RUGGEDCOM®
INDUSTRIAL STRENGTH NETWORKS™

RuggedSwitch™ RS900GP

Hardware Installation Guide

Revision 100 - November 10, 2011

www.RuggedCom.com

RuggedSwitch™ RS900GP: Hardware Installation Guide

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Warranty

Five (5) years from date of purchase, return to factory. For warranty details, visit www.RuggedCom.com or contact your customer service representative.

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FCC Statement And Cautions

Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Caution: LASER

This product contains a laser system and is classified as a CLASS 1 LASER PRODUCT. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution: Service

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 RuggedCom Inc. could invalidate specifications, test results, and agency approvals, and void the user's authority to operate the equipment.

Should this device require service, refer to Appendix A, Warranty in this guide.

Caution: Physical Access

This product should be installed in a restricted access location where access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

Caution: Hot Surfaces

When in operation, regions of the unit surface may be hot.

Caution: Lithium Battery

This product contains a Lithium battery that is not replaceable by the operator or by service personnel.

1. Product Overview

The RuggedSwitch™ RS900GP is an industrially hardened, fully managed Ethernet switch providing dual fiber optical Gigabit Ethernet ports and eight Fast Ethernet copper ports - each capable of supplying high power 802.3at compliant power over Ethernet. Designed to operate reliably in harsh industrial environments, the RS900GP provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found in electric utility substations, factory floors or in curb side traffic control cabinets. An operating temperature range of -40°C to +85°C coupled with hazardous location certification, a powder coated aluminum enclosure and optional conformal coating allows the RS900GP to be placed in almost any location.

The embedded Rugged Operating System (ROS™) provides advanced networking features such as Enhanced Rapid Spanning Tree (eRSTP™), Port Rate Limiting and a full array of intelligent functionality for high network availability and manageability.

Ethernet Ports

- Up to 2 - Fiber Optic Gigabit-Ethernet Ports(100/1000BaseX)
- 8 - Fast Ethernet Ports (10/100BaseTX) all external 802.3af/802.3at compliant PoE
- Up to 2 - 10/100/1000 BaseTX copper ports
- Full compliance with IEEE: 802.3, 802.3u and 802.3z
- Non-blocking, store and forward switching
- Full duplex operation and flow control (IEEE 802.3x)
- Industry standard fiber optical connectors: LC, SC, SFP
- Bi-Directional simplex fiber support
- Long haul optics allow Gigabit distances up to 70km

Power Over Ethernet (PoE)

- 8-10/100 BaseTx 802.3af/802.3at compliant ports
- Data and power over a single Ethernet cable
- Auto-sensing ports that provide power only to PoE end devices

RuggedRated™ for Reliability in Harsh Environments

- Meets IEEE 1613 (electric utility substations)
- Exceeds IEC 61850-3 (electric utility substations)
- Exceeds IEEE 61800-3 (variable speed drive systems)
- Exceeds IEC 61000-6-2 (generic industrial environment)
- Exceeds NEMA TS-2 (traffic control equipment)
- Hazardous Location Certification: Class 1 Division 2
- -40 to +85°C operating temperature (no fans)
- Conformal coated circuit boards (optional)
- Rugged powder coated aluminum enclosure

Power Supply

- 2 (redundant) 54VDC inputs (51-57VDC)
- Supports 8 30W PoE powered devices (minimum 260W total output)
- Supports power supply sharing
- Reverse polarity protection
- CSA/UL 60950 safety approved to +85°C

Simple Plug and Play Operation

- Plug and play operation 802.3af/802.3at
- Automatic learning of up to 8192 MAC addresses
- Auto-negotiation on all 10/100BaseTX ports
- Auto-MDI/MDIX (crossover) on all 10/100BaseTX ports
- LED indicators for Link/Activity and Power

ROS™ Advanced Network Management

- Enhanced Rapid Spanning Tree (eRSTPTM)
- Quality of Service (802.1p) for real-time traffic
- Port rate limiting: 128kbps to 8Mbps
- VLAN (802.1q) with double tagging
- IGMP Snooping for multicast filtering
- Port configuration, status, statistics, mirroring, security
- Loss of link management on fiber ports
- Web-based, Telnet, CLI management interfaces
- SNMP v2 and RMON
- Rich set of diagnostics with logging and alarms

