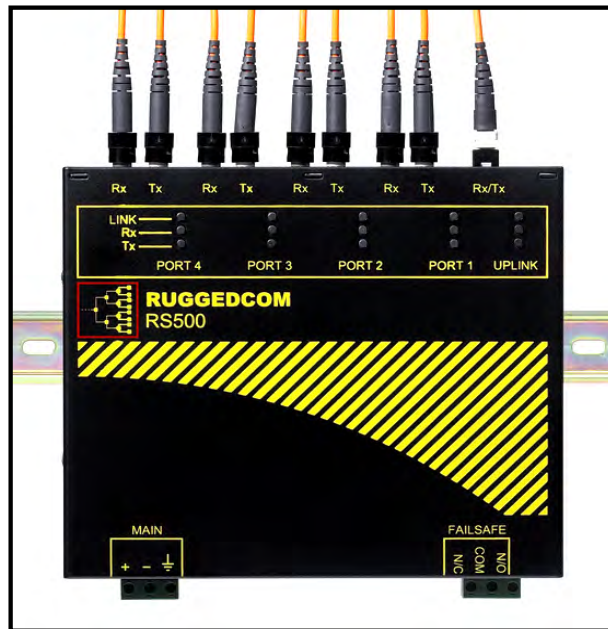


RuggedSwitch® RS500

Installation Guide



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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 on his own expense.

Warning: Changes or modifications not expressly approved by RuggedCom Inc. could void the user's authority to operate the equipment.

Important:

The RS500 contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

The RS500 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.

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1 Product Overview

1.1 Functional Overview

The **RuggedSwitch™** RS500 is a substation hardened, fiber optical Ethernet switch specifically designed to operate in harsh environments such as those found in electric utility substations and harsh industrial environments. The RS500 provides 4 10BaseFL fiber optical ports and one 100BaseFX port.

Specifically tested to the same standards as mission critical protective relaying equipment (i.e. ANSI/IEEE C37.90 and IEC 60255) the RS500 is ideally suited to form the Ethernet network in a UCA2 (Utility Communications Architecture 2.0) based substation automation network. Because the RS500 was designed to meet the demands of the substation environment it is also ideally suited for industrial automation networks based on Industrial Ethernet. The reliability of the RS500 exceeds that of commercial Ethernet switches by having no rotating mechanical parts such as cooling fans and by utilizing high-temperature solid-state components.

1.2 Feature Highlights

- Utility Grade (i.e. substation hardened) per ANSI/IEEE C37.90, IEC 60255, and the new IEC 61850-3 (2002), IEC 61000-6-5 standards
- Operating temperature: -40° to 85°C (no fan)
- Radiated RF Immunity: 35V/m per ANSI/IEEE C37.90.2
- Power supply options: 24VDC, 48VDC or 110VDC
- Failsafe output relay for critical failure or error alarming
- 4 – 10BaseFL (10Mbps) multimode
- 1 – 100BaseFX fiber optical port
- Full-duplex operation (no collisions)

