



The RuggedRouter® RX1100 is an industrially hardened advanced cyber security appliance with integrated router, firewall, VPN and Intrusion Detection functionality (IDS). The RX1100 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 RX1100 is designed to protect and secure mission-critical networks connected directly to the Internet, or within a company's Wide Area Network (WAN) or Local Area Network (LAN).

The RX1100 includes security functions such as full IPSec Virtual Private Networking (VPN), firewall capabilities with the capacity to securely connect hundreds of remote sites across a Wide Area Network, and Intrusion Detection Services for performing real-time network traffic analysis and packet logging on IP networks.

The modular architecture of the RX1100 allows customization of the number and types of Ethernet and WAN ports. Integrated modem and GPS time synchronization options are also available. The RX1100 is hardened to the RuggedRated™ specification which provides a high level of immunity to electromagnetic interference (EMI) and heavy electrical surges typical of many harsh environments found in many industrial applications. An operating temperature range of -40 to +85°C (-40 to +185°F) allows the RX1100 to be placed in almost any location.

### Key Features and Benefits

#### Security Appliance Functions

- Integrated Router/Firewall/VPN
- Stateful Firewall with NAT
- Full IPSec Virtual Private Networking
- VPN with 3DES, AES128, AES256 support
- Intrusion Detection Services (IDS)
- RADIUS centralized password management

#### 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 IEC 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 (up to 4 ports):
  - 10/100BaseTX, 100BaseFX
- Cellular Modem
- WAN Port Options (up to 8 ports):
  - T1/E1 (channelized/unchannelized)
    - supports 2Mbps G.703 with 120 ohm balanced connections
  - PPPoE/Bridged Ethernet via ADSL
  - T3 DS3
  - 56 Kbps DDS
- Serial Ports (up to 8 ports):
  - Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable) – RJ45 connectors
  - Raw socket mode support allows conversion of any serial protocol
- Embedded Modem Port
- Precision Time Protocol (PTP): Accurate time synchronization with using NTP, IRIG-B, and/or IEEE1588

#### Protocols

- WAN
  - Frame Relay RFC 1490 or RFC 1294
  - PPP RFC 1661, 1332, 1321, 1334, PAP, CHAP Authentication
  - PPPoE over DSL
  - GOOSE messaging support
- IP
  - Routing: VRRP, OSPF, RIP, BGP
  - DHCP Agent (Option 82 Capable)
  - Traffic prioritization, NTP Server, IP Multicast Routing

#### 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
- Loopback diagnostic tests
- Raw and interpreted real time line traces

#### Universal Power Supply Options

- Fully integrated power supplies (no external adaptors)
- Input voltage range of 10-59VDC, 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



# RuggedRouter® RX1100

### 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 56kbps
- ▶ T3 DS3
- ▶ Cellular Modem - HSPA/EVDO rev. A

### Modular HMI

- ▶ Front or Rear Mount

### Cell Modem (Optional);

- ▶ GSM- EDGE



### Precision Time Protocol (Optional):

- ▶ Built-in GPS, Antenna Input
- ▶ NTP Server and Client
- ▶ IRIG-B (user selectable)
- ▶ IEEE 1588 master or slave port
- ▶ see separate PTP card datasheet

### V.90 Modem (Optional); or

### RS232 External Modem Interface (Optional)

### Serial Ports

- ▶ 4 or 8 ports
- ▶ Software Selectable RS232/RS422/RS485
- ▶ RJ45 connector

### Mounting Options

- ▶ Panel/Din rail
- ▶ 19" Rack Mount

### Enclosure:

### Operating Temperature

- ▶ -40°C to +85°C
- ▶ No Fans



### Integrated Power Supply:

### EMI Immunity

- ▶ Meets IEEE 1613 (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 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.

### Cellular Modem Support

Fixed telephone line infrastructure is not always available. The RuggedRouter® can be equipped with a cellular modem allowing you to cost effectively connect to your remote sites; anywhere there is cell coverage. There are a number of options available including GSM/EDGE, EV-DO Rev A (for CDMA networks) and HSPA.

