Industrial Din-Rail Ruggedized 802.11AX Fast Roaming WiFi 6 Wireless AP/Router

WA512G-AX-D

Industrial Din-Rail 802.11AX WiFi 6 AP/Router

The WA512G-AX-D is a dual-band, concurrent Wi-Fi 6 access point/router designed with industrial-grade features such as dual 24V power input, dual digital input, and DIN-rail mounting. It integrates a quad-core 1.2GHz ARM processor for high performance, supporting both 5GHz and 2.4GHz 802.11ax WLAN radios, backward compatible with 802.11ac/n standards. This allows for data transfer rates of up to 1200Mbps (5GHz) and 574Mbps (2.4GHz). Wi-Fi 6 technology in the WA512G-AX-D enables features like OFDMA, BSS coloring, DL and UL MU-MIMO, and TWT for superior efficiency and performance. It also supports fast roaming protocols such as 802.11k, 802.11v, and 802.11r, ensuring smooth handovers without re-authentication. On the security front, the router provides advanced protection with Firewall, OpenVPN, IPSec, and L2TP. Its rugged design, including a compact enclosure, DIN-rail mounting, an operational temperature range of -40˚C to 70˚C, and support for dual 24V and PoE power inputs, makes it ideal for field network applications like Automatic Guided Vehicles (AGVs) and small cabinets.

802.11ax | 802.11k/v/r Fast Roaming | VPN | IEC61000-6-2 IEC61000-6-4 | -40~70 °C | PoE+ 24VDCx2 | ViewMaster NetMaster

Features & Benefits

Dual Bands Wi-Fi 6 Wireless LAN

- Quad-Core 1.2GHz 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) and TWT, 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
- Max. 128 Wireless Clients

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*

Qualcomm® Wi-Fi SON Technology *(WA512GM-AX-D)

- Self-Healing auto rerouting through multi-hop
- Self-Configuring Plug-and-play via Wireless network with ViewMaster utility
- Easy MESH setup and Group MESH setup
- MESH Network Status Monitoring
- Autonomous performance optimization
- Interference management via band steering
- Seamless roaming

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

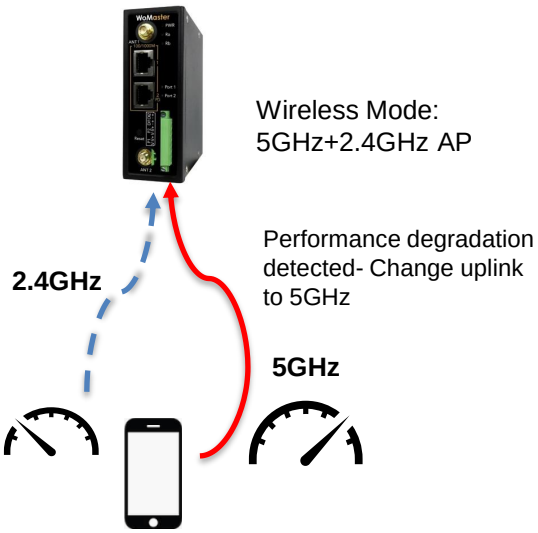
Slim & Rugged Design for Industrial IoT Application

- 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 ~70ºC environments

✓ Dual Band Dual Concurrent

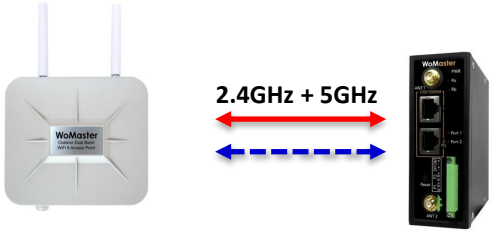
- IEEE 802.11ax, compatible with 802.11ac/n/g/b/a
- Dual Band Dual Concurrent (DBDC) 2.4G+5GHz radio, up to 1200Mbps + 574Mbps Bandwidth
- Failsafe in either 2.4GHz or 5GHz Radio failed
- Dual 2.4G+5GHz Radios consolidated in One Antenna
- Supports Wireless AP, Client modes

