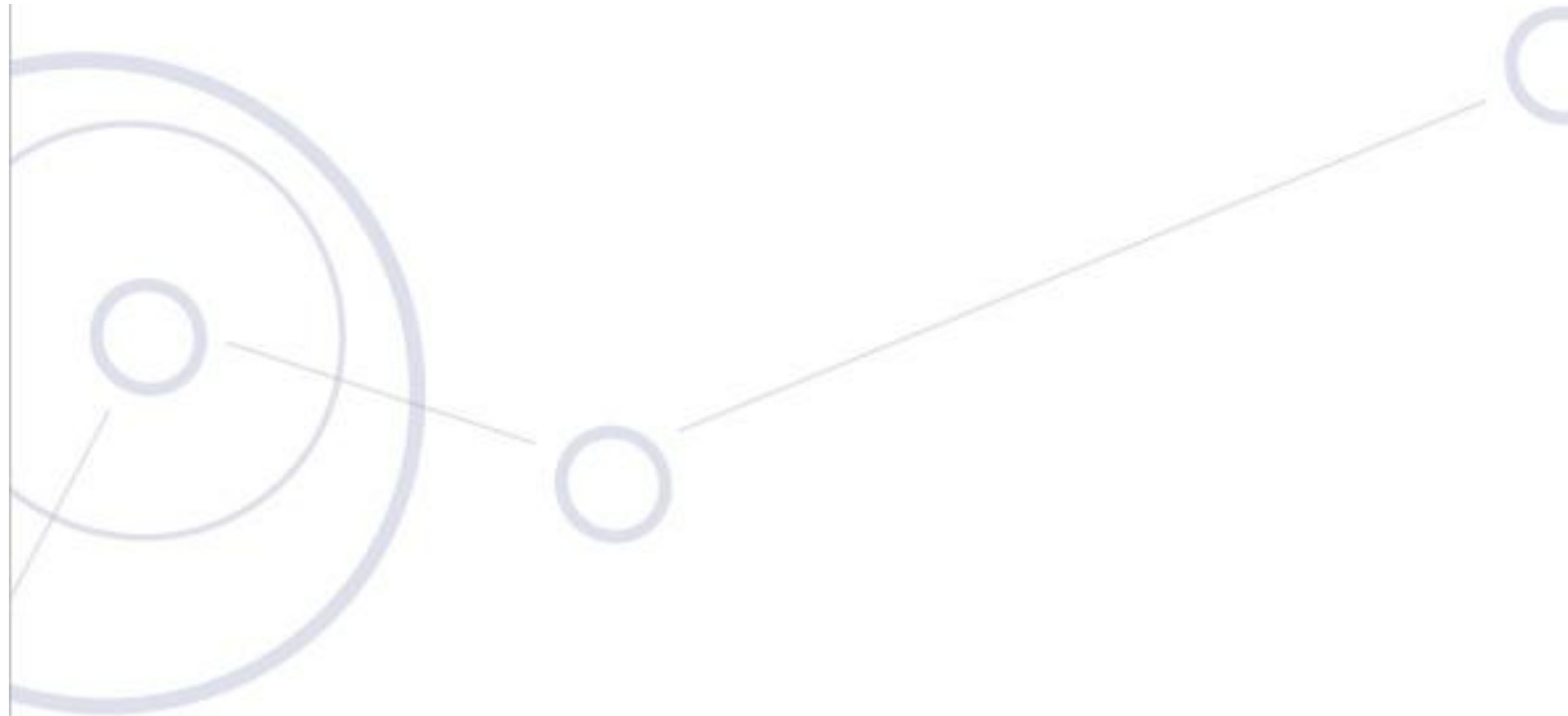


RADWIN

RADWIN 6000

Small Cell Base Station

REFERENCE GUIDE



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Regulatory Compliance

FCC - 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.



Warning

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.



Warning

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.



Caution

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.



-
- 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.

