

INSTALLATION GUIDE

RADWIN 2000-PLUS FAMILY POINT TO POINT BROADBAND WIRELESS

Release 4.9.75

RADWIN

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Chapter 1: Introduction

1.1 Scope of This Document

This document shows how to install RADWIN 2000-Plus Family radios.

For a detailed description of how to configure RADWIN 2000-Plus Family radios, see the RADWIN 2000-Plus Family Configuration Guide.

1.2 RADWIN 2000-Plus Family Overview

RADWIN 2000-Plus Family delivers up to 750 Mbps (depending on the specific model) in a point-to-point link, and is the ideal choice for last mile enterprise connectivity and high-end applications that demand assured performance with guaranteed link bandwidth.

The RADWIN 2000-Plus Family has several models, each offering different characteristics. The main differences are shown below. Other differences are noted throughout this publication.

Table 1-1: RADWIN 2000-Plus Family Model Comparisons

Model Name	Max T-put (Mbps)	Input Voltage & Current	Form Factor	Enclosure Type	Oper. Temp	Hub Site Synchronization	AES 256 Support
RADWIN 2000 A-Plus	25	55VDC, 1A	Small (SFF)	IP67/Type 4	-35C to +60C	Ethernet, External GPS	No
RADWIN 2000 Alpha EMB	350	24-56VDC, 1A	Alpha Embedded	IP66/Type 4	-35C to +60C	Ethernet (HSS client only)	No
RADWIN 2000 Alpha INT 5.x RADWIN 2000 Alpha INT 3.x	350	24-56VDC, 1A	Alpha Integrated	IP67/Type 4	-35C to +60C	Ethernet (HSS client only)	No
RADWIN 2000 C-Plus	250	48-57VDC, 1A	Large (LFF)	IP67/Type 4	-35C to +60C	Serial, Ethernet, External GPS	Yes ^a
RADWIN 2000 D-Plus	750	48-57VDC, 1A	Large (LFF)	IP67/Type 4	-35C to +60C	Serial, Ethernet, External GPS	No

a. (UNI and WPC regs only)



Some options and models may not be available for your regulatory environment.

1.2.1 Radio Units

There are four types of outdoor radio units (ODUs):

- Large Form Factor (LFF) - With an integrated or external antenna.



Figure 1-1: LFF radio with integrated antenna



Figure 1-2: LFF radio connectorized for external antenna

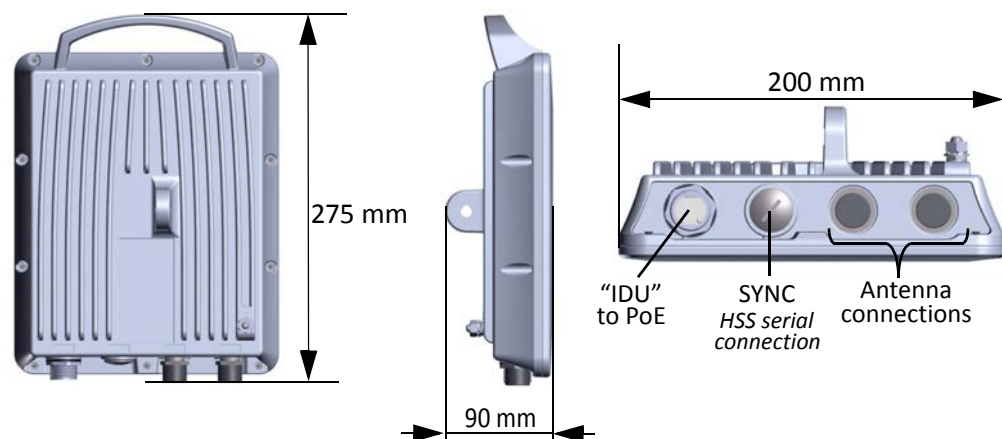


Figure 1-3: LFF radio external dimensions

- Small Form Factor (SFF) - As its name implies, this unit is smaller than an LFF unit, but can also have an integrated or external antenna.



Figure 1-4: SFF radio with integrated antenna



Figure 1-5: SFF radio connectorized for external antenna

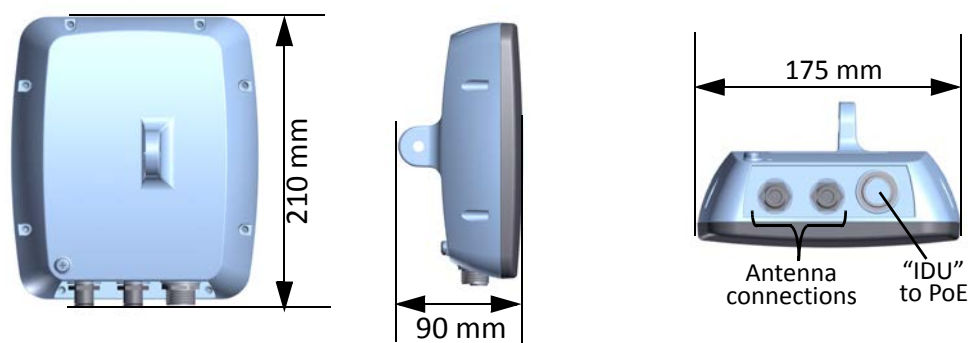


Figure 1-6: SFF radio external dimensions

- **RADWIN 2000 Alpha EMB units** - Uses a smaller form-factor than that of the LFF or SFF. Can also have an integrated antenna - the *Turbo Gain* antenna that installs directly on the unit - or a separate, non-integrated, external antenna.



Figure 1-7: RADWIN 2000 Alpha EMB unit



Figure 1-8: RADWIN 2000 Alpha EMB unit with Turbo Gain antenna

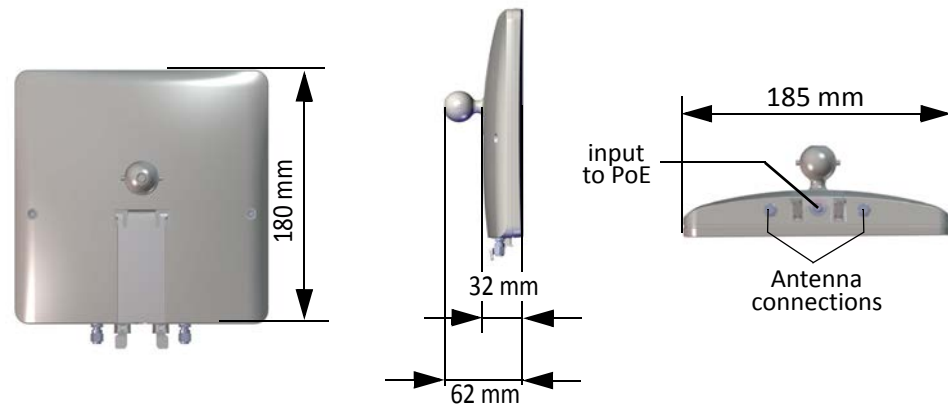


Figure 1-9: RADWIN 2000 Alpha EMB unit external dimensions

- RADWIN 2000 Alpha INT 5.x and RADWIN 2000 Alpha INT 3.x (integrated antenna) units - Uses a larger form-factor than that of the RADWIN 2000 Alpha EMB.



Figure 1-10: RADWIN 2000 Alpha INT 5.x & RADWIN 2000 Alpha INT 3.x unit

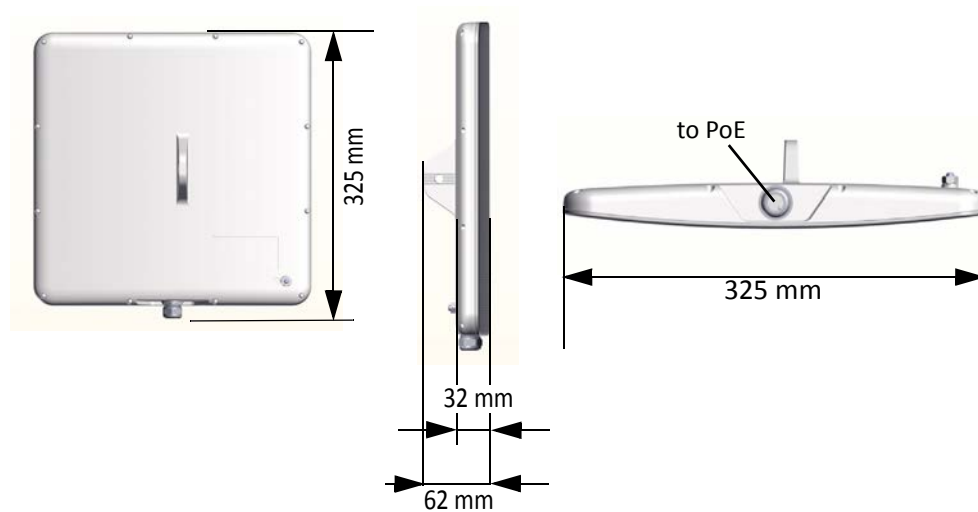


Figure 1-11: RADWIN 2000 Alpha INT 5.x and RADWIN 2000 Alpha INT 3.x unit external dimensions



Note

With the exception of the frequency band, the RADWIN 2000 Alpha INT 5.x and RADWIN 2000 Alpha INT 3.x are identical in form factor and function. We will use the term RADWIN 2000 Alpha INT to refer to both units.

The RADWIN 2000 Alpha EMB and the RADWIN 2000 Alpha INT can be converted for use as an SU **PRO** EMB and SU **PRO** INT respectively.

Do this as follows:

1. Restore factory settings (recommended):



Note

- RADWIN Manager: **Configuration -> Operations -> Restore Defaults.**
- WebUI: **Operations -> Factory Default -> Restore**

2. Verify that the unit to be converted is a “Slave ODU”. If not, change the ODU mode accordingly.
3. Set the *Sector ID* the same as the *Sector ID* of the base station. This is called the *Link ID* in the 2000-Plus.
4. Reset the unit.

1.2.2 Method of Work

The radio units communicate with the service provider and users through PoE devices. The communication protocol for both the service provider and the users is Ethernet. See [Figure 1-12, RADWIN 2000-Plus Family Connection Scheme](#):

- A PoE device is connected to power and the communications network:
- Using CAT-5e cables, the radio units are connected to power and the communications network via a Power-over-Ethernet (PoE) device.
- The radio units and PoE devices are also connected to ground.
- The radios communicate with each other via the air interface.



For simplicity, Lightning Protection Units (LPU) are not shown in [Figure 1-12](#), but these are recommended. See [Mounting the Lightning Protection Units on page 2-23](#) for directions on how to install the LPUs.

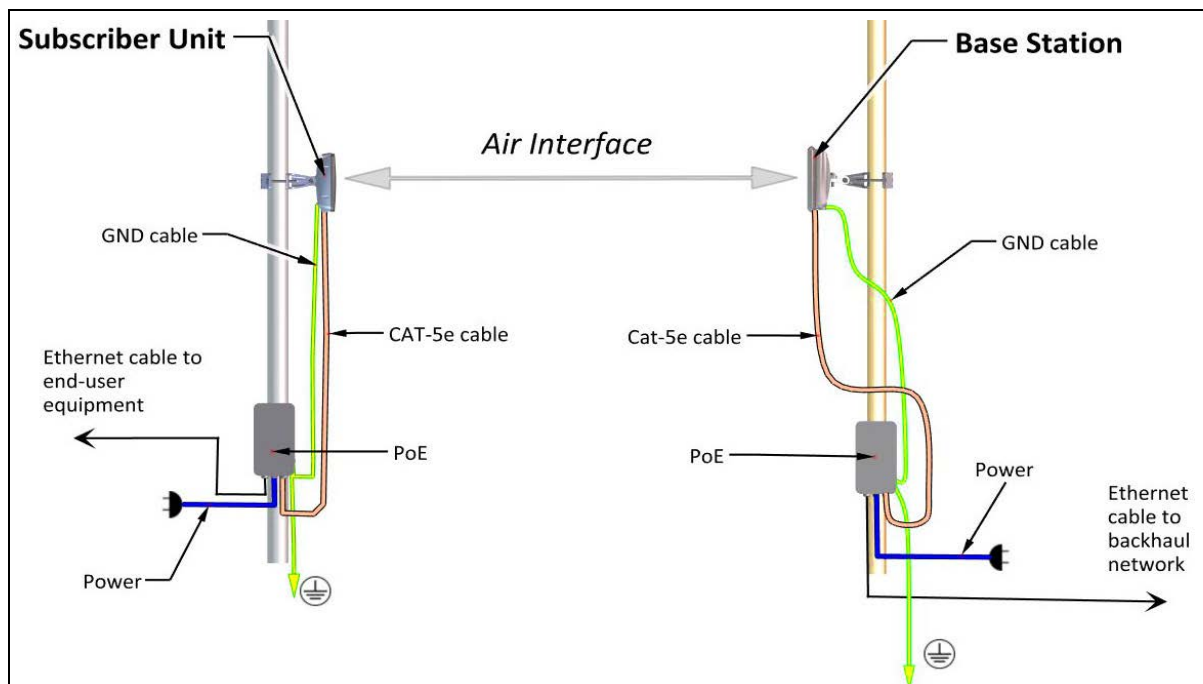


Figure 1-12: RADWIN 2000-Plus Family Connection Scheme

Although the link is symmetric, one unit is defined as a “Base Station” (RT-A(HBS)) and the other as a “Subscriber Unit” (RT-B(HSU)). Sometimes these are also called the “Hub” and “Client” site. The differences are summarized here:

Table 1-2: RT-A(HBS) vs. RT-B(HSU)

RT-A(HBS)	RT-B(HSU)
Must be “activated” to work	Must be “registered” opposite an RT-A(HBS)
VLAN for services not available from the RT-A(HBS)	VLANs can be defined from the RT-B(HSU)

1.2.3 Management Tools

RADWIN Web Interface

The Web Interface enables you to carry out unit and/or link management functions using a Web browser. It is an easy way to rapidly configure and setup a link.

It may be used to -

- Set or change radio unit parameters in the field
- Establish a sector
- Check link parameters and make changes
- View the link Inventory
- Inspect the Recent Events logs



Only the RADWIN 2000 Alpha EMB / RADWIN 2000 Alpha INT has a web interface. Legacy HBS and HSU radios (SFF and LFF) do not have one.

RADWIN Manager

The RADWIN Manager is an SNMP-based management application which manages a complete sector over a single IP address.

1.3 Key features of the RADWIN 2000-Plus Family

- » Ethernet connectivity
- » Advanced OFDM & MIMO 2x2 for nLOS performance
- » Inter & intra site sync to reduce self interference
- » Regulations supported - FCC/ISED/ETSI/WPC/MII/Universal (the product shipped to any given regulatory environment can only support those regulations)
- » Simple to deploy
- » Web Interface for link management
- » Fully integrated with RADWIN's family of solutions:
 - Master ODU of RADWIN 2000-Plus Family can co-exist with other Master ODUs, as well as with base stations of all other RADWIN products
 - Common RADWIN Manager
 - Common RNMS
- » Separate uplink and downlink configurable Maximum Information Rate (MIR)

1.4 What's New in Release 4.9.75

» See the Release Notes for details

1.5 Notifications

Notifications consist of Notes, Cautions, and Warnings:



Caution: Risk of damage to equipment or of service degradation



Warning: Risk of danger to persons operating near the equipment



The purpose of a **Note** is to:

- Draw your attention to something that may not be obvious
- Emphasize a special feature
- Provide additional background

Chapter 2: Installation Steps

To install and establish a basic connection with a radio unit, carry out the steps shown below. Print out this list, and place a checkmark next to a completed task.

Table 2-1: Installation Check-List

Step	Action	Page	Done?
	Before deploying at installation site		
1.	<i>Prepare Laptop</i>	page 2-2	
2.	<i>Connect Laptop to Radio Unit</i>	page 2-2	
3.	<i>Update Connectivity Parameters of Radio Unit</i>	page 2-5	
4.	<i>Check items to be installed</i>	page 2-8	
5.	<i>Prepare Tools</i>	page 2-8	
	Installation		
6.	<i>Install Standard Mounting Kit</i>	page 2-8	
7.	<i>Install RADWIN 2000 Alpha EMB Mounting Kit</i>	page 2-17	
8.	<i>Mounting a Unit with the Standard Mounting Kit</i>	page 2-14	
9.	<i>Ground Radio Unit</i>	page 2-22	
10.	<i>Mounting the RADWIN 2000 Alpha EMB</i>	page 2-20	
11.	<i>Mounting the RADWIN 2000 Alpha INT</i>	page 2-17	
12.	<i>Mounting the Lightning Protection Units</i>	page 2-23	
13.	<i>Connect External Antenna (if applicable)</i>	page 2-27	
14.	<i>Waterproofing</i>	page 2-30	
	Commissioning		
15.	<i>Connect Radio (External Connections)</i>	page 2-31	
16.	<i>Check Connectivity to Radio</i>	page 2-34	
17.	<i>Define One Unit as the RT-A(HBS)</i>	page 2-35	
18.	<i>Activate RT-A(HBS)</i>	page 2-36	
19.	<i>Align RT-B(HSU) Unit</i>	page 2-37	

2.1 Prepare Laptop

Configure IP address and subnet mask of laptop as follows:

- Control Panel -> Network and Internet -> Network and Sharing Center -> Change Adapter settings -> click on Network Interface Card name
- Properties -> Select Internet Protocol Version 4 (TCP/IPv4) -> Properties -> set IP address to 10.0.0.100 and Subnet mask to 255.255.0

2.2 Connect Laptop to Radio Unit

Connect PoE to power, connect the laptop's ethernet port to the IN (or LAN) socket on the PoE, then connect the OUT (or PoE) socket on the PoE to the appropriate socket on the radio unit. Make sure you are using the appropriate PoE for your specific radio unit.

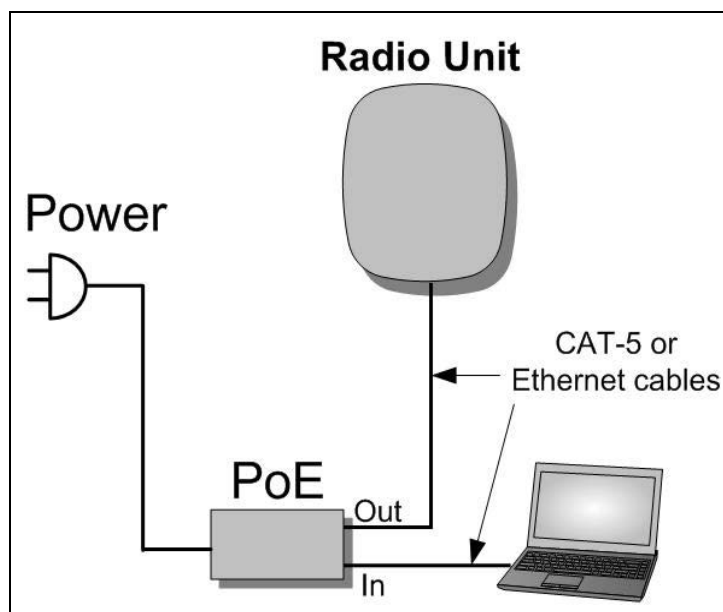


Figure 2-1: Connecting laptop to a radio unit

2.2.1 2000-Plus (LFF and SFF) Units

Connect to socket labeled -> “IDU”

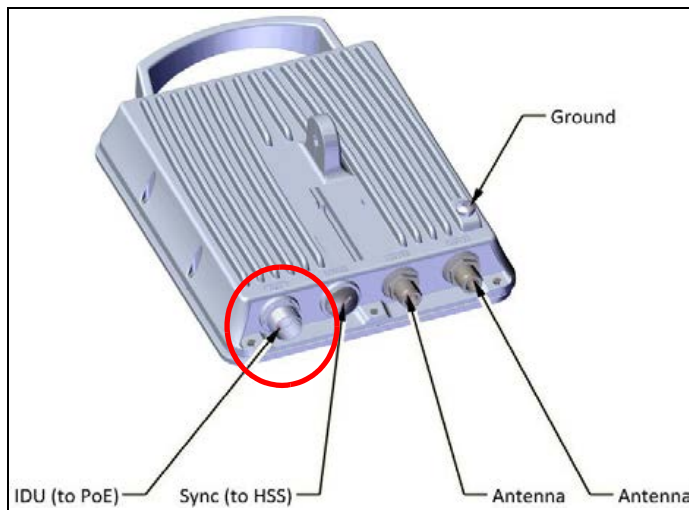


Figure 2-2: Laptop/network port: LFF radio unit (connectorized unit shown)

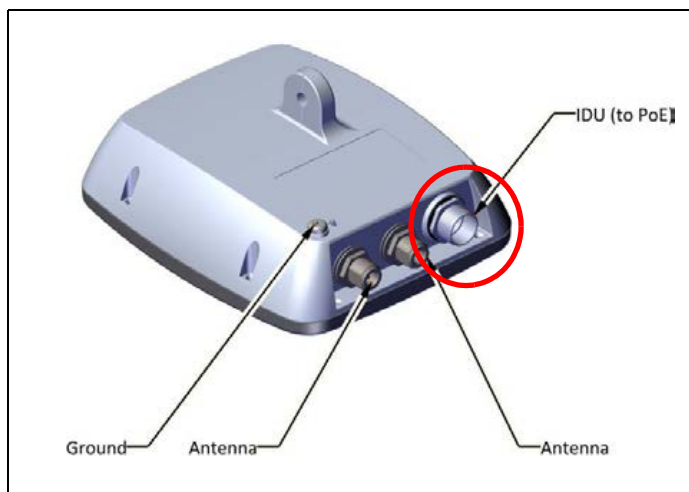


Figure 2-3: Laptop/network port: SFF radio unit (connectorized unit shown)

