



MDS Orbit Cellular Solutions

Highly Reliable Cellular Solutions for Critical Applications



MDS™ Orbit is a next-generation industrially hardened wireless communications networking platform designed with a common operating system, device management tools, and a comprehensive networking and cyber-security framework. These commonalities in the platform significantly reduce the overall learning time for users, simplifying the set-up and commissioning of networks, and enables the deployment of a variety of network designs and topologies.

The MDS Orbit platform is available in two models, the Multiservice-Connect Router (MCR) which supports dual Wide Area Network (WAN) radio options and the Edge-Connect Router (ECR) which supports a single WAN radio option. The Orbit platform supports multiple wireless technologies including 4G cellular, unlicensed 900 MHz, and licensed 100, 200, 400, 700, and 900 MHz.

In addition to the core feature suite derived from the MDS Orbit platform, the cellular options enable operators to extend secure and reliable 4G LTE cellular connectivity to critical applications while minimizing network downtime and improving application availability. The Platform supports a rich set of cellular modem options and cover a wide variety of bands in order to maximize the flexibility of deployment across carriers and countries.

The MDS Orbit platform features rich networking capabilities with integrated routing and switching, tunneling, VPNs as well as advanced Quality of Service. It further supports a rigid enterprise-class security framework to enable the secure transport of data and advanced protection of network and assets.

Key Benefits

- Minimize network downtime and maximize critical applications availability utilizing dual private and cellular radio options on the MDS Orbit MCR
- Extend cellular coverage into rural areas using a cellular uplink and a private point to multipoint radio downlink on the MDS Orbit MCR
- Protect network assets and access with enterprise-class security such as firewalling, IPSec VPNs, X.509 certificate management, and RADIUS
- Overcome harsh environments with IEEE® 1613 and IEC® 61850-3 and Class 1 Div 2 standard certifications

Applications



Oil & Gas

- Well head automation
- WiFi connectivity
- Remote field office connectivity



Electric Utilities

- Distribution automation
- Maintenance workforce mobility
- RTU serial/IP SCADA and IEC 618500



Water & Wastewater

- Pressure monitoring
- Pipeline monitoring and control
- Maintenance workforce mobility



Smart Cities & Municipalities

- Traffic signals control
- Video security
- Weather monitoring stations

Industry Leading Reliability

- 30 years of extensive experience with more than 1.5 millions radios deployed
- Combined cellular and private radio options for redundant wireless uplinks resulting in higher network availability
- Built for harsh environments with compliance to IEEE 1613, IEC 61850-3 and Class 1 Div 2
- Industry leading Mean Time Between Failures (MTBF) of 68 years
- 5-year manufacturer warranty lowers total cost of ownership

Advanced Networking & Security

- Flexible Quality of Service enables simultaneous applications on the same uplink while preserving performance
- Concurrent routing and bridging enables flexibility for a variety of network designs and topologies
- Enterprise-class device with network cyber security functionality and VPNs ensures advanced protection for network assets
- FIPS 140-2 (Level 2) certified*

Ease of Use & Compact Design

- Intuitive user interface and configuration wizards simplify complex network configuration tasks resulting in accelerated deployment of advanced networking
- One of the industry's most compact radios with full router functionality

Diverse Cellular Options

Support for 4G cellular technology with fallback options on both GSM and CDMA networks allow the flexibility of global deployment across carriers and regions. GPS support on select 4G LTE models enable position reporting for asset tracking as well as GIS integration.

Flexible Networking

Concurrent routing and bridging allow for the flexibility of deployment in a variety of network designs and topologies. Layer 2 (Ethernet) and Layer 3 tunneling further enable the establishment of VPNs across any type of networks, including the tunneling of Layer 2 automation protocols such as IEC 61850 GOOSE over cellular networks.

Hybrid Radios

The MDS Orbit MCR's support for redundant private and cellular radio uplinks maximizes network availability for critical applications. It further allows the extension of cellular connectivity using licensed or unlicensed private networks to expand cellular network coverage deep into rural and deserted areas. Private radio options include unlicensed 900 MHz Frequency Hopping Spread Spectrum with throughput of up to 1.25Mbps, in addition to licensed narrowband with QPSK, 16-QAM, and 64-QAM modulations with throughput up to 120 Kbps.

