RuggedRouter™ RX1000

Industrially Hardened Cyber Security Appliance

The RuggedRouter™ RX1000 is an industrially hardened cyber security appliance with integrated router, firewall, and VPN functionality. The RX1000 can be used to establish an electronic security perimeter around critical cyber assets found in control and automation systems, in order to prevent the disruption of operations by accidental or malicious acts. Ideally suited for electric power utilities, the industrial plant floor, and traffic control systems, the RX1000 is designed to protect and secure SCADA system networks connected directly to the Internet, or within a company's Wide Area Network (WAN) or Local Area Network (LAN).

The RX1000 includes security functions such as full IPSec Virtual Private Networking (VPN), and firewall capabilities with the capacity to securely connect hundreds of other remote sites over Frame Relay and PPP. The modular architecture allows customization of the number and types of Ethernet and WAN ports. Integrated modem and GPS time synchronization options are also available.

The RX1000 is hardened to the RuggedRated™ specification which provides a high level of immunity to electromagnetic interference (EMI) and heavy electrical surges typical of the harsh environments found in many industrial applications. An operating temperature range of -40 to +85°C (-40 to +185°F) allows the RX1000 to be placed in almost any location.

For applications requiring high availability, the RX1000 provides the option for integrated dual redundant power supplies each capable of accommodating a wide range of input voltages for worldwide operability. Also unique is the ability to have each power supply fed from different voltage levels and/or sources thereby providing great flexibility in creating high availability systems.

Key Features and Benefits

Security Appliance Functions

- Integrated Router/Firewall/VPN
- Stateful Firewall with NAT
- Full IPSec Virtual Private Networking
- VPN with 3DES, DES and AES support

RuggedRated™ for Reliability in Harsh Environments

- Immunity to EMI and high voltage electrical transients
  - 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)
- -40°C to +85°C operating temperature (no fans)
- Failsafe Output Relay: For critical failure or error alarming
- 18 AWG galvanized steel enclosure and 19" rack-mount adapter

Physical Ports

- Ethernet Options:
  - 10/100BaseTX, 100BaseFX
  - Multiple configurations, up to 4 ports
- WAN Port Options:
  - T1/E1
    - channelized and unchannelized
    - supports 2Mbps G.703 with 120 ohm balanced connections
  - 56 Kbps DDS and DSL
  - Multiple configurations, up to 8 ports
- Embedded Modem Port
- GPS IRIG-B Time Sync (coming soon)

Protocols

- WAN
  - Frame Relay RFC 1490 or RFC 1294
  - PPP RFC 1661, 1332, 1321, 1334, PAP, CHAP Authentication
  - PPPoE over DSL
- IP
  - Routing
  - VRRP, OSPF, DHCP Agent
  - Traffic prioritization, NTP Host (Stratum 2)

Frame Relay Support

- ISO and ITU compliant, network certified.
- ANSI T1.617 Annex D, Q.933 or LMI Local Signaling

Management Tools

- Web-based, SSH, CLI management interfaces
- SNMP v2/v3
- Remote Syslog
- Rich set of diagnostics with logging and alarms
- WAN tools for engineering level debugging
- Raw and interpreted real time line traces

Universal Power Supply Options

- Fully integrated power supplies (no external adaptors)
- Input voltage range of 9-59VDC, 88-300VDC, and 85-264VAC for worldwide operability
- Optional dual redundant, parallel load-sharing power supplies for increased network availability
- Can be powered from different sources for ultimate redundancy
- CSA/UL 60950 safety approved to +85°C

Warranty

- 5 Year Warranty

RUGGEDCOM
ISO 9001:2000
CERTIFIED

RuggedRouter™ RX1000

Multiple Ethernet Ports:
- ▶ Up to 4 100 Mbps ports
- ▶ Fiber or Copper
- ▶ LC, ST, MTRJ, SC

Multiple WAN Ports:
- ▶ Up to 8 T1/E1
- ▶ Dual DSL
- ▶ Dual DDS 56/64kbps

Modular HMI
- ▶ Front or Rear Mount

GPS / IRIG Ports (Optional):
- ▶ Built-in GPS, Antenna Input
- ▶ Multiple IRIG-B Outputs
- ▶ Manchester, AM, Baseband IRIG-B Types

