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Edition 11/2022

Installation Manual

SIMATIC NET

Rugged Ethernet Switches

RUGGEDCOM RS910L

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Rugged Ethernet Switches RUGGEDCOM RS910L

Installation Manual

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11/2022
C79000-G8976-1030-11

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

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Process Automation
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Canada

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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.

Related Documents

Other documents that may be of interest include:

Document Title	Link
RUGGEDCOM ROS Configuration Manual	https://support.industry.siemens.com/cs/ww/en/view/109737222

SIMATIC NET Glossary

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

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

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

Accessing Documentation

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

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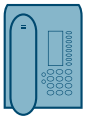
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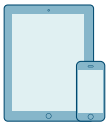
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- Submit SRs or check on the status of an existing SR
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- Ask questions or share knowledge with fellow Siemens customers and the support community

Contacting Siemens

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E-Mail	info.ruggedcom@siemens.com
Web	https://www.siemens.com

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), 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.

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

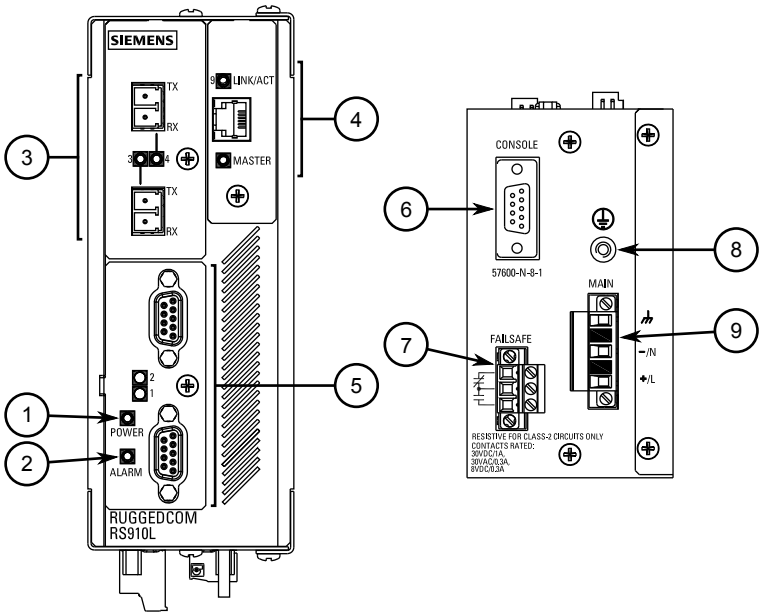
- Immunity to EMI and heavy electrical surges
- -40 to 85 °C (-40 to 185 °F) ambient operating temperature (no fans)
- 20 AWG Galvanized Steel
- DIN or panel mounting options provide secure mechanical reliability
- [Optional] Conformal coated printed circuit boards

Power Supply

- Fully integrated power supply
- Universal high-voltage range: 88-300 VDC or 85-264 VAC
- Dual LO DC inputs: 24 or 48 VDC
- Terminal blocks for reliable maintenance free connections
- CSA/UL 62368-1 safety approved to 85 °C (185 °F)

1.2 Description

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



① POWER LED
② ALARM LED
③ [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

Figure 1.1 RUGGEDCOM RS910L

POWER LED	Illuminates green during boot up and 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 "Connecting to the Device" (Page 17).
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 "Communication Ports" (Page 19).
Failsafe Alarm Relay	Latches to default state when a power disruption or other alarm condition occurs. For more information, refer to: • "Connecting the Failsafe Alarm Relay" (Page 11) • "Failsafe Alarm Relay Specifications" (Page 27)
Power Supply Terminal Blocks	Pluggable terminal blocks for connecting one or more power sources. For more information, refer to "Connecting Power" (Page 12) and "Power Supply Specifications" (Page 27).

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.
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.

1.4 Decommissioning and Disposal

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

Decommissioning

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

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

Recycling and Disposal

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

1.5 Cabling Recommendations

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.

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

This chapter describes how to install the device, including mounting the device, connecting power, and connecting the device to the network.



⚠ DANGER

Electrocution hazard – risk of serious personal injury and/or damage to equipment

Before performing any maintenance tasks, make sure all power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.



⚠ WARNING

Radiation hazard – risk of serious personal injury

This product contains a laser system and is classified as a *Class I LASER PRODUCT*. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



⚠ CAUTION

Burn hazard – risk of personal injury

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

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

⚠ NOTICE

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

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

⚠ NOTICE

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

2.1 General Procedure

The general procedure for installing the device is as follows:

Note

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

1. Review the relevant certification information for any regulatory requirements. For more information, refer to "Approvals" (Page 33).
2. 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.