1.1. RS900GP Front Panel

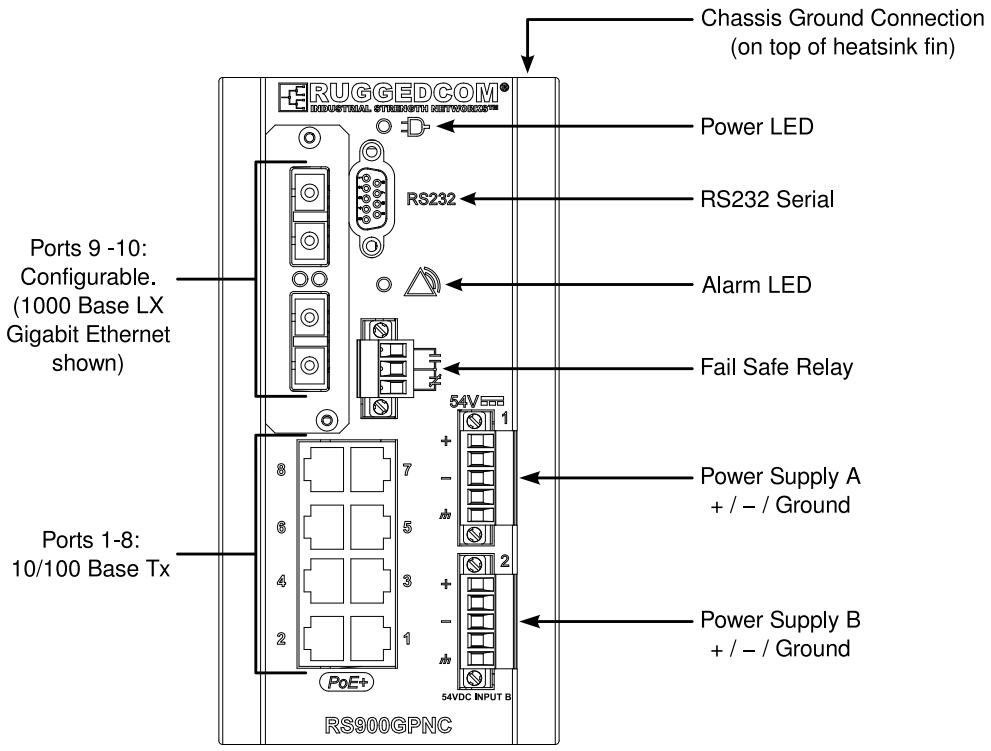

Figure 1.1. RS900GP Front Panel

LED Indicator	LED Color and State	Description
Power LED	Green, steady.	Power is on.
Alarm LED	Red, steady.	Alarm condition exists.
Ethernet Port 1-8 Link LED	Green, steady.	Network link.
Ethernet Port 1-8 Link LED	Green, blinking.	Network activity.
Ethernet Port 1-8 PoE LED	Orange, steady.	PoE is enabled and powered on.
Ethernet Port 1-8 PoE LED	Orange, blinking.	PoE is enabled and powered off.
Ethernet Port 1-8 PoE LED	Off.	PoE is disabled.

Table 1.1. Front Panel LED Definitions

2. Installation

2.1. DIN Rail Mounting

An optional DIN rail mounting bracket is available for the RS900GP.

