



Installation Guide

PTP 820

RFU-E

System Release 10.9



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About This User Guide

This guide describes RFU-E installation procedures and provides additional information concerning system parts and frequency bands.

This guide contains the following chapters:

- [Chapter 1: Product description](#)
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Main website:	http://www.cambiumnetworks.com
Sales enquiries:	solutions@cambiumnetworks.com
Support enquiries:	https://support.cambiumnetworks.com
Repair inquiries	https://support.cambiumnetworks.com
Telephone number list:	http://www.cambiumnetworks.com/support/contact-support
Address:	Cambium Networks Limited, Linhay Business Park, Eastern Road, Ashburton, Devon, UK, TQ13 7UP

Purpose

Cambium Networks Point-To-Point (PTP) documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium PTP equipment and ancillary devices. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or express, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

Cross references

References to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered, but are individually named at the top of each page, and are listed in the table of contents.

Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents. Send feedback to support@cambiumnetworks.com.

Problems and warranty

Reporting problems

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

- 1 Search this document and the software release notes of supported releases.
- 2 Visit the support website.
- 3 Ask for assistance from the Cambium product supplier.
- 4 Gather information from affected units, such as any available diagnostic downloads.
- 5 Escalate the problem by emailing or telephoning support.

Repair and service

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the support website.

Hardware warranty

Cambium's standard hardware warranty is for one (1) year from date of shipment from Cambium Networks or a Cambium distributor. Cambium Networks warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days.

To register PTP products or activate warranties, visit the support website. For warranty assistance, contact the reseller or distributor.



Caution

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

Security advice

Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

In certain instances Cambium makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.

Warnings, cautions, and notes

The following describes how warnings and cautions are used in this document and in all documents of the Cambium Networks document set.

Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:

**Warning**

Warning text and consequence for not following the instructions in the warning.

Cautions

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:

**Caution**

Caution text and consequence for not following the instructions in the caution.

Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:

**Note**

Note text.

Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

In EU countries

The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium equipment in EU countries.



Disposal of Cambium equipment

European Union (EU) Directive 2002/96/EC Waste Electrical and Electronic Equipment (WEEE)

Do not dispose of Cambium equipment in landfill sites. For disposal instructions, refer to <http://www.cambiumnetworks.com/support>

Disposal of surplus packaging

Do not dispose of surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

Chapter 1: Before You Start

This chapter provides technical information about RFU-C installation. This chapter consists of the following sections:








- [Important Notes](#)
- [Safety Precautions & Declared Material](#)
- [Pre-installation Instructions](#)
- [Appendix Antenna Types](#)
- [Power Specifications](#)





Important Notes

- For the warranty to be honored, install the unit in accordance with the instructions in this manual.
- Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the warranty for such equipment.
- RFU-E is intended for installation in a restricted access location.
- RFU-E must be installed and permanently connected to protective earth by qualified service personnel in accordance with applicable national electrical codes

Safety Precautions & Declared Material

General Equipment Precautions

	<p>Caution</p> <p>To avoid malfunctioning or personnel injuries, equipment or accessories/kits/plug-in unit installation, requires qualified and trained personnel. Changes or modifications not expressly approved by Cambium Networks could void the user's authority to operate the equipment.</p>
	<p>Caution</p> <p>Where special cables, shields, adapters and grounding kits are supplied or described in this manual, these items must be used, to comply with the FCC regulations.</p>
	<p>Caution</p> <p>Use of controls, adjustments, or performing procedures other than those specified herein, may result in hazardous radiation exposure.</p>
	<p>Caution</p> <p>When working with a RFU-C, note the following risk of electric shock and energy hazard: Disconnecting one power supply disconnects only one power supply module. To isolate the unit completely, disconnect all power supplies.</p>
	<p>Caution</p> <p>Machine noise information order - 3. GPSGV, the highest sound pressure level amounts to 70 dB (A) or less, in accordance with ISO EN 7779.</p>
	<p>Anti Static</p> <p>Static electricity may cause body harm, as well as harm to electronic components inside the device. Anyone responsible for the installation or maintenance of the RFU-C RFU must use an ESD Wrist Strap. ESD protection measures must be observed when touching the unit. To prevent damage, before touching components inside the device, all electrostatic must be discharged from both personnel and tools.</p>
	<p>Caution</p> <p>In Norway and Sweden:</p> <p>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).</p> <p>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.</p>

	<p>Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.</p>
	<p>Caution Précautions générales relatives à l'équipement</p>
	<p>Caution L'utilisation de commandes ou de réglages ou l'exécution de procédures autres que celles spécifiées dans les présentes peut engendrer une exposition dangereuse aux rayonnements.</p>
	<p>Caution L'usage de RFU-C s'accompagne du risque suivant d'électrocution et de danger électrique : le débranchement d'une alimentation électrique ne déconnecte qu'un module d'alimentation électrique. Pour isoler complètement l'unité, il faut débrancher toutes les alimentations électriques.</p>
	<p>Caution Bruit de machine d'ordre - 3. GPSGV, le plus haut niveau de pression sonore s'élève à 70 dB (A) au maximum, dans le respect de la norme ISO EN 7779.</p>

Allgemeine Vorsichtsmaßnahmen für die Anlage

**Caution**

Wenn andere Steuerelemente verwendet, Einstellungen vorgenommen oder Verfahren durchgeführt werden als die hier angegebenen, kann dies gefährliche Strahlung verursachen.

**Caution**

Beachten Sie beim Arbeiten mit RFU-C das folgende Stromschlag- und Gefahrenrisiko: Durch Abtrennen einer Stromquelle wird nur ein.

**Caution**

Stromversorgungsmodul abtrennt. Um die Einheit vollständig zu isolieren, trennen Sie alle Stromversorgungen ab.

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 70 dB(A) oder weniger gemäß EN ISO 7779.

Pre-installation Instructions

Packing

The equipment must be packed and sealed in moisture absorbing bags.

Transportation and Storage

The equipment should be prepared for public transportation. The cargo must be kept dry during transportation, in accordance with ETS 300 019-1-2, Class 2.3.

It is recommended that the equipment be transported to the installation site in its original packing case.

If intermediate storing is required, the packed equipment must be stored in a dry and cool environment, and out of direct sunlight, in accordance with ETS 300 019-1-1, Class 1.2.

Unpacking

The equipment is packed in sealed plastic bags and moisture absorbing bags are inserted. Any separate sensitive product such as printed boards, are packed in anti-static handling bags. The equipment is further packed in special designed cases.

Marking is done according to standard practice unless otherwise specified by customers. The following details must be marked:

- Customers address
- Contract No
- Site name (if known)
- Case No

Inspection

Check the packing lists and ensure that correct parts numbers quantities of goods have arrived. Inspect for any damage on the cases and equipment. Please report any damage or discrepancy to Cambium Networks support by e-mailing to support@cambiumnetworks.com.

Antenna Types

RFU-E Antenna Types

RFU-E uses two types of antennas:

- Integrated 43 dBi Class 3 antenna
- Direct Mount antenna.

RFU-E Integrated Antenna

The following table describes the electrical parameters of the RFU-E integrated antenna.

Table 1: RFU-E Integrated Antenna – Electrical Parameters

Frequency coverage	71-86 GHz
Gain	43dBi
3dB beam width (azimuth and elevation)	1°
Polarization	Single Linear, V or H
Co/cross-polar ratio	>30dB
Side lobe suppression	ETSI EN 3020217-4 V2.1.1 (2017-05) CLASS 3

Direct Mount Antenna

RFU-E can be mounted directly using the following antenna types (for integrated antennas, specific antennas are required):

- CommScope: VHLP series

The Direct Mount antenna interface is according to:

Waveguide Standard		Antenna Flange
WR12		UG387/U

If a different antenna type (CPR flange) is used, a flange adaptor is required. Please contact your Cambium Networks representative for details.



Note

Appropriate lubricant or grease can be applied to the screws that connect the RFU-E to the antenna interface.

Power Specifications

Electrical Requirements

- Maximum Power Consumption: 43W (RFU-only)

Important Notes!

- The unit must only be installed by service personnel.
- The unit must have a permanent connection to protective grounding.
- The RSL interface connector is intended for technician use only.
- When using an external power source, the disconnect device (circuit breaker) in the building installation:
 - Shall be readily accessible and incorporated external to the equipment.
 - The maximum rating of the overcurrent protection shall be up to 6 Amp.

Environmental Specifications

Operating: ETSI EN 300 019-1-4 Class 4.1

Temperature range for continuous operating temperature with high reliability:

-33°C (-27°F) to +55°C (131°F)

Temperature range for exceptional temperatures; tested successfully, with limited margins:

-45°C (-49°F) to +60°C (140°F)

Humidity: 5%RH to 100%RH

IEC529 IP66

Storage: ETSI EN 300 019-1-1 Class 1.2

Transportation: ETSI EN 300 019-1-2 Class 2.3

Chapter 2: Grounding the RFU-E

List of Items

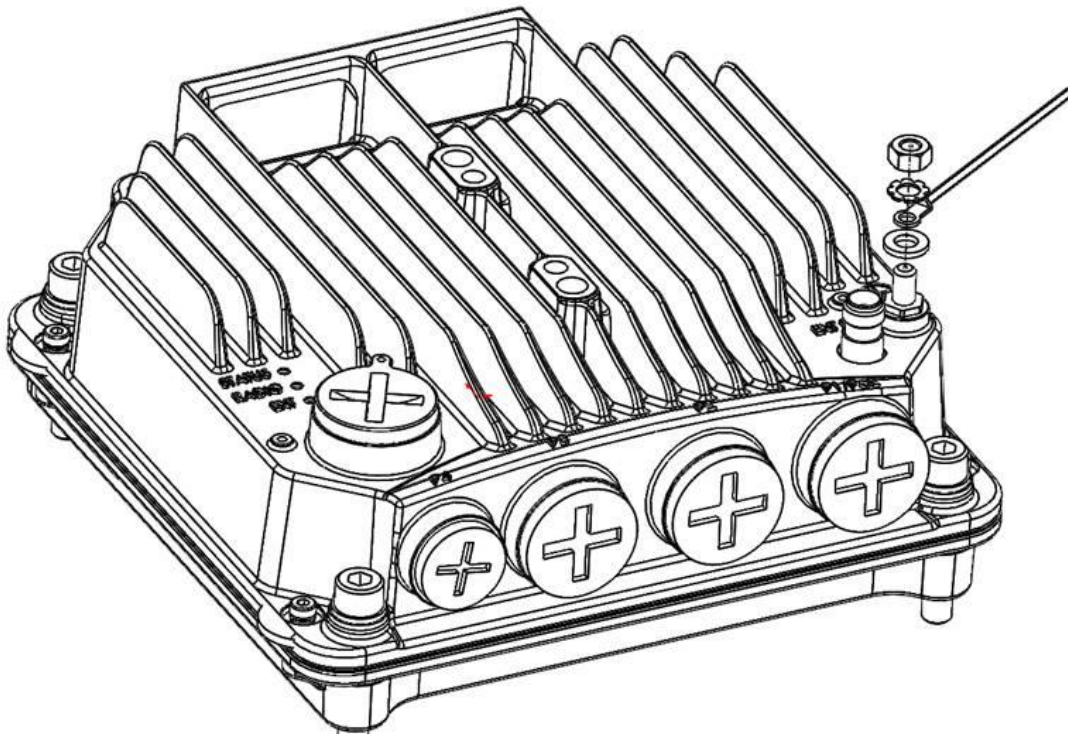
Item	Description	Quantity	Remarks
1	PTP 820 GROUND CABLE FOR IDU and ODU	1	

Required Tools

- Metric offset wrench key wrench #3
- Metric wrench 10mm

Procedure

1. On the front of each RFU-E unit, loosen the nut, plain washer, and serrated washer from the GND stud, using the metric offset hexagon key and the wrench.



2. Place the cable lug (supplied with the RFU-E grounding kit) in place on the screw.
3. Secure the cable lug.
4. The second side of the GND cable should be connected to the main ground bar or terminal ground bar of the site.
5. Perform a resistance test between the 2 lugs of the GND cable. Verify that the result is 0-2 ohms.

**Note**

The unit's earthing screw terminal shall be permanently connected to protective earth in a building installation in accordance with applicable national code and regulations by a service person.

Any outdoor antenna cable shield shall be permanently connected to protective earth in a building installation.

Chapter 3: Connecting the Data and Power Cables

RFU-E is connected to the IDU via a standard CAT-5e or preferably CAT-6/6a cable, with RJ-45 connectors on the RFU and an RJ-45 connector on the IDU. They can also be connected to the IDU over optical fiber cables via the optical (SFP) RFU connection on the IDU.

When using a CAT-5e or CAT-6 cable, the cable can carry both the data and the DC power required for the RFU-E. The CAT-5e or CAT-6 cable is connected to P1.

When using an optical fiber cable, an external DC power cable is required to supply power to the RFU. The DC power cable is connected to P1 and the optical fiber cable is connected to P2.



Note

P3 and P4 are reserved for future use.

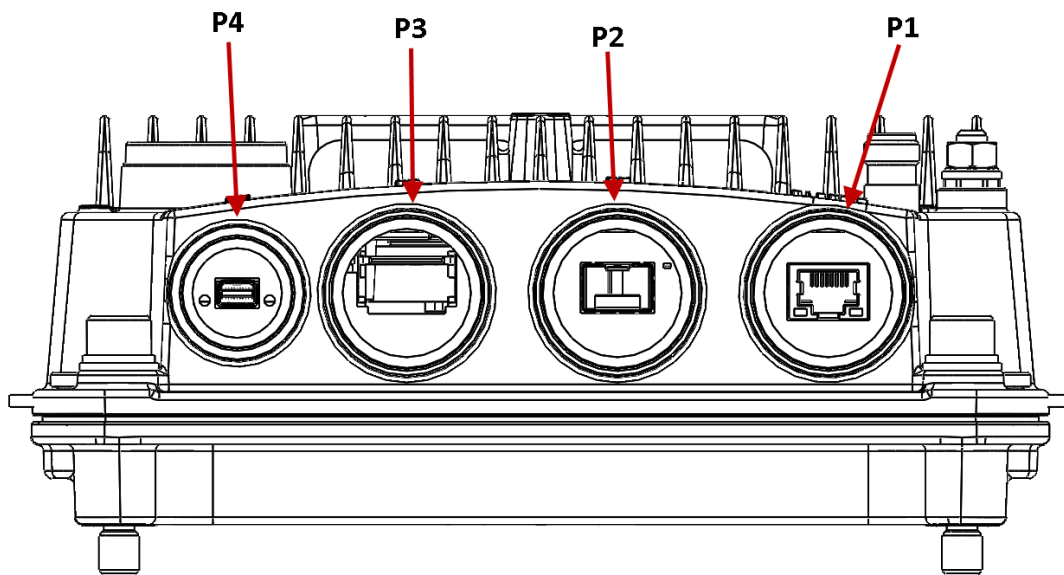


Figure 1: RFU-E Data and Power Interfaces

Table 2: Maximum Cable Length

Interface	Cable Type	Maximum Length
Optical	Fiber	300m
Electrical	CAT-5e (24 AWG)	150m
	CAT-6a (22 AWG)	150m
DC Power	DC (18 AWG)	150m
	DC (14 AWG)	151m-300m

Grounding the Cables

To fit the gland, the outer cable diameter should be between 6-10 mm.

Cables must be grounded as follows.

- For fiber cables (see [Connecting an Optical Fiber Cable and SFP](#)), no grounding is required.
- For DC power cables (see [Connecting a DC Power Cable](#)), no grounding is required.
- For CAT-5e/CAT-6 cables (see [Connecting a CAT-5e or CAT-6 Data Cable](#)), the shielded Ethernet cable (SF/UTP construction) must be grounded to the antenna tower at the top (next to the RFU), the entry to the indoor cabinet, and every 50m using the kit CAT6a_gnd_kit_kit.



Table 3: Cable Grounding Kit

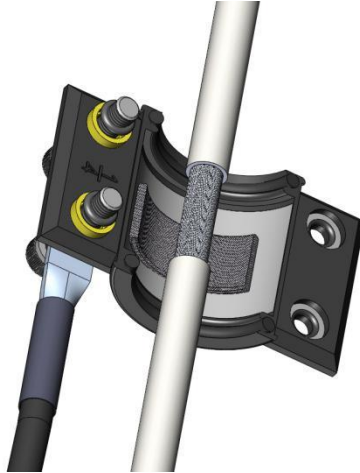
Marketing Model	Description
PTP 820 High Speed GND Kit for CAT6A Cable	Universal Grounding Kit

To connect the grounding kit:

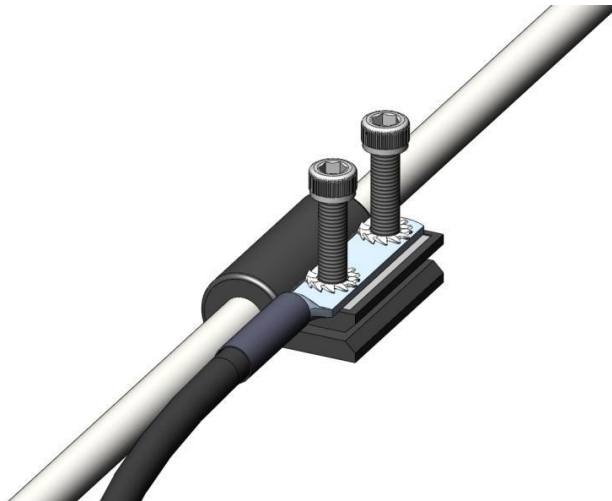
1. Strip the cable jacket.



