



INSTALLATION GUIDE

PTP 850EX PTP 850EX-P

Release 13.1



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Contents

Contents	3
Before You Start	6
Safety Precautions & Declared Material	6
Public and Occupational Boundary Distances Under Article 3.1(a) of the RE Directive	6
General Equipment Precautions	7
Précautions générales relatives à l'équipement	8
Allgemeine Vorsichtsmaßnahmen für die Anlage	8
Pre-Installation Instructions	9
Packing	9
Transportation and Storage	9
Unpacking	9
Inspection	9
Torque Requirements	9
Tips for Installation and Alignment	10
Product Hardware Description	11
PTP 850EX Hardware Overview	11
PTP 850EX and PTP 850EX-P Interfaces	12
Resetting the IP Address	14
PoE Injector	14
PoE Injector Interfaces	15
System Component	15
Adaptors and Installation Kits	16
Antenna Interface Specifications	17
Power Specifications	18
Power Input Specifications	18
Power Consumption Specifications	18
Environmental Specifications	18
Cable Installation and Grounding	20
Minimum and Maximum Cable Diameter	20
Grounding the Cables	20
Grounding the PTP 850EX Unit	25

Power Source	27
Surge Protection	27
Available Cable Options	28
Fiber Optic Cables – Single Mode (SM)	28
Fiber Optic Cables – Multi Mode (MM)	28
DC Cable and Connector	29
Extension Cables for Unit Redundancy and XPIC	29
Clock Sharing Cable for XPIC	30
Ethernet Cable and Specifications	30
Outdoor Ethernet Cable Specifications	31
Special Instructions for use of Glands	33
General Installation Procedure	35
Connecting an Optical Fiber Cable and SFP	41
Types of SFPs	41
Connecting Optical Fiber to SFPs	42
Connecting Optical Fiber and a QSFP-to-SFP Adaptor to the QSFP Port	47
Connecting a DC Power Cable	50
Connecting the Ethernet Cable	55
Preparing the Ethernet Cable and Plug-in Field	55
Preparing the Ethernet Cable Already Assembled	59
Connection of Ethernet Cable to PTP 850EX	60
Connection of Protection/XPIC Cable to PTP 850EX	63
Direct Mount Configurations	66
Antenna and Radio Polarization	66
1+0 Direct Mount Installation	68
1+0 Direct Mount Installation without Antenna Adaptor	68
1+0 Direct Mount Installation with Antenna Adaptor	70
2+0 Direct Mount Dual Polarization (XPIC)	75
1+1 HSB (Unit Redundancy)	78
Installation Procedure and Antenna Alignment with 43 dBi Flat Antenna and Alignment Device	80
Pole Mount Assembly and Installation	84
Wall Mount Assembly and Installation	87
Attaching the PTP 850EX to the Installation and Alignment Device	90

Performing Antenna Alignment Using the Enhanced Alignment Kit	94
Adjusting the Antenna Azimuth	94
Adjusting the Antenna Elevation	97
2+0 (XPIC) with 43 dBi Flat Antenna and Alignment Device	101
PoE Injector Installation and Connection	103
PoE Injector Cable Connection	103
PoE Injector Grounding	104
PoE Injector Wall Mount Installation	104
PoE Injector Pole Mount Installation	107
PoE Injector 19 Rack Installation	108
PoE Injector ETSI Rack Installation	110
Appendix A: Acceptance & Commissioning Procedures	113
Site Acceptance Procedure	113
Site Acceptance Checklist Notes	116
Radio Link Commissioning Procedure	117
Scope	117
Commissioning Test	117
PTP 850EX Commissioning Log	118
Cambium Networks	121

Before You Start

Consider the following **important key points** before you start the installation:

- 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 avoid the user's authority to operate the equipment and the warranty for such equipment.
- PTP 850EX is intended for installation in a restricted access location.
- PTP 850EX must be installed and permanently connected to protective earth by qualified service personnel in accordance with applicable national electrical codes.
- 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.
- Site grounding is the responsibility of the operator or owner of the site. It is critical that all site components be properly grounded in accordance with the specific site requirements and applicable industry standards and best practices. Ground resistance must be no more than 5 ohms. Any higher resistance may lead to equipment malfunction and affect the product's warranty.
- Ethernet cables must be shielded and grounded, as described in [Grounding the Cables](#).
- Whenever crimp connections are used with cables, the bare conductors must be cleaned and coated with antioxidants before the crimp connections are made.
- PTP 850EX is intended to be installed and used in a variety of cell-sites and other outdoor customer locations. Use case scenarios include:
 - Macro site backhaul
 - Macro site aggregation
 - Ultra-high capacity to POP
 - Small cell backhaul

Safety Precautions & Declared Material

Following are the safety precautions and declared materials:

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

Based on the highest nominal output power of the PTP 850EX:

- The public exposure of compliance boundary distance is 4.5m. This is the worst case for the highest nominal output power, using antennas below 2 feet. For all other configurations, the compliance boundary distance is 0.
- The occupational exposure of compliance boundary distance is 0.

**Note**

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

**Warning:**

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.

**Warning:**

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.

**Warning:**

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

**Warning:**

When working with a PTP 850EX, 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.

**Warning:**

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

**Warning:**

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.



Caution:

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 PTP 850EX 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.

Précautions générales relatives à l'équipement



AVERTISSEMENT :

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.



AVERTISSEMENT :

L'usage de PTP 850EX 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.



AVERTISSEMENT :

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



WARNUNG:

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



WARNUNG:

Beachten Sie beim Arbeiten mit PTP 850EX das folgende Stromschlag- und Gefahrenrisiko: Durch Abtrennen einer Stromquelle wird nur ein



WARNUNG:

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

Pre-Installation Instructions

Packing

The equipment should 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 packaging 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 specially 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 part numbers and quantities of goods have arrived. Inspect for any damage to the cases and equipment. Report any damage or discrepancy to a Cambium Networks representative, by e-mail or fax.

Torque Requirements

When performing the procedures described in this document, make sure to use the following torque according to the type of screws used in the procedure:

- M8 screws: 23 Nm
- M6 screws: 9 Nm
- M3 screws (used with PTP 820C and PTP 820S twist): 0.8 Nm
- #4-40 Screws (used with PTP 850EX and PTP 850EX coupler/splitter twist): 0.8 Nm

Tips for Installation and Alignment

The following recommendations can help ensure a smooth and successful installation and alignment procedure:

- Lubricate the mounting hardware well in order to ensure that the equipment moves smoothly and without jumps during alignment.
- During alignment, make small adjustments to the alignment screw and wait several seconds until the multimeter updates the values before making further adjustments.
- Make sure to connect the antenna evenly to the radio unit. Be careful to tighten all of the screws evenly but not tightly. Then, tighten the screws firmly in diagonal order.

Product Hardware Description

PTP 850EX Hardware Overview

PTP 850EX features an all-outdoor architecture consisting of a single unit, which can be either directly mounted on the antenna or supplied with an integrated antenna.



Note

The equipment is type approved and labeled according to Radio Equipment Directive – RED (2014/53/EU).

Figure 1: PTP 850EX Direct Mount HW Ready – Rear View (Left) and Front View (Right)

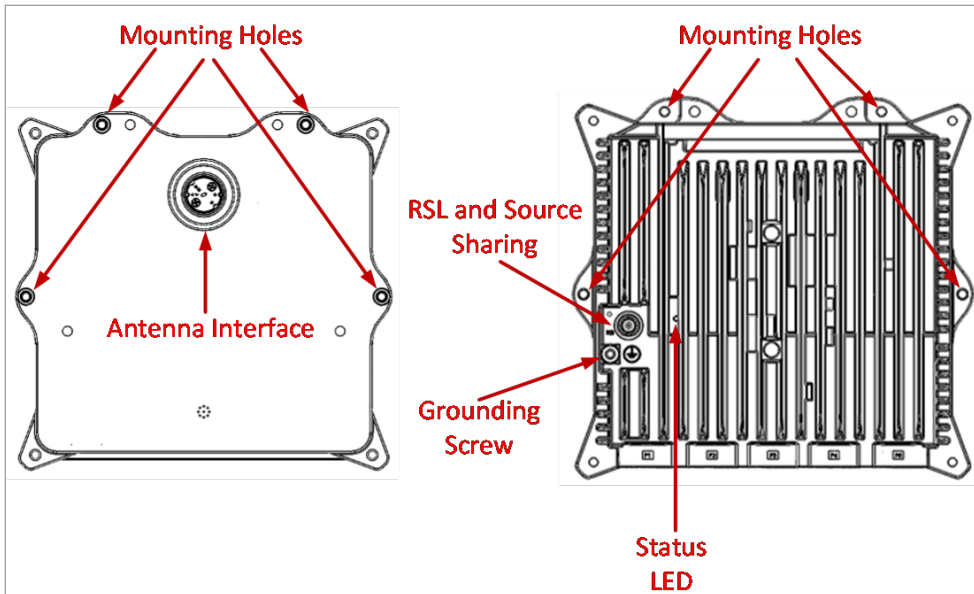
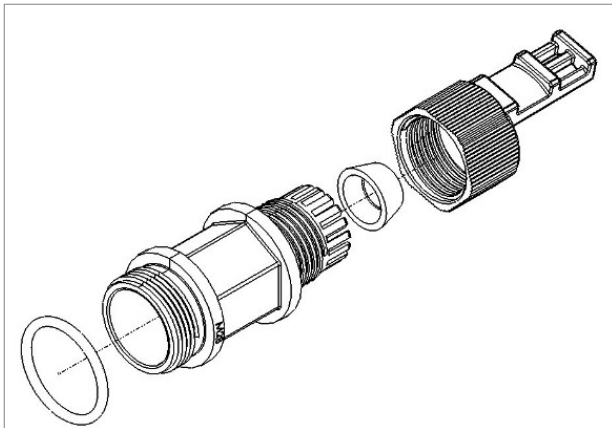


Figure 2: Cable Gland Construction



PTP 850EX and PTP 850EX-P Interfaces

TBD – after approval of TD, copy the whole section from TD to here. For references to QSFP accessories, cross-ref to the QSFP accessories table, bookmark QSFP_Accessories.

