

# FREEWAVE FUSION WIFI BRIDGE

## Quickstart Guide

The FreeWave Fusion Wi-Fi Bridge is designed to create a seamless Wi-Fi access point (AP) anywhere on a ZumLink network. This allows Wi-Fi devices and sensors to be connected in remote and rugged locations, without extra wiring or special networking.

This guide will walk you through the first-time setup and configuration of the Fusion Wi-Fi Bridge, connecting the device to a ZumLink network and introducing the device's Wi-Fi parameters and functionality.

This guide assumes a level of familiarity with ZumLink networks. If information about setting up a ZumLink network is required, please visit

<https://www.freewave.com/gettingstartedwithzum/>

### You Will Need

1. A computer running Windows with an available USB port
2. A FreeWave ZumLink 900MHz system or gateway to which the Fusion device can connect as an endpoint

### Kit Contents

#### 1. Fusion Wifi Bridge

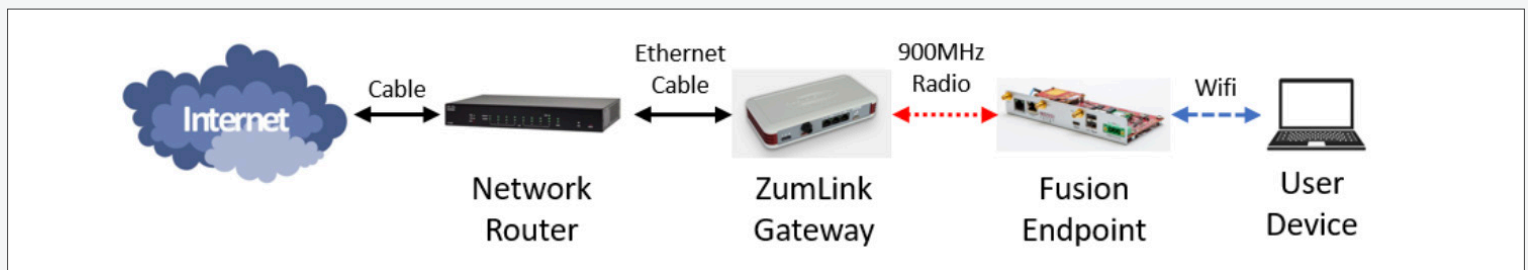
- a. 900MHz SMA antenna (long antenna)
- b. 2xDual-band Wifi antenna (short antenna)
- c. Fusion power supply, terminated



FreeWave Fusion

### Purpose of this guide

This document will guide the setup and installation of a Fusion Wi-Fi Bridge endpoint on a ZumLink network. By the end of this guide, we will have created a Wi-Fi AP that allows the user to connect Wi-Fi devices to a ZumLink network, as pictured below.

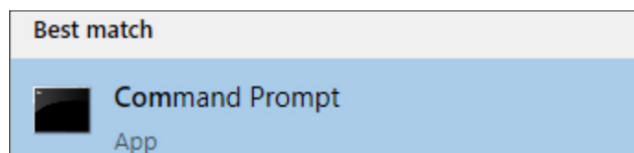


## Determine the IP of Your Network Gateway

For the Fusion device to connect to the internet, it is important that it be configured with the same IP range as your network gateway. This varies from network to network, so before we configure the Fusion, we need to determine the IP of the default gateway for your test network.

**Note:** This guide assumes the computer used to configure the device is connected to the same network to which the ZumLink gateway is connected. If this is not the case, you'll need to find the Default Gateway value for the network router to which your ZumLink gateway is connected. Use this value for the Default Gateway when it is mentioned in this guide.

1. Open a command prompt window (click the Start button and type "cmd" to find the Command Prompt shortcut)



2. type "ipconfig" and press Enter (ifconfig on Linux)

3. Look in the output for your main network connection, i.e. the interface your computer is using to connect to your network - Wi-Fi or Ethernet. In the output pictured below, the "Wireless LAN adapter Wi-Fi" interface is the way the computer is connecting to the wireless router

