SIEMENS

RUGGEDCOM RSG2488

Installation Guide

4/2015
RC1048-EN-04

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Table of Contents

Preface

This guide describes the RUGGEDCOM RSG2488. 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.

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

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

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

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

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

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

Related Documents

Other documents that may be of interest include:

- *ROS User Guide for the RSG2488*

Accessing Documentation

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- **Online**

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  - 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 RSG2488 is a utility grade, fully managed, industrial Ethernet switch designed to operate reliably in harsh environments. With a rugged metal enclosure and an optional conformal coating, the RUGGEDCOM RSG2488 provides a high level of immunity to electromagnetic interference and heavy electrical surges, and can withstand temperatures between -40 and 85 °C (-40 and 185 °F).

Highly modular, the RSG2488 switch supports up to 28 electrical and/or optical interfaces with data transfer rates of 10/100/1000 Mbit/s. This makes it the ideal industry-standard switch for constructing electrical and/or optical line, ring and star topologies.

The following sections provide more information about the RSG2488:

Section 1.1

Feature Highlights

Extreme Flexibility

- Support for up to a total of 28 non-blocking ports (six 4-port modules and two 2-port modules)
- Mixture of fiber optic or copper Gigabit ports with up to 28 Gig Ethernet ports
- All-aluminum construction

Compact 1U Form Factor

- Space-saving design

Vertical Loading Modular Design

- Allows for simple, cost effective in-field servicing and upgrading

Dual Redundant Smart Power Supplies

- Hot-swappable, cable-free
- HI voltage AC/DC: 100-300 V DC or 88-264 V AC
- Smart power supplies able to detect loss of input voltage

Fast Network Fault Recovery

- Less than 5 ms per hop (typical)

Reliability in harsh environments

- Immunity to EMI and heavy electrical surges
  - Zero-Packet-Loss Technology
  - Meets IEEE 1613 Class 2 (electric utility substations)[1]

[1] Requires Siemens FastConnect connectors and shielded cable

  - Exceeds IEC 61850-3 (electric utility substations)
  - Exceeds IEC 61000-6-2 (generic industrial)
- Supports Siemens FastConnect RJ45 Cabling System
- -40 to 85 °C (-40 to 185 °F) operating temperature (fanless)
- Conformal coated printed circuit boards (optional)

Section 1.2
Description

The RUGGEDCOM RSG2488 features various ports, controls and indicator LEDs on the front panel for connecting, configuring and troubleshooting the device.

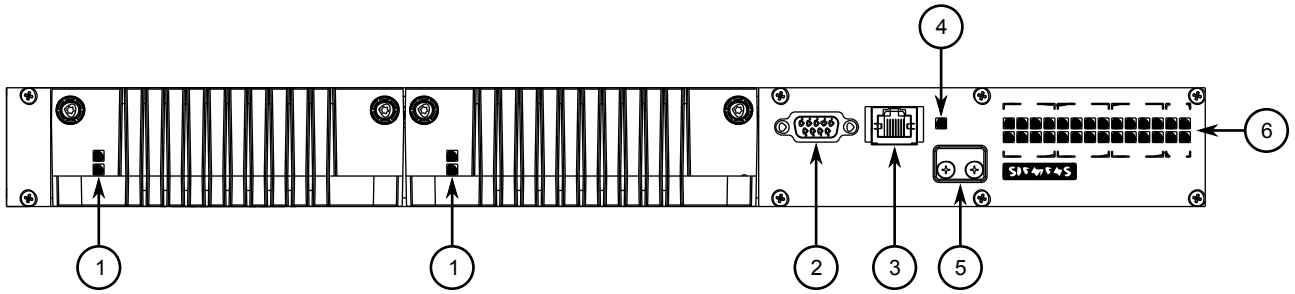

Figure 1: RUGGEDCOM RSG2488

1. Power Module Indicator LEDs **2.** RS-232 Serial Console Port **3.** Management Port **4.** Alarm Indicator LED **5.** Access Plate **6.** Port Status Indicator LEDs

- **Power Module Indicator LEDs** – The power module indicator LEDs indicate the status of the power modules. The top LED indicates the power supply is supplying power. The bottom LED indicates the power supply is receiving power.
- **RS-232 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”.
- **Management Port** – The 10/100Base-T Ethernet management port is for system management that is out-of-band from the switch fabric. For information about connecting to the device via the 10/100Base-T Ethernet management port, refer to Section 2.7, “Connecting to the Device”.
- **Alarm Indicator LED** – The alarm indicator LED illuminates when an alarm condition exists.
- **Access Plate** – The removable access plate provides access to the microSD slot. Use a microSD card to load/store the firmware and configuration for the device. For information about using a microSD card, refer to Section 2.6, “Inserting/Removing the MicroSD Card”.
- **Port Status Indicator LEDs** – Port status indicator LEDs indicate the operational status of each port. For more information, refer to Chapter 3, *Communication Ports*.

Section 1.3

Precision Time Protocol (PTP) Support

The Precision Time Protocol (PTP) module adds the ability to provide time synchronization via Ethernet using the Precision Time Protocol (PTP) and Network Time Protocol (NTP), and to synchronize with an external IRIG-B source or GPS network.

The PTP module features BNC ports for AM IN/OUT, TTL IN/OUT and GPS IN. It also includes an LED to indicate when synchronization has been achieved.

NOTE
The AM IN port is non-functional.

NOTE
The PTP module can only be installed in slot 1. For more information, refer to Chapter 3, Communication Ports.

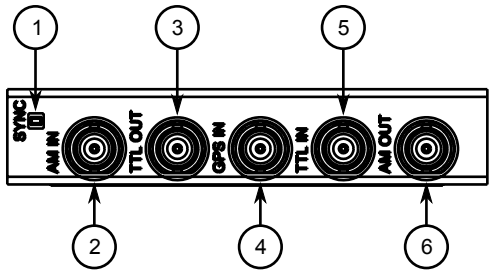

Figure 2: PTP Module

1. Synchronization LED **2.** AM IN Port **3.** TTL OUT Port **4.** GPS IN Port **5.** TTL IN Port **6.** AM OUT Port

For more information about the BNC ports, refer to Section 3.4, “BNC Ports”.

The following sections describe the PTP support in more detail:

- Section 1.3.1, “Supported Time Synchronization Sources”
- Section 1.3.2, “AM and TTL Outputs”
- Section 1.3.3, “IEEE 1588 Support”

Section 1.3.1

Supported Time Synchronization Sources

The following time synchronization sources are supported by the RSG2488, with or without the PTP card:

Synchronization Source	Without PTP Card	With PTP Card
NTP	✓	✓
IEEE 1588 v2	✓	✓
IRIG-B PWM	×	✓

Synchronization Source	Without PTP Card	With PTP Card
GPS	×	✓

NTP

NTP (Network Time Protocol) is the standard for synchronizing the clocks of computer systems throughout the Internet and is suitable for systems that require accuracies in the order of 1 ms.

IRIG-B PWM

IRIG-B time synchronization is an even older, established, inter-device time synchronization mechanism providing accuracy in sub-milliseconds.

GPS

The Global Positioning System (GPS), as a source of accurate time, requires an external GPS antenna input to provide accurate time signals comparable to 500 ns. The RSG2488 can use the GPS receiver on the PTP module to provide the time base for the system.

IEEE 1588

IEEE 1588 is designed to provide networked, packet-based time synchronization between different networking nodes (PTP devices). The RSG2488 supports PTP v2, which is defined in the IEEE 1588-2008 standard. IEEE 1588 is designed to fill a niche not well served by either of the two older, dominant protocols, NTP and IRIG-B. IEEE 1588 is also designed for applications that cannot bear the cost of a GPS receiver at each node or for which GPS signals are inaccessible.

The RSG2488 supports ordinary clock, boundary clock, peer-to-peer transparent clock, and end-to-end transparent clock modes. An ordinary clock can be configured as either a Grandmaster Clock (GM) or a Slave Clock (SC) within the master-slave hierarchy.

Every Ethernet port on the RSG2488 supports IEEE 1588. For more information, refer to Section 1.3.3, “IEEE 1588 Support”.

Section 1.3.2

AM and TTL Outputs

The PTP card provides AM (Amplitude Modulated) and TTL (Transistor-Transistor Logic) outputs.

The AM OUT port supports the IRIG-B AM signal format, while the TTL OUT port supports the IRIG-B PWM and PPS signal formats. Enabling/disabling the output ports and – in the case of TTL OUT – selecting the signal format is controlled through the RUGGEDCOM ROS operating system.

The number of devices that can be connected to the AM OUT and TTL Out ports is dependent on the cabling type and length, as well as the input impedances of the devices. The following simplified circuit schematic shows the interface between an IRIG-B source and connected devices.

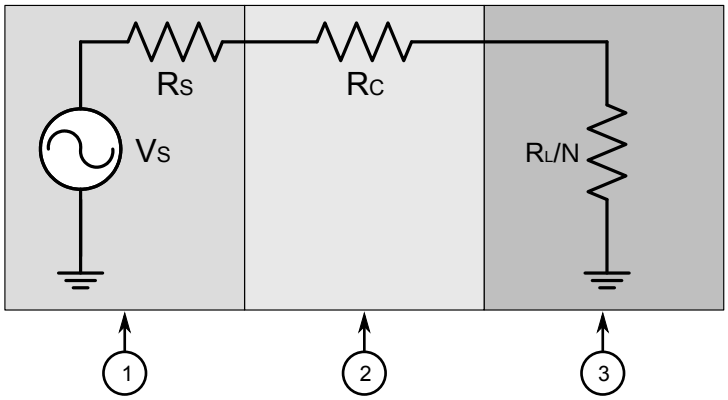

Figure 3: IRIG-B Simplified Circuit Schematic

1. Source **2.** Cabling **3.** Device

The maximum number of devices (N) that can be connected to the source is determined by checking if the source current (IS) required to drive the connected devices is less than the maximum drive current the source can provide, and verifying that the load voltage (VL) the connected devices see is greater than the minimum required voltage.

Section 1.3.3

IEEE 1588 Support

RSG2488 supports various IEEE 1588 time synchronization capabilities and provides synchronization in 1-step and 2-step modes. However, of the 28 ports available, ports 2/4, 4/4, 6/4 and 7/2 only support 1-step mode and select clock types. All other ports support both modes and all clock types.

