comnet
Communication Networks

RL1000GW

LIFETIME ∞ WARRANTY	IEC 61850-3 IEEE 1613		SFP	HARDENED			1G GIGABIT	10/100 ETHERNET	GIGABIT ETHERNET
EXCLUSIVE	SUBSTATION	DIN RAIL	FLEXIBILITY	-40° TO +85°C	LAYER 3	FIREWALL	UPLINK	1	1

ComNet product series RL1000GW are substation-rated and industrially hardened layer 3 router/gateways, with a unique and highly robust packet processing SCADA-aware security firewall for the most mission-critical and demanding cyber-security applications. The RL1000GW is intended for deployment in environments where high levels of electromagnetic noise and interference (EMI) and severe voltage transients and surges are routinely encountered, such as electrical utility substations and switchyards, heavy manufacturing facilities, track-side electronic equipment, and other difficult out-of-plant installations. Layer 3 routing functionality allows for the participation and foundation of a core network infrastructure. The compact-sized DIN-rail mountable RL1000GW is ideally suited to those installations and applications where space may be limited. These features make the RL1000GW an effective platform for deploying a secure communications and networking gateway for remote electrical utility sites, and other critical infrastructure applications.

FEATURES

› Fully compliant with the requirements of IEC 61850-3 and IEEE 1613 Class 2, for use in electrical utility substations; and NEMA TS-1/TS-2 for Traffic Signal Control Equipment

› For NERC-CIP-5 and NERC-CIP-014 compliance, or any network application demanding effective cyber-security protection

› Small Size: Perfect for installations where space may be extremely limited

› Optional internal 2G/3G/4G LTE GPRS/UMTS cellular radio modem with 2 SIM card slots, for maximum network reliability and availability

› Serial interface supports 2 ports of RS-232 or 1 port each of RS-232 and 4-wire RS-485 serial data, with serial gateway and serial tunneling

› Optional 100/1000 Mbps SFP uplink port, for high-speed connection to the user's network

› Highly advanced and sophisticated security suite: Per Port Deep Packet Inspection (DPI) SCADA-aware firewall supports DNP-3, ModBus, IEC 104/101, and IEC 61850 protocols for NERC-CIP-5 compliance

› Network Learning allows the user to easily create secure and highly effective SCADA firewall rules

› IEEE 802.1X Port-based network access control

› L-2/3/4 ACL for incoming traffic, and layer 2/layer 3 VPN with IPsec

› User APA (Authentication Proxy Access) controls remote access and communications to end-point/edge of network devices by all users, with extreme granularity across the users, time, physical Ethernet or serial data ports, TCP ports, and SCADA protocols. It also provides PCAP for the entire allowed maintenance or access session.

› IPsec VPN with X.509 certificates, for use over any cellular or fiber-optic network

› Ethernet layer 3 IP routing with integrated VPN

› Fault/event notification provided through Syslog and SNMP traps

› Environmentally hardened for deployment in difficult unconditioned out-of-plant installations: Extended ambient operating temperature range of -40˚ C to +85˚ C. Conformal coating is optionally available for humidity with condensation or airborne particulate matter environments

› Rugged metal housing. DIN-rail mountable, & rated for IP-30 ingress protection

› Internal/self-contained universal power supply: Available in operating voltage ranges from 9 to 60 VDC.

› No fans or forced-air cooling; cooling via natural convection eliminates unreliable and troublesome fans/moving parts, with no periodic maintenance requirements

* Small Form-Factor Pluggable Module. Sold separately.

LIFETIME WARRANTY   **WWW.COMNET.NET**   TECH SUPPORT: 1.888.678.9427

PRODUCT DESCRIPTION

Seamless & Reliable Connection to Any Network

The RL1000GW provides connectivity to any copper, fiber optic, or cellular radio-based Ethernet network. Fiber optic networks are supported by the use of the optional 100/1000FX SFP uplink port. The optional highly resilient 2G/3G/4G LTE cellular radio uplink with 2 SIM card slots for network redundancy, is ideal where fiber optic infrastructure is not available, and may be used as a back-up link for those applications where interruption of service is not tolerable.

