



The RuggedSwitch® RSG2300PNC is an industrially hardened, Power Over Ethernet (PoE) enabled, fully managed, modular Ethernet switch specifically designed to operate reliably in electrically harsh and climatically demanding utility substation and industrial environments. The RSG2300PNC's superior ruggedized hardware design coupled with the RuggedSwitch® Operating System (ROS®) provides improved system reliability and advanced networking features making it ideally suited for creating Ethernet networks for mission-critical, real-time, control applications.

The RSG2300PNC comes standard with 2 10/100BaseTX 802.3af (PoE) compliant Ethernet ports, with the option to add an additional 2 PoE ports, and offers modular flexibility of up to 6 additional Ethernet ports including 10BaseFL /100BaseFX/ 1000BaseX fiber and 10/100/1000BaseTX copper port combinations. The RSG2300PNC is highly versatile and can support multiple fiber types and connectors (ST, MTRJ, LC, SC) without loss of port density.

The RSG2300PNC is an ideal solution to power and connect several Ethernet devices such as IP phones, video cameras, and wireless access points where AC power is not available or cost-prohibitive to provide locally.

### Features and Benefits

#### Power Over Ethernet (PoE)

- Up to 4 10/100BaseTx 802.3af compliant ports
- Data and power over a single Ethernet cable
- Powered from the internal 48VDC source
- No mid-span patch panel required
- Fully compatible with 802.3af powered devices
- Auto-sensing ports that provide power only to PoE end devices
- Power to port is turned off if cables are removed

#### Additional Ethernet Ports

- Up to 4-Gigabit Ethernet ports - copper and/or fiber
- 24-Fast Ethernet copper ports
- Many fiber and connector options

#### Cyber Security Features

- Multi-level user passwords
- SSL with 56-bit encryption

- Enable/disable ports, MAC based port security
- Port based network access control (802.1x)
- VLAN (802.1Q) to segregate and secure network traffic
- RADIUS centralized password management
- SNMPv3 authentication and 56-bit encryption

#### RuggedRated™ for Reliability in Harsh Environments

- Immunity to EMI and heavy electrical surges
  - Meets IEEE 1613 Class 2 (electric utility substations)
  - Exceeds IEC 61850-3 (electric utility substations)
  - Exceeds IEC 61800-3 (variable speed drive systems)
  - Exceeds IEC 61000-6-2 (generic industrial)
  - Exceeds NEMA TS-2 (traffic control equipment)
- -40° to +85°C operating temperature (no fans)
- Conformal coated printed circuit boards (optional)
- 18 AWG galvanized steel enclosure
- Hazardous Location Certification: Class 1 Division 2 (Pending Certification)

#### Rugged Operating System (ROS®) Features

- Simple plug and play operation - automatic learning, negotiation, and crossover detection
- MSTP 802.1Q-2005 (formerly 802.1s)
- RSTP (802.1w) and Enhanced Rapid Spanning Tree (eRSTP™) network fault recovery (<5ms)
- Quality of Service (802.1p) for real-time traffic
- VLAN (802.1Q) with double tagging and GVRP support
- IGMP Snooping for multicast filtering
- Port configuration, status, statistics, mirroring, security
- Industrial automation features (eg. Modbus)

#### Management Tools

- Web-based, Telnet, CLI management interfaces
- SNMP v1/v2/v3 (56-bit encryption)
- Remote Monitoring (RMON)
- Rich set of diagnostics with logging and alarms

#### Universal Power Supply Options

- Fully integrated, power supplies
- Unit Power Supply: 24VDC(10-36VDC), 48VDC (36-72VDC), 88-300VDC or 85-264VAC
- Screw or pluggable terminal blocks available
- Terminal blocks for reliable maintenance free connections
- CSA/UL 60950 safety approved to +85°C
- PoE Power supply 48VDC