1.3 RS500 Front Panel Description

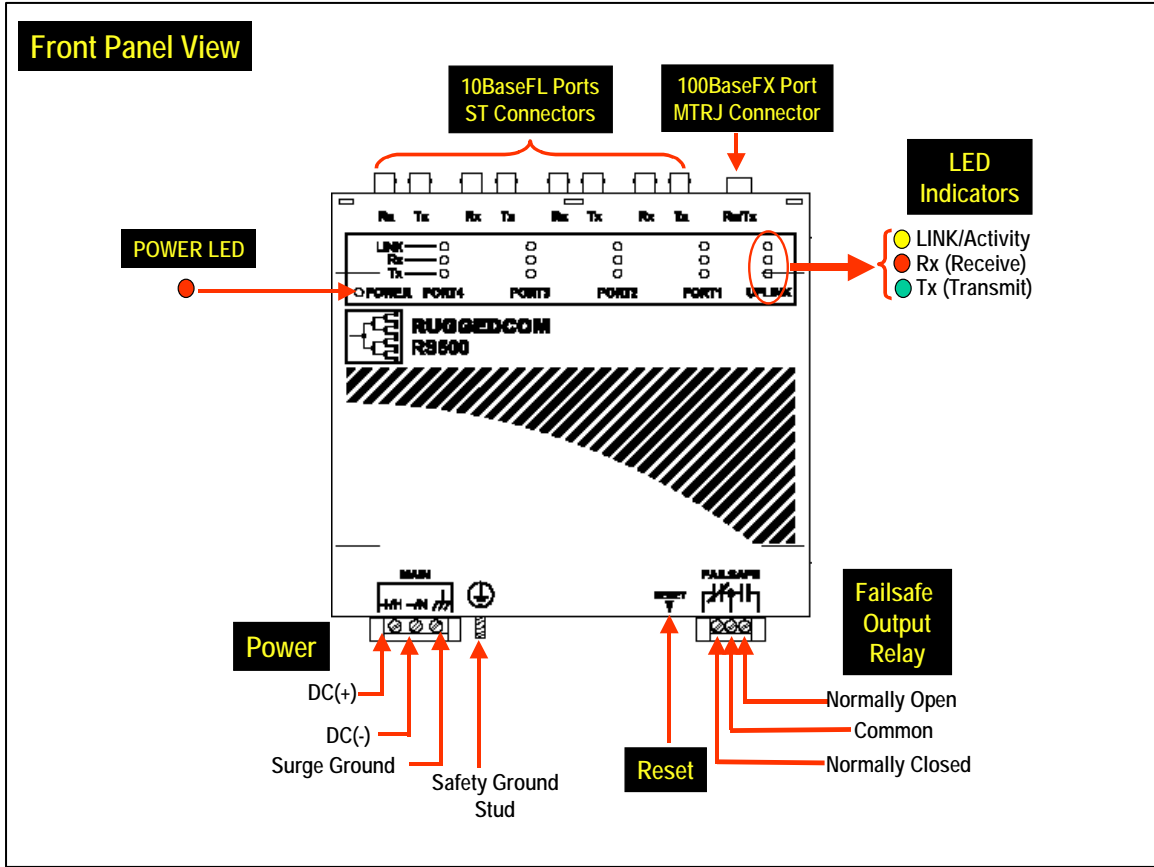


Fig. 1.3.1 RS500 Front Panel Detail

ITEM	Activity	Comments
LINK LED (Yellow)	Solid	Link Established
	Blinking – Once per second	Tx, Rx Activity
Tx LED (Red)	Blinking	Tx (Transmit) Activity
Rx LED (Green)	Blinking	Rx (Receive) Activity
POWER LED (Red)	Solid	Power On

