If necessary, use a screw driver to unlock the release. Let go of the release to lock the device in position.

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 RMC41 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.

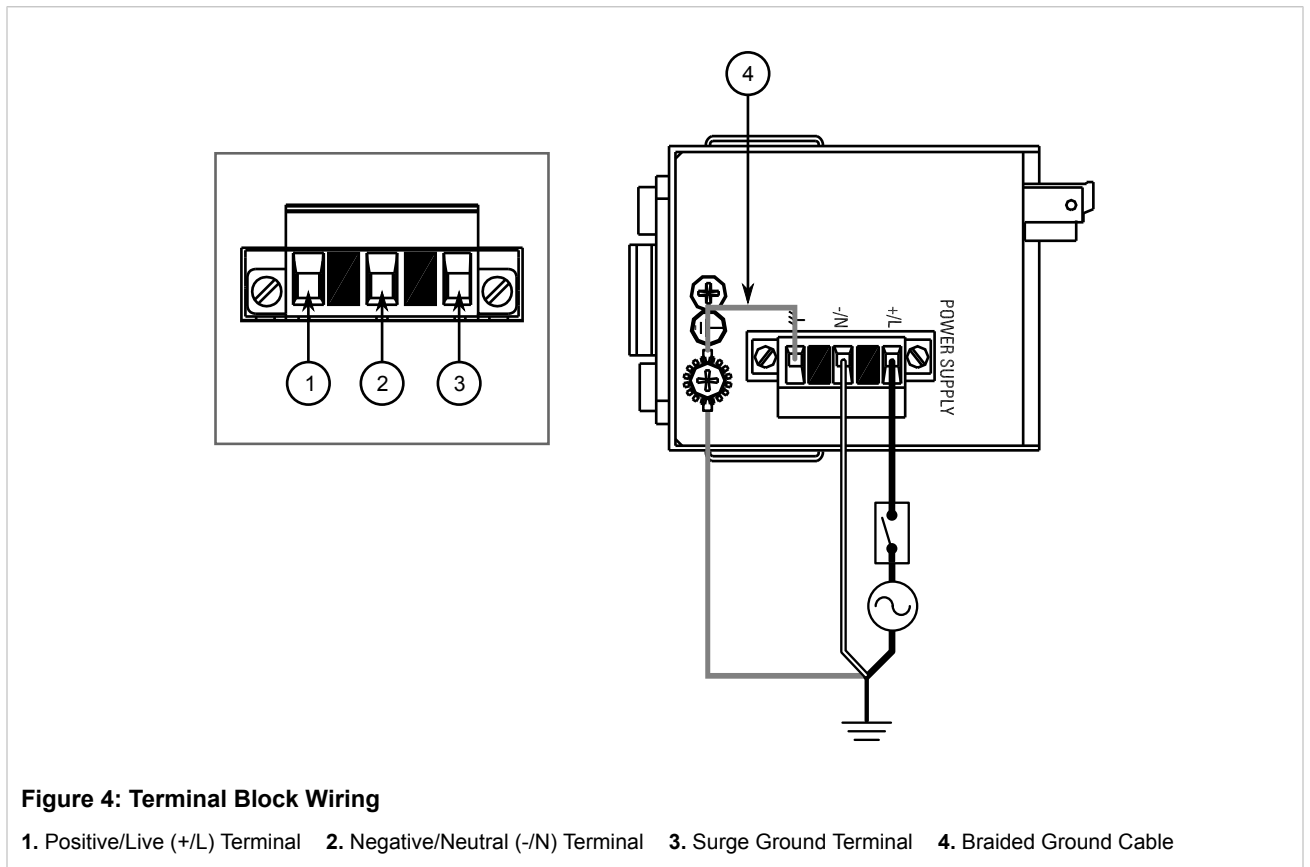


Figure 4: Terminal Block Wiring

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

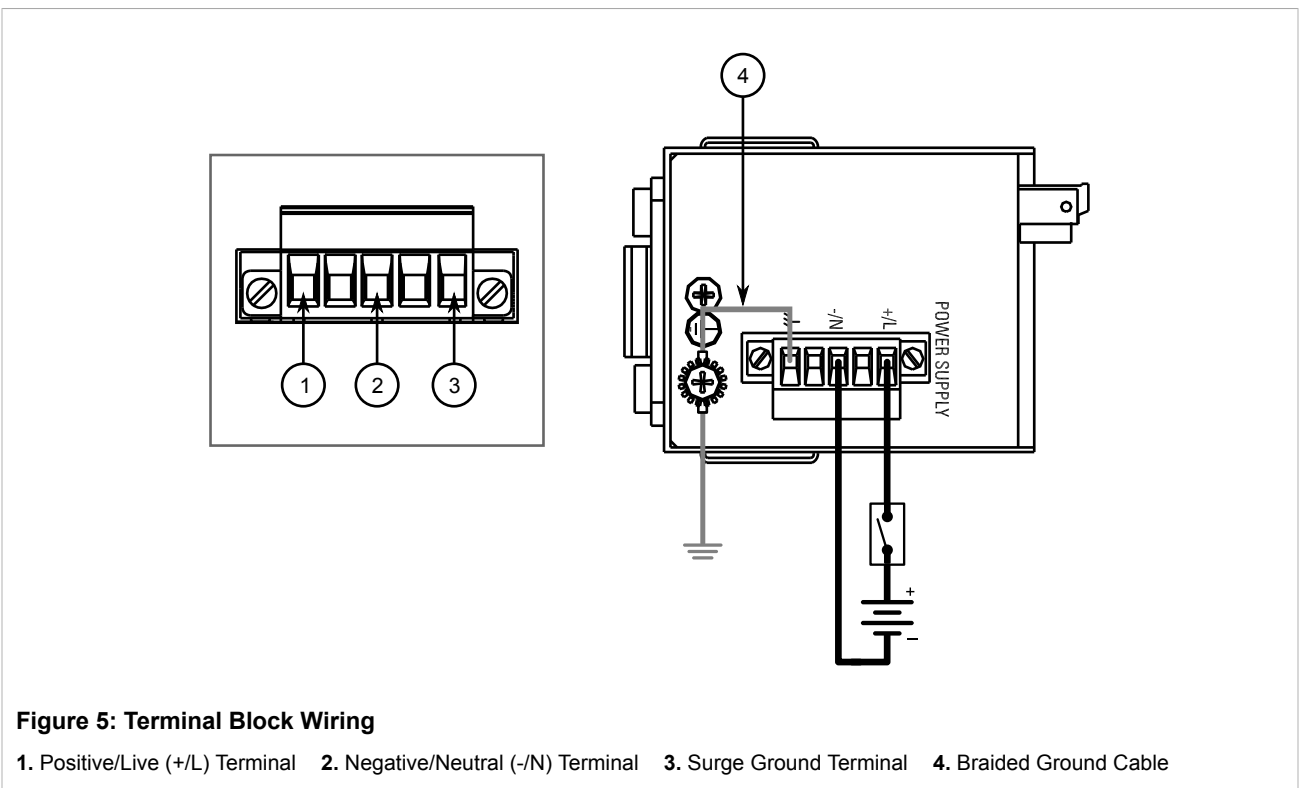
To connect a high or low DC power supply to the device, do the following:



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 RMC41 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 RMC41.

