Secured and Rugged LTE Router for Vehicle and Railway

WR322A M12 Series

Industrial Secure M12 Cellular IIoT Router

The ruggedized vibration-proof LTE WLAN router WR322A-M12 Series is designed for vehicle and railway with high-speed LTE routing and dual WLAN networks. The RS232/422/485 serial port with Modbus support brings sensor and meter data to cloud wirelessly. To safeguard cybersecurity, security features such as Firewall, OpenVPN, GRE tunnel are supported. The embedded MQTT and RESTful API enables instant public cloud integration such as AWS or Azure. The private cloud platform ThingsMaster and ThingsMaster OTA can also be set up for an instant and secured access to receive data or manage devices remotely.

LTE · NB-IoT · LTE-M · 5GHz 802.11a/n/ac · 2.4GHz 802.11b/g/n · Cyber Security · VPN

Features & Benefits

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
- LTE Global Band
  LTE: FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28
  LTE: TDD B38/B39/B40/B41
  WCDMA: FDD B1/B2/B4/B5/B6/B8/B19
  GSM: B2/B3/B5/B8
- Support GPS for location services
- Supports dual WLAN for local coverage, 5GHz 802.11ac up to 866 and 2.4GHz 802.11n up to 300Mbps bandwidth

Serial Communication & High Throughput Data Switching

- 1 port RS232/422/485 full functions for serial over LTE/Wi-Fi/Ethernet data switching
- 2-port Gigabit Ethernet supports routing and bridging mode
- Close to wire-speed NAT routing performance
- Hardware NAT for CPU utilization saving

Dynamic Routing with Redundancy Protection

- RIPv1&v2, OSPFv1&v2 for intra-domain routing within an autonomous system
- Efficient unicast/multicast* static routing
- VRRP guarantees sustainable routing in a single point of failure

Rugged Design for Wayside Surveillance, ITS Application

- EN50121-4 railway trackside EMC certificate design for Industrial IoT, ITS applications
- Operate in -40~70°C environments
- IEC61000-6-2/IEC61000-6-4 heavy industrial EMC compliance

Enhanced Cyber Security

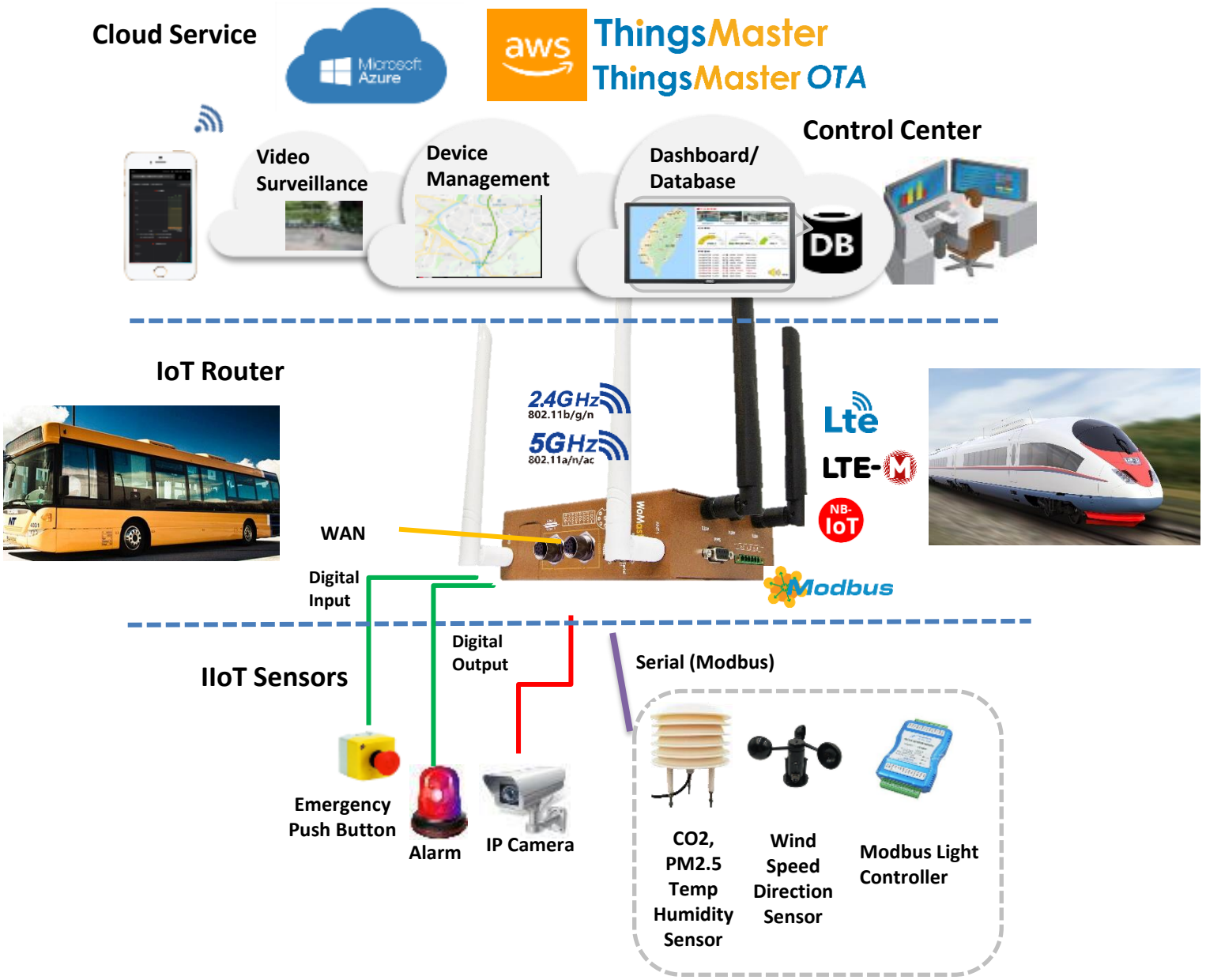
- Firewall for inbound/outbound traffic
- OpenVPN (server/client), IPsec for secure remote connection
- L2TP with PPP, PAP, CHAP(LCP, IPCP)
- GRE tunnel
- HTTPs/SSH secure login
- TACACS+ multi-user authentication for privileged user management
- Dual SIM backup