PTP 850EX and PTP 850EX-P has two optical SFP28 cages for traffic and one RJ-45 port for management and traffic. They also has one QSFP port which can be used as an XPIC/protection port or a 1 x 1GbE or 10GbE traffic port.

PTP 850EX has an RJ-45 management port, which can also be used for traffic.



Note

In System Release 12.9.5 and 13.0, only PTP 850EX-P supports traffic over the management port.

For power, PTP 850EX and PTP 850EX-P both have a DC power interface (-48V) (Port 1).

In addition, PTP 850EX-P has an option to receive PoE power from a Cambium-approved PoE injector via the management port, P2.

Figure 3: PTP 850EX Interfaces

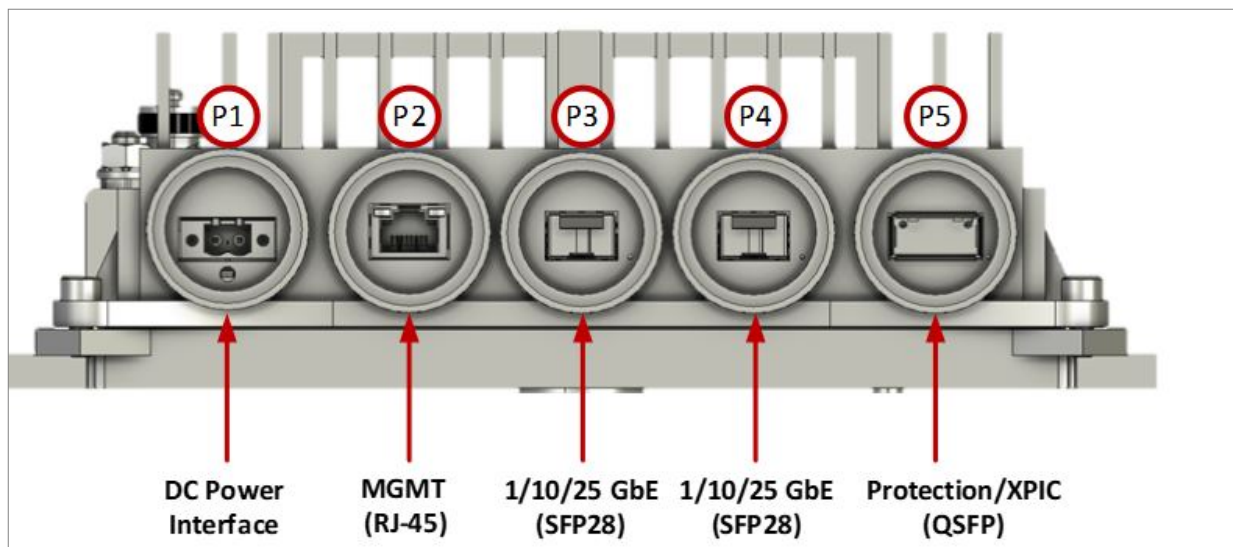
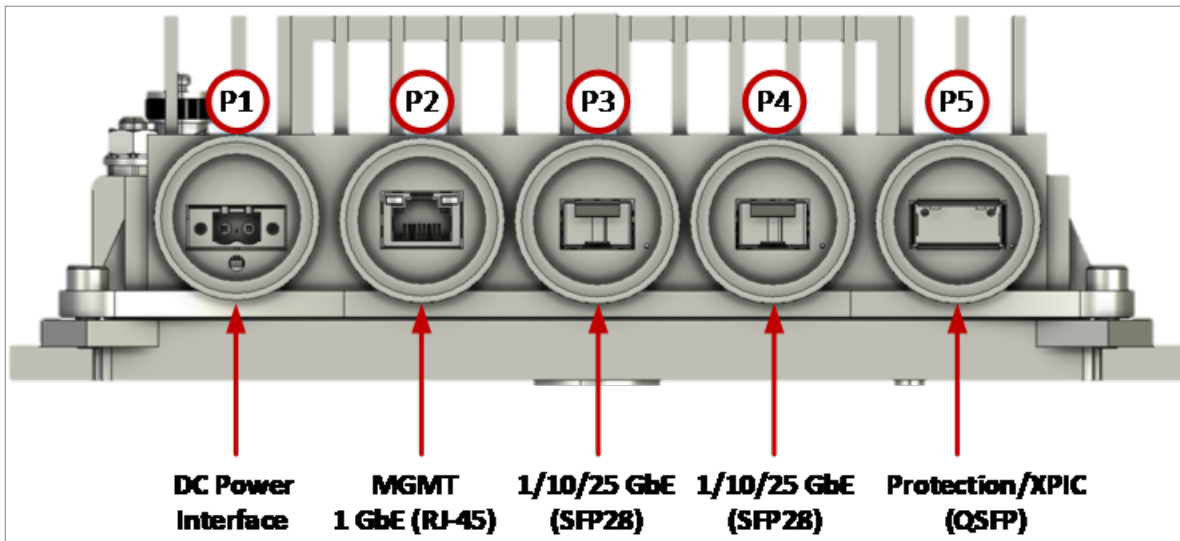


Figure 4: PTP 850EX-P Interfaces



- P1 – Power Interface (-48V)
 - Reset button – see Resetting the IP Address
- P2 (MNG 1/Eth 1):
 - Electric: 100/1000Base-T RJ-45
 - Management port
 - 1G Eth traffic



Note

In System Release 12.9.5 and 13.0, only PTP 850EX-P supports traffic over the management port.

- PoE (PTP 850EX-P only)
- P3 (Eth 2):
 - SFP cage which supports SFP28 standard
 - 1/10/25 GbE Eth traffic (user configurable)
- P4 (Eth 3):
 - SFP cage which supports SFP28 standard
 - 1/10/25 GbE Eth traffic (user configurable)
- P5 (Eth 4):
 - QSFP (internal) for XPIC and Unit Redundancy (Protection)
 - Option for SFP or SFP+ (1 x 1 or 10GbE) with adaptor (1+0 configurations only)
- RSL/Source Sharing interface – TNC connector. Use a TNC-to-DVM 6 mm jack cable to measure the RSL with this interface.



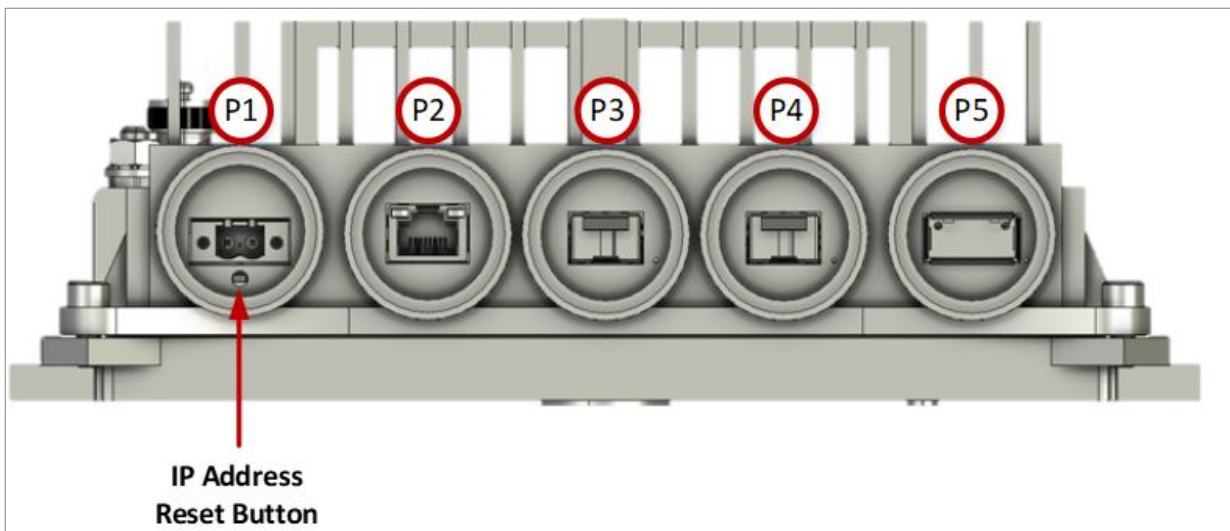
Note

A TNC Plug (male) to banana plug cable is available and can be ordered from Cambium Networks. The marketing model is: AGC BNC/TNC to DVM cable. The kit also includes a BNC plug to 4 mm and 2 mm banana plugs.

- Antenna Port – Cambium Networks proprietary flange (flange compliant with UG385/U)
- Grounding screw

Resetting the IP Address

If the unit's IP address on an PTP 850EX has been changed from its default of 192.168.1.1, and you do not know the new IP address, you can reset the IP address by pressing a reset button underneath the DC Power Interface (P1). You must press the button for at least ten seconds.



PoE Injector

PTP 850EX-P can be used with a Cambium-approved PoE Injector to provide power via the management port, P2.

The following PoE Injector model is available:

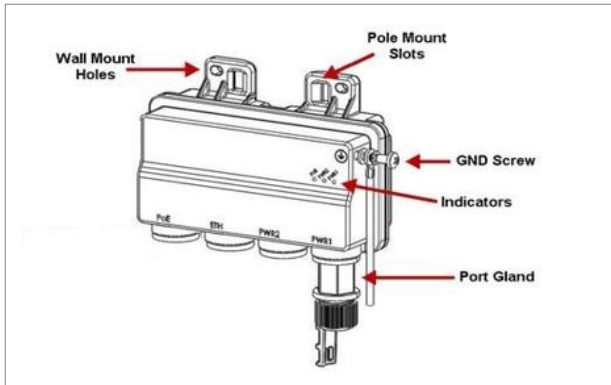
- PoE_Inj_AO_2DC_24V_48V – Includes two DC power ports with power input ranges of $\pm(18-60)V$ each.

The PoE injector can be ordered with a DC feed protection, as well as EMC surge protection for both indoor and outdoor installation options. It can be mounted on poles, walls, or inside racks.