1.4 RS500 Top and Bottom View

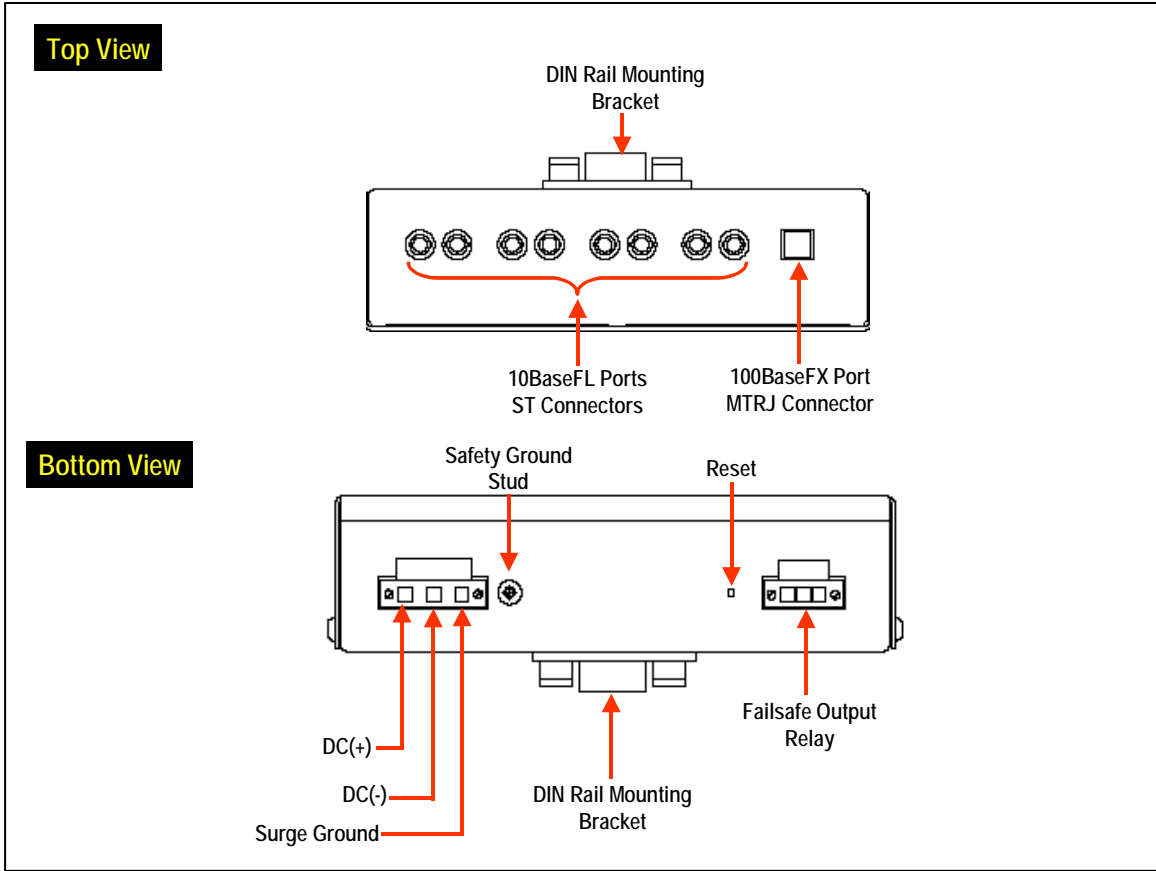


Fig. 1.4.1 RS500 Top and Bottom View

2 Installation

2.1 DIN Rail Mounting

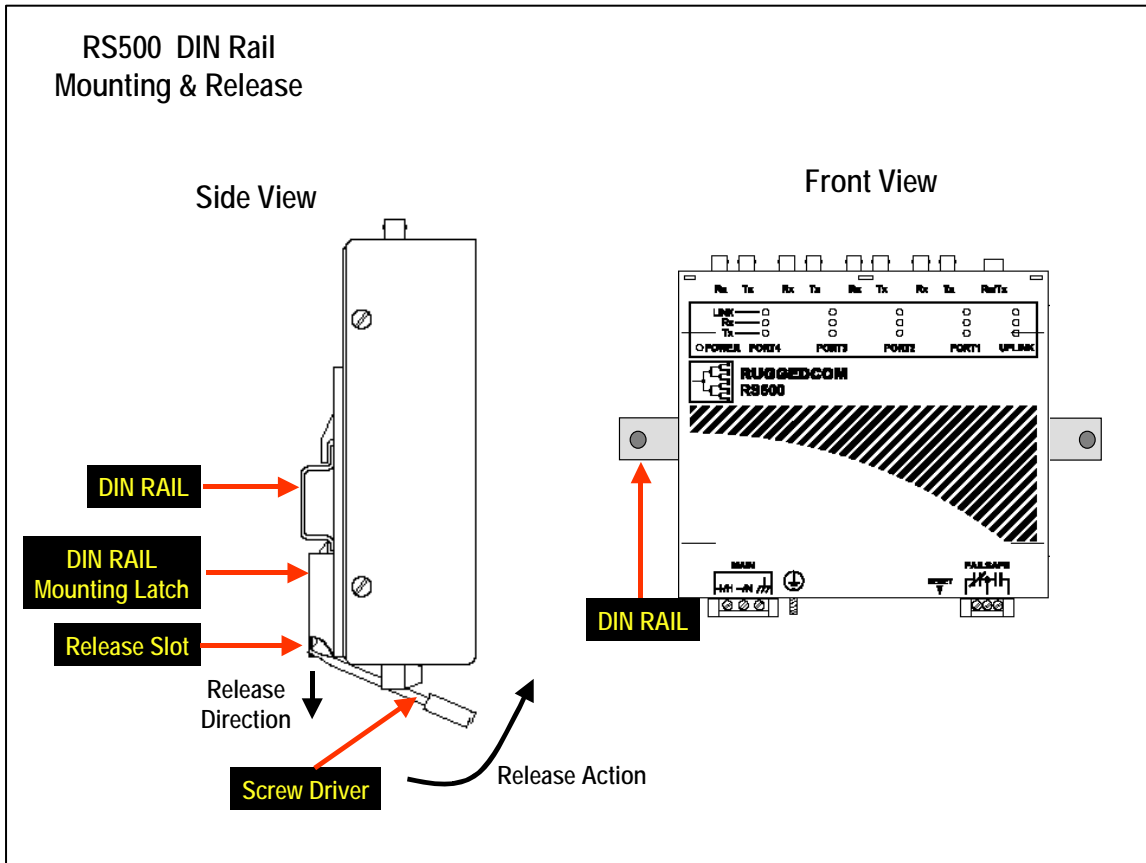


Fig. 2.1.1 RS500 Rail Mounting

2.2 Power Supply Wiring and Grounding

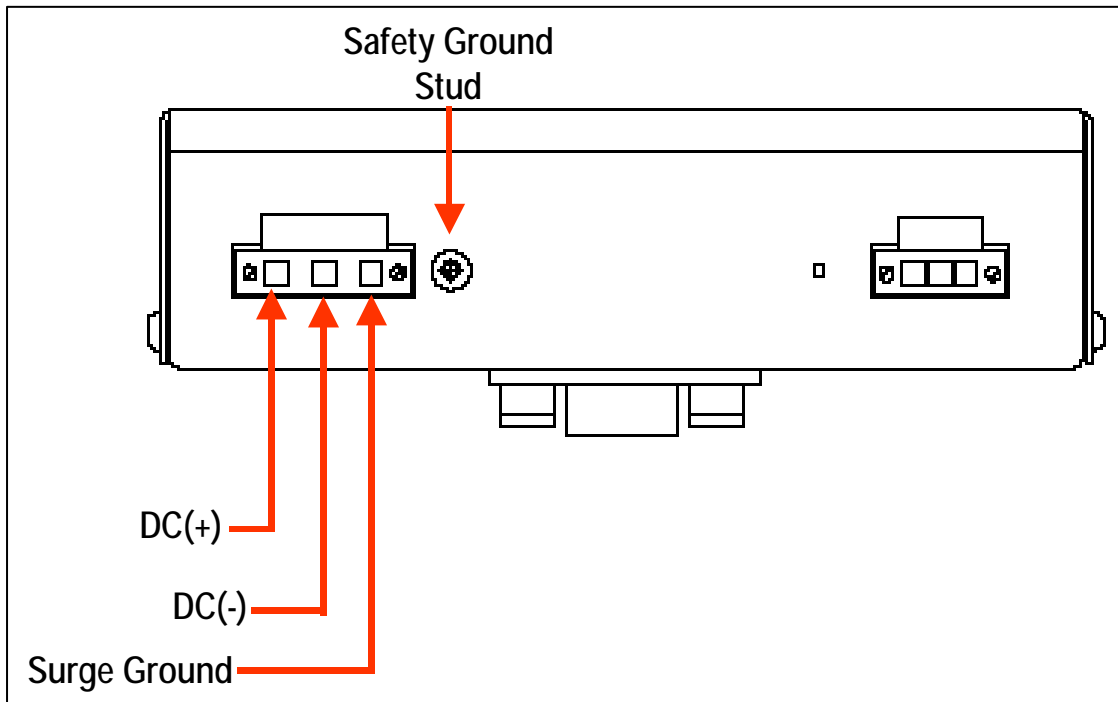


Fig. 2.2.1 RS500 Power Supply Inputs

The power supply input is connected as follows:

1. + = DC (+) is connected to the positive (+) terminal if the power source is DC or to the (Hot) terminal if the power source is AC.
2. - = DC (-) is connected to the negative (-) terminal if the power source is DC or to the (Neutral) terminal if the power source is AC.
3. **Surge Ground** is used as the ground conductor for all surge and transient suppression circuitry internal to the RS500. Surge Ground is connected directly to the safety ground terminal internally.