2.2 Unpacking the Device

When unpacking the device, do the following:

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

Note

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

2.3 Mounting the Device

The RUGGEDCOM RS910L is designed for maximum mounting and display flexibility. It can be equipped with adapters that allow it to be attached to a DIN rail or panel.

Note

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 "Dimension Drawings" (Page 30).

2.3.1 Mounting the Device on a DIN Rail

The RUGGEDCOM RS910L can be ordered with a DIN rail adapter preinstalled on the back of the chassis. Use the adapter to mount the device to a standard 35 mm (1.4 in) IEC/EN 60715 or TS35 DIN rail.

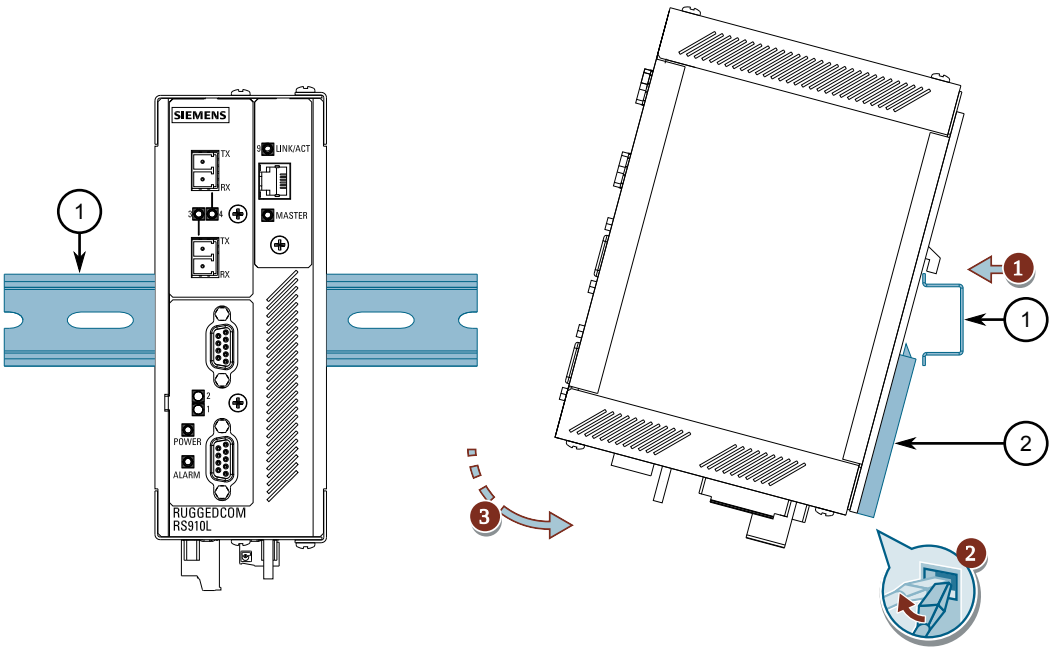
Mounting the Device

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

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

Note

The adapter features a sliding release with a slot at the bottom for a flathead screwdriver.



