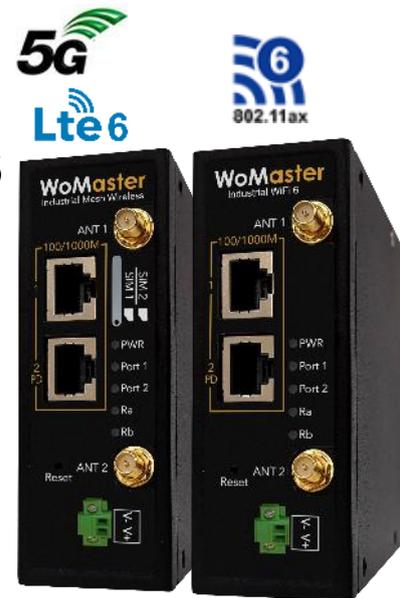


Industrial Din-Rail 802.11ax Wi-Fi 6 AP/5G Cellular Router

WA512G-AX-D-M2 /WA512G-AX-D-LTE6

Industrial Din-Rail 802.11ax Wi-Fi 6 AP+5GNR/LTE6 Cellular Router

The WA512G-AX-D is a robust industrial dual-band Wi-Fi 6 access point/router, engineered for reliability with dual 24V DC and PoE power inputs, dual digital inputs, a wide operating temperature range of -40°C to 70°C, and DIN-rail mounting. Powered by a quad-core 1.2GHz Qualcomm ARM processor, it delivers high-performance networking, supporting both 5GHz and 2.4GHz 802.11ax WLAN radios with data transfer speeds of up to 1200Mbps (5GHz) and 574Mbps (2.4GHz). For enhanced wireless WAN connectivity, the WA512G-AX-5GM2-D model incorporates a 5G cellular module, while the WA512G-AX-D-LTE6 model is equipped with LTE Cat.6 cellular module. The WA512G-AX series supports seamless roaming with 802.11k, 802.11v, and 802.11r protocols, ensuring smooth handovers without re-authentication. On the security front, it offers robust protection with Firewall, OpenVPN, IPSec, and L2TP. Its rugged design and compact form factor make it ideal for demanding field applications such as Automatic Guided Vehicles (AGVs) and small enclosures.



Features & Benefits

Dual Bands Wi-Fi 6 Wireless LAN

- **Quad-Core** 1.2Gbps ARM Processor
- Wi-Fi 6(802.11ax) WLAN solution, backward compatible Wi-Fi 5/4 (11ac/n)
- Dual Band Concurrent 2.4G+5GHz radio, up to 1774Mbps Bandwidth, 1.5 times than 802.11ac
- **Powered by Qualcomm® Wi-Fi 6** with OFDMA, BSS Coloring, Downlink/Uplink Multiple Input Multiple Output (MU-MIMO), provides high speed, high capacity, less interference, optimizing network efficiency and performance.
- Dual 2.4G+5GHz Radios in One Antenna
- Dual Gigabit Ethernet ports in Router mode for WLAN/LAN to Eth-WAN routing
- **Optional M2 socket** with dual SIM tray for 5GNR or 4G LTE expansion, allows for WLAN/LAN to Cellular network connectivity

Enhanced Cyber Security & Redundancy

- Support Firewall for inbound/outbound traffic
- OpenVPN Server/Client and Key Generation
- IPsec VPN for secure remote connection
- IPsec Performance >150Mbps @256-bit encryption
- Support L2TP with PPP, PAP, CHAP(LCP, IPCP)
- HTTPs/SSH secure login
- Support TACACS+ multi-user authentication for privileged user management*

Management Features

- 802.11k, 802.11v, 802.11r* Fast Roaming for seamless transitions between access points
- Various configuration paths, including Web GUI, Telnet, LAN Utility (ViewMaster) and NMS (NetMaster)
- Support First login password management
- Web GUI for Wireless LAN Setting, Radio On/Off, Band and Frequency selection, SSID/Multiple SSID, SSID Broadcast On/Off
- 1:1 NAT, port forwarding for local traffic protection
- Support SNMPv3, MIB II (RFC1213)
- NTP v3 time management
- Wireless Client Router mode for LAN to Wireless WAN NAT
- WPA3* encryption ensuring user data security

Cloud Monitoring Service

- Support Private IoT cloud and proprietary ThingsMaster OTA cloud service
- Interactive monitoring dashboard and map shows the status, signal strength*, location etc.
- Optional to support Amazon AWS & Microsoft Azure cloud service*

Slim & Rugged Design for Industrial IoT Application

- Slim size Din-Rail mounting design
- Dual 24VDC Power input with 9.6~50V range
- Dual Digital Input for monitoring sensor
- Power Input 802.3at/af PD by Industrial PoE switch as a complete wire/wireless solution.
- IP40 Enclosure design
- Effective heat dissipation design for operating in -40~70°C environments

