SIEMENS

Edition 11/2022

Installation Manual

# SIMATIC NET

## Rugged Ethernet Switches

RUGGEDCOM RS400

https://www.siemens.com/ruggedcom

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# Rugged Ethernet Switches RUGGEDCOM RS400

Installation Manual




11/2022
C79000-G8976-1016-12

# Legal Information

## Warning Notice System

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

**⚠ DANGER**

indicates that death or severe personal injury will result if proper precautions are not taken.

**⚠ WARNING**

indicates that death or severe personal injury may result if proper precautions are not taken.

**⚠ CAUTION**

indicates that minor personal injury can result if proper precautions are not taken.

**⚠ NOTICE**

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

## Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

## Proper Use of Siemens Products

Note the following:

**⚠ WARNING**

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

## Trademarks

All names identified by ® are registered trademarks of Siemens Canada Ltd.. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

## Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Digital Industries
Process Automation
300 Applewood Crescent
Concord, Ontario, L4K 4E5
Canada

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# Table of Contents

# Preface

This guide describes the RUGGEDCOM RS400. 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.

## Related Documents

Other documents that may be of interest include:

| Document Title | Link |
|---|---|
| RUGGEDCOM ROS Configuration Manual | https://support.industry.siemens.com/cs/ww/en/view/109737244 |

## SIMATIC NET Glossary

The SIMATIC NET Glossary describes special terms that may be used in this document.

The glossary is available online via Siemens Industry Online Support (SIOS) at:

https://support.industry.siemens.com/cs/ww/en/view/50305045

## Accessing Documentation

The latest user documentation for RUGGEDCOM RS400 is available online at https://support.industry.siemens.com. To request or inquire about a user document, contact Siemens Customer Support.

## Registered Trademarks

RUGGEDCOM™ and ROS™ are trademarks of Siemens Canada Ltd..

Other designations in this manual might be trademarks whose use by third parties for their own purposes would infringe the rights of the owner.

## Warranty

Siemens warrants this product for a period of five (5) years from the date of purchase, conditional upon the return to factory for maintenance during the warranty term. This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. The warranties set forth in this article are exclusive and are in lieu of all other warranties, performance guarantees and conditions whether written or oral, statutory, express or implied (including all warranties and conditions of merchantability and fitness for a particular purpose, and all warranties and conditions arising from course of dealing or usage or trade). Correction of nonconformities in the manner and for the period of time provided above shall constitute the Seller's sole liability and the Customer's exclusive remedy for defective or nonconforming goods or services whether claims of the Customer are based in contract (including fundamental breach), in tort (including negligence and strict liability) or otherwise.

For warranty details, visit https://www.siemens.com or contact a Siemens customer service 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.

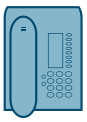
For more information about training services and course availability, visit https://www.siemens.com or contact a Siemens Sales representative.

## Customer Support

Customer support is available 24 hours, 7 days a week for all Siemens customers. For technical support or general information, contact Siemens Customer Support through any of the following methods:

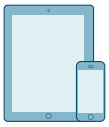
**Online**

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



**Telephone**

Call a local hotline center to submit a Support Request (SR). To locate a local hotline center, visit https://w3.siemens.com/aspa_app/?lang=en.



**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' extensive library of support documentation, including FAQs and manuals
- Submit SRs or check on the status of an existing SR
- Contact a local Siemens representative from Sales, Technical Support, Training, etc.
- Ask questions or share knowledge with fellow Siemens customers and the support community

## Contacting Siemens

| | |
|---|---|
| **Address** | Siemens Canada Ltd.<br>Digital Industries<br>Process Automation<br>300 Applewood Crescent<br>Concord, Ontario<br>Canada, L4K 5C7 |
| **Telephone** | Toll-free: 1 888 264 0006<br>Tel: +1 905 856 5288<br>Fax: +1 905 856 1995 |
| **E-Mail** | info.ruggedcom@siemens.com |
| **Web** | https://www.siemens.com |

# 1 Introduction

The RUGGEDCOM RS400 is an industrially hardened, serial device server with an integrated, fully managed Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environments. Featuring an integrated 4 port serial server, a 4 port managed Ethernet switch, and an optional V.90 modem, the RUGGEDCOM RS400 is able to interconnect multiple types of intelligent electronic devices (IEDs) that have different methods of communications. Using the RUGGEDCOM RS400 results in fewer connectivity devices (which reduces overall system costs) and also extends the useful life of existing legacy IEDs (which minimizes capital expenditure for new equipment).

The RUGGEDCOM RS400 provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found in electric utility substations, factory floors or in curb side traffic control cabinets. The RUGGEDCOM RS400 meets or exceeds a wide range of industry standards including IEC61850, IEEE1613, IEC61000-6- 2, IEC1800-3 and NEMA TS-2. The RUGGEDCOM RS400 also features a wide operating temperature range of -40 to 85 °C (-40 to 185 °F) allowing it to be installed in virtually any location.

The RUGGEDCOM RS400 also includes an industrially rated integrated power supply that can support a wide range of power supply options suitable for multiple industries and for worldwide operability. Options include 24 VDC, 48 VDC, 88-300 VDC and 85-264VAC, allowing for great installation flexibility.

The embedded Rugged Operating System (ROS) within the RUGGEDCOM RS400 provides advanced Layer 2 and Layer 3 networking functions, advanced cyber security features, and a full array of intelligent functionality for high network availability and manageability. Coupled with the ruggedized hardware design, the RUGGEDCOM RS400 is ideal for creating mission-critical, real-time, control applications in any harsh environment.

## 1.1 Feature Highlights

**Serial Device Server**

- Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable) - DB9, RJ45, Phoenix style connectors
- 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
- Supports multiple Modbus masters
- Serial IP port redirection software to support PC applications statistics and built-in *sniffer* for troubleshooting

**Cyber Security Features**

- Multi-level user passwords
- SSH/SSL (128-bit encryption)
- Enable/disable ports, MAC based port security
- Port based network access control (802.1x)
- VLAN (802.1Q) to segregate and secure network traffic
- RADIUS centralized password management
- SNMPv3 authentication and 56-bit encryption

**Ethernet Ports**

- Integrated Ethernet Switch – up to 4 ports
- High performance and throughput Ethernet switching
- Fully IEEE 802.3, IEEE 802.3u, IEEE 802.3x compliance
- Non-blocking, store and forward switching
- 10/100Base-TX, 10Base-FL, 100Base-FX options

**Remote Dial Up Access**

- Integrated V.90 modem and PPP server
- Provides remote access to serial devices and Ethernet LAN

**Rated for Reliability in Harsh Environments**

- Immunity to EMI and heavy electrical surges
- Fully independent 2 kV (RMS) isolated serial ports
- -40 to 85 °C (-40 to 185 °F) operating temperature (no fans)
- 18 AWG galvanized steel enclosure

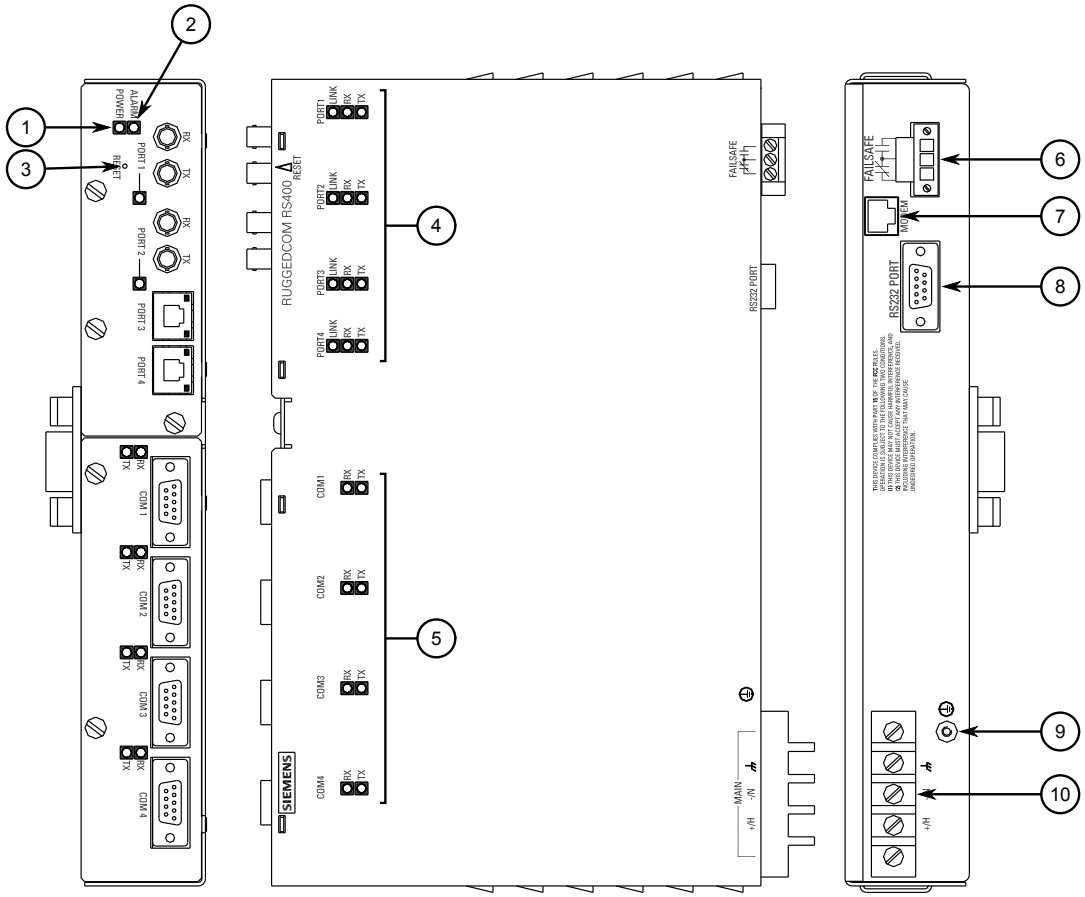
**Universal Power Supply Options**

- Fully integrated power supplies (no external adaptors)
- Popular low voltage ranges: 24 VDC (10-36 VDC), 48 VDC (36-59 VDC)
- Universal high-voltage range: 88-300 VDC or 85-264 VAC