① DIN Rail
② DIN Rail Adapter

Figure 2.1 Mounting the Device to a DIN Rail

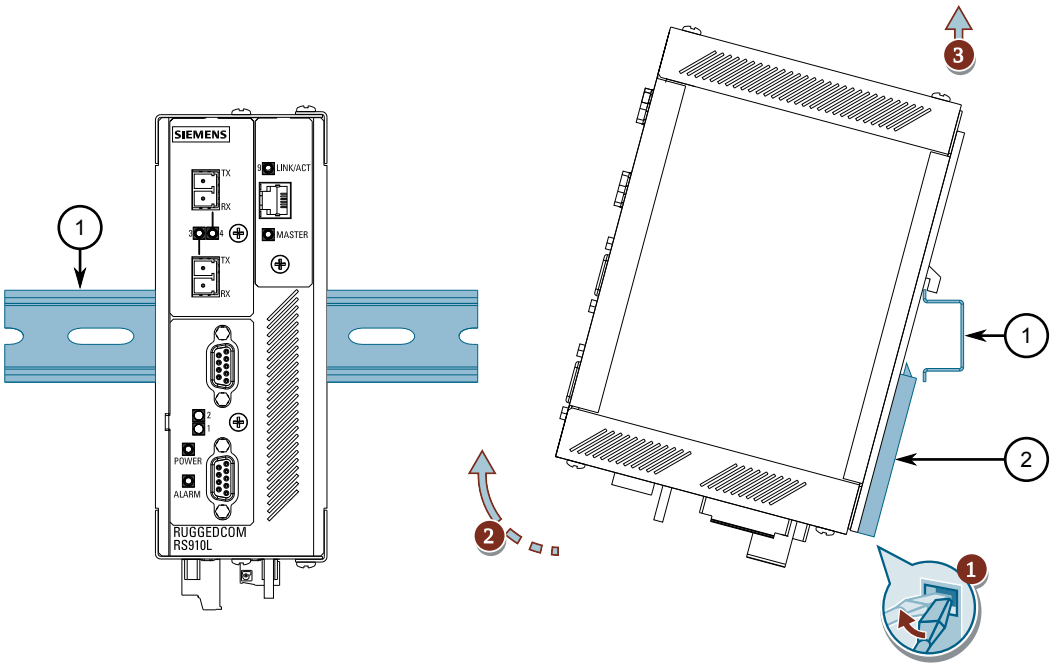
2. Insert a flathead screwdriver into the slot of the sliding release and move it down.

3. Push the device against the bottom of the DIN rail, then let go of the sliding release to latch the device.

Removing the Device

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

1. Insert a flathead screwdriver into the slot of the sliding release and move it down.



① DIN Rail
② DIN Rail Adapter

Figure 2.2 Removing the Device from a DIN Rail

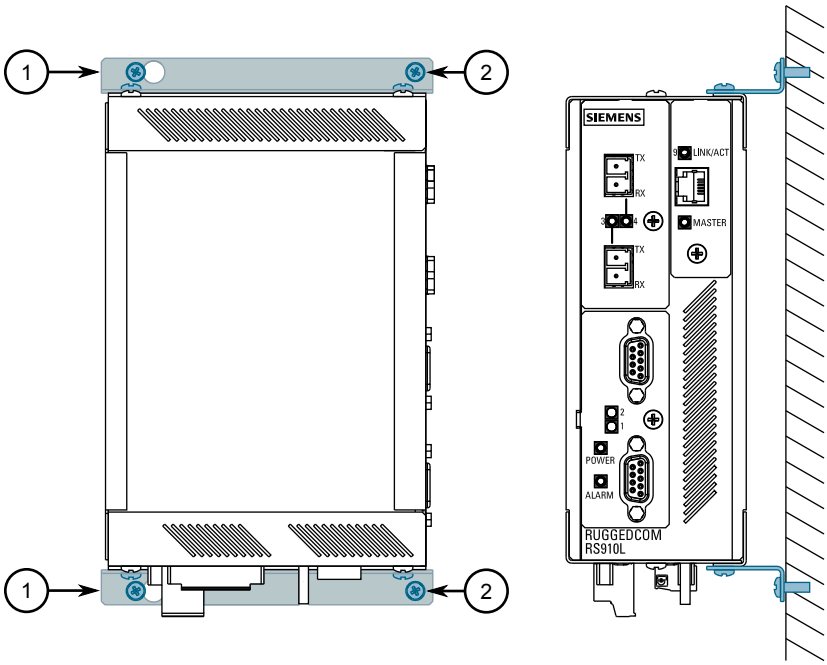
2. Swing the bottom of the device away from the DIN rail.
3. Lift the device off the DIN rail.

2.3.2 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.



① Screw (M3.5 or #6-32)
② Panel Mount Adapter

Figure 2.3 Panel Mounting

3. Secure the adapters to the panel with M3.5 or #6-32 screws.

2.4 Connecting the Failsafe Alarm Relay

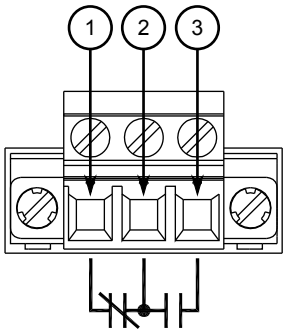
The failsafe relay can be configured to latch based on alarm conditions. The NO (Normally Open) contact is closed when the unit is powered and there are no active alarms. If the device is not powered or if an active alarm is configured, the relay opens the NO contact and closes the NC (Normally Closed)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

Note

Control of the failsafe relay output is configurable through RUGGEDCOM RS910L. One common application for this relay is to signal an alarm if a power failure occurs. For more information, refer to the "RUGGEDCOM ROS Configuration Manual" for the RUGGEDCOM 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.



