

Chapter 1 Product Overview

Using a single web-based user interface, our cellular units simplify I/O, network and security configurations to integrate complex hardware settings. This easy-to-manage configuration reduces the cost and complexity of deploying and administering multiple devices at remote locations. Furthermore, an integrated configurable stateful firewall provides intrusion protection and encrypted data access while a built-in Software Development Kit (SDK) enables users to develop custom applications.

Working in conjunction with SixView Manager remote monitoring and control software, RAM RTUs provide low-cost, real-time access to outlying sites.

RAM® 9000 Cellular RTU Product Highlights

- Supports Multi-Carrier 4G LTE connectivity with fall back to 3G (and 2G for non-EU/JP Models)
- Real-time access to mission-critical data through built-in Modbus gateway
- Software Development Kit (SDK) for custom application support
- Native support for DNP3 and Modbus protocols
- Integrated security firewall provides intrusion protection
- Simplified deployment and configuration with single web-based GUI
- Support for new and legacy devices with RS232/485 serial or RJ45 Ethernet
- Powerful event engine that can trigger built-in I/O, send SMS text or email alerts based on real-time operational data.



Specifications

General Specifications

Wireless Interfaces	AT&T LTE with fallback to HSPA+ (non-EU/JP models) Bell Mobility LTE with fallback to HSPA+ Generic LTE with fallback to HSPA+ Rogers LTE with fallback to HSPA+ TELUS LTE with fallback to HSPA+ Verizon LTE with fallback to EVDO (non-EU/JP models)
Programmable Platform	Configurable Events: up to 99 events can be triggered by I/O, Modbus registers, or over 200 system variables which in turn can send text messages, send email alerts or control I/O Software Development Kit (SDK) C/C++/Perl
Protocol Gateway	I/O Controller Modbus RTU/TCP/ASCII DNP3 - slave
System Performance	32-bit ARM9 400 MHz CPU 512 MB NAND Memory 128 MB RAM
Tunneling	IPsec, GRE, OpenVPN
IP	NAT, port forwarding, dynamic DNS, DHCP Stateful inspection firewall, IP Transparency
Routing Protocols	OSPF, BGP, RIP
Clustering	VRRP
GPS	GNSS supported: GPS L1, GLONASS L1, Galileo E1 High RF sensitivity plus jamming detection/removal
Connectors	Ethernet: One (1) or two (2) 10/100Base-T RJ-45 ports WAN capability on port 2 Serial: One (1) RS-232 (DB9) 115200bps One (1) RS-485 (screw block) 115200bps USB: One (1) USB 2.0 (mini) Antennas: Three (3) SMA connectors (antenna, diversity, GPS) One (1) RP-SMA connector (Wi-Fi optional)



Inputs & Outputs	2 Digital Inputs 2 Digital Outputs 3 Analog Inputs 1 Form C Relay See detailed I/O specifications in Section 1.2.5 below
Wi-Fi Interface (Optional)	Complies with IEEE802.11b/g/n Maximum output power up to 25dBm Supports up to 150Mbps with 40MHz channel
Power Input	Input: 12-24 VDC Power consumption (less DO power): - Standby: 4W (all models) - Transmitting: 9911 & 9711: 5.0W - 9.4W (cellular only) 9931 & 9731: 5.0W - 13.6W (cellular and Wi-Fi) Power consumption of DO (max each): 0.7A/DO Heat dissipation: 46 BTU/hour max; 20 BTU/hour typical
Mechanical	Dimensions: 132H x 127D x 70W mm (5.2" x 5.00" x 2.75") Material : Steel with black zinc coating Weight: 906 g (2 lbs)
Environmental	Operating temperature: -40°C to +75°C* Shock: IEC60068-2-27 Vibration: IEC60068-2-6 Humidity: 5 to 95% non-condensing Ingress Protection: IP30
Ethernet Interface (10/100 Auto Sensing)	1x or 2x RJ45 (Isolation 1500 Vrms 1 minute) WAN capability on 2 nd port
Serial interface	1x RS232 Serial DB9 115200bps 1x RS485 Serial Screws 115200bps (Isolation 1200 Vrms 1 minute)
USB interface	1x USB 2.0 Device mini 1x USB 2.0 Host type A
LED indicators	Dual Power, Status Reset, WAN, RSSI, RS232, RS485, GPS, SD, Ethernet Link & Activity