### 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.

### VRRP (Virtual Router Redundancy Protocol)

VRRP is an Internet protocol that provides a way to have one or more backup routers when using a statically configured router on a local area network (LAN). Using VRRP, a virtual IP address can be specified as a default. A virtual IP address is shared among the routers, with one designated as the master router and the others as backups. In case the master fails, the virtual IP address is mapped to a backup router's IP address. (This backup becomes the master router.) The MAC address of the Virtual IP address is also not changed, but is moved from the malfunctioning master router to the backup master, making sure that Mac Address tables are kept current and unchanged.

### OSPF (Open Shortest Path First)

OSPF is a routing protocol that determines the best path for routing IP traffic over a TCP/IP network based on link states between nodes and several quality parameters. OSPF is an interior gateway protocol (IGP), which is designed to work within an autonomous system. It is also a link state protocol, meaning that the best route is determined by the type and speed of the inter-router links, not by how many router hops they are away from each other (as in Distance-Vector routing protocols, i.e. RIP and RIP II).

### PPP Networking Extended (Point-to-Point Protocol)

The most popular method for transporting IP packets over a serial link between the user and the ISP. Developed in 1994 by the IETF and superseding the SLIP protocol, PPP establishes the session between the user's computer and the ISP using its own Link Control Protocol (LCP). PPP supports PAP and CHAP authentication, as well as EAP, which is a conduit for numerous other authentication methods. PPP can run on any full-duplex link from POTS to ISDN to T1, etc. On dial-up connections, PPP can hang up a low-quality call and redial.

Using Multilink PPP (MPPP), two modems and phone lines can be bonded together to increase speed. PPP encapsulates high-level protocol packets in HDLC-based frames; for example, IP over PPP (IPCP) for the Internet and IPX over PPP (IPXCP) for NetWare networks, and it can multiplex different protocols over the same circuit. PPP also supports Ethernet frames for DSL and cable modem hookups (PPPoE).

## Router Software Features



### Link Backup

Link backup provides an easily configured means of raising a backup link upon the failure of a designated main link. The main and backup links can be Ethernet, CDMA or Dial Modem, TE1, DDS, ADSL or T3. The feature can back up to multiple remote locations, managing multiple main:backup link relationships. When the backup link is a modem, many “profiles” of dialed numbers can exist (each serving as a distinct backup link). The feature can also back up a permanent high speed WAN link to a permanent low speed WAN link and can be used to migrate the default route from the main to the backup link.

### Precision Time Protocol (PTP) Card

The PTP card features a GPS receiver, IRIG-B output ports and an additional 10/100BaseTX port. With the addition of this card the router can synchronize via Network Time Protocol (NTP) and IRIG-B to a stratum 0 clock source. NTP allows Intelligent Electronic Devices (IED) and Remote Terminal Units (RTU) to obtain accurate time information. The IRIG-B protocol allows IEDs and RTUs to obtain nanosecond accuracy via TTL Pulse Width Modulation (PWM) and Pulse Per Second (PPS) ports and a 12VPP Amplitude Modulation (AM) port. IEEE1588 synchronization protocol is offered on the added 10/100BaseTX port. (see PTP card datasheet for more information).

### Serial IP Encapsulation

Many ‘legacy’ devices (RTU, PLC, IED, etc.) only support serial communications via RS232, RS422 or RS485. ROX™ encapsulates the serial data within a TCP connection allowing these devices to be reached via an IP network. A wide range of baud rates, frame packetization options, and diagnostics are available and the raw socket support allows conversion of any serial protocol.

### HTML Web-Browser and SSH

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

### 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 ROX™ are v1, v2c, and v3. SNMPv3 in particular provides security features (such as authentication, privacy, and access control) not present in earlier SNMP versions. ROX™ also supports numerous standard MIBs (Management Information Base) allowing for easy integration with any network management system (NMS). A feature of SNMP supported by ROX™ is the ability to generate “traps” upon system events. A NMS can record traps from multiple devices providing a powerful network troubleshooting tool.

### Port Configuration and Status

ROX™ 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.

### Event Logging and Alarms

ROX™ 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.

