

# Easy Programmable Edge Computer for IIoT

## WR322GR-EC Series

### Industrial IoT Edge Computer Series



The WR302G-EC/WR312G-EC/WR322GR-EC edge computing platform is designed for embedded data acquisition applications. The computer comes with two software selectable RS-232/422/485 full-signal serial ports and two 10/100/1000 Mbps Ethernet ports, as well as optional one or two Wi-Fi/Cellular modules. These versatile communication capabilities let users efficiently customize for a variety of complex communication applications. The QCA9558 MIPS-based processor that is widely applicable to a variety of industrial solutions. The built in Node-RED flow-based programming in the tiny embedded computer provides reliable and secure gateway for data acquisition and processing at field sites as well as a user friendly communication platform for many other large-scale deployments.



### Features & Benefits

#### Programmable Edge Computer and Gateway

- QCA9558 MIPS-based processor 720MHz processor
- 2 auto-sensing 10/100/1000 Mbps Ethernet ports
- SD socket for storage expansion
- Rich programmable LEDs and a programmable button for easy installation and maintenance
- Node-RED flow-based programming

#### Serial Communication & High Throughput Data Switching

- Dual serial ports with RS232/422/485 full functions for serial over LTE/Wi-Fi/Ethernet data switching
- 2-port Gigabit Ethernet supports routing and bridging mode
- Hardware NAT for CPU utilization saving\*

#### Internet Security Suite and Cryptographic

- Netfilter suite for firewall
- Iptables suite for NAT/NAPT and port forwarding
- OpenVPN, IPsec for secure remote connection
- HTTPs/SSH for secure login
- AES, SHA, OpenSSL, random generator

#### Cloud Management Service

- Support Amazon AWS & Microsoft Azure cloud service\*
- Support proprietary ThingsMaster cloud service\*
- Interactive monitoring dashboard and map shows the status, signal strength, location etc.\*

#### High speed 4G LTE & Wi-Fi Network

- LTE Cat.4, 2x2 MIMO, 150M downlink and 50M uplink
- LTE Cat.6 with 2CA, 2T2R MIMO provides 300M downlink and 50M uplink
- 4G/3G/2G full cellular network compatibility
- Support GPS for location services
- IEEE 802.11ac compliant & backward compatible with 802.11a/b/g/n
- Selectable 5G/2.4G Wi-Fi for local coverage, up to 866Mbps bandwidth

#### Programming Environment

- GCC C/C++ cross development tool chain
- Ash, bash\* System Shell
- vim, nano\* text editor
- Lua, Perl\*, Python\* programming language

#### Rugged Design for Wayside Surveillance, ITS Application

- EN50121-4 railway trackside EMC certificate design for Industrial IoT, ITS applications
- Effective heat dissipation design for operating in -40~75°C environments
- CE Marking
- IEC61000-6-2/IEC61000-6-4 heavy industrial EMC compliance

# Intuitive Node-RED Programming



**Scenario built with building blocks**

Library With Building Blocks

CO2, Humidity, Temperature

Information Panel

## Link Different Protocols and Platforms

**input**

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- tcp
- udp

**modbus**

- Modbus Response
- Modbus Read
- Modbus Getter
- Modbus Flex Getter
- Modbus Write
- Modbus Flex Write
- Modbus Server
- Modbus Flex Server
- Modbus Queue Info
- Modbus Flex Connector
- Modbus Response Filter

**function**

- function
- template
- delay
- trigger
- comment
- http request
- tcp request
- switch