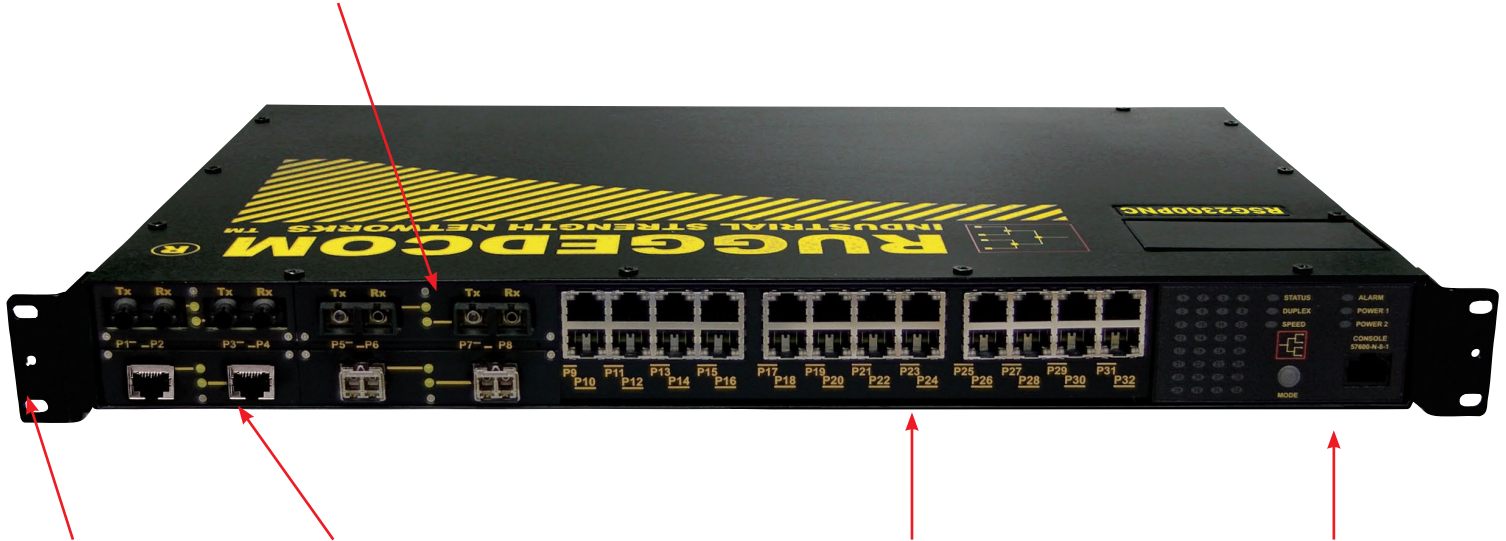
## RuggedSwitch® RSG2300PNC

### Modular Gigabit Port Types:

- ▶ up to 4 Gigabit modular Ports
- ▶ 10/100/1000 TX RJ45
- ▶ 1000SX Multimode
- ▶ 1000LX Singlemode
- ▶ Pluggable Optics (SFP and GBIC)
- ▶ SC, ST, LC and MTRJ

### Modular Fast Ethernet Port Types:

- ▶ up to 6 Fast Ethernet modular Ports
- ▶ 100FX Multimode & Singlemode
- ▶ SC, ST, LC and MTRJ



### Mounting Options

- ▶ Panel/DIN Rail
- ▶ 19" Rack Mount
- ▶ Front or Rear Mount

### Power over Ethernet

- ▶ 2 or 4 10/100 BaseTx Ports
- ▶ 802.3af Compliant Ports
- ▶ Auto-sensing

### Standard Fast Ethernet Ports Types:

- ▶ 24 10/100TX Copper Ethernet Ports

### Modular HMI:

- ▶ Front or Rear Mount

### Integrated Power Supply

- ▶ Universal high-voltage range: 88-300VDC or 85-264VAC
- ▶ Popular low voltage DC ranges: 24VDC (10-36VDC), 48VDC (36-72VDC)
- ▶ Separate 48VDC PoE Power Supply
- ▶ Screw or pluggable terminal blocks available

### Operating Temperature

- ▶ -40°C to +85°C
- ▶ No Fans

### Critical Alarm Relay

- ▶ Form-C contact ratings:  
Max Voltage 250VAC, 125VDC  
Max Current 2A@250VAC,  
2A@30VDC



## ROS® Features

  
Rugged Operating System™

### Cyber Security

Cyber security is an urgent issue in many industries where advanced automation and communications networks play a crucial role in mission critical applications and where high reliability is of paramount importance. Key ROS® features that address security issues at the local area network level include:

