

RUGGEDCOM[®]
INDUSTRIAL STRENGTH NETWORKS[™]

RuggedMC[™] RMC30

Installation Guide



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Federal Communications Commission Radio Frequency Interference Statement

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.

Warning: Changes or modifications not expressly approved by RuggedCom Inc. could void the user's authority to operate the equipment.

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

Should this device require service see the “Warranty and Service” section of this installation guide.

Important:

The RuggedMC™ should be installed in a **restricted access location** where access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

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1 Product Overview

INTRODUCTION

The RuggedServer™ RMC30 is an industrially hardened, 2-port serial device server that has been specifically designed to operate in electrically harsh and climatically demanding environments. The RMC30 allows you to communicate 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.

CONNECTIVITY

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

SERIAL ENCAPSULATION

- 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

UNIVERSAL POWER SUPPLY OPTIONS

- Input voltages of 24VDC, 48VDC, and (88-300VDC or 85-264VAC) for worldwide operability
- Integrated power supply eliminates need for an awkward external power transformer
- Screw down terminal blocks ensure reliable maintenance free connections
- CSA/UL 60950 safety approved to +85°C

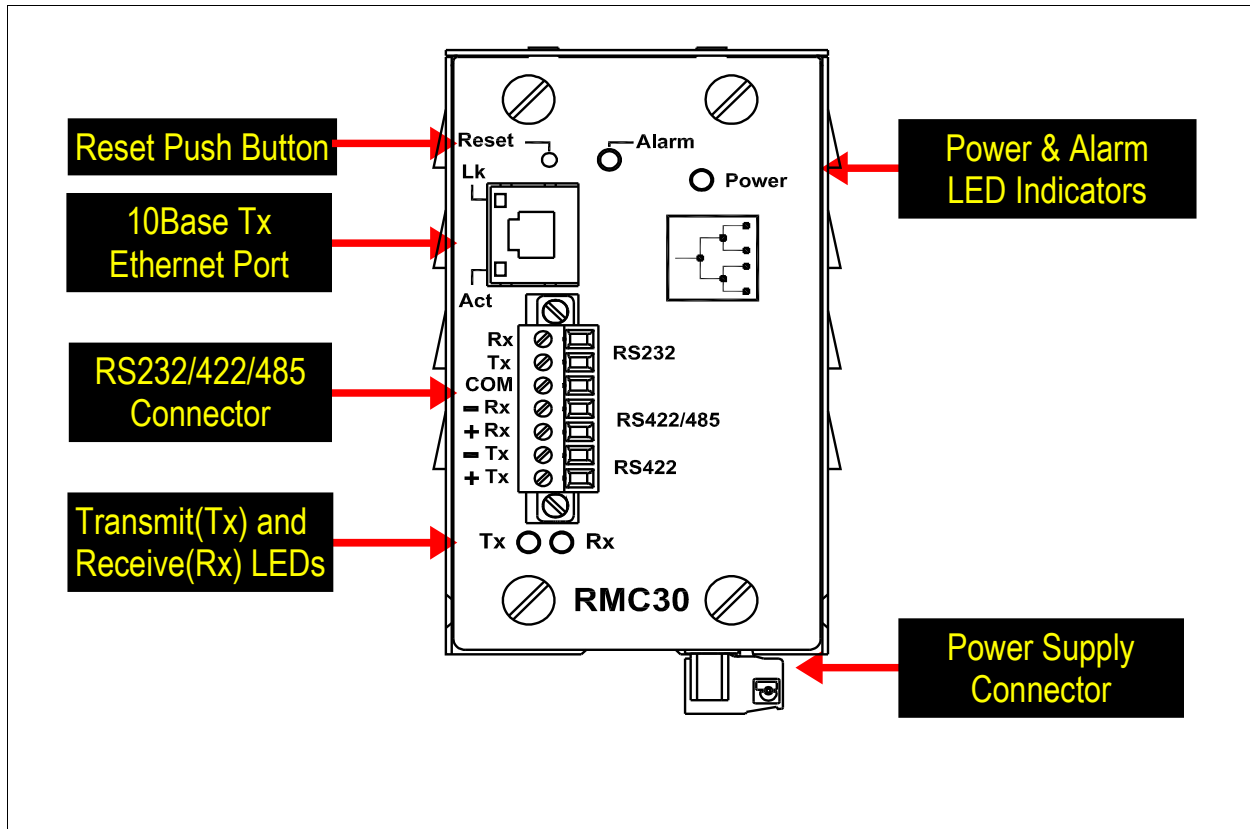
DESIGNED FOR HARSH ENVIRONMENTS

- Exceeds IEC 61850-3 requirements for electric power substations
- Exceeds IEC 61000-6-2 for industrial environments
- Exceeds NEMA TS 2 requirements for traffic control equipment
- Meets IEEE 1613 requirements for electric power substations
- Fully Independent, 3kV (RMS) Isolated, EIA/TIA RS485 ports
- Operates over a temperature range of -40°C to +85°C without the use of fans for improved reliability
- 18 AWG galvanized steel enclosure and DIN or panel mounting options provide secure mechanical reliability

MANAGEMENT AND DIAGNOSTICS

- Web-based, Telnet, CLI management interfaces
- SNMP v2 with traps
- 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