① Normally Closed
② Common
③ Normally Open

Figure 2.4 Failsafe Alarm Relay Wiring

2.5 Connecting Power

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

Note

- 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.

2.5.1 Connecting High AC/DC Power

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

⚠ NOTICE

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.

⚠ NOTICE

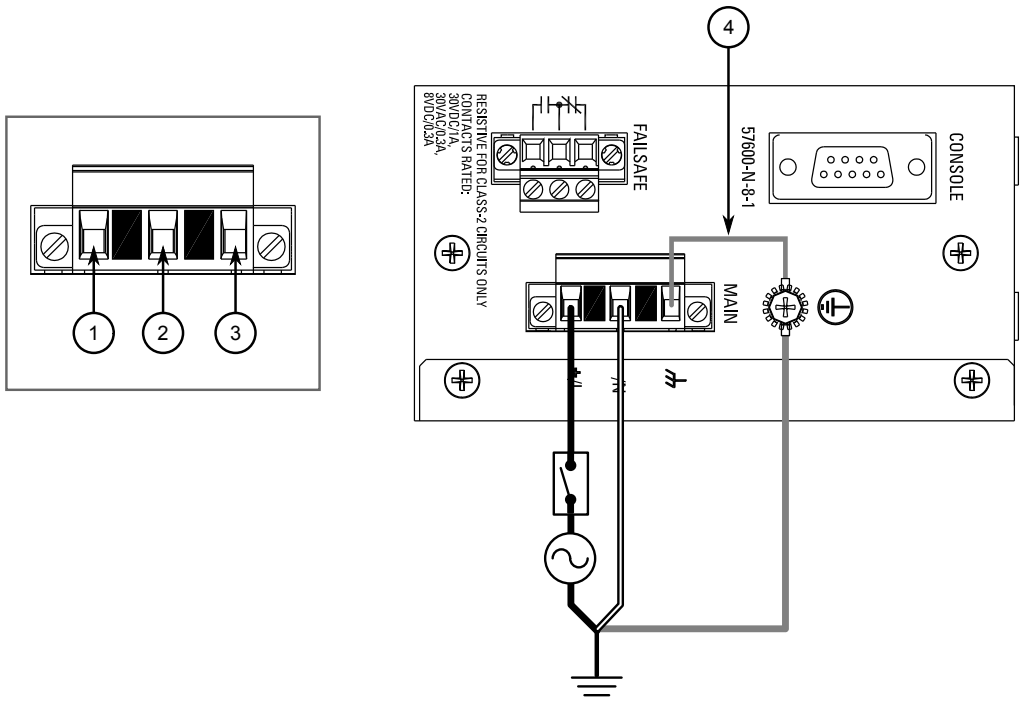
Electrical hazard – risk of damage to equipment

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

Note

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

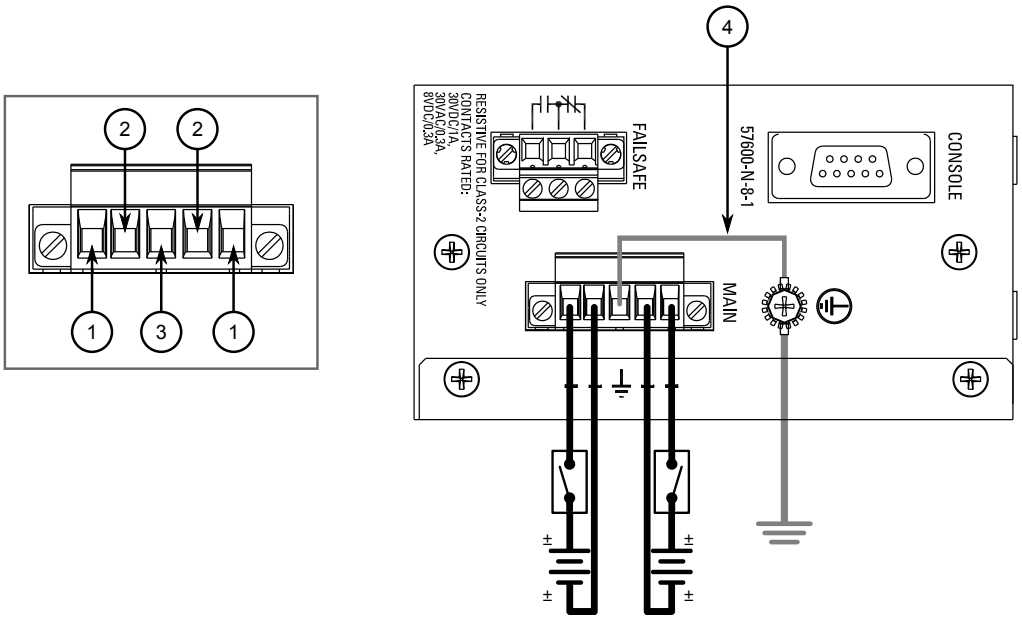
1. Secure the power terminal block to the device.
2. Connect the positive wire from the power source to the positive/live (+/L) terminal on the terminal block.