Each PoE Injector kit includes the following items:

- PoE injector
- 2 DC power connectors

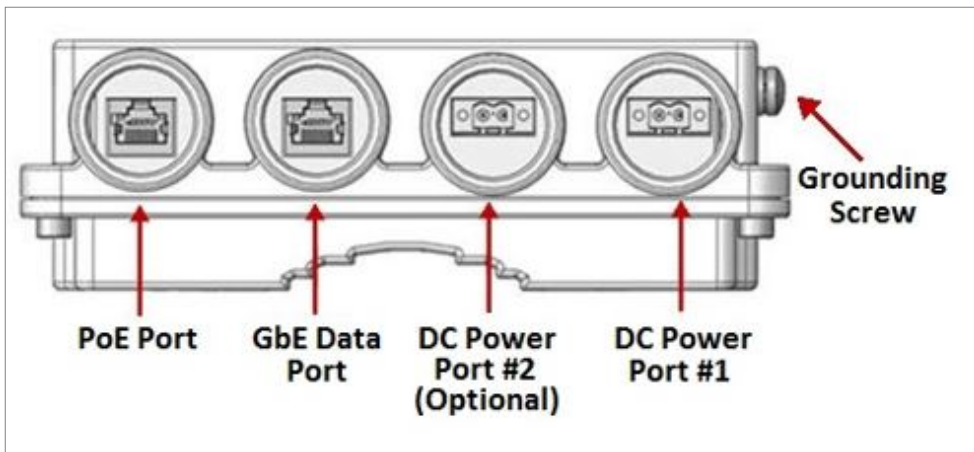
Figure 5: PoE Injector



PoE Injector Interfaces

- Power-Over-Ethernet (PoE) Port
- GbE Data Port supporting 10/100/1000Base-T
- DC Power Port 1 $\pm(18-60)V$ or $\pm(40-60)V$
- DC Power Port 2 $\pm(18-60)V$ (Optional)
- Grounding screw

Figure 6: PoE Injector Ports



System Component

The following figures show the main components used in the PTP 850EX installation procedures.

Figure 7: PTP 850EX

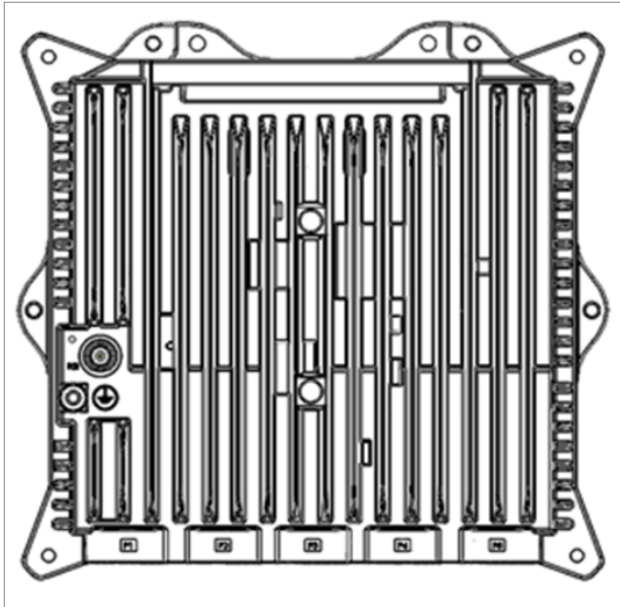
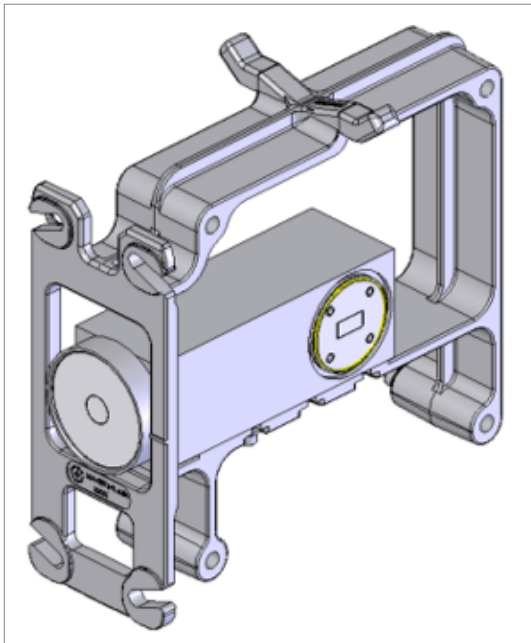


Figure 8: OMT



Adaptors and Installation Kits



Note:

The antenna interface on the PTP 850EX and PTP 850EX-P is located slightly higher than other Cambium E-band products, the E-band mediation devices have been modified to accommodate all Cambium E-band products, including the PTP 850EX and PTP 850EX-P. Before performing the installation, make sure that you have the modified versions of any

necessary mediation devices, according to the relevant PCNs that have been issued by Cambium Networks.

Table 1 PTP 850EX Accessories

Part Number	Description
N800082L001A	PTP 820E/850E OMT Kit
N800082L002A	PTP 820E/850E Splitter Kit
N800082L003A	PTP 820E/850E Coupler Kit

Table 2 PoE Injector (PTP 850EX-P only)

Marketing Model	Description
N000082L022A	PoE injector, all outdoor, redundant DC input, -48VDC +24VDC
N000082L020A	PoE Injector 19" Rack Mount Kit
N000082L021A	PoE Injector ETSI Rack Mount Kit

Table 3 QSFP Accessories

Marketing Model	Item Description
QSFP to SFP Kit	Converts the QSFP port to an SFP or SFP+ port. This adaptor is used when P5 is providing a 1x1/10Gbps traffic interface. Note: This adaptor supports a temperature range of 0° to +70°C (32° to 158°F).
QSFP Transceiver (Multi Mode)	In 2x1/10Gbps configurations with PTP 850EXA, the transceiver is attached to the QSFP port (P5), and a 2x Dual LC cable is attached to the transceiver.
QSFP Transceiver (Single Mode)	In 2x1/10Gbps configurations with PTP 850EXA, the transceiver is attached to the QSFP port (P5), and a 2x Dual LC cable is attached to the transceiver.
QSFP Transceiver (Single Mode)	In 2x1/10Gbps configurations with PTP 850EXA, the transceiver is attached to the QSFP port (P5), and a 2x Dual LC cable is attached to the transceiver.
FO_SM_MPO_to_2xLC_ARM_100m	Connects the QSFP port (P5) to two SFP ports on the external switch or router. One of the QSFP transceivers listed above must be used with this cable.
QSFP+_to_QSFP+_cable	Used to connect the QSFP ports (P5) of two PTP 850EX devices in Unit Redundancy and XPIC configurations.

Antenna Interface Specifications

Remote Mount Antenna Interface:

Waveguide	Standard	Antenna Flange
WR12		UG387/U Cambium Antenna Interface

**Note**

Appropriate lubricant or grease can be applied to the screws that connect the PTP 850EX to the antenna interface.

Power Specifications

Power Input Specifications

Standard Input	-48 VDC nominal
Standard Input	-48 VDC
DC Input range	-40.5 to -60 VDC

Power Consumption Specifications

Table 4 Power Consumption – Standard PTP 850EX Devices

Unit Configuration	Power Consumption
Typical Power	50W
Maximum Power	55W

Table 5 Power Consumption – Standard PTP 850EX-P Devices

Unit Configuration	Power Consumption
Typical Power	61W
Maximum Power	65W

**Note**

- The unit must only be installed by service personnel.
- The unit must have a permanent connection to protective grounding.
- SFP and QSFP ports (Port 3, Port 4, and Port 5) do not provide protection from over-voltages on telecommunication networks for host equipment users.
- 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 4 Amp.

Environmental Specifications

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

Temperature range: -33°C (-27°F) to +55°C (131°F)

Humidity: 5%RH to 100%RH

IEC529 IP67

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

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

Cable Installation and Grounding

Minimum and Maximum Cable Diameter

To fit the gland, the outer cable diameter should be between 6-10 mm. This applies to all glands on the PTP 850EX.

Grounding the Cables

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 Ethernet cables, 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 C000065L007A (PTP 650/670 LPU and Grounding Kit (1 kit per ODU)).