1.1 RMC30 Front Panel Description



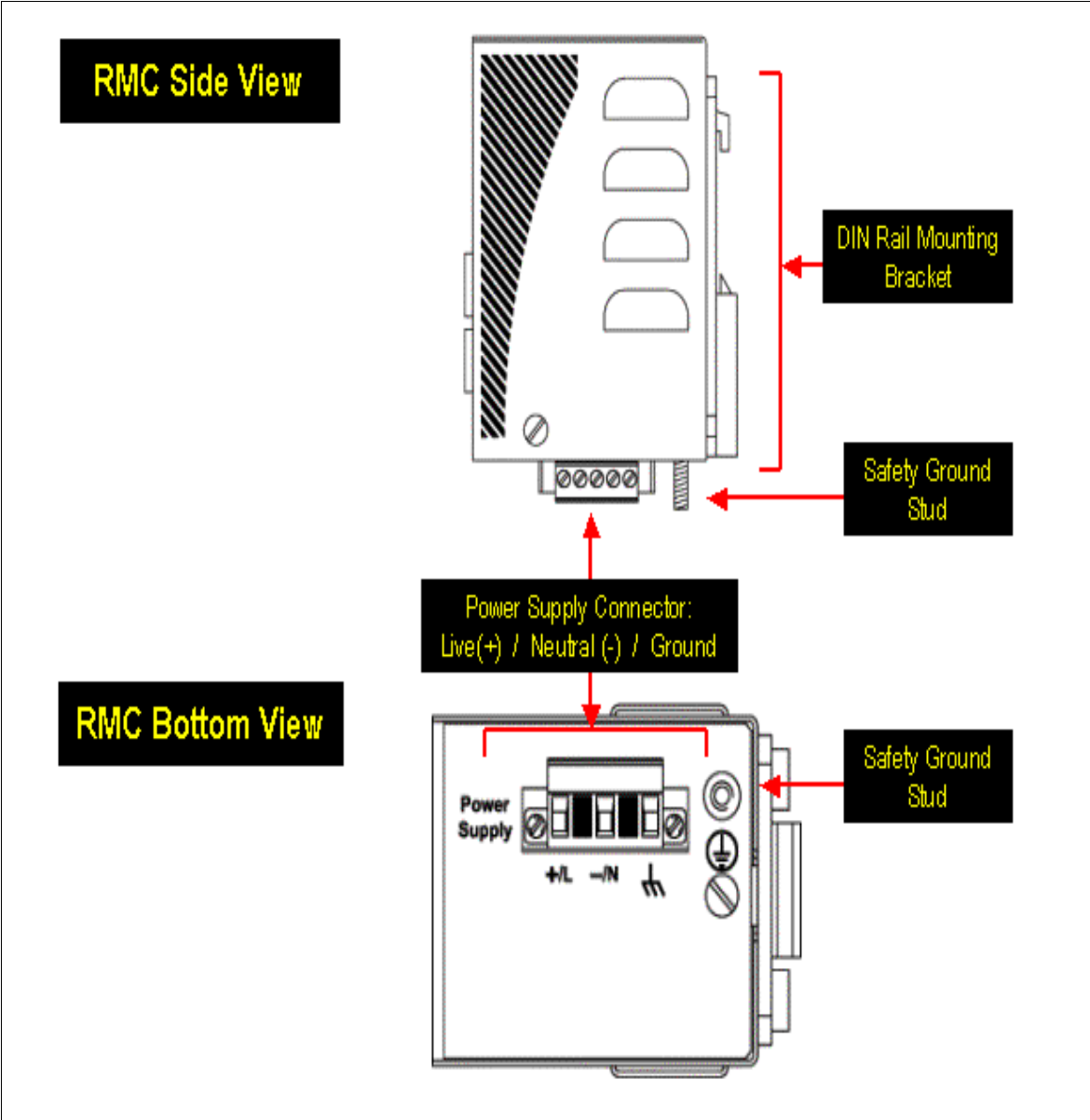
Drawing 1 - RMC30 Front Panel Description

The RMC30 LED definitions are as follows:

LED	Activity	Description
Power	Solid (Green)	Power On
Alarm	Solid (Red)	Alarm condition present. For example, Ethernet link failed, self-test error, etc. See RMC30 User's Guide for complete details.
Link	Solid (Yellow)	Ethernet link established.
Act	Blinking (Yellow)	Transmitting/receiving Ethernet data.
Tx	Blinking (Yellow)	Transmitting serial data*
Rx	Blinking (Yellow)	Receiving serial data*

* The Tx/Rx LEDs blink for either RS232 and RS422/485 data.

