SIEMENS

RUGGEDCOM RX1400

Installation Guide

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3/2015
RC1103-EN-04

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

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Preface

This guide describes the RUGGEDCOM RX1400. It describes the major features of the device, installation, commissioning and important technical specifications.

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

Alerts

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

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

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

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

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

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

Related Documents

Other documents that may be of interest include:

- *ROX II User Guide for the RX1400*

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.

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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**

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  - Access Siemens' 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
  - And much more...

1 Introduction

The RUGGEDCOM RX1400 is a multi-protocol intelligent node that combines Ethernet switch, routing and firewall functionality with various wide area connectivity options.

The RX1400 switch, with its rugged metal housing, is designed for DIN rail, panel or rack mounting.

The device has IP40 degree protection, does not use internal fans for cooling and supports a -40 to 85 °C (-40 to 185 °F) extended temperature range.

The RX1400 provides a high level of immunity to electromagnetic interference, heavy electrical surges, extreme temperature and humidity for reliable operation in harsh environments.

Primary benefits include:

- Cost effective solution for large scale deployments
- Space-saving installation
- Reduced maintenance costs
- Customer data protection
- Support for additional applications

The RX1400 is designed to support primary communications over public mobile networks and leverage enhanced capabilities of mobile networks, while making reliable and secure connections for mission critical applications in electric utility substations, traffic control cabinets, railway applications, oil and gas and other harsh environment applications.

IMPORTANT!
This device must only be used for mobile and fixed applications.

The following sections provide more information about the RX1400:

- Section 1.1, “Feature Highlights”
- Section 1.2, “Description”

Section 1.1

Feature Highlights

Wireless Interfaces

- LTE: 700- B13, B17, 800/900/1800/2100/2600 MHz
- UMTS/HSPA+: 850/900/1900/2100 MHz
- Quad-Band EDGE/GPRS/GSM
- GNSS

Optical SFP Pluggable Transceivers

- 2 x 1000 Mbit/s ports

Ethernet Interfaces

- 4 x 10/100Base-T RJ45 ports

Serial Interfaces with Isolation

- 2 x RS232/422/485 ports

Other Interfaces

- Isolated built-in power input
- RS232 console port for local management/ diagnostics on the device

Power Supply

- 12 or 24

- SMA connectors for RF interfaces

Cyber Security

- Passwords – compliant with NERC guidelines including provision for RADIUS-based authentication
- SSH/SSL – extends capability of password protection to add encryption of passwords and data as they cross the network
- Enable/Disable Ports – capability to disable ports so unauthorized devices cannot connect to unused ports
- VLAN (IEEE 802.1Q) – provides the ability to logically segregate traffic between predefined ports on switches
- SNMPv3 – encrypted authentication and access security
- IEEE 802.1x – only permitted devices can connect to the RX1400
- MAC Access List – controls access to devices that do not support RADIUS authentication

Section 1.2

Description

The RX1400 features various ports, controls and indicator LEDs on the front panel for connecting, configuring and troubleshooting the device.

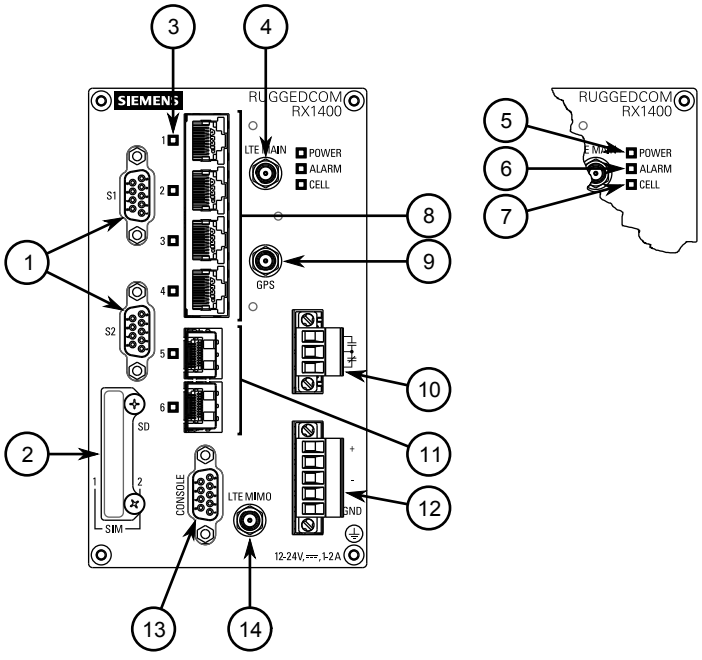


Figure 1: RX1400

1. Serial Ports **2.** Access Plate **3.** Port Status LEDs **4.** LTE Main Antenna Port **5.** POWER LED **6.** ALARM LED **7.** CELL LED **8.** Fast Ethernet Ports **9.** GPS Antenna Port **10.** Failsafe Alarm Relay **11.** SFP Ports **12.** Power Supply Terminal Block **13.** RS232 Serial Console Port (DB9) **14.** LTE MIMO Port

- **LEDs** – LEDs indicate the operational status of the device.
  - **POWER LED** – Illuminates when power is being supplied to the device.

  - **ALARM LED** – Illuminates when an alarm condition exists.
  - **CELL LED** – Indicates when the cellular modem is connected to the network.
    - Solid = Activity
    - Off = No activity
  - **Port Status LEDs** – Indicate the status of each port:
    - Solid = Link
    - Blinking = Activity
    - Off = No link/activity
- **Access Plate** – The removable access plate provides access to the Micro SD card and SIM card slots.
  - Use a Micro SD card to store the firmware and configuration for the device
  - Use a single or dual (recommended) SIM cards to connect to an LTE network
- **RS232 Serial Console Port** – 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 Section 2.7, “Connecting to the Device”.
- **LTE MAIN, LTE MIMO and GPS Ports** – SMA ports for connecting to an LTE network or Global Navigation Satellite System (GNSS). For more information, refer to:
  - Section 2.4, “Installing the Antennas”
  - Section 4.6, “Cellular Modem Specifications”
- **Failsafe Alarm Relay** – Latches to default state when a power disruption or other alarm condition occurs. For more information, refer to:
  - Section 2.6, “Connecting the Failsafe Alarm Relay”
  - Section 4.2, “Failsafe Alarm Relay Specifications”
- **Power Supply Terminal Block** – A pluggable terminal block. For more information, refer to:
  - Section 2.3, “Connecting Power”
  - Section 4.1, “Power Supply Specifications”

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.

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.

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.

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.

The general procedure for installing the device is as follows:

1. Mount the device to a rack, panel or DIN rail.
2. Connect power to the device and ground the device to safety Earth.
3. Connect the LTE and/or GPS antennas.
4. Connect the failsafe alarm relay.
5. Connect the device to the network.

