RADWIN

RW 2000 Series Installation Guide

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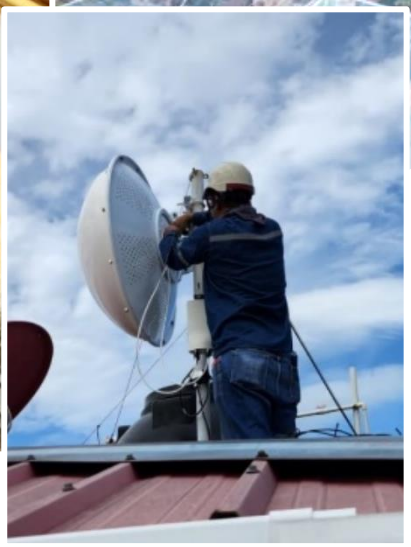


Table of Contents

1. Introduction

1.1 Scope of This Document

This document shows how to install RADWIN 2000 Series ODUs.
For a detailed description of how to configure RADWIN 2000 Series ODUs, see the RADWIN 2000 Series Configuration Guide.

1.2 RADWIN 2000 Series Overview

The RADWIN 2000 Series delivers up to 2.5Gbps (depending on the specific model) in a point-to-point architecture and is the ideal choice for last-mile enterprise connectivity, short-distance backhaul, and high-end applications.

The RADWIN 2000 Series has several models, as summarized in the following table. Please refer to the WINPro catalog for specific part numbers.

RADWIN 2000 Series Products

Model Name	**Aggregate Capacity**	**Antenna**	**Frequency Range** (may be limited by regulation)
RADWIN 2000 E INT	2.5 Gbps	Integrated 24dbi flat panel	4.9-6.0 Ghz
RADWIN 2000 E EXT	2.5 Gbps	External (N-type connectors)	4.9-6.0 Ghz
RADWIN 2000 Alpha INT RADWIN 2000 Alpha-PRO INT	50-500 Mbps	Integrated 21dbi flat panel	4.9-6.0 Ghz
RADWIN 2000 Alpha EXT RADWIN 2000 Alpha-PRO EXT	50-500 Mbps	External (N-type connectors)	4.9-6.0 Ghz
RADWIN 2000 Alpha 6.4Ghz	250-500 Mbps	Integrated 25 / 28dbi flat panel	5.1-6.4 Ghz
RADWIN 2000 Alpha 3.5Ghz	500 Mbps	Integrated 18dbi flat panel	3.4-3.8 Ghz

For legacy products such as RADWIN 2000 Alpha Embedded, A-Plus, C-Plus and D-Plus please refer to previous version of this installation guide.

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

1.2.1 System Components and Connectivity

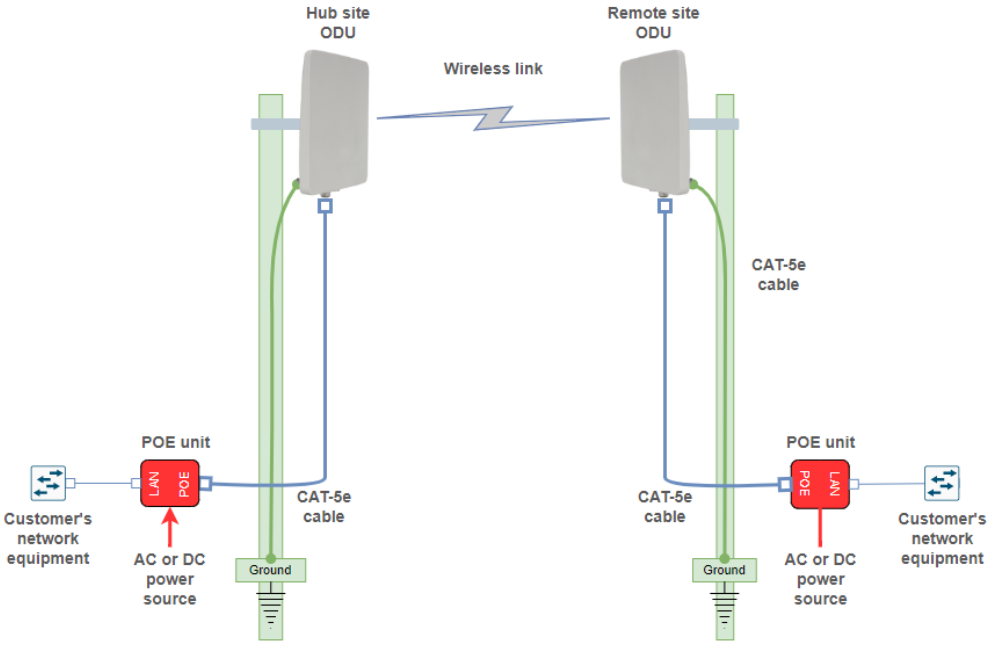
The ODUs operate through PoE devices that provide power and Ethernet connectivity on a single CAT5e cable. The communication protocol for both the service provider and users is Ethernet. The RW 2000 E supports SFP (fiber) in addition to Ethernet.

See the *RADWIN 2000 Series Connection Scheme* diagram below.

- A PoE device is connected to power and the communications network.
- Using CAT-5e cables, the ODUs are connected to power and the communications network via a Power-over-Ethernet (PoE) device.
- The ODUs and PoE devices must be grounded.
- The ODUs communicate with each other via the air interface.

The ODUs should be accessed only by skilled persons. Check the voltage on the antenna connector before access. Hazardous voltage of 56VDC may appear on the antenna metal connector in case of a single fault condition.

For simplicity, Lightning Protection Units (LPUs) are not shown in the following figure, but they are recommended. See for directions on how to install the LPUs.



RADWIN 2000 Series Connection Scheme

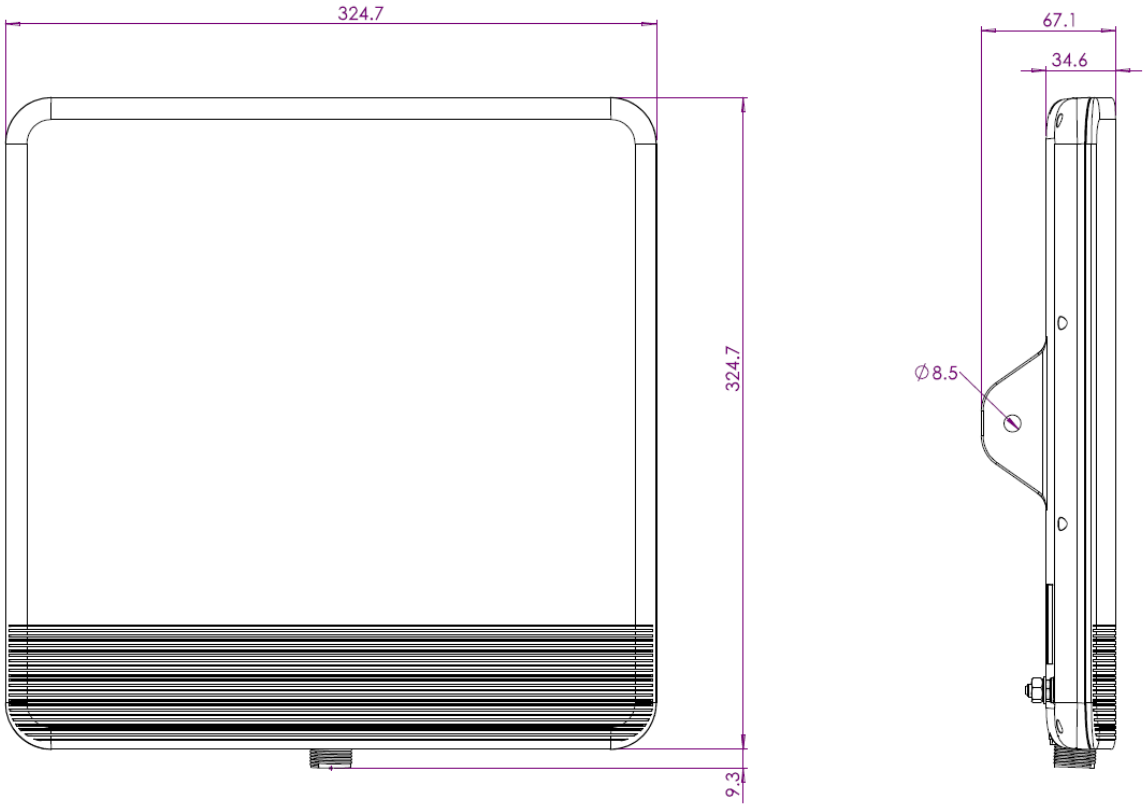
In order to establish a link, the two ODUs should be configured as follows:

- Hub site ODU should be configured in **Hub mode**
- Remote site ODU should be configured in **Client mode**

1.2.2 Outdoor Units (ODUs)

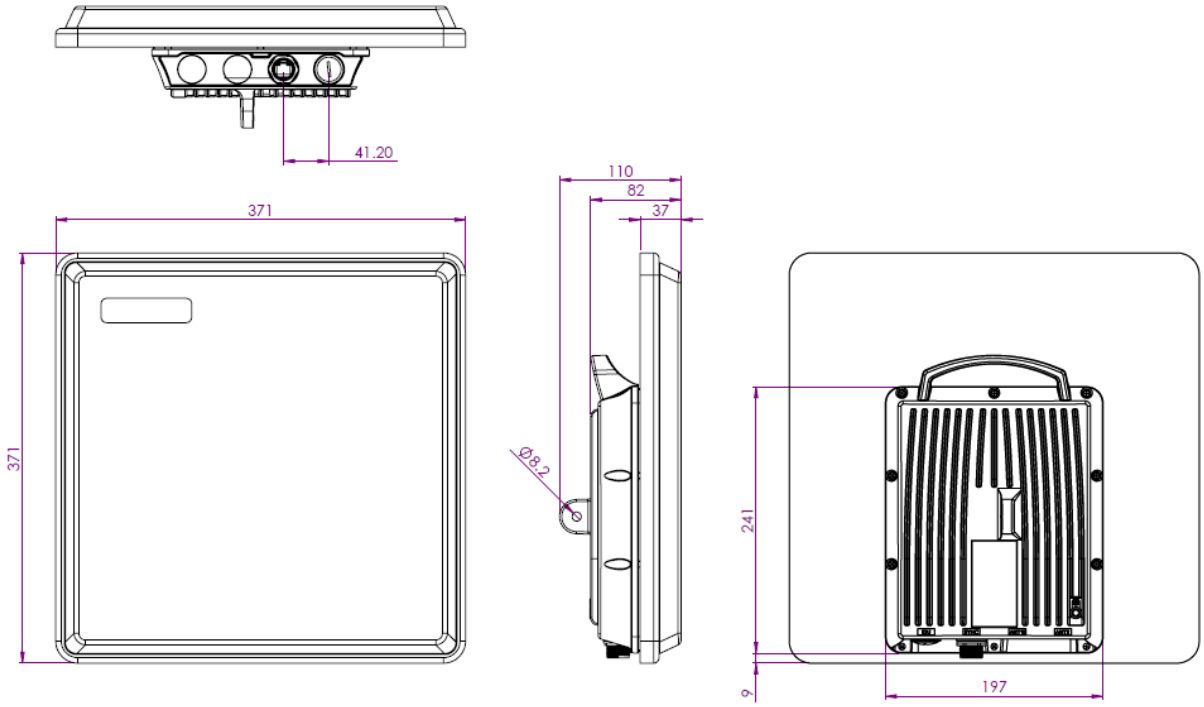
RADWIN 2000 Alpha / Alpha-PRO Integrated

RADWIN 2000 Alpha / Alpha-PRO Integrated

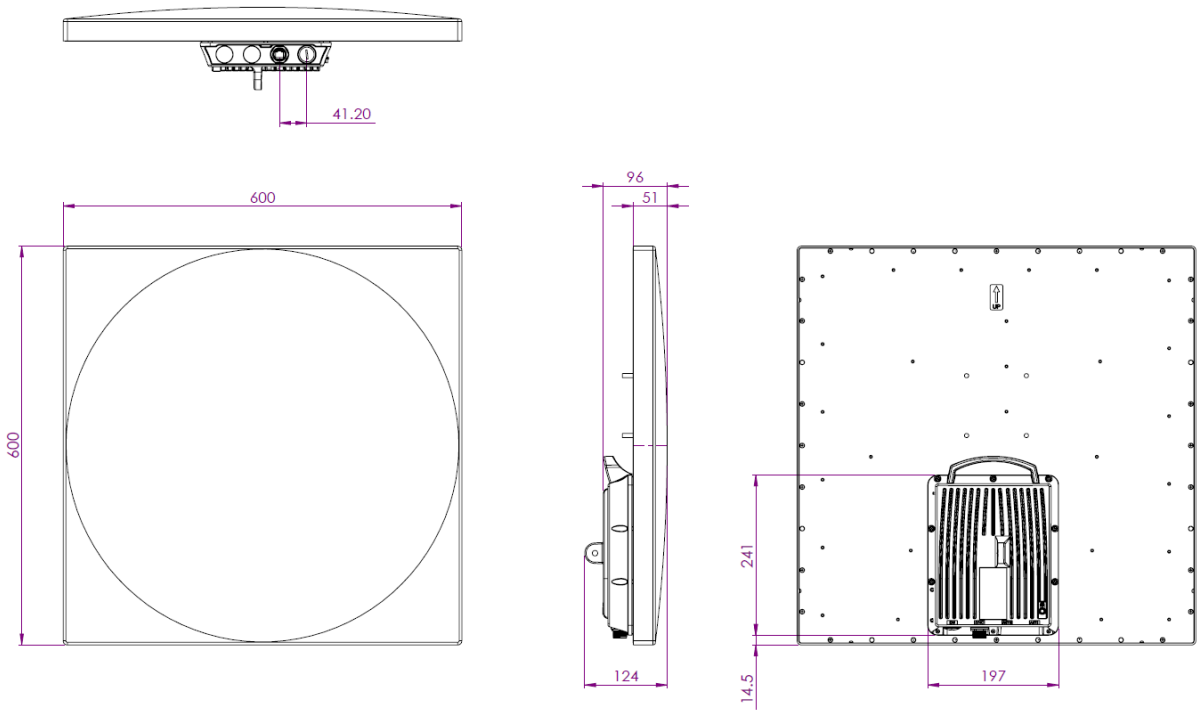


RADWIN 2000 Alpha / Alpha-PRO Integrated external dimensions

RADWIN 2000 Alpha Integrated 6.4 GHz



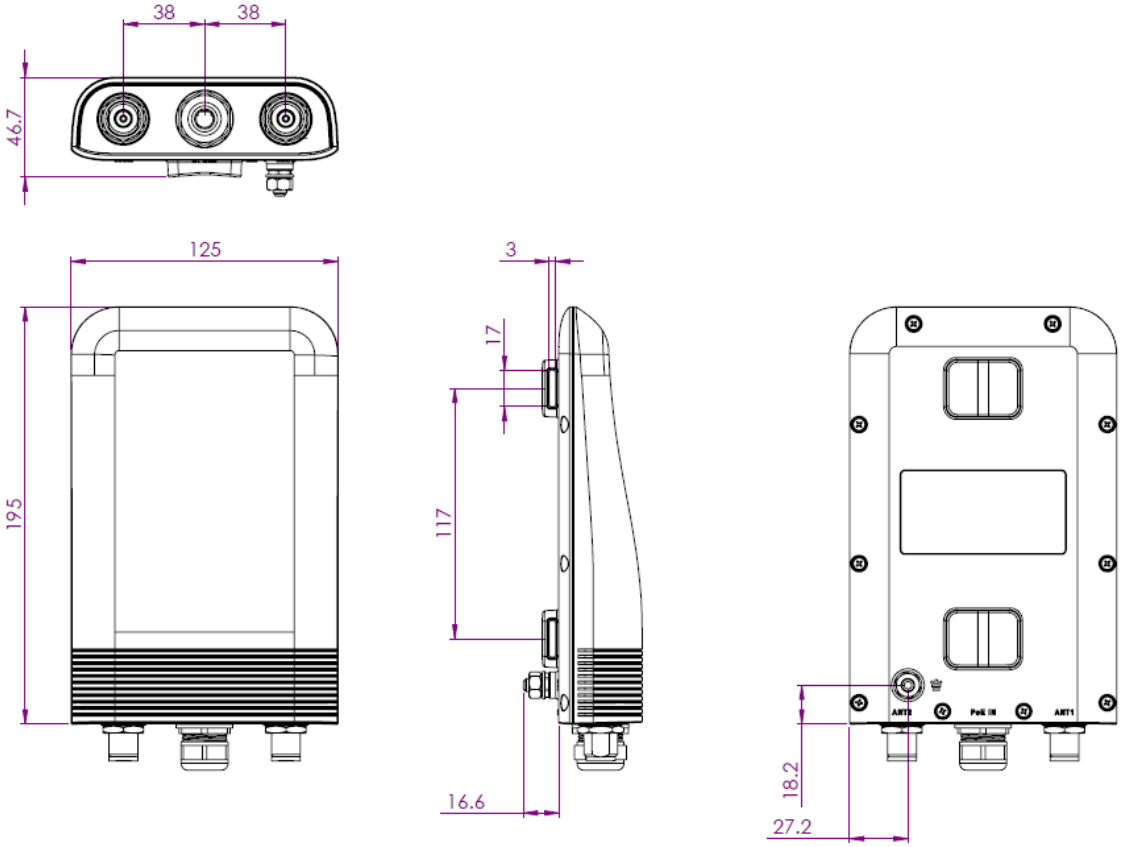
RADWIN 2000 Alpha 6.4 GHz Integrated 25dbi external dimensions