① Positive/Live (+/L) Terminal
② Negative/Neutral (-/N) Terminal
③ Surge Ground Terminal

④ Braided Ground Cable

Figure 2.5 Terminal Block Wiring



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

Figure 2.6 Terminal Block Wiring – Dual DC Power Supply Inputs

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.

2.5.2 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.

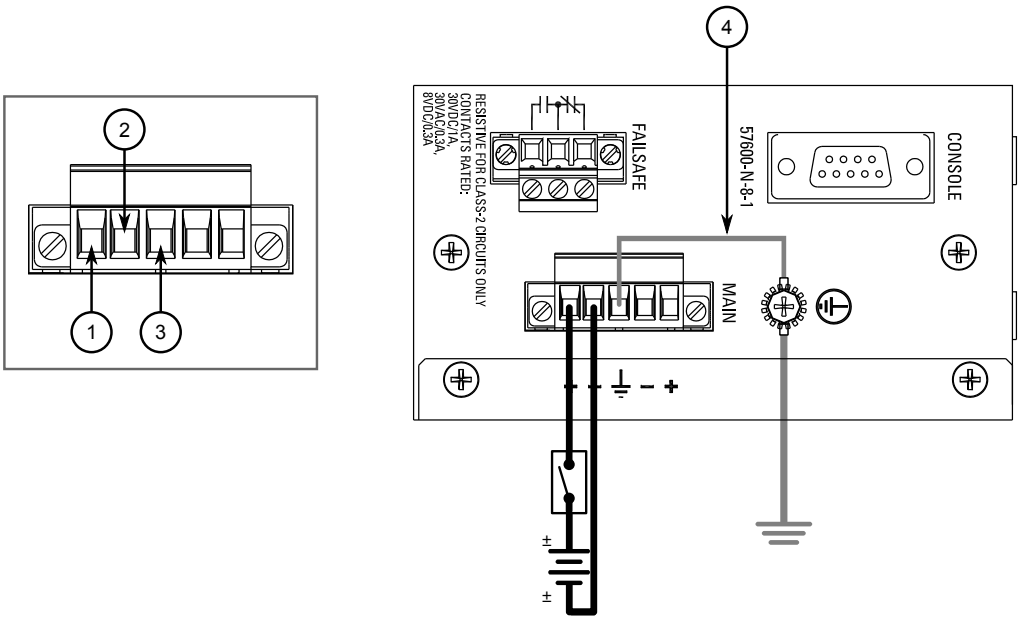
To connect a low DC power supply to the device, do the following:

Note

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

1. Secure the power terminal block to the device.

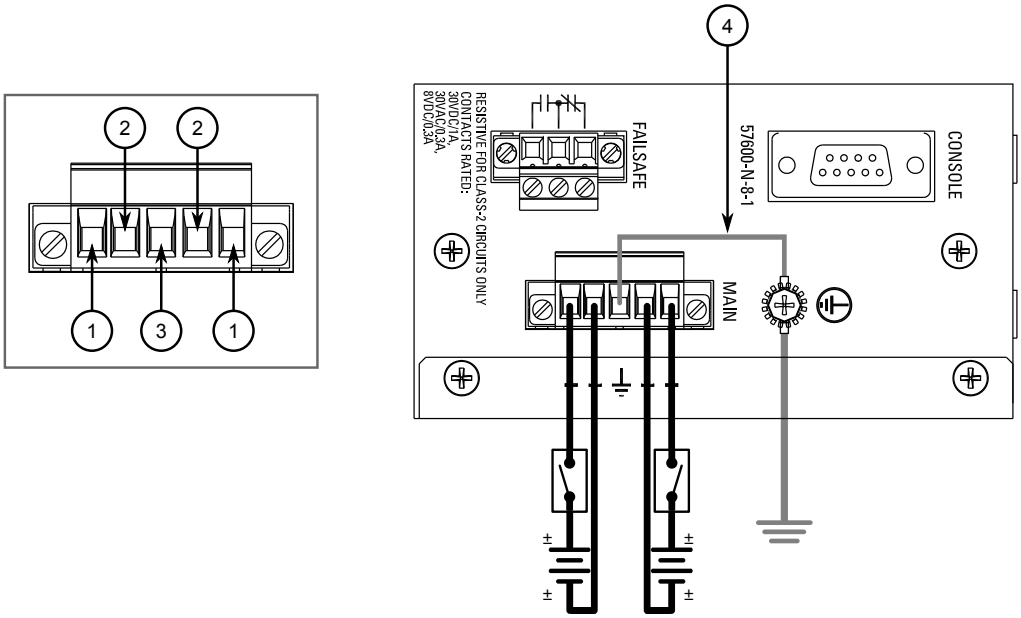
2. Connect the positive wire from the power source to the positive terminal on the terminal block.