*NOTE: Since the Chassis Ground is connected to the equipment ground bus internally, HIPOT testing **cannot** be performed in the field.*

2.2.1 Power Supply - DC Input

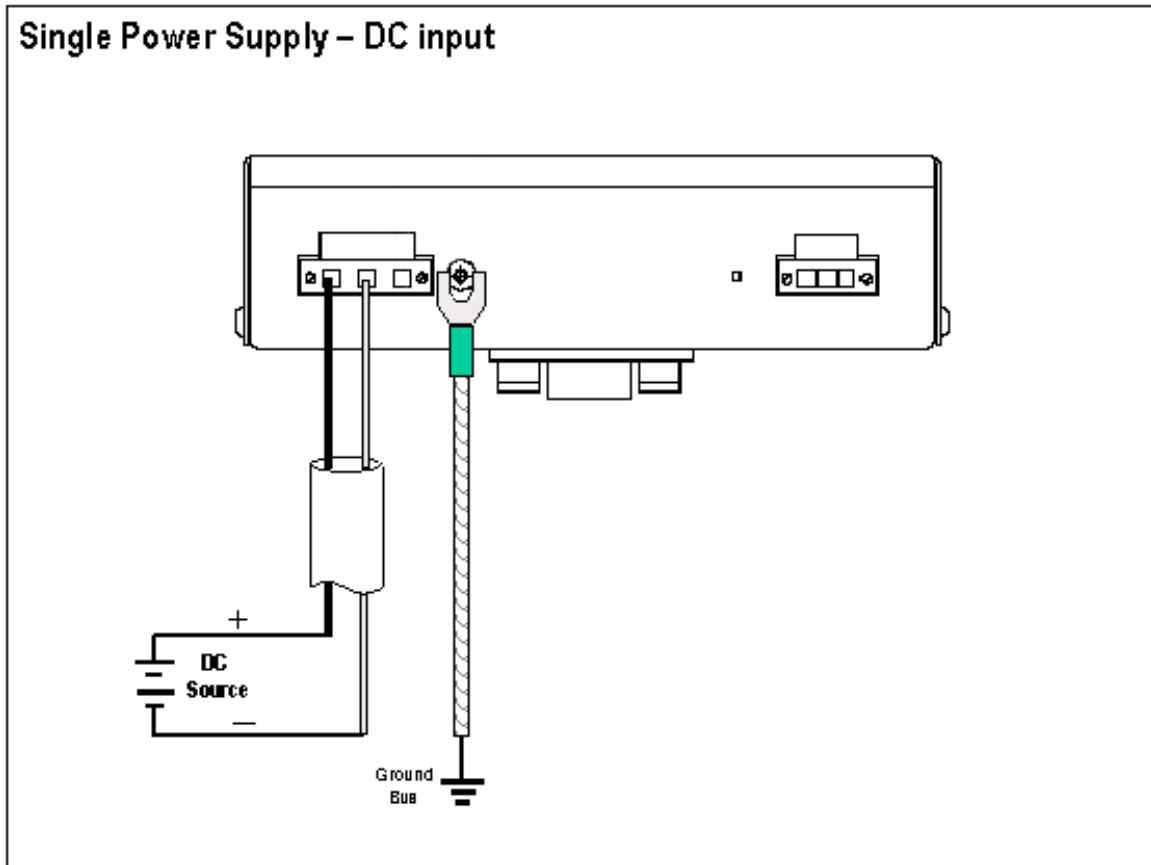


Fig. 2.2.2 Power Supply – DC Input

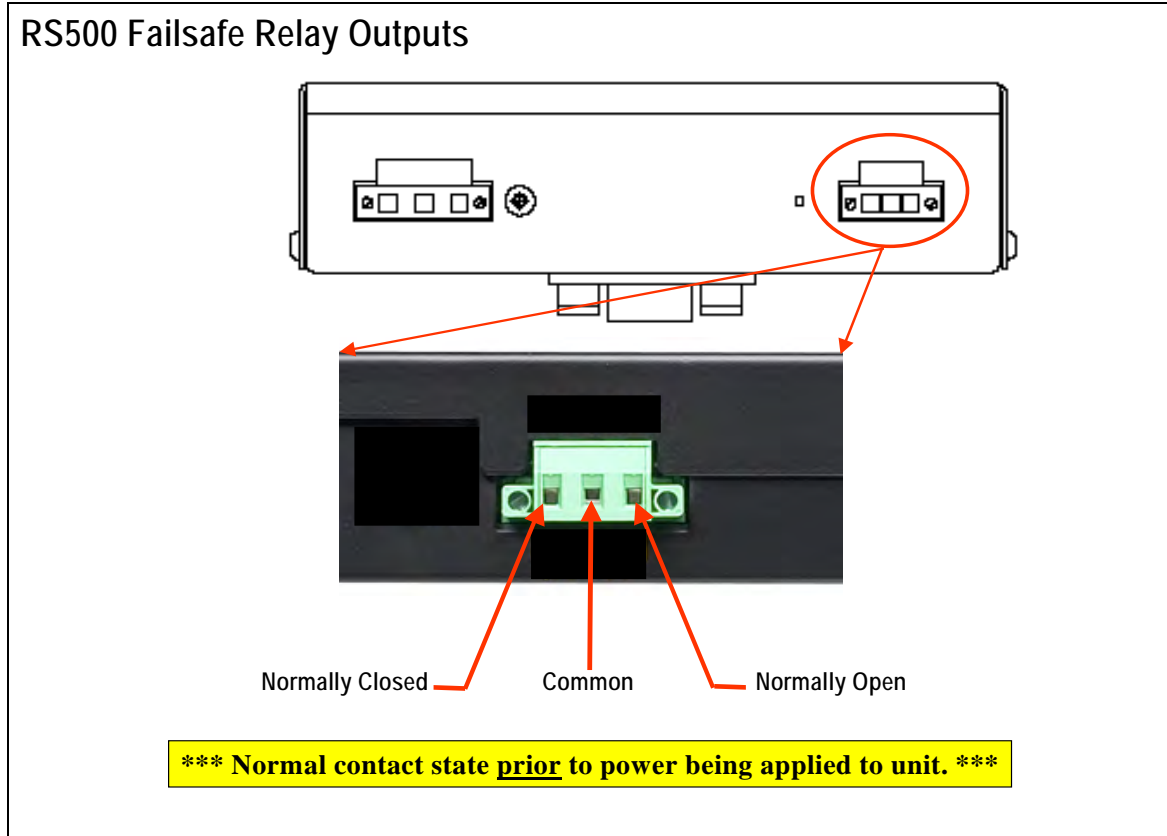
Note: Ground bus can either be connected to the Ground Stud on the rear of the RS500 chassis, or the Surge Ground port on the screw-in terminal block.

2.3 HIPOT (Dielectric Strength) Testing

HIPOT Dielectric strength testing **cannot** be performed in the field due to transient/surge suppression circuitry connected to the RS500 Surge/Chassis Ground. All RuggedSwitch products are HIPOT tested according to IEC 60255-5 (Section 4.1) during final test.

2.4 Failsafe Output Wiring and Specifications

The “Failsafe” output relay is provided to signal critical error conditions that may occur on the RS500. The contacts are energized upon power up of the unit and remain energized until a critical error occurs.



3 Technical Specifications

3.1 Power Supply Specifications

<i>Power Supply Type</i>	<i>Minimum Input</i>	<i>Maximum Input</i>	<i>Internal Fuse Rating</i>	<i>Maximum Power Consumption</i>
24 VDC	18 VDC	36 VDC	5A(F)	10 W
48 VDC	36 VDC	59 VDC	3.15A(T)	
HI (110 VDC)	88 VDC	150 VDC	3.15A(T)	

NOTES:

- (T) denotes time-delay fuse.