### GOOSE Tunnels

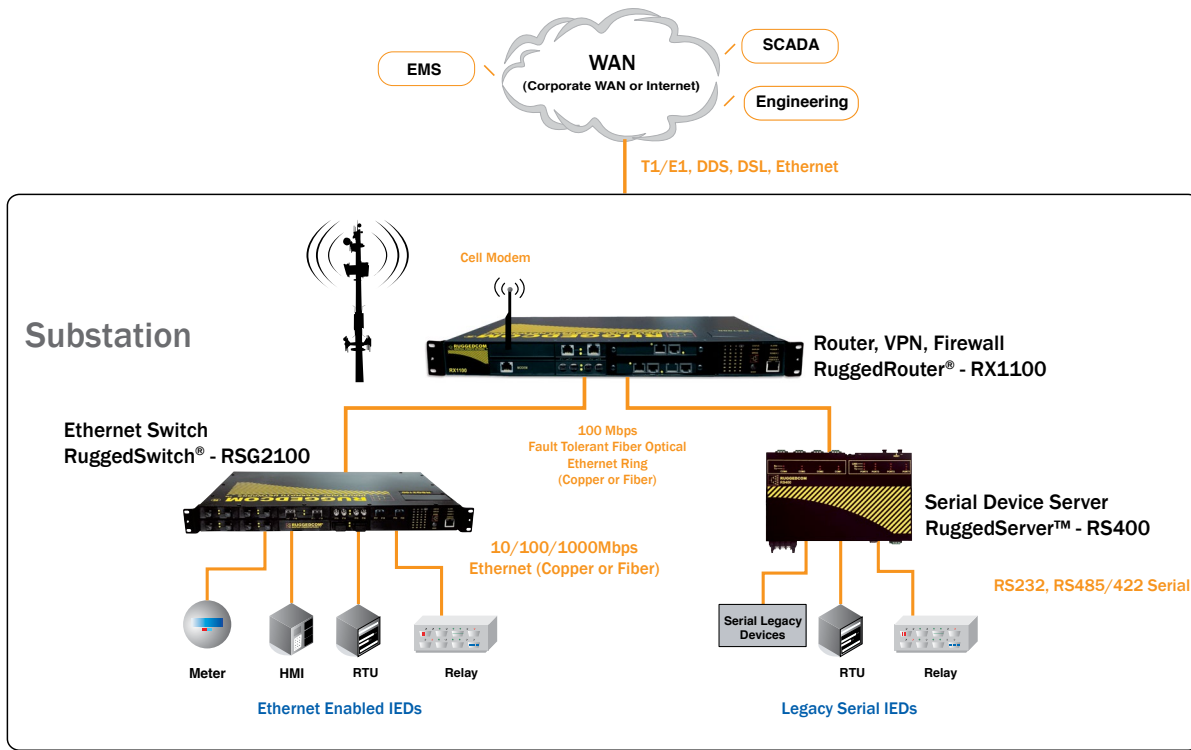
IEC61850 is an international standard for substation automation. One feature of IEC61850 is the Generic Object Oriented Substation Event (GOOSE) protocol that facilitates the fast transfer of events. IEC61850 uses Layer 2 multicast frames to distribute its messages and hence, is incapable of operating outside of a switched Ethernet Network. The GOOSE tunnel feature provides a capability to bridge GOOSE frames over a wide area network (WAN).