V.90 Modem (Optional);
- ▶ 56kbps

Mounting Options
- ▶ Panel/Din rail
- ▶ 19” Rack Mount

Enclosure:
- ▶ IP40
- ▶ 18 AWG Galvanized Steel

Operating Temperature
- ▶ -40°C to +85°C
- ▶ No Fans

Integrated Power Supply:
- ▶ 24VDC (9-36VDC), 48VDC (36-59VDC), or HI (88-300VDC/85-264VAC) power supply options
- ▶ Optional Dual Redundant Power Supply with Parallel Load Sharing

EMI Immunity
- ▶ 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)

Router Software Features

Frame Relay Central Site Concentration

RuggedRouter Frame Relay provides the ability to inexpensively network a large number of widely separated remote sites via a Frame Relay network provider. A number of remote sites are established, using physical interfaces such as 56Kbps DDS, Fractional or full T1, and in some cases broadband DSL. Remote sites may be fully meshed, but typically connect only to a central site. The central site typically employs one or more T1 connections and routes data between remote sites if required. Data link connections are configured to carry traffic from the remote sites to the central site. The maximum traffic rate and traffic bursting characteristics can be programmed individually for each connection. The connection can then be treated as a routed IP link. Traffic shaping policies (see below) can then be applied to the link.

PPP Networking

Certain remote sites may be located "off" of the Frame Relay network or may be infrequently used. RuggedRouter supports the ability to allocate a portion of the central site channelized T1 line for connection to these remote sites. The T1 link can then simultaneously support IP over Frame Relay connections to the Frame network and PPP connections to off-net devices. PPP can be employed on the embedded modem, over unchannelized T1 lines or as PPPoE using the broadband DSL card.

Virtual Private Networking

Virtual private networking provides the ability treat your remote sites as if they are part of a secure private network, by creating secure tunnels through untrusted networks. All traffic on those tunnels is encrypted. The RuggedRouter allows you establish a tunnel to each of your remote sites with strong authentication and encryption. Tunnels may be constructed to the site as a whole, to specific hosts on specific ports at the remote site or passed through to the hosts.

Firewalls

Firewalls restrict traffic between specific hosts using specific services. RuggedCom provides easy to configure, robust firewalls that operate in conjunction with VPN. Network Address Translation (NAT), Port Forwarding and message logging are only some of the features provided by the firewall.

Traffic Prioritization

Traffic shaping is the ability to prioritize the transmission of data over a network link. Traffic prioritization is used to optimize or guarantee performance, low-latency, and/or bandwidth. The RuggedRouter can prioritize based on wide number of criteria, including: type of protocol, TOS fields in received packets, IP address and port numbers.

Automatic Dial Backup (coming soon)

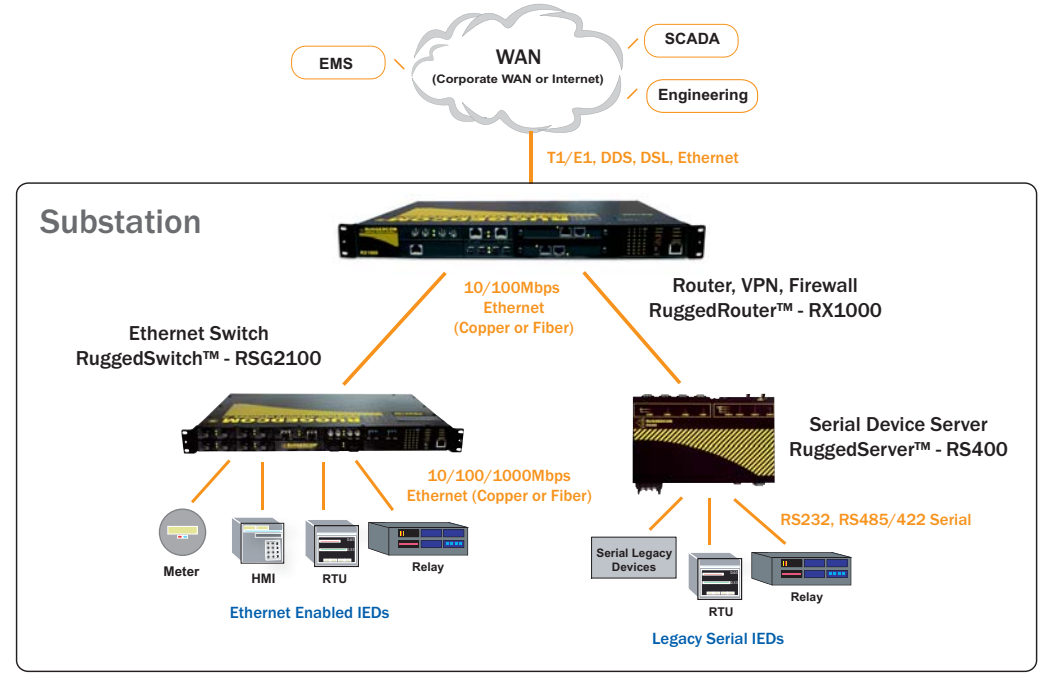
Automatic Dial Backup provides capability to raise a backup connection to a RAS server upon failure of the designated link. The RuggedRouter can operate the dynamic link as a stand-alone entity or bond it with a pre-existing Multilink PPP bundle.