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

Figure 2.7 Terminal Block Wiring – Single DC Power Supply Inputs

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 (Page 15) and step 3 (Page 15) to connect the secondary power inputs.



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

Figure 2.8 Terminal Block Wiring – Dual DC Power Supply Inputs

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.

3.1 Connecting to the Device

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

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 RS910L's console interface.

Note

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:

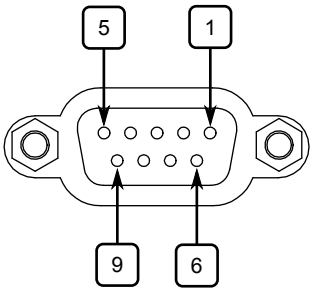


Figure 3.1 Serial DB9 Console Port

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

[a] *Connected internally.*

[b] *Connected internally.*

Ethernet Ports

Connect any of the available Ethernet ports on the device to a management switch and access the RUGGEDCOM RS910L 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.

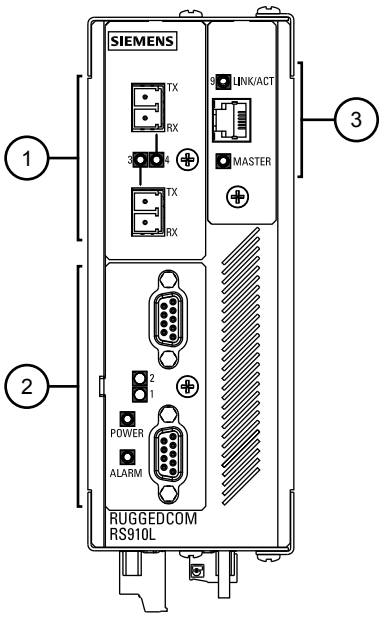
For more information about available ports, refer to "Communication Ports" (Page 19).

3.2 Configuring the Device

Once the device is installed and connected to the network, it must be configured. All configuration management is done via the RUGGEDCOM RS910L interface. For more information about configuring the device, refer to the "RUGGEDCOM ROS Configuration Manual" associated with the installed software release.

4 Communication Ports

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



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

Figure 4.1 Port Assignment

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

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.

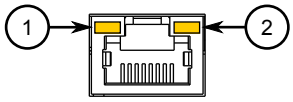
⚠ WARNING

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.



① Speed LED
② Link/Activity LED

Figure 4.2 RJ45 Port LEDs

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:

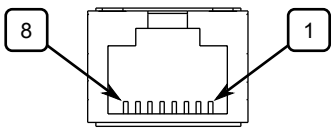


Figure 4.3 RJ45 Ethernet Port Pin Configuration

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

Pin	Name	Description
5	Reserved (Do Not Connect)	
6	TX-	Transmit Data-
7	Reserved (Do Not Connect)	
8	Reserved (Do Not Connect)	

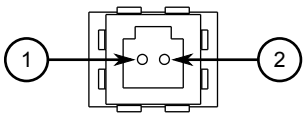
Specifications

For specifications on the available copper Ethernet ports, refer to "Copper Ethernet Port Specifications" (Page 28).