- CSA/UL 60950 safety approved to 85 °C (185 °F)

## 1.2 Description

The RUGGEDCOM RS400 features various ports, controls and indicator LEDs on the front panel for connecting, configuring and troubleshooting the device.




① POWER LED
② ALARM LED
③ RESET Button
④ Ethernet Port Status LEDs
⑤ Serial Port Status LEDs
⑥ Failsafe Alarm Relay
⑦ Modem Port (Optional)
⑧ RS232 Serial Console Port (DB9)
⑨ Surge Ground Terminal
⑩ Power Supply Terminal Block

Figure 1.1 RUGGEDCOM RS400 Modules

| | |
|---|---|
| **POWER LED** | Illuminates when power is being supplied to the device. |
| **ALARM LED** | Illuminates when an alarm condition exists. |

<table>
<tr><td>RESET Button</td><td>Shuts down and restarts the device.</td></tr>
<tr><td>Ethernet Port Status LEDs</td><td>Indicate the status of the associated Ethernet port.
<table>
<tr><th>LED</th><th>State</th><th>Meaning</th></tr>
<tr><td rowspan="3">LINK</td><td>Solid</td><td>Link established</td></tr>
<tr><td>Blinking</td><td>Link activity</td></tr>
<tr><td>Off</td><td>No link detected</td></tr>
<tr><td rowspan="2">Rx</td><td>Blinking</td><td>Link activity (receive)</td></tr>
<tr><td>Off</td><td>No link activity</td></tr>
<tr><td rowspan="2">Tx</td><td>Blinking</td><td>Link activity (transmit)</td></tr>
<tr><td>Off</td><td>No link activity</td></tr>
</table></td></tr>
<tr><td>Ethernet Port Status LEDs</td><td>Indicate the status of the associated serial port.
<table>
<tr><th>LED</th><th>State</th><th>Meaning</th></tr>
<tr><td rowspan="2">RxX</td><td>Blinking</td><td>Link activity (receive)</td></tr>
<tr><td>Off</td><td>No link activity</td></tr>
<tr><td rowspan="2">Tx</td><td>Blinking</td><td>Link activity (transmit)</td></tr>
<tr><td>Off</td><td>No link activity</td></tr>
</table></td></tr>
<tr><td>Communication Ports</td><td>Receive and transmit data, as well as provide access to the RUGGEDCOM RS400 Web interface. For more information about the various ports available for the RUGGEDCOM RS400, refer to "Communication Ports" (Page 19).</td></tr>
<tr><td>RS-232 Console Port</td><td>The serial console port is for interfacing directly with the device and accessing initial management functions. For information about connecting to the device via the serial console port, refer to "Connecting to the Device" (Page 17).</td></tr>
<tr><td>Failsafe Alarm Relay</td><td>Latches to default state when a power disruption or other alarm condition occurs. For more information, refer to:<ul><li>"Connecting the Failsafe Alarm Relay" (Page 12)</li><li>"Failsafe Alarm Relay Specifications" (Page 27)</li></ul></td></tr>
<tr><td>Power Supply Terminal Block</td><td>A pluggable terminal block. For more information, refer to "Connecting Power" (Page 13) and "Power Supply Specifications" (Page 27)</td></tr>
</table>

## 1.3 Required Tools and Materials

The following tools and materials are required to install the RUGGEDCOM RS400:

| Tools/Materials | Purpose |
|---|---|
| AC or DC power cord (16 AWG) | For connecting power to the device. |
| Multi-mode and/or single-mode fiber optic cables | For connecting the device to a LAN. |
| CAT-5 Ethernet cables | For connecting the device to a LAN. |
| Flathead screwdriver | For mounting the device to a DIN rail. |

| Tools/Materials | Purpose |
|---|---|
| Phillips screwdriver | For mounting the device to a panel. |
| 4 x #6-32 screws | For mounting the device to a panel. |

## 1.4 Decommissioning and Disposal

Proper decommissioning and disposal of this device is important to prevent malicious users from obtaining proprietary information and to protect the environment.

### Decommissioning

This device may include sensitive, proprietary data. Before taking the device out of service, either permanently or for maintenance by a third-party, make sure it has been fully decommissioned.

For more information, refer to the associated "Configuration Manual".

### Recycling and Disposal

For environmentally friendly recycling and disposal of this device and related accessories, contact a facility certified to dispose of waste electrical and electronic equipment. Recycling and disposal must be done in accordance with local regulations.

## 1.5 Cabling Recommendations

Siemens recommends using SIMATIC NET industrial Ethernet shielded cables for all Ethernet ports.

### 1.5.1 Protection On Twisted-Pair Data Ports

All copper Ethernet ports on RUGGEDCOM products include transient suppression circuitry to protect against damage from electrical transients and conform with IEC 61850-3 and IEEE 1613 Class 1 standards. This means that during a transient electrical event, communications errors or interruptions may occur, but recovery is automatic.

Siemens also does not recommend using copper Ethernet ports to interface with devices in the field across distances that could produce high levels of ground potential rise (i.e. greater than 2500 V), during line-to-ground fault conditions.

### 1.5.2 Supported Fiber Optic Cables

The following fiber optic cable types are supported under the stated conditions.

| Cable Type | Wavelength (nm) | Modal Bandwidth (MHz·km) | Distance (m) | | |
|---|---|---|---|---|---|
| | | | 100Base-FX | 1000Base-SX | 10GBase-SR |
| OM1 (62.5/125) | 850 | 200 | — | 275 | 33 |
| | 1300 | 500 | 2000 | — | — |
| OM2 (50/125) | 850 | 500 | — | 550 | 82 |
| | 1300 | 500 | 2000 | — | — |
| OM3 (50/125)[a] | 850 | 1500 | — | 550 | 300 |
| | 1300 | 500 | 2000 | — | — |
| OM4 (50/125)[a] | 850 | 3500 | — | 550 | 400 |
| | 1300 | 500 | 2000 | — | — |

[a] *Laser optimized.*

# 2 Installing the Device

This chapter describes how to install the device, including mounting the device, 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.

**⚠ CAUTION**

**Burn hazard – risk of personal injury**

The surface of the device may be hot during operation, or as a result of the ambient air temperature.

Wear appropriate personal protective equipment and use caution when working with or around the device.

**⚠ NOTICE**

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.

**⚠ NOTICE**

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.

## 2.1 General Procedure

The general procedure for installing the device is as follows:

**⚠ NOTICE**

The user is responsible for the operating environment of the device, including maintaining the integrity of all protective conductor connections and checking equipment ratings. Make sure to review all operating and installation instructions before commissioning or performing maintenance on the device.

1. **Review the relevant certification information for any regulatory requirements.**

   For more information, refer to "Approvals" (Page 33).
2. **Unpack and inspect the device.**

   For more information, refer to "Unpacking the Device" (Page 8).
3. **Mount the device.**

   For more information, refer to "Mounting the Device" (Page 9).
4. **Connect the failsafe alarm relay.**

   For more information, refer to "Connecting the Failsafe Alarm Relay" (Page 12).
5. **Connect power to the device and ground the device to safety Earth.**

   For more information, refer to "Connecting Power" (Page 13).
6. **Connect the device to the network.**

   For more information, refer to "Communication Ports" (Page 19).
7. **Configure the device.**

   For more information, refer to "Configuring the Device" (Page 18).

## 2.2 Unpacking the Device

When unpacking the device, do the following:

1. Inspect the package for damage before opening it.
2. Visually inspect each item in the package for any physical damage.
3. Verify all items are included.

**Note**

If any item is missing or damaged, contact Siemens for assistance.