These steps, and other related information, are described in the following sections:

- Section 2.1, “Required Tools and Materials”
- Section 2.2, “Mounting the Device”
- Section 2.3, “Connecting Power”
- Section 2.4, “Installing the Antennas”
- Section 2.5, “Installing the SIM Cards”
- Section 2.6, “Connecting the Failsafe Alarm Relay”
- Section 2.7, “Connecting to the Device”

- Section 2.8, “Cabling Recommendations”

Section 2.1
Required Tools and Materials

The following tools and materials are required to install the RX1400:

Tool/Material	Available For Purchase From Siemens[a]
LTE and/or GPS antennas	✓
AC/DC power cord (16 AWG)	×
Lightning protector	×
Shielded coaxial cables	×
SIM Card(s) provided by the network carrier	×
Flathead screwdriver for mounting the device to a DIN rail	×
Phillips screwdriver for mounting the device to a rack or panel	×
Braided or equivalent ground wire for grounding the device	×

[a] *For more information, contact a Siemens Sales representative.*

Section 2.2
Mounting the Device

The RX1400 is designed for maximum mounting and display flexibility. It can be equipped with brackets that allow it to be installed in a 48 cm (19 in) rack, 35 mm (1.4 in) DIN rail, or directly on a panel.

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

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

- Section 2.2.1, “Mounting the Device to a Rack”
- Section 2.2.2, “Mounting the Device on a DIN Rail”
- Section 2.2.3, “Mounting the Device to a Panel”

Section 2.2.1
Mounting the Device to a Rack

For rack mount installations, the RX1400 can be equipped with rack mount adapters pre-installed on the chassis.

CAUTION!
Electrical/mechanical hazard – risk of damage to the device. Before installing the device in a rack, make sure of the following:

- *When installing the device in a closed or multi-device rack, be aware the operating ambient temperature of the rack may be higher than the ambient temperature of the room. Make sure the rack is installed in a suitable environment that can withstand the maximum ambient temperature generated by the rack.*
- *Make sure each device in the rack is separated by at least one rack-unit of space, or 44 mm (1.75 in), to promote 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.*
- *Do not exceed the maximum number of devices or weight restrictions specified by the rack manufacturer.*
- *Do not overload the supply circuit. Refer to the over-current protection and power supply ratings specified by the rack manufacturer.*
- *Make sure the rack and all devices have a proper ground-to-Earth connection. Pay particular attention to power supply connections other than direct connections to the branch circuit (e.g. power strips).*

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

1. Make sure the rack mount adapters are installed.

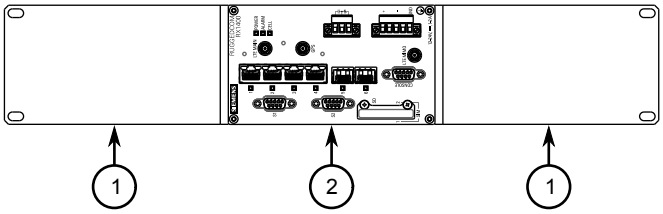


Figure 2: Rack Mount Adapters

1. Rack Mount Adapter **2.** RX1400

2. Insert the assembly into the rack.
3. Secure the adapters to the rack using the supplied hardware.

Section 2.2.2

Mounting the Device on a DIN Rail

For DIN rail installations, the RX1400 can be equipped with panel/DIN rail adapters pre-installed on each side of the chassis. The adapters allow 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 adapters with the DIN rails and slide the device into place.

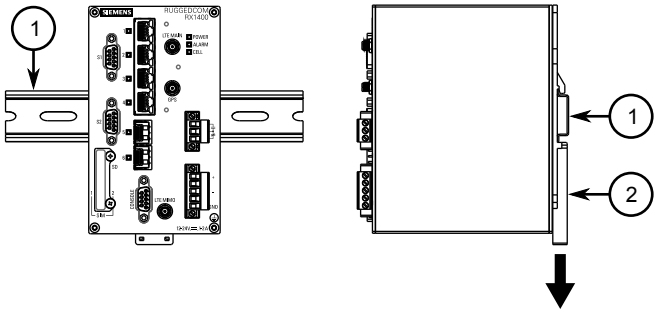


Figure 3: DIN Rail Mounting

1. Panel/DIN Rail Adapter **2.** DIN Rail **3.** Screw

2. Install one of the supplied screws on either side of the device to secure the adapters to the DIN rails.

Section 2.2.3
Mounting the Device to a Panel

For panel installations, the RX1400 can be equipped with panel 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.

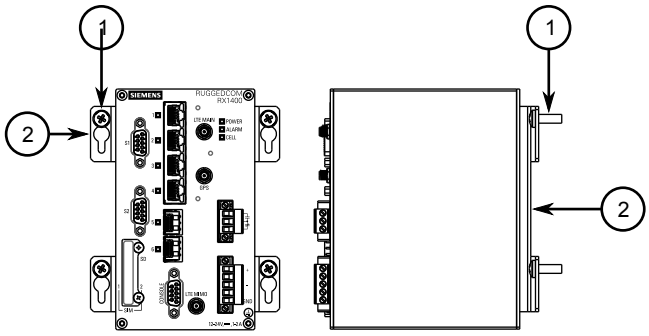


Figure 4: Panel Mounting

1. Screw **2.** Panel Adapter

2. Install the supplied screws to secure the adapters to the panel.

Section 2.3
Connecting Power

The RX1400 supports a single integrated low DC power supply.

IMPORTANT!

Before installing the device, note the following:

- *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.*

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

1. Connect the power supply terminal block to the device.

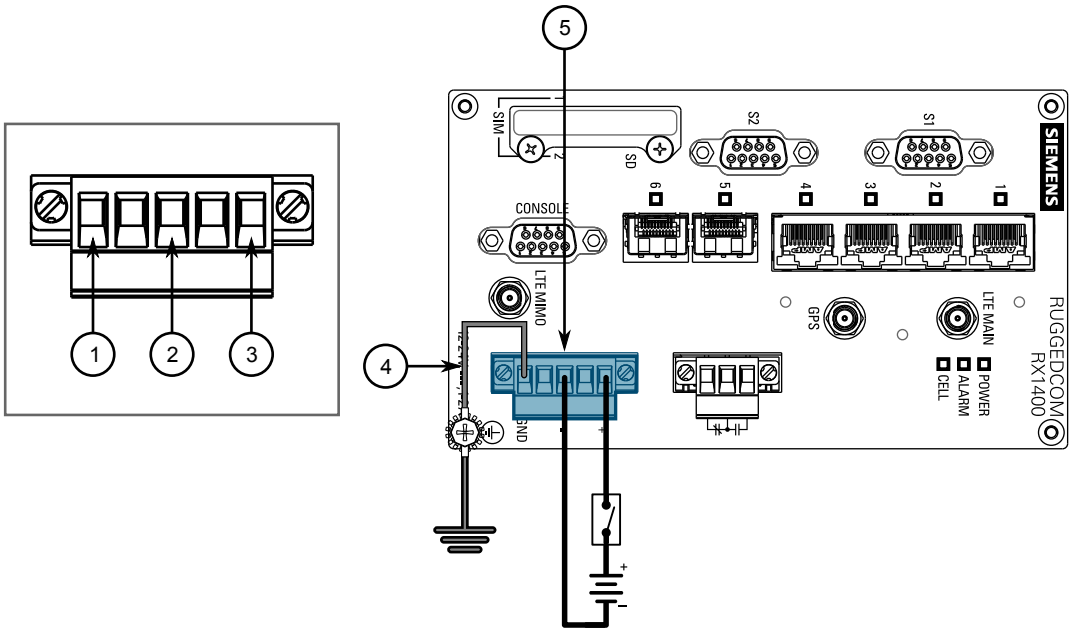


Figure 5: Terminal Block Wiring

1. Surge Ground Terminal **2.** Negative Terminal **3.** Positive Terminal **4.** Braided Ground Cable **5.** Power Supply Terminal Block

2. Connect the positive wire from the power source to the positive terminal on the terminal block.
3. Connect the negative wire from the power source to the negative terminal on the terminal block.
4. 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.
5. Connect the ground terminal on the power source to the chassis ground terminal on the device.