- **Passwords** - Multi-level user passwords secures switch against unauthorized configuration
- **Enable/Disable Ports** - Capability to disable ports so that traffic can not pass
- **802.1Q VLAN** - Provides the ability to logically segregate traffic between predefined ports on switches
- **MAC Based Port Security** - The ability to secure ports on a switch so only specific Devices / MAC addresses can communicate via that port
- **802.1x Port Based Network Access Control** - The ability to lock down ports on a switch so that only authorized clients can communicate via this port
- **RADIUS** - authentication service using MD5 hash and providing centralized password management
- **SNMPv3** - encrypted authentication access security and data encryption (CBC-DES with 56-bit encryption key)
- **Secure Socket Layer** - Web-based management using SSL with data encryption (56-bit encryption key)
- **RSA** – 1024 bit key for key management and key exchange
- **TACACS+** - Terminal Access Control and Accounting Services Client provides cleartext authentication and authorization
- **Point to Point (PPP)** - using CHAP (MD5 Hash) authentication service

The ROS® cyber security features are included to help address the various industry specific security standards such as NERC CIP, ISA S99, AGA 12, IEC 62443, ISO 17799:2005 and PCSRF SPP-ICS.

### Enhanced Rapid Spanning Tree Protocol (eRSTP™)

RuggedCom eRSTP™ allows the creation of fault-tolerant ring and mesh Ethernet networks that incorporate redundant links that are 'pruned' to prevent loops. eRSTP™ yields worst-case fault recovery 1 of 5ms times the 'bridge diameter' and allows rings of up to 160 switches. For example, a ring of ten switches will have fault recovery times under 50ms. eRSTP™ implements both STP and RSTP to ensure interoperability with commercial switches unlike other proprietary 'ring' solutions.

### Quality of Service (IEEE 802.1p)

Some networking applications such as real-time control or VoIP (voice over IP) require predictable arrival times for Ethernet frames. Switches can introduce latency in times of heavy network traffic due to the internal queues that buffer frames and then transmit on a first come first serve basis. ROS® supports 'Class of Service' in accordance with IEEE 802.1p

that allows time critical traffic to jump ahead to the front of the queue thus minimizing latency and reducing jitter to allow such demanding applications to operate correctly. ROS® allows priority classification by port, tags, MAC address, and IP type of service (ToS). A configurable "weighted fair queuing" algorithm controls how frames are emptied from the queues.

### VLAN (IEEE 802.1Q)

Virtual local area networks (VLAN) allow the segregation of a physical network into separate logical networks with independent broadcast domains. A measure of security is provided since hosts can only access other hosts on the same VLAN and traffic storms are isolated. ROS® supports 802.1Q tagged Ethernet frames and VLAN trunks. Port based classification allows legacy devices to be assigned to the correct VLAN. GVRP support is also provided to simplify the configuration of the switches on the VLAN.

### Link Aggregation (802.3ad)

The link aggregation feature provides the ability to aggregate several Ethernet ports into one logical link (port trunk) with higher bandwidth. This provides an inexpensive way to set up a high speed backbone to improve network bandwidth. This feature is also known as "port trunking", "port bundling", "port teaming", and "Ethernet trunk".

### IGMP Snooping

ROS® uses IGMP snooping (Internet Group Management Protocol v1&v2) to intelligently forward or filter multicast traffic streams (e.g. MPEG video) to or from hosts on the network. This reduces the load on network trunks and prevents packets from being received on hosts that are not involved. ROS® has a very powerful implementation of IGMP snooping that:

- Can be enabled on a per VLAN basis.
- Detects and filters all multicast streams regardless of whether subscribers exist.
- Supports "router-less" operation by supporting an "active" mode.
- Restores traffic streams immediately after an RSTP topology change.