## 2.3 Mounting the Device

The RUGGEDCOM RS400 is designed for maximum mounting and display flexibility. It can be equipped with connectors that allow it to be installed in a rack, on a DIN rail, or directly on a panel.

**⚠ NOTICE**

Heat generated by the device is channeled outwards from the enclosure. As such, it is recommended that 2.5 cm (1 in) of space be maintained on all open sides of the device to allow for some convectional airflow.

Forced airflow is not required. However, any increase in airflow will result in a reduction of ambient temperature and improve the long-term reliability of all equipment mounted in the rack space.

**Note**

For detailed dimensions of the device with either rack, DIN rail or panel hardware installed, refer to "Dimension Drawings" (Page 29).

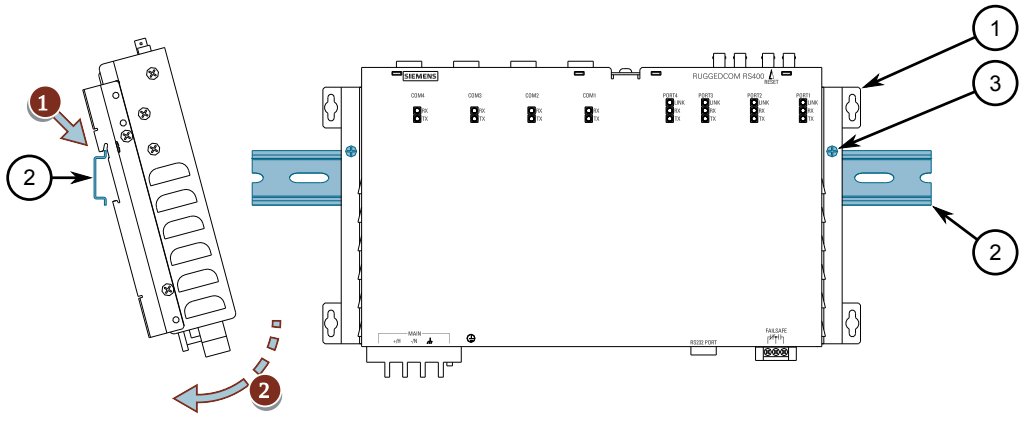
### 2.3.1 Mounting the Device on a DIN Rail

The RUGGEDCOM RS400 can be ordered with panel/DIN rail adapters preinstalled on each side of the chassis. Use the adapters to mount the device to a standard 35 mm (1.4 in) IEC/EN 60715 or TS35 DIN rail.

#### Mounting the Device

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

1. Hook the top teeth of the adapters onto the DIN rail.




① Panel/DIN Rail Adapter
② DIN Rail

③ Screw

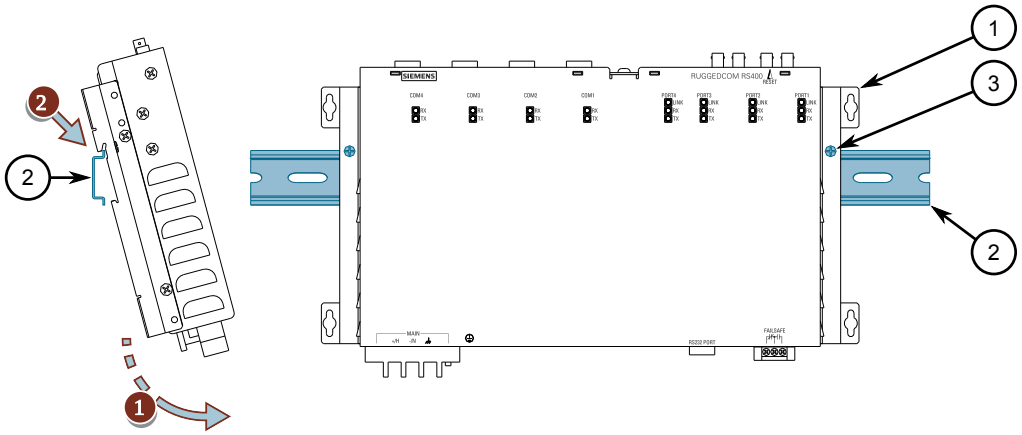
Figure 2.1 Mounting the Device to a DIN Rail

2. Install one of the supplied #8-32 lock screws on either side of the device to secure the adapters to the DIN rails.

### Removing the Device

To remove the device from a DIN rail, do the following:

1. Loosen or remove the #8-32 lock screws on both sides of the device.




① Panel/DIN Rail Adapter
② DIN Rail
③ Screw

Figure 2.2 Removing the Device from a DIN Rail

2. Lift the device off the DIN rail.

## 2.3.2 Mounting the Device to a Rack

For rack mount installations, the RUGGEDCOM RS400 can be equipped with rack mount adapters pre-installed at the front or rear of the chassis. Additional adapters are provided to further secure the device in high-vibration or seismically active locations.

To secure the device to a standard 48 cm (19 in) rack, do the following:

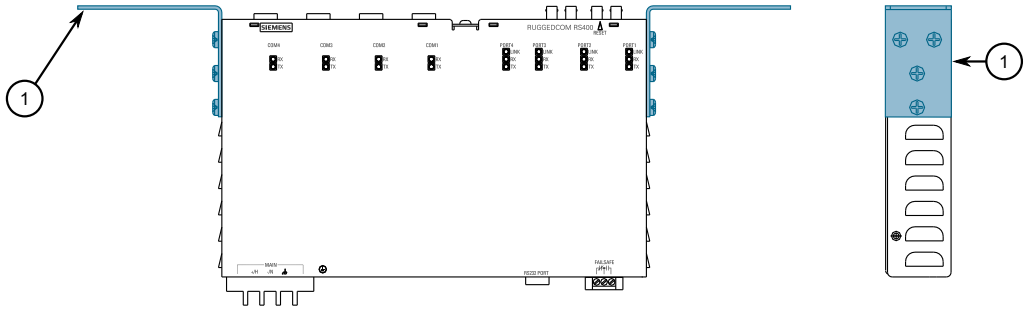
**Note**

The device can be ordered with the communication ports located at the front or rear of the device. Placing the ports at the rear allows all data and power cabling to be installed and connected at the rear of the rack.

1. Make sure the rack mount adapters are installed on the correct side of the chassis.

**Note**

The chassis features multiple mounting holes, allowing the rack mount adapters to be installed up to 25 mm (1 in) from the face of the device.




① Rear
② Front
③ Rack Mount Adaptor

Figure 2.3 Rack Mount Adaptors

2. If required, install adapters on the opposite side of the device to protect from vibrations.
3. Insert the device into the rack.

**Note**

Since heat within the device is channelled to the enclosure, it is recommended that 1 rack-unit of space, or 44 mm (1.75 in), be kept empty above the device. This allows a small amount of convectional airflow.

Forced airflow is not required. However, any increase in airflow will result in a reduction of ambient temperature and improve the long-term reliability of all equipment mounted in the rack space.

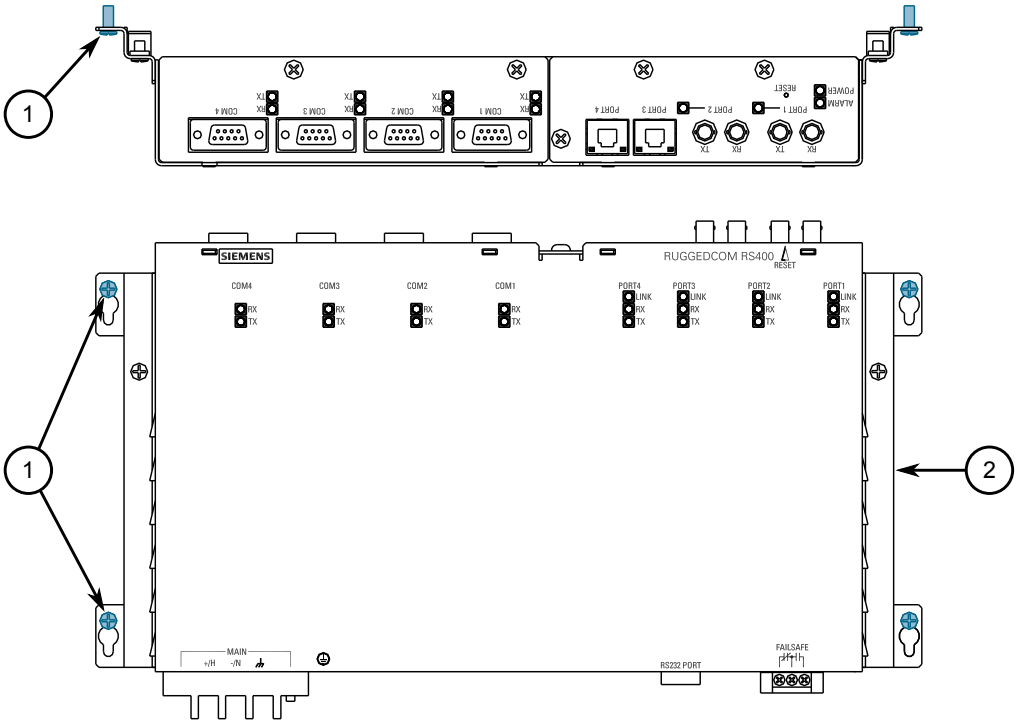
4. Secure the adapters to the rack using the supplied hardware.