Clock Type	1-Step and 2-Step Ports	1-Step Only Ports
1-Step Peer-to-Peer Transparent Clock	✓	✓
End-to-End Transparent Clock	✓	✓
End-to-End Slave Clock	✓	×
End-to-End Master Clock	✓	×
Peer-to-Peer Slave Clock	✓	×
Peer-to-Peer Master Clock	✓	✓
Peer-to-Peer Ordinary/Transparent Clock	✓	×
Boundary Clock	✓	×

2 Installing the Device

The following sections describe 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 may contain 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!
Attempted service by unauthorized personnel shall render all warranties null and void.

Changes or modifications not expressly approved by Siemens Canada Ltd. could invalidate specifications, test results, and agency approvals, and void the user's authority to operate the equipment.

IMPORTANT!
This product should be installed in a restricted access location where access can only be gained by authorized personnel who have been informed of the restrictions and any precautions that must be taken. Access must only be possible through the use of a tool, lock and key, or other means of security, and controlled by the authority responsible for the location.

Section 2.1

Mounting the Device

The RSG2488 is designed for maximum mounting and display flexibility. It can be ordered with connectors 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 2.1.1, “Mounting the Device to a Rack”
- Section 2.1.2, “Mounting the Device on a DIN Rail”
- Section 2.1.3, “Mounting the Device to a Panel”

Section 2.1.1
Mounting the Device to a Rack

For rack mount installations, the RSG2488 can be ordered with rack mount adapters pre-installed at the front and 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:

1. Make sure the front and rear rack mount adapters are installed on the both sides 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.

   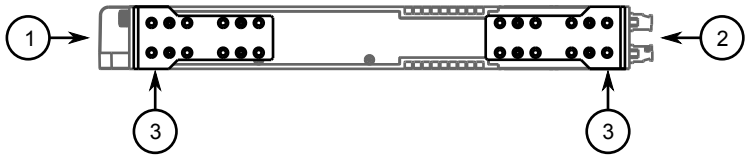

   Figure 4: Rack Mount Adapters

   1. Rear **2.** Front **3.** Rack Mount Adapter

2. Insert the device into the rack. To make the modules and ports accessible from the front, insert the power supply side of the device first. Reverse the orientation to have the power supplies, management ports and LEDs accessible from the front.

   NOTE
   Since heat within the device is channeled 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.

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

Section 2.1.2
Mounting the Device on a DIN Rail

For DIN rail installations, the RSG2488 can be ordered 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.

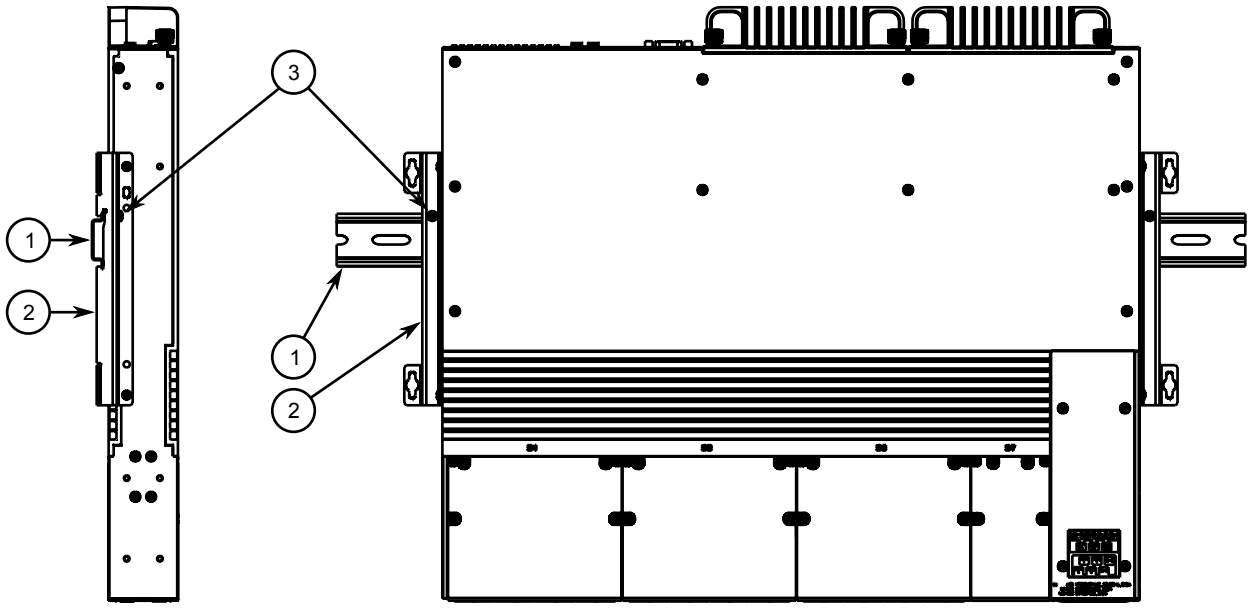

Figure 5: DIN Rail Mounting

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

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

Section 2.1.3
Mounting the Device to a Panel

For panel installations, the RSG2488 can be ordered 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.

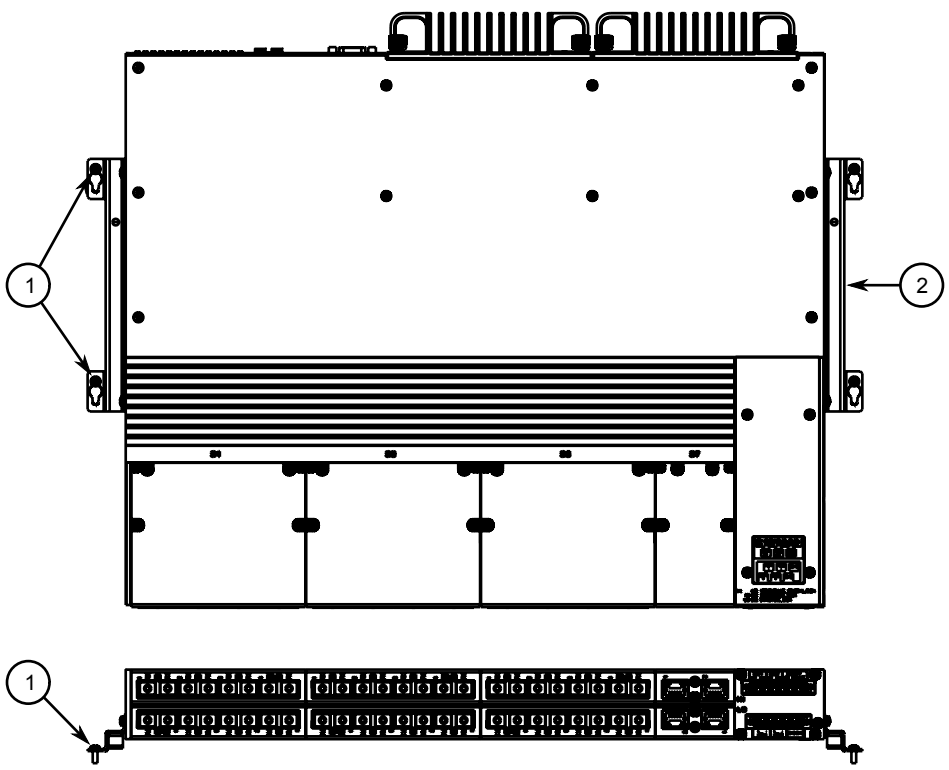

Figure 6: Panel Mounting

1. Screw **2.** Panel/DIN Rail Adaptor

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

Section 2.2

Installing the GPS Antenna (If Required)

For increased signal coverage and improved performance, the GPS antenna is intended to be installed in a remote location separate from the RSG2488. The signals received from the GPS satellite network are at a frequency of 1575.42 MHz. The GPS antenna must therefore have a clear view of the sky to receive the low power signals and track the maximum number of satellites. Structures, such as rooftops, that are clear of obstructions and have a clear view of the horizon are ideal.

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

NOTE
Although it is impossible to protect the antenna from a direct lightning strike, the antenna and connected components can be protected from secondary effects through site selection and by installing protection devices.

Install the antenna at least 15 m (49 ft) away from and lower than any structures that attract lightning. GPS antenna damage is usually not the result of a direct lightning strike, but due to high currents induced by the effects of a lightning strike on a nearby structure. Lightning arrestors should also be installed in the antenna line to protect the receiver and connected devices. If a lightning arrestor is installed, it is important to make sure it has a low impedance path to ground.

NOTE
Although an active antenna has gain, depending on the length of the coaxial cable used, it may not be enough. In such a case, a line amplifier will be required as well. Most active antennas include filters. However, if there is a high potential for electromagnetic interference – such as from the near field of a radio transmitter – through the antenna system, additional antenna line filtering may be necessary.

A typical GPS system includes the following components:

- An active GPS antenna (required)
- Coaxial cables (required)
- Lightning arrestor (optional)
- Line amplifier or bandpass filter (optional)

NOTE
Siemens offers an antenna kit for the RSG2488 , which includes a GPS antenna, mounting bracket and coaxial cable. For more information, contact a Siemens Sales representative.

To promote signal reception and avoid signal saturation at the receiver input, the overall GPS system requires a relative gain between 5 and 18 dBi.

Use only low loss, 50 Ω coaxial cabling when connecting the GPS and any other optional components to the RSG2488.

NOTE
Using any length of coaxial cable will add some time delay to the GPS signal, which degrades the accuracy of the calculated time and position. The time delay is dependent on the type of dielectric material in the cable and ranges from 1 to 2 ns/ft. The table below gives some examples of the delay that can be expected based on the dielectric type.

Dielectric Type	*Time Delay (ns/ft)*	*Propagation Velocity (% of c)*
Solid Polyethylene (PE)	*1.54*	*65.9*
Foam Polyethylene (FE)	*1.27*	*80.0*
Foam Polystyrene (FS)	*1.12*	*91.0*
Air Space Polyethylene (ASP)	*1.15-1.21*	*84-88*
Solid Teflon (ST)	*1.46*	*69.4*
Air Space Teflon (AST)	*1.13-1.20*	*85-90*

To install the GPS antenna, do the following:

WARNING!
Radiation hazard – risk of Radio Frequency (RF) exposure. This device is compliant with the requirements set forth in CFR 47, 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).