Each communication port type has a specific place in the RMC41 chassis.

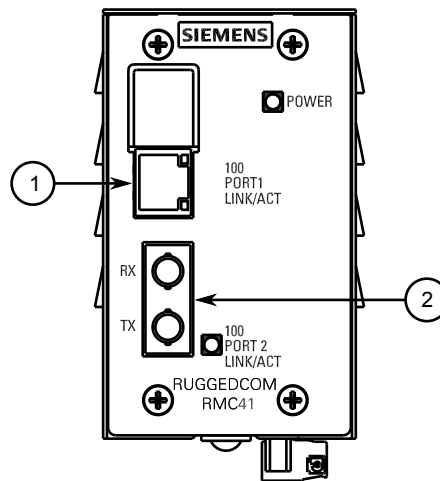


Figure 6: Port Assignment

1. Port 1 2. Port 2

Port	Type
1	Fast Ethernet Port (10/100Base-TX)
2	Fast Ethernet Port (100Base-FX)

The following sections describe the available ports:

- [Section 3.1, “Copper Ethernet Ports”](#)
- [Section 3.2, “Fiber Optic Ethernet Ports”](#)

Section 3.1

Copper Ethernet Ports

The RMC41 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:

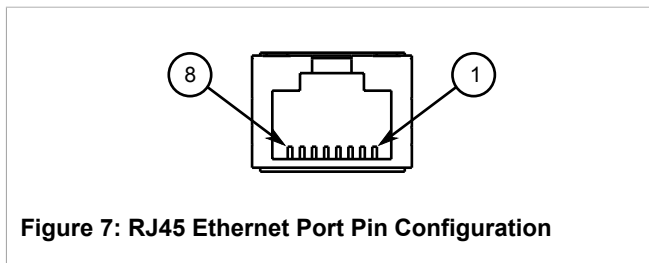


Figure 7: RJ45 Ethernet Port Pin Configuration

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)