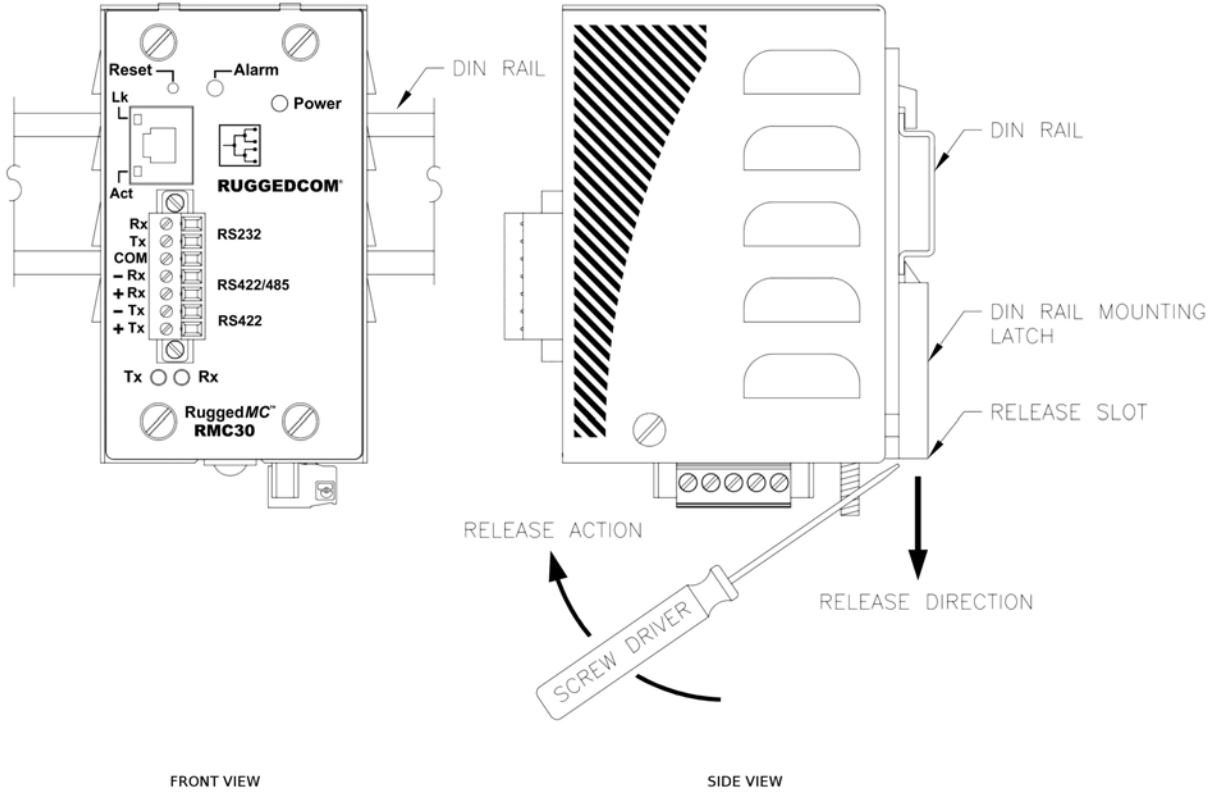
1.2 RMC30 Side and Bottom View



Drawing 2- RMC30 Side and Bottom View

2 Installation

2.1 DIN Rail Mounting

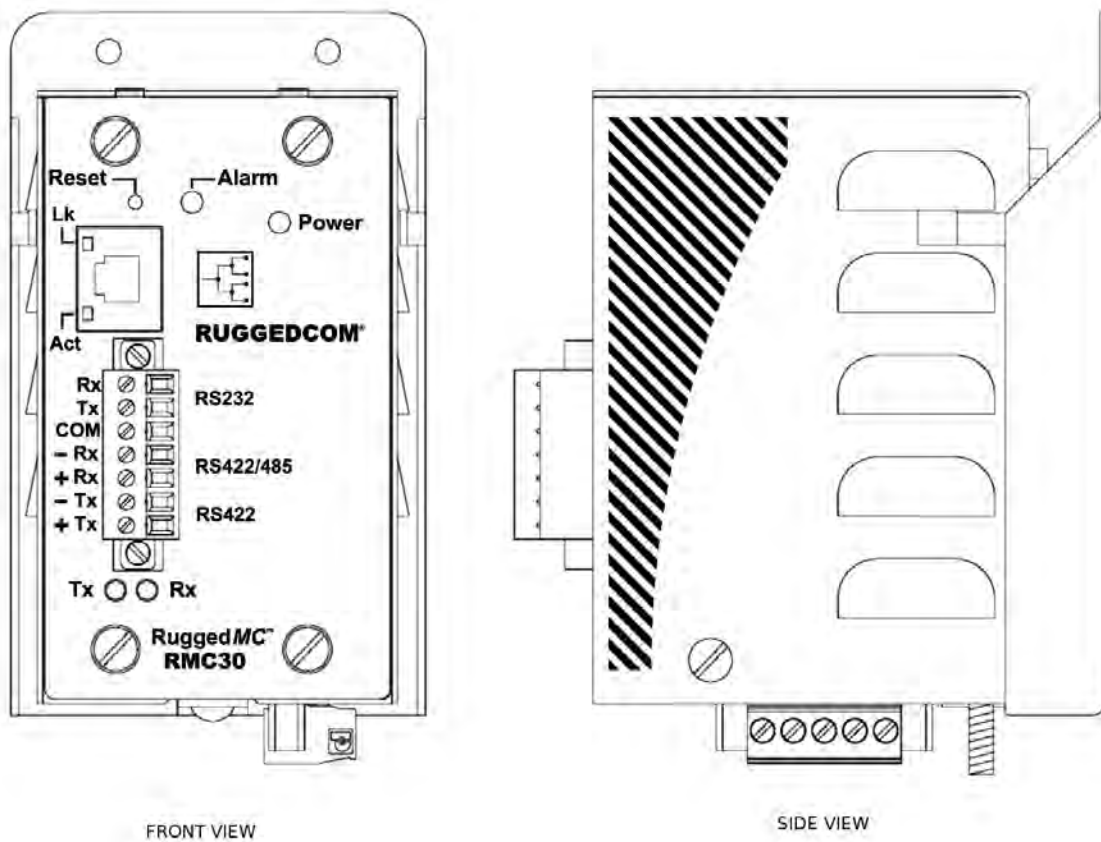


Drawing 3 - RMC30 DIN Rail Mounting

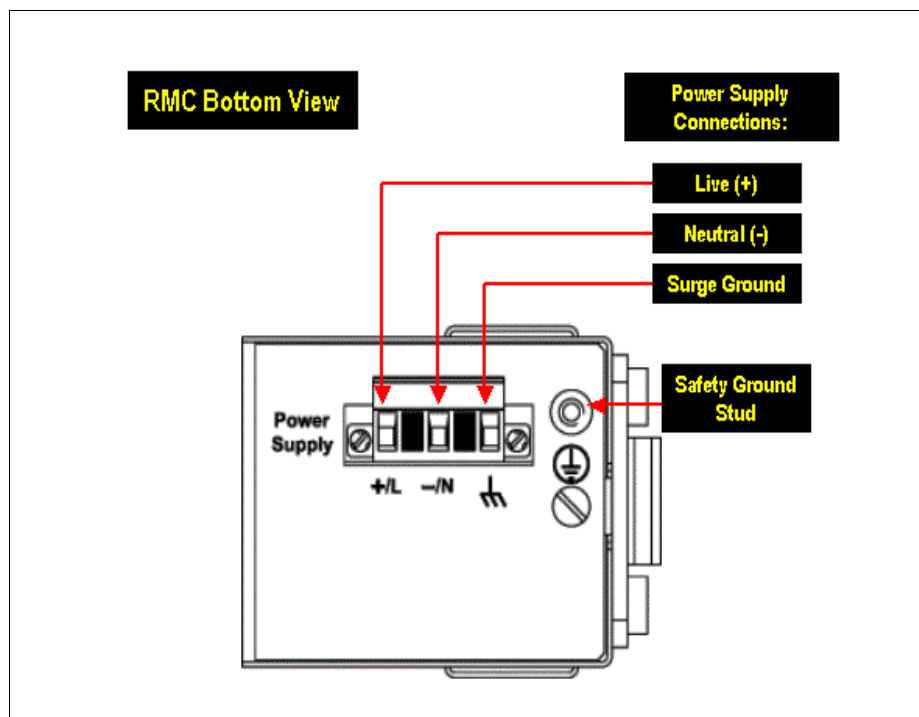
2.2 Panel Mounting

With the use of an optional panel-mount adapter, the RuggedMC™ series of media converters can be panel mounted. Drawing 4 shows an example of an RMC unit panel mounted using the optional panel mount adapter.

The panel mount adapter can be secured to a panel with three screws. The RuggedMC™ product is easily mounted onto the panel mount adapter via the two metal clips on either side of the unit, and a single screw located on the bottom.



2.3 Power Supply Wiring and Grounding



Drawing 5 - RuggedMCTM Power Supply Inputs

The RuggedMC™ power supply inputs are identical and are connected as follows:

1. **+/L** = DC (+) / AC (Hot) is connected to the positive (+) terminal if the power source is DC or to the (Hot) terminal if the power source is AC.
2. **-/N** = DC (-) / AC (Neutral) is connected to the negative (-) terminal if the power source is DC or to the (Neutral) terminal if the power source is AC.
3. **Surge Ground** is connected to the Safety Ground via a braided cable or other appropriate grounding wire. Surge Ground is used as the ground conductor for all surge and transient suppression circuitry internal to the RuggedMC™.
4. **Safety Ground** should be connected to the power supply ground. This should be the *safety ground* for AC inputs or the *equipment ground bus* for DC inputs.

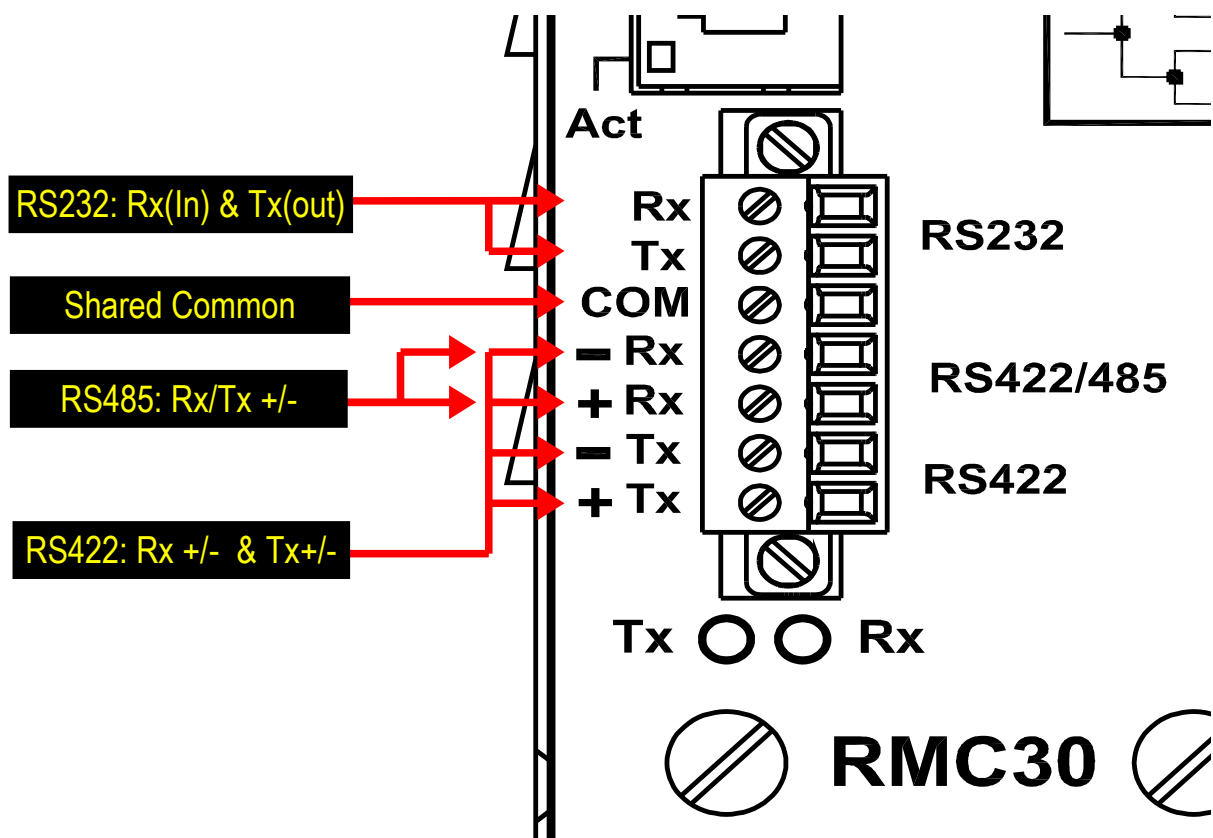
Note: Surge Ground must be disconnected from Chassis Ground during HIPOT (Dielectric strength) testing.