Enterprise-Class Security

The MDS Orbit platform's hardware and software is built on an extensive enterprise-class cyber security framework. Advanced features such as firewalling, VPNs, X.509 certificates, RADIUS authentication as well as secure boot and firmware provide advanced security for device, network and users.

Advanced Quality of Service

Advanced Quality of Service (QoS) allows the simultaneous handling of various applications while ensuring the preservation of each application's priority and performance requirements. Layer 2, 3 and 4 classification enables the detailed identification of application types for maximum flexibility in addition to standard 802.1p and DSCP based classifications.

Intuitive User Interface

An easy-to-use Graphical User Interface (GUI) allows for the quick provisioning and maintenance from a web browser. MDS Orbit's wizards accelerate the configuration of complex network functionality by breaking down processes into simple, concise and automated steps.



MDS Orbit MCR
with Cellular and 900 MHz



MDS Orbit ECR
with 4G LTE Cellular and WiFi



MDS Orbit ECR
with 4G LTE Cellular

A Multiservice Router for Electric Utilities Field Area Networks

The MDS Orbit MCR and ECR routers offer a number of key features and benefits when applied as a multiservice router gateway for distribution automation field area networks. The substation hardened design complies with IEC 61850-3, IEEE 1613 standards and NFPA 70 Class 1 Div 2 thus permitting a reliable deployment in harsh substation environments.

4G LTE North America and APAC/EMEA cellular models support a GPS/Glonass functionality to feed location information into fleet management and GIS applications. Advanced QoS allows multiple traffic streams to co-exist efficiently on the same uplink such that each application's priority and performance criteria are preserved while ensuring critical applications are handled first. Support for concurrent private radios and cellular uplinks

dramatically improves network availability and offer a viable replacement for legacy Telco 4-wire circuits.

Flexible Layer 2 and Layer 3 GRE combined with routing and IPSec VPNs enable the transport of various applications, including IEC 61850 GOOSE protocol seamlessly over private and/or cellular networks. Enterprise-class security including APNs, IPSec VPNs, RADIUS authentication, stateful firewalling and MAC filtering enable grid operators to securely transport critical data over cellular carriers and protect network assets. MDS Orbit's security framework allows integration into applications demanding NERC® CIP compliance.

Wireless Substations

Migrate legacy substations to a reliable wireless MCR solution with a primary private network and backup cellular.



Distribution Automation

Automate reclosers, voltage regulators, distributed generation and other distribution assets with a secure ECR cellular solution.



