



Airvine WaveCore™

Installation Guide



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TABLE OF CONTENTS

Regulatory & Safety Information.....	4
Important Safety Warnings.....	4
US and Canada Restrictions	4
Symbols on Equipment or Documentation	5
System Overview and Introduction	6
WaveCore Deployment Scenarios	7
Connecting Wirelessly Through Walls and Ceilings.....	7
WaveCore Models.....	8
Node Types – Controller Node and Subordinate Node	8
WaveCore Key System Features – Back Side of Unit	9
WaveCore Key System Features – Front Side of Unit.....	10
WaveCore Key System Features – Top Side of Unit.....	11
Key Specifications – Model 1000RH	12
Electrical and Mechanical Interfaces	13
Ethernet RJ45 Interface LEDs.....	14
External System LEDs.....	15
WaveCore System Accessories	17
Short Mounting Bracket Kit (ACC-220S)	17
Optional Long Mounting Bracket Kit (ACC-220L).....	18
Optional AC/DC Power Adapter (ACC-PS-ACDC-XX00)	19
Optional PoE Injector (ACC-POE-10G-XX00)	20
Device Installation	21
Step 1: Plan for Installation.....	21
Calculate Link Performance	22
Determine which Mounting Brackets are Needed (short or long).....	23
Determine how each device will be powered and connected to its network	24
Step 2: Pre-Staging / Pre-Configuring the Unit.....	25
Step 3: Mount the equipment and align the antenna.....	27
Mount the Controller Node	27
Mount the Subordinate Node.....	28
Validate Radio Connection	29

Align Antennas	29
Installation Tips – Working Mounting Brackets	32
Attaching mounting brackets to a WaveCore Device	32
Removing Mounting Bracket Plastic Cover	36
Installation Tips – Powering and Connecting Units	37
Installation Power/Cabling Options – WaveCore Powered by AC Adapter	37
Installation Power/Cabling Options – WaveCore Powered by PoE Injector	37
Installation Power/Cabling Options – WaveCore with Redundant Power Sources (12V and PoE)..	38
Installation Power/Cabling Options – PoE Switch or Router	38
Installation Power/Cabling Options – Switch/Router with Optical Interface	39
Appendix A – VineManager HTTP GUI.....	40
Factory Default IP Address and User Login.....	40
Accessing the VineManager Web GUI	41
Logging Into VineManager	42
VineManager Graphical User Interface Overview.....	43
Appendix B – EIRP Limits by Country.....	44

Regulatory & Safety Information

For important regulatory compliance information for the WaveCore System, please refer to the **Airvine Regulatory and Safety Guide** which is available for download at www.airvine.com/support.

Important Safety Warnings

All products are intended to be installed, used, and maintained by experienced and trained professional personnel only.

When installing and using these products, safety precautions should always be carefully followed to reduce the risk of fire, electrical shock, injury to persons, and damage to the system.

Such safety precautions including the following:

- Read the installation instructions before using, installing, or connecting the system to the power source.
- Only skilled, instructed, and qualified personnel should be allowed to install, replace, or service this equipment. A skilled person has the relevant experience to be able to identify hazards and to take appropriate action to reduce risks of injury to themselves and others. An instructed person is one who is instructed or supervised by a skilled person regarding energy sources and who can responsibly use equipment and precautionary safeguards with respect to those energy sources. A qualified person includes those persons that have been certified by Airvine to install their products
- Devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation.
- Installation of these products in the end use environments must conform to all applicable national and local regulations and codes including all relevant electrical codes.
- Devices are to be used with and powered only by power sources that are either provided by Airvine or recommended by Airvine. Failure to properly power the unit, which includes using power sources that don't comply to the system's required input voltage or current ranges, or the use of unapproved power sources, or the failure to not properly connect the power sources to the system's power connector, can result in possible injury or permanent damage to the unit.
- Ultimate disposal of this product should be handled according to all national laws and regulations.
- No user-serviceable parts inside; all repairs must be handled by a qualified Airvine service center.
- To avoid the risk of electric shock or damage to the unit, do not open the unit or remove any covers.
- Do not insert any objects inside these devices while powered on. Such objects may contact hazardous energized parts that could result in a risk of fire, personal injury, or damage to the unit.
- Do not remove or alter the markings or labels affixed to these devices.

US and Canada Restrictions

- FCC and ISED regulations restrict and limit operation of these devices to indoor use only.
- FCC and ISED regulations prohibit operation of these devices on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying about 10,000 feet only in the 5.925-6.425 GHz band.
- FCC and ISED regulations prohibit these devices to be used for control of or communications with unmanned aircraft systems, including drones.

Symbols on Equipment or Documentation



DANGER

DANGER statements indicate potentially hazardous situations including those that could cause loss of life or physical injury.



CAUTION

CAUTION statements alert a possibility of damage to the system, software, or individual items or parts of equipment withing a system. However, this damage presents no danger to a person.



NOTE

A NOTE provides a tip, guidance, or advice and can emphasize important information.

System Overview and Introduction

Airvine WaveCore devices are indoor wireless point-to-point (PTP) devices that provide wireless Layer 2 Ethernet bridge networking solutions for enterprise and business markets. WaveCore devices are sold in pairs, and wirelessly communicate through walls and ceilings (up to 8 inches or more of concrete), which allows through-wall and through-ceiling communications without having to drill holes or pull wiring.



A WaveCore pair includes a Controller Node and a Subordinate Node. The Controller Node starts broadcasting on a factory-set frequency band as soon as it is powered up, and the Subordinate Node starts searching for the Controller Node broadcast when it powers up, and then locks onto that broadcast so the pair is immediately communicating. Use the Controller Node as the primary device for configuring and monitoring the WaveCore pair.

Both WaveCore devices are configured and monitored through the Controller Node, using an on-board VineManager Web GUI HTTP website, accessible using a Wi-Fi or a wired connection. Selected changes made to the Controller Node are also automatically made to the Subordinate Node, so any changes made to the Web GUI parameters and the transmission frequency and bandwidth are made to both WaveCore devices.

WaveCore devices include internal high-gain directional antennas, using individual transmit and receive links. For optimized transmit and receive rates, the WaveCore antennas need to be aligned to within +/- 18 degrees of each other. This alignment not only assures maximum transmission rates, but also reduces any interference between the WaveCore pair and any other devices. To ensure optimized transmit and receive rates, the WaveCore devices include on-board signal diagnostics.

WaveCore devices come from the factory with standard 3-inch mounting brackets, and customers can order alternative 5-inch mounting brackets. Customers can also order other optional accessories listed later in this manual.

The WaveCore devices are powered by 12 VDC, PoE, or both. This allows for power supply redundancy and support of failsafe operation. As an added benefit, WaveCore devices can be powered directly by the Airvine WaveTunnel PoE output.

WaveCore Deployment Scenarios

There are many deployment scenarios that WaveCore is designed to handle, many of which involve making wireless connections through walls or ceilings.

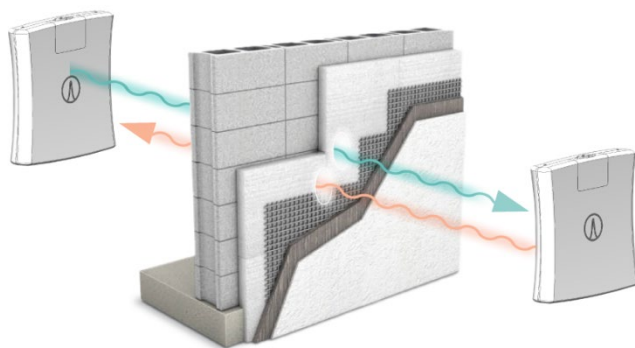
Concrete Walls and Floors are a fact of life in most commercial buildings. Deployment of new networks or expanding of networks in existing commercial buildings often require high cost and lengthy delays associated with laying wire networking cable through obstructions and across longer distance interior spans.

WaveCore was designed from the ground up to allow quick, easy, and cost-effective deployments of a high-speed internal wireless backbone that can transmit through obstructions and avoid the cost and delays associated with rolling out networking cable within the enterprise that include labor cost, extensive permitting, core/wall drilling, need to contract licensed contractors, materials, x-rays).

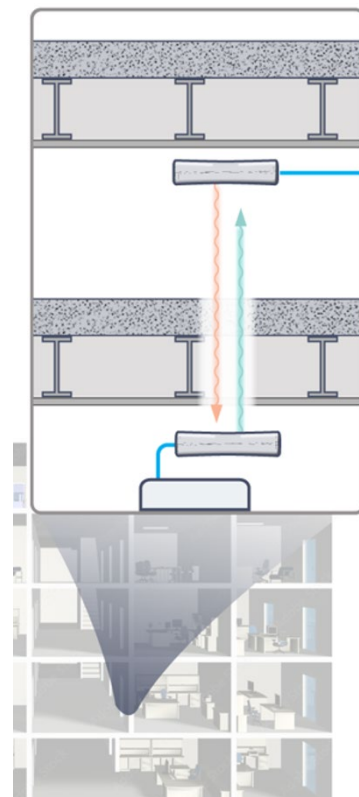
Connecting Wirelessly Through Walls and Ceilings

Specifically routing networks into or out of:

- HVAC and Fire Alarm rooms
- Networking Rooms, IDF/MDF
- Floors/ceilings



Connecting Through Walls



**Connecting Through
Ceilings
Floor-to-Floor**

WaveCore Models

There are currently two versions of the WaveCore product.

Part Number	Description
WC-1000RH-US	<p>This is a complete point-to-point wireless bridge link that contains two 1000RH-US Wireless Radio Devices, and a short wall/ceiling mounting bracket kit (PN: ACC-220) containing two brackets and mounting hardware.</p> <p>This model is designed to be operated only in the US and Canada.</p> <p>Per FCC/ISED regulations, the 2-digit country code of the model is fixed to "US". It is not possible for users to change the country code on this model.</p>
WC-1000RH-RW	<p>This is a complete point to point wireless bridge link that contains two 1000RH-RW Wireless Radio Devices, and a short wall/ceiling mounting bracket kit (PN: ACC-220) containing two brackets and mounting hardware.</p> <p>This model cannot be operated in the US and Canada.</p> <p>With this model, users choose a country code and the system will automatically conform to the relevant regulations covering power, spectrum and channel size.</p>

* The country code can only be configured on the RW "world" model.

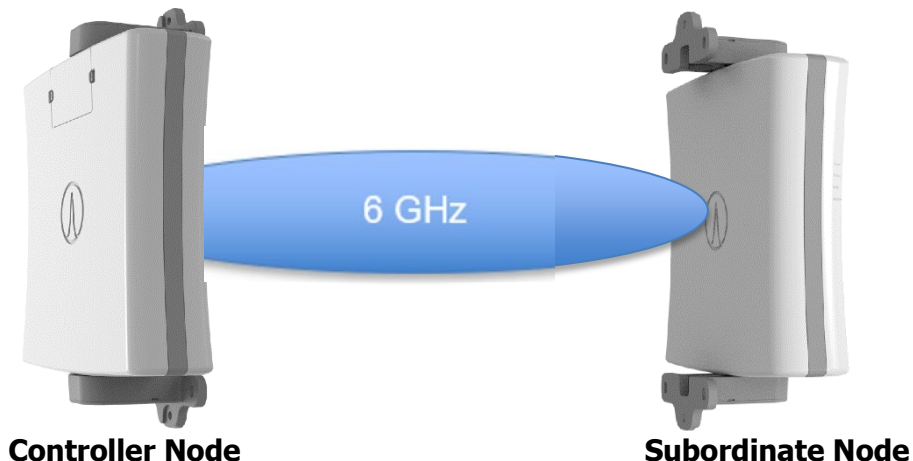
Node Types – Controller Node and Subordinate Node

A link is comprised of a Controller Node and a Subordinate Node. Both Node Types can be individually managed and monitored using the VineManager web-based management utility (see [Appendix A](#)).