**output**

- debug
- link
- mqtt
- http response
- websocket
- tcp
- udp

**advanced**

- watch
- feedparser
- exec
- analysis
- sentiment

**social**

- email
- twitter
- email
- twitter

**storage**

- tail
- file
- file

Protocols

Platforms



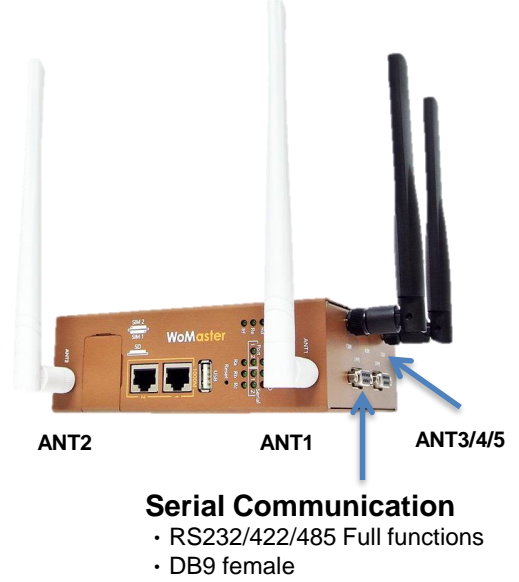
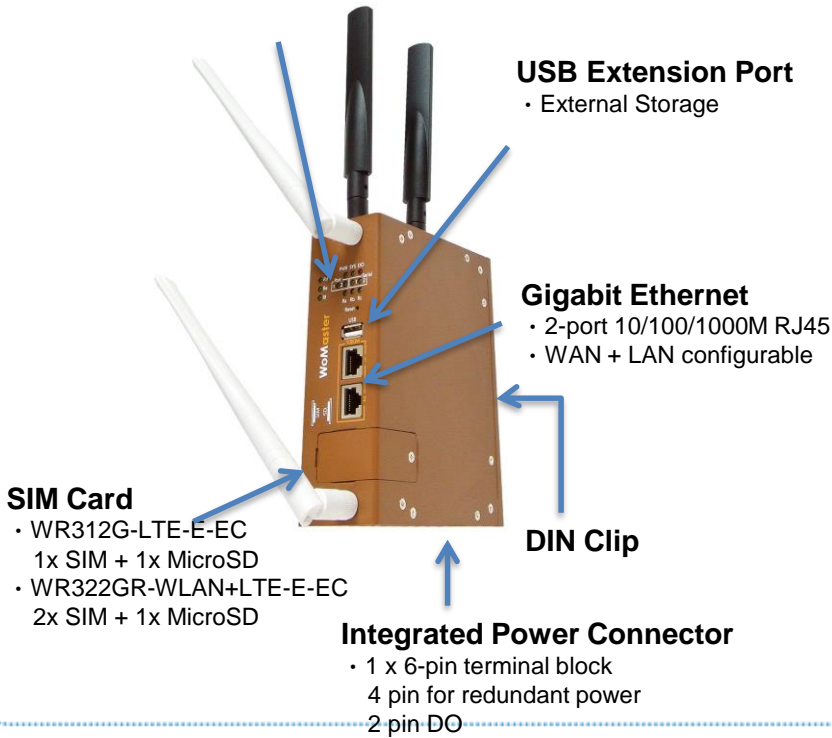
## Interfaces

