



Installation Guide

PTP 820

RFU-S

System Release 10.9



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About This Installation Guide

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

This guide contains the following chapters:

- [Chapter 1:Before You Start](#)
- [Chapter 2:Grounding the RFU-S](#)
- [Chapter 3:Connecting the Data and Power Cables](#)
- [Chapter 4:Generic Installation Procedures](#)
- [Chapter 5:Installation Procedures per Configuration Type](#)
- [Chapter 6:RFU-S LEDs](#)
- [Chapter 7:Installing RFU-S on Third-Party Antenna Adaptors](#)

Contacting Cambium Networks

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Support enquiries:	support@cambiumnetworks.com
Repair inquiries	rma@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 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

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-S is intended for installation in a restricted access location.
- RFU-S must be installed and permanently connected to protective earth by qualified service personnel in accordance with applicable national electrical codes.

Safety Precautions & Declared Material

Public and Occupational Boundary Distances Under Article 3.1(a) of the RE Directive

Based on the highest nominal output power of the RFU-S:

- The public exposure of compliance boundary distance is 4.8m.
- The occupational exposure of compliance boundary distance is 1.2m. This is the worst case for the highest nominal output power, using 10-13 GHz frequency bands and antennas up to 1 ft. For all other configurations, the compliance boundary distance is 0.

Note that even when the compliance boundary is a non-zero value, this only applies within the bore sight of the antenna dish. Therefore, during work within and close to the front of the antenna, make sure the transmitters are turned off. As long as the transmitters are turned off during any work on the system, the occupational exposure limit is not of concern to workers operating in or around the parabolic dish antenna.

General Equipment Precautions



Caution

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.



Caution

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.

**Caution**

Use of controls, adjustments, or performing procedures other than those specified herein, may result in hazardous radiation exposure.

**Caution**

When working with an RFU-S, 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.

**Caution**

Machine noise information order - 3. GPSGV, the highest sound pressure level amounts to 70 dB (A) or less, in accordance with ISO EN 7779.

**Anti Static**

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-S 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.

**Caution**

In Norway and Sweden:

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).

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.

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.

Précautions générales relatives à l'équipement



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.



Caution

L'usage de RFU-S 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.



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.

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-S das folgende Stromschlag- und Gefahrenrisiko: Durch Abtrennen einer Stromquelle wird nur ein



Caution

Stromversorgungsmodul abgetrennt. 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 cases are prepared for shipment by air, truck, railway and sea, suitable for handling by forklift trucks and slings. The cargo must be kept dry during transportation, in accordance with ETS 300 019-1-2, Class 2.3. For sea-transport, deck-side shipment is not permitted. Carrier-owned cargo containers should be used.

It is recommended that the equipment be transported to the installation site in its original packing case. If intermediate storage 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, i.e. 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 should 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.

System Components

The following figures show the main components used in the RFU-S installation procedures.



Note

The availability of the installation components follows the RFU-S frequency rollout as stated in the published roadmap.

The presence of a specific component in this manual does not indicate that it is available for ordering. Please consult with your respective pre-sales engineer for specific component availability.

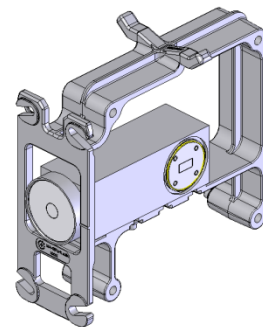
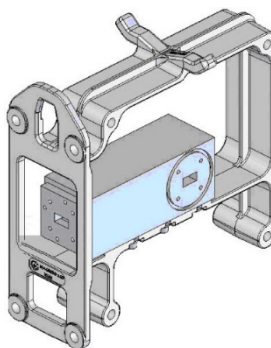
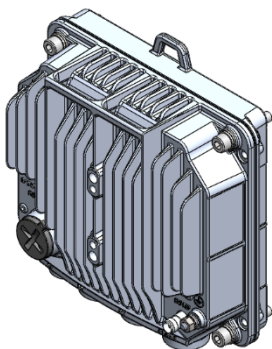


Figure 1 RFU-S



Figure 2 Coupler/Splitter

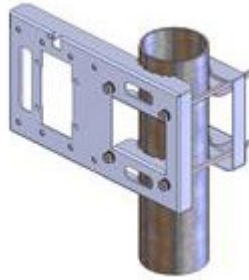


Figure 3 OMT



Figure 4 Remote Pole Mount

Figure 5 Remote Dual Pole Mount

Figure 6 Twist

Adaptors and Installation Kits

Component Kits

Table 1: Component Kits - 6 - 18 GHz

Description	6 GHz	7-8 GHz	10-11 GHz	13 GHz	15 GHz	18 GHz
RFU-C Coupler Kit	N060082L145A	N070082L301A	N110082L090A	N130082L058A	N150082L080A	N180082L046A
RFU-C Symmetrical Couplers Kit	N060082L149A	N070082L305A	N110082L094A	N130082L062A	N150082L084A	N180082L050A
RFU-C Twist Kit	N060082L148A	N070082L304A	N110082L093A	N130082L061A	N150082L083A	N180082L049A
RFU-C OMT-DM Kit	N060082L146A	N070082L302A	N110082L091A	N130082L059A	N150082L081A	N180082L047A

Table 2: Component Kits - 23 - 38 GHz

Description	23 GHz	26 GHz	28-31 GHz	32 GHz	38 GHz
RFU-C Coupler Kit	N230082L037A	N260082L030A	N280082L040A	N320082L023A	N380082L047A
RFU-C Symmetrical Couplers Kit	N230082L040A	N260082L033A	N280082L043A	N320082L026A	N380082L051A
RFU-C Twist Kit	N230082L036A N230082L036A		N280082L039A N280082L039A		N380082L050A
RFU-C OMT-DM Kit	N230082L038A	N260082L031A	N280082L041A	N320082L024A	N380082L048A

Table 3: Remote Mount Component Kits

Description	6 GHz	7-8 GHz	10-11 GHz	13 GHz
RFU-C- Remote Mount Adpator	N060082L003A	N070082L002A	N110082L002A	N130082L002A
RFU-C Pole Mount Kit	N000082L121A N000082L121A	N000082L121A	N000082L121A	

Table 4: Unique Installations and Accessories

Description	6 GHz	7-8 GHz	10-11 GHz	13 GHz	15 GHz	18 GHz	23 GHz	26 GHz	28-31 GHz	32 GHz	38 GHz
PTP 820 RFU-C 19 inch Rack Mount Kit	N000082L071A										

Table 5: Antenna Circ. Adapters for OMT - 6GHz - 18GHz

Antenna Circ. Adapters for OMT	6 GHz	7-8 GHz	10-11 GHz	13 GHz	15 GHz	18 GHz
PTP 820 RFU-C OMT Interface-Andrew	N060082L147A	N070082L303A	N110082L092A	N130082L060A	N150082L082A	N180082L048A
PTP 820 RFU-C OMT Interface-Radiowave	N060082L154A	N070082L310A	N110082L103A	N130082L068A	N150082L090A	N180082L056A
PTP 820 RFU-C OMT Interface-CNT	N060082L155A	N070082L311A	N110082L104A	N130082L069A	N150082L091A	N180082L057A

Antenna Circ. Adapters for OMT	23 GHz	26 GHz	28 GHz	32 GHz	38 GHz
PTP 820 RFU-C OMT Interface- Andrew	N230082L039A	N260082L032A	N280082L042A	N320082L025A	N380082L049A
PTP 820 RFU-C OMT Interface- Radiowave	N230082L046A	N260082L038A	N280082L046A	N320082L029A	N380082L054A
PTP 820 RFU-C OMT Interface- CNT	N230082L047A	N260082L039A	N280082L047A	N320082L030A	N380082L055A

Antenna Connection

RFU-S can be mounted directly for all frequencies (6-38 GHz) using the following antenna types (for integrated antennas, specific antennas are required):

- Cambium CNT series
- CommScope: VHLP series
- Radiowave: HP series

For remote mount installations, the following Flexible Waveguide flanges should be used (millimetric). The same antenna type (integrated) as indicated above can be used (recommended).

Other antenna types using the flanges listed in the table below may also be used.

Table 6: Antenna Flanges

Frequency Band	Range (GHz)	Circ. WG Diameter	Rect. WG Flange Des.	Radio Side (Remote) Flange Des.	Flex WG Side A Flange Des.	Flex WG Side B Flange Des.	Antenna (Remote) Flange Des.
6(L/U) GHz	5.8-7.1					PDR70	UDR70
7/8 GHz	7.1-8.5	26 mm	WR112	UBR84	PBR84	PBR84	UBR84
10/11 GHz	10.0-11.7	18 mm	WR90	UBR100	PBR100	PBR100	UBR100
13 GHz	12.7-13.3	15 mm	WR75	UBR120	PBR120	PBR120	UBR120
15 GHz	14.5-15.4	13.5 mm	WR62	UBR140	PBR140	PBR140	UBR140
18 GHz	17.7-19.7	10.5 mm	WR42	UBR220	PBR220	PBR220	UBR220
23 GHz	21.2-23.6	9 mm					
26 GHz	24.5-26.6	8 mm					
28-31 GHz	27.3-29.5	7 mm	WR28	UBR320	PBR320	PBR320	UBR320
32 GHz	31.8-33.4	6.5 mm					
38 GHz	37.0-40.0	5.5 mm					

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



Note

Appropriate lubricant or grease can be applied to the screws that connect the RFU-S 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-S

List of Items

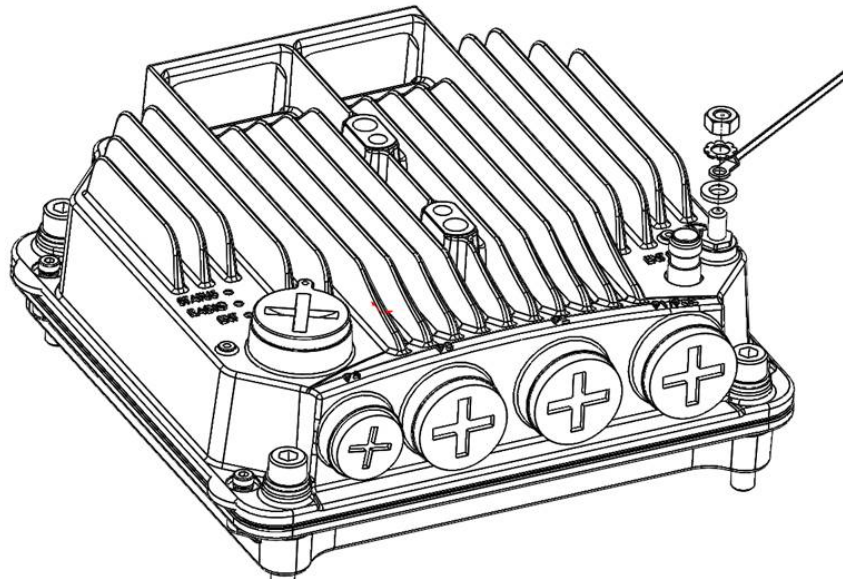
Item	Description	Quantity	Remarks
1	N000082L116A PTP 820 GROUND CABLE FOR IDU AND ODU.	1	

Required Tools

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

Procedure

1. On the front of each RFU-S 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-S 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-S 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 cable, the cable can carry both the data and the DC power required for the RFU-S. The CAT-5e 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 7 RFU-S Data and Power Interfaces