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*

NOTE

For technical specifications, refer to Section 4.5, "GPS Antenna 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. Make sure 90° of the sky is visible to the antenna.
2. If required, connect the optional lightning arrestor, line amplifier or bandpass filter to the antenna.
3. Connect the antenna assembly to the **GPS** port on the device.

Section 2.3

Connecting Power

The RSG2488 supports dual redundant AC and/or DC power supplies that can be installed in any combination. The use of two power modules is recommended to provide redundancy and load balancing.

The RSG2488 can be equipped with either a screw-type or pluggable terminal block, which provides power to both power supplies. The screw-type terminal block is installed using Phillips screws and compression plates, allowing either bare wire connections or crimped terminal lugs. Use #6 size ring lugs for secure, reliable connections under severe shock or vibration.

DANGER!

Electrocution hazard – risk of serious personal injury or death. The device may have two power supplies equipped, which may be connected to separate power sources. Make sure all power sources are off before servicing the power supply terminals.

CAUTION!

Electrical hazard – risk of damage to equipment. Do not connect wiring to unused power supply input terminals. For instance, if a Low DC power supply is installed in the PS1 slot, do not connect the PS1 High AC/DC terminals to a power source.

IMPORTANT!

- *In a high AC/DC and low DC (24/48 V) power supply arrangement, the placement of the AC and DC power supplies is not slot-dependent. However, if a high AC/DC power supply is installed in slot PS1, the high AC/DC wiring must be connected to the high terminal block PS1 terminals. If a low DC power supply is installed in slot PS1, the low DC wiring must be made to the low terminal block PS1*

terminals. High voltage wiring is always made to the upper Hi terminal block and low voltage (24/48 V) wiring is always made to the lower Lo terminal block.

- *Use only #16 gage wiring when connecting terminal blocks.*
- *The maximum wire length between the terminal block and power source must not exceed 6 m (20 ft) for 24 V power supplies or 18 m (60 ft) for 48 V power supplies.*
- *A circuit breaker rated no higher than 20 A must be installed between the device and the supply mains.*
- *Whenever possible, use a separate circuit breaker for each power supply.*
- *For maximum redundancy in a dual power supply configuration, use two independent power sources.*
- *A socket outlet/disconnect device must be installed near the device and be easily accessible.*
- *Equipment must be installed according to applicable local wiring codes and standards.*

The following sections describe how to connect power to the device:

- Section 2.3.1, “Installing/Removing Power Supplies”
- Section 2.3.2, “Connecting High AC/DC Power”
- Section 2.3.3, “Connecting Low DC Power”
- Section 2.3.4, “Wiring Examples”

Section 2.3.1
Installing/Removing Power Supplies

The RSG2488 supports dual redundant AC and/or DC power supplies that can be installed in any combination. Slots for the removable power modules are located on the front panel of the device.

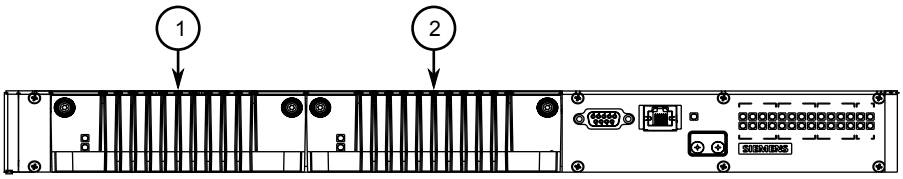

Figure 7: Power Module Slots

1. Slot PS1 **2.** Slot PS2

The following sections describe how to install, remove and wire the power supplies:

- Section 2.3.1.1, “Installing the Power Supplies”
- Section 2.3.1.2, “Removing the Power Supplies”

Section 2.3.1.1
Installing the Power Supplies

To install a power supply, do the following:

NOTE
The power supplies are hot swappable. It is not necessary to disconnect power to the device before installing or removing a power supply.

1. Remove the blank power module assembly or, if equipped, the currently installed power supply. For information about removing power supplies, refer to Section 2.3.1.2, “Removing the Power Supplies”.
2. Insert the power supply into the empty slot. When power is supplied to the device, the top and bottom LEDs on the power supply should be green, indicating that power is being received and supplied to the device.

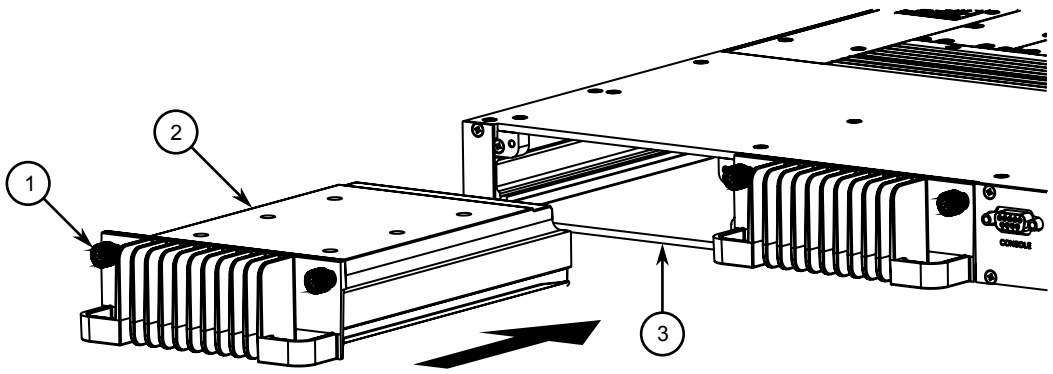

Figure 8: Installing a Power Supply

1. Screws **2.** Power Supply **3.** Slot

3. Hand-tighten the screws to secure the power supply.

Section 2.3.1.2
Removing the Power Supplies

To remove a power supply, do the following:

NOTE
The power supplies are hot swappable. It is not necessary to disconnect power to the device before installing or removing a power supply.

1. Remove the screws that secure the power supply.
2. Pull the power supply from the chassis.

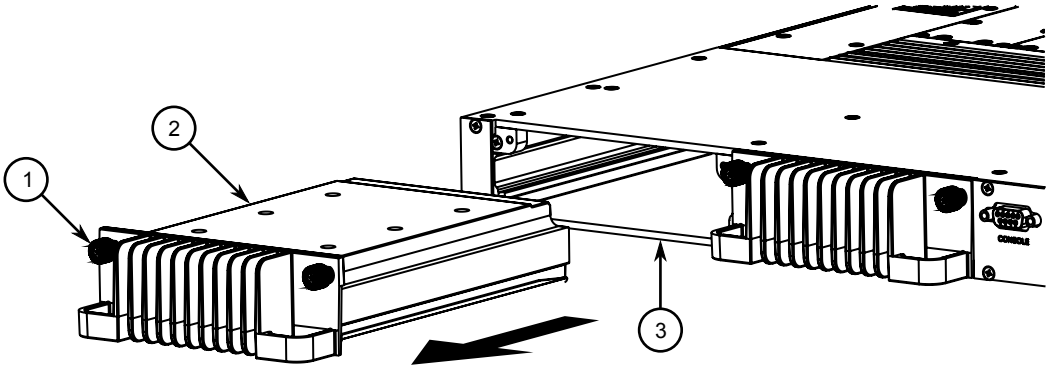

Figure 9: Removing a Power Supply

1. Screws **2.** Power Supply **3.** Slot

3. Install the blank power module assembly into the empy slot to prevent the ingress of dust and dirt.

Section 2.3.2

Connecting High AC/DC Power

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

DANGER!
Electrocution hazard – risk of death, serious personal injury and/or damage to the device. Make sure the supplied cover is always installed over high voltage screw-type terminal blocks.

CAUTION!
Electrical hazard – risk of damage to equipment. Do not connect AC power cables to a DC power supply terminal block. Damage to the power supply may occur.

NOTE
The screw-type terminal block is installed using Phillips screws and compression plates, allowing either bare wire connections or crimped terminal lugs. Use #6 size ring lugs for secure, reliable screws, which must be removed to make connections.

1. Connect the positive wire from the power source to the positive/live (+/L) terminal on the terminal block.

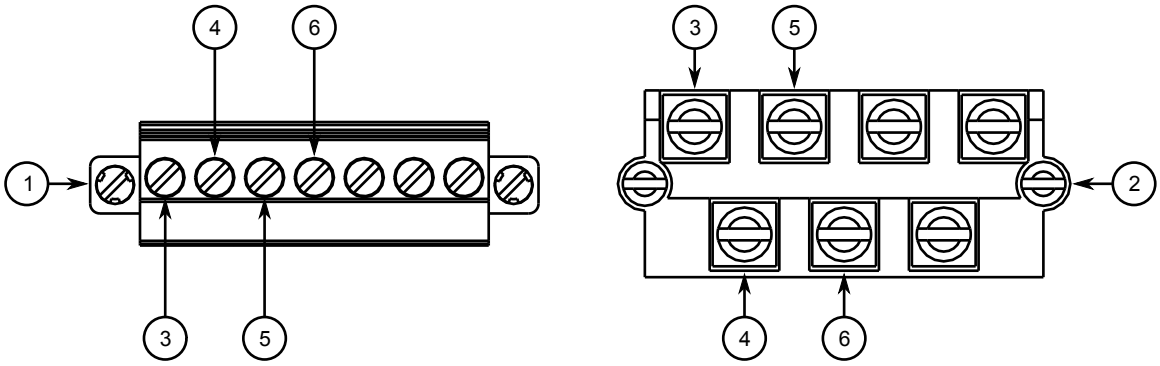

Figure 10: AC Terminal Block Wiring

1. Pluggable Terminal Block for HI Power Supplies **2.** Screw-Type Terminal Block for HIP Power Supplies **3.** Positive/Live (+/L) Terminal for PS1 **4.** Neutral/Negative (-/N) Terminal for PS1 **5.** Positive/Live (+/L) Terminal for PS2 **6.** Neutral/Negative (-/N) Terminal for PS2

2. Connect the negative wire from the power source to the neutral/negative (-/N) terminal on the terminal block.
3. Connect the ground terminal on the power source to the ground terminal on the device. For more information, refer to Section 2.5, “Grounding the Device”.

Section 2.3.3
Connecting Low DC Power

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

NOTE
The screw-type terminal block is installed using Phillips screws and compression plates, allowing either bare wire connections or crimped terminal lugs. Use #6 size ring lugs for secure, reliable screws, which must be removed to make connections.