Extremely Effective Network Security, For the Most Mission-Critical Applications

Service Gateway

The RL1000GW service gateway includes a highly robust application layer, and provides legacy support, a Deep Packet Inspection (DPI) application-aware SCADA firewall, serial tunnelling, protocol gateway, and extremely effective encryption technologies. The service gateway offers a uniquely capable feature set which may serve as the hardware foundation to a secure industrial controls network, and includes Protocol Gateway, VPN, and IPsec features.

Protocol Gateway

Gateway functionality between a DNP3 TCP client (master) and a DNP3 Serial RTU, IED, PLC, or other compatible device is supported. This same functionality is supported across MODBUS TCP to MODBUS RTU, and IEC 61850 101/104 TCP to IEC 61850 101/104 RTU. This level of protocol conversion allows legacy protocols to be secured by enterprise and industry best practice level encryption across a TCP IP-based network.

VPN

VPN tunnels are included for secure inter-site connectivity with IPsec, DM-VPN, and VPN GRE tunnels with key management certificates. The supported VPN modes allow both layer-2 and layer-3 services, to best suit the user's application-specific cyber-protection needs.

IPSec

Internet Protocol Security (IPsec) is a protocol suite for securing Internet Protocol (IP) communications by authenticating and/or encrypting each IP packet of a communication session. IPsec-VPN as well as IPsec encryption are supported over other VPN technologies. By implementing this level of industry-accepted encryption, data may traverse the network in a guaranteed delivery method, as well as providing a cohesive and secure methodology for network communication across legacy and modern networks.

Identity Management and Authentication Proxy Access (APA)

NERC-CIP-5 defines the important requirement for network security protection of remote and unattended facilities. The capability of identifying the user and creating specific network privileges per identified and authenticated user prior to granting the user access to the network therefore becomes critical

The Authentication Proxy Access (APA) is a highly sophisticated security feature, which allows the network operator to manage the substation or any other facility maintenance process. This feature gives full control of the maintenance process to the operator by granting the capability to create dynamic policies to specific tasks within an explicitly defined time window. Following this time window, operators receive reporting on activities performed during the task. This audit trail comes in the form of an overview log, and a full packet capture (PCAP) of the session.

Before a user is allowed access to the network, they must log in to ComNet's internal authentication process with their unique user name and password. Upon validation of the user profile, specific access is granted to predefined devices and functions, and each operation is logged. Multi-factor authentication is available when combined with the Cyber-Physical Integration feature.

X.509 Certificate Exchange for VPN Connections

VPN tunnels for secure inter-site connectivity with IPsec VPN, GRE Tunnels, and DMVPN technologies are fully supported. In addition to IPsec encryption, X.509 key management certificates are provided. This certificate support allows for a secure signed key exchange between a Certificate Authority, and two secure nodes. Having a third-party authority as a signing participant offers end-to-end security that may be managed and reissued from a trusted central source within the user's network.

RL1000GW

Small Form Factor Substation-Rated Secure Ethernet Layer 2 Switch/Layer 3 Router, with Optional 2G/3G/4G LTE Cellular Radio Link, and 100/1000 Mbps SFP Uplink Port

PRODUCT DESCRIPTION (Cont'd)

Cyber-Physical Integration

Integrated within the enhanced-security RL1000GW, is a physical identity server system, allowing the use of external authentication hardware, such as magnetic card readers, biometric identification sensors, facial recognition cameras, etc., to create a two-factor authentication to the APA feature. This provides an additional level of validation of the user and his/her credentials, prior to granting the user network access. Once the authentication is validated and approved, a set of defined policies allow the authenticated technician to perform their task.

Enhanced SCADA-Aware Firewall

A whitelist-based firewall is provided for every Ethernet and serial data port, so full firewall protection is available at all remote sites within the network. Every SCADA protocol packet (IEC 61850, DNP3 RTU/TCP, ModBus RTU/TCP, and IEC 101/104) is scanned and validated by the firewall engine for its source and destination, as well as its protocol and packet content.

The structure of the distributed firewall allows the creation of a unique firewall at each access point to the network. This is critical for securing against insider cyber-attacks, compromised field devices, man-in-the-middle attacks, and a myriad of alternate attack vectors, by providing a secure baseline.

Two firewall states are included: Monitoring, and enforcing. The monitoring state provides an alarm at the control center for any network violation, without blocking the network traffic. The enforcing state is extremely effective for blocking suspicious traffic, while also triggering a violation alarm at the control center.