### System LED

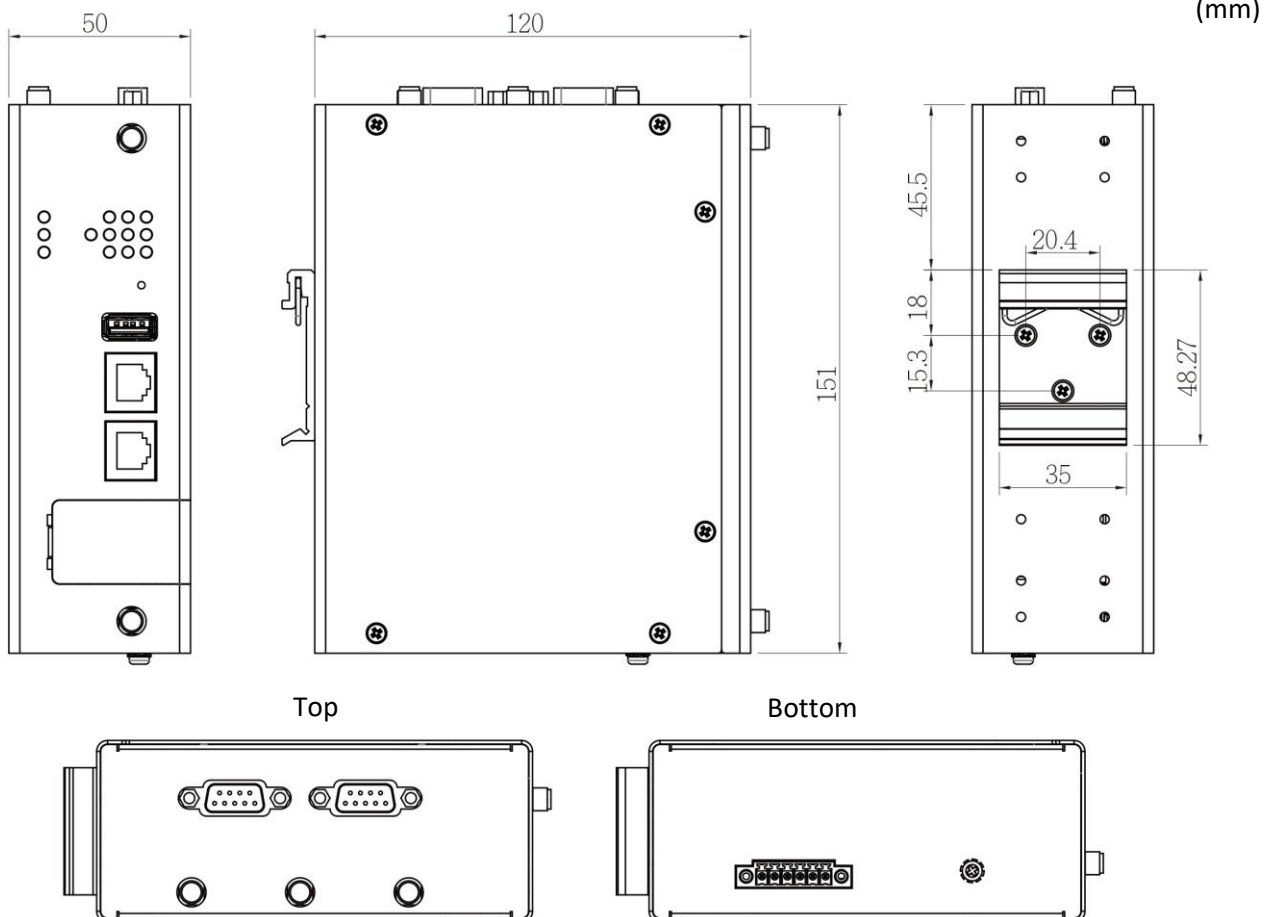
- 1 x Power
- 1 x System Status
- 1 x DO
- 2 x Ethernet Port
- 2 x Serial Port
- 6 x Radio LED (Ra~Rf)

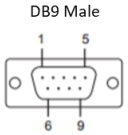
	WR312G-LTE-E-EC	WR322GR-WLAN+LTE-E-EC
Ant 1	LTE-Main	Wi-Fi 1
Ant 2	LTE- Diversity/ GPS (by model)	Wi-Fi 2
Ant 3	-	LTE-Main
Ant 4	-	GPS (by model)
Ant 5	-	LTE-Diversity