The RADWIN 6000 band 2 should be installed and operated with a minimum distance of 243 cm (8 ft) between the radiator and any person and RADWIN 6000 band 5 should be installed and operated with a minimum distance of 142 cm (4.7 ft) between the radiator and any person

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

Canadian Emission Requirements for Indoor Units

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

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

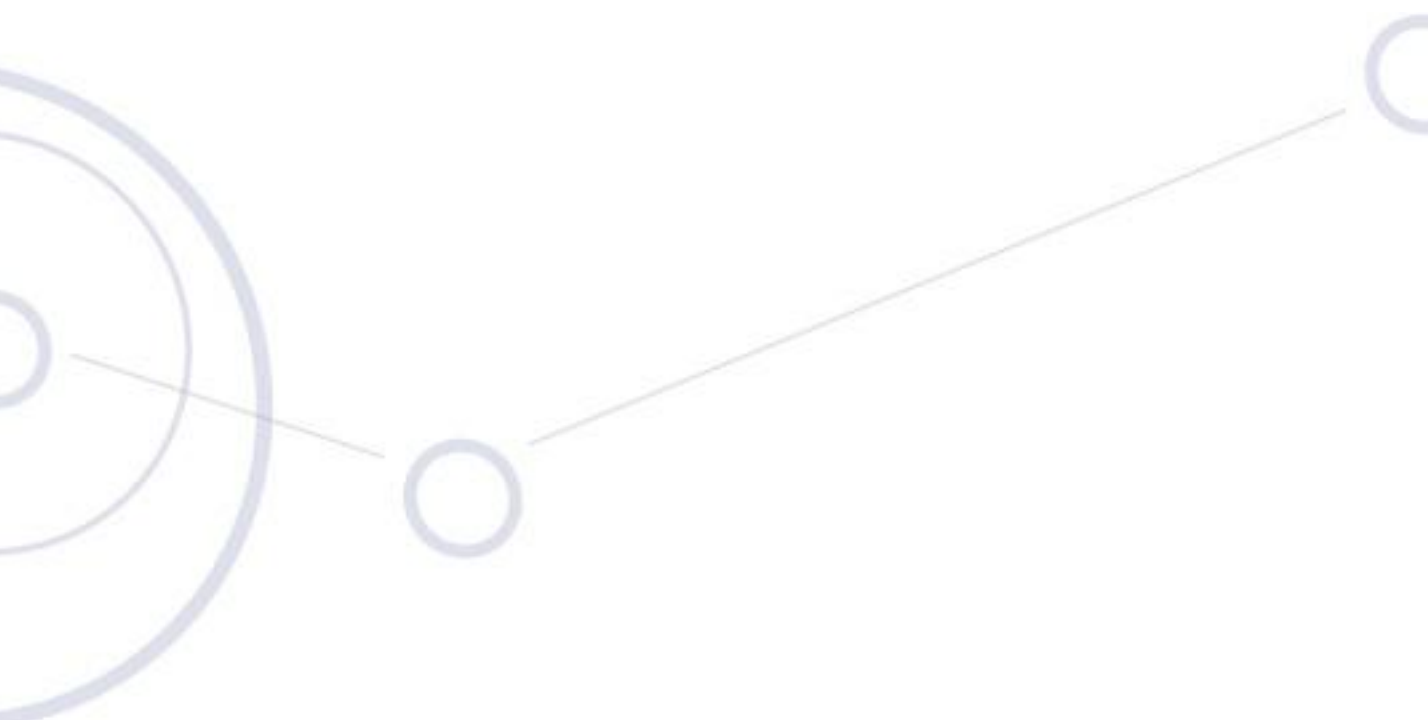
3. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.

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Part 1: Basic Installation

Introduction

Product Overview

RW6000 is a small cell solution that provides (UMTS) HSPA+ services for cellular operators and Broadband Wireless Access (BWA) Services for Internet Service Providers. This compact, carrier grade and fully outdoor unit supports high capacity and high transmission power with remarkably low power consumption. Offering an intelligent and cost effective solution, RW6000 extends remote rural area coverage and expands capacity in dense urban outdoor hotspots.