AP/Router mode



Model	WA512G-D	WA512G-AX-D
Processor	Quad-core 700MHz	**Quad-core 1.2GHz**
Standard	802.11ac/n	**802.11ax**
Frequency	5GHz 802.11ac + 2.4GHz 11n	**5GHz+2.4GHz 802.11ax**
Max. Rate	866Mbps+ 300Mbps	**1200Mbps + 574Mbps**
DBDC	DBDC	**DBDC**
MIMO	DL MIMO	**UL+DL MIMO**
PHY	QAM 256	**QAM 1024**
Modulation	OFDM	**OFDMA**
Bandwidth	20/40/80	**20/40/80**
BSS	-	**BSS Coloring**
TWT time	-	**Yes**
MESH	Wi-Fi SON	**- (by request)**
Roaming	WOM Fast Roaming	**802.11r Fast Roaming 802.11k/v**

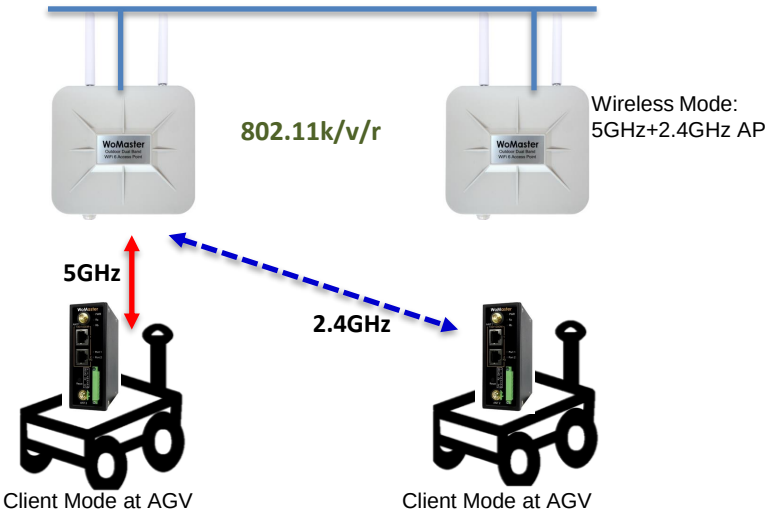
AP to Client Device



Wireless Mode:
5GHz AP +
2.4GHz Client

2.4GHz or
5GHz Client

AP to Multi-Client Fast Roaming

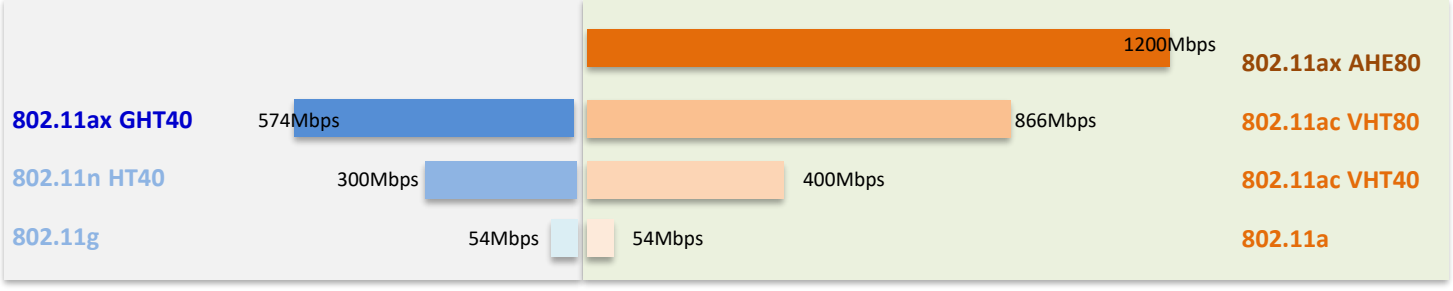


Client Mode at AGV
Fast Roaming*

Client Mode at AGV
Fast Roaming*

Max. PHY Rate:

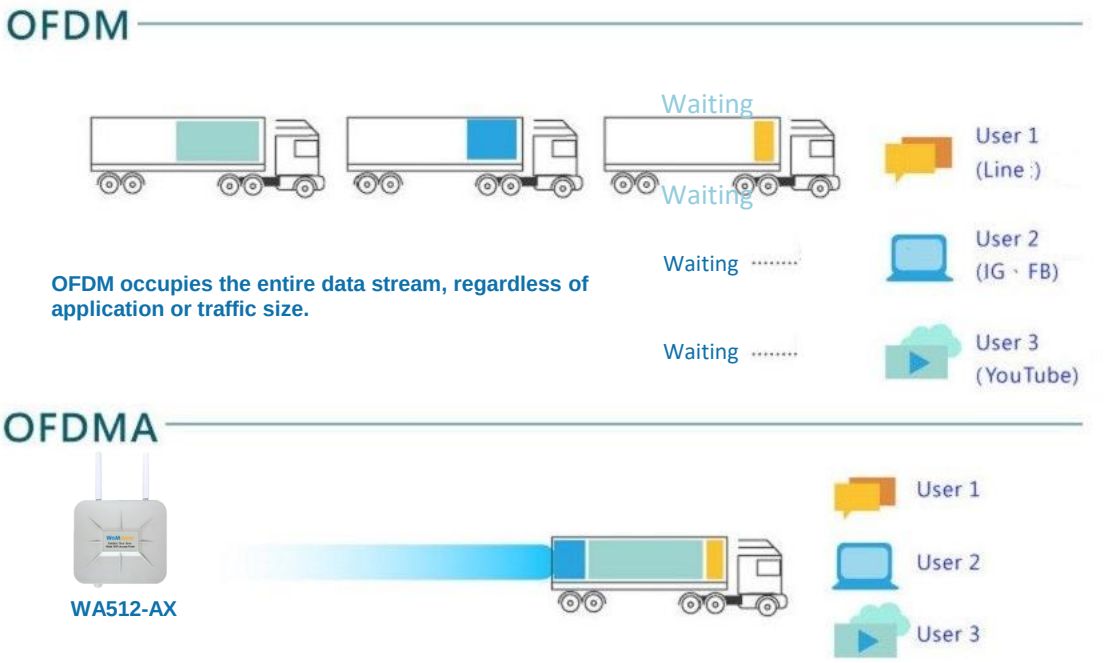
802.11ax 5GHz is **1.37** times higher than 802.11ac, 2.4GHz is **1.91** times higher than 802.11n.
802.11ax 5GHz+2.4GHz DBDC is **1.52** times higher than 5GHz 802.11ac + 2.4GHz 802.11n DBDC.



✓ 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.



(Source: Qualcomm, will update soon)

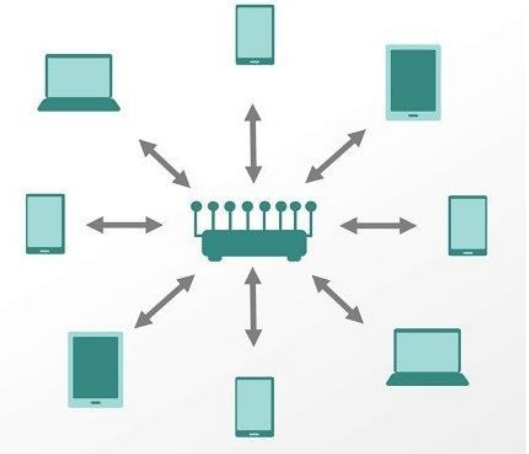
✓ Downlink & Uplink MU-MIMO

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..