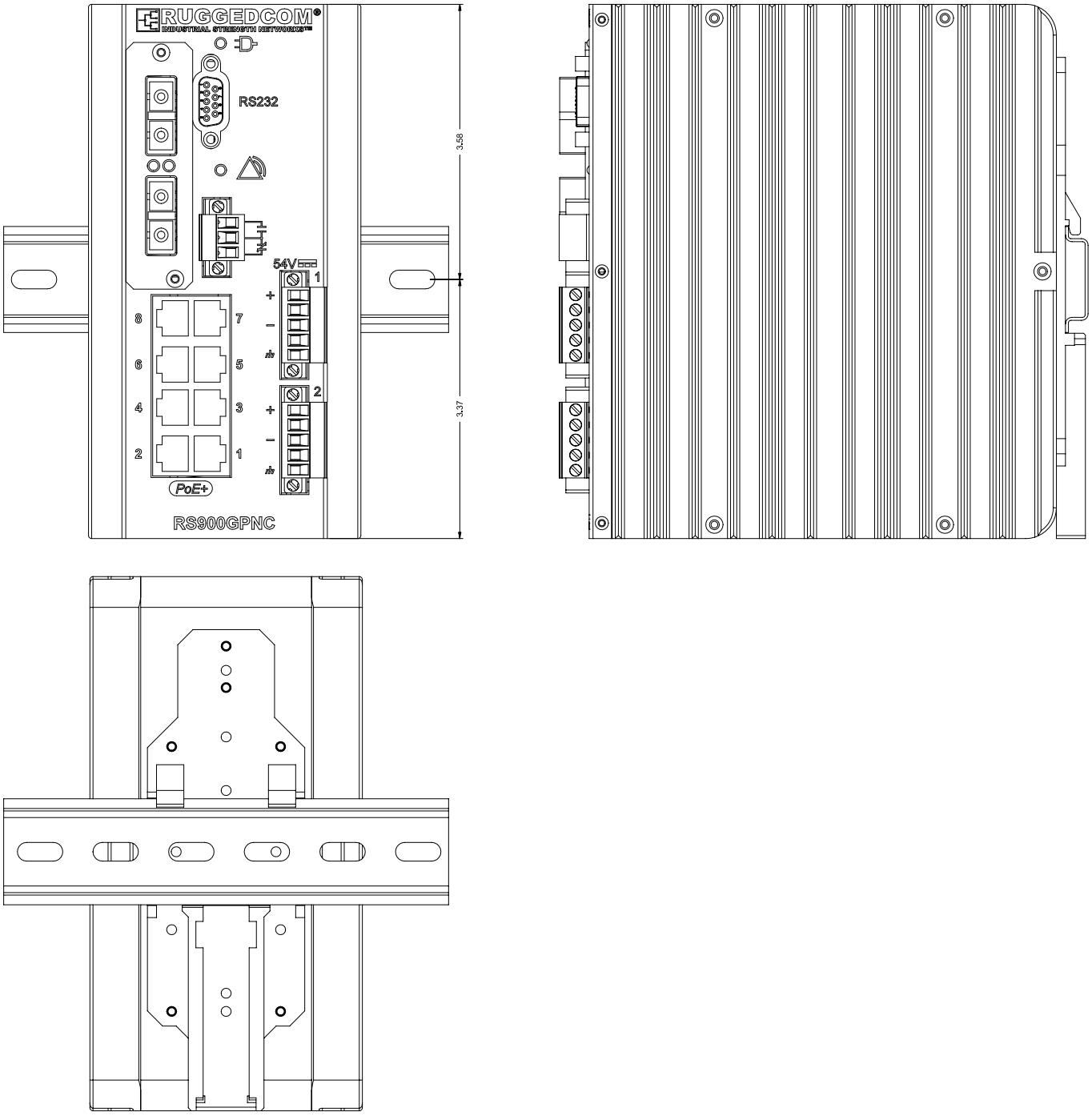

Figure 2.1. DIN Rail Mounting

2.2. Panel Mounting Options

The RS900GP can be equipped with front, rear, or side panel mount brackets.

2.2.1. RS900GP Front Panel Mount Option

The front panel mounting brackets fit flush with the front of the RS900GP.

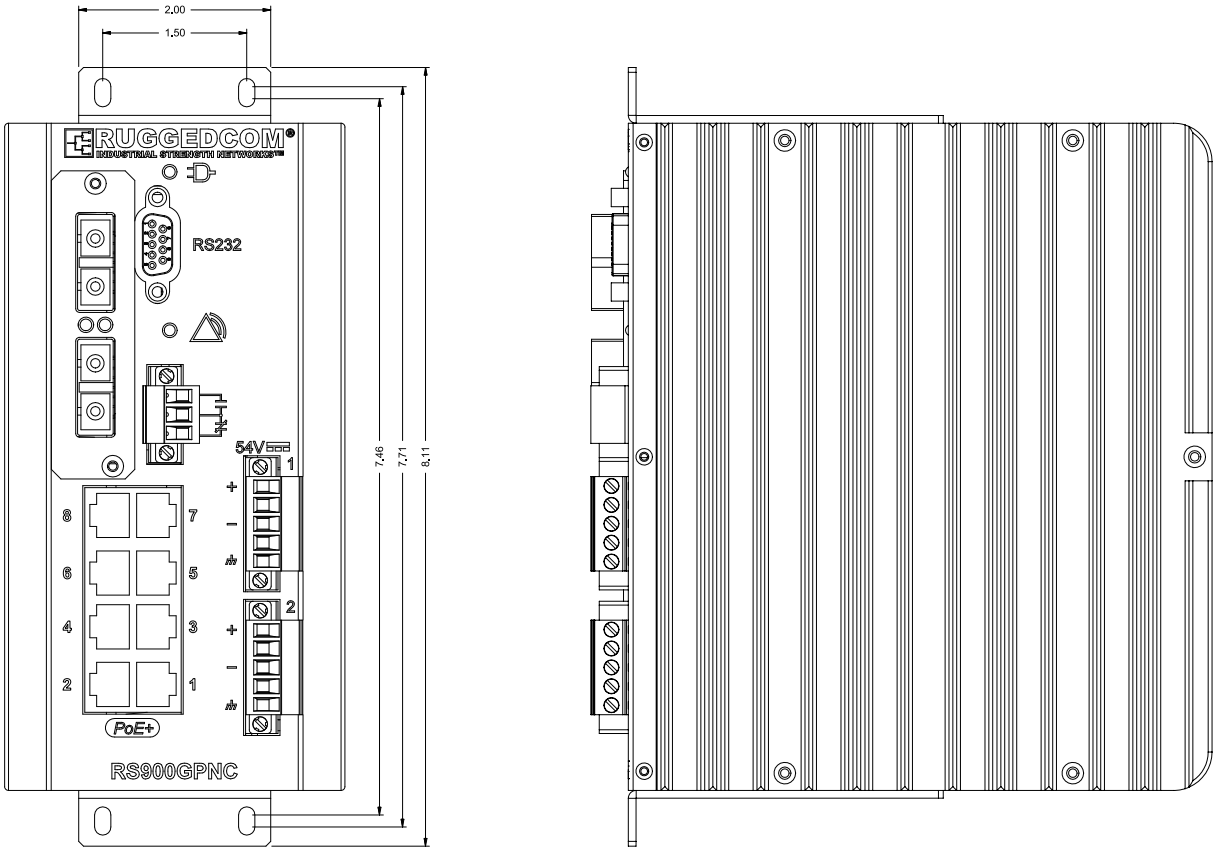

Figure 2.2. Front Panel Mounting

2.2.2. RS900GP Rear Panel Mount Option

The rear panel mounting brackets fit flush with the rear of the RS900GP.