Figure 9: Cable Grounding Kit

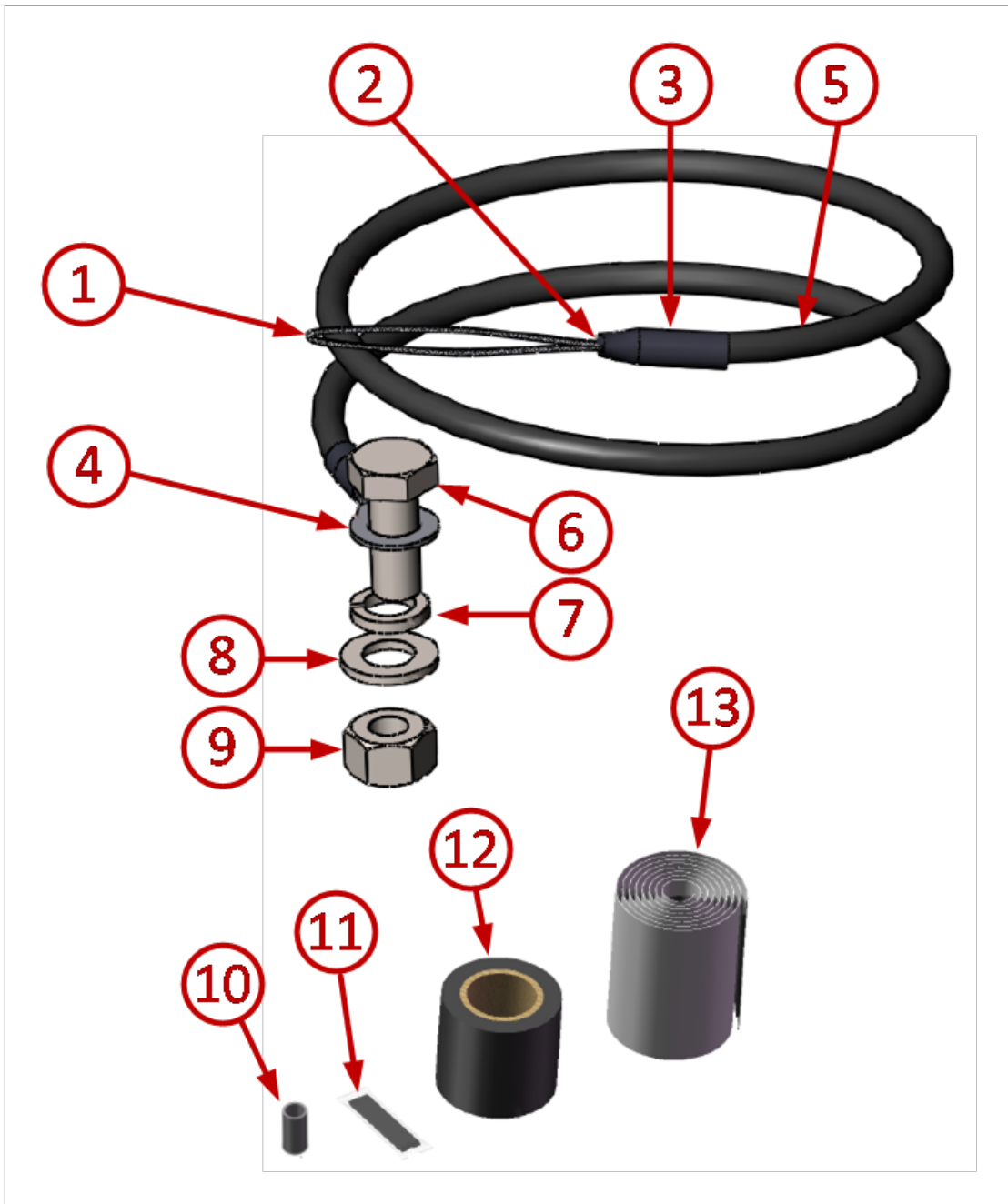
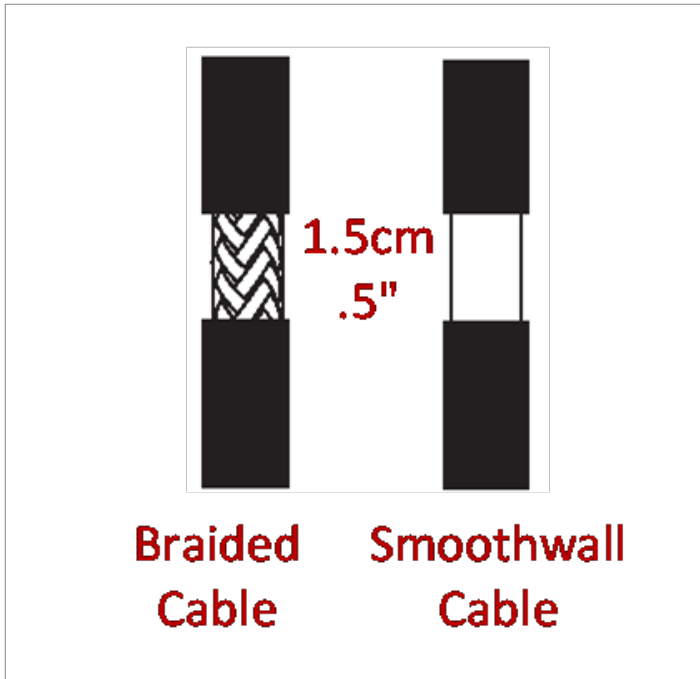


Table 6 Cable Grounding Kit

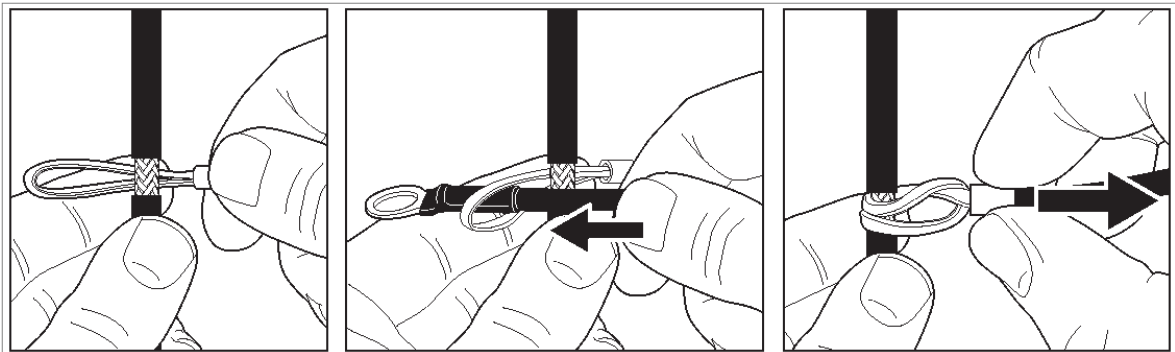
Part Number	Description
UNIV_GRD_KIT_1/2	Universal Grounding Kit up to 1/2" cable

To connect the grounding kit:

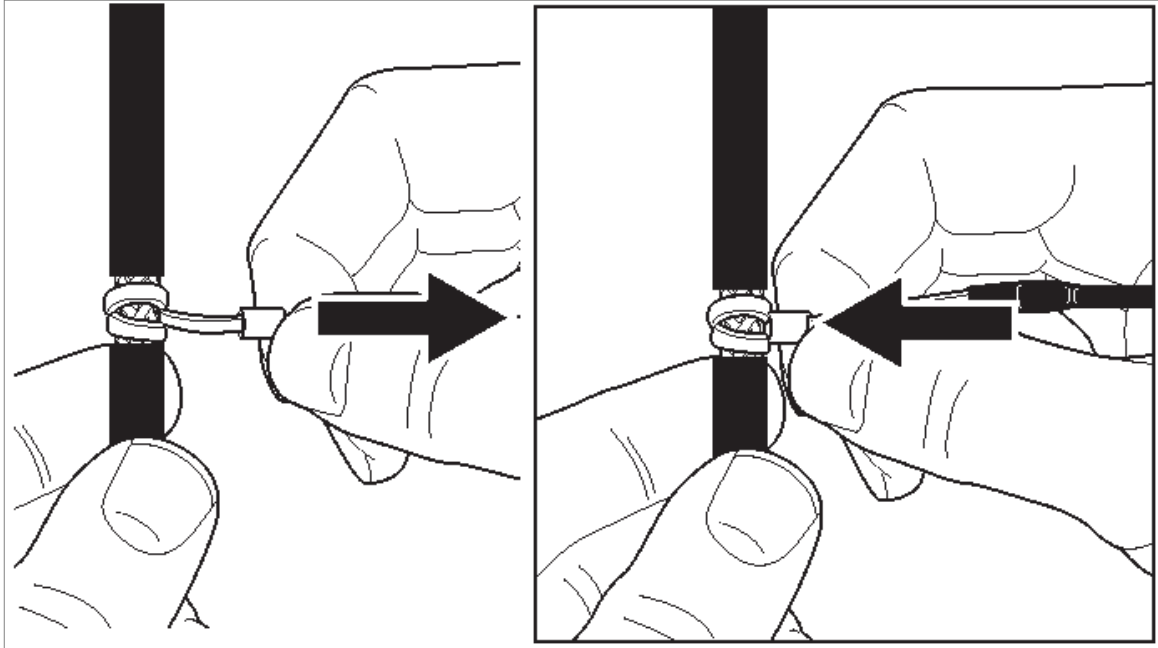
1. Strip the cable jacket about 1.5 cm (.5").



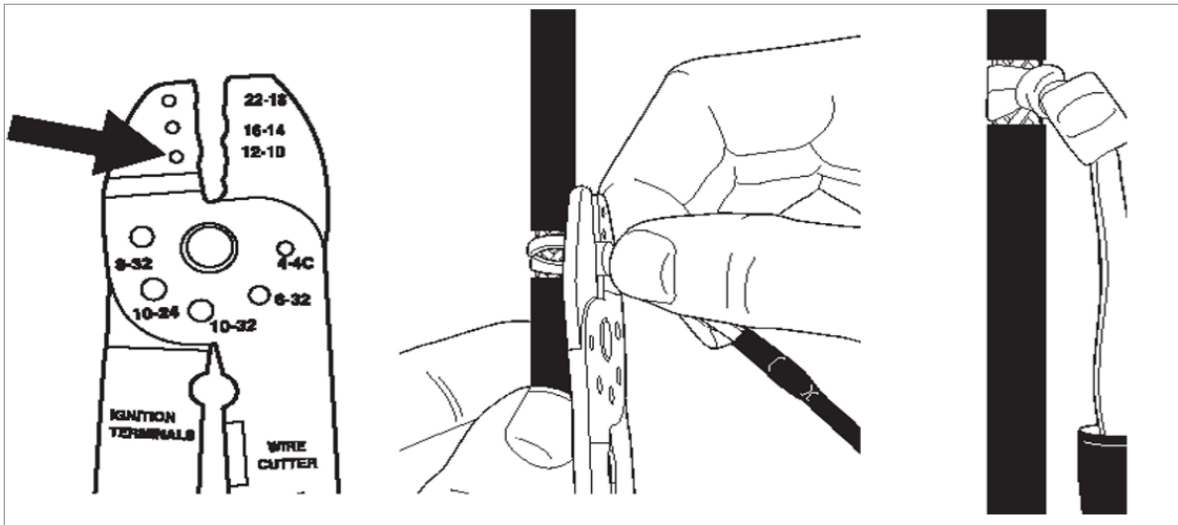
2. Loop the grounding wire's braid belt (1) around the stripped portion of the cable, insert the rest of the grounding wire (5) through the braid belt, and tighten to form a knot, as shown in the figure below.



