SIEMENS

RUGGEDCOM RS910L

Installation Guide

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Table of Contents

Preface

This guide describes the RUGGEDCOM RS910L. 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.

CONTENTS

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:

- RUGGEDCOM ROS User Guide [https://support.industry.siemens.com/cs/ww/en/view/109737222]

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The latest user documentation for RUGGEDCOM RS910L is available online at https://www.siemens.com/ruggedcom. To request or inquire about a user document, contact Siemens Customer Support.

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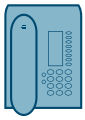

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- Access Siemens' extensive library of support documentation, including FAQs and manuals
- Submit SRs or check on the status of an existing SR

- Contact a local Siemens representative from Sales, Technical Support, Training, etc.
- Ask questions or share knowledge with fellow Siemens customers and the support community

1 Introduction

The RUGGEDCOM RS910L is a utility-grade serial device server and managed Ethernet switch supporting Ethernet over VDSL (EoVDSL). The RUGGEDCOM RS910L can be configured with two serial ports (RS485/RS422/RS232) and/or two Ethernet ports (copper of fiber).

The RUGGEDCOM RS910L can interconnect multiple types of intelligent electronic devices (IEDs) that have different methods of communication.

EoVDSL supports LAN segments of up to 5 km (3.1 mi) over telephone grade cable (or other legacy serial cabling) at up to 35 Mbps (upstream and downstream). It allows an Ethernet-enabled device to communicate with a central control room using existing cabling. It is the perfect solution for bringing Ethernet networking to applications where existing wiring is already present, thus saving the considerable cost of upgrading existing legacy devices or installing new network cabling.

The RUGGEDCOM RS910L provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found on plant floors and curb-side traffic control cabinets. An operating temperature range of -40 to 85 °C (-40 to 185 °F) coupled with hazardous location certification (Class I Division 2), optional conformal coating and a galvanized steel enclosure allows the RUGGEDCOM RS910L to be placed in almost any location.

The RUGGEDCOM RS910L can be mounted on a DIN rail or panel for efficient use of cabinet space.

The integrated power supply supports a wide range of voltages (88-300 VDC or 85-264 VAC) for worldwide operability, as well as dual-redundant, reversible polarity, 24 VDC and 48 VDC power supply inputs for high availability applications requiring dual or backup power inputs.

The RUGGEDCOM RS910L's superior ruggedized design and embedded RUGGEDCOM Rugged Operating System (ROS) provides superior system reliability and advanced networking features making it ideally suited for creating Ethernet networks for mission-critical, real-time, control applications.

CONTENTS

Section 1.1

Feature Highlights

Ethernet Ports

- 2 x 10/100Base-TX copper or 10/100Base-FX fiber optic Ethernet ports

Serial Interface

- 2 x RS485/RS422/RS232 Serial Ports (DB9 or RJ45)
- [Optional] Serial Fiber Interface (ST)

Ethernet Over VDSL (EoVDSL)

- 2 x Ethernet over VDSL (EoVDSL) ports
- Up to 5 km (3.1 mi) LAN segments
- Symmetric data rates up to 35 Mbps
- Asymmetric data rates up to 40 Mbps
- Automatically selects fastest data rate based on distance and quality of cable
- Software selectable to be master or slave
- Frequency Division Multiplexing (FDM)

Rated for Reliability in Harsh Environments

- Immunity to EMI and heavy electrical surges
- Hazardous Location Certification: Class I Division 2
- -40 to 85 °C (-40 to 185 °F) ambient operating temperature (no fans)
- 20 AWG Galvanized Steel
- DIN or panel mounting options provide secure mechanical reliability
- [Optional] Conformal coated printed circuit boards

Universal Power Supply Options

- Fully integrated power supply
- Universal high-voltage range:
  - 125-250 VDC or 100-240 VAC (Hazardous Environments)
  - 88-300 VDC or 85-264 VAC (Non-Hazardous Environments)
- Dual low-voltage DC inputs: 24 or 48 VDC
- Terminal blocks for reliable maintenance free connections
- CSA/UL 60950-1 safety approved to 85 °C (185 °F)

Section 1.2

Description

The RUGGEDCOM RS910L features various ports, controls and indicator LEDs on the front panel for connecting, configuring and troubleshooting the device.

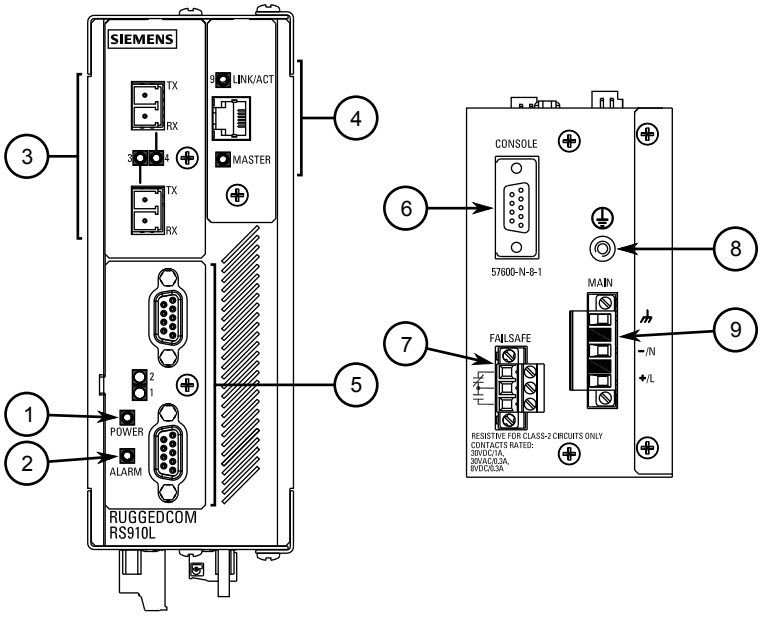

Figure 1: RUGGEDCOM RS910L

1. POWER LED **2.** ALARM LED **3.** [Optional] Copper (10/100Base-TX) or Fiber Optic (100Base-FX) Ethernet Ports **4.** EoVDSL Port **5.** Serial Ports **6.** RS232 Console Port (Serial) **7.** Failsafe Alarm Relay **8.** Chassis Ground Connection **9.** Power Supply Terminal Block

POWER LED	Illuminates green when power is supplied to the device.
ALARM LED	Illuminates red when an alarm condition exists.
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 3.1, "Connecting to the Device".
Communication Ports	Communication ports in general receive and transmit data, as well as provide access to the RUGGEDCOM ROS Web interface. For more information about the various ports available, refer to Chapter 4, *Communication Ports*.
Failsafe Alarm Relay	Latches to default state when a power disruption or other alarm condition occurs. For more information, refer to: • Section 2.5, "Connecting the Failsafe Alarm Relay" • Section 5.2, "Failsafe Alarm Relay Specifications"
Power Supply Terminal Blocks	Pluggable terminal blocks for connecting one or more power sources. For more information, refer to Section 2.6, "Connecting Power" and Section 5.1, "Power Supply Specifications".

Section 1.3

Required Tools and Materials

The following tools and materials are required to install the RUGGEDCOM RS910L:

Tools/Materials	Purpose
AC power cord (16 AWG)	For connecting power to the device.