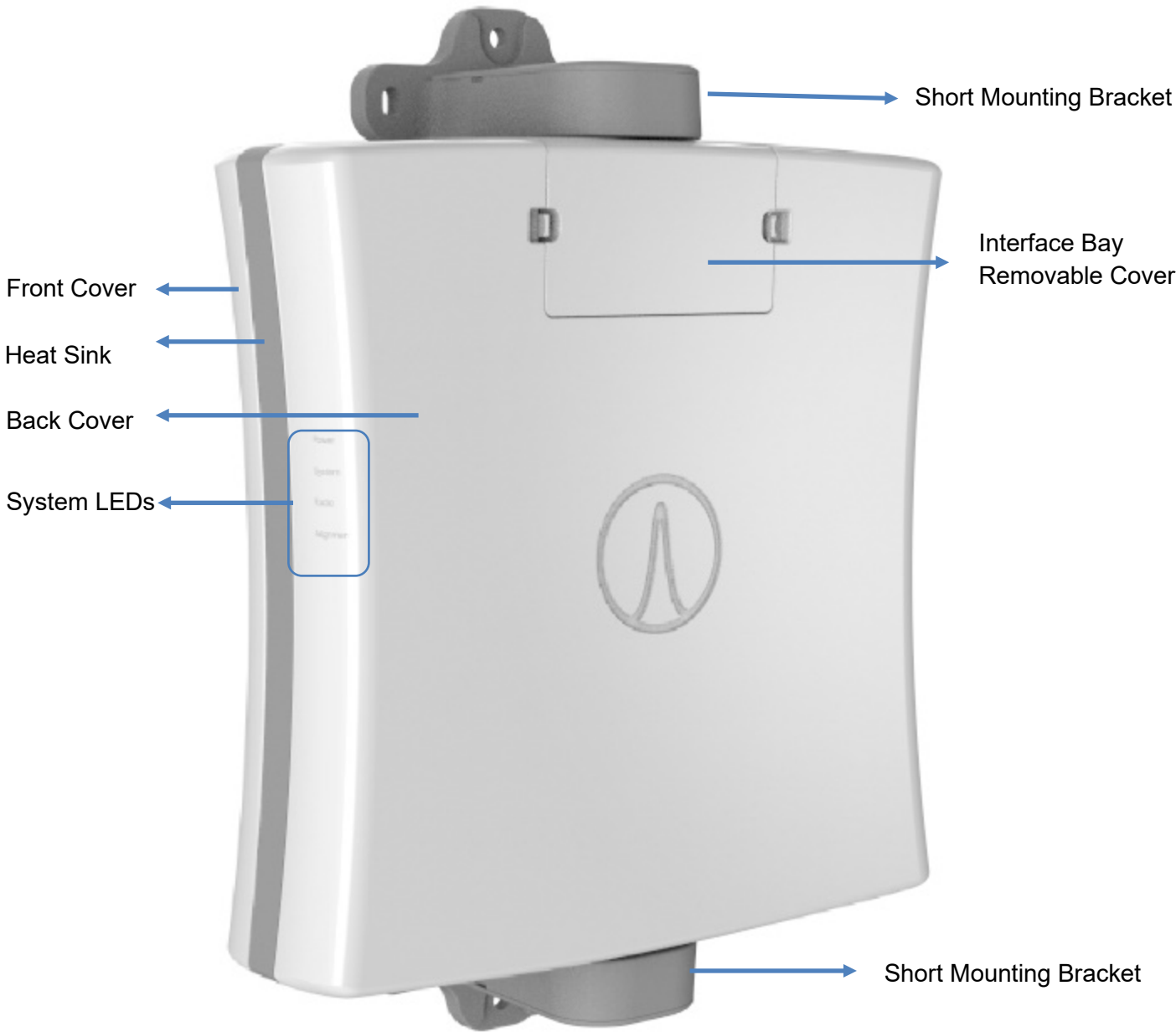
Node Types	Description
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Controller Node:	<p>Initiates and manages the link to the Subordinate Note</p> <p>The Controller Node can only connect to a Subordinate Node</p>
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Subordinate Node:	<p>The Subordinate Node operates under the control of the Controller Node</p> <p>The Subordinate Node can only connect wirelessly to a Controller Node</p>
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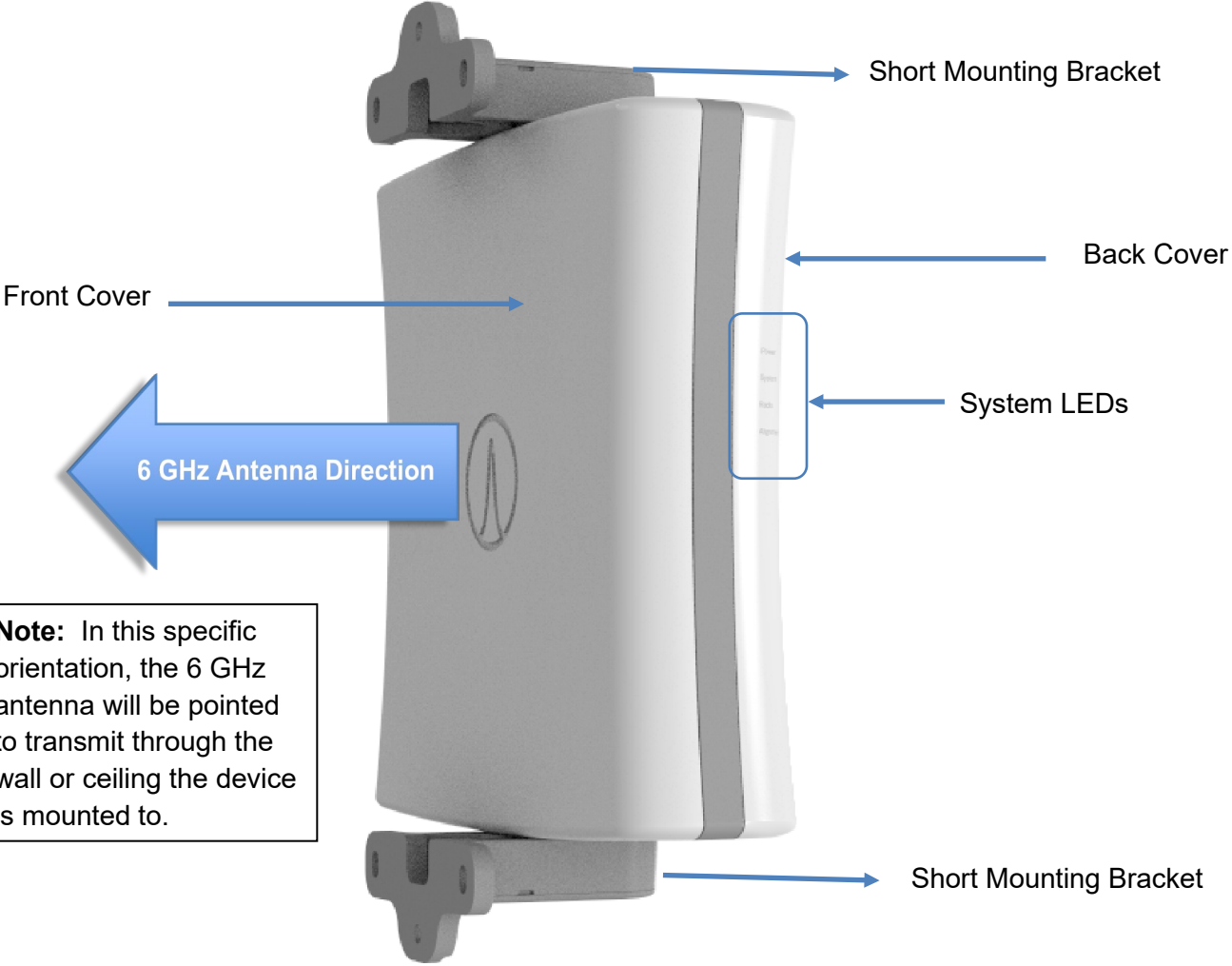


WaveCore Key System Features – Back Side of Unit



WaveCore Key System Features – Front Side of Unit

The 6 GHz directional antenna is located under the front cover and points outwards away from the unit.



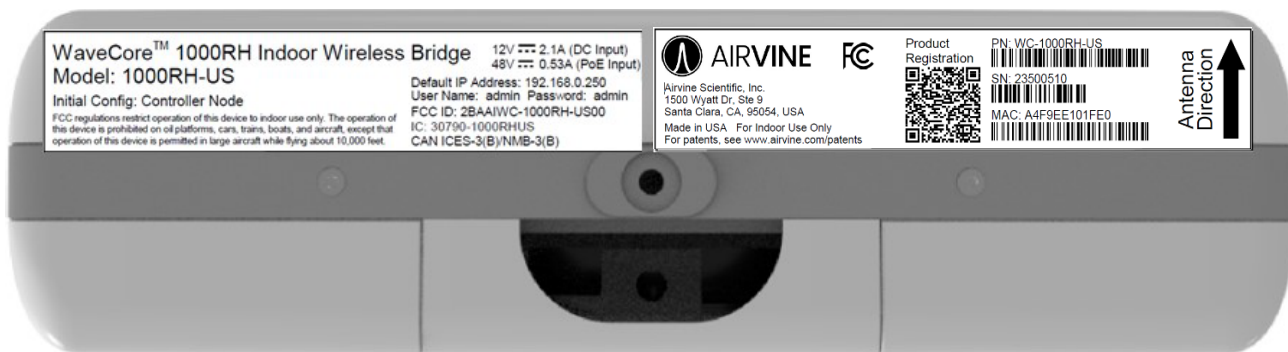
Note: In this specific orientation, the 6 GHz antenna will be pointed to transmit through the wall or ceiling the device is mounted to.

WaveCore Key System Features – Top Side of Unit




On the top of the unit, there is a mounting point for the bracket as well as the label that indicates important information such as:

- Ethernet MAC Address
- Device Type Initial Configuration (Controller Node or Subordinate Node) as shipped from the factory.
- Direction of the antenna
- Production Registration QR Code

Use your mobile device camera to register your device for important notifications updates.