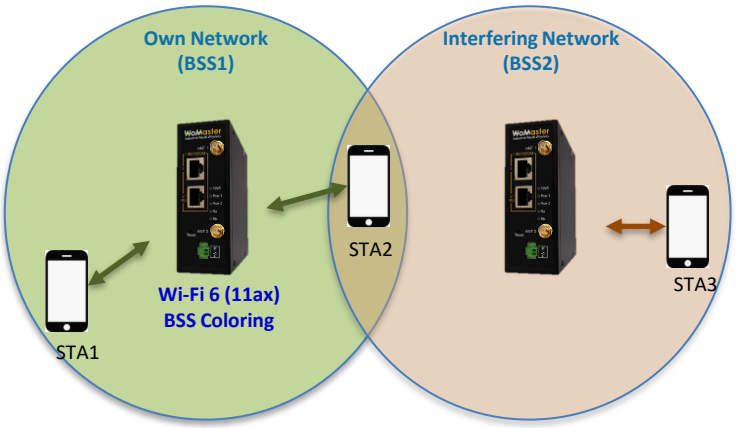
(Source: Qualcomm, will update soon)

✓ 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.

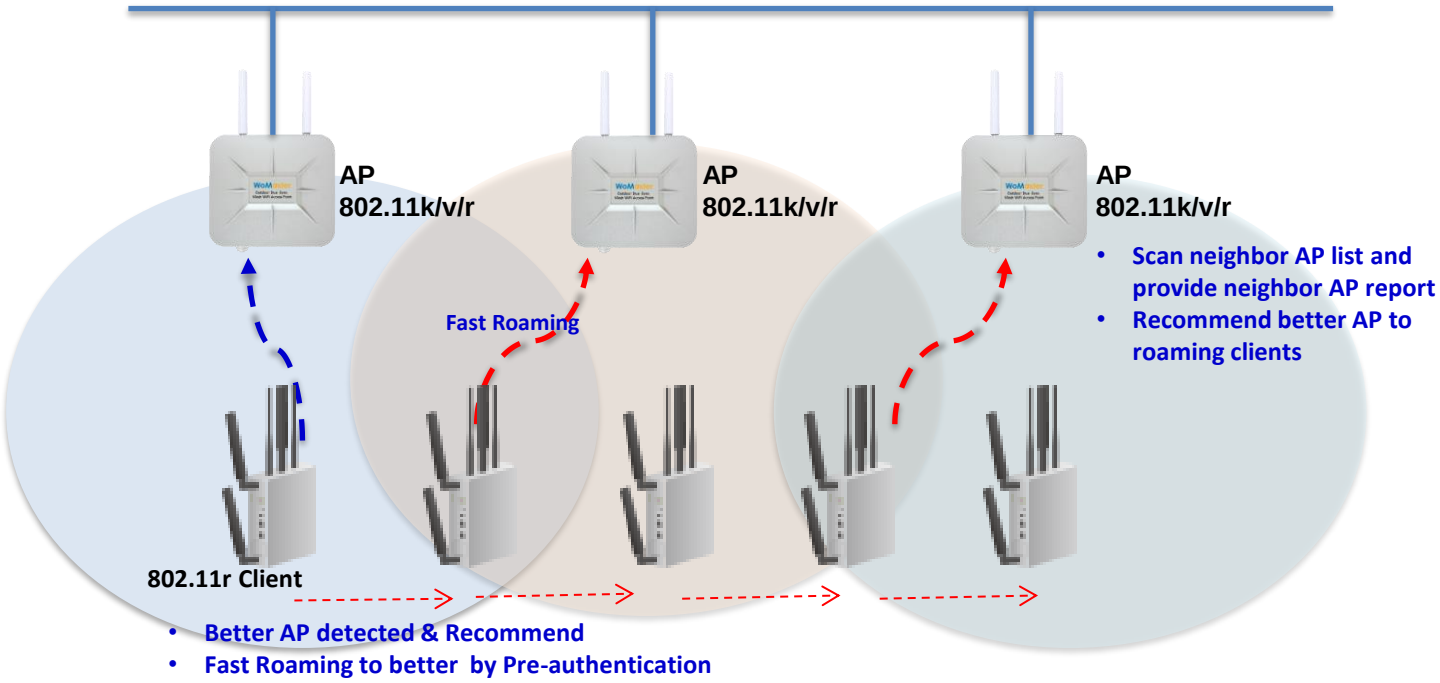
BSS Coloring helps prevent unnecessary retransmissions and conflicts caused by neighboring networks, thereby improving overall network efficiency and potentially extending the available range of IoT devices.