### RADIUS Authentication

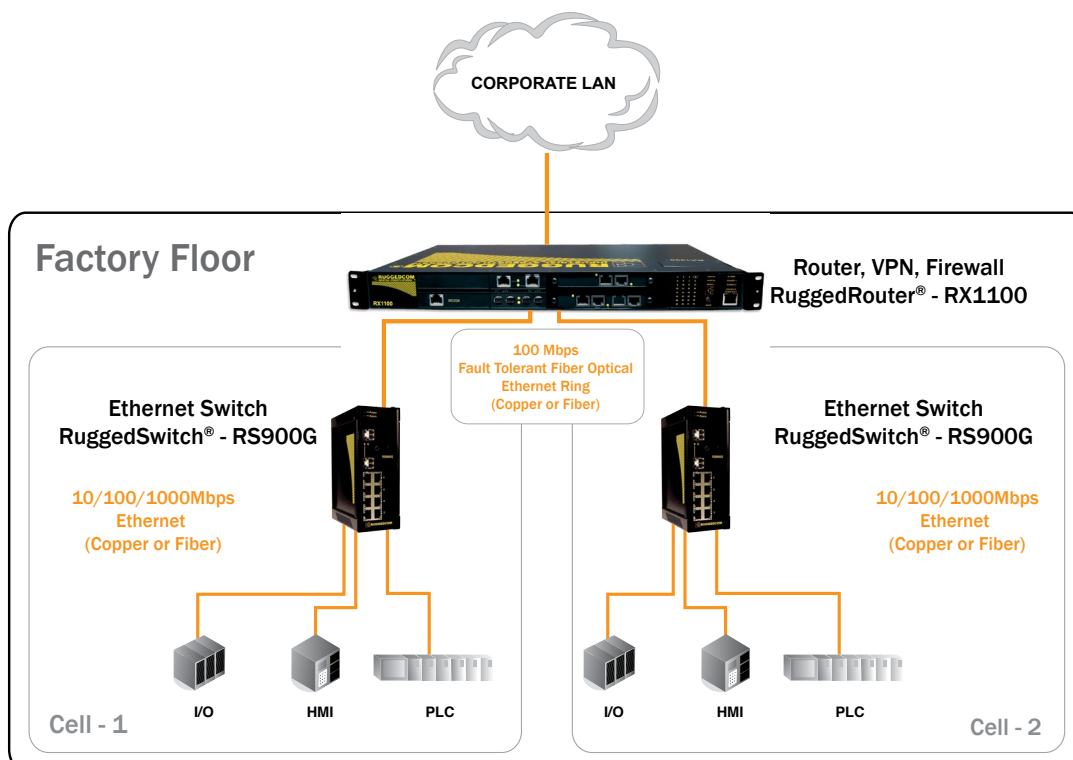
The RADIUS protocol provides a means for carrying authentication, authorization, and configuration information between a client (the router) which desires to authenticate its links and a shared Authentication Server. Transactions between the router and RADIUS server are authenticated through the use of a shared secret, which is never sent over the network. In addition, any user passwords are sent encrypted between the router and RADIUS server, to eliminate the possibility that someone snooping on an insecure network could determine a user’s password.

# Application Examples

## Electric Utility Substation



## Industrial Plant Floor



## Intrusion Detection Services (IDS)

The RX1100 supports Intrusion Detection Services (IDS) capable of performing real-time traffic analysis and packet logging on IP networks. It can perform protocol analysis, content searching/matching and can be used to detect a variety of attacks and probes, such as buffer overflows, stealth port scans, CGI attacks, SMB probes, OS fingerprinting attempts, and much more. The IDS system uses a flexible rules language to describe traffic that it should collect or pass, as well as a detection engine that utilizes modular plugin architecture. It can be used as a straight packet sniffer like tcpdump or as a full blown network intrusion prevention system. The RX1100 IDS system is based on Snort, a popular open source network intrusion prevention system, enabling administrators to access a large knowledge base surrounding IDS issues.

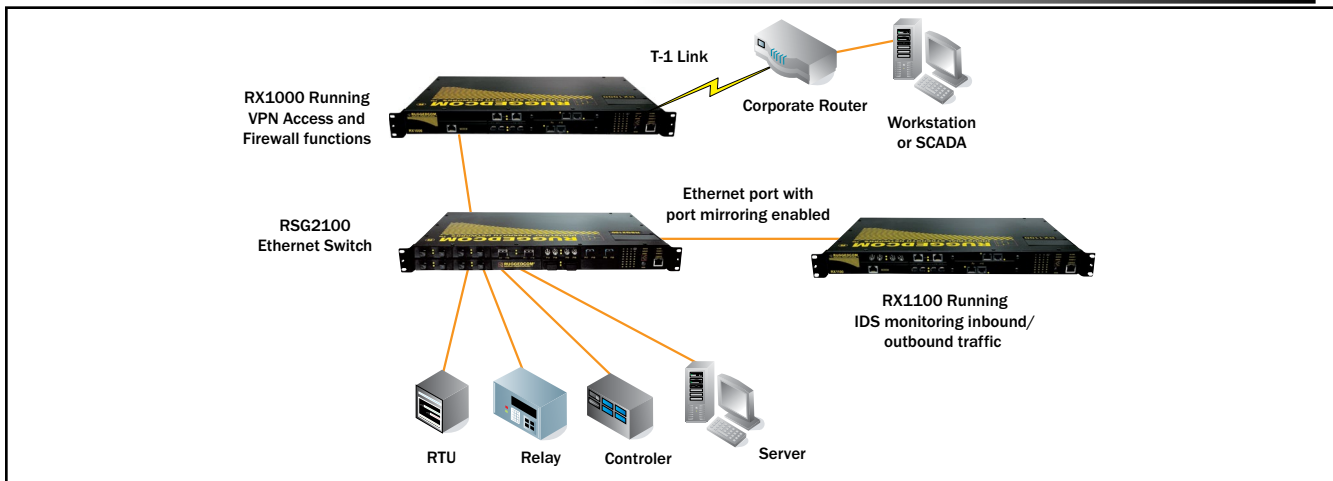
A key component of the IDS system is the policy signatures. These signatures are rule-sets that are used to provide evidence of an intrusion, and are stored on the RX1100 for the system and network administrator to maintain. Because each signature is different, it is possible for system administrators to determine, by looking at the intrusion signature what the intrusion was, how and when it was perpetrated, and even how skilled the intruder is.