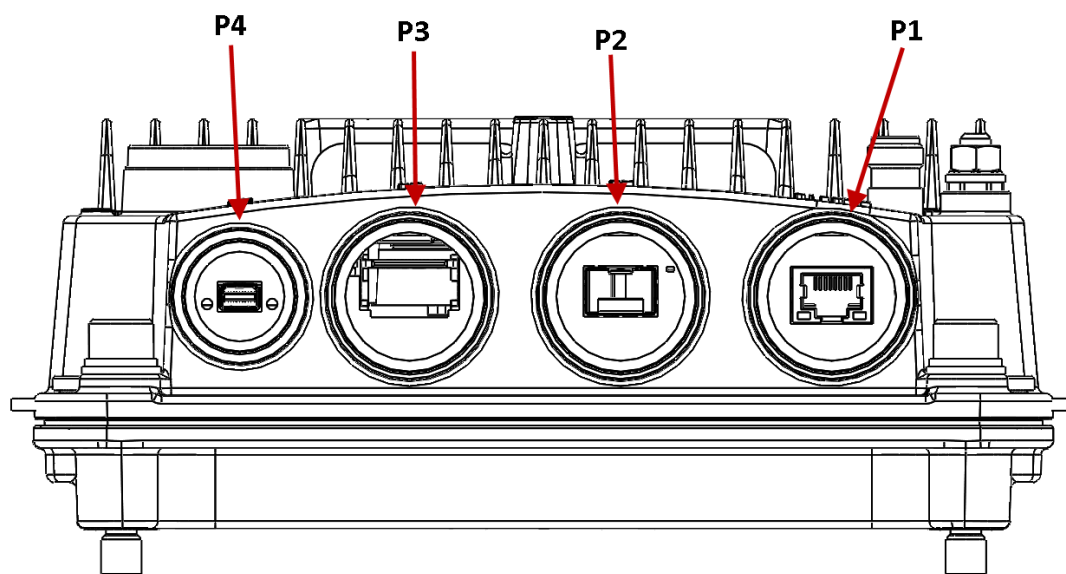


Table 7: Maximum Cable Length

Item	Quantity	Remarks
Optical	Fiber	300m
Electrical	CAT-5e (24 AWG)	150m
	CAT-6a (22 AWG)	150m
DC Power	DC (18 AWG)	150m

Item	Quantity	Remarks
	DC (14 AWG)	151m-300m

Grounding the Cables

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

To fit the grounding clamp, the outer diameter of CAT5E Ethernet cables must be between 6-7.1mm.

Cables must be grounded as follows:

- 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 CAT5E_gnd_kit.



Table 8: Cable Grounding Kit

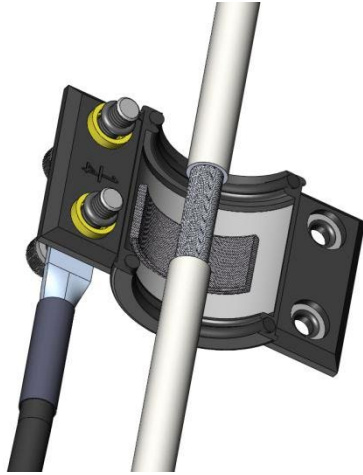
Part Number	Description
N000082L017A	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable

To connect the grounding kit:

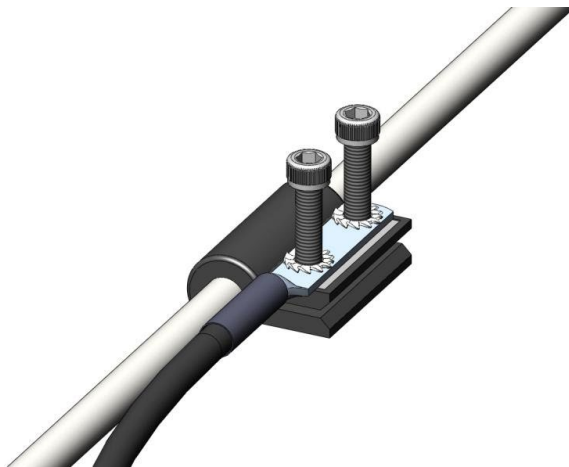
1. Strip the cable jacket.



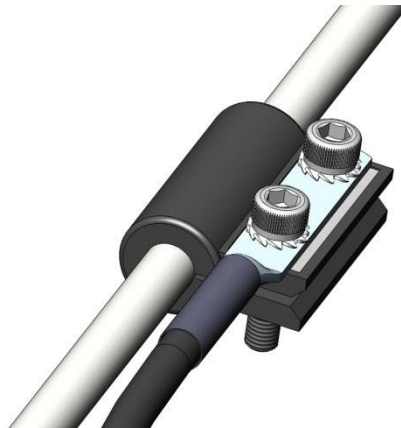
2. Place the cable in the middle of the grounding bracket.



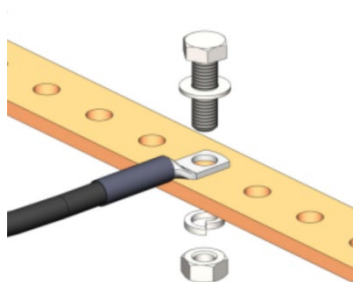
3. Close the grounding bracket around the cable.



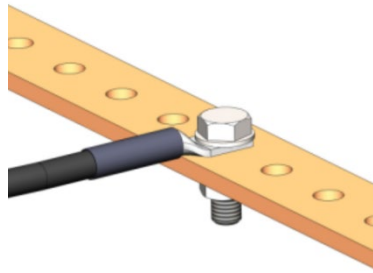
4. Tighten the two screws to secure the grounding bracket around the cable.



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-S power supply.

Any other connection may cause damage to the system!



Note

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

Surge Protection

RFU-S includes built-in surge protection for its RJ-45 power and data port (P1). RFU-S'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-S unit.

Available Cable Options

Fiber Optic Cables - Single Mode

Table 9: Fiber Optic Cables - Single Mode

Part Number	Description
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 10: DC Cable and Connector

Part Number	Description
N000082L169A	PTP 820 Outdoor_DC_cbl_2x14AWG_drum, 305m
N000082L165A	PTP 820 Mini Power Adaptor

Cat-5e Cable and Specifications

Table 11: CAT-5e Cable and Specifications

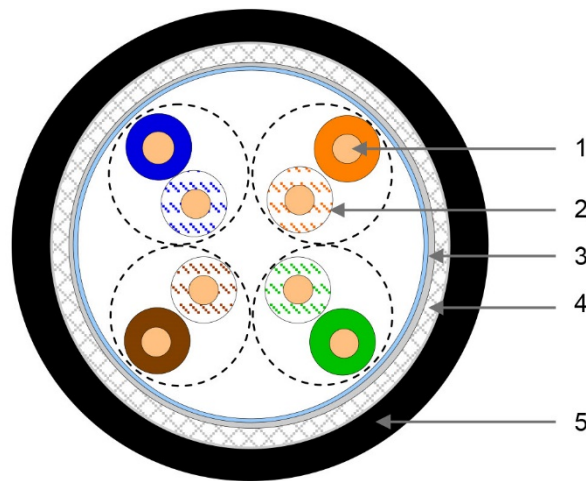
Part Number	Description
N000082L016A	PTP 820 CAT5E Outdoor 100m drum

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 8 RFU-S Data and Power Interfaces



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

Table 12: 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 CAT-5e Cable Specifications

Table 13: Outdoor CAT-5e Cable Specifications - Electrical Requirements

Cable type	CAT-5e SFUTP, 4 pairs, according to ANSI/TIA/EIA-568-B-2
Wire gage	24 AWG
Stranding	Solid
Voltage rating	70V
Shielding	Tinned copper Braid (Coverage: $\geq 80\%$) + Aluminum Foil









Pinout	RJ45,P1	RJ45,P2
	1 —  WHITE/GREEN	1
	2 —  GREEN	2
	3 —  WHITE/ORANGE	3
	6 —  ORANGE	6
	4 —  BLUE	4
	5 —  WHITE/BLUE	5
	7 —  WHITE/BROWN	7
	8 —  BROWN	8
	SHELL — DRAIN WIRE + SHIELD — SHEEL	

Table 14: Outdoor CAT-5e Cable Specifications – Mechanical/ Environmental Requirements

Jacket	UV resistant
Outer diameter	6-7.1 mm (in order to be compatible with the grounding clamp, CAT5E_gnd_kit)
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

Outdoor DC Cable Specifications

Table 15: 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 16: 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, Part Number “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



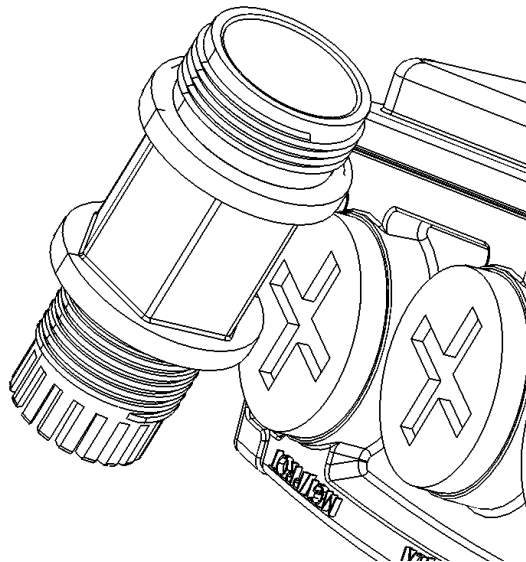
Note

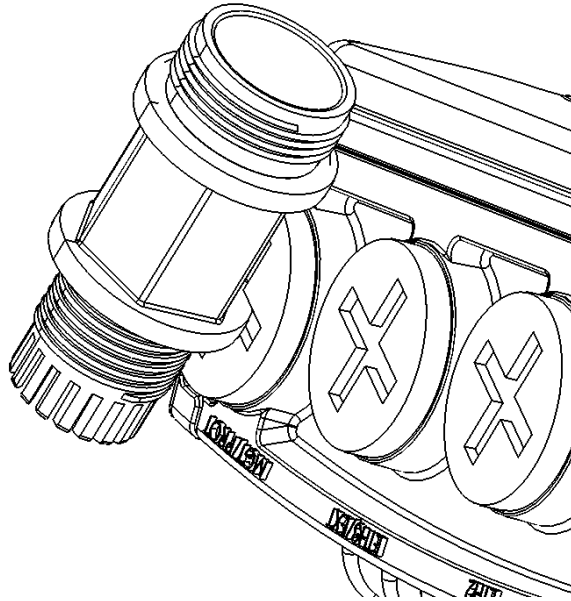
Each RFU-S unit is supplied with one gland. If additional glands are required, they must be ordered separately, in kits of five glands each.