Industrial IoT LAN & Cloud Management

- Embedded Amazon AWS & Microsoft Azure cloud service
- Various configuration paths, including CGI WebGUI, CLI, SNMP and RMON*
- 1:1 NAT, port forwarding and NAPT for local traffic protection
- Support SNMPv3 and entity-MIB (RFC4133), MIB II (RFC1213)
- NTP v3 time management
- WoMaster Software Utilities
  -**NetMaster:** Network Management System with VLAN visualization* and ERPS* Ring
  -**ViewMaster:** Configuration Management
  -**ThingMaster**: Interactive monitoring dashboard to collect data from field devices
  -**ThingMaster OTA**: Realtime map showing the status, signal strength, location of the remote devices, over-the-air batch device registration, configuration and firmware upgrade*, alerts on critical events to prevent downtime
- Support MQTT protocol, ready to use AWS/Azure and Private Cloud Agent for cloud management
- LLDP* for topology control, auto-topology drawing
- USB for easy field configuration and firmware update
- Diagnostic tool includes Ping, TFTP, SNMP Trap, E-mail Alert and System Log

*by request

✓ Ready Total Solution for IoT

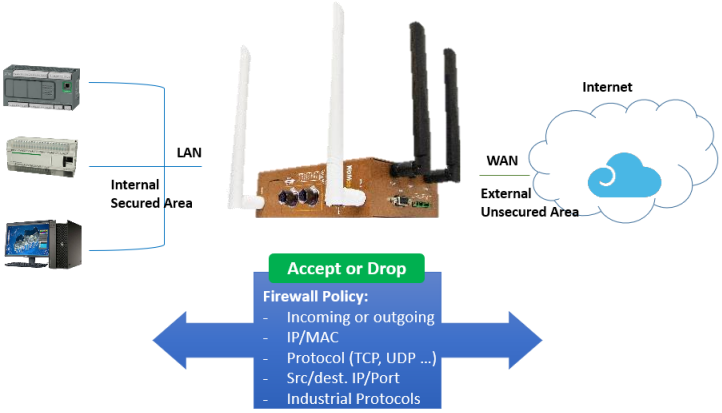


✓ Secured Remote Access by VPN

WR322A-M12 can act as a VPN server for data encryption and dynamic remote access. Multiple VPN protocols are supported such as OpenVPN, GRE, and L2TP. The channels between multiple networks, ex. private/public/hybrid networks are fully secured and with authentication features.