Product Highlights:

- 5 Watt 3GPP compliant UTRAN solution
- High capacity - Up to 24 simultaneous users
- HSPA+ data rates: 21.1 Mbps / 5.7 Mbps
- Superb coverage with maximum transmission power of 5 Watt and Rx space diversity
- Extremely low power consumption of 25 Watt
- Integrated GPS for synchronization and inventory management
- Integrated Ethernet switch with PoE
- Small, rugged and sealed enclosure to withstand extreme outdoor conditions
- High availability, no fans or moving parts
- Self-organizing capabilities for quick & easy installation and maintenance
- IPv4 support (Iu over IP only)
- RADWIN Small Cell Access point Access control
- UE Access control
- Aggregation of UE associated signaling links from multiple RADWIN Small Cell Access point towards CN
- Terminating non-UE associated procedures towards the RADWIN Small Cell Access point and towards the CN

Reference and Standards

Reference Number	Reference Description
3GPP TR 25.820	3G Home Node B (HNB) study item Technical Report
3GPP TS 22.220	Service requirements for Home Node B
3GPP TS 25.467	UTRAN architecture for 3G Home Node B (HNB); Stage 2 – UTRAN
3GPP TS 25.469	UTRAN Iuh interface Home Node B (HNB) Application Part (HNBAP) signaling
3GPP TR 21.905	"Vocabulary for 3GPP Specifications".
3GPP TS 25.468	"UTRAN Iuh Interface RUA signaling".
3GPP TS 25.469	"UTRAN Iuh Interface HNBAP signaling".
3GPP TS 25.401	"UTRAN overall description".
3GPP TS 25.410	"UTRAN Iu Interface
RFC 4960 (September 2007)	"Stream Control Transmission Protocol".
3GPP TS 25.444	"Iuh data transport and transport signaling".
3GPP TS 25.413	"UTRAN Iu Interface RANAP Signaling".
3GPP TS 23.060	"General Packet Radio Service (GPRS); Service Description; Stage 2".
3GPP TS 22.220	"Service requirements for Home NodeBs and Home eNodeBs".
3GPP TS 25.419	"UTRAN Iu Interface

What's in the Box

The RADWIN 6000 packages include the following items:

- One RADWIN 6000 ODU - see Figure 1-2 below for front and rear view
- An ODU mounting kit - see Figure 1-1 below
- Two cable glands (to be used with CAT 5e PoE out cable)
- One AC/DC cable gland
- One 0.5 meter 10 AWG grounding cable
- DC/AC Power connector
- One short power cable (BD)



Figure 1-1: RADWIN 6000 Mounting kit

The RADWIN 6000ODU is shown in **Figure 1-2** below:



Figure 1-2: Left, front, center rear, right top, top ports, right bottom, bottom ports

Related Equipment and Accessories

Lightning Protector

Lightning protection is mandatory for radio links. RADWIN supplies a lightning protector device designed for use with RADWIN products.



Figure 1-14: Left: RADWIN Lightning Protector Right: Using RADWIN lightning protectors

Hardware Installation

This chapter sets out the requirements and procedures for the hardware installation of the RADWIN 6000. It is intended to guide qualified field technicians.



Warning

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 expose the end user or the service provider to legal and financial liabilities. RADWIN and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Safety Practices

Preventing overexposure to RF energy

To protect against overexposure to RF energy, install the ODU 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 ODU must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

Grounding

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

- The **ODU** should be earthed by a wire with diameter of at least **10 AWG**.
The RADWIN 6000 ODU must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with Section 810 and Article 725 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit. It also lays down the size of grounding conductors and connection requirements for grounding electrodes.

The RADWIN 6000 ODU must be grounded to a Protective Earth as described in and in accordance with the Local Electrical Regulations.

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

Protection against Lightning

The use of lightning protection is dependent on regulatory and end user requirements. All of 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 lightning protector devices to protect the equipment from nearby lightning strikes.

See [Chapter 3](#) for detailed installation instructions of lightning protection devices.

General

It is recommended that installation of an outdoor unit be contracted to a professional installer.

- Before working on equipment connected to power lines or telecommunication lines, you should 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 6000 PoEs always use the AC power adapter supplied by RADWIN.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, RADWIN 6000 ODUs require additional specific tools detailed on [page 2-4](#) below.