### SNMP (Simple Network Management Protocol)

SNMP provides a standardized method for network management stations the ability to interrogate devices from different vendors. SNMP versions supported by ROS® are v1, v2c, and v3. SNMPv3 in particular provides security features such as authentication, privacy with data encryption (CBC-DES with 56-bit encryption key) and access control not present in earlier SNMP versions. ROS® also supports numerous standard MIBs (Management Information Base) allowing for easy integration with any network management system (NMS). A feature of SNMP supported by ROS® is the ability to generate "traps" upon system events. RuggedNMSTM, the RuggedCom management solution, can

## ROS® Features



record traps from multiple devices providing a powerful network troubleshooting tool. It also provides a graphical visualization of the network and is fully integrated with all RuggedCom products.

1 eRSTP fault recovery times may be approximated as follows:  
For 100 Mbps, fault recovery performance is <5ms/hop  
For 1,000 Mbps, fault recovery performance is <5ms/hop + 20ms

### SNTP (Simple Network Time Protocol)

SNTP automatically synchronizes the internal clock of all ROS® devices on the network. This allows for correlation of time stamped events for troubleshooting.

### SCADA and Industrial Automation

ROS® contains features that optimize network performance and simplify switch management based on the unique requirements found in SCADA and industrial automation applications. Features such as Modbus TCP management for retrieval of switch data using the ubiquitous Modbus protocol and DHCP Option 82, a Rockwell Automation ODVA requirement for IP address assignment based on the location of the end device, provide capabilities not found in typical “commercial” or “office grade” Ethernet switches.

### Port Based Network Access Control (802.1x)

ROS® supports the IEEE 802.1x standard that defines a mechanism for port-based network access control which provides a means of authenticating and authorizing devices attached to LAN ports.

### Port Rate Limiting

ROS® supports configurable rate limiting per port to limit unicast and multicast traffic. This can be essential to managing precious network bandwidth for service providers. It also provides edge security for denial of service (DoS) attacks.

### Broadcast Storm Filtering

Broadcast storms wreak havoc on a network and can cause attached devices to malfunction. This could be disastrous on a network with mission critical equipment. ROS® limits this by filtering broadcast frames with a user-defined threshold.

### Loss of Link Management

Some intelligent electronic devices (IEDs) have dual fiber optic ports with automatic failover to a backup port should the primary fail. ROS® ensures this mechanism works reliably under all failure modes by appropriately disabling link signals when required. ROS® also flushes learned MAC addresses to ensure the failover occurs quickly.

### Port Mirroring

ROS® can be configured to duplicate all traffic on one port to a designated mirror port. When combined with a network analyzer, this can be a powerful troubleshooting tool.

### Port Configuration and Status

ROS® allows individual ports to be ‘hard’ configured for speed, duplex, auto-negotiation, flow control and more. This allows proper connection with devices that do not negotiate or have unusual settings. Detailed status of ports with alarm and SNMP trap on link problems aid greatly in system troubleshooting.

### Port Statistics and RMON (Remote Monitoring)

ROS® provides continuously updating statistics per port that provide both ingress and egress packet and byte counters as well as detailed error figures. Also provided is full support for the RMON statistics, history, alarms, and event groups. RMON allows for very sophisticated data collection, analysis and detection of traffic patterns.

### Event Logging and Alarms

ROS® records all significant events to a non-volatile system log allowing forensic troubleshooting. Events include link failure and recovery, unauthorized access, broadcast storm detection, and self-test diagnostics among others. Alarms provide a snapshot of recent events that have yet to be acknowledged by the network administrator. An external hardware relay is de-energized during the presence of critical alarms allowing an external controller to react if desired.

### HTML Web Browser and Telnet User Interfaces

ROS® provides a simple, intuitive user interface for configuration and monitoring via a standard graphical web browser or via Telnet. All system parameters include detailed on-line help to make setup a breeze. ROS®, presents a common look and feel and standardized configuration process allowing easy migration to other RuggedCom managed products.

### Configuration via ASCII Text File

All configuration parameters are stored in an ASCII formatted text file that can easily be transferred via TFTP or Xmodem. The configuration file can be saved for backup purposes and easily manipulated by a text editor. The same text file can be downloaded to the switch at a later date in order to re-configure or restore a previous configuration.

### Command Line Interface (CLI)

A command line interface can be used in conjunction with remote shell to automate data retrieval, configuration updates, and firmware upgrades. A powerful SQL-like capability allows expert users the ability to selectively retrieve or manipulate any parameters the device has to offer.