Tools/Materials	Purpose
Multi-mode fiber optic cables	For connecting the device to a LAN.
CAT-5 Ethernet cables	For connecting the device to a LAN.
Flathead screwdriver	For mounting the device to a DIN rail.
Phillips screwdriver	For mounting the device to a panel.
4 x #6-32 screws	For mounting the device to a panel.

Section 1.4

Decommissioning and Disposal

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

Decommissioning

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

For more information, refer to the associated *User Guide*.

Recycling and Disposal

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

Section 1.5

Cabling Recommendations

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 I 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.

CONTENTS

Section 1.5.1

Supported Fiber Optic Cables

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

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

[a] *Laser optimized.*

2 Installing the Device

The following sections describe how to install the device, including mounting the device, installing/removing modules, connecting power, and connecting the device to the network.

DANGER!
Electrocution hazard – risk of serious personal injury and/or damage to equipment. Before performing any maintenance tasks, make sure all power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.

WARNING!
*Radiation hazard – risk of serious personal injury. This product contains a laser system and is classified as a **Class I LASER PRODUCT**. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

IMPORTANT!
This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

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

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

CONTENTS

Section 2.1
General Procedure

The general procedure for installing the device is as follows:

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

1. Review the relevant certification information for any regulatory requirements. For more information, refer to Section 6.1, "Approvals".
2. Mount the device.
3. Connect the failsafe alarm relay.
4. Connect power to the device and ground the device to safety Earth.
5. Connect the device to the network.
6. Configure the device.

Section 2.2
Unpacking the Device

When unpacking the device, do the following:

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

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

Section 2.3
Installing the Device in Hazardous Locations

The RUGGEDCOM RS910L is designed to comply with the safety standards for Class I, Division 2 hazardous locations where concentrations of flammable gases, vapors or liquids may be present, as opposed to normal operating environments.

IMPORTANT!
The device is certified for installation in hazardous environments as a component only. It is required to be installed in a suitable enclosure where the final combination is subject to acceptance by an authorized local inspection authority.

Installation and use of the device in a hazardous location should meet the following special conditions for safe use:

- The equipment should be installed in an enclosure that is considered to be not accessible in normal operation without the use of a tool providing a degree of protection of not less than IP54. The enclosure should have a minimum service temperature range of -40 to 100 °C (-40 to 212 °F).
- The equipment should be used in an area of not more than pollution degree 2.
- The console port should only be used in the safe area.
- The equipment should be appropriately connected to safety Earth upon installation.

NOTE
For further details of the device's compliance with Class I, Division 2 standards, refer to Section 6.1, "Approvals".

IMPORTANT!
Do not disconnect or open equipment unless power has been switched off or the area is known to be non-hazardous.

IMPORTANT !
Débrancher ou ouvrir l'équipment seulement si l'alimnetation a été coupée ou si l'on sait que la zone ne pose aucun danger.

IMPORTANT!
Substitution of the components may impair suitability for Class I, Division 2.

IMPORTANT !
Le remplacement de composants pourrait compromettre l'admissibilité à la Classe I, Division 2.

Section 2.4

Mounting the Device

The RUGGEDCOM RS910L is designed for maximum mounting and display flexibility. It can be equipped with adapters that allow it to be installed on a 35 mm (1.4 in) DIN rail or affixed to a panel.

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

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

NOTE
For detailed dimensions of the device with either DIN rail or panel hardware installed, refer to Section 5.8, "Dimension Drawings".

CONTENTS

Section 2.4.1
Mounting the Device on a DIN Rail

For DIN rail installations, the RS910L can be equipped with a DIN rail bracket pre-installed on the back of the chassis. The bracket allows the device to be slid or clipped onto a standard 35 mm (1.4 in) DIN rail.

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

1. Align the slot in the bracket with the DIN rail.

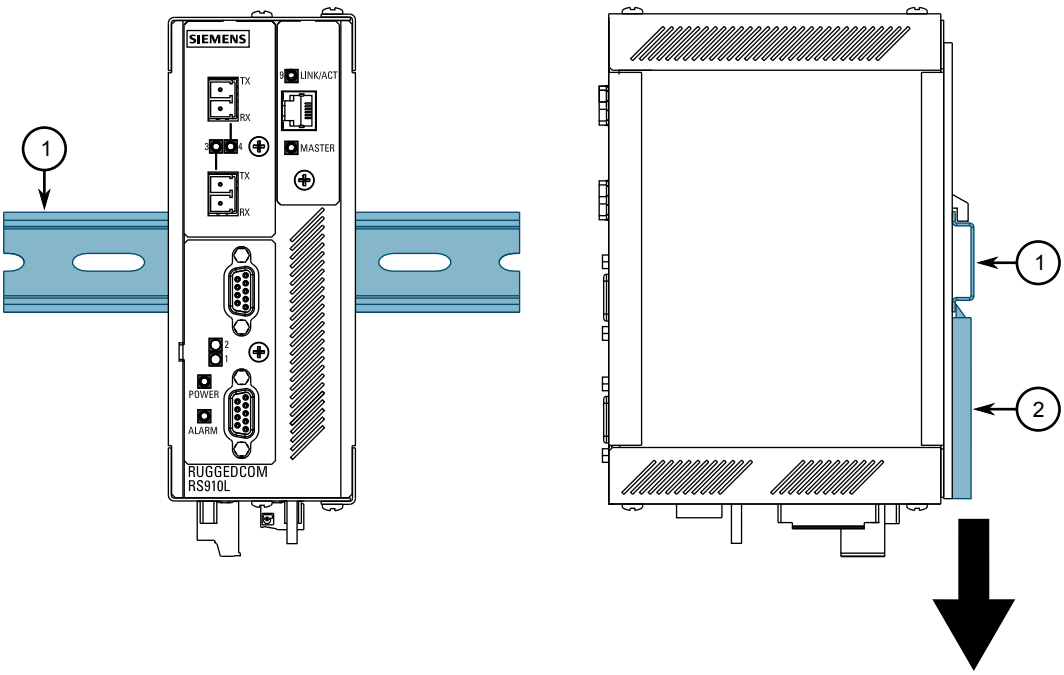

Figure 2: DIN Rail Mounting

1. DIN Rail **2.** DIN Rail Bracket

2. Pull the release on the bracket down and slide the device onto the DIN rail. Let go of the release to lock the device in position. If access to the release is limited, use a slotted screwdriver or a similar tool to reach the release.

Section 2.4.2
Mounting the Device to a Panel

For panel installations, the RUGGEDCOM RS910L can be equipped with panel adapters on the top and bottom 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. Prepare mounting holes in the panel where the device is to be installed.
2. Place the device against the panel and align the adapters with the mounting holes.