✓ Cyber Security Guard

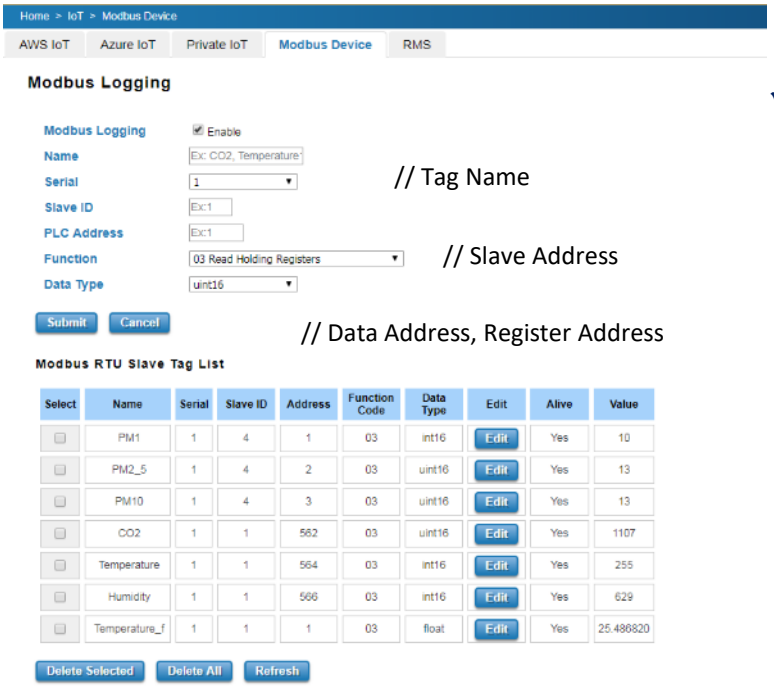
The stateful firewall can monitor the status of connection at all time. Multiple industrial fieldbus protocols, ex. Modbus TCP*, EtherNet/IP* are also supported for factory automation applications.



*by request

Secure IoT Modbus Tags

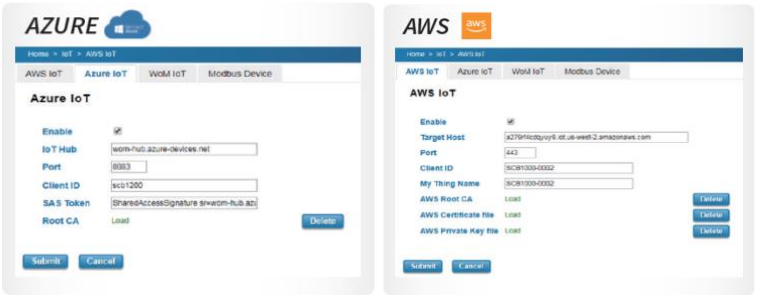
Tag-based data acquisition with MQTT support
MQTT client acting as publisher and subscriber
The latest TLS encryption and X.509 authentication
Selectable serial port and data type. Sensor alive check and display sensor value.



Secured Multi-sites Management

N to N VPN
Latest TLS encryption and X.509 authentication

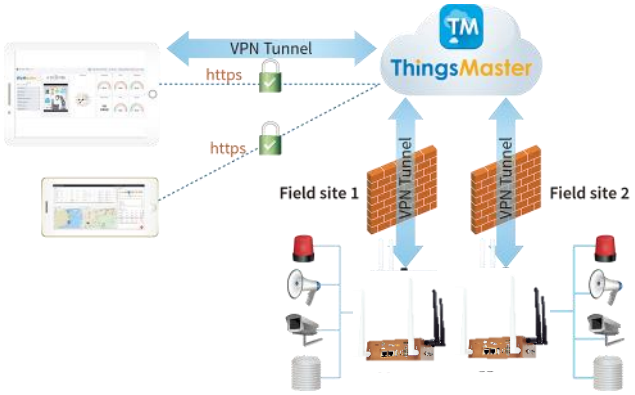
✓ Built-in Microsoft Azure and Amazon AWS agent