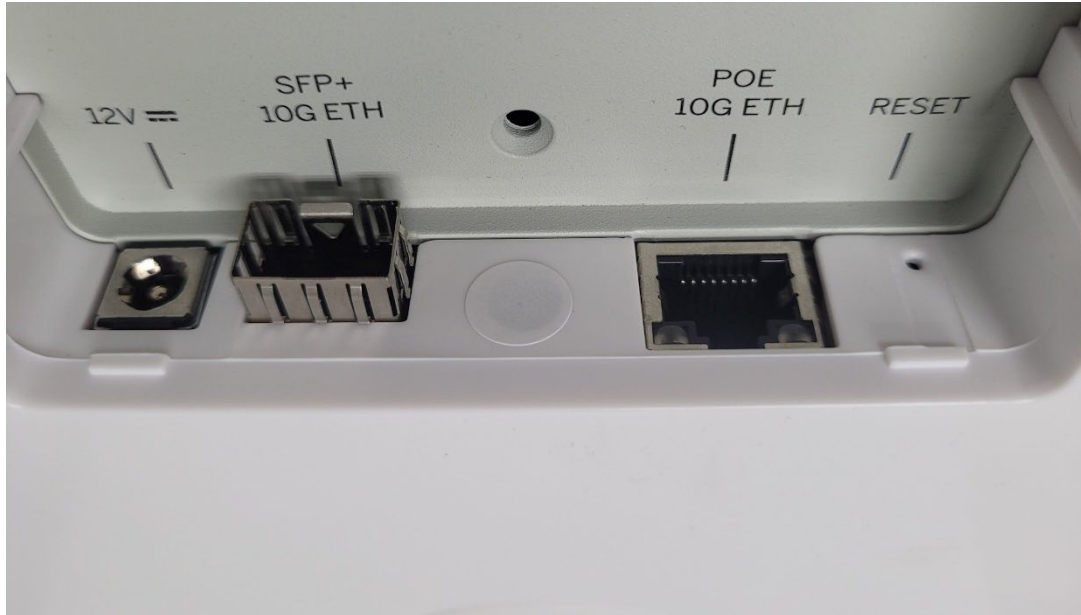
Key Specifications – Model 1000RH

Networking Interface	10 Gbps Ethernet port (RJ45) 10 Gbps Ethernet Port (SFP+)	PoE 802.3at PD Power Input Available only with optional feature license
RF Connections	One 6 GHz high-capacity radio with directional antenna One 2.4 GHz Wi-Fi 802.11b/g radio with omni antenna for local management	
Frequency Band*	5.925 MHz – 7.125 GHz	
Bandwidth	320 MHz, 160 MHz, or 80 MHz	
Power Consumption	25.5 Watts Maximum, 20 Watts Typical	
Input Voltage/Current	Power Input Values: 12V DC Power Input 12V  2.1 A PoE Power Input 48V  0.53 A	
12V Power Input	Accepts circular 5.5 mm OD / 2.1mm ID power connectors. 	
Operating Temperature	-20 – 55 °C	
Humidity	0 – 95%, non-condensing	
Usage	For Indoor Use Only	
Antenna	6 GHz High Gain Antenna, Elevation = 18 deg, Azimuth = 18 deg.	

* Frequency Band Support will vary based on system part number and country of operation.

Electrical and Mechanical Interfaces

The following Electrical and Mechanical Interfaces are located on the back side of the radio device under the Interface Bay Removeable Cover.



- **12 DC Power Input** Center Pin: 2.1mm / Outer 5.5 mm circular barrel connector
Outside ⊖ ⊕ Inside
- **SFP+ Ethernet Port** Enabled with optional SW Feature License Key
- **10G Ethernet Port** RJ45, (POE PD Input, 802.3at, 25.5Watt), upgradeable to 10G with optional SW Feature License Key.
- **System Reset Button** Pin Hole Access
Press once Resets/Reboots the unit, uses prior configured parameters.
Press and hold 5 seconds Resets unit to factory defaults, all configuration info will be lost.



Caution:

If you are using the 12VDC Power Input, maintaining compliance with IEC 62368-1 safety standard requires the use of the Airvine AC/DC 36-Watt Power Adapter, PN: ACC-PS-ACDC-XX00.

Airvine recommends usage of the Airvine ACC-POE-10G-XX00 801.3at PoE Injector: 30-Watt, 53-Volt, 0.75A, AC Input (100-240V). If a different 801.3at PoE power source is used, such power source must be a limited power source that will not exceed 56-Volts, 30-watts, or 0.75A. Passive PoE injectors should never be used.

Ethernet RJ45 Interface LEDs

The RJ45 Ethernet Connector has two LEDs to help indicate connectivity status and traffic activity on the RJ45 Ethernet Interface. The LED on the left side of the connector is Green. The LED on the right side of the connector is dual color (Green / Amber).

The following table indicates the connection status.

RJ45 Connector State	Green LED	Green/Amber LED*
No Connection	Green	Off
10 Gbps	Green	Green
5 Gbps	Green	Amber
2.5 Gbps	Off	Amber
1 Gbps	Off	Green
100 Mbps	Off	Off

*The Green/Amber LED will blink when traffic is detected.

External System LEDs

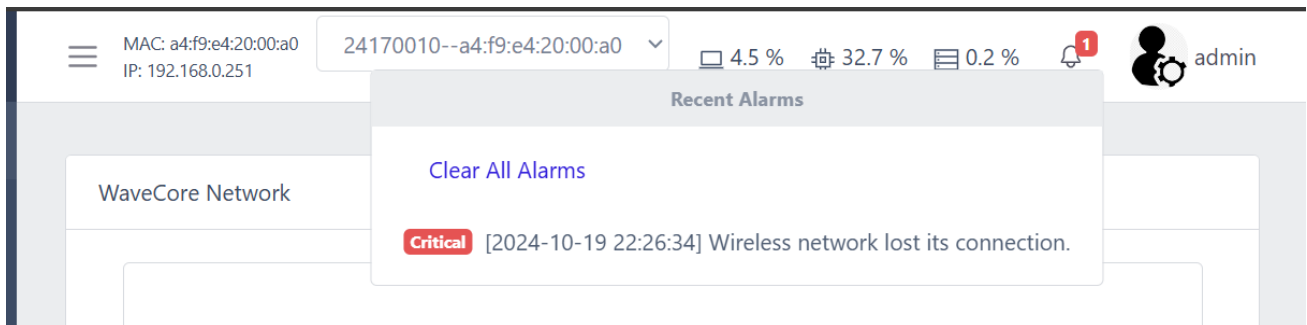
On the left side of the WaveCore are 4 system indicator LEDs.

Power	Power	Provides status of power to the system
System	System	Provides important system and alarm status
Radio	Radio	Indicates if radio is enabled, trying to make a connection, or has made a connection to a far-end WaveCore device.
Alignment	Alignment	When in "Alignment Mode", indicates how well the near-end and far-end radio are mutually aligned.

Power LED	Behavior
Off	No power source detected
Green On	Power source detected; unit has power

System LED (dual color)	Behavior
Off	System Not Powered On
Green Blinking	System Booting Up and Being Initialized
Green Solid	System Booted Up and Operating Normally
Red Solid	System Booted Up but Not Functioning Normally (Critical Alarm)

If the **SYSTEM LED** is solid RED, this means the system has booted up successfully, but one or more critical alarms have been activated. To view and clear the alarm(s), log onto VineManager Web GUI and click on the RED-highlighted Alarm Bell located at the top of the window to view the alarms. Clicking the blue-highlighted "**Clear All Alarms**" text will clear the alarms and will result in the **SYSTEM LED** to turn to solid GREEN.



Radio LED	Behavior
Off	Radio Disabled
Green Blinking	Radio powered on, trying to make a connection to another WaveCore device
Green On Solid	Radio powered on and connected to another WaveCore device

Align LED – dual color Green Amber	Receiver SNR Level (the higher the stronger the signal).	Approximate Over-the-Air Data Rate
Off Off	No Connection or Align Mode Not Enabled	
Off Blinking Slow	RSSI is less than -79 dBm	Lower Data Rate
Off Blinking Fast	RSSI is between -70 dBm and -79 dBm	
Off On Solid	RSSI is between -60 dBm and -69 dBm	
Blinking Slow Off	RSSI is between -50 dBm and -59 dBm	
Blinking Fast Off	RSSI is between -40 dBm and -49 dBm	
On Solid Off	RSSI is greater than -40 dBm	Highest Data Rate

WaveCore System Accessories

Short Mounting Bracket Kit (ACC-220S)

The Short Mounting Bracket Kit contains two mounting brackets, plastic covers, and screws/washers to mount the bracket to the top and bottom of the WaveCore unit. Three mounting holes in each bracket can accommodate 1/4" or M7 screws (not included) to secure it to a ceiling or wall.

Note: One Short Mounting Bracket Kit (ACC-220S), that contains two short brackets, is included with each WaveCore Complete Wireless Link: Part Number: WC-1000RH-US and WC-1000RH-RW



Short Mounting Bracket Kit Contains:

Qty	Description
2	Short Metal Mounting Brackets
2	Short Plastic Mounting Bracket Cable Covers
2	Stainless Steel Hex Head Screw, 1/4"-20 Thread Size, 3/4" Long
2	Stainless Steel Split Lock Washer for 1/4" Screw Size, 0.26" ID, 0.487" OD
2	Stainless Steel Washer for 1/4" Screw Size, 0.281" ID, 0.625" OD
2	Stainless Steel External-Tooth Lock Washer for M6 Screw Size, 6.4 mm ID, 11 mm OD

Optional Long Mounting Bracket Kit (ACC-220L)

The optional long mounting bracket kit is sold separately. Each kit contains two long mounting brackets, plastic covers, and screws/ washers to mount the bracket to the top and bottom of the WaveCore unit. Three mounting holes in each bracket can accommodate 1/4" or M7 screws (not included) to secure it to a ceiling or wall.

The long bracket allows the WaveCore radio to rotate 360 degrees allowing improved capabilities to point the WaveCore radio antenna in virtually any direction including towards a wall/ceiling or away



Qty	Description
-----	-------------

- | | |
|---|---|
| 2 | Long Metal Mounting Bracket |
| 2 | Long Plastic Mounting Bracket Cable Covers |
| 2 | Hex Head Screw, 1/4"-20 Thread Size, 3/4" Long |
| 2 | Split Lock Washer for 1/4" Screw Size, 0.26" ID, 0.487" OD |
| 2 | Washer for 1/4" Screw Size, 0.281" ID, 0.625" OD |
| 2 | External-Tooth Lock Washer for M6 Screw Size, 6.4 mm ID, 11 mm OD |



Optional AC/DC Power Adapter (ACC-PS-ACDC-XX00)

Airvine highly recommends using the Airvine AC/DC 36 Watt AC/DC Power Adapter. Non-Airvine power adapters should have current limiting capability to not exceed 3A to protect the system from potential damage.

This AC/DC Power Adapter includes a 1.8-meter AC Power Cord where XX = Country AC Power Cord to be included in the unit (i.e. US, EU, ZA, UK).



Specifications:

Input	100-240 VAC, 50/60 Hz
Output	12VDC / 3A
Regulatory	FCC, CE, UKCA, EAC
Energy Efficiency	VI
Operating Temp	-25C to +55C
Operating Temp	0C to +40C (for compliance to 60601-1-11:2015+A1)
Power Class	ClassII
AC Connector Plug	Use C7 Plug, 2.1mm (ID) x 5.5mm (OD) x 11mm
	Outside ⊖ ⊕ Inside



Caution:

If you are using the 12VDC Power Input, maintaining WaveCore compliance with IEC 62368-1 safety standard requires the use of the Airvine AC/DC 36-Watt Power Adapter, PN: ACC-PS-ACDC-XX00. Furthermore, if using the Airvine ACC-PS-ACDC-XX00 power adapter, maintaining WaveCore compliance to IEC 62368-1 requires the ambient temperature of the power adapter to be no higher than +40C.

Optional PoE Injector (ACC-POE-10G-XX00)

Airvine highly recommends using the Airvine 802.3at 10Gbps POE Power Adapter. If a using non-Airvine POE power adapter, it should have current limiting capability to not exceed 700ma. Passive POE injectors are not recommended.

This POE injector is shipped with a 1.8-meter AC Power Cord where XX = region-specific AC power plug type (i.e. US, EU, ZA, UK).

Power LED indicates PSE is on and getting AC Power

Active LED indicates POE is connected to and powering a POE PD device.