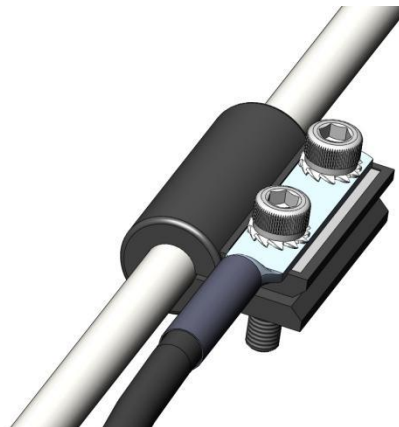
2. Place the cable in the middle of the grounding bracket.



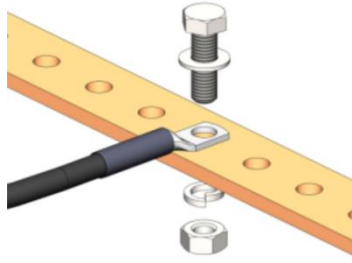
3. Close the grounding bracket around the cable.



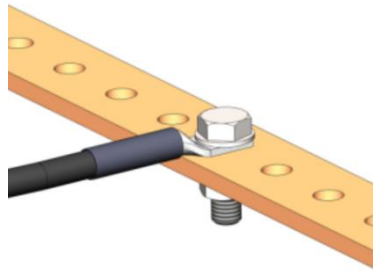
4. Tighten the two screws to secure the grounding bracket around the cable.



5. Install the grounding lug on the grounding bar, or directly to the tower.



6. Tighten the grounding lug.



Power Source

When selecting a power source, the following must be considered:

DC power can be from -40.5 to -59 VDC.

Recommended: Availability of a UPS (Uninterrupted Power Source), battery backup, and emergency power generator.

The power supply must have grounding points on the AC and DC sides.

**Caution!**

The user power supply GND must be connected to the positive pole in the RFU-E power supply. Any other connection may cause damage to the system!

**Note**

For the warranty to be honored, you must install the RFU-E in accordance with the instructions above.

Surge Protection

RFU-E includes built-in surge protection for its RJ-45 power and data port (P1). RFU-E's surge protection implementation for this port complies with EN61000-4-5, Class 4 , provided the DC or CAT-5e/CAT-6 cable was prepared according to the instructions in [Connecting a CAT-5e or CAT-6 Data Cable](#).

In areas in which severe lightning conditions are likely to occur, it is strongly recommended to add additional protection by placing lightning protectors on the CAT-5e or CAT-6 cable, near the connection point with the RFU-E unit.

Available Cable Options

Fiber Optic Cables - Single Mode

Table 4: Fiber Optic Cables - Single Mode

Marketing Model	Description
N000082L176A	PTP 820 Optical CABLE,SM, 5m
N000082L139A	PTP 820 Optical CABLE,SM, 30m
N000082L140A	PTP 820 Optical CABLE,SM, 50m
N000082L141A	PTP 820 Optical CABLE,SM, 80m
N000082L142A	PTP 820 Optical CABLE,SM, 100m
N000082L143A	PTP 820 Optical CABLE,SM, 150m

DC Cable and Connector

Table 5: DC Cable and Connector

Marketing Model	Description
N000082L019A	PTP 820 Outdoor_DC_cbl_2x18AWG_drum, 305m
N000082L165A	PTP 820 Mini Power Adaptor

Cat-5e Cable and Specifications

Table 6: CAT-5e Cable and Specifications

Marketing Model	Description
N000082L016A	PTP 820 CAT5E Outdoor 100m drum

Marketing Model	Description

This cable has the following specifications:

- Suitable for:
 - Fast Ethernet
 - Gigabit Ethernet
 - PoE

Cable Design – The numbers in the figure below refer to the items listed beneath the figure.

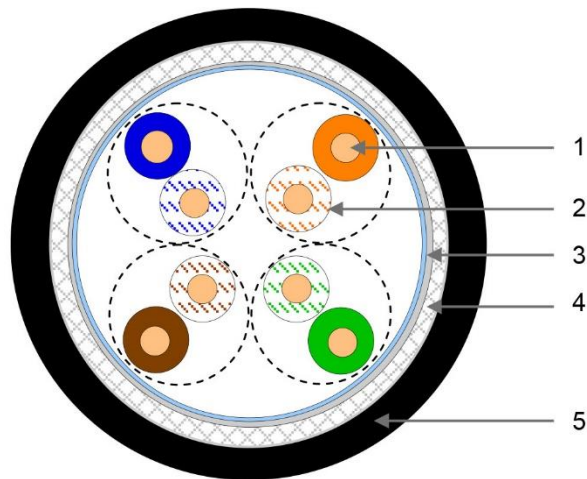


Figure 2: Cable Design

- [1] Conductor
- [2] Insulation
- [3] Screen: Alu/Pet foil. Alu outside
- [4] Tinned copper braid
- [5] Jacket

Table 7: CAT-5e Cable Color Code

Pair	Wire A	Wire B
1	WHITE-blue	BLUE
2	WHITE-orange	ORANGE
3	WHITE-green	GREEN
4	WHITE-brown	BROWN

Outdoor DC Cable Specifications

Table 10: Outdoor DC Cable Specifications – Electrical Requirements

Cable type	2 tinned copper wires
Wire gage	18 AWG (for ≤150m (492ft) installations, optical connections) 14 AWG (for 150m ÷ 300m (492ft ÷ 984ft) installations, electrical connections)
Stranding	stranded
Voltage rating	600V
Spark test	4KV
Dielectric strength	2KV AC min

Table 11: Outdoor DC Cable Specifications – Mechanical/ Environmental Requirements

Jacket	UV resistant
Outer diameter	7-10 mm
Operating and Storage temperature range	-40°C - 85°C
Flammability rating	According to UL-1581 VW1, IEC 60332-1
RoHS	According to Directive/2002/95/EC

Securing the Cables

All cables should be secured at every meter on-site using either a T-Rups kit, Marketing Model “Outdoor Ties” or cable clamps. When using the T-Rups kit, take special care to apply the proper amount of force in order to avoid damage to the cable. This is especially important for optical (SFP) cables.

Special Instructions for use of Glands



Note

Each RFU-E unit is supplied with one gland. If additional glands are required, they must be ordered separately, in kits of five glands each.

Table 12: Glands Kit

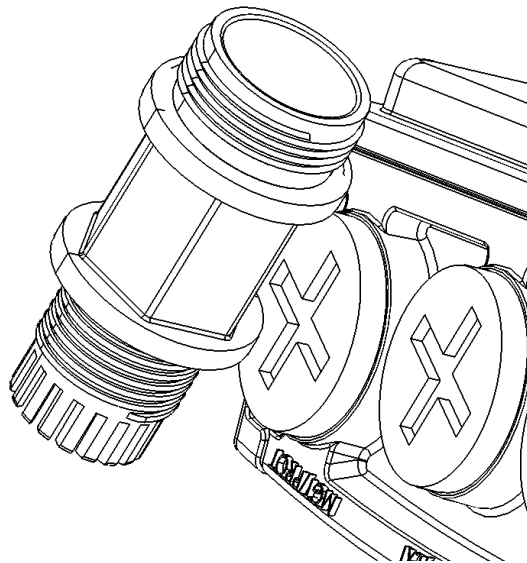
P/N	Description
N000082L014A	PTP 820 Glands_x5_KIT

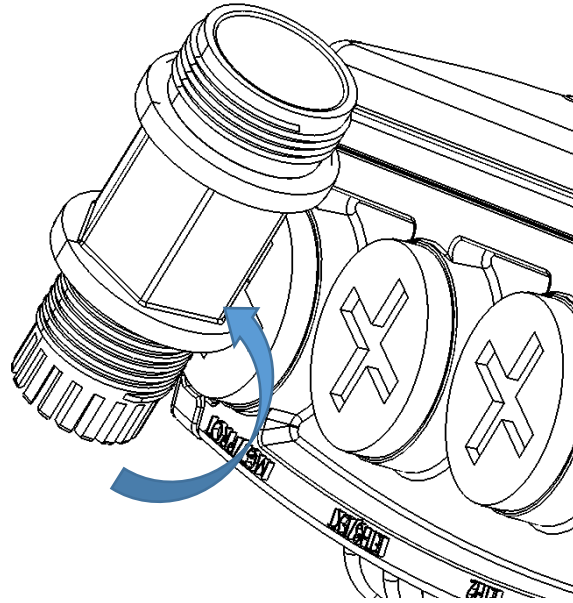
In addition, gland caps can be ordered to protect the cable and connector from damage when elevating the cable and gland to the radio unit. See Step **Error! Reference source not found.** in Section Appendix , General Installation Procedure. Gland caps are ordered separately, in kits of 10 caps each.

Table 13: Gland Caps

P/N	Description
N800082L009A	PTP 820E Cable Protection Cap (Qty 10)

In order to remove the plastic plugs for the unit, you can use the flange of supplied glands to disconnect them. See figures below.

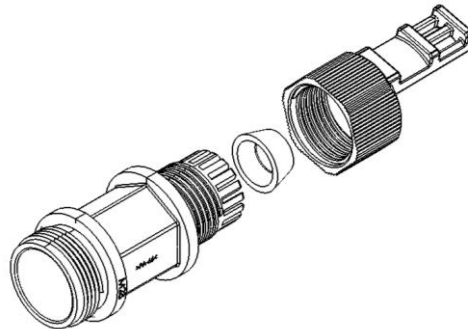




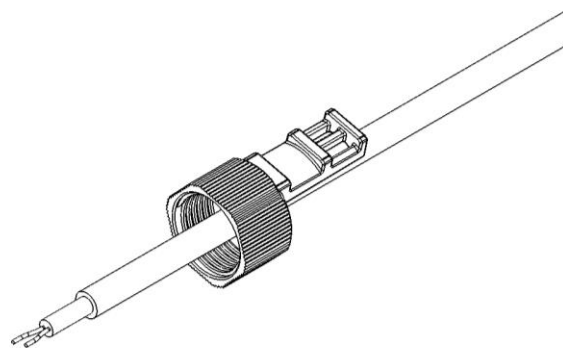
General Installation Procedure

This procedure applies to all cable types, and explains how to install the cables using long glands. The gland is supplied assembled.

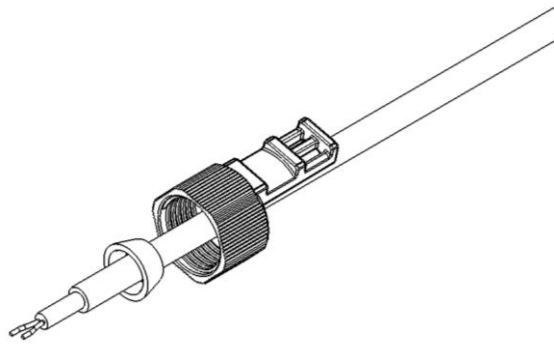
1. Before inserting a cable, you must disassemble the gland cap and gland rubber from the gland body.



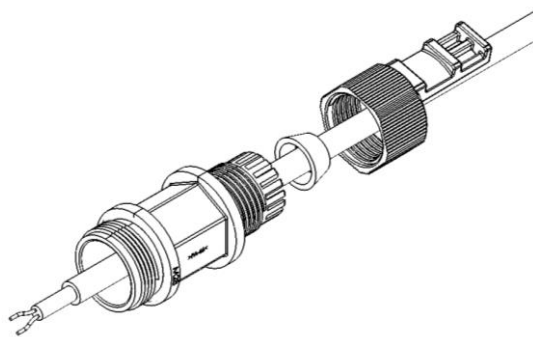
2. Slide the gland cap into the cable.



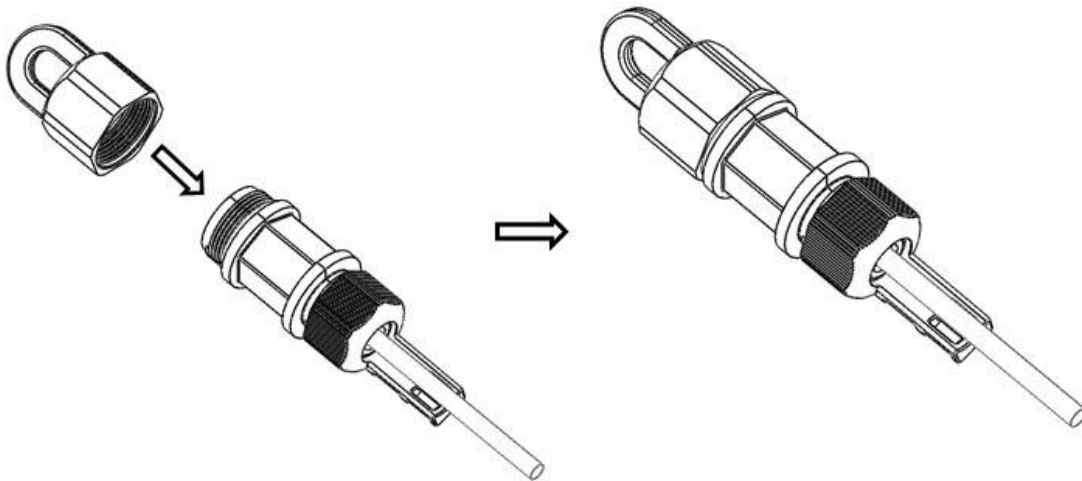
3. Slide the gland rubber into the cable.



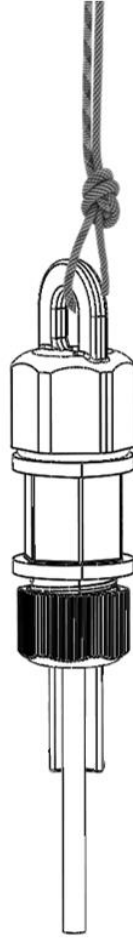
4. Slide the cable into the body of the gland. If you are using a gland cap (see Step **Error! Reference source not found.**), make sure to leave enough space for the gland cap to fit into the gland without disturbing the cable.



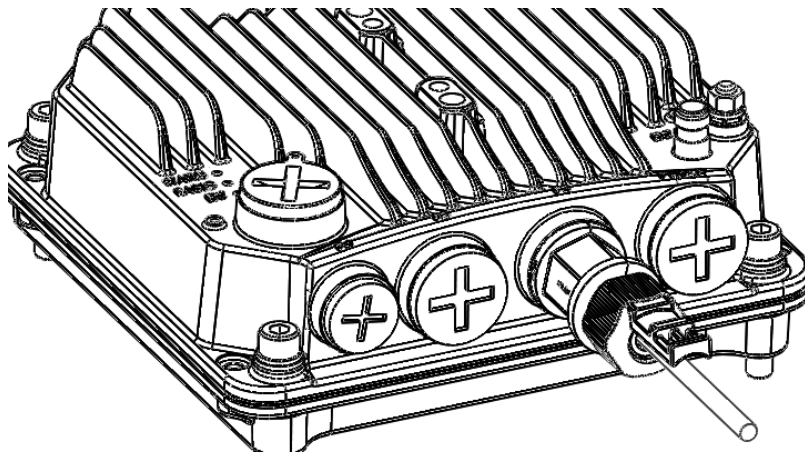
5. Optionally, after securing the cable into the body of the gland, you can close the other side of the gland with an M28 gland cap. The gland cap protects the cable and connector from damage when elevating the cable and gland to the radio unit.



6. The M28 gland cap has a hook on top. After attaching the gland cap to the gland, you can connect a rope to the hook and use this to lift the gland and cable up to the radio unit. Before screwing the gland into the radio unit, you must remove the gland cap.



7. If you used an M28 gland cap to close the gland when raising the gland and cable to the radio unit, remove the gland cap from the gland at this point by unscrewing the cap.
8. Connect the cable to the port.
9. Screw the gland into the radio unit until there is full contact between the gland and the radio unit.



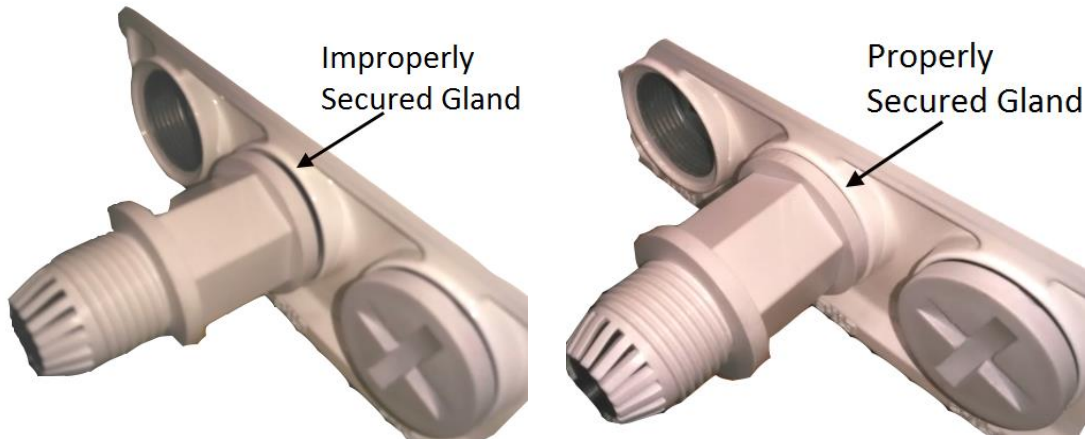
**Note**

Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface

10. Insert the main part of the gland into the thread in the radio body and tighten until there is full contact and the gasket is fully contained between the gland and the radio and cannot be seen. Tighten the gland gently and make sure there is no resistance. If there is resistance, stop immediately, and thread out the gland. Verify that the gland thread is not damaged and tighten the gland again.

**Note**

Pay attention that the gland rubber is properly located and not damaged during the tightening of the gland cap. If the gland thread is damaged do not use it!



11. Tighten the rear portion of the gland onto the main part of the gland and make sure that the main part of the gland does not have an additional swivel after the rear portion is secured.

**Note**

If the main portion of the gland is rotated while the rear portion is seizing the cable, this may ruin the cable connector.