# EMI and Environmental Type Tests

IEC 61850-3 EMI 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	Note 1
		Signal ports	+/- 4kV @ 2.5kHz	Note 1
IEC 61000-4-4	Burst (Fast Transient)	D.C. Power ports	+/- 4kV	4
		A.C. Power ports	+/- 4kV	4
		Earth ground ports	+/- 4kV	4
		Signal ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
IEC 61000-4-5	Surge	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
		Signal ports	10V	3
IEC 61000-4-6	Induced (Conducted) RFI	D.C Power ports	10V	3
		A.C. Power ports	10V	3
		Earth ground ports	10V	3
		Signal ports	10V	3
IEC 61000-4-8	8 Magnetic Field	Enclosure ports	40 A/m continuous, 1000 A/m for 1 s 1000 A/m for 1 s	Note 1 5
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 100% for 5 periods, 100% for 50 periods	N/A
IEC 61000-4-12	Damped Oscillatory	Signal ports	2.5kV common, 1kV diff. mode@1MHz	3
		D.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	3
		A.C. Power ports	2.5kV common, 1kV diff. 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	2kVac (Fail-Safe Relay output)	N/A
		D.C. Power ports	1.5kV DC	N/A
		A.C. Power ports	2kVac	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

IEEE 1613 (C37.90.x) EMI IMMUNITY TYPE TESTS <sup>2</sup>				
Test	Description		Test Levels	
IEEE C37.90.3	ESD	Enclosure Contact	+/-2kV, +/-4kV, +/- 8kV	
		Enclosure Air	+/-4kV, +/-8kV, +/-15kV	
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m	
		Signal ports	+/- 4kV @ 2.5kHz	
IEEE C37.90.1	Fast Transient	D.C. Power ports	+/- 4kV	
		A.C. Power ports	+/- 4kV	
		Earth ground ports <sup>3</sup>	+/- 4kV	
		Signal ports	2.5kV common mode @1MHz	
IEEE C37.90.1	Oscillatory	D.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	
		A.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	
		Signal ports	5kV (Fail-Safe Relay output)	
IEEE C37.90	H.V. Impulse	D.C. Power ports	5kV	
		A.C. Power ports	5kV	
		Signal ports	2kVac	
IEEE C37.90	Dielectric Strength	D.C. Power ports	1.5kV DC	
		A.C. Power ports	2kVac	
		Signal ports	2kVac	

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

Notes: 1. Ruggedcom specified severity levels  
2. Meets Class 2 requirements for an all fiber configuration. Class 1 for copper ports.

## Technical Specifications

### Power Supply

- Power Consumption: 32W Max
- 24VDC: 10-36 VDC, 1.2A
- 48VDC: 36-59 VDC, 0.6A
- HI Voltage AC/DC: 88-300VDC or 85-264VAC
- PoE Power Supply 48VDC: 36-59VDC, 0.6A

### Critical Alarm Relay

- Form-C contact ratings:
  - Max Voltage 250VAC, 125VDC
  - Max Current 2A@250VAC, 2A@30VDC

### Physical

- Height: 1.74"
- Width: 18.3"
- Depth: 12.4"
- Weight: 5.2kg
- Ingress Protection: IP40 (1mm objects)
- Enclosure: 18 AWG galvanized steel enclosure
- Mounting: DIN rail or panel mounted

### Switch Properties

- Switching method: Store & Forward
- Switching latency: 7 us
- Switching bandwidth: 9.2 Gbps
- MAC addresses: 8192
- MAC address table size: 64kbytes
- Priority Queues: 4
- Frame buffer memory: 2 Mbit
- Simultaneous VLANs: 255
- VLAN ID Range: 1 to 4094
- IGMP multicast groups: 256
- Port rate limiting
- No head of line blocking

### Approvals

- ISO: Designed and manufactured using a ISO9001: 2000 certified quality program
- CE Marking (Pending)
- Emissions: FCC Part 15 (Class A),  
EN55022 (CISPR22 Class A)
- Safety: cCSAus (Compliant with CSA C22.2 No. 60950, UL 60950, EN60950)
- Laser Eye Safety (FDA/CDRH): Complies with 21 CFR Chapter 1, Subchapter J.