RADWIN 2000 Alpha 6.4 GHz Integrated 28dbi external dimensions

RADWIN 2000 Alpha Connectorized ODU

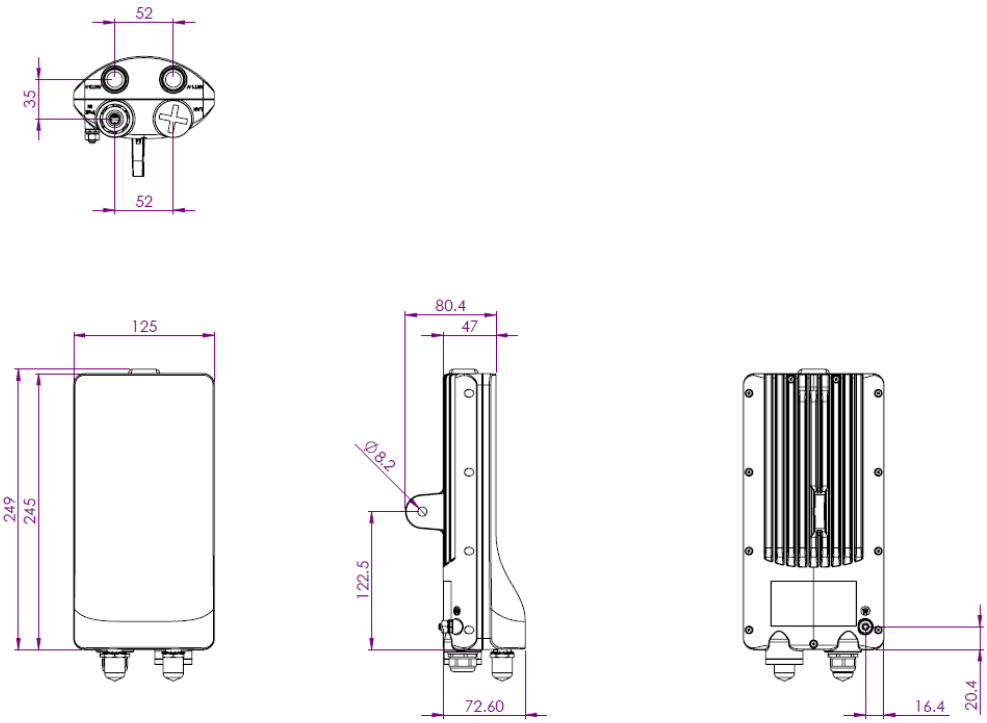
Alpha Connectorized ODU



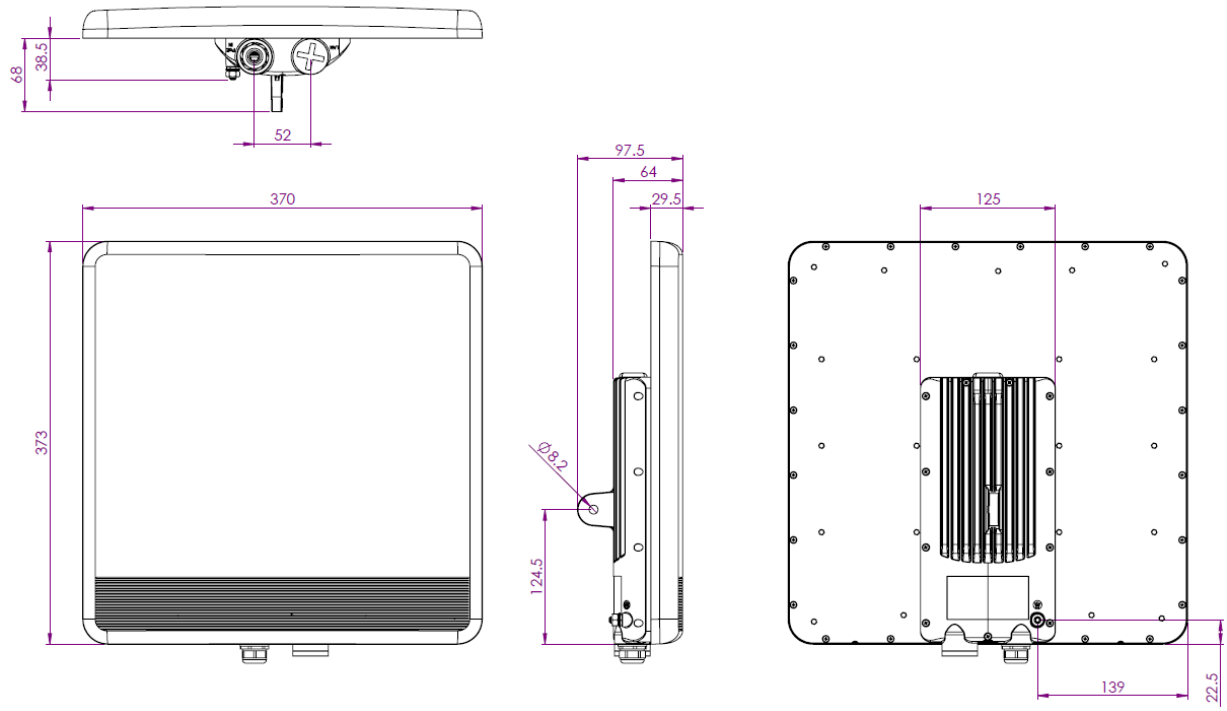
Alpha Connectorized ODU external dimensions

Except for the frequency band, the RADWIN 2000 Alpha-PRO Integrated 5.x, RADWIN 2000 Alpha Integrated 5.x, 3.x are identical from installation point of view. **We will use the term RADWIN 2000 Alpha Integrated to refer to all ODUs.**

RADWIN 2000 E Connectorized ODU



RADWIN 2000 E Integrated ODU



1.2.3 POE sources

RADWIN POE units (POE power supplies) are available for any standard type of power feed (AC or DC), for indoor or outdoor installation scenarios. See recommended POE units in the table below. RADWIN IDU series POE switches are also available.

Please refer to Appendix 5.1 for details on POE compatibility.

See available POE units and switches in WINPro catalog POE and Networking tabs.

Power feed voltage	Indoor POE units	Outdoor POE units
100-240V AC	RW-9921-400x series 	RW-9921-0080 
10-60V DC	RW-9921-2069 	RW-9921-0110 

1.2.4 POE Cable

POE feed for RADWIN ODUs must be connected using an outdoor rated CAT-5e STP cable, 24 AWG, terminated with shielded RJ-45 connectors.

RADWIN ODU-IDU cables in various lengths are available for purchase (see WINPro catalog). These cables are shipped ready for installation with an IP-67 protective gland pre-installed on one end of the cable for connection to the ODU, and with RJ-45 male shielded connectors on both ends.

The cable contains 4 twisted pairs, overall shielded with aluminium foil and jacketed with a heavy duty, black, UV resistant & flame-retardant PVC compound.

RADWIN ODU-IDU cables have the following specifications:

Parameter	Value
Cabling standards	Conforms to ANSI/TIA/EIA-568-B.2, ISO/IEC 11801, IEC 61156-5
Inner and outer jacket	Heavy-duty, UV-resistant, Flame-retardant PVC compound for outdoor use
Flame test	IEC 60332-1 & UL 1581 VW-1
UV resistance test	2016 Hr min. exposure according to ASTM G53
NEC rating	CMX UL 444 / CSA C22.2 No 214-02, UL Listed
EU RoHS	Fully conforms to Directive 2002/95/EC
China RoHS	Fully conforms to Directive SJ/T-11363-2006

1.2.5 External Antennas

Various RADWIN sector and directional antennas are available for connectorized base station and subscriber radios. All RADWIN antennas are supplied with mounting kit and 2x low attenuation 1.2 meter RF cables (LMR-400) with N-type connectors at both ends.

Please refer to WINPro catalog and datasheets for more details.

Any RADWIN radio connectorized for external antenna can be used with external antennas provided by RADWIN or 3rd party, provided the antenna meets the basic specs:

- 50 Ohm impedance
- Frequency range matching the operating frequencies
- Rated for outdoor installation
- Complies with regulation terms (please refer to Chapter 5)

1.2.6 Lightning Protector Units (LPU)

RADWIN LPU are robust outdoor units designed to be installed on a pole or on a wall at each end of the ODU-IDU cable. LPU has two ports with protective glands for CAT-5e cables and a grounding lug. Each LPU is supplied with a 0.5m CAT5e cable and a stainless-steel pole mounting band.

Parameter	Specification
Ingress protection grade	IP-67
Compatible Interfaces	10/100/1000/2500BaseT
Data Rates	Up to 2500 Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC (@ 650 mA)
Maximum Continuous current	1 A
Impedance	90 to 110 Ohm
Connection type	RJ45, CAT 5e STP (shielded)
Protected pins	All 8 pins
Response time	<5 microseconds (with ODU)
Nominal discharge currents	
Line to Line	500 A @ 8/20µs
Line to Ground	2000 A @ 8/20µs
Impulse Discharge Current	
20000 A, 8/20 µs	At least 1 operation
10000 A, 8/20 µs	10 operations
2000 A, 10/350 µs	1 operation
200 A, 10/1000 µs	> 300 operations
200 A, 10/700 µs	> 500 operations
Impulse Spark-over	
DC Spark-over ±20 % @ 100 V/s	150 V
DC Spark-over ±20 % @ 100 V/µs	350 V
DC Spark-over ±20 % @ 1000 V/µs	500 V
Capacitance	< 2 pF
DC Holdover Voltage	80 V

1.2.7 Worldwide regulation products

RADWIN 2000 Alpha PRO and 2000E have a world-wide single part number.

These products include a built-in GPS/GNSS receiver. The ODUs identify their location from GNSS, and determine the country in which they are located and the regulation that applies in that country. Subsequently, a single PN is available for each HW version of the radio, without needing to create multiple PNs (dedicated PN for each regulation). The same radio device can be transferred from one regulation zone to another.

In cases where the operator is permitted by his local regulatory authority to operate in additional bands not specified by the regulation in his country, a licensing mechanism is available to enable opening additional bands for use in the radio device.

In cases where the installation / setup process is performed without GNSS reception, the installer is allowed to manually select the country in which the radio is located. When GNSS fix is obtained by the ODU, the ODU will automatically set the country and regulation to the one detected by GNSS. If the installer manually selected a regulation band that is not supported in the current country, the link will stop, and the installer will have to select an allowed band.

1.2.8 Management Tools

Built-in Web UI enables ODU and/or link management functions using a browser, including:

- View and configure ODU parameters
- View and configure link parameters
- Inspect inventory, events and monitoring data
- Perform maintenance tasks such as software upgrade, back up, and restore

Please refer to the relevant Configuration Guide for details on Web UI

1.3 Notification Notations

Notifications consist of Notes, Cautions, and Warnings:

The purpose of a Note is to:

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

Caution: Risk of damage to equipment or of service degradation.

Warning: Risk of danger to persons operating near the equipment.

2. Safety Practices and Provisions

This section describes various safety practices as follows:

- General
- Grounding
- Protection against Lightning
- Preventing Overexposure to RF Energy
- Internal ESD Protection Circuits
- High Voltage

2.1 General

- It is recommended that the installation of ODUs 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 an ODU upside down or horizontally. Doing so may void your product warranty.

2.2 Grounding

All RADWIN products should be grounded during operation. For more information, see Protecting ODUs through Grounding and Lightning Protection Units.

2.3 Protection against Lightning

The use of lightning protection is dependent on regulatory and end-user requirements. For more information, see Protecting ODUs through Grounding and Lightning Protection Units.

2.4 Preventing Overexposure to RF Energy

To protect against overexposure to RF energy, install the ODUs so all persons can maintain safe distances from radio sources.
When the system is operational, avoid standing directly in front of the antenna. Strong RF fields are present when the transmitter is on. The ODU must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

2.5 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 ODU/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 UL60950 Table 2H (for mains <= 150V, the transient rating is 1500V; for 150V < mains <= 300V, the transient rating is 2500V; and for 300V < mains <= 600V, the transient rating is 4000V).

2.6 High Voltage

When working with Connectorized ODUs:
Possibility of hazardous voltage 56VDC appearance exists on accessible antenna connections. Use Personal Protection Equipment (e.g. insulating gloves) when working with the ODU or the antenna. Connect the shield of the antenna coaxial cable to the protective earth when coaxial cable is used.

3. Installation Steps

The overall installation procedure is as follows:

1. Install and activate the Hub ODU.
2. Point the Hub ODU in the direction of the Client ODU site.
3. Install the Client ODU.
4. Align the Client ODU based on RSS reading.
5. (Recommended): Finalize the alignment of the Hub ODU based on RSS reading.

3.1 Checking Items to be Installed

- Radio ODU for each side of the link (supplied with mounting kit and IP67 glands)
- 1x / 2x LPUs for each ODU (recommended)
- PoE power supply units
    - Alpha PRO is supplied with AC POE unit and power cable
    - Alpha and 2000E are not supplied with POE units
    - When using RADWIN POE switches (IDU-SI / IDU-S), POE units are not required
- Outdoor CAT-5e cables
- Grounding cables (14 AWG) for ODU, LPUs and outdoor PoEs (if used)
- External antenna (if used)
- RF cables (supplied with RADWIN antennas)

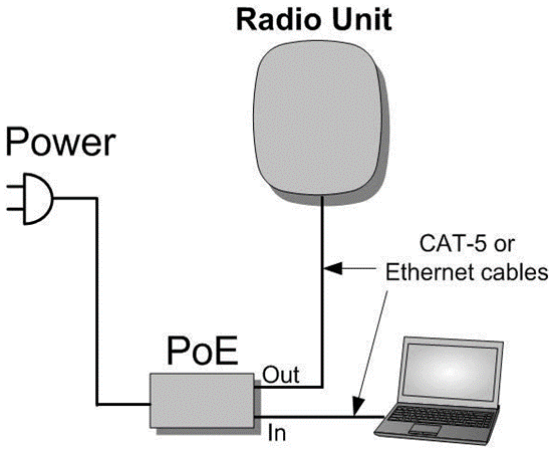
3.2 Required Tools

- Crimping tool (in case CAT-5e outdoor cables will be terminated on-site)
- Spanner/wrench 13mm (1/2")
- Cable ties
- Sealing material
- Waterproofing tape (Scotch 23 or equivalent)

3.3 Connecting POE and network to an ODU

Make sure you are using the appropriate PoE for your specific ODU.

1. Connect the PoE to a power source.
2. Connect an ethernet cable between the laptop ethernet port and the PoE IN or LAN socket.
3. Connect the PoE OUT or PoE socket to the appropriate ODU socket.

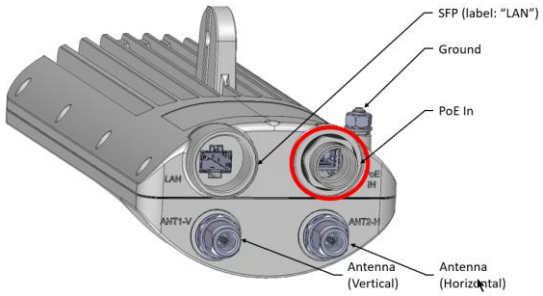


Connecting the laptop to an ODU

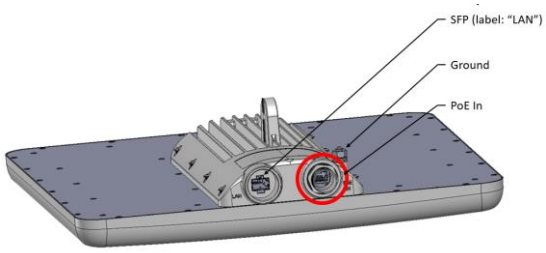
POE port location on different ODU models is shown in the following pages.

3.3.1 RADWIN 2000 E

Connect to the ODU **PoE IN** socket.



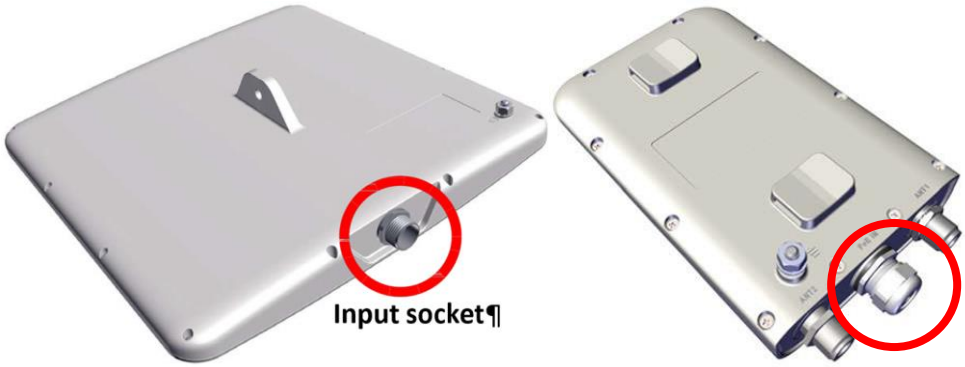
2000E EXT ODU - POE IN socket



2000E INT ODU - POE IN socket

3.3.2 RADWIN 2000 Alpha INT and EXT

Connect to the POE IN port



RADWIN 2000 Alpha INT and EXT ODU: POE port

3.3.3 RADWIN 2000 Alpha 6.4 Ghz

Connect to the SYNC socket.