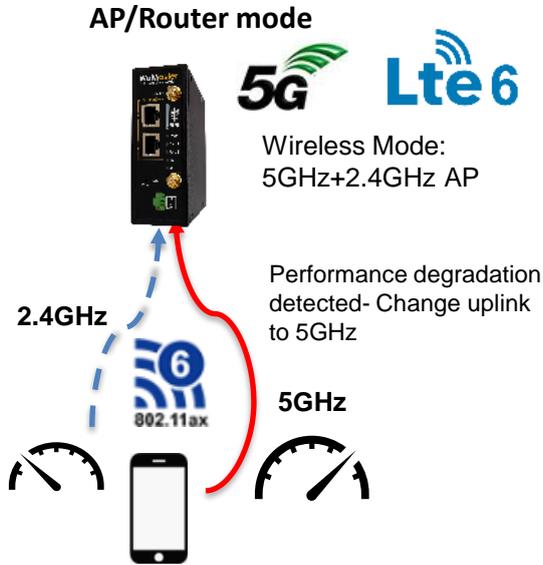


✓ Dual Band Dual Concurrent

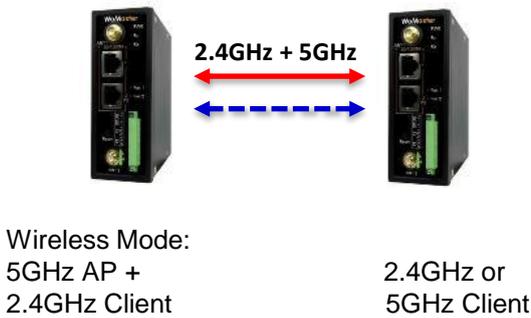
- IEEE 802.11ax, compatible with 802.11ac/n/g/b/a
- Dual Band Dual Concurrent (DBDC) 2.4G+5GHz radio, up to 1200Mbps + 574Mbps Bandwidth
- Failsafe in either 2.4GHz or 5GHz Radio failed
- Dual 2.4G+5GHz Radios consolidated in One Antenna
- Supports Wireless AP, Client modes

✓ Combines High Speed 5G / LTE6 Cellular WAN and WiFi 6 Wireless LAN

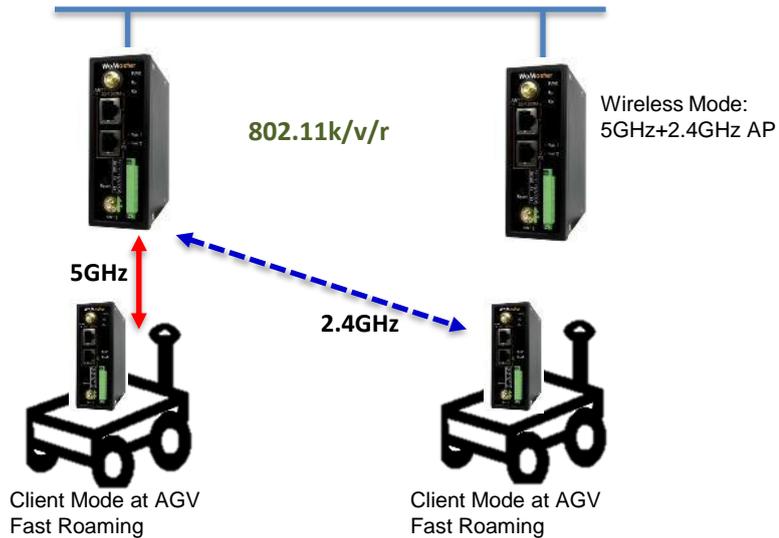
The **WA512G-AX-5GM2-D** seamlessly integrates **5G NR** or **LTE 6** cellular WAN connectivity with **WiFi 6** wireless LAN technology. Its advanced dual-network capability delivers ultra-low latency, high-speed internet access, and robust network coverage, making it ideal for mission-critical applications in industrial automation, transportation, and remote monitoring.



AP to Client Device



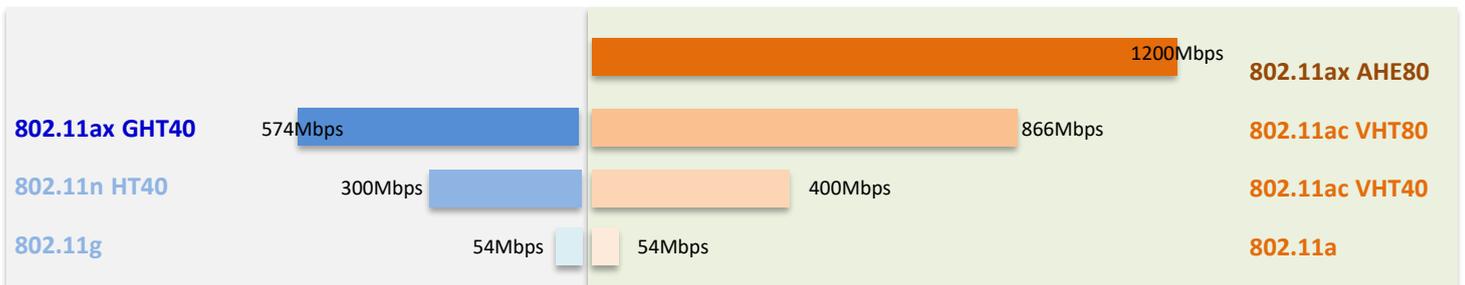
AP to Multi-Client Fast Roaming



Max. PHY Rate:

802.11ax 5GHz is **1.37** times than 802.11ac, 2.4GHz is **1.91** times than 802.11n.