NTP and GPS (coming soon)

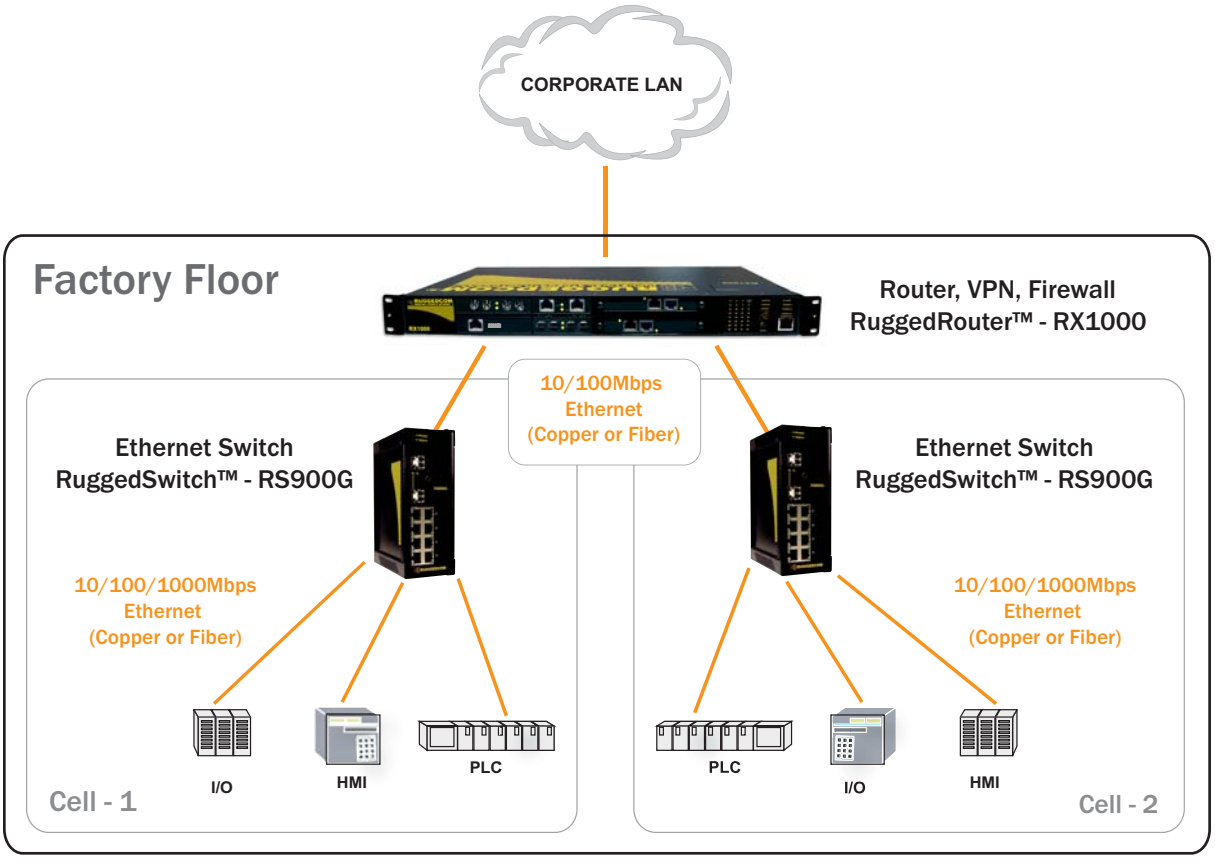
The Network Time Protocol allows Intelligent Electronic Devices (IED) and Remote Terminal Units (RTU) to obtain accurate time information from NTP hosts. The RuggedRouter features a GPS system that obtains timing information from GPS satellites and will act as an NTP host, providing stratum 2 quality resolution. Multiple types of IRIG-B outputs are available including AM, Baseband, and Manchester.