Mobile Communications

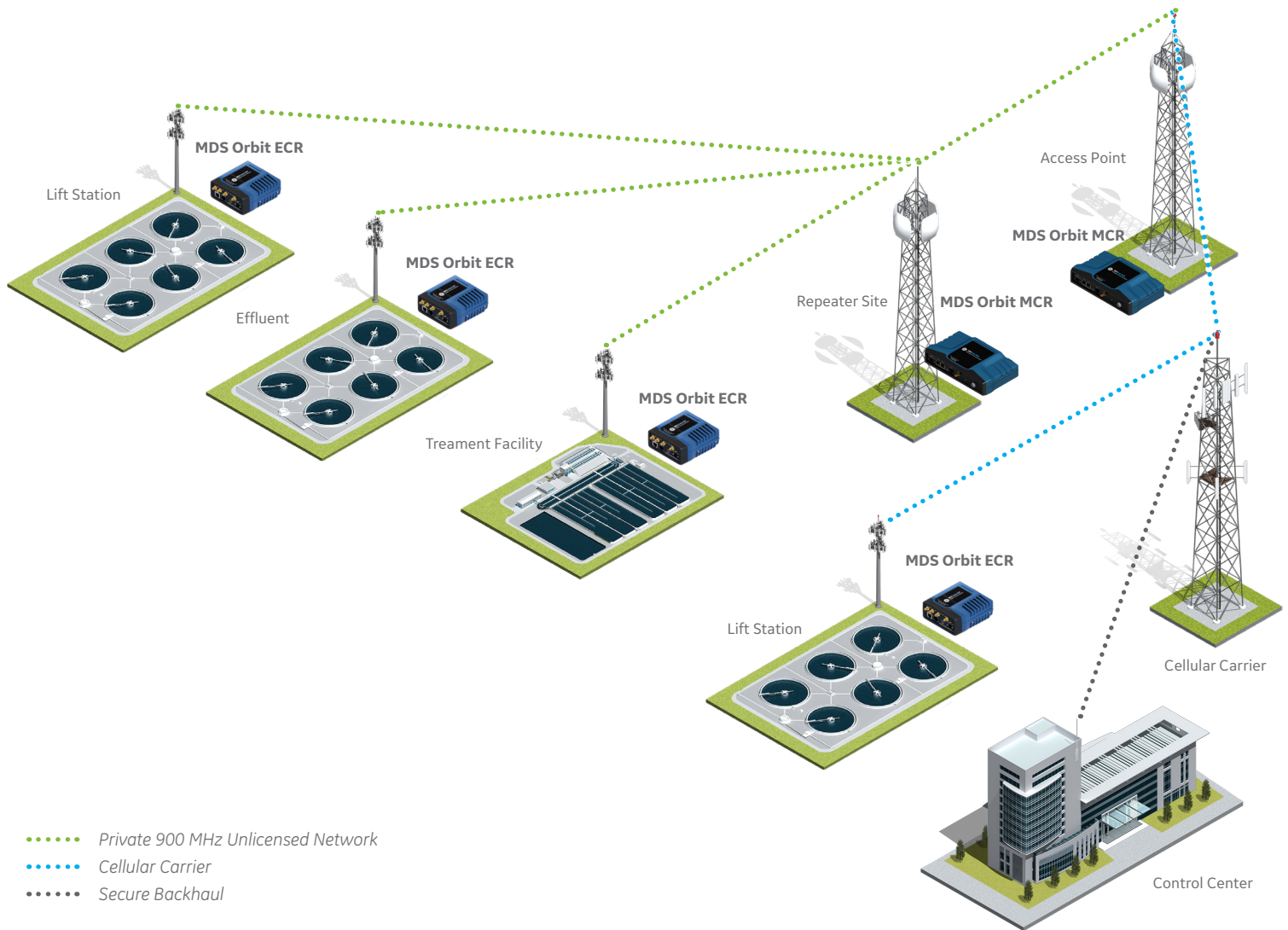
Provide mobile communications to fleets via cellular communications. Enable remote management, VoIP and GPS.



Flexible SCADA and Video Communication Solutions for Water & Wastewater

The MDS Orbit MCR and ECR routers offer a number of key benefits for water and wastewater applications. Coupled with low-cost cellular plans, the MDS Orbit offers a rich, long-lasting and cost-effective M2M solution. When applicable, cellular and private networks can be deployed simultaneously on

the MCR form factor to interconnect various sites for SCADA, video security, and other applications. In addition, advanced Quality of Service capabilities ensure that various applications can co-exist effectively on the same uplink.