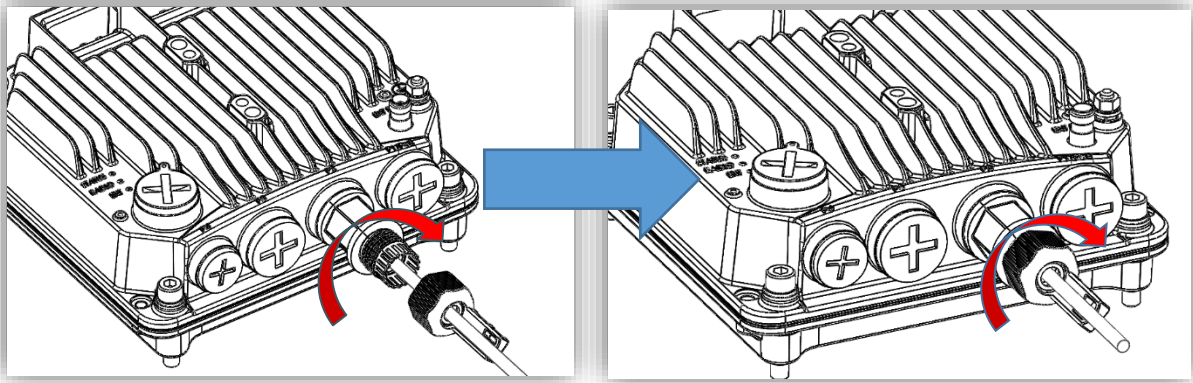
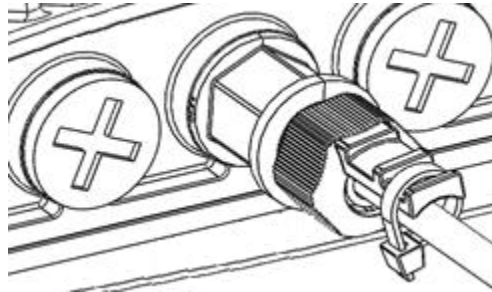


Figure 3: Tightening the Front Portion of the Gland

Figure 4: Tightening the Rear Portion of the Gland

12. Secure the cable to the lip of the gland using a tie wrap.

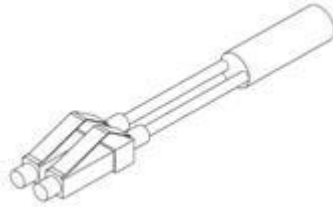


Connecting an Optical Fiber Cable and SFP

When using an optical fiber cable, the cable must be inserted in port P2. A separate DC power cable must be used to connect the RFU-E to an external power source. See [Connecting a DC Power Cable](#).

To connect an optical fiber cable and the SFP transceiver:

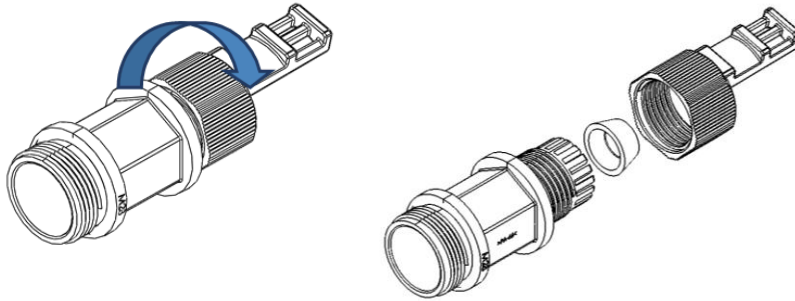
1. Use a pre-assembled cable.



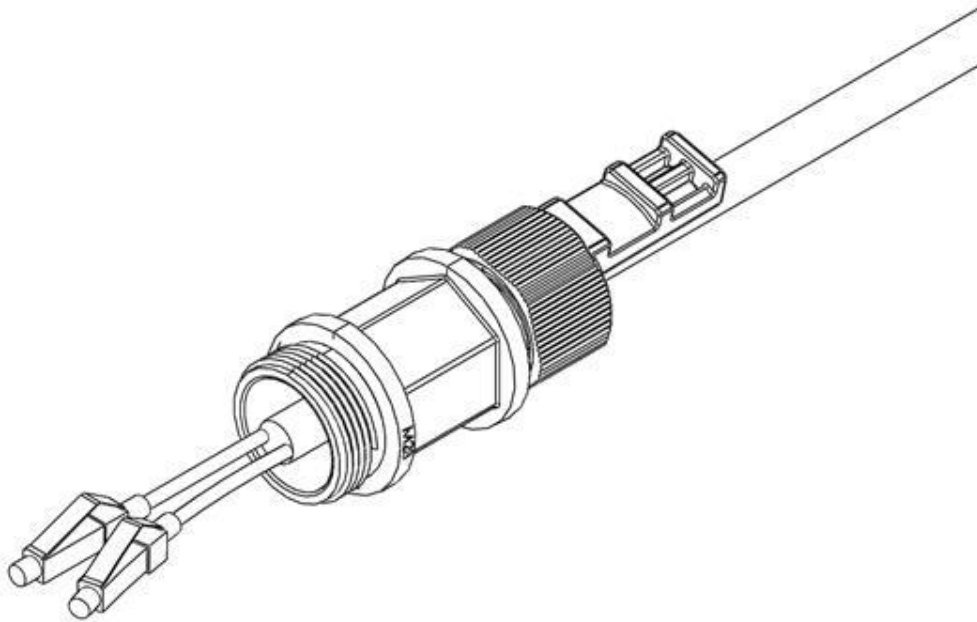
2. Split the connector into two separate LC connectors (one for each fiber).



3. Remove the gland cap and rubber from the gland body.



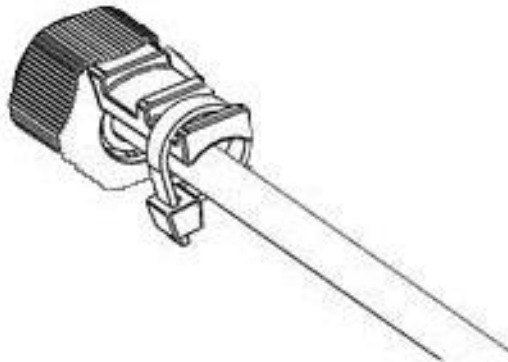
4. Slide the gland cap into the cable.
5. Slide the rubber into the cable.
6. Insert the fibers with the connectors one by one into the cable gland.



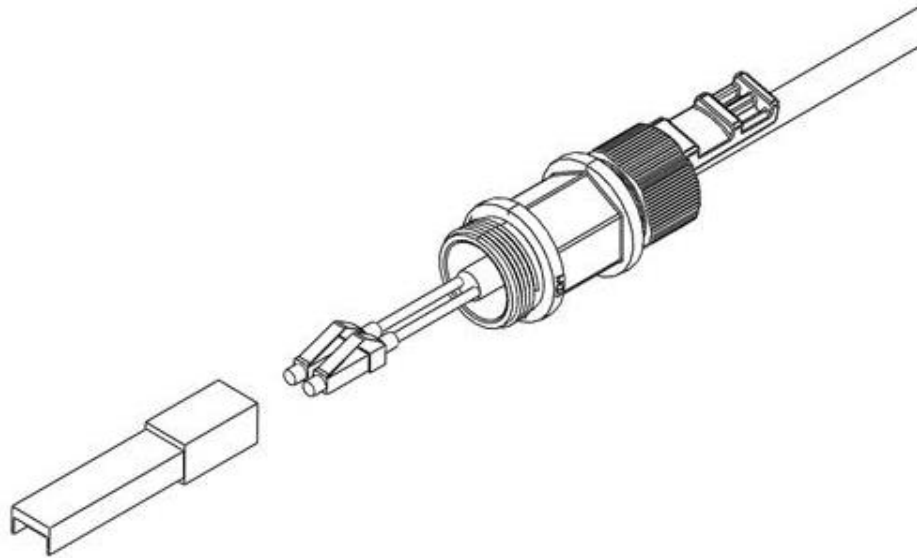
7. Secure the cable to the lip of the gland using a tie wrap.



Important Note! If you are raising the cable to a radio unit on a tower, this step is crucial to prevent the cable from slipping from the gland, which could damage the connector.



8. Connect the fibers to the SFP transceiver. Listen for the “click” to ensure that they are fully inserted.

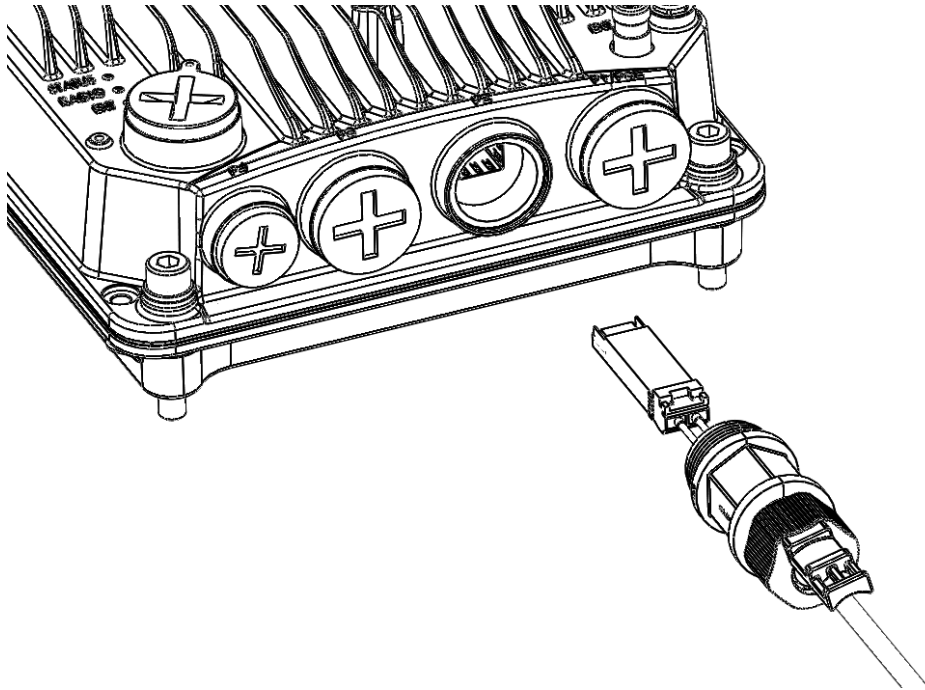


9. Remove the tie wrap securing the cable to the gland.



Note A new tie wrap must be used to secure the cable to the gland at the end of the procedure, as described in Step **Error! Reference source not found.**

10. Connect the connector into the RFU-E connector.



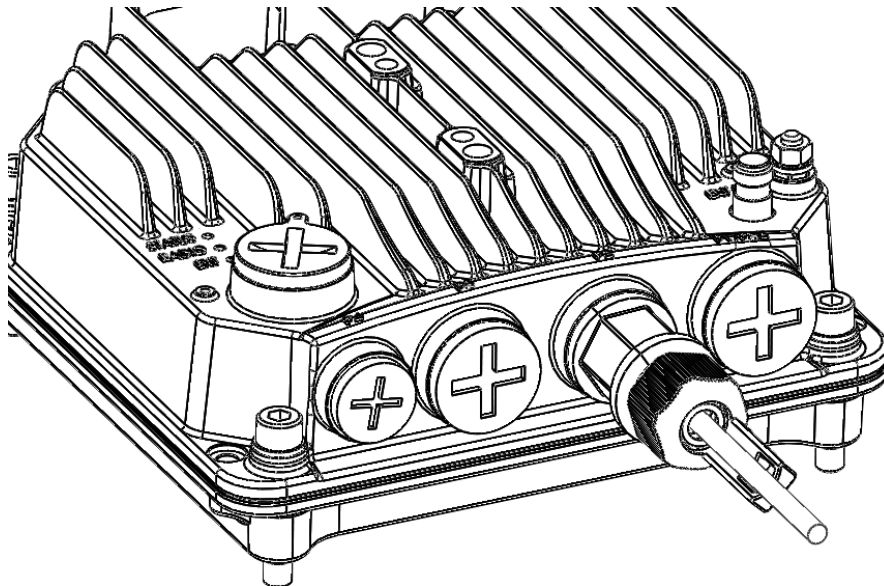
11. Tighten the gland to the radio unit until there is full contact between the gland and the radio unit.
12. Tighten the gland cap.



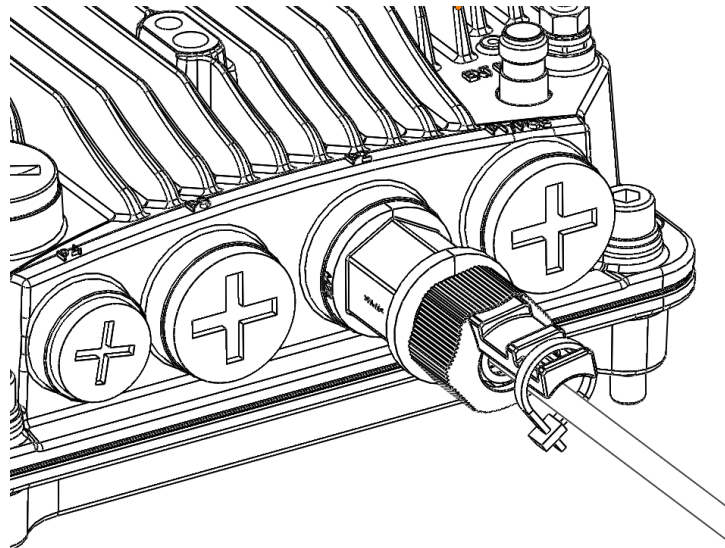
Important Note! Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit.

Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface. Tighten the gland gently and make sure there is no resistance. If there is resistance, stop immediately, thread out the gland, and verify that the gland threads are not damaged. Then, tighten the gland again.

If the gland thread is damaged do not use it!



13. Secure the cable to the gland using a tie wrap.



Connecting a DC Power Cable

When the RFU-E is connected to the IDU via an optical fiber cable, a DC power cable must be connected to port P1 to provide power from an external power source to the RFU. A special power connector is used with the cable, as described in Steps **Error! Reference source not found.** and .



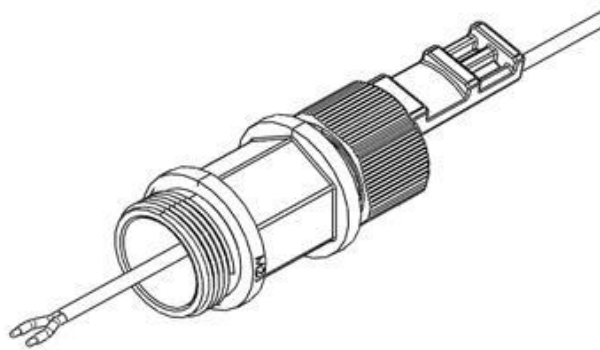
Note: The DC power cable and connector must be ordered separately. See [DC Cable and Connector](#).

To connect a DC power cable:

1. Strip off 45 mm from the cable jacket.
2. Expose 10 mm at the edge of each of the two wires.

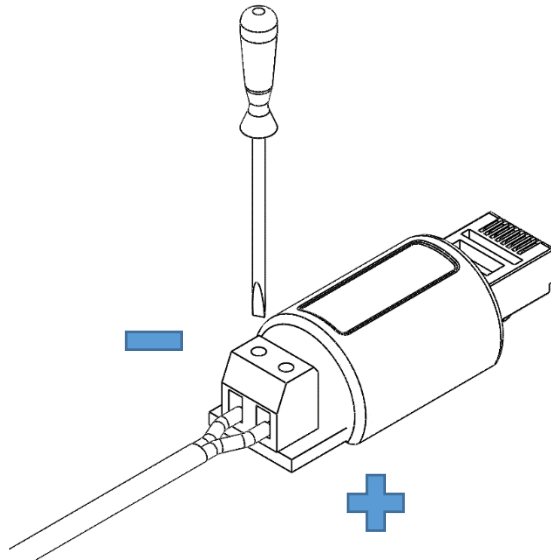


3. Insert the power cable into the gland.

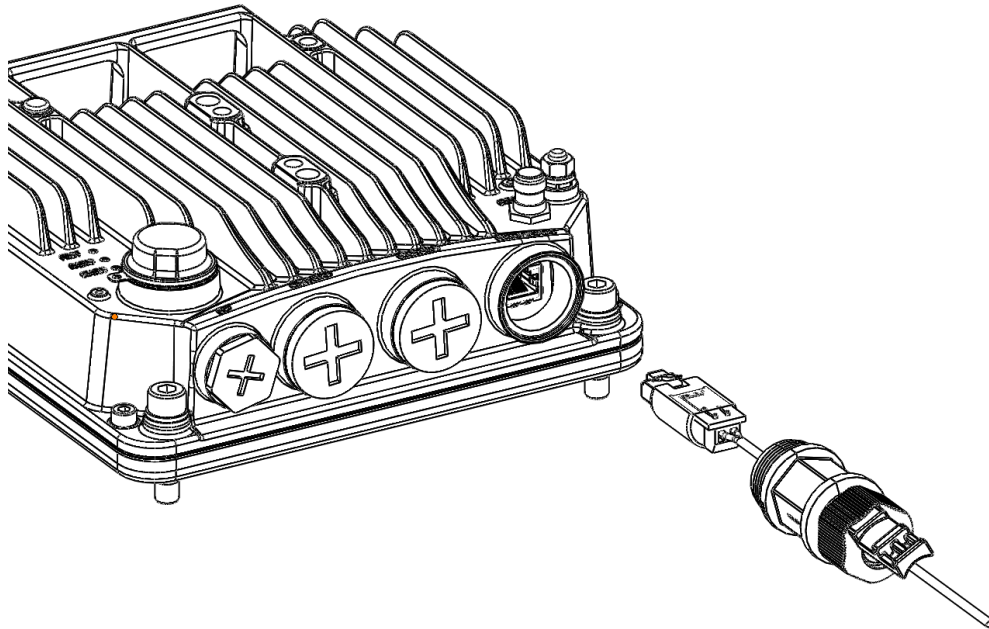


4. Insert the power cable wires into the power connector.

5. Insert the power cable wires into the power connector. Match “+” to the 0V wire and “-” to the -48V wire, and tighten the screws with a flat screwdriver.