Application Examples

Electric Utility Substation



Industrial Plant Floor



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	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 [3]	+/- 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 [3]	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
		A.C. Power ports	30% for 1 period, 60% for 50 periods	N/A
IEC 61000-4-11			100% for 5 periods, 100% for 50 periods [2]	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	2kVac	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

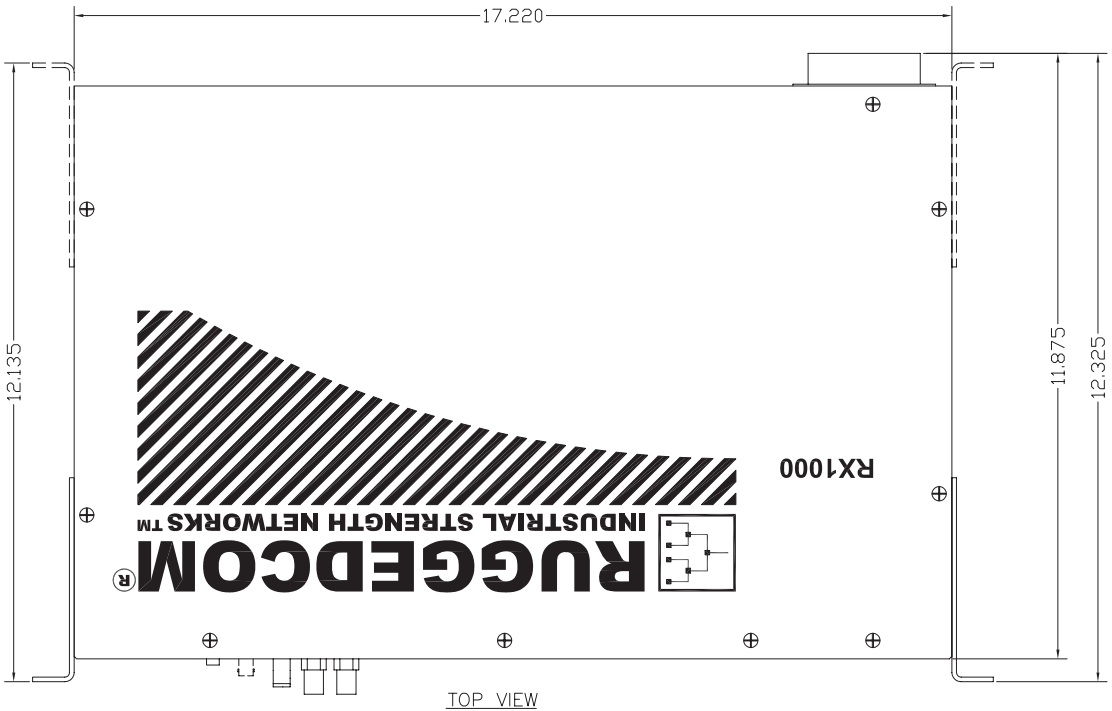
IEEE 1613 (C37.90.x) EMI IMMUNITY TYPE TESTS				
Test	***Description***		***Test Levels***	***Severity Levels***
IEEE C37.90.3	ESD	Enclosure Contact	+/- 8kV	N/A
		Enclosure Air	+/- 15kV	N/A
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m	N/A
IEEE C37.90.1	Fast Transient	Signal ports	+/- 4kV @ 2.5kHz	N/A
		D.C. Power ports	+/- 4kV	N/A
		A.C. Power ports	+/- 4kV	N/A
		Earth ground ports3	+/- 4kV	N/A
IEEE C37.90.1	Oscillatory	Signal ports	2.5kV common mode @1MHz	N/A
		D.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	N/A
		A.C. Power ports	2.5kV common, 1kV diff. mode@1MHz	N/A
IEEE C37.90	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 C37.90	Dielectric Strength	Signal ports	2kVac	N/A
		D.C. Power ports	2kVac	N/A
		A.C. Power ports	2kVac	N/A