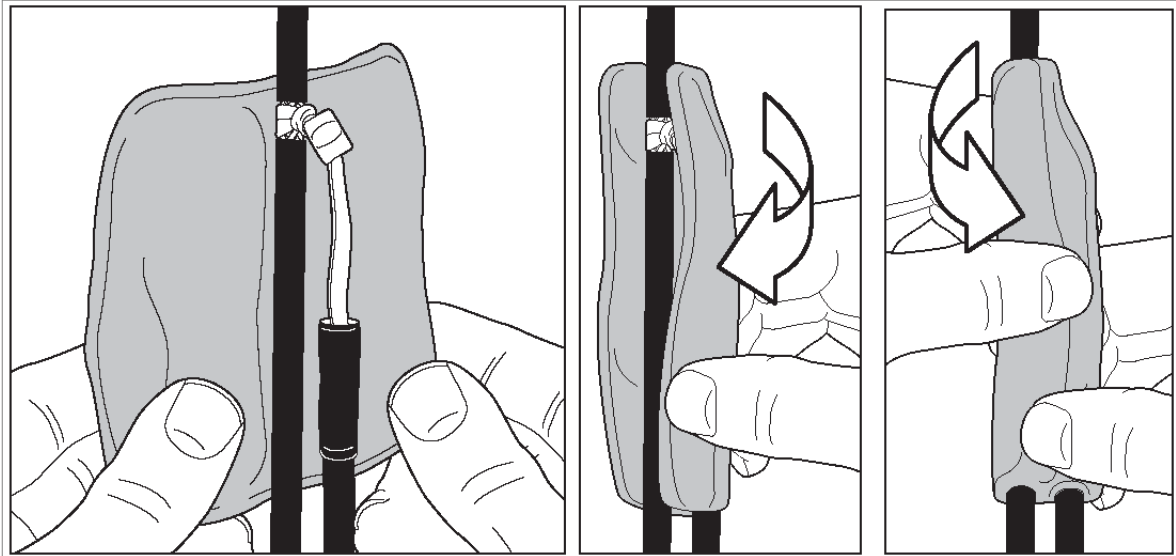
3. Grasp the terminal of the braid belt (2) and slide it flush with the knot around the cable, as shown in the figure below.



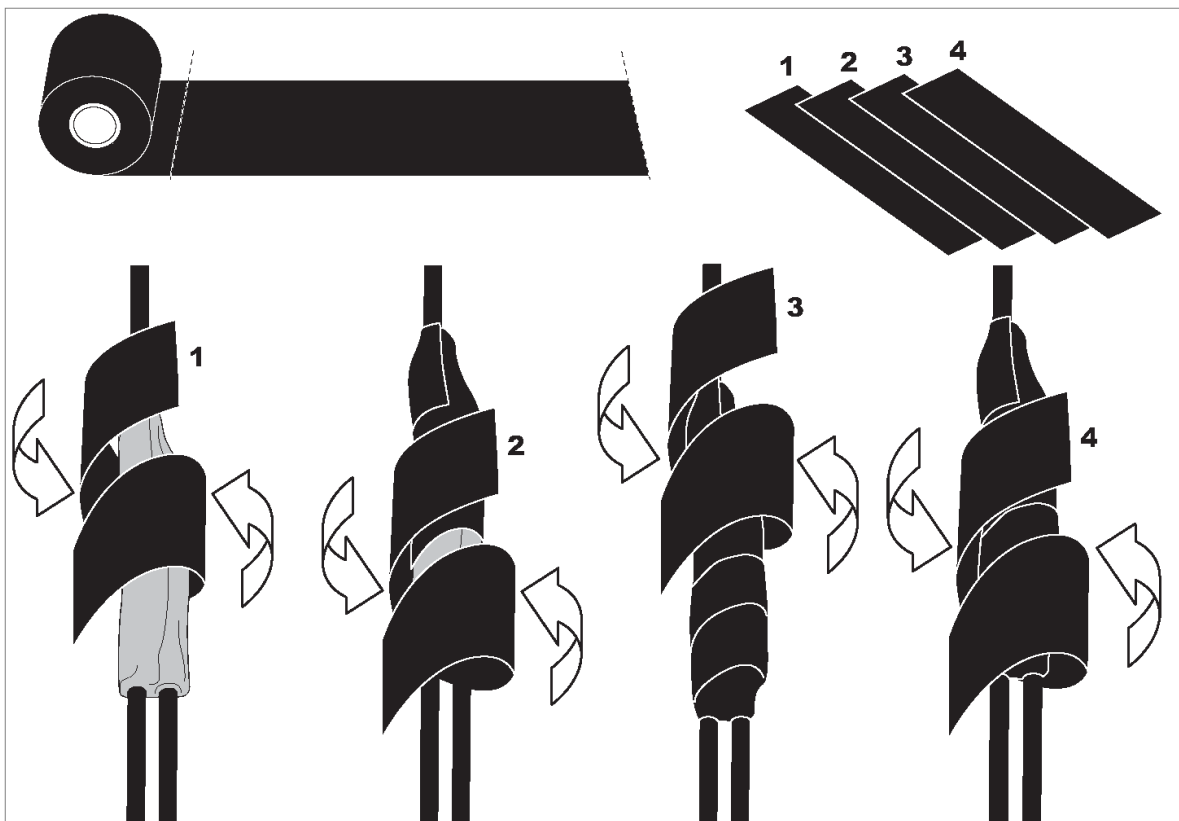
4. Crimp the knotted braided belt (1) and the bare terminal (10) together, as shown in the figures below.



5. Wrap the butyl rubber sealing clay (13) around the cable and the grounding wire, as shown in the figures below.

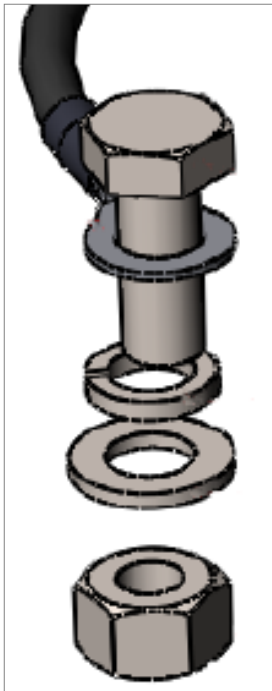


6. Cut four strips of the tape (12), approximately 20 cm (8") each, and wrap these strips of tape around the butyl rubber sealing clay (13), as shown in the figures below.





7. Pass the hex bolt (6) through the copper lug at the end of the grounding wire (4) and secure it to the grounding bar using the flat washer (7), the spring washer (8), and the nut (9). Use conductive grease (11) on the bolt and nut to ensure proper contact.



Grounding the PTP 850EX Unit

The grounding of the PTP 850EX must be connected with a grounding cable to the closest main grounding point (Common Bonding Network). The grounding cable must be at least 6 AWG or wider. The recommended length of the grounding cable is up to 2 meters, but in any case, not more than 6 meters. The recommended resistance between the tower's main grounding point and the PTP 850EX chassis is 2.5 m Ω or less, but in any case, not more than 10 m Ω .

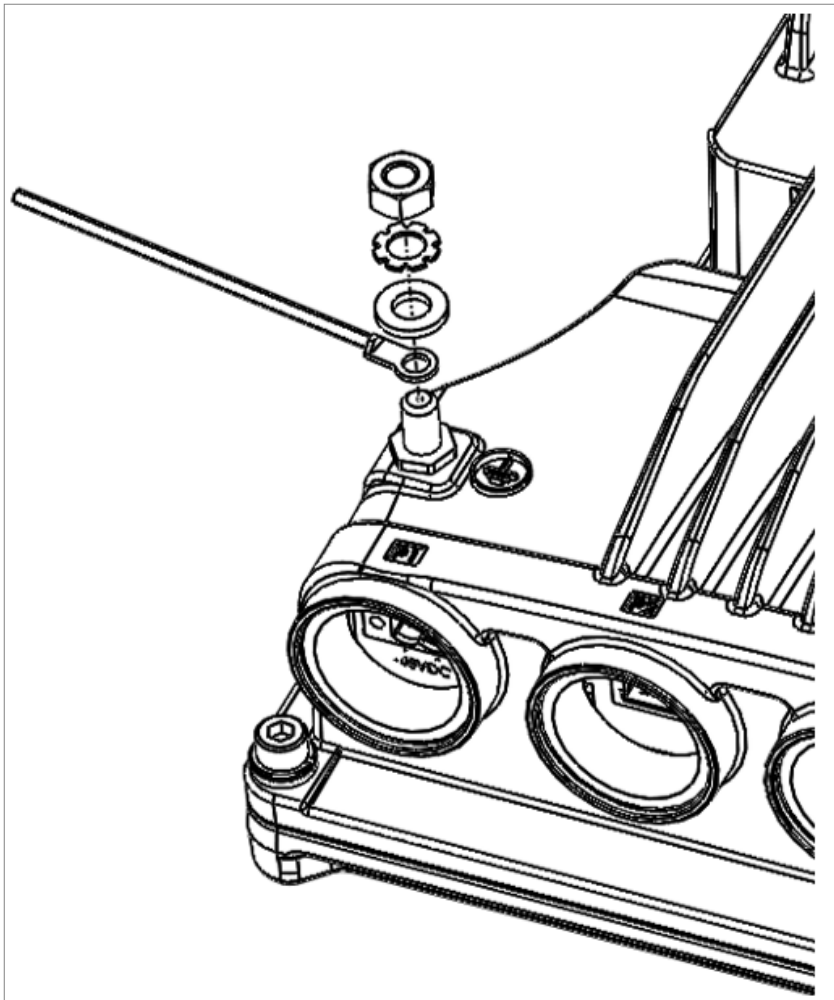
The grounding cable must be copper or copper-clad aluminum. It is recommended to use a copper cable.

Required Tools:

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

Procedure:

1. On the front of each PTP 850EX 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 PTP 850EX 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.

A 2-pole circuit breaker, a branch circuit protector, suitably certified in accordance with applicable national code and regulations, rated maximum 20A, shall be installed for full power disconnection in a building installation.

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

Power Source

The power cable must be plugged into the unit before turning on the external power.

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

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.



The user power supply GND must be connected to the positive pole in the PTP 850EX power supply. Any other connection may cause damage to the system.



Note

For the warranty to be honored, you must install the PTP 850EX in accordance with the instructions above.