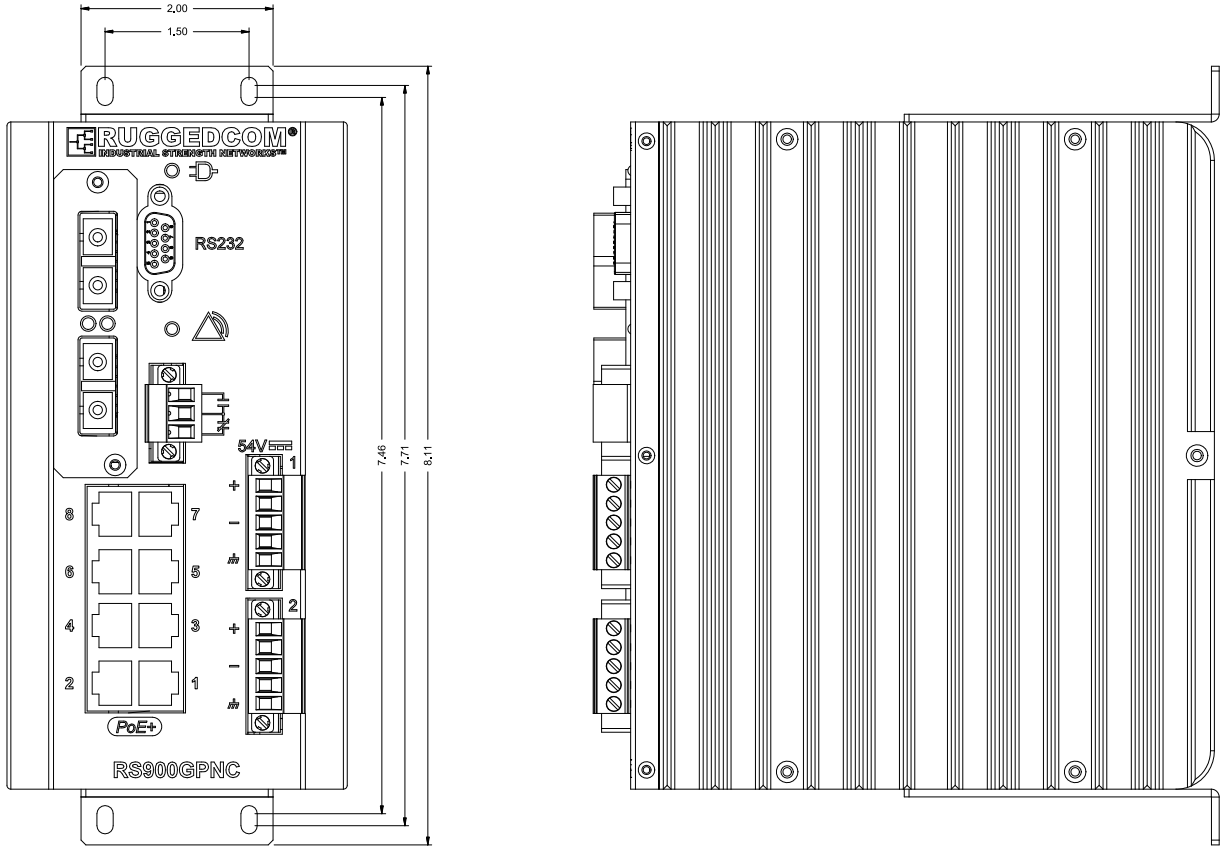

Figure 2.3. Rear Panel Mounting

2.2.3. RS900GP Side Panel Mount Option

The side panel mounting brackets fit flush with the side of the RS900GP.