## 2.3.3 Mounting the Device to a Panel

For panel installations, the RUGGEDCOM RS400 can be equipped with panel/DIN rail adapters pre-installed on each side of the chassis. The adapters allow the device to be attached to a panel using screws.

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

1. Place the device against the panel and align the adapters with the mounting holes.




① Screw
② Panel/DIN Rail Adaptor

Figure 2.4 Panel Mounting

2. Secure the device to the panel using four #6-32 screws.

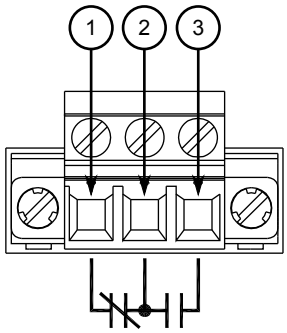
## 2.4 Connecting the Failsafe Alarm Relay

The failsafe relay can be configured to latch based on alarm conditions. The NO (Normally Open) contact is closed when the unit is powered and there are no active alarms. If the device is not powered or if an active alarm is configured, the relay opens the NO contact and closes the NC (Normally Closed) contact.

**Note**

Control of the failsafe relay output is configurable through RUGGEDCOM RS400. One common application for this relay is to signal an alarm if a power failure occurs. For more information, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

The following shows the proper relay connections.

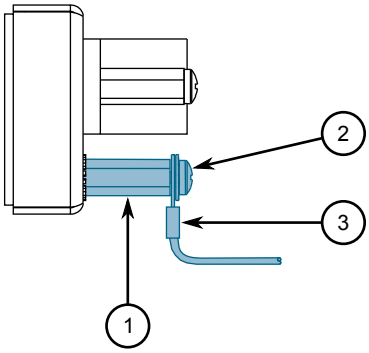



① Normally Closed
② Common
③ Normally Open

Figure 2.5 Failsafe Alarm Relay Wiring

## 2.5 Grounding the Device

The RUGGEDCOM RS400 chassis ground terminal uses a #6-32 screw. It is recommended to terminate the ground connection with a #6 ring lug and torque it to 1.7 N·m (15 lbf·in).




① Stainless Steel Stud
② #6-32 Screw
③ #6 Ring Lug

Figure 2.6 Chassis Ground Connection

## 2.6 Connecting Power

The RUGGEDCOM RS400 supports a single integrated high AC/DC or low DC power supply

**Note**

- For 88-300 VDC rated equipment, an appropriately rated circuit breaker must be installed.
- For 100-240 VAC rated equipment, an appropriately rated circuit breaker must be installed.
- Use only #16 gage copper wiring when connecting terminal blocks.
- A circuit breaker is not required for 12, 24 or 48 VDC rated equipment.
- Power input terminals have reverse polarity protection for 12, 24 and 48 VDC rated equipment.
- Equipment must be installed according to applicable local wiring codes and standards.

## 2.6.1 Connecting AC Power

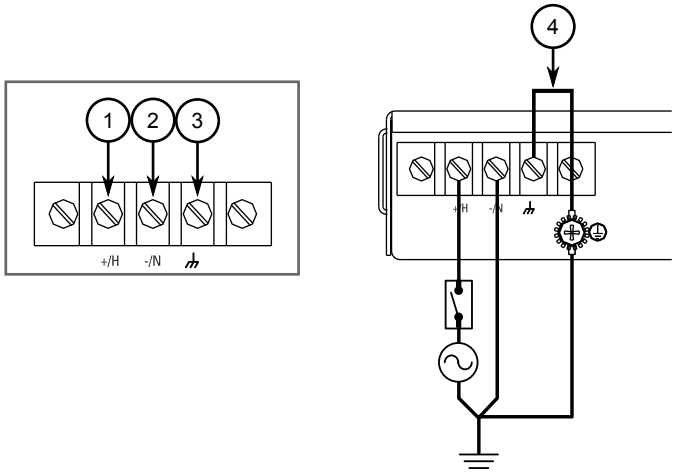
To connect a high AC power supply to the device, do the following:

**⚠ NOTICE**

**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/hot (+/H) terminal on the terminal block.




① Positive/Hot (+/H) Terminal
② Negative/Neutral (-/N) Terminal
③ Surge Ground Terminal

④ Braided Ground Cable

Figure 2.7 Terminal Block Wiring

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. For more information, refer to "Grounding the Device" (Page 13).

## 2.6.2 Connecting DC Power

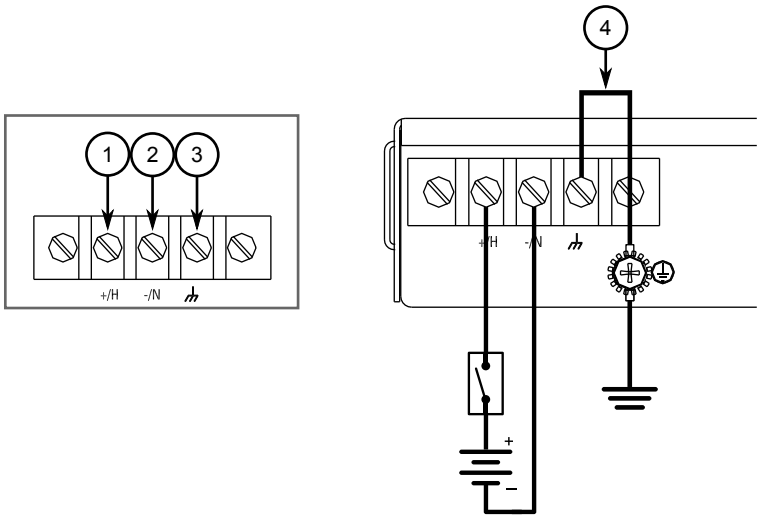
To connect a high or low DC power supply to the device, do the following:

**⚠ NOTICE**

**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/hot (+/H) terminal on the terminal block.




① Positive/Hot (+/H) Terminal
② Negative/Neutral (-/N) Terminal
③ Surge Ground Terminal

④ Braided Ground Cable

Figure 2.8 Terminal Block Wiring

2. Connect the negative wire from the power source to the negative/neutral (-/N) 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. For more information, refer to "Grounding the Device" (Page 13).

# 3 Device Management

This section describes how to connect to and manage the device.

## 3.1 Connecting to the Device

The following describes the various methods for accessing the RUGGEDCOM RS400 console and Web interfaces on the device. For more detailed instructions, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

### Serial Console Port

Connect a PC or terminal directly to the serial console port to access the boot-time control and RUGGEDCOM ROS console interface.

| ⚠ NOTICE |
| --- |
| The serial console port is intended to be used only as temporary connections during initial configuration or troubleshooting. |

The serial console port implements RS232 DCE (Data Communication Equipment) on a DB9 connector. The following is the pin-out for the port:

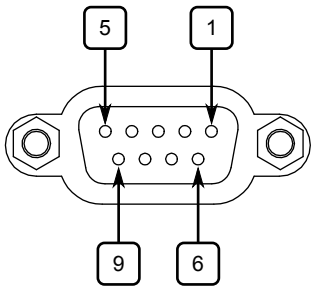



Figure 3.1 Serial DB9 Console Port

| Pin | Name | Description |
| --- | --- | --- |
| 1[a] | Reserved (Do Not Connect) | |
| 2 | TX | Transmit Data |
| 3 | RX | Receive Data |
| 4[a] | Reserved (Do Not Connect) | |
| 5 | GND | Signal Ground |
| 6[a] | Reserved (Do Not Connect) | |
| 7[b] | Reserved (Do Not Connect) | |
| 8[b] | Reserved (Do Not Connect) | |
| 9 | Reserved (Do Not Connect) | |

[a] *Connected internally.*

[b] *Connected internally.*

### Communication Ports

Connect any of the available Ethernet ports on the device to a management switch and access the RUGGEDCOM RS400 console and Web interfaces via the device's

IP address. For more information about available ports, refer to "Communication Ports" (Page 19).