3.4 Accessing Web UI

To connect to any ODU via POE port using a PC/laptop:

1. Configure a static IP address for the Ethernet NIC
2. Set IP address to 10.0.0.1 (or any other address in 10.0.0.X other than 10.0.0.120)
3. Set Subnet mask to 255.255.255.0, default Gateway not required
4. In your browser enter the ODU's IP address (default value: **10.0.0.120**)

To connect via Wi-Fi (not supported by 2000E):

1. Scan for Wi-Fi networks on a laptop or a mobile device
    - Connect to a network with an SSID of **R-[serial number of the unit]**
    - Enter default WPA2 password **wireless**
2. Once connected, your device will get a DHCP address in the 192.168.1.x/24 subnet.
3. In your browser enter the ODU's Wi-Fi IP address (default value: **192.168.1.1**)

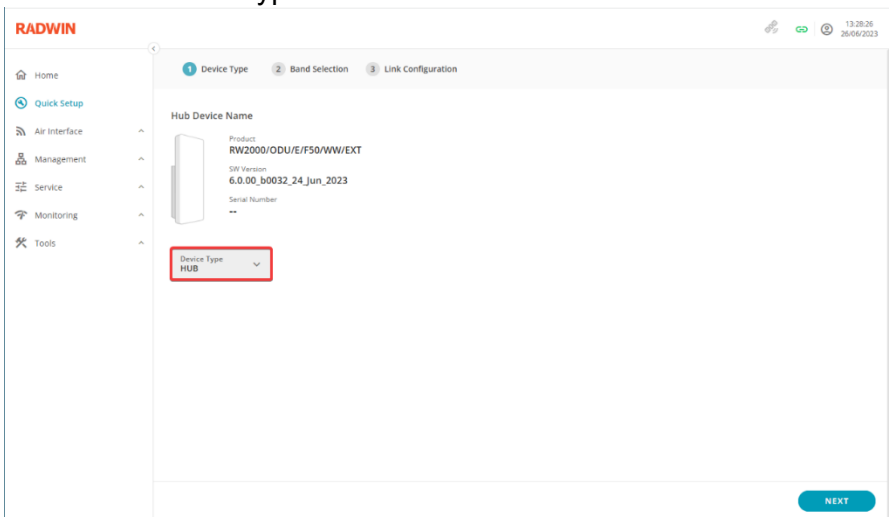
Enter login credentials (by default: username = **admin,** password = **netwireless)**

3.5 Updating ODU settings

Follow the basic steps below to perform the initial configuration of ODUs.
Please refer to Configuration Guide for more details.

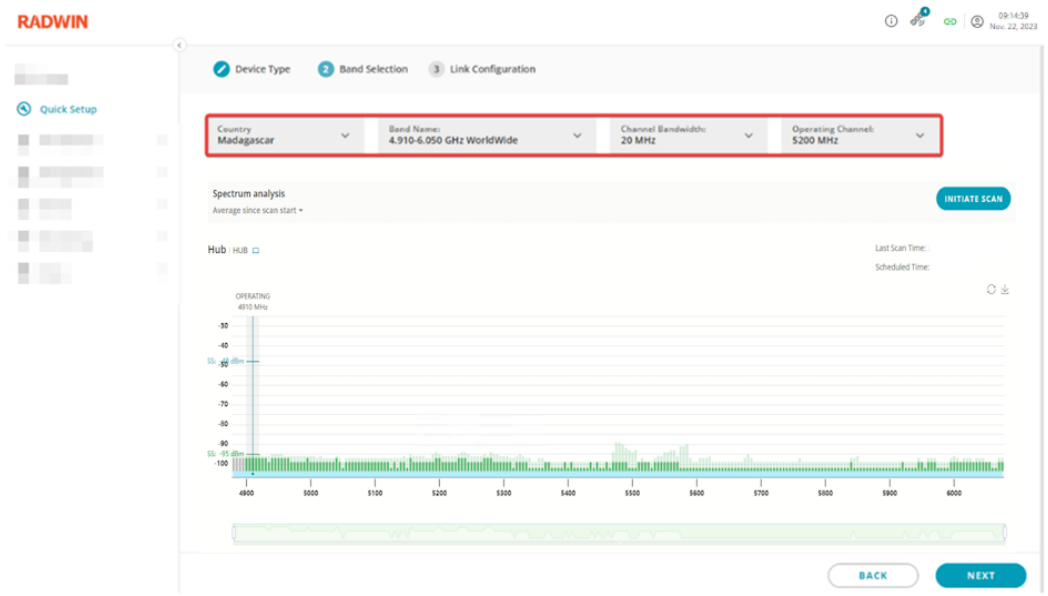
3.5.1 RADWIN 2000 E

- **Quick Setup** wizard starts automatically in case ODU is in factory default settings
- Select the Device Type as Hub or Client and click **NEXT**.



When changing device type, the ODU will perform a reboot

- For Hub only, select the operating band, channel bandwidth and operating channel:



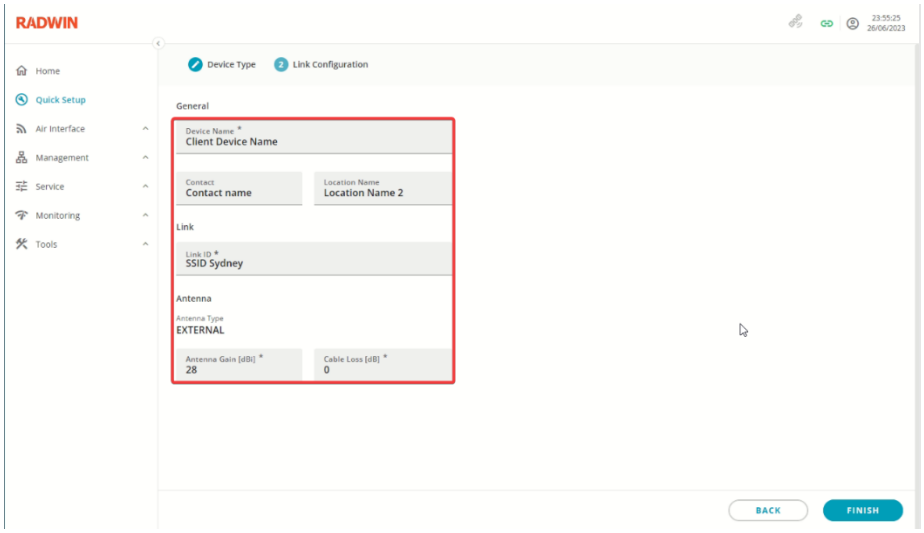
- During the first boot of the device, a spectrum scan analysis is done for 5 seconds to provide the initial information regarding the spectrum environment and assist with channel selection. We advise you to run a spectrum scan for several minutes to get a more accurate spectrum assessment. For more information, please refer to the Configuration Manual.

- If the ODU has a GNSS/GPS fix, the country is automatically selected by the system.
- If the ODU doesn't have a GNSS/GPS fix, manually select the actual country in which the ODU is installed.

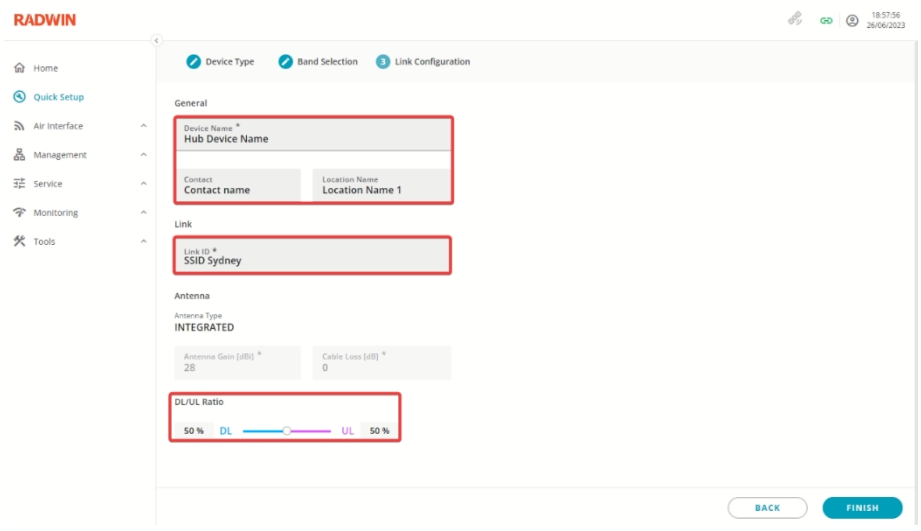
> Selection of a different country will result in the link being stopped if the ODU gets a GPS fix and the configured band is not permitted according to the regulation in the detected country.

- Complete the Link Configuration:

For Client:



For Hub:



- Update network settings for both units (mandatory for Hub unit) via **Management -> Network** menu

3.5.2 RADWIN 2000 Alpha

- Select the local ODU
- For the ODU which will act as a Hub unit:

- Select **Operations -> Change Mode** to change mode to Hub and reboot
- Select **Configure -> Air Interface -> Change band** to adjust the operating band as needed
- Click **Activate** and complete the activation wizard configuring key device and radio parameters

- Update network settings for both units (mandatory for Hub unit):
  - Select **Configure -> Management -> Network** to update IP address settings and optionally Management VLAN
  - Connect the ODU to target network configured according to the new settings
  - Ping radio unit using the new IP address to verify update

3.6 Mounting RADWIN 2000 Alpha INT, RADWIN 2000 E and accessories

Standard mounting kit is supplied with:

- RADWIN 2000 Alpha/Alpha-PRO INT ODUs
- RADWIN 2000 Alpha 6.4 Ghz 25dbi ODUs
- RADWIN 2000 E ODUs
- Outdoor PoE

3.6.1 Installing the Standard Mounting Kit on a Vertical Pole

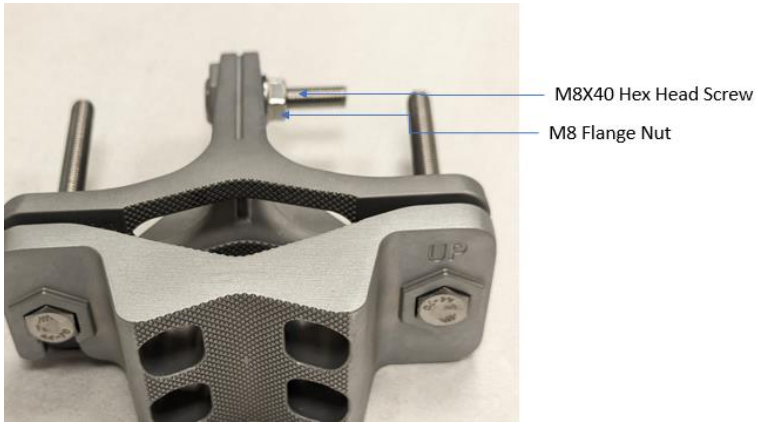
The mounting kit can be used on a thin, medium, or thick pole according to the following diameters:

Pole Type	Diameter
Thin Pole	¾ -1½”
Medium Pole	2 - 3”
Thick Pole	> 3”

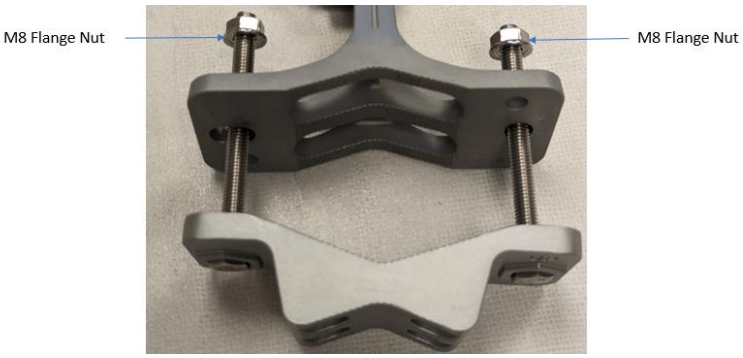
Thin Vertical Pole (¾” -1½”) and Medium Vertical Pole (2 - 3”)

1. Remove the mounting kit from the ODU packaging box.

2. Remove the M8X40 Hex Head Screw and the M8 Flange Nut from the mounting kit.



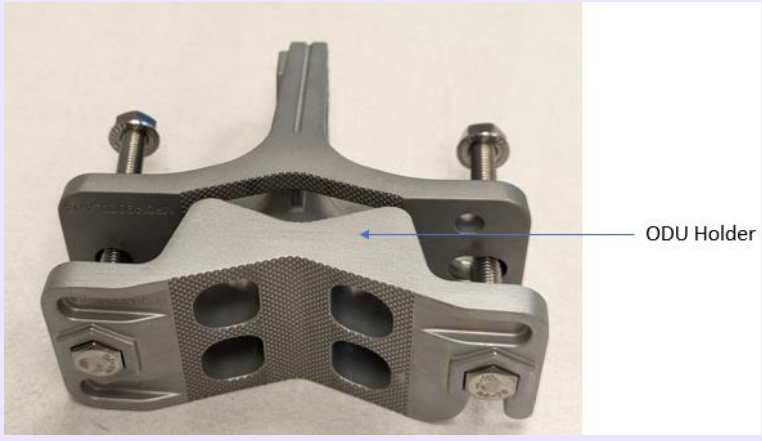
3. Loosen both M8X90 Hex Head Screws by rotating both M8 Flange Nuts until the end of the Hex Head Screw.



Note:
The mounting kit is preassembled for mounting on a 2-3" medium size pole.

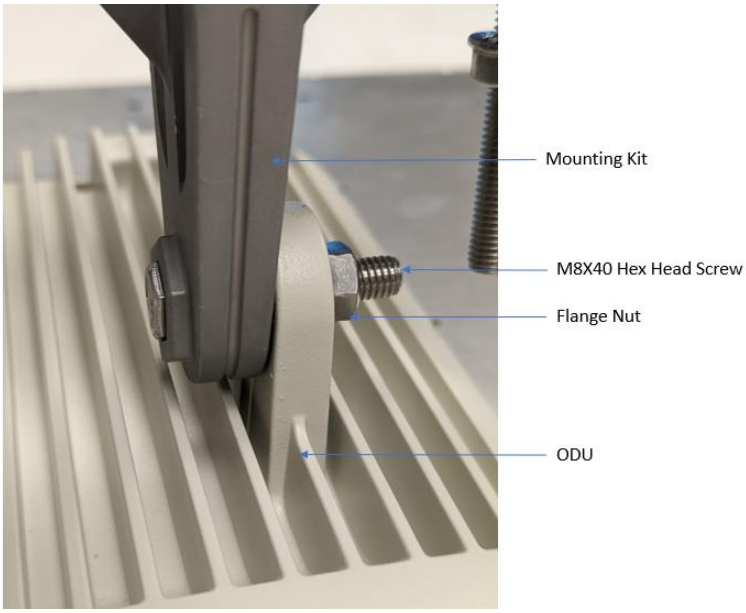
If you are mounting the ODU on a small sized ¾ -1½" pole, perform the following:

1. Remove the Pole Clamp by dissembling both M8 Flange Nuts and both M8X90 Head Hex Screws.
2. Reverse the Pole Clamp and reattach it to the ODU holder by reassembling both M8X90 Head Hex Screws and both M8 Flange Nuts.



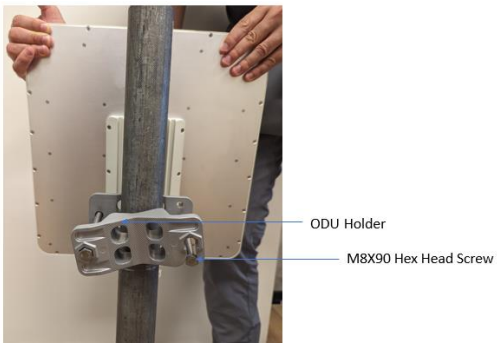
4. Mount the mounting kit on the ODU by inserting the M8X40 Hex Head Screw in the hole of the ODU.

5. Tighten the M8 Flange Nut with a torque of 15 Nm until the mounting kit is firmly on the ODU.

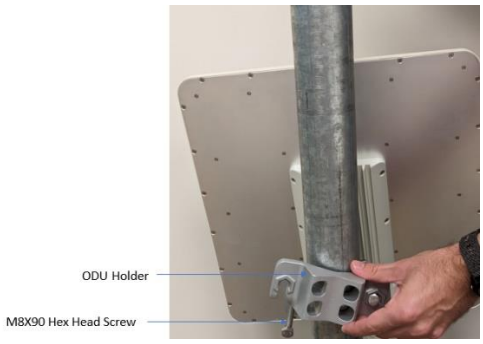


6. Open the Pole Clamp allowing the ODU Holder to attach onto the pole, then close the Pole Clamp on the M8X90 Hex Head Screw.

Thin Vertical Pole ¾” -1½”



Medium Vertical Pole 2 - 3”



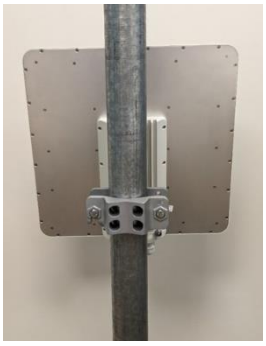
Note:

Align the antenna before tightening the pole bracket bolts, as described in chapter 4.