\*Antenna: Wi-Fi in White; LTE in Black



## Dimensions



Interface																																									
<b>CPU</b>	QCA9558 MIPS-based processor 720MHz processor																																								
<b>OS (preinstalled)</b>	Linux (OpenWRT LEDE, Kernel 4.4)																																								
<b>USB</b>	USB 2.0 hosts x 1, Type A connector																																								
<b>DRAM</b>	DDR2 SDRAM 256MB																																								
<b>Main Storage</b>	8G Micro SD																																								
<b>Storage Expansion</b>	Micro SD expand to 16G/32G/64G																																								
<b>Ethernet Port</b>	2 x 10/100/1000MBase-T RJ45, Auto Negotiation, Auto-MDI/MDIX																																								
<b>System LED</b>	1 x PWR: Green On 2 x Ethernet Ports: Link: Green On, Activity: Green Blinking Programmable: 1x SYS, 2 x Serial Ports (s1, s2), 1 x DO: Red On  <b>WR312G-LTE-E-EC:</b> Programmable: Ra, Rb, Rc  <b>WR322GR-WLAN+LTE-E-EC:</b> Programmable: Ra, Rb, Rc, Rd, Re Rf: Base station connected: Green On for 2 sec period, Base station disconnected: Green Off for 2 sec period																																								
<b>Reset</b>	1 x Reset button ( <b>Programmable</b> )																																								
<b>SMA Socket</b>	<b>WR312G-LTE:</b> Up to 2 x RP-SMA Female LTE 2T2R: ANT1 for LTE Main, ANT2 for LTE Aux OR LTE + GPS: ANT1 for LTE Main, ANT2 for GPS <b>WR322GR-WLAN+LTE:</b> Up to 5 x RP-SMA Female Wi-Fi 2T2R: ANT1 for Wi-Fi1, ANT2 for Wi-Fi2, LTE 2T2R: ANT3 for LTE Main, ANT 5 for LTE Aux GPS: ANT4																																								
<b>SIM Socket</b>	2 x Nano SIM with redundancy																																								
<b>Serial</b>	Up to 2 x RS232/422/485, DB9   <table border="1" data-bbox="1013 1086 1348 1355"> <thead> <tr> <th>Pin</th> <th>RS232</th> <th>RS485-4w/422</th> <th>RS485-2w</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>DCD</td> <td>TX-</td> <td>Data-</td> </tr> <tr> <td>2</td> <td>TXD</td> <td>RX+</td> <td>-</td> </tr> <tr> <td>3</td> <td>RXD</td> <td>TX+</td> <td>Data+</td> </tr> <tr> <td>4</td> <td>DSR</td> <td>-</td> <td>-</td> </tr> <tr> <td>5</td> <td>GND</td> <td>GND</td> <td>-</td> </tr> <tr> <td>6</td> <td>DTR</td> <td>RX-</td> <td>-</td> </tr> <tr> <td>7</td> <td>CTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>8</td> <td>RTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>9</td> <td>RI</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Pin	RS232	RS485-4w/422	RS485-2w	1	DCD	TX-	Data-	2	TXD	RX+	-	3	RXD	TX+	Data+	4	DSR	-	-	5	GND	GND	-	6	DTR	RX-	-	7	CTS	-	-	8	RTS	-	-	9	RI	-	-
Pin	RS232	RS485-4w/422	RS485-2w																																						
1	DCD	TX-	Data-																																						
2	TXD	RX+	-																																						
3	RXD	TX+	Data+																																						
4	DSR	-	-																																						
5	GND	GND	-																																						
6	DTR	RX-	-																																						
7	CTS	-	-																																						
8	RTS	-	-																																						
9	RI	-	-																																						
<b>Power Input, Digital Output</b>	6-Pin Removable Terminal Block Connector 4 Pin for Redundant Power 2 Pin for DO (Relay Alarm) DO: Dry Relay Output with 1A/24V DC																																								