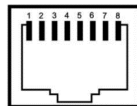
To LAN Network

To WaveCore Device

To 100-240 VAC

Specifications:

Data Rate	Up to 10 Gbps Ethernet
Ethernet Connector	RJ45 shielded
Input	100 VAC – 240 VAC, 50/60Hz, Max 0.75A
Output:	53VDC ± 2V, 0.6 A
Regulatory	FCC, CE, UKCA, NOM/NYCE, EAC, CCC, India BIS
AC Connector Plug	C5 AC Plug
Operating Temp	-10C to +45C
Operating Humidity	10% to 90%, Non-Condensing
Weight	210g (7.4 oz)
Dimensions	139mm x 63mm x 36mm
Pin Assignments	Pins; - (3,6) +(1,2)



Device Installation

This section provides installation information for the WaveCore system.

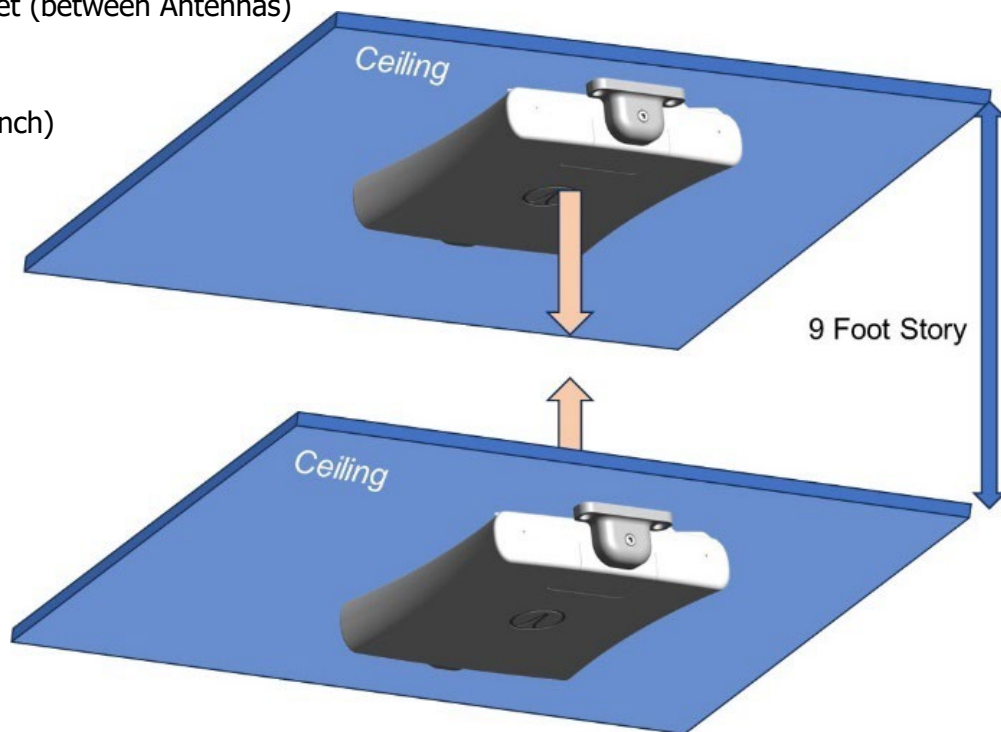
Step 1: Plan for Installation

Decide where to install the units and determine the spacing between them. Consider the types of materials the signal will need to penetrate. Plan how the units will be powered and connected to the network. A site survey is always recommended to confirm the distances and desired installation locations.

For example, you might plan a floor-to-floor link where both radios are mounted on the ceiling. You determine that ceiling consists of 4 inches of concrete, with a 6-inch gap for utilities between the concrete and the lower ceiling structure, which includes drywall, wood framing, and a plywood floor above the concrete. You determine the distance between floors is 9 feet.

In this scenario, you can then evaluate the link using:

- Link Distance of 9 feet (between Antennas)
- 4 inches on concrete
- 5.8 inch of drywall
- Wood Flooring (1/2 inch)



Calculate Link Performance

Use the Airvine VineCalculator to get an estimate of the connection quality and potential throuput of a WaveCore link before implementation.

The VineCalculator tool, available at <https://services.airvine.com/calculator/vbcalc>, allows users to input link parameters such as country of operation, frequency band, channel bandwidth, and the type and thickness of materials the signal will need to penetrate (e.g., drywall, concrete, glass, wood). It then provides an estimate of the achievable link margin.

The country of operation is important because different countries have regulatory limits on the maximum transmit power each radio can produce. Higher transmit power enables better material penetration, greater distance, and increased throughput. Appendix B indicates WaveCore EIRP transmit power limits used by VineCalculator for different countries.

VineCalculator for WaveCore

WaveCore Calculator

Please input the following parameters to calculate the Link Margin.

United State (US) Select the countries | 80 MHz Select the bandwidth

Link Distance (Meters) Enter the link distance between the CN to SN: 0.25 | meter/cm Select the unit

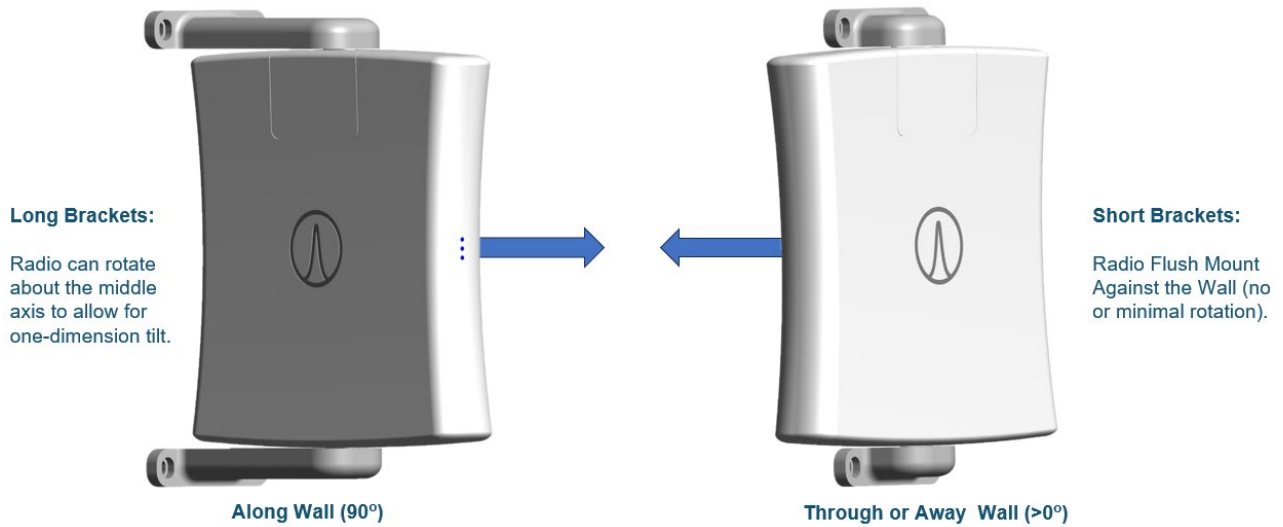
Walls between CN and SN

Select	Wall Material	Thickness (cm)	Actions
<input type="checkbox"/>	Concrete	0	
<input type="checkbox"/>	Brick	0	
<input type="checkbox"/>	Dry Lumber	0	
<input type="checkbox"/>	Glass	0	
<input type="checkbox"/>	Combined Drywall	0	
<input type="checkbox"/>	Plywood	0	

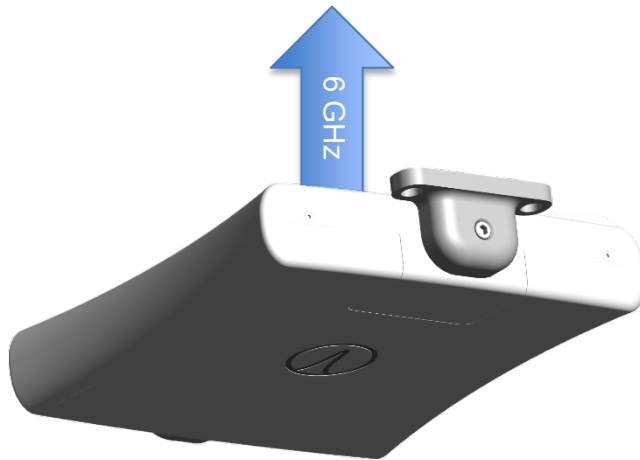
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CALCULATE **RESET**

Determine which Mounting Brackets are Needed (short or long)



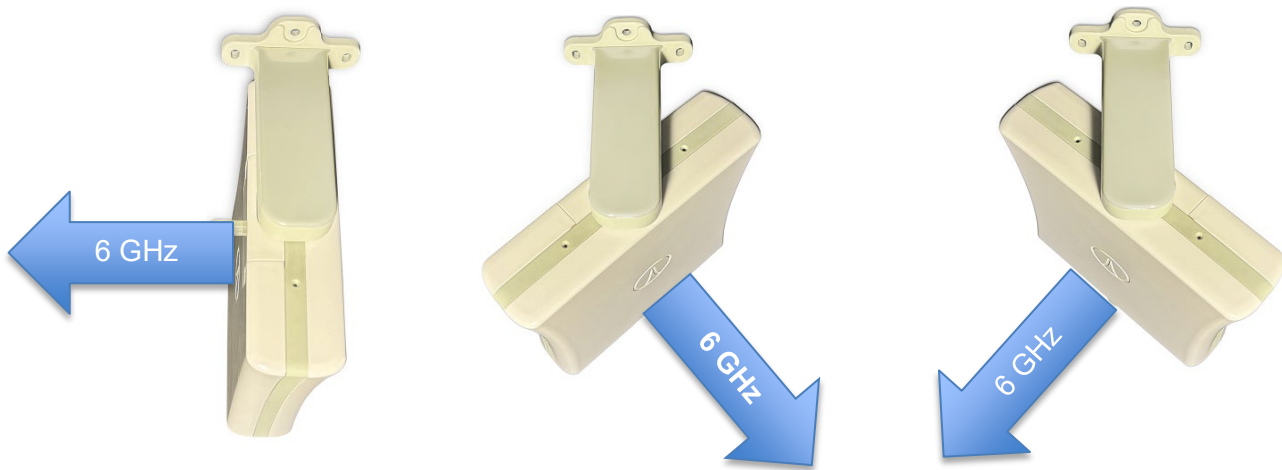
WaveCore units are shipped with [Short Mounting Bracket Kits \(ACC-220S\)](#). The short mounting kit enables the WaveCore device to be flush-mounted directly against a wall or ceiling, enhancing visual appeal. However, it offers limited flexibility for adjusting or aligning the antenna.



WaveCore Ceiling Mount with Short Mounting Bracket

The short bracket allows the antenna to be angled up to 4 degrees from parallel to the wall or ceiling, while the antenna itself has an approximate 18-degree \pm azimuth/elevation beamwidth. In many cases, short brackets are adequate, as the far-end radio antenna can be mounted directly in alignment and within the beamwidth of the antenna's path.

If the antenna needs to be pointed beyond the limits of the Short Mounting Bracket, the optional [Long Mounting Bracket Kit \(ACC-220L\)](#), which must be purchased separately, should be used. The Long Mounting Bracket allows the radio unit to rotate a full 360 degrees, providing complete flexibility to aim the antenna in any direction. When installing multiple radios, it is recommended to keep a few Long Bracket Kits available during installation in case adjustments or repositioning of the radio devices are necessary.



If there is a need to replace the Small Mounting Bracket with the Large Mounting Brackets, please see [Installation Tips – Working with Mounting Brackets](#)

Determine how each device will be powered and connected to its network

Please refer to [Installation Tips – Powering and Connecting Units](#) that indicates the supported power and connection options available with the WaveCore unit.