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	Tests Fc	2g @ (10 - 150) Hz	Class 2
IEC 60255-21-2	Shock	Tests Ea	30g @ 11mS	Class 2

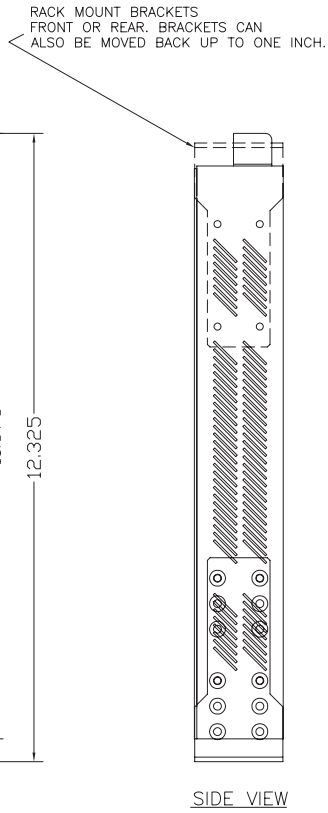
Notes: 1. Only applicable to functional earth connections separated from the safety earth connection.
2. Class 2 refers to "Measuring relays and protection equipment for which a very high security margin is required or where the vibration levels are very high, (e.g. shipboard application and for severe transportation conditions")

Mechanical Drawing

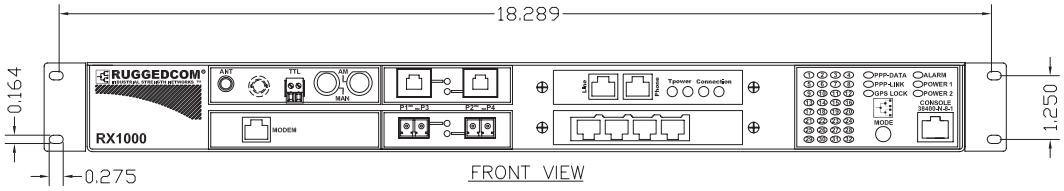
REAR VIEW



TOP VIEW



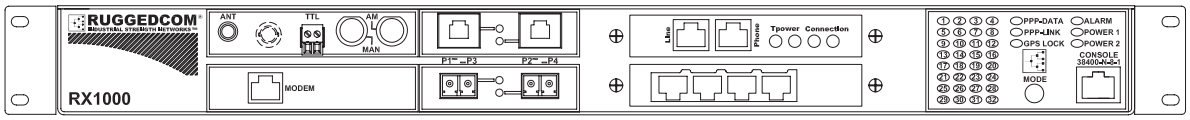
SIDE VIEW



FRONT VIEW

Mounting Options

19" Rack Front Mount - (Connectors At Front)

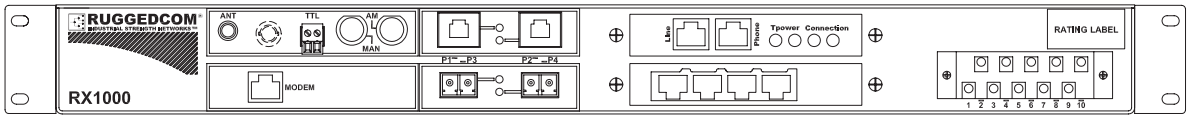


FRONT VIEW

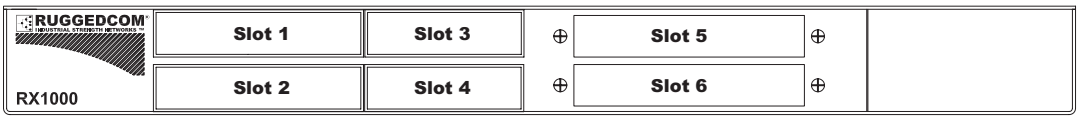
REAR VIEW

19" Rack Rear Mount - (Connectors At Rear)