DPI (Deep Packet Inspection) SCADA Protocols Firewall

ComNet's distributed DPI firewall ensures that the operator will have full control over the network, even when faced with a sophisticated attempt at breaching the network. Monitoring SCADA commands, this highly robust whitelist-based firewall analyses SCADA network traffic, and is provided for every Ethernet and serial data port, so full firewall protection is available at all remote sites within the network, as well as all IEDs, RTUs, PLCs, or any other device connected to the network. Every SCADA protocol packet (IEC 61850, DNP3 RTU/TCP, ModBus RTU/TCP, and IEC 101/104) is scanned and validated by the firewall engine for its source and destination, as well as its protocol and its specific packet

Any detected abnormal traffic behavioral patterns are blocked, any affected subnets are isolated, and alerts are automatically generated.

Ease of Installation and Network Integration

High levels of cyber-security experience are not required to successfully deploy the RL1000GW. It is fully supported by ComNet's Reliance Product Configuration Utility and CLI, allowing the secure switch/router to be easily configured, and to diagnose network and security functions.

Configuration of the secure firewall is also simple. Once connected to the user's network, the RL1000GW immediately begins to collect and analyse information across the network, including from other connected devices, traffic behavior, etc. Recommended firewall rules are then suggested to the user; the implementation of these rules is optional, and they can be easily edited using the Configuration Utility.

OAM (IEEE 802.3-2005 & IEEE 802.1ag) and QoS are also supported. Strict priority, Weighted Round Robin (WRR), ingress policing, and egress traffic shaping are included for traffic management.

Serial Data Interface

The 2-port serial interface is available for applications including terminal server with protocol gateway and serial tunnelling functionality, and provides direct connectivity to legacy RS-232 or 4-wire RS-485 serial data IEDs, RTUs, PLCs, and other devices.

PRODUCT OPTIONS

Cellular Radio Option

An internal 2G/3G/4G LTE GPRS/UMTS cellular radio modem, with 2 SIM card slots for maximum network reliability and availability. All world-wide cellular radio frequency bands are supported.

100/1000 Mbps SFP Uplink Option

Provides one high-speed 100/1000 Mbps SFP uplink port for direct connection to fiber, via ComNet-furnished SFPs

RL1000GW

Small Form Factor Substation-Rated Secure Ethernet Layer 3 Router/Gateway with Optional 2G/3G/4G LTE Cellular Radio Link, and 100/1000 Mbps SFP Uplink Port

APPLICATIONS

› NERC-CIP-5 compliance for electrical substation automation & SCADA networks; protective relaying systems; power transmission & distribution systems; remote/unattended wind farm, hydroelectric, and solar/photovoltaic power generation facilities; and other electrical utility-specific applications

› NERC-CIP-014 compliance for perimeter security, surveillance monitoring, and controlled access to electrical substations and power generating facilities, and other critical infrastructure/high value, mission-critical sites and assets

› Distribution Automation: Status indication, monitoring, and control of reclosers and other remotely-located electrical utility-specific equipment, via the internal cellular radio link

› Industrial/Factory Automation & Process Control SCADA Networks

› Chemical and petrochemical refining and processing facilities, oil and gas pipelines/transmission systems, and mining installations

› Food processing/pharmaceutical manufacturing facilities› Wastewater treatment plants, and suppliers of potable drinking water

› ITS/transportation closed-loop signalization and VMS/VDS/surveillance/incident detection systems