1. Connect the positive wire from the power source to the positive terminal on the terminal block.

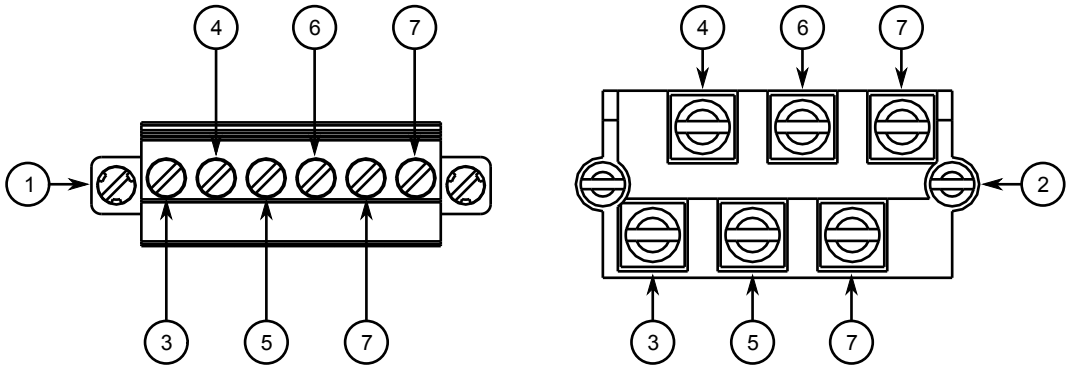

Figure 11: DC Terminal Block Wiring

1. Pluggable Terminal Block for 24P and 48P Power Supply **2.** Screw-Type Terminal Block for 24 and 48 Power Supply **3.** Positive Terminal for PS1 **4.** Negative Terminal for PS1 **5.** Positive Terminal for PS2 **6.** Negative Terminal for PS2 **7.** Chassis Ground

2. Connect the negative wire from the power source to the negative terminal on the terminal block.
3. Connect the ground terminal on the power source to the ground terminal on the device. For more information, refer to Section 2.5, “Grounding the Device”.

Section 2.3.4

Wiring Examples

The following illustrate how to connect power to single and dual power supplies.

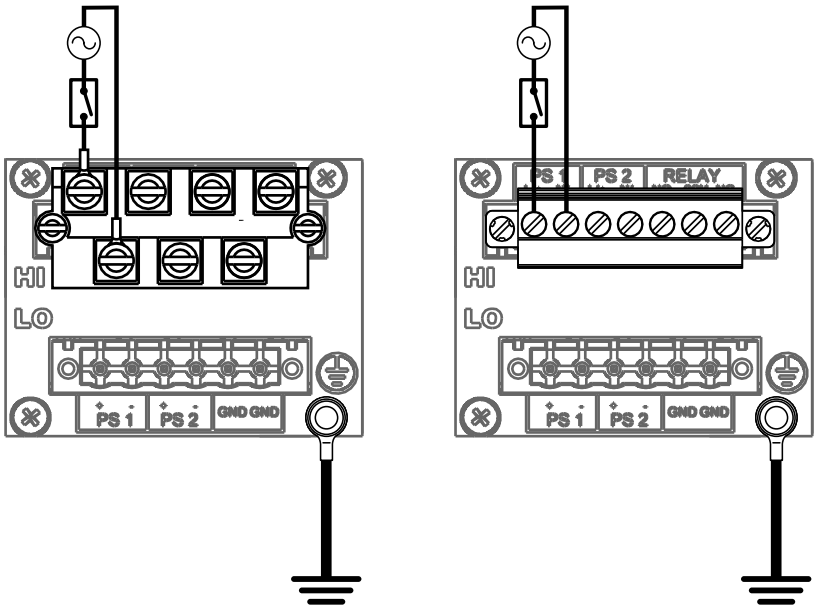

Figure 12: Single High AC/DC Power Supply

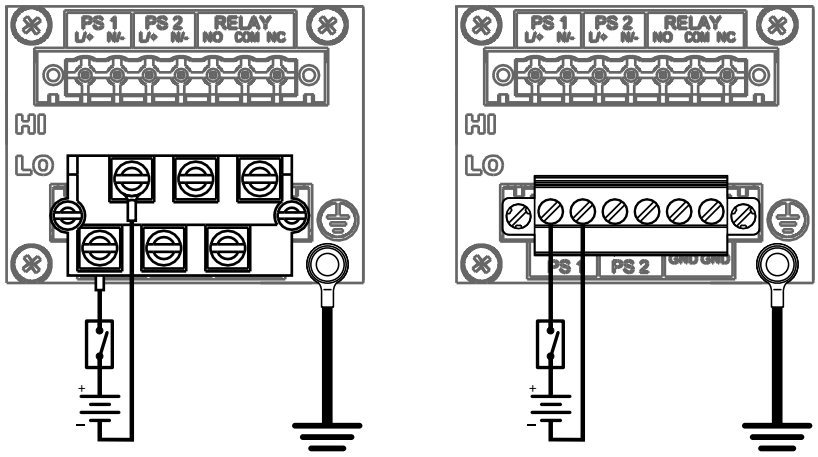

Figure 13: Single Low DC Power Supply

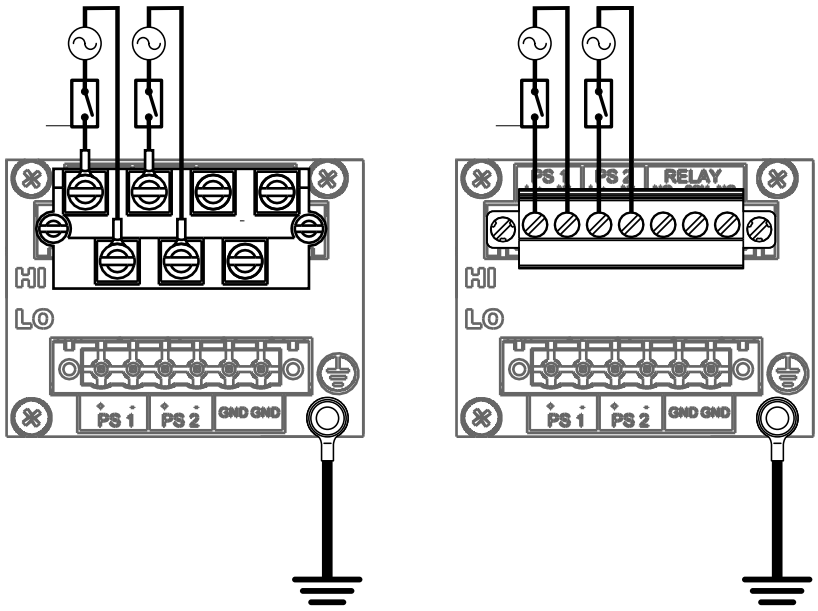

Figure 14: Dual High AC/DC Power Supply

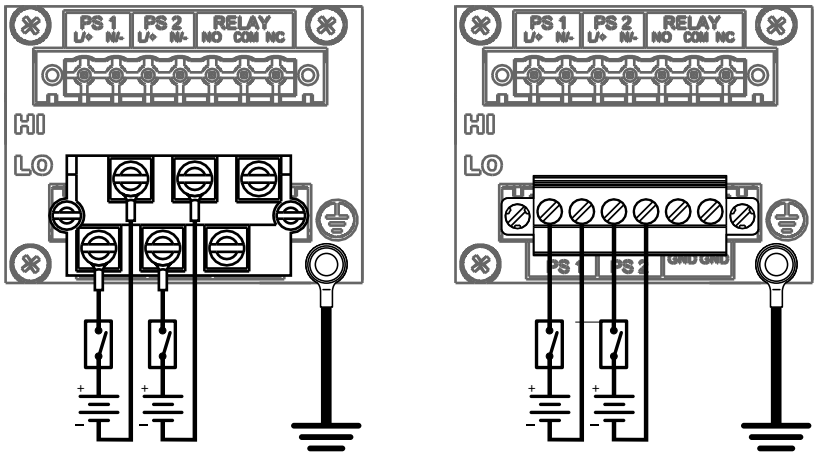

Figure 15: Dual Low DC Power Supply

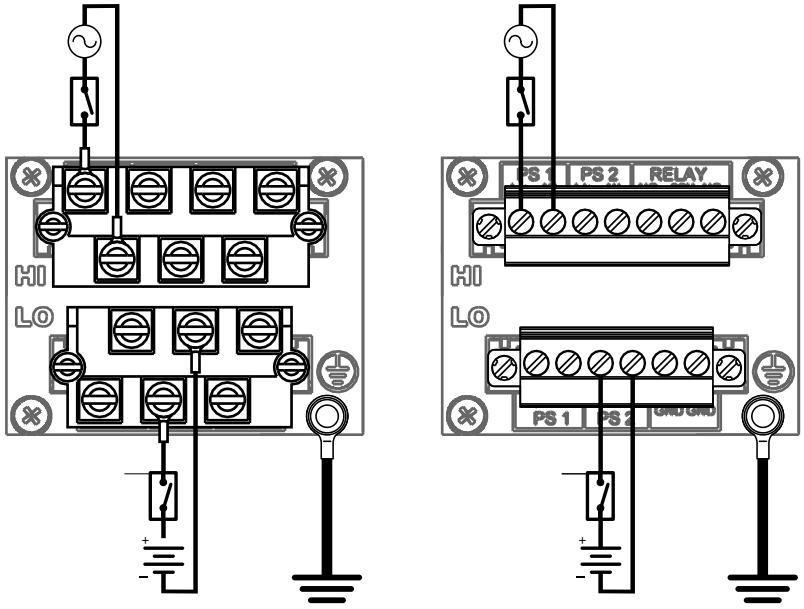

Figure 16: High AC/DC Power Supply and Low DC Power Supply

Section 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 ROS . One common application for this relay is to signal an alarm if a power failure occurs. For more information, refer to the ROS User Guide for the RSG2488.

The following shows the proper relay connections.