3.2 Failsafe Relay Specifications

<i>Parameter</i>	<i>Value (Resistive)</i>
Max Switching Voltage	30VAC, 80VDC
Rated Switching Current	0.3A @ 30VAC 1A @ 30VDC, 0.3A @ 80VDC

3.3 Networking Standards Supported

<i>Parameter</i>	<i>10Mbps Ports</i>	<i>100Mbps Ports</i>	<i>Notes</i>
IEEE 802.3	✓		10BaseT / 10BaseFL
IEEE 802.3u		✓	100BaseTX / 100BaseFX
IEEE 802.3x	✓	✓	Full Duplex Operation

3.4 Fiber Optical Specifications

<i>Parameter</i>	<i>Ports 1 to 4 10Mbps Ports</i>		<i>Uplink 100Mbps Port</i>	
	<i>Multi-Mode</i>	<i>Single-Mode*</i>	<i>Multi-Mode</i>	<i>Single-Mode*</i>
Speed Standard	10BaseFL		100BaseFX	
Connector Type	ST		MTRJ	LC
Segment Length	2 km	15 km	2 km	15 km
Optical Wavelength	820nm	1310nm	1300nm	1310nm
Cable Size Core/Cladding	62.5/125µm	9/125µm	62.5/125µm	9/125µm
Optical Tx Power Min/Max (dBm Peak)	-13.5/-7.6	-23/-15	-16/-11	-15/-8
Optical Rx Sensitivity (dBm Average)	-34.4	-38	-33.5	-31
Max Optical Rx Power (dBm Peak)	-8.2	-3.0	-11	-5
Typical Optical Power Budget (dB)	22	18	17	16.5

* Available as an option

3.5 Networking Performance Specifications

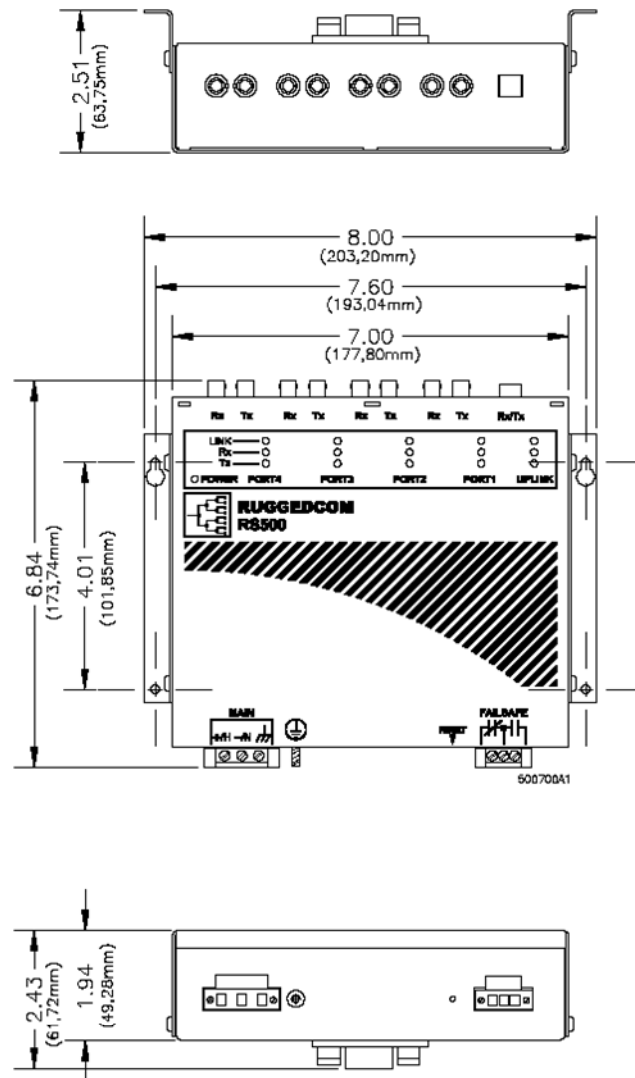
<i>Parameter</i>	<i>10Mbps Ports (10BaseFL)</i>	<i>100Mbps Ports (100BaseFX)</i>	<i>Notes</i>
Latency	16us + frame time	5us + frame time	
Filtering Rate	14 880	148 800	Frames/sec
MAC Address Table	8192		
VLAN Address Table	4096		