Package Contents

The RADWIN 6000 packages include the following items:

- One RADWIN 6000- see [Figure 2-5](#) below for front and rear view
- An ODU mounting kit - see [Figure 2-6](#) below
- A CD containing -
 the RADWIN Manager
 User Manual
- Label showing the MAC address and the alternative Community string. The label is self-adhesive. You should keep this label safe
- Two cable glands (to be used with CAT 5e cables)
- One AC/DC cable gland
- One 0.5 meter 10 AWG grounding cable
- AC Power cable RADWIN 6000 Mounting kit

Table 2-1: Bill of Materials: ODU mounting kit

Item	Qty
Large Clamp (see Figure 2-1)	1
Small Clamp (see Figure 2-2)	1
Arm (see Figure 2-3)	1
Screw hex head M8x40 4	4
Screw hex head M8x70 2	2
Washer flat M8 4	4
Washer spring M8 3	3
M8 Nuts 2	2



Figure 2-1: Large Clamp Figure 2-2: Small Clamp Figure 2-3: Arm Figure 2-4: Accessories

The RADWIN 6000 ODU is shown in [Figure 2-5](#) below:



Figure 2-5: Left, front, center rear, right top, top ports, right bottom, bottom ports

Additional Tools and Materials Required

The following is a list of the equipment and materials required to install RADWIN 6000 hardware.

Tools and Materials

- Crimping tool for RJ-45 (if the ODU-PoE cable is without connectors)
- Spanner/wrench 13 mm (1/2")
- Drill (for wall mounting only)
- Cable ties
- Sealing material

Cables and connectors

- CAT 5e LAN cable
- PoE-out cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG), up to 100 m. for 100BaseT connection. For a 1000BaseT connection (HBS only) use an ODU-PoE cable no longer than 75m.

**Note**

For 1000BaseT, you should use RADWIN supplied ODU-PoE cables, which guarantee 1Gb performance. RADWIN cannot guarantee 1Gb performance if you use third party cables.

Outdoor installation

Mounting the ODU

The ODU can be mounted on a pole or a wall. In both installations, the supplied mounting kit is used to secure the ODU.

**Note**

A mast-sited ODU typically uses a pole attached to the mast.

**Warning**

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded pole.

- Only a qualified person using the proper safety equipment should climb the antenna mast
 - Only qualified professional personnel should install or dismantle ODUs and masts
-

➤ To mount the ODU on a pole or a wall:

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. **(If they are on top, water may penetrate into the unit causing damage.)** It is possible to mount an ODU horizontally.
3. Refer also to for detailed ODU mounting kit contents and schematics.

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The RADWIN 6000 ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional lightning protector devices to protect the equipment from nearby lightning strikes.

Refer to [Chapter 4](#) for detailed installation instructions for use of lightning protection devices.

Outdoor Connections

➤ To complete the outdoor connections:

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the lightning protection device to the ODU (see [Chapter 4](#)).
3. Attach the ODU-IDU cable to the PoE RJ-45 connector
4. Attach the LAN cable to the LAN RJ-45 connector.
5. Screw in the cable glands to ensure hermetic sealing of the ODU.
6. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The RADWIN 6000 ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional lightning protector devices to protect the equipment from nearby lightning strikes.



Figure 2-6: RADWIN Lightning Protector Right: Using RADWIN lightning protectors

Lightning Protection and Grounding Guidelines

Meticulous implementation of the guidelines in this chapter will provide best protection against electric shock and lightning.



100% protection is neither implied nor possible.



This chapter is at best a guide. The actual degree of lightning protection required depends on local conditions and regulations.

The RADWIN Lightning Protection System consists of the following components:

-
- Grounding for ODU
- External Primary Lightning Protector units and grounding for the outdoor cable
- Internal ESD protection circuits over the Power/Telecom lines

ODU Grounding

RADWIN Lightning Protection System uses a Shielded CAT 5e cable to interconnect the Outdoor (ODU) and Indoor (IDU) units.