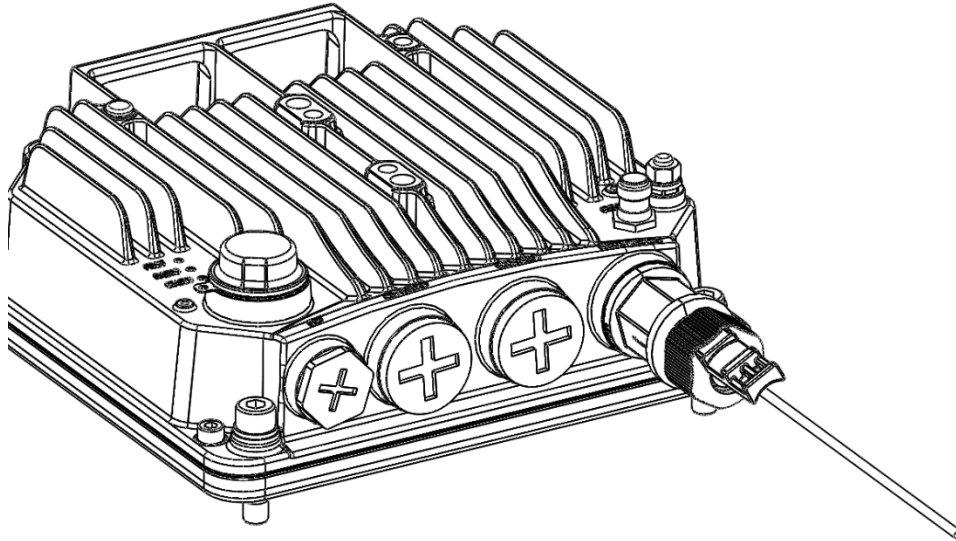
6. Plug the power cable with connector into the P1 port.



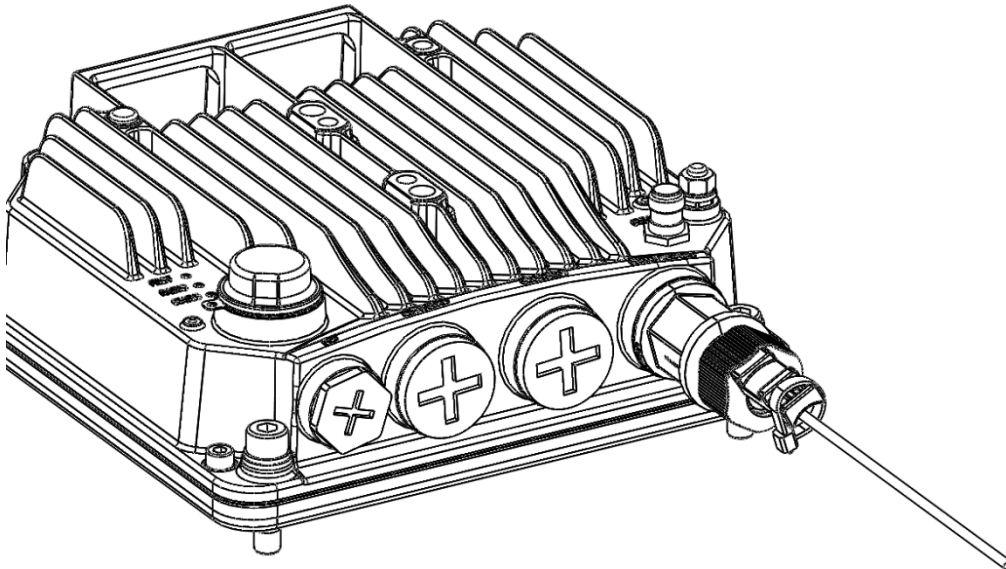
7. Screw the gland into the radio unit



Important Note! Before tightening the gland, make sure the gland is even with the cover. Tighten the gland gently and make sure there is no resistance. If there is resistance, stop immediately and verify that the gland is not being inserted at an angle. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface.



8. Tighten the gland cap.
9. Secure the cable to the gland with a tie wrap.



Connecting a CAT-5e or CAT-6 Data Cable

If you need to assemble the CAT-5e or CAT-6 cable, follow the instructions in section 0, *Preparing the CAT-5e or CAT-6 Cable and Plug-in Field*, then proceed to section 0, *Connection of CAT-5e or CAT-6 Cable to RFU-E*.

If you using a pre-assembled CAT-5e or CAT-6 cable, follow the instructions in section 0, *Preparing the CAT-5e or CAT-6 Data Cable Already Assembled*, then proceed to section 0, *Connection of CAT-5e or CAT-6 Cable to RFU-E*.



Note: To ensure proper grounding and connectivity, it is recommended to use pre-assembled CAT-5e or CAT-6 cables.

Important Note! To ensure proper grounding, the RJ-45 plug must be shielded, with a crimping tail.

Preparing the CAT-5e or CAT-6 Cable and Plug-in Field



Table 14: Materials for Preparing Ethernet Data Cables

P/N	Description
N000082L016A	PTP 820 CAT5E Outdoor 100m drum
N000082L014A	PTP 820 Glands_x5_KIT
N000082L173A	PTP 820 High Speed GND Kit for CAT6A Cable
N000082L073A	PTP 820 GBE_Connector_kit

To prepare the CAT-5e or CAT-6 cable and plug-in field:

1. Prepare the gland and insert the cable, as described in [General Installation Procedure](#).
2. Strip off approximately 45 mm of the outer insulation jacket from the CAT-5e or CAT-6 cable.
3. Do not strip off the end of the cable shield, but rather, twist the shield to form a braid.



4. Roll back the foil shield insulation and wrap the drain wire around the foil. Do not remove any insulation from the conductors.
5. Align the colored wires.

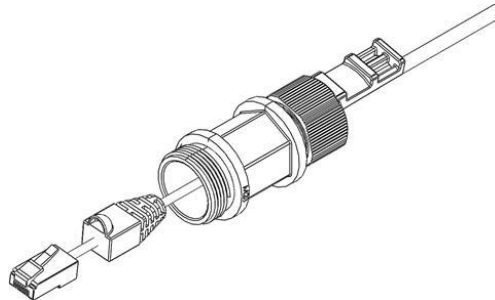


Note: Cord colors should be matched to the same pins on both ends of the cable.

6. Trim all wires to the same length. About 12 mm on the left should be exposed from the inner sheath.
7. Separate the wires and place the twisted shield between the separated wires.



8. Insert the wires into the RJ45 plug. Verify that each wire is fully inserted into the front of the RJ45 plug and in the correct order, according to the pinouts shown in Section Appendix , *Outdoor CAT-5e Cable Specifications*. The sheath of the CAT-5e or CAT-6 cable should extend into the plug by about 13 mm and held in place by the crimp.
9. Extend the cable jacket with the shield into the connector about 5 mm for strain relief and shielding connection.



10. Wrap the twisted braid firmly around the cable jacket and let the crimping tail of the RJ45 plug envelop it.



Important Note! To ensure proper grounding, it is essential that the twisted braid be firmly connected to the RJ45 plug.



Twisted Braid Enveloped by Crimping Tail

11. Crimp the RJ45 plug with the crimp tool. Make sure the twisted shield is crimped firmly to the RJ45 plug.



12. Verify that the wires ended up the correct order and that the wires extend to the front of the RJ45 plug and make good contact with the metal contacts in the RJ45 plug.
13. Push back the CAT-5e or CAT-6 plug cover on the connector plug.

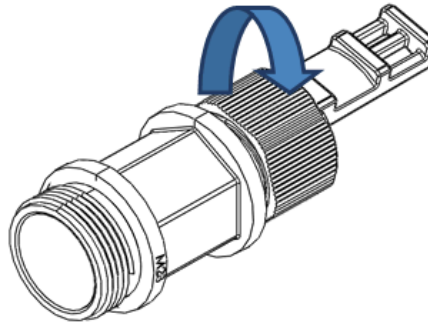


Note: It is recommended that the newly prepared cable be tested with a Cable Analyzer such as the FLUKE DTX-1800 (or the equivalent), to make sure the cable complies with ANSI/TIA/EIA-568-B-2. Make sure to verify both connectivity and grounding continuity at both ends of the cable.

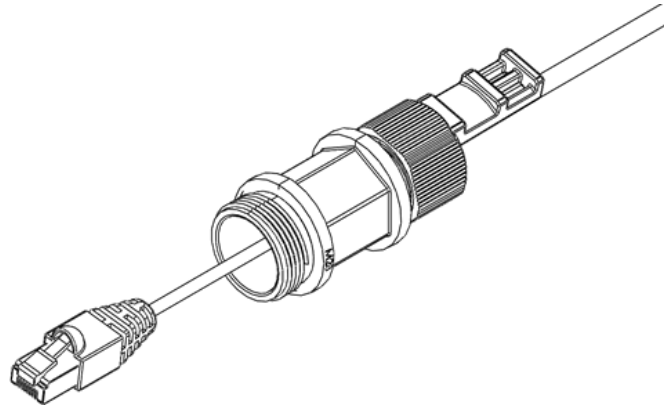
Preparing the CAT-5e or CAT-6 Data Cable Already Assembled

To prepare the CAT-5e or CAT-6 cable already assembled:

1. Release the gland cap and the gland rubber slightly.



2. Insert the CAT-5e or CAT-6 cable into the gland cap and into the rubber gland.

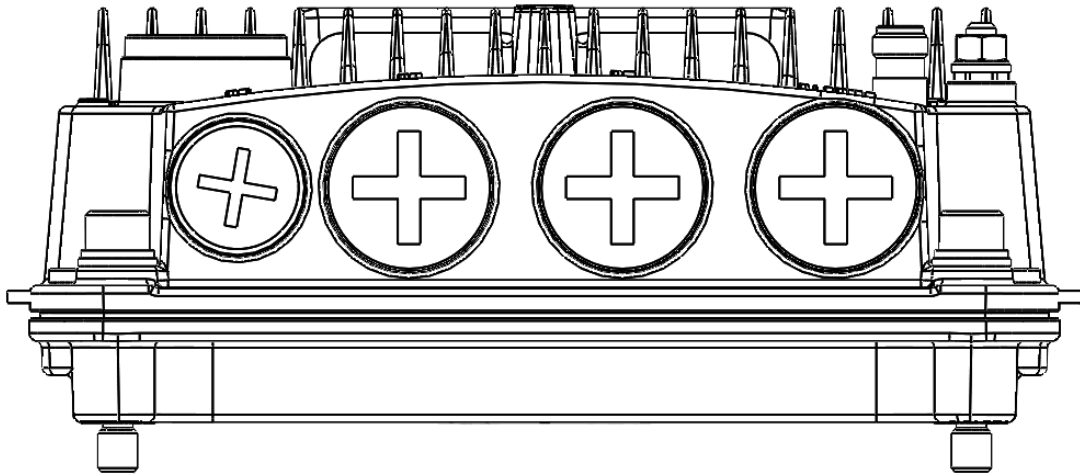


3. Insert the CAT-5e or CAT-6 cable into the gland body.

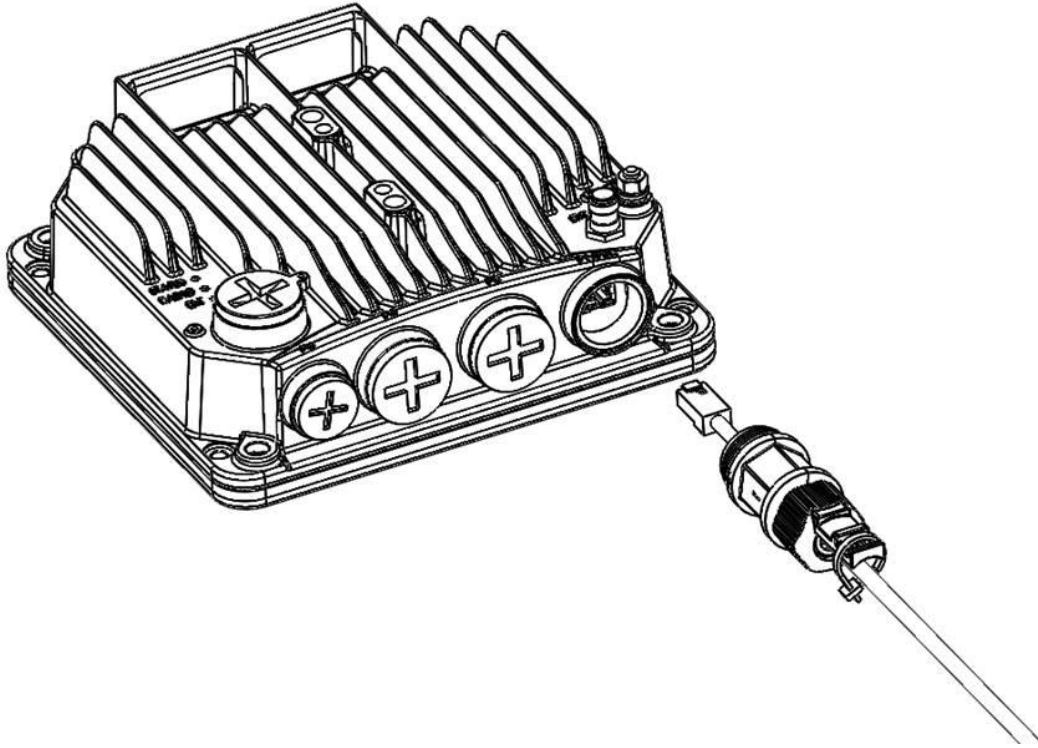
Connection of CAT-5e or CAT-6 Cable to RFU-E

To connect the CAT-5e or CAT-6 cable to the RFU-E:

1. Remove the relevant cap from the RFU-E radio. You can use the side of the gland to unscrew the cap.



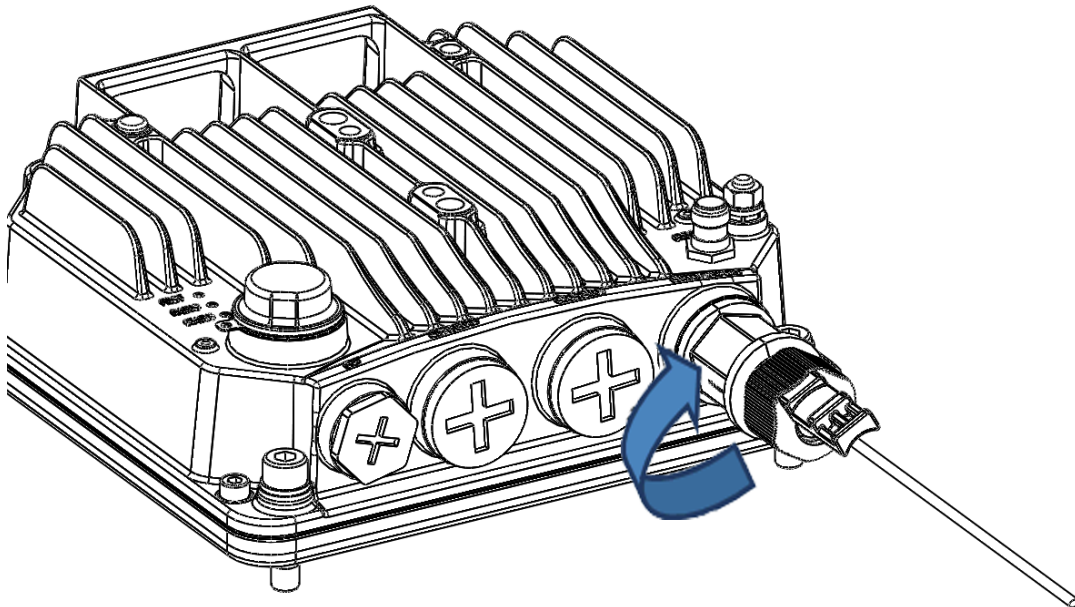
2. Connect the cable to the RFU-E.



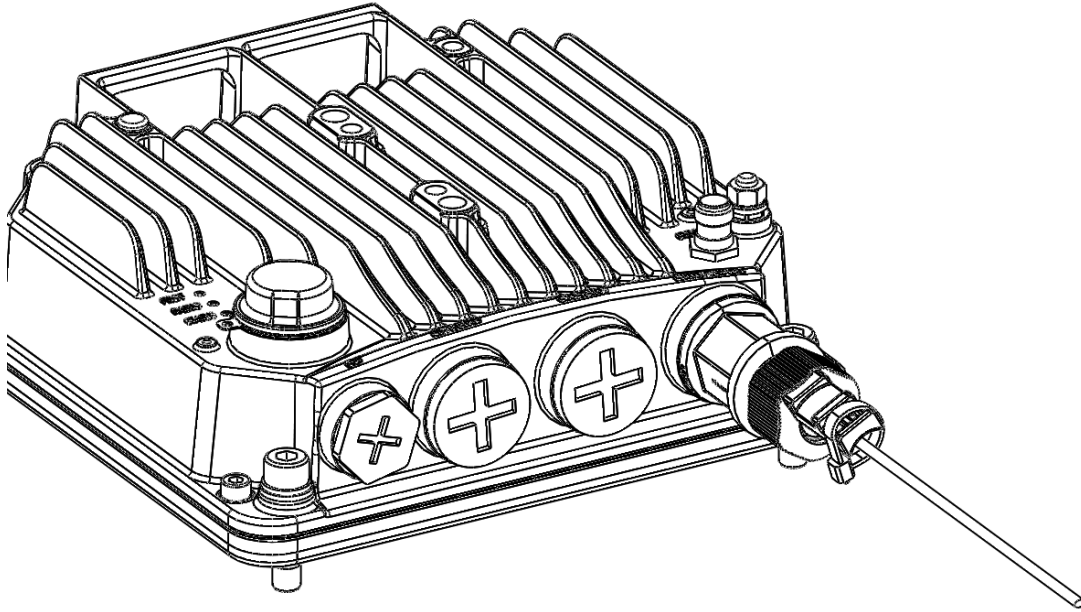
3. Screw the gland into the radio unit.