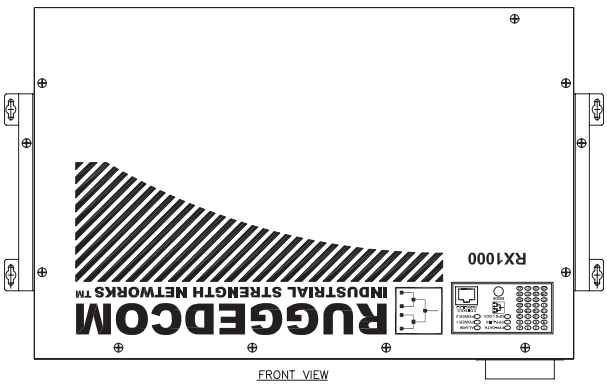
FRONT VIEW



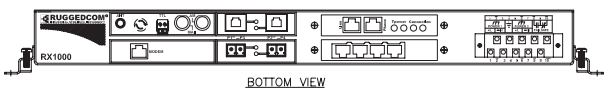
REAR VIEW



Panel / DIN Rail Bottom Mount - (Connectors At Bottom)

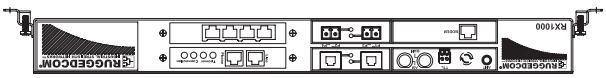


FRONT VIEW

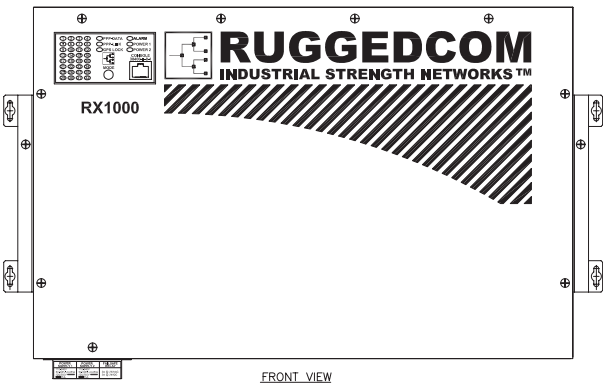


BOTTOM VIEW

Panel / DIN Rail Top Mount - (Connectors At Top)



TOP VIEW



FRONT VIEW

Technical Specifications

Power Supply
- Power Consumption: 25W (MAX)
- 24VDC: 9-36VDC (MAX)
- 48VDC: 36-59VDC (MAX)
- HI VOLTAGE AC/DC: 88-300VDC, 85-264VAC (MAX)

Critical Alarm Relay
- Form-C failsafe contact relay: 1A@30VDC

Physical
- Height: 1.74"
- Width: 17.2"
- Depth: 11.9"
- Weight: 10lbs (4.5 Kg)
- Ingress Protection: IP40 (1mm objects)
- Enclosure: 18 AWG galvanized steel enclosure
- Mounting: Panel/DIN Rail mount or 19 inch Rack Mount

Approvals
- ISO: Manufactured in an ISO9001 facility
- cCSAus: CSA C22.2 No. 60950, UL 60950 (pending)
- CE Marking (pending)
- Emissions: FCC Part 15, Class A (pending)
- Complies with 21 CFR Chapter 1, Subchapter J. (pending)
- NEMA TS-2 (pending)

Warranty
- 5 Years-Applicable to design or manufacturing related product defects.

Network Management
- HTTP graphical web-based
- SNMP v2/v3
- Command Line Interface (Console and Remotely via SS)
- Quick setup facility

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 (pending)

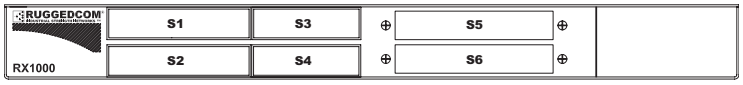
IEEE Compliance
- 802.3-10BaseT
- 802.3u-100BaseTX, 100BaseFX
- 802.3z-1000BaseLX
- 802.3x-Flow Control
- 802.3d-MAC Bridges

IETF RFC Compliance
- RFC791-IP
- RFC792-ICMP
- RFC793-TCP
- RFC783-TFTP
- RFC826-ARP
- RFC768-UDP
- RFC854-Telnet
- RFC1490-Frame Relay
- RFC1294-Frame Relay
- RFC1661-PPP
- RFC1332-PPP (IPCP)
- RFC1321-PPP (MD5)
- RFC1334-PPP Authentication
- RFC1519-CIDR
- RFC1541-DHCP (client)
- RFC1305-NTP
- RFC2068-HTTP
- RFC2338-VRRP
- RFC2475-Differentiated Services