Section 2.4

Installing the Antennas

For increased signal coverage and improved performance, the LTE and GPS antennas are intended to be installed in a remote location separate from the RX1400.

NOTE
A specific brand of antenna is not specified.

To install the LTE and/or GPS antennas, do the following:

WARNING!
Radiation hazard – risk of Radio Frequency (RF) exposure. This device is compliant with the requirements set forth in FCC 47 CFR, section 1.1307, addressing Radio Frequency (RF) exposure from radio frequency base stations, as defined in FCC OET Bulletin 65 [http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf]. The emitted radiation should be as little as possible. To achieve minimum RF exposure, install the device when it is configured not to transmit and set it to operational mode remotely, rather than having a technician enable transmission on-site. For maintenance of the base station, or other operations which require RF exposure, the exposure should be minimized in time and according to the regulations set forth by the country of installation or the Federal Communications Commission (FCC).

WARNING!
The device must be placed at a distance of at least 20 cm (8 in) from all persons during normal operation. The antennas used for this product must not be located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter evaluation procedures.

CAUTION!
Configuration hazard – risk of reduced performance. Each antenna and connecting cable must have a nominal impedance of 50 Ω with a return loss of better than 10 dB across each frequency band. If the nominal impedance is different, Radio Frequency (RF) performance will be reduced.

IMPORTANT!
The antenna installation must be as per Article 810 of the NEC. Specifically, the grounding conductor must not be less than 10 AWG (Cu). The scheme should be either:

- *In accordance with UL 96 and 96A Lightning Protection Components and Installation Requirements for Lightning Protection Systems (LPS)*
- *Tested in accordance with UL 50 and UL 497*

IMPORTANT!
A Radio Frequency (RF) site survey is recommended prior to any installation to help determine the best location for the LTE and GPS antennas. For assistance, contact a Siemens Sales representative.

IMPORTANT!
*The cellular modem supports SISO (Single Input Single Output) and MIMO (Multiple Input Multiple Output) modes. At minimum, a single antenna connected to the **LTE MAIN** port is required for SISO mode and to support lower generation wireless standards, such as GSM or EDGE. A separate diversity (secondary) antenna is required for MIMO performance.*

IMPORTANT!
For mobile and fixed operating configurations, in accordance with FCC 47 CFR, section 2.1091, the antenna gain, including cable loss must not exceed:

- *6.5 dBi at 800/850 MHz*
- *3.0 dBi at 1900 MHz*

- *9.0 dBi at 700 MHz*
- *6.0 dBi at 1700 MHz*

Under no conditions may an antenna gain be used that would exceed the ERP and/or EIRP power limits specified in FCC 47 CFR Parts 22, 24, 27 and 90.

NOTE
For technical specifications, refer to Section 4.6, "Cellular Modem Specifications".

1. Mount the antenna to a pole or wall in an area that provides good signal coverage and is away from any signal noise emanating from other communications equipment.

   For GPS antennas only, make sure 90° of the sky is visible to the antenna.

2. Using a shielded coaxial cables, connect the antenna to the lightning protector. Make sure the cables are routed away from any noise sources, such as Switch-Mode Power Supplies (SMPS).

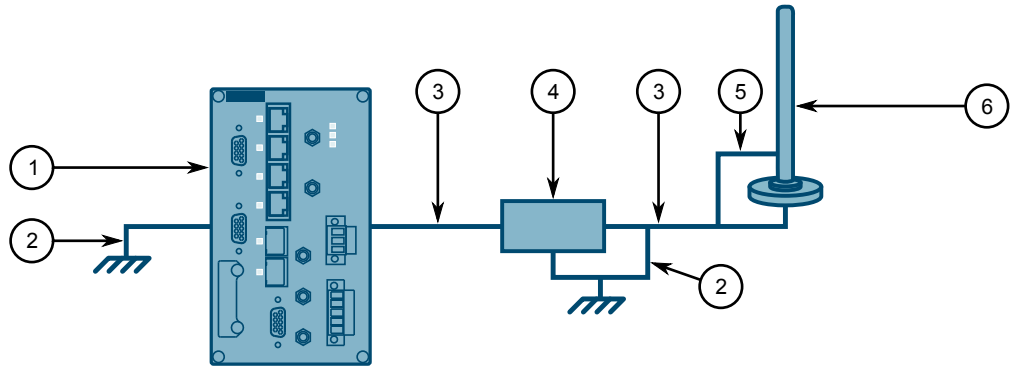


Figure 6: Antenna and Lightning Protector Assembly

1. RX1400 **2.** Drain Wire **3.** Shielded Coaxial Cable **4.** Lightning Protector **5.** Ground Wire **6.** Antenna

3. Connect the lightning protector to the appropriate antenna port on the device:
   - For an LTE primary antenna, connect the cable to the **LTE MAIN** port
   - For an LTE diversity (secondary) antenna, connect the cable to the **LTE MIMO** port
   - For the GPS antenna, connect the cable to the **GPS** port

Section 2.5
Installing the SIM Cards

The RX1400 supports dual micro-SIM cards for the LTE modem to provide a fail-over mechanism should one of the SIM cards lose connectivity with the network.

To install micro-SIM cards from a regional cellular carrier, do the following:

CAUTION!
Static electricity hazard – risk of damage to equipment. Take appropriate anti-static precautions before accessing the SIM cards.

1. Remove the SIM card access panel.

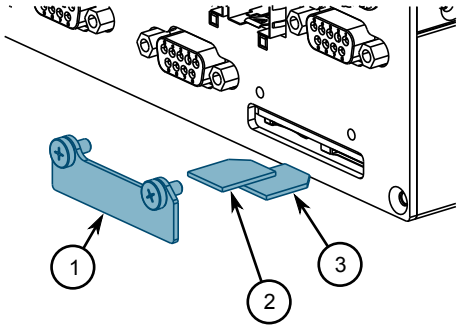


Figure 7: Accessing the SIM Cards

1. Access Panel **2.** Secondary Micro-SIM Card **3.** Primary Micro-SIM Card

2. Insert the SIM cards into the slots. Slot 1 is for the primary SIM card and slot 2 is for the secondary (backup) SIM card.
3. Close the access panel and secure it with the two screws.

Section 2.6

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 ROX II . One common application for this relay is to signal an alarm if a power failure occurs. For more information, refer to the ROX II User Guide for the RX1400.

The following shows the proper relay connections.

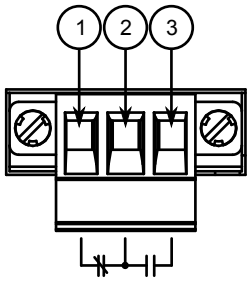


Figure 8: Failsafe Alarm Relay Wiring

1. Normally Closed **2.** Common **3.** Normally Open

Section 2.7

Connecting to the Device

The following describes the various methods for accessing the ROX II console and Web interfaces on the device. For more detailed instructions, refer to the *ROX II User Guide* for the RX1400.