2.2.2 RADWIN 2000 Alpha INT Units

Connect to -> Input socket (not labeled)

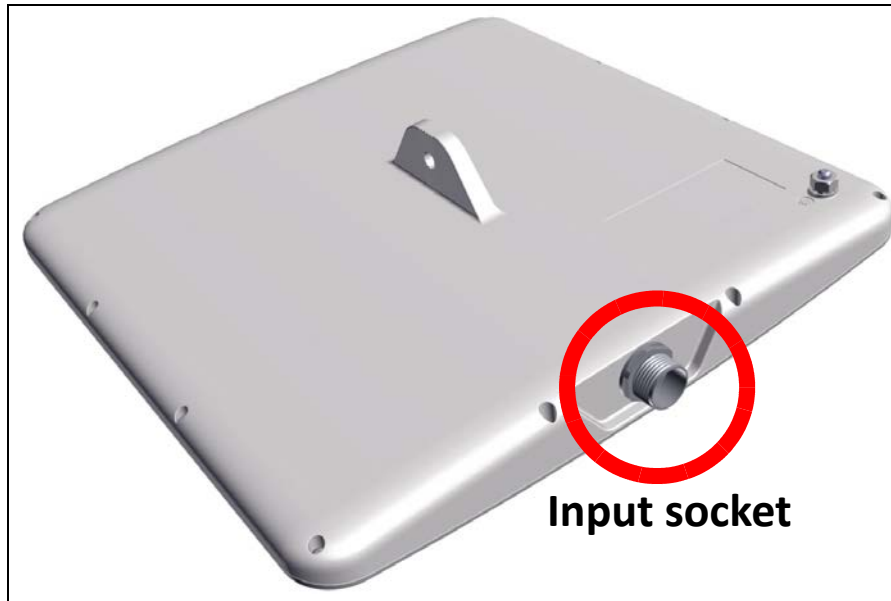


Figure 2-4: Laptop/network port: RADWIN 2000 Alpha INT radio unit

2.2.3 RADWIN 2000 Alpha EMB Units

Connect to -> Input socket (not labeled)

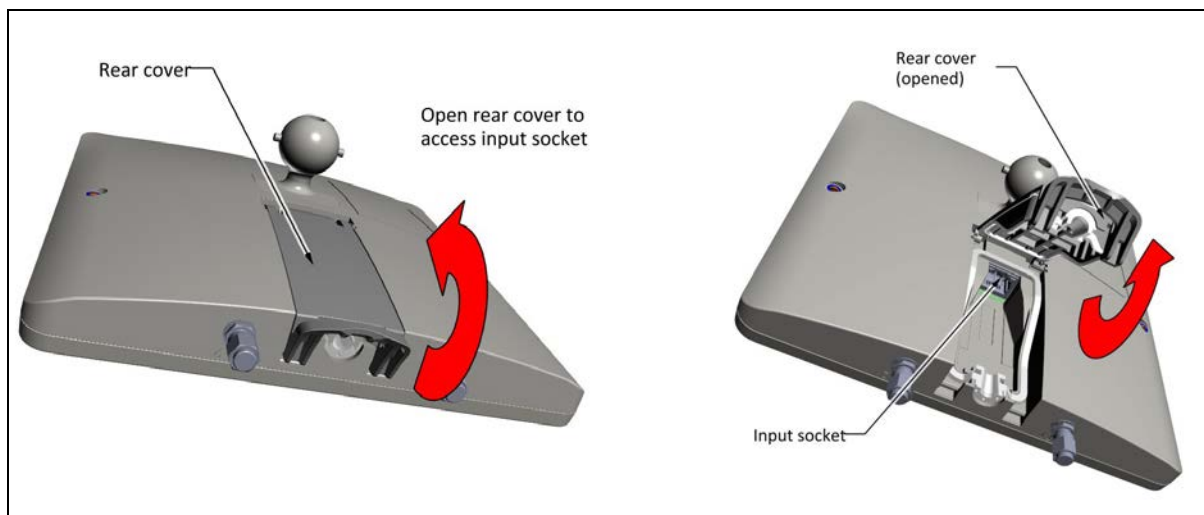


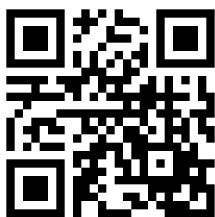
Figure 2-5: Laptop/network port: RADWIN 2000 Alpha EMB radio unit

2.3 Update Connectivity Parameters of Radio Unit

2.3.1 2000-Plus (LFF or SFF radio units)



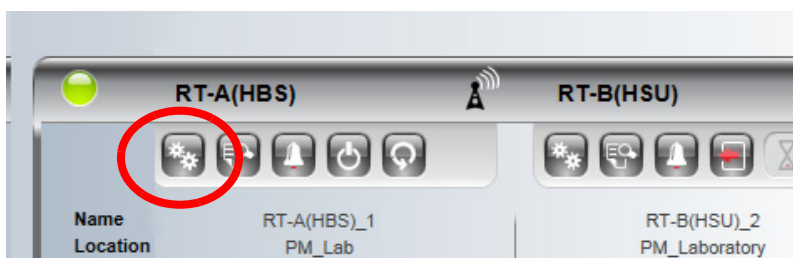
1. If you have not already done so, connect the radio to your PC/network and voltage via its “IDU” port.
2. Install the RADWIN Manager application from: <http://www.radwin.com/download>, or use the QR code:



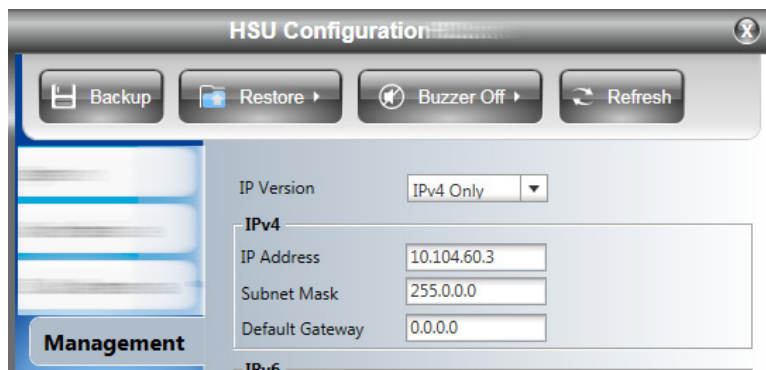
3. Log on to the RADWIN Manager as an “Installer” and enter the default IP address (<http://10.0.0.120>) and password: **wireless**.

Log on →

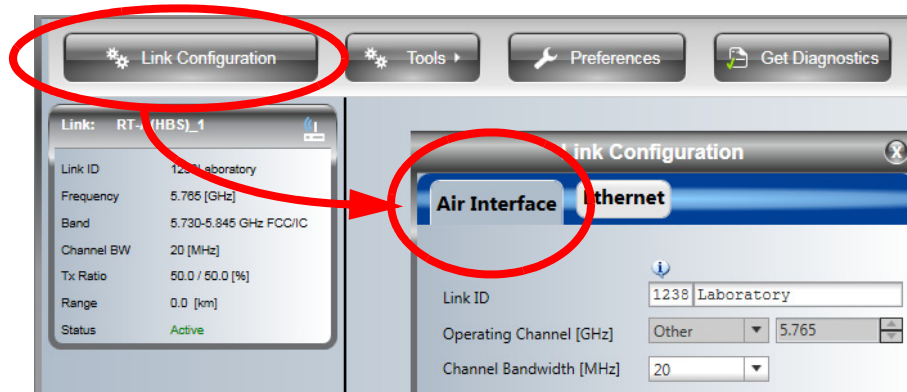
4. From the RADWIN Manager, click the **Configure** icon:



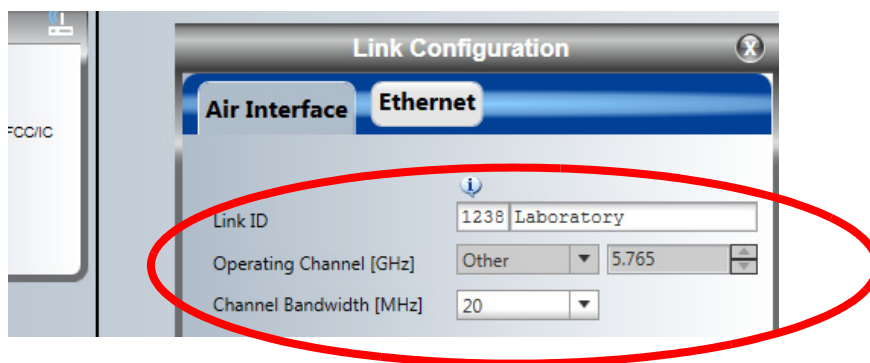
5. Select the **Management** tab.
6. Enter new IP Address, Subnet Mask, and Default Gateway in the indicated fields.



7. Click **Apply** when done.
8. You will be warned that the device will be reset. If all the values are correct, click **OK**.
9. Click the **Link Configuration** button from the main window.
10. Select the **Air Interface** tab.



11. Enter the Link ID and the Channel Bandwidth in the indicated fields.

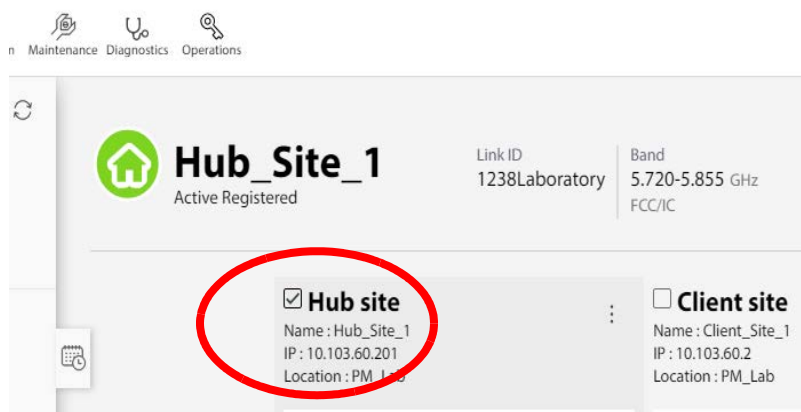


12. Click **OK** when done.
 13. From a command line, ping radio unit using the new IP address to verify change.
- Once you are finished with the steps above, disconnect the radio unit and prepare it for deployment in the field.

2.3.2 RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT Units



1. If you have not already done so, connect the radio to your PC/network and voltage via its input port.
2. Enter its IP address in a web browser (default value: 10.0.0.120).
3. From the login page, enter username **admin** and password **netwireless**.
4. Select the unit for which you want to update the parameters by placing a checkmark next to its name:



5. Click the **Configure** icon



6. Select **Air Interface -> Radio**
7. Enter the Sector ID (equivalent to the Link ID), and if applicable, Channel Bandwidth, then click **Save**.
8. Select **Management -> Network**
9. Enter the new IP Address, Subnet Mask, and Default Gateway, then click **Save**.
10. You will be warned that the device will be reset. If all the values are correct, click **OK**.
11. From a command line, ping radio unit using new IP address to verify change.

Once you are finished with the steps above, disconnect the radio unit and prepare it for deployment in the field.



Alternatively, you can use the WINTouch smartphone application to change the IP address. Log on to WINTouch and follow the instructions.

2.4 Check items to be installed

- Radio unit + mounting kit
- 2 LPUs for each radio (recommended)
- PoE (if outdoor, requires mounting kit)
- CAT-5e cables
- Grounding cables (10 AWG) for radio unit, LPUs and outdoor PoE (if used)
- External antenna + mounting kit (if using an external antenna for LFF or SFF units)
- RF cables (if using an external antenna for LFF or SFF units)
- Turbo Gain antenna (if using this antenna for the RADWIN 2000 Alpha EMB unit)

2.5 Prepare Tools

- Crimping tool
- Spanner/wrench 13mm (1/2")
- Cable ties
- Sealing material
- Waterproofing tape (like Scotch 23)

2.6 Install Standard Mounting Kit

2.6.1 Standard Mounting Kit

Use the standard mounting kit for:

- LFF (large form-factor) radio units
- SFF (small form-factor) radio units
- RADWIN 2000 Alpha INT radio units
- External PoEs
- RADWIN GSUs
- External antennas (with mounting kit adaptor)

The RADWIN 2000 Alpha EMB has its own mounting kit: see [Install RADWIN 2000 Alpha EMB Mounting Kit](#) on page 2-17.

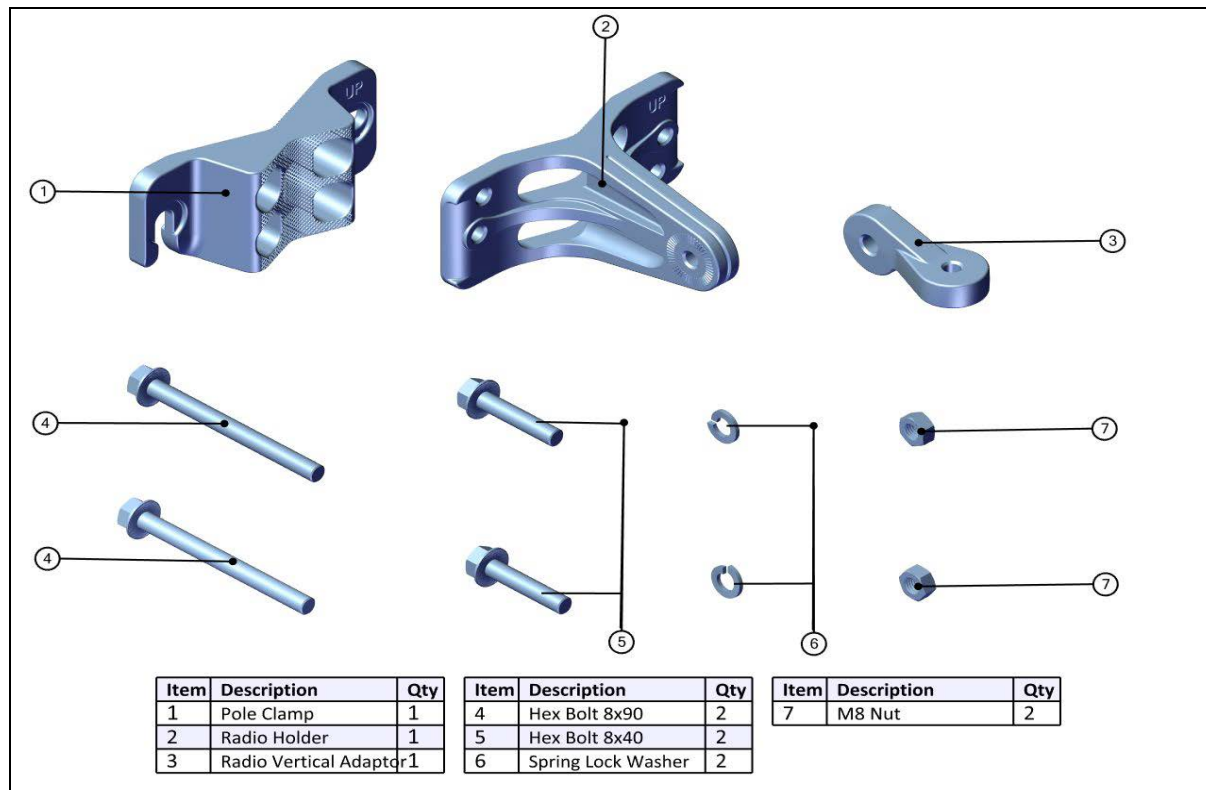


Figure 2-6: Mounting Kit Contents



Note

Tighten all bolts with a torque of 15Nm.

The mounting kit can be used on a vertical or horizontal pole or on a wall:

Vertical Pole	page 2-9
Horizontal Pole	page 2-11
Wall	page 2-12

2.6.2 Vertical Pole

The mounting kit can be used on a thin, medium, or thick pole.

Thin Pole	Dia. 3/4 - 1 1/2	page 2-10
Medium Pole	Dia. 2 - 3	page 2-10
Thick Pole	Dia. > 3	page 2-11

Thin Pole

1. Diameter 3/4 to 1 1/2: Position the pole clamp as shown in the following figures. Do not tighten the bolts all the way.

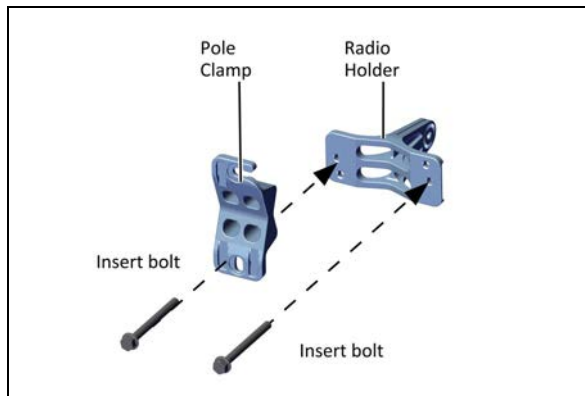


Figure 2-7: Connect Pole Clamp to Radio Holder

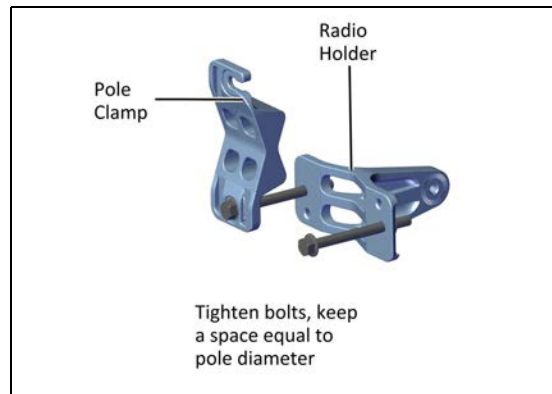


Figure 2-8: Partially tighten bolts

2. Place this “unit” on the pole where you want to mount the device. Once it is in place, rotate the pole clamp as shown, then tighten both bolts.

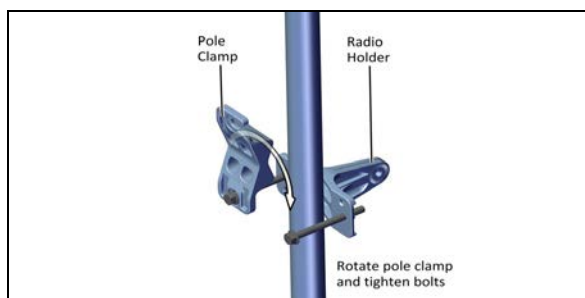


Figure 2-9: Rotate Clamp and tighten bolts

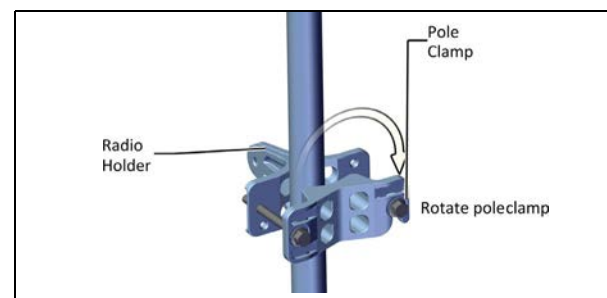


Figure 2-10: Completely tighten bolts

Medium Pole

1. Diameter 2 to 3: Position the pole clamp as shown in the following figures. Do not tighten the bolts all the way.

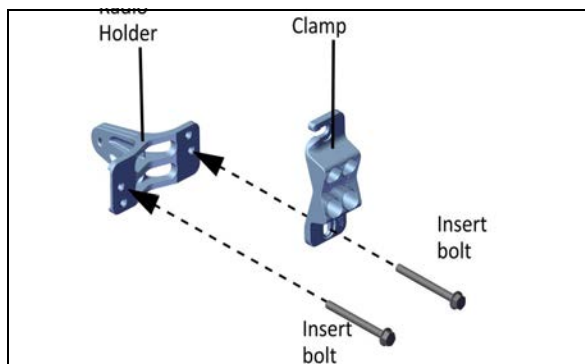


Figure 2-11: Connect Pole Clamp to Radio Holder

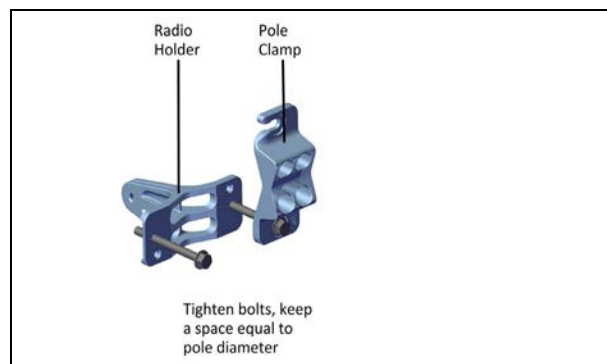


Figure 2-12: Tighten bolts

2. Place this “unit” on the pole where you want to mount the device. Once it is in place, rotate the pole clamp as shown, then tighten both bolts.