✓ Multi-Level User Passwords

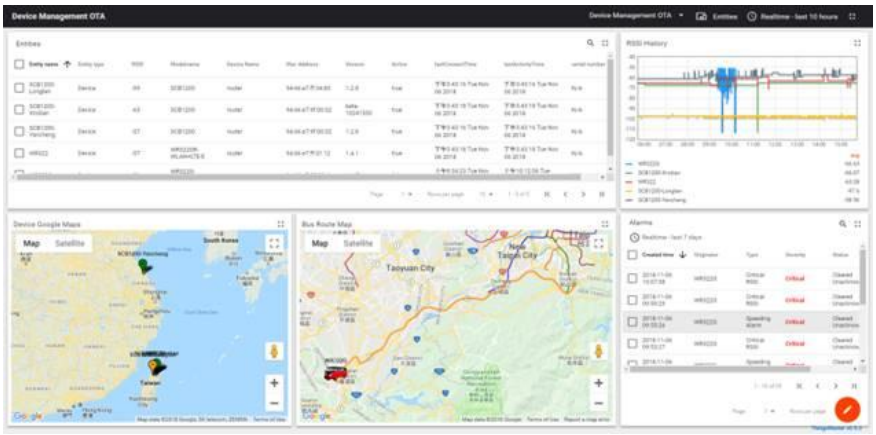
Different centralized authentication servers are supported such as RADIUS and TACACS+. Using a central authentication server simplifies account administration, when you have more than one switches in the network.

Authentication Chain is also supported. An authentication chain is an ordered list of authentication methods to handle more advanced authentication scenarios. For example, you can create an authentication chain which first contacts a RADIUS server, and then looks in a local database if the RADIUS server does not respond.



✓ ThingsMaster OTA (device management over the air)

The OTA agent embedded in WR322A-M12 upgrades device management over the air, anywhere you are and any time you want over your mobile devices. ThingsMaster OTA is a secured local OTA software that can be installed in a private or public server or even QNAP NAS (network attached storage). With OTA, all device information such as location, warning event can be shown in real time. The maintenance such as configuration reload, or device reboot can also be run by group.



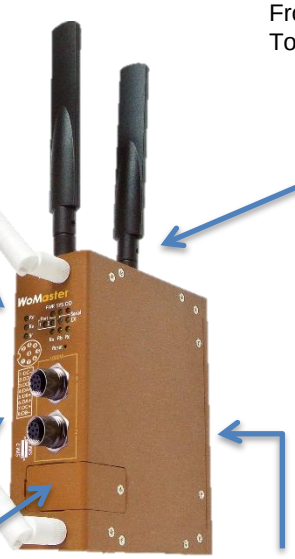
Interfaces

Antenna
Front: Ant. 1/2
Top: Ant. 3/4/5/6

	WR312A-M12	WR322A-M12
Ant 1	LTE-Main	LTE-Main
Ant 2	LTE- Diversity/ GPS (by model)	LTE- Diversity/ GPS (by model)
Ant 3	-	WLAN 1-Main
Ant 4	-	WLAN 2-Main
Ant 5	-	WLAN 1-Aux.
Ant 6		WLAN 2-Aux.

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

System LED
- 1 x Power
- 1 x System Status
- 1 x DO
- 2 x Ethernet Port
- 1 or 2 x Serial Port (By Model)
- 1 x DI (By Model)
- 3 x Radio LED (Ra, Rb, Rc)