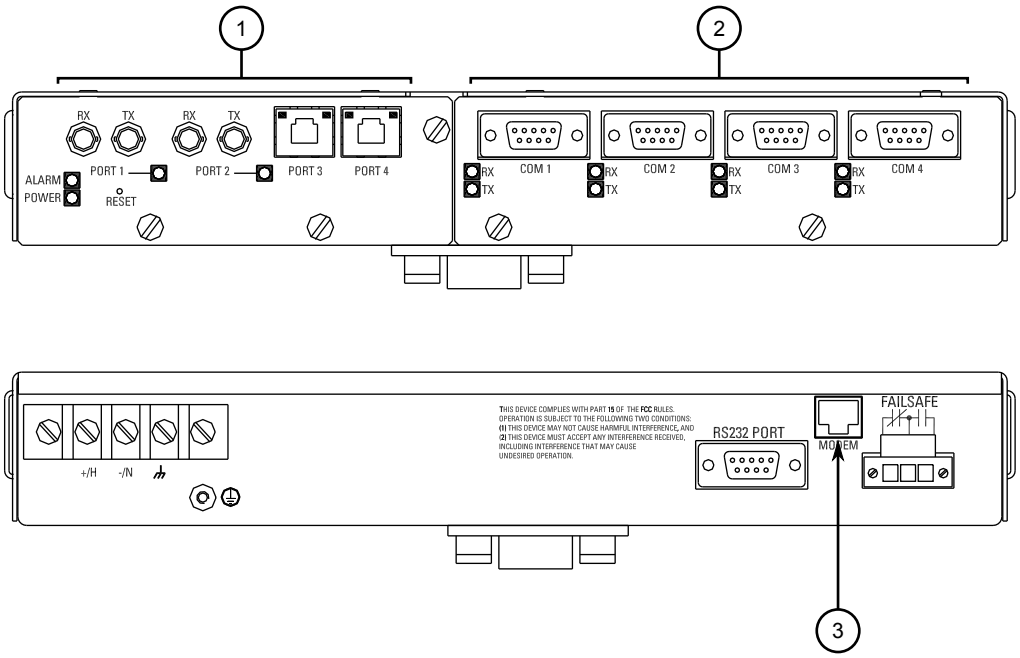
## 3.2 Configuring the Device

Once the device is installed and connected to the network, it must be configured. All configuration management is done via the RUGGEDCOM ROS interface. For more information about configuring the device, refer to the "RUGGEDCOM ROS Configuration Manual" associated with the installed software release.

# 4 Communication Ports

The RUGGEDCOM RS400 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 RUGGEDCOM RS400. For more information on how to access the factory data file, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

Each communication port type has a specific place in the RUGGEDCOM RS400 chassis.




① Copper or Fiber Ethernet Ports
② Serial Ports
③ Modem Port (Optional)

Figure 4.1 Port Assignment

## 4.1 Copper Ethernet Ports

The RUGGEDCOM RS400 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 connectors 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.

### LEDs

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

| LED | State | Description |
|---|---|---|
| Speed | Yellow | The port is operating at maximum speed |
| | Off | The port is not operating at maximum speed |
| Link | Yellow (Solid) | Link established |
| | Yellow (Blinking) | Link activity |
| | Off | No link detected |

### Pin-Out Description

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

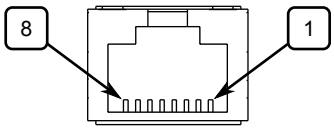



Figure 4.2 RJ45 Ethernet Port Pin Configuration

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

### Specifications

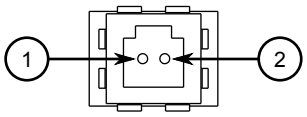
For specifications on the available copper Ethernet ports, refer to "Copper Ethernet Port Specifications" (Page 27).

## 4.2 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

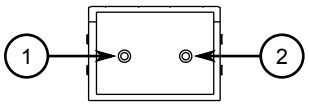
(Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

### Port Types



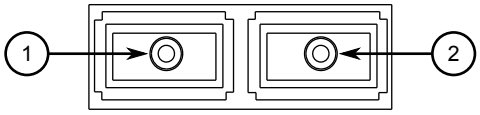

① Tx Connector
② Rx Connector

Figure 4.3 MTRJ Port



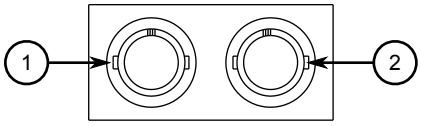

① Tx Connector
② Rx Connector

Figure 4.4 LC Port




① Tx Connector
② Rx Connector

Figure 4.5 SC Port




① Tx Connector
② Rx Connector

Figure 4.6 ST Port

### Specifications

For specifications on the available fiber optic Ethernet ports, refer to "Fiber Optic Ethernet Port Specifications" (Page 28).

## 4.3 Modem Port

The RUGGEDCOM RS400 can optionally be equipped with a V.90 Modem connection for PPP (Point-to-Point Protocol) connections. For information about how to configure and operate the modem, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

| ⚠ **WARNING** |
| --- |
| **Fire hazard – risk of serious personal injury and/or damage to equipment** |
| To reduce the risk of fire, use only #26 AWG or larger telecommunication line cord. |

The modem card is equipped with a standard RJ11 telephone port. The following is the pin-out description for the RJ11 port:

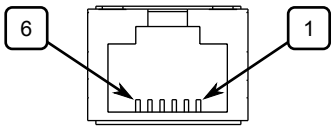



Figure 4.7 RJ11 Port Pin Configuration

| Pin | Description |
|---|---|
| 1 | Reserved (Do Not Connect) |
| 2 | Reserved (Do Not Connect) |
| 3 | Ring |
| 4 | Tip |
| 5 | Reserved (Do Not Connect) |
| 6 | Reserved (Do Not Connect) |

**Note**

This product meets the applicable Industry Canada technical specifications.

The Ringer Equivalence Number is an indication of the maximum number of devices allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices does not exceed five.

## 4.4 Serial Ports

The RUGGEDCOM RS400 supports RJ45 or DB9 serial ports, which can be run in RS232, RS485 or RS422 mode.

**Note**

On power-up, all serial ports default to RS485 mode. Each port can be individually set to RS232, RS485 or RS422 mode through RUGGEDCOM RS400. For more information, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

All serial ports feature an LED that indicates the current state of the port.

| State | Description |
|---|---|
| Green | Activity detected |
| Off | No activity |

For specifications on serial ports, refer to "Serial Port Specifications" (Page 29).

### 4.4.1 Serial RS232 DB9 Ports

Serial RS232 DB9 ports offer a female Data Communications Equipment (DCE) interface. When communicating with a Data Terminal Equipment (DTE) device, such as a PC, a straight-through serial cable (3 pin or 9 pin) is required. When

communicating with an another DCE device, such as another RUGGEDCOM RS400, the RX and TX pins must be *crossed-over* using, for example, a NULL modem cable.

The following is the pin-out description for the RS232 DB9 ports:

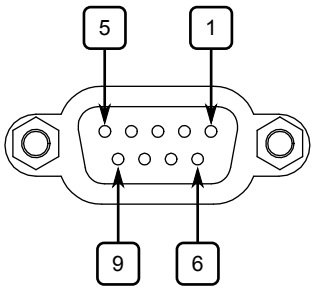



Figure 4.8 RS232 DB9 Serial Console Port

| Pin | Name | Description |
|---|---|---|
| 1 | Reserved (Do Not Connect) | |
| 2 | TX | Transmit Data |
| 3 | RX | Receive Data |
| 4 | Reserved (Do Not Connect) | |
| 5 | GND | Common Ground |
| 6 | Reserved (Do Not Connect) | |
| 7 | Reserved (Do Not Connect) | |
| 8 | Reserved (Do Not Connect) | |
| 9 | Reserved (Do Not Connect) | |

## 4.4.2 Serial RS232/RS485/RS422 DB9 Ports

The RUGGEDCOM RS400 can be equipped with serial RS232/RS485/RS422 DB9 ports. Each port can be set individually through the RUGGEDCOM RS400 operating system to operate in RS232, RS485 or RS422 mode. For more information, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

The following is the pin-out description for the RS232/RS485/RS422 DB9 ports:

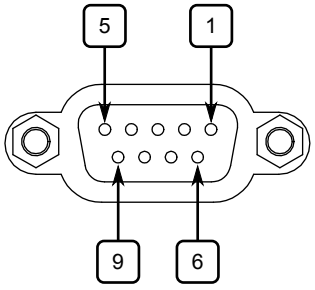



Figure 4.9 RS232/RS485/RS422 DB9 Serial Console Port

| Pin[a] | Name | | |
|---|---|---|---|
| | RS232 Mode | RS485 Mode | RS422 Mode |
| 1 | CD (No Connection) | — | — |
| 2 | TX | TX/RX+ | TX+ |
| 3 | RX | — | RX+ |
| 4 | DTR (No Connection) | — | — |
| 5 | Common (Isolated Ground)[b] | | |
| 6 | DSR (No Connection) | — | RX- |
| 7 | CTS[c] | TX/RX- | TX- |
| 8 | RTS[c] | — | — |
| 9 | RI (No Connection) | — | — |
| Shield | Chassis Ground | | |

[a] *No internal termination is provided.*

[b] *The Common terminal is optically isolated. However, there is transient voltage protection circuitry between the Common terminal and chassis ground.*

[c] *Pins 7 and 8 are connected together internally. In RS232 mode, these pins enter a high impedance state. A DTE that asserts RTS will see CTS asserted, although the device will not perform hardware flow control.*

### 4.4.3 Serial RS232/RS485/RS422 RJ45 Ports

The RUGGEDCOM RS400 can be equipped with serial RS232/RS485/RS422 RJ45 ports. Each port can be set individually through the RUGGEDCOM RS400 operating system to operate in RS232, RS485 or RS422 mode. For more information, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM RS400.