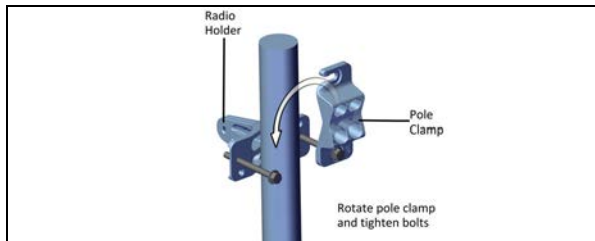


Figure 2-13: Rotate Clamp

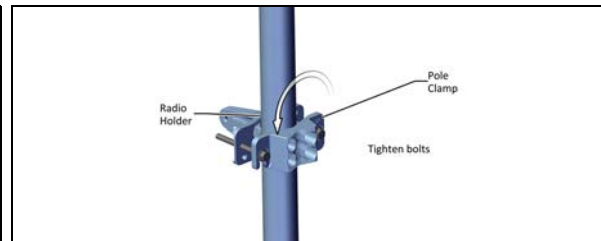


Figure 2-14: Completely tighten bolts

Thick Pole

1. Diameter larger than 3: Use worm drive clamps (not supplied), threaded through the holes as shown:

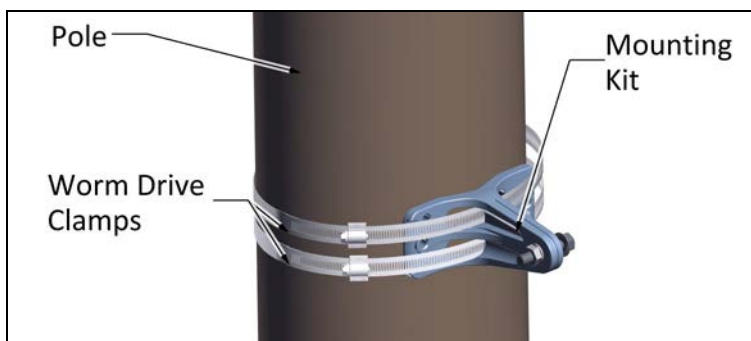


Figure 2-15: Mounting kit on a thick pole

The pole clamp is not needed.

2.6.3 Horizontal Pole

Installing the mounting kit on a horizontal pole is done in a similar manner to that on a vertical pole (thin, medium, or thick sizes):

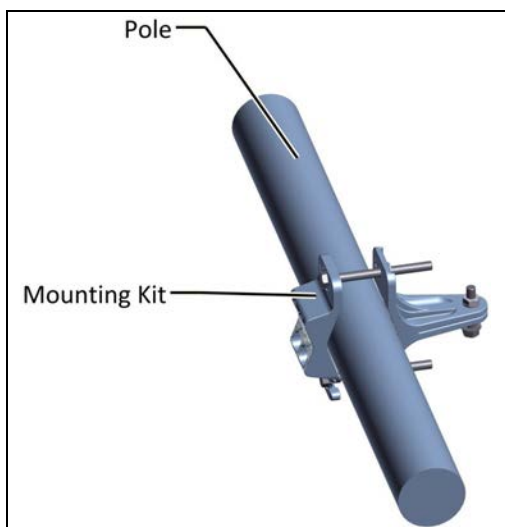


Figure 2-16: Mounting Kit on a horizontal pole

When mounting a Large Form-Factor (LFF) radio unit, Small Form-Factor (SFF) radio unit, RADWIN 2000 Alpha INT, GSU, PoE, or external antenna on a horizontal pole, use the radio vertical adaptor:

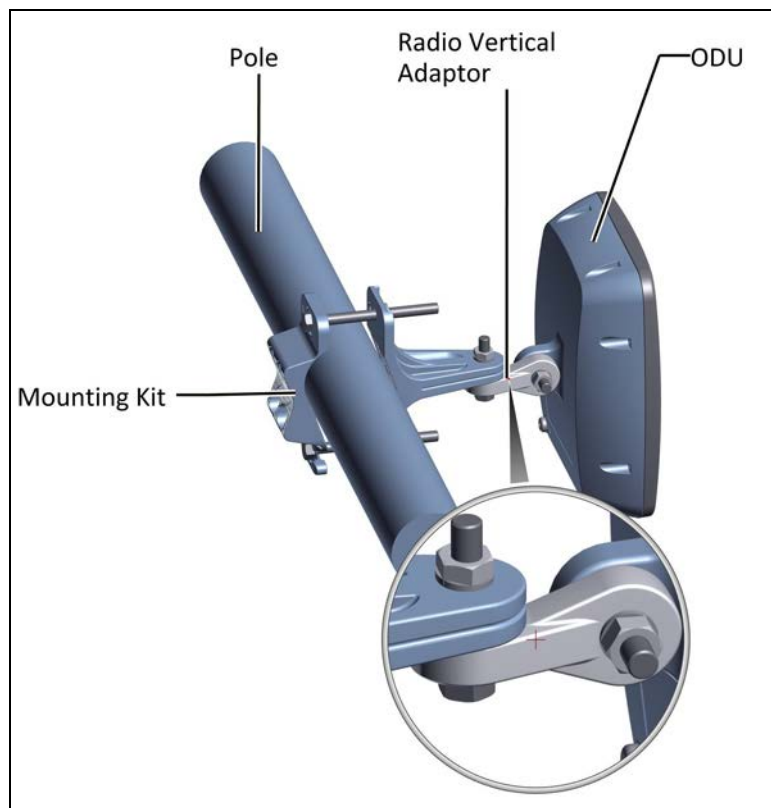


Figure 2-17: Radio unit mounted on a horizontal pole

2.6.4 Wall

Use two mounting screws (not included) appropriate for the type of wall to install the mounting kit on a wall. Make sure you use the indicated holes.

The pole clamp is not needed.

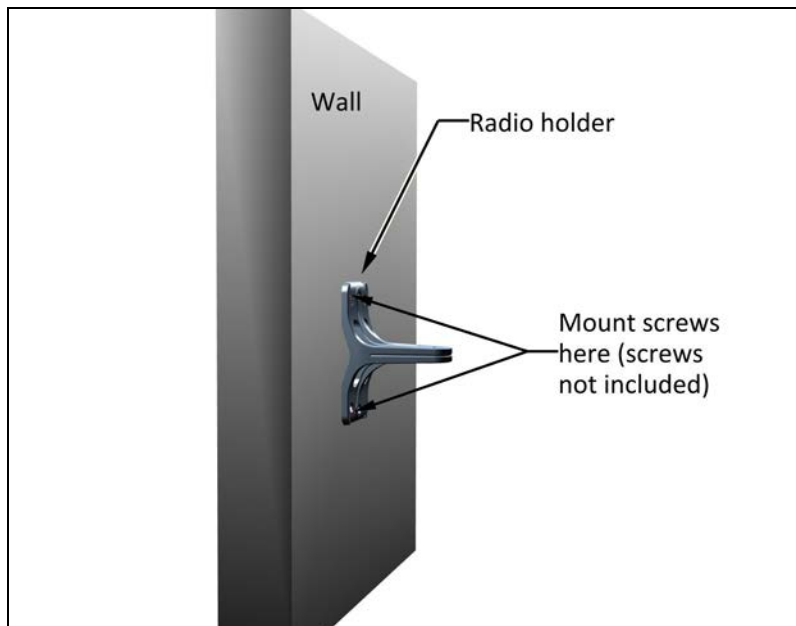


Figure 2-18: Mounting kit on a wall

2.7 Mounting a Unit with the Standard Mounting Kit

LFF (large form-factor) radios, SFF (small form-factor) radios, RADWIN 2000 Alpha INT radios, as well as external PoEs, RADWIN GSUs, and external antennas can use the mounting kit as shown in [Figure 2-19](#) to [Figure 2-22](#):

(if mounting a flat-panel antenna, see [page 2-15](#)).

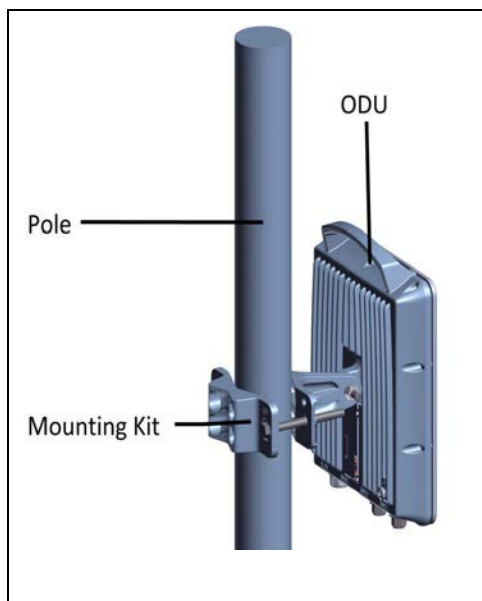


Figure 2-19: Mounted LFF radio unit

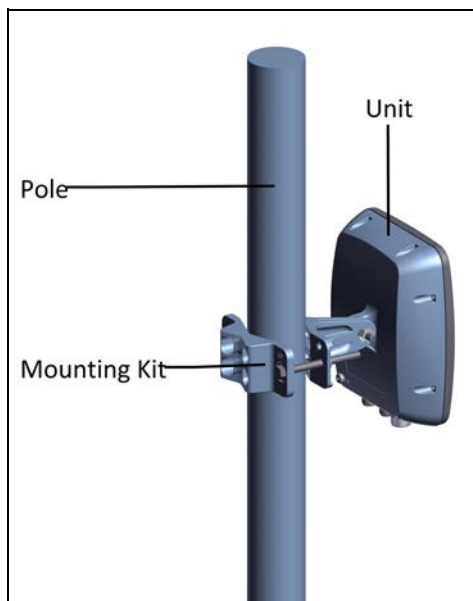


Figure 2-20: Mounted SFF radio unit or GSU

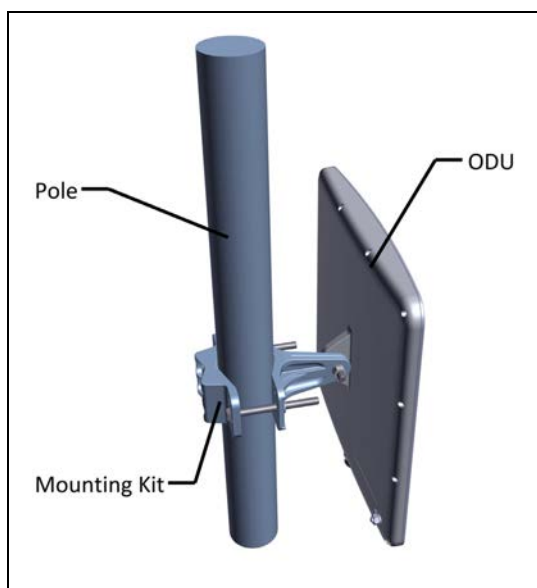


Figure 2-21: Mounted RADWIN 2000 Alpha INT unit

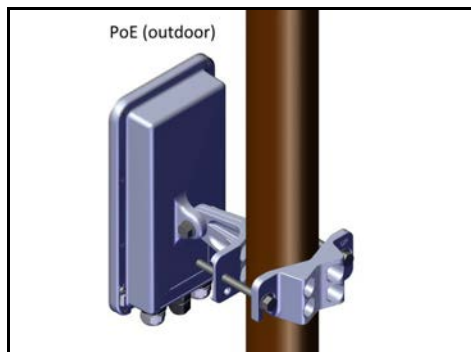


Figure 2-22: Mounted PoE

Flat panel antenna

If mounting a flat panel antenna, a mounting kit adapter is required (see [Figure 2-23](#)):

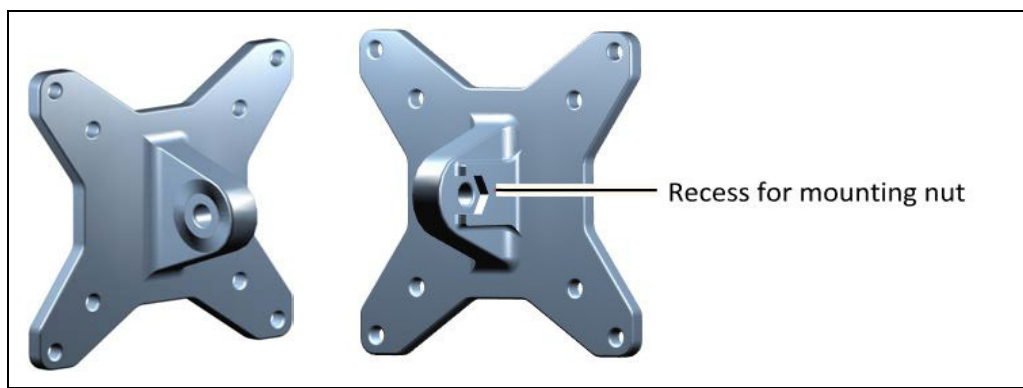


Figure 2-23: Flat panel antenna mounting kit adapter

Attach the mounting kit adaptor to the rear of the external antenna as shown:

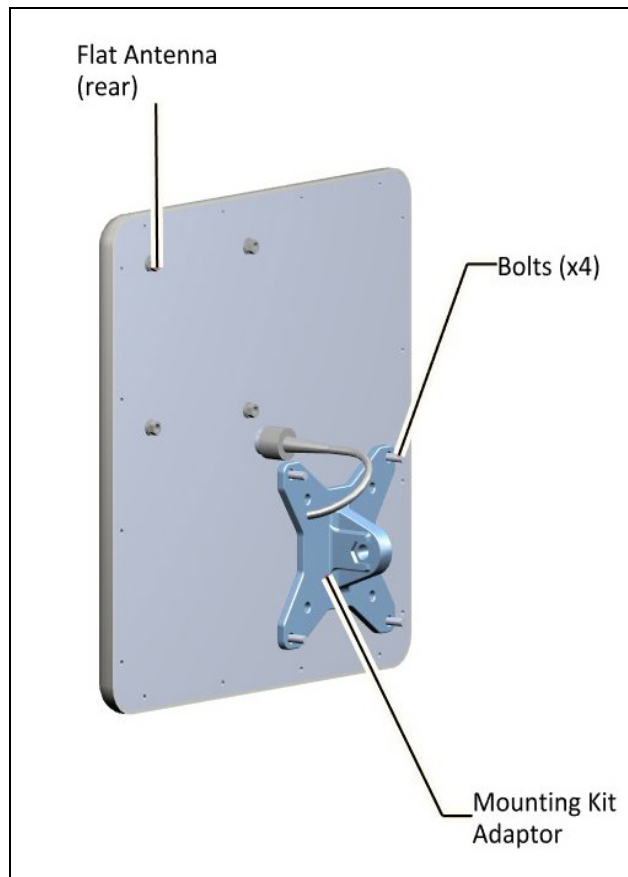


Figure 2-24: Flat Panel antenna - rear with mounting kit adapter

Mount the antenna with the adaptor to a vertical or horizontal pole (as shown in [Figure 2-19](#) to [Figure 2-20](#)).

[Figure 2-25](#) shows a mounted antenna. Attach the mounting bolt to the side of the adaptor with the recess, as shown.

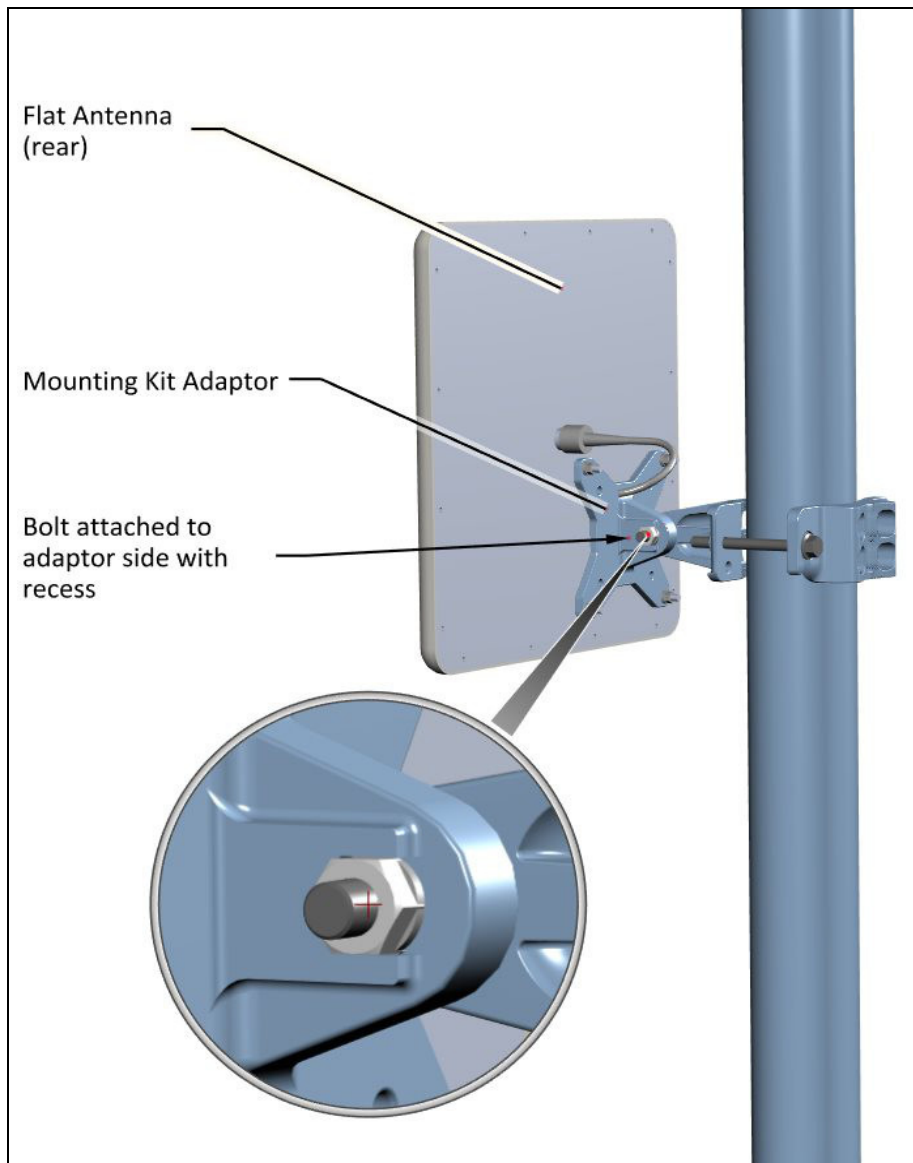


Figure 2-25: Flat Panel antenna - mounted on a pole

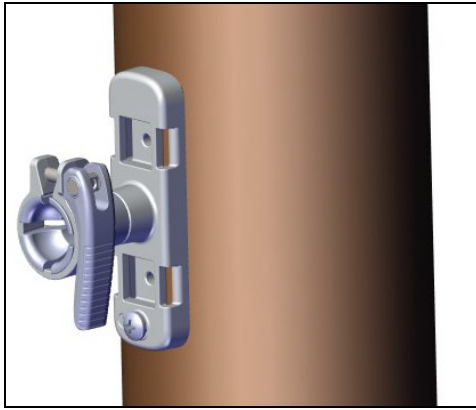
2.7.1 Mounting the RADWIN 2000 Alpha INT

The RADWIN 2000 Alpha INT unit is mounted in the same way as the LFF or SFF radio see [Mounting a Unit with the Standard Mounting Kit](#) on page 2-14.