Important Note! Before tightening the gland, make sure the gland is even with the cover. Tighten the gland gently and make sure there is no resistance. If there is resistance, stop immediately and verify that the gland is not being inserted at an angle. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface.



4. Tighten the gland cap.
5. Secure the cable to the gland using a tie wrap.



Chapter 4: Generic Installation Procedures

Before starting an installation, use a leveler to make sure that the poles are 100% vertical. You need to check both sides of each pole at 90 degrees separation. This is a critical step in any link but most important when installing XPIC.

Torque Requirements

When tightening the captive screws, use 20 Nm torque for radio-antenna, radio-mediation device, and mediation device-antenna connections. In order to avoid misalignment, screws should be tightened progressively.

When fastening a waveguide to the radio or mediation device, use the following torque, according to frequency and screw type:

- 6 GHz: M5/#10-32: 3.5 Nm
- 7/8-15 GHz: M4/#8-32: 2.5 Nm
- 18-42 GHz: M3/#4-40: 1Nm

Chapter 5: Installation Procedure and Antenna Alignment – 1+0 with 43 dBi Flat Antenna and Alignment Device

When you order an RFU-E with a 43 dBi flat antenna, the radio and antenna are delivered together as a single unit. The polarization is determined by the placement of the radio-antenna unit.

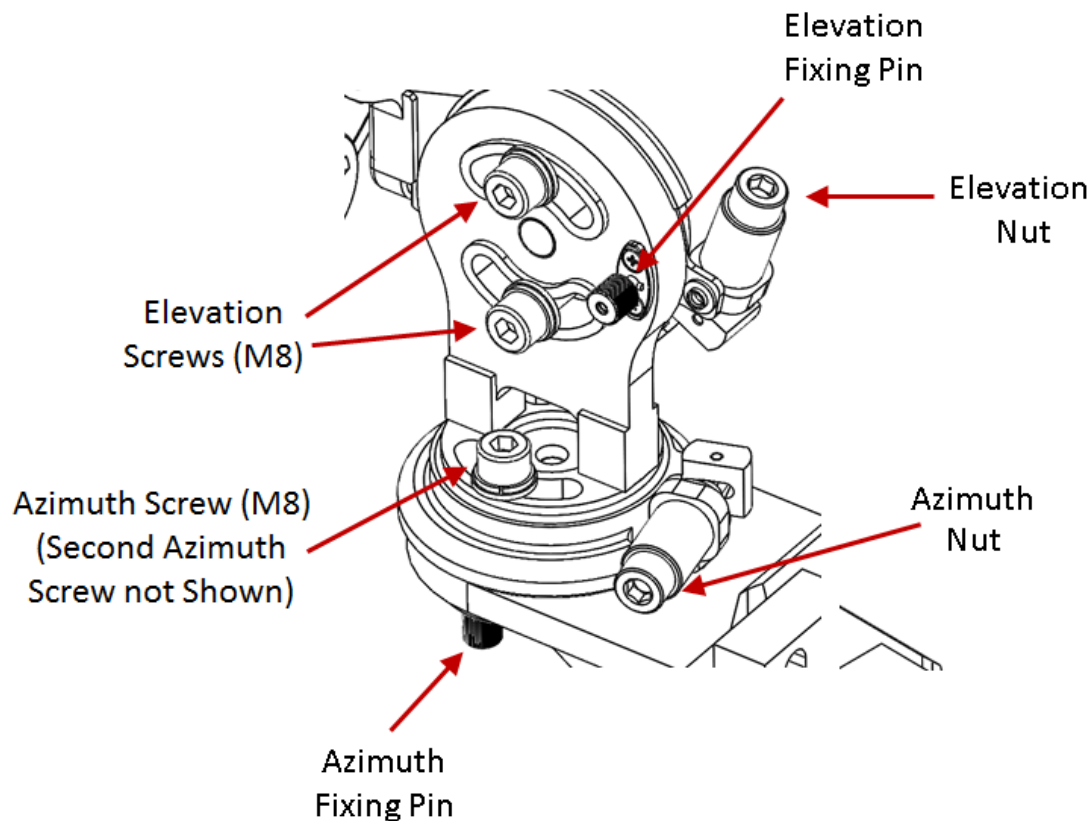


Figure 5: Installation and Alignment Device – Azimuth and Elevation Adjustment Tools

The installation and alignment device enables you to easily adjust the antenna's azimuth and elevation, in gross and fine intervals. Gross alignment enables you to adjust the azimuth and elevation in 15° increments. Fine alignment enables you to make more precise adjustments by turning the Azimuth and Elevation nuts such that each ¼ turn is equal to an adjustment of 0.25°.

There are two M8 Elevation Screws and two M8 Azimuth screws, as shown in Figure 5. Before starting the alignment, make sure these screws are securely in place so they will not fall out during the procedure, but not too tight, so as to enable you to manually adjust the azimuth and elevation to the approximate position you want, before performing exact antenna alignment as described in the following sections.

Upon delivery, the installation and alignment device is aligned 45° downward (elevation) and straight ahead (azimuth).

You can adjust the azimuth up to 45° in either direction by manually turning the azimuth base.

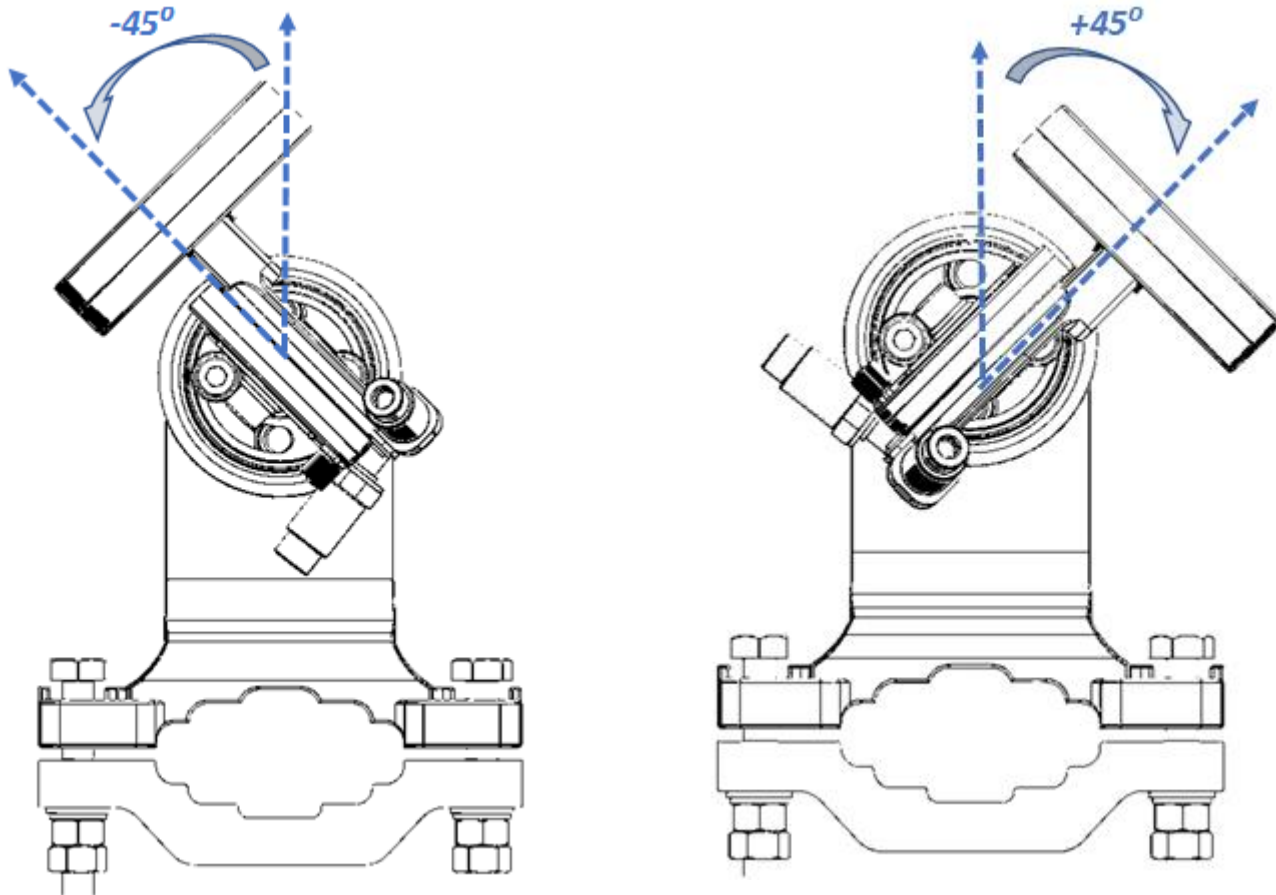


Figure 6: Installation and Alignment Device – Azimuth Range

For wall mount installations, you can adjust the azimuth an additional 45° in either direction by changing the placement of the Azimuth Screws. This enables you to adjust the azimuth a full 90° in either direction. See Extending the Azimuth Range.

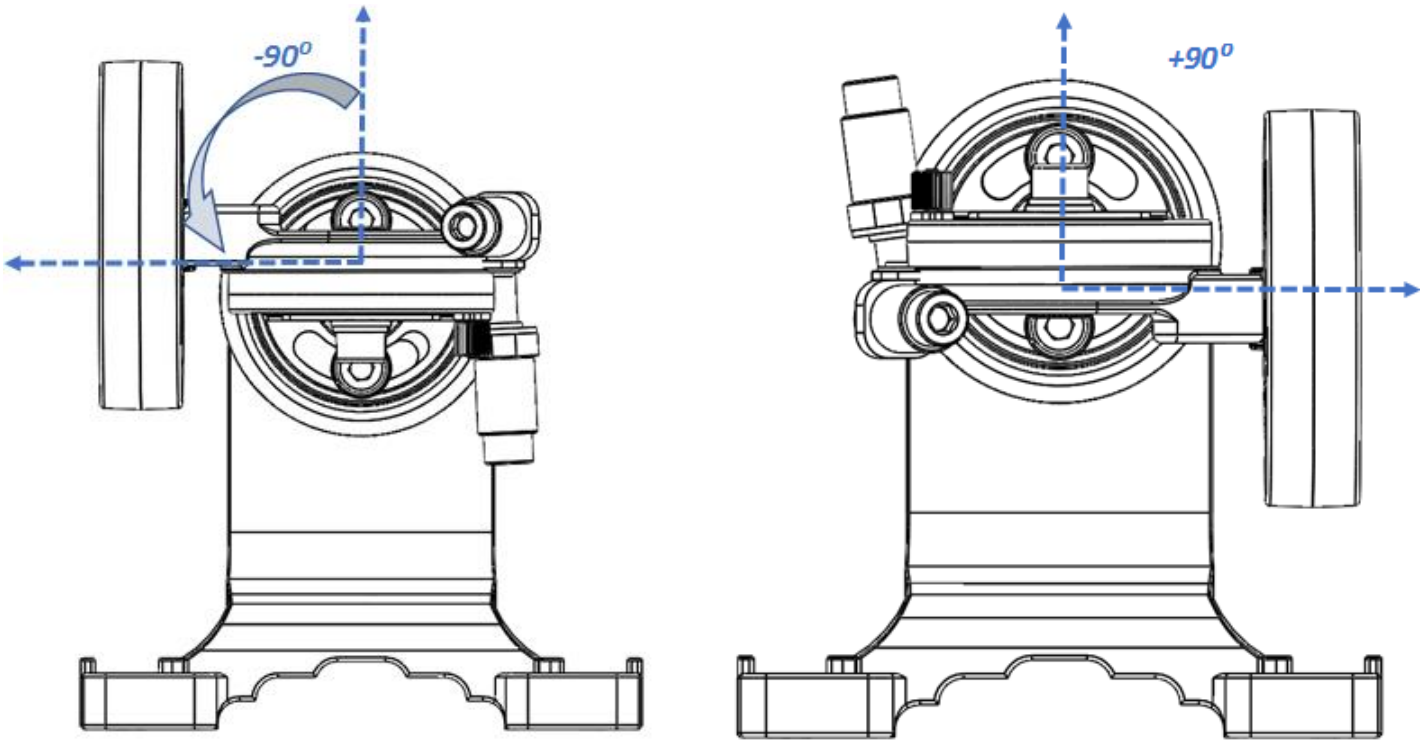


Figure 7: Installation and Alignment Device – Extended Azimuth Range

You can adjust the elevation from the delivery position of 45° downward to a position as far as 45° upward. Be sure to attach the RFU-E radio and antenna to the installation and alignment device *before* adjusting the elevation, otherwise the weight of the radio and antenna might accidentally reduce the elevation angle.

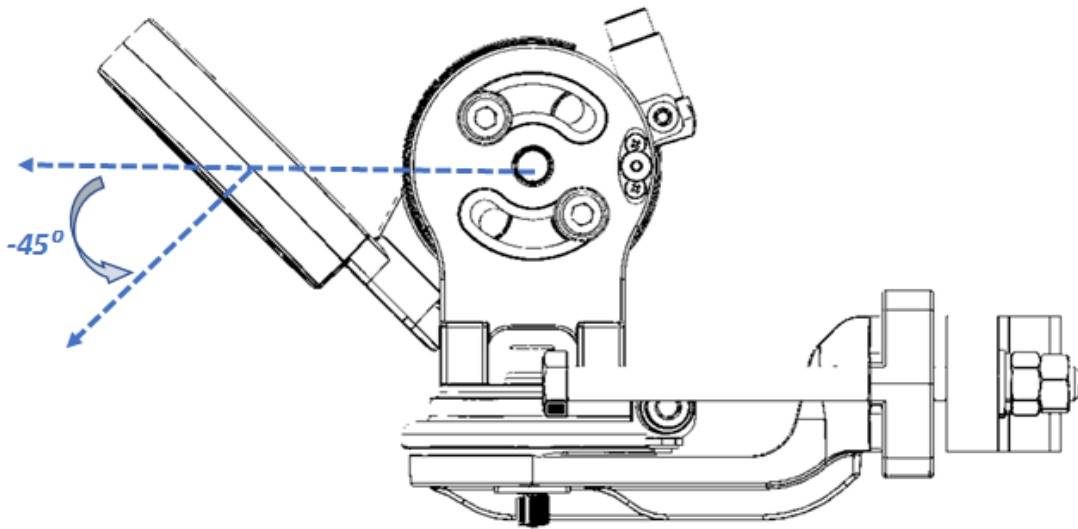


Figure 8: Installation and Alignment Device – Delivery Elevation (45° Downward)

You can adjust the elevation upwards as far as 45° upward.

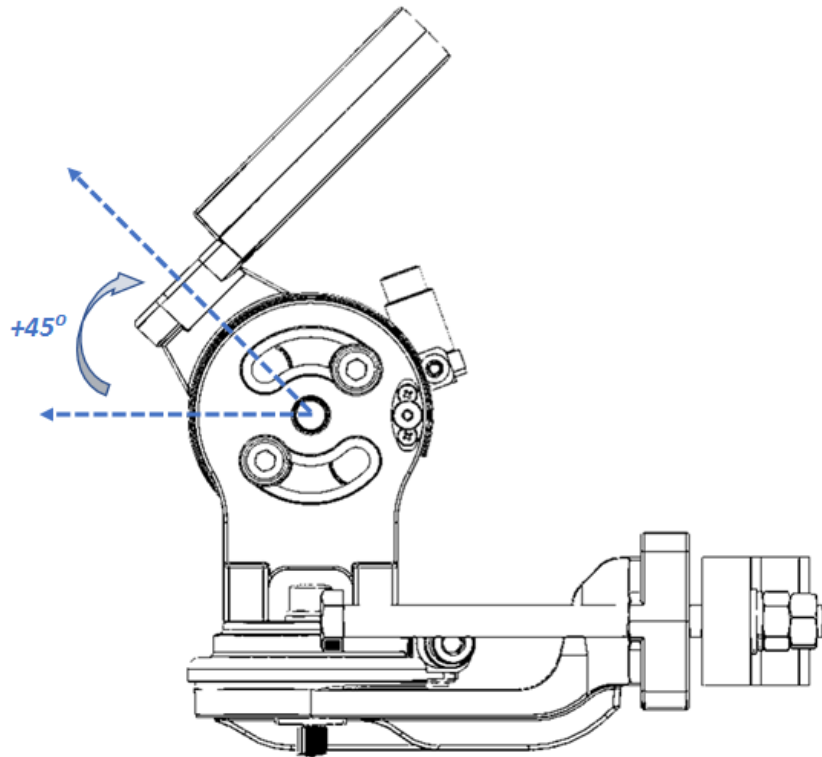


Figure 9: Installation and Alignment Device – Highest Elevation (45° Upward)

Pole Mount Assembly and Installation

The pole diameter range for pole mount installations is 8.89 cm – 11.43 cm (3.5 inches – 4.5 inches).



Note: The RFU-E radio can be assembled on the installation and alignment device on the ground, prior to attaching the device to the pole mount, if the logistics of the location make this more feasible than attaching the radio afterwards. See Attaching the RFU-E to the Installation and Alignment Device.