Table 17: Glands Kit

Part Number	Description
N000082L014A	PTP 820 Glands_x5_KIT

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

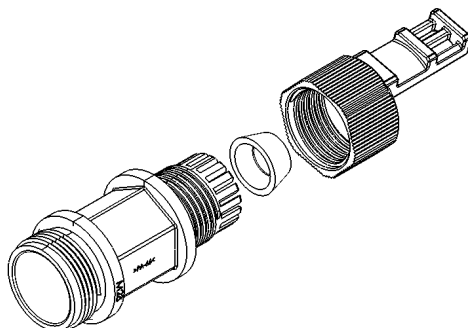




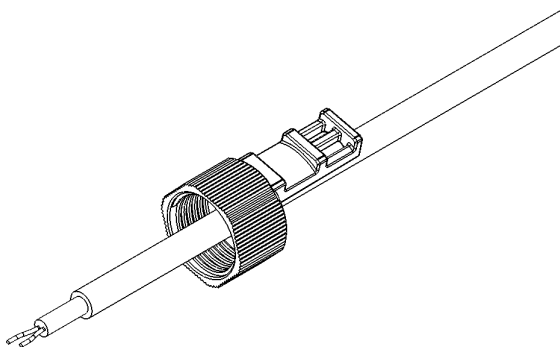
General Installation Procedure

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

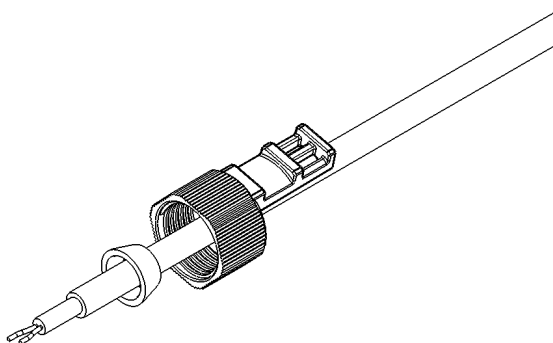
1. Before inserting a cable, you must disassemble the gland cap and gland rubber from the gland body.



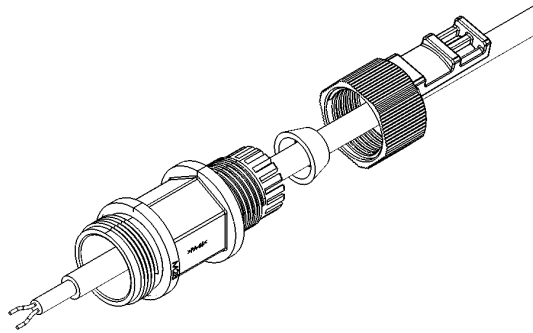
2. Slide the gland cap into the cable.



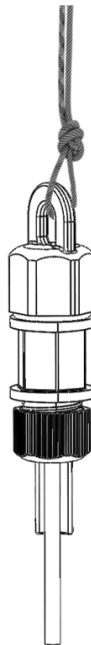
3. Slide the gland rubber into the cable.



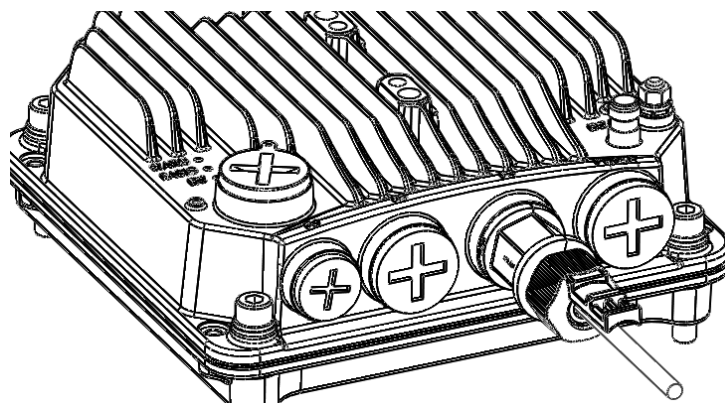
4. Slide the cable into the body of the gland. If you are using a gland cap (see Step 5), make sure to leave enough space for the gland cap to fit into the gland without disturbing the cable.



5. 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.



6. 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.
7. Connect the cable to the port.
8. Screw the gland into the radio unit until there is full contact between the gland and the radio unit.



**Note**

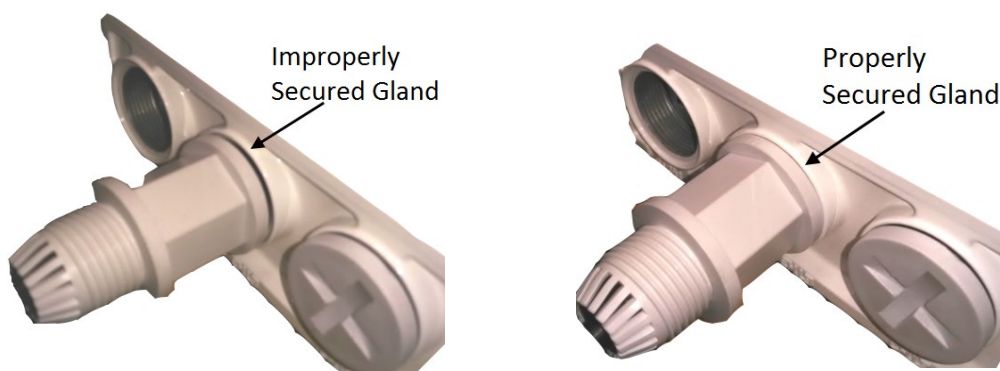
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface.

9. 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!



10. 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.

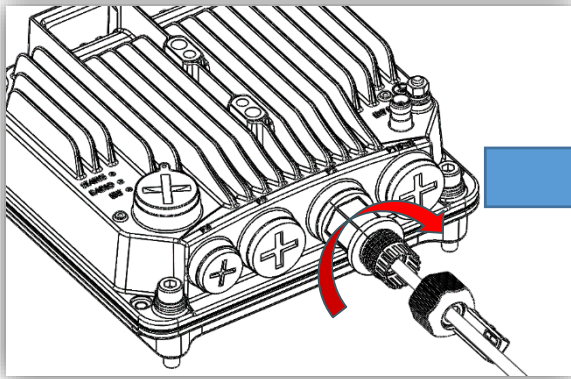


Figure 9 Tightening the Front Portion of the Gland

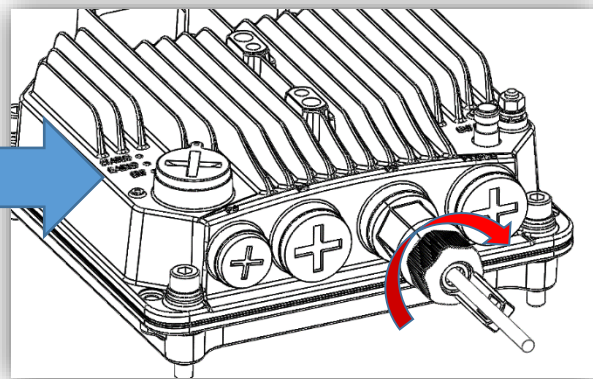
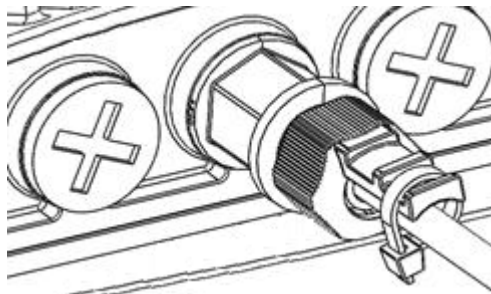


Figure 10 Tightening the Rear Portion of the Gland

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

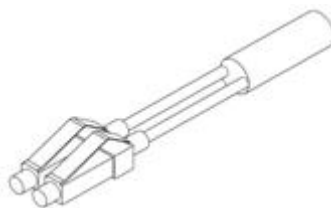


Connecting an Optical Fiber Cable and SFP

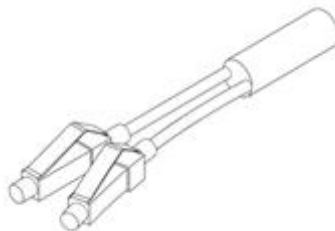
When using an optical fiber cable, the cable must be inserted in port P2. A separate DC power cable must be used to connect the RFU-S to an external power source. See [Connecting a DC Power Cable](#).

To connect an optical fiber cable and the SFP transceiver:

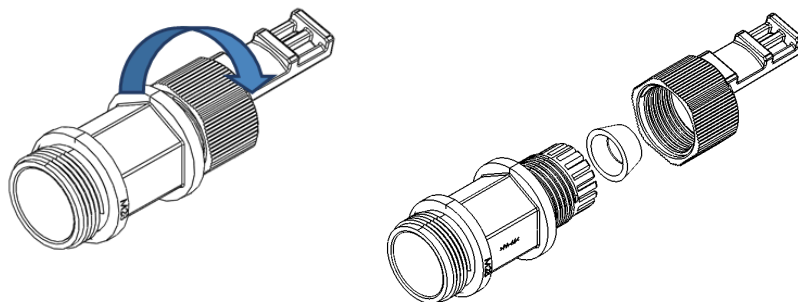
1. Use a pre-assembled cable.



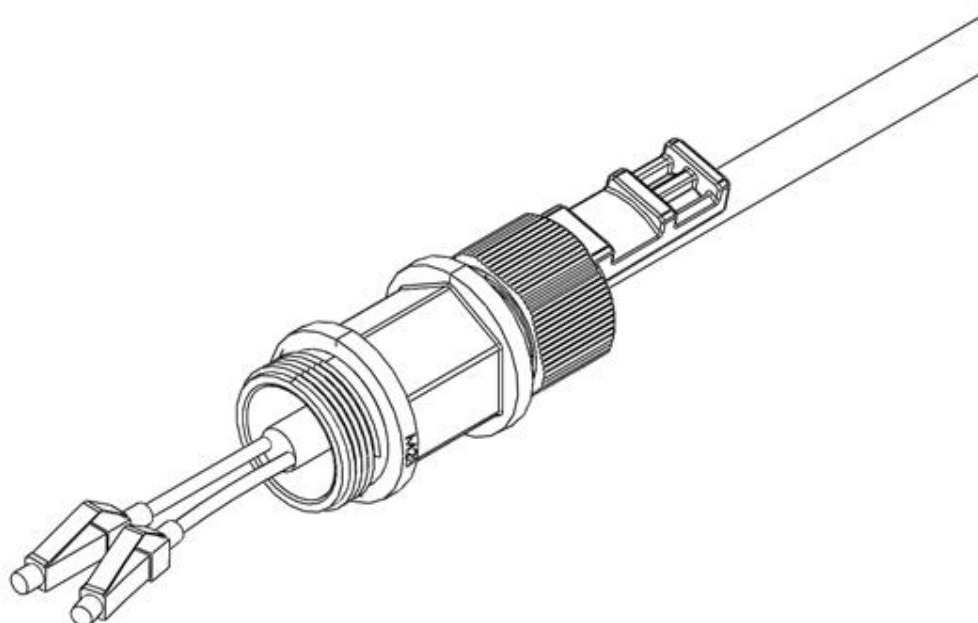
2. Split the connector into two separate LC connectors (one for each fiber).



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.