2.8 Install RADWIN 2000 Alpha EMB Mounting Kit

The RADWIN 2000 Alpha EMB has its own mounting kit. Mount this unit as shown in the steps below:

1. Place the mount on a pole or wall:



2. Secure the mount using the worm drive clamps. These are “quick-release” clamps, and work as follows:

a. Open the clamp:



b. Slide the metal band through the mount:



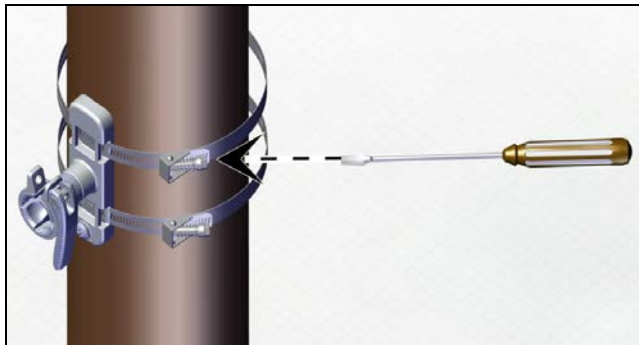
c. Slide the metal band through the clamp:



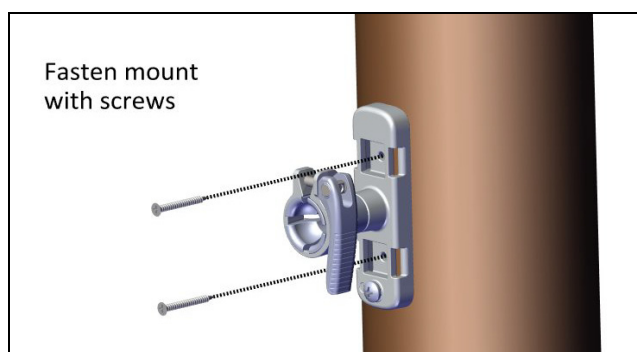
- d. Adjust the radius of the band, and lock it with the clamp:



- e. Once the band is at the correct radius, close the clamp and tighten with a screwdriver (make sure the tops of the screws face away from the mount):

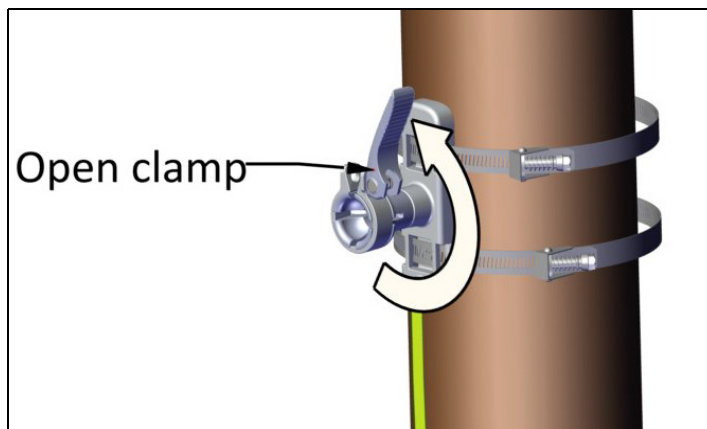


3. Alternatively, you can fasten the mount with screws (not included) appropriate for the surface being used:

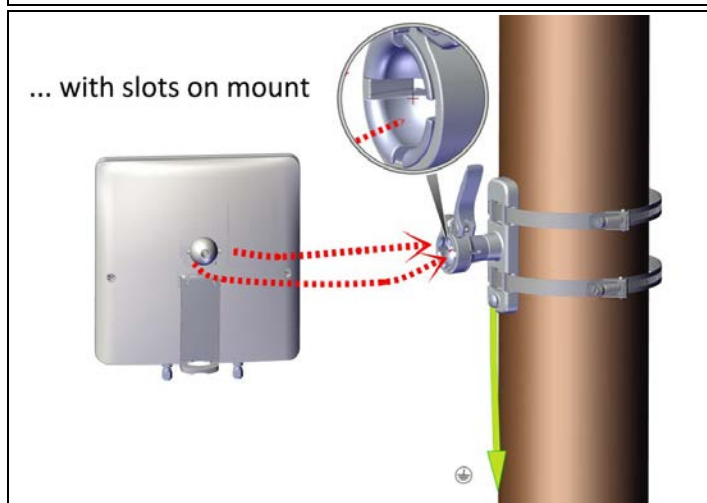
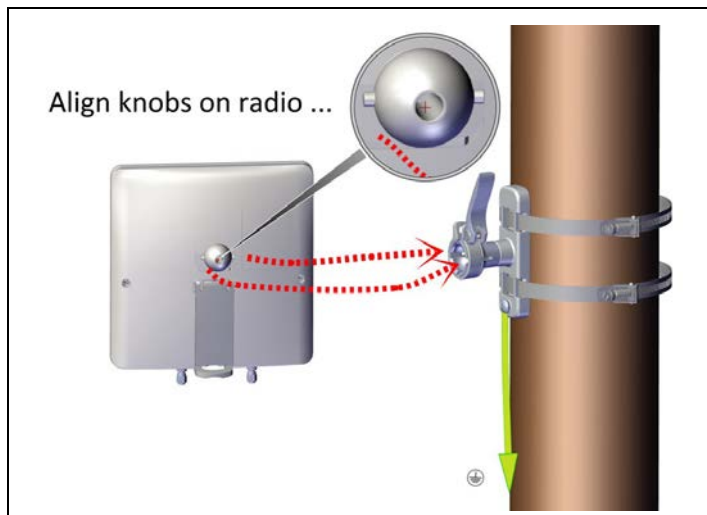


2.9 Mounting the RADWIN 2000 Alpha EMB

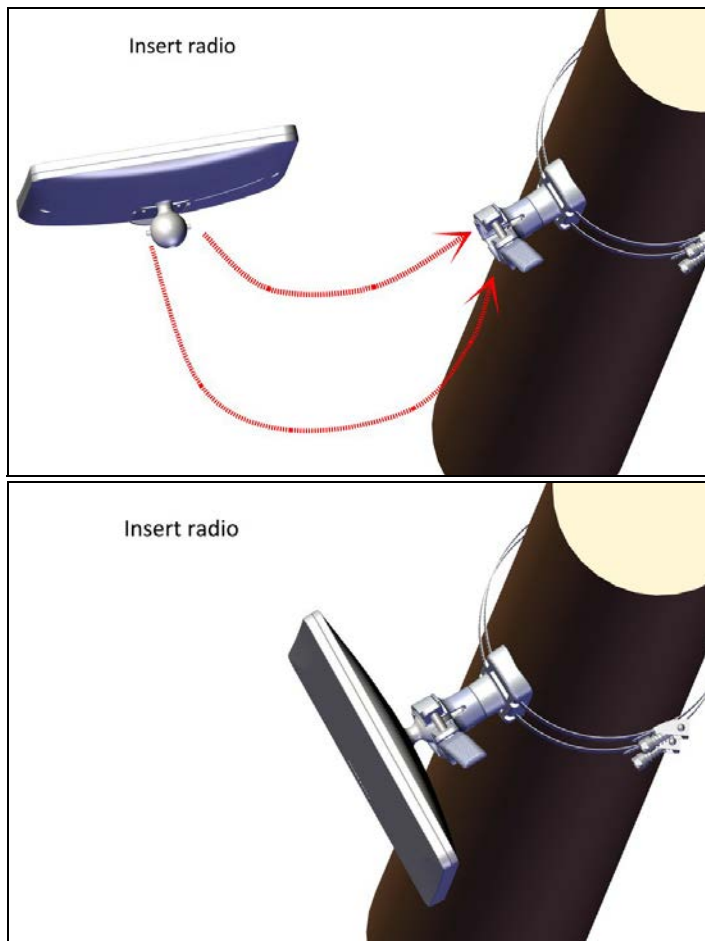
1. Open the clamp (for radio unit):



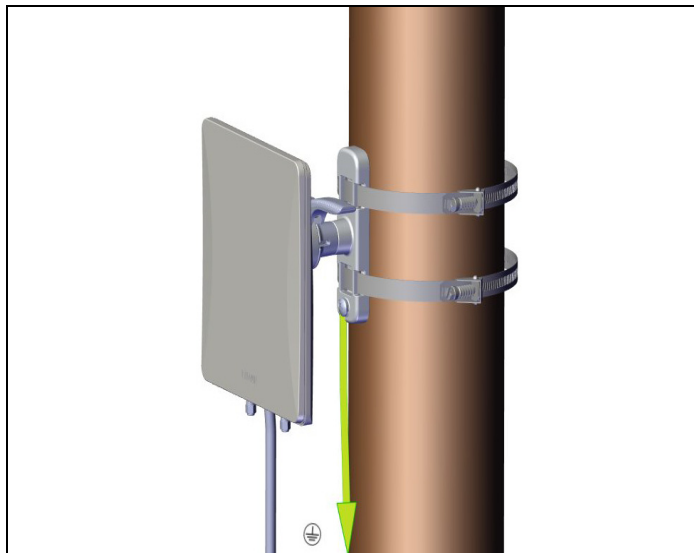
2. Position the radio unit so that the knobs on the mounting ball on the rear are opposite the slots on the mount:



3. Firmly place the radio unit into the mount until you hear a click:



4. Close the clamp half-way:



5. Keep the clamp half-closed until the alignment procedure is complete.

2.10 Ground Radio Unit

Connect a ground cable to the indicated ground connection on the radio unit as shown in the sections below:

2.10.1 LFF Units

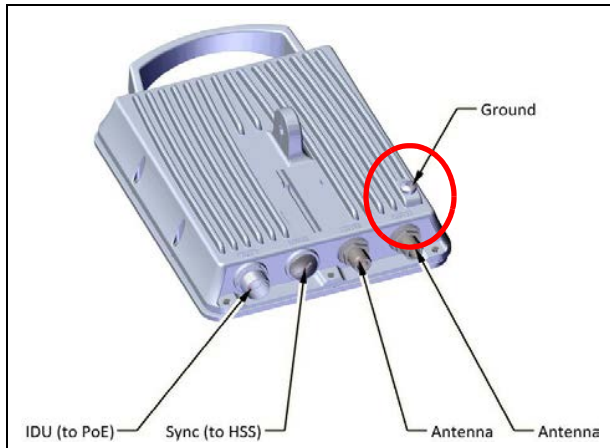


Figure 2-26: Ground: LFF radio unit

2.10.2 SFF Units

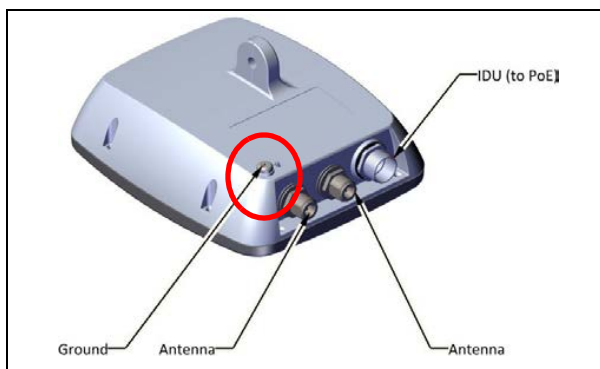


Figure 2-27: Ground: SFF radio unit

2.10.3 RADWIN 2000 Alpha INT Units



Figure 2-28: Ground: RADWIN 2000 Alpha INT radio unit

2.10.4 RADWIN 2000 Alpha EMB Units

Since the RADWIN 2000 Alpha EMB is grounded via its mounting kit, it must be grounded before being mounted.

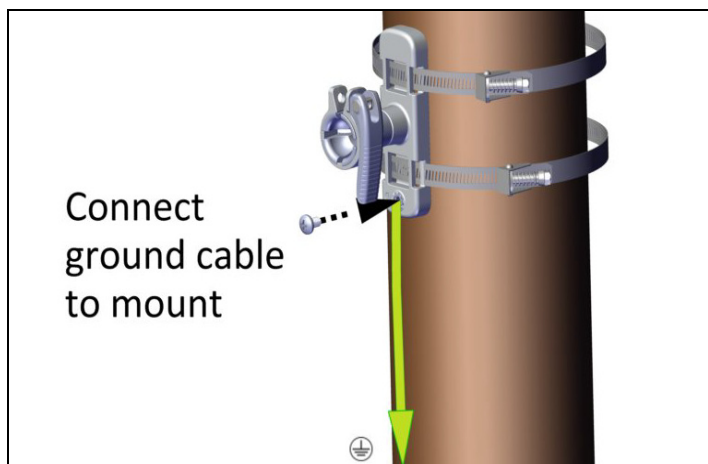
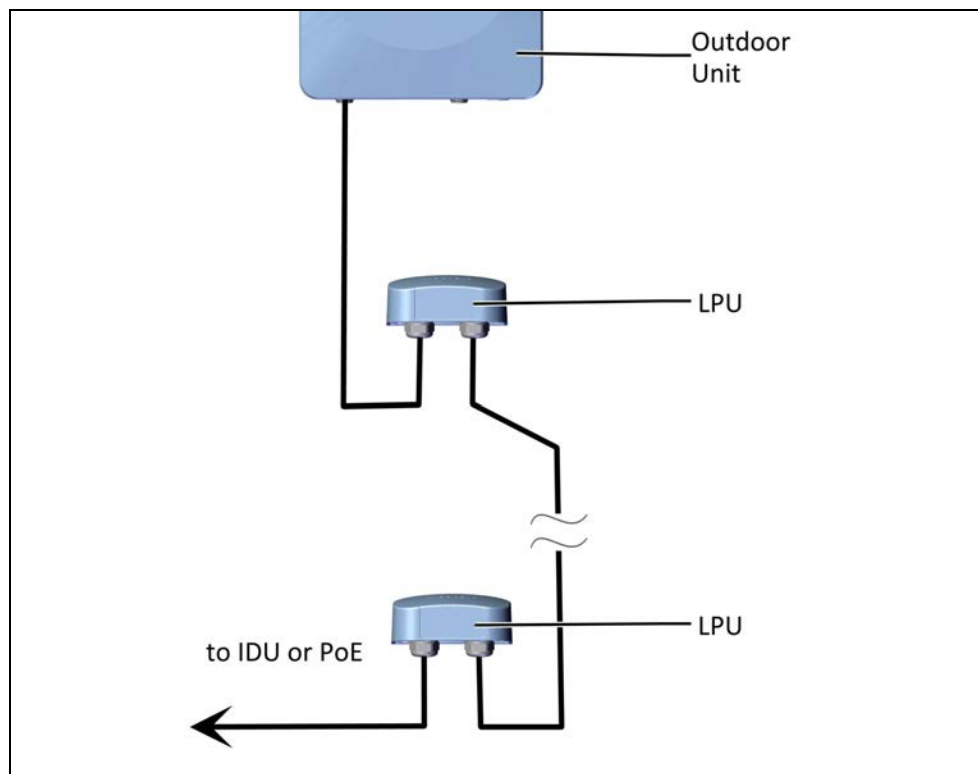


Figure 2-29: Ground: RADWIN 2000 Alpha EMB radio unit

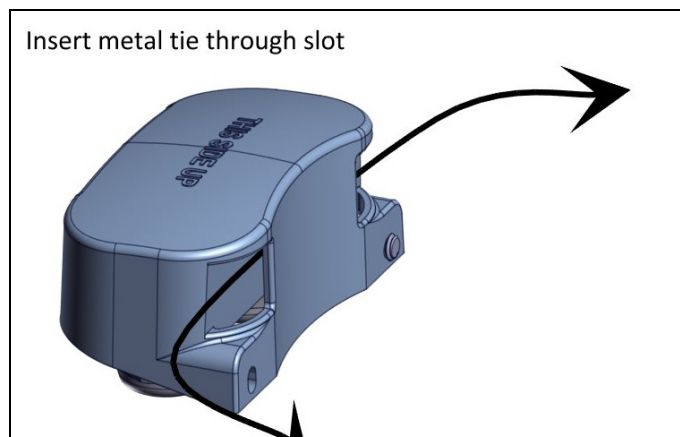
2.11 Mounting the Lightning Protection Units

- We recommend using two lightning protection units (LPUs) for each radio unit installation: One near the radio unit and one near the PoE.
- The LPU can be mounted on a pole or on a wall.
- Make sure the LPU is oriented with the cable glands oriented towards the bottom.
- Mount one LPU near the radio unit, and the second near the PoE:

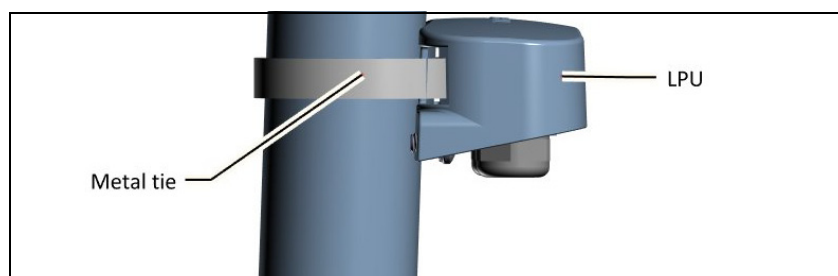


2.11.1 Mounting the LPU on a pole

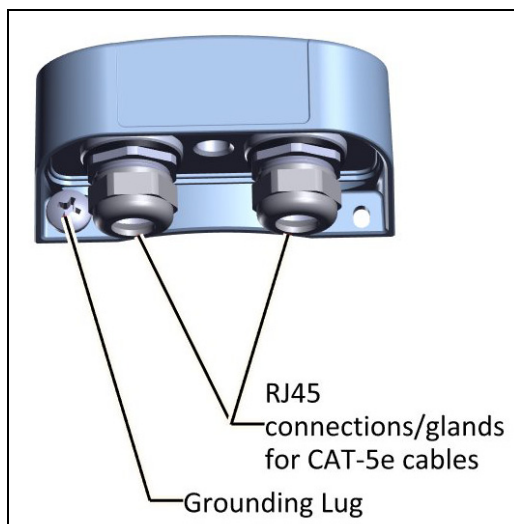
1. Insert the metal band through the slots on the LPU as shown:



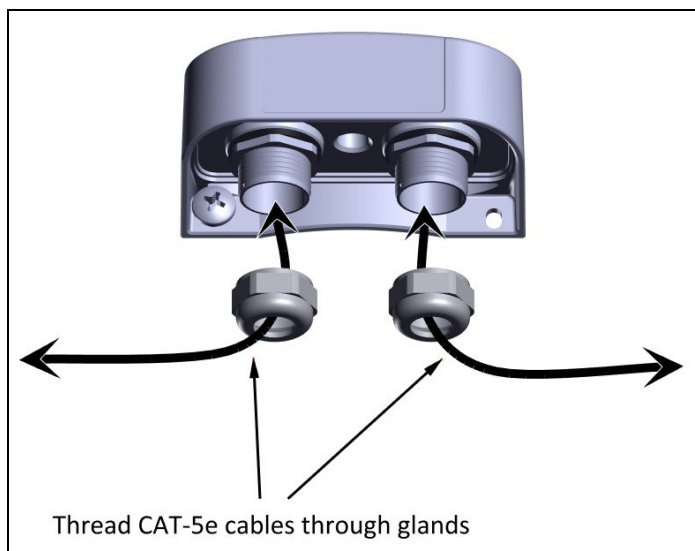
2. Tighten the metal band.



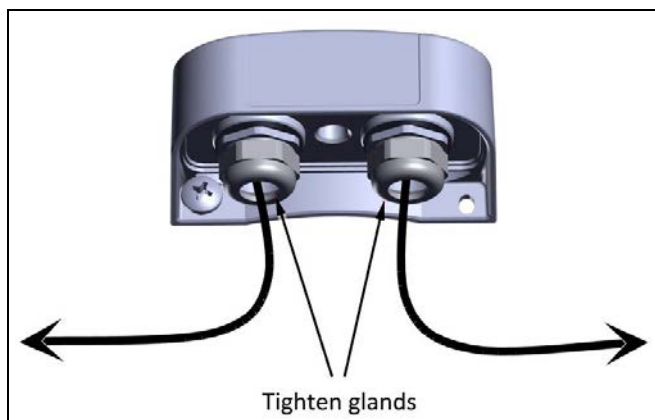
3. Connect the grounding lug to a ground source.



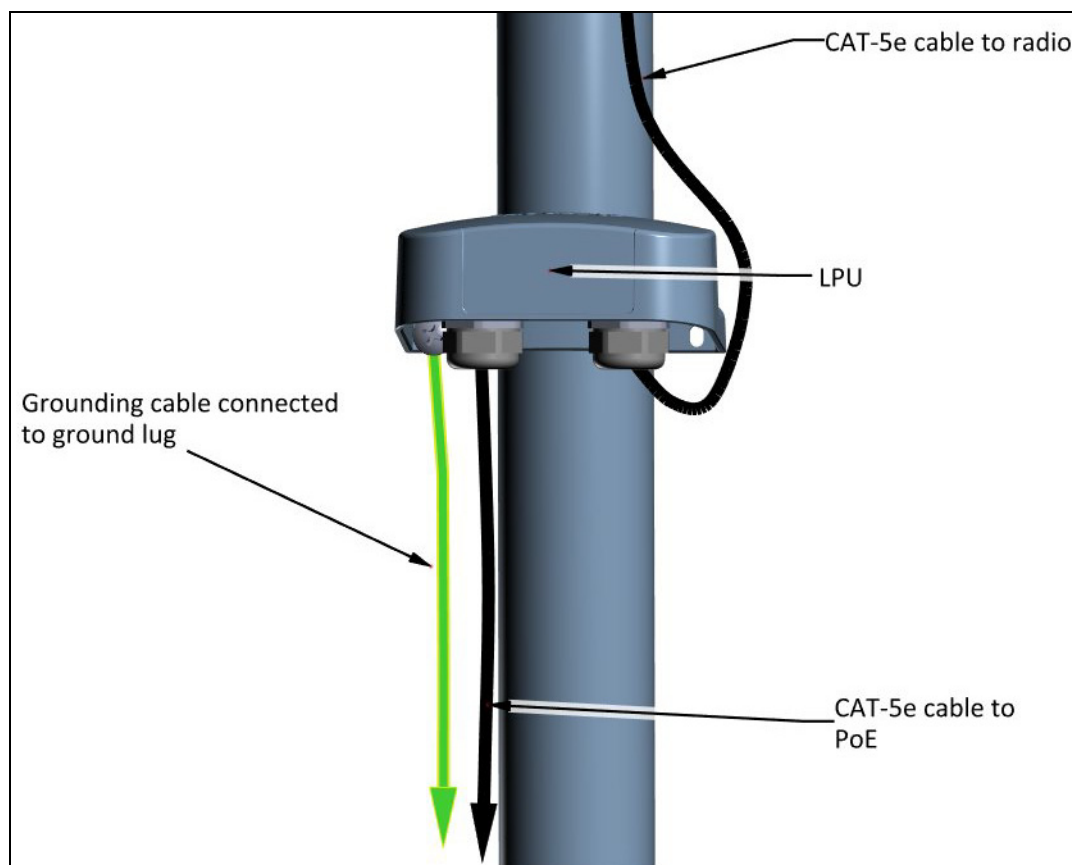
4. Remove the cable glands, and thread the CAT-5e cables through them:



5. Connect the cables to the LPU's sockets, and the glands around the cables as shown:

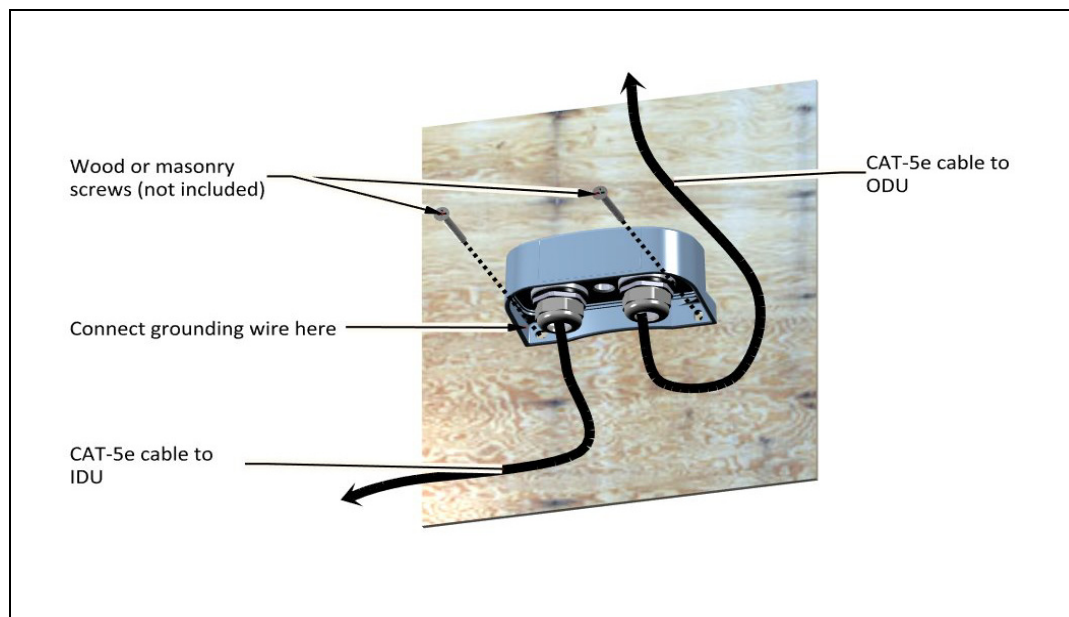


6. Route one CAT-5e cable up to the radio unit, and the other down to the PoE (via the lower LPU). An LPU installed on a pole is shown below:



2.11.2 Mounting the LPU on a wall

1. Remove the grounding lug.
2. Fasten the LPU to the wall using screws appropriate for the wall (screws not included).
3. Connect the left screw (where the grounding lug was located) to a grounding source via a grounding cable.
4. Attach the CAT-5e cables as shown in Steps [4.](#) and [5.](#) above.