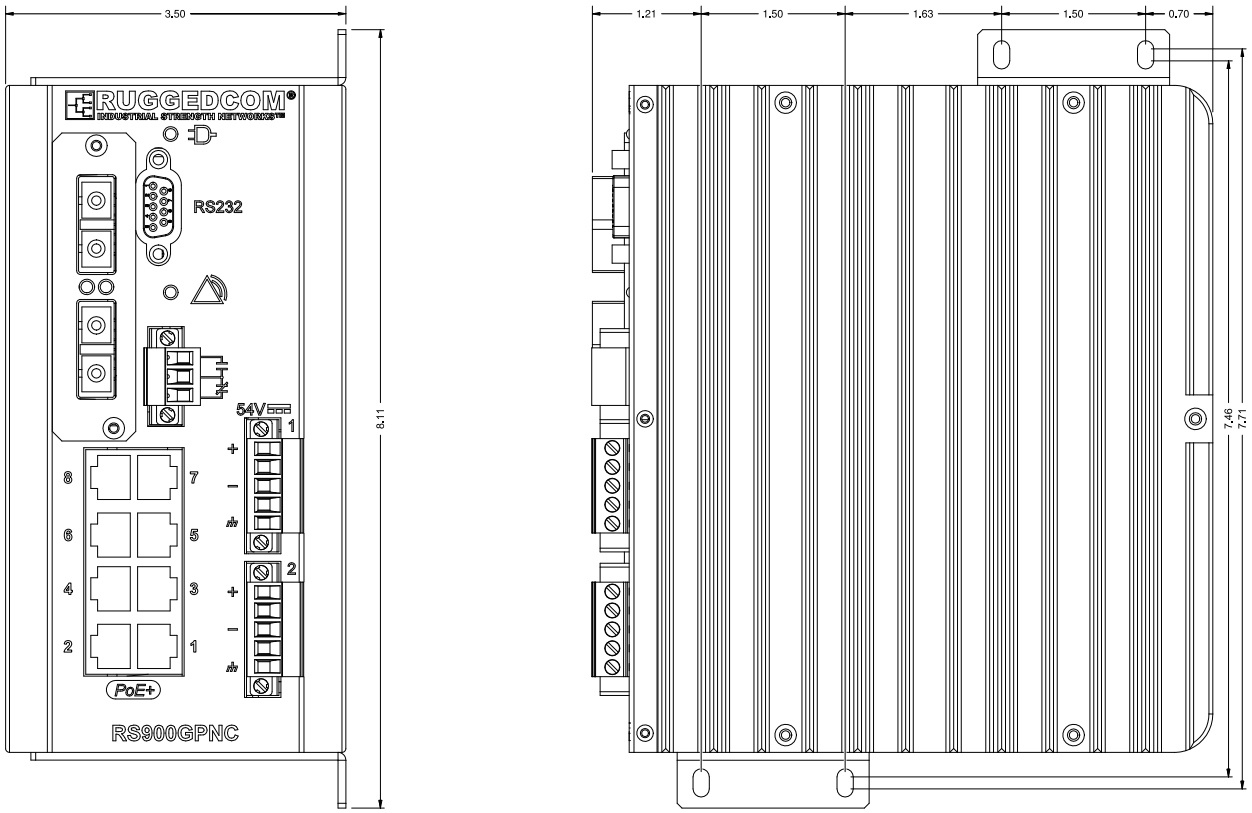

Figure 2.4. Side Panel Mounting

2.3. DC Power Supply Wiring and Grounding

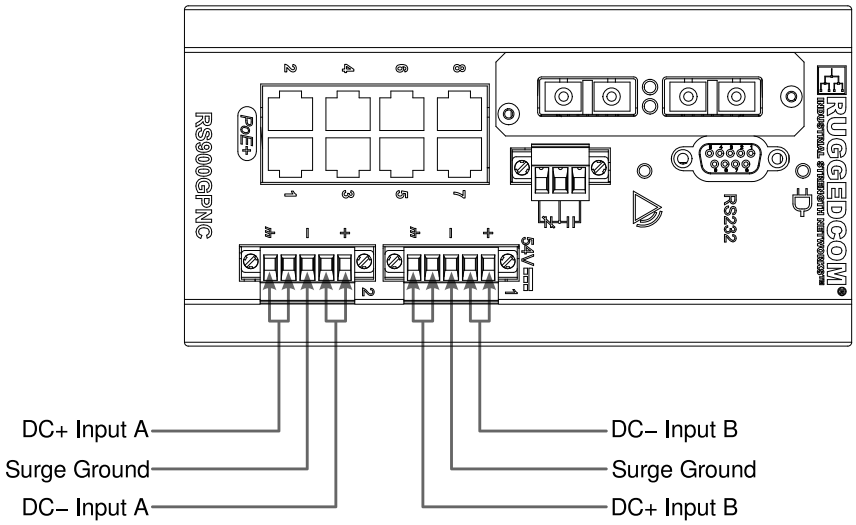

Figure 2.5. DC Power Supply Wiring and Grounding

The RS900GP low voltage DC power supply features reverse polarity protection and dual independent inputs. This feature allows the connection of two DC sources with the same nominal voltage to provide redundant power supply inputs. The DC source must be connected to the DC inputs according to the polarity markings on the unit.

1. *Equipment must be installed according to the applicable country wiring codes.*
2. *Surge Ground should be connected to Chassis Ground via a braided cable or other appropriate ground wire.*
3. *Chassis Ground must be connected to the protective earth.*
4. *All line-to-ground transient energy is shunted to the Surge Ground terminal. In cases where users require the DC 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.*

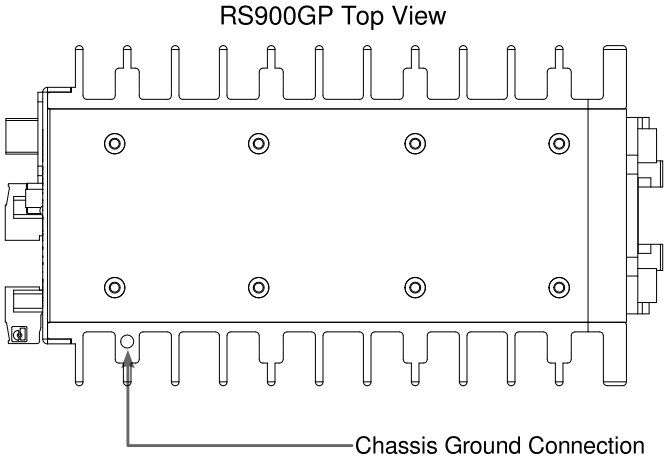

Figure 2.6. RS900GP Chassis Ground Connection

2.4. Failsafe Output Wiring and Specifications

The “Failsafe” output relay is provided to signal critical error conditions that may occur on the RS900GP. The contacts are energized upon power up of the unit and remain energized until an alarm condition or power loss occurs.