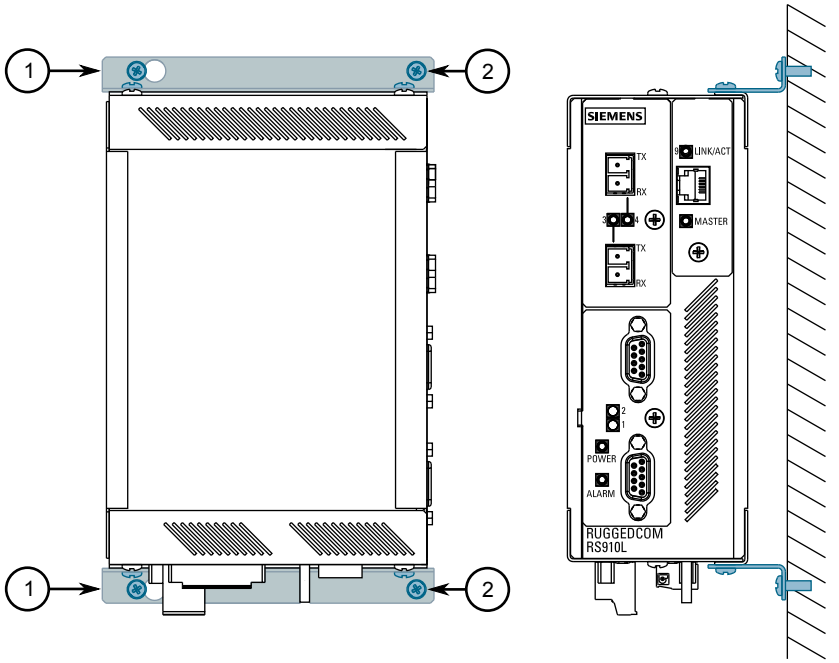

Figure 3: Panel Mounting

1. Screw **2.** Panel Mount Adapter

3. Secure the adapters to the panel with #6-32 screws.

Section 2.5

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 RUGGEDCOM RS910L.

To connect the failsafe alarm relay, do the following:

1. Insert the failsafe alarm relay terminal block into the device and tighten the screws.
2. Connect a failsafe device to the terminal block.

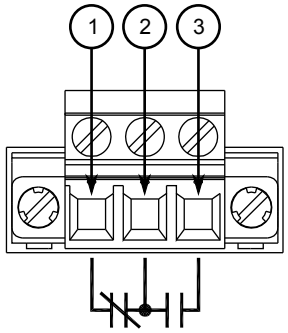

Figure 4: Failsafe Alarm Relay Wiring

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

Section 2.6

Connecting Power

The RUGGEDCOM RS910L supports power input from a single high AC/DC or low DC power supply.

IMPORTANT!

- *For 110/230 VAC rated equipment, an appropriately rated AC circuit breaker must be installed.*
- *For 125/250 VDC rated equipment, an appropriately rated DC circuit breaker must be installed.*
- *Use minimum #16 gage copper wiring when connecting terminal blocks.*
- *Equipment must be installed according to applicable local wiring codes and standards.*
- *All line-to-ground transient energy is shunted to the Surge Ground terminal. In cases where users require the inputs to be isolated from ground, remove the ground braid between Surge and Chassis Ground. Note that all line-to-ground transient protection circuitry will be disabled.*

CONTENTS

Section 2.6.1

Connecting High AC/DC Power

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

CAUTION!

Electrical hazard – risk of damage to equipment. Do not connect AC power cables to terminals for DC power. Damage to the power supply may occur.

CAUTION!
Electrical hazard – risk of damage to equipment. Before testing the dielectric strength (HIPOT) in the field, remove the braided ground cable connected to the surge ground terminal and chassis ground. This cable connects transient suppression circuitry to chassis ground and must be removed in order to avoid damage to transient suppression circuitry during testing.

NOTE
Torque all terminal connections to 0.6 N·m (5 lbf-in).

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

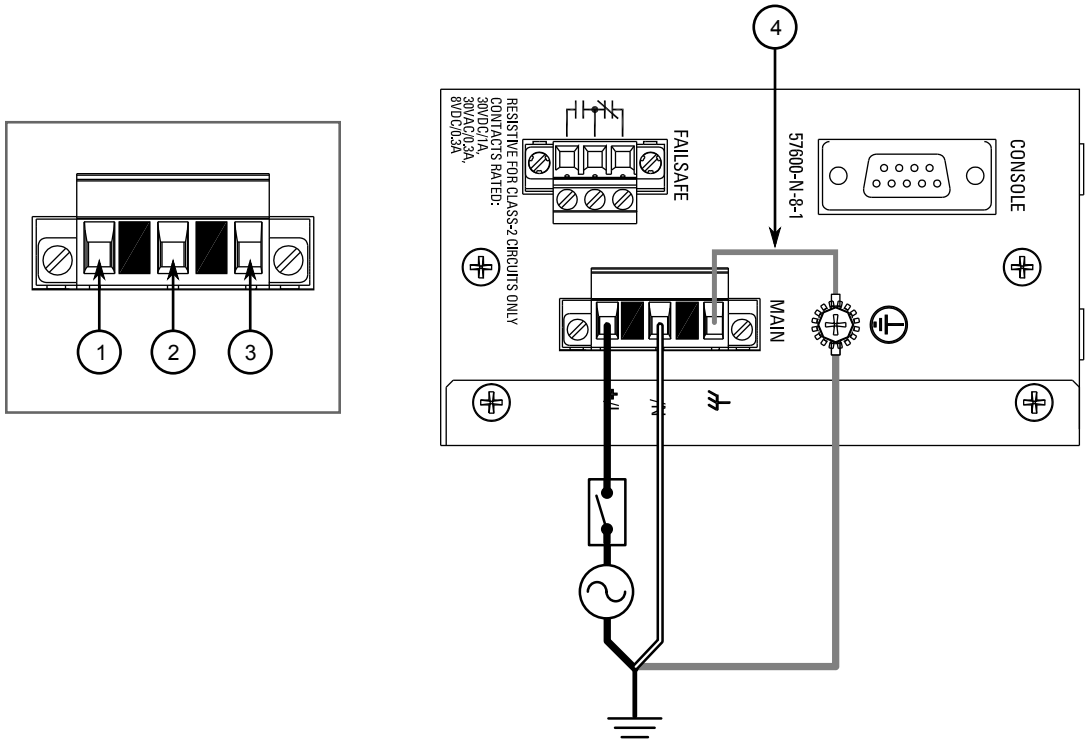

Figure 5: Terminal Block Wiring

1. Positive/Live (+/L) Terminal **2.** Negative/Neutral (-/N) Terminal **3.** Surge Ground Terminal **4.** Braided Ground Cable