802.11ax 5GHz+2.4GHz DBDC is **1.52** times than 5GHz 802.11ac + 2.4GHz 802.11n DBDC.



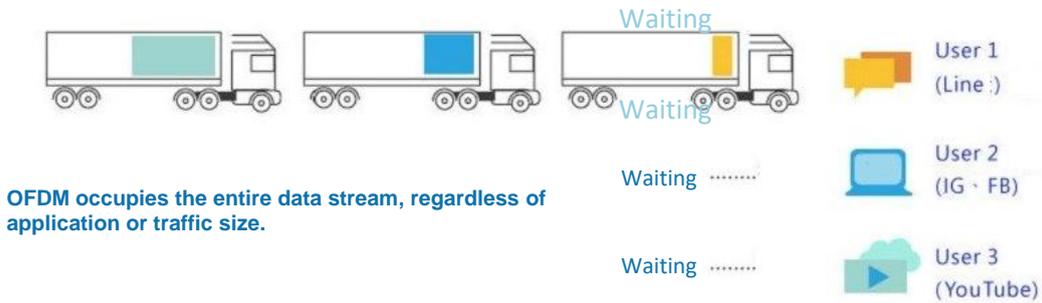
2.4GHz+5GHz

✓ **OFDMA**

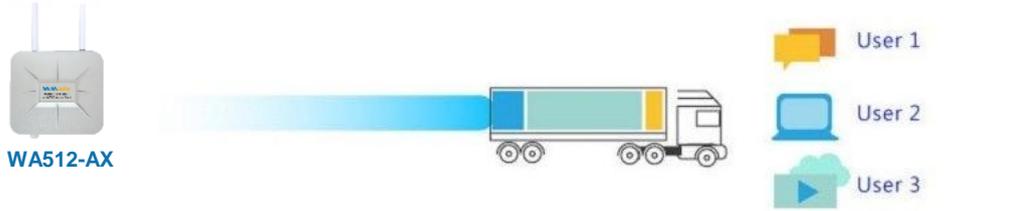
OFDMA is applied in Wi-Fi 6 (IEEE 802.11ax). It is a user access technology that allows spectrum to be simultaneously allocated to multiple users or devices, enabling the transmission of multiple data streams on the same frequency band, thereby enhancing network efficiency.

It can also be adjusted according to demand or priority, achieving more flexible network resource management. By dividing the spectrum into small subcarriers, OFDMA can also reduce interference between adjacent users, making the signal more reliable and stable. This is one of the latest key technologies in Wi-Fi 6.

OFDM



OFDMA



(Source: Qualcomm, will update soon)

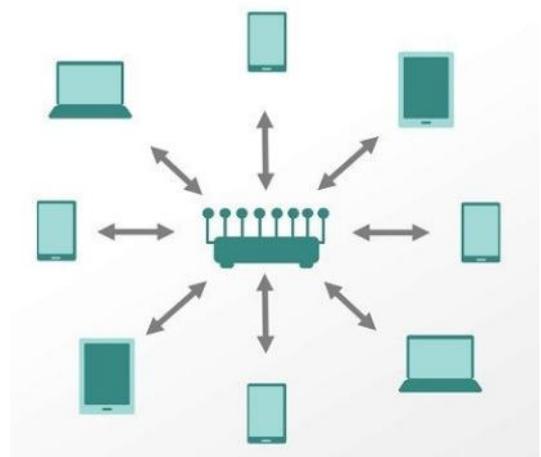
✓ **Downlink & Uplink MU-MIMO**

In 802.11ac, basic Downlink MU-MIMO was introduced, allowing wireless access points (such as routers) to simultaneously transmit data to multiple client devices.

However, in Wi-Fi 6, MU-MIMO technology has been further developed to communicate simultaneously with multiple devices in both the Downlink and Uplink directions.

This means that whether sending data from the access point to devices or from devices to the access point, multiple device data streams can be processed simultaneously.

This enables faster and more reliable wireless connections, while also improving network throughput and efficiency..