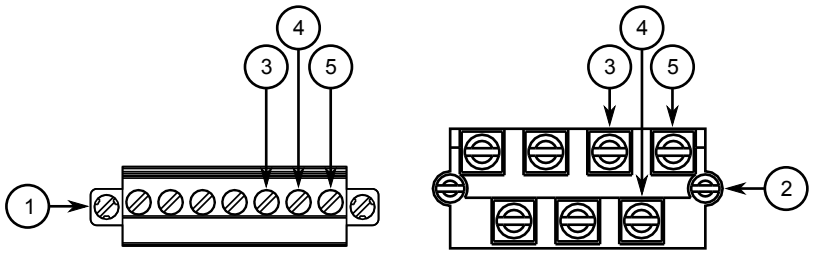

Figure 17: Failsafe Alarm Relay Wiring

1. Pluggable Terminal Block for HI Power Supplies **2.** Screw-Type Terminal Block for HIP Power Supplies **3.** Normally Open Terminal **4.** Common Terminal **5.** Normally Closed Terminal

Section 2.5
Grounding the Device

The RSG2488 chassis ground terminal uses an M3 screw. It is recommended to terminate the ground connection with an M3 ring or spade lug and torque it to 1.7 N·m (15 lbf-in).

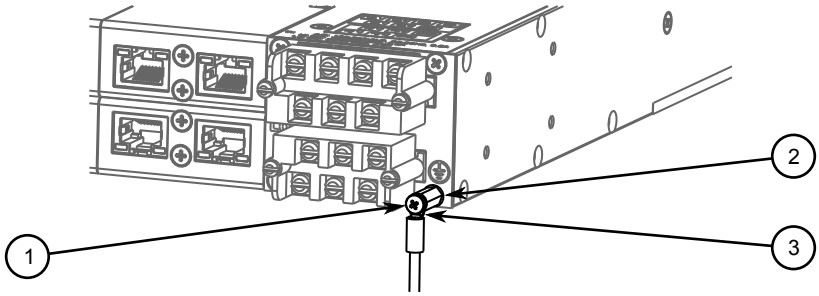

Figure 18: Chassis Ground Connection

1. M3 Screw **2.** Standoff **3.** M3 Ring Lug

Section 2.6
Inserting/Removing the MicroSD Card

The RUGGEDCOM RSG2488 accepts a microSD card for storing configuration files and/or software updates.

CAUTION!
Configuration hazard – risk of data loss. The microSD card must not be removed or replaced during normal operation of the device. Make sure the device is powered down before removing or inserting the card.

CAUTION!
Mechanical/electrical hazard – risk of damage to the microSD card.

- *Do not expose the microSD car to extreme temperatures or humidity.*
- *Do not expose the microSD card to large magnetic or static electric fields.*
- *Do not bend or drop the microSD card.*

CAUTION!
Security hazard – risk of unauthorized access and/or exploitation. Make sure to remove the microSD card before decommissioning the device or sending the device to a third-party.

To insert or remove a microSD card, do the following:

1. Power down the device.
2. Unscrew the retention screws and remove the access plate.

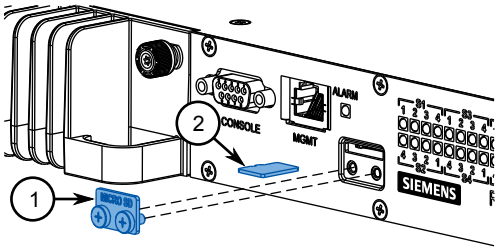

Figure 19: Inserting/Removing a MicroSD Card

1. Access Plate **2.** MicroSD Card

3. Without touching the contacts on the card, insert or remove the microSD card.
4. Install the access plate and finger-tighten the retention screws.
5. Power up the device.

Section 2.7

Connecting to the Device

The following describes the various methods for accessing the ROS console and Web interfaces on the device. For more detailed instructions, refer to the *ROS User Guide* for the RSG2488.

Serial Console and Management Ports

Connect a workstation directly to the serial console or management ports to access the boot-time control and ROS interfaces. The serial console port provides access to ROS 's console interface, while the management port provides access to ROS's console and Web interfaces.

IMPORTANT!
The serial console and management (MGMT) ports are intended to be used only as temporary connections during initial configuration or troubleshooting.

The serial console port implements RS-232 DCE (Data Communication Equipment) on a DB9 connector. The following is the pin-out for the port:

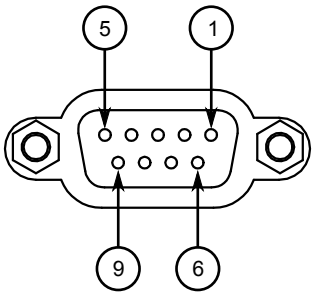

Figure 20: Serial DB9 Console Port

Pin	Name	Description
1	DCD	Data Carrier Detect
2	RX	Receive Data
3	TX	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear To Send
9	Reserved (Do Not Connect)	

The management port is a 10/100Base-TX copper Ethernet port with an RJ45 connector. The following is the pin-out for the management port:

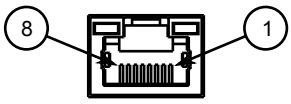

Figure 21: RJ45 Management Port

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

Communication Ports

Connect to any of the available Ethernet ports on the device to access the ROS 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

Before connecting the device, be aware of the recommendations and considerations outlined in the following sections:

- 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.
- Shielded/screened cabling can be used when required. Care should be taken to avoid the creation of ground loops with shielded cabling.

3 Communication Ports

The RSG2488 can be equipped with various types of communication ports to enhance its abilities and performance. Each set of communication ports is part of a field replaceable module that makes switching ports fast and easy.

The following sections describe the available modules in more detail:

Section 3.1

Copper Ethernet Ports

The RSG2488 supports several 10/100/1000Base-TX Ethernet ports that allow connection to standard Category 5 (CAT-5) unshielded twisted-pair (UTP) cables with RJ45, M12 (non-bypass), or Siemens's FastConnect RJ45 male connectors. All 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.

CAUTION!
Contamination hazard – risk of damage to equipment. M12 modules are shipped with internal O-rings and dust caps to prevent the ingress of dirt and debris that may damage the port. Make sure the O-rings and dust caps are installed on all unused M12 ports.

NOTE
For more information about Siemens 's FastConnect cabling system, visit www.siemens.com/ruggedcom.

Available Modules

Figure 22: 4 × 10/100/1000Base-TX with RJ45 Ports

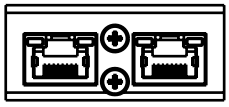

Figure 23: 2 × 10/100/1000Base-TX with RJ45 Ports

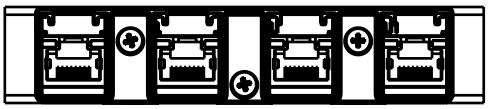

Figure 24: 4 × 10/100/1000Base-TX with FastConnect RJ45 Ports

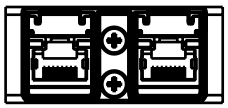

Figure 25: 2 × 10/100/1000Base-TX with FastConnect RJ45 Ports

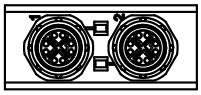

Figure 26: 2 x 8-Pin 10/100/1000TX with M12 X-Coded Ports

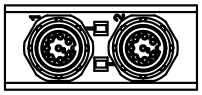

Figure 27: 2 x 8-Pin 10/100/1000TX with M12 A-Coded Ports

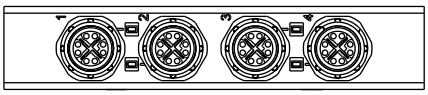

Figure 28: 4 x 8-Pin 10/100TX with M12 X-Coded Ports

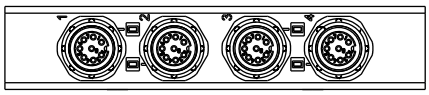

Figure 29: 4 x 8-Pin 10/100TX with M12 A-Coded Ports

LEDs

Each port features LEDs that indicate the state of the port.

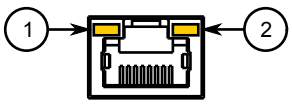

Figure 30: RJ45 and FastConnect RJ45 Port LEDs

1. Speed LED **2.** Link/Activity LED

LED	State	Description
Speed	Yellow	The port is operating at 1000 Mbps
	Off	The port is operating at 10 or 100 Mbps
Link/Activity	Yellow (Solid)	Link established
	Yellow (Blinking)	Link activity
	Off	No link detected

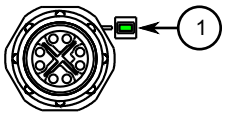

Figure 31: M12 Port LED

1. Link/Activity LED

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

The following are the pin-out descriptions for the RJ45, M12, and FastConnect RJ45 male connectors:

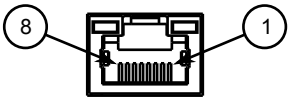

Figure 32: RJ45 and FastConnect RJ45 Ethernet Port Pin Configuration

Pin	Name		Description
	10/100Base-TX	1000Base-TX	
1	RX+	BI_DB+	Receive Data+ or Bi-Directional
2	RX-	BI_DB-	Receive Data- or Bi-Directional
3	TX+	BI_DA+	Transmit Data+ or Bi-Directional
4	Reserved (Do Not Connect)	BI_DD+	Bi-Directional
5	Reserved (Do Not Connect)	BI_DD-	Bi-Directional
6	TX-	BI_DA-	Transmit Data- or Bi-Directional
7	Reserved (Do Not Connect)	BI_DC+	Bi-Directional
8	Reserved (Do Not Connect)	BI_DC-	Bi-Directional

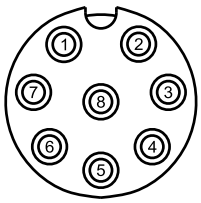

Figure 33: 8-Pin M12 A-Coded Ethernet Port Pin Configuration

Pin	10/100Base-Tx Signal	10/100/1000Base-Tx Signal
1	Reserved (Do Not Connect)[a]	C+
2	Reserved (Do Not Connect)[a]	D+
3	Reserved (Do Not Connect)[a]	D-
4	TX-	A-
5	RX+	B+
6	TX+	A+
7	Reserved (Do Not Connect)[a]	C-
8	RX-	B-

Figure 34: 8-Pin M12 X-Coded Ethernet Port Pin Configuration

Pin	10/100/1000Base-Tx Signal
1	A+
2	A-
3	B+
4	B-
5	D+
6	D-
7	C+
8	C-

[a] *Terminated at GND (Ground)*

For specifications on the available copper Ethernet ports, refer to Section 4.3, “Copper Ethernet Port Specifications”.