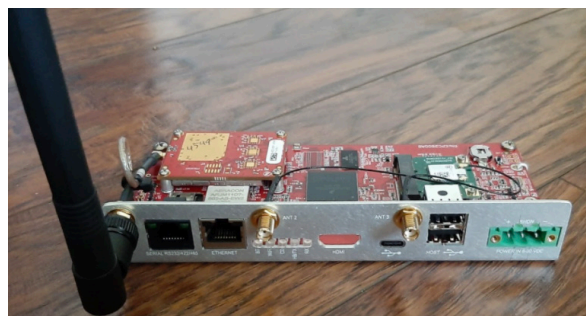
```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix  . : 
Link-local IPv6 Address . . . . . : fe80::e4c4:4df7:8221::...
IPv4 Address. . . . . : 192.168.1.8
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.1.1
```

4. Make a note of the "Default Gateway" IP. In the case above, the Default Gateway is 192.168.1.1 We will use this later in Fusion configuration.

## Power Up the Fusion

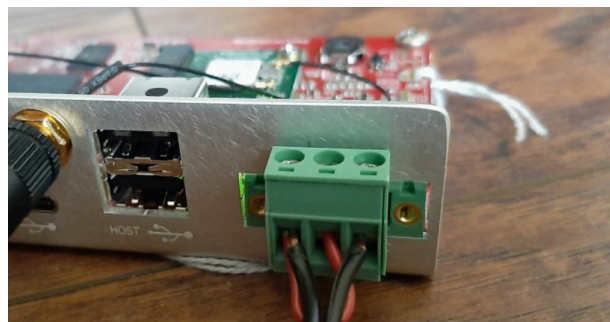
1. Now we'll prepare the Fusion device for configuration. To start, screw the larger SMA whip antenna into the SMA jack on the far-left side of the device.



2. Next, connect the two smaller antennas to the remaining SMA jacks to the left and right of center of the front panel. These are the Wi-Fi antennas, and they are both dual-band, meaning that either antenna can be connected to either jack.



3. Finally, connect the green connector from the power supply to the front of the unit, and plug the wall adapter into a wall power source. The device will power up. On first power up, the LEDs on the device will flash in sequence several times. When boot up is complete, the LED labeled "CD" should light up and hold a steady red. The device is now ready to configure.



## Navigate to the configuration page

Once the device is powered, the next step is to navigate to the configuration page using a browser and begin configuring the radios. There are two options for connecting to the radio for configuration: physically through the USB-C connection, or wirelessly by connecting to the FusionWiFi Access Point:

### Connection Option 1: USB-C

1. Plug in a USB-C cable to the device, and connect the other end to your computer OR

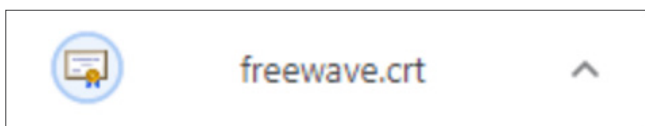
### Connection Option 2: Wi-Fi

2. Find the “FusionWiFi” network in your Wi-Fi settings on your device and connect to it as your Wi-Fi AP.

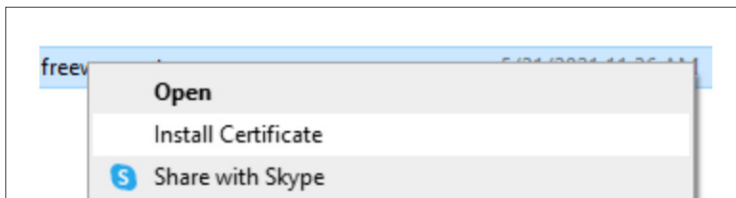
## Certificate Installation

Because the Fusion configuration site uses the secure https:// URL, one must first install the Fusion security certificate. This is located on the device and can be downloaded directly in a browser:

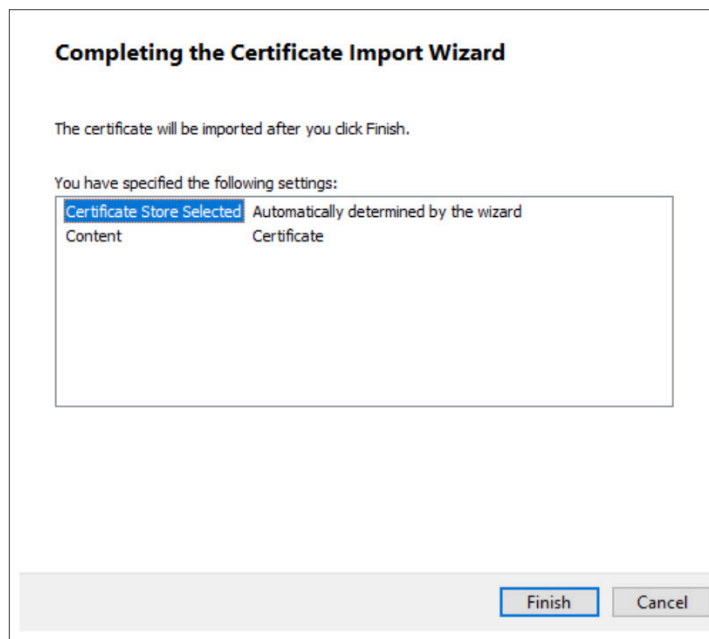
1. Navigate to <https://192.168.1.150/freewave.crt>
2. The browser should automatically begin downloading the certificate from the Fusion device



3. Once the certificate has downloaded, open the Downloads folder, right click on the freewave.crt file, and select “Install Certificate”




4. The certificate will now be installed, click through the install wizard with the default selections on each screen, then click “Finish”. The certificate is now installed and your browser will now recognize the Fusion device.



## Web Setup

1. Open a browser (Chrome or Firefox) and navigate to the IP 192.168.1.150 This is the default IP of the Fusion device
2. You should now be at the Login screen. Login with the credentials:

username:**admin** and password:**password**

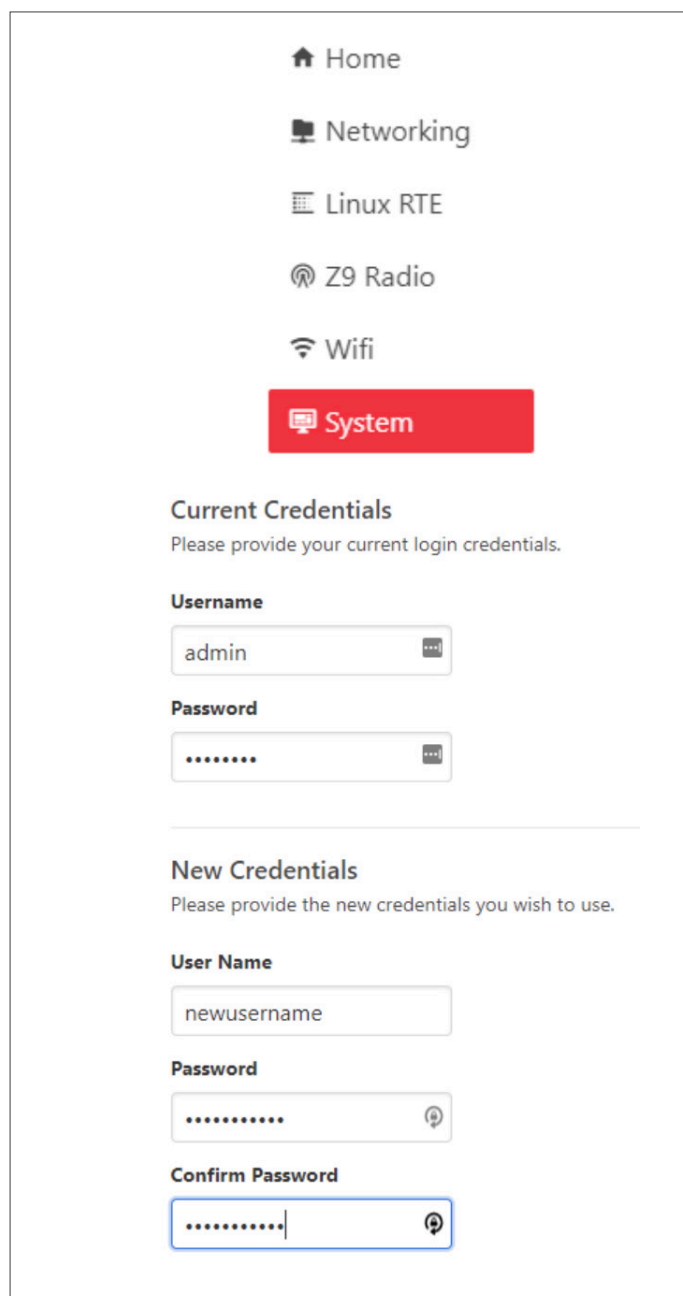


The screenshot shows the FreeWave login interface. At the top is the FreeWave logo. Below it are two input fields: 'Username' with the value 'admin' and 'Password' with masked characters '.....'. A dark blue 'Login' button is at the bottom.