3.6 *Operating Environment*

<i>Parameter</i>	<i>Range</i>	<i>Comments</i>
Ambient Operating Temperature	-40 to 85°C	Ambient Temperature as measured from a 30cm radius surrounding the center of the R500 enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85°C	

3.7 Physical Dimensions

Parameter	Value	Comments
Dimensions	8.0 x 6.84 x 2.43 inches (203,20) x (173,74) x (61,72) mm	(Length x Width x Height) with mounting brackets installed
Weight	5 lb (2.25 Kg)	
Enclosure	18 gauge Galvanized Steel	



4 Type Tests

4.1 IEC 61850-3 Type Tests

<i>Test</i>	<i>Description</i>		<i>Test Levels</i>	<i>Severity Levels</i>
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	+/- 4kV @ 2.5kHz	x
		D.C. Power ports	+/- 4kV	4
		A.C. Power ports	+/- 4kV	4
		Earth ground ports	+/- 4kV	4
IEC 61000-4-5	Surge	Signal ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
		D.C. Power ports	+/- 2kV line-to-earth, +/- 1kV line-to-line	3
		A.C. Power ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10V	3
		D.C. Power ports	10V	3
		A.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 61000-4-11		A.C. Power ports	30% for 1 period, 60% for 50 periods	N/A
IEC 61000-4-12	Damped Oscillatory	Signal ports	100% for 5 periods, 100% for 50 periods ²	N/A
		D.C. Power ports	2.5kV common, 1kV differential mode @ 1MHz	3
		A.C. Power ports	2.5kV common, 1kV differential mode @ 1MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	2.5kV common, 1kV differential mode @ 1MHz	3
		D.C. Power ports	30V Continuous, 300V for 1s	4
IEC 61000-4-17	Ripple on D.C. Power Supply	D.C. Power ports	30V Continuous, 300V for 1s	4
		D.C. Power ports	10%	3
IEC 60255-5	Dielectric Strength	Signal ports	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	1.5kV DC	N/A
		A.C. Power ports	2kV 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
		A.C. Power ports	5kV	N/A

4.2 IEEE 1613 Type Tests

<i>IEEE Test</i>	<i>IEEE 1613 Clause</i>	<i>Description</i>		<i>Test Levels</i>
C37.90.3	9	ESD	Enclosure Contact	+/- 8kV
			Enclosure Air	+/- 15kV
C37.90.2	8	Radiated RFI	Enclosure ports	35 V/m
C37.90.1	7	Fast Transient	Signal ports	+/- 4kV @ 2.5kHz
			D.C. Power ports	+/- 4kV
			A.C. Power ports	+/- 4kV
			Earth ground ports	+/- 4kV
C37.90.1	7	Oscillatory	Signal ports	2.5kV common mode @ 1MHz
			D.C. Power ports	2.5kV common & differential mode @ 1MHz
			A.C. Power ports	2.5kV common & differential mode @ 1MHz
C37.90	6	H.V. Impulse	Signal ports	5 kV (Failsafe Relay)
			D.C. Power ports	5 kV
			A.C. Power ports	5 kV
C37.90	6	Dielectric Strength	Signal ports	2kV AC(Failsafe Relay)
			D.C. Power ports	1.5kV DC
			A.C. Power ports	2kV AC

NOTE:

- 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).

4.3 IEC Environmental Type Tests

<i>Test</i>	<i>Description</i>		<i>Test Levels</i>	<i>Severity Levels</i>
IEC 60068-2-1	Cold Temperature	Test Ad	-40 deg. C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85 deg. 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

5 Agency Approvals

<i>Agency</i>	<i>Standards</i>	<i>Comments</i>
cCSAus, CE	CSA C22.2 No. 60950, UL 60950, EN 60950 EN 61000-6-2	Approved
FCC	FCC Part 15, Class A	Approved

6 Warranty

RuggedCom warrants this product for a period of five (5) years from date of purchase. For warranty details, visit <http://www.ruggedcom.com/> or contact your customer service representative.

Should this product require warranty or service contact the factory at:

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