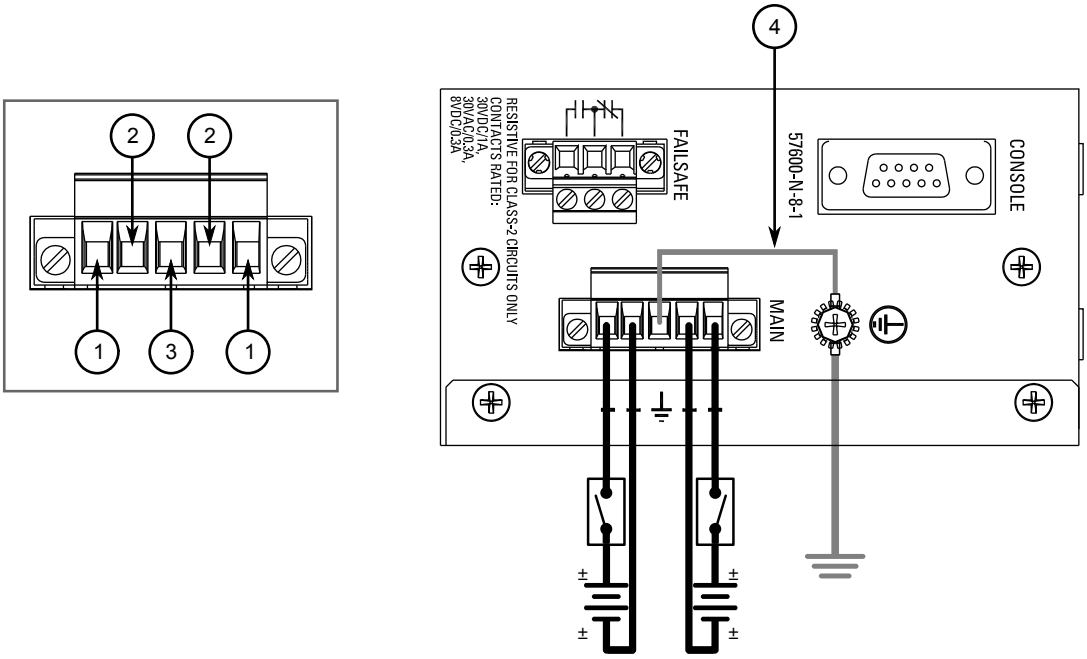

Figure 6: Terminal Block Wiring – Dual DC Power Supply Inputs

1. Positive Terminal **2.** Negative Terminal **3.** Surge Ground Terminal **4.** Braided Ground Cable

3. Connect the negative wire from the power source to the negative/neutral (-/N) terminal on the terminal block.
4. Connect the ground wire from the power source to the chassis groun terminal on the terminal block.

Section 2.6.2

Connecting Low DC Power

RUGGEDCOM RS910L's equipped with 24 or 48 V power supply inputs feature reverse polarity protection and dual power supply inputs allowing the device to accept redundant connections to a single DC power supply.

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

NOTE
Torque all terminal connections to 0.6 N·m (5 lbf-in).

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

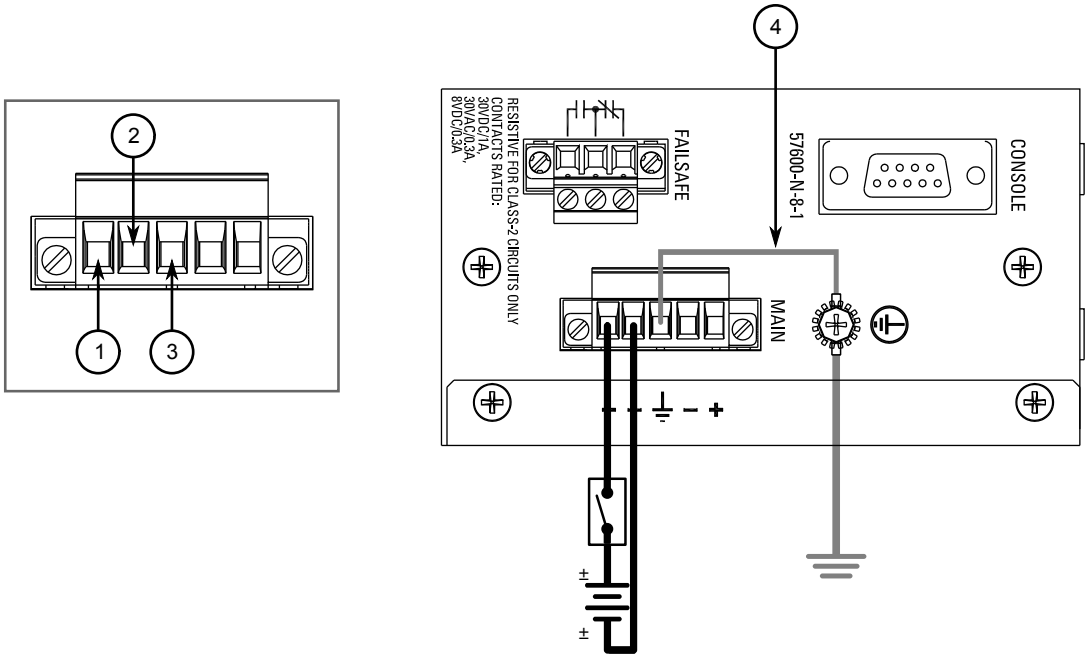

Figure 7: Terminal Block Wiring – Single DC Power Supply Inputs

1. Positive Terminal **2.** Negative Terminal **3.** Surge Ground Terminal **4.** Braided Ground Cable

3. Connect the negative wire from the power source to the negative terminal on the terminal block.
4. [Optional] If a redundant connection is required, repeat Step 2 and Step 3 to connect the secondary power inputs.

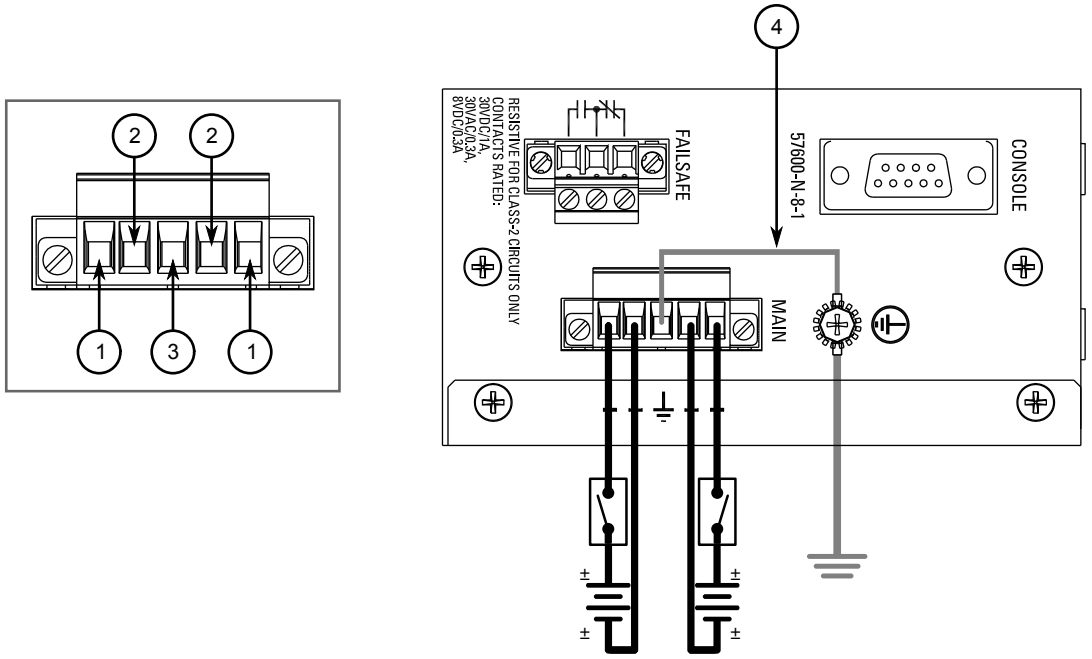

Figure 8: Terminal Block Wiring – Dual DC Power Supply Inputs

1. Positive Terminal **2.** Negative Terminal **3.** Surge Ground Terminal **4.** Braided Ground Cable

5. 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.
6. Connect the ground wire from the power source to the chassis groun terminal on the terminal block.

3 Device Management

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

CONTENTS

Section 3.1

Connecting to the Device

The following describes the various methods for accessing the RUGGEDCOM ROS console and Web interfaces on the device. For more detailed instructions, refer to the *RUGGEDCOM ROS User Guide* for the RUGGEDCOM RS910L.