Software	
<b>OS</b>	Linux OpenWRT LEDE
<b>Web Server</b>	uHttpd, luCI Web Interface, Apache*
<b>Terminal Server (SSH)</b>	Secure encrypted communications between two untrusted hosts over an insecure network
<b>Kernel</b>	GNU/Linux kernel v4.4
<b>System Shell</b>	ASH (default), BASH*
<b>Text Editor</b>	vim, nano*
<b>File System</b>	JFFS2, NFS, Ext3, Ext4, VFAT, OverlayFS, NTFS
<b>Internet Protocol Suite</b>	TCP, UDP, IPv4, IPv6, SNMPv2, v3, ICMP, ARP, HTTP, CHAP,PAP,DHCP, NTP, NFS, SSH, PPP, SFTP, RSYNC, SSL, SCP
<b>Programming Language Support</b>	Lua, Perl*, Python*
<b>Flow-based programming</b>	Node-RED (Modbus TCP and Serial contribution package included)
<b>Internet Security Suite</b>	OpenVPN, IPSec, Netfilter/iptables
<b>Cryptographic</b>	AES, SHA, OpenSSL, random generator
<b>Linux Board Support Packages (BSP)</b>	GCC C/C++ cross development tool chain Kernel/ filesystem
<b>Cellular Networking</b>	QMI (Qualcomm MSM Interface): Glib-based library for talking to WWAN modems and devices that speak the Qualcomm MSM Interface (QMI) protocol

Cellular Properties (LTE Cat. 6)	
<b>Standard</b>	UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 12 (LTE Cat.6)
<b>Data Rate</b>	TD-SCDMA: DL Max 4.2Mbps, UL: Max 2.2Mbps HSPA: DL: Max. 42 Mbps, UL: Max. 5.76 Mbps WCDMA: DL: Max 384Kbps, UL: Max 384Kbps LTE-FDD: DL: Max. 300 Mbps, UL: Max. 50 Mbps, 2x2 DL MIMO LTE-TDD: DL: Max. 226 Mbps, UL: Max. 28 Mbps, 2x2 DL MIMO
<b>Band Information: LTE-E</b>	LTE-FDD: B1/B3/B5/B7/B8/B20/B28/B32 (2100/1800/850/2600/900/800/700/1500MHz) LTE-TDD: B38/B40/B41 (2600/2300/2500MHz) WCDMA: B1/B3/B5/B8 (2100/1800/850/900MHz)
<b>Band Information: LTE-U</b>	LTE-FDD: B2/B4/B5/B7/B12/B13/B17/B25/B26/B29/B30/B66 (1900/1700/700/2600/700/700/700/1900/850/700/2300/1700MHz) LTE-TDD: B41 (2500MHz) WCDMA: B2/B4/B5 (1900/1700/850MHz)
<b>Band Information: LTE-AP</b>	LTE-FDD: B1/B3/B5/B7/B8/B18/B19/B21/B26 (2100/1800/850/2600/900/850/850/1500/850MHz) LTE-TDD: B38/B39/B40/B41 (2600/1900/2300/2500MHz) WCDMA: B1/B5/B6/B8/B9/B19 (2100/850/UMTS only/900/1800/850MHz) TD-SCDMA: B39 (1900MHz)

Cellular Properties (LTE Cat. 4)	
<b>Standard</b>	GSM/GPRS/EDGE 3GPP Release 6 UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 11
<b>Data Rate</b>	GPRS: DL: max. 85.6 kbps, UL: max. 85.6 kbps EDGE: DL: max. 236.8 kbps, UL: max. 236.8 kbps HSPA: DL: max. 42 Mbps, UL: max. 5.76 Mbps LTE-FDD Cat.4: DL: max. 150 Mbps, UL: max. 50 Mbps, 2x2 DL MIMO LTE-TDD Cat.4: DL: max. 130 Mbps, UL: max. 35 Mbps, 2x2 DL MIMO
<b>Band Information: LTE-E</b>	LTE: FDD B1/B3/B5/B7/B8/B20 (2100/1800/850/2600/900/800MHz) LTE: TDD B38/B40/B41 (2600/2300/2500MHz) WCDMA: FDD B1/B5/B8 (2100/850/900MHz) GSM: B3/B8 (1800/900MHz)
<b>Band Information: LTE-AU</b>	LTE: FDD B1/B2/B3/B4/B5/B7/B8/B28 (2100/1900/1800/1700/850/2600/900/700MHz) LTE: TDD B40 (2300MHz) WCDMA: FDD B1/B2/B5/B8 (2100/1900/850/900MHz) GSM: B2/B3/B5/B8 (1900/1800/850/900MHz)
<b>Band Information: LTE-U</b>	LTE: FDD B2/B4/B12 (1900/1700/700MHz) WCDMA: B2/B4/B5 (1900/1700/850MHz)
<b>Band Information: LTE-CN</b>	LTE FDD: B1/B3/B5/B8 (2100/1800/850/900MHz) LTE TDD: B38/B39/B40/B41 (2600/1900/2300/2500MHz) TD-SCDMA: B34/B39 (2000/1900MHz) WCDMA: B1/B8 (2100/900MHz) CDMA: BC0 GSM: 900/1800MHz