› Railway/trackside control and monitoring systems

› City Center security and surveillance monitoring

› Military, defense, and government communications networks

› Integrated IP-Video, VOIP, and data transmission networks

› Cellular and wireless backhaul networks

OUTLINE DRAWING
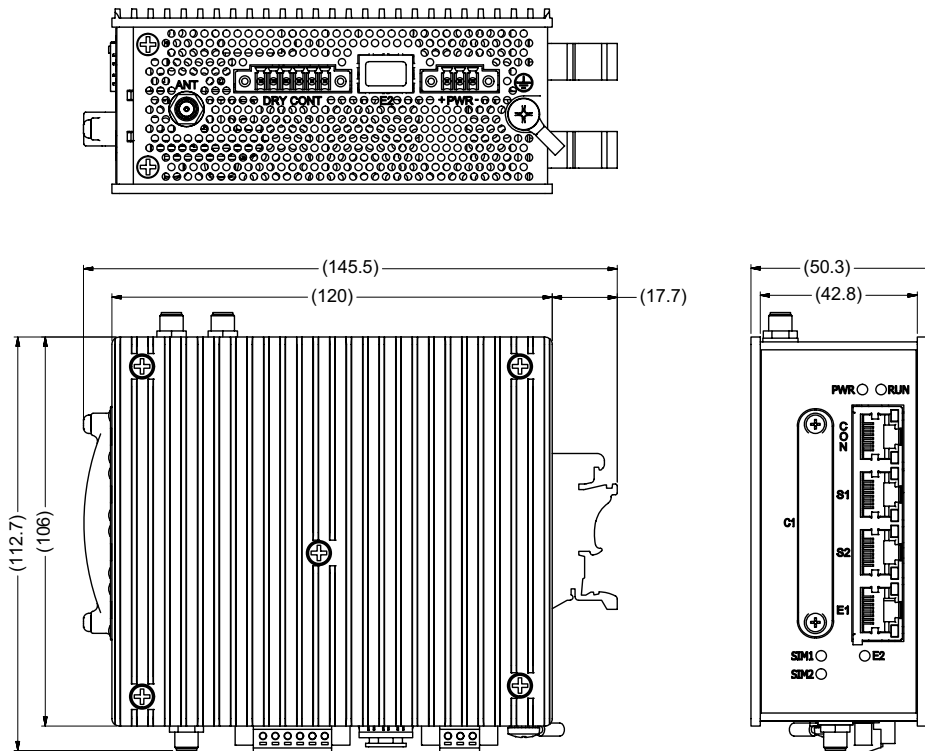
Complete Dimensional Drawings for this product series are available at www.comnet.net

SPECIFICATIONS

Connectors

1 or 2 × RS-232 RJ-45 serial port, with control lines
1 RS-485 RJ-45 serial port
1 × 10/100TX RJ-45 Ethernet port
1 × 100/1000 SFP[1] Ethernet port
Cellular modem with 2 SIM cards for GPRS/UMTS or HSPA/EVDO/LTE networks.
Discrete lines: 2 In, 2 Out
Console RS-232 RJ-45 serial port

Security

Distributed DPI Firewall	Profile based firewall
	Security rules planning per service group
	Firewall monitoring Mode
	Firewall enforcement Mode
	Firewall Learning Mode
	IEC 104 DPI Firewall
	IEC 61850 DPI Firewall
	Modbus TCP DPI Firewall
	DNP3 TCP DPI Firewall
VPN	IPsec Certificates X.509
	IPsec CRL server
	IPsec CA server
	IPsec Dynamic Key Exchange
	IPSec encryption AES
	IPSec encryption 3DES
	L3 IPSec VPN
	L3 mGRE DM-VPN
Access control	Access Lists L3
	Access Lists L4
	VRF
	NAT
	User activity report
	local APA (Authentication Proxy Access)
	User activity report (under local APA)
	OS image encryption

Protection

Conditioned / scheduled system reboot
Protection between Cellular ISP (SIM cards backup)

AGENCY COMPLIANCE

FC PART 15 COMPLIANT   CE   RoHS

Low Power Consumption

Networking

SCADA gateway for IEC101/104, ModBus RTU/TCP and DNP3 RTU/TCP
Terminal Server frame and byte modes
Serial transparent tunneling byte mode
QOS

Routing	Static Routing
	OSPF v2
	IPv4
Switching	Auto Crossing
	Auto Negotiation IEEE 802.3ab
	VLAN Tagging
Time	Local Time settings
Diagnostic	Counters & statistics per Port
	LED diagnostics
	Ping
	RMON
	DDM

Management

Console serial port
Backup / Restore running config
Conditioned/ scheduled system reboot
Remote management and upgrade
TFTP/ SFTP Client
Safe Mode
Syslog

Mechanical

Indicator LEDs	PWR Port Activity/Speed RUN SIM × 2 E2
Enclosure	Rugged - IP 30 rated, No fans
Weight	1.4 kg
Size (H × W × D)	106 × 50 × 120 mm
Mounting	DIN rail enclosure

Environmental

MTBF	> 250,000 hours
Storage Temperature	-40º to +85ºC
Operating Temperature	-40º to + 85ºC[2]
Operating Humidity	0 to 95%