Surge Protection

PTP 850EX includes built-in surge protection for its Ethernet and power interfaces. PTP 850EX's surge protection implementation complies with surge immunity standard IEC 61000-4-5, level 2, provided the Ethernet cables were prepared according to the instructions in [Connecting the Ethernet Cable](#).

However, when using an electrical SFP connection with CAT5 or CAT6 Ethernet cable, internal surge protection is not present, and an external surge protector is recommended. It is recommended to use the surge protector described in [Table 7](#).



Note

To provide maximum protection, make sure to prepare the Ethernet cables according to the instructions in [Connecting the Ethernet Cable](#) and to ground the cables in accordance with the instructions in [Grounding the Cables](#).

In areas in which severe lighting conditions are likely to occur, it is strongly recommended to add additional protection by placing surge protectors on all electrical Ethernet cables, near the connection points with the PTP 850EX unit.

The following surge protector is available from Cambium Networks.

Table 7 Surge Protector

Part Number	Description
C000065L007A	PTP 650/670 LPU and Grounding Kit (1 kit per ODU)



Note

For the surge protection devices to work properly, the PTP 850EX unit must be properly grounded according to [Grounding the PTP 850EX Unit](#).

Available Cable Options



Note

For 10GbE connections longer than 80m, only Single Mode cables can be used.

Fiber Optic Cables – Single Mode (SM)

Table 8 Fiber Optic Cables – Single Mode (SM)

Part Number	Description
N000082L139A	Optical CABLE, SM, 30m
N000082L140A	Optical CABLE, SM, 50m
N000082L141A	Optical CABLE, SM, 80m
N000082L142A	Optical CABLE, SM, 100m
N000082L143A	Optical CABLE, SM, 150m

Fiber Optic Cables – Multi Mode (MM)



Note

This section includes two tables:

- For SFP28 interfaces using SFP28-25GbE-MM-SR-EXT-TEMP, you must use one of the cables in [Table 9](#).
- For interfaces using other Multi Mode SFP transceivers, you can use any of the cables listed in [Table 9](#) or [Table 10](#). For future compatibility, it is recommended to use one of the cables in Table 6.

For a list of approved SFP, SFP+, and SFP28 transceivers, refer to the Technical Description for PTP 850EX.

Table 9 Fiber Optic Cables – Multi Mode (MM) – 25GbE Interfaces

Part Number	Description
N000082L192A	Optical CABLE, MM, 10m
N000082L194A	Optical CABLE, MM, 30m
N000082L196A	Optical CABLE, MM, 80m
N000082L198A	Optical CABLE, MM, 150m

Table 10 Fiber Optic Cables – Multi Mode – 1G and 10G Interfaces

Part Number	Description
N000082L266A	PRP 820 SM LC2LC ARM 50m

DC Cable and Connector

Table 11 DC Cable and Connector

Part Number	Description
N000082L065A	PTP 820 DC Connector
N000082L019A	PTP 820 Outdoor_DC_cbl_2x18AWG_drum, 305m
N000082L169A	PTP 820 Outdoor_DC_cbl_2x14AWG_drum, 305m

Extension Cables for Unit Redundancy and XPIC



Note

For availability of Unit Redundancy and XPIC, refer to the Release Notes for the System Release version you are using.

Table 12 Extension Cables for Unit Redundancy and XPIC

Part Number	Model Name	Description
QSFP+_to_ QSFP+_cable	QSFP-to- QSFP Cable	For XPIC and unit protection configurations. Note: For availability of XPIC and Unit Redundancy, check the Release Notes for the Cambium version you are using.

Clock Sharing Cable for XPIC

Table 13 Clock Sharing Cable for XPIC

Part Number	Description
SOURCE_SHARING_1M	CABLE,TNC RA TO TNC RA,1M,18Ghz,3/8in,HELIAX

Ethernet Cable and Specifications

Table 14 Ethernet Cables

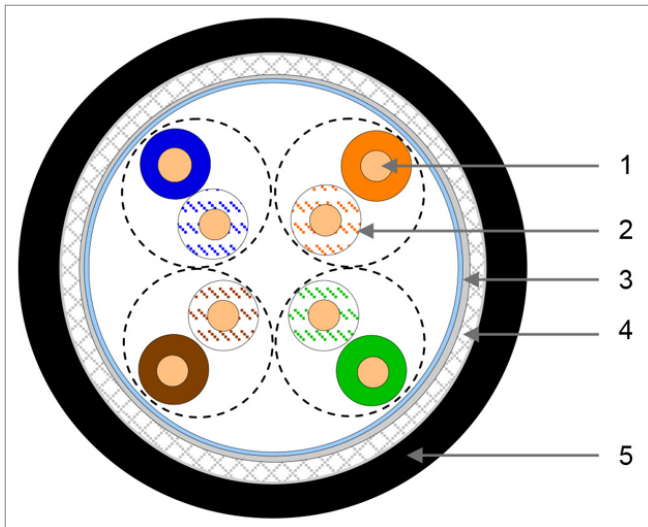
Part Number	Description
N000000L155A	CAT6A Outdoor Cable, 100m
N000082L172B	CAT6A Outdoor Cable, 305m

This cable is suitable for:

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

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

Figure 10: Cable Design



- [1] Conductor
- [2] Insulation
- [3] Screen: Alu/Pet foil. Alu outside

- [4] Tinned copper braid
- [5] Jacket

Table 15 Ethernet 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 Ethernet Cable Specifications

Table 16 Outdoor Ethernet Cable Electrical Requirements

Requirement	Details
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	Braid + Foil

Table 17 Outdoor Ethernet Cable – RJ-45 Connector Pinout

Pin #	Wire Color Legend	Signal
1	 White/Orange	TX+
2	 Orange	TX-
3	 White/Green	RX+
4	 Blue	TRD2+
5	 White/Blue	TRD2
6	 Green	RX-
7	 White/Brown	TRS3+

Pin #	Wire Color Legend	Signal
8	 Brown	TRD3-

Table 18 *Outdoor Ethernet Cable Mechanical/Environmental Requirements*

Requirement	Details
Jacket	UV resistant
Outer diameter	6-10 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

Outdoor DC Cable Specifications

Table 19 *Outdoor DC Cable Electrical Requirements*

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

Table 20 *Outdoor DC Cable Mechanical/Environmental Requirements*

Requirement	Details
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 (P/N: SI-0027-0) 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.

The following cable clamps are available:

Table 21 *Cables Clamps*

Part Number	Description
N000082L013A	Dual Feeder Clamp 4.0-7.0mm Cable 6 Way

Special Instructions for use of Glands



Note

Each PTP 850EX unit is supplied with two glands. If additional glands are required, they must be ordered separately, in kits of five glands each.

Table 22 *Glands Kit*

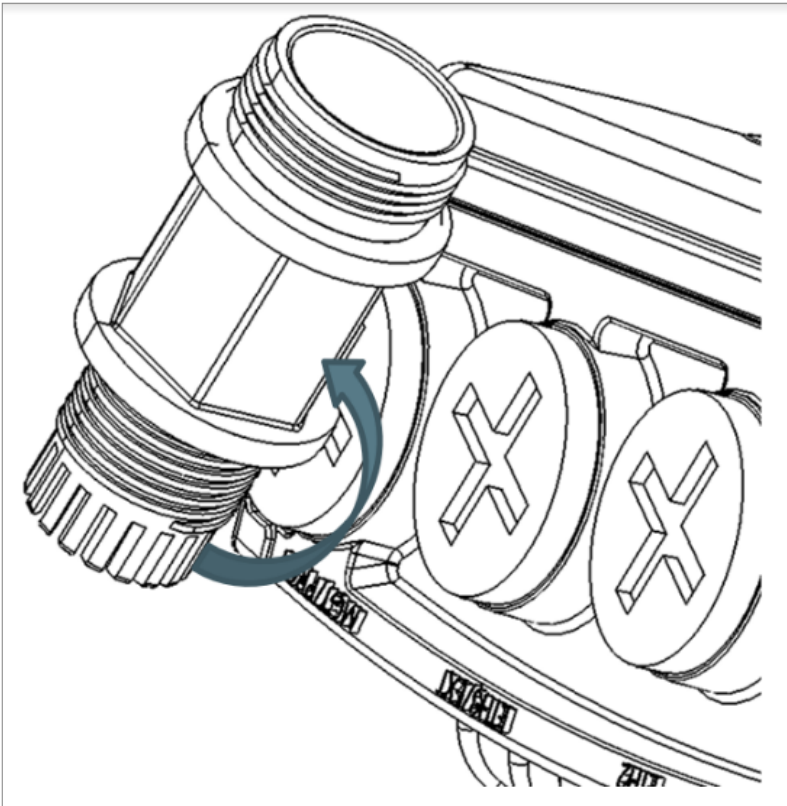
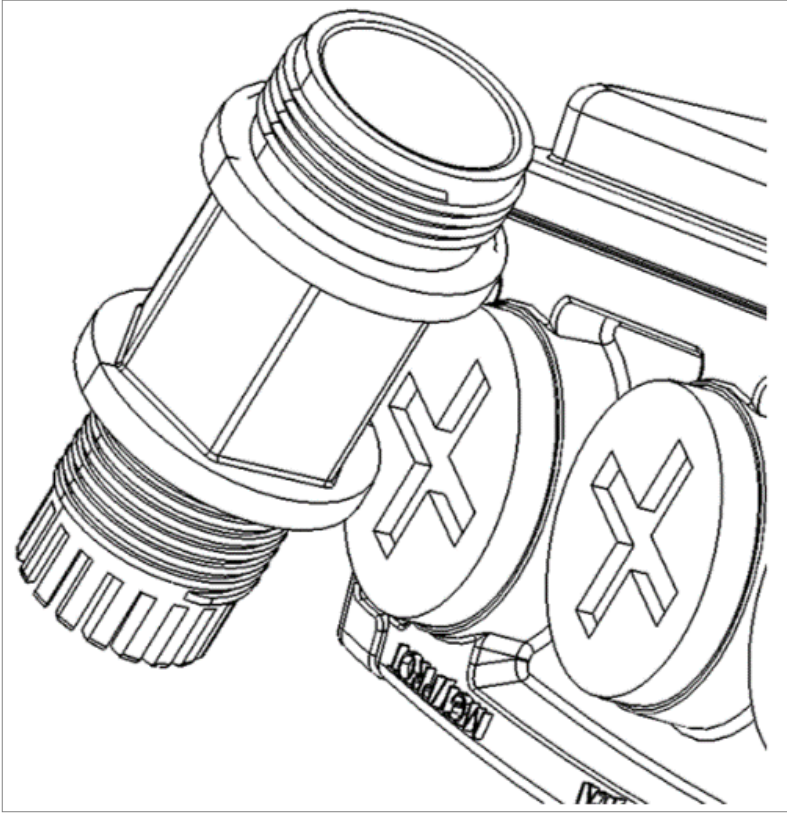
Part Number	Description
N000082L014A	PTP 820_Glands_x5_kit

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 5 in [General Installation Procedure](#). Gland caps are ordered separately, in kits of 10 caps each.