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), SC (Standard or Subscriber Connector) or ST (Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

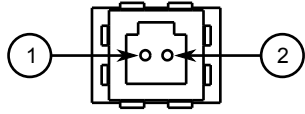


Figure 8: MTRJ Port

1. Tx Connector 2. Rx Connector

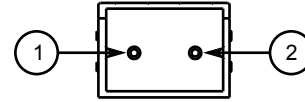


Figure 9: LC Port

1. Tx Connector 2. Rx Connector

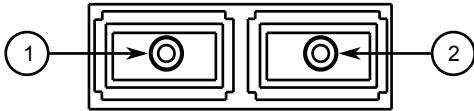


Figure 10: SC Port

1. Tx Connector 2. Rx Connector

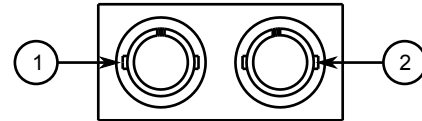


Figure 11: ST Port

1. Tx Connector 2. Rx Connector

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

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, “Fiber Optic Ethernet Port Specifications”](#)
- [Section 4.4, “Supported Networking Standards”](#)
- [Section 4.5, “Operating Environment”](#)
- [Section 4.6, “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 RMC41.

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 RMC41.



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) ^h	Tx (dBm)	Rx Sensitivity (dBm)	Distance (km) ^h	Power Budget (dB)
MM	SC	62.5/125	1310	-15.7	-33.5	2	17
		50					
MM	MTRJ	62.5/125	1310	-15.7	-33.5	2	17
		50					
MM	ST	62.5/125	1310	-15.7	-33.5	2	17
		50					
MM	LC	62.5/125	1310	-15.7	-33.5	2	17
		50					
SM	SC	9/125	1310	-15.5	-32	20	16.5
		8					
SM	SC	9/125	1310	-2.5	-37	50	34.5
		8					
SM	SC	9/125	1310	2.5	-39	90	41.5
		8					
SM	SC	9/125	1310	-15.5	-32	20	16.5
		8					
SM	SC	9/125	1310	-2.5	-37	50	34.5
		8					
SM	SC	9/125	1310	2.5	-39	90	41.5
		8					
MM	ST	62.5/125	1310	-15.7	-33.5	20	17
		50					

^h Typical.

Section 4.4

Supported Networking Standards

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

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

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.