IMPORTANT!
Ethernet cables should be only be connected/disconnected in a non-hazardous area, or when the device is not energized.

» Console Port

Connect a workstation directly to the RS232 serial console port to access the boot-time control and RUGGEDCOM ROS console interface. The console port provides access to RUGGEDCOM ROS's console interface.

IMPORTANT!
The serial console port is intended to be used only as a temporary connection during initial configuration or troubleshooting, and should only be used in a safe area (as defined by IEC 60079-0, Edition 6.0).

Use the following settings to connect to the port:

Speed	57600 baud
Data Bits	8
Stop Bit	1
Parity	None
Flow Control	Off
Terminal ID	VT100

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

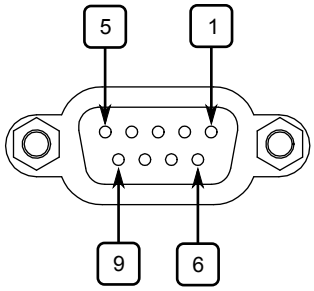

Figure 9: Serial DB9 Console Port

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

[a] *Connected internally.*

[b] *Connected internally.*

Ethernet Ports

Connect any of the available Ethernet ports on the device to a management switch and access the RUGGEDCOM ROS console and Web interfaces via the device's IP address. The factory default IP address for the RUGGEDCOM RS910L is https://192.168.0.1.

For more information about available ports, refer to Chapter 4, *Communication Ports*.

Section 3.2

Configuring the Device

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

4 Communication Ports

The RUGGEDCOM RS910L can be equipped with various types of communication ports to enhance its abilities and performance.

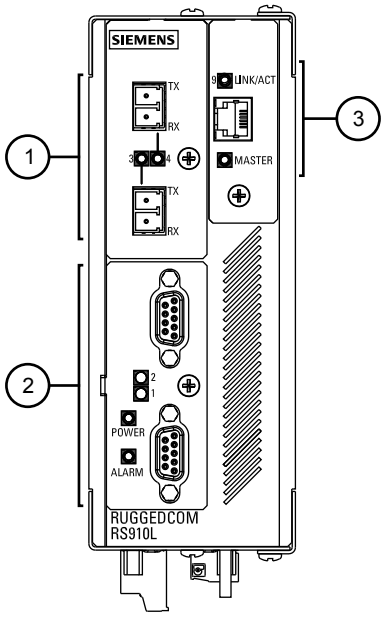

Figure 10: Port Assignment

1. Ports 1 and 2 **2.** Ports 3 and 4 **3.** Port 9

Port	Type
1 and 2	Serial Ports
3 and 4	Copper (10/100Base-TX) or Fiber Optic (100Base-FX) Ethernet Ports
9	EoVDSL Port

CONTENTS

Section 4.1

Copper Ethernet Ports

The RUGGEDCOM RS910L supports multiple 10/100Base-TX Ethernet ports that allow connection to standard Category 5 (CAT-5) shielded or unshielded twisted-pair cables with RJ45 male connectors.

WARNING!
Electric shock hazard – risk of serious personal injury and/or equipment interference. When shielded cables are used, make sure the shielded cables do not form a ground loop via the shield wire and the RJ45 receptacles at either end. Ground loops can cause excessive noise and interference, but more importantly, create a potential shock hazard that can result in serious injury.

LEDs

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

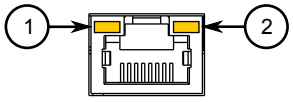

Figure 11: RJ45 Port LEDs

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

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

Pin-Out

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

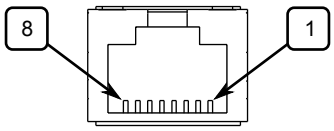

Figure 12: RJ45 Ethernet Port Pin Configuration

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

Specifications

For specifications on the available copper Ethernet ports, refer to Section 5.3, “Copper Ethernet Port Specifications”.

Section 4.2
Fiber Optic Ethernet Ports

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

Port Types

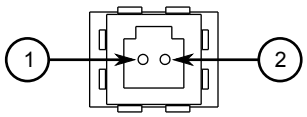

Figure 13: MTRJ Port

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

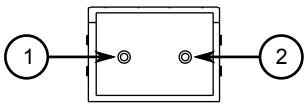

Figure 14: LC Port

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

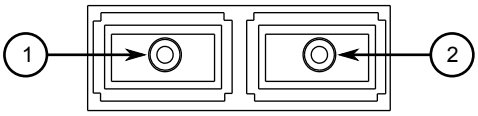

Figure 15: SC Port

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

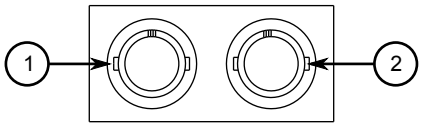

Figure 16: ST Port

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

LEDs

Each port features an LED that indicates the link/activity state of the port.

State	Description
Yellow (Solid)	Link established
Yellow (Blinking)	Link activity
Off	No link detected

Specifications

For specifications on the available fiber optic Ethernet ports, refer to Section 5.4, “Fiber Optic Ethernet Port Specifications”.

Section 4.3
EoVDSL Ports

Ethernet over VDSL (EoVDSL) connections operate in pairs with one device configured as the Master and the other as the Slave. In VDSL (Very-high-bit-rate Digital Subscriber Line), the terms Central Office (CO) or Line Termination

(LT) are used interchangeably for the Master, and the terms Customer Premise Equipment (CPE) or Network Termination (NT) are used interchangeably for the Slave. All EoVDSL line configuration settings are modified on the Master and pushed to the Slave. Data flowing from the Master to the Slave is designated *downstream*, while data flowing from the Slave to the Master is designated *upstream*.

Siemens supports two types of EoVDSL:

- **Universal EoVDSL**
  Universal EoVDSL ports are Master/Slave selectable and offer symmetric data rates (upstream and downstream) up to 35 Mbps. They are best suited for higher throughput connections spanning distances up to 2.5 km (1.6 mi).
- **Long-Reach EoVDSL**
  Long-Reach EoVDSL ports are fixed as either Master or Slave, but offer asymmetric data rates (upstream and downstream) up to 40 Mbps. They are best suited for lower throughput connections spanning distances up to 5 km (3.1 mi).

Universal and Long-Reach EoVDSL ports are physically indistinguishable from each other. However, the port type can be determined either from the order code or through the RUGGEDCOM ROS user interface.

EoVDSL ports can be connected using RJ11 male connectors.

IMPORTANT!
Universal and Long-Reach EoVDSL ports (master or slave) must be connected to EoVDSL ports (slave or master) of the same type. Connection between Universal EoVDSL ports and Long-Reach EoVDSL ports is not supported. While master/slave mode can be modified on Universal EoVDSL ports, the operating mode of all Long-Reach EoVDSL ports is predetermined by hardware. As a result, master/slave mode cannot be modified on Long-Reach EoVDSL ports.

LEDs

Each EoVDSL port has a **Link/Act** LED and a **Master** LED. On devices with Universal EoVDSL ports, the **Master** LED can be toggled on or off depending on whether the port is set to be a Master or Slave. On devices with Long-Reach EoVDSL ports, the **Master** LED will be on all the time if the device is set to be the Master, or off if the device is set to be the Slave.