List of Items

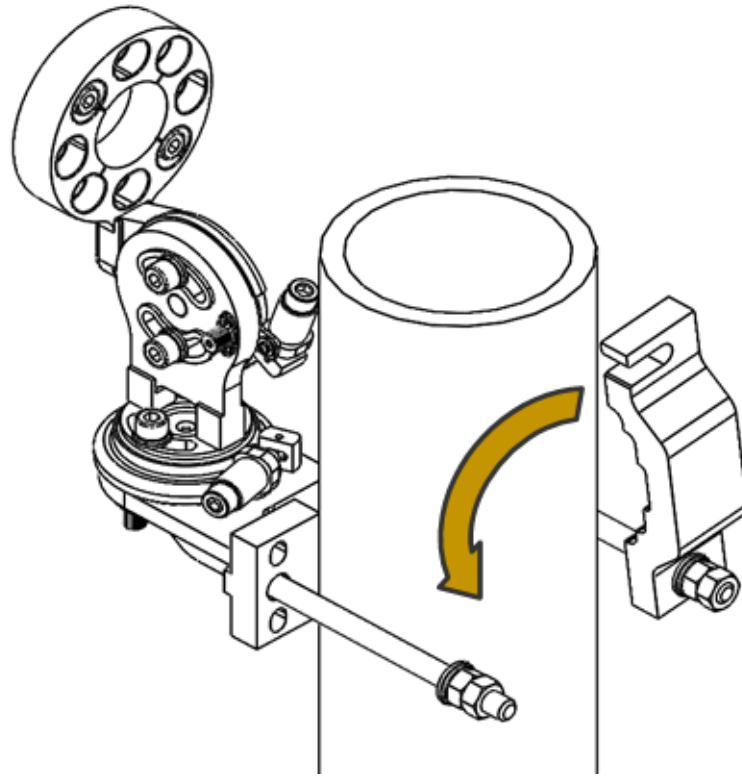
Item	Description	Quantity	Remarks
1	PTP 820E Flat Antenna Mounting kit	1	

Required Tools

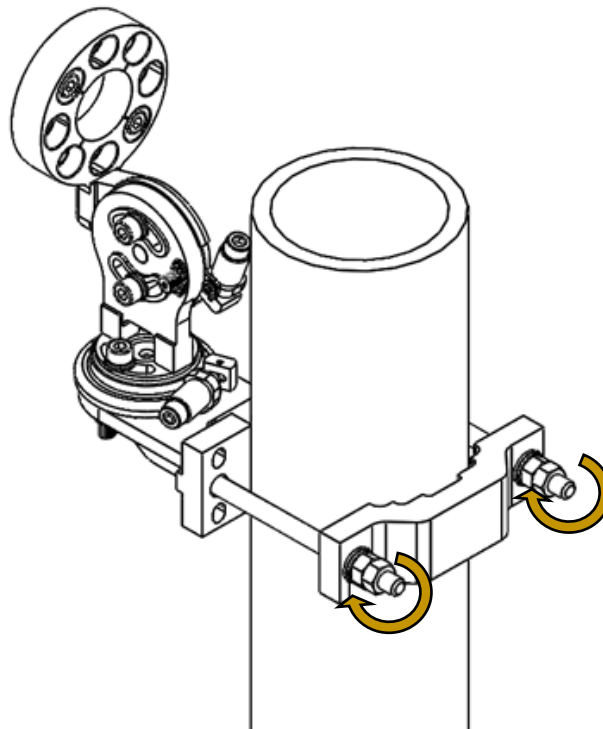
- Socket key wrench inch set
- Socket key wrench metric set
- Open metric wrench set

Procedure

1. Open the outer bracket to slide the installation and alignment device onto the pole, then close the bracket as shown in the figure below.



2. To secure the installation and alignment device to the pole, tighten the four nuts on the outer bracket, two on each side as shown in the figure below.



Wall Mount Assembly and Installation

This section contains instructions for installing a mounting kit on a wall. A mounting kit should only be installed on a concrete wall that is capable of supporting weight of at least 15 kg.

Item	Description	Quantity	Remarks
1	RFU-E Flat Antenna Mounting Kit	1	
2	RFU-E radio with 43 dBi Flat Antenna	1	
3	Anchor screws M8x70	4	Not supplied with mounting kit
4	M8x45 screws	4	Not supplied with mounting kit
5	M8 spring washer	4	Not supplied with mounting kit
6	M8 flat washer	4	Not supplied with mounting kit

Required Tools

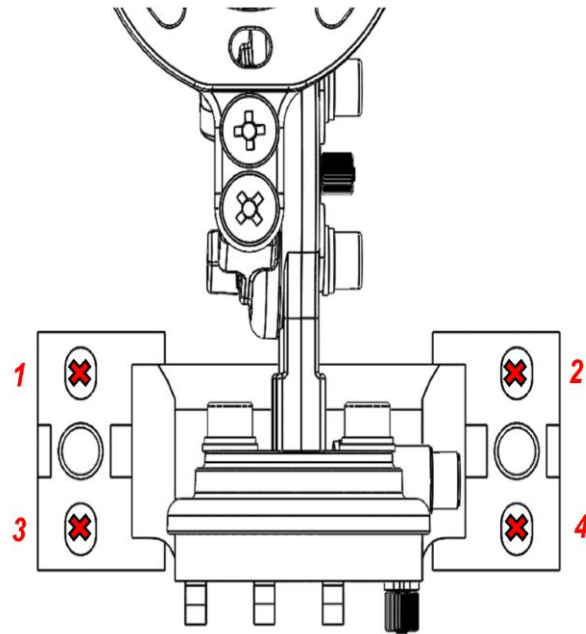
- Appropriate key wrench for the M8x45 screws
- A drilling machine



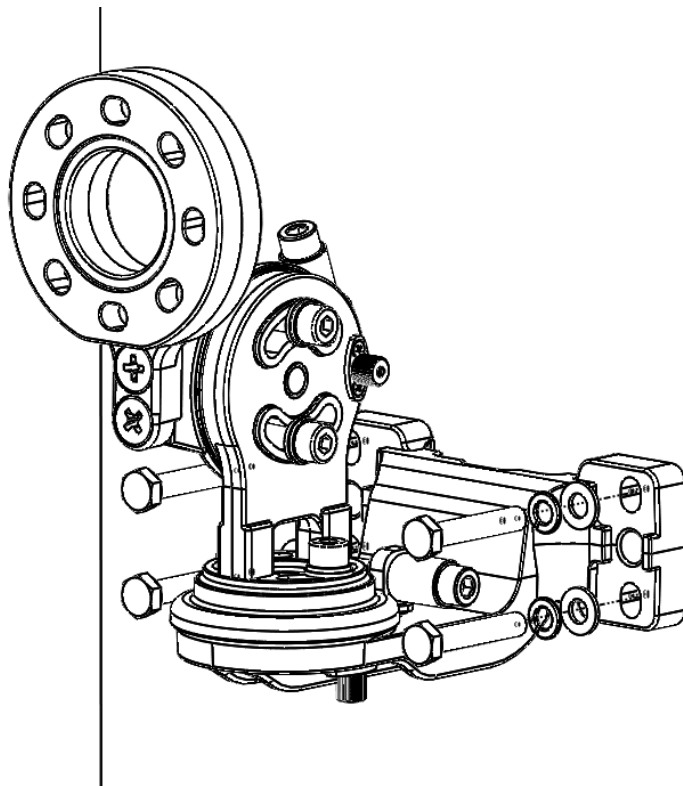
Note: In wall mount assembly, the 4 M10 nuts, 2 M10 flat and spring washers, 2 M10x150 screws, and the rear bracket that are supplied with the mounting kit are not used.

Procedure

1. Place the mounting kit on the wall and mark four screws positions.



2. Remove the bracket and drill four holes into the wall.
3. Insert the anchor screws into the wall.
4. Place the mounting kit in front of the 4 anchor screws and tighten the 4 M8 screws, spring washers, and flat washers to secure the mounting device to the wall.



Attaching the RFU-E to the Installation and Alignment Device

1. Connect the RFU-E unit to the installation and alignment device, using the two M8 screws and washers supplied with the installation and alignment kit. Attach the RFU-E according to the desired polarization, as shown in the figures below. Note that:
 - For vertical polarization, the upper screw must be approximately 2:00 to the right, the lower screw must be approximately 8:00 to the left, and the RSL interface should be at approximately 9:00 to the left.
 - For horizontal polarization, the upper screw must be approximately 10:00 to the left, the lower screw must be approximately 4:00 to the right, and the RSL interface should be at the bottom.

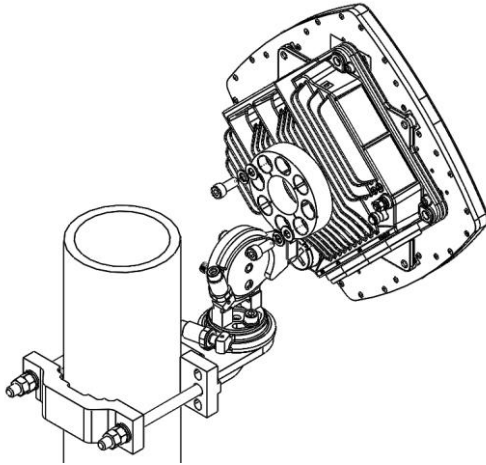


Figure 10: Horizontal Polarization – Radio and Installation and Alignment Kit

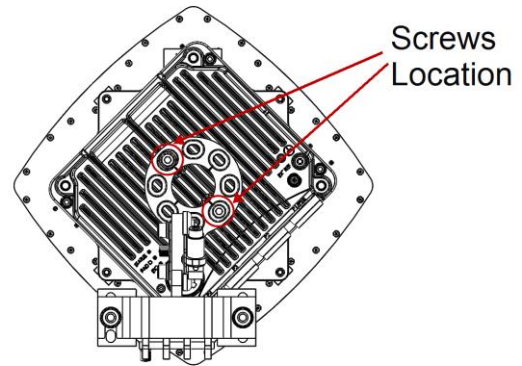


Figure 11: Horizontal Polarization – Screws Location

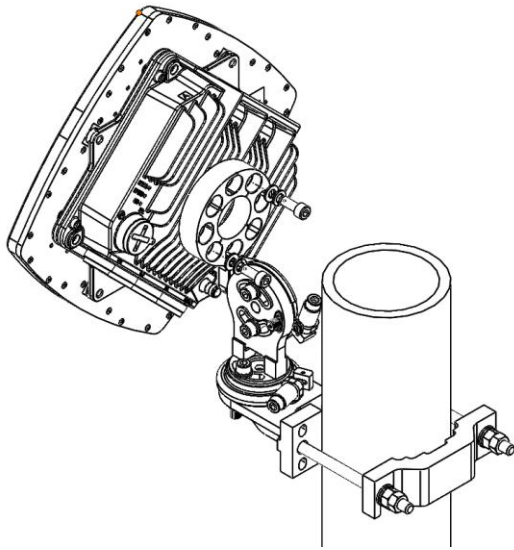


Figure 12: Vertical Polarization – Radio and Installation and Alignment Kit

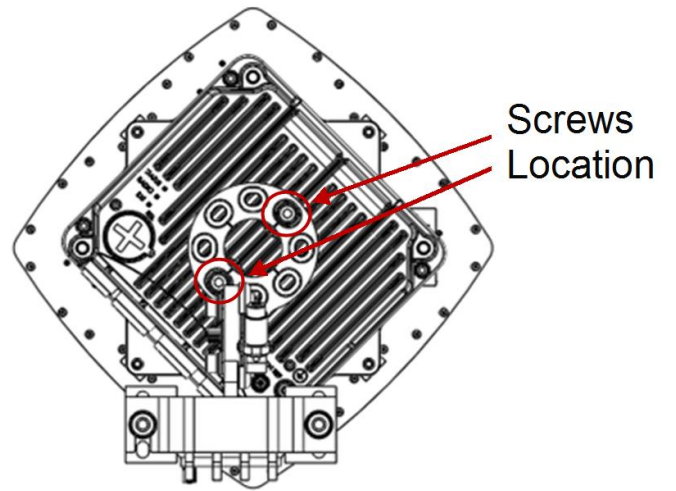


Figure 13: Vertical Polarization – Screws Location

Performing Antenna Alignment Using the Enhanced Alignment Kit

You can easily adjust the azimuth and elevation of the antenna using a number of screws and nuts located on the installation and alignment device (*Figure 5*Figure 5).

Adjusting the Antenna Azimuth

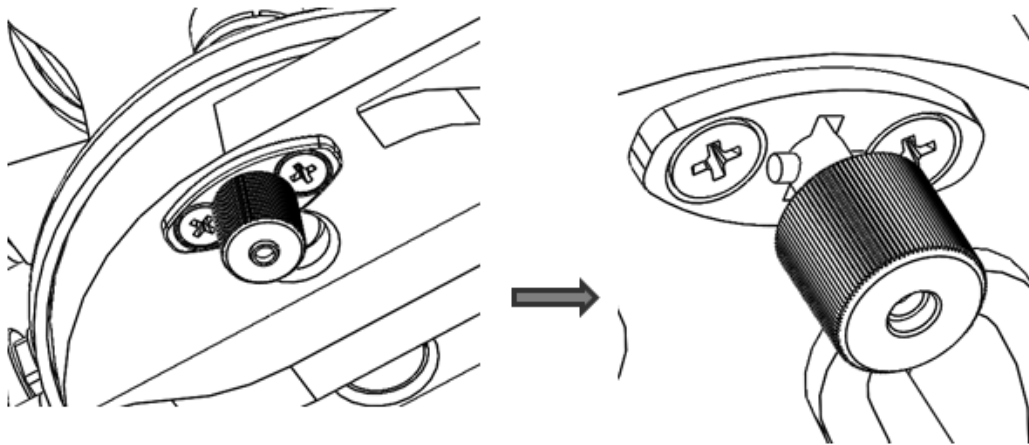


Note: For wall-mount installations, if it is necessary to adjust the azimuth by more than 45°, you must first adjust the position of the Azimuth Screws. See Extending the Azimuth Range.

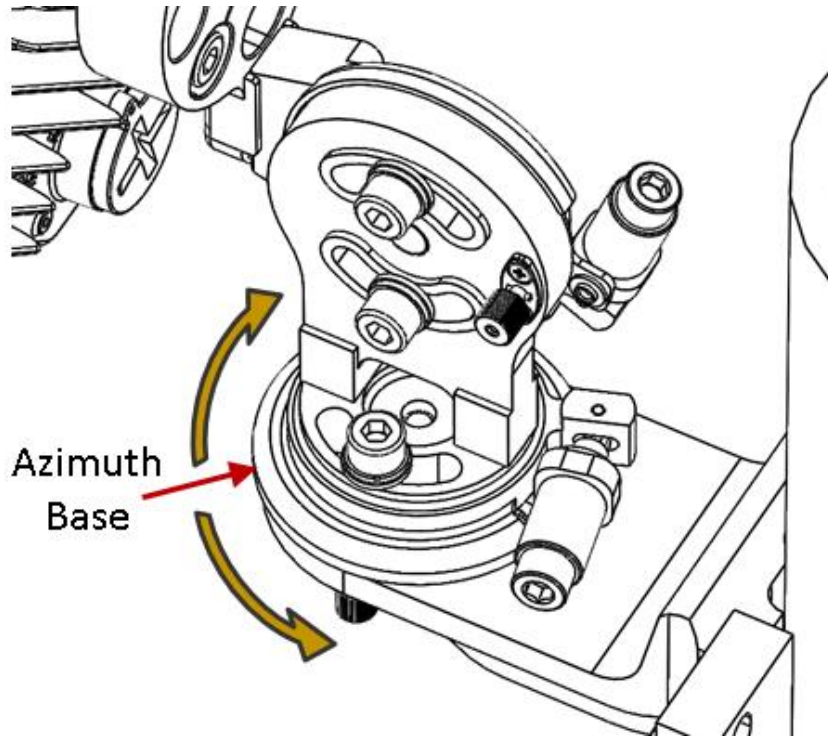
Performing Gross Azimuth Adjustment

To adjust the antenna azimuth:

1. Loosen the Azimuth Fixing Pin (Figure 5) by pulling it gently out of its groove and rotating it counter-clockwise.

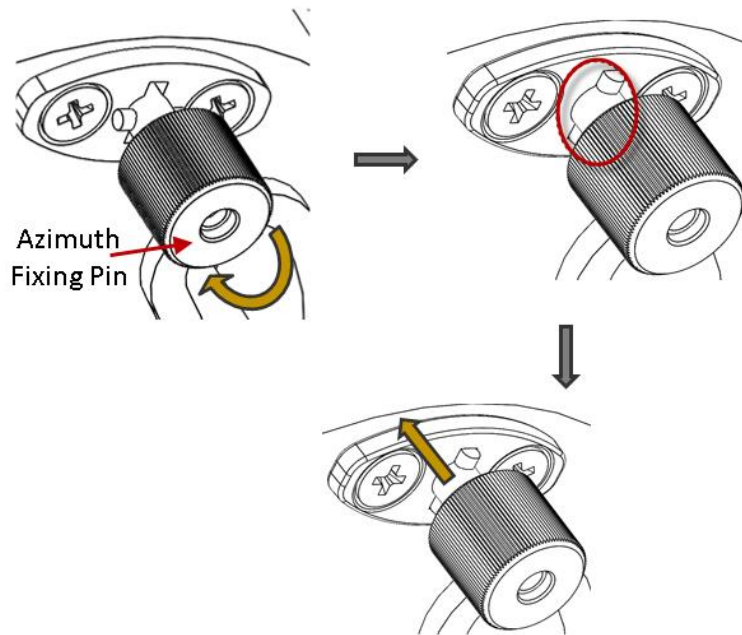


2. Manually adjust the azimuth base to its required location.



3. Once the azimuth base has been adjusted to its approximate location, lock the azimuth fixing pin by rotating the pin clockwise until it appears to be aligned with its groove. At this point, you must adjust the azimuth base until the fixing pin slips into its groove. There are notches within the device that enable you to adjust the azimuth in 15° increments. You can then perform fine azimuth adjustment as described below.