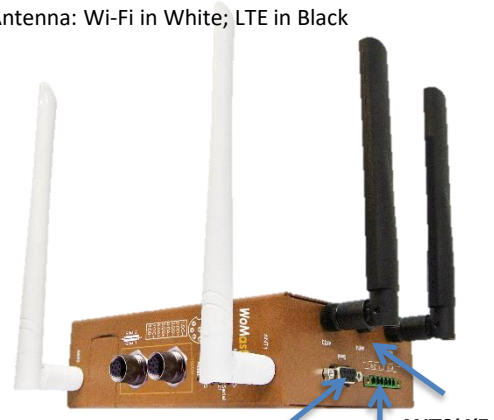


Gigabit Ethernet
- 2-port 10/100/1000M M12 A/X-code
- WAN + LAN configurable

SIM Card
- 2x SIM

DIN Clip

Integrated Power Connector
- M12 4 pin D-Code Male
- Dual 24VDC power input

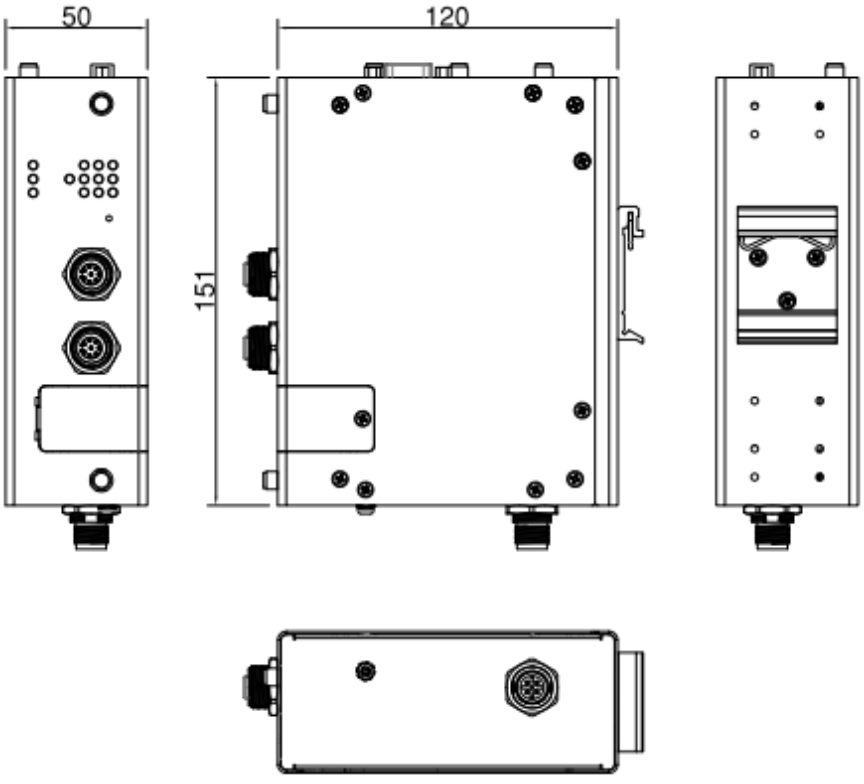


Serial Communication
- RS232/422/485 Full functions
- DB9 female

Digital I/O
- 2DI+1DO

Dimensions

(mm)

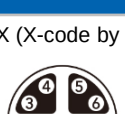
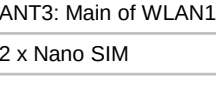
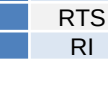


Specifications

Technology

Standard	3GPP Release 11/12 Long Term Evolution (LTE), fallback 3GPP Release 7,8,9 for HSPA/UMTS
	IEEE 802.11ac wireless local area network (WLAN), Backward support 802.11n/g/a/b Wireless LAN
	IEEE 802.3 10Base-T Ethernet
	IEEE 802.3u 100Base-TX Fast Ethernet
	IEEE 802.3ab 1000Base-T Gigabit Ethernet Copper
	IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP)
	IEEE 802.1Q for VLAN

Interface

Ethernet Port	2 x 10/100/1000MBase-T M12 A-code, Auto-Negotiation, Auto-MDI/MDIX (X-code by request) **Pin Definition:** 8 pin X-Code Female: #1 (D1+), #2 (D1-), #3 (D2+), #4 (D2-), **(WR312A-M12-X)** #5 (D4+), #6 (D4-), #7 (D3-), #8 (D3+) 8 pin A-Code Female: #1 (D3-), #2 (D4+), #3 (D4-), #4 (D1-), **(WR3x2A-M12-A)** #5 (D2+), #6 (D1+), #7 (D3+), #8 (D2-) **Cable:** 1000 Base-T: 4-pair Cat.5E/Cat.6 FTP/STP cable, EIA/TIA 568B 100Ohm, 100Meters *Recommended uses FTP/STP cable for the railway on-board application  X-Code  A-Code
System LED	1 x PWR: Green On 1 x SYS: Ready: Green On, Firmware Updating: Green Blinking 1 x DO: Red On 2 x Ethernet Ports: Link: Green On, Activity: Green Blinking 1 x Serial Ports : Activity: Green Blinking 1 x DI: Green On **WR312A-M12-LTE:** 3 x Radio (Ra, Rb, Rc): Radio status Ra: SIM detected: Green On, SIM not inserted: Off Rb: 2/3/4G Signal Strength. Good(>-83dBm): Green On, Medium: Blinking, Low(<-95dBm):Off Rc: 2/3/4G communication connection. Established: Green On, Disconnected: Off **WR322A-M12-WLAN+LTE:** 3 x Radio (Ra, Rb, Rc): Radio status Ra: 2/3/4G Signal Strength. Good(>-83dBm): Green On, Medium: Blinking, Low(<-95dBm)/Disable/SIM Not Inserted: Off Rb: 802.11ac(5GHz) AP mode: Green ON, Client Mode: Green Blinking, Not enabled: OFF Rc: 802.11n(2.4GHz) AP mode: Green ON, Client Mode: Green Blinking, Not enabled: OFF
Reset	System Reset(2~6 Seconds) / Default Settings Reset(over 7 Seconds)
SMA Socket	**WR312A-M12-LTE:** 2x SMA-Female: ANT1 for LTE Main, ANT2 for LTE Aux/GPS **WR322A-M12-WLAN+LTE:** 2x SMA-Female: ANT1 for LTE Main, ANT2 for LTE Aux/GPS 4x RP-SMA: ANT3: Main of WLAN1, ANT4: Main of WLAN 2, ANT5: AUX of WLAN 1, ANT6: Aux of WLAN 2
SIM Socket	2 x Nano SIM
MicroSD	Internal mSD socket can pre-install SD card for field diagnostic data logging
Serial	1 x RS232/422/485, DB9 female  Pin 1: DCD / TX- / Data- Pin 2: TXD / RX+ / - Pin 3: RXD / TX+ / Data+ Pin 4: DSR / - / - Pin 5: GND / GND / GND Pin 6: DTR / RX- / - Pin 7: CTS / - / - Pin 8: RTS / - / - Pin 9: RI / - / -
Digital Input/ Digital Output	6-Pin Removable Terminal Block Connector: 4 Pins for 2x DI with isolation High: DC 2~30V Low: DC 0~1V 2 Pins for 1x DO: 0.1A/24V with isolation
Power Input	M12 4 pin D-Code Male with polarity reverse protection Pin Definition:  Pin 1: V1 + Pin 2: V2 + Pin 3: V2 - Pin 4: V1 -