Certification	EMI/EMC – Emissions: FCC, Part 15 and Industry Canada, ICES-003; Class A; EN55022, IEC61000-6-4 Immunity: IEC61000-6-2 (EN61000-4-2,3,4,5,6,8) Hazardous locations: Class I, Div. 2, Groups A, B, C, D, ANSI/ISA 12.12.01 Electrical safety: UL508/CSA22.2/14 (CUL): IEC61010-1 Carrier specific approvals (Contact Red Lion for latest) RoHS compliant
ATEX	• Protection string:  II 3 G Ex nA IIC T3 Gc • ATEX Certificate string: DEMKO 15 ATEX 1366X • Ambient temperature ranges: • $-40^{\circ}\text{C} \leq \text{Tamb} \leq 75^{\circ}\text{C}$ for units utilizing Panasonic BR-1225A • $-40^{\circ}\text{C} \leq \text{Tamb} \leq 55^{\circ}\text{C}$ for units utilizing Rayovac BR1225X-BA • Conductor temperature of at least 107°C • Battery Replacement info: Replace w/ Panasonic BR1225A or Rayovac BR1225X-BA based on operating temperature given above. • Standards evaluated for ATEX: IEC 60079-0 6th Edition, IEC 60079-15 4th Edition, EN 60079-0:2012 + A11:2013, and EN 60079-15:2010 • The equipment shall be installed in an ATEX-Certified enclosure that provides a degree of protection not less than IP54 in accordance with EN/IEC 60079-15 and used in an environment of not more than Pollution Degree 2 in accordance with EN/IEC60664-1 when applied in Zone 2 environments. The enclosure must be accessible only by the use of a tool. • Conditions of Safe Use: Provision shall be made to prevent the rated voltage being exceeded by the transient disturbances of more than 140% of the peak rated voltage • Special Conditions of Use: Antenna Connections are for internal wiring only. • 
Compliances	The Red Lion Sixnet Series RAM 9000 products meet the following standards plus others:
  	Electrical Safety These devices have been designed to meet the basic safety requirements of the following standards: • CE per Low Voltage Directive and IEC 61010-1 (CE applies only to the -EU models. Please contact Red Lion for availability) • UL508 (Industrial control equipment), ANSI/ISA 12.12.01 (Hazardous Locations) • CSA C22.2 No. 142 and No. 213 (per cUL)



EMC (emissions and immunity)

- CE per the EMC directive (CE applies only to the -EU models. Please contact Red Lion for availability)
- IEC 61000-6-2: Immunity in industrial environments
- IEC 61000-6-4: Emissions in industrial environments
- FCC part 15 and ICES 003. See FCC statement on page 6.
- EN 55022 (CISPR22)

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 instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at their own expense. Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Information to the user: If this equipment causes interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: In order to meet FCC emissions limits, this equipment must be used only with cables that comply with IEEE 802.3. If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from: U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4



WEEE compliance

These devices comply with the WEEE directive. Do not throw away these devices in the standard trash. Contact Red Lion regarding proper disposal.



RoHS compliance

These devices comply with the RoHS directive and are considered lead and other hazardous substance free.

*-40°C to +75°C - See [Thermal Performance and Considerations section](#) in Chapter 2.

Note: All specifications are subject to change. Consult the Red Lion website for more information.



RAM 9000 Cellular RTU View



Power Specifications and Consumption

Power Input:

- Input: 12-24 VDC (absolute min./max.: 8-30 VDC)
- Power consumption (less DO power):
 - Idle: 4W
 - Typical: 5 - 6 W
 - Maximum: 6 - 14 W (depends on model)
- Power consumption of DO (max. each):
 - 0.7A/DO
- Heat dissipation: 46 BTU/hour max.; 20 BTU/hour typical

Power input to the unit is protected against reverse polarity and over-voltage up to 33VDC. The router's power consumption is as follows:

Typical Power Consumption (Watts)				
Model	Standby	Transmitting Minimum	Transmitting Maximum	Geographic Region
RAM-99x1	4.0	5.0	9.4	Non-EU
RAM-99x1-EU	4.0	5.0	9.4	EU
RAM-99x1-JP	4.0	5.0	9.4	JP



Typical Power Consumption (Watts)				
Model	Standby	Transmitting Minimum	Transmitting Maximum	Geographic Region
RAM-97x1	4.0	5.0	9.4	Non-EU
RAM-96x1	4.0	4.6	5.5	Non-EU
RAM-9931	4.0	5.0	13.6	Non-EU
RAM-9931-EU	4.0	5.0	13.6	EU
RAM-9931-JP	4.0	5.0	13.6	JP
RAM-9731	4.0	5.0	13.6	Non-EU
RAM-9631	4.0	4.6	9.7	Non-EU

Note: Wiring instructions are provided in [I/O Wiring section](#) in Chapter 2 of this guide.

To meet UL requirements, a “Class 2 Source” power supply is required.