Notes:

1. **For 125/250VDC rated equipment: An appropriately rated 300VDC circuit breaker must be installed within 3 meters of unit.**
2. **For 110/230VAC rated equipment: An appropriately rated 250VAC circuit breaker must be installed within 3 meters of the unit**
3. **A circuit breaker is not required for 48 or 24VDC rated equipment.**
4. **For multiple supplies, separate circuit breakers must be installed. Equipment must be installed according to the applicable country wiring codes.**

2.4 Serial Ports – Signal Description

The RMC30 is equipped with a seven-terminal phoenix style connector. This connector can accommodate one RS232 connection, and one RS485/422 connection. Drawing 6 shows the connections for RS232, RS485, and RS422 communications. The following sections describe installation details for respective ports.



Drawing 6- Serial RS232, RS485, and RS422 terminal block connections

2.4.1 RS232 Data Port

The RMC30 is equipped with a single EIA/TIA RS232 compliant port, consisting of three terminals: **Transmit**, **Receive**, and **Common**. 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:

1. To minimize the effects of ambient electrical noise, shielded cabling is recommended.
2. Reliable communications within 15m. Greater distances are possible.
3. Communications of up to 120kbaud signal rate.

The RMC30's RS232 port does not use an industry standard DB9 connector but rather a 'Phoenix' style compression connector. See Table 1 and Drawing 3 for pinouts.

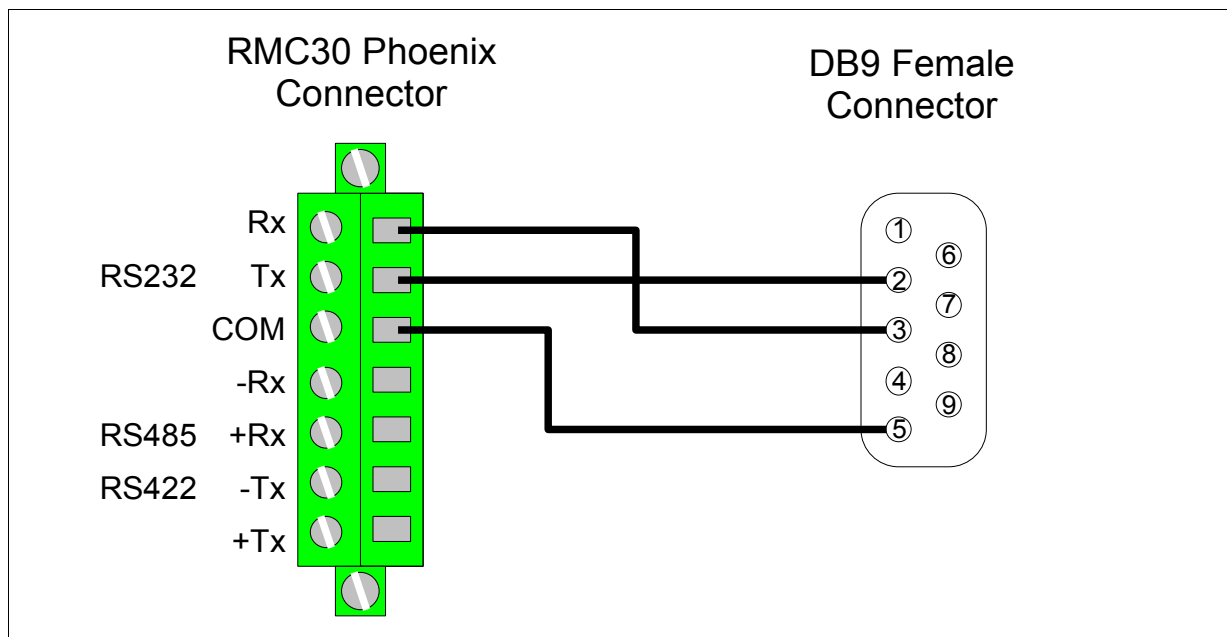
The RS232 data port has two modes of operations; only one mode is active at any given time:

1. Communications with IEDs (intelligent electronic devices such as PLC, RTU, etc.)
2. Console configuration of the RMC30.