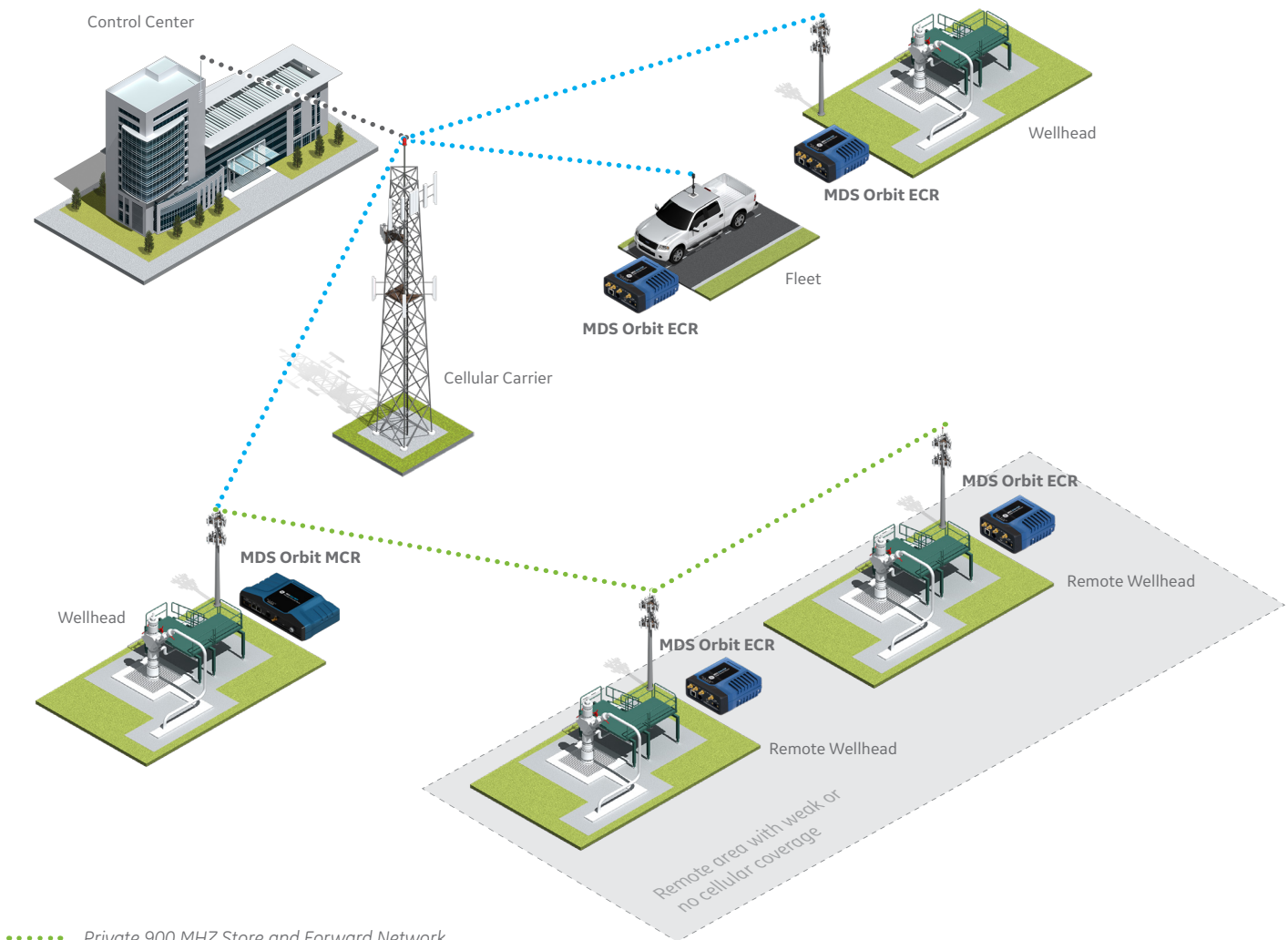
Hybrid Cellular and Private Communications Enable the Digital Oil & Gas Field

The MDS Orbit MCR and ECR routers also provide a number of key benefits for Oil & Gas applications including a dual or single uplink connectivity over cellular and/or private networks. Connectivity extends into remote areas with weak or no cellular coverage using MDS Orbit 900 MHz unlicensed FHSS technology which provides a self-healing network with 1.25Mbps of throughput and a network depth of 8 hops via Store-and-Forward technology.

MDS Orbit's rich networking and advanced Quality of Service capabilities allow for a variety of applications such as SCADA, Voice over IP, video and WiFi access to co-exist on the same uplinks even when bandwidth is limited.

Advanced Quality of Service ensures that data traffic entering the network is re-organized and prioritized in such a way that critical applications are handled first in order to minimize performance impact due to any unforeseeable network congestion.



The single-radio MDS Orbit ECR cellular router can be deployed in mobile or nomadic applications requiring ubiquitous network connectivity. The integrated active GPS allows for transmission of coordinates to feed into fleet management applications for asset tracking.



- Private 900 MHz Store and Forward Network
- Cellular Carrier
- Secure Backhaul

Typical oil & gas application example

MDS Orbit MCR and ECR Model Comparison

FORM FACTOR	NETWORKING & SECURITY CAPABILITIES	PRIMARY RADIO (FACTORY CONFIGURED)	OPTIONAL SECONDARY RADIO (FACTORY CONFIGURED)	PORT OPTIONS
MCR (Multiservice-Connect Router) 	Identical, based on MDS Orbit	<ul style="list-style-type: none"> 4G LTE North America + GPS 4G LTE EMEA/APAC + GPS 	<ul style="list-style-type: none"> 900 MHz ISM Licensed narrowband (consult Sales for supported options) 2.4GHz Wi-Fi 2.4/5GHz 2x2 MIMO Wi-Fi 	<ul style="list-style-type: none"> Option A: 2 Ethernet, 1 Serial, 1 USB Option B: 1 Ethernet, 2 Serial, 1 USB Option C: 4 Ethernet, 2 Serial, 1 USB*
ECR (Edge-Connect Router) 	Identical, based on MDS Orbit	<ul style="list-style-type: none"> 4G LTE North America + GPS 4G LTE EMEA/APAC + GPS 	<ul style="list-style-type: none"> 2.4GHz Wi-Fi 	<ul style="list-style-type: none"> 1 Ethernet, 1 Serial, 1 USB