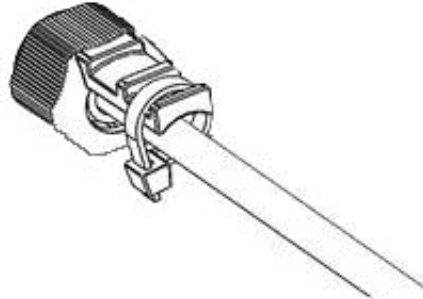


7. Secure the cable to the lip of the gland using a tie wrap.

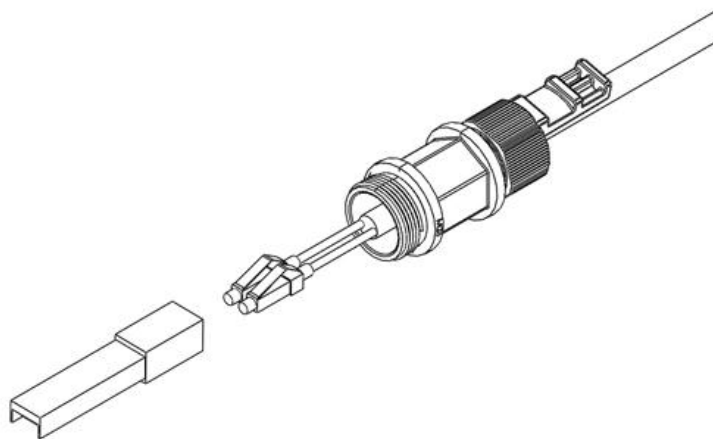


Note

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.



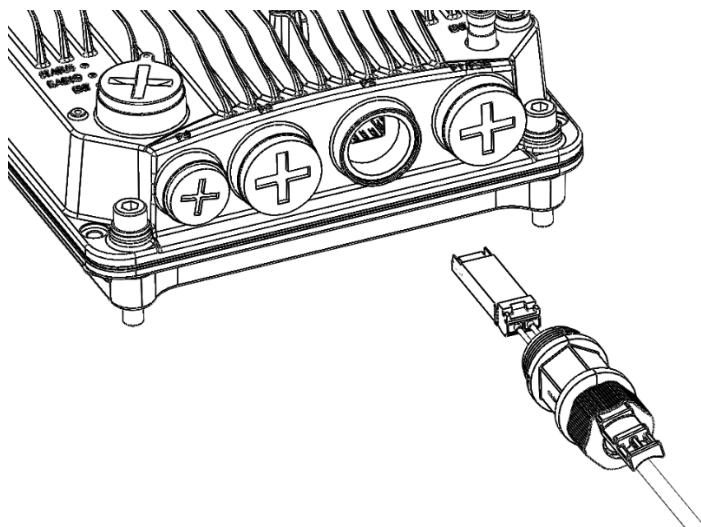
9. Remove the tie wrap securing the cable to the gland.



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 13.

10. Connect the connector into the RFU-S 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.

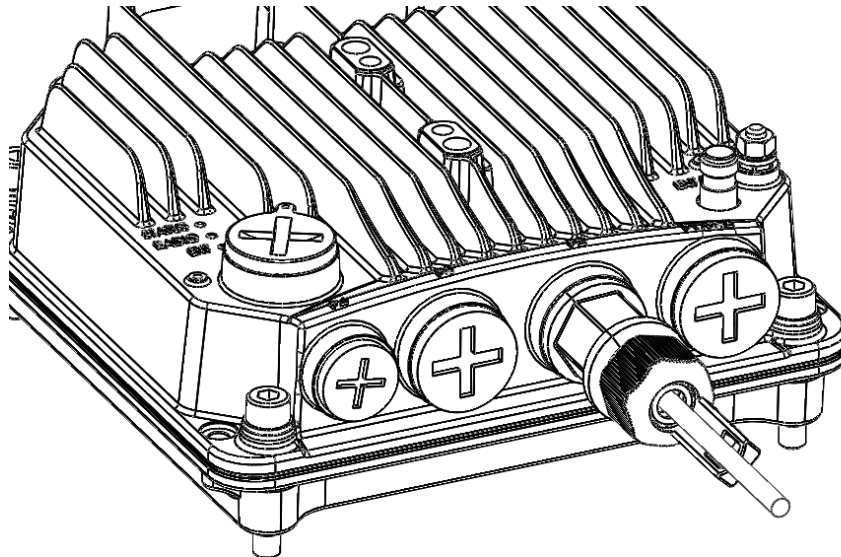


Note

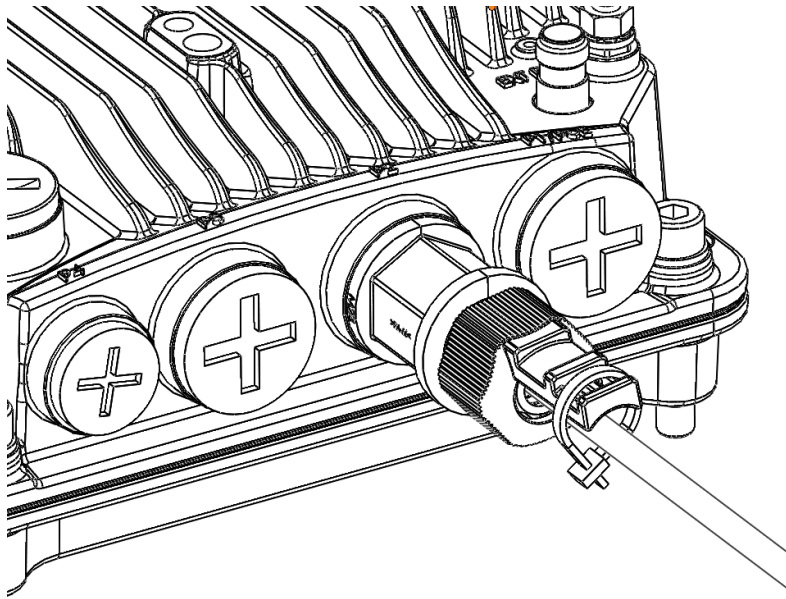
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit.

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-S 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 4 and 5.

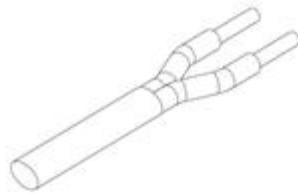


Note

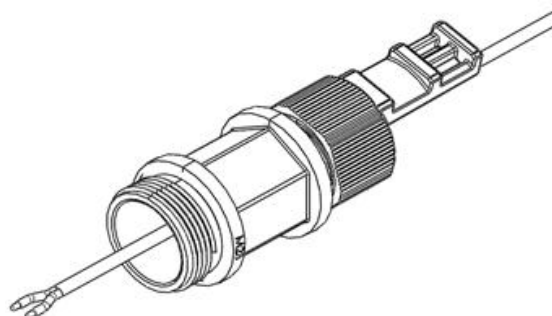
The DC power cable and connector must be ordered separately. See DC Cable and Connector.

To connect a DC power cable:

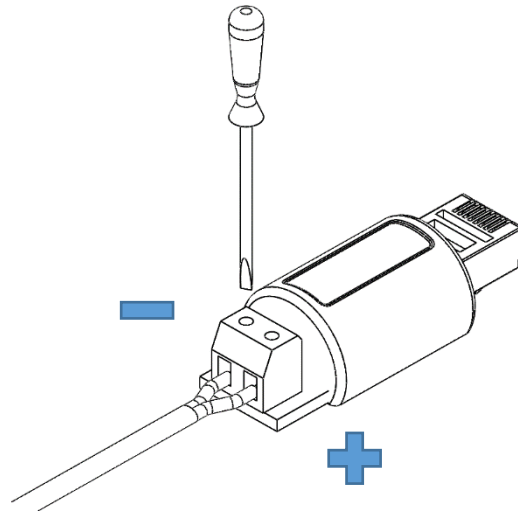
1. Strip off 45 mm from the cable jacket.
2. Expose 10 mm at the edge of each of the two wires.



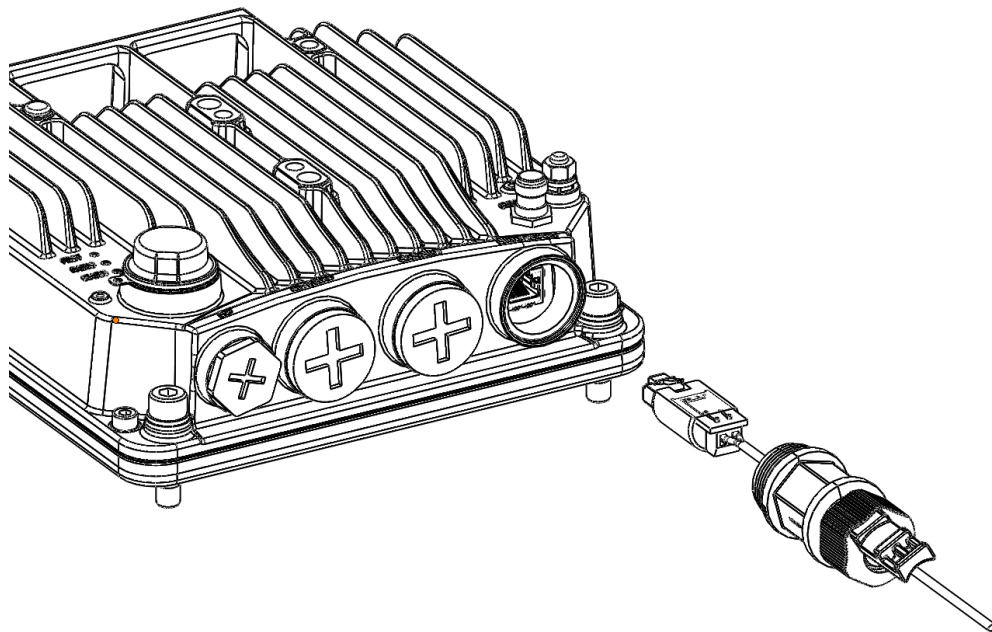
3. Insert the power cable into the gland.



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.

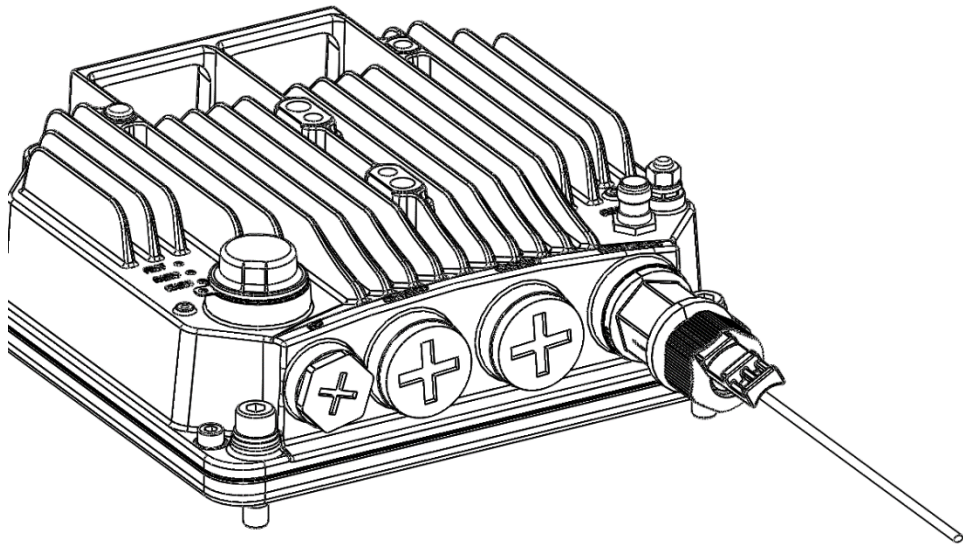


7. Screw the gland into the radio unit

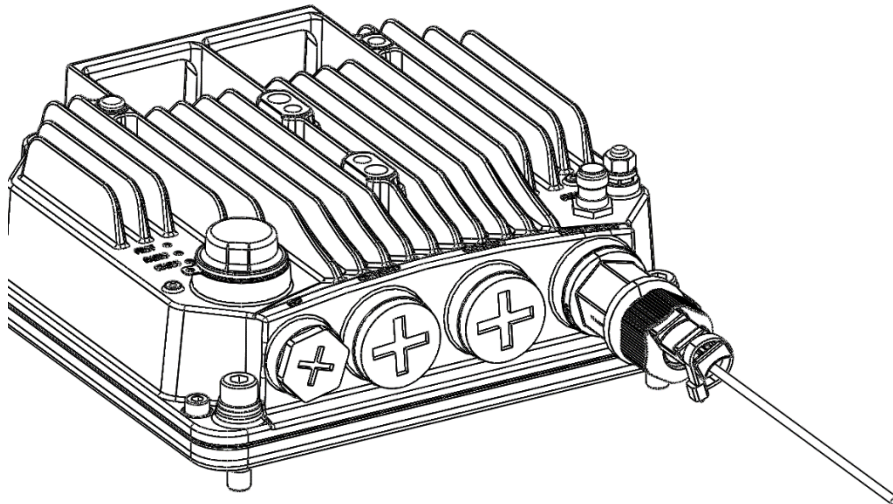


Note

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 Preparing the CAT-5e or CAT-6 Cable and Plug-in Field, then proceed to Connection of CAT-5e or CAT-6 Cable to RFU-S.