GPS Properties	
<b>GNSS</b>	GPS/GLONASS/BeiDou/Galileo
<b>Performance</b>	Cold start: 18s, Warm start: 2.2s, Hot start: 1.8s
<b>Sensitivity</b>	Cold start: -146dBm, Reacquisition: -157dBm, Tracking: -157dBm
<b>Accuracy</b>	<1.5M
<b>GNSS Frequency</b>	GPS/Galileo: 1575.42±1.023 MHz GLONASS: 1597.5~1605.8 MHz BeiDou: 1561.098±2.046 MHz
<b>Antenna (Optional Accessory-A-GPS-27-RSM-3M)</b>	Frequency range: 1561~1615MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi

Wi-Fi Properties	
<b>Standard</b>	IEEE 802.11ac/a/b/g/n, 2T2R MIMO 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
<b>Data Rate</b>	802.11ac: MCS0 ~ 9, max. 866Mbps 802.11b: 11Mbps / 802.11a/g: 54Mbps / 802.11n: MCS0 ~ 15, max. 300Mbps Check detail TX/RX information in User Manual
<b>Frequency</b>	ISM Band, 2.412GHz ~ 2.472GHz, 5.180MHz ~ 5.825MHz(Band 1,4)
<b>RSSI</b>	≤20db, compliant with CE request

Antenna	
LTE Default Antenna	<b>Frequency:</b> 704~960/1710~2690 MHz
	<b>Gain:</b> 2 dBi
	<b>Dimension:</b> 161xΦ13 mm
Wi-Fi Default Antenna	<b>Frequency:</b> 2400~2500/ 4900~5900 MHz
	<b>Gain:</b> 2.4GHz: 2.5 dBi, 5GHz: 3dBi
	<b>Direction:</b> Omni-directional
	<b>Dimension:</b> 196xΦ13 mm
Power Requirement	
<b>Input Voltage</b>	24V (12~48VDC)
<b>Reverse Polarity Protect</b>	Yes
<b>Input Current</b>	<b>WR312G-LTE-E-EC:</b> 0.23A @24V <b>WR322GR-WLAN+LTE-E-EC:</b> 0.26A @24V
<b>Power Consumption</b>	<b>WR312G-LTE-E-EC:</b> Max 5.52W @24VDC full traffic, suggest to reserve 15% tolerance <b>WR322GR-WLAN+LTE-E-EC:</b> Max 6.24W @24VDC full traffic, suggest to reserve 15% tolerance
Mechanical	
<b>Installation</b>	DIN Rail
<b>Enclosure Material</b>	Steel Metal with Aluminum
<b>Dimension</b>	50 x 151 x 120 mm(W x H x D) / without DIN Rail Clip
<b>Ingress Protection</b>	IP30
<b>Weight</b>	WR312G: ~600g without package WR322GR: ~660g without package
Environmental	
<b>Operating Temperature &amp; Humidity</b>	-40°C~75°C , 5%~95% Non- Condensing
<b>Storage Temperature</b>	-40°C~85°C
<b>MTBF</b>	>200,000 hours at 40° full cycle
<b>Warranty</b>	5 years
Approval	
<b>Safety</b>	EN 60950-1 Compliance EN 62368-1:2014/AC:2017 Compliance IEC 60255-27:2013 Compliance
<b>EMC</b>	EN61000-6-2/EN61000-6-4 Compliance
<b>EMI</b>	CISPR 22, FCC part 15B Class A Compliance
<b>EMS</b>	EN61000-4-2 ESD, EN61000-4-3 RS, EN61000-4-4 EFT, EN61000-4-5, EN61000-4-6 CS, EN61000-4-8 Magnetic Field EN61000-4-12/16/17/18/29
<b>Radio</b>	RED Compliance Safety: EN 62368-1 EN 50385/EN62311 MPE assessment EN 301 489-1/17/19/52, EN 55032/55024 EN 300 328/EN 301 893 EN 301 908-1 FCC Part 15B
<b>Railway</b>	EN50121-4
<b>Environmental</b>	EN 60870-2-2:1998 Compliance IEC 60068-2-21:2006 Compliance