* High port density Port Option C only supports 2.4GHz Wi-Fi as an optional secondary radio

Supported Cellular Radios on Orbit

CELLULAR MODEM TYPE	ECR	MCR	PROTOCOL/FREQUENCIES	FALLBACK SUPPORT	APPROVALS/CERTIFICATIONS	MAX RATE DOWN/UP MBPS	# SIM SLOTS	GPS
4G LTE North America	Yes	Yes	<ul style="list-style-type: none"> FDD LTE (Cat 3) Bands 2,4,5,13,17,25 DC-HSPA+ (42/5.76 Mbps) 1,2,4,5,8 EVDO Rev A/ CDMA 1x BC0, BC1, BC10 Quad-band EDGE/GPRS/GSM 	2G/3G GSM and CDMA	AT&T, Bell, Telus, Rogers, Verizon, US Cellular, FCC, PTCRB	100/50	1	Yes
4G LTE EMEA/APAC	Yes	Yes	<ul style="list-style-type: none"> FDD LTE (Cat 3) 1,3,7,8,20 DC-HSPA+ (42/5.76 Mbps) 1,2,5,8 Quad-band EDGE/GPRS/GSM 	2G/3G GSM	Europe, Australia*, CE, GCF	100/50	1	Yes

* Australia ACMA compliance for MDS Orbit MCR only

Technical Specifications

Networking

- Routing: Static Routing with Failover, Dynamic routing: OSPFv2, RIPv2, BGPv4
- Ethernet IEEE 802.3, 802.1Q/VLANs, IGMP, STP, 64 VLANs
- Concurrent Bridging & Routing Yes
- Tunneling Layer 2 (Ethernet) and Layer 3 (IP) – GRE, IPsec, Dynamic Multipoint VPN (DMVPN)
- High Availability Failover between any two wireless/Ethernet interfaces, performance based failover (latency and packet loss)
- Quality of Service 16 egress queues, Priority Queuing, Fair Queuing, Traffic Shaping, Classification based on DSCP, 802.1p and Layer 2-4 classifiers
- IP Protocols TCP, UDP, ARP, DHCP, ICMP, NTP, FTP, SFTP, TFTP, DNS, configurable HTTP and HTTPS, SSH
- Serial TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP Unicast and Multicast, BSAP, and DNP3

Cyber Security

- IPsec VPN Server (responder) and Client (initiator)
- Authentication Public Key, EAP TLS, Pre-Shared, IKE 1-2
- Encryption 3DES, AES 128/192/256, CBC, CTR, CCM, GCM, SHA 256/384/512 HMAC
- Firewall Stateful L3-4 Access Control List, Layer 2 MAC Filtering, NAT, Source NAT (Masquerading), Static NAT, Port Forwarding
- Device Security Secure Boot, Secure Firmware, Digitally Signed Hardware and Software, Magnetometer Tamper Detection
- Certificate Management X.509, SCEP, PEM, DER, RSA
- User Authentication Local RBAC, AAA/RADIUS
- FIPS 140-2 (Level 2) certified*

WiFi

IEEE 802.11 b/g/n 2.4 GHz option:

- 1x1 SISO (single antenna/radio chain)
- Scalability up to 2 SSIDs, up to 7 clients/stations
- Max transmit power (adjustable): up to 20dBm
- Operating modes: Access Point (AP), Station, Station bridging
- Security: WPA/WPA2 PSK, Enterprise
- Applications:
 - Local configuration and management using Wi-Fi devices
 - Station/client connecting to a 2.4GHz AP in outdoor LOS environment
 - Small-scale 2.4GHz AP operating in outdoor LOS environment

IEEE 802.11 a/b/g/n Dual-Band 2.4/5 GHz option:

- 2x2 MIMO (dual antenna/radio chain)
- Scalability up to 2 SSIDs, up to 32+ clients/stations
- Max transmit power (adjustable): up to 26dBm (23dBm per antenna/chain) for 2.4GHz and 23dBm (20dBm per antenna/chain) for 5GHz

