

# MDS Orbit Industrial Cellular Routers

## Highly Reliable Cellular Solutions for Critical Applications

GE's MDS™ Orbit MCR (Multiservice-Connect Router) and MDS Orbit ECR (Edge-Connect Router) are ultra reliable rugged wireless routers based on the MDS Orbit platform. They enable operators to extend secure and reliable 2G/3G/4G LTE cellular connectivity to critical applications while minimizing network downtime and improving application availability.

The MDS Orbit MCR and ECR share the same networking and security functionality with the MCR model being a dual WAN radio router and the ECR model a single WAN radio router in a more compact form factor. Both models support 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



#### Water & Wastewater

- Pressure Monitoring
- Pipeline Monitoring and Control
- Maintenance Workforce Mobility



#### Electric Utilities

- Distribution Automation
- Maintenance Workforce Mobility
- RTU Serial/IP SCADA and IEC 61850



#### 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

- Diverse choice of cellular modems provide coverage for majority of bands and regions with GPS support
- 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

### 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



imagination at work

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## Diverse Cellular Options

Support for a variety of cellular technologies such as 2G, 3G and 4G 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 GRE tunneling further enable the establishment of point to point 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 900MHz Frequency Hopping Spread Spectrum with throughput of up to 1.25Mbps, in addition to licensed narrowband in the 400MHz and 900MHz spectrum with QPSK, 16-QAM, and 64-QAM modulations with throughput up to 120Kbps.