Model	Eth-WAN	Eth-LAN	Serial	Radio 1	Radio 2	USB	SD	SIM	GPS	DI/DO
WR302G-EC	1 x GE	1 x GE	2 x RS232/422/485	-	-	1	1	-	-	0/1
WR312G-WLAN-EC	1 x GE	1 x GE	2 x RS232/422/485	Wi-Fi 2.4G 11n/5G 11ac	-	1	1	-	-	0/1
WR312G-LTE-E-EC	1 x GE	1 x GE	2 x RS232/422/485	LTE Cat.4	-	1	1	1	-	0/1
WR322GR-WLAN+LTE-E-EC	1 x GE	1 x GE	2 x RS232/422/485	Wi-Fi 2.4G 11n/5G 11ac	LTE Cat.4	1	1	2	Yes	0/1

Model Name	Description
WR302G-EC	Industrial Edge Computing Secure Serial Server, 2GbE+2COM, USB, SD
WR312G-WLAN-EC	Industrial Secure Wireless Edge Computer, 2GbE+2COM, USB, SD, 802.11ac/n WLAN
WR312G-LTE-E-EC	Industrial Secure Cellular Edge Computer, 2GbE+2COM, USB, SD, LTE-E, 1SIM, FDD B1/3/5/7/8/20, TDD B38/40/41
WR322GR-WLAN+LTE-E-EC	Industrial Secure Cellular Edge Computer, 2GbE+2COM, USB, SD, 802.11ac/n WLAN, LTE-E, GPS, 2SIM, FDD B1/3/5/7/8/20, TDD B38/40/41
	*Embedded SIM by request *LTE-AU/LTE-U Cat.4 by request *LTE-AP/LTE-U Cat.6 by request *Dual LTE concurrent by request *GPS support for WR312G-LTE-E-EC series by request
	<b>Package List</b> 1 x Product Unit 1 x 6-pin Removable Terminal Connector 1 x Quick Installation Guide 1 x Attached Din Clip <b>Default Enclosed Antennas:</b> <b>WR312G-LTE:</b> 2 x LTE Antennas, Black <b>WR312G-WLAN:</b> 2 x Wi-Fi Antennas, White <b>WR322GR-WLAN+LTE :</b> 2 x LTE Antennas, Black + 2 x Wi-Fi Antennas, White