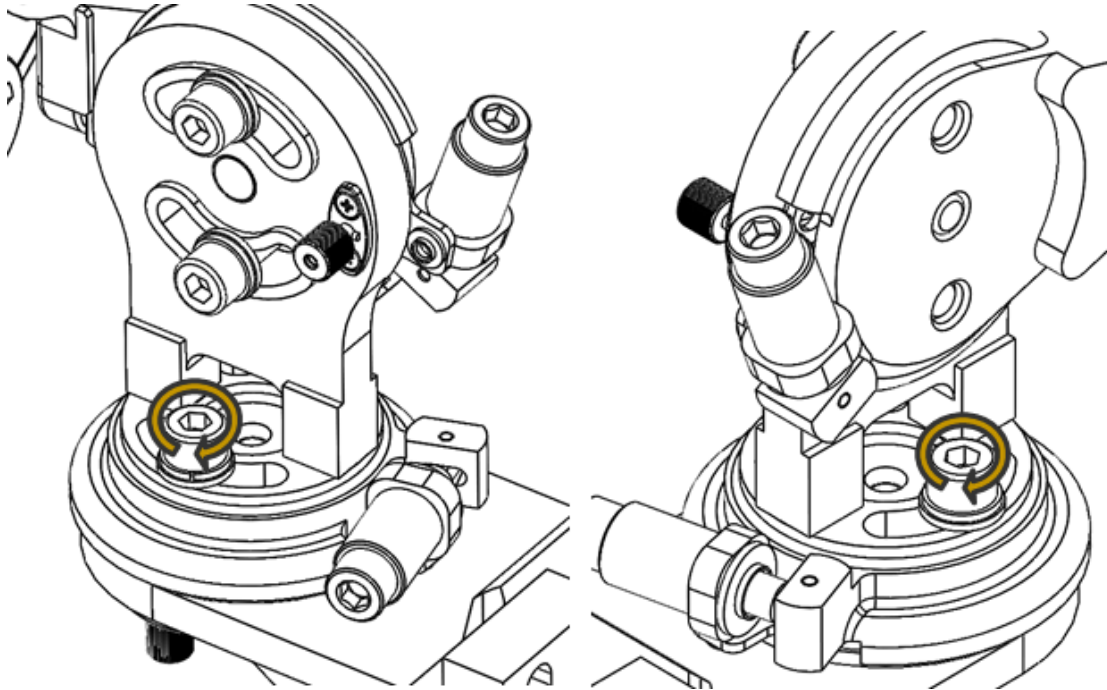
You will hear a click when the pin slips into the groove.



Performing Fine Azimuth Adjustment

To perform fine azimuth alignment:

1. Turn the Azimuth Nut (Figure 5), either by hand or using a key wrench, for fine tuning of the azimuth. Each $\frac{1}{4}$ turn is equal to an adjustment of 0.25° .
2. Tighten the two M8 Azimuth Screws connected to the azimuth base.



Extending the Azimuth Range

To extend the azimuth range beyond 45° in either direction:

1. Manually rotate the azimuth base 45° in the direction you want to align the azimuth.
2. Remove the two Azimuth Screws.

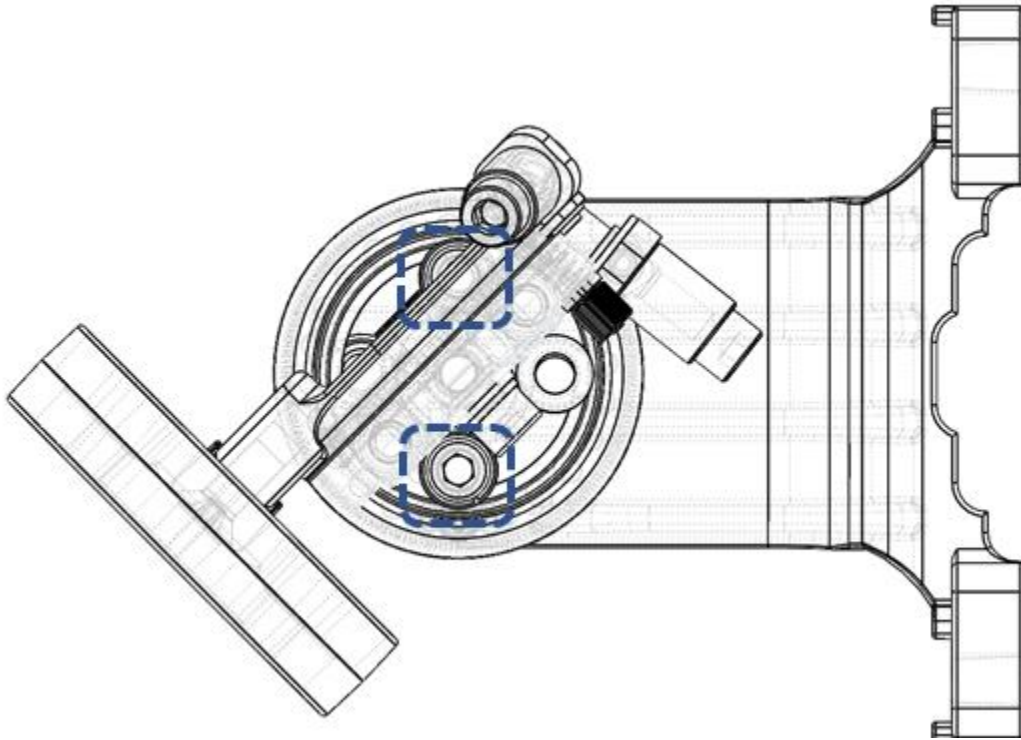


Figure 14: Azimuth Screws – Top View (Azimuth 45° to the Right)

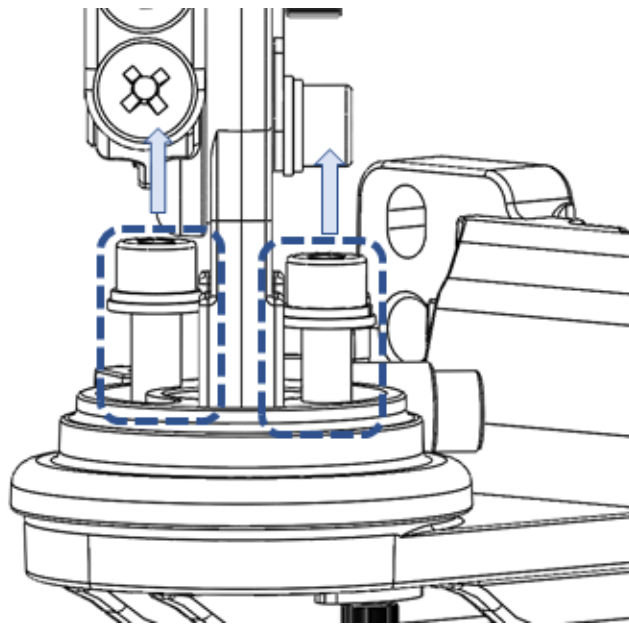


Figure 15: Removing the Azimuth Screws (Side View)

3. Insert the Azimuth Screws in the holes opposite their previous locations. For example, if you are adjusting the azimuth to the left, move the Azimuth Screw to the left of the device from the left hole to the right hole and move the Azimuth Screw to the right of the device from the right hole to the left hole, as

shown in Figure 14 and Figure 16. This will place the azimuth at an angle of 45° to the left or 45° to the right.

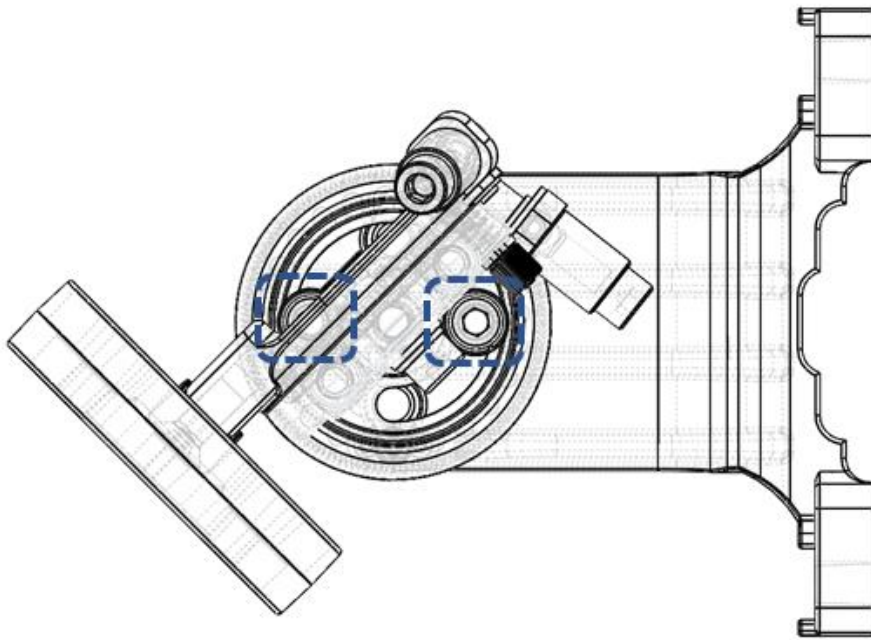


Figure 16: Azimuth Screws in New Placement – Top View (Azimuth 45° to the Right)

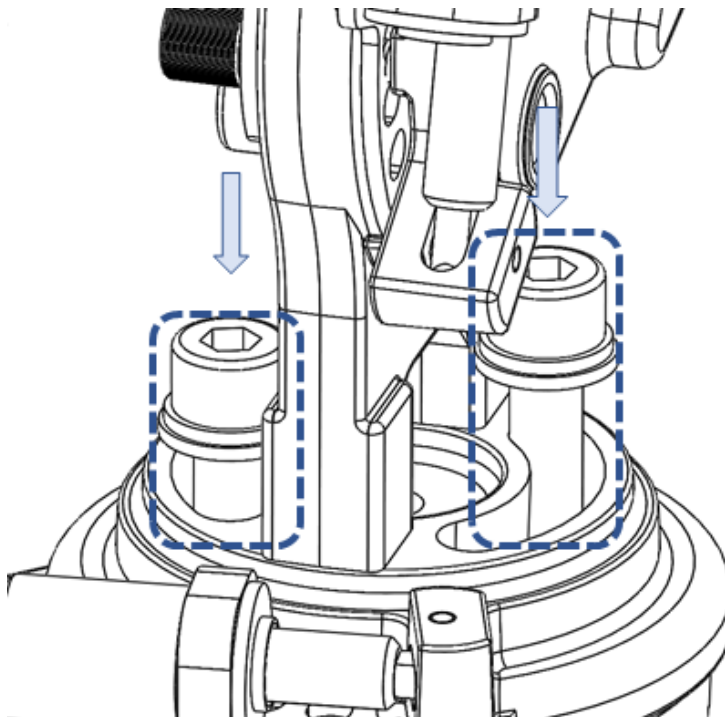


Figure 17: Repositioning the Azimuth Screws (Side View)

4. Tighten the two Azimuth Screws by hand, leaving them free enough so that you can manually rotate the azimuth base.

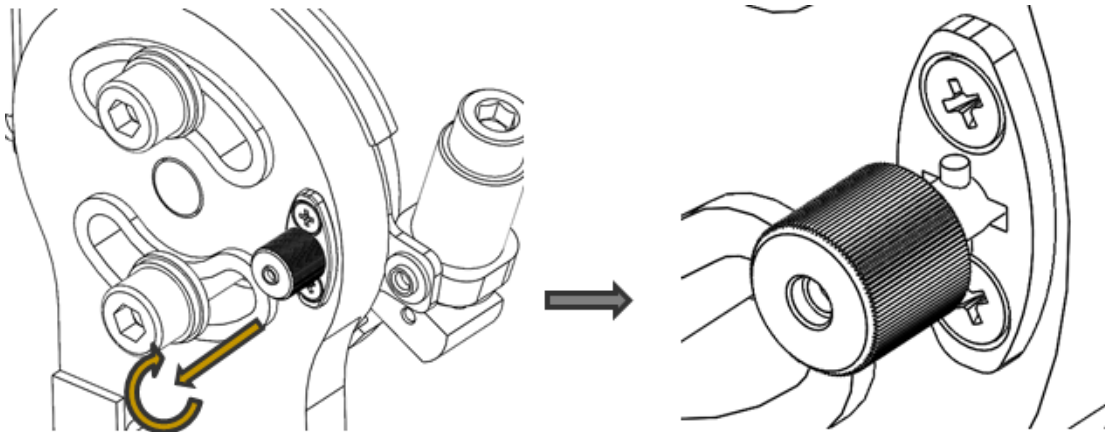
5. Follow the procedures in Performing Gross Azimuth Adjustment and Performing Fine Azimuth Adjustment to further adjust the azimuth from the 45° angle created by repositioning the Azimuth Screws.

Adjusting the Antenna Elevation

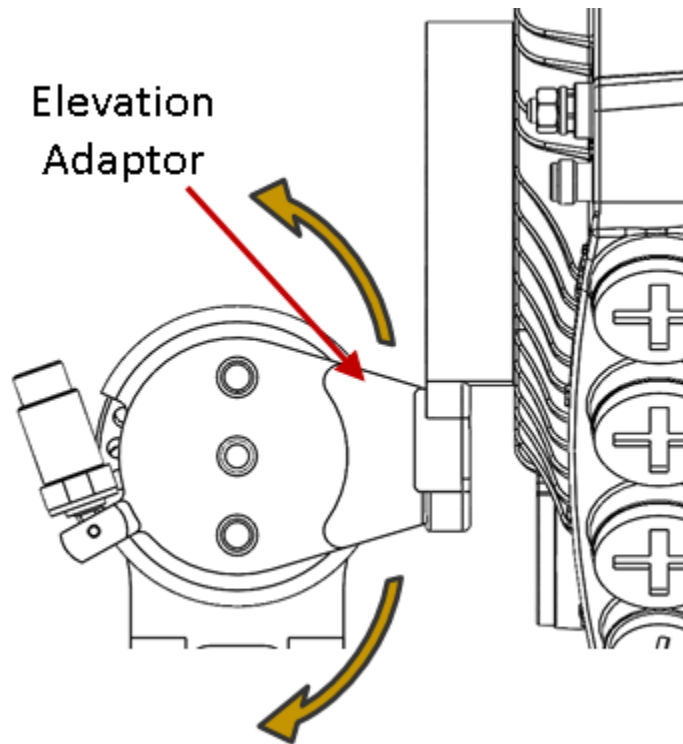
Performing Gross Elevation Adjustment

To perform gross adjustment of the antenna elevation:

1. Loosen the Elevation Fixing Pin (Figure 5) by pulling it gently out of its groove and rotating it counter-clockwise.

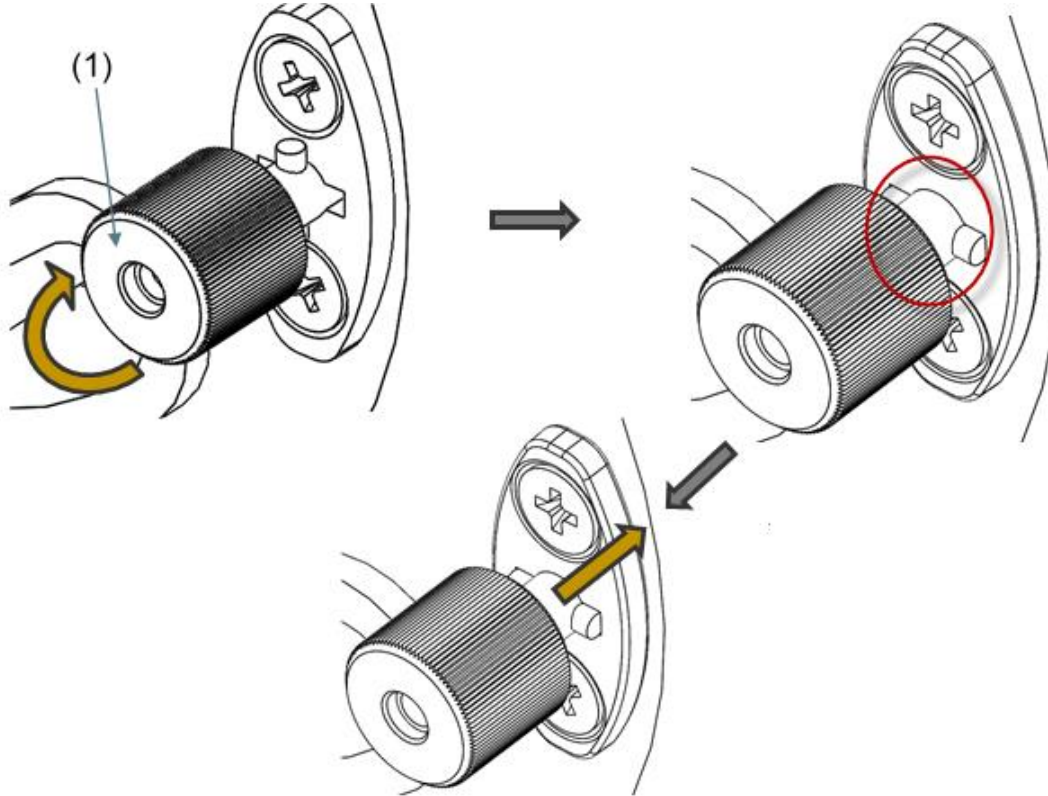


2. Move the Elevation Adaptor to the required location.



3. Once the Elevation Adaptor has been adjusted to its approximate location, lock the elevation fixing pin by rotating the pin clockwise until it appears to be aligned with its groove. At this point, you must adjust the Elevation Adaptor until the fixing pin slips into its groove. There are notches within the device that enable you to adjust the elevation in 15° increments. You can then perform fine elevation adjustment as described below.