Serial Console Port

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

IMPORTANT!
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:

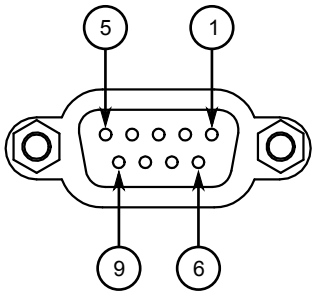


Figure 9: Serial DB9 Console Port

Pin	Name
1	Reserved (Do Not Connect)
2	Output Signal
3	Input Signal
4	Reserved (Do Not Connect)
5	Ground
6	Reserved (Do Not Connect)
7	Reserved (Do Not Connect)
8	Reserved (Do Not Connect)
9	Reserved (Do Not Connect)

For information about how to connect to the device via the serial console port, refer to the *RUGGEDCOM ROX II CLI User Guide* for the RX1400.

Communication Ports

Connect any of the available Ethernet ports on the device to a management switch and access the ROX II console and Web interfaces via the device's IP address. For more information about available ports, refer to Chapter 3, *Communication Ports*.

Section 2.8

Cabling Recommendations

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

Refer to the following sections for further recommendations and considerations:

- Section 2.8.1, “Protection On Twisted-Pair Data Ports”
- Section 2.8.2, “Gigabit Ethernet 1000Base-TX Cabling Recommendations”

Section 2.8.1

Protection On Twisted-Pair Data Ports

Siemens does not recommend the use of copper cabling of any length for critical, real-time substation automation applications. 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.

Section 2.8.2

Gigabit Ethernet 1000Base-TX Cabling Recommendations

The IEEE 802.3ab Gigabit Ethernet standard defines 1000 Mbit/s Ethernet communications over distances of up to 100 m (328 ft) using all 4 pairs in category 5 (or higher) balanced, unshielded twisted-pair cabling. For wiring guidelines, system designers and integrators should refer to the Telecommunications Industry Association (TIA) TIA/EIA-568-A wiring standard that characterizes minimum cabling performance specifications required for proper Gigabit Ethernet operation. For reliable, error-free data communication, new and pre-existing communication paths should be verified for TIA/EIA-568-A compliance.

The following table summarizes the relevant cabling standards:

Cabling Category	1000Base-TX Compliant	Required Action
< 5	No	New wiring infrastructure required.
5	Yes	Verify TIA/EIA-568-A compliance.
5e	Yes	No action required. New installations should be designed with Category 5e or higher.
6	Yes	No action required.
> 6	Yes	Connector and wiring standards to be determined.

Follow these recommendations for copper data cabling in high electrical noise environments:

- Data cable lengths should be as short as possible, preferably 3 m (10 ft) in length. Copper data cables should not be used for inter-building communications.
- Power and data cables should not be run in parallel for long distances, and should be installed in separate conduits. Power and data cables should intersect at 90° angles when necessary to reduce inductive coupling.

3 Communication Ports

The RX1400 can be equipped with various types of communication ports to enhance its abilities and performance.

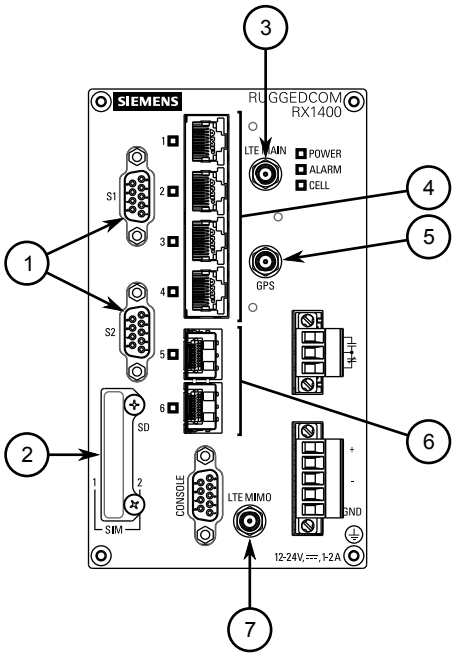


Figure 10: Port Assignment

1. Serial DB9 Ports **2.** SIM Card Slots **3.** LTE MAIN Port **4.** Fast Ethernet RJ45 Ports **5.** GPS Port **6.** SFP Ports **7.** LTE MIMO Port

The following sections describe the available ports:

NOTE
*For information about the **LTE MAIN**, **LTE MIMO** or **GPS** ports and the cellular modem, refer to Section 4.6, "Cellular Modem Specifications".*

- Section 3.1, "Fast Ethernet Ports"
- Section 3.2, "SFP Optic Ethernet Ports"
- Section 3.3, "Serial Ports"

Section 3.1
Fast Ethernet Ports

The RX1400 features four 10/100Base-TX fast Ethernet (FE) ports with RJ45 connectors. The RJ45 connectors are directly connected to the chassis ground on the device and can accept CAT-5 shielded twisted-pair (STP) cables.

For technical specifications, refer to Section 4.3, “Fast Ethernet Port Specifications”.

Each port features an LED that indicates its link state.

State	Description
Green (Solid)	Link established
Green (Blinking)	Activity
Off	No link detected

The following are the pin-out descriptions for the RJ45 connectors:

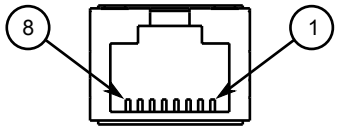


Figure 11: RJ45 Ethernet Port Pin Configuration

Pin	10/100Base-TX	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)	

Section 3.2
SFP Optic Ethernet Ports

The RX1400 features two 1000Base-FX Small Form-Factor Pluggable (SFP) optic Ethernet ports with LC (Lucent Connector) connectors.

For technical specifications, refer to Section 4.5, “SFP Optic Ethernet Port Specifications”.

IMPORTANT!
Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and oriented within the SFP cage to establish a proper link.

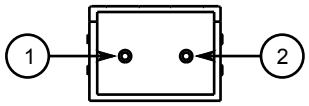


Figure 12: LC Port

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

Each port features an LED that indicates its link state.

State	Description
Green (Solid)	Link established
Green (Blinking)	Activity
Off	No link detected

NOTE
SFP ports can be safely inserted and removed while the chassis is powered and operating.

The following sections describe how to install and remove SFP optical ports:

- Section 3.2.1, “Installing an SFP Optical Port”
- Section 3.2.2, “Removing an SFP Optical Port”

Section 3.2.1

Installing an SFP Optical Port

To install an SFP optical port, do the following:

CAUTION!
Electrical hazard – risk of damage to equipment. Use only components certified by Siemens with RUGGEDCOM products. Damage to the module and device may occur if compatibility and reliability have not been properly assessed.

CAUTION!
Electrical hazard – risk of damage to equipment. Make sure all electrostatic energy is dissipated before installing or removing components from the device. An electrostatic discharge (ESD) can cause serious damage to the component once it is outside the chassis.

1. Make sure all potential electrostatic build-up has been properly discharged to prevent electrostatic discharges (ESD). This can be accomplished by wearing an ESD wrist strap or by touching Earth or the chassis ground.
2. Remove the dust cover from the port opening in the module.

   CAUTION!
   Mechanical hazard – risk of component damage. SFP optical ports are designed to insert in only one orientation. Do not force the port into the module.
3. Remove the port from its packaging.