LED	State	Description
Master	Green (Solid)	The device is in Master mode.
	Off	The device is in Slave mode.
Link/Act	Green (Solid)	Link established
	Green (Blinking)	Link activity
	Off	No link detected

Pin-Out

The following is the pin-out for the RJ11 connectors:

NOTE
All RJ11 connectors conform to the standard telephony pin configuration.

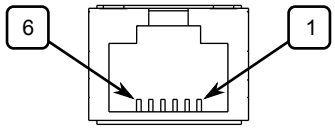

Figure 17: EoVDSL RJ11 Modem Port

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

CONTENTS

Section 4.3.1

EoVDSL Wiring

VDSL operates over 2-wire Category 3 (CAT-3) or higher twisted-pair wiring. Other twisted-pair wiring with similar characteristics may work, although the performance will vary depending on the cable characteristics and distance.

When wiring EoVDSL ports, note the following:

- EoVDSL ports are designed to be used on private communications lines for point-to-point connections and are not to be connected to the Public Switched Telephone Network (PSTN).
- To reduce the risk of fire, use only #26 AWG or larger telecommunication line cord.
- Twisted-pairs are an effective way of reducing both magnetic and capacitive interference, as they reduce the magnetic loop area to nearly zero and maintain a consistent distribution of capacitances to both ground and other sources. Therefore, make sure twisting is consistent throughout the cable length.
- Open leads (also known as bridged taps or drop-lines) along the length of the cable will cause an impedance mismatch and result in VDSL signal degradation.
- Make sure the cable impedance is consistent throughout the cable run. Avoid mixing different wiring (e.g. wiring with different gages) in cable runs, as this will cause an impedance mismatch and result in VDSL signal degradation.
- Make sure wiring is adequately separated between power and control circuits. Switching spikes and surges in power and control circuits can couple noise onto the VDSL line, causing interruptions in communications.
- Lower speeds are less susceptible to interference and will transmit greater distances over the same wiring than higher speeds. Use the minimum speed that will provide adequate data transfer speed.

Section 4.3.2

Configuration and Setup

If the RUGGEDCOM RS910L and another device both have Universal EoVDSL ports, configure one device to be the Master and the other the Slave. If both devices have a Long-Reach EoVDSL port, no Master/Slave configuration is necessary, since the ports will already be fixed as Master or Slave.

Once configured and connected together, each device will attempt to achieve the maximum speed based on the line length and conditions. The RUGGEDCOM RS910L's **Link/Act** LED may flash on and off several times before setting on a final link speed and declaring the port up.

For more information about configuring the RUGGEDCOM RS910L, refer to the *ROS User Guide* for the RS910L.

Section 4.3.3
EoVDSL Performance

The following describes the behavior and performance characteristics of EoVDSL.

EoVDSL Modes

The EoVDSL port can be configured to operate in one of two modes:

- **Auto Mode (default)**
  In Auto Mode, the device will step through the different speeds and automatically select the best bit-rate based on the current line conditions.
- **Manual Mode**
  In Manual Mode, the user can select one of the speed settings and the device will only attempt to attain the set speed.

If the line conditions degrade (reducing the SNR or Signal to Noise Ratio), but the device is able to maintain the link, an alarm will be triggered to notify the user of the reduced SNR. By configuring the *Rescan Mode* parameter in RUGGEDCOM ROS, the user can control at which point the scan process will be restarted when the line conditions degrade. If `Link only` is selected, the device will restart the scan process if the line conditions degrade, such that the device is unable to maintain the current link. If `Link or SNR` is selected, the device will restart the scan process if either the SNR has dropped below a pre-defined acceptable level or when the device is unable to maintain the current link, or whichever comes first.

NOTE
If the Mode parameter is set to `Manual Mode`*, the restart of the scan process will only attempt to attain the set speed in manual mode.*

For information about configuring EoVDSL, refer to the *RUGGEDCOM ROS User Guide for the RUGGEDCOM RS910L*.

NOTE
Assuming the distance can support the speed setting, the time to establish a link is typically 15 to 30 seconds.

Universal EoVDSL Performance Characteristics

On No. 24 AWG Polyethylene Insulated Cable (PIC) twisted-pair wiring, the following performance is typical with Universal EoVDSL:

Distance	Downstream/Upstream (Mbps)
0.5 km (1640 ft)	35
0.6 km (1969 ft)	30
0.7 km (2297 ft)	25

Distance	Downstream/Upstream (Mbps)
0.9 km (2953 ft)	20
1.0 km (3280 ft)	15
1.3 km (4265 ft)	10
1.7 km (5577 ft)	5
2.0 km (6562 ft)	2.5
2.5 km (8202 ft)	1.2

Long-Reach EoVDSL Performance Characteristics

On No. 24 AWG Polyethylene Insulated Cable (PIC) twisted-pair wiring, the following performance is typical with Long-Reach EoVDSL:

Distance (km)	Distance (ft)	Downstream (Master to Slave) (Mbps)	Upstream (Slave to Master) (Mbps)
0.50	1600	40	20
1.00	3300	25	5
1.50	4900	20	0.54
2.00	6600	15	0.54
2.50	8200	10	0.54
3.20	10500	5	0.54
4.00	13100	2.1	0.54
4.60	15100	1.2	0.54
5.00	16400	0.48	0.18

5 Technical Specifications

This section provides important technical specifications related to the device.

CONTENTS

Section 5.1

Power Supply Specifications

NOTE
When determining cable lengths, make sure the minimum input voltage for the power supply is provided at the power source.

Hazardous Environments

Power Supply Type	Input Range		Internal Fuse Rating[a]	Isolation	Maximum Power Consumption[b]
	Minimum	Maximum			
HI	125 VDC	250 VDC	3.15 A(T)	4 kVAC	10 W
	100 VAC	240 VAC	3.15 A(T)	4 kVAC	10 W
24	12 VDC	24 VDC	3.15 A(T)	1.5 kVDC	10 W
48	37 VDC	72 VDC	3.15 A(T)	1.5 kVDC	10 W

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

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

Non-Hazardous Environments

Power Supply Type	Input Voltage		Internal Fuse Rating[c]	Isolation	Maximum Power Consumption[d]
	Minimum	Maximum			
HI	88 VDC	300 VDC	3.15 A(T)	4 kVAC	10 W
	85 VAC	264 VAC	3.15 A(T)	5.5 kVDC	10 W
24	10 VDC	36 VDC	3.15 A(T)	1.5 kVDC	10 W
48	37 VDC	72 VDC	3.15 A(T)	1.5 kVDC	10 W

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

[d] *Power consumption may vary based on configuration.*

Section 5.2

Failsafe Alarm Relay Specifications

Hazardous Environments

Maximum Switching Voltage	Rated Switching Current	Isolation
30 VDC	1 A	1500 V_{rms} for 1 minute
80 VDC	0.3 A	
30 VAC		

Non-Hazardous Environments

Maximum Switching Voltage	Rated Switching Current	Isolation
30 VDC	2 A, 60 W	1500 V_{rms} for 1 minute
125 VDC	0.24 A, 30 W	
125 VAC	0.5 A, 62.5 W	
220 VDC	0.24 A, 60 W	
250 VAC	0.25 A, 62.5 W	

Section 5.3

Copper Ethernet Port Specifications

The following details the specifications for copper Ethernet ports that can be ordered with the RUGGEDCOM RS910L.