Section 3.2

Fiber Optic Ethernet Ports

Fiber optic Ethernet ports are available with either LC (Lucent Connector), SC (Standard or Subscriber Connector) or ST (Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

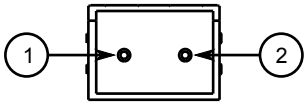

Figure 35: LC Port

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

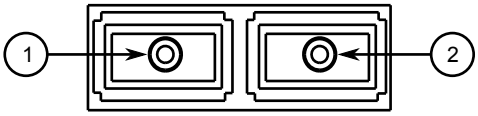

Figure 36: SC Port

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

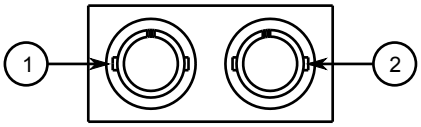

Figure 37: ST Port

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

For specifications on the available fiber optic Ethernet ports, refer to Section 4.4, “Fiber Optic Ethernet Port Specifications”.

Section 3.3
SFP Optic Ethernet Ports

SFP (Small Form-Factor Pluggable) optic Ethernet ports are available with LC (Lucent Connector) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.

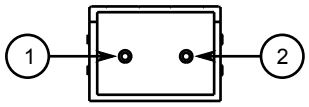

Figure 38: LC Port

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

NOTE
SFP modules, as well as their optical ports, can be safely inserted and removed while the chassis is powered and operating.

NOTE
Due to the uncertain latency introduced by the built-in PHY, the time accuracy of IEEE 1588 may be significantly degraded on a copper SFP port.

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

- Section 3.3.1, “Installing an SFP Optical Port”
- Section 3.3.2, “Removing an SFP Optical Port”

Section 3.3.1
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.

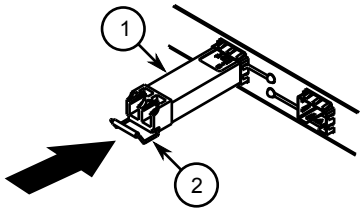

Figure 39: Installing an SFP Optical Port (Typical)

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 3.3.2
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. Grab the metal bail-latch on the port and remove the port from the module.

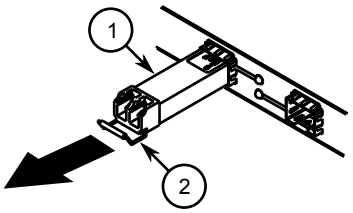

Figure 40: Removing an SFP Optical Port (Typical)

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).

Section 3.4
BNC Ports

The following BNC ports are available on the PTP module:

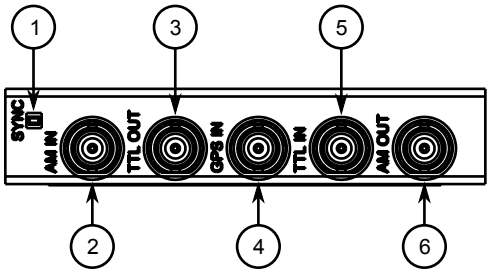

Figure 41: PTP Module

1. Sync LED **2.** AM IN Port **3.** TTL OUT Port **4.** GPS IN Port **5.** TTL IN Port **6.** AM OUT Port

Port	Function
AM IN	AM-level IRIG-B signal input, software enabled
AM OUT	IRIG-B AM signal output, software enabled
TTL OUT	IRIG-B PWM or 1 PPS signal output, software selectable
TTL IN	TTL-level IRIG-B PWM signal input
GPS IN	GPS antenna input

Inputs are controlled by RUGGEDCOM ROS and only one can be active at any time. For information about activating an input, refer to the *RUGGEDCOM ROS User Guide* for the RSG2488.

The color of the **Sync** LED on the front panel of the PTP module indicates the status of the incoming timing signal:

- **Green** – Signal locked
- **Amber/Yellow** – Holdover
- **Red** – Error
- **Off** – No signal detected

Section 3.5
Installing/Removing Modules

The following sections describe how to install and remove modules:

- Section 3.5.1, “Installing Modules”
- Section 3.5.2, “Removing Modules”

Section 3.5.1
Installing Modules

Upon installing a new module in the device, all the features associated to the module are available in the operating system. For more information, refer to the *ROS User Guide* for the RSG2488.

To install a module, do the following:

1. Make sure power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.
2. If the device is installed in a rack, remove it from the rack.
3. Remove the current module from the slot. For more information, refer to Section 3.5.2, “Removing Modules”.
4. Insert the new module into the slot.

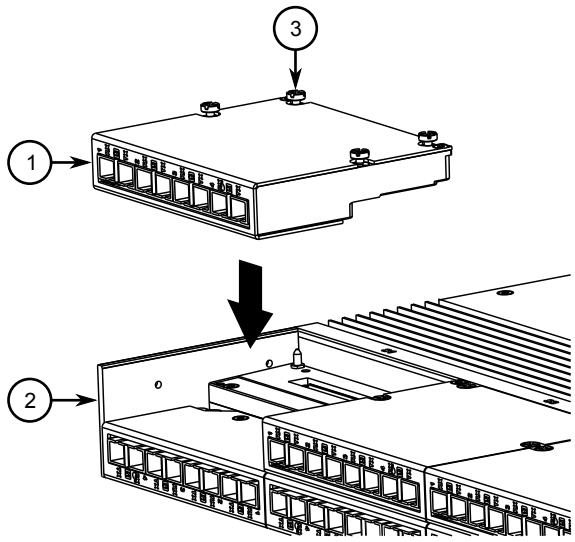

Figure 42: Installing a Module

1. Module **2.** Chassis **3.** Screw

5. Tighten the screws to secure the module.
6. If necessary, install the device in the rack.
7. Connect power to the device.

Section 3.5.2
Removing Modules

Once a module is removed, all the features associated with the module are hidden or disabled in the operating system.

To remove a module, do the following:

1. Make sure power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.

2. If the device is installed in a rack, remove it from the rack.
3. Loosen the screws that secure the module.
4. Pull the module from the chassis to disconnect it.

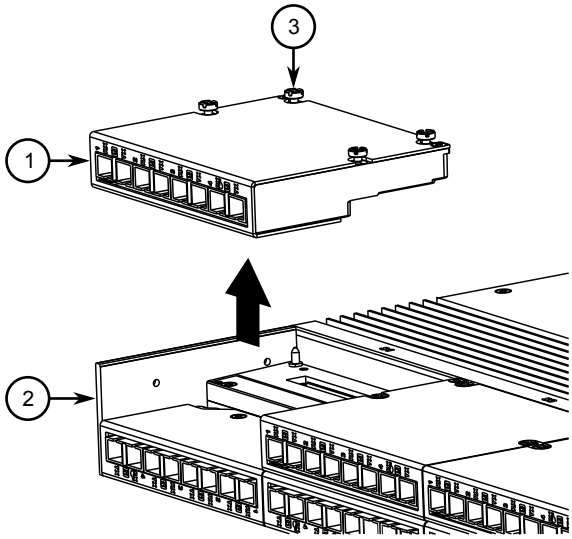

Figure 43: Removing a Module

1. Module **2.** Chassis **3.** Screw

5. Install a new module or a blank module (to prevent the ingress of dust and dirt). For more information, refer to Section 3.5.1, “Installing Modules”.
6. If necessary, install the device in the rack.
7. Connect power to the device.

4 Technical Specifications

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

Section 4.1

Power Supply Specifications

NOTE
Use the internal fuse rating to determine the size of the external circuit breaker/fuse.

Power Supply Type	Terminal Block Type	Input Range		Internal Fuse Rating	Maximum Power Consumption	Maximum Cable Length[a]
		Min	Max			
24 VDC (Single)	Screw	13 VDC	36 VDC	10 A	62 W	9.4 m (30.8 ft)
48 VDC (Single)		38 VDC	72 VDC	5 A	59 W	44.9 m (167 ft)
High Voltage AC/DC	Screw/Pluggable	98 VDC	300 VDC	3.15 A	66 W	—
		88 VAC	264 VAC			

[a] *Based on #16 AWG wiring.*

Section 4.2

Failsafe Relay Specifications

IMPORTANT!
The alarm switching voltage must be greater than the Safety Extra Low-Voltage (SELV) to meet safety requirements.

Parameter	Value (Resistive Load)
Maximum Switching Voltage	250 VAC 30 VDC
Rated Switching Current	2 A @ 250 VAC 2 A @ 30 VDC
Maximum Switching Capacity	150 W 500 VA

Section 4.3

Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the RSG2488.

Speed[b]	Connector	Duplex[b]	Cable Type[c]	Wiring Standard[d]	Maximum Distance[e]	Isolation[f]
10/100/1000Base-TX	RJ45	FDX/HDX	> CAT-5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV
10/100/1000Base-TX	FastConnect RJ45	FDX/HDX	> CAT-5	TIA/EIA T568A/B	100 m (328 ft)	1.5 kV
10/100/1000Base-TX	2-Pin A-Coded M12	FDX/HDX	> CAT-5	Local	100 m (328 ft)	1.5 kV
10/100/1000Base-TX	2-Pin X-Coded M12	FDX/HDX	> CAT-5	Local	100 m (328 ft)	1.5 kV
10/100/1000Base-TX	4-Pin A-Coded M12	FDX/HDX	> CAT-5	Local	100 m (328 ft)	1.5 kV
10/100/1000Base-TX	4-Pin X-Coded M12	FDX/HDX	> CAT-5	Local	100 m (328 ft)	1.5 kV

[b] *Auto-negotiating.*

[c] *Shielded or unshielded.*

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

[e] *Typical distance. Dependent on the number of connectors and splices.*

[f] *RMS 1 minute.*

Section 4.4

Fiber Optic Ethernet Port Specifications

The following sections detail fiber optic specifications for ports that can be equipped on the RSG2488 . The user determines the type of optics at the time of ordering, and can determine the ports installed on a particular unit by reading the factory data file via the ROS user interface. The specifications are organized by order code. Module order codes are contained within each unit when it is assembled and configured at the factory. For information about obtaining factory configuration data, refer to the *ROS User Guide* for the RSG2488.