Cellular Properties	(LTE Cat. 4)
Standard	GSM/GPRS/EDGE 3GPP Release 6 UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 11
Data Rate	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
Band Information: LTE-EUX	LTE: FDD B1/B3/B7/B8/B20/B28A LTE: TDD B38/B40/B41 WCDMA: FDD B1/B8, GSM: B3/B8
Band Information: LTE-ECGA	LTE: FDD B1/B3/B7/B8/B20/B28A WCDMA: FDD B1/B8, GSM: B3/B8
Band Information: LTE-AU	LTE: FDD B1/B2*/B3/B4/B5/B7/B8/B28 LTE: TDD B40 WCDMA: FDD B1/B2/B5/B8, GSM: B2/B3/B5/B8
Band Information: LTE-G (By MoQ Request)	LTE: FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28 LTE: TDD B38/B39/B40/B41 WCDMA: FDD B1/B2/B4/B5/B6/B8/B19, GSM: B2/B3/B5/B8
Cellular Properties	**(LTE Cat. 6, By MoQ Request)**
Standard	UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 12 (LTE Cat.6)
Data Rate	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
Band Information: LTE-E	LTE-FDD: B1/B3/B5/B7/B8/B20/B28 LTE-TDD: B38/B40/B41 WCDMA: B1/B3/B5/B8
Band Information: LTE-U	LTE-FDD: B2/B4/B5/B7/B12/B13/B17/B25/B26/B30/B66 LTE-TDD: B41 WCDMA: B2/B4/B5
GPS Properties	
GNSS	GPS/GLONASS/BeiDou/Galileo
Performance	Cold start: 18s, Warm start: 2.2s, Hot start: 1.8s
Sensitivity	Cold start: -146dBm, Reacquisition: -157dBm, Tracking: -157dBm
Accuracy	<1.5M
GNSS Frequency	GPS/Galileo: 1575.42±1.023 MHz GLONASS: 1597.5~1605.8 MHz BeiDou: 1561.098±2.046 MHz
Antenna (Optional Accessory-A-GPS-27-RSM-3M)	Frequency range: 1561~1615MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi
Wi-Fi Properties	
Standard	IEEE 802.11ac/a/b/g/n, 2T2R MIMO 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
Data Rate	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
Frequency	ISM Band, 2.412GHz ~ 2.472GHz, 5.180MHz ~ 5.825MHz(Band 1,4)
RSSI	Compliant with CE request: ≦20db (2.4GHz) ≦23db (5GHz)
Max. RF Power	Compliant with FCC request. Read User Manual for detail.