- 5GHz (U-NII-1 and U-NII-3 bands supported)
- Operating modes: Access Point, Station, Station bridging, Access-Point-Station (simultaneous AP and Station operation)
- Security: WPA/WPA2 PSK, Enterprise
- Applications:
 - Local configuration and management using Wi-Fi devices
 - Station/client connecting to a 2.4GHz/5GHz AP in indoor/outdoor LOS/NLOS environment
 - Large-scale AP operating in indoor/outdoor LOS/NLOS environment

Network Management

- Secure device management via HTTP/HTTPS (GUI) and Juniper-style CLI via SSH or local console
- Event logging, Syslog over TLS
- Iperf throughput diagnostic
- NETCONF
- SNMPv1/v2c/v3, MIB-II, Enterprise MIB
- GE MDS PulseNET NMS Support

Electrical and Power Consumption

- Input Voltage 10 to 60 VDC
- Orbit ECR and MCR Power Consumption Calculations (with nominal 25C)

WITH 4G LTE	POWER	13.8V
• Connected (Idle)	4.0W	292mA
• Typical download	4.3W	310mA
WITH 4G LTE + WI-FI	POWER	13.8V
• Connected (Idle)	4.8W	350mA
• Typical download	5.5W	400mA

Physical Interfaces

- 10/100 Ethernet RJ45
- RS-232/RS-485 Serial RJ45
 - ECR: 1 Ethernet + 1 Serial
 - MCR: 2 Ethernet + 1 Serial; OR 1 Ethernet + 2 Serial; OR 4 Ethernet + 2 Serial
- USB Management: 1 x Mini-USB 2.0 port on MCR and ECR
- Antenna Connectors
- 400 MHz/900 MHz licensed: TNC900
- ISM: TNC | WiFi: RP-SMA
- Cellular: SMA | GPS: SMA fem
- LEDs PWR, ETH, COM, NIC1, NIC2

Agency Approvals / Standards

- FCC Part 15 and IC
- ETSI / CE (WiFi models)

- PTCRB, GCF
- IEEE 1613, IEC61850-3
- CSA Class 1, Div. 2, UL 508, UL 1604
- EN 60079-0:2012, EN60079-15:2010
- Shock: MIL-STD-810F Method 516.5
- Vibration: MIL-STD-810F Method 514.5
- Shock and Vibration: EIA RS374A
- Storage Temp: Mil-Std 810F Section 501.4 with 1 week soak test
- IP 40/41 per IEC 60529 for Vertical Falling Water and Pollution 3 for Dust

Environmental & Mechanical

- Operating Temp -40° to +70°C (-40° 158°F)
- Storage Temp -40° to +85°C (-40° 185°F)
- Humidity 95% at 60°C (140°F) non-condensing
- Case Die Cast Aluminum
- Mounting Options Integrated DIN Rail mount and Standard Mounting bracket
- No Fans, No Moving Parts
- HALT& HASS Testing
- MCR Dimensions:
 - 1.75 H x 8.0 W x 4.8 D inches
 - 4.5 H x 20.3 W x 12.2 D cm
- MCR Weight 2lbs (0.91 Kg)
- ECR Dimensions:
 - 2.1 H x 4.3 W x 4.6 D
 - 5.4 H x 10.9 W x 11.7 D cm)
- ECR Weight 1.45lbs (0.66 Kg)

GPS

- Available with 4G LTE North America & EMEA/APAC cellular models
- GNSS, GPS, Glonass
- Maximum 30 channels (16 GPS, 14 GLONASS), simultaneous tracking
- NMEA 0183 V3.0
- Acquisition Time: Hot start 1s, Warm start 29s, Cold start 32s
- Accuracy: Horizontal < 2 m (50%); < 5 m (90%) Altitude: < 4 m (50%); < 8 m (90%); Velocity: < 0.2 m/s

Warranty

- 5-year standard manufacturer warranty

* Check with local sales representative for availability.

For more information about
GE Industrial Communications products visit
geautomation.com



For more information in North America, call **1-888-437-5739** or email gemds.customersupport@ge.com. For more information Worldwide, call **1-704-561-5751** or email gemds.international@ge.com.

GE Power
Automation & Controls
2500 Austin Dr
Charlottesville, VA 22911
www.geautomation.com

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