Power

Power input	12/24V Version: 9 - 36 VDC
	24/48V Version: 18 - 60 VDC
Consumption	12 W Max

Compliance

IEC 61850-3 - Electric Utility Substations
IEEE 1613, Class 2 - Electric Utility Substations
NEMA TS-1/TS-2 - Traffic Signal Control Equipment

[1] SFP Fiber modules require a fiber installation with a minimum 30 dB connector return loss. Multimode fiber needs to meet or exceed fiber standard ITU-T G.651. Single mode fiber needs to meet or exceed fiber standard ITU-T G.652The use of Super Polish Connectors is recommended.

Complies with FDA Performance Standard for Laser Products, Title 21, Code of Federal Regulations, Subchapter J.

Note: In a continuing effort to improve and advance technology, product specifications are subject to change without notice.
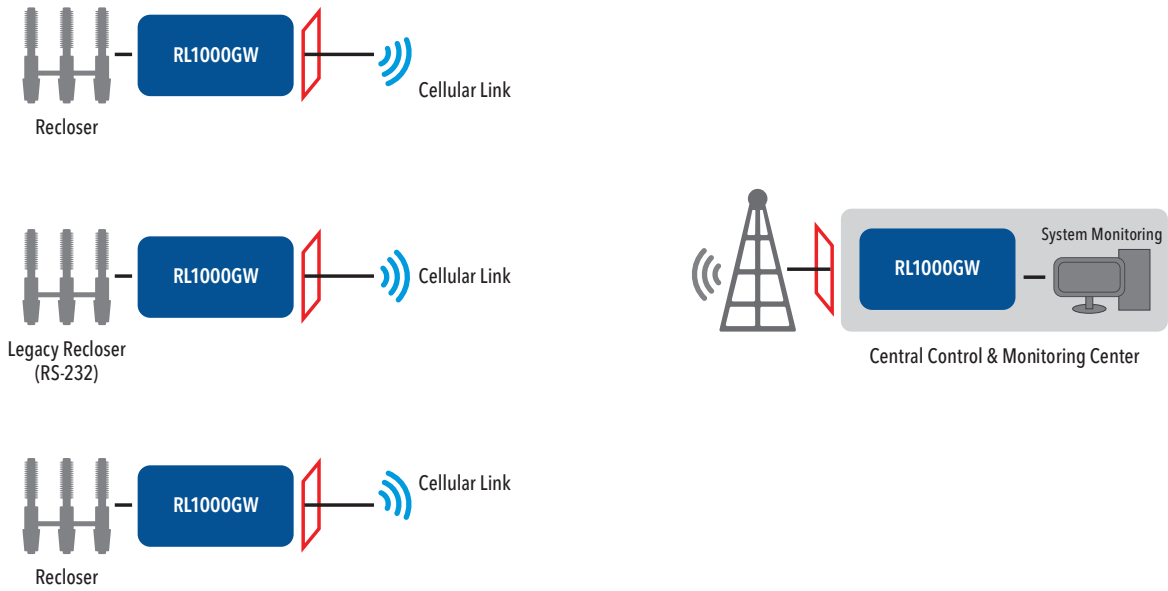
ORDERING INFORMATION