However, this shielding does not provide a good lightning discharge path, since it can not tolerate the high Lightning Current surges.

To provide an alternate Lightning Discharge path, the ODU grounding posts should be connected to ground point by a 10 AWG short copper wire.

The device should be permanently connected to ground.

The RADWIN Lightning Protection Kit

The RADWIN lightning protection kit contains the items as shown in [Figure 3-2](#):



Figure 3-2: *RADWIN* Lightning Protection Kit

The lightning protector incorporates high-power gas discharge tube and current transistor protection in a single protector unit. Technical specifications are shown in .

Using Lightning Protectors and Grounding

A Grounding Kit and lightning protector Unit must be located near the ODU and properly grounded as illustrated in Figures [3-3](#) and [3-4](#) below:

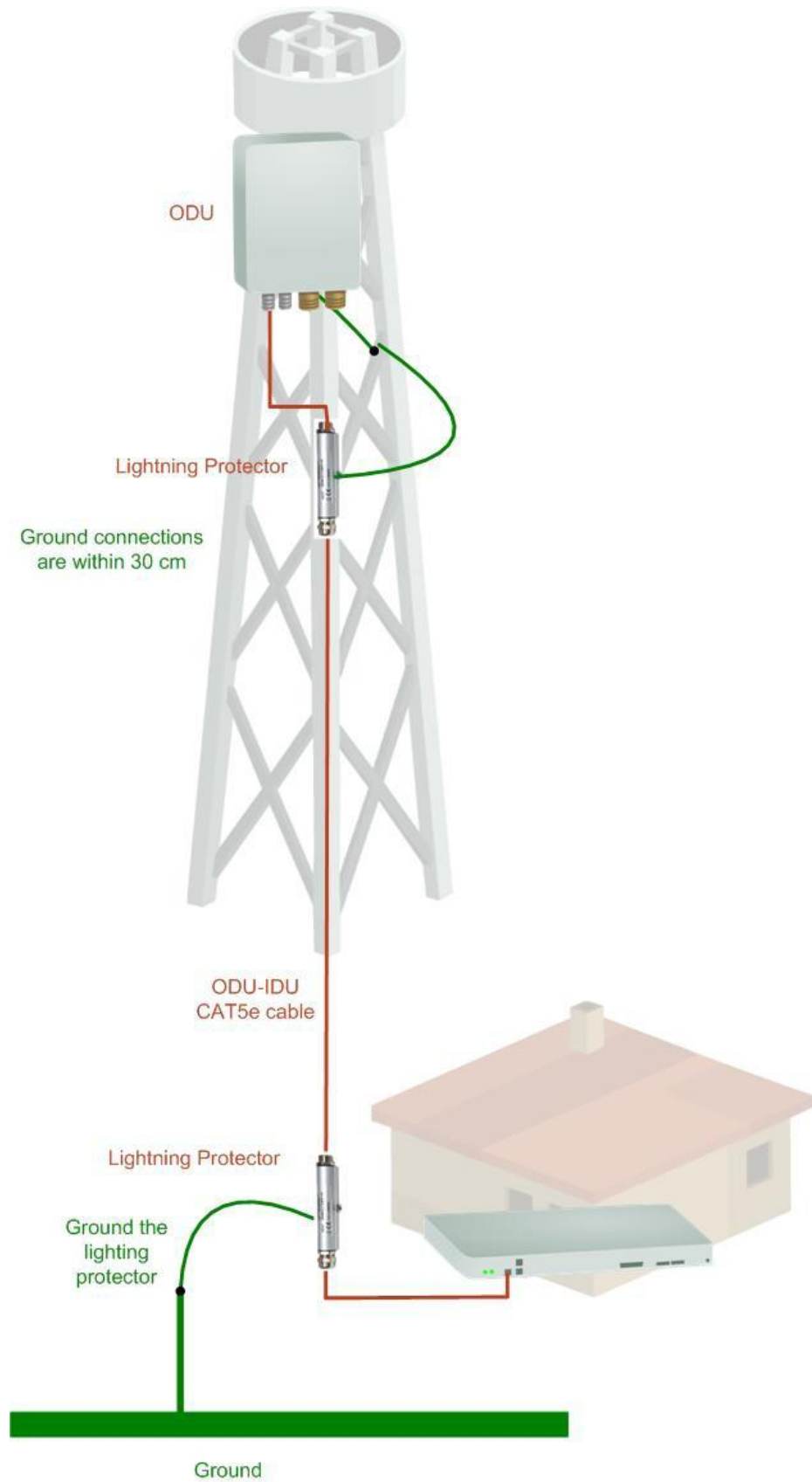


Figure 3-3: Grounding a typical pole installation

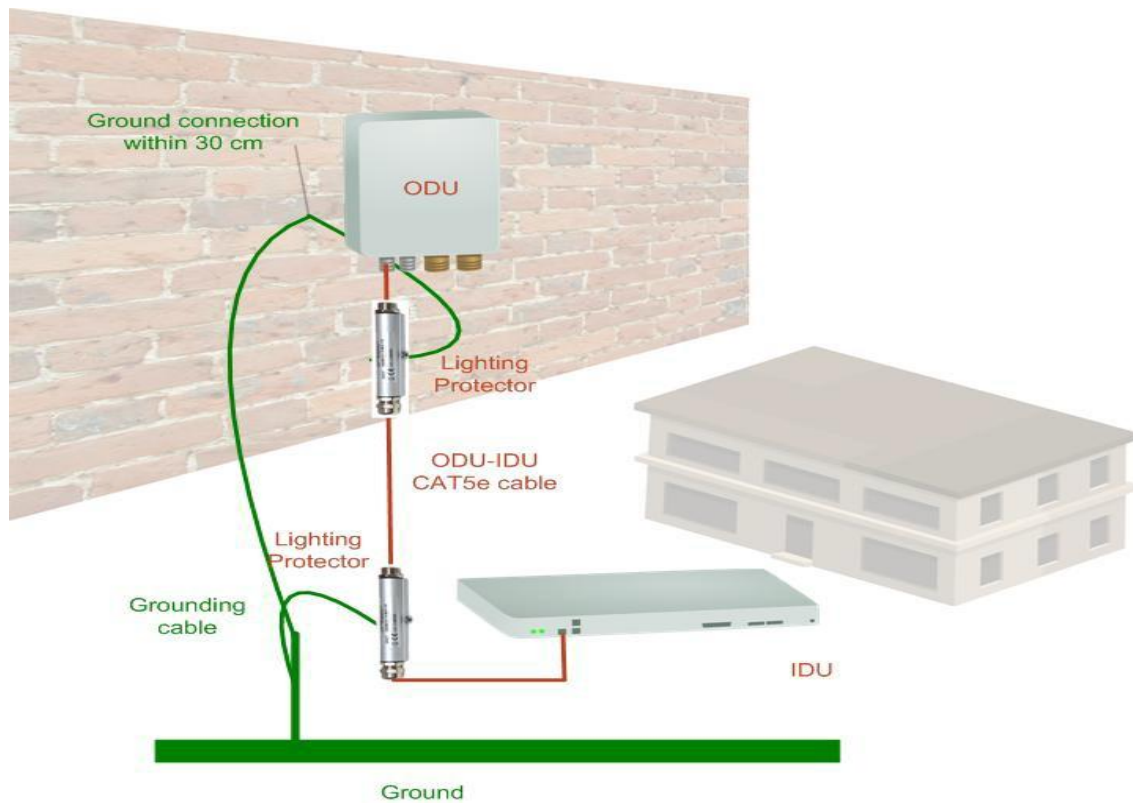


Figure 3-4: Grounding a typical wall installation

The next figure shows a close-up of the rear of grounded ODU:

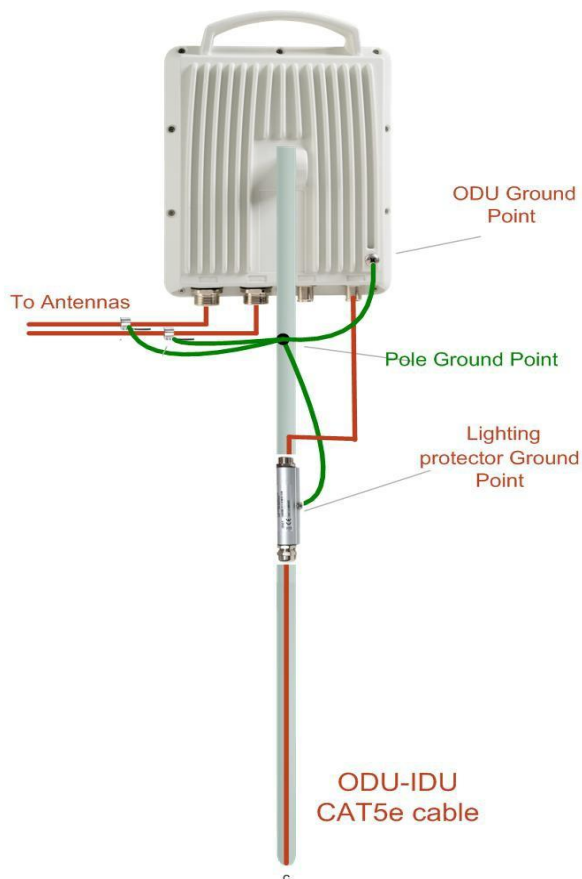


Figure 3-5: ODU Lightning Protector and grounding

Mounting RADWIN Lighting Protection unit

10 To mount a lightning protection device:

Mount the device as close to the ODU as possible.

Mount the unit to on the pole using the supplied band.

Connect the ODU-IDU cable using the RJ-45 jack.

Connect one cable between the ODU and the protector using an RJ-45 jack.

Connect the protector's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.



There may also be regulatory requirements to cross bond the ODU-IDU CAT-5e cable at regular intervals up the mast. This may be as frequent as every 10 meters (33 feet).

A second lightning protector Unit should be mounted at the building entry point and must be grounded, as shown in [Figure 3-4](#) above.

➤ To mount the lightning protection at the building entry point:

1. Mount the device outside the building, located as near as possible to the entrance of the CAT 5e ODU-IDU cable.
2. Mount the unit to on the pole using the supplied band.
3. Connect the ODU-IDU cable using the RJ-45 jack.
4. Connect one cable between the IDU and the protector using an RJ-45 jack.
5. Connect the protector's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.