3. You should now have access to configure the device

## Change username and password

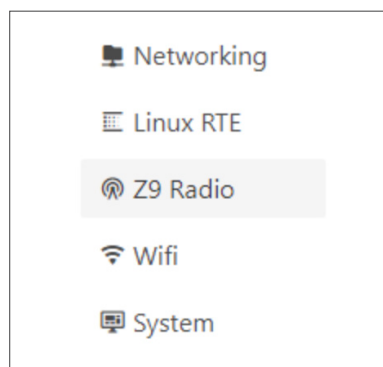
4. When signing in for the first time, we recommend that you change the credentials to something only known to you (note, this is optional, but recommended if the system will be used in non-test conditions). To change your credentials now, navigate to the System tab and update your credentials there.



The screenshot shows the 'System' configuration page in the FreeWave web interface. A sidebar on the left contains navigation links: Home, Networking, Linux RTE, Z9 Radio, Wifi, and System (highlighted in red). The main content area has a 'Current Credentials' section with a prompt to provide current login credentials, followed by 'Username' (admin) and 'Password' (masked) fields. Below this is a 'New Credentials' section with a prompt to provide new credentials, followed by 'User Name' (newusername), 'Password' (masked), and 'Confirm Password' (masked) fields.

## Configure the Z9

Now it is time to configure the Z9 radio on the Fusion device. In the configuration area, click the “**Z9 Radio**” tab to navigate to the Z9 configuration page

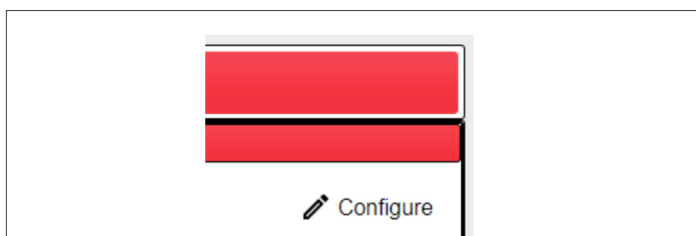


You may be asked for your user credentials again. These are the same credentials used to login to the original configuration area.

5. Once in the Z9 configuration area, navigate to the “**Radio Settings**” tab on the top left of the screen



6. Once in the radio settings tab, click “**Configure**” on the right side of the screen:



7. You should now see the radio configuration settings. At this point, you should now configure the Z9 settings such that the Fusion device is an Endpoint on your ZumLink network. An example setup is pictured below. If you are unfamiliar with how to configure a ZumLink endpoint, please visit <https://www.freewave.com/gettingstartedwithzum/>

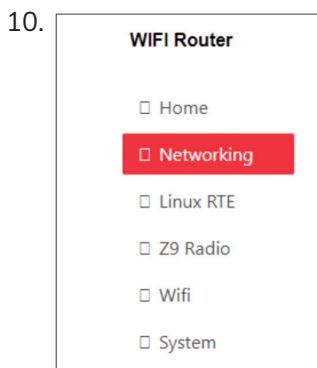
Radio Settings	
Radio Mode	Endpoint
RF Data Rate	RATE_4M
TX Power	15dbm
Network ID	500
Node ID	5309
Radio Hopping Mode	Hopping_On
LNA Bypass	0
Max Link Distance in Miles	20
Frequency Masks	

8. Once the above values are entered, click the Update button on the bottom left of the configuration screen. If the Z9 is successfully configured as an endpoint, the “CD” LED on the front panel of the device should change from solid red to solid green.

## Configure the Networking module

If, in the **Determine the IP of your Network Gateway** phase, it was determined that the IP of your network Gateway is 192.168.1.1, then your system should be configured and ready to use, and you should skip to the “Utilizing the Fusion Wi-Fi Bridge” section of this guide. If not, continue following the steps below.