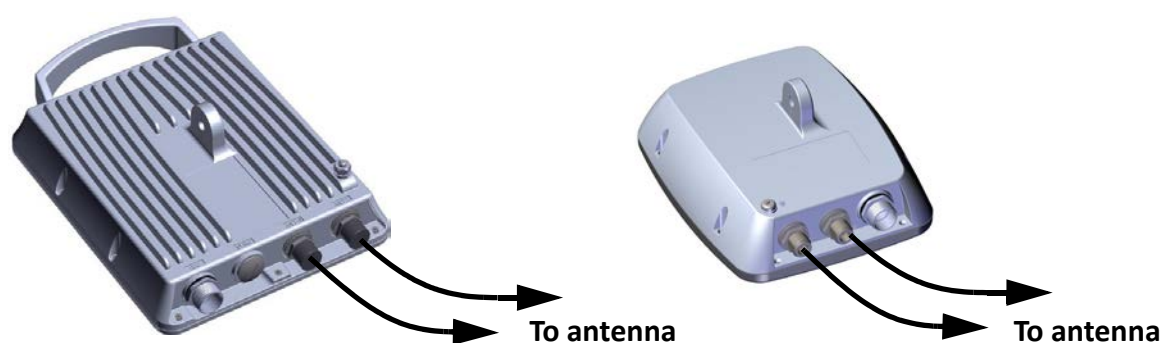
2.12 Connect External Antenna (if applicable)

An external or supplemental antenna can be used for these units:

- Connectorized LFF (large form-factor) radio units
- Connectorized SFF (small form-factor) radio units
- RADWIN 2000 Alpha EMB radio units

2.12.1 LFF and SFF Units

Connect the external antenna to the antenna connections on the radio as shown.



Mount the radio unit using a standard mounting kit (see [Mounting a Unit with the Standard Mounting Kit](#) on page 2-14), as well as the external antenna (needs its own mounting kit).

It does not matter if the V or H connection of the antenna is connected to either the ANT 1 or ANT 2 connection of the radio, but what is important is that you preserve the same connection scheme throughout the sector (eg: V is always connected to ANT 1, H is always connected to ANT 2).

2.12.2 RADWIN 2000 Alpha EMB Units

Turbo Gain antenna

Fasten the Turbo Gain antenna on the RADWIN 2000 Alpha EMB unit using these steps::

- a. Connect the cables to the radio
- b. Seal the cables (see [Waterproofing](#) on page 2-30)
- c. Connect the Turbo Gain antenna
- d. Close the screws of the Turbo Gain antenna
- e. Seal the connectors on the Turbo Gain antenna using the sealing tape.



Connect cables



Prepare sealing tape



Apply sealing tape - 1



Apply sealing tape - 2



Sealing tape applied



Connect Turbo Gain antenna



Connect cables to Turbo Gain



Sealing tape for Turbo Gain



Tape applied on Turbo Gain - 2



You may need to re-align the unit.

External, non-integrated antenna

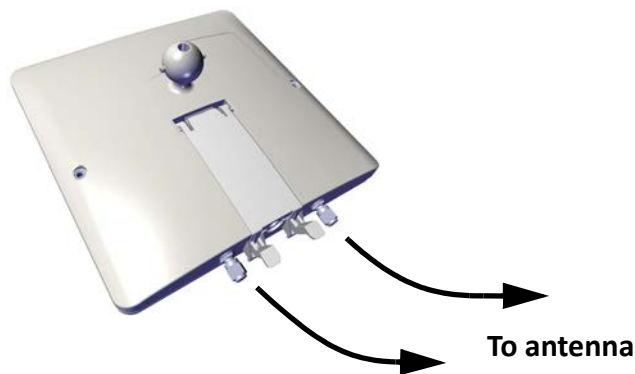
Follow these steps to connect an external, non-integrated to the RADWIN 2000 Alpha EMB unit:

- a. Connect the cables to the radio
- b. Seal the cables using Scotch™ 23 splicing tape or similar.
- c. Mount an external, non-integrated antenna using the standard mounting kit (see [Mounting a Unit with the Standard Mounting Kit](#) on page 2-14).
- d. Connect the cables to the external, non-integrated antenna
- e. Seal the connectors on the external, non-integrated antenna (see [Waterproofing](#) on page 2-30)



Re-configure the unit as having an external antenna (see the RADWIN 5000 Configuration Guide).

You may need to re-align the antenna.



It does not matter if the V or H connection of the antenna is connected to either the ANT 1 or ANT 2 connection of the radio, but what is important is that you preserve the same connection scheme throughout the sector (eg: V is always connected to ANT 1, H is always connected to ANT 2).

2.13 Waterproofing

Protect all outdoor connections¹ from rain, dust, moisture and salt by taping the cable/gland connection with an appropriate sealant tape. We recommend using Scotch™ 23 splicing tape or similar.

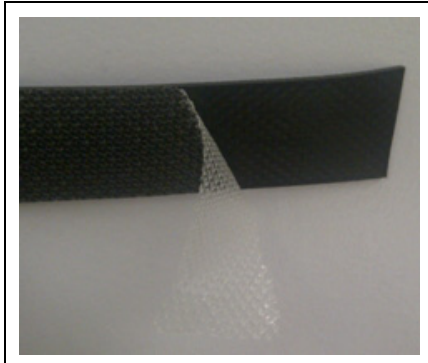


Figure 2-30: Sealant tape

Add tape as shown below.



Figure 2-31: Applying sealant tape to an external connection

1. This is not required for the RADWIN 2000 Alpha EMB unit

2.14 Connect Radio (External Connections)

2.14.1 LFF, SFF, and RADWIN 2000 Alpha INT Units

1. Connect a CAT-5e cable to the input port of the radio as shown:

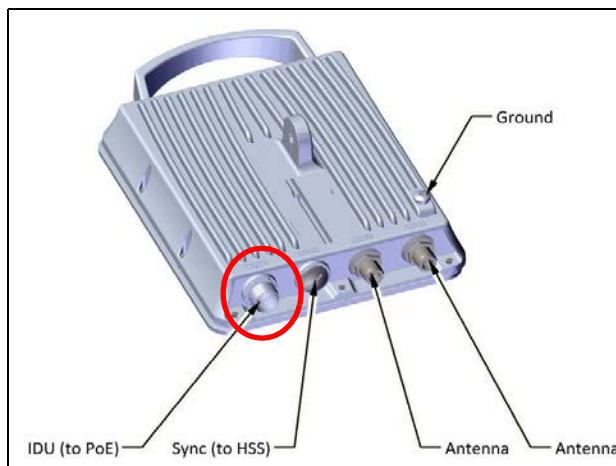


Figure 2-32: Input port: LFF unit (connection label: "IDU")

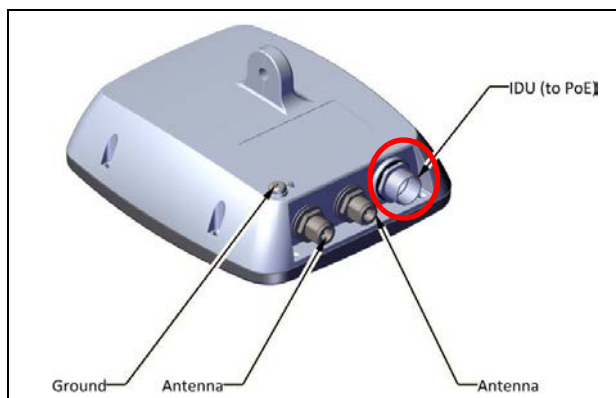


Figure 2-33: Input port: SFF unit (connection label: "IDU")

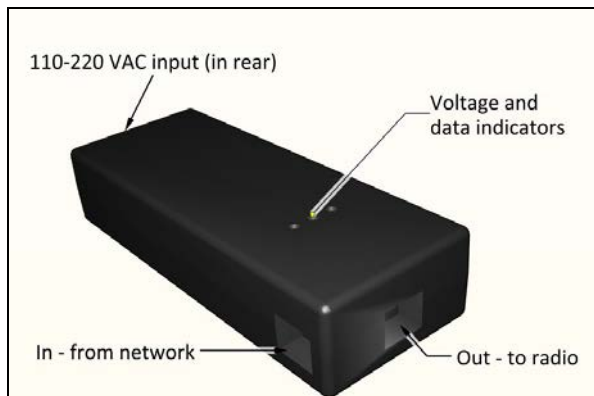


Figure 2-34: Input port: RADWIN 2000 Alpha INT unit (no label)

2. Add sealant tape to the connections (see ["Waterproofing" on page 2-30.](#))

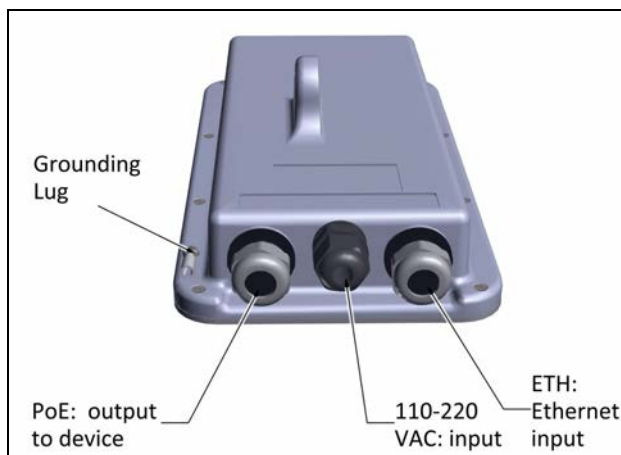
3. Route the CAT-5e and ground cables down from the radio to a PoE via 2 LPUs: one near the radio, one near the PoE. Fasten CAT-5e cable connections with a cable gland, add sealant tape.
4. Connect ground cable to ground.
5. Perform final connections via a PoE, depending on the type of PoE you are using, as follows:

Indoor PoE



- a. Connect CAT-5e cable from lower LPU to “Out” port
- b. Connect LAN cable to “In” port.
- c. Connect power cable

Outdoor PoE



- a. Connect LAN cable to “ETH” port, fasten with cable gland, add tape.
- b. Connect ground cable.
- c. Connect power cable

DC Injector



Use only safety approved DC PS according to IEC/EN/UL 60950-1 or 62368-1 with rated output voltage of 56VDC, 1A max

Use only safety approved AC POE PS according to IEC/EN/UL 60950-1 or 62368-1 with rated output voltage of 24-56VDC, 1A max

All units must be installed in a RESTRICTED ACCESS LOCATIONS

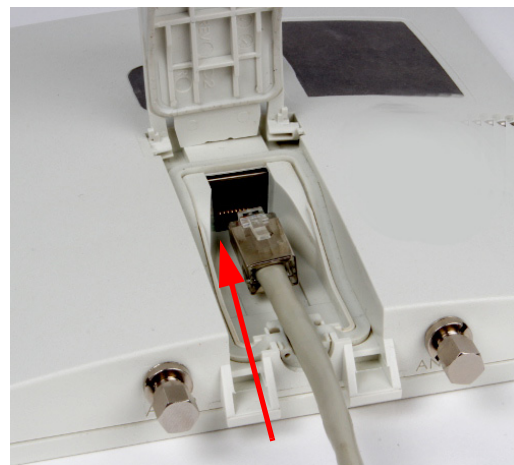
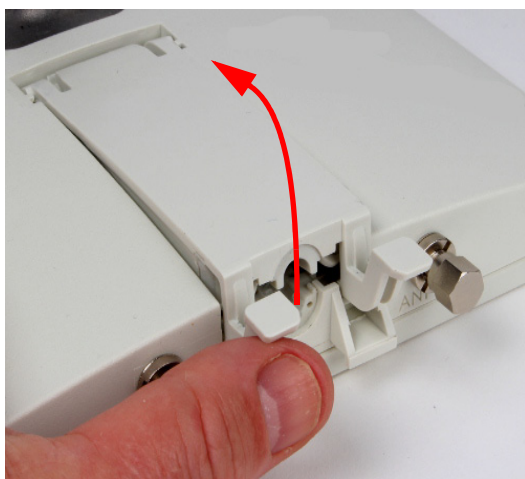


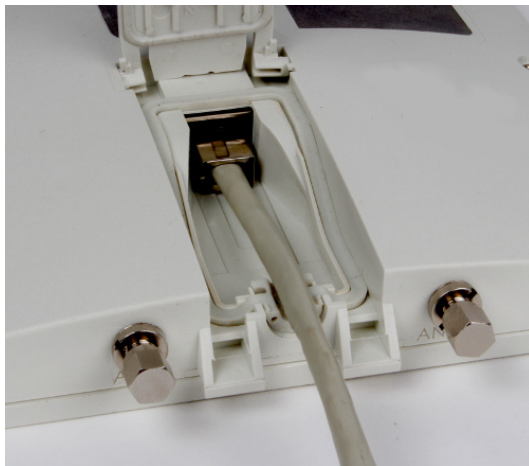
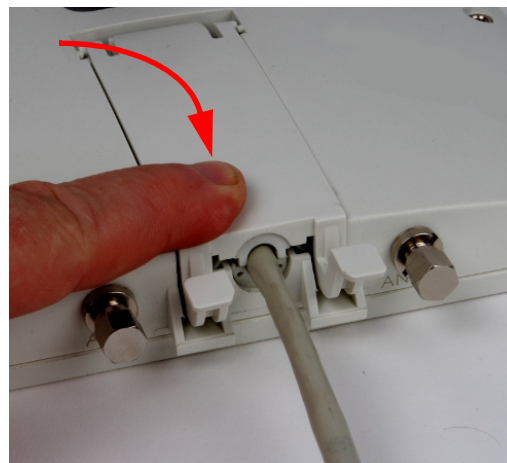
Ground the unit with a 10 AWG wire before applying power.

2.14.2 RADWIN 2000 Alpha EMB Units

Connect a CAT-5e cable to the input port of the radio as shown

1. Open the rear cover of the RADWIN 2000 Alpha EMB
2. Insert a CAT-5e cable into the input port
3. Close the rear cover tightly



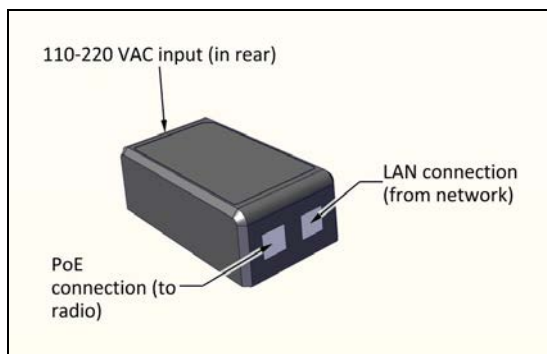
Open rear door**Insert CAT-5e cable****Insert CAT-5e cable****Close rear door tightly**

4. Route the CAT-5e and ground cables down from the radio to a PoE.

- Recommended, although not required: route the CAT-5e cable via 2 LPUs: one near the radio, one near the PoE. Fasten CAT-5e cable connections with gland, add sealant tape.

5. Connect ground cable to ground.

6. Perform final connections via the RADWIN 2000 Alpha EMB PoE:



7. Connect CAT-5e cable from lower LPU to the “PoE” port.

8. Connect LAN cable to “LAN” port.

9. Connect power cable.

2.15 Check Connectivity to Radio

1. Connect to radio unit:

- From a laptop in the field: Disconnect the PoE from the communications network (LAN connection), and connect the laptop.
- From the NOC: Keep the PoE connected to the LAN.

2. From a command line, ping radio using radio’s IP address.


2.16 Define One Unit as the RT-A(HBS)

All units are shipped from the factory defined as an RT-B(HSU). You must define one as an RT-A(HBS) before you can activate it (see [table 1-2 on page 7](#)).



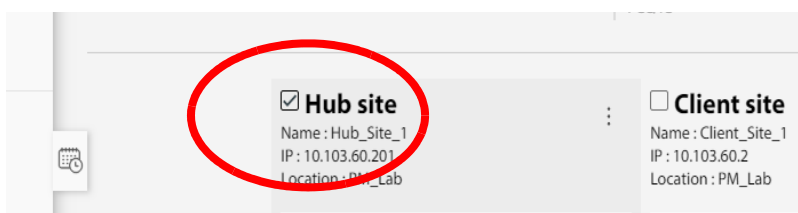
For LFF and SFF units, this must be done using the RADWIN Manager.
For RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT units, this can be done either with the RADWIN Manager, or via its Web UI.

2.16.1 Using the RADWIN Manager

1. Connect to radio unit:
 - From a laptop in the field: Disconnect the PoE from the communications network (LAN connection), and connect the laptop.
 - From the NOC: Keep the PoE connected to the LAN.
2. Enter IP address of the radio that is to be the RT-A(HBS).
3. Log on to the RADWIN Manager application as “Installer”.
4. From main window of the RADWIN Manager application, click the **Configuration** button ().
5. Choose the **Operations** tab.
6. Click **Change ODU Mode**.
7. Click on the RT-A(HBS) button, and follow the on-screen instructions.

2.16.2 Using the Web UI (RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT only)

1. Connect to radio unit:
 - From a laptop in the field: Disconnect the PoE from the communications network (LAN connection), and connect the laptop.
 - From the NOC: Keep the PoE connected to the LAN.
2. Enter the IP address of the radio that is to be the RT-A(HBS) in a web browser.
3. From the login page, enter username **admin** and password **netwireless**.
4. Select the unit that is to be the RT-A(HBS) by placing a checkmark next to its name:



- Click the **Operations** icon



- Select **Change Mode**
- You will be warned that changing the mode will disconnect the link. This is not a problem if you have a direct connection to the unit. Note also that any previous settings on the unit will be deleted. If this is acceptable, click **Switch to HBS**.
- The unit will reset. Once the login page reappears, log in again.
- Verify that the mode has changed to RT-A(HBS).

2.17 Activate RT-A(HBS)



For LFF and SFF units, this must be done using the RADWIN Manager.
For RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT units, this can be done either with the RADWIN Manager, or via its Web UI.

2.17.1 Using the RADWIN Manager

- Connect to radio unit:
 - From a laptop in the field: Disconnect the PoE from the communications network (LAN connection), and connect the laptop.
 - From the NOC: Keep the PoE connected to the LAN.
- Log on to the RADWIN Manager application as “Installer”.
- Enter IP address of the radio (RT-A(HBS)).
- From main window of the RADWIN Manager application, click **Activate**.



- Follow wizard instructions to activate radio.

2.17.2 Using the Web UI (RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT only)

(The RT-A(HBS) is called the Hub Site in the Alpha EMB/INT web page)

- Connect to radio unit:

- From a laptop in the field: Disconnect the PoE from the communications network (LAN connection), and connect the laptop.
 - From the NOC: Keep the PoE connected to the LAN.
2. In a web browser, enter the IP address of the RT-A(HBS) radio that is to be activated.
 3. From the login page, enter username **admin** and password **netwireless**.
 4. Select the Hub site by placing a checkmark next to its name:



5. You will see the blue Activate button enabled. Click it to start the Activation process.
6. Enter the parameters as requested in the windows that appear, and click **Next** when you are ready to move to the next one.
7. When you are finished, click the **Activate** button.
8. The main window will display a brief message saying the action was completed successfully, and after a few moments, the unit will be activated.