To activate console configuration mode the user must press the <CTRL>Z key for approximately 10 seconds during power up. To deactivate console mode requires resting the RMC30.

Table 1 - RS232 DB9 Pinouts

RMC30 Connector	DB9 Connector Pin:Signal
RS232:Tx	2:RD (Receive Data)
RS232:Rx	3:TD(Transmit Data)
COM	5:SGND (Signal Ground)



Drawing 7 - RS232 DB9 Cable Wiring

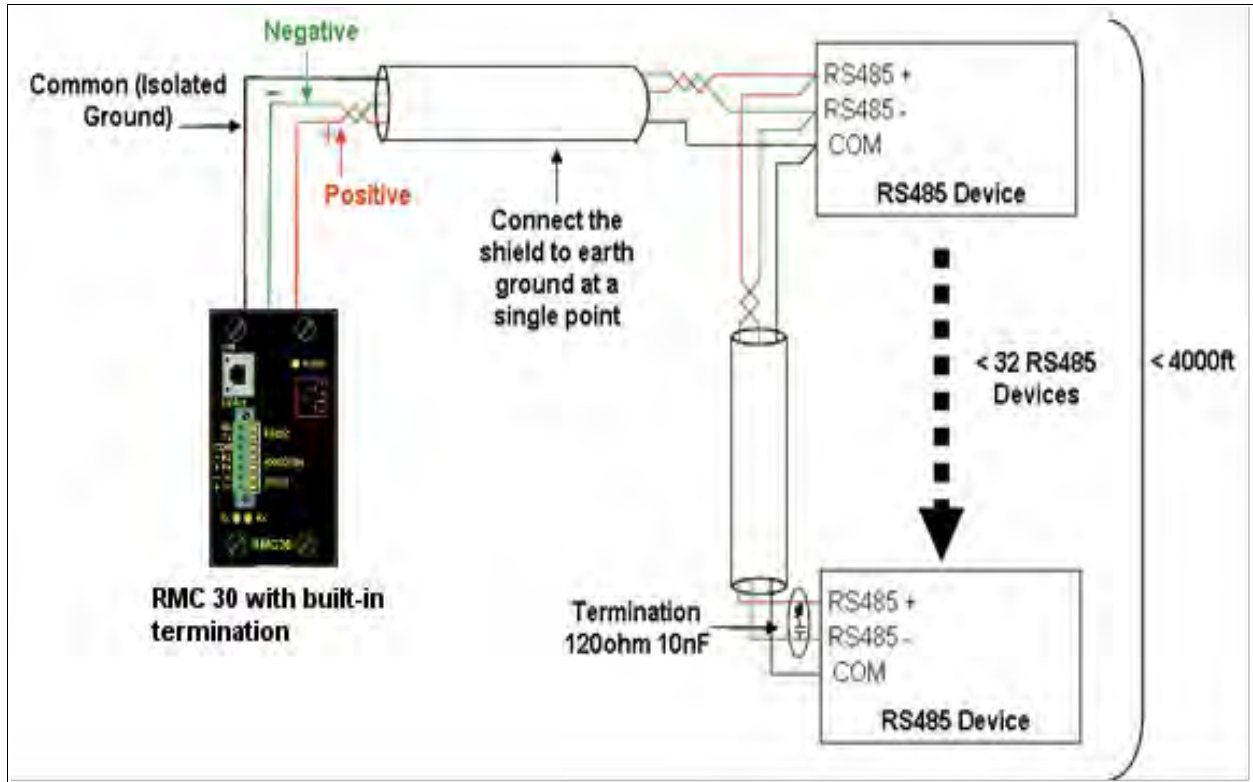
2.4.2 RS422 and RS485 Data Ports

The RMC30 is equipped with a single RS485 / RS422 data port. In half duplex mode (See section 2.5 for RMC30 configuration) 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:

1. To minimize the effects of ambient electrical noise, shielded cabling is recommended
2. The correct polarity must be observed throughout the daisy chain
3. The number of devices wired should not exceed 32, and total distance should be less than 4000 feet (at 100Kbps)
4. The COM terminal should be connected to the common wire inside the shield.
5. The shield/COM should be grounded at ONE single point to avoid loop currents
6. The twisted pair should be terminated at each end of the chain. (Typically with a 120Ohm 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 RMC30 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.



Drawing 8 - Conceptual RS485 wiring diagram

2.5 RMC30 Quick Start Recommendations

The following is an excerpt from the RMC30 User's Guide. It is included to aid those users experienced with communications equipment that may wish to attempt to configure the server without fully reading the guide. We recommend review of the User Guide for a complete understanding of the RMC30 serial device server.

1. Attach a PC running terminal emulation software to the RS232 port and apply power to the chassis (default baud rate, data bits, parity - "57600 8 n", no hardware/software flow control). Set the terminal type to VT100. See section 2.4.1 for making an appropriate RS232 cable.
2. While the RMC30 is powering on press and hold the <CTRL>Z key. The following prompt should appear on the screen:

```
Console mode...  
Type 'yes' if you want to enter MAIN console mode:
```

After entering 'yes' and then pressing any key the main login screen will appear. Using the default password of "admin" will provide access to the User Interface (see Chapter 1).