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.*

Section 4.4.1

Fast Ethernet (100 Mbps) Optical Specifications

Speed	Mode[g]	Connector Type	Cable Type (µm)	Tx λ (nm)[h]	Tx min. (dBm)	Tx max. (dBm)	Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[h]	Power Budget (dB)
100Base-FX	MM	ST	62.5/125	1300	-19	-14	-31	-14	2	12
			50/125		-22.5					8.5
100Base-FX	MM	LC	62.5/125	1300	-19	-14	-32	-14	2	13
100Base-FX	MM	SC	62.5/125	1300	-19	-14	-31	-14	2	12
			50/125		-22.5					8.5
100Base-FX	SM	ST	9/125	1310	-15	-8	-32	-3	20	17
100Base-FX	SM	LC	9/125	1310	-15	-8	-34	-8	20	19
100Base-FX	SM	SC	9/125	1310	-15	-8	-31	-7	20	16
100Base-FX	SM	SC	9/125	1310	-5	0	-34	-3	50	29
100Base-FX	SM	LC	9/125	1310	-5	0	-35	3	50	30
100Base-FX	SM	SC	9/125	1310	0	5	-37	0	90	37
100Base-FX	SM	LC	9/125	1310	0	5	-37	0	90	37

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

[h] *Typical*

Section 4.4.2

Gigabit Ethernet (1 Gbps) Optical Specifications

Fixed Gigabit Transceivers

Speed	Mode[i]	Connector Type	Cable Type (µm)	Tx λ (nm)[j]	Tx min (dBm)	Tx max (dBm)	Rx Sensitivity (dBm)	RX Saturation (dBm)	Distance (km)[j]	Power Budget (dB)
1000Base-SX	MM	LC	50/125	850	-9	-2.5	-20	0	0.5	11
			62.5/125							

Speed	Mode[i]	Connector Type	Cable Type (µm)	Tx λ (nm)[j]	Tx min (dBm)	Tx max (dBm)	Rx Sensitivity (dBm)	RX Saturation (dBm)	Distance (km)[j]	Power Budget (dB)
1000Base-LX	SM	LC	9/125	1310	-9.5	-3	-21	-3	10	11.5
1000Base-LX	SM	SC	9/125	1310	-10	-3	-20	-3	10	10
1000Base-LX	SM	SC	9/125	1310	-5	0	-20	-3	25	15
1000Base-LX	SM	LC	9/125	1310	-7	-3	-24	-3	25	17

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

[j] *Typical*

SFP Gigabit Transceivers

Speed	Mode[k]	Connector Type	Cable Type (µm)	Tx λ (nm)[l]	Tx min (dBm)	Tx max (dBm)	Rx Sensitivity (dBm)	RX Saturation (dBm)	Distance (km)[l]	Power Budget (dB)
1000Base-SX	MM	LC	50/125	850	-9	-2.5	-20	0	0.5	11
			62.5/125							
1000Base-LX	SM	LC	9/125	1310	-9.5	-3	-19	-3	10	9.5
1000Base-LX	SM	LC	9/125	1310	-7	-3	-23	-3	25	9.5
1000Base-LX	SM	LC	9/125	1550	0	5	-23	-3	70	9.5

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

[l] *Typical*

Section 4.5

GPS Antenna Specifications

The PTP module requires an active GPS antenna with the following specifications:

Parameter	Specification
Polarization	Right-Hand Circular Polarized
Receive Frequency	1.57542 GHz ± 1.023 MHz
Power Supply	5 VDC
DC Current	< 10 mA at 3 VDC
Antenna Gain	Select antenna gain based on system configuration
Total Gain at GPS Input Port[m]	≤ 18 dBi
Axial Ratio	< 3 dB
Output VSWR	< 2.5

[m] *Includes antenna gain, cable loss, lightning arrestor loss, line amplifier gain and bandpass filter loss*

NOTE
The PTP module's GPS input provides 5 VDC at up to 10 mA to power the antenna.

Best results can be achieved with a total gain of 16 dB (includes antenna gain, cable loss, lightning arrestor loss, line amplifier gain and filter loss) at the antenna input.

Section 4.6

PTP Specifications

IRIG-B PWM Input Specifications

Parameter	Specification
Input Voltage	TTL-Compatible
Input Impedance	> 200 kΩ

IRIG-B PWM Output Specifications

Parameter	Specification
Output Current (I_S)	100 mA
Output Voltage (V_S)	TTL-Compatible
Output Impedance (R_S)	50 Ω

IRIG-B AM Output Specifications

Parameter	Specification
Carrier Frequency	1 kHz
Modulation Depth	3:1±10%
Output Current (I_S)	24 mA
Output Impedance (R_S)	10 Ω
Output Voltage (V_S)	6 V_{p-p}

Section 4.7

Supported Networking Standards

Parameter	10 Mbps	100 Mbps	1000 Mbps	Notes
IEEE 802.1AB	Yes	Yes	Yes	Link Layer Discovery Protocol (LLDP)
IEEE 802.1D	Yes	Yes	Yes	MAC bridges
IEEE 802.1Q	Yes	Yes	Yes	VLAN (Virtual LAN)
IEEE 802.1p	Yes	Yes	Yes	Priority levels
IEEE 802.1x	Yes	Yes	Yes	Port-based network access control
IEEE 802.3	Yes	No	No	10Base-T
IEEE 802.3u	No	Yes	No	100Base-TX/100Base-FX

Parameter	10 Mbps	100 Mbps	1000 Mbps	Notes
IEEE 802.3z	No	No	Yes	1000Base-SX/LX
IEEE 802.3ab	No	No	Yes	1000Base-TX
IEEE 802.3x	Yes	Yes	Yes	Full duplex operation

Section 4.8
Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85 °C (-40 to 185 °F)	Measured from a 30 cm (11.8 in) radius surrounding the center of the enclosure
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85 °C (-40 to 185 °F)	

Section 4.9
Mechanical Specifications

Parameter	Value
Dimensions	Refer to Chapter 5, *Dimension Drawings*
Weight	8.6 kg (19 lbs)
Enclosure	Aluminum

5 Dimension Drawings

NOTE
All dimensions are in millimeters, unless otherwise stated.