2.18 Align RT-B(HSU) Unit

- Make sure the RT-A(HBS) unit is activated (check with the NOC).
- Point the RT-B(HSU) (or its external antenna) in the general direction of the RT-A(HBS) unit.
- Continue according to the type of unit you are using:

2.18.1 LFF and SFF Units

1. Align the unit horizontally (in azimuth):
 - a. Swivel the unit 90° to the left slowly, 180° to the right, and then 90° back towards the base station.

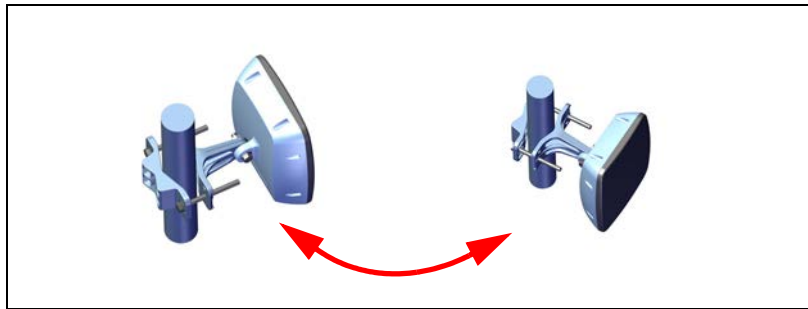
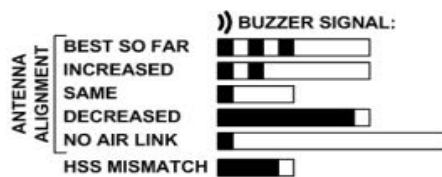


Figure 2-35: Swivel horizontally (SFF unit shown)

- b. While swiveling the unit, listen to the buzzer beep sequence until optimal alignment is achieved (3 beeps and a pause, as shown below).



2. Repeat the above in elevation.

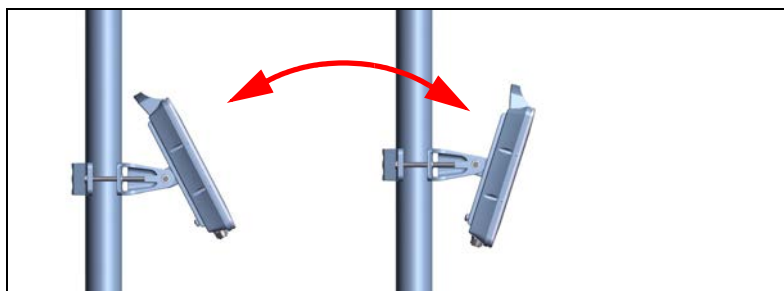


Figure 2-36: Swivel vertically (LFF unit shown)

3. Once alignment is complete, tighten the bolt holding the radio on the mounting kit.

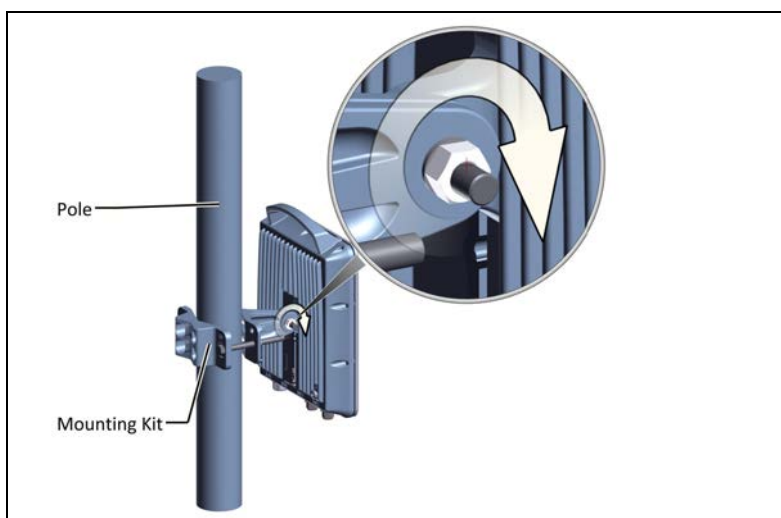


Figure 2-37: Tighten bolt (LFF shown)

- The subscriber unit will stop beeping when it is aligned with the base station, and configured.

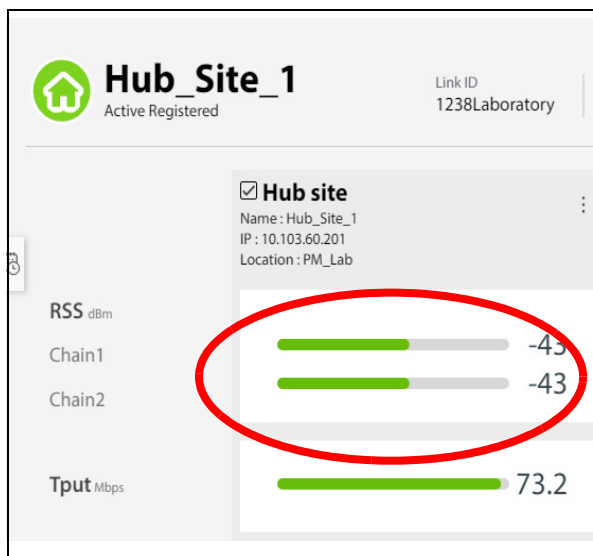
- You can use the RSS indicator on the main window of the RADWIN Manager for a more accurate indication of the signal strength.
- You can manually cease the beeping via the RADWIN Manager application.

2.18.2 RADWIN 2000 Alpha EMB and RADWIN 2000 Alpha INT Units

(The RT-B(HSU) is called the Client Site in the Alpha EMB/INT web page)

Show unit's RSS value

- Access the web interface (enter the unit's IP address in a web browser)
- Log in using username **admin** and password **netwireless**.
- From the main window, you can see the RSS (radio signal strength) as a green bar. While referring to this, do the following:
 - Swivel the unit 90° to the right slowly, 180° to the left, and then 90° back towards the base station. Note at which point the RSS value is maximum.
 - Repeat the above in elevation.



- Although the RADWIN 2000 Alpha EMB vs. the RADWIN 2000 Alpha INT units use different mounts (as shown in the figures below), the fundamental process is the same:

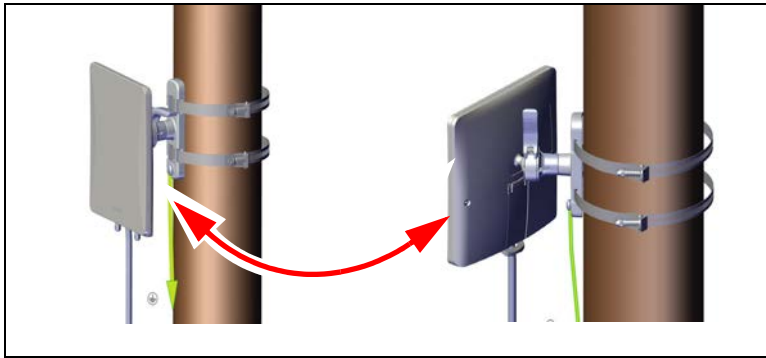
RADWIN 2000 Alpha EMB mount

Figure 2-38: Swivel horizontally

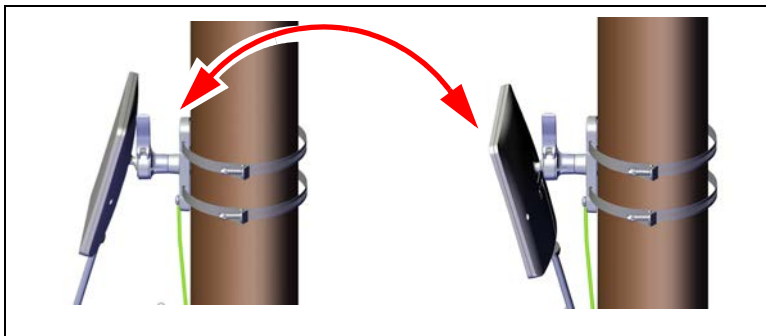


Figure 2-39: Swivel vertically

- Once alignment is complete, tighten the arm on the RADWIN 2000 Alpha EMB mounting kit (see [Figure 2-40](#)).
- If the unit requires more tightening, use the hex screw with a 5mm hex key as shown in [Figure 2-41](#).

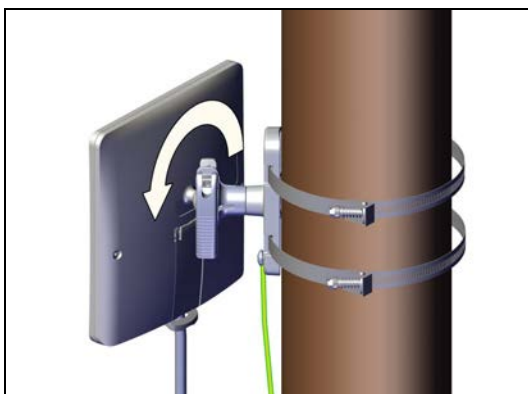


Figure 2-40: Tighten arm on mount: RADWIN 2000 Alpha EMB radio unit

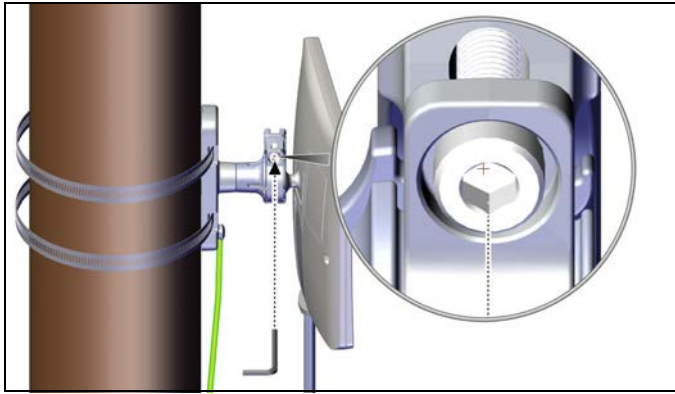


Figure 2-41: Use hex screw to further tighten arm on mount

RADWIN 2000 Alpha INT mount

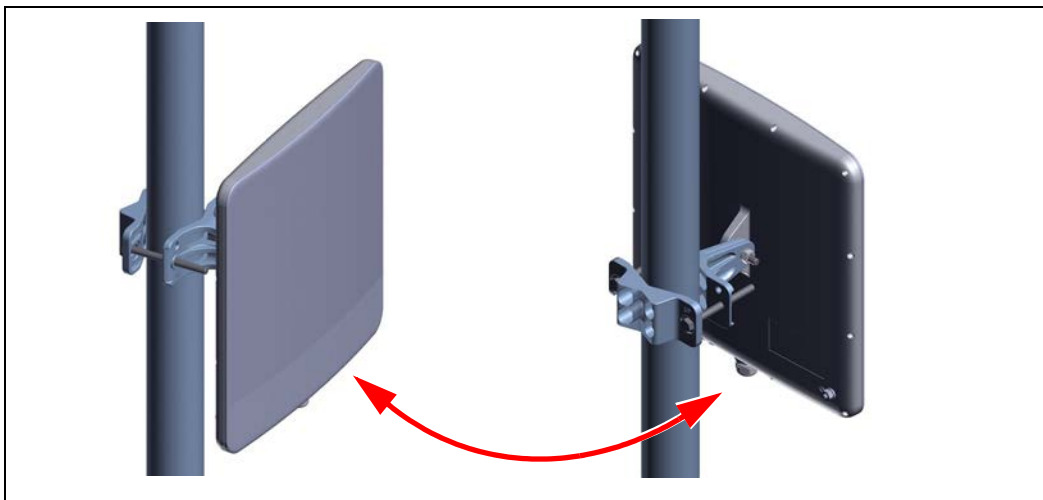


Figure 2-42: Swivel horizontally

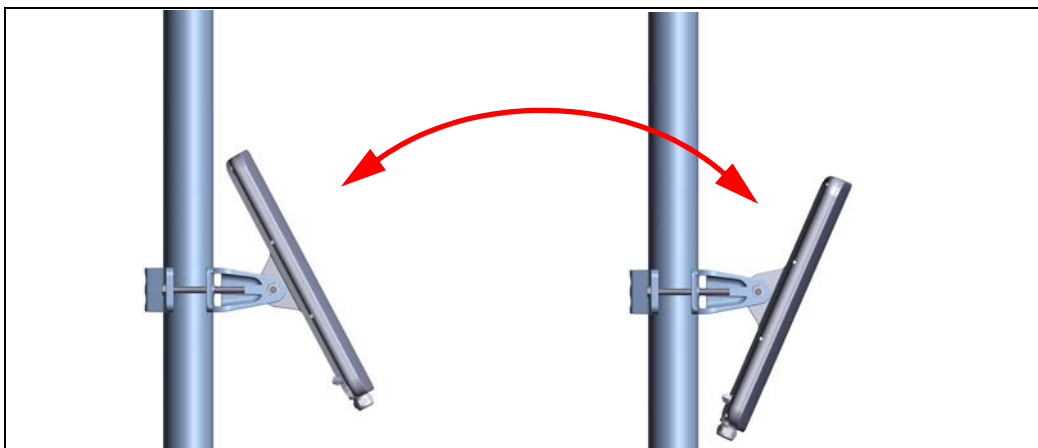


Figure 2-43: Swivel vertically

- Once alignment is complete, tighten the bolt (see [Figure 2-44](#) for the RADWIN 2000 Alpha INT).

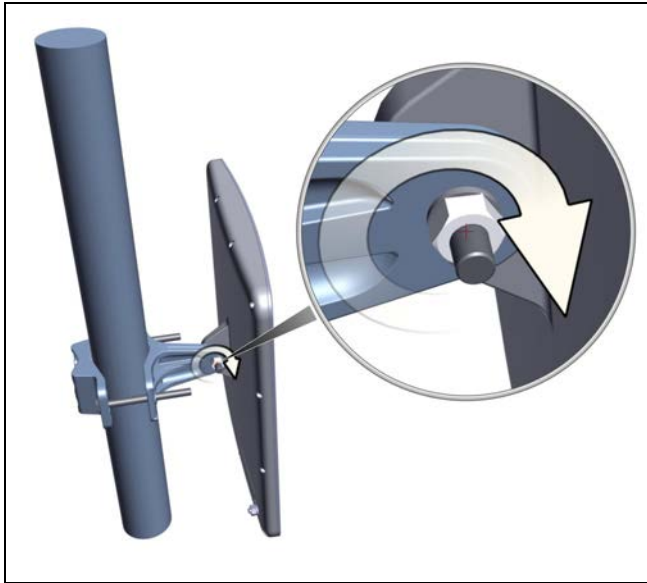


Figure 2-44: Tighten bolt



RADWIN recommends that you repeat the above alignment procedure for the RT-A(HBS) opposite the RT-B(HSU) as well.

Chapter 3: Safety Practices and Provisions

3.1 Scope of this Chapter

This chapter describes various safety practices.

3.1.1 Preventing Overexposure to RF Energy

To protect against overexposure to RF energy, install the radio units so as to provide and maintain minimal separation distances from all persons.

When the system is operational, avoid standing directly in front of the antenna. Strong RF fields are present when the transmitter is on. The radio unit must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

3.1.2 Grounding

All RADWIN products should be grounded during operation. In addition:

- All LFF and SFF ODUs should be grounded by a wire with diameter of at least **10 AWG**.

Further, you should -

- Always make the ground connection first and disconnect it last
- Never connect telecommunication cables to ungrounded equipment
- Ensure that all other cables are disconnected before disconnecting the ground

3.1.3 Protection against Lightning

The use of lightning protection is dependent on regulatory and end user requirements. All RADWIN outdoor units are designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

3.1.4 General

- It is recommended that installation of outdoor units be contracted to a professional installer
- Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts
- Use extreme care when installing antennas near power lines
- Use extreme care when working at heights
- When using an AC power source for RADWIN devices, always use the AC power adapter supplied by RADWIN
- Use the right tools!
- Do not mount a radio unit upside down or horizontally. Doing this may void your product warranty.

3.1.5 Internal ESD Protection circuits

RADWIN equipment is designed to meet the ETSI/FCC/Aus/NZ/CSA EMC and Safety requirements. To fulfill these requirements, the system's Telecom lines at the radio unit/PoE are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.



When installing an AC powered HSU: To maintain Overvoltage (Installation) Category II, install a suitable surge suppressor device in the branch circuit to limit expected transients to Overvoltage Category II values.

The limits are based on IEC60664 and are also located in Table 2H of UL60950 (for mains $\leq 150V$, the transient rating is 1500V; for $150V < \text{mains} \leq 300V$, the transient rating is 2500V; and for $300V < \text{mains} \leq 600V$, the transient rating is 4000V).

Appendix A: Terminology

Table A-1: Terminology (Sheet 1 of 4)

Term	Description
Assured throughput	Actual number of timeslots allocated to a radio unit.
ACS	Automatic Channel Selection. Option that instructs the radio to choose which frequency to use. Enabling or disabling this option has various ramifications as shown in the documentation.
ATPC	Automatic Transmit Power Control
BE	Best Effort: A level of priority for traffic in which users receive dynamic resource allocation according to overall demand. They are not guaranteed resources. See also CIR .
BFD	Bidirectional Forwarding Detection. A network protocol used to detect faults between two forwarding engines connected by a link.
BS	Base Station: a radio that can transmit and receive to more than one point. See also HBS
CIR	Committed Information Rate: A level of priority for traffic in which users receive a guaranteed percentage of resources in addition to dynamic resources if available. See also BE .
CPE	Customer Premises Equipment
DBA	Dynamic Bandwidth Allocation: a method that allocates bandwidth between the various users of that same bandwidth in the network.
DBS	Dynamic Bandwidth Selection: When activating a base station, or when changing its bandwidth, if you choose the maximum value available for the bandwidth, the link may dynamically switch between the maximum value and values as low as 20MHz to ensure the best throughput.
DHCP	Dynamic Host Configuration Protocol: a protocol that automatically assigns IP addresses and other network configuration parameters.

Table A-1: Terminology (Sheet 2 of 4)

Term	Description
Diversity	A technique by which the reliability of a radio link is increased using multiple transmitting and receiving antennas, transmitting the same signal on all antennas.
Downlink	Data traffic from an HBS to an HSU, or Data traffic from an RT-A to an RT-B
DUO	Dual Band base station
EIRP	Equivalent (or Effective) Isotropically Radiated Power: The power that an antenna must emit to produce the peak power density in the direction of maximum antenna gain. In our cases, this is usually: System Tx Power + Antenna Gain - Cable Loss.
FAA	Federal Aviation Administration. A U.S. federal office that manages aviation regulations throughout the United States.
Fixed (HSU)	A “fixed” HSU remains in one location, as contrasted with a nomadic or mobile HSU, which does not remain in one location.
GHSS	GPS Hub Site Synchronization
GRE	Generic Routing Encapsulation. A communication protocol used to establish a direct, point-to-point connection between network nodes. GRE lets two peers share data they wouldn’t be able to share over the public network itself.
GRE Tunnel	A virtual point-to-point connection between two networks, using the GRE protocol to carry this out.
HBS	High capacity Base Station. Same as a BS
HMU	High capacity Mobility (subscriber) Unit. Similar to an HSU, but can be mobile.
HSC	Hub Sync Client: When using Hub Site Synchronization, one unit is a master (generates the sync pulses), and the other units are clients.
HSM	Hub Sync Master: When using Hub Site Synchronization, one unit is a master (generates the sync pulses), and the other units are clients.
HSU	High capacity Subscriber Unit. Same as an SU
IGMP	Internet Group Management Protocol
ISU	Integrated Synchronization Unit: a network device that provides a synchronization signal to underground HBSs.
ITHO	Intra-train handover mechanism
LFF	Large Form-Factor

Table A-1: Terminology (Sheet 3 of 4)

Term	Description
MD5	Message digest algorithm: an authentication type for SNMPv3 connections.
MIMO	Multiple In, Multiple Out. A technique by which the capacity of a radio link is increased using multiple transmitting and receiving antennas, transmitting a different signal on all antennas.
MIR	Maximum Information Rate
Mobile (HSU)	A “mobile” HSU can move from location to location and provide service while it moves or when it is stationary.
Nomadic (HSU)	A “nomadic” HSU move from location to location but can only provide service when it is stationary.
ODU	Outdoor Unit: a generic term for any radio, and can usually be exchanged for HBS or HSU.
On-board	Items or subject matter that relates to the environment on or inside the train itself. Also called “Train Side”
PPPoE	Point-to-Point Protocol over Ethernet
PtMP	Point to Multi-Point: link from an HBS to several HSUs
PtP	Point to Point
RADIUS	Remote Authentication Dial-In User Service
RSS	Radio Signal Strength
QoS	Quality of Service
SBM	Smart Bandwidth Management
Sector	A group of radios that consists of one HBS and several HSUs that communicate with the HBS.
SFF	Small Form-Factor
SHA1	Secure hash algorithm: an authentication type for SNMPv3 connections.
SLA	Service Level Agreement - the basic agreement between the service provider and its customer regarding certain aspects of the service provided. For example, what should be the data rate, throughput, jitter of the line, who should pay what fees, the mean time between failure (MTBF) of the equipment, and so forth,
SSM	Synchronization Status Message: Provides traceability of synchronization signals, and is used in the Synchronous Ethernet standard of communication.
SU	Subscriber Unit: a radio that can transmit and receive to one point. See also HSU

Table A-1: Terminology (Sheet 4 of 4)

Term	Description
Sync E or SyncE	Synchronous Ethernet: A standard of communication for ethernet that provides a synchronization signal to network elements that need such a signal.
TBS	Transportation Base Station. Similar to an HBS or BS, but used with high-speed transportation applications.
TDWR	Terminal Doppler Weather Radar: a type of radar station used in the U.S. and other countries for weather reporting. If a radio unit is installed close enough to one of these stations, the FCC requires that certain actions must be taken on the part of the customer. Regulations in other countries varies.
TMU	Transportation Mobile Unit. Similar to an SU
Track Side	Items or subject matter that relates to the environment not on or inside the train. It is not limited to precisely next to the track. Also called “wayside”
Train Side	Items or subject matter that relates to the environment on or inside the train itself. Also called “On-board”
TSN	Time Sensitive Network
Uplink	Data traffic from an HSU to an HBS, or Data traffic from an RT-B to an RT-A
VMU	Vehicular Mobile Unit
Wayside	Items or subject matter that relates to the environment not on or inside the train. It is not limited to precisely next to the track. Also called “Track Side”
WI	Web Interface: web-based application that provides simple configuration capabilities for the radio units.
WISPA	Wireless Internet Service Provider Association. An organization that manages registration of wireless devices that operate close to TDWR facilities run by the FAA.
VRRP	Virtual Router Redundancy Protocol - a networking protocol that provides for automatic assignment of available IP routers to participating hosts.