3. As an alternative to steps 1 and 2, you may use Telnet or HTTP via the default IP address of 192.168.0.1 to configure the RMC30. This may require some minor setup of you PC network interfaces to ensure that the RMC30 can be reached.
4. Configure the server's IP address (**Administration, Configure IP Services, IP Address**) and Subnet Mask (**Administration, Configure IP Services, Subnet**). If instead you wish the server to load the address via DHCP, set the address type to dynamic (**Administration, Configure IP Services, IP Address Type**). See Chapter 1 for more details.
5. You may wish to change the default guest, operator and administration passwords (**Administration, Configure IP Services, Configure Passwords**). See Chapter 1 for more details.
6. The serial ports may be configured to support Serial encapsulation or TcpModbus, placing connections to or accepting connections from a remote host. See Chapter 2 for more details
7. You may wish to configure the security aspects of the server. By default the server allows a number of incoming telnet sessions. TFTP sessions are allowed, and may read (and not write) the servers configuration. The server also allows a number of web management sessions to occur. You can limit the numbers of these sessions or disable them completely (**Administration, IP Services**). If remote SNMP management or traps are desired, configure the appropriate manage station (**Administration, Configure SNMP Management Stations**).
8. Further concerns such as fine-tuning serial port parameters, measuring and optimizing performance are dealt with by reading the guide fully.

3 Technical Specifications

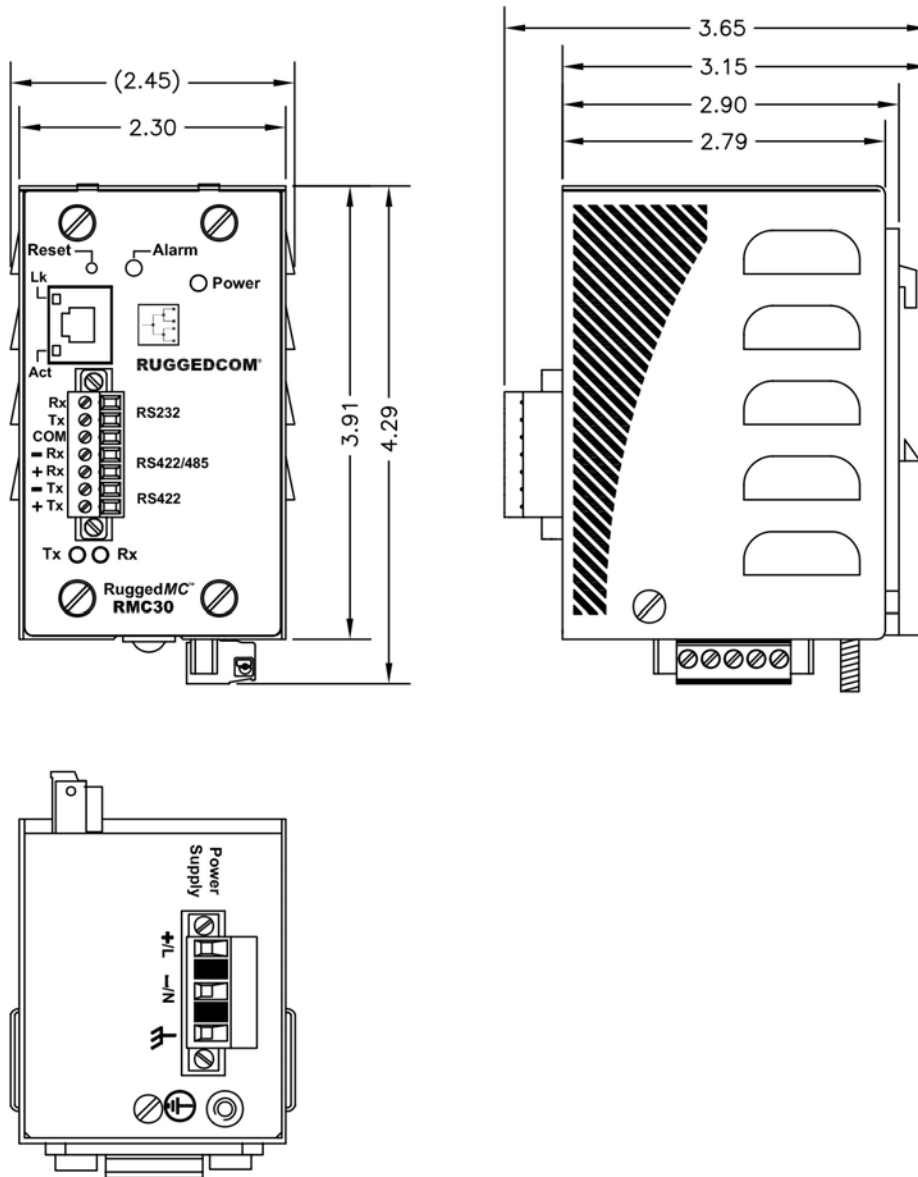
3.1 Power Supply Specifications

Power Supply Type	Minimum Input	Maximum Input	Internal Fuse Rating	Maximum Power Consumption
24 VDC	18 VDC	36 VDC	3.15A(T) ²	3 W
48 VDC	36 VDC	72 VDC	3.15A(T) ²	
HI (88/300 VDC) ¹	88 VDC	300 VDC	3.15A(T) ²	
HI (120/240 VAC) ¹	85 VAC	264 VAC		

Notes: 1 – This is the same power supply for both AC and DC.