4.2 Fiber Optic Ethernet Ports

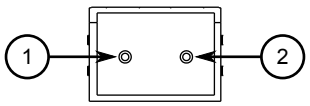
Fiber optic Ethernet ports are available with either MTRJ (Mechanical Transfer Registered Jack), LC (Lucent Connector), SC (Standard or Subscriber Connector) or ST (Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish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

Port Types



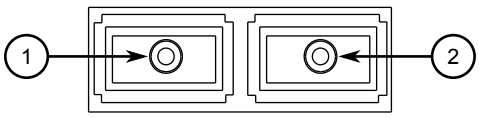
① Tx Connector
② Rx Connector

Figure 4.4 MTRJ Port



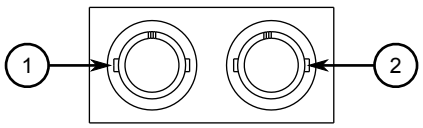
① Tx Connector
② Rx Connector

Figure 4.5 LC Port



① Tx Connector
② Rx Connector

Figure 4.6 SC Port



① Tx Connector
② Rx Connector

Figure 4.7 ST Port

LEDs

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

State	Description
Yellow (Solid)	Link established

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

Specifications

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

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 RS910L user interface.

EoVDSL ports can be connected using RJ11 male connectors.

⚠ NOTICE

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.

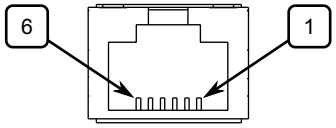


Figure 4.8 EoVDSL RJ11 Modem Port

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)

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.

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 "RUGGEDCOM ROS Configuration Manual" for the RS910L.

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 RS910L, 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 Configuration Manual" 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
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

Distance (km)	Distance (ft)	Downstream (Master to Slave) (Mbps)	Upstream (Slave to Master) (Mbps)
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.

5.1 Power Supply Specifications

Note

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

Power Supply Type	Input Voltage		Internal Fuse Rating[a]	Isolation	Maximum Power Consumption[b]
	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

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

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

5.2 Failsafe Alarm Relay Specifications

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	

5.3 Supported Networking Standards

The following networking standards are supported by RUGGEDCOM RS910L:

Standard	10 Mbps Ports	100 Mbps Ports	1000 Mbps Ports	Notes
IEEE 802.3x	•	•	•	Full Duplex Operation

Standard	10 Mbps Ports	100 Mbps Ports	1000 Mbps Ports	Notes
IEEE 802.3z			•	1000Base-LX
IEEE 802.3ab			•	1000Base-Tx
IEEE 802.1D	•	•	•	MAC Bridges
IEEE 802.1Q	•	•	•	VLAN (Virtual LAN)
IEEE 802.1p	•	•	•	Priority Levels

5.4 Copper Ethernet Port Specifications

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

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

[a] *Auto-negotiating.*

[b] *Shielded or unshielded.*

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

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

[e] *RMS 1 minute.*

5.5 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)[a]	Cable Type (µm)	Tx (dBm)		Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[a]	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

[a] *Typical.*

100Base-FX Fiber Optic

Mode	Connector Type	Tx λ (nm)[a]	Cable Type (µm)	Tx (dBm)		Rx Sensitivity (dBm)	Rx Saturation (dBm)	Distance (km)[a]	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
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

[a] *Typical.*

5.6 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)	820
Cable Size	50/125 or 62.5/125

5.7 Operating Environment

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

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

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

[b] *Non-condensing.*

5.8 Mechanical Specifications

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

5.9 Dimension Drawings

Note

All dimensions are in millimeters, unless otherwise stated.