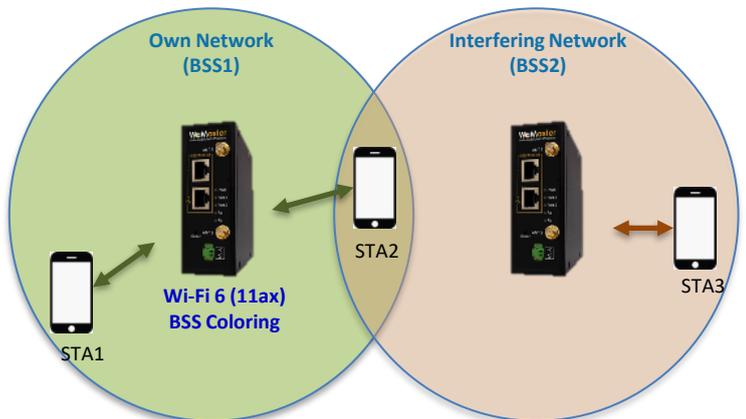
(Source: Qualcomm, will update soon)

✓ **BSS Coloring**

BSS Coloring is a feature introduced in the 802.11ax Wi-Fi standard, which helps reduce interference from neighboring Access Points (APs) and improves coexistence between multiple APs.

The basic idea behind BSS Coloring is that each BSS or AP is assigned a unique color, which is added to the preamble of each transmitted data packet. When a client device receives a packet, it can check the color of the received preamble and use this information to differentiate signals from different APs.

BSS Coloring helps prevent unnecessary retransmissions and conflicts caused by neighboring networks, thereby improving overall network efficiency and potentially extending the available range of IoT devices.

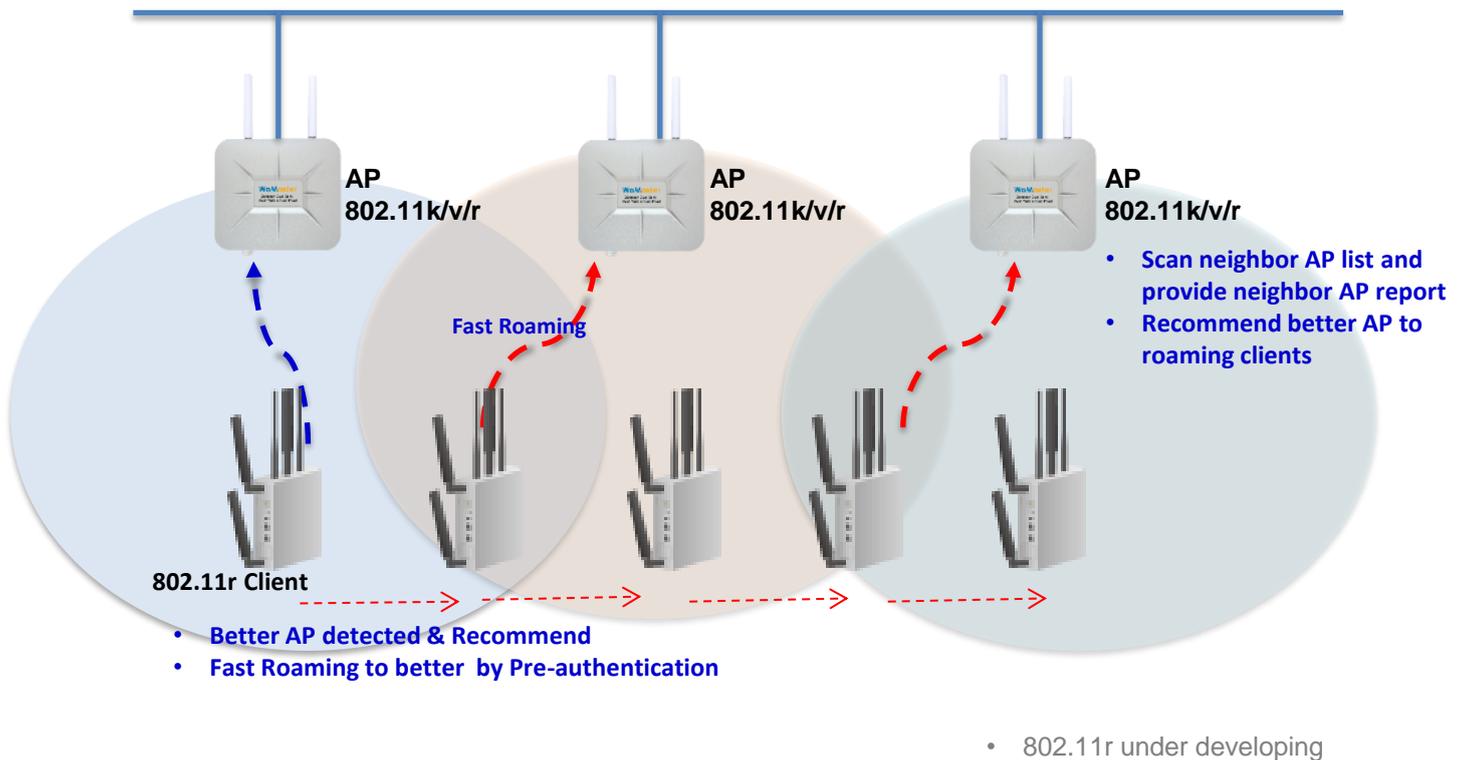


Each AP is assigned a unique color. STA2 can check the color to reduce interfering...