2 – (T) Denotes time-delay fuse

3.2 Mechanical Specifications



Drawing 9 - RMC30 Mechanical Dimensions

Parameter	Value	Comments
Dimensions	4.30 x 2.40 x 3.30 inches (110) x (61) x (84) mm	(Length x Width x Height)
Weight	1.5 lb (0,68 Kg)	
Enclosure	18 gauge Galvanized Steel	

3.3 Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85°C	Ambient Temperature as measured from a 30cm radius surrounding the center of the RuggedMC™ enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85°C	

4 Type Test Specifications

4.1 IEC 61850-3 Type Tests

IEC 61850-3 EMI TYPE TESTS				
Test	Description		Test Levels	Severity Levels
IEC 61000-4-2	ESD	Enclosure Contact	+/- 8kV	4
		Enclosure Air	+/- 15kV	4
IEC 61000-4-3	Radiated RFI	Enclosure ports	20 V/m	x
IEC 61000-4-4	Burst (Fast Transient)	Signal ports	+/- 4kV @ 2.5kHz	x
		D.C. Power ports	+/- 4kV	4
		A.C. Power ports	+/- 4kV	4
		Earth ground ports ¹	+/- 4kV	4
IEC 61000-4-5	Surge	Signal ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
		D.C. Power ports	+/- 2kV line-to-earth, +/- 1kV line-to-line	3
		A.C. Power ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10V	3
		D.C Power ports	10V	3
		A.C. Power ports	10V	3
		Earth ground ports ¹	10V	3
IEC 61000-4-8	Magnetic Field	Enclosure ports	40 A/m continuous, 1000 A/m for 1 s	N/A
IEC 61000-4-29	Voltage Dips & Interrupts	D.C. Power ports	30% for 0.1s, 60% for 0.1s, 100% for 0.05s	N/A
		A.C. Power ports	30% for 1 period, 60% for 50 periods	N/A
IEC 61000-4-11			100% for 5 periods, 100% for 50 periods ²	N/A
IEC 61000-4-12	Damped Oscillatory	Signal ports	2.5kV common, 1kV diff. mode@1MHz	3
		D.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	3
		A.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	30V Continuous, 300V for 1s	4

		D.C. Power ports	30V Continuous, 300V for 1s	4
IEC 61000-4-17	Ripple on D.C. Power Supply	D.C. Power ports	10%	3
IEC 60255-5	Dielectric Strength	Signal ports	2kVac (Fail-Safe Relay output)	N/A
		D.C. Power ports	1.5kVdc	N/A
		A.C. Power ports	2kVac	N/A
IEC 60255-5	H.V. Impulse	Signal ports	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	5kV	N/A
		A.C. Power ports	5kV	N/A

4.2 IEEE 1613 Type Tests

IEEE 1613 (C37.90.x) EMI IMMUNITYTYPE TESTS				
Test	Description		Test Levels	Severity Levels
IEEE C37.90.3	ESD	Enclosure Contact	+/- 8kV	N/A
		Enclosure Air	+/- 15kV	N/A
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m	N/A
IEEE C37.90.1	Fast Transient	Signal ports	+/- 4kV @ 2.5kHz	N/A
		D.C. Power ports	+/- 4kV	N/A
		A.C. Power ports	+/- 4kV	N/A
		Earth ground ports ³	+/- 4kV	N/A
IEEE C37.90.1	Oscillatory	Signal ports	2.5kV common mode @1MHz	N/A
		D.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	N/A
		A.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	N/A
IEEE C37.90	H.V. Impulse	Signal ports	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	5kV	N/A
		A.C. Power ports	5kV	N/A
IEEE C37.90	Dielectric Strength	Signal ports	2kVac	N/A
		D.C. Power ports	1.5kVdc	N/A
		A.C. Power ports	2kVac	N/A

4.3 IEC Environmental Type Tests

ENVIRONMENTAL TYPE TESTS				
Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40°C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85°C, 16 Hours	N/A
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C, 6 cycles	N/A
IEC 60255-21-1	Vibration	Tests Fc	2g @ (10 - 150) Hz	Class 2 ²
IEC 60255-21-2	Shock	Tests Ea	30g @ 11mS	Class 2 ²

Notes: 1 – Only applicable to functional earth connections separated from the safety earth connection.

2 – Class 2 refers to "Measuring relays and protection equipment for which a very high security margin is required or where the vibration levels are very high (e.g. shipboard application and for severe transportation conditions").

5 Agency Approvals

Agency	Standards	Comments
CSA, CE	CSA C22.2 No. 60950, UL 60950, EN 60950 EN 61000-6-2	Approved
FCC	FCC Part 15, Class A	Approved
CISPR	EN55022, Class A	Approved
FDA/CDRH	21 CFR Chapter 1, Subchapter J	Compliant
IEC/EN	EN60825-1:1994 + A11:1996 + A2:2001	Compliant

6 Warranty

RuggedCom warrants this product for a period of five (5) years from date of purchase. For warranty details, visit <http://www.ruggedcom.com/> or contact your customer service representative.

Should this product require warranty or service contact the factory at:

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