The following is the pin-out description for the RS232/RS485/RS422 RJ45 ports:

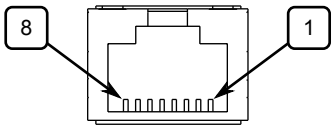



Figure 4.10 RS232/RS485/RS422 RJ45 Serial Console Port

| Pin[a] | Name | | |
|---|---|---|---|
| | **RS232 Mode** | **RS485 Mode** | **RS422 Mode** |
| 1 | DSR[b] | | RX- |
| 2 | DCD[b] | | |
| 3 | DTR[b] | | |
| 4 | Common (Isolated) Ground | | |
| 5 | RXD[c] | | RX+ |
| 6 | TXD[c] | TX/RX+ | TX+ |
| 7 | CTS | | |
| 8 | RTS | TX/RX- | TX- |
| Shield | Chassis Ground | | |

[a] *No internal termination is provided.*

[b] *The DSR, DCD and DTR pins are connected together internally.*

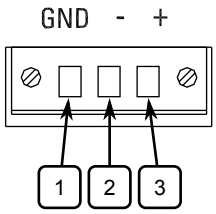
[c] *In RS232 mode, the RJ45 ports conform to EIA-561 DTE, which transmit on TXD and receive on RXD.*

### 4.4.4 Serial Insulated Terminals

The RUGGEDCOM RS400 can be equipped with serial RS485 insulated terminals. The terminals are terminated by default from the factory. Termination provided is AC Termination style 120 Ohm resistor in series with a 10nF capacitor. The following details the appropriate jumper configuration for each RS485 port.

| Port | Jumper Number | Jumper Position | |
|---|---|---|---|
| | | **No Termination** | **AC Termination** |
| 1 | JP5 | Removed | Installed |
| 2 | JP6 | | |
| 3 | JP7 | | |
| 4 | JP8 | | |

The following is the pin-out description for the RS485 insulated terminals:




| Terminal | Description |
|---|---|
| 1 | Positive |
| 2 | Negative |
| 3 | Common (Isolated Ground) |

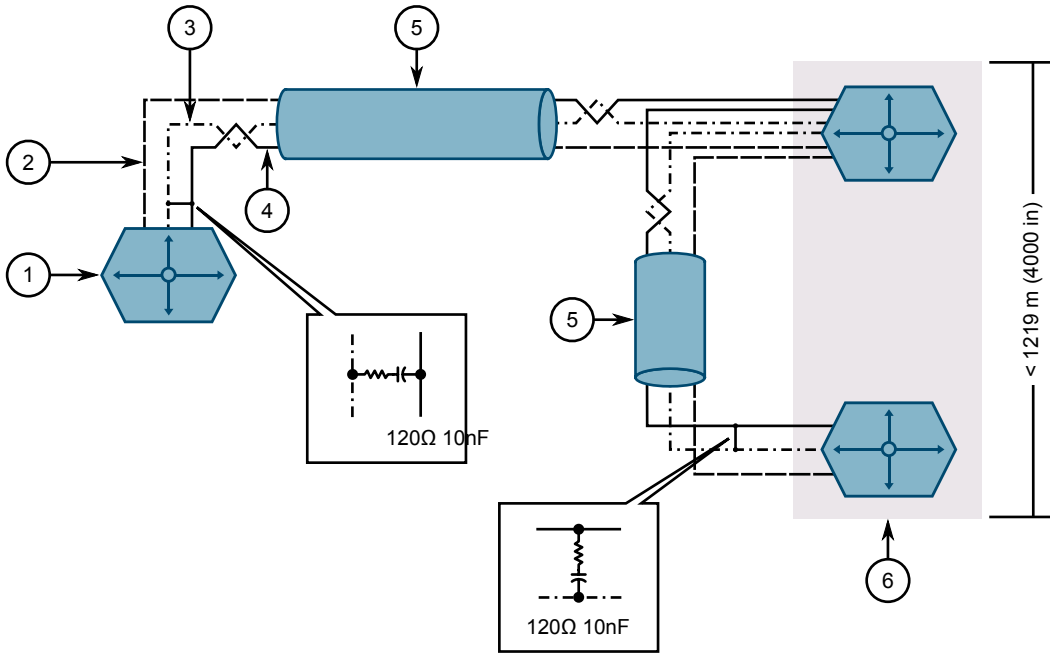
Figure 4.11 Serial Insulated Terminal Port

## 4.4.5 Connecting Multiple RS485 Devices

Each RS485 port can communicate with multiple RS485 devices by wiring devices together in sequence over a single twisted pair with transmit and receive signals on the same two wires (half duplex). For reliable, continuous communication, adhere to the following guidelines:

- 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.

The following shows the recommended RS485 wiring.




① RUGGEDCOM RS400
② Common (Isolated Ground)
③ Negative
④ Positive
⑤ Shield to Earth (Connected At a Single Point)
⑥ RS485 Devices (32 Total)

Figure 4.12 Recommended RS485 Wiring

# 5 Technical Specifications

This section details the specifications and operating conditions of the device.

## 5.1 Power Supply Specifications

| Power Supply Type | Minimum Input | Maximum Input | Internal Fuse Rating | Maximum Power Consumption |
|---|---|---|---|---|
| 12-24 VDC | 10 VDC | 36 VDC | 6.3 A(F)[a] | 8 W |
| 48 VDC | 36 VDC | 59 VDC | 2 A(T)[a] | |
| HI (125/250 VDC)[b] | 88 VDC | 300 VDC | 2 A(T)[ab] | |
| HI (110/230 VAC)[b] | 85 VAC | 265 VAC | | |

[a] *(F) denotes fast-acting fuse; (T) denotes time-delay fuse.*

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

## 5.2 Failsafe Alarm Relay Specifications

| | |
|---|---|
| **Max Switching Voltage** | 30 VAC, 80 VDC, 125 VAC, 250 VAC |
| **Rated Switching Current** | 0.3 A @ 30 VAC<br>1 A @ 30 VDC, 0.3 A @ 80 VDC<br>0.2 A @ 250 VAC<br>0.6 A @ 125 VAC |

## 5.3 Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the RUGGEDCOM RS400.

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

[a] *Auto-negotiating.*

[b] *Shielded or unshielded.*

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

[d] *RMS 1 minute.*

## 5.4 Fiber Optic Ethernet Port Specifications

The following details the specifications for fiber Ethernet ports that can be ordered with the RUGGEDCOM RS400.

### 10Base-FL Ethernet Optical Specifications

| Mode | Connector | Tx λ (nm)[a] | Cable Type (µm)[b] | Tx (dBm peak)[b] | | Rx Sensitivity (dBm Average)[b] | Rx Saturation (dBm Peak)[b] | Distance (km)[c] | Power Budget (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Minimum | Maximum | | | | |
| MM | ST | 62.5/125 | 1300 | -19 | -14 | -33.9 | -14 | 2 | 14.9 |

[a] *Typical.*

[b] *To convert from average to peak, add 3 dBm. To convert from peak to average, subtract 3 dBm.*

[c] *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.*

### Fast Ethernet (100 Mbps) Optical Specifications

| Mode | Connector | Cable Type (µm)[a] | Tx λ (nm)[b] | Tx (dBm peak)[a] | | Rx Sensitivity (dBm Average)[a] | Rx Saturation (dBm Peak)[a] | Distance (km)[c] | Power Budget (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Minimum | Maximum | | | | |
| MM | LC | 62.5/125 | 1310 | -20 | -14 | -31 | -14 | 2 | 11 |
| MM | ST | 62.5/125 | 1300 | -19 | -14 | -33.9 | -14 | 2 | 11.4 |
| MM | ST | 50/125 | 1300 | -22.5 | -14 | -33.9 | -14 | 2 | 14.9 |
| MM | ST | 62.5/125 | 1300 | -19 | -14 | -30 | -14 | 2.5 | 11 |
| MM | SC | 62.5/125 | 1300 | -19 | -14 | -33.9 | -14 | 2 | 14.9 |
| MM | SC | 50/125 | 1300 | -22.5 | -14 | -33.9 | -14 | 2 | 14.9 |
| MM | LC | 62.5/125 | 1310 | -19 | -14 | -32 | -14 | 2 | 13 |
| MM | MTRJ | 62.5/125 | 1300 | -19 | -14 | -33.5 | -14 | 2 | 14.5 |
| MM | MTRJ | 50/125 | 1300 | -22.5 | -14 | -33.5 | -14 | 2 | 14.5 |
| SM | ST | 9/125 | 1310 | -15 | -7 | -34 | -3 | 20 | 19 |
| SM | SC | 9/125 | 1300 | -15 | -8 | -31 | -7 | 20 | 16 |
| SM | SC | 9/125 | 1310 | -5 | 0 | -34 | -3 | 50 | 29 |
| SM | SC | 9/125 | 1310 | 0 | 5 | -37 | 0 | 90 | 42 |
| SM | LC | 9/125 | 1300 | -15 | -8 | -38 | -3 | 20 | 23 |
| SM | LC | 9/125 | 1310 | -5 | 0 | -35 | -3 | 50 | 30 |
| SM | LC | 9/125 | 1310 | 0 | 5 | -37 | 0 | 90 | 37 |