4. Insert the port into the module and swing the bail-latch up to lock it in place.

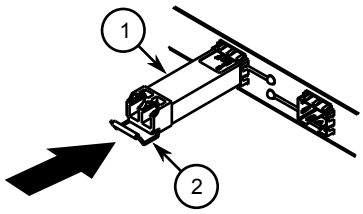


Figure 13: Installing an SFP Optical Port (Typical)

1. SFP Optical Port **2.** Metal Bail-Latch

5. Remove the dust cover from the port.
6. Connect a cable to the port and test the connection.

Section 3.2.2

Removing an SFP Optical Port

To remove an SFP optical port, do the following:

CAUTION!
Electrical hazard – risk of damage to equipment. Make sure all electrostatic energy is dissipated before performing installing or removing components from the device. An electrostatic discharge (ESD) can cause serious damage to the component once it is outside the chassis.

1. Make sure all potential electrostatic build-up has been properly discharged to prevent electrostatic discharges (ESD). This can be accomplished by wearing an ESD wrist strap or by touching Earth or the chassis ground.
2. Disconnect the cable from the port.
3. Swing the metal bail-latch down and pull the port from the module.

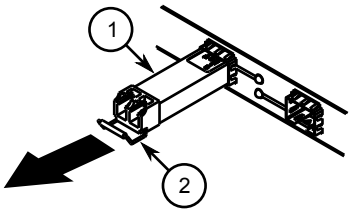


Figure 14: Removing an SFP Optical Port (Typical)

1. SFP Optical Port **2.** Metal Bail-Latch

4. Store the port in an ESD-safe bag or other suitable ESD-safe environment, free from moisture and stored at the proper temperature (-40 to 85 °C or -40 to 185 °F).
5. Insert a plug in the empty port opening to prevent the ingress of dust and dirt.

Section 3.3

Serial Ports

The RX1400 supports two serial ports with DB9 connectors, which can be run in RS232, RS485 or RS422 mode. For technical specifications, refer to Section 4.4, “Serial Port Specifications”.

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

Serial DB9 Port

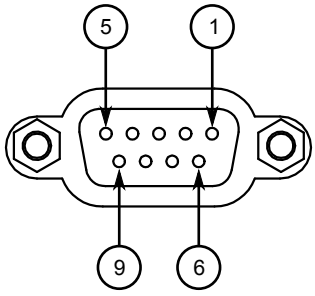


Figure 15: Serial DB9 Port Pin Configuration

Pin	Mode		
	RS232 DCE	RS422	RS485
1	Reserved (Do Not Connect)		
2	TX[a]	TX-	TX-/RX-
3	RX[a]	RX-	
4	Reserved (Do Not Connect)		
5	Common (Isolated) Ground		
6	Reserved (Do Not Connect)		
7	CTS	RX+	
8	RTS	TX+	TX+/RX+
9	Reserved (Do Not Connect)		
Shield	Chassis Ground		

[a] *In RS232 DCE mode, ports transmit to DTE devices on pin 2 and receive from DTE on pin 3.*

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.

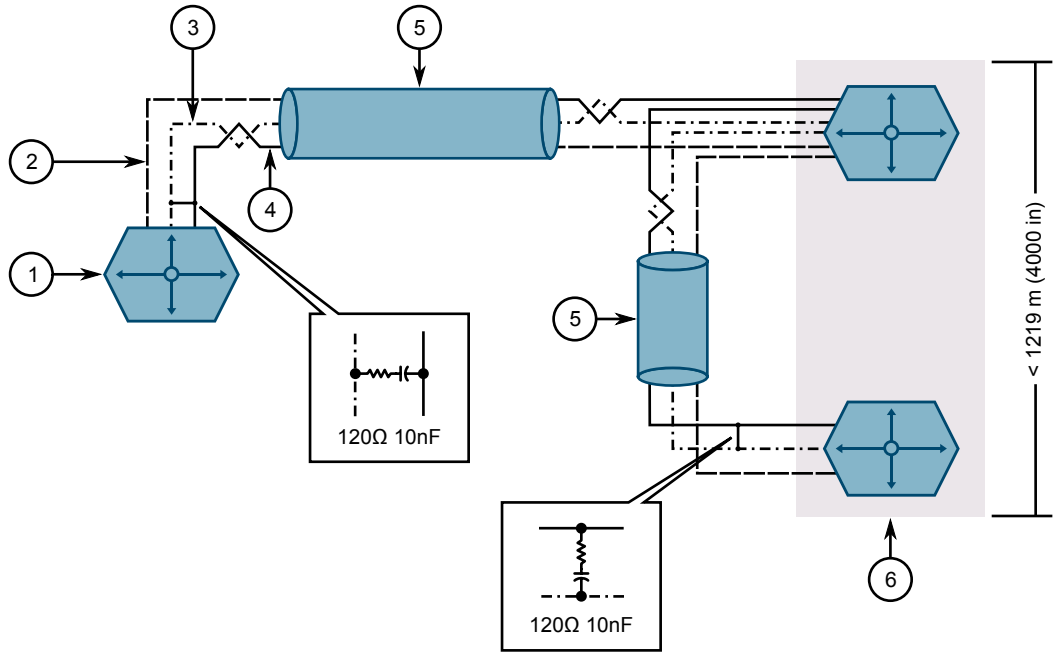


Figure 16: Recommended RS485 Wiring

1. RX1400 Device **2.** Common (Isolated Ground) **3.** Negative **4.** Positive **5.** Shield to Earth (Connected At a Single Point)
6. RS485 Devices (32 Total)

4 Technical Specifications

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

- Section 4.1, “Power Supply Specifications”
- Section 4.2, “Failsafe Alarm Relay Specifications”
- Section 4.3, “Fast Ethernet Port Specifications”
- Section 4.4, “Serial Port Specifications”
- Section 4.5, “SFP Optic Ethernet Port Specifications”
- Section 4.6, “Cellular Modem Specifications”
- Section 4.7, “Operating Environment”
- Section 4.8, “Mechanical Specifications”

Section 4.1

Power Supply Specifications

The RX1400 includes one of the following internal power supplies:

Power Supply Type	Input Range (V)		Internal Fuse Rating[a]	Max. Power Consumption[b]
	Minimum	Maximum		
12	9	36	6.3 A(T)	< 25 W
24				

[a] *(T) denotes time-delay fuse.*

[b] *Power consumption varies based on the device configuration.*

Section 4.2

Failsafe Alarm Relay Specifications

Parameter	Value (Resistive Load)
Max Switching Voltage	240 VAC 125 VDC
Rated Switching Current	2 A @ 240 VAC 0.15 A @ 125 VDC 2 A @ 30 VDC
Maximum Switching Capacity	150 W 500 VA

Section 4.3
Fast Ethernet Port Specifications

The RX1400 features four 10/100Base-TX fast Ethernet (FE) ports with RJ45 connectors. For more information about the serial ports, refer to Section 3.1, “Fast Ethernet Ports”.

Speed[c]	Connector	Duplex[c]	Cable Type[d]	Wiring Standard[e]	Maximum Distance	Isolation[f]
100 Mbps	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] *RMS 1 minute.*

Section 4.4
Serial Port Specifications

The RX1400 supports two serial ports with DB9 connectors. For more information about the serial ports, refer to Section 3.3, “Serial Ports”.