For example, when a malicious attack is launched against a system, the attack typically leaves evidence of the intrusion in the system's logs. Each intrusion leaves a kind of footprint behind (e.g., unauthorized software executions, failed logins, misuse of administrative privileges, file and directory access) that administrators can document and use to prevent the same attacks in the future. By keeping tables of intrusion signatures and instructing devices in the IDS to look for the intrusion signatures, a system's security is strengthened against malicious attacks. The RX1100 can support many common and uncommon Enterprise based application policies, as well as policies designed for Electric Utility, Transportation and Industrial applications.

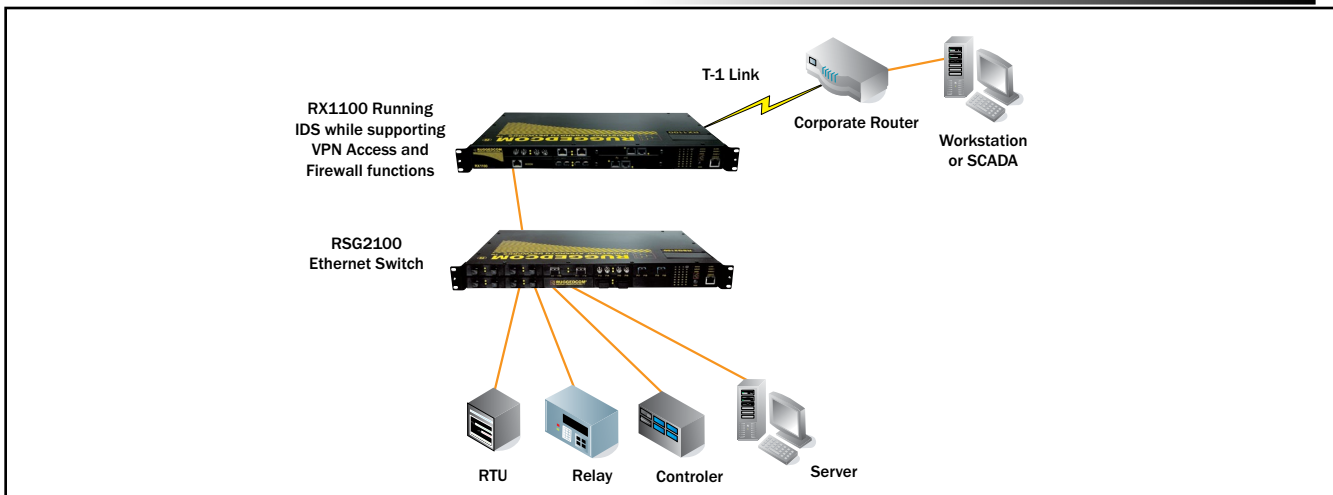
The RX1100 should be used as an integral part of an overall cyber security strategy for any IP networks deployed in industrial and mission critical applications.