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



Note

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

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



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



Table 18: Materials for Preparing Ethernet Data Cables

Part Number	Description
N000082L016A	PTP 820 CAT5E Outdoor 100m drum

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.

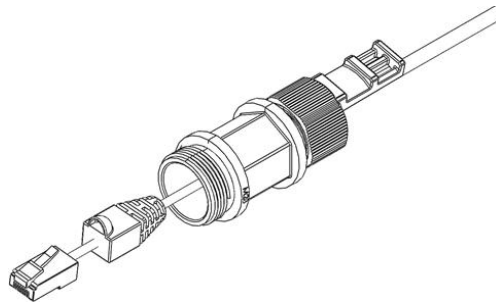


Note
Cord colors should be matched to the same pins on both ends of the cable.

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 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.



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.

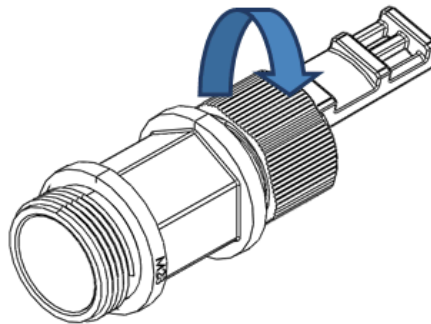
**Note**

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.

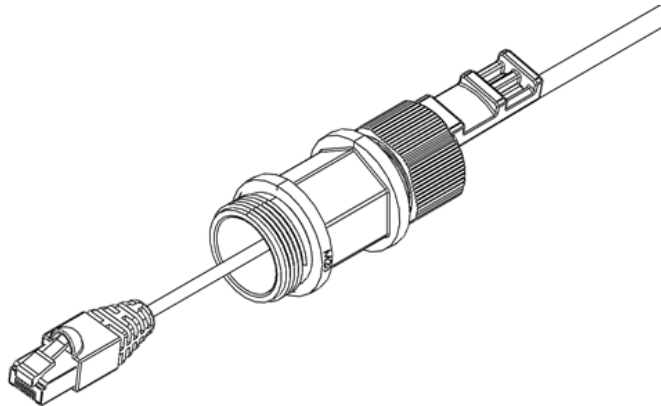
Preparing the CAT-5e or CAT-6 Data Cable Already Assembled

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.

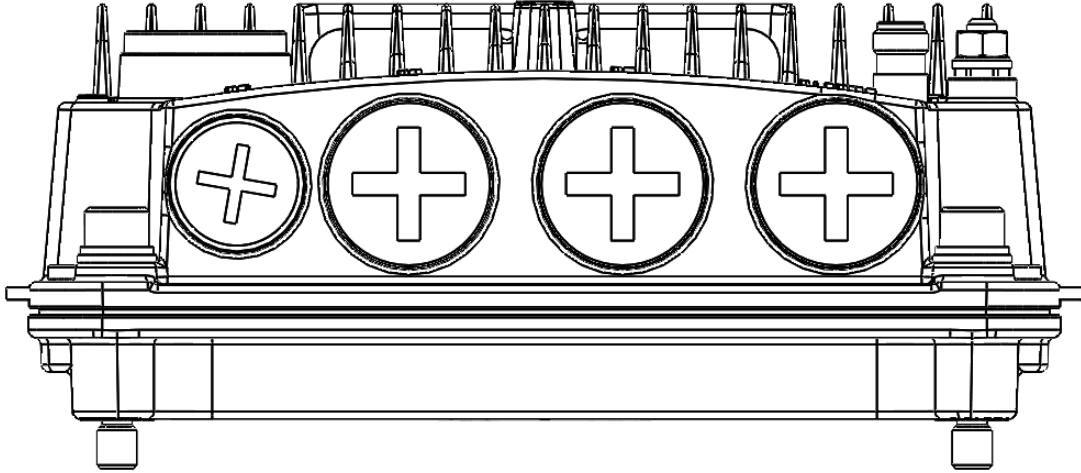


3. Insert the CAT-5e or CAT-6 cable into the gland body.

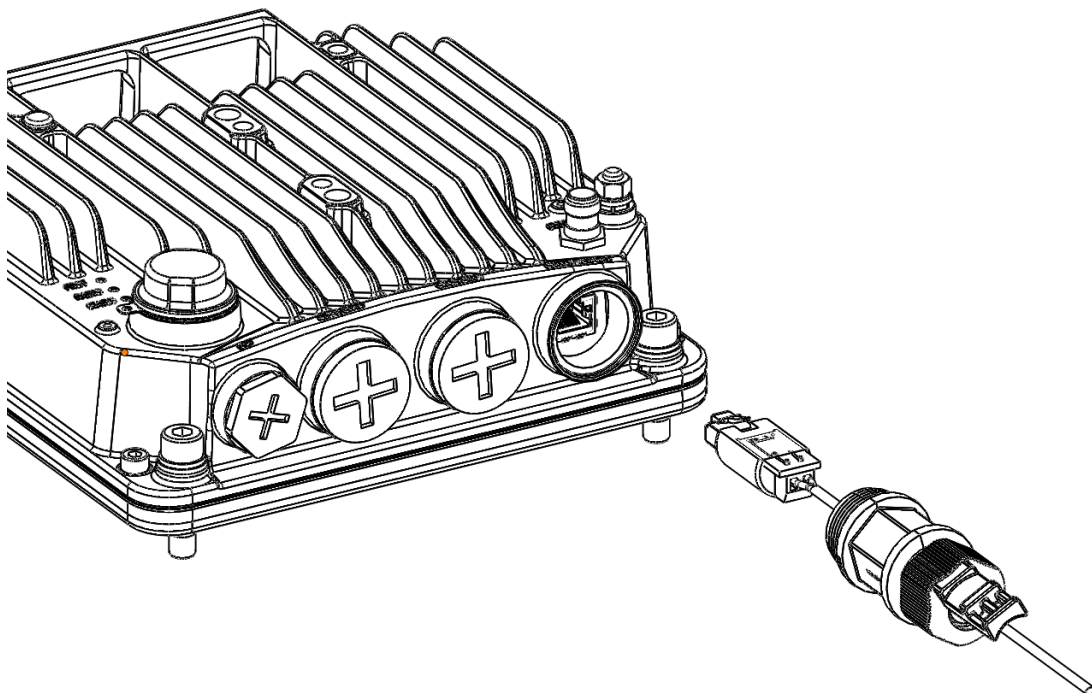
Connection of CAT-5e or CAT-6 Cable to RFU-S

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

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



2. Connect the cable to the RFU-S.

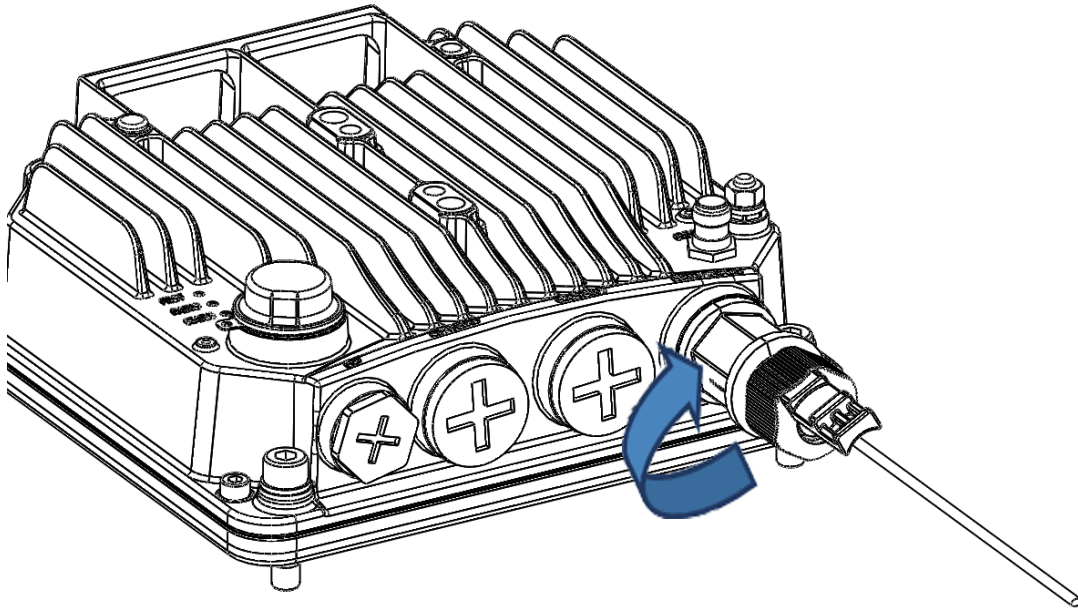


3. Screw the gland into the radio unit.

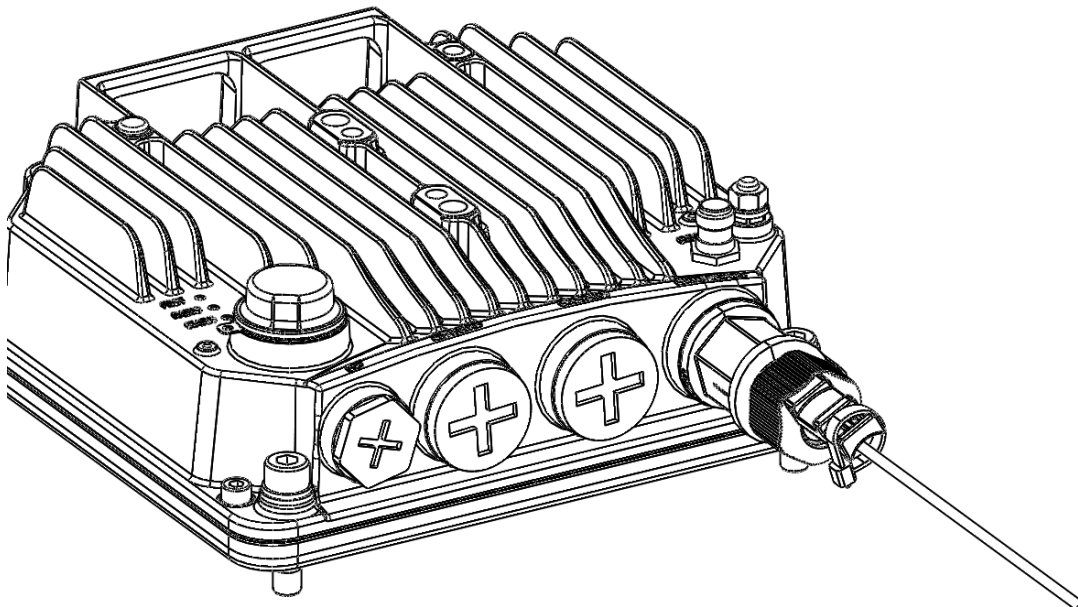


Note

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

Installing the Diplexer on the Radio

For frequencies of 6 to 15 GHz, the RFU-S is delivered as two separate components: a generic radio unit and a diplexer unit. This section explains how to attach the diplexer unit to the radio unit.