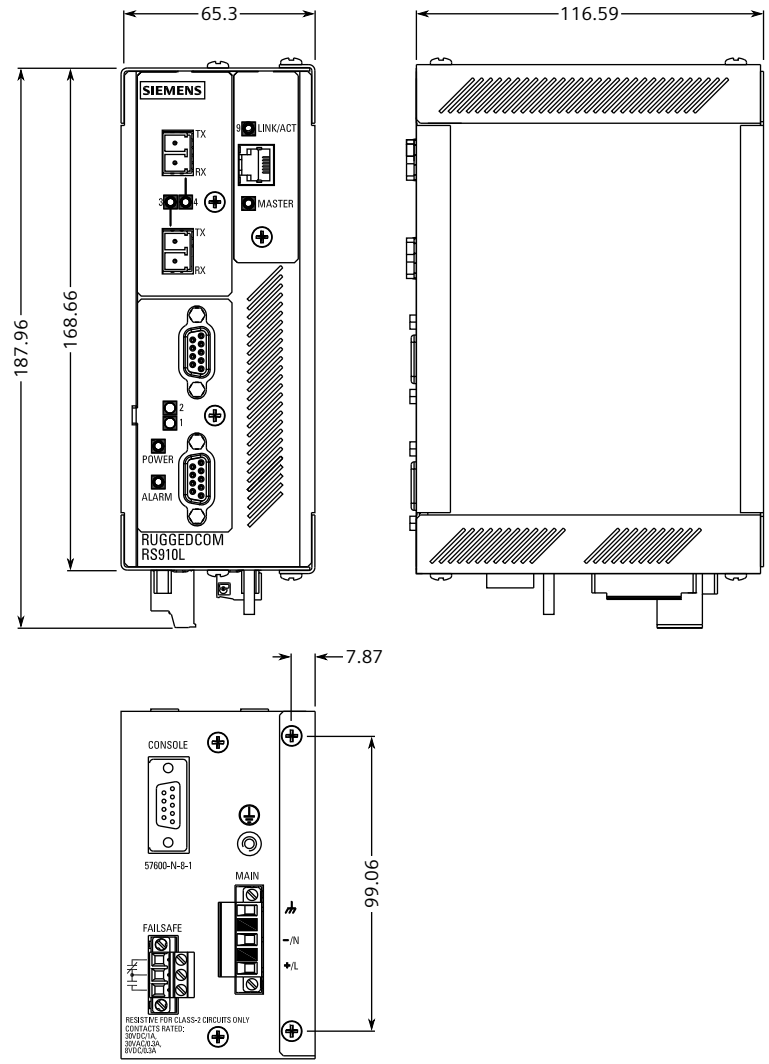


Figure 5.1 Overall Dimensions

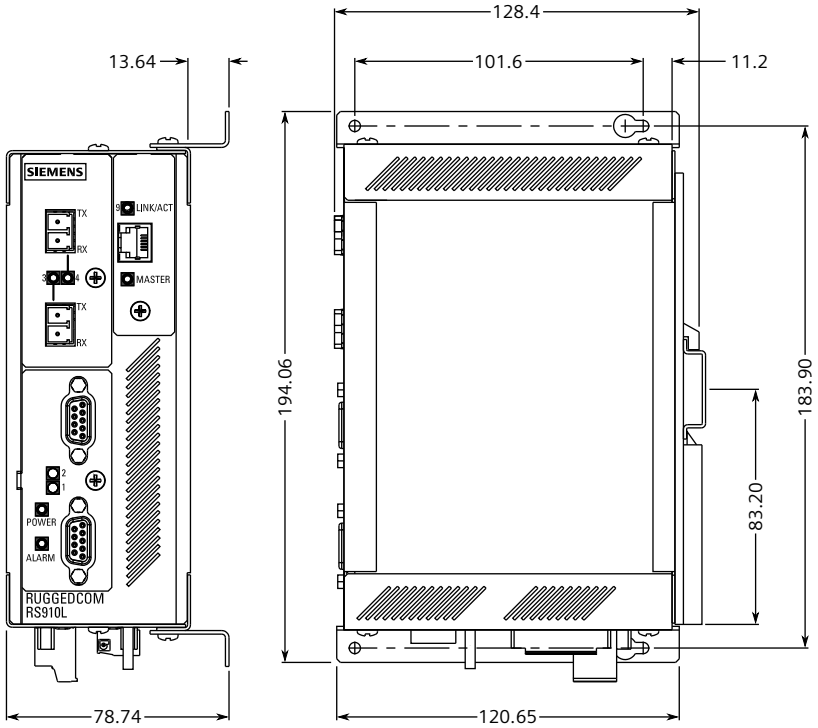


Figure 5.2 Panel and DIN Rail Mount Dimensions

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.

6.1 Approvals

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

Note

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

6.1.1 CSA

This device meets the requirements of the following Canadian and U.S. standards under certificate 1550963:

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

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



6.1.2 European Union (EU)

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

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

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

CE

6.1.3 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.

Note

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

6.1.4 FDA/CDRH

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

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

6.1.5 ISED

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

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

6.1.6 TÜV SÜD

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

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

6.1.7 ISO

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

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

6.1.8 RoHS

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

- **China RoHS 2**

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

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

6.1.9 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

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
		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	

Test	Description		Test Levels	Severity Levels
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 60255-27	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

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

Description		Test Levels
ESD	Enclosure Contact	± 8 kV
	Enclosure Air	± 15 kV
Radiated RFI	Enclosure Ports	35 V/m

Description		Test Levels
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

For more information

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