✓ 802.11k/v/r Fast Roaming Technology

- **Radio Resource Management (802.11k):** 802.11k enhances network efficiency by enabling devices to gather information about neighboring APs. This data allows devices to make informed decisions when selecting the best AP for connection, improving overall network performance and user experience.
- **Network Assisted Roaming (802.11v):** 802.11v allows the network to assist devices in making better roaming decisions. The APs can communicate with the client devices to steer them toward the most optimal AP. This helps maintain a balanced network and ensures consistent performance.
- **Fast Roaming (802.11r):** This standard enables mobile devices to transition rapidly from one access point (AP) to another within a network without requiring full re-authentication. This fast roaming capability ensures a seamless experience as users move around, reducing connection interruptions and maintaining continuous network access.
- **Seamless Switching (802.11r):** By minimizing re-authentication requirements, 802.11r provides a seamless roaming experience. Users can automatically connect to APs with stronger signals or better quality as they move, without the need to manually reconnect or re-enter credentials.
- **Pre-authentication (802.11r):** Before actual movement occurs, mobile devices can pre-authenticate to potential target APs, enabling quick switching to the AP when needed, further reducing connection interruption time during the handoff process.



✓ Discover & Configuring by ViewMaster Utility

- Discovery & Configuring IP Address
 1. Select the Network Interface Card
 2. Auto discovery
 3. One AP: Change IP, DHCP Client Enable
Multi-AP: Auto Assign IP, DHCP Client Enable
- Firmware Upgrade
- Configuration Backup/Restore
- Open Web GUI
- Reboot





Interfaces

WA512G-AX-D-M2 WA512G-AX-D

Optional Antenna 3/4 (Top)

Dual SIM
• Dual SIM Tray

GbE Ethernet 1
• 2-port 10/100/1000M RJ45
• WAN/LAN configurable

GbE Ethernet 2 /PD Input
• 802.3at PD PoE Ethernet
• 10/100/1000M RJ45

Reset to Default

Optional Antenna 5/6 (5GNR only)

Chassis Ground

DI and DC Input Terminal block
• 2 x Digital Input
• 2 x DC Power Input

Antenna 1
• 2.4G+5GHz Dual Concurrent Bands
• WLAN-Main

System LED
• 1 x Power
• 2 x Radio LED (Ra/Rb)
• 2 x Ethernet Port

DIN Clip(Back)

Antenna 2
• 2.4G+5GHz Dual Concurrent Bands
• WLAN-Diversity

	WA512G-AX-D/ WA512G-AX-D-M2
Ant 1	WLAN-Main 2.4+5G Dual Band
Ant 2	WLAN-Diversity 2.4+5G Dual Band

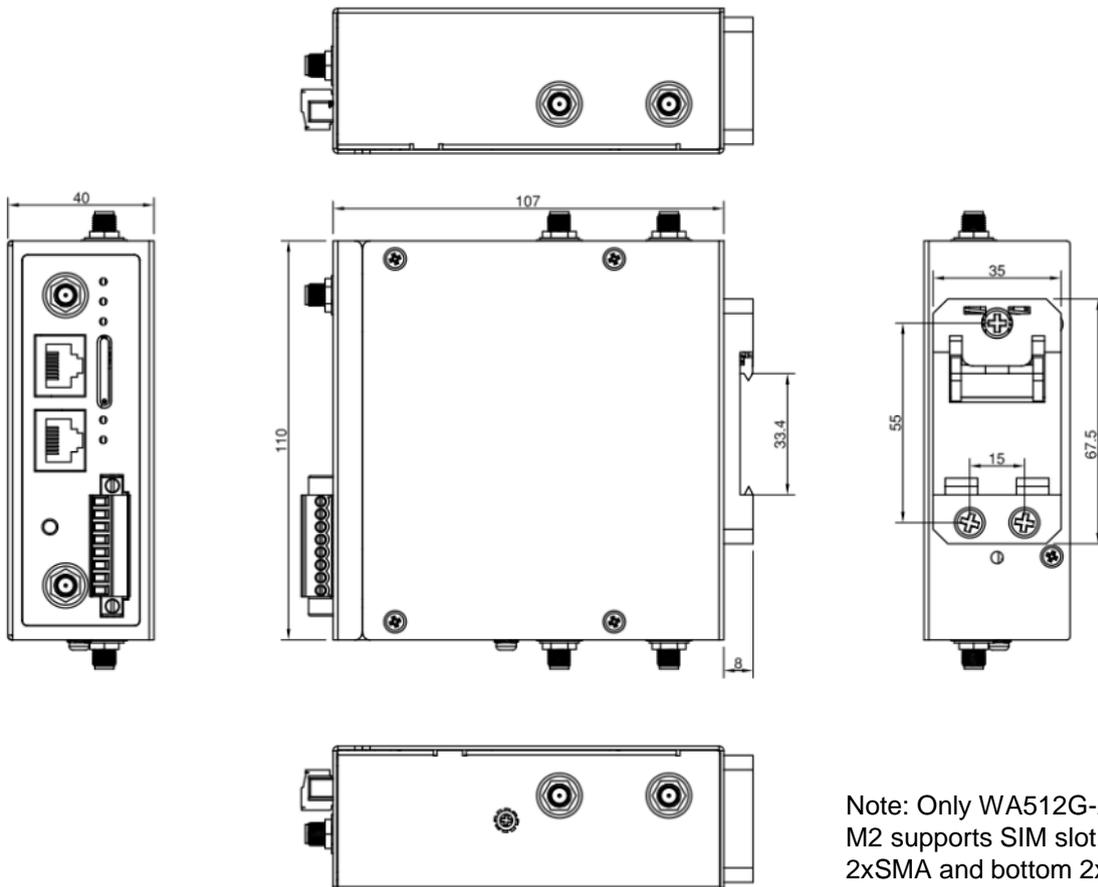
	WA512G-AX-D-M2
Ant 3	LTE6-Main/ 5GNR
Ant 4	LTE6-Div./ 5GNR
Ant 5	5GNR
Ant 6	5GNR