The WaveCore has two ways to power the device:

- 12 Volt DC Input Connector
- PoE 802.3at-compliant Ethernet

The WaveCore features two Ethernet interfaces (an RJ45 port and an optional SFP+ port), providing flexible connectivity options for networking equipment using different cable types, including copper Cat5/6/7 cables and fiber optic cables.

Step 2: Pre-Staging / Pre-Configuring the Unit

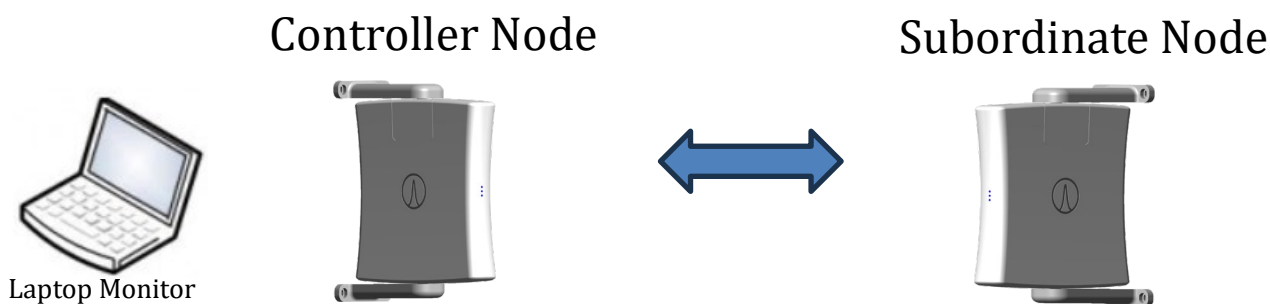
Once the equipment is delivered and available at the site for installation, it is highly recommended (but not mandatory) to pre-stage and/or pre-configure the unit and to validate the equipment link is fully operational.

1) Unpack the radios

Ensure all brackets and materials (cables, power supplies, etc.) are available.

2) Collect the following equipment and power on the radios

- Laptop or computer running a standard internet browser
- Ethernet cable to connect to one of the WaveCore node or network
- Or a Wi-Fi 2.4 GHz wireless connection to connect locally to the WaveCore's 2.4GHz wireless interface.



Locate the equipment on a desk or location where you can power both radios and confirm a link can be established. This should be done prior to the physical installation of the radios.



Caution

Before powering on the equipment, ensure the radio antennas are not positioned directly back-to-back to avoid overloading the receivers and reducing the risk of damage.

Be sure to keep the radios several feet apart from one another as each radio has very high gain antennas and multiple transmitters.

3) Logon to the Controller Node (CN) and Validate Link to Subordinate Node (SN)

Before installing the radios, it is recommended to first logon to the units and validate that the link is performing properly.

Using a browser on a laptop or mobile device, log onto the radios by entering the following IP Address in the browser window.



Wired Ethernet Management Parameters:

The following are the factory-default parameters to manage the WaveCore using the VineManager HTTP Web GUI **over a wired Ethernet connection:**

WaveCore Wired Ethernet default IP address:	192.168.0.250
WaveCore Management default user login and password:	admin/admin

Wi-Fi Management Parameters:

The following are the factory-default parameters to manage the WaveCore using the VineManager HTTP Web GUI **over a Wi-Fi connection:**

WaveCore Management Wi-Fi SSID:	AirVine2
WaveCore Management Wi-Fi WPA2 passcode:	airvine!
WaveCore Management Wi-Fi IP address:	192.168.3.1
WaveCore Management default user login and password:	admin/admin

With the WaveCore US version, the two radios will automatically pair and establish a link upon power up of both radios.

With the WaveCore RW (world) version, before the radio can start transmitting, user must first log onto the CN, and also the SN, and configure the **Country Code** of the country the two devices will operate in. This is needed in order to comply with local regulatory requirements.

When the **RADIO LED** is blinking green, the CN and SN are "searching" (attempting to make a connection).

When the **RADIO LED** is lit solid green, the wireless link between CN and SN has been established.

Step 3: Mount the equipment and align the antenna

Mount the Controller Node

- Decide on the location for the CN

It is recommended to mount the CN and the SN at locations where both units will be best aligned. The CN should be deployed closest to the core/distribution domain of the network while the SN should be closest to the access/end-device domain of the network.

- Mount the CN in place in a solid, secure structure that can safely accommodate the weight of the unit.



Use the appropriate type and size of screws that are suitable to attach the radio unit to the intended wall or ceiling.

The bracket's center mounting hole has a diameter of 0.28 inch / 7.2 mm

The bracket's two side mounting holes have a diameter/width of 0.28 / 7.2 mm



Caution:

Be sure to use two brackets to attach the WaveCore device with 6 screws or bolts (and all 6 mounting holes in the bracket) to firmly secure it to a ceiling or wall to minimize any risk of the device coming loose or falling which can be a hazard that can cause injury or death.

- Attach networking cables to the unit.
- Attach a [12 Volt Power Source](#) or [PoE Power Source](#) (or both) and power on the device.

Mount the Subordinate Node

- Decide on the location for the SN

It is recommended that the Subordinate Node be mounted closer to the access domain of the network.



Note

If it is safe to do so, you can validate the link connection prior to mounting the SN by holding a powered-on SN near the mounting location and point the SN in the direction of the CN and use the **ALIGN LED** to check/validate the connection and improve its performance/throughput.

Sometimes, a suboptimal connection can be easily fixed by moving the SN to a slightly different location to clear an unforeseen obstruction between the path of the RF signal. For example, in raised ceilings, there could be HVAC ventilation, equipment, or other obstructions that a minor adjustment in the radio location would address.

- Mount the SN onto a solid, secure structure that can safely accommodate the weight of the unit.



Use the appropriate type and size of screws that are suitable to attach the radio unit to the intended wall or ceiling.

The bracket's center mounting hole has a diameter of 0.28 inch / 7.2 mm

The bracket's two side mounting holes have a diameter/width of 0.28 / 7.2 mm



Caution:

Ensure the WaveCore device is securely mounted using two brackets and all six screws or bolts, utilizing all six mounting holes in the brackets. This will firmly secure the device to the ceiling or wall, minimizing the risk of it coming loose or falling, which could pose a serious safety hazard and potentially cause injury or death.

- Attach networking cables to the unit.
- Attach a [12 Volt Power Source](#) or [PoE Power Source](#) (or both) and power on the device.

Validate Radio Connection

- When both radios are powered up and paired, they can establish a secure wireless link with one another.
- Use the **RADIO LED** to check if the radios are connected.
- When the **RADIO LED** is blinking Green, the CN and SN are “searching” and attempting to make a connection. While the Radios are “searching” the **ALIGN LED** is Off.
- When the **Radio LED** is lit solid GREEN, the SN/CN Link is established. At this time, the **ALIGN LED** will light up.

Align Antennas

Performing the antenna alignment process is important to increase the performance and reliability of the wireless link. Aligning the antennas involves moving and positioning the radios so they directly point to one-another to increase the overall signal strength transmission and reception.

Two methods can be used to align the antennas: Using **ALIGN LEDs** and using VineManager Web GUI.

Align Antenna using the External ALIGN LED:

While adjusting the position of the Radio, view the system **ALIGN LED** to fine tune and align the antennas to increase the performance and reliability of the link.

The Received Signal Strength Indicator (RSSI) parameter to align antennas and determine link quality and performance. Green LED color indicates a link with higher data rates than when the LED has an Amber color.

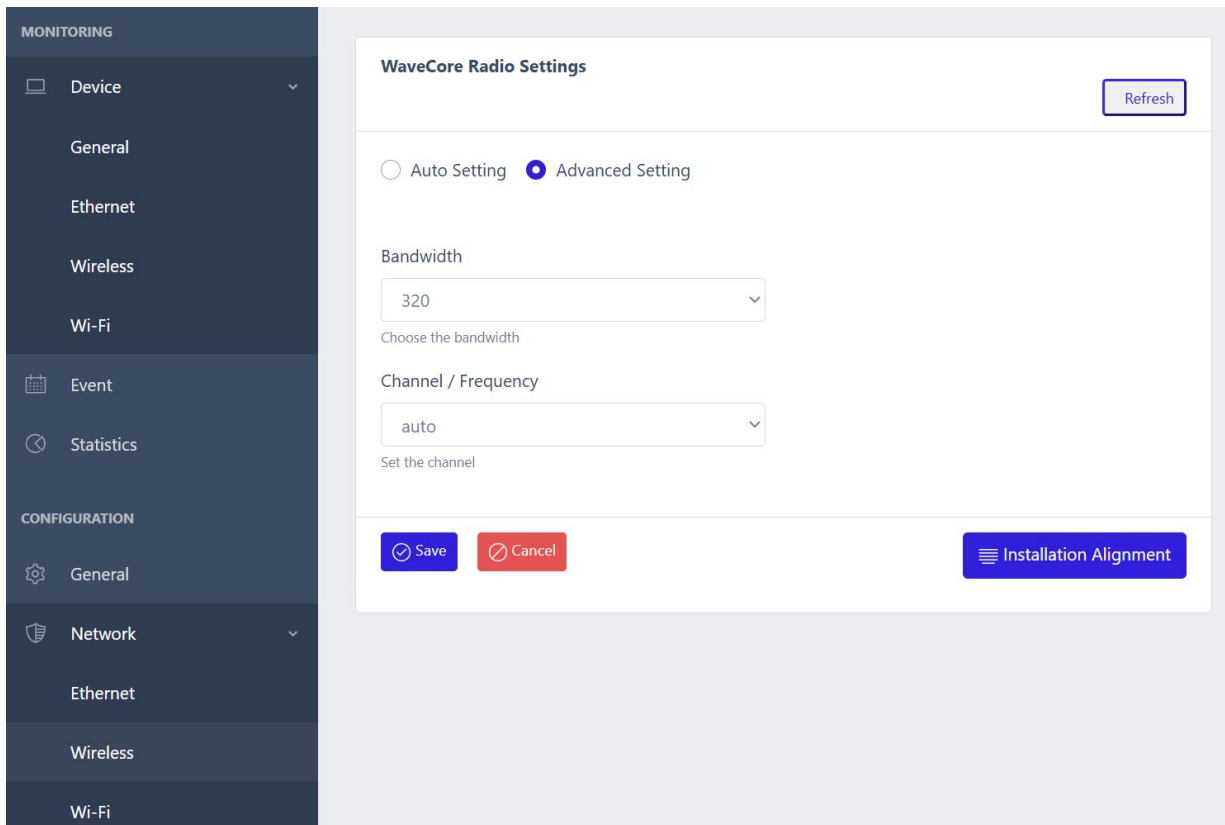
Align LED – dual color		Receiver SNR Level (the higher the stronger the signal).	Link Data Rate Performance
Green	Amber		
Off	Off	No Connection or Align Mode Not Enabled	
Off	Blinking Slow	RSSI is less than -79 dBm	Lower Data Rates
Off	Blinking Fast	RSSI is between -70 dBm and -79 dBm	
Off	On Solid	RSSI is between -60 dBm and -69 dBm	
Blinking Slow	Off	RSSI is between -50 dBm and -59 dBm	
Blinking Fast	Off	RSSI is between -40 dBm and -49 dBm	
On Solid	Off	RSSI is greater than -40 dBm	Highest Data Rates

Increasing the Refresh Rate of the ALIGN LED:

By default, the **ALIGN LED** has a refresh rate of 15 seconds.

To temporarily reduce the refresh rate of the **ALIGN LED** to 2 seconds, navigate to **CONFIGURATION/Network/Wireless** screen and click on the blue "Installation Alignment" button which will reduce the refresh rate of the LED to 2 seconds for a period of 90 seconds.

If more time is needed, the button can be pressed again for another 90 second period.