Baud Rate	Connector	Isolation
1200 to 230400 kbps	DB9	2.5 kV

Section 4.5
SFP Optic Ethernet Port Specifications

The RX1400 features two 10/100/1000Base-FX Small Form-Factor Pluggable (SFP) optic Ethernet ports with LC (Lucent Connector) connectors. For more information about the serial ports, refer to Section 3.2, “SFP Optic Ethernet Ports”.

NOTE

- *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.*
- *All optical power numbers are listed as dBm averages.*

Speed (Mbit/s)	Interface	Mode[g]	Connector Type	Tx λ (nm)[h]	Tx min (dBm)	Tx max (dBm)	Distance (km)[h]
1000[i]	SX	MM	LC	850	—	—	0.5
1000[j]	LX	SM	LC	1310	—	—	10
1000[j]	LX	SM	LC	1310	—	—	25
1000[i]	ZX	SM	LC	1550	—	—	40
1000[i]	ZX	SM	LC	1550	—	—	70

Speed (Mbit/s)	Interface	Mode[g]	Connector Type	Tx λ (nm)[h]	Tx min (dBm)	Tx max (dBm)	Distance (km)[h]
1000[k]	ZX	SM	LC	1550	—	—	100
1000[j]	BX	SM	LC	—	1310	1490	10
1000[j]	BX	SM	LC	—	1310	1490	40
1000[j]	BX	SM	LC	—	1490	1310	10
1000[j]	BX	SM	LC	—	1490	1310	40

[g] *MM = Multi-Mode, SM = Single-Mode*

[h] *Typical.*

[i] *Suitable for temperatures of -20 to 85 °C (-4 to 185 °F)*

[j] *Suitable for temperatures of -40 to 85 °C (-40 to 185 °F)*

[k] *Suitable for temperatures of 0 to 85 °C (32 to 185 °F)*

Section 4.6

Cellular Modem Specifications

Supported LTE Frequency Bands

Band	Network	Frequencies (MHz)	
		Transmit (Tx)	Receive (Rx)
Band 1	Europe	1920-1980	2110-2170
Band 2	AT&T	1850-1910	1930-1990
Band 3	Europe	1710-1785	1805-1880
Band 4 (AWS)	AT&T	1710-1755	2110-2155
Band 5	AT&T	824-849	869-894
Band 7	Europe	2500-2570	2620-2690
Band 8	Europe	880-915	925-960
Band 13	AT&T	777-787	746-756
Band 17	AT&T	704-716	734-746
Band 20	Europe	832-862	791-821
Band 25	AT&T	1850-1915	1930-1995

Supported LTE Bandwidths

Band	Network	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Band 1	Europe	×	×	✓	✓	✓	✓
Band 2	AT&T	✓	✓	✓	✓	✓	✓
Band 3	Europe	✓	✓	✓	✓	✓	✓
Band 4 (AWS)	AT&T	✓	✓	✓	✓	✓	✓

Band	Network	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Band 5	AT&T	✓	✓	✓	✓	×	×
Band 7	Europe	×	×	✓	✓	✓	✓
Band 8	Europe	✓	✓	✓	✓	×	×
Band 13	AT&T	×	×	✓	✓	×	×
Band 17	AT&T	×	×	✓	✓	×	×
Band 20	Europe	×	×	✓	✓	✓	✓
Band 25	AT&T	✓	✓	✓	✓	✓	✓

Supported WCDMA Frequency Bands

Band	Network	Frequencies (MHz)	
		Transmit (Tx)	Receive (Rx)
Band 1 WCDMA 2100	AT&T Europe	1920-1980	2110-2170
Band 2 WCDMA 1900	AT&T Europe	1850-1910	1930-1990
Band 5 WCDMA 850	AT&T Europe	824-849	869-894
Band 6 WCDMA 800	Europe	830-840	875-885
Band 8 WCDMA 900	AT&T Europe	880-915	925-960

Supported GSM Frequency Bands

Band	Frequencies (MHz)	
	Transmit (Tx)	Receive (Rx)
GSM 850	824-849	869-894
EGSM 900	880-915	925-960
DCS 1800	1710-1785	1805-1880
PCS 1900	1850-1910	1930-1990

GNSS Specifications

Satellite Channels	12 channel, continuous tracking
Protocols	NMEA 0183 v3.0
Acquisition Time	• Hot start: 1 s • Warm start: 29 s • Cold start: 32 s
Accuracy	• Horizontal: < 2 m 6.6 ft (50 %), < 5 m or 16.4 ft (90 %) • Altitude: < 4 m or 13.1 (50 %), < 8 m or 26.2 (90 %)

	• Velocity: < 0.2 m/s or 0.7 ft/s
Sensitivity	• Tracking: -161 dBm • Acquisition (Assisted, Non-LTE): -158 dBm • Acquisition (Assisted, LTE): -153 dBm • Acquisition (Standalone): -145 dBm
Operational Limits	Altitude < 6000 m (3.7 mi) or velocity < 100 m/s (328 ft/s)[l]

[l] *Either limit may be exceeded, but not both*

GNSS Standalone Antenna Requirements

Frequency Range	• Narrow-band GPS: 1572.42 MHz ± 2 MHz minimum • Wide-band GPS and GLONASS: 1565 to 1606 MHz recommended
Field of View (FoV)	• Omni-directional in azimuth • -45° to 90° in elevation
Polarization (average Gv/Gh)	> 0 dB[m]
Free space average gain (Gv+Gh) over FoV	> -3 (preferred) or -6 dBi[n]
Gain	• Maximum gain and uniform coverage in the high elevation angle and zenith • Gain in azimuth plane is not desired
Average 3D gain	> -5 dBi
Isolation between GNSS and LTE Main (Primary)	> 10 dB in all uplink bands
Typical VSWR	< 2:5:1
Polarization	Any other than LHCP (Left-Hand Circular Polarized) is acceptable.

[m] *Vertical linear polarization is sufficient.*

[n] *Gv and Gh are measured and averaged over -45 to 90° in elevation, and ± 180° in azimuth.*

Section 4.7

Operating Environment

The RX1400 can operate under the following environmental conditions:

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85 °C (-40 to 185 °F)[o]	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)	

[o] *Maximum ambient operating temperature is 70 °C (158 °F) when the device is installed along with Underwriter Laboratories (UL) listed devices.*

Section 4.8

Mechanical Specifications

Parameter	Value
Dimensions	Refer to Chapter 5, *Dimension Drawings*
Weight	2.5 kg (5.5 lb)
Ingress Protection	IP40
Enclosure	Aluminum

5 Dimension Drawings

NOTE
All dimensions are in millimeters, unless otherwise stated.