Note: Ant. 3/4/5/6 SMA and RF Cable are pre-assembled. User must connect to the correct antenna pin-count on the 5GNR/LTE module.



Dimensions

(mm)



Technology	
Standard	IEEE 802.11ax wireless local area network (WLAN), Backward support 802.11ac/n/g/b/a Wireless LAN
	IEEE 802.3 10Base-T Ethernet
	IEEE 802.3u 100Base-TX Fast Ethernet
	IEEE 802.3ab 1000Base-T Gigabit Ethernet Copper
	IEEE 802.3af PoE
Interface	
Ethernet Port	2 x 10/100/1000MBase-T RJ45, Auto Negotiation, Auto-MDI/MDIX 1x802.3at/af PD compliant, Bridge/Router mode Bridge Mode: 1: LAN, 2/PD: LAN, Router Mode: 1: LAN, 2/PD: WAN
System LED	1x PWR: Green On 2 x Ethernet Ports: Link: Green On, Activity: Green Blinking RF LED in AP/Client mode: 1x Ra (2.4GHz): AP mode: Green On, Station mode connected: Green Blinking, Station mode/radio disable: Off 1x Rb (5GHz): AP mode: Green On, Station mode connected: Green Blinking, Station mode/radio disable: Off
Reset	System Reset(2~6 Seconds) / Default Settings Reset(over 7 Seconds)
SMA Socket	2x RP-SMA Female for WLAN: Dual 2.4G+5GHz Radio in One Antenna
Power Input and Digital Input	8-pin Terminal block with screw 4 pin for Dual Power Input: V+,V-,V+,V- 4 Pins for DI with isolation High: DC 2~30V Low: DC 0~1V
WA512G-AX-D-M2	Internal M.2 Socket for Expansion Dual-SIM Tray 4x additional SMA connectors (2 on top and 2 on bottom), depends on the selected cellular module
Power Requirement	
Power Input	Terminal Block : Dual 24VDC Input, Range: 9.6~50VDC 802.3at/af PD: 44~57VDC
Power Consumption	10W full traffic, suggest to reserve 15% tolerance
WLAN Properties	
Processor	Quad-Core ARM A53 1.2GHz CPU
Standard	IEEE 802.11ax/ac/n/a 5GHz and IEEE 802.11ax/n/g/b 2.4GHz, also known as Wi-Fi 6 802.11ax: OFDMA, OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM)
Frequency	ISM Band, 2.4GHz: 2.412GHz ~ 2.472GHz 5GHz: 5.180MHz ~ 5.240MHz, 5.745 ~ 5.825MHz(CE: Band 1, FCC: Band 1, 4)
Operation Channel	Channel Bandwidth: 20MHz, 40MHz, 80MHz 2.4GHz: Europe ETSI: CH1~13, US/FCC: CH1~11 5GHz Non-DFS: Band 1: 36, 40, 44, 48, Band 4: 149,153,157,161,165 5GHz DFS support by request. *5GHz channel and DFS may difference in different countries.
Data Rate	802.11ax 5GHz: MCS0 ~ MCS11 max. 1200Mbps, 802.11ax 2.4GHz: MCS0 ~ 9, max. 574Mbps, 802.11ac 5GHz: MCS0 ~ 9, max. 866Mbps, 802.11n 2.4GHz: MCS0 ~ 7, max. 300Mbps 802.11a 5GHz/11g 2.4GHz: max. 54Mbps
MU-MIMO	2.4/5GHz: 2T2R Downlink & Uplink MU-MIMO DBDC (Dual Band Dual Concurrent) 2x SMA connector for simultaneous dual bands concurrent
Max. E.I.R.P.	≤20db/≤23db, compliant with CE 2.4G/5G request Check other detail TX/RX information in User Manual
WLAN Antenna	
WLAN Default Antenna A-WLAN-3-RSM	Frequency: 2400~2500/ 4900~5900 MHz
	Peak Gain: 2.4GHz: 1.92dBi@2450MHz, 5GHz: 3.4dBi@5150MHz
	Direction: Omni
	Connector: RP SMA Male
	Dimension: 196xΦ13 mm