Align Antennas using VineManager:

Navigate to **Monitor/Network/Wireless** screen which contains **RX Signal** (RSSI); a key alignment parameter. Physically adjust and reposition so that the radios face directly towards one another. As you adjust each radios position/direction, this value will either increase (become less negative) which means the link is performing better or it will decrease (become more negative) which means the link will perform worse. Adjust the radios until you reach the lowest **RX Signal** number (on both radios). The screen will take about 10-15 seconds to refresh this value.

This table provides an approximate indication of what over-the-air physical (layer 1) data rate to expect which varies based on RSSI and Channel Bandwidth. Higher channel bandwidths result in increased link data rates.

MCS Level	Modulation & Coding	Minimum RSSI (in dBm)			Approx Over-the-Air Datarate (in Mbps)		
		80 MHz	160 MHz	320 MHz	80 MHz	160 MHz	320 MHz
MCS 0	BPSK 1/2	-88	-84	-82	144	288	577
MCS 1	QPSK 1/2	-86	-82	-79	288	577	1153
MCS 2	QPSK 3/4	-83	-80	-76	432	865	1729
MCS 3	16QAM 1/2	-80	-78	-73	577	1153	2306
MCS 4	16QAM 3/4	-78	-75	-70	865	1729	3459
MCS 5	64QAM 2/3	-76	-72	-67	1153	2306	4612
MCS 6	64QAM 3/4	-74	-68	-63	1297	2594	5188
MCS 7	64QAM 5/6	-71	-65	-61	1441	2882	5765
MCS 8	256QAM 3/4	-68	-65	-58	1729	3459	6918
MCS 9	256QAM 5/6	-66	-63	-56	1922	3843	7686
MCS 10	1024QAM 3/4	-63	-60	-53	2162	4324	8647
MCS 11	1024QAM 5/6	-60	-58	-51	2402	4804	9608
MCS 12	4096QAM 3/4	-56	-53	-49	2594	5188	10377
MCS 13	4096QAM 5/6	-53	-50	-47	2882	5765	11529

Installation Tips – Working Mounting Brackets

Attaching mounting brackets to a WaveCore Device

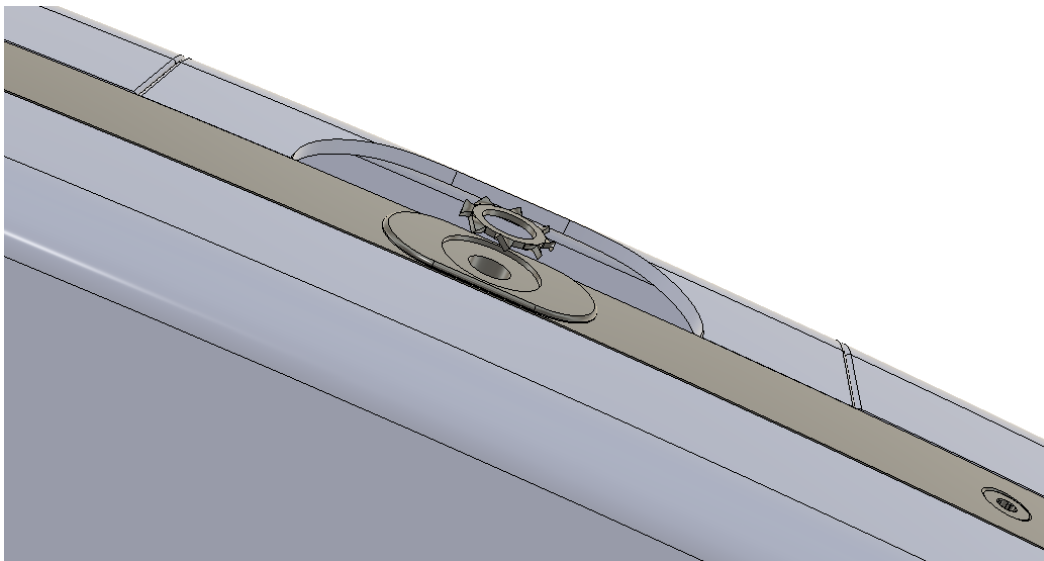
Follow these steps to attach a bracket to a WaveCore device.



Note

WaveCore links come shipped with the Short Brackets attached and bracket covers unattached. As such, some of these steps may not apply to newly purchased WaveCore links.

Step 1: Place the lock washer that has “teeth” into round inset located on the top or bottom side.

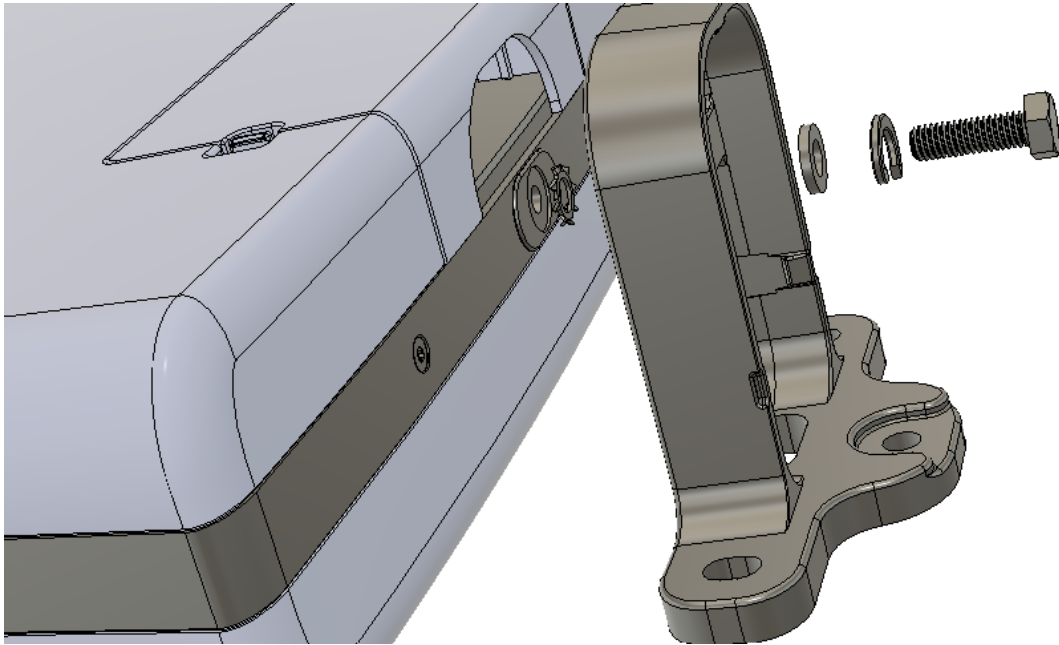


Step 2: Attach both brackets to the WaveCore device

Position the bracket onto the mounting hole in the right orientation depending on in which direction the antenna (located on the front of the radio) should point. For example, you may want to antenna pointed (front side of the device) towards the wall or ceiling that you want to connect through, or you may want to have the antenna (back side of the device) pointed away from the wall or ceiling.

Once you have the intended orientation, assemble the bolt such that the lock washer is in contact with the bolt head and then the smooth washer (see picture below). Insert the bolt containing the washers through the bracket mounting hole and into the WaveCore device threaded mountain hole located on the top or the bottom of the wave core unit and hand tighten. Then use a 7/16 socket wrench to secure and

attach the bracket firmly against the WaveCore device. Be sure to mount both brackets to the top and bottom of WaveCore device.



Step 3: Remove the Plastic Interface Bay Cover

When the radio is unpacked, the Removeable Interface Bay Cover will be attached to the device.

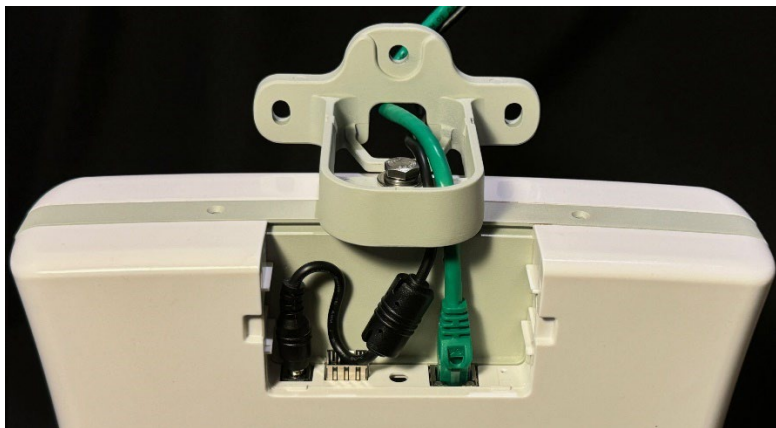
This cover must first be removed before power and network cables can be connected to the device. It's easiest to use two hands for this task.

First, insert a finger into the interface Bay and press lightly against the removeable cover. Next, using your other hand, grip and press in the two interface cover locking tabs located on both sides of the cover and gently remove the cover, pulling straight out, directly away from the WaveCore device.



Step 4: Route and attach the cables

On the top-side bracket, route the networking and power cables through the bracket. Feed the cable through the rear cable hole of the bracket then feed the cables down through the front of the bracket attach the cables to their respective interfaces.

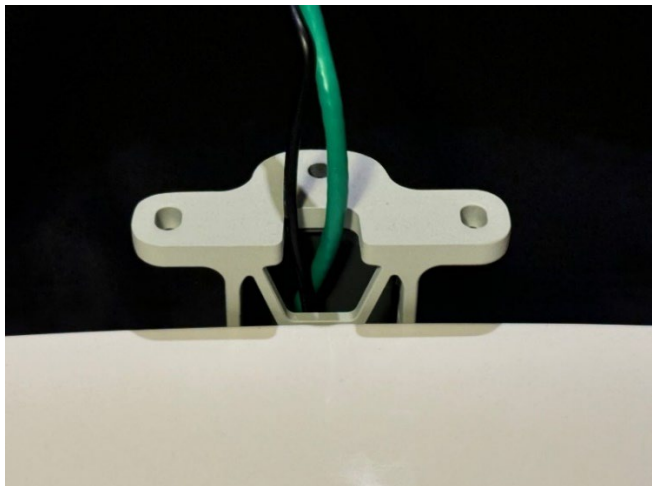


Step 5: Re-attach the removable interface bay cover

Re-attach the removable interface bay cover by sliding it straight down along the two side guide rails until the two locking tabs snap into place.

Step 6: Attach the plastic bracket cover by snapping it into the top of the bracket.

After completing all these steps, the attached bracket should look like the following.



Note

In many cases, it may be required to first install the cables in the wall such that the cables will protrude out of the wall or ceiling hole.

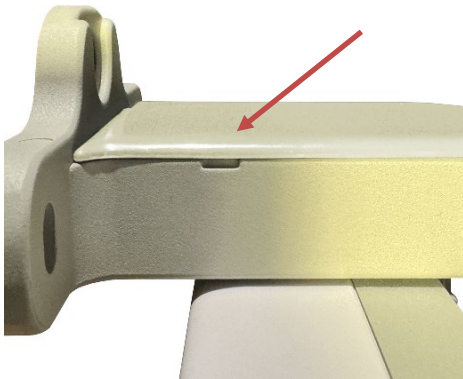
In this case, it will be required to carefully position the bracket against the wall hole containing the cable strands, then mount the device onto the wall. After this is done, the cables can be routed through the bracket, plugged into the interfaces. After this, both bracket cover and interface bay covers will be snapped into place.

Removing Mounting Bracket Plastic Cover

Occasionally, once the bracket is fully assembled, there may be a need to change or modify cable connections requiring removal of the bracket cover.