Appendix B: Wiring Specifications

B.1 ODU-PoE Cable

The ODU-PoE cable is shielded/outdoor class CAT-5e, 4 twisted-pair 24 AWG terminated with RJ-45 connectors on both ends. A cable gland on the ODU side provides hermetic sealing.

The following table shows the connector pinout:

Table B-1: ODU-PoE RJ-45 Connector Pinout

Function	Color	PoE	ODU
Rx N	White/Green	1	1
Rx T	Green	2	2
Tx T	White/Orange	3	3
Tx N	Orange	6	6
Power (+)	Blue	4	4
Power (+)	White/Blue	5	5
Power (–)	White/Brown	7	7
Power (–)	Brown	8	8

Table B-2: LAN-GbE PoE RJ-45 Connector Pinout

Function	Color	PoE	LAN
TxRx A	White/Green	1	1
TxRx A	Green	2	2
TxRx B	White/Orange	3	3
TxRx B	Orange	6	6
TxRx C & Power(+)	Blue	4	4

Table B-2: LAN-GbE PoE RJ-45 Connector Pinout (Continued)

Function	Color	PoE	LAN
TxRx C & Power(+)	White/Blue	5	5
TxRx D & Power(-)	White/Brown	7	7
TxRx D & Power(-)	Brown	8	8

B.2 RT-A(HBS)/HSS Unit Connection Pinout

The pinout is for the HSS Unit, used in serial HSS.

Table B-3: HBS/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5
White/Brown	7	7
Brown	8	8

B.3 User Port Connectors

B.3.1 LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to [Table B-4](#).

Table B-4: Fast Ethernet Connector Pinout

Function	Signal	Pin
Transmit Data (positive)	TD (+)	1
Transmit Data (negative)	TD (-)	2

Table B-4: Fast Ethernet Connector Pinout (Continued)

Function	Signal	Pin
Receive Data (positive)	RD (+)	3
Receive Data (negative)	RD (–)	6

B.4 DC Power Terminals

B.4.1 DC PoE

Table B-5: Terminal Block 2-pin -48VDC

Function	Pin
+	Right
–	Left

Appendix C: Setting Antenna Parameters

C.1 Antenna Issues

Before proceeding to antenna installation details, the following background information should be considered:

C.2 About Single and Dual Antennas

Each RADWIN 2000-Plus Family ODU is made of two radio transceivers (radios). The radios make use of algorithms that utilize both Spatial Multiplexing and Diversity resulting in enhanced capacity, range and link availability. The number of antennas used is determined by user configuration and by automatic system decisions, explained below.

C.2.1 Dual Antennas at the RT-A(HBS) and RT-B(HSU)

When using dual antennas at both sites (single bipolar antenna or two unipolar antennas) you can choose between Spatial Multiplexing Mode and Diversity Mode.

Spatial Multiplexing Mode

Under this mode, the system doubles the link capacity. At the same time, it keeps the same rate and modulation per radio as was used with single antenna, thus increasing capacity, range and availability.

For example, at 80MHz CBW, using a dual antenna, a RADWIN 2000 D-Plus radio unit can transmit at modulation of 256QAM and FEC of 5/6 and get an air rate of 866.7 Mbps, compared to 433.3 Mbps with single antenna.

To work in this mode, each antenna port must be connected to an antenna, the RSS level in both receivers should be balanced and a minimal separation between the antennas must be maintained. (For example, by using dual polarization antennas a cross polarization separation is attained).

Upon selecting Antenna Type as Dual, a RADWIN 2000-Plus Family radio automatically selects this mode and doubles the air rates.

The RADWIN Manager indicates a case of unbalanced RSS between the two antennas in the center panel.

Diversity Mode

Diversity Mode uses two antennas to improve the quality and reliability of the link. Often, there is not a clear line-of-sight (LOS) between transmitter and receiver. Instead the signal is reflected along multiple paths before finally being received.

Each such “bounce” can introduce phase shifts, time delays, attenuations, and even distortions that can destructively interfere with one another at the aperture of the receiving antenna. Antenna diversity is especially effective at mitigating these multi-path situations.

This is because multiple antennas afford a receiver several recordings of the same signal. Each antenna will be exposed to a different interference environment. Thus, if one antenna is undergoing a deep fade, it is likely that another has a sufficient signal. Collectively such a system can provide a robust link.

Antenna diversity requires a separation between the antennas; this is done by using a dual-polarization antenna or by two spatially separated antennas.

Use Diversity instead of Spatial Multiplexing in the following situations:

- When the system cannot operate in Spatial Multiplexing Mode
- When one of the receivers has high interference compared to the second receiver (i.e. the system is “unbalanced”)
- When you achieve higher capacity in Diversity Mode than in Spatial Multiplexing Mode
- When high robustness is of importance and the capacity of Diversity Mode is sufficient (up to 25 Mbps full duplex)

C.2.2 Single Antennas at Both Sites

By selecting a single antenna at both sites, the radio units operate with a single radio that is connected to the ANT 1 connector. The second radio is automatically shut down.

C.2.3 Single at One Site, Dual Antennas at the Other

In this mode one of the sites uses the radio unit with a single antenna while the other site uses the radio unit with a dual antenna.

The advantages in this mode in comparison to using a single antenna in both sites are doubled total Tx Power and additional polarization and/or space diversity (depending on the polarization of installed antennas).

The air rates used in this mode are same as when using single antennas in both sites.

C.3 Considerations for Changing Antenna Parameters

Let:

max Available Tx Power denote the maximum Tx Power practically available from an ODU. (It appears as **Tx Power per Radio**.)

maxRegEIRP denote the maximum EIRP available by regulation. It will be determined by three factors:

- per band/regulation
- per channel bandwidth
- antenna gain

maxRegTxPower denote the maximum regulatory Tx Power for the equipment, also having regard the above three points.

Then, the following relationship must be satisfied:

$$\text{maxAvailableTxPower} \leq \min(\text{maxRegEIRP} - \text{AntennaGain} + \text{CableLoss}, \text{maxRegTxPower}) \quad \dots (*)$$

The Tx Power (per radio) indicates the power of each radio inside the ODU and is used for Link Budget Calculations. The Tx Power (System) shows the total transmission power of the ODU and is used to calculate the EIRP according to regulations.



- To see the relationship between Tx Power (radio) and Tx Power (system), note that $\text{dBm} = 10 \times \log_{10} \text{milliWatt}$ so that if you double the power in milliWatts (for two radios) then dBm will increase by $10 \times \log_{10} 2 \approx 3$.
- The Max EIRP level will be automatically set according to the selected band and regulation.
- The EIRP level is the sum of the System Tx Power and the Antenna Gain minus the Cable Loss.

The inequality (*) above is always satisfied by the system in accordance with the relevant regulation.

The precise relationship between the items in inequality (*) is as follows:

- Required Tx Power (per radio) will be adjusted down to the lesser of the value entered and **maxAvailableTxPower**
- Tx Power (system) is **maxAvailableTxPower + 3** (for 2 radios)
- Max EIRP is **maxRegEIRP**.

Appendix D: Regional Notice: French Canadian

D.1 Procédures de sécurité

D.1.1 Généralités

Avant de manipuler du matériel connecté à des lignes électriques ou de télécommunications, il est conseillé de se défaire de bijoux ou de tout autre objet métallique qui pourrait entrer en contact avec les éléments sous tension.

D.1.2 Mise à la terre

Tous les produits RADWIN doivent être mis à la terre pendant l'usage courant. La mise à la terre est assurée en reliant la fiche d'alimentation à une prise de courant avec une protection de terre. En outre:

- La cosse de masse sur l'IDU-C doit être constamment connectée à la protection de terre, par un câble de diamètre de 18 AWG ou plus. Le matériel monté sur rack doit être installé seulement sur des racks ou armoires reliés à la terre
- Une ODU doit être mise à la terre par un câble de diamètre de 10 AWG ou plus
- Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre

De plus:

- Il faut toujours connecter la terre en premier et la déconnecter en dernier
- Il ne faut jamais connecter les câbles de télécommunication à du matériel non à la terre
- Il faut s'assurer que tous les autres câbles sont déconnectés avant de déconnecter la terre

D.1.3 Protection contre la foudre

L'utilisation de dispositifs de protection contre la foudre dépend des exigences réglementaires et de l'utilisateur final. Toutes les unités extérieures RADWIN sont conçues avec des circuits de limitation de surtension afin de minimiser les risques de dommages dus à

la foudre. RADWIN conseille l'utilisation d'un dispositif de parafoudre supplémentaire afin de protéger le matériel de coups de foudre proches.

Matériel supplémentaire requis

L'équipement requis pour l'installation du matériel est le suivant:

- Pince à sertir RJ-45 (si un câble pré-assemblé ODU/IDU n'est pas utilisé)
- Perceuse (pour le montage sur mur seulement)
- Câbles de terre IDU et ODU
- Clef 13 mm (½")
- Câble ODU - IDU si non commandé (type extérieur, CAT-5e, 4 paires torsadées, 24 AWG)
- Colliers de serrage
- Ordinateur portable avec Windows 2000 ou Windows XP.

D.1.4 Précautions de sécurité pendant le montage de ODU

Avant de connecter un câble à l'ODU, la borne protectrice de masse (visse) de l'ODU doit être connectée à un conducteur externe protecteur ou à un pylône relié à la terre. Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre.

Seulement un personnel qualifié utilisant l'équipement de sécurité approprié doit pouvoir monter sur le pylône d'antenne. De même, l'installation ou le démontage de ODU ou de pylônes doit être effectuée seulement par des professionnels ayant suivi une formation.

➤ Pour monter l'ODU:

1. Vérifier que les supports de fixation de l'ODU sont correctement mis à la terre.
2. Monter l'unité ODU sur le pylône ou sur le mur; se référer à la [Installation sur pylône et mur](#) au dessous.
3. Connecter la câble de terre au point de châssis sur l'ODU.
4. Relier le câble ODU-IDU au connecteur ODU RJ-45.
5. Visser les presses-étoupe de câbles pour assurer le scellement hermétique des unités ODU.
6. Attacher le *câble au pylône ou aux supports en utilisant des colliers classés UV.*
7. Répéter la procédure sur le site distant.



Ne pas se placer en face d'une ODU sous tension.

D.1.5 Connecter la terre à IDU-C

Connecter un câble de terre de 18 AWG à la borne de masse de l'appareil. L'appareil doit être constamment connecté à la terre.



- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm avec un conduit de 16 mm.

D.2 Installation sur pylône et mur

L' ODU ou l'O-PoE peuvent être montés sur un pylône ou un mur.

D.2.1 Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

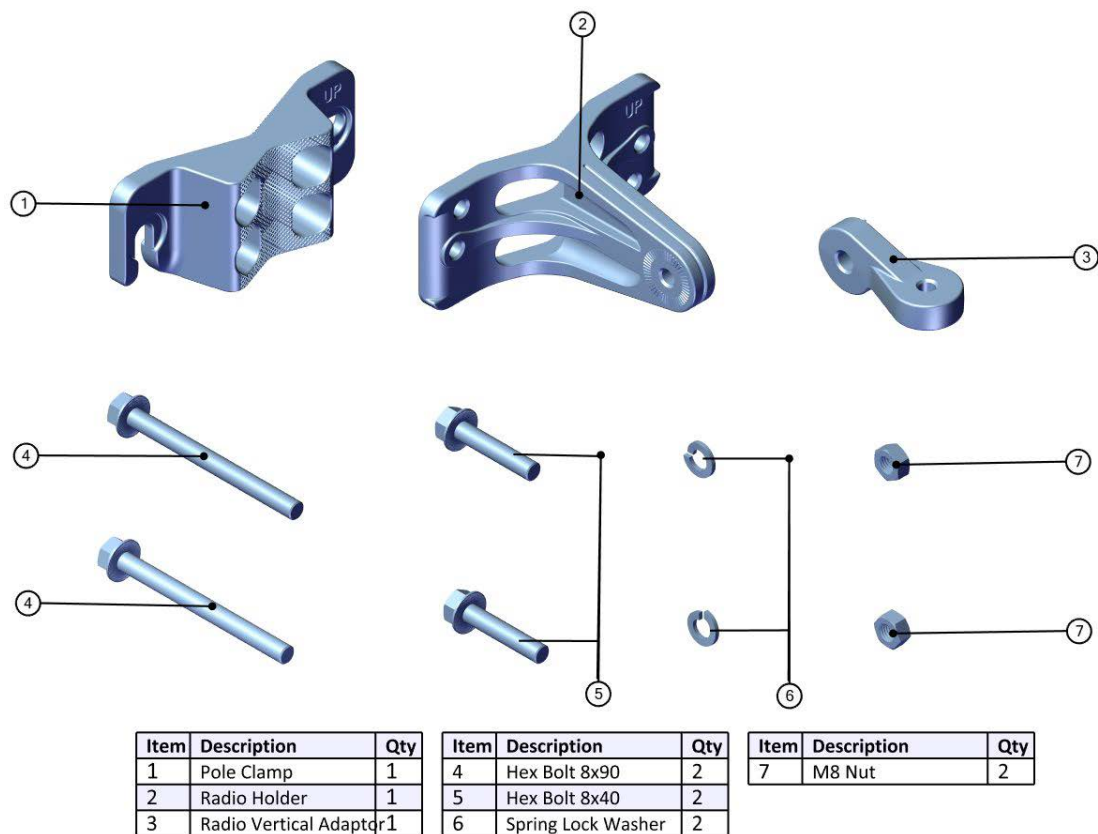


Figure D-1: Contenu du kit de montage ODU

D.2.2 Montage sur un pylône

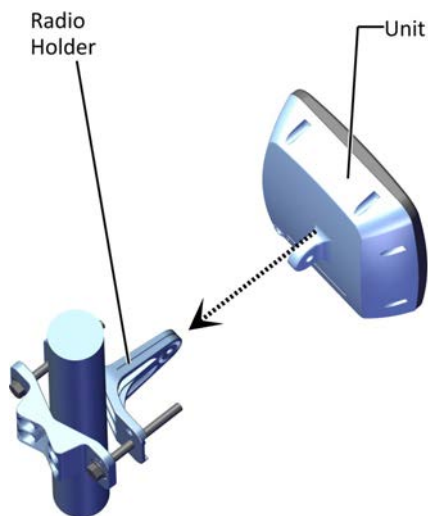


Figure D-2: Montage sur un pylône (1)

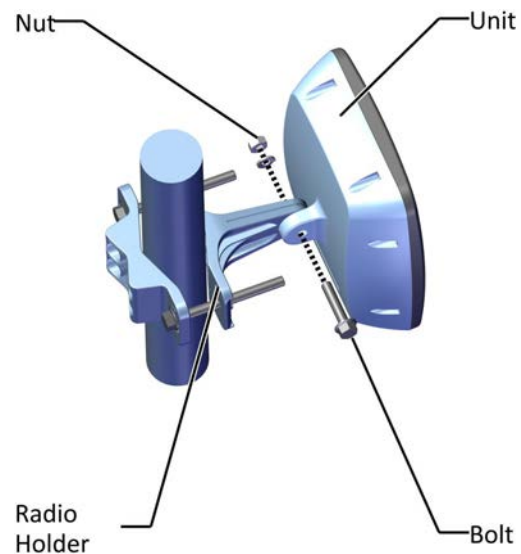


Figure D-3: Montage sur un pylône (2)

D.2.3 Montage sur un mur

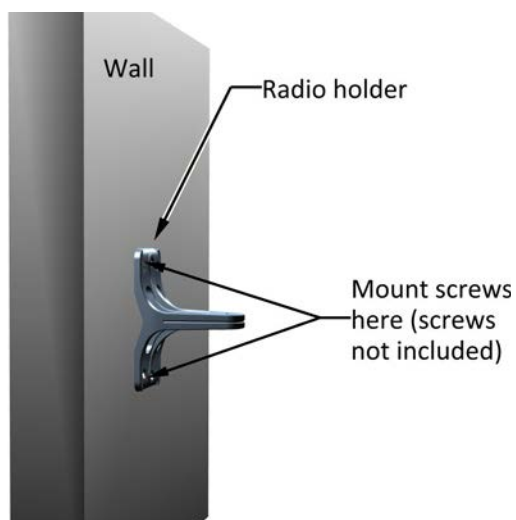


Figure D-4: Montage sur un mur (1)

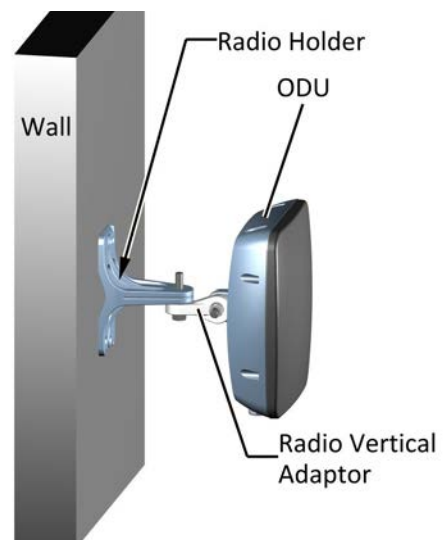


Figure D-5: Montage sur un mur (2)

D.2.4 Montage d'une antenne externe

L'antenne externe optionnelle peut être montée sur un pylône.

D.2.5 Contenu du kit de montage d'une antenne externe

Le kit de montage d'une antenne externe comprend les pièces suivantes

- Douze rondelles plates
- Huit rondelles élastiques
- Huit écrous hex

- Quatre boulons
- Un support en U
- Un support à pivotement
- Deux courroies de fixation en métal



Pour installer une antenne externe sur un pylône:

1. Attacher le support en U à l'arrière de l'antenne en utilisant quatre rondelles plates, quatre rondelles élastiques et quatre écrous hex.
2. Attacher le support à pivotement au support en U en utilisant huit rondelles plates, quatre rondelles élastiques, quatre écrous hex et quatre boulons.
3. Passer les deux courroies de fixation par les fentes verticales dans le support à pivotement.
4. Attacher l'antenne au pylône en utilisant les deux courroies de fixation .

Ajuster l'inclinaison nécessaire en utilisant l'échelle angulaire et serrer tous les boulons et écrous à la position requise.

Appendix E: Certified Antennas

Only the antennas shown in the tables below or antennas of the same type with lower gain are approved for use in this system. The antennas must be installed so as to provide a minimum separation distance from bystanders as specified in the tables below.

E.1 For Deployment in US/Canada

Radio devices that bear the following FCC/IC IDs on the label refer to the following table:

Contains FCC ID: Q3KRW24MOD

Contains IC: 5100A-RW24MOD

Only the antennas shown in the table below or antennas of the same type with lower gain are approved for use in this system. The antennas must be installed so as to provide a minimum separation distance from bystanders as specified in the table below.

Cat. No.	Type	Gain (dBi)	Dir BW	Freq. Band (MHz)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Omni	8	360°	2400-2483.5	25	20
RW-9612-2427	Flat DP	20	16°	2400-2483.5	22	51
Integrated	Flat DP	17.5	16°	2400-2483.5	23	43

Radio devices that bear the following FCC/IC IDs on the label refer to the following table:

Contains FCC ID: Q3KRW3XMOLD

Contains IC: 5100A-RW3XMOD

Only the antennas shown in the table below or antennas of the same type with lower gain are approved for use in this system. The antennas must be installed so as to provide a minimum separation distance from bystanders as specified in the table below.