List of Items

Item	Description	Quantity	Remarks
1	RFU-S BASIC RADIO UNIT	1	
2	RFU-S COVER and DIPLEXER UNIT	1	

Required Tools

- Metric offset hexagon socket key wrench #4 (Allen key)

Procedure

**Note**

Do not remove the transparent pressure window located on the antenna interface on the cover + diplexer unit



1. Prior to the installation, remove the sticker which is covering the diplexer ports on cover + diplexer unit and the sticker that is covering the TRX ports on the basic radio unit.

Figure 11 Removing Sticker from Diplexer Unit

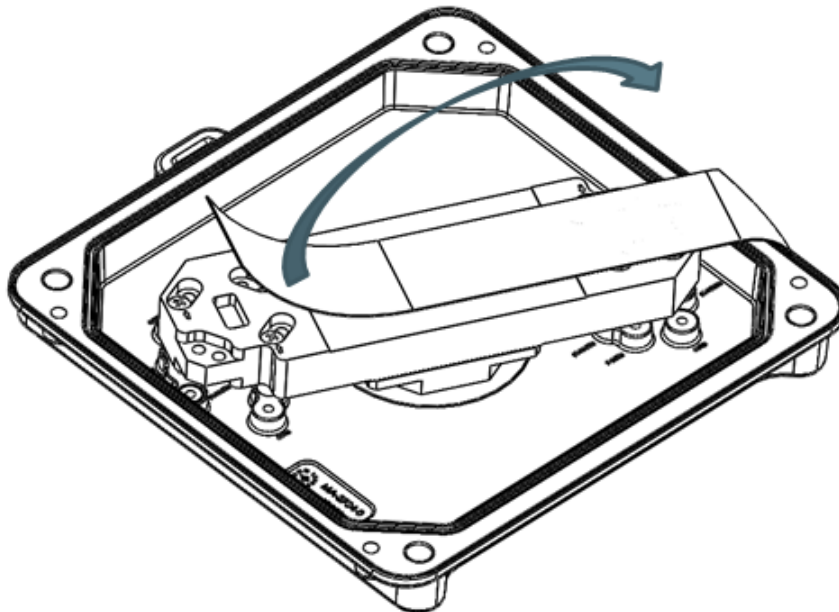
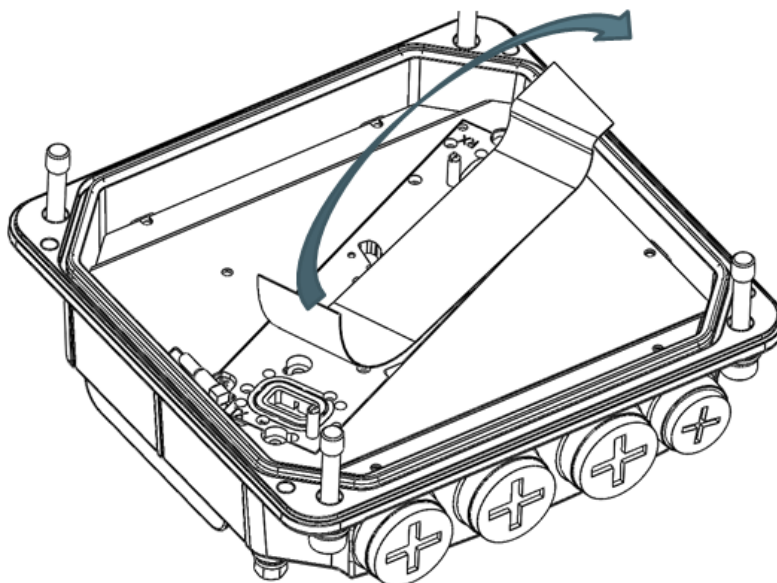


Figure 12 Removing Sticker from Radio Unit



2. Position the diplexer unit on the radio unit so that the two location pins mounted on the TRX ports of the radio unit (Figure 13) fit into the corresponding holes in the diplexer unit (Figure 14).
3. Attach the diplexer to the TRX using the two location pins. Make sure that the hook and the carrying handle are on the same side in both the radio unit and the diplexer unit (Figure 16).

Figure 13 Fitting the Diplexer Unit to the Radio Unit - Radio Side

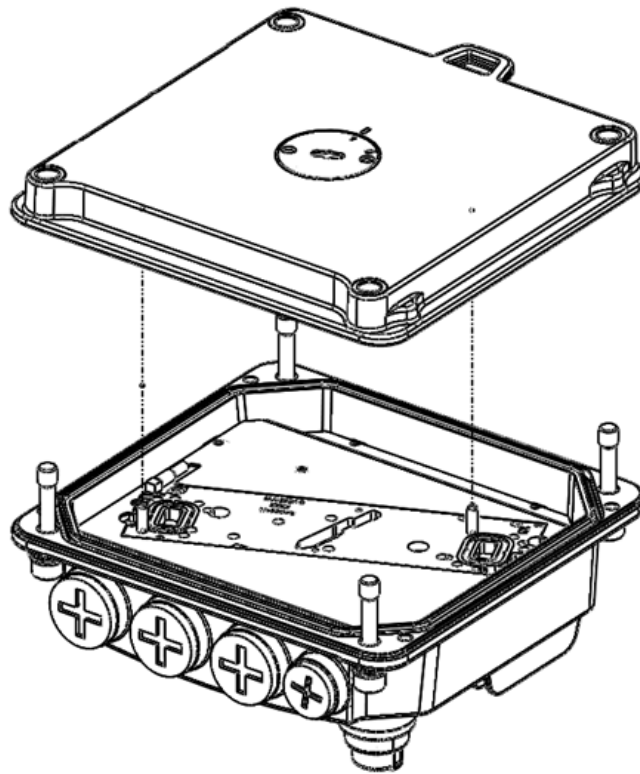


Figure 14 Fitting the Diplexer Unit to the Radio Unit - Diplexer Unit Side

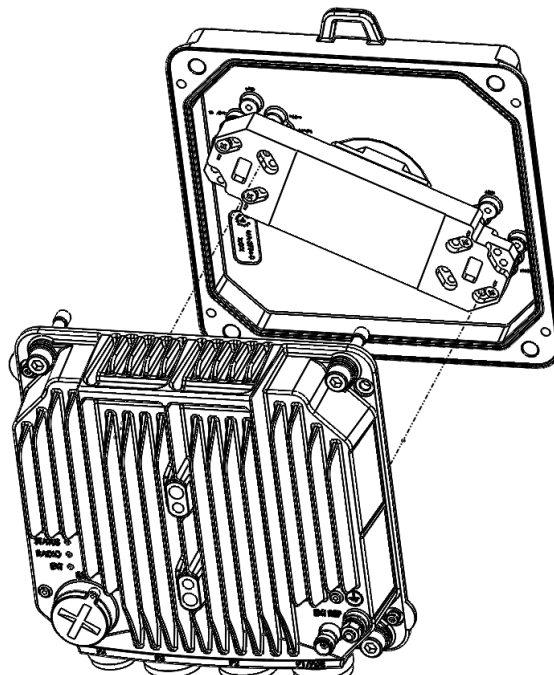


Figure 15 Radio and Diplexer Units Together

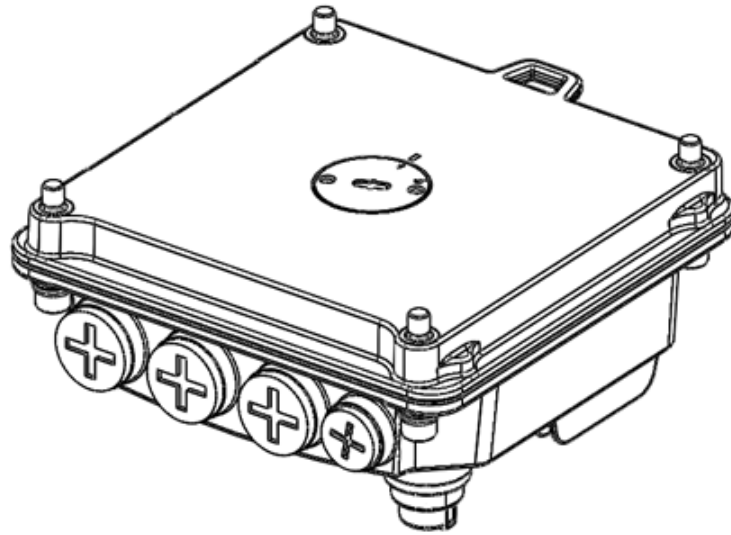
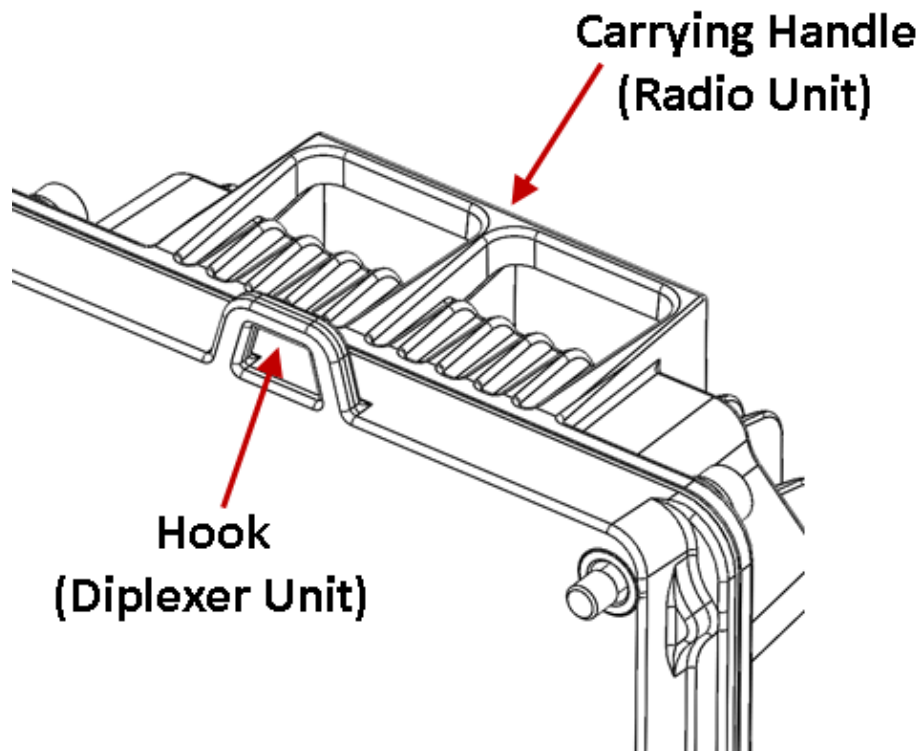
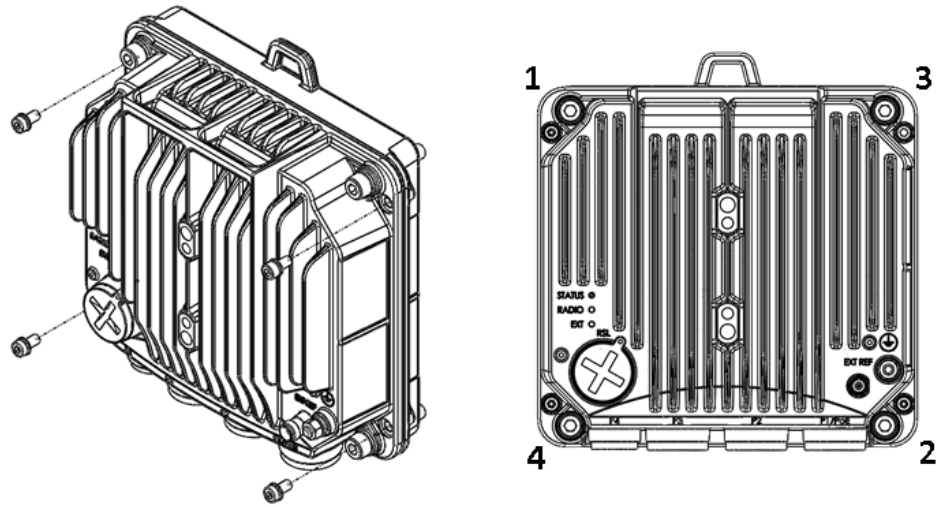