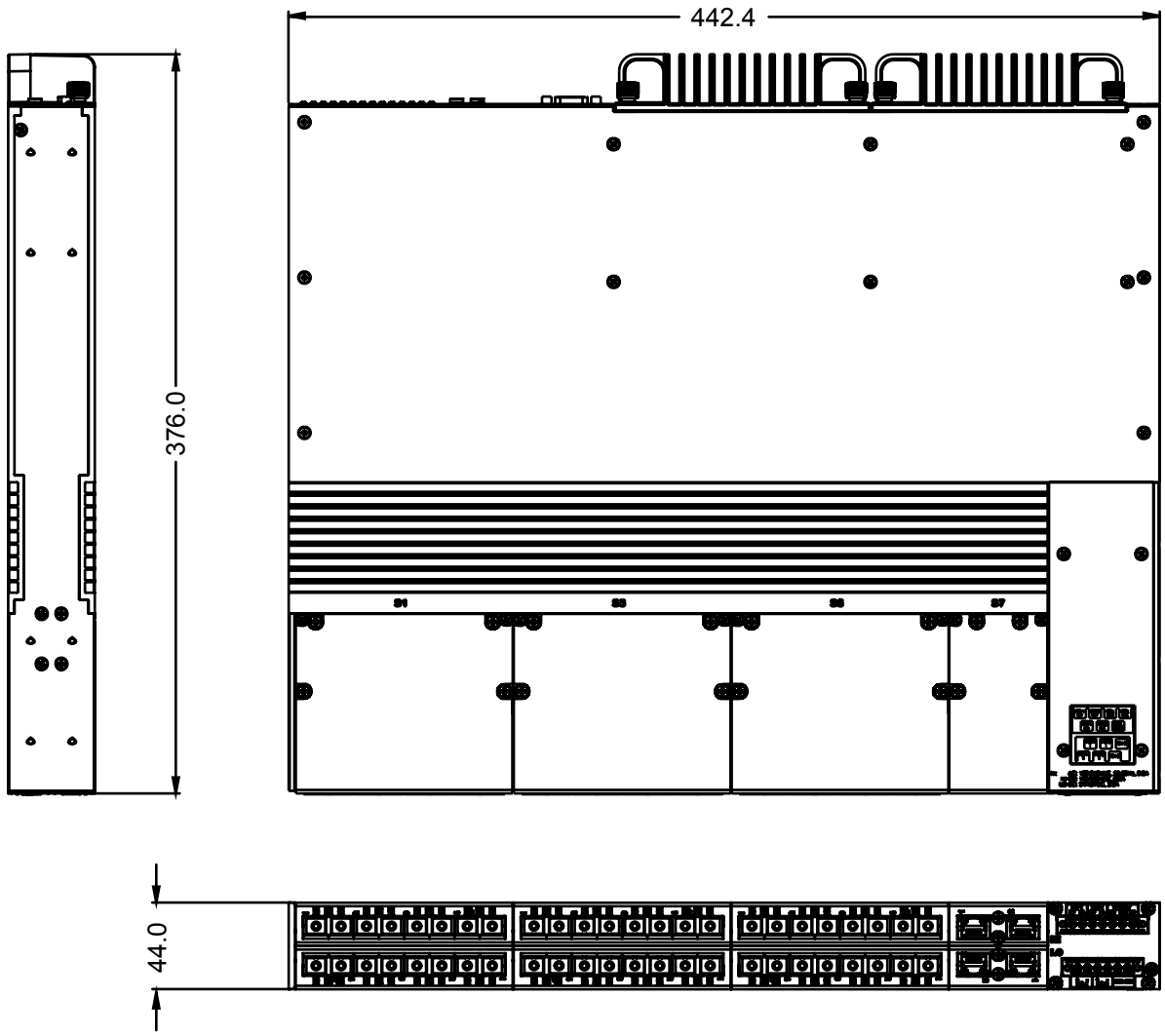

Figure 44: Overall Dimensions

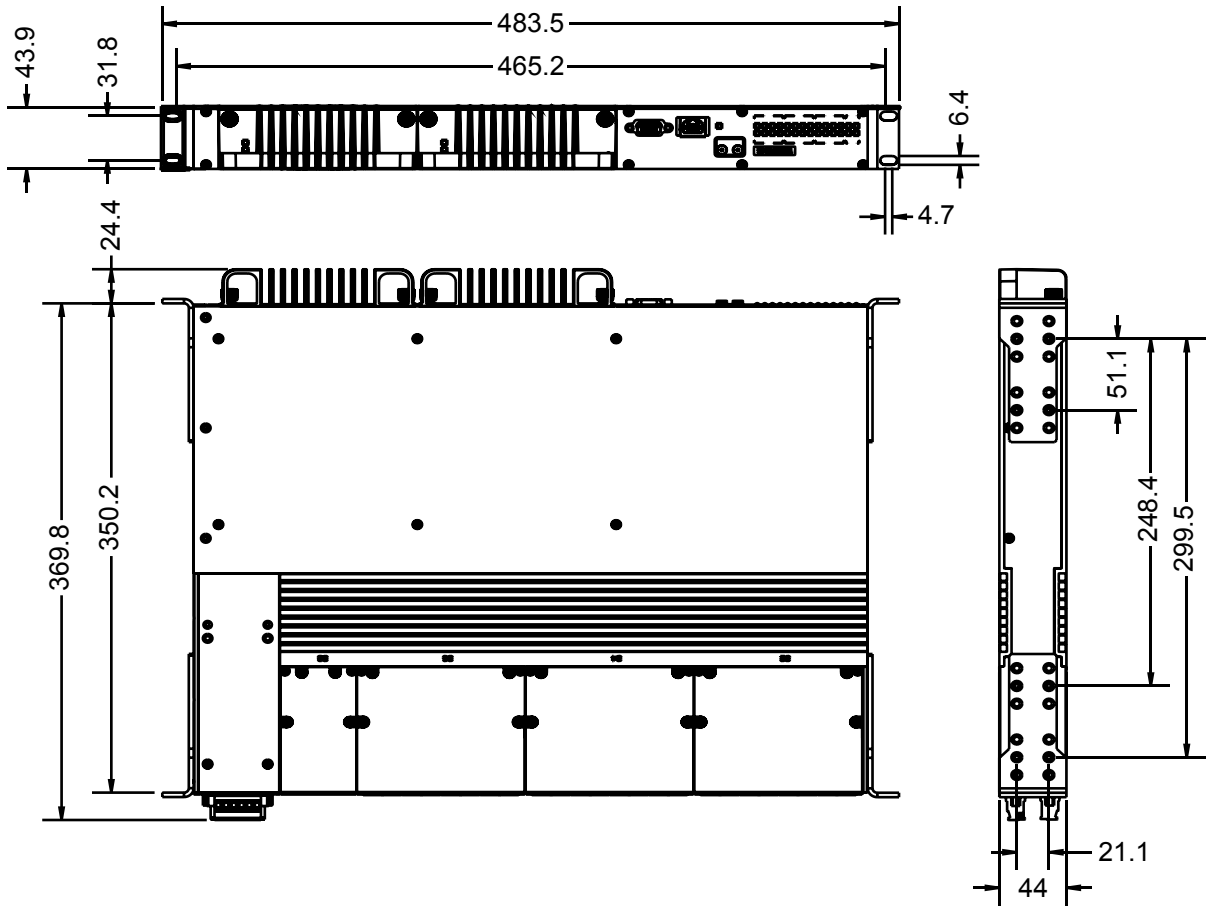

Figure 45: Rack Mount Dimensions

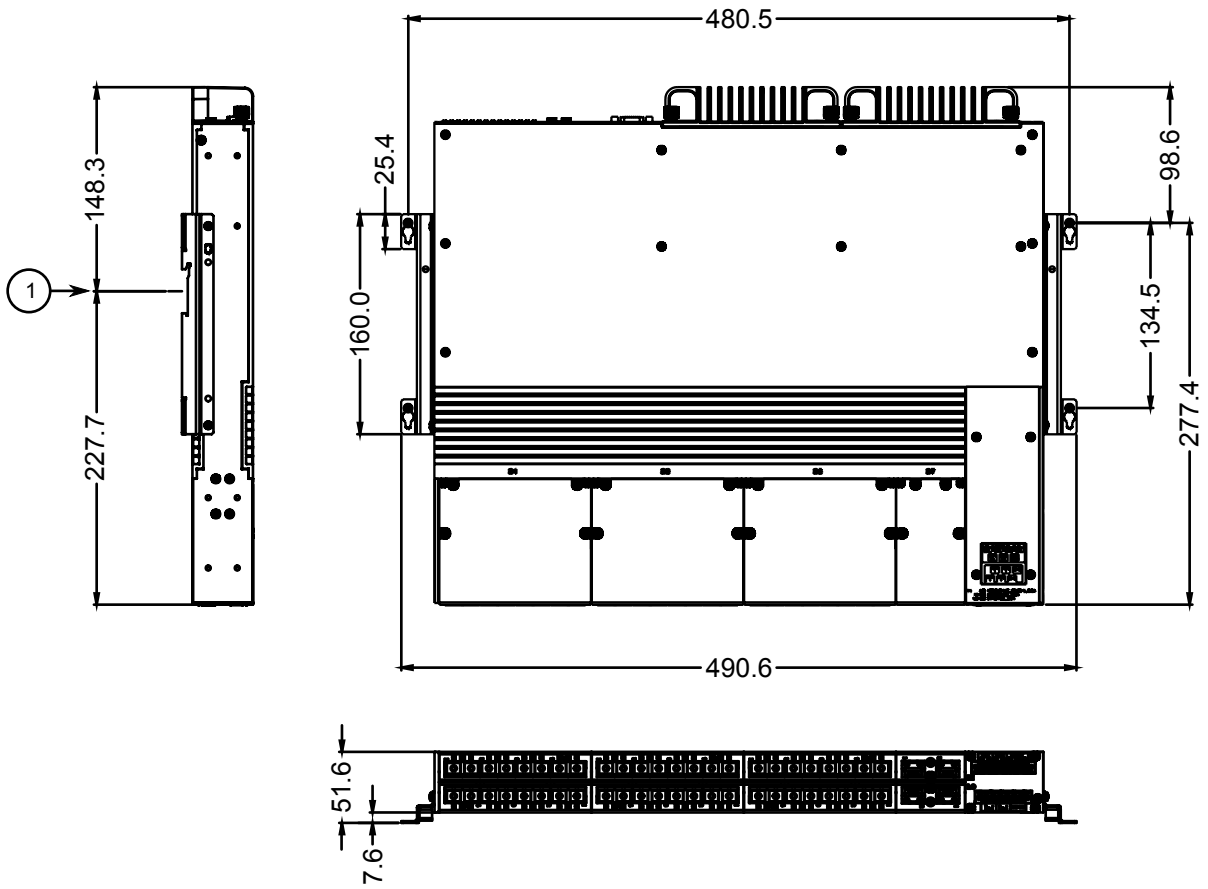

Figure 46: Panel and Din Rail Mount Dimensions

1. DIN Rail Centerline

6 Certification

The RUGGEDCOM RSG2488 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

The RSG2488 has received approval from various agencies.

Agency	Standards	Comments
FCC	FCC Part 15	Class A for USA
CE	EN 55022, EN 61000-3-2, EN 61000-3-3, EN 61000-6-2, EN 60950-1, EN 60825-1, EN 50581	EU directives include 2004/108/EC (EMC Directive), 2011/65/EU (ROHS) and 2006/95/EC (Low Voltage Directive)
TUV	IEC 60950-1, EN 60950-1, CSA/UL 60950-1	International Safety Compliance
Industry Canada (IC)	ICES-003	Class A for Canada
FDA/CDRH	21 CFR Chapter I, Sub-chapter J	Compliant

Section 6.2

FCC Compliance

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

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

Section 6.3

Industry Canada Compliance

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

Section 6.4

EMI and Environmental Type Tests

The RSG2488 has passed the following EMI and environmental tests.

IEC 61850-3 EMI Type Tests

NOTE

- *In the case of an all fiber port configuration, this product meets all Class 2 requirements. Otherwise, all Class 1 requirements are met for copper ports.*
- *If the unit contains copper ports, the IEC 1613 conformance is Class 1, during which disturbance errors may occur but recovery is automatic.*
- *If the unit contains all fiber ports, the IEC1613 conformance is Class 2, during which no disturbance errors will occur.*

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
		AC Power Ports		
		Earth Ground Ports		
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
		AC Power Ports	+/- 4 kV Line-to-Earth, +/- 2 kV Line-to-Line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal Ports	10 V	3
		DC Power Ports		
		AC 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	
		AC Power Ports	30% for 1 period, 60% for 50 periods	
IEC 61000-4-11	Voltage Dips and Interrupts	AC Power Ports	100% for 5 periods, 100% for 50 periods	

Test	Description		Test Levels	Severity Levels
IEC 61000-4-12	Damped Oscillatory	Signal Ports	2.5 kV common, 1 kV differential mode @ 1 MHz	3
		DC Power Ports		
		AC Power Ports		
IEC 61000-4-16	Mains Frequency Voltage	Signal Ports	30 V Continuous, 300 V for 1s	4
		DC Power Ports		
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	
	HV Impulse	Signal Ports	5 kV (Fail-Safe Relay Output)	
		DC Power Ports	5 kV	
		AC Power Ports		

[a] *Siemens-specified severity levels*

IEEE 1613 (C37.90.x) EMI Immunity Type Tests

NOTE
The RSG2488 meets Class 2 requirements for an all-fiber configuration and Class 1 requirements for copper ports.

Test	Description		Test Levels
IEEE C37.90	HV Impulse	Signal ports	5 kV (Failsafe Relay Output)
		DC Power Ports	5 kV
		AC Power Ports	
	Dielectric Strength	Signal ports	2 kVAC
		DC Power Ports	1.5 kVDC
		AC Power Ports	2 kVAC
IEEE C37.90.1	Fast Transient	Signal ports	+/- 4 kV @ 2.5 kHz
		DC Power Ports	+/- 4 kV
		AC Power Ports	
		Earth ground ports	
	Oscillatory	Signal ports	2.5 kV common mode @1MHz
		DC Power Ports	2.5 kV common, 1 kV differential mode @ 1 MHz
		AC Power Ports	
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m

Test	Description		Test Levels
IEEE C37.90.3	ESD	Enclosure Contact	+/-2 kV, +/-4 kV, +/- 8 kV
		Enclosure Air	+/-4 kV, +/-8 kV, +/-15 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		Level 2 (2 g @ 10-150 Hz)
IEC 60255-21-2	Shock		Level 2 (30 g @ 11 mS)
	Bump		Level 1 (10 g @ 16 mS)