### Architecture Examples

#### Dedicated Monitoring



#### Combined Functionality



# 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 <sup>3</sup>	+/- 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 <sup>3</sup>	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 100% for 5 periods, 100% for 50 periods <sup>2</sup>	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 ports <sup>3</sup>	+/- 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

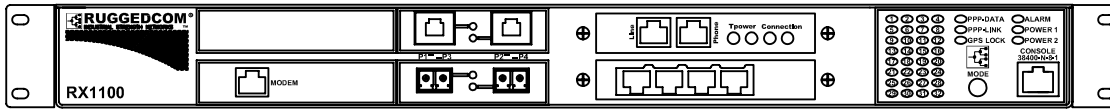
Environmental Type Tests			
Test	Description		Test Levels
IEC 60068-2-1	Cold Temperature Dry Heat	Test Ad	-40°C, 16 Hours
IEC 60068-2-2		Test Bd	+85°C, 16 Hours
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C , 6 cycles
IEC 60255-21-1	Vibration Response		Level 2 (1G @ 10-150 Hz)
	Vibration Endurance		Level 2 (2G @ 10-150 Hz)
IEC 60255-21-2	Shock Response		Level 1 (5G @ 11ms)
	Shock Withstand		Level 2 (30G @ 11ms)

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")



## Mounting Options

### 19" Rack Front Mount - (Connectors At Front)



FRONT VIEW

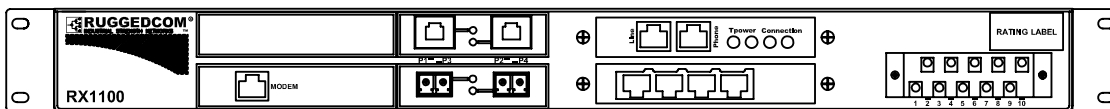


REAR VIEW

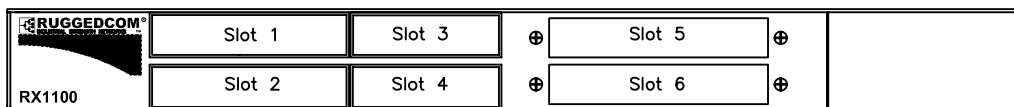
### 19" Rack Rear Mount - (Connectors At Rear)



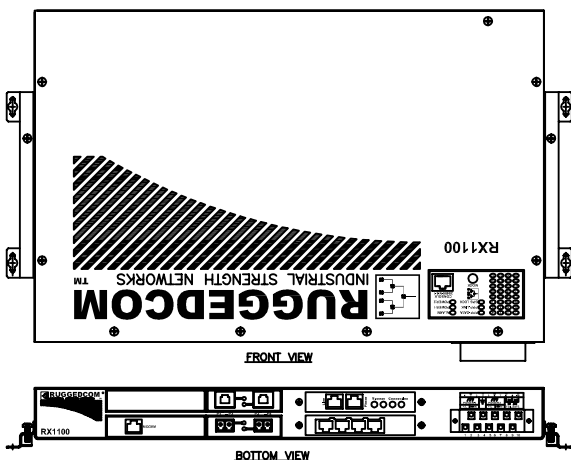
FRONT VIEW



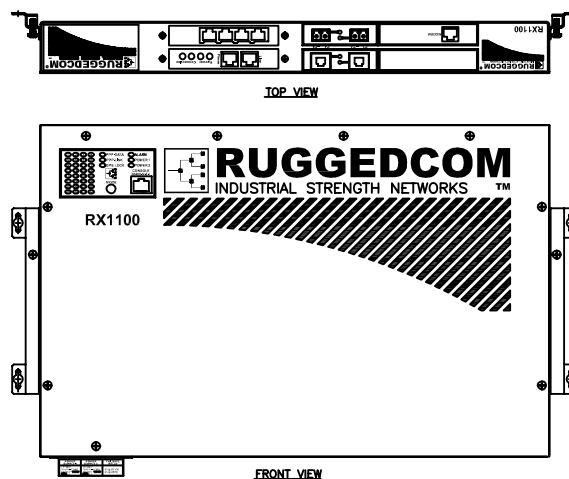
REAR VIEW



### Panel/DIN Rail Bottom Mount – (Connectors At Bottom)



### Panel/DIN Rail Top Mount – (Connectors At Top)



## 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
- CE Marking
- Emissions: FCC Part 15, Class A
- Complies with 21 CFR Chapter 1, Subchapter J. (pending)
- NEMA TS-2