## 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 4GLTE 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.



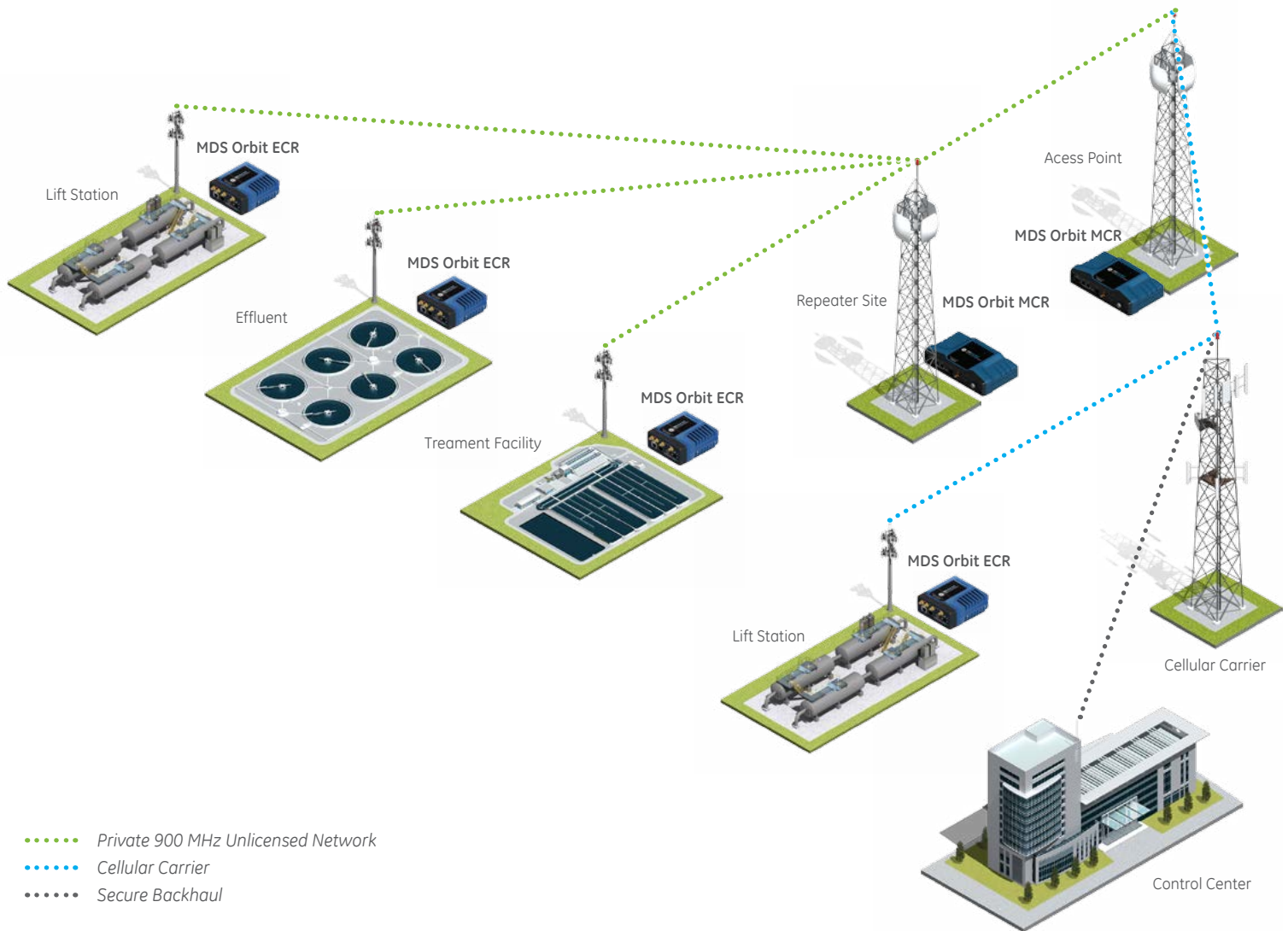
### Mobile Communications

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.



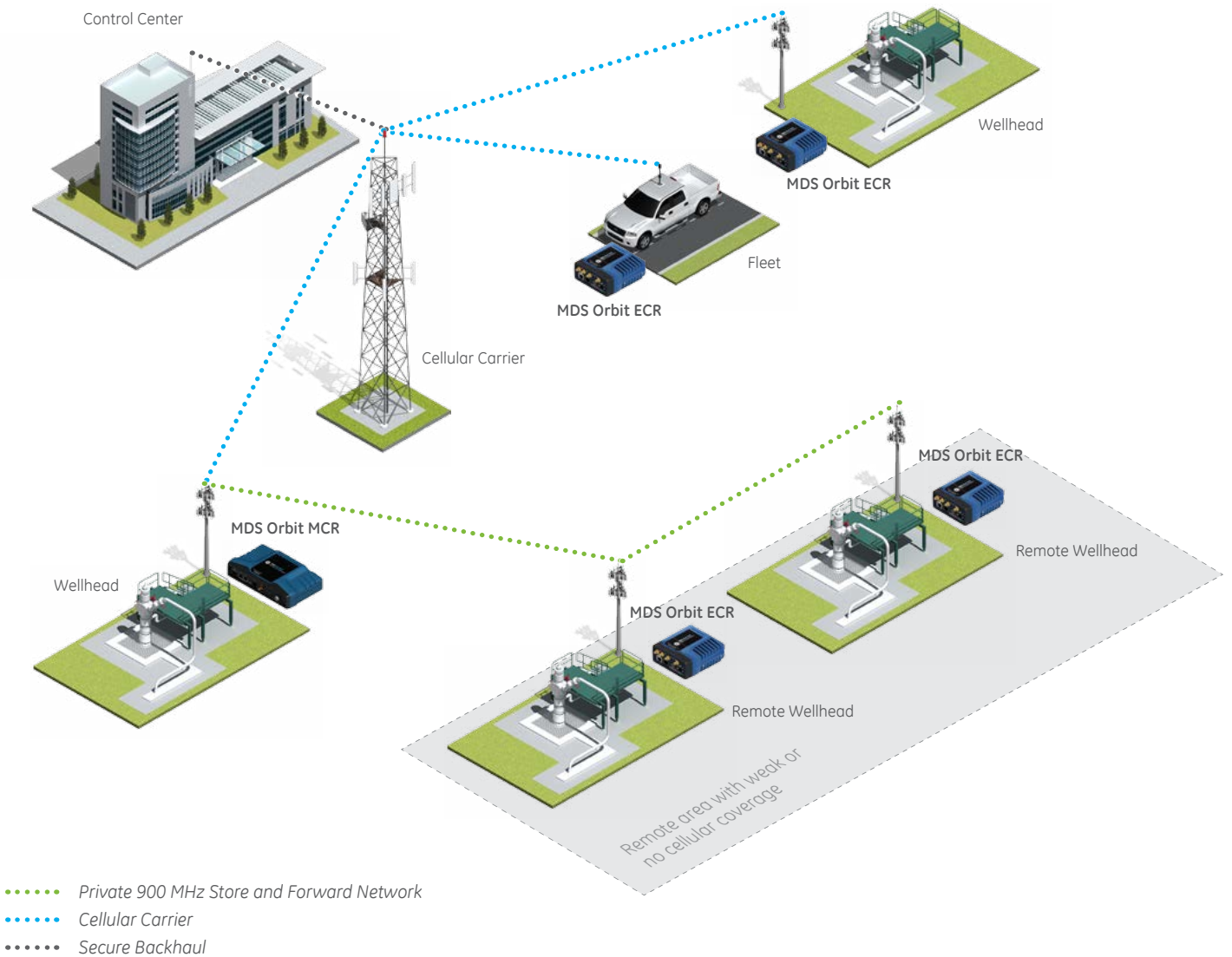
Typical water & wastewater application example