7. Tighten both M8 Flange Nuts with a torque of 15 Nm until firmly secure on the pole.

Thin Vertical Pole ¾” -1½”

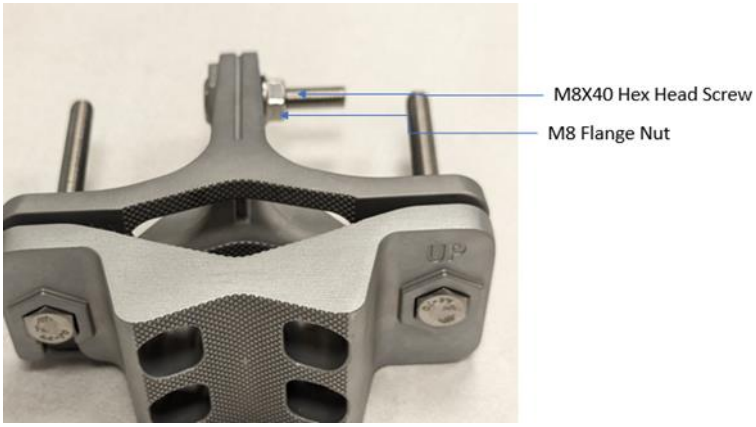
Medium Vertical Pole 2 - 3”



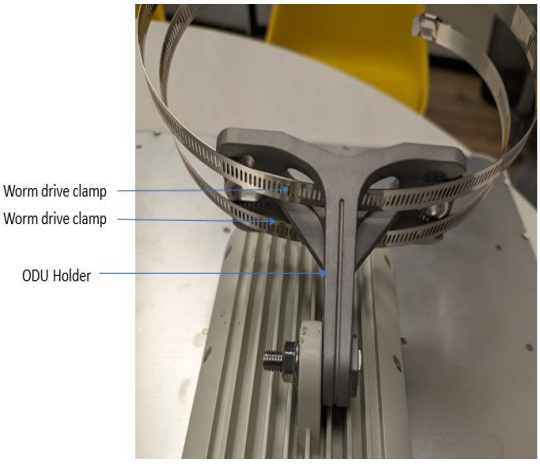
Thick Vertical Pole > 3”

1. Remove the mounting kit from the ODU packaging box.

2. Remove the M8X40 Hex Head Screw and the M8 Flange Nut from the mounting kit.



3. Remove the Pole Clamp and thread the two metal worm drive clamps into the holes of the ODU Holder.

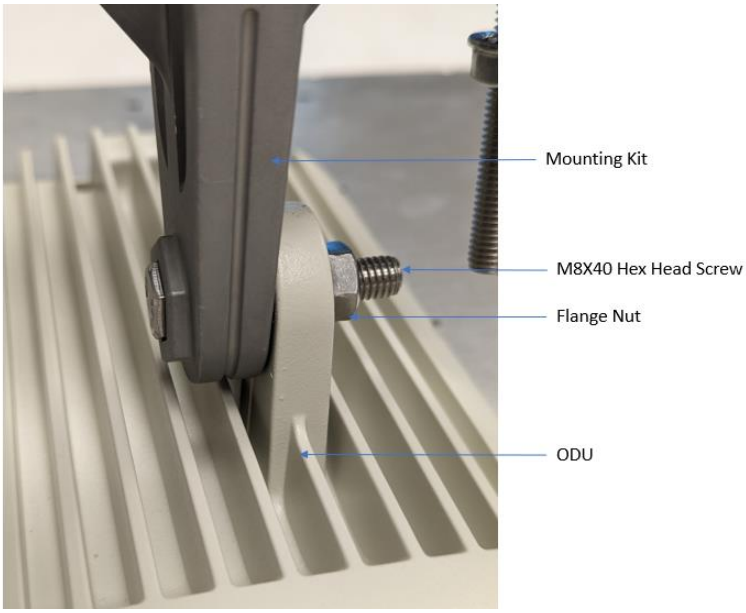


4. Mount the mounting kit on the ODU by inserting the M8X40 Hex Head Screw in the hole of the ODU.

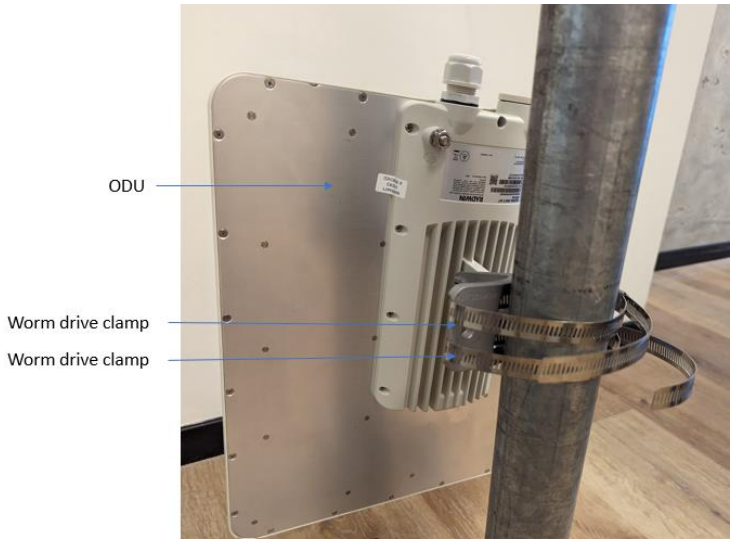
Note:

Align the antenna before tightening the pole bracket bolts, as described in chapter 4.

5. Tighten the M8 Flange Nut with a torque of 15 Nm until the mounting kit is firmly on the ODU.

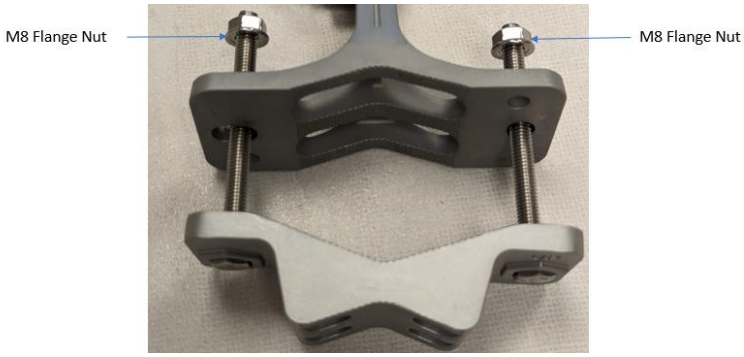


6. Tighten both worm drive clamps using a screwdriver until the ODU is secure on the pole.

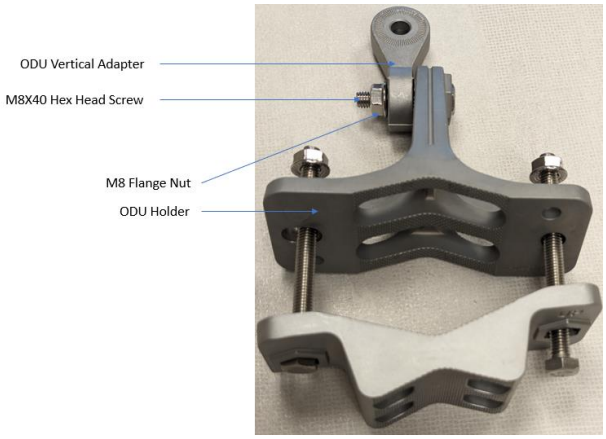


3.6.2 Installing the Standard Mounting Kit on a Horizontal Pole

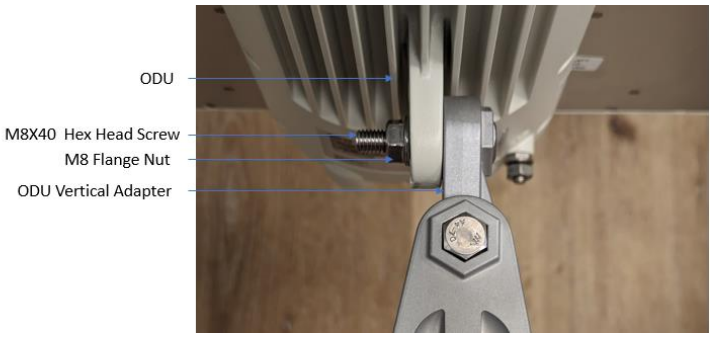
1. Loosen both M8X90 Hex Head Screws by rotating both M8 Flange Nuts until the end of the Hex Head Screw.



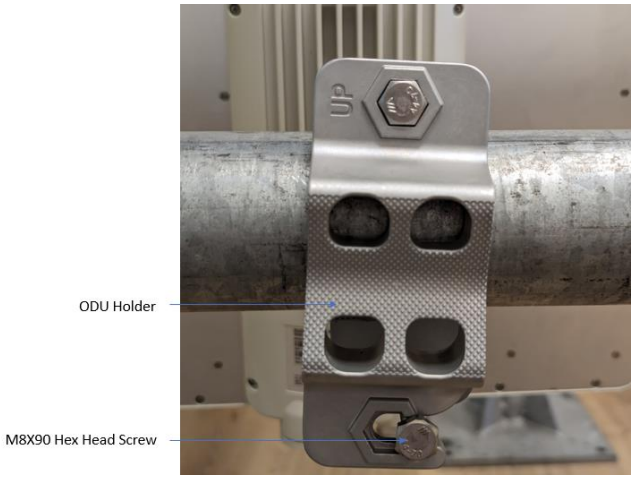
2. Remove the M8 Flange Nut from the M8X40 Hex Head Screw.
3. Place the ODU Vertical Adapter on the M8X40 Hex Head Screw.
4. Tighten the M8 Flange Nut with a torque of 15 Nm until the mounting kit is firmly on the ODU.



5. Insert the ODU Vertical Adapter into the ODU hole. Tighten the M8 Flange Nut with a torque of 15 Nm until the mounting kit is firmly on the ODU.



6. Open the Pole Clamp and attach the ODU Holder to the pole, then close the Pole Clamp on the M8X90 Hex Head Screw.

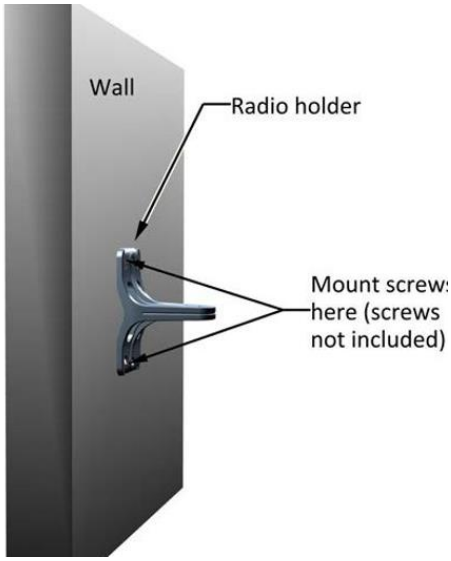


7. Tighten both M8 Flange Nuts with a torque of 15 Nm until firmly secured on the pole.

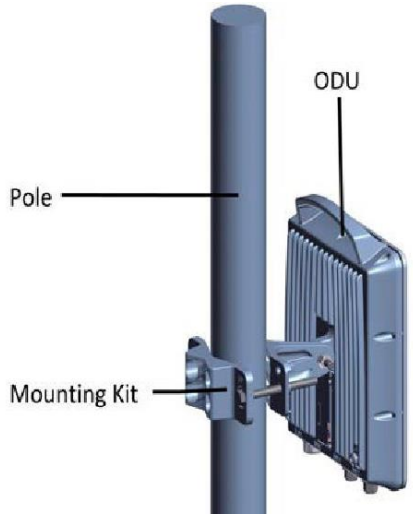
3.6.3 Installing the Standard Mounting Kit on a Wall

1. Remove the mounting kit from the ODU packaging box.

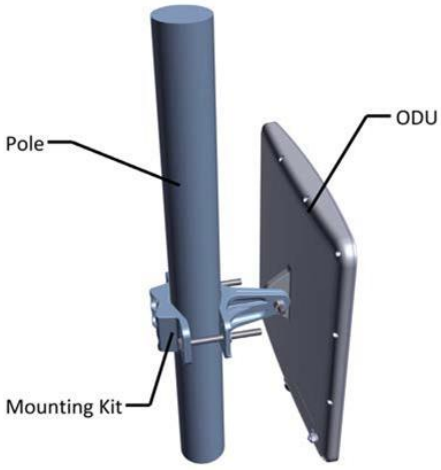
2. Dissemble all parts from the ODU Holder.
3. Install the mounting kit on a wall using two mounting screws (not included) appropriate for the type of wall. Make sure to use the indicated holes.



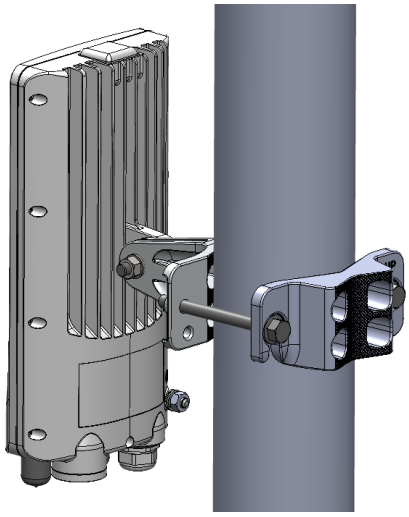
3.6.4 Mounting ODUs on a Standard Mounting Kit



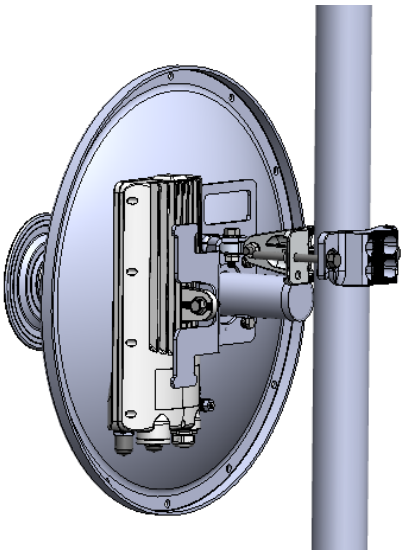
RADWIN 2000 Alpha 6.4 GHz 25dbi ODU



RADWIN 2000 Alpha INT ODU



RADWIN 2000E EXT ODU



RADWIN 2000E EXT ODU installed on 25dbi dish antenna

Outdoor PoE

3.7 Mounting RADWIN 2000 Alpha EXT

The Alpha/Alpha-PRO Connectorized ODU is mounted on a pole using worm-drive clamps.

1. Place the ODU on a pole.

2. Fasten the ODU to the pole using the worm-drive clamps.

3.8 Protecting ODUs through Grounding and Lightning Protection Units

3.8.1 Before You Start

Before installing any RADWIN equipment, make sure you have the results of the site survey you conducted. For guidelines on how to conduct a site survey, see the RADWIN 5000 Site Survey application note.

Examples of grounding and lightning protection regulations are:

- USA, ANSI/NFPA No.70-1984 (USA), Section 810 of the National Electric Code.
- Canada, Section 54 of the Canadian Electrical Code.
- Europe IEC/EN 62305 and IEC61024-1 for electrical and structural protection against lightning.

The above regulations are only examples. It is the responsibility of the customer to ensure that the most up to date and proper regulations are followed.

Grounding Survey

Once you have completed the Site Survey, perform a Grounding Survey as follows:

1. Check all mounting structures and surfaces to be used for equipment installation for protection against lightning.
2. Check the grounding of all mounting structures and surfaces.
3. Check the distance between the lightning collectors and the location of the ODUs.
4. Record the above information.
5. Continue with the Grounding Survey and identify:
    a. The best location to install the ODU. Avoid long ground wires to the pole (ground bonding).
    b. The best method for securing the ground wire to the ground bonding (minimum impedance).
    c. The best location to install the ODU so it is not the highest metal object on the site.
    d. Identify a location close to the ODU for the safe installation of an LPU.
6. Continue only after you verified that all equipment, mounting structures, and surfaces are protected according to local and national regulations.

Air-Termination System

To determine where to install equipment, and what, if any, extra equipment is needed to protect the ODUs from lightning, you must design an "air-termination system". Typically, an air-termination system can be designed using one of the following methods:

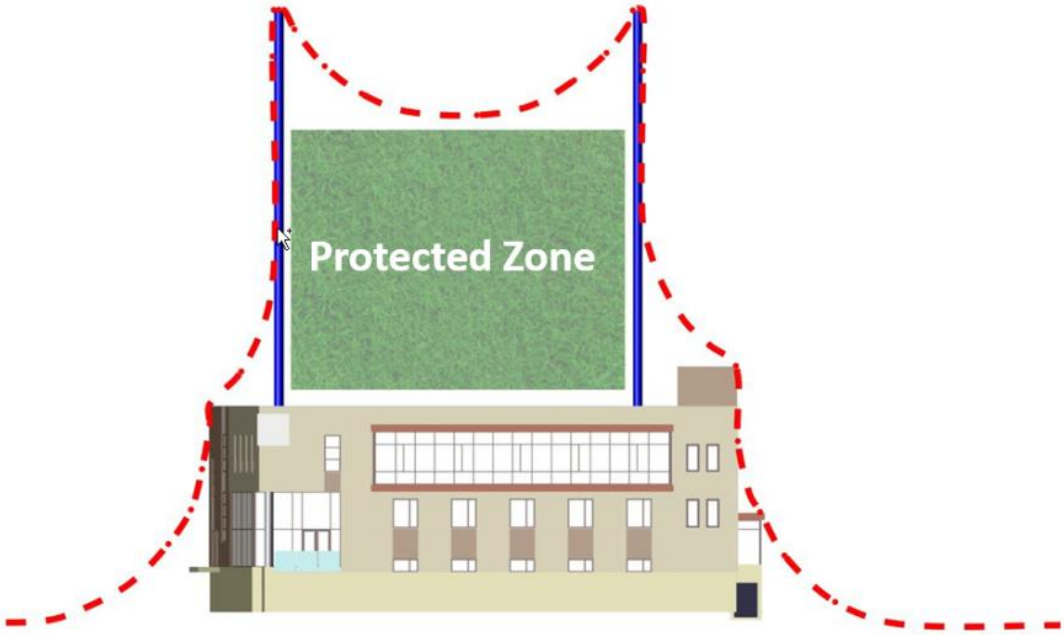
- Rolling sphere

- Mesh
- Protective angle

The rolling sphere method is recommended for geometrically complicated installations. For a more detailed discussion of these methods, refer to the Lightning Protection Guide by Dehn International
(www.dehn-international.com).
An example of designing an air-termination system:

1. Take a composite 3D diagram (or use an actual model) of the installation neighborhood. Example:

2. In the above example, a vulnerable zone exists immediately above the building. Equipment in this area is vulnerable to lightning strikes:



3. To remedy this, you can install two towers and ground them so they function as lightning rods.

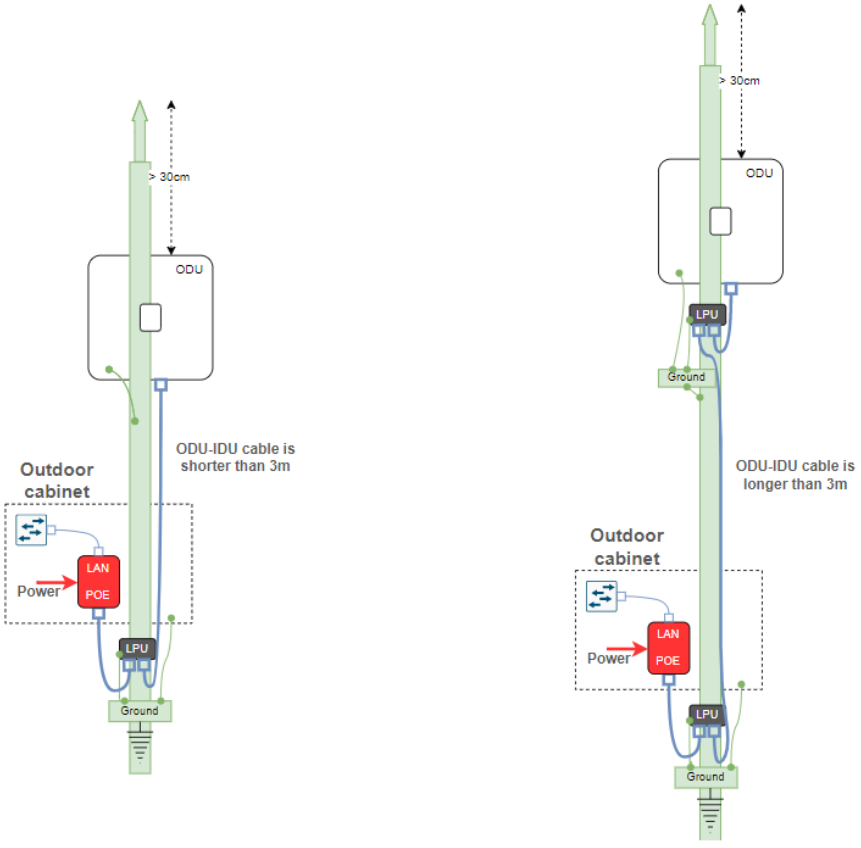
4. The previous vulnerable zone has now been eliminated. Equipment in this zone is now better protected against lightning strikes.