Cellular Properties		Expansion 5G NR M2 Module	
5G NR-EU (WM-5G NR-M2S-E)		5G NR: n1/n3/n28/n77/n78/n79 LTE FDD: B1/B3/B5/B7/B8/B20/B28 LTE TDD: B34/B38/B39/B40/B41/B42 WCDMA: B1/B5/B8 GSM/GPRS/EDGE: L1+L5 Dual SIM supported	
5G NR-GL (WM-5G NR-M2S-G/ WM-5G NR-M2Q-G)		5G/4G/3G Multi-mode, 3GPP Rel.15, LTE Cat.16 5G NR: n1/n2/n3/n5/n7/n8/n12/n20/n28/n38/n40/n41/n48*/n66/n71/n77/n78/n79 LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66/B71 LTE TDD: B34/B38/39/B40/B41/B42/B48 LTE LAA: B46 WCDMA: B1/B2/B3/B4/B5/B8 GNSS: GP/GLONASS/BeiDou(Compass)/Galileo	
		*For other frequency bands not listed, please inquire with our sales. *Not every module support dual SIM card. Some may support one physical SIM plus one e-SIM, please check with our technical support or sales.	
Cellular Properties		4G LTE Cat.6 M2 Module	
Band Info: LTE-G (LTE Cat.6, Model with SIM6600)		LTE Cat.6, M.2 form factor, 2xCA, Dual SIM Dual Standby LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66/B71 LTE-TDD: B34/B38/B39/B40/B41 WCDMA: B1/B2/B4/B5/B8	
		*For LTE Cat.6 region, frequency bands not listed above, we can customize it as needed, please inquire with our sales team. *The router supports M.2-format LTE Cat.6, but not every modules support dual SIM dual standby. If you prefer a different module, please inquire with our sales team.	
Default Antenna			
5G NR Antenna for 5G radio (A-5G NR-5-SM)		Frequency: 700~5000 MHz	
		Gain: 4.12dBi @ 3500MHz 690~960MHz: 0.73~3.04dBi, 1700~1900MHz: 2.2~3.11dBi, 3300~3800MHz: 4.12~5.95dBi, 4000~5000MHz: 3.16~5.97dBi	
		Direction: Omni	
		Connector: SMA Male	
		Dimension: 220x27mmΦ13mm	
LTE Antenna for 4G Radio (A-LTE-2-SM)		Frequency: 690~960/1710~2700 MHz	
		Peak Gain: 3.15dBi 690MHz: 1.36dBi, 960MHz: 1.37dBi, 1710MHz: 3.12dBi, 1800MHz: 1.29dBi 1900MHz: 2.63dBi, 2100MHz: 1.47dBi, 2170MHz: 1.14dBi, 2500MHz: 3.15dBi 2600MHz: 2.46dBi, 2700MHz: 1.89dBi	
		Direction: Omni	
		Connector: SMA Male	
		Dimension: 158x17.6xΦ13 mm	
Optional GNSS/GPS Antenna for 4G Models (Optional Accessory- A-GPS-27-RSM-3M)		Frequency range: 1561~1615MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi	

*5G NR / 4G LTE Module supports M.2 format, the module can be replaced according to customer regional requirements.

*The location/meaning of 5G NR/4G antenna may be different in different module/regions. Please check the user manual for detail.

*The 5G/4G antennas are included as standard accessories. For larger projects that do not require antennas, we can remove them from the packaging. Please contact our sales team for more details.