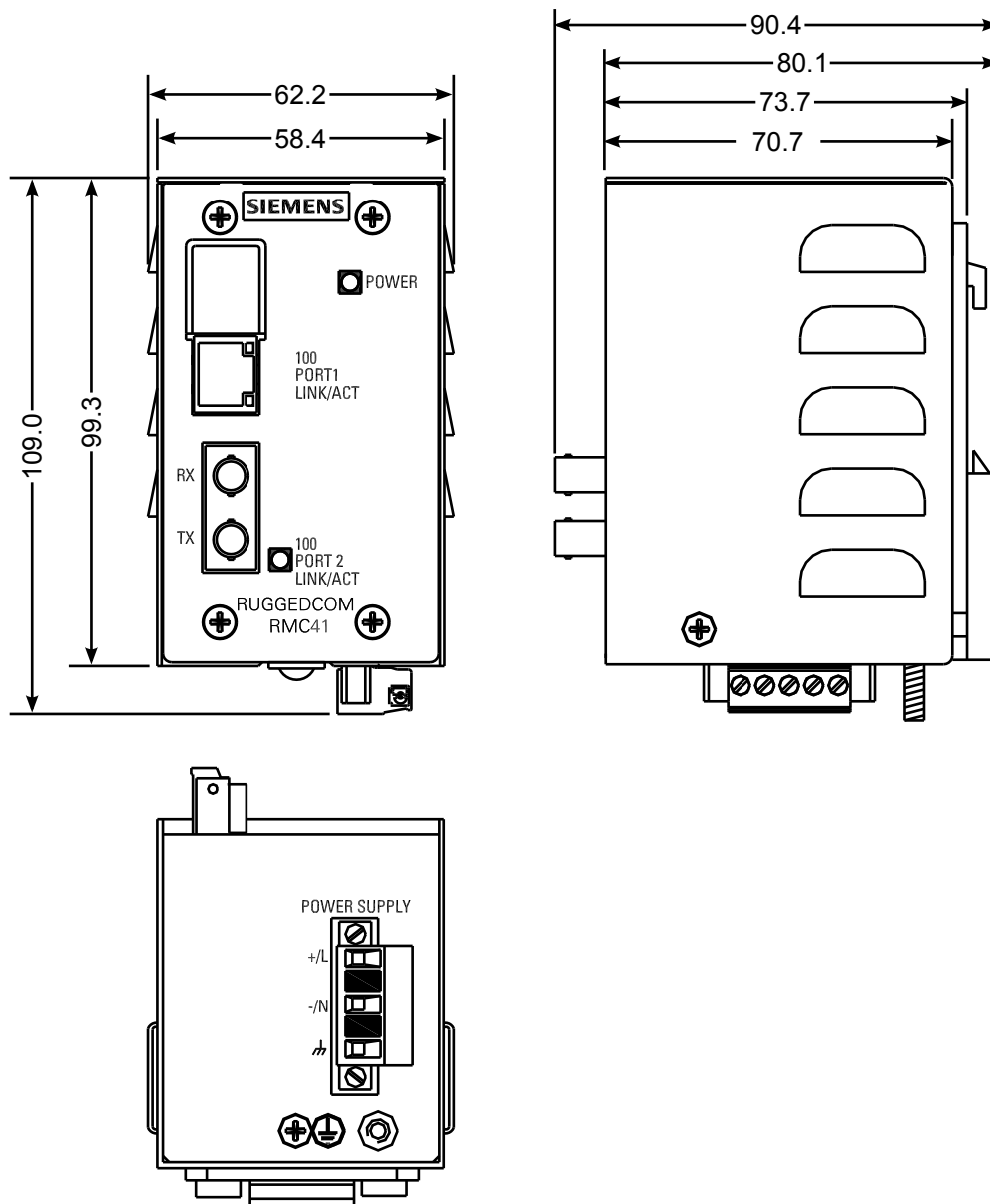


Figure 12: Overall Dimensions

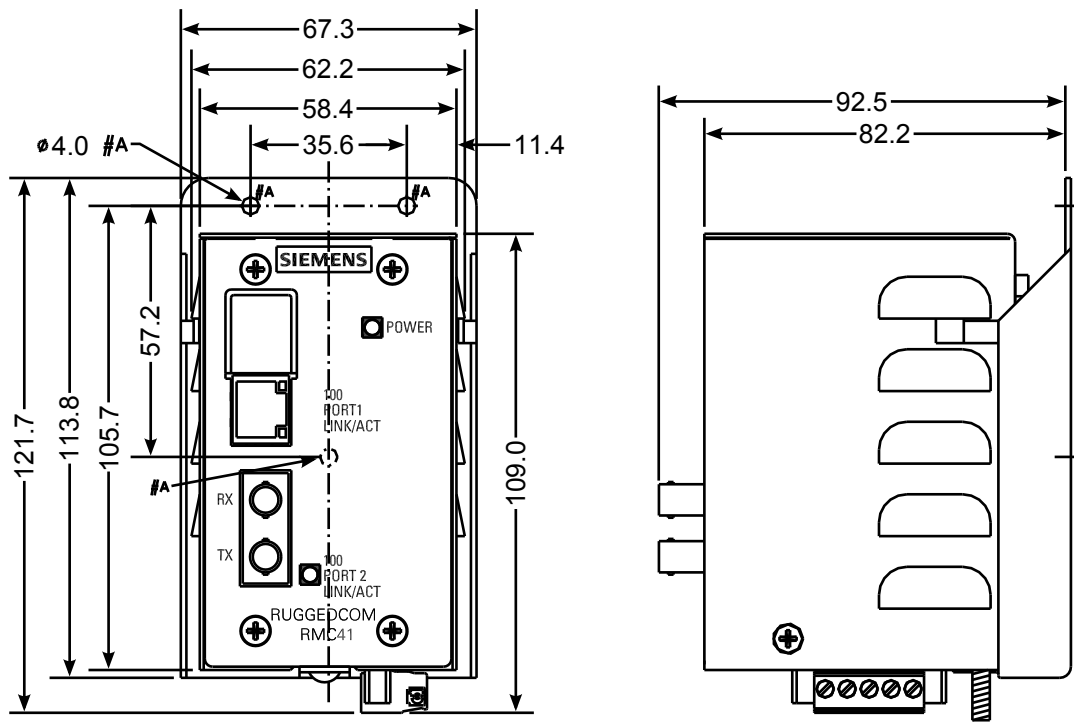


Figure 13: Panel Mount Dimensions

6 Certification

The RMC41 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 RMC41 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 RMC41 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
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