- Equipment in this zone are still not immune from the effects of EMD, but they are significantly reduced.
- Further details relating to rolling sphere and risk assessment can be found in IEC/EN62305 and IEC 61024-1.

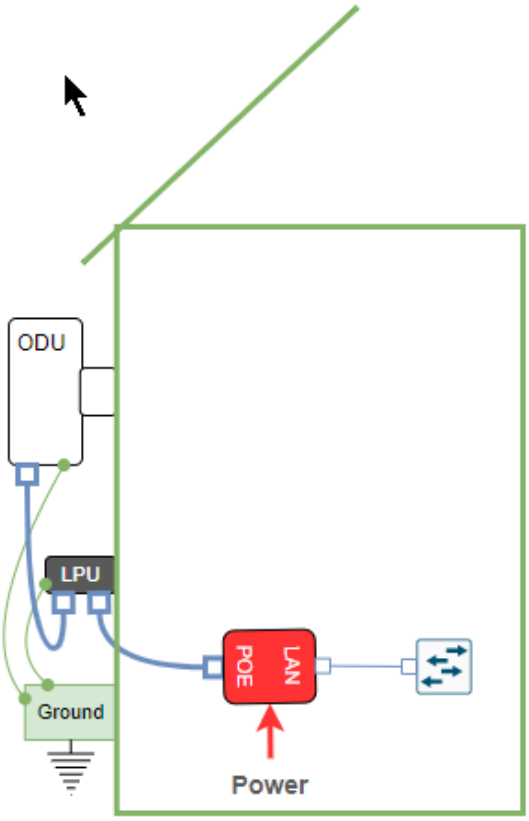
General Grounding Instructions

Before mounting any equipment, ensure that any existing ground connection is properly connected and that the resistance between the grounding location on the tower or building and the ground is as close to 0 Ω impedance as possible, and less than 5 Ω.
If a new grounding connection is to be installed, it must also be verified prior to equipment installation. An example of grounding connections and shielding appears in the following figures.

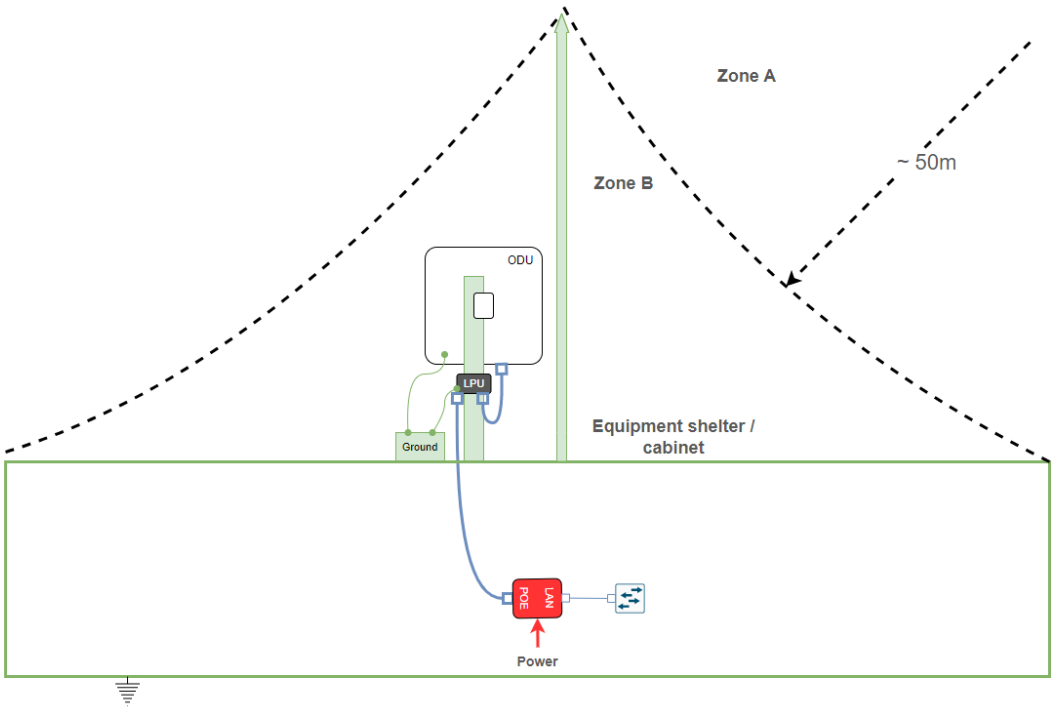
The following figures are examples. Your installation will have its own specific configuration.



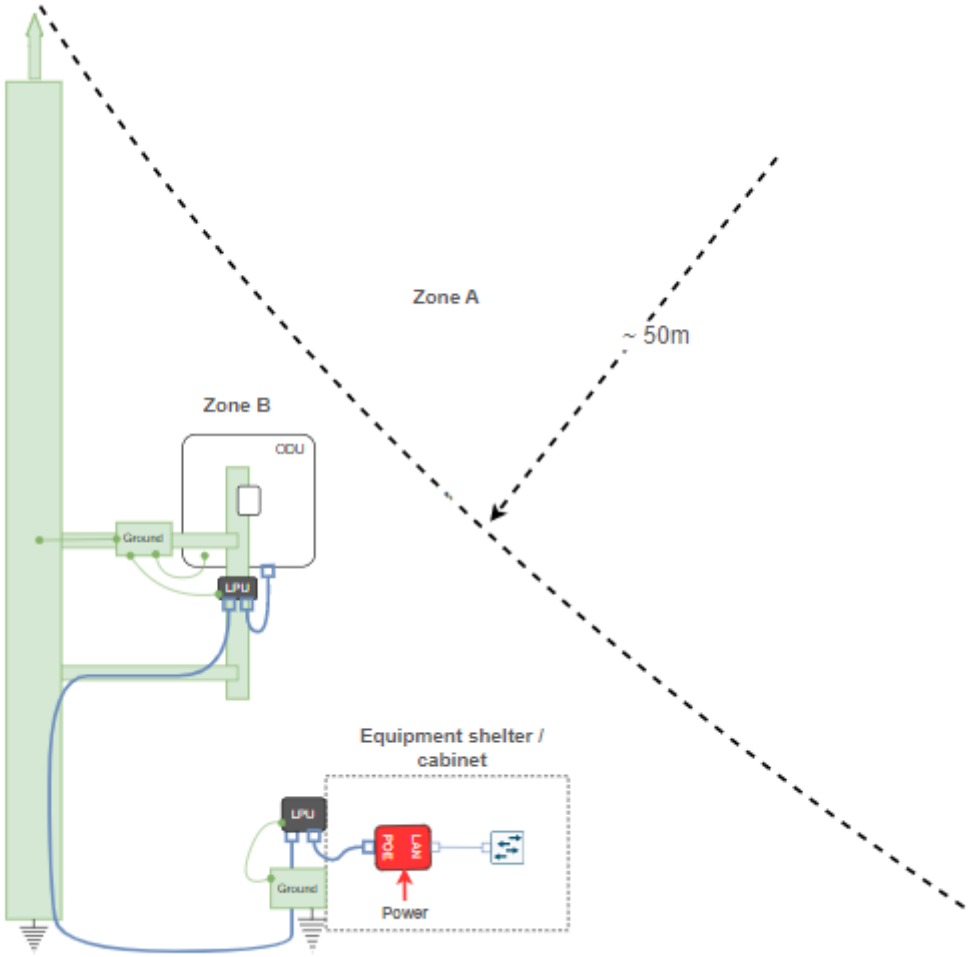
Grounding for Pole-Mounted ODUs



Grounding for Wall-Mounted ODUs



Grounding for Rooftop-Mounted ODUs



Grounding for Tower-Mounted ODUs

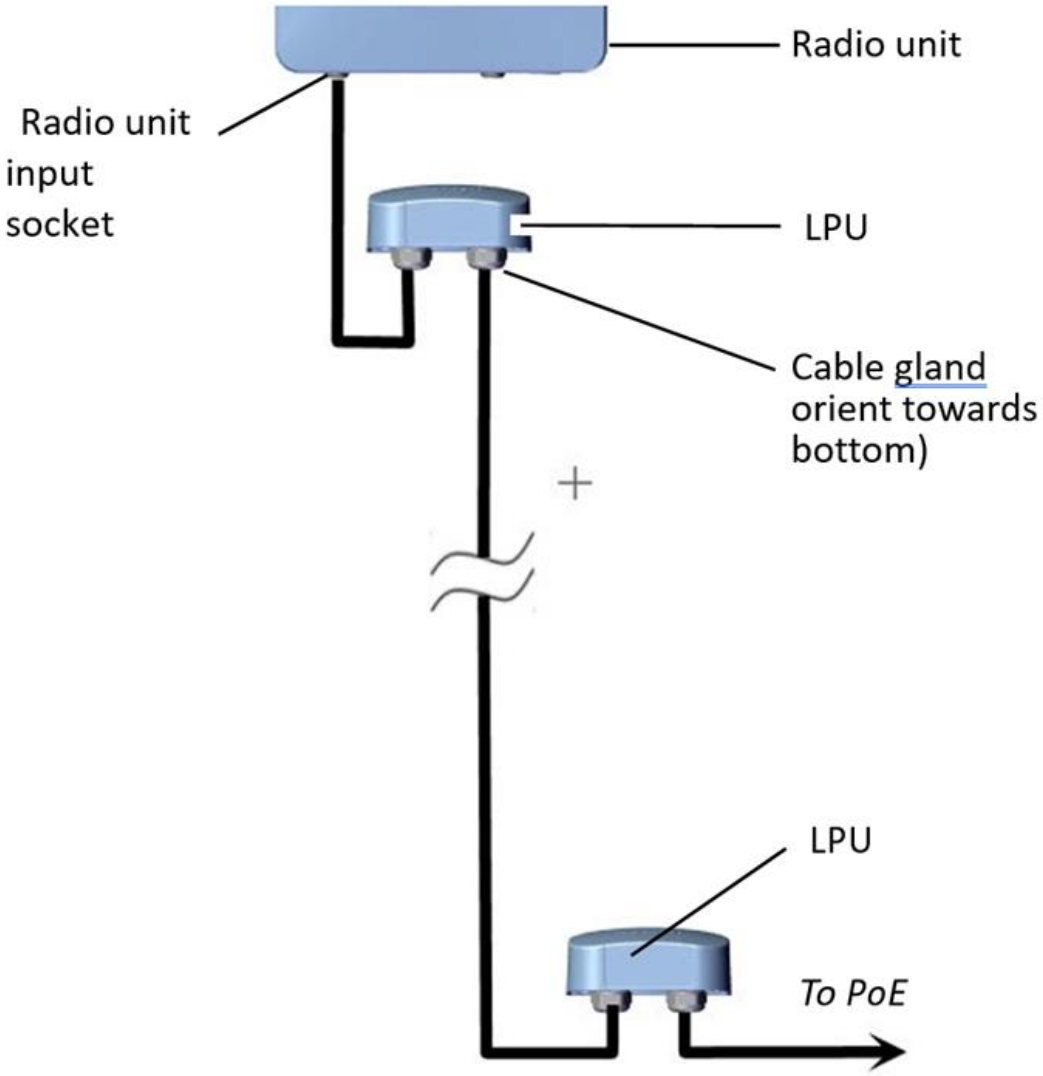
All equipment, antenna and external power sources must be connected to an appropriate, regulatory-approved surge suppressor.

- The installer is responsible for verifying that the wiring AWG is rated at a suitable amperage level for the equipment. Otherwise, the suppressor or the equipment may be damaged by a lightning strike.
- Any connections made to pole-side cabinets must be verified to ensure that the grounding for the ODUs also meets the requirements and local electrical earthing regulations.
- RADWIN does not provide a warranty for equipment damaged by electromagnetic discharge (EMD). If the guidelines provided here and local relevant regulations are followed, the chances of damage from lightning (EMD) can be drastically reduced.

Lightning Protection Units (LPUs)

The design of all installations must include the appropriate addition of both ground bonding and surge/LPUs to better protect equipment and reduce network outages.

RADWIN recommends using two LPUs for each ODU installation: one near the ODU and one near the PoE.