Part Number	Description
RL1000GW/12/E/S22	RL1000GW with 2 x RS-232 and 1 x 10/100 Tx, 12/24V DC
RL1000GW/12/E/S24	RL1000GW with 1 x RS-232, 1 x RS-485 and 1 x 10/100 Tx, 12/24 VDC
RL1000GW/12/ESFP/S22	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 1 x 100/1000 Fx SFP, 12/24 VDC
RL1000GW/12/ESFP/S24	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 1 x 100/1000 Fx SFP, 12/24 VDC
RL1000GW/12/E/S22/CH+	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 2G/3G/HSPA+ Cellular Modem, 12/24 VDC
RL1000GW/12/E/S24/CH+	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 2G/3G/HSPA+ Cellular Modem, 12/24 VDC
RL1000GW/12/ESFP/S22/CH+	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 2G/3G/HSPA+ Cellular Modem, 12/24 VDC
RL1000GW/12/ESFP/S24/CH+	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 2G/3G/HSPA+ Cellular Modem, 12/24 VDC
RL1000GW/12/E/S22/CNA	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 4G LTE Cellular Modem (NA Bands), 12/24 VDC
RL1000GW/12/E/S24/CNA	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 4G LTE Cellular Modem (NA Bands), 12/24 VDC
RL1000GW/12/ESFP/S22/CNA	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (NA Bands), 12/24 VDC
RL1000GW/12/ESFP/S24/CNA	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (NA Bands), 12/24 VDC
RL1000GW/12/E/S22/CEU	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 4G LTE Cellular Modem (EU Bands), 12/24 VDC
RL1000GW/12/E/S24/CEU	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 4G LTE Cellular Modem (EU Bands), 12/24 VDC
RL1000GW/12/ESFP/S22/CEU	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (EU Bands), 12/24 VDC
RL1000GW/12/ESFP/S24/CEU	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (EU Bands), 12/24 VDC
RL1000GW/48/E/S22	RL1000GW with 2 x RS-232 and 1 x 10/100 Tx, 24/48V DC
RL1000GW/48/E/S24	RL1000GW with 1 x RS-232, 1 x RS-485 and 1 x 10/100 Tx, 24/48 VDC
RL1000GW/48/ESFP/S22	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 1 x 100/1000 Fx SFP, 24/48 VDC
RL1000GW/48/ESFP/S24	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 1 x 100/1000 Fx SFP, 24/48 VDC
RL1000GW/48/E/S22/CH+	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 2G/3G/HSPA+ Cellular Modem, 24/48 VDC
RL1000GW/48/E/S24/CH+	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 2G/3G/HSPA+ Cellular Modem, 24/48 VDC
RL1000GW/48/ESFP/S22/CH+	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 2G/3G/HSPA+ Cellular Modem, 24/48 VDC
RL1000GW/48/ESFP/S24/CH+	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 2G/3G/HSPA+ Cellular Modem, 24/48 VDC
RL1000GW/48/E/S22/CNA	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 4G LTE Cellular Modem (NA Bands), 24/48 VDC
RL1000GW/48/E/S24/CNA	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 4G LTE Cellular Modem (NA Bands), 24/48 VDC
RL1000GW/48/ESFP/S22/CNA	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (NA Bands), 24/48 VDC
RL1000GW/48/ESFP/S24/CNA	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (NA Bands), 24/48 VDC
RL1000GW/48/E/S22/CEU	RL1000GW with 2 x RS-232, 1 x 10/100 Tx and 4G LTE Cellular Modem (EU Bands), 24/48 VDC
RL1000GW/48/E/S24/CEU	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx and 4G LTE Cellular Modem (EU Bands), 24/48 VDC
RL1000GW/48/ESFP/S22/CEU	RL1000GW with 2 x RS-232, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (EU Bands), 24/48 VDC
RL1000GW/48/ESFP/S24/CEU	RL1000GW with 1 x RS-232, 1 x RS-485, 1 x 10/100 Tx, 1 x 100/1000 Fx SFP and 4G LTE Cellular Modem (EU Bands), 24/48 VDC