[a] *To convert from average to peak, add 3 dBm. To convert from peak to average, subtract 3 dBm.*

[b] *Typical.*

[c] *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.*

## 5.5 Serial Port Specifications

| Port Type | Media | Distance | Connector Type |
|---|---|---|---|
| RS232 | Standard RS232 Shielded Serial Cable | 15 m (49 ft) | DB9 |
| RS485 | Shielded Twisted-Pair | 1200 m (3937 ft) | Insulated Terminals |
| RS232/RS485/RS422 | Shielded Twisted-Pair | 1200 m (3937 ft) | DB9 |
| RS232/RS485/RS422 | Shielded Twisted-Pair | 1200 m (3937 ft) | RJ45 |

## 5.6 Operating Environment

The RUGGEDCOM RS400 is rated to operate under the following environmental conditions.

| | |
|---|---|
| **Ambient Operating Temperature**[a] | -40 to 85 °C (-40 to 185 °F) |
| **Ambient Storage Temperature** | -40 to 85 °C (-40 to 185 °F) |
| **Ambient Relative Humidity**[b] | 5% to 95% |
| **Maximum Altitude** | 2000 m (6562 ft) |

[a] *Measured from a 30 cm (12 in) radius surrounding the center of the enclosure.*

[b] *Non-condensing.*

## 5.7 Mechanical Specifications

| | |
|---|---|
| **Weight** | 2.2 kg (4.8 lb) |
| **Ingress Protection** | IP30 |
| **Enclosure** | 18 AWG Galvanized Steel |

## 5.8 Dimension Drawings

**Note**

All dimensions are in millimeters, unless otherwise stated.

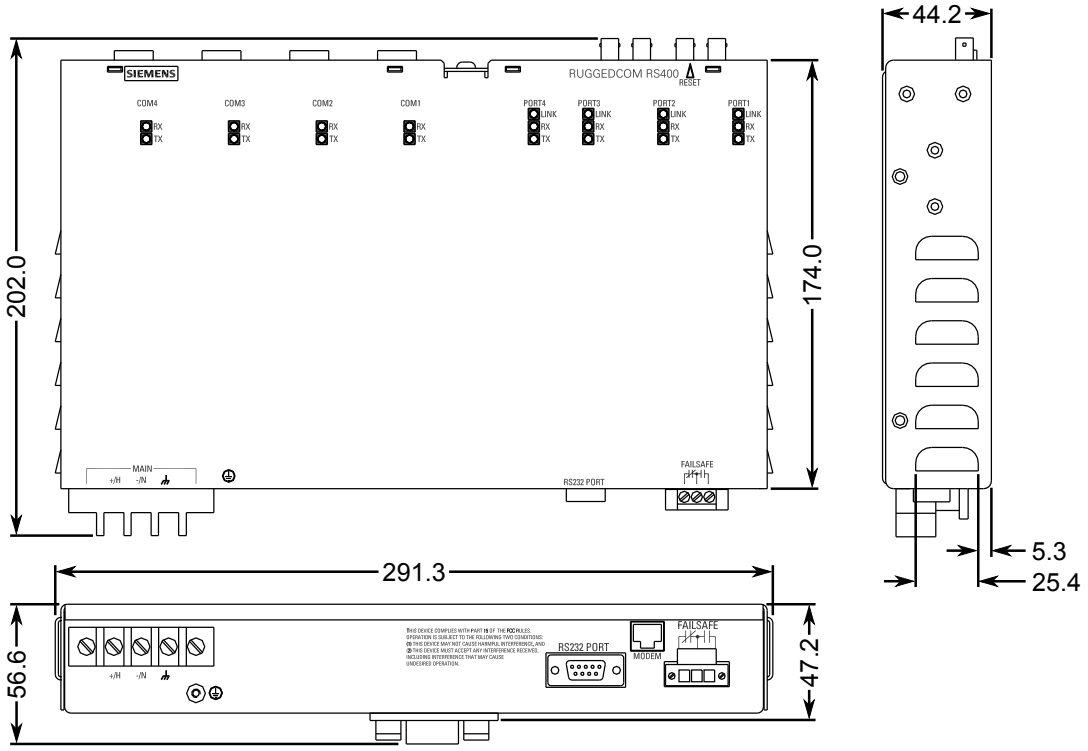



Figure 5.1 Overall Dimensions

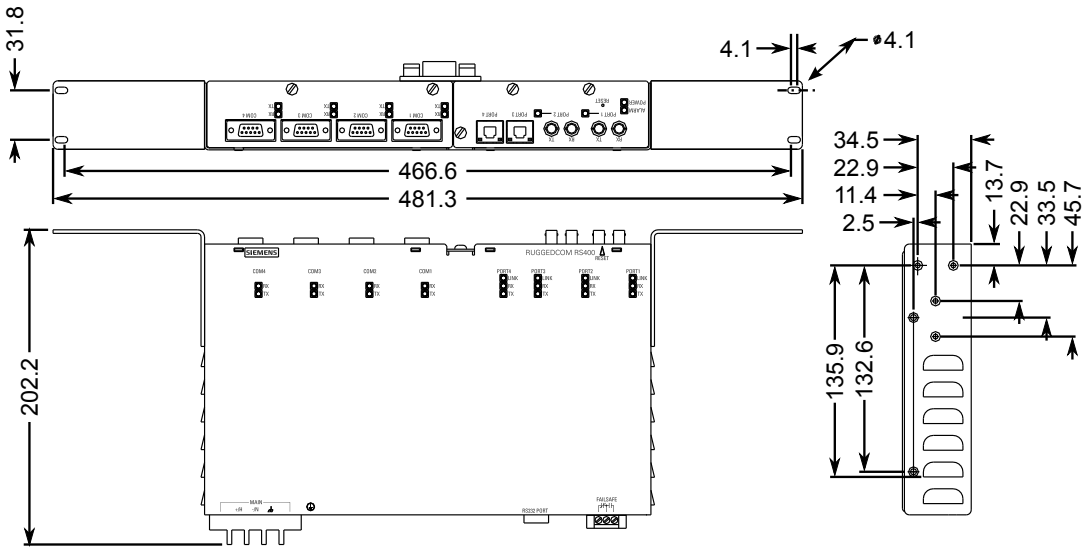



Figure 5.2 Rack Mount Dimensions

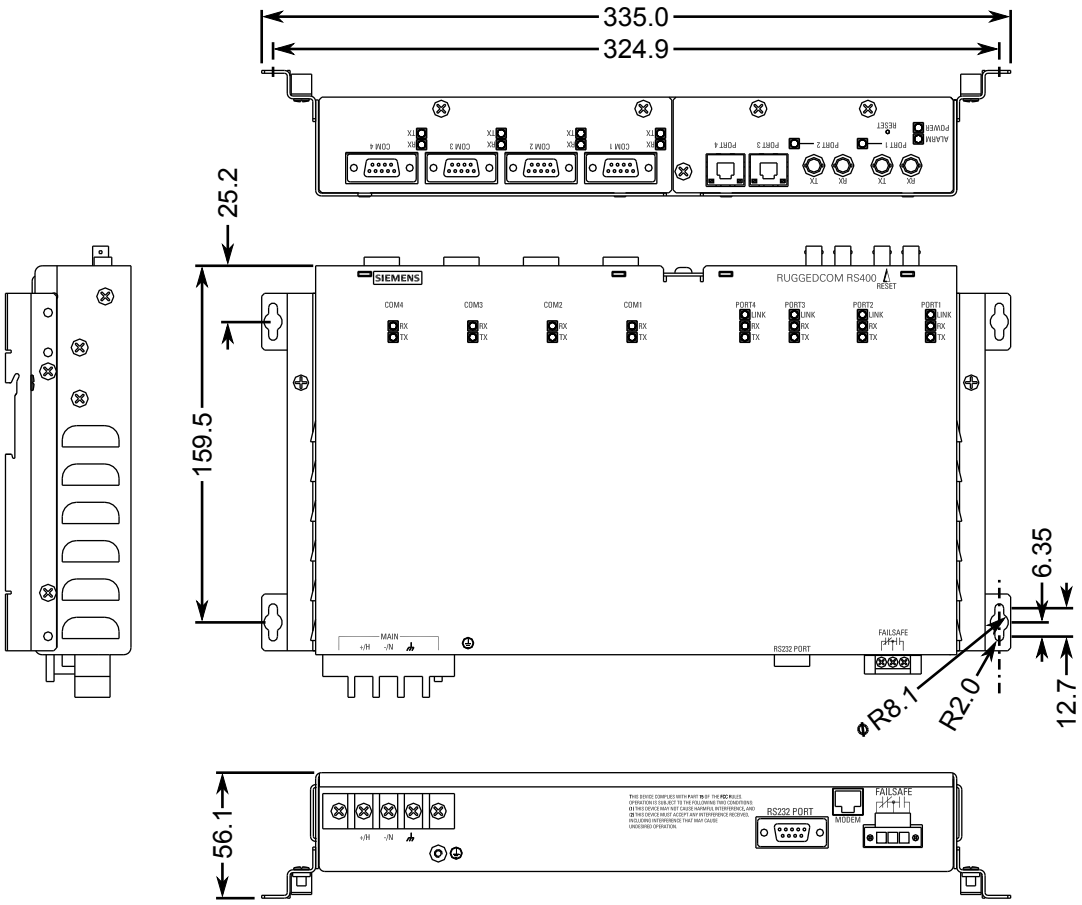



Figure 5.3 Panel and Din Rail Mount Dimensions

# 6 Certification

The RUGGEDCOM RS400 device has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