3.8.2 Grounding the ODUs

Alpha 6.4 ODUs

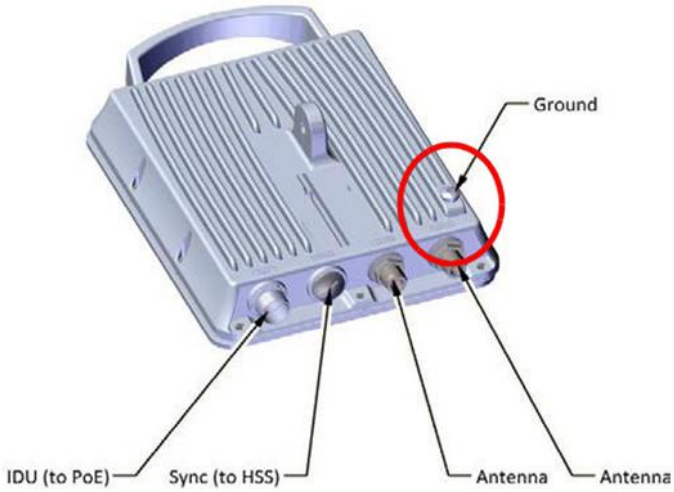


Figure 1 Ground: Alpha 6.4 ODU

RADWIN 2000 Alpha/Alpha-PRO INT ODUs

Figure 2 Ground: RADWIN 2000 Alpha/Alpha-PRO INT ODU

Alpha/Alpha-PRO Connectorized ODUs

Figure 3 Ground: Alpha/Alpha-PRO Connectorized ODU

RADWIN 2000 E ODUs

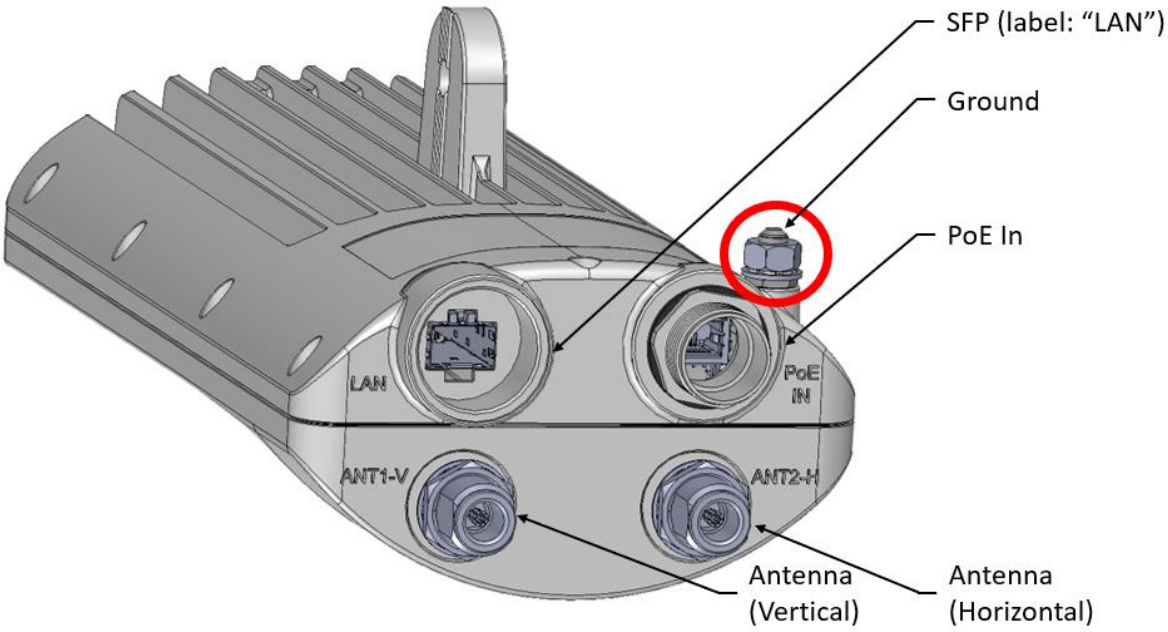


Figure 4 Ground: RADWIN 2000 E External ODU

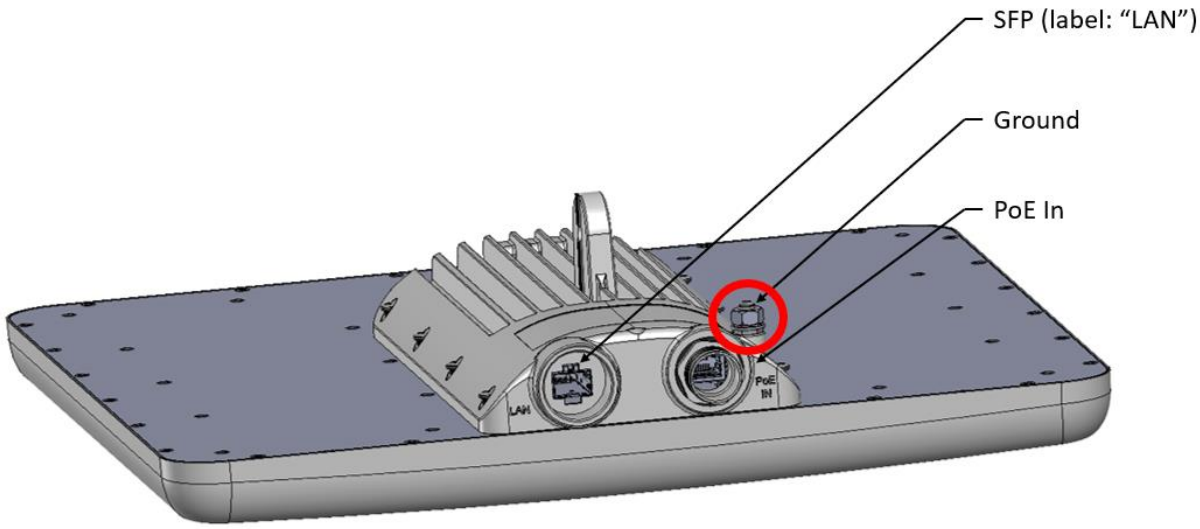
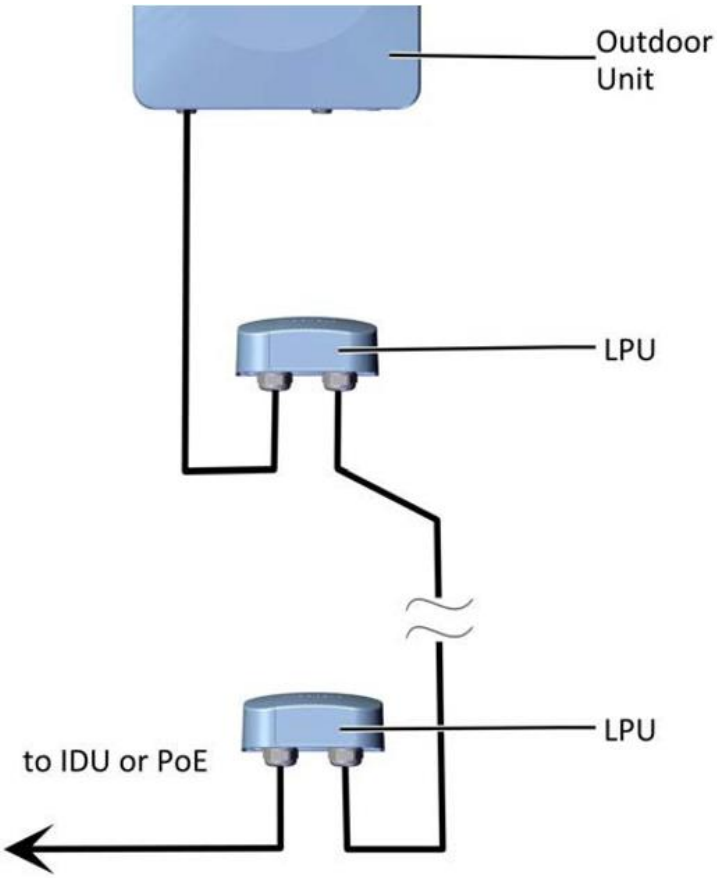


Figure 5 Ground: RADWIN 2000 E Integrated ODU

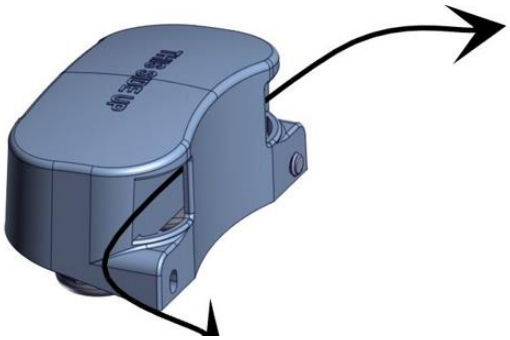
3.8.3 Mounting and Connecting the LPUs

- Make sure the LPU is oriented with the cable glands oriented towards the bottom
- Mount one LPU near the ODU, and the second near the PoE

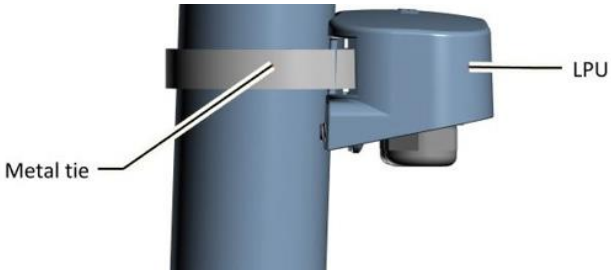


Mount the LPUs as follows:

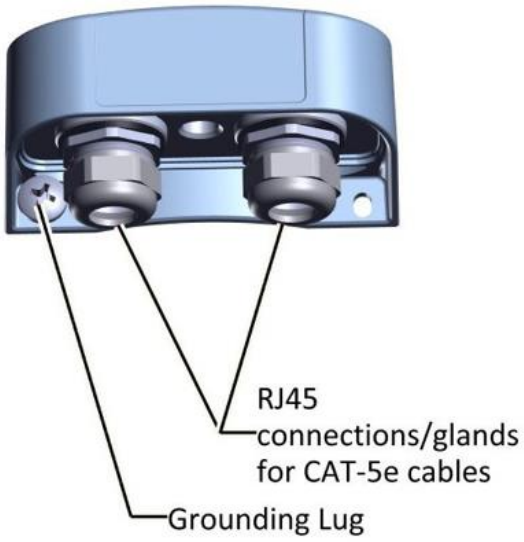
1. Insert the metal band through the slots on the LPU.



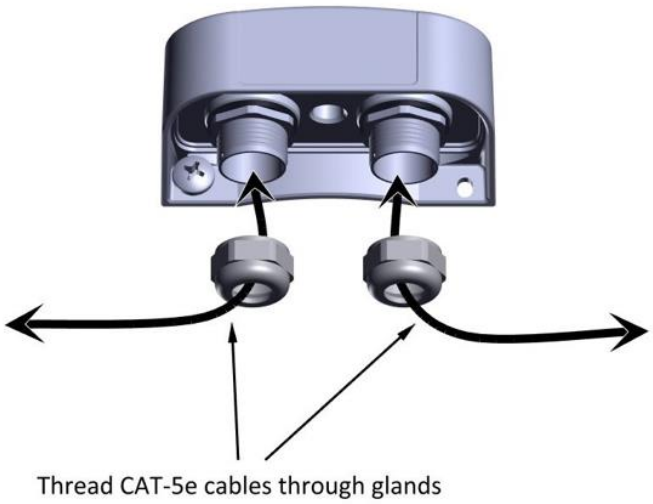
2. Tighten the metal band:



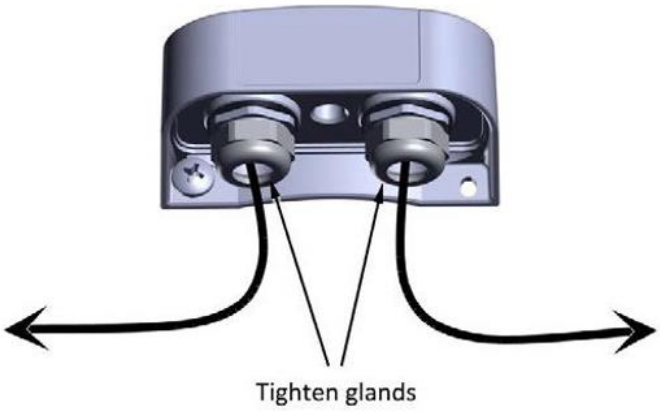
3. Connect the grounding lug to ground cable.



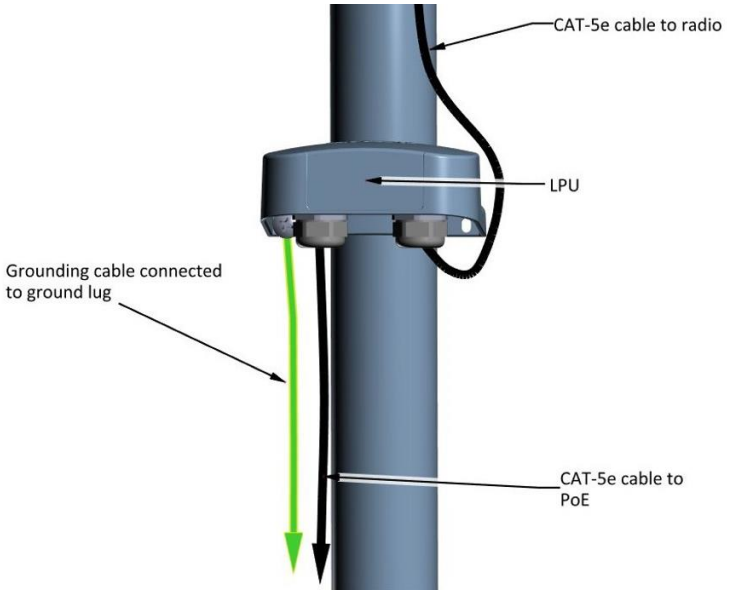
4. Remove the cable glands, and thread the CAT-5e cables through them.



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



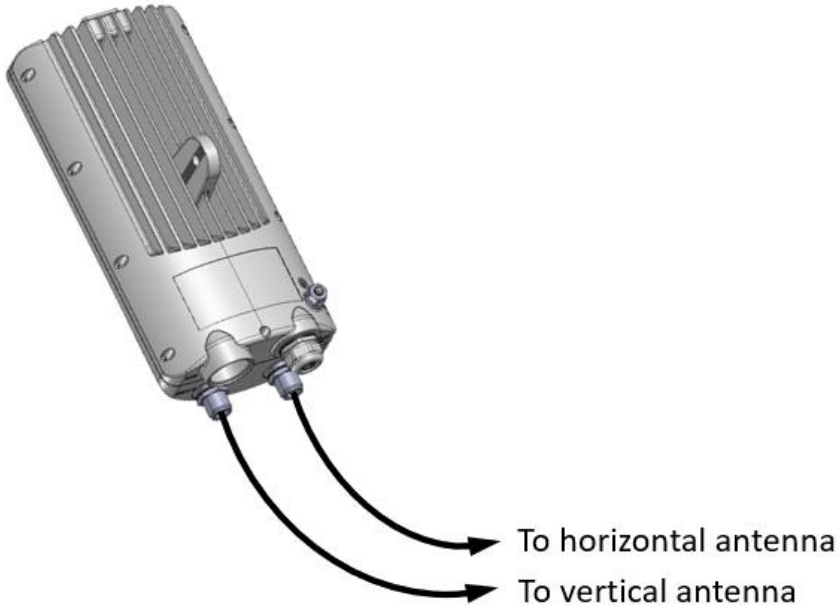
6. Route one CAT-5e cable up to the ODU, and the other down to the PoE (via the lower LPU). An LPU installed on a pole is shown below.



3.9 Connecting the ODUs to an External Antenna

3.9.1 RADWIN 2000 E Connectorized

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



3.9.2 RADWIN 2000 Alpha Connectorized

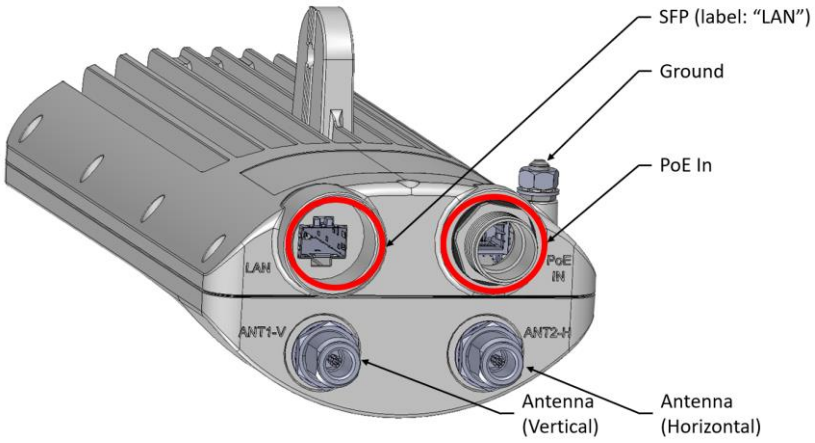
Connect the V or H antenna connector to either ANT 1 or ANT 2 radio connector.

3.10 Connecting POE and data cables

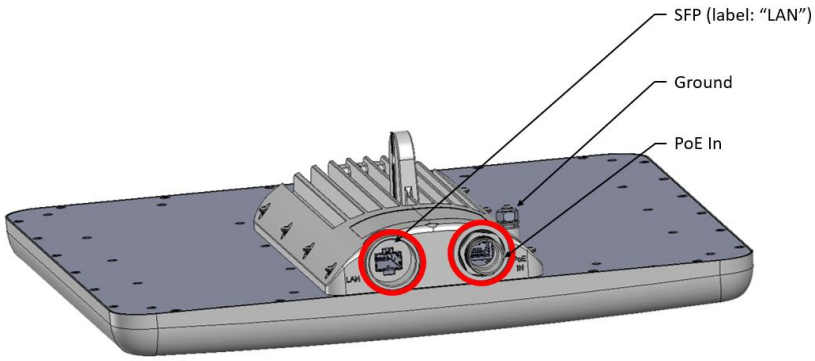
3.10.1 RADWIN 2000 E ODUs

Connect the RADWIN 2000 E ODU as follows:

1. Connect an ethernet cable to the input port of the ODU as follows:
   Note: If you are using a FO cable, connect it to the SFP port (labeled “LAN”).



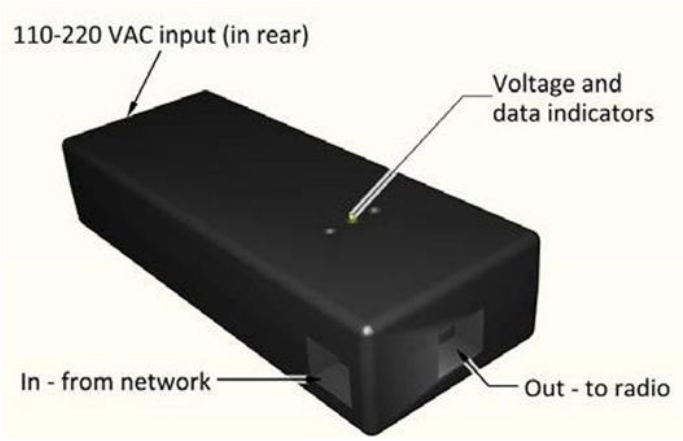
External ODU Input port: PoE In and optionally SFP (label: “LAN")



Integrated ODU Input port: PoE In and optionally SFP (label: “LAN")

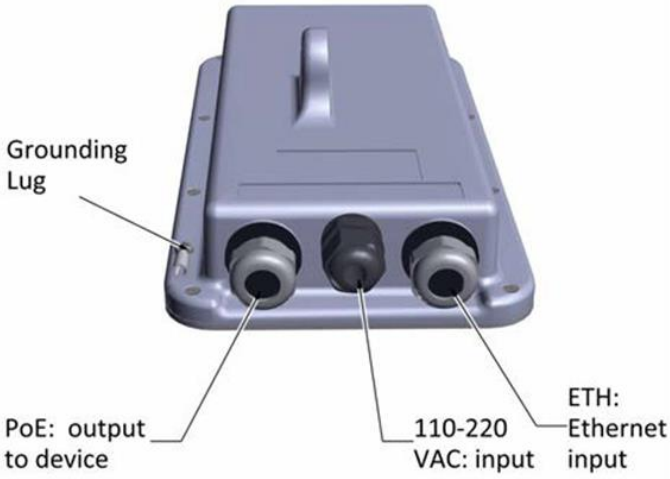
2. Fasten the ethernet cable (and SFP) connections with a cable gland and add sealant tape (see Waterproofing).
3. Route the ethernet (and SFP) cables down from the ODU to a PoE.
   It is recommended to route the ethernet cable via 2 LPUs: one near the ODU, and one near the PoE.
4. Perform the final connections to the PoE depending on the type of PoE you are using, as described below.

Indoor PoE



1. Connect ODU POE cable to the “POE” port
2. Connect customer Ethernet network to the "ETH” port
3. Connect the power input cable.

Outdoor PoE



4. Connect ODU POE cable to the “POE” port
5. Connect customer Ethernet network to the "ETH” port
6. Connect the ground cable.
7. Connect the power cable.
8. Fasten cable glands
9. Waterproof

3.10.2 RADWIN 2000 Alpha ODUs

When working with the Alpha/Alpha-PRO Connectorized ODU:

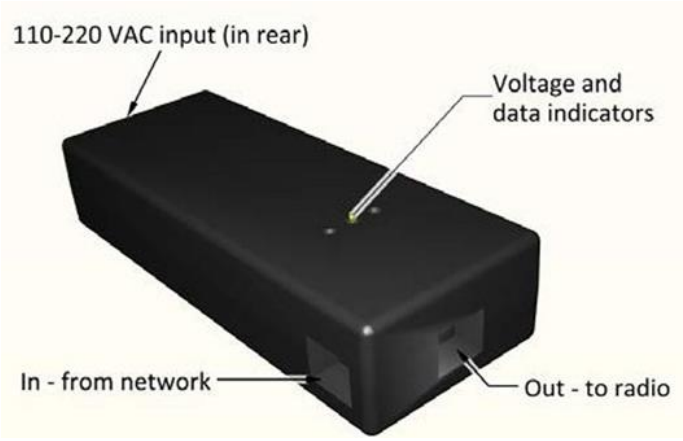
- Hazardous 56VDC voltage may appear on accessible antenna connections. Use Personal Protection Equipment (e.g. insulating gloves) when working with the ODU or the antenna.
- Connect the shield of the antenna coaxial cable to the protective earth when the coaxial cable is used.
- A skilled person should permanently connect the ODU to protective earth using 14 AWG wiring minimum.