Table 23 *Gland Cap*

Part Number	Description
N800082L009A	KIT 10pcs of M28 Gland Cap With Hook

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



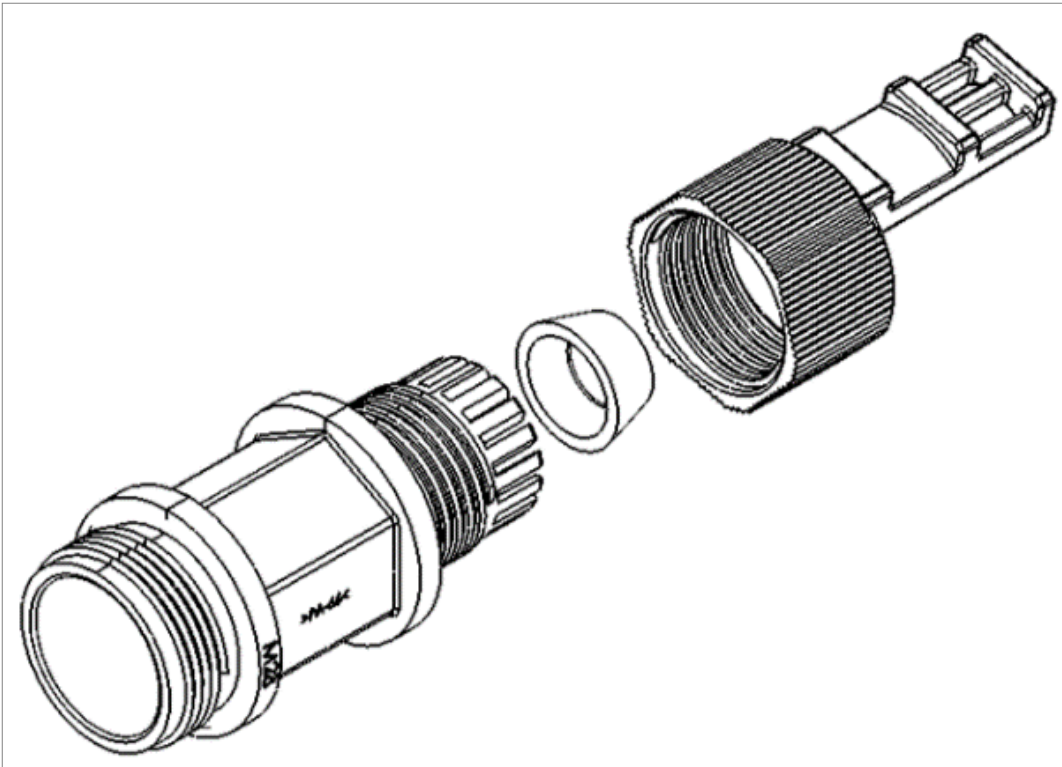
General Installation Procedure

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

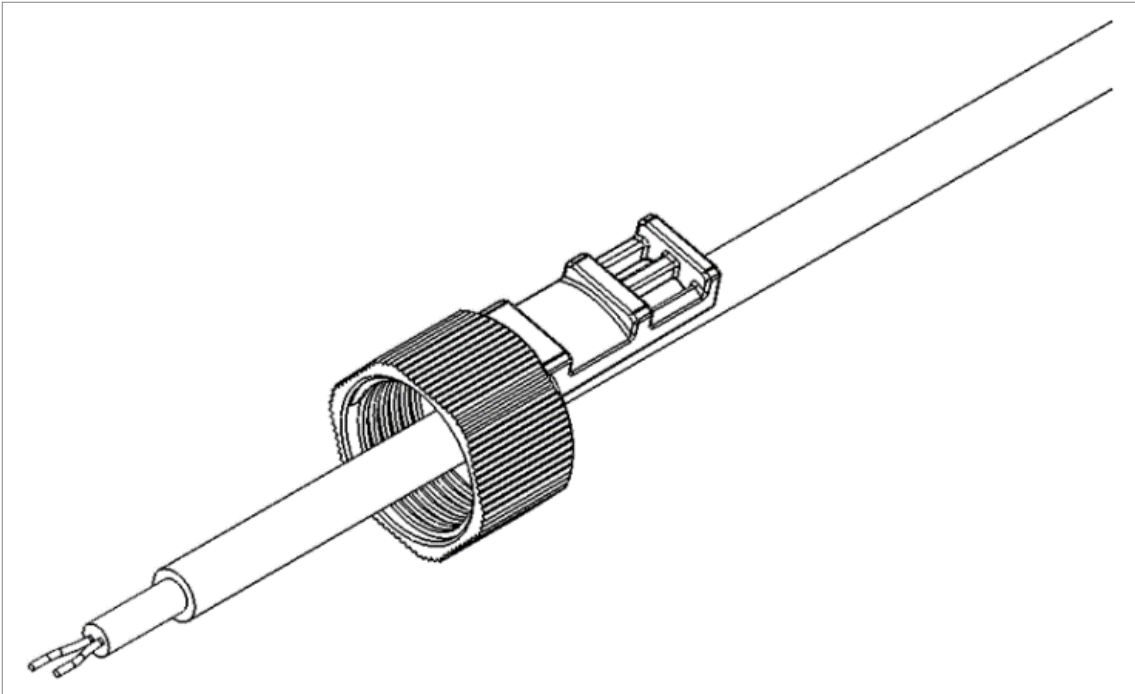
1. Strip off a maximum of 20 mm from the cable jacket.
2. Expose 10 mm at the edge of each of the two wires.

For all installations, perform the following steps:

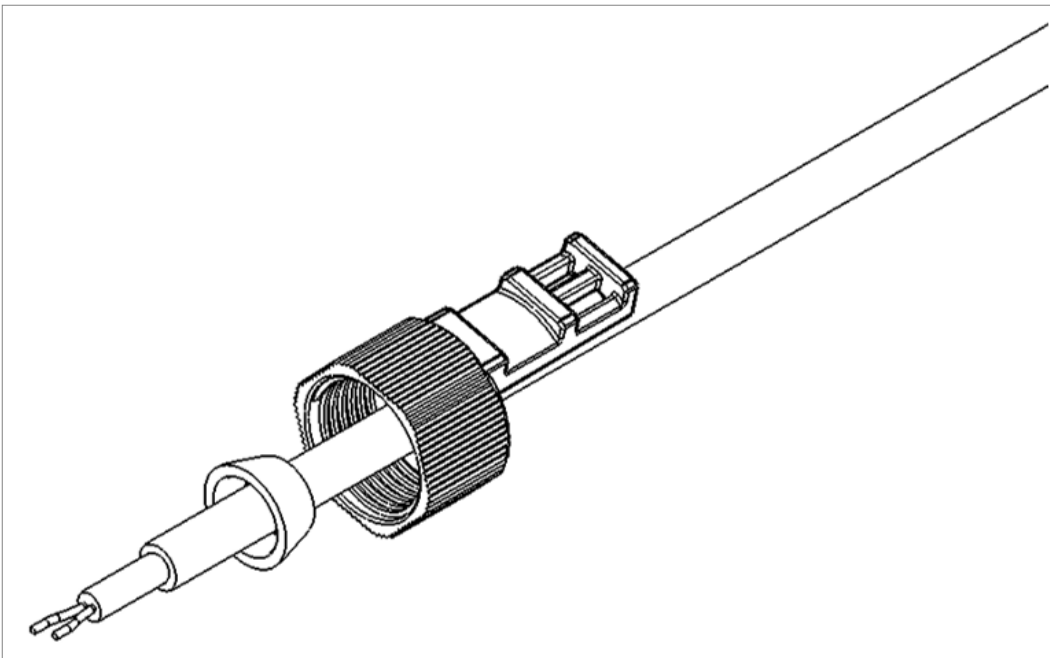
1. Before inserting a cable, you must disassemble the gland cap and gland rubber from the gland body.