Antenna	
LTE Default Antenna	**Frequency:** 704~960/1710~2690 MHz
	Gain: 2 dBi
	Dimension: 161xΦ13 mm
Wi-Fi Default Antenna	**Frequency:** 2400~2500/ 4900~5900 MHz
	Gain: 2.4GHz: 2.5 dBi, 5GHz: 3dBi
	Direction: Omni-directional
	Dimension: 196xΦ13 mm
Power Requirement	
Input Voltage	Dual 24VDC (12~48VDC)
Reverse Polarity Protect	Yes
Input Current	**WR312A-M12-LTE:** 0.23A@24V **WR322A-M12-WLAN+LTE:** 0.26A@24V
Power Consumption	**WR312A-M12-LTE:** Max 5.52W@24VDC full traffic, suggest to reserve 15% tolerance **WR322A-M12-WLAN+LTE:** Max 6.24W@24VDC full traffic, suggest to reserve 15% tolerance
Software	
Management	CGI WebGUI, Command Line Interface (CLI), IPv4/IPv6*, Telnet, SNMP v1/v2c/v3, DDNS, DHCP server/client, DHCP Relay, TFTP, System Log, SMTP, Proxy ARP, DNS (client/proxy), PPPOE*
Traffic Management	Flow Control*, Traffic shaping
Filter	IEEE802.1Q VLAN
Security	IEEE 802.1X/RADIUS, TLS v1.2, HTTPs/SSH, First login password management WLAN AP Security: Share Key, WPA/WPA2-PSK(Pre-Shared Key), WPA/WPA2 Enterprise Encryption: 64/128-bit WEP(Wired Equivalent Privacy), TKIP(WPA-PSK), AES(WPA2-PSK), MAC Filter
Advanced Security	TACACS+, Mutli-user authentication
Time Management	NTP, SNTP, Cellular Time
WAN / Routing / NAT/ Firewall / VPN	Routing: RIPv2, OSPFv2, VRRPv2 NAT: 1-1 NAT, NAPT(SNAT/DNAT), Port Forwarding, DMZ Firewall: Stateful Inspection firewall, IP/Port Filter VPN: IPSec, OpenVPN (Multipoint VPN), L2TP, GRE, PPTP, MGRE*
Watchdog	Hardware watchdog for system status monitoring Software cellular watchdog/ ping watchdog for connection monitoring
IIoT Industrial Protocol	Modbus RTU, MQTT, RESTful API
Private Cloud	ThingsMaster, ThingsMaster OTA
Public Cloud	AWS Agent, Azure Agent
Location	Google map, Baidu map
MIB	MIB-II, Entity MIB, WoMaster Private MIB
Utility	ViewMaster, NetMaster, Ping, Traceroute, IP SLA*
Serial communication	TCP Server/TCP Client/UDP mode, TCP Alive check, Force TX Delimiter/Timeout/interval/length, Long Distance Termination, DLMS*
Cellular Configuration	Radio on/off, 2G, 3G and 4G modes configurable, SIM Security, Connection Status, GPS positioning (by model), Backup SIM Retry (1-10 times)
WLAN Configuration	WLAN Basic Settings: Radio on/off, AP/client mode, 2.4G 11n/5G 11ac Band and Frequency selection, SSID/Multi-SSID configuration, SSID broadcast, VLAN ID, WLAN to LAN Link fault pass-through*, dvanced WLAN settings, 802.1X
Mechanical	
Installation	DIN Rail
Enclosure Material	Steel Metal with Aluminum
Dimension	50 x 151 x 120 mm(W x H x D) / without DIN Rail Clip
Ingress Protection	IP30
Weight	WR312A: ~600g without package WR322A: ~660g without package

*by request

Environmental	
Operating Temperature & Humidity	-40°C~70°C , 5%~95% Non- Condensing
Storage Temperature	-40°C~85°C
MTBF	>200,000 hours at 40º full cycle
Warranty	3 years
Approval	
CE	CE RED Compliance Safety: EN 62368-1 Health: EN 62311 MPE assessment compliant EMC: EN 301 489-1/17/19/52, EN 55032/55024 RF: EN 301 908-1*, EN 300 328/EN 301 893*
FCC	FCC part 15B Class A Compliance FCC Approved LTE/WLAN Module
EMC	Railway Roadside EN 50121-1/4 compliance 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 compliance for power application
Environmental	Shock/Vibration: EN 50155:2017/EN 61373:2010 Railway Shock/Vibration compliance Shock: IEC60068-2-27 Compliance Free fall: IEC60068-2-31 Compliance Vibration: IEC 60068-2-6 Compliance