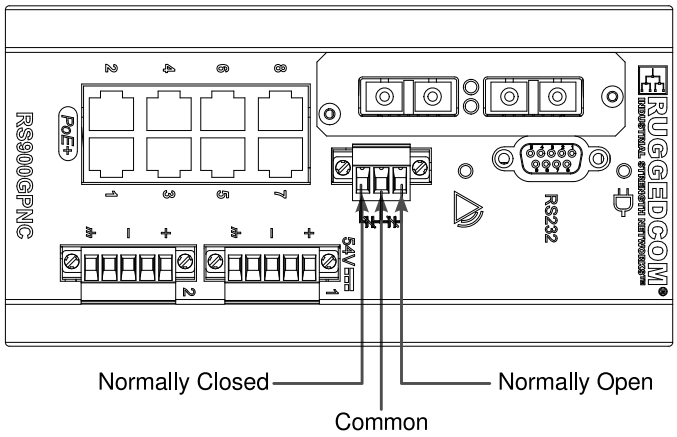

Figure 2.7. Failsafe Output Relay

2.5. RS232 Port Wiring

The RS232 port is used for configuring the unit. A straight-through serial cable with a DB-9 connector is required. There is no need to crossover the Transmit and Receive signals from the PC side since this has been done internally as shown in the figure below.

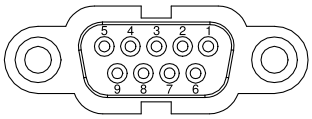

Figure 2.8. RS232 Female Connector

Pin	Signal
1	No Connection
2	Transmit Data
3	Receive Data
4	No Connection
5	Ground
6	No Connection
7	No Connection
8	No Connection
9	No Connection

Table 2.1. RS232 Female DCE Pinout

This port is not intended to be a permanent connection and the cable shall be less than 2m (6.5 ft) in length.

2.6. RJ45 Ports: Signal Description

The RS900GP has several 10/100BaseTX ports that allow connection to standard CAT-5 UTP cable with RJ45 male connectors. The RJ45 receptacles are directly connected to the chassis ground on the unit and can accept shielded CAT-5 cables. If shielded cables are used, care must be taken to ensure the shielded cables do not form a ground loop via the shield wire and the RJ45 receptacles at either end.

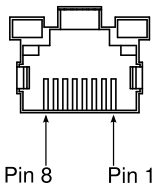

Figure 2.9. RJ45 Port Connector

RJ45 Pin	10/100Base-Tx	10/100/1000Base-Tx
1	RX+	A+
2	RX-	A-
3	TX+	B+
4	NC	C+
5	NC	C-
6	TX-	B-
7	NC	D+
8	NC	D-

Table 2.2. RJ45 Ethernet Pin Assignment

RuggedCom does not recommend the use of CAT-5 cabling of any length for critical real-time substation automation applications. However, transient suppression circuitry is present on all copper ports to protect against damage from electrical transients and to ensure IEC 61850-3 and IEEE 1613 Class 1 conformance. This means that during the transient event communications errors or interruptions may occur but recovery is automatic.

RuggedCom also does not recommended to use these ports to interface to field devices across distances which could produce high levels of ground potential rise, (i.e. greater than 2500V) during line to ground fault conditions.

3. Specifications

3.1. Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85°C	Ambient Temperature as measured from a 30cm radius surrounding the center of the RS900GP enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85°C	
Operating Altitude	0 to 15240m (0 to 50000 ft)	Over temperature range of -40 to 85°C

Table 3.1. Operating Environment

3.2. Power Supply Specifications

3.2.1. General

Power Supply Type	Minimum Input	Maximum Input	Fuse Rating	Isolation	RS900GP Maximum Power Consumption	Maximum Combined Power Output at PoE Ports
54 VDC	45 VDC	57 VDC	6.3A (T) [a]	1.5 kV DC	15W	273W

[a] (T) denotes time-delay fuse

Table 3.2. RS900GP Power Supply Specifications

3.2.2. IEEE802.3AF

Power In	Power Out
45-57 VDC, 3.5 A MAX	44-57 VDC, 15 W/PORT MAX

Table 3.3. IEEE802.3AF Power Supply Ratings

3.2.3. IEEE802.3AT

Power In	Power Out
51-57 VDC, 6 A MAX	50-57 VDC, 30 W/PORT MAX

Table 3.4. IEEE802.3AT Power Supply Ratings

3.3. Failsafe Relay Specifications

Parameter	Value
Max Switching Voltage	30VAC, 80VDC
Rated Switching Current	0.3A @ 30VAC 1A @ 30VDC, 0.3A @ 80VDC

Table 3.5. Failsafe Relay Specifications

- *Resistive Load.*
- *For Class-2 circuits only.*

3.4. Twisted Pair Data Port Specifications

Data Port	Media	Distance	Connector Type
10/100 Mbps	Cat 5 UTP or STP	100m	RJ45

Table 3.6. Twisted Pair Data Port Specifications

3.5. Fiber Optic Port Specifications

For maximum flexibility, RuggedCom Inc. offers a number of different transceiver choices for Gigabit fiber optic communications. The following table details fiber optic specifications based on the order code/transceiver selected at time of ordering.