### 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 SSH)
- 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

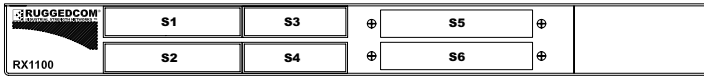
- 802.3-10BaseT
- 802.3u-100BaseTX, 100BaseFX

### 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-RRRP
- RFC2475-Differentiated Services

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Main Mount PS1 PS2 S1 S2 S3 S4 S5 S6 MOD

## Order Codes



### 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 <sup>(10)</sup>

- 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
- XX = No Power Supply (PS2 Only)

### S1: Modules for Slot 1 <sup>(11)</sup>

- XX = Empty
- M1 = V90 Modem
- M2 = RS232 External Modem Interface
- W10 = Cellular Modem (GSM-EDGE) <sup>(1) (6)</sup>

### S2: Modules for Slot 2 <sup>(11)</sup>

- XX = Empty
- M1 = V90 Modem
- M2 = RS232 External Modem Interface

### S3 and S4: Ethernet Modules for Slots 3 and 4 <sup>(3)(4)</sup>

- 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: RX1100 Modules for Slots 5 and 6 <sup>(5)</sup>

- XXX = Empty
- TC1 = Single T1/E1 Channelized/Unchannelized
- TC2 = Dual T1/E1 Channelized/Unchannelized
- TC4 = Quad T1/E1 Channelized/Unchannelized
- DS3 = Clear Channel T3 DS3 card
- D01 = DSL
- D02 = 56 kbps DDS DSU/CSU
- TS1 = Precision Time Protocol (PTP) Card: GPS, NTP, IRIG-B, IEEE 1588 Time Synchronization <sup>(2)</sup>
- S01 = 4 x RS232/RS422/RS485 via RJ45
- S02 = Synchronous Dual Serial Card – Dual Serial DB25 interface <sup>(9)</sup>
- W11 = Cellular Modem GSM/EDGE/HSPA <sup>(1) (7)</sup>
- W20 = Cellular Modem EVDO rev A – Verizon US <sup>(1) (8)</sup>

### MOD: Hardware Modifications

- XX = No Hardware Modifications
- C01 = Conformal Coating

#### NOTES:

- 1 Only one cellular modem can be installed on the RuggedRouter®.
- 2 Only one (1) GPS card can be configured per router; see PTP card datasheet for more information.
- 3 One Ethernet module must be ordered with each router.
- 4 S3 must be populated before S4
- 5 S5 must be populated before S6
- 6 This module has an operating temperature range of -30°C to 50°C
- 7 Supported operating temperature range is pending final testing and excludes carrier provided SIM. Please contact your regional sales manager for information on carrier approval for this option.
- 8 This module's supported operating temperature range is pending final testing
- 9 Consult factory for availability
- 10 PS1 and PS2 must be both either pluggable or screw terminal block.
- 11 Only one RS232 External Modem can be installed at a time.

### Example Order Codes

**RX1100-R-RM-24-XX-XX-XX-TX01-TX01-TC2-XXX-XX**  
19" Rack mounted, single 24VDC power supply, 4 10/100 RJ45 Ethernet ports, Dual T1 WAN interface, with Ethernet ports on the rear. No hardware modifications.

**RX1100-F-RM-48-48-XX-XX-FL01-FX02-TC4-XXX-XX**  
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. No hardware modifications.

**RX1100-R-RM-24-HI-XX-XX-TX01-FX05-TC4-XXX-XX**  
19" Rack mounted, dual redundant power supply (mixed voltage), 2 10/100 RJ45 and 2 1300nm Singlemode Fiber Ethernet ports, Quad T1 WAN interface, with Ethernet ports on the rear. No hardware modifications.

### Accessories

- 41-11-0011 - Cable support bracket (one)
- 43-10-0007 - Power cable (North America three prong connector -> beau)
- 99-01-0001-001- Dual Band Antenna for use with the W20 Option
- 99-01-0002-001 - 7 Band Antenna for use with the W11 Option

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