## 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.



Typical oil & gas application example

## MDS Orbit MCR and ECR Model Comparison

MDS Orbit Product	Networking & Security Capabilities	Primary Radio (factory configured)	Optional Secondary Radio (factory configured)	Port Options
 MCR	Identical, based on MDS Orbit	3G GSM World 4G LTE North America + GPS 4G LTE EMEA/APAC + GPS 4G LTE Verizon	900MHz ISM LN4 400Mhz Licensed NB LN9 900Mhz Licensed NB WiFi	Option A: 2 Ethernet, 1 Serial, 1 USB Option B: 1 Ethernet, 2 Serial, 1 USB
 ECR	Identical, based on MDS Orbit	3G GSM World 4G LTE North America + GPS 4G LTE EMEA/APAC + GPS	WiFi	1 Eth, 2 Ser, 1 USB

## Supported Cellular Radios on Orbit

Cellular Modem Type	ECR	MCR	Protocol / Frequencies	Fallback Support	Approvals/Certifications	Max Rate down/up Mbps	# SIM Slots	GPS
3G GSM World	Yes	Yes	GSM/GPRS/EDGE:850/900/1800/1900MHz UMTS/HSPA/HSPA+: 800/850(B6&19)/900 AWS1700/1900/2100 MHz	2G GSM	AT&T, Bell, Telus, Rogers, Global PTCRB, GCF, regional carriers	21/5	1 or 2	No
4G LTE Verizon	No	Yes	LTE Release 8 700MHz Band 13 (MIMO) CDMA Band class 0 (850 MHz) & class1 (1900 MHz)	3G CDMA	U.S Verizon, FCC	50/25	1	No
4G LTE North America	Yes	Yes	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*, Sprint*, FCC, CE, PTCRB, GCF	100/50	1	Yes
4G LTE EMEA /APAC	2015	Yes	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 Telstra, CE, GCF	100/50	1	Yes

\*2015 Roadmap

# Technical Specifications

## NETWORKING

- Routing IPv4 Static Routing with Failover, OSPF, RIPV2
- Ethernet IEEE 802.3, 802.1Q/VLANs, IGMP, STP, 64 VLANs
- Concurrent Bridging & Routing Yes
- Tunneling Layer 2 (Ethernet) and Layer 3 GRE
- 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

## WIFI

- Optional with ECR or MCR
- Frequency 2.4GHz
- Standard IEEE 802.11 b/g/n
- Data Rate up to 54Mbps
- Operating Modes Access Point, Station
- Scalability Up to 2 SSIDs, up to 7 clients
- SSID hiding Yes
- VLAN mapping Yes
- Security WPA/WPA2 PSK, Enterprise
- Carrier Power 20dBm adjustable
- Agency/Regulatory FCC, IC-Industry

## 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 & POWER CONSUMPTION

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

With 3G GSM World	Power	13.8V
Connected (Idle)	2.5W	182mA
Typical download	3.2W	235mA

With 4G LTE	Power	13.8V
Connected (Idle)	4.0W	292mA
Typical download	4.3W	310mA

With 4G LTE + WiFi	Power	13.8V
Connected (Idle)	4.8W	350mA
Typical download	5.5W	400mA

## PHYSICAL INTERFACES

- ECR: 1 x RJ45 10/100 Ethernet, 1 x RJ45 RS-232/RS-485 Serial, 1 x mini USB 2.0
- MCR: 2 x RJ45 10/100 Ethernet and 1 x RJ45 RS-232/RS-485 Serial OR 1 x RJ45 10/100 Ethernet and 2 x RJ45 RS-232/RS-485 Serial.
- USB Management: 1 x Mini-USB 2.0 port on MCR and ECR
- Antenna Connectors  
400MHz/900MHz 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 (3G and WiFi models)
- PTCRB, GCF
- IEEE 1613, IEC61850-3
- CSA Class 1, Div. 2, UL 508, UL 1604
- ATEX approval for EU on MCR\*\*
- 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

\*\*2015 Roadmap for ECR

For more information about  
GE Industrial Communications products visit  
[GEDigitalEnergy.com/Communications](http://GEDigitalEnergy.com/Communications)



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