Order Code	Mode / Connector	Tx λ (nm)	Cable Type 1. [a]	Tx Pwr (dBm) (Min/Max) [b]	Rx Sensitivity (dBm) [b]	Rx Saturation (dBm) [b]	Typical Distance (km) [c]
2LCMM	MM / LC	850	50µ/125	-9.5 / -4	-20	0	0.5
2LC10	SM / LC	1310	9µ/125	-9.5 / -3	-22	-3	10
2LC25	SM / LC	1310	9µ/125	-5 / 0	-22	-3	25
2SC10	SM / SC	1310	9µ/125	-10 / -3	-22	-3	10
2SC25	SM / SC	1310	9µ/125	-7 / -3	-24	-3	25
SFP	MM / LC	850	50µ/125	-8.5 / -4	-22	-3	0.5
SFP	SM / LC	1310	9µ/125	-9 / -3	-24	0	10
SFP	SM / LC	1310	9µ/125	-7 / -3	-26	-3	25
SFP[d]	SM / LC	1550	9µ/125	-5 / 0	-26	0	50
SFP [d]	SM / LC	1550	9µ/125	0 / 5	-26	0	80
SFP	SM / SC Simplex	1310	9µ/125	-9 / -3	-22	-3	10
SFP [d]	SM / SC Simplex	1490	9µ/125	-9 / -3	-22	-3	10

[a] All cabling is duplex type unless otherwise specified.

[b] All optical power numbers are listed as dBm averages.

[c] Maximum segment length is greatly dependent on factors such as fiber quality, and number of patches and splices. Please consult RuggedCom sales associates when determining maximum segment distances.

[d] These transceivers utilize a distributed feedback (DFB) type laser and are rated for -20#C to +85#C operation only.

Table 3.7. Fiber Optic Port Specifications

3.6. Physical Dimensions

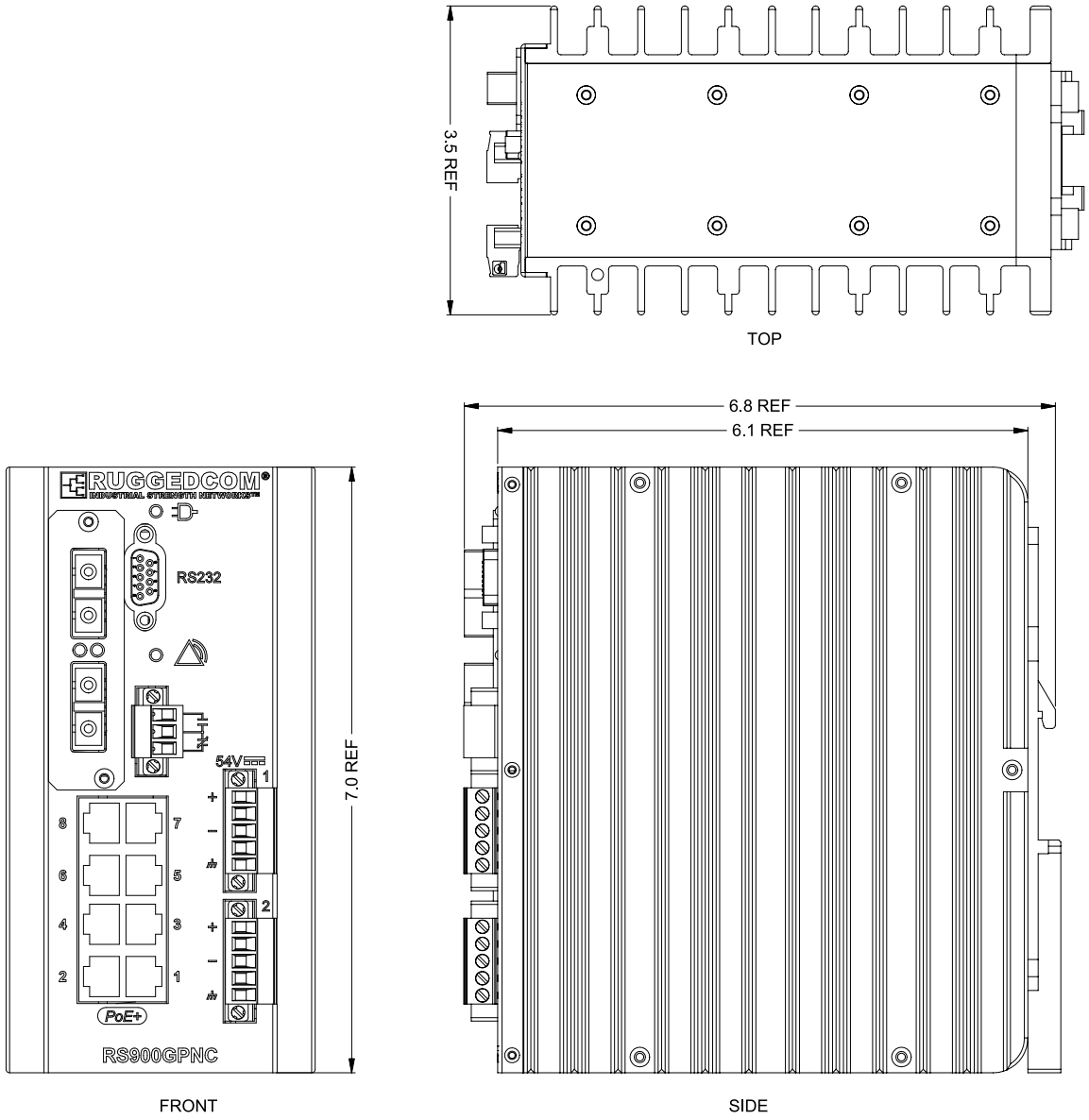

Figure 3.1. RS900GP Physical Dimensions

Parameter	Value	Comments
Dimensions	6.95 × 3.63 × 6.08 inches (17.653 × 9.22 × 14.4432 cm)	(Length × Width × Depth
Weight	To be determined	
Ingress Protection	IP40	(1mm objects)
Enclosure	Cast Aluminum	