Electrical Specifications and Pinout

Discrete Inputs:

- 2 Channels
- Isolated fully differential
- Isolation (channel to channel) = 1 KV
- Voltage range = 8-30 VDC
- Guaranteed ON voltage = 2.8 VDC
- Guaranteed OFF voltage = 2.7 VDC
- Input resistance = 315K Ohms
- Input current @ 24 VDC = 10 mA
- Filtered ON/OFF delay = 25 ms (10 Hz max count rate)
- Count resolution = 16 or 32 bits

Discrete Outputs:

- 2 Channels
- Sourcing of module power
- Max. output load per channel = 1 A (up to 35°C)



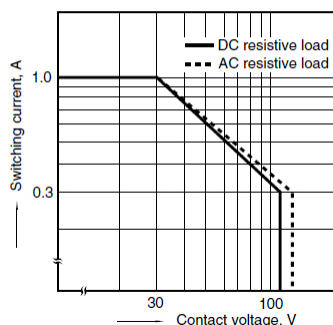
- Derate to 0.7 A up to 50°C
- Derate to 0.55 A up to 70°C
- Derate to 0.4 A up to 80°C
- Derate to 0.3 A up to 85°C
- Min. output load per channel = 1 mA
- Max. OFF state leakage current = <0.05 mA
- Inrush current (100 mA surge) = 5A
- Typical ON voltage drop (@1 A) = 0.13 VDC
- Short circuit protection = self-reset fuses (trip above 1.5 Amp at 20C)

Relay Outputs Specs:

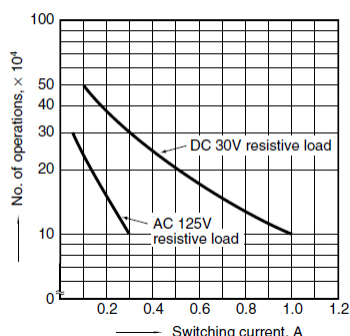
- 1 channel
- Relay type = Form C (NO/NC)
- Minimum output voltage = 0 VAC/VDC
- Maximum output voltage = 110 VDC, 125 VAC
- Minimum switching capacity = 10 μ A, 10 mV DC
- Maximum load current per output (30 VDC) = 2 Amps
- Maximum load current per output (125 VAC) = 0.3 Amps
- Minimum OFF resistance = 1000 Meg Ohms
- Maximum relay turn ON time = 4 ms
- Maximum relay turn OFF time = 4 ms
- Load current versus contact voltage chart:

1. Max. switching capacity

* Max. switching capacity is 2A 30V DC.

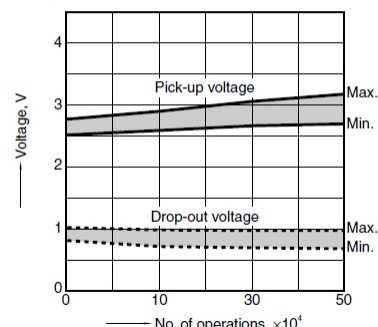


2. Life curve



3. Mechanical life

Operating speed: 180 cpm



Analog Input Specs:

- 3 channels
- Ranges = 4-20 mA or 0-10 VDC
- Ranges are software selectable

- A/D resolution = 16 bits (0.003%)
- Input resolution = 2 μ A or 0.5 mV
- Full scale accuracy (@20°C) (after field calibration) = +/- 0.1%
- Input span adjustability = +/- 25%
- Input offset adjustability = +/- 25%
- Span temperature coefficient +/- 50 ppm per °C
- Offset temperature coefficient +/- 50 ppm per °C
- Input impedance
 - Current ranges = 100 Ohms
 - Voltage ranges = 10K Ohms
- Current protection (current range) = self-resetting fuses
- DMRR at 50/60 Hz = 66dB
- Fastest update time = 120 ms per channel
- Self-calibration interval = 5 seconds



Ordering Guide

Model Number	Series	Serial		Ethernet	Wi-Fi	Cellular	Power Connector	Default Carriers**
		RS-232	RS-485	10/100				
RAM-9911-xx	RAM	1	1	2 (WAN/ LAN)	N	4G LTE	DC powered	(AT) AT&T (VZ) Verizon (AM) Generic*
RAM-9931-xx	RAM	1	1	2 (WAN/ LAN)	Y	4G LTE	DC powered	
RAM-9911-EU	RAM	1	1	2 (WAN/ LAN)	N	4G LTE	DC powered	Generic
RAM-9931-EU	RAM	1	1	2 (WAN/ LAN)	Y	4G LTE	DC powered	
RAM-9911-JP	RAM	1	1	2 (WAN/ LAN)	N	4G LTE	DC powered	DoCoMo
RAM-9931-JP	RAM	1	1	2 (WAN/ LAN)	Y	4G LTE	DC powered	

* See Band/Frequency table for compatibility

** Carrier is pre-configured on device. Carrier can be selected via software.

Where xx = carrier code