Speed[e]	10/100Base-TX
Connector	RJ45
Duplex[e]	FDX/HDX

Cable Type[f]	> CAT 5
Wiring Standard[g]	TIA/EIA T568A/B
Maximum Distance[h]	100 m (328 ft)
Isolation[i]	1.5 kV

[e] *Auto-negotiating.*

[f] *Shielded or unshielded.*

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

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

[i] *RMS 1 minute.*

Section 5.4

Fiber Optic Ethernet Port Specifications

The following details the specifications for fiber Ethernet ports that can be ordered with the RUGGEDCOM RS910L.

NOTE

- *All optical power numbers are listed as dBm averages. To convert from average to peak, add 3 dBm. To convert from peak to average, subtract 3 dBm.*
- *Maximum segment length is greatly dependent on factors such as fiber quality, and the number of patches and splices. Consult a Siemens sales associate when determining maximum segment distances.*

10Base-FL Fiber Optic

Mode	Connector Type	Tx λ (nm)[j]	Cable Type (µm)	Tx (dBm)		Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[j]	Power Budget (dB)
				Minimum	Maximum				
MM	ST	62.5/125	850	-16	-9	-34	-11.2	2	18
		50/125	850	-19.8	-12.8				14.2

[j] *Typical.*

100Base-FX Fiber Optic

Mode	Connector Type	Tx λ (nm)[k]	Cable Type (µm)	Tx (dBm)		Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[k]	Power Budget (dB)
				Minimum	Maximum				
MM	ST	62.5/125	1300	-19	-14	-31	-14	2	12
		50/125	1300	-22.5	-14	-31	-14	2	8.5
MM	SC	62.5/125	1300	-19	-14	-31	-14	2	12
		50/125	1300	-22.5	-14	-31	-14	2	8.5
MM	MTRJ	62.5/125	1300	-19	-14	-31	-14	2	12

Mode	Connector Type	Tx λ (nm)[k]	Cable Type (µm)	Tx (dBm)		Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[k]	Power Budget (dB)
				Minimum	Maximum				
SM	ST	9/125	1300	-15	-8	-32	-3	20	17
SM	SC	9/125	1300	-15	-8	-31	-7	20	16
SM	LC	9/125	1300	-15	-8	-34	-7	20	19
SM	SC	9/125	1300	-5	0	-34	-3	50	29
SM	LC	9/125	1300	-5	0	-35	3	50	30
SM	SC	9/125	1300	0	5	-37	0	90	37
SM	LC	9/125	1300	0	5	-37	0	90	37
MM	LC	50/125	1300	-22.5	-14	-31	-14	2	8.5

[k] *Typical.*

Section 5.5
Serial Port Specifications

The following details the specifications for serial ports that can be ordered with the RUGGEDCOM RS910L.

Copper Serial Ports

Baud Rate	300 to 230 kbps
Connector	DB9 or RJ45
Isolation	2.5 kV

Fiber Serial Ports

Mode	Multimode
Connector	ST
Typical Distance (km)	5
Optical Wavelength (nm)	850
Cable Size	50/125 or 62.5/125

Section 5.6
Operating Environment

The RUGGEDCOM RS910L is rated to operate under the following environmental conditions.

Ambient Operating Temperature[l]	-40 to 85 °C (-40 to 185 °F)
Ambient Storage Temperature	-40 to 85 °C (-40 to 185 °F)

Ambient Relative Humidity[m]	5% to 95%
Maximum Altitude	2000 m

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

[m] *Non-condensing.*

Section 5.7
Mechanical Specifications

Weight	1.2 kg (2.7 lbs)
Enclosure	20 AWG Galvanized Steel

Section 5.8
Dimension Drawings

NOTE
All dimensions are in millimeters, unless otherwise stated.