9. Navigate to the Network configuration page on the Fusion configuration tool. If you’re still on the Z9 configuration, use the “**Wi-Fi Router**” link at the top to get back to the main screen, then click “**Networking**” on the left of the configuration tool:





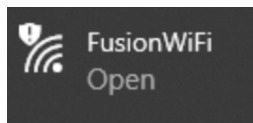
11. Once on the Networking configuration page, edit the network settings to work on your network as follows:
  - a. Change the IP address such that the first three number fields match that of your home network. For example, if your home network is 192.168.1.X, change the first three values to 192, 168, and 1. Set the last number to a value that is unique to your network. "150" is likely an open address if you have a standard-size home network. Likewise, if your network is 10.0.0.X, set the first three values to 10, 0, and 0, with the fourth number being unique to your network (once again, "99" is a safe bet). Note: Advanced networks may have a special subnet mask. If you believe this to be the case on your network, contact the network administrator for the subnet values to use.
  - b. Next, change your "Default Gateway" values to match the "Default Gateway" of your system, the IP found in step 4:

IP Address:	192	.	168	.	1	.	150
Subnet Mask:	255	.	255	.	255	.	0
Default Gateway:	192	.	168	.	1	.	1
OR							
IP Address:	10	.	0	.	0	.	150
Subnet Mask:	255	.	255	.	255	.	0
Default Gateway:	10	.	0	.	0	.	1

- c. Click "Save Settings" at the bottom of the page.

## Utilizing the Fusion Wi-Fi Bridge

12. You should now be able to use the Fusion as a Wi-Fi bridge on the ZumLink network. Click on your Wi-Fi interfaces icon on the Start bar, and "FusionWiFi" should be available.



13. This is currently an open, non-password-protected Wi-Fi access point. You can now connect to this device as you would with a regular Wi-Fi router. Fusion will direct your Wi-Fi traffic over the ZumLink network to the ZumLink Gateway, and then on to the internet.

## Wi-Fi Configuration

The final step is to configure the Fusion's Wi-Fi parameters such as security, passwords, broadcast, SSID, etc.

14. Navigate to the Wi-Fi section of the configuration page:

A screenshot of the Wi-Fi configuration page. On the left is a sidebar with navigation links: Home, Networking, Linux RTE, Z9 Radio, Wi-Fi (highlighted), System, and Update. The main content area is titled "WIFI" and contains several sections: "Enable WiFi" with a toggle switch; "SSID" with a "Name" field containing "FusionWiFi" and a note about valid SSID characters; "Broadcast" with a toggle switch; "Security" with a "Mode" dropdown set to "None"; and "Advanced Settings" with a toggle switch. At the bottom are two buttons: "Reset to Defaults" and "Save Settings".

Use this page to choose an SSID name, set security to Open, WPA, or WPA2, and set a password for the Wi-Fi network.

The Fusion Wi-Fi Bridge is now be configured and ready to use with Wi-Fi devices. The configuration will remain static through power cycles, so when the device is powered up, it will automatically start the Wi-Fi AP, connect to the ZumLink network, and be ready to connect Wi-Fi devices to the network!

The system we have created in this guide has a single endpoint, in larger systems with many endpoints, the Wi-Fi user will now be connected to the on-premises network, connecting the Wi-Fi device to any other Endpoint connections, such as SCADA equipment and on-premises gateways!

## Support/Further Reading

This is just the beginning of what is capable with FreeWave Fusion and ZumLink devices. With the multi-radio configurability of Fusion, users will be able to create complex networks build with a mixed variety of radio and network types according to their need.

- For the latest on FreeWave Fusion, please visit <https://www.freewave.com/products/fusion/>
- For more on the features of the ZumLink products, please visit <https://www.freewave.com/gettingstartedwithzum/>
- To purchase, or to find out how FreeWave can solve your network challenges, please visit <https://www.freewave.com/how-to-buy/>
- For questions and support with the Fusion device, please visit <https://support.freewave.com/>

## FCC Notifications

### FCC Supplier's Declaration of Conformity

FreeWave Technologies, Inc.

5395 Pearl Parkway, Boulder, CO 80301

Phone Number: 303.381.9200

Website: [www.freewave.com](http://www.freewave.com)

FreeWave Technologies declare under our sole responsibility that the product Models: FUSION-BR-WZ complies with Part 15 of FCC Rules.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The content of this guide covers FreeWave Technologies, Inc. models sold under FCC ID: KNPMT0101AB and the Silex WiFi/Bluetooth module solder under FCC ID: N6C-SXPCEAC2. All devices have been tested and comply under the colocation Part 15 (b) - SDoC.