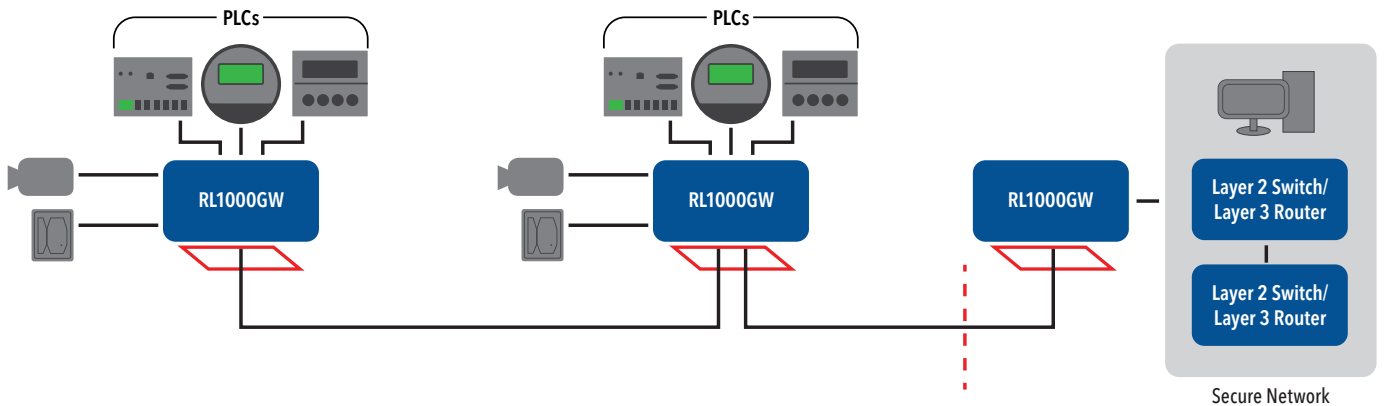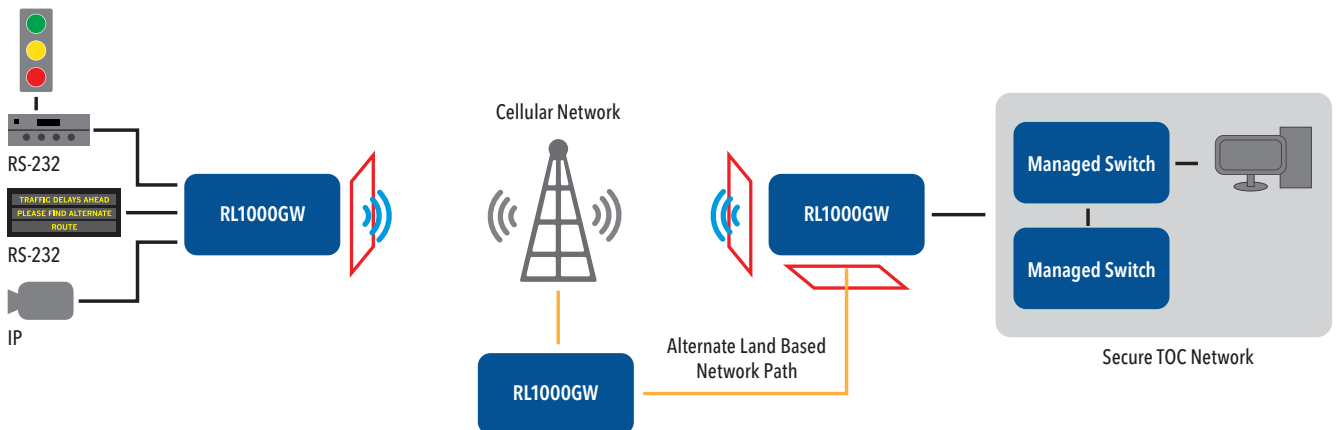| Optional Part No	Description	Included
ANT3G-2M	2G/3G External Grade Cellular Antenna with 2M cable (1 required per switch)	Extra Charge, Consult Factory
ANT3G-5M	2G/3G External Grade Cellular Antenna with 5M cable (1 required per switch)	Extra Charge, Consult Factory
ANT4G-2M	4G LTE External Grade Cellular Antenna with 2M cable (1 required per switch)	Extra Charge, Consult Factory
ANT4G-5M	4G LTE External Grade Cellular Antenna with 5M cable (1 required per switch)	Extra Charge, Consult Factory
Power Supply	12 V, 24 V or 48 V DC DIN Rail power supply	Extra Charge, Consult Factory
Conformal Coat	Add suffix '/C' for Conformally Coated Circuit Boards to extend to condensation conditions	Extra Charge, Consult Factory
SFP Modules[1]	User selection of ComNet SFP (See SFP Modules data sheet for product numbers and compatibility)	Extra Charge, Consult Factory
DINBKT3	19-inch rack mount panel adapter	Extra Charge, Consult Factory

RL1000GW

TYPICAL APPLICATIONS

Secure Cellular Radio Connection of Reclosers, for Distribution Automation

Recloser — RL1000GW — Cellular Link

Legacy Recloser (RS-232) — RL1000GW — Cellular Link

Recloser — RL1000GW — Cellular Link

RL1000GW — System Monitoring

Central Control & Monitoring Center

Securing Distributed Networks: Process Control

PLCs — RL1000GW

PLCs — RL1000GW

RL1000GW

Layer 2 Switch/ Layer 3 Router

Layer 2 Switch/ Layer 3 Router

Secure Network

ITS/Traffic Signalization System Over Cellular Radio

RS-232

TRAFFIC DELAYS AHEAD PLEASE FIND ALTERNATE ROUTE

RS-232

IP

RL1000GW

Cellular Network

RL1000GW

Managed Switch

Managed Switch

Secure TOC Network

RL1000GW

Alternate Land Based Network Path

22 Aug 2016

RL1000GW

Small Form Factor Substation-Rated Secure Ethernet Layer 3 Router/Gateway with Optional 2G/3G/4G LTE Cellular Radio Link, and 100/1000 Mbps SFP Uplink Port