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

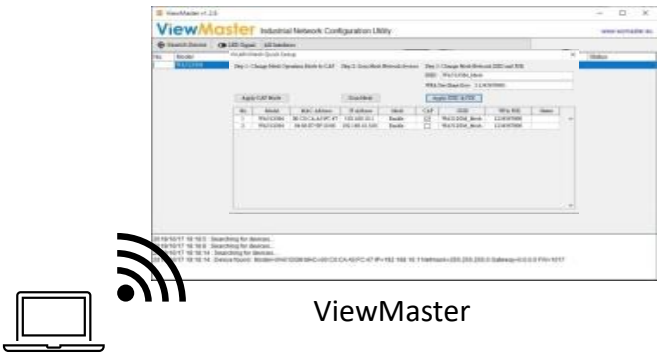
✓ 802.11k/v/r Fast Roaming Technology

- **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.



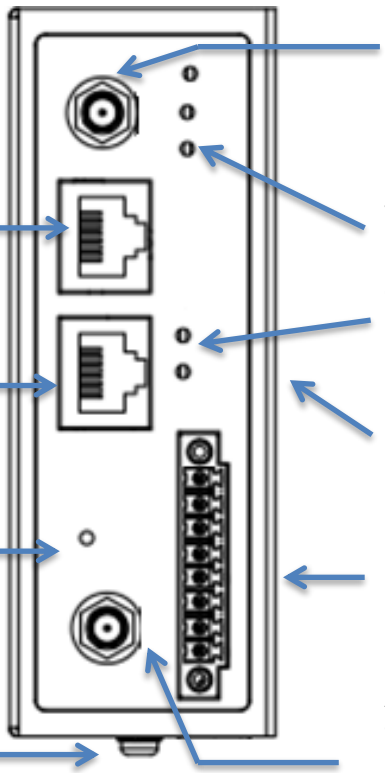
✓ Discover & Configuring by ViewMaster Utility

- 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



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

GbE Ethernet 1
- 2-port 10/100/1000M RJ45

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

GbE Ethernet 2 /PD Input
- 802.3af PD PoE Ethernet
- 10/100/1000M RJ45
- WAN/LAN configurable

DIN Clip(Back)