### Warranty

- 5 Years - Applicable to design and manufacturing related product defects.

### Network Management

- HTTP graphical web-based, SSL (56-bit Encryption)
- SNMP v1, v2c, v3 (56-bit Encryption)
- Telnet, VT100, TFTP
- Command Line Interface (CLI)
- RSA Key Management (1024 bit key)
- Authentication and Accounting - TACACS+ (cleartext), RADIUS client, PPP

### EMI Immunity and Environmental Compliance

- IEC 61000-6-2 Industrial (Generic)
- IEC 61800-3 Industrial (Variable Speed Drive Systems)
- IEC 61850-3 Electric Utility Substations
- IEEE 1613 Electric Utility Substations
- NEMA TS 2 Traffic Control Equipment

### IEEE Compliance

- 802.3-10BaseT
- 802.3u-100BaseTX, 100BaseFX
- 802.3x-Flow Control
- 802.3z-1000BaseLX
- 802.3ab-1000BaseTX
- 802.3ad-Link Aggregation
- 802.1D-MAC Bridges
- 802.1D-Spanning Tree Protocol
- 802.1p-Class of Service
- 802.1Q-VLAN Tagging
- 802.1w-Rapid Spanning Tree Protocol
- 802.1x-Port Based Network Access Control
- 802.1Q-2005 (formerly 802.1s) MSTP
- 802.3af - Power over Ethernet (PoE)