Table 3.8. Physical Specifications

3.7. Type Test Specifications

3.7.1. IEC 61850-3 Type Tests

Test	Description		Test Levels	Severity Levels
IEC 61000-4-2	ESD	Enclosure Contact	+/- 8kV	4
		Enclosure Air	+/- 15kV	4
IEC 61000-4-3	Radiated RFI	Enclosure ports	20 V/m	x
IEC 61000-4-4	Burst (Fast Transient)	Signal ports	+/- 2kV @ 2.5kHz	x
		D.C. Power ports	+/- 2kV	4
		Earth ground ports	+/- 2kV	4
IEC 61000-4-5	Surge	Signal ports	+/- 2kV line-to-earth, +/- 1.5kV line-to-line	4
		D.C. Power ports	+/- 1.5kV line-to-earth, +/- 1kV line-to-line	3
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10V	3
		D.C Power ports	10V	3
		Earth ground ports	10V	3
IEC 61000-4-8	Magnetic Field	Enclosure ports	40 A/m continuous, 1000 A/m for 1 s	N/A
IEC 61000-4-29	Voltage Dips & Interrupts	D.C. Power ports	30% for 0.1s, 60% for 0.1s, 100% for 0.05s	N/A
IEC 61000-4-12	Damped Oscillatory	Signal ports	2.5kV common, 1kV differential mode @ 1MHz	3
		D.C. Power ports	2.5kV common, 1kV differential mode @ 1MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	30V Continuous, 300V for 1s	4
		D.C. Power ports	30V Continuous, 300V for 1s	4
IEC 61000-4-17	Ripple on D.C. Power Supply	D.C. Power ports	10%	3
IEC 60255-5	Dielectric Strength	Signal ports	1.5kV AC (Fail-Safe Relay output)	N/A
		D.C. Power ports	1.5kV DC	N/A
IEC 60255-5	H.V. Impulse	Signal ports	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	5kV	N/A

Table 3.9. RS900GP IEC 61850-3 Type Tests

3.7.2. IEEE 1613 Type Tests

IEEE Test	IEEE 1613 Clause	Description		Test Levels
C37.90.3	9	ESD	Enclosure Contact	+/- 8kV
			Enclosure Air	+/- 12kV
C37.90.2	8	Radiated RFI	Enclosure ports	35 V/m
C37.90.1	7	Fast Transient	Signal ports	+/- 2kV @ 2.5kHz
			D.C. Power ports	+/- 2kV
			Earth ground ports	+/- 2kV
C37.90.1	7	Oscillatory	Signal ports	2.2kV common mode @ 1MHz
			D.C. Power ports	2.2kV common & differential mode @ 1MHz
C37.90	6	H.V. Impulse	Signal ports	5 kV (Failsafe Relay)
			D.C. Power ports	5 kV
C37.90	6	Dielectric Strength	Signal ports	2kV AC(Failsafe Relay)
			D.C. Power ports	1.2kV DC

Table 3.10. RS900GP IEEE 1613 Type Tests

- *If the unit contains copper ports the IEEE 1613 conformance is Class 1 (During disturbance errors may occur but recovery is automatic).*
- *If the unit contains all fiber ports the IEEE 1613 conformance is Class 2 (During disturbance no errors will occur).*

3.7.3. IEC Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40°C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85°C, 16 Hours	N/A
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C, 6 cycles	N/A
IEC 60255-21-1	Vibration		2g @ (10-150) Hz	Class 2
IEC 60255-21-2	Shock		30g @ 11 ms	Class 2

Table 3.11. IEC Environmental Type Tests

3.8. Agency Approvals

Agency	Standards	Comments
CSA	CSA C22.2 No. 60950, UL 60950	Approved
CE	EN 60950, EN 61000-6-2	CE Compliance is claimed via Declaration of Self Conformity Route
FCC	FCC Part 15, Class A	Approved
CISPR[a]	EN55022, Class A	Approved
FDA/CDRH	21 CFR Chapter 1, Subchapter J	Approved
IEC/EN	EN60825-1:1994 + A11:1996 + A2:2001	Approved
CSA	Hazardous Locations Class 1, Division 2, Groups A, B, C,& D. T6 rating at 40°C, T4A rating at 85°C	Approved

[a] With the use of shielded Ethernet cables.

Table 3.12. Agency Approvals

Appendix A. Warranty

RuggedCom warrants this product for a period of five (5) years from the date of purchase. This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. For warranty details, visit www.RuggedCom.com or contact your customer service representative.

Should this product require service, contact the factory at:

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