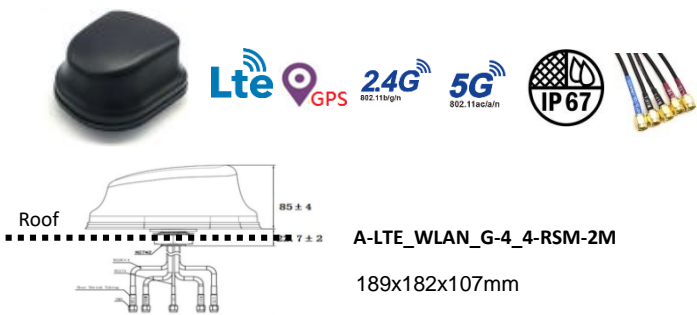
**Ordering Information**

<b>A-LTE_WLAN_G-4_4-RSM-2M</b>	Combo IP67 Antenna, LTE WW 4dBi, Wi-Fi 2.4/5GHz dual band Omni-directional 4/4dBi, GPS 1561-1670MHz 28dBi, RP-SMA male, 2M
<b>A-LTE_WLAN_G-3_2-RSM-2M</b>	Combo IP67 Antenna, LTE WW 3dBi, Wi-Fi 2.4/5GHz dual band Omni-directional 2/2dBi, GPS 1575-1610MHz 28dBi, RP-SMA male, 2M
<b>A-LTE-3-NM</b>	LTE Antenna, LTE WW 3dBi, N-type male
<b>A-WLAN-6-NM</b>	Wi-Fi Antenna, Wi-Fi 2.4/5GHz dual band Omni-directional 4/6dBi, N-type male
<b>A-GPS-27-RSM-3M</b>	GPS Antenna, GPS 1575MHz 27dBi, RP-SMA male, 3M
<b>C-RF-R-RSF_RSM-1M</b>	RF cable, RP-SMA female to RP-SMA male, 1M
<b>C-RF-C2-NF_RSM-2M</b>	RF cable, N-type female to RP-SMA male, CFD200, 2M

**Outdoor Vehicle Combo Antenna**

**A-LTE\_WLAN\_G-4\_4-RSM-2M**

- 5 RF cables, LTE MIMO, Wi-Fi MIMO, GPS/GLONASS/GALILEO/BEIDOU
- 4dBi gain for LTE and 4dBi gain for 2.4G/5G WIFI RF
- High WLAN gain is perfect for train to ground vehicle application
- 5 x 2 meter cables in RP SMA male connector
- Outdoor high gain, IP67 waterproof and -40°~85°C wide temperature design
- 189x182x107mm



**A-LTE\_WLAN\_G-3\_2-RSM-2M**

- 5 RF cables, LTE MIMO, Wi-Fi MIMO, GPS&GLONASS
- 3dBi gain for LTE and 2dBi gain for 2.4G/5G WIFI
- Suitable for in-vehicle, roadside box and short range coverage WLAN to LTE communication environment
- 5 x 2 meter cables in RP SMA male connector
- Outdoor IP67 waterproof and -40°~85°C wide temperature
- 110x110x80mm slim size



	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-LTE_WLAN_G-4_4-RSM-2M (optional)	Omni	LTE: 698~960/1710~2690/2900~3600 WLAN: 2400~2483.5/4900~5825 GNSS: 1561.1~1610 (GPS/GLONASS/GALILEO/BEIDOU)	4 4 28	5x RP SMA Male	189x182x107	2	-40°C~85°C	Outdoor
	A-LTE_WLAN_G-3_2-RSM-2M (optional)	Omni	LTE: 698~960/1710~2690 WLAN: 2400~2483.5/4900~5825 GNSS: 1575.42~1610 (GPS/GLONASS)	3 2 28	5x RP SMA Male	110x110x80	2	-40°C~85°C	Outdoor

**LTE Antenna**

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-LTE-2-RSM (Default)	Omni	704~960/1710~2690	2	RP SMA Male	161xΦ13	-	-20°C~ 65°C	Indoor
	A-LTE-3-NM (optional) (require RF cable)	Omni	704~960 1710~2700	2 3	N-Type Male	187xΦ20	-	-20°C~ 65°C	Outdoor

**Wi-Fi Antenna**

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-WLAN-3-RSM (Default)	Omni	2400~2500 4900~5900	2.5 3	RP SMA Male	196xΦ13	-	-40°C~ 65°C	Indoor
	A-WLAN-6-NM (optional) (require RF cable)	Omni	2400~2500 5150~5850	4 6	N-Type Male	187xΦ20	-	-20°C~ 65°C	Outdoor

**GPS Antenna (optional)**

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-GPS-27-RSM-3M	Omni	1575.42	27	RP SMA Male	36x36x13.9	3	-20°C~ 65°C	Indoor