Figure 16 Hook and Carrying Handle



4. Secure the diplexer unit to the radio unit using the four M5 screws supplied with the radio unit. First, gently tighten the screws in the order shown in Figure 17. Then strongly tighten the screws in the same order.

Figure 17 Securing the Diplexer Unit to the Radio Unit



5. Proceed to install the RFU-S in the desired configuration, as described in Chapter 5.

Chapter 5: Installation Procedures per Configuration Type

1+0 Direct Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	RFU-S RADIO	1	

Required Tools

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

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

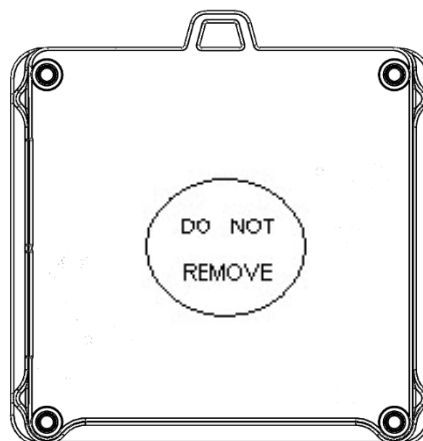
Procedure



Note

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

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



Note

If necessary, change the radio polarization by disassembling the two screws, rotating the twist, and tightening the two screws to the appropriate place.

Figure 18 Vertical Polarization (Default)

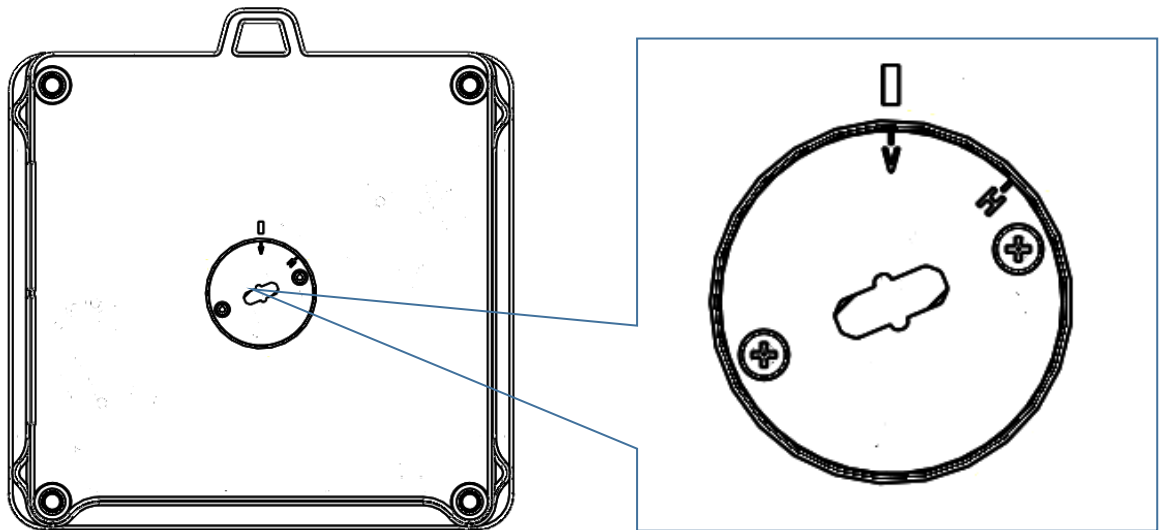
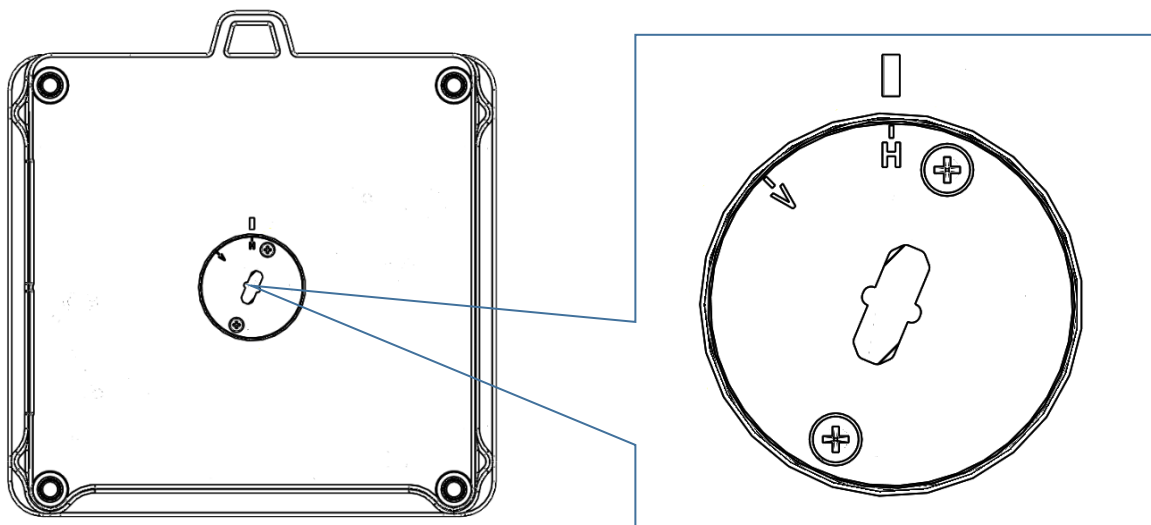
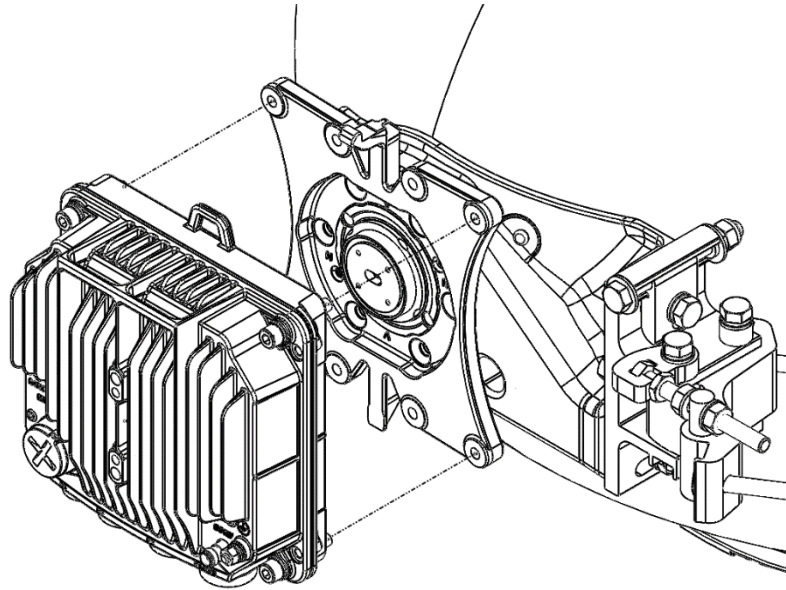


Figure 19 Horizontal Polarization



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



Note

Make sure the polarization mounting direction of the RFU-S is correct.

1+1 Direct Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	RFU-S RADIO	2	
2	RFU-C COUPLER KIT	1	
3	RFU-C TWIST KIT	1	

Required Tools

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

- Metric offset hexagon key wrench #6
- Phillips #2 screwdriver
- Metric offset hexagon key wrench #2.5 and #3

Procedure

In a 1+1 direct mount installation, the RFU-S is attached to a coupler. To install an RFU-S in a direct mount 1+1 configuration:

**Note**

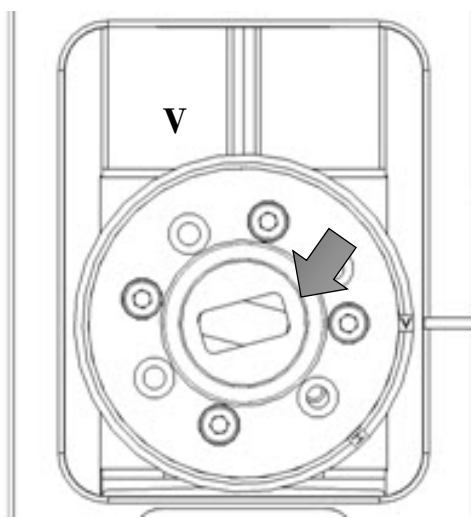
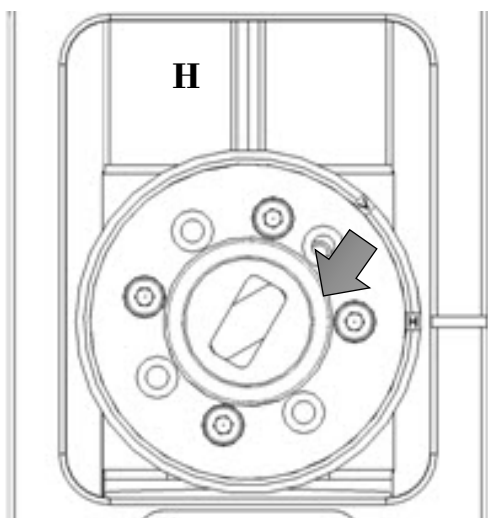
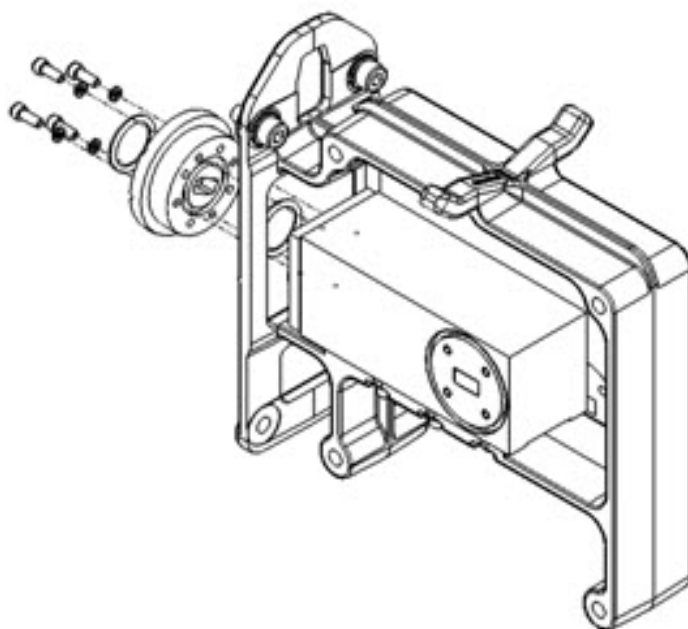
For 15 and 18 GHz frequencies, two O-Rings are supplied in the Twist kit and should be mounted in the twist grooves.