All models sold under the listed FCC ID(s) must be installed professionally and are only approved for use when installed in devices produced by FreeWave Technologies or third party OEMs with the express written approval of FreeWave Technologies, Inc. Changes or modifications should not be made to the device.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Part 15 Class A

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the User-Reference Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

### FCC NEMA Installation and Label

Where applicable, the models described in this guide must be installed in a NEMA enclosure. When any FreeWave Technologies, Inc. module is placed inside an enclosure, a label must be placed on the outside of the enclosure. The label must include the text: "Contains FCC ID: KNPMT0101AB" and "Contains FCC ID: N6C-SXPCEAC2".

### FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 24.42cm between the radiator and your body.

### FCC Notification of Power Warning

The FUSION-BR-WZ covered in this document has a maximum transmitted output power of +30dBm. The antennas used MUST provide a separation distance of at least 24.42cm from all persons and MUST NOT be co-located or operate in conjunction with any other antenna or transmitter.



## ISED Notifications

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. CAN ICES-3 (A)/NMB-3(A)

Ce dispositif est conforme aux normes permis-exemptes du Canada RSS d'industrie. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence, et (2) ce dispositif doit accepter n'importe quelle interférence, y compris l'interférence qui peut causer le fonctionnement peu désiré du dispositif. CAN ICES-3 (A)/NMB-3(A)

## ISED Host Installation and Label

The content of this documentation covers FreeWave Technologies, Inc. models sold under IC: 2329B-PMT0101AB and the Silex WiFi/Bluetooth module solder under IC: 4908A-SXPCEAC2. All devices have been tested and comply under the colocation ISED - SDoC. When any FreeWave Technologies, Inc. module is placed inside a Host, a label must be placed on the outside of the Host. The label must include the text "Contains IC: 2329B-PMT0101AB" and "Contains IC: 4908A-SXPCEAC2".

## Professional Installation

All models sold under the listed IC ID must be professionally installed.

## ISED Radiation Exposure Statement

This system has been evaluated for RF Exposure per RSS-102 and is in compliance with the limits specified by Health Canada Safety Code 6. The system must be installed at a minimum separation distance from the antenna to a general bystander of 20.5 inches (52cm) to maintain compliance with the General Population limits.

L'exposition aux radiofréquences de ce système a été évaluée selon la norme RSS-102 et est jugée conforme aux limites établies par le Code de sécurité 6 de Santé Canada. Le système doit être installé à une distance minimale de 20.5 pouces (52cm) séparant l'antenne d'une personne présente en conformité avec les limites permises d'exposition du grand public.

Only FCC and IC approved antennas may be used.

The antenna must be professionally installed on a fixed, mounted, and permanent outdoor structure to satisfy RF exposure requirements.

Any antenna placed outdoors must be properly grounded.

Use extreme caution when installing antennas and follow all instructions included with the antenna.

## Approved Antennas

### Yagi Directional Antennas

The 900MHz radio is approved by the FCC for use with directional antennas with a 10.5 dBi gain or less.  
900MHz Yagi Directional Antennas

Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
6.45	8.6	WaveLink	PRO890-8-40F02N4	EAN0906YC

## Omni-directional Antennas

The 900MHz radio is approved by the FCC for use with omni-directional antennas with a 10.5dBi gain or less.  
900MHz Omni-Directional Antennas

Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
2.85	5	Antenex	EB8965C	EAN0905WC
3	5.15	Maxrad	MAX-9053	EAN0900WC
0.85	3	Mobile Mark	PSKN3-925S	EAN0900SR
-2.15	0	Mobile Mark	PSTG0-915SE	EAN0900SQ

## Alternative Antennas

Antennas other than those listed in this section can potentially be used with the FUSION-BR-WZ with provisions.

- The antennas must be of a similar type.
- The antenna gain CANNOT exceed 10.5dBi for Omni-directional.
- The antenna gain CANNOT exceed 16.0dBi for Directional antennas.
- The overall system EIRP does not exceed 36dBm.