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)
Traffic Management	Traffic shaping, Flow Control*
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)
Advanced Security	TACACS+*, Multi-user authentication
Time Management	NTP, SNTP
WAN/Routing/NAT/Firewall/VPN	Routing: RIPv2, OSPFv2 NAT: 1-1 NAT, NAPT(SNAT/DNAT), Port Forwarding, DMZ Firewall: Stateful Inspection firewall, DMZ, IP/Port Filter, MAC ACL VPN: IPsec, OpenVPN, L2TP, PPTP*, GRE*, >150Mbps IPsec Performance @256-bit encryption
Fast Roaming	802.11k/v/r*
IIoT Industrial Protocol	MQTTs
Private Cloud	ThingMaster OTA
MIB	MIB-II, WoMaster Private MIB*
Utility	ViewMaster, NetMaster, Ping, Traceroute
WLAN Configuration	WLAN Basic Settings: Radio on/off, Wireless AP/Client mode, 802.11ax/ac/n/g/b mode, Band and Frequency selection, SSID/Multi-SSID configuration, SSID broadcast and advanced WLAN settings
Cellular Configuration (Model with Cellular)	Radio on/off, Cellular Mode Setup, Dual SIM , SIM Security, Connection Status, GPS positioning*, Cellular Time, Cellular to WAN Redundancy (WA512GM-D-M2 Series with Expansion Cellular Module)
MESH Wi-Fi * (Model with MESH)	Qualcomm® Wi-Fi SON Technology, Self-healing by auto rerouting through multi-hop, Mesh SSID/WPA PSK, Mesh status (signal/channel/uplink)* Self-configuring Plug-and-play via ViewMaster,
Mechanical	
Installation	DIN Rail
Enclosure Material	Steel Metal
Dimension	40 x 110 x 107 mm(W x H x D) / without DIN Rail Clip
Ingress Protection	IP40
Weight	660g
Environmental	
Operating Temperature & Humidity	-40°C~70°C (WA512G-AX-D, WA512G-AX-D-M2 DC Input) *40°C~60°C (WA512G-AX-D-M2 with Cellular 5G NR Module, PD input) 5%~95% Non-Condensing Note: Power the device by Industrial PoE Switch for high temperature environment. Note: When plugging in the 5G NR M2 module, it is recommended to use DC input due to higher power requirements.
Storage Temperature	-40°C~85°C
MTBF	>200,000 hours at 40° full cycle
Warranty	3 years
Approval	
CE	CE RED Compliance Safety: IEC/EN 62368-1 EN 301 489-1/17/52(WA512G-AX-D-M2) EN 300 328/ EN 301 893/ EN 300 400(B4) EN 62311 MPE
FCC	Part 15B *FCC Part 15C (15.247) (Pending) *FCC Part 15E (15.407): B1,B4 (Pending)



Ordering Information

Model Name	Description
WA512G-AX-D	Industrial 802.11ax Din-Rail Dual Radio 2.4+5GHz Concurrent Wireless AP/Router, 802.11ax WLAN, 2GE, Din-Rail, Dual 24VDC+802.3at PD
WA512G-AX-D-M2	Industrial Din-Rail 802.11ax+Cellular Wireless Router, 2.4G+5GHz 802.11ax, 2GE, 24VDC+802.3at PD, M2 socket
WA512G-AX-D-LTE6-G	Industrial Din-Rail 802.11ax+Cellular Wireless Router, 2.4G+5GHz 802.11ax, 2GE, 24VDC+802.3at PD, M2 socket, LTE6-G
WA512G-AX-D-5GM2-(Region)	Industrial Din-Rail 802.11ax+Cellular Wireless Router, 2.4G+5GHz 802.11ax, 2GE, 24VDC+802.3at PD, M2 socket, 5GNR-(Region)
Package List	
1 x Product Unit	
1 x Quick Installation Guide	
2 x WLAN Antenna, White Model with 5GNR: 4x5GNR Antenna, Black Model with LTE6: 2x LTE Antenna, Black	
1 x Attached Din Clip	

***Model with 5GNR/LTE6:** The router supports 5GNR/LTE6 module, it can be pre-installed by need before shipping. Refer to below list or contact our sales.

WA512G-AX-D-5GM2-(Region): 5GM2-EU for European, 5GM2-GL for Global bands

WA512G-AX-D-LTE6-(Region): LTE6-G for Global Band

Expansion Module Kit	
WM-5GNR-M2S-E Kit	Wireless 5GNR M2 Module Kit, 5GNR Module, Heat Pad, 4xAntennas, Screws, EU Bands
WM-5GNR-M2S-G Kit	Wireless 5GNR M2 Module Kit, 5GNR Module, Heat Pad, 4xAntennas, Screws, Global Bands
WM-LTE6-M2S-G Kit	Wireless LTE6 M2 Module kit, LTE Cat6 Module, Heat Pad, 2xAntennas, Screws, Global Bands



Product Series

Outdoor Model	Description
WA512G-AX-IP67-U	Industrial Dual Radio 2.4G +5GHz Concurrent Wi-Fi 6 Wireless AP, 802.11ax WLAN, 2GE, USB, IP67 Enclosure, US-plug
WA512G-AX-IP67-E	Industrial Dual Radio 2.4G +5GHz Concurrent Wi-Fi 6 Wireless AP, 802.11ax WLAN, 2GE, USB, IP67 Enclosure, EU-plug
WA512G-AX-4N-IP67-U	Industrial Dual Radio 2.4G +5GHz 2T2R Wi-Fi 6 Wireless AP, 802.11ax WLAN, 2GE, USB, 4 N-Type Antenna, IP67 Enclosure, US-plug
WA512G-AX-4N-IP67-E	Industrial Dual Radio 2.4G +5GHz 2T2R Wi-Fi 6 Wireless AP, 802.11ax WLAN, 2GE, USB, 4 N-Type Antenna, IP67 Enclosure, EU-plug

WA512G-AX-IP67	WA512G-AX-D	WA512G-AX-D-M2
		
269 x 239 x 81mm (W x H x D) IP67 Enclosure, -40-70°C	40 x 110 x 107 mm(W x H x D) Din-Rail Mount, -40-70°C	40 x 110 x 107 mm(W x H x D) Din-Rail Mount, -40-70°C