Ordering Information

Model Name	Description
WR302A-M12-A	Industrial Secure M12 IIoT Router, 2GbE+1COM, 2DI+1DO, A-code M12 Ethernet
WR302A-M12-X	Industrial Secure M12 IIoT Router, 2GbE+1COM, 2DI+1DO, X-code M12 Ethernet
WR312A-M12-A-LTE-(Region)	Industrial Secure M12 Cellular IIoT Router, 2GbE+1COM, 2DI+1DO, A-code M12 Ethernet, 2SIM, LTE-EUX/ECGA/AU/G*(choose one by region)
WR312A-M12-X-LTE-(Region)	Industrial Secure M12 Cellular IIoT Router, 2GbE+1COM, 2DI+1DO, X-code M12 Ethernet, 2SIM, LTE-EUX/ECGA/AU/G*(choose one by region)
WR322A-M12-A-WLAN+LTE-(Region)	Industrial Secure M12 Cellular IIoT Router, 2GbE+1COM, 2DI+1DO, A-code M12 Ethernet, 2xWLAN, 2SIM, LTE-EUX/ECGA/AU/G*(choose one by region)
WR322A-M12-X-WLAN+LTE-(Region)	Industrial Secure M12 Cellular IIoT Router, 2GbE+1COM, 2DI+1DO, X-code M12 Ethernet, 2xWLAN, 2SIM, LTE-EUX/ECGA/AU/G*(choose one by region)
	Package List
	1 x Product Unit
	1 x 6-pin Removable Terminal Connector
	1 x Quick Installation Guide
	1 x Attached Din Clip
	Default Enclosed Antennas: **WR312A-M12-A/X-LTE**: 2 x LTE Antennas, Black **WR322A-M12-A/X-WLAN+LTE**: 2 x LTE Antennas, Black + 4 x Wi-Fi Antennas, White

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Outdoor WLAN Directional Antennas

- 2.4Ghz / 5.8Ghz Wireless Access Point to Point
- High Gain, Long Distance Coverage
- Vertical Polarization, 50Ω **Input Impedance**
- IP65 Protection Enclosure and Prevention of Rust
- -40˚C ~ +60˚C operation temperature
- 190 * 190*30 mm (L x W x H)
- N Type Female Connector
- Two 1-meter RF Cables (C-RF-LMR200-NM_NM-1M)

Model	Frequency	Transmission	Gain	Max. Distance	Beam
A-D1T1R-2.4GHZ-14DB-6KM-NF	2.4 GHz	1T1R	14dBi	6KM	30˚ for Horizontal Plane and 28˚ Vertical
A-D1T1R-5GHZ-12DB-5KM-NF	5.8Ghz	1T1R	12dBi	5KM	40˚ for Horizontal Plane and 38˚ Vertical
A-D2T2R-5GHZ-15DB-6KM-NF	5.8Ghz	2T2R	15dBi	6KM	35˚ for Horizontal Plane and 16˚ Vertical
A-D2T2R-5GHZ-19DB-8KM-NF	5.8Ghz	2T2R	19dBi	8KM	90˚ for Horizontal Plane and 4˚ Vertical

Outdoor Omni Antennas

Model		Frequency	Gain	Enclosure	Dimension	RF Cable
A-2.4/5GHZ-2-RSM-2Mx2		2400-2500/5150~5850	2dBi	IP67	Φ80×15mm	Two 2-meter RG174 cables RP SMA male connector
A-LTE-2-SM-2M		700~960/1710~2690 /2900~3600	2dBi	IP67	Φ80×15mm	Two 2-meter RG174 cables SMA male connector
A-GPS-38-SM-3M		GPS 1575	38dBi	outdoor	50×38×17mm	3M RG174 cable SMA male
A-LORA433-7-SM-3M		433	7dBi	outdoor	Φ30×175mm	3M RG174 cable SMA male
A-LORA850-925-7-SM-3M		850~925	7dBi	outdoor	Φ30×290mm	3M RG174 cable SMA male

Outdoor Combo Antennas

Model		Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)
A-LTE_WLAN_G-4_4-RSM-2M		LTE: 698~960/1710~2690/2900~3600 WLAN: 2400~2483.5/4900~5825 GNSS: 1561.1~1610 (GPS/GLONASS/GALILEO/BEIDOU)	4 4 28	3x SMA Male (LTE/GPS) 2x RP-SMA Male (Wi-Fi)	189x182x107	2
A-LTE_WLAN_G-3_2-RSM-2M		LTE: 698~960/1710~2690 WLAN: 2400~2483.5/4900~5825 GNSS: 1575.42~1610 (GPS/GLONASS)	3 2 28	3x SMA Male (LTE/GPS) 2x RP-SMA Male (Wi-Fi)	110x110x80	2
A-LTE_WLAN_G-5_5-RSM-1M		LTE: 700~2700 WLAN: 2400~2500 GNSS: 1575.42	5 5 28	2x SMA Male (LTE/GPS) 1x RP-SMA Male (Wi-Fi)	70x70x15	1