POE port: RADWIN 2000 Alpha/Alpha-PRO INT ODU

POE port: Alpha/Alpha-PRO Connectorized ODU ("PoE IN")

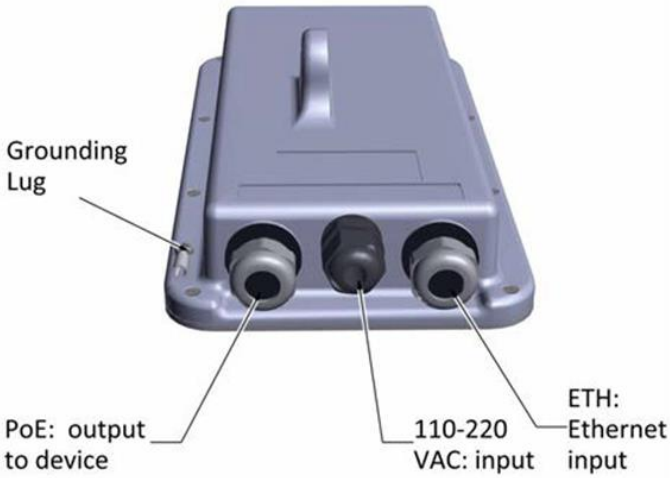
1. Add sealant tape to the connections (see Waterproofing).
2. Route the CAT-5e and ground cables down from the ODU to a PoE.
   It is recommended to route the CAT-5e cable via 2 LPUs: one near the ODU, and one near the PoE.
3. Fasten CAT-5e cable connections with a cable gland and add sealant tape.
4. Connect the ground cable to the ground.
5. Perform the final connections via a PoE depending on the type of PoE you are using, as described below.

Indoor PoE



1. Connect the CAT-5e cable from the lower LPU to the "Out" port.
2. Connect the LAN cable to the "In" port.
3. Connect the power cable.

Outdoor PoE



1. Connect the LAN cable to the "ETH" port, and fasten it with a cable gland, then add tape.
2. Connect the ground cable.
3. Connect the power cable.

DC Injector

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

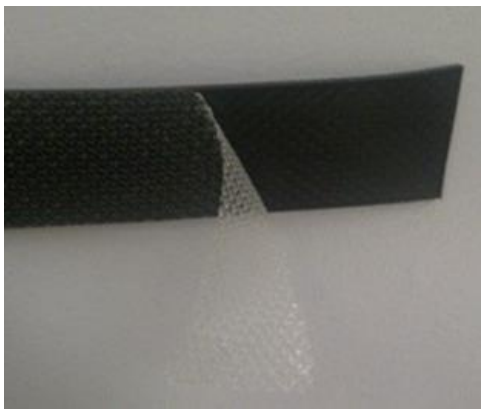
- Only use a safety-approved AC POE PS according to IEC/EN/UL 60950-1 or a 62368-1 with a rated output voltage of 24-56VDC, 1A max.
- All PSs must be installed in a RESTRICTED ACCESS LOCATION.

Ground the PS before applying power.

3.11 Waterproofing

Protect all outdoor connections from rain, dust, moisture and salt by taping the cable/gland connection with an appropriate sealant tape.

RADWIN recommends using Scotch™ 23 splicing tape or similar type.



4. Aligning the link

Follow the general guidance below for link alignment:

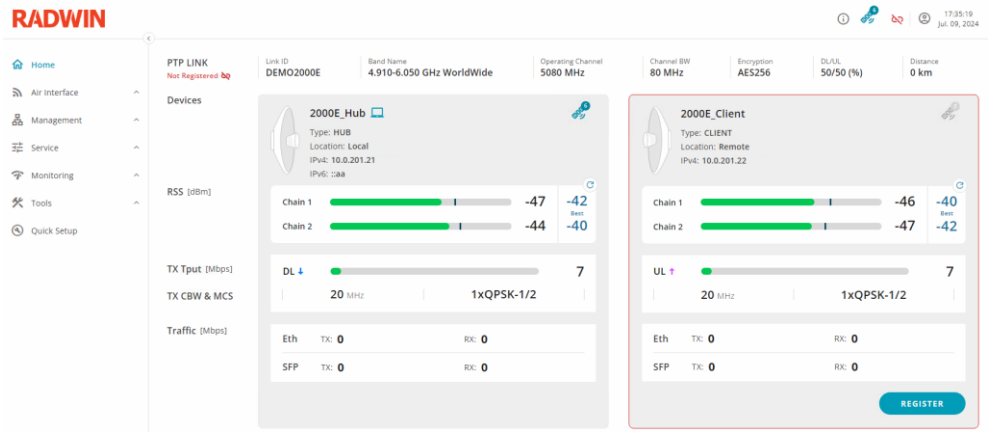
- Make sure the Hub ODU is activated and Client ODU is not registered
- Align the antennas visually or by using azimuth and elevation according to the link planning
- Perform a fine alignment for the Client ODU
    - Monitor the RSS level
    - Perform azimuth alignment:
        i. Swivel to the extreme left in the horizontal (azimuth) direction
        ii. Scan slowly to the right, then slowly swivel back towards the expected target azimuth.
        iii. When the RSS value is the best so far, lock the azimuth alignment.
    - Repeat the same steps for elevation alignment.
- Improve the alignment for the Hub ODU (if necessary)
- When RSS levels are the highest achievable, register the link
- Once registered, the link will reach the highest possible modulation and capacity, which may cause RSS levels to decrease – this is an expected behavior

Refer to the next chapters for detailed procedures for each ODU model.

4.1 Aligning RADWIN 2000 E ODUs

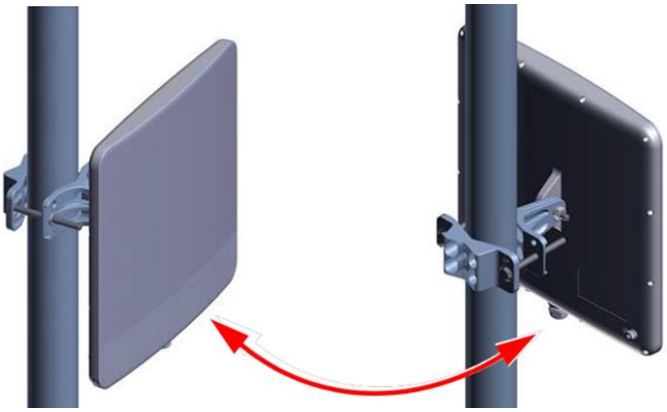
4.1.1 Monitoring RSS

1. Log in to Web UI
2. Verify the link is not registered (Register button should be visible in Client site panel)
3. Current RSS levels for both units will be displayed once the link is synchronized
4. Best RSS (displayed to the right of the Current RSS) shows best RSS level so far

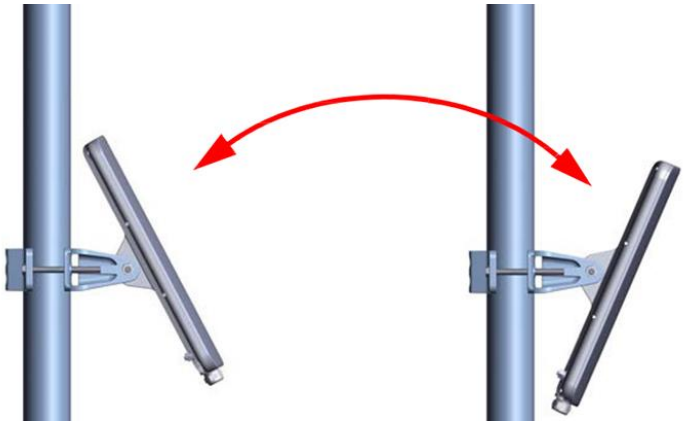


4.1.2 Swiveling a RADWIN 2000 E INT

1. Loosen pole bracket bolts for azimuth alignment



2. Loosen ODU bolt for elevation alignment

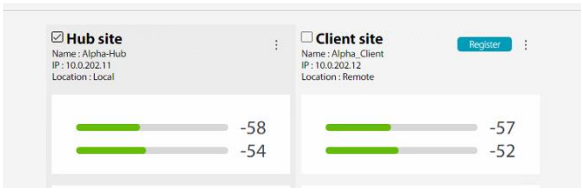


3. Secure all bolts once alignment is done

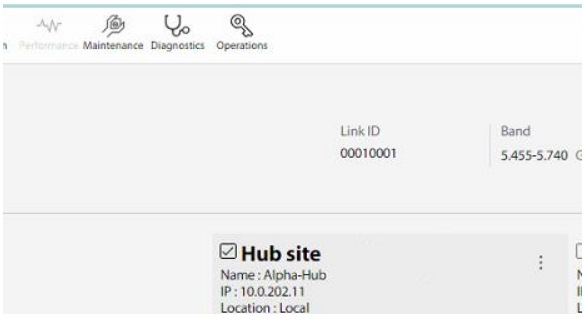
4.2 Aligning RADWIN 2000 Alpha ODUs

4.2.1 Monitoring RSS

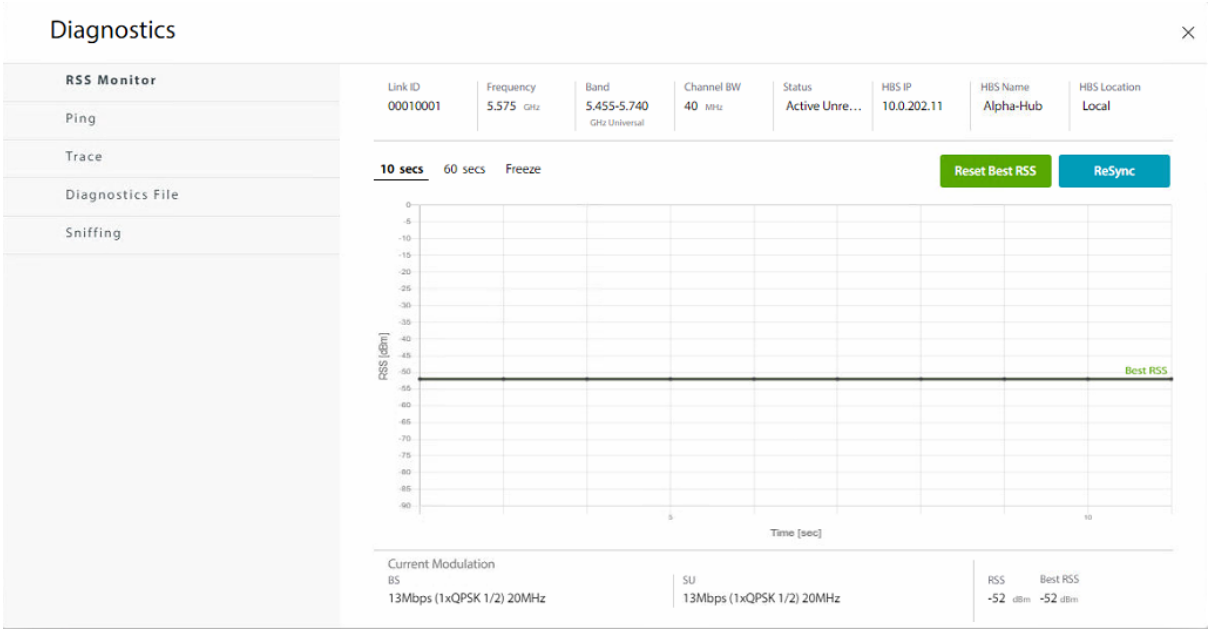
1. Log in to Web UI
2. Verify the link is not registered (Register button should be visible in Client site panel)
3. RSS levels will be displayed once the link is synchronized



4. For more advanced monitoring of RSS, select the local ODU (shown on the left side)
5. Click Diagnostics menu.

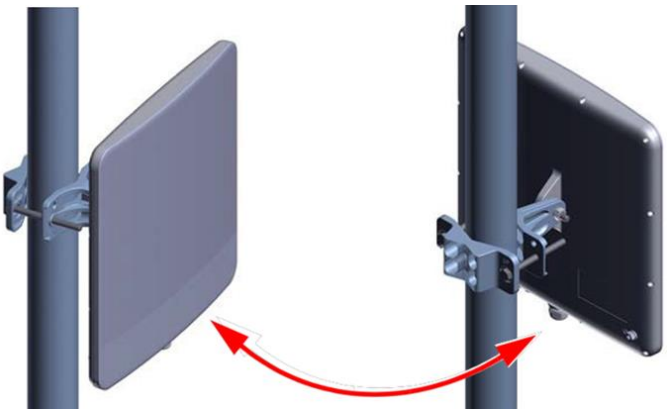


6. RSS Monitor tool will show a real-time graph for current RSS and Best RSS values.

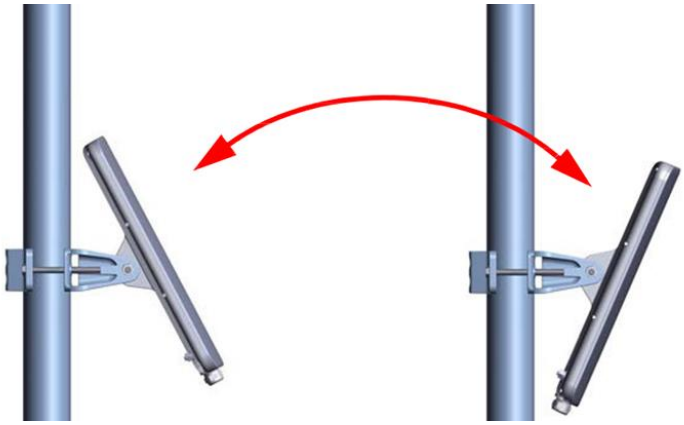


4.2.2 Swiveling a RADWIN 2000 Alpha/Alpha-PRO INT

1. Loosen pole bracket bolts for azimuth alignment



2. Loosen ODU bolt for elevation alignment



3. Secure all bolts once alignment is done

5. Appendixes

5.1 POE Specifications

5.1.1 PoE Compatibility

The table below shows compatibility matrix between POE sources and ODUs.

Dying Gasp is supported by Alpha EXT, Alpha INT 500M and Alpha PRO only.

Once active, an SNMP trap is sent upon power input loss on AC or DC PoE at the client site only.

Dying Gasp support requires one of the POEs marked with (D.G) in the table

Compatibility legend

[+]	Recommended POE source
+	Supported POE source
(D.G.)	Dying Gasp support
(1G)	Max Ethernet speed is limited to 1Gbps
-	Not supported

POE sources						ODU models			
Part Number	Nominal input voltage	IDU ports	Output power	POE voltage	Max speed	Alpha PRO	Alpha	Alpha 6.4 GHz	2000E
Indoor AC POE									
RW-9921-400x	100-240V AC		56W	55V	2.5G	[+] (D.G)	[+] (D.G)	[+]	[+]
RW-9921-102x	100-240V AC		24W	24V	1G	[Included]	+	-	-
TerraNet POE	100-240V AC		24W	48V	2.5G	-	-	-	-
Indoor DC POE									
RW-9921-2069	10-60V DC		35W	55V	2.5G	[+] (D.G)	[+] (D.G)	[+]	[+]
RW-9921-2059	10-60V DC		35W	55V	1G	[+] (D.G)	[+] (D.G)	[+]	+ (1G)
RW-9921-1059	20-60V DC		55W	55V	2.5G	+ (D.G.)	+ (D.G.)	+	+
RW-9921-1049	20-60V DC		55W	55V	1G	+ (D.G.)	+ (D.G.)	+	+ (1G)
RW-9921-1039	24-57V		24W	24-57V	1G	+	+	-	-
Outdoor AC POE									
RW-9921-008x	100-240V AC		35W	55V	1G	[+] (D.G)	[+] (D.G)	[+]	+ (1G)
Outdoor DC POE									
RW-9921-0110	10-60V DC		35W	55V	1G	[+] (D.G)	[+] (D.G)	[+]	+ (1G)
IDU-H									
RW-7301-2006	44-57V DC	1-6	30W	55V	1G	+	+	+	+ (1G)
IDU-S									
RW-7401-6006	44-57V DC	1-4	90W	55V	2.5G	[+]	[+]	[+]	[+]
		5-6	90W	55V	1G	[+]	[+]	[+]	+ (1G)
IDU-SI									
RW-7400-8008	44-57V DC	1-4	90W	55V	1G	[+]	[+]	[+]	+ (1G)
		5-8	90W	55V	2.5	[+]	[+]	[+]	[+]
Standard POE									
802.3at/bt						-	-	802.3at Class 4 (30W)	802.3at Class 4 (30W)

5.1.2 POE Port Pinout for Alpha / Alpha-PRO ODUs

RADWIN 2000 Alpha / Alpha-PRO ODUs have the following pinout:

Function	Pin
Data TxRx A	1
Data TxRx A	2
Data TxRx B	3
Data TxRx B	6
Data TxRx C & Power(+)	4
Data TxRx C & Power(+)	5
Data TxRx D & Power(-)	7
Data TxRx D & Power(-)	8

5.1.3 POE Port Pinout for Alpha 6.4 GHz and 2000E ODUs

RADWIN 2000 E and Alpha 6.4 GHz ODUs have the following pinout, compatible with RADWIN POE sources and 802.3at 30W POE sources:

Function	Pin
Data TxRx A & Power(+)	1
Data TxRx A & Power(+)	2
Data TxRx B & Power(-)	3
Data TxRx B & Power(-)	6
Data TxRx C & Power(+)	4
Data TxRx C & Power(+)	5
Data TxRx D & Power(-)	7
Data TxRx D & Power(-)	8

5.1.4 ODU PoE Cable Specifications

The required ODU PoE cable is outdoor CAT-5e STP, 24 AWG, with shielded RJ-45 connectors.