For 6 GHz frequency, a gasket is used instead of an O-Ring. The gasket should be mounted between the twist and the RFU-C Coupler kit.

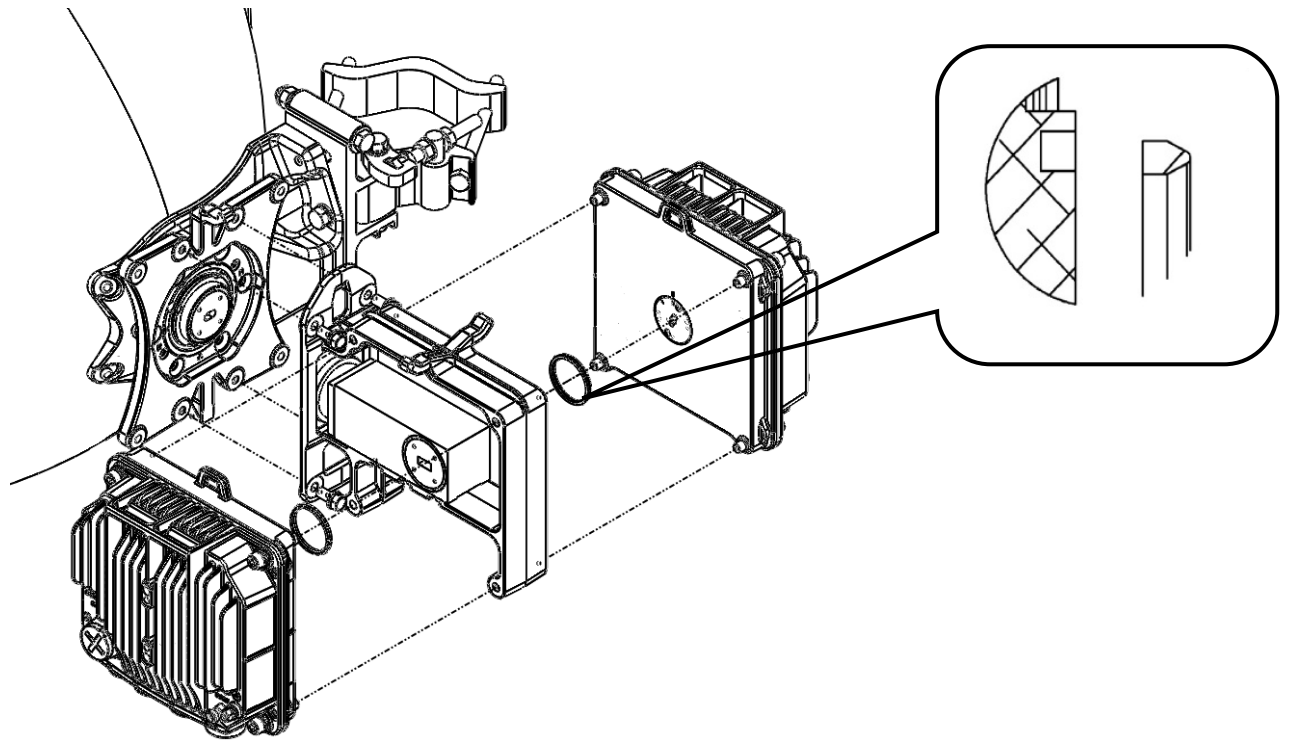
1. Mount the twist to the coupler using the O-Ring and four screws supplied with the Twist kit and tighten the screws.

**Note**

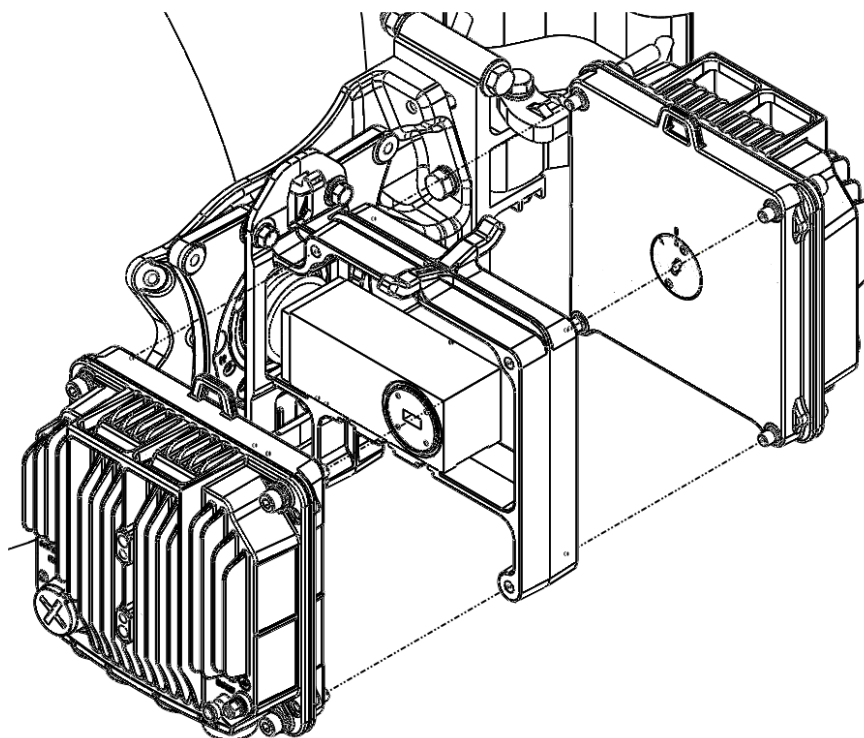
Make sure the polarization mounting direction of the twist to the coupler is according to the antenna polarization.



2. Mount the coupler on the antenna using the four M8 screws and washers supplied with the RFU-C Coupler kit and tighten the screws.
3. Mount the two O-Rings supplied with the RFU-C Coupler kit, as shown in the following figure.



4. Mount the RFU-S to the body of the coupler using the four M8 captive screws and washers that are supplied, assembled, with the RFU-S, and tighten the screws.



Chapter 6: RFU-S LEDs

The RFU-S 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



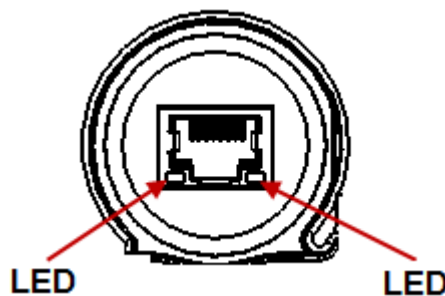
Note

The EXT LED is not relevant for RFU-S.

Electrical GbE Interface (RJ-45) LEDs

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

Figure 20 RFU-S LEDs – RJ-45 Interface



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

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

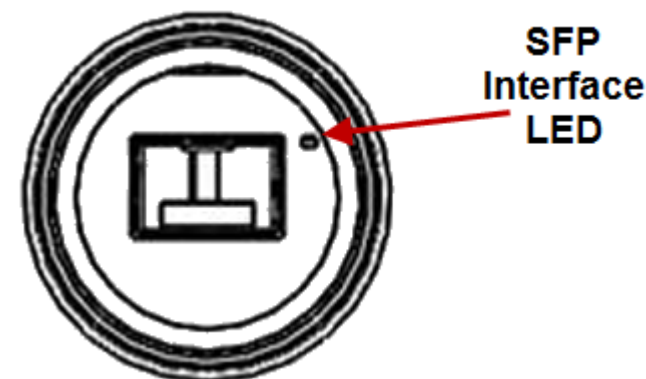
The LED on the right indicates the interface's Admin and cable connection status, and whether there is traffic on the interface:

- **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 21 RFU-S 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-S 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-S.

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.

Chapter 7: Installing RFU-S on Third-Party Antenna Adaptors

Since the RFU-S uses the same antennas as RFU-C, it can utilize the 3rd party mediation devices much in the same way they are used with RFU-C installations.

Special attention must be taken in assembling these configurations, as the 3rd party adaptors can be used only for single polarization configurations. Dual polarization configurations cannot be accommodated with RFU-S.

In general, once the correct 3rd party adaptor has been selected and installed on the antenna, the interface now is identical to a generic single polarization RFU-S interface. From this moment forth it is ready for any subsequent RFU-S configuration.

The following tables describe available adaptors.

Table 19: 3rd-Party Adaptors, 6 GHz – 15 GHz

Other Vendors Antennas	6 GHz	7 GHz	11 GHz	13GHz	15GHz
PTP820 Dragonwave Antenna Adaptor			N110082L011A	N130082L004A	
PTP 820 Andrew Valuline Antenna Convert kit	N060082L004A	N070082L003A	N110082L003A	N130082L003A	N150082L001A

Table 20: 3rd-Party Adaptors, 18 GHz – 38 GHz

Other Vendors Antennas	18 GHz	23 GHz	26 GHz	28-31 GHz	32 GHz	38 GHz
PTP820 Dragonwave Antenna Adaptor	N180082L009A	N230082L002A				
PTP 820 Andrew Valuline Antenna Convert kit	N180082L001A	N230082L001A	N260082L001A	N280082L001 A	N320082L001 A	N380082L001 A

**Note**

For instructions how to install these third-party adaptors, refer to the RFU-C Installation Guide.

Special Note on Converting ValuLine 3 Antennas

Part Numbers for ValuLine 3 antenna conversion kits are valid for most ValuLine 3 antennas, integrated or non-integrated. These conversion kits can also be used to convert CommScope ValuLine 3 antennas with the old Nera Evolution interface to RFU-C. The kits support the majority of CommScope's ValuLine 3 antennas, 1-6ft. However, since there are some unique cases in which CommScope provided special antennas which are not supported by these adaptors, it is recommended that you supply your Cambium representative with a picture of the current antenna (back plain side), in order to confirm the antenna's compatibility prior to implementing this solution. You can also check the following to determine whether the antenna is compatible with the conversion kit:

- Verify that the antenna is, in fact, a ValuLine 3 antenna.
- Verify that the back plate of the antenna has in its holding plate the six mounting holes shown in red in the figure below.