There are two ways to do this:

- 1) On each side of the bracket, there is a small indentation that allows the use of a tool like a screwdriver to gently push the cover up and remove it from the bracket.



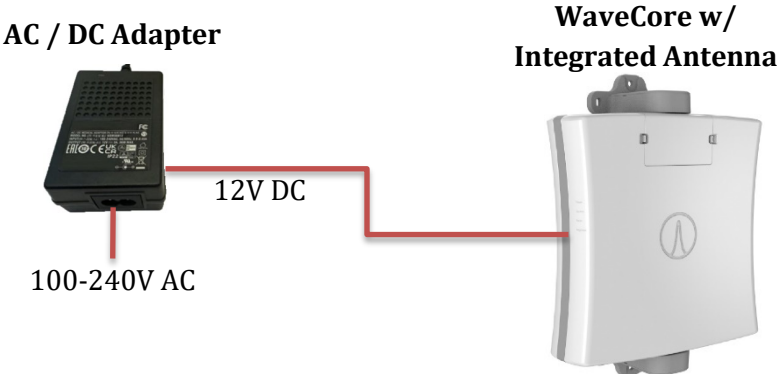
- 2) Using your finger, insert it into the cable routing hole located on the rear of the bracket and press gently up against the plastic cover to remove it.

This method only works if the radio unit is not mounted already to a wall or ceiling.

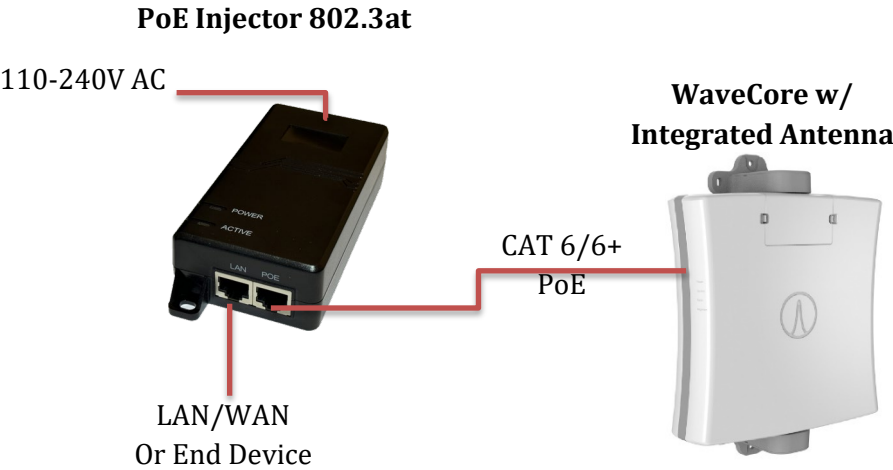


Installation Tips – Powering and Connecting Units

Installation Power/Cabling Options – WaveCore Powered by AC Adapter

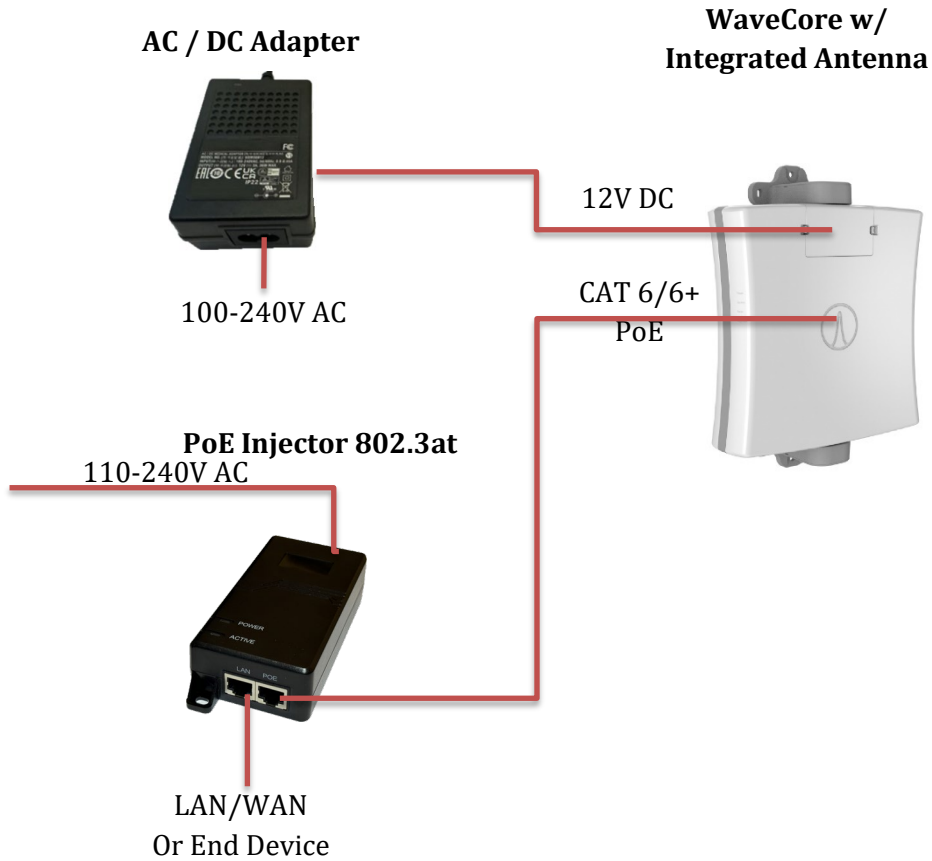


Installation Power/Cabling Options – WaveCore Powered by PoE Injector

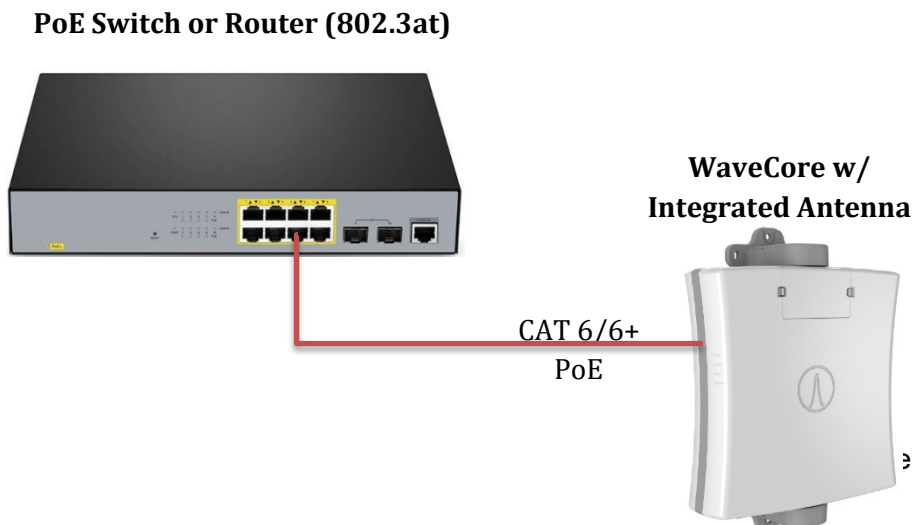


Installation Power/Cabling Options – WaveCore with Redundant Power Sources (12V and PoE)

The WaveCore device can be powered both by a 12V DC and a PoE power source to provide power redundancy for the radio.



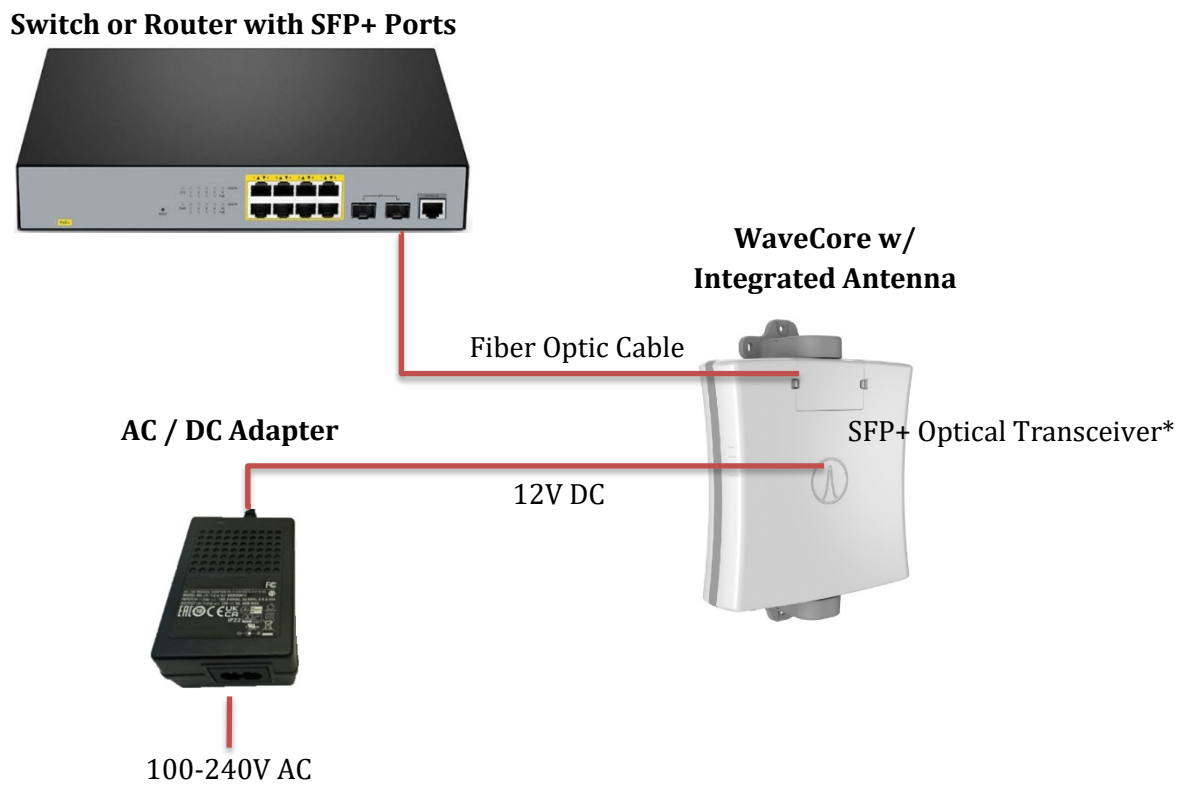
Installation Power/Cabling Options – PoE Switch or Router



Installation Power/Cabling Options – Switch/Router with Optical Interface

An optional SFP+ port is available, with optional SW license key, to provide a second Ethernet Port up to 10 Gbps.

The SFP+ cage can accommodate Airvine-tested modules SFP+ modules including optical/fiber transceivers (single mode, multi-mode) to allow long distance links over a fiber-optic cable up to 10 Gbps.



* SFP+ license is required to enable SFP+ port. SFP+ transceiver modules sold separately.

Appendix A – VineManager HTTP GUI

VineManager is the management interface Web GUI supported that is used to remotely or locally manage WaveCore devices.

A summary of how to access and log on to VineManager in this section.

For more details on using VineManager, please consult the following documents that can be downloaded on www.airvine.com/support:

- Airvine WaveCore Getting Started Guide
- Airvine WaveCore Configuration Manual

Factory Default IP Address and User Login

When shipped from the factory, the WaveCore device will be configured with the following default Management IP Addresses and user login and passwords.