Reset to Default

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

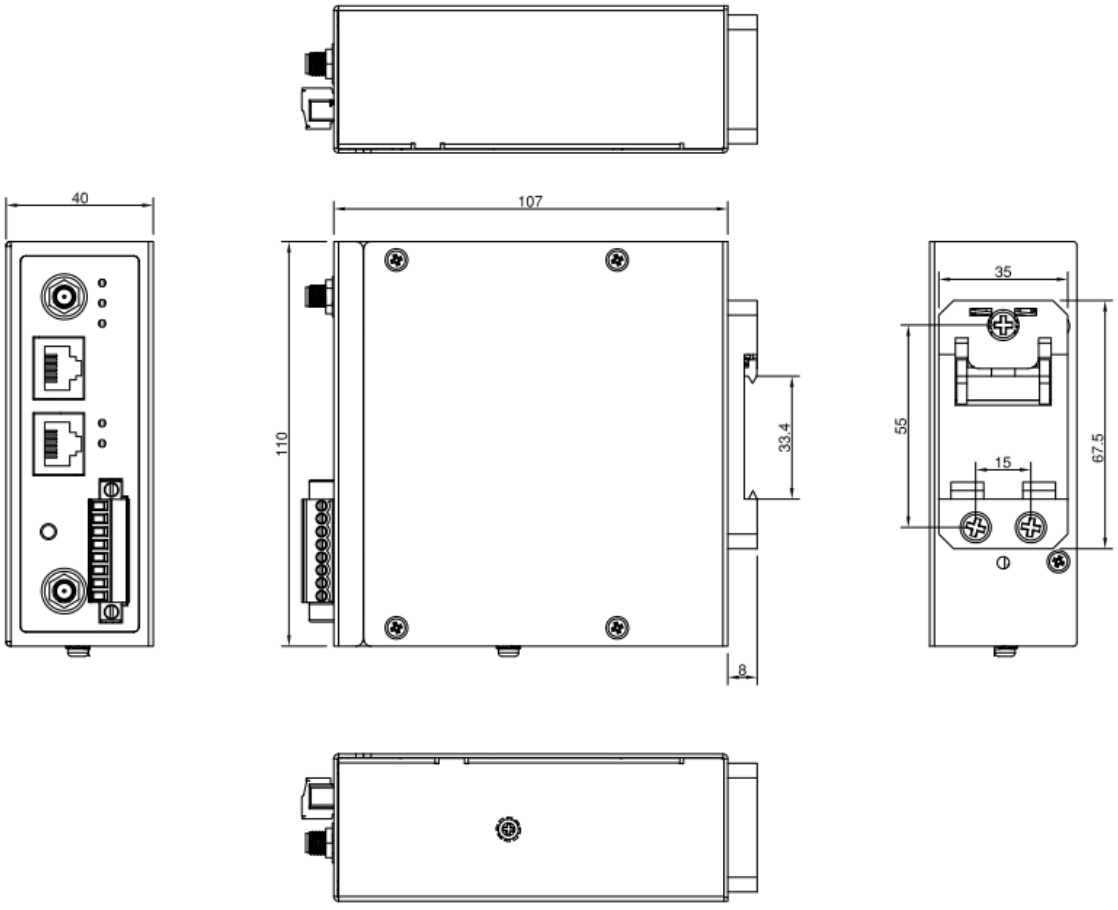
Chassis Ground

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

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

Dimensions

WA512G-AX-D



(mm)

Specifications

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: Dual WLAN 2.4GHz + 5GHz: Green ON Single WLAN 2.4GHz or 5GHz: Green Blinking disable: Off 1x Rb: Cellular (reserved)
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
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 2.4GGHz, 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

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, WPA3)
Advanced Security	TACACS+*, Mutli-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, GRE*, >150Mbps IPSec Performance @256-bit encryption Wireless WAN for LAN to Wireless WAN NAT
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
MESH Wi-Fi * (WA512GM-AX-D)	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 (PD mode) 5%~95% Non- Condensing Note: Power the device by Industrial PoE Switch for high temperature environment.
Storage Temperature	-40˚C~85˚C
MTBF	>200,000 hours at 40º full cycle
Warranty	3 years
Approval	
CE	CE RED Compliance Safety: IEC/EN 62368-1 EN 301 489-1/17 EN 300 328/ EN 301 893/ EN 300 400(B4/DFS by request) EN 62311 MPE

*By Request/Future Release

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
WA512GM-AX-D*	Industrial 802.11ax Din-Rail Dual Radio 2.4+5GHz Concurrent Wireless Mesh AP, 802.11ax WLAN, 2GE, Din-Rail, 24VDC TB
WA512G-AX-D-M2*	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, M2 socket for 5GNR
	Package List
	1 x Product Unit
	2 x WLAN Antenna, White A-WLAN-3-RSM
	1 x Quick Installation Guide
	1 x Attached Din Clip

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
WA512GM-AX-IP67-U	Industrial Dual Radio 2.4G +5GHz Concurrent Wi-Fi 6 Wireless MESH AP, 802.11ax WLAN, 2GE, USB, IP67 Enclosure, US-plug
WA512GM-AX-IP67-E	Industrial Dual Radio 2.4G +5GHz Concurrent Wi-Fi 6 Wireless MESH AP, 802.11ax WLAN, 2GE, USB, IP67 Enclosure, EU-plug

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