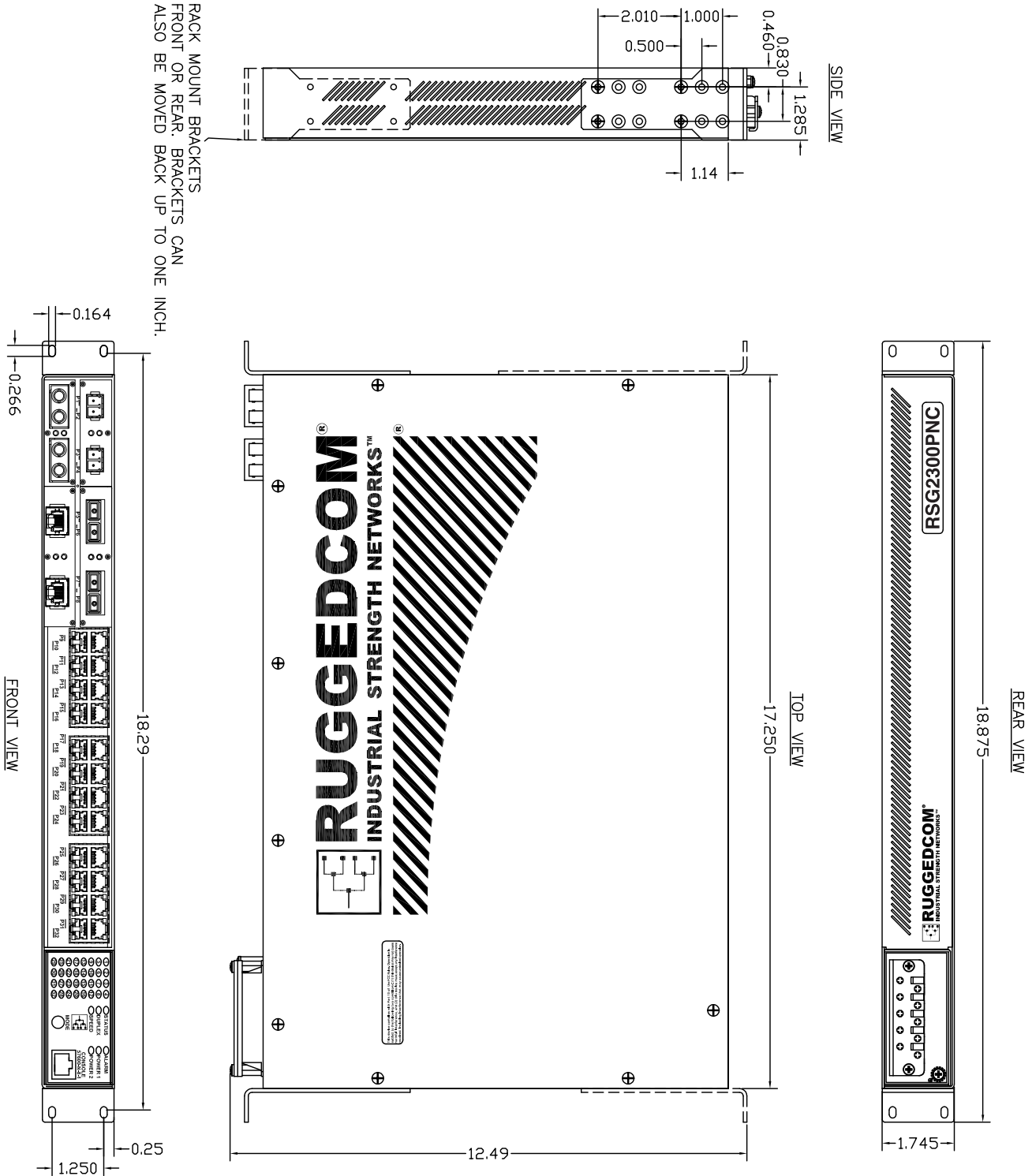
### IETF RFC Compliance

- RFC768-UDP
- RFC783-TFTP
- RFC791-IP
- RFC792-ICMP
- RFC793-TCP
- RFC826-ARP
- RFC854-Telnet
- RFC894-IP over Ethernet
- RFC1112-IGMP v1
- RFC1519-CIDR
- RFC1541-DHCP (client)
- RFC2030-SNTP
- RFC2068-HTTP
- RFC2236-IGMP v2
- RFC2284-EAP
- RFC2475-Differentiated Services
- RFC2865-RADIUS
- RFC3414-SNMPv3-USM
- RFC3415-SNMPv3-VACM

### IETF SNMP MIBS

- RFC1493-BRIDGE-MIB
- RFC1907-SNMPv2-MIB
- RFC2012-TCP-MIB
- RFC2013-UDP-MIB
- RFC2578-SNMPv2-SMI
- RFC2579-SNMPv2-TC
- RFC2819-RMON-MIB
- RFC2863-IF-MIB
- draft-ietf-bridge-rstpmib-03-BRIDGE-MIB
- draft-ietf-bridge-bridgemib-smiv2-03-RSTP-MIB
- IANAifType-MIB

**Dimensions**





**Example Order Codes:**

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**RSG2300PNC-R-RM-24-48PoE-PX01-PX01-XXXX-XXXX-XX**

19" Rack mounted, 24VDC power supply, 48VDC PoE Power Supply, 24 10/100 RJ45 Ethernet ports, 4 10/100 RJ45 PoE Ethernet ports, with Ethernet ports on the rear.

**RSG2300PNC-F-RM-48- 48PoE-PX01-PX01-FXA01-FXA01-C01**

19" Rack mounted, 48VDC power supply, 48VDC PoE Power Supply, 24 10/100 RJ45 Ethernet ports, 4 10/100 RJ45 PoE Ethernet ports, 4 100FX (Multi Mode 1300nm Fiber) Ethernet ports, with Ethernet ports on the front, conformal coating.

**RSG2300PNC-R-RM-HI-48PoE-PX01-PX01-FG02-FG02-C01**

19" Rack mounted, HI power supply, 48VDC PoE Power Supply, 24 10/100 RJ45 Ethernet ports, 4 10/100 RJ45 PoE Ethernet ports, 4 1000LX (Gigabit) Ethernet ports, with Ethernet ports on the rear, conformal coating.

**Accessories/Options**

41-11-0011 - Cable support bracket (one)

43-10-0007 - Power cable (North America three prong connector -> beau)

**RuggedCom Inc.**

300 Applewood Crescent, Unit 1,  
Concord, Ontario, Canada L4K 5C7

**Tel:** +1 (905) 856-5288 **Fax:** +1 (905) 856-1995

**Toll Free:** 1 (888) 264-0006

**Technical Support Center**

**Toll Free (USA & Canada):** 1 (866) 922-7975

**International:** +1 (905) 856-5288

**USA:** +1 (954) 922-7975

**E-mail:** Support@RuggedCom.com

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