Cat. No.	Type	Gain (dBi)	Dir BW	Freq. Band (MHz)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	22	12°	3650-3700	21	57
Integrated	Flat DP	17	18°	3650-3700	25	36
Integrated	Flat DP	14	--	3650-3700	25	26

Radio devices that bear the following FCC/IC IDs on the label refer to the following table:

Contains FCC ID: Q3K- 5XACMOLD

Contains IC: 5100A- 5XACMOD

Only the antennas shown in the table below or antennas of the same type with lower gain are approved for use in this system. The antennas must be installed so as to provide a minimum separation distance from bystanders as specified in the table below:

Frequency Band 5725-5850 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	16.0	35°	25	45
Integrated	Flat DP	16.5	35°	25	48
RW-9613-4960	Flat DP	23.0	8°	25	100
Integrated	Flat DP	23.5	8°	25	107
RW-9622-5001	Flat DP	29.0	5°	25	200
RW-9721-5158	Dish DP	28.0	5.5°	25	178
RW-9732-4958	Dish DP	32.0	4°	25	283

Frequency Bands 5250-5350 MHz and 5470-5725 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	16.0	35°	11	20
Integrated	Flat DP	16.5	35°	10.5	20
RW-9613-4960	Flat DP	23.0	8°	4	20
Integrated	Flat DP	23.5	8°	3.5	20
RW-9721-5158	Dish DP	28.0	5.5°	-1	20
RW-9732-4958	Dish DP	32.0	4°	-5	20

Frequency Bands 5150-5250 MHz (this band is licensed under ISSED)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	16.0	35°	24	40
Integrated	Flat DP	16.0	35°	24	40
RW-9613-4960	Flat DP	23.0	8°	25	100
Integrated	Flat DP	23.5	8°	25	107
RW-9622-5001	Flat DP	29.0	5°	22	142
RW-9721-5158	Dish DP	28.0	5.5°	19	90
RW-9732-4958	Dish DP	32.0	4°	19	142

Frequency Bands 4940-4990 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	14.0	35°	25	36
Integrated	Flat DP	16.0	35°	25	45
RW-9613-4960	Flat DP	23.0	8°	25	100

Frequency Bands 4940-4990 MHz (Continued)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	21.0	8°	25	80
RW-9622-5001	Flat DP	29.0	5°	25	200
RW-9721-5158	Dish DP	28.0	5.5°	25	178
RW-9732-4958	Dish DP	30.0	4°	25	225

The RADWIN 2000 Alpha EMB bears the following FCC/IC IDs on the label. Refer to the tables below:

FCC ID: Q3K-5AXULC-X

IC: 5100A-5AXULCX

The RADWIN 2000 Alpha EMB must be installed so as to provide a minimum separation distance from bystanders as specified in the tables below:

Frequency Band 5725-5850 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Embedded	Flat DB	16.0	17.5° Hor 29.1° Ver	27	110
RW-9614-5359	Flat DB	23.0	10.0°	27	110

Frequency Bands 5250-5350 MHz and 5470-5725 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Embedded	Flat DB	16.0	17.5° Hor 29.1° Ver	10	20
RW-9614-5359	Flat DB	23.0	10.0°	4	20

Frequency Band 5150-5250 MHz (*)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Embedded	Flat DB	16.0	17.5° Hor 29.1° Ver	11	107
RW-9614-5359	Flat DB	23.0	10.0°	4	107

(*) This band is licensed under ISSED

Frequency Band 4940-4990 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Embedded	Flat DB	14.0	17.5° Hor 29.1° Ver	17	43
RW-9614-5359	Flat DB	23.0	10.0°	17	43

The RADWIN 2000 Alpha INT bears the following FCC/IC IDs on the label. Refer to the tables below:

FCC ID: Q3K-5XACULCHG

IC: 5100A-5XACULCHG

The RADWIN 2000 Alpha INT must be installed so as to provide a minimum separation distance from bystanders as specified in the tables below:

Frequency Band 5725-5850 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DB	22.0	10.0°	27	70

Frequency Bands 5250-5350 MHz(*) and 5470-5725 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DB	21.0	10.0°	5	70

(*) This band not supported under ISSED

Frequency Band 5150-5250 MHz (*)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DB	21.0	10.0°	5	70

(*) This band is licensed under ISSED

E.1 For Deployment in EU Member States

Safe distances for RADWIN 2000-Plus Family ETSI products:

Frequency Band [GHz]	Antenna gain [dBi]	Min. Safe Distance [cm]
5.8 / 5.3 / 5.4 / 2.4	All gains	20
3.5	17	69

The RADWIN 2000 Alpha EMB must be installed so as to provide a minimum separation distance from bystanders as specified in the tables below:

Frequency Band 5725-5875 MHz

Gain (dBi)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
22	11	20

Frequency Band 5470-5725 MHz

Gain (dBi)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
22	5	20

The RADWIN 2000 Alpha INT must be installed so as to provide a minimum separation distance from bystanders as specified in the tables below:

Frequency Band 5725-5875 MHz

Gain (dBi)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
22	11	20

:

Frequency Band 5470-5725 MHz

Gain (dBi)	Tx Power per chain (dBm)	Min. Safe Distance (cm)
21	6	20

Regulatory Compliance

General Note

This system has achieved Type Approval in various countries around the world. This means that the system has been tested against various local technical regulations and found to comply. The frequency bands in which the system operates may be “unlicensed” and in these bands, the system can be used provided it does not cause interference.

For information on the restrictions on putting the device into service please contact your national telecommunication authorities.

FCC/ISED - Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

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

RF Exposure

For the safety of the general public it is recommended to keep a minimum safe distance from radiating antennas according to the table below:

Pour la sécurité du grand public, il est recommandé de respecter une distance de sécurité minimale par rapport aux antennes rayonnantes, conformément au tableau ci-dessous:

FCC Identifier	IC Identifier	Band (GHz)	Safe Distance (cm)	
			U.S.	Canada
Contains FCC ID: Q3K-5XACMOLD	Contains IC: 5100A-5XACMOD	5.1 ^a ; 4.9-5.8	310	314
FCC ID: Q3K-BFJET5X	IC: 5100A-BFJET5X	5.1 ^a ; 4.9-5.8	94.38	96
FCC ID: Q3K-JETDB5X3X	N/A	3.6; 5.1 ^a ; 5.8	55	N/A
FCC ID: Q3K-5XACULC-X	IC: 5100A-5XACULCX	2.4; 5.1 ^a ; 4.9-5.8	110	115
FCC ID: Q3K-5XACULCHG	IC: 5100A-5XACULCHG	2.4; 5.1 ^a ; 5.2 ^b , 5.4-5.8	70	70

a. This band is licensed under ISSED

b. FCC Only



It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204.



It is the responsibility of the installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR part 15.204.

Indoor Units comply with part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) These devices may not cause harmful interference.
- (2) These devices must accept any interference received, including interference that may cause undesired operation.



Outdoor units and antennas should be installed **ONLY** by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas. The installer should configure the output power level of antennas according to country regulations and antenna type.



Les unités extérieures et les antennes doivent être installées **UNIQUEMENT** par des professionnels de l'installation qui connaissent le bâtiment et la sécurité locaux codes et, le cas échéant, sont autorisés par les autorités compétentes autorités de réglementation gouvernementales. Ne pas le faire peut annuler le produit garantie et peut exposer l'utilisateur final ou le fournisseur de services à des passifs financiers. Les revendeurs ou distributeurs de cet équipement ne sont pas responsable des blessures, des dommages ou de la violation de la réglementation installation d'unités extérieures ou d'antennes. L'installateur doit configurer le niveau de puissance de sortie des antennes selon les réglementations du pays et type d'antenne.



- Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.
- This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 10 AWG grounding cable - which must be used with the unit to insure compliance.



The system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden. The radio must be installed and used in strict accordance with the manufacturer's instructions as described in this guide. Any other installation or use of the product violates FCC Part 15 regulations.



Le système doit être professionnellement installé pour assurer la conformité avec Certification de la partie 15 Il est de la responsabilité de l'opérateur et de l'installateur professionnel que seuls les systèmes certifiés sont déployés aux États-Unis. L'utilisation du système dans toute autre combinaison (p. antennes transmettant la même information) est expressément interdite. La radio doit être installée et utilisée en stricte conformité avec les instructions du fabricant décrites dans ce guide. Toute autre installation ou utilisation du produit enfreint les règlements de l'ISDE règlements.



It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204. A list of approved external antennas can be found in the Certified Antennas appendix .



Le système doit être professionnellement installé pour assurer la conformité avec Certification de la partie 15 Il est de la responsabilité de l'opérateur et de l'installateur professionnel que seuls les systèmes certifiés sont déployés aux États-Unis. L'utilisation du système dans toute autre combinaison (p. antennes transmettant la même information) est expressément interdite. Il est de la responsabilité de l'installateur de s'assurer que lors de l'utilisation du kits d'antenne extérieure aux États-Unis (ou lorsque les règles de la FCC s'appliquent), seulement les antennes certifiées avec le produit sont utilisées. L'utilisation de tout l'antenne autre que celles certifiées avec le produit est expressément interdite par les règlements ISDE. Une liste d'antennes externes approuvées peut se trouve à l'annexe Antennes Certifiées



It is the responsibility of the operator and professional installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR part 15.204



Il est de la responsabilité de l'opérateur et de l'installateur professionnel que lors de la configuration de la radio au Canada (ou lorsque les règles canadiennes appliquer), la puissance Tx est définie en fonction des valeurs pour lesquelles le produit est agréé. L'utilisation de valeurs de puissance Tx autres que celles pour lesquelles le produit est certifié, est expressément interdit par les règlements de l'ISDE



It is the responsibility of the installer to ensure that Sector and Base Station radios operating in the band 5150-5250 MHz are installed so that the antennas do not exceed 21 dBm EIRP at any elevation angle above 30 degrees as measured from the horizon, as required by FCC rule 47 CFR Part 15.407 (a)(1)(i).



In Canada Radio Local Area Network Devices Operating in the 5150-5250 MHz Frequency Band may only be allowed following licensing process.

Au Canada, les appareils du réseau local radio fonctionnant dans la bande de fréquences 5150-5250 MHz ne peuvent être autorisés qu'après un processus d'attribution de licence.



Under regulatory environments supporting other than FCC/ISED rules: Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.

This product was tested with special accessories indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 10 AWG grounding cable - which must be used with the unit to insure compliance.



Dans des environnements réglementaires prenant en charge d'autres règles que celles de la FCC / ISED: Où les unités extérieures sont configurables par logiciel aux valeurs de puissance Tx autres que ceux pour lesquels le produit est certifié, c'est le la responsabilité de l'installateur professionnel de restreindre la puissance Tx à les limites certifiées.

Ce produit a été testé avec des accessoires spéciaux - unité intérieure (UDI ou PoE), câble blindé FTP CAT-5e avec joint d'étanchéité, mise à la terre 10 AWG câble - qui doit être utilisé avec l'unité pour assurer la conformité.



Radio devices using external antennas operating in the 5250-5350 MHz and 5470-5725 MHz bands must comply with the EIRP limits as specified in the Certified Antennas appendix

Appareils radio utilisant des antennes externes fonctionnant dans les bandes 5250-5350 MHz et 5470-5725 MHz seront conformes ala EIRP limites iniquees à l'annexe Antennes Certifiées



Radio devices using external antennas operating in the 5725-5850 MHz band must comply with the EIRP limits as specified in the Certified Antennas appendix for point-to-point and point-to-multipoint operation.

Appareils radio utilisant des antennes externes fonctionnant dans la bande 5725-5850 MHz seront conformes ala EIRP limites iniquees à l'annexe Antennes Certifiées pour un fonctionnement point a point et non point a point.



Radio devices shall be so installed to have worst-case tilt angle to remain compliant with the EIRP elevation mask requirement set forth in RSS-247 Section 6.2.2(3).

Appareils de radio doivent etre installes de maniere a avoir l'angle d'inclinaison du pire poir rester conforme a la EIRP exigence de masque d'elevation selon la RSS-247 Sec tion 6.2.2(3)



Installers are advised to consider high-power radars allocation as priority users of the bands 5250-5350 MHz and 5470-5725 MHz and that these radars could cause interference and/or damage to the radio devices.

Les installateurs sont invites a envisager de radars a haute puissance allocation que les utilisateurs prioritaires des bandes 5250-5350 MHz - 5470-5725 MHz et que ces radars pourraient causer interferences et /ou endommager les appareils de radio.

Radio devices operating in the 3650-3700 MHz band must comply with the output power limits as specified in [Appendix E](#)

Base stations operating in the 3650-3700 MHz band may not be located within 150 km of any grandfathered satellite earth station operating in the 3650-3700 MHz band. The coordinates of these stations are available at <http://www.fcc.gov/ib/sd/3650/>.

Base stations operating in the 3650-3700 MHz band may not be located within 80 km of the following Federal Government radio location facilities:

- St. Inigoes, MD - 38° 10' N., 76°, 23' W
- Pensacola, FL - 30° 21' 28" N., 87°, 16' 26" W
- Pascagoula, MS - 30° 22' N, 88° 29'



The radio devices in this manual have been approved by Industry Canada to operate with the antenna types listed in the Certified Antennas appendix with the maximum permissible gain and required antenna impedance for each antenna type indicated.

Antenna types not included in this list, having a gain greater than the maximum gain indicate for that type, are strictly prohibited for use with this device.

Les appareils de radio dans ce manuel ont été approuvés par Industrie Canada pour fonctionner avec les types d'antenne énumérées à l'annexe Antennes Certifiées avec le gain maximal admissible et l'impédance d'antenne requise pour chaque type d'antenne indiquée.

Types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.



Radio devices subject to RSS-247 issue 2 shall not be capable of transmitting in the band 5600-5650 MHz.

Dispositifs radio soumis à la délivrance RS-247 2 ne sont pas capables de transmettre dans la bande 5600-5650 MHz.



Radio devices subject to RSS-247 issue 2 shall not be capable of transmitting in the band 5600-5650 MHz.

Dispositifs radio soumis à la délivrance RSS-247 2 ne sont pas capables de transmettre dans la bande 5600-5650 MHz.

Licensees installing equipment in the 3650-3700 MHz band should determine if there are any nearby U.S. Federal Government radar systems that could affect their operations. Information regarding the location and operational characteristics of the radar systems operating adjacent to this band are provided in NTIA TR-99-361.

Requests for base station locations closer than 80 km to the U.S. Federal Government radio location facilities listed above will only be approved upon successful coordination by the Commission with NTIA through the Frequency Assignment Subcommittee of the Interdepartmental Radio Advisory Committee.

Fixed devices operating in the 3650-3700 MHz band generally must be located at least 8 kilometers from the U.S./Canada or U.S./Mexico border if the antenna of that device looks within the 160° sector away from the border. Fixed devices must be located at least 56 kilometers from each border if the antenna looks within the 200° sector towards the border.

Fixed devices may be located nearer to the U.S./Canada or U.S./Mexico border than specified above only if the Commission is able to coordinate such use with Canada or Mexico, as appropriate.

Licensees in the 3650-3700 MHz band must comply with the requirements of current and future agreements with Canada and Mexico regarding operation in U.S./Canada and U.S./Mexico border areas.

Canadian Emission Requirements for Indoor Units

This Class B digital apparatus complies with Canadian ISED-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

EU – Compliance



Radio transmitters operating in the EU need to comply the RE-DIRECTIVE 2014/53/EU, EMC Directive 2014/30/EU, Low Voltage Directive 2014/35/EU.

The 5.8 GHz products are suitable for use in, and comply with the Broadband Wireless Access System (WAS). It is a Class 2 device and uses operating frequencies that are not harmonized throughout the EU member states. The operator is responsible for obtaining any national licenses required to operate this product and these must be obtained before using the product in any particular country.

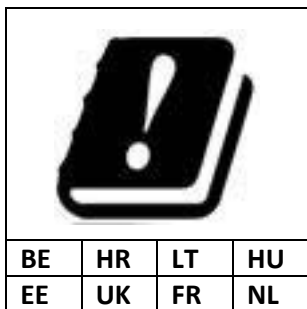
The RADWIN 2000-Plus Family 5.8 GHz product complies with the requirements of the harmonized standard ETSI EN 302 502 and the ECC RECOMMENDATION (06)04

The 3.5 GHz band complies with the standard ETSI EN 302 326-2 V1.2.2 and draft standard ETSI EN 302 326-2 V dft 0.0.2 (20016-11). The operator is responsible for obtaining any national licenses required to operate this product and these must be obtained before using the product in any particular country.

Restrictions on the use of 5.8 GHz Band in EU member states

BE	EL	LT	PT	BG	ES
LU	RO	CZ	FR	HU	SI
DK	HR	SK	DE	IT	UL
NL	CY	AT	SE	IE	LV
PL	UK				

Restrictions on the use of 3.5 GHz Band in EU member states



China MII

Operation of the equipment is only allowed under China MII 5.8GHz band regulation configuration with EIRP limited to 33 dBm (2 Watt).

India WPC

Operation of the equipment is only allowed under India WPC GSR-38 for 5.8GHz band regulation configuration.

Brazil

The equipment will operate only in the frequency bands 5470 - 5725 MHz and 5725 - 5850 MHz. The software version to be sold in Brazil with blocking is from version 4.6.

The power supplies presented in this user manual are not sold with this product.

O equipamento irá operar apenas nas faixas de frequências 5470 - 5725 MHz e 5725 - 5850 MHz. A versão do software a ser comercializado no Brasil com bloqueio é a partir da versão 4.6.

As fontes de alimentação apresentadas neste manual não serão comercializadas junto com este produto.

For Norway and Sweden only

Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11).

Norway

Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplett utstyr - og er tilkoplett et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel-TV nettet

Sweden

Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.

Unregulated


In countries where the radio is not regulated the equipment can be operated in any regulation configuration, best results will be obtained using Universal regulation configuration.

Safety Practices

Applicable requirements of National Electrical Code (NEC), NFPA 70; and the National Electrical Safety Code, ANSI/IEEE C2, must be considered during installation.

NOTES:

1. A Primary Protector is not required to protect the exposed wiring as long as the exposed wiring length is limited to less than or equal to 140 feet, and instructions are provided to avoid exposure of wiring to accidental contact with lightning and power conductors in accordance with NEC Sections 725-54 (c) and 800-30.



In all other cases, an appropriate Listed Primary Protector must be provided. Refer to Articles 800 and 810 of the NEC for details.

2. For protection of ODU against direct lightning strikes, appropriate requirements of NFPA 780 should be considered in addition to NEC.

3. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.

4. Only UL Listed parts and components will be used for installation. Use UL Listed devices having an environmental rating equal to or better than the enclosure rating to close all unfilled openings.

5. Use min. 10AWG external protective earthing conductor.

Appendix B: Revision History

Table B-1: Revision History

Cat.No/Release	Date	Description
Release 4.9.50 Rev.01	03.05.18	Initial release based on PtP 4.9.35
Release 4.9.50 Rev.02	14.05.18	External connection photographs updated
Release 4.9.70	01.04.19	Secure Sync method
Release 4.9.71	22.05.19	New product: RADWIN 2000 Alpha INT
Release 4.9.75	Aug, 2019	New product: RW 2000 ALPHA INT 3.x

RADWIN Worldwide Offices

Corporate and EMEA Regional Headquarters

Corporate and EMEA Headquarters

27 Habarzel Street
Tel Aviv, 6971039
Israel
Tel: +972.3.766.2900
Fax: +972.3.766.2902
Email: sales@radwin.com

North America Regional Headquarters

900 Corporate Drive
Mahwah, NJ, 07430
USA
Tel: +1-877-RADWIN US
(+1-877 723-9468)
Tel: +1-201-252-4224
Fax: +1-201-621-8911
Email: salesna@radwin.com
Customer Support - North America:
Hours: 9 am - 6 pm EST (Mon - Fri)
Email: supportusa@radwin.com

RADWIN Regional Offices

RADWIN Brazil

Av. Chucri Zaidan, 920 – 9º
São Paulo, 04583-904
Brazil
Tel: +55.11.3048-4110
Email: salesbr@radwin.com

RADWIN Mexico

Quinto #20 Col El Centinela
Mexico, DF, 04450
Mexico
Tel: +52 (55) 5689 8970
Email: salesmx@radwin.com

RADWIN Peru

Av. Antares 213
Lima, 33
Peru
Tel: +511.6285105
Fax: +511-990304095
Email: salespe@radwin.com

RADWIN India

E-13,B-1 Extn., Mohan Co-operative Industrial Estate
New Delhi, 110 044
India
Tel: +91-11-40539178
Email: salesin@radwin.com

RADWIN Philippines

5 Bur Bank St.
Laguna, Belair, Santa Rosa
Laguna Philippines
Tel: +63 928 7668230
Email: salesph@radwin.com

RADWIN South Africa

P.O. Box 3554, Rivonia
Johannesburg, 2128
South Africa
Tel: +27 (0)82 551 5600
Email: sales@radwin.com

RADWIN Italy and Spain

Piazza Arenella 7/H
Napoli, 80128
Italy
Tel: +390815564116
Fax: +39335433620
Email: salesit@radwin.com

RADWIN Central America

Calle La Cañada # 108-E
Jardines de la Hacienda
Ciudad Merliot El Salvador
Tel: +503 2278-5628
Email: sales@radwin.com



RADWIN Worldwide Offices (Continued)

RADWIN South East Asia

All Season Mansion
87/38 Wireless Road Lumpinee
Bangkok ,10330
Thailand
Tel: +66811707503
Email: sales@radwin.com

End page

RADWIN