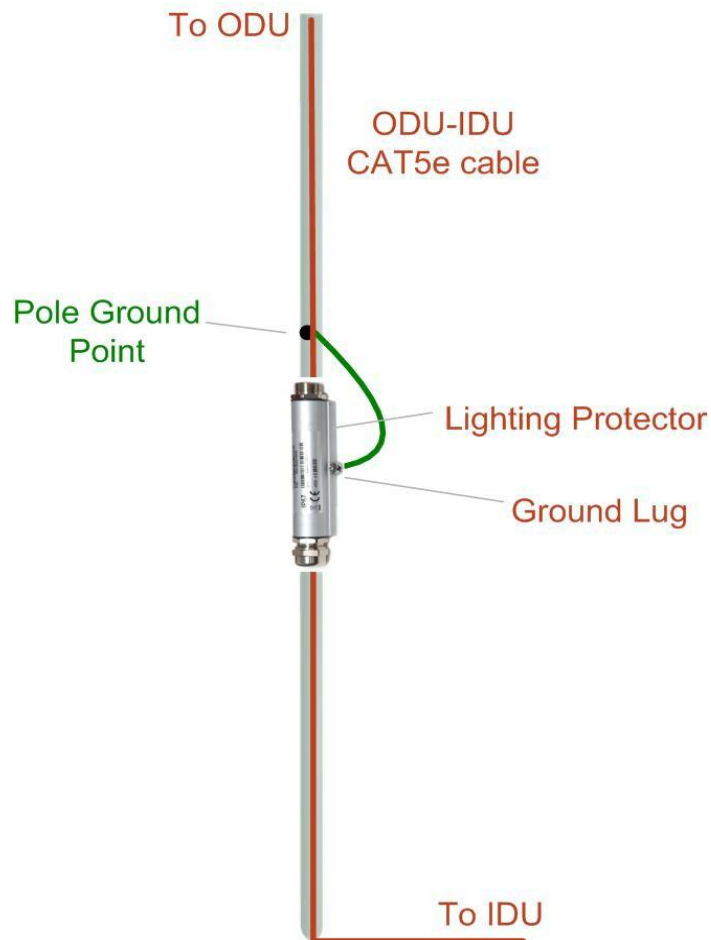


Figure 3-6: Lightning protector and grounding at building entry point

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/IDU are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.

Technical Specifications

Scope of these Specifications

This appendix contains technical specifications for the RADWIN 6000 appearing in this User Manual. They are correct at the date of publication, but are intended for general background only. The latest authoritative and most up to date technical specifications are available as Data Sheets obtainable from RADWIN Customer Service.

In any event, RADWIN reserves the right to change these specifications without notice.

ODU - RADWIN 6000

Capacity	24 simultaneous users
Range	Up to 3 km
Maximum data range	21.1 Mbps / 5.7 Mbps
Basic configuration	Small form factor outdoor unit connectorized for external cellular antennas
Integrated GPS Synchronization	Supported
Integrated GLONASS Synchronization	option
IEEE 1588	option
Tx Power	Configurable from 100mW up to 5 Watt (37 dBm), controlled by 1 dB step
Rx Diversity	Supported
Spectrum Sniffing	Supported (UMTS, GSM)
Power Supply	44-60 VDC or 90-264 VAC
Power Consumption	< 25W (typical)

Band	UL Frequencies (MHz)	DL Frequencies (MHz)
Band II (PCS)	1850–1910	1932.4–1987.6
Band V (CLR) (850)	824 - 849	871.4 – 891.6

Environmental

Operating Temperatures	- 30°C to +50°C / - 22°F to +122°F
Humidity	Up to 100% non-condensing, IP67
Storage	-40° to 85°C / -40°F to 185°F

Safety

FCC/IC (cTUVus)	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	47 CFR Class B, Part15, Subpart B
ETSI	EN 301 489-1, EN 301 489-23, EN 301 489-17
CAN/CSA	CISPR 22-04 Class B
AS/NZS	CISPR 22:2004 Class B

Interfaces

Local Connection / Transmission	10/100BaseT RJ45
Transmission and PoE	10/100BaseT RJ45, 802.3af/at PoE (legacy mode)
Core Network connectivity	Luh 3GPP Release 9, 3GPP TS 25.467, 3GPP TS 25.468, 3GPP TS 25.469
Management	TR-196/TR-069, SNMPv3, Web based, CLI

Mechanical

Dimensions	360(h) x 200(w) x 70(d) mm / 360(h) x 200(w) x 90(d) mm with backhaul option
Weight	4.5 kg / 5.5 kg with backhaul option
Volume	1.7 liter / 2 liter with backhaul option
Mount	Mast or wall mountable

Lightning Protector

Electrical

Compatible Interfaces	10/100/1000BaseT
Data Rates	Up to 1000Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC - 650 mA
Maximum Continues current	1 A
Impedance	90 to 110 Ohm
Connection type	RJ45 CAT 5e STP (shielded)
Pin-out	8 wires + shielding
Pins Protected	All pins protected
Response time	<5 microseconds (with ODU)

Nominal discharge currents

Line to Line	500 A @ 8/20 μ s
Line to Ground	2000 A @ 8/20 μ s

Impulse Discharge Current

20000 A, 8/20 μs	1 operation minimum
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 \pm20 % @ 100 V/s	150 V
100 V/μs	350 V
1000 V/μs	500 V
Capacitance	< 2 pF
DC Holdover Voltage	80V

Mechanical

Enclosure	Metal
Connection to bonding Network	Screw
Dimensions	150mm
Weight	220 gram (0.22Kg)

Environmental

Operating temperature	-40 to +60
Storage temperature	-50 to +70

Enclosure rating	IP67
Humidity	100% non condensing