Wired Ethernet Management Parameters:

The following are the factory-default parameters to manage the WaveCore using the HTTP Web GUI or the CLI/SSH **over a wired Ethernet connection** to the WaveCore:

WaveCore Wired Ethernet default IP address:	192.168.0.250
WaveCore Management default user login and password:	admin/admin

Wi-Fi Management Parameters:

The following are the factory-default parameters to manage the WaveCore using the AirvineMobile App, HTTP Web GUI, or CLI SSH **over a Wi-Fi connection** to the WaveCore:

WaveCore Management Wi-Fi SSID:	AirVine2
WaveCore Management Wi-Fi WPA2 passcode:	airvine!
WaveCore Management Wi-Fi IP address:	192.168.3.1
WaveCore Management default user login and password:	admin/admin

Accessing the VineManager Web GUI

WaveCore uses an intuitive Web-Based GUI for configuration and monitoring called VineManager. A standard internet browser running on a PC, Notebook, or mobile device is all that is needed to manage a WaveCore device. To access the VineManager Web GUI, enter the applicable Management IP Address into the browser address bar.

VineManager can be accessed device via the following WaveCore interfaces:

- The WaveCore Wired Ethernet port
- The WaveCore 2.4GHz Local Wi-Fi management interface

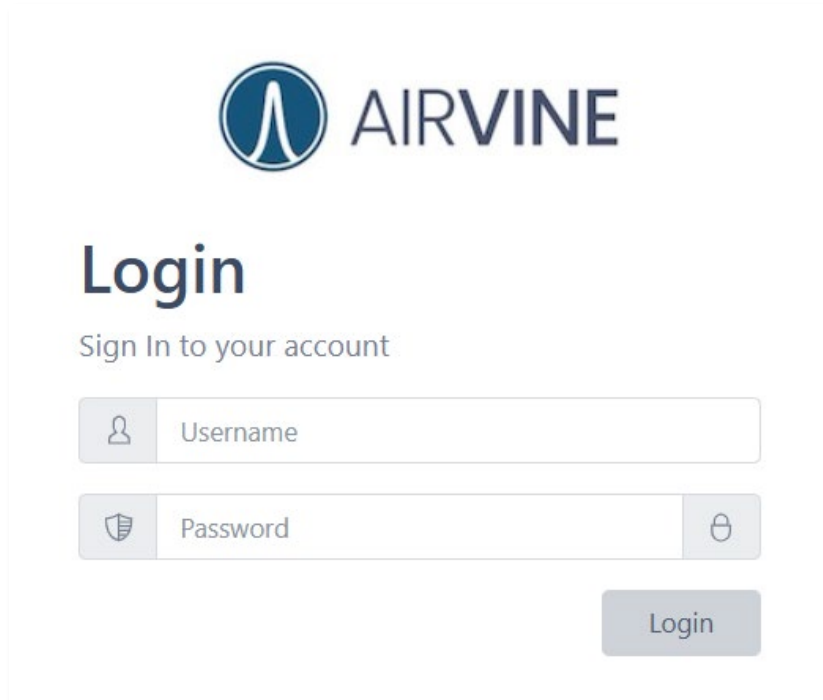
Supported Management Interfaces over Wired Ethernet	VineManager, a browser-based Web GUI using HTTP and HTTPS.
Supported Management Interfaces over the WaveCore Wi-Fi Interfaces (Note 1)	VineManager, a browser-based Web GUI using HTTP and HTTPS.
Supported Wi-Fi Browsers	Google Chrome Microsoft Edge Safari Firefox

Note 1: The Web GUI supports both http and https connections. For https connections, the web server of the WaveCore device uses a self-signed certificate. Thus, you need to ignore the security warnings on the browser to bypass the validation.



Logging Into VineManager

When first connecting to the management IP address on your web browser, log onto the VineManager GUI using the default user login and password (admin / admin).



Note
For enhanced security, it is recommended to change the password after the first login. To do this log into VineManager and navigate to **CONFIGURATION/User-Change Password.**

VineManager Graphical User Interface Overview

After logging in, the GUI title bar will display at the top of the browser screen along with a **Navigation Pane** on the left of the browser screen, and a main **Content Pane** in the center right of the browser screen. The Dashboard provides a high-level summary of the link performance and connection status.

For details on using VineManager Web GUI, please consult the *WaveCore Configuration Manual* located at www.airvine.com/support.

The screenshot shows the VineManager GUI with several callouts:

- MAC and IP of Device:** Points to the header information: MAC: a4:f9:e4:20:00:a0 IP: 192.168.0.251.
- Drop Down: Select which device on the link to manage:** Points to a dropdown menu showing device IDs like 24170010--a4:f9:e4:20:00:a0.
- CPU Usage:** Points to a gauge showing 1.0%.
- Memory Usage:** Points to a gauge showing 35.9%.
- User Acct/Logout:** Points to the user profile 'admin'.
- Disk Usage:** Points to a gauge showing 0.3%.
- Active Alarms:** Points to a bell icon.
- The highlighted Tab indicates current menu / screen:** Points to the 'Dashboard' tab in the left navigation pane.
- Link Status:** Points to a diagram showing two devices connected by a green dashed line.
- "<" indicates sub-menus:** Points to the left-pointing arrows next to 'Network', 'User', and 'Operations' in the navigation pane.
- Red line Indicates which device is being managed:** Points to the red line connecting the two devices in the link status diagram.
- Content Pane for the selected menu on the Navigation Panel:** Points to the main content area showing traffic graphs.
- Main Navigation Pane:** Points to the entire left sidebar.

The main content area displays 'WaveCore Network' with a link status diagram and two traffic graphs: 'Ethernet Traffic' (10G Ethernet) and 'Wireless Traffic', both showing Mbps over time.

Appendix B – EIRP Limits by Country

The WaveCore 1000RH operates in the 6 GHz bands (U-NII 5, 6, 7, and 8) and confirms to all applicable regulatory limits. The following table is for information purposes only and indicates EIRP Limits associated Frequency Bands for depending on the country code configured for the device. The Airvine VineCalculator Link Performance Simulator Tool utilizes these values.



Note:

WaveCore is not certified in all countries listed in this table and not all country codes are available to be configured. Please contact Airvine Sales regulatory status or requests for country certification.

Country Code	Country	Controller Node EIRP Limits			Subordinate Node EIRP Limits			Frequency Band
		Channel Size			Channel Size			
		320 MHz	160 MHz	80 MHz	320 MHz	160 MHz	80 MHz	
AX	ALAND ISLANDS	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AS	AMERICAN SAMOA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
AD	ANDORRA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AG	ANTIGUA AND BARBUDA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
AR	ARGENTINA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
AM	ARMENIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AW	ARUBA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
AU	AUSTRALIA	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
AT	AUSTRIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AZ	AZERBAIJAN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
BS	BAHAMAS	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
BH	BAHRAIN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
BE	BELGIUM	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
BM	BERMUDA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
BR	BRAZIL	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
BG	BULGARIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
BF	BURKINA-FASO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
CA	CANADA	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
KY	CAYMAN ISLANDS	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
CL	CHILE	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
CX	CHRISTMAS ISLAND	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
CO	COLUMBIA	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
CK	COOK ISLANDS	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
CR	COSTA RICA	30 dBm	30 dBm	30 dBm	30 dBm	30 dBm	30 dBm	5.925 to 7.125 GHz
CW	CURACAO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
CY	CYPRUS	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
CZ	CZECH REPUBLIC	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
DK	DENMARK	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
DO	DOMINICAN REPUBLIC	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
SV	EL SALVADOR	30 dBm	27 dBm	24 dBm	24 dBm	21 dBm	18 dBm	5.925 to 7.125 GHz
EE	ESTONIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz

Country Code	Country	Controller Node EIRP Limits			Subordinate Node EIRP Limits			Frequency Band
		Channel Size			Channel Size			
		320 MHz	160 MHz	80 MHz	320 MHz	160 MHz	80 MHz	
FK	FALKLAND ISLANDS	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
FO	FAROE ISLANDS	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
FJ	FIJI	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
FI	FINLAND	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
FR	FRANCE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GF	FRENCH GUIANA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
PF	FRENCH POLYNESIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
TF	FRENCH SOUTHERN TERRIT	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GE	GEORGIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
DE	GERMANY	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GH	GHANA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GI	GIBRALTER	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
GR	GREECE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GD	GRENADA	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
GP	GUADELOUPE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
GU	GUAM	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
GT	GUATEMALA	23 dBm	23 dBm	22 dBm	22 dBm	22 dBm	22 dBm	5.925 to 7.125 GHz
GG	GUERNSEY	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
HT	HAITI	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
HM	HEARD ISLAND AND MCDON	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
VA	HOLY SEE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
HN	HONDURAS	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
HK	HONG KONG	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
HU	HUNGARY	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
IS	ICELAND	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
IE	IRELAND	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
IM	ISLE OF MAN	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
IL	ISRAEL	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
IT	ITALY	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
JM	JAMAICA	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
JP	JAPAN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
JE	JERSEY	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
JO	JORDAN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
KE	KENYA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
KR	KOREA ROC	None	15 dBm	15 dBm	None	15 dBm	15 dBm	5.925 to 5.425 GHz
KW	KUWAIT	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LA	LAO PEOPLE'S DEMOCRATIC	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
LV	LATVIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LB	LEBANON	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LI	LIECHTENSTEIN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LT	LITHUANIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LU	LUXEMBOURG	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MY	MALAYSIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MT	MALTA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MQ	MARTINIQUE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MU	MAURITIUS	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
YT	MAYOTTE	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz

Country Code	Country	Controller Node EIRP Limits			Subordinate Node EIRP Limits			Frequency Band
		Channel Size			Channel Size			
		320 MHz	160 MHz	80 MHz	320 MHz	160 MHz	80 MHz	
MX	MEXICO	30 dBm	27 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 7.125 GHz
MD	MOLDOVA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MC	MONACO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MN	MONGOLIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
MS	MONTERRAT	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
MA	MOROCCO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
NA	NAMIBIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
NL	NETHERLANDS	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AN	NETHERLANDS-ANTILLES	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
NC	NEW CALEDONIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
NZ	NEW ZEALAND	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
NU	NIUE	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
NF	NORFOLK ISLAND	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
MP	NORTHERN MARIANA ISLAN	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
NO	NORWAY	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
PE	PERU	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
PL	POLAND	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
PT	POTUGAL	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
PR	PUERTO RICO	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
QA	QATAR	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
RE	REUNION	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
RO	ROMANIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
RU	RUSSIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SH	SAINT HELENA	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
KN	SAINT KITTS AND NEVIS	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
LC	SAINT LUCIA	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
PM	SAINT PIERRE AND MIQUEL	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SM	SAN MARINO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SA	SAUDI ARABIA	30 dBm	30 dBm	29 dBm	24 dBm	24 dBm	24 dBm	5.925 to 7.125 GHz
RS	SERBIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SG	SINGAPORE	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
SX	SINT MARTEN (DUTCH PART	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SK	SLOVAKIA (SLOVAK REPUBLI	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SI	SLOVENIA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
ZA	SOUTH AFRICA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
ES	SPAIN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
LK	SRI LANKA	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SR	SURINAME	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SJ	SVALBARD AND JAN MAYEN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
SE	SWEDEN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
CH	SWITZERLAND	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
TW	TAIWAN	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
TH	THAILAND	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
TG	TOGO	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
TR	TURKEY	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	23 dBm	5.925 to 5.425 GHz
AE	UNITED ARAB EMIRATES	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
GB	UNITED KINGDOM	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz
US	UNITED STATES	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
UM	UNITED STATES MINOR OU	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
VU	VANUATU	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
VE	VENEZUELA	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
VI	VIRGIN ISLANDS (U.S.)	30 dBm	27 dBm	24 dBm	30 dBm	27 dBm	24 dBm	5.925 to 7.125 GHz
VG	VIRGIN ISLANDS BRITISH	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	24 dBm	5.925 to 5.425 GHz