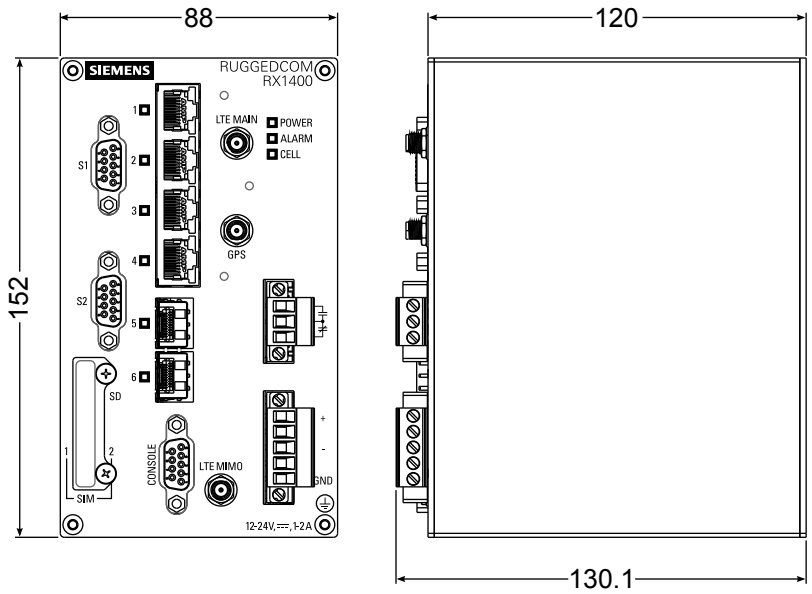


Figure 17: Overall Dimensions

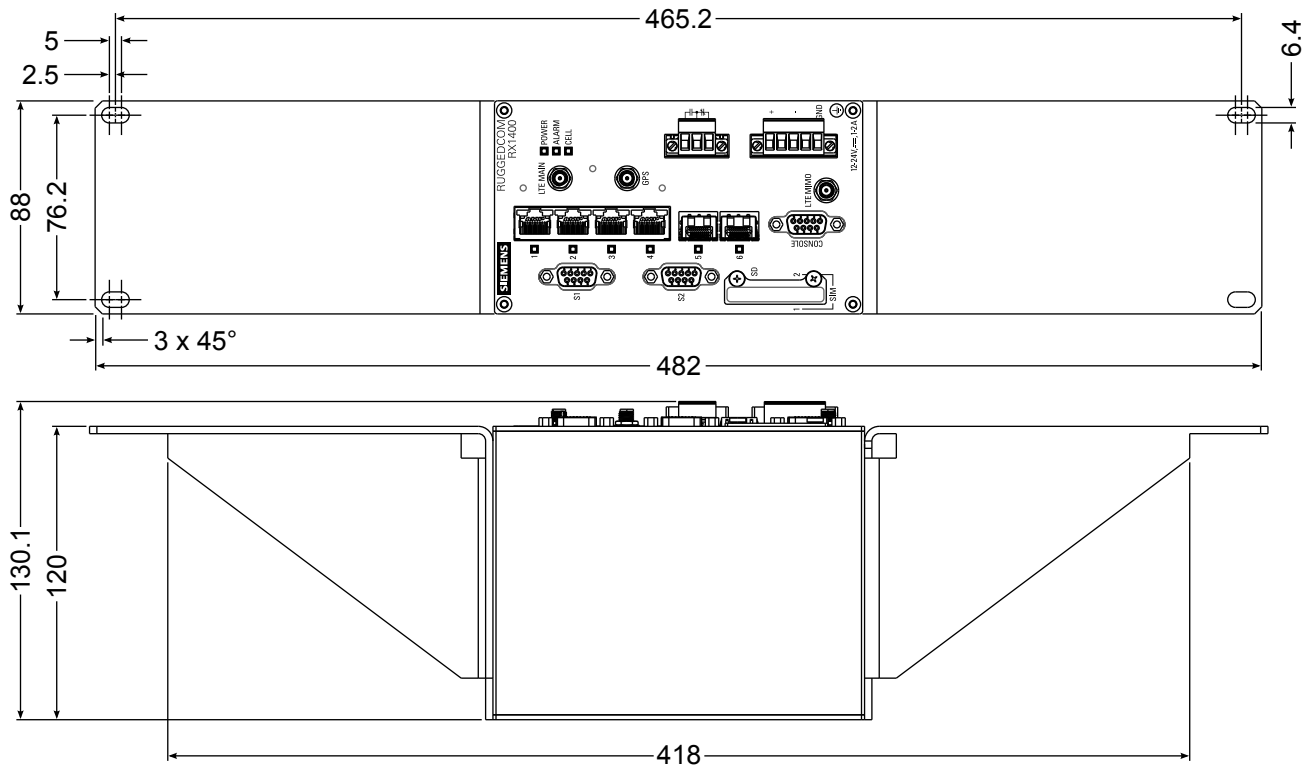


Figure 18: Rack Mount Dimensions

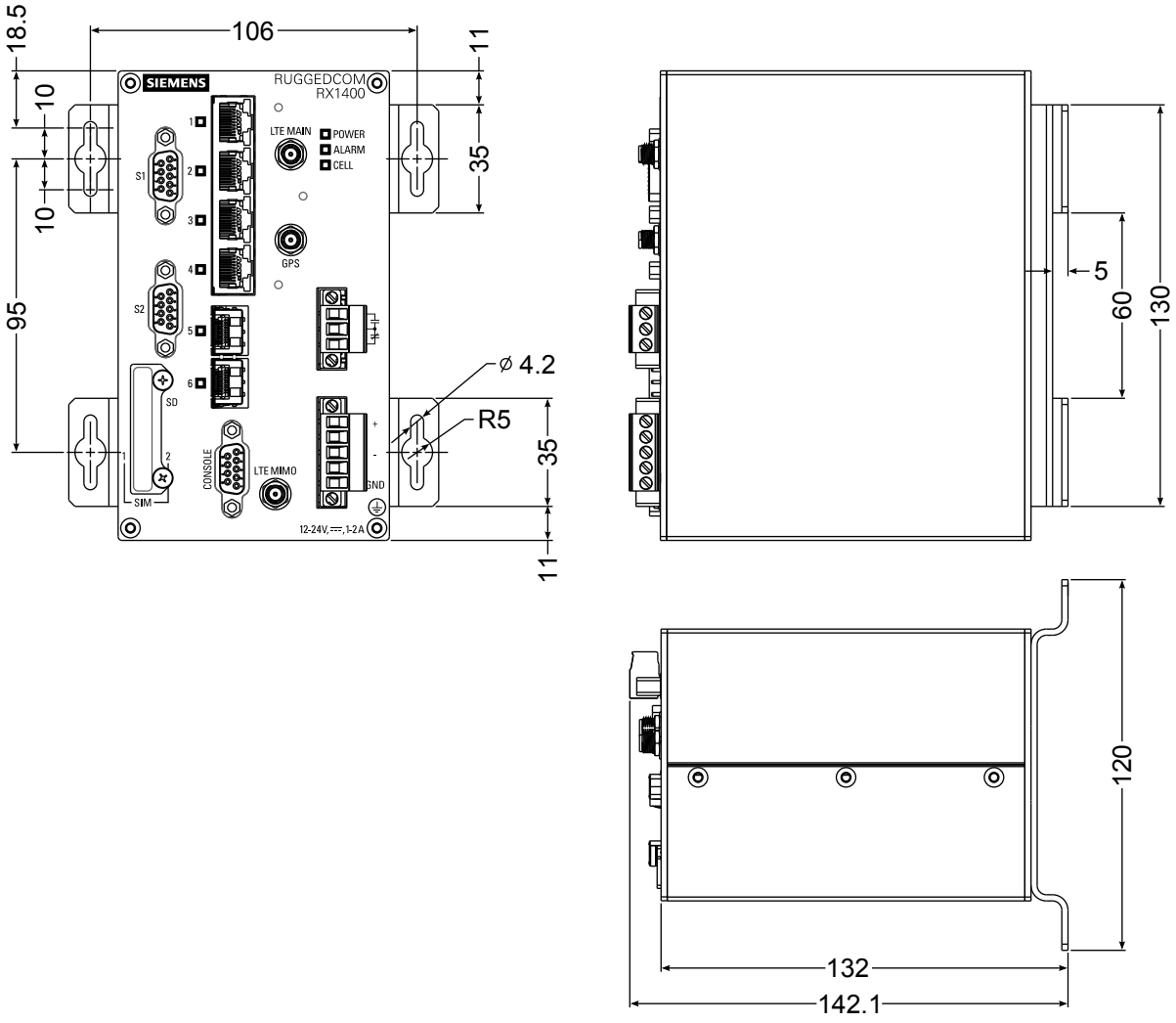


Figure 19: Panel Mount Dimensions

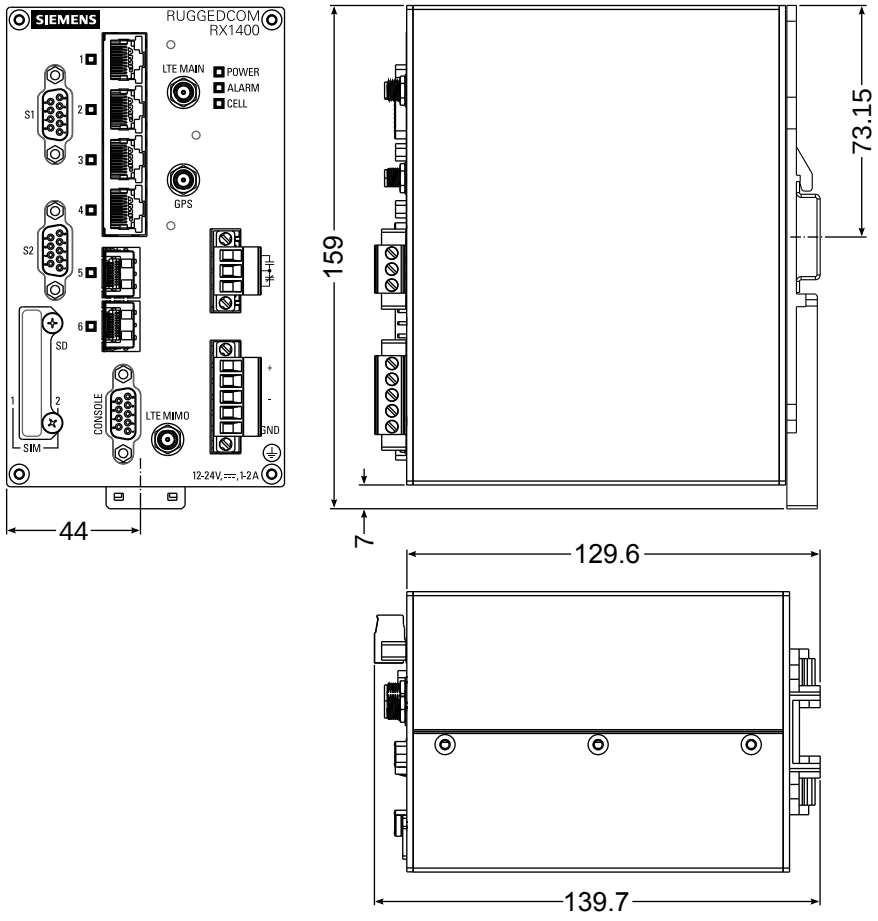


Figure 20: Din Rail Mount Dimensions

6 Certification

The RX1400 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, “EMC and Environmental Type Tests”

Section 6.1

Agency Approvals

Agency	Standards	Comments
TUV	UL 60950-1 CAN/CSA-C22.2 No. 60950-1	Approved
CE	EN 60950-1, EN 61000-6-2, EN 55022, EN 60825-1, EN 50581	CE Compliance is claimed via Declaration of Self Conformity Route
FCC	FCC Part 15, Class B	Approved
FDA/CDRH	21 CFR Chapter I, Sub-chapter J	Laser Eye Safety
ISO	ISO9001:2008	Designed and manufactured using an ISO9001: 2008 certified quality program
Industry Canada	ICES-003	

Section 6.2

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B 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
EMC and Environmental Type Tests

The RX1400 has passed the following Electromagnetic Compatibility (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	
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	
		DC Power Ports	+/- 4 kV	4
		Earth Ground Ports	+/- 4 kV	
IEC 61000-4-5	Surge	Signal ports	+/- 4 kV line-to-earth, +/- 2 kV line-to-line	
		DC Power Ports	+/- 2 kV line-to-earth, +/- 1 kV line-to-line	3
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10 V	3
		DC Power Ports		
		Earth Ground Ports		
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 61000-4-18	Damped Oscillatory Wave	Slow Damped	2.5 kV common, 100 kHz or 1 MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	30 V Continuous, 300 V for 1s	4