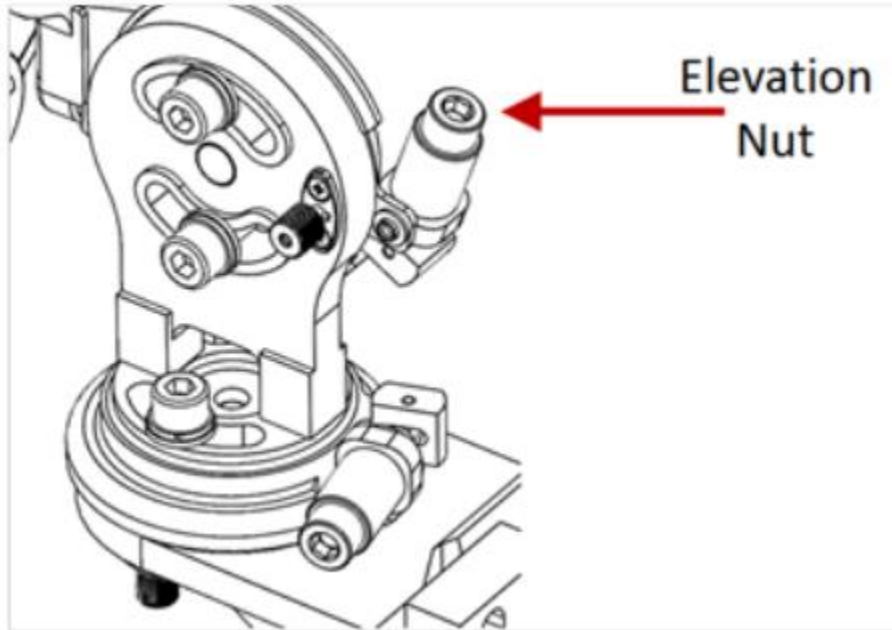
You will hear a click when the pin slips into the groove.



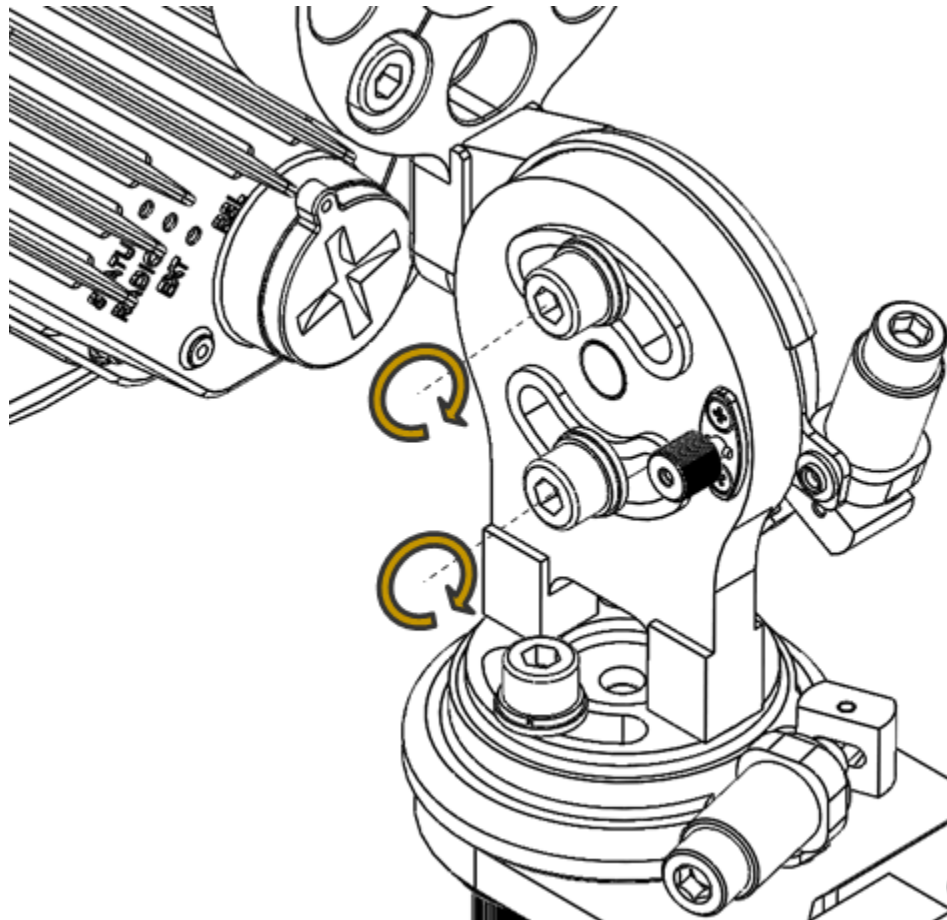
Performing Fine Elevation Adjustment

To perform fine elevation alignment:

1. Turn the Elevation Nut (Figure 5), either by hand or using a key wrench, for fine tuning of the elevation. Each $\frac{1}{4}$ turn is equal to an adjustment of 0.25°.



2. Tighten the two M8 Elevation Screws connected to the Elevation Adaptor.



Chapter 6: 1+0 Direct Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	RFU-E RADIO	1	

Required Tools

The following tools are required for the RFU-E installation:

- Metric offset hexagon socket key wrench #6 (Allen key)
- Phillips #2 screwdriver

Procedure



Important! Do not remove the transparent pressure window located on the antenna interface.

To install the RFU-E in a direct-mount 1+0 configuration:



Note: If necessary, change the antenna polarization by rotating the unit in accordance with the relevant antenna installation guide.

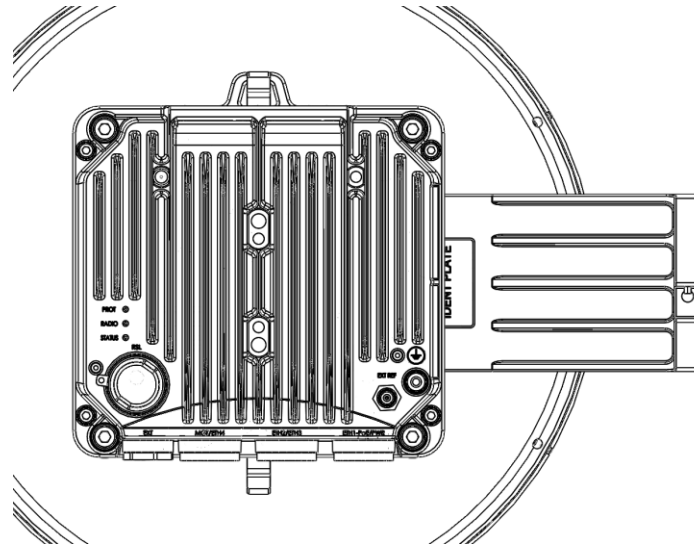
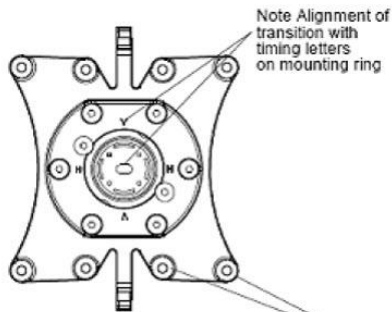


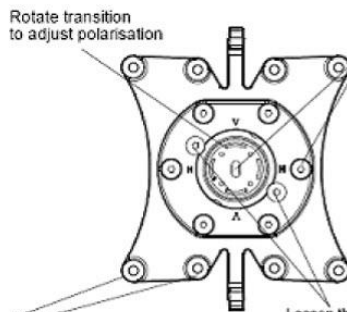
Figure 18: Horizontal / Vertical Pole

VERTICALLY POLARISED



Note Alignment of transition with timing letters on mounting ring

HORIZONTALLY POLARISED



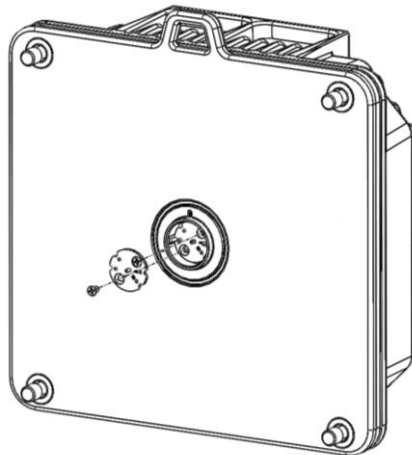
Rotate transition to adjust polarisation

Note Alignment of transition with timing letters on mounting ring

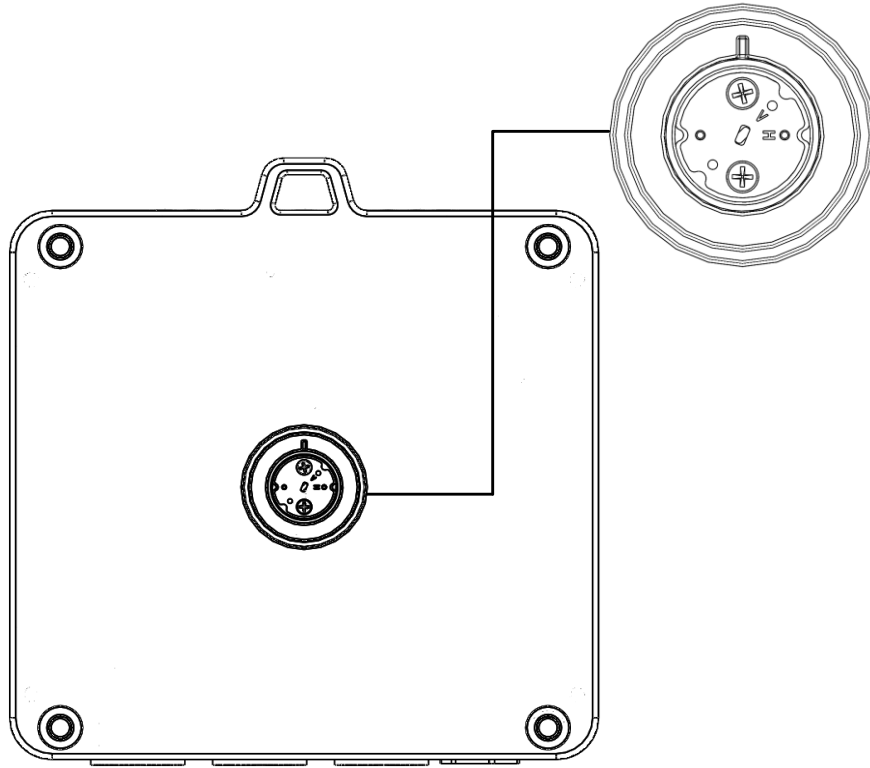
Torque M8 ODU/Coupler hardware to 12Nm.

Loosen the two c'sk screws and remove to adjust polarisation. Make sure the screws seat correctly in the alignment notches on transition rim. Tighten to a torque of 5Nm (3.69 lb-ft)

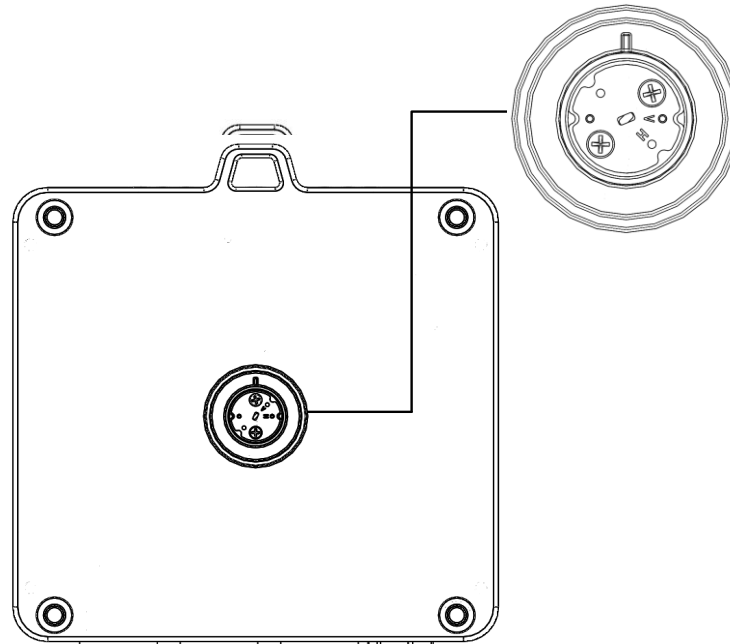
Twist orientation:



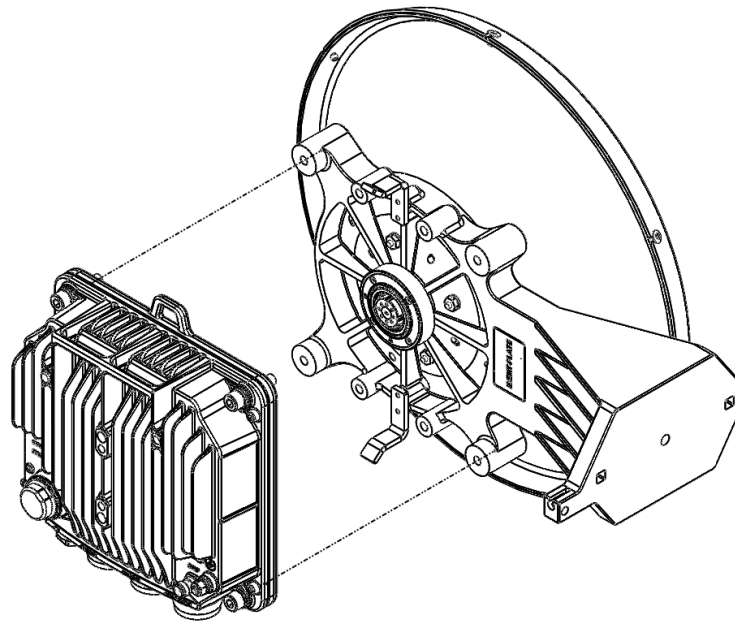
- For horizontal polarization, locate the twist with the letter “H” vertical to the hook cover (at 3:00) and fasten the two screws.



- For vertical polarization, locate the twist with the letter “V” vertical to the hook cover (at 3:00) and fasten the two screws.



1. Mount the RFU-E on the antenna using the four M8 captive screws and washers that are supplied, assembled, with the RFU-E, and tighten the screws.



Note: Make sure the polarization mounting direction of the RFU-E is correct.

Chapter 7: RFU-E LEDs

The RFU-E provides the following LEDs to indicate the status of the unit's interfaces, and the unit as a whole:

- *Electrical GbE Interface (RJ-45) LEDs*
- *Optical GbE Interface (SFP) LED*
- *Status LED*



Note: The EXT LED is not relevant for RFU-E.

Electrical GbE Interface (RJ-45) LEDs

There are two Green LEDs on either side of the electrical (RJ-45) interface.

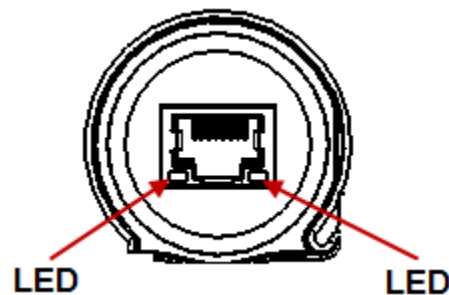


Figure 19: RFU-E LEDs – RJ-45 Interface

The LED on the left indicates the port's Admin state:

- **Off** – Admin is Disabled.
- **Green** – Admin is Enabled.

The LED on the right indicates the interface's Admin and cable connection status, and whether there is traffic on the interface:

- **Off** - Admin is Disabled *or* no cable is connected to the interface.
- **Green** - Admin is Enabled and a cable is connected to the interface.
- **Blinking Green** - Admin is Enabled and a cable is connected to the interface, *and* there is traffic on the interface.

Optical GbE Interface (SFP) LED

There is a single green LED to the upper right of the SFP interface.

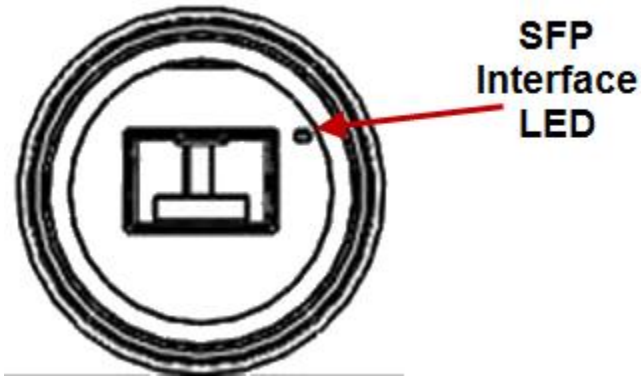


Figure 20: RFU-E LED – SFP Interface

The SFP LED indicates the interface's Admin and cable connection status, and whether there is traffic on the interface:

- **Off** - Admin is Disabled *or* no cable is connected to the interface.
- **Green** - Admin is Enabled and a cable is connected to the interface.

Unit LEDs

The RFU-E has three LEDs that indicate the status of the radio link and the unit as a whole: Status, Radio, and EXT. The EXT LED is not relevant for RFU-E.

Status LED

The Status LED indicates the power status of the RFU:

- **Off** – The power is off.
- **Red** - The power is on, the system is in initialization phase, and the link to the IDU is not yet up.
- **Green** - The power is on, and the link to the IDU is up.

Radio LED

The Radio LED indicates the status of the radio link:

- **Off** – The radio is off.
- **Green** - The power is on, and the radio carrier is operational (up).
- **Red** - A loss of frame (LOF), excessive BER, or signal degraded condition exists in at least one carrier.