## 6.1 Approvals

This section details the standards to which the RUGGEDCOM RS400 complies.

**Note**

All relevant certificates and test reports are available on Siemens Industry Online Support [https://support.industry.siemens.com].

### 6.1.1 UKCA

This device is certified for use in Great Britain and bears the United Kingdom Certified Assessed (UKCA) marking. The marking is printed on the body of the device, along with the identification number of the notified body.

### 6.1.2 CSA

This device meets the requirements of the following Canadian Standards Association (CSA) standards:

- **CAN/CSA-C22.2 No. 62368-1**
  Information Technology Equipment – Safety – Part 1: General Requirements (Bi-National Standard, with UL 62368-1)
- **UL 62368-1**
  Information Technology Equipment – Safety – Part 1: General Requirements

The device is marked with a CSA symbol that indicates compliance with both Canadian and U.S. requirements.


### 6.1.3 European Union (EU)

This device is declared by Siemens Canada Ltd. to comply with essential requirements and other relevant provisions of the following EU directives:

- **EN 62368-1**
  Information Technology Equipment – Safety – Part 1: General Requirements
- **EN 61000-6-2**
  Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments
- **EN 60825-1**
  Safety of Laser Products – Equipment Classification and Requirements
- **EN 63000**
  Technical Documentation for the Assessment of Electrical and Electronic Products with Respect to the Restriction of Hazardous Substances
- **CISPR 32/EN 55032**
  Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements

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

### 6.1.4 FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference on his own expense.

### 6.1.5 FDA/CDRH

This device meets the requirements of the following U.S. Food and Drug Administration (FDA) standard:

- Title 21 Code of Federal Regulations (CFR) – Chapter I – Sub-chapter J – Radiological Health

### 6.1.6 ISED

This device is declared by Siemens Canada Ltd. to meet the requirements of the following ISED (Innovation Science and Economic Development Canada) standard:

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

### 6.1.7 ISO

This device was designed and manufactured using a certified ISO (International Organization for Standardization) quality program that adheres to the following standard:

- **ISO 9001:2015**
  Quality management systems – Requirements

### 6.1.8 ACMA

This device meets the requirements of the following Australian Communications and Media Authority (ACMA) standards under certificate ABN 98 004 347 880:

- Radiocommunications (Compliance Labelling – Devices) Notice 2014 made under Section 182 of the Radiocommunications Act 1992
- Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2008 made under Section 182 of the Radiocommunications Act 1992
- Radiocommunications (Compliance Labelling – Electromagnetic Radiation) Notice 2003 made under Section 182 of the Radiocommunications Act 1992
- Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice 2001 made under Section 407 of the Telecommunication Act 1997

The device is marked with an RCM symbol to indicate compliance when sold in the Australian region.

A copy of the Declaration of Conformity is available via Siemens Industry Online Support at https://support.industry.siemens.com/cs/ww/en/view/89855782.

### 6.1.9 RoHS

This device is declared by Siemens Canada Ltd. to meet the requirements of the following RoHS (Restriction of Hazardous Substances) directives for the restricted use of certain hazardous substances in electrical and electronic equipment:

- **China RoHS 2**

  Administrative Measure on the Control of Pollution Caused by Electronic Information Products

A copy of the Material Declaration is available online at https://support.industry.siemens.com/cs/ww/en/view/109738831.

### 6.1.10 Other Approvals

This device meets the requirements of the following additional standards:

- **IEEE 1613**
  IEEE Standard Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations
- **IEC 61850-3**
  Communications Networks and Systems for Power Utility Automation – Part 3: General Requirements
- **IEC 61000-6-2**
  Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments
- **NEMA TS-2**
  Traffic Controller Assemblies with NTCIP Requirements

## 6.2 EMC and Environmental Type Tests

The RUGGEDCOM RS400 has passed the following EMC and environmental tests.

#### IEC 61850-3 EMC 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 | |
| IEC 61000-4-4 | Burst (Fast Transient) | Signal Ports | ±4 kV at 2.5 kHz | |
| | | DC Power Ports | ±4 kV | 4 |
| | | AC Power Ports | ±4 kV | 4 |
| | | Earth Ground Ports | ±4 kV | 4 |

| Test | Description | | Test Levels | Severity Levels |
|---|---|---|---|---|
| IEC 61000-4-5 | Surge | Signal Ports | ±4 kV Line-to-Earth,<br>±2 kV Line-to-Line | 4 |
| | | DC Power Ports | ±2 kV Line-to-Earth,<br>±1 kV Line-to-Line | 3 |
| | | AC Power Ports | ±4 kV Line-to-Earth,<br>±2 kV Line-to-Line | 4 |
| IEC 61000-4-6 | Induced (Conducted) RFI | Signal Ports | 10 V | 3 |
| | | D.C 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,<br>1000 A/m for 1 s | |
| IEC 61000-4-29 | Voltage Dips and Interrupts | DC Power Ports | 30% for 0.1 s, 100% for 0.05 s | |
| | | AC Power Ports | 30% for 1 period,<br>60% for 250 periods | |
| IEC 61000-4-11 | | | 100% for 5 periods,<br>100% for 50 periods[2] | |
| IEC 61000-4-12 | Damped Oscillatory | Signal Ports | 2.5 kV common, 1 kV differential mode at 1 MHz | 3 |
| | | DC Power Ports | 2.5 kV common, 1 kV differential mode at 1 MHz | 3 |
| | | AC Power Ports | 2.5 kV common, 1 kV differential mode at 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 |
| 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 kVAC | |
| | H.V. Impulse | Signal Ports | 5 kV (Fail-Safe Relay output) | |
| | | DC Power Ports | 5 kV | |
| | | AC Power Ports | 5 kV | |

## IEEE 1613 (C37.90.x) EMC Immunity Type Tests

**Note**

RUGGEDCOM products meet Class 1 requirements for copper Ethernet configurations and Class 2 for fiber Ethernet configurations. Class 1 allows for temporary communication loss, while Class 2 requires error-free and interrupted communications.

| Description | | Test Levels |
|---|---|---|
| ESD | Enclosure Contact | ±8 kV |
| | Enclosure Air | ±15 kV |
| Radiated RFI | Enclosure Ports | 35 V/m |
| Fast Transient | Signal Ports | ±4 kV at 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 at 1 MHz |
| | DC Power Ports | 1 kV Common and Differential Mode at 1 MHz |
| | AC Power Ports | 1 kV Common and Differential Mode at 1 MHz |
| Dielectric Strength | Signal Ports | 2 kVAC |
| | DC Power Ports | 1.5 kVDC |
| | AC Power Ports | 2 kVAC |
| HV Impulse | Signal Ports | 5 kV (Failsafe Relay) |
| | DC Power Ports | 5 kV |
| | AC Power Ports | 5 kV |

## Environmental Type Tests

| Test | Description | | Test Levels |
|---|---|---|---|
| IEC 60068-2-1 | Cold Temperature | Test Ad | -40 °C (-40 °F), 16 Hours |
| IEC 60068-2-2 | Dry Heat | Test Bd | 85 °C (185 °F), 16 Hours |
| IEC 60068-2-30 | Humidity (Damp Heat, Cyclic) | Test Db | 95% (non-condensing), 55 °C (131 °F), 6 cycles |
| IEC 60255-21-1 | Vibration | | 2 g at 10-150 Hz |
| IEC 60255-21-2 | Shock | | 30 g at 11 ms |

## For more information

Siemens RUGGEDCOM
**https://www.siemens.com/ruggedcom**

Industry Online Support (service and support)
**https://support.industry.siemens.com**

Industry Mall
**https://mall.industry.siemens.com**

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