RADWIN ODU-IDU cables in various lengths are available for purchase (see WINPro catalog). These cables are shipped ready for installation with an IP-67 protective gland pre-installed on one end of the cable for connection to the ODU, and with RJ-45 male shielded connectors on both ends.

The cable contains 4 twisted pairs, overall shielded with aluminum foil and jacketed with a heavy duty, black, UV resistant & flame-retardant PVC compound.

RADWIN ODU-IDU cables have the following specifications:

Parameter	Value
Cabling standards	Conforms to ANSI/TIA/EIA-568-B.2, ISO/IEC 11801, IEC 61156-5
Inner and outer jacket	Heavy-duty, UV-resistant, Flame-retardant PVC compound for outdoor use
Flame test	IEC 60332-1 & UL 1581 VW-1
UV resistance test	2016 Hr min. exposure according to ASTM G53
NEC rating	CMX UL 444 / CSA C22.2 No 214-02, UL Listed
EU RoHS	Fully conforms to Directive 2002/95/EC
China RoHS	Fully conforms to Directive SJ/T-11363-2006

5.2 Setting Antenna Parameters

5.2.1 Antenna Issues

Before proceeding to the details of antenna installations, the following background information should be considered.

5.2.2 About Single and Dual Antennas

Each RADWIN 2000 Series 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.

Dual Antennas at Both Sites

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 a single antenna, thus increasing capacity, range, and availability.
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 minimum separation between the antennas must be maintained (for example, by using dual polarization antennas a cross-polarization separation is attained).

Diversity Mode

Diversity Mode uses two antennas to improve the quality and reliability of the link. Often, there is no clear line-of-sight (LOS) between the transmitter and the 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
- 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

Single Antennas at Both Sites

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

Single at One Site, Dual Antennas at the Other

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

The advantages of this mode - in comparison to using a single antenna in both sites - are double the 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 the same as when using single antennas in both sites.

5.2.3 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:

```
maxAvailableTxPower ≤ min(maxRegEIRP – AntennaGain + CableLoss, maxRegTxPower)*
```

* The above inequality is always satisfied by the system in accordance with the relevant regulation.
The precise relationship between the items in the inequality is as follows:

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

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: dBm = 10 x $\log_{10}$ milliwatt.
  So if you double the power in milliwatts (for two radios) then dBm will increase by 10 x $\log_{10}2 \approx 3$.
- The maximum EIRP level is automatically set according to the selected band and regulation.
- The EIRP level is:
  System Tx Power + Antenna Gain - Cable Loss.

5.3 Regional Notice

5.3.1 Procédures de sécurité

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.

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 mise à la terre par un câble de diamètre de 14 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

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.

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.

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.

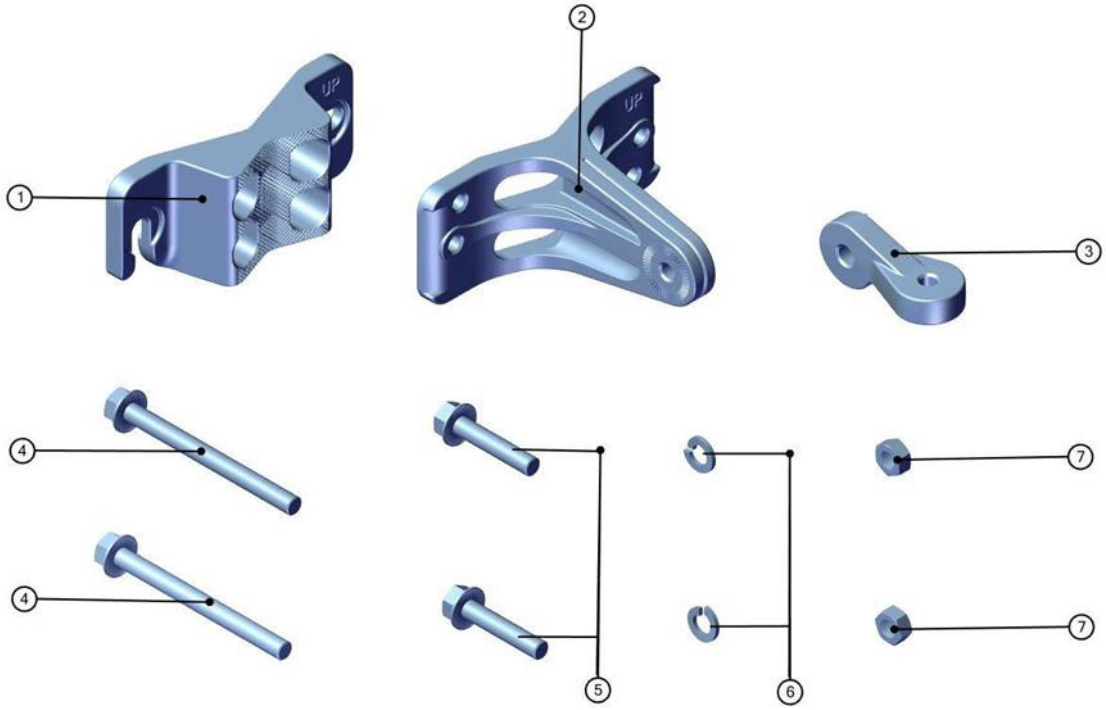
- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm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

5.3.2 Installation sur pylône et mur

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

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:



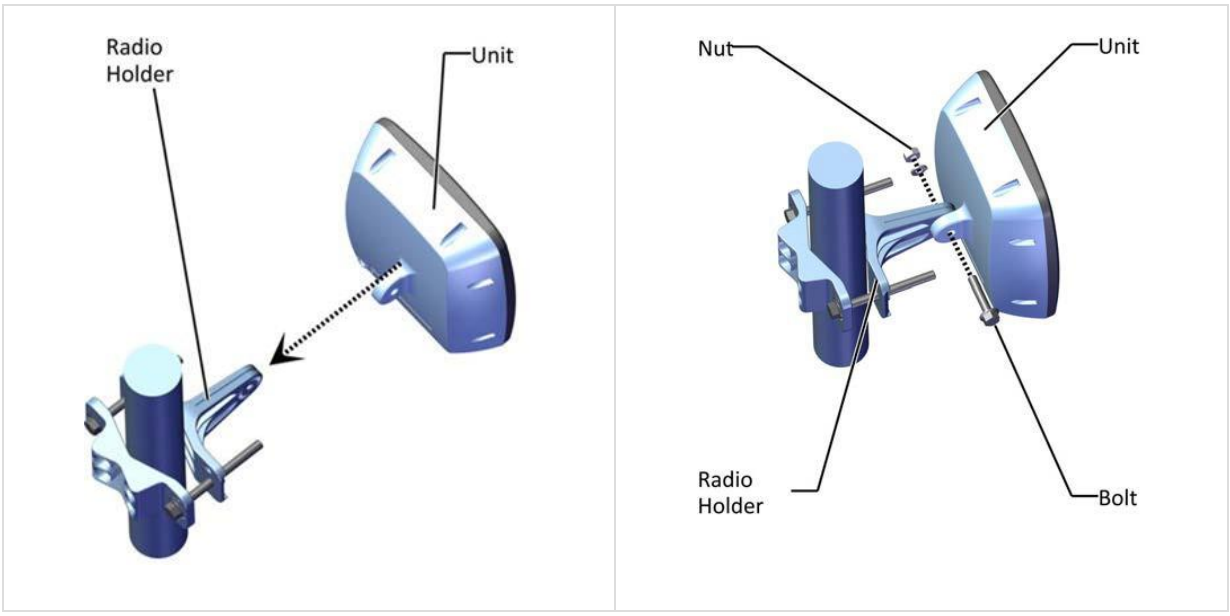
Item	Description	Qty
1	Pole Clamp	1
2	Radio Holder	1
3	Radio Vertical Adaptor	1

Item	Description	Qty
4	Hex Bolt 8x90	2
5	Hex Bolt 8x40	2
6	Spring Lock Washer	2

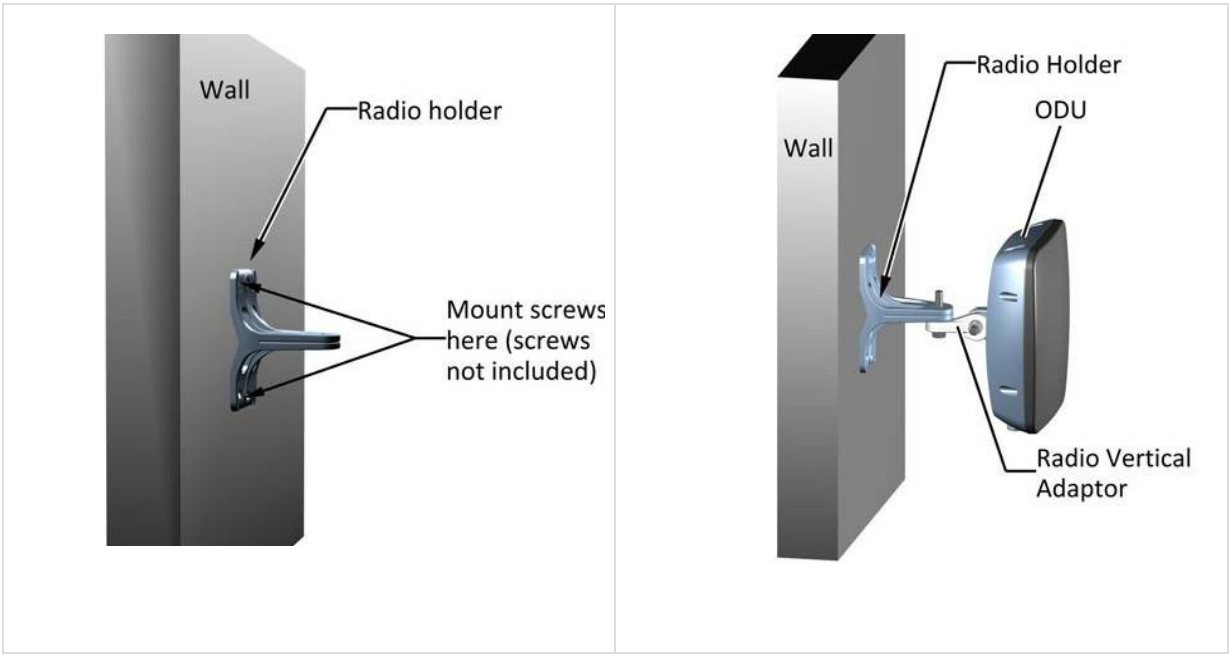
Item	Description	Qty
7	M8 Nut	2

Figure 6 Contenu du kit de montage ODU

Montage sur un pylône



Montage sur un mur



Montage d'une antenne externe

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

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.

5.4 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.

5.4.1 For Deployment in US and Canada

Radio devices labeled FCC ID: Q3KRW24MOD / 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 following table:

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 labeled FCC ID: Q3K- 5XACMOLD / 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 following tables:

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 ISED)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
Integrated	Flat DP	16.0	35°	24	40

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min. Safe Distance (cm)
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
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

Radio devices labeled FCC ID: Q3K-5AXCULC-X / IC: 5100A-5AXCULCX (RADWIN 2000 Alpha EMB)

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

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 ISED.

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

Radio devices labeled FCC ID: Q3K-5XSUALMOD / IC: 5100A-5XSUALMOD (RADWIN 2000 Alpha INT and Alpha Connectorized ODUs)

Radio transmitters with this label have been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

The input impedance of all antennas is 50 Ohm.

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

Frequency Band 5725-5850 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9105-5159	Flat DP	13	30°	25.0	32
RW-9105-4958	Flat DP	16	20°	22.0	32
Integrated	Flat DP	22	10°	23.0	71
RW-9613-4960	Flat DP	23	10°	22.0	71
Integrated	Flat DP	25	8°	20.0	71
RW-9622-5001	Flat DP	28	5°	11.0	36
RW-9721-5158	Dish DP	28	5.5°	14.0	51
RW-9732-4958	Dish DP	32	4°	10.0	51

Frequency Band 5150-5250 MHz (FCC Only)

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9105-5159	Flat DP	13	30°	26	36
RW-9105-4958	Flat DP	16	20°	20	26
Integrated	Flat DP	22	10°	19	45
RW-9613-4960	Flat DP	23	10°	19	51
Integrated	Flat DP	25	8°	16	45
RW-9622-5001	Flat DP	28	5°	12	40
RW-9721-5158	Dish DP	28	5.5°	11	36
RW-9732-4958	Dish DP	32	4°	7	36

Frequency Band 5250-5350 and 5470-5725 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9105-5159	Flat DP	13	30°	14	20
RW-9105-4958	Flat DP	16	20°	11	20
Integrated	Flat DP	22	10°	5	20
RW-9613-4960	Flat DP	23	10°	4	20
Integrated	Flat DP	25*	8°	2	20

*The 80MHz channel bandwidth must not be operated with the 25 dBi integrated antenna.

5.4.2 For Deployment in EU Member States

RADWIN 2000-Plus Series ETSI Products

RADWIN 2000-Plus Series ETSI products must be installed so as to provide a minimum separation distance from bystanders as specified in the following table:

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

RADWIN 2000 Alpha EMB

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

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

RADWIN 2000 Alpha INT

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

Frequency Band 5725-5875 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9401-5007	Omni	10	360°	23.0	20

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9105-5159	Flat DP	13	30°	20.0	20
RW-9105-4958	Flat DP	16	20°	17.0	20
Integrated	Flat DP	22	10°	11.0	20
RW-9613-4960	Flat DP	23	10°	10.0	20

Frequency Band 5470-5725 MHz

Cat. No.	Type	Gain (dBi)	Dir BW	Tx Power per chain (dBm)	Min Safe Distance (cm)
RW-9401-5007	Omni	10	360°	17.0	20
RW-9105-5159	Flat DP	13	30°	14.0	20
RW-9105-4958	Flat DP	16	20°	11.0	20
Integrated	Flat DP	22	10°	5.0	20
RW-9613-4960	Flat DP	23	10°	4.0	20

5.5 Revision History

	Document version	Date	Description
1.	Release 4.9.50 Rev 0.1	03.05.18	Initial release based on PtP 4.9.35
2.	Release 4.9.50 Rev 0.2	14.05.18	External connection photographs updated
3.	Release 4.9.70 Rev 0.3	01.04.19	Secure Sync method
4.	Release 4.9.71 Rev 0.4	22.05.19	New product: RADWIN 2000 Alpha Integrated
5.	Release 4.9.75 Rev 0.5	Aug, 2019	New product: RW 2000 ALPHA INT 3.x
6.	Release 4.9.75 Rev 0.6	Oct, 2019	Removed iPerf and modified Sniffer (sniffing) Comment
7.	Release 4.9.75 Rev 0.7	Jan, 2020	Removed LPU wall mount instructions.
8.	Release 4.9.75 Rev 0.8	Aug, 2020	Regulatory: Changed 3.4-3.8 Alpha INT table to 2.4
9.	Release 4.9.75 Rev 0.9	Feb, 2021	Grounding cable adjusted Regulatory warning added for external antenna connections including TG.
10.	Release 5.1.10 Rev 1.0	Jun, 2021	New product: Alpha Connectorized
11.	Release 5.1.30	Jan, 2022	Alpha GPS
12.	Document version 12.0	Jun, 2023	New product: 2000 E Changed document tracking from release to document version
13.	Document version 12.1	May, 2024	2000 E: Add the offline spectrum analyzer
14.	Document version 13	July, 2024	New product: Alpha PRO POE compatibility guide

5.6 Regulatory Compliance

5.6.1 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.

5.6.2 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.

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 Identifier	IC Identifier	Band (GHz)	Safe Distance (cm)	
FCC ID: Q3K-5XACULC-X	IC: 5100A-5XACULCX	5.1[a]; 4.9-5.8	110	115
Contains FCC ID: Q3K-5XSUALMOD	Contains IC: 5100A-5XSUALMOD	5.1[a], 5.2, 5.4, 5.8	80	80

[a]. This band is licensed under ISED
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 ODU 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 anunites according to country regulations and antenna type.

Les unités extérieures et les antennes doivent être installées UNIQUEMENT par des les 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 finresponsibles 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, 14 AWG grounding cable - which must be used with the unit to ensure 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 ODU 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 ISED. 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 ODU 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 ODUs 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, 14 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 14 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. Section 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.

The ODUs 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 ete approuves par Industrie Canada pour fonctionner avec les types d'antenne enumeries à l'annexe Antennes Certifiées avec le gain maximal admissible et l'impedance d'antenne requise pour chaque type d'antenne indique.
Types d'antennes non inclus dans cette liste, ayant un gain superieur au gain maximum indique pour ce type, sont strictement interdics pur 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 a la delivrance 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 a la delivrance RSS-247 2 ne sont pas capables de transmettre dans la bande 5600-5650 MHz.

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'

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.

5.6.3 Canadian Emission Requirements for Indoor Units

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

Cet appareil numeique de la classe B est conforme a la norme NMB-003 du Canada.

5.6.4 EU – Compliance

CE

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.
All RADWIN products that operate in the 5.8 GHz band comply 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(NI)**				

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

			
BE	**HR**	**LT**	**HU**
EE	**UK(NI)**	**FR**	**NL**

5.6.5 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).

5.6.6 India WPC

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

5.6.7 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 comercizliadas junto com este produto.

5.6.8 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).

5.6.9 Norway

Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr - og er tilkoplet 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

5.6.10 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 ät gal- vanisk isolator finnas mellan utrustningen och kabel-TV nätet.

5.6.11 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.

5.6.12 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.

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.

1. For protection of ODU against direct lightning strikes, appropriate requirements of NFPA 780 should be considered in addition to NEC.
2. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.
3. 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.
4. Use min. 14 AWG external protective earthing conductor.

5. Earth the antenna coax shield to the building earth or mast.

5.6.13 Maritime coating

Products are tested and approved according to IEC-60068-2-11 Test Ka: Salt mist.