TYPICAL APPLICATIONS (CONT'D)

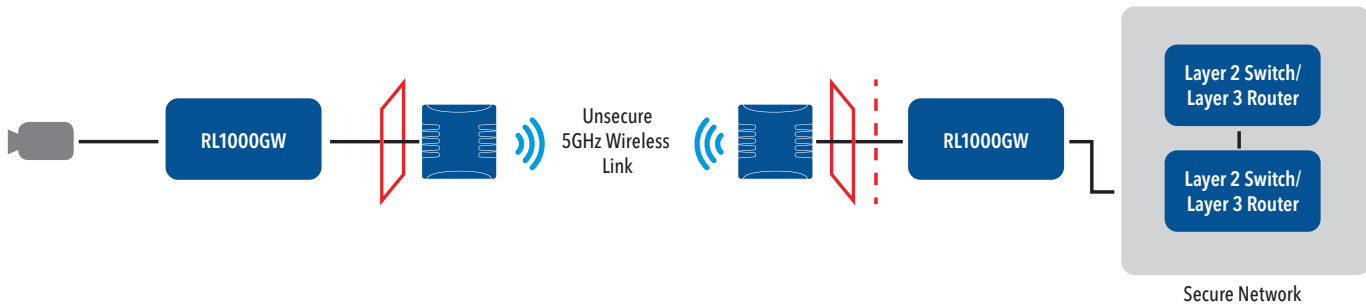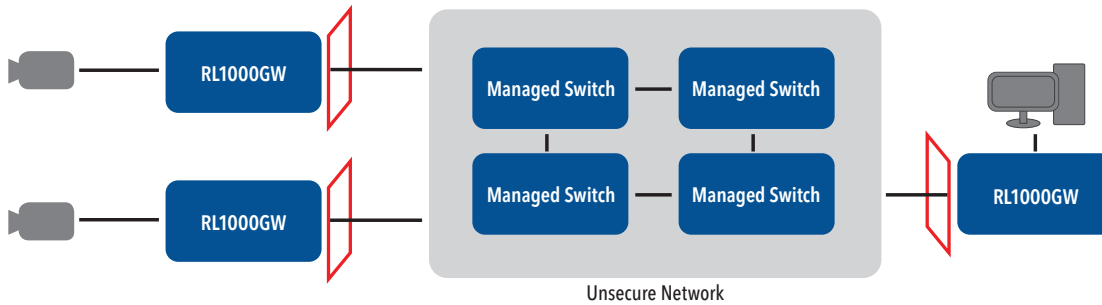### Securing Remote Access
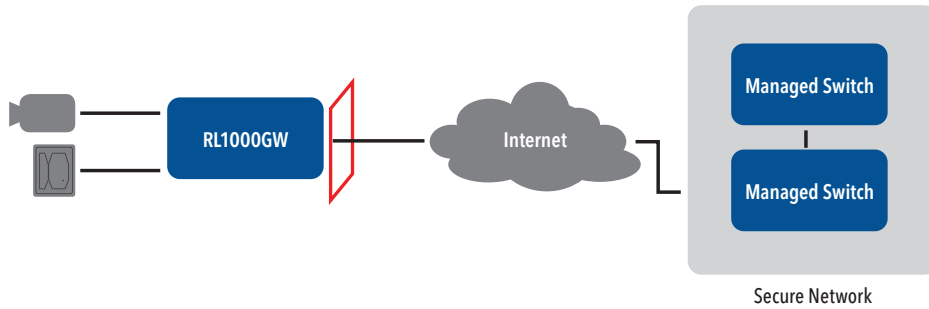
Securing A Wireless Radio Link

Securing Devices on an Unsecure Network

Securing Exterior Sites

22 Aug 2016