		DC Power Ports	30 V Continuous, 300 V for 1s	
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	
	HV Impulse	Signal ports	5 kV (Fail-Safe Relay output)	

Test	Description		Test Levels	Severity Levels
		DC Power Ports	5 kV	

[a] *Siemens-specified severity levels*

IEEE 1613 EMC Type Tests

NOTE
The RX1400 meets Class 1 requirements for copper ports.

Test	Description		Test Levels
IEEE 1613	HV Impulse	Signal ports	5 kV (Fail-Safe Relay Output)
		DC Power Ports	5 kV
	Dielectric Strength	Signal ports	2 kVAC
		DC Power Ports	1.5 kVDC
	Fast Transient (SWC)	Signal ports	+/- 4 kV @ 2.5 kHz
		DC Power Ports	+/- 4 kV
		Earth Ground Ports	
	Oscillatory (SWC)	Signal ports	2.5 kV common mode @1 MHz
		DC Power Ports	2.5 kV common, 1 kV differential mode @ 1 MHz
	Radiated RFI	Enclosure ports	35 V/m
	ESD	Enclosure Contact	+/-2 kV, +/-4 kV, +/- 8 kV
		Enclosure Air	+/-4 kV, +/-8 kV, +/-15 kV
IEEE 1613.1/ IEC 61000-4-10	Damped Oscillating Magnetic Field	Enclosure Ports	100 A/m for 1 s (100 kHz and 1 MHz)

Environmental Type Tests

Test	Description		Test Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40 °C (-40 °F), 16 Hours
	Cold Storage	Test Ab	-40 °C (-40 °F), 16 hours
IEC 60068-2-2	Dry Heat	Test Bd	85 °C (185 °F), 16 Hours
	Dry Heat Storage	Test Bb	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 60068-78	Humidity (Damp Heat, Steady State)		10 days @ 55 °C (131 °F) and 93% relative humidity
IEC 60255-21-1	Vibration		2 g @ 10-150 Hz
IEC 60255-21-2	Shock		30 g @ 11 mS
IEC 60255-21-3	Seismic		Method A, Class 2
IEC 61850-3:2013	Change of Temperature		5 Cycles (-40 to 85 °C or -40 to 185 °F)

Test	Description	Test Levels
IEC 60068-1-14:2013		