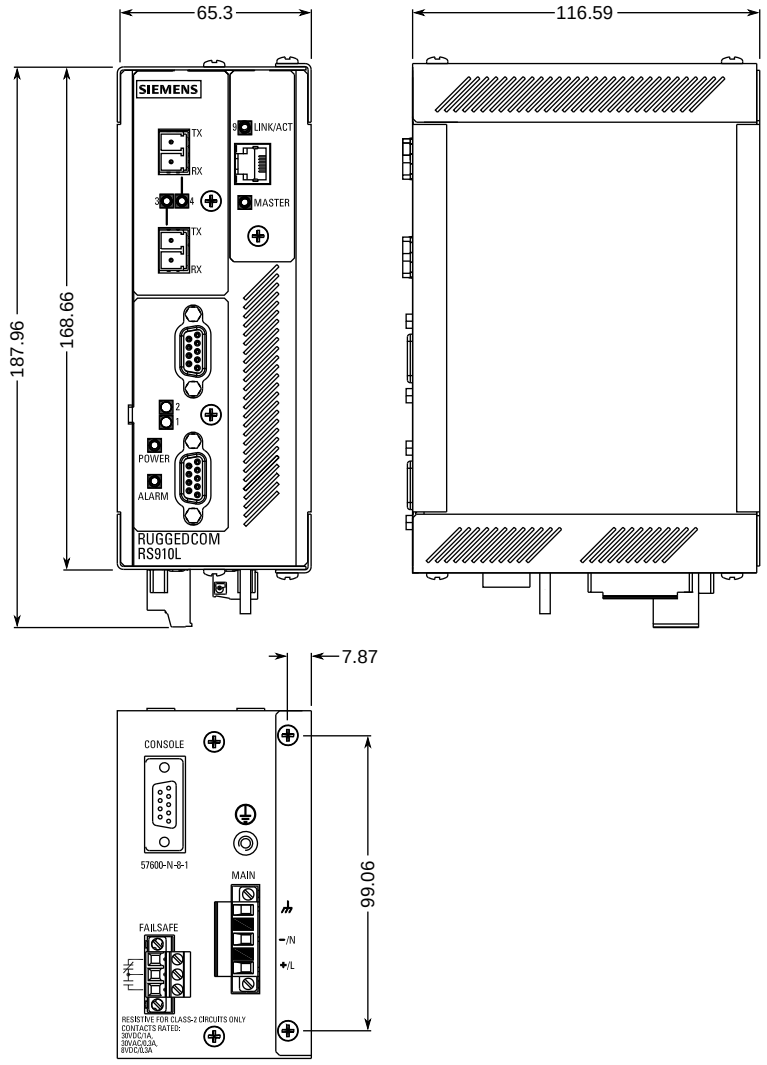

Figure 18: Overall Dimensions

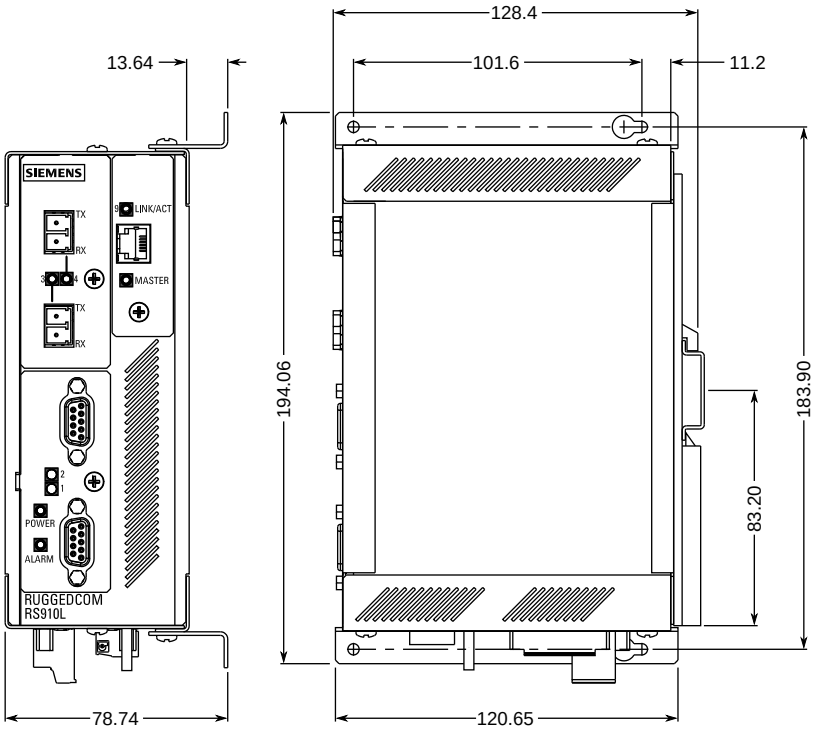

Figure 19: Panel and DIN Rail Mount Dimensions

6 Certification

The RUGGEDCOM RS910L device has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

CONTENTS

Section 6.1

Approvals

This section details the standards to which the RUGGEDCOM RS910L complies.

CONTENTS

Section 6.1.1

CSA

This device meets the requirements of the following Canadian Standards Association (CSA) standards under certificate 1550963:

- **CAN/CSA-C22.2 No. 60950-1**
  Information Technology Equipment – Safety – Part 1: General Requirements (Bi-National Standard, with UL 60950-1)
- **UL 60950-1**
  Information Technology Equipment – Safety Part 1: General Requirements
- **CAN/CSA-C22.2 No. 0-M91**
  General Requirements - Canadian Electrical Code, Part II

- **CAN/CSA-C22.2 No. 142-M1987**
  Process Control Equipment Industrial Products
- **CAN/CSA-C22.2 No. 213-16**
  Non-Incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations (Bi-National Standard with ANSI/ISA-12.12.01-2016)
- **UL 916**
  Standard for Energy Management Equipment
- **ANSI/ISA-12.12.01-2015**
  Non-Incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations

It is specifically approved for use in hazardous locations with the following markings:

- Class I, Division 2, Groups A, B, C, D
- Temperature rating T6 at 40 °C and T4A at 85 °C

Section 6.1.2
FCC

This device 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 device 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 users will be required to correct the interference at their own expense.

IMPORTANT!
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this device.

Section 6.1.3
FDA/CDRH

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

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

Section 6.1.4
ISED

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

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

Section 6.1.5
TÜV SÜD

This device is certified by TÜV SÜD to meet the requirements of the following standards:

- **CAN/CSA-C22.2 NO. 60950-1**
  Information Technology Equipment – Safety – Part 1: General Requirements (Bi-National standard, with UL 60950-1)
- **UL 60950-1**
  Information Technology Equipment – Safety – Part 1: General Requirements

Section 6.1.6
RoHS

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

- **China RoHS 2**
  Administrative Measure on the Control of Pollution Caused by Electronic Information Products

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

Section 6.1.7
Other Approvals

This device meets the requirements of the following additional standards:

- **IEC 61000-6-2**
  Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments

Section 6.2
EMC and Environmental Type Tests

The RUGGEDCOM RS910L has passed the following Electromagnetic Compatibility (EMC) and environmental tests.

» EMC Type Tests

Test	Description		Test Levels	Severity Levels
IEC 61000-4-2	ESD	Enclosure Contact	± 8 kV	4
		Enclosure Air	± 15 kV	4
IEC 61000-4-3	Radiated RFI	Enclosure Ports	20 V/m	
IEC 61000-4-4	Burst (Fast Transient)	Signal Ports	± 4 kV @ 2.5 kHz	x
		DC Power Ports	± 4 kV	4

Test	Description		Test Levels	Severity Levels
		AC Power Ports	± 4 kV	4
		Earth Ground Ports	± 4 kV	4
IEC 61000-4-5	Surge	Signal Ports	± 4 kV Line-to-Ground ± 2 kV	4
		DC Power Ports	± 2 kV Line-to-Ground ± 1 kV Line-to-Line	3
		AC Power Ports	± 4 kV Line-to-Ground ± 2 kV Line-to-Line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal Ports	10 V	3
		DC Power Ports	10 V	3
		AC Power Ports	10 V	3
		Earth Ground Ports	10 V	3
IEC 61000-4-8	Magnetic Field	Enclosure Ports	40 A/m Continuous 1000 A/m for 1 s	
IEC 61000-4-11	Voltage Dips and Interrupts	AC Power Ports	100% for 5 Periods 100% for 50 Periods	
IEC 61000-4-12	Damped Oscillatory	Signal Ports	2.5 kV Common Mode @ 1 MHz 1 kV Differential Mode @ 1 MHz	3
		DC Power Ports	2.5 kV Common Mode @ 1 MHz 1 kV Differential Mode @ 1 MHz	3
		AC Power Ports	2.5 kV Common Mode @ 1 MHz 1 kV Differential Mode @ 1 MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal Ports	30 V Continuous 300 V for 1 s	4
		DC Power Ports	30 V Continuous 300 V for 1 s	4
IEC 61000-4-17	Ripple on DC Power Supply	DC Power Ports	10%	3
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 60255-5	Dielectric Strength	Signal Ports	2 kV (Failsafe Relay Output)	
		DC Power Ports	2 kV	
		AC Power Ports	2 kV	
	HV Impulse	Signal Ports	5 kV (Failsafe Relay Output)	
		DC Power Ports	5 kV	
		AC Power Ports	5 kV	

EMC Immunity Type Tests per IEEE 1613

NOTE
The RUGGEDCOM RS910L meets Class 2 requirements for an all-fiber configuration and Class 1 requirements for copper ports. Class 1 allows for temporary communication loss, while Class 2 requires error-free and interrupted communications.

Description		Test Levels
ESD	Enclosure Contact	± 8 kV
	Enclosure Air	± 15 kV
Radiated RFI	Enclosure Ports	35 V/m
Fast Transient	Signal Ports	± 4 kV @ 2.5 kHz
	DC Power Ports	± 4 kV
	AC Power Ports	± 4 kV
	Earth Ground Ports	± 4 kV
Oscillatory	Signal Ports	2.5 kV Common Mode @ 1 MHz
	DC Power Ports	2.5 kV Common and Differential Mode @ 1 MHz
	AC Power Ports	2.5 kV Common and Differential Mode @ 1 MHz
HV Impulse	Signal Ports	5 kV (Failsafe Relay)
	DC Power Ports	5 kV
	AC Power Ports	5 kV
Dielectric Strength	Signal Ports	2 kV (Failsafe Relay)
	DC Power Ports	2 kV
	AC Power Ports	2 kV

Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40 °C (-40 °F), 16 Hours	
IEC 60068-2-2	Dry Heat	Test Bd	85 °C (185 °F), 16 Hours	
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (Non-Condensing), 55 °C (131 °F), 6 Cycles	
IEC 60255-21-1	Vibration		2 g @ 10 to 150 Hz	Class 2
IEC 60255-21-2	Shock		30 g @ 11 ms	Class 2