Order Codes

RX1000 -_____ -_____ -____ -____ -____ -____ -____ -____ -____ -____

Main Mount PS1 PS2 S1 S2 S3 S4 S5 S6



Main: Ethernet and Power Connectors

- R = Ethernet on rear; LED panel on front; power connector on rear
- F = Ethernet on front; LED panel on front; power connector on rear
- B = Ethernet on rear; LED panel on top; power connector on rear
- T = Ethernet on front; LED panel on top; power connector on rear

Mount: Mounting Options

- RM = 19" Rack Mount Kit
- DP = DIN and Panel Mount Kit
- RD = 19" Rack, DIN, and Panel Mount Kit
- 00 = No Mounting Option

PS1 and PS2: Power Supply 1 and Redundant Power Supply

- 24 = 24VDC (9-36VDC), screw terminal block
- 48 = 48VDC (36-59VDC), screw terminal block
- HI = 88-300VDC or 85-264VAC, screw terminal block
- 24P = 24VDC (9-36VDC), pluggable terminal block
- 48P = 48VDC (36-59VDC), pluggable terminal block
- HIP = 88-300VDC or 85-264VAC, pluggable terminal block
- 00 = No Power Supply (PS2 Only)

S1: Modules for Slot 1

- XX = Empty

S2: Modules for Slot 2

- XX = Empty
- M1 = V90 Modem

S3 and S4: Ethernet Modules for Slots 3 and 4

- XXXX = Empty
- TX01 = 2 x 10/100Tx RJ45
- FX01 = 2 x 100FX - Multimode, 1300nm, ST connectors
- FX02 = 2 x 100FX - Multimode, 1300nm, SC connectors
- FX11 = 2 x 100FX - Multimode, 1300nm, LC connectors
- FX03 = 2 x 100FX - Multimode, 1300nm, MTRJ connectors
- FX04 = 2 x 100FX - Singlemode, 1300nm, ST connectors, 20km
- FX05 = 2 x 100FX - Singlemode, 1300nm, SC connectors, 20km
- FX06 = 2 x 100FX - Singlemode, 1300nm, LC connectors, 20km
- FX07 = 2 x 100FX - Singlemode, 1300nm, SC connectors, 50km
- FX08 = 2 x 100FX - Singlemode, 1300nm, LC connectors, 50km
- FX09 = 2 x 100FX - Singlemode, 1300nm, SC connectors, 90km
- FX10 = 2 x 100FX - Singlemode, 1300nm, LC connectors, 90km

S5 and S6: RX1000 WAN Modules for Slots 5 and 6

- XXX = Empty
- TU1 = Single T1/E1 Unchannelized
- TU2 = Dual T1/E1 Unchannelized
- TU4 = Quad T1/E1 Unchannelized
- TC1 = Single T1/E1 Channelized
- TC2 = Dual T1/E1 Channelized
- TC4 = Quad T1/E1 Channelized
- D01 = DSL
- D02 = 56 kBbps DDS DSU/CSU (1)
- TS1 = GPS IRIG-B Time Sync (coming soon) (2)

Example Order Codes

RX1000-R-RM-24-00-XX-XX-TX01-TX01-TU2-XXX
19" Rack mounted, single 24VDC power supply, 4 10/100 RJ45 Ethernet ports, Dual T1 WAN interface, with Ethernet ports on the rear

RX1000-F-RM-48-48-XX-XX-FL01-FX02-TU4-XXX
19" Rack mounted, dual redundant 48VDC power supply, 2 FL01 Multimode 850nm Fiber and 2 FX02 Singlemode 1300nm Fiber Ethernet ports, Quad T1 WAN interface, with Ethernet ports on the front

RX1000-R-RM-24-HI-XX-XX-TX01-FX05-TC2-XXX
19" Rack mounted, dual redundant power supply (mixed voltage), 2 10/100 RJ45 and 2 1300nm Singlemode Fiber Ethernet ports, Quad T1 Channelized WAN interface, with Ethernet ports on the rear

Accessories

42-11-0021 - Cable support brackets (two)
43-10-0007 - Power cable (North America three prong connector -> beau)

NOTES:
1 This module has an operating temperature range of -40°C to +50°C.
2 Only one (1) GPS card can be configured per router.

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Rev 2-H

For additional information on our products and services, please visit our website at: www.ruggedcom.com