**Warning!** A proper combination with the FUSION-BR-WZ is required to ensure the system meets FCC requirements.

## Intertek and Safety Notification

FUSION-BR-WZ a recognized component under Intertek File Numbers:

Control # 5019876

Report # 104544854CRT-001

## Standards and Editions

HazLoc Standards

UL 121201-2019

CSA C22.2 No. 213-17

Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified)  
Locations – Edition 3 Revision Date 2019/08/26

Ordinary Location Standards

UL 60950, 2nd Edition

CAN / CSA-C22.2 No. 60950, 2nd Edition

IEC 60950, 2nd Edition

EN 60950, 2nd Edition

## Power Source

FUSION-BR-WZ is intended to be operated from a Limited Power Source (LPS) or Class 2 power source in accordance with IEC/EN/UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07.

The FUSION-BR-WZ is approved to operate with an input voltage range of +6 to +30 VDC, 14W, Tmra of 85°C.

## Hazardous Locations Installation Instructions

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D OR non-hazardous locations only.

Open type device intended to be installed in a suitable enclosure that requires the use of a tool to access.

Ambient: -20°C to +70°C

Temperature Code: T4

Input voltage rating of +6 to +30 VDC, 14W

**WARNING – EXPLOSION HAZARD. DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED. AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS BRANCHER NI DÉBRANCHER SOUS TENSION. WARNING – EXTERNAL USE OF THE ANTENNA IS NOT PERMITTED. THE ANTENNA IS TO BE TERMINATED AND MOUNTED INTERNAL TO THE FINAL INSTALLED ENCLOSURE AVERTISSEMENT - L'UTILISATION EXTERNE DE L'ANTENNE N'EST PAS AUTORISÉE. L'ANTENNE DOIT ÊTRE TERMINÉE ET MONTÉE À L'INTÉRIEUR DU BOÎTIER FINAL INSTALLÉ**

The Antenna must be a 50OHM, passive type.

**Note on Nominal Gain Antennas (2.3dBi):** When using nominal gain antennas (ex. MobileMark 2.3dBi, default for the product) connected to the stock faceplate of the Fusion device. The device must be at least 34cm away from other transmitter antennas from other devices in order to eliminate the possibility of any colocation interference from the two transmitters. Failure to accommodate this requirement will result in non-compliance and/or create a situation where interference from the antennas creates a non-compliant noise environment, causing degraded performance from RF devices.

**Note on High Gain Antennas (6dBi):** When using high gain (6dBi) antennas with the Fusion device for either the 900MHz or the WiFi radio, the antennas need to be spaced no closer than 34cm from each other, in order to maintain FCC compliance and not create interference that may degrade radio performance. When utilizing high-gain antennas, it is recommended that the user not mount the antennas directly to the Fusion device front faceplate, but rather mount the antennas to an external mount point and connect the antennas to the device using coax cable (certain lengths available from FreeWave upon purchase).

Power Output listed is conducted. Single Modular Approval. This device is granted for use in Mobile only configurations in which the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 24.42 cm from all persons and not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

The Grantee is responsible for providing the documentation required for modular use. The responsibility for the use of this module, in all configurations utilized or contemplated, remains with the Grantee.

**Battery Note:** This device houses a lithium polymer coin cell battery that serves to maintain certain functions of the device. It is not intended to be replaced by the user and should only be handled and/or replaced by a certified or instructed technician.

**Warning - Export Compliance:** This document describes a product that contains encryption and is subject to the Export Administration Regulations (EAR) and Office of Foreign Assets Control (OFAC). This product may be restricted to certain countries and users. Access to this document does not guarantee or imply the product will be available for purchase to a specific end-user. Export, re-export, release or transfer of the product in violation of U.S. Export Regulations including the International in Traffic Regulations (ITAR), Export Administration Regulations (EAR) or Office of Foreign Assets Control (OFAC) is prohibited. Any party exporting, re-exporting, releasing or transferring the product is responsible for obtaining all necessary U.S. government authorizations as required to ensure compliance with these and other applicable U.S. laws. Consult with your Trade Compliance department or legal counsel for further guidance or contact [compliance@freewave.com](mailto:compliance@freewave.com). Violations of these regulations are punishable by fine, imprisonment, or both. Diversion or use contrary to U.S. law is prohibited.