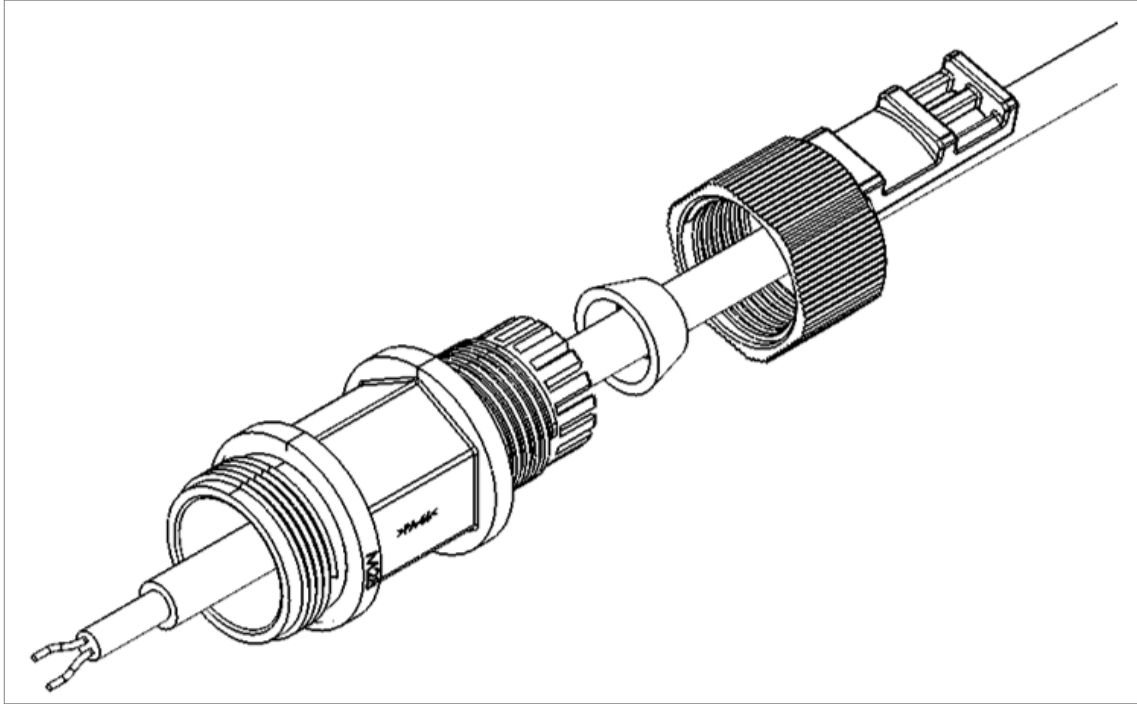
2. Slide the gland cap into the cable.



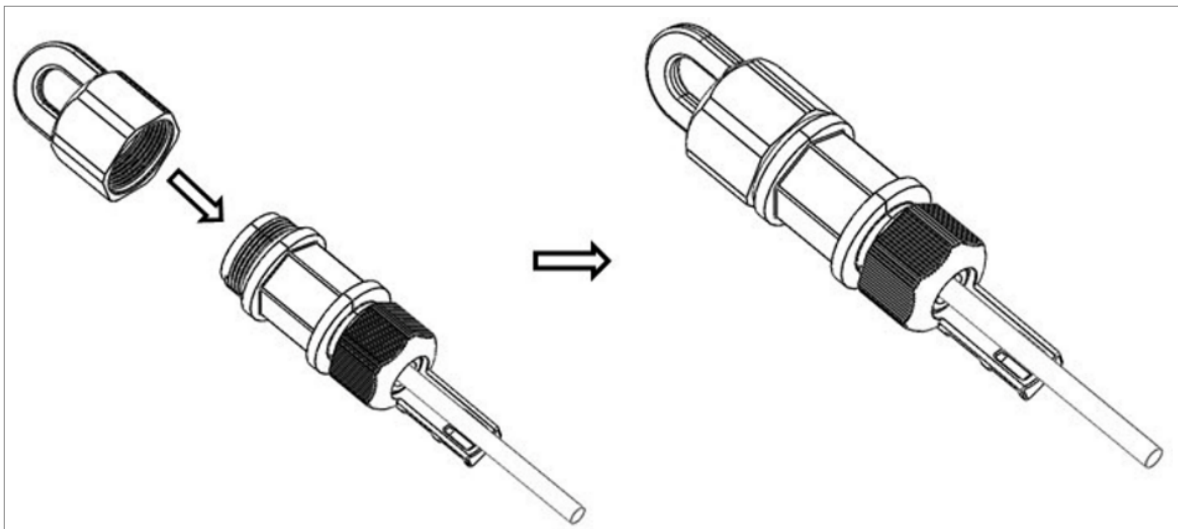
3. Slide the gland rubber into the cable.



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.

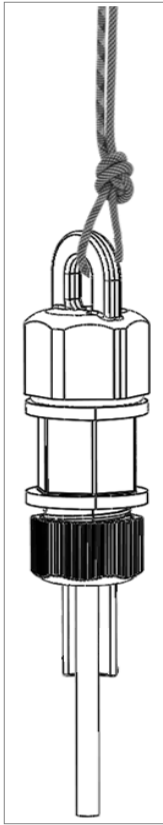


5. Optionally, after securing the cable into the body of the gland, you can close the other side of the gland with an M28 gland cap. The gland cap protects the cable and connector from damage when elevating the cable and gland to the radio unit.



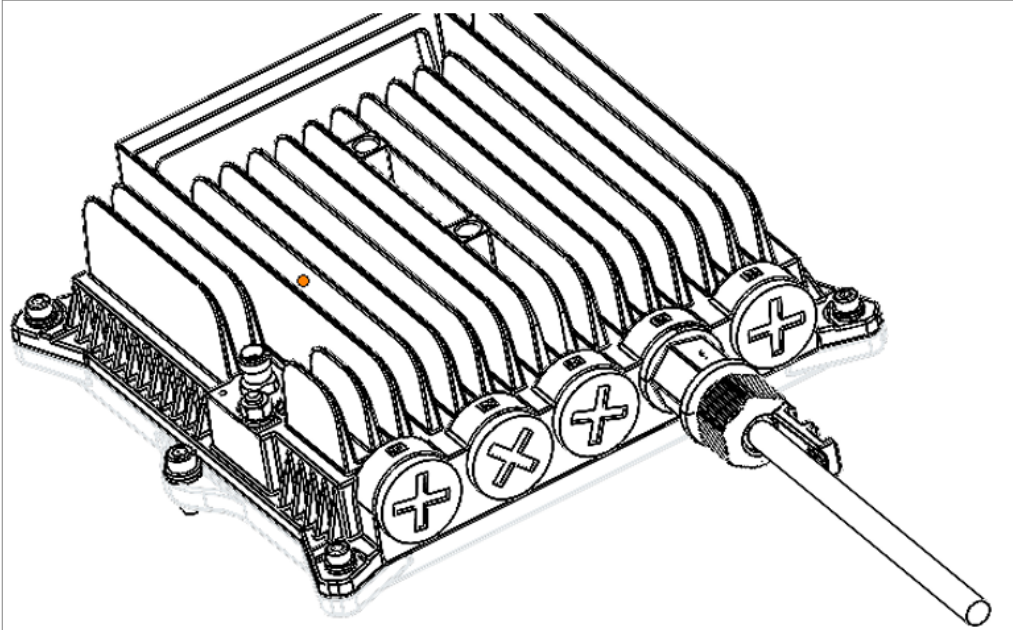
6. The M28 gland cap has hook on top. After attaching the gland cap to the gland, you can connect a rope to the hook and use this to lift the gland and cable up to the radio unit. Before screwing the gland

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

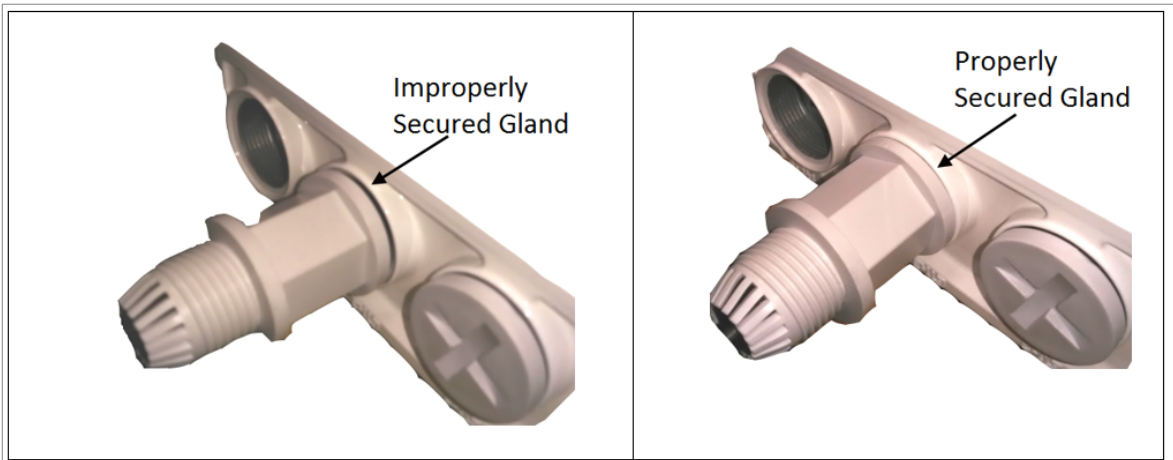
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface.

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.

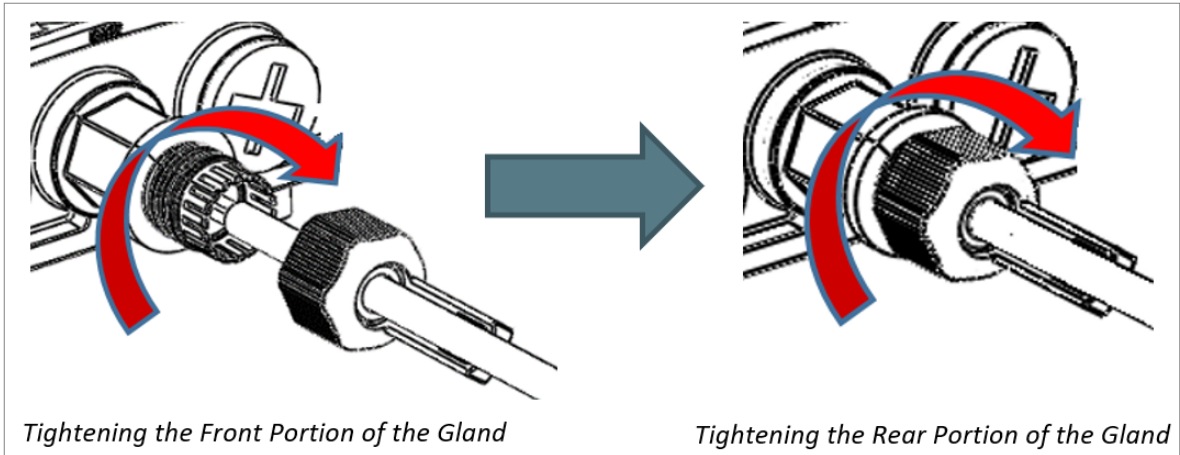


11. Tighten the rear portion of the gland onto the main part of the gland and make sure that the main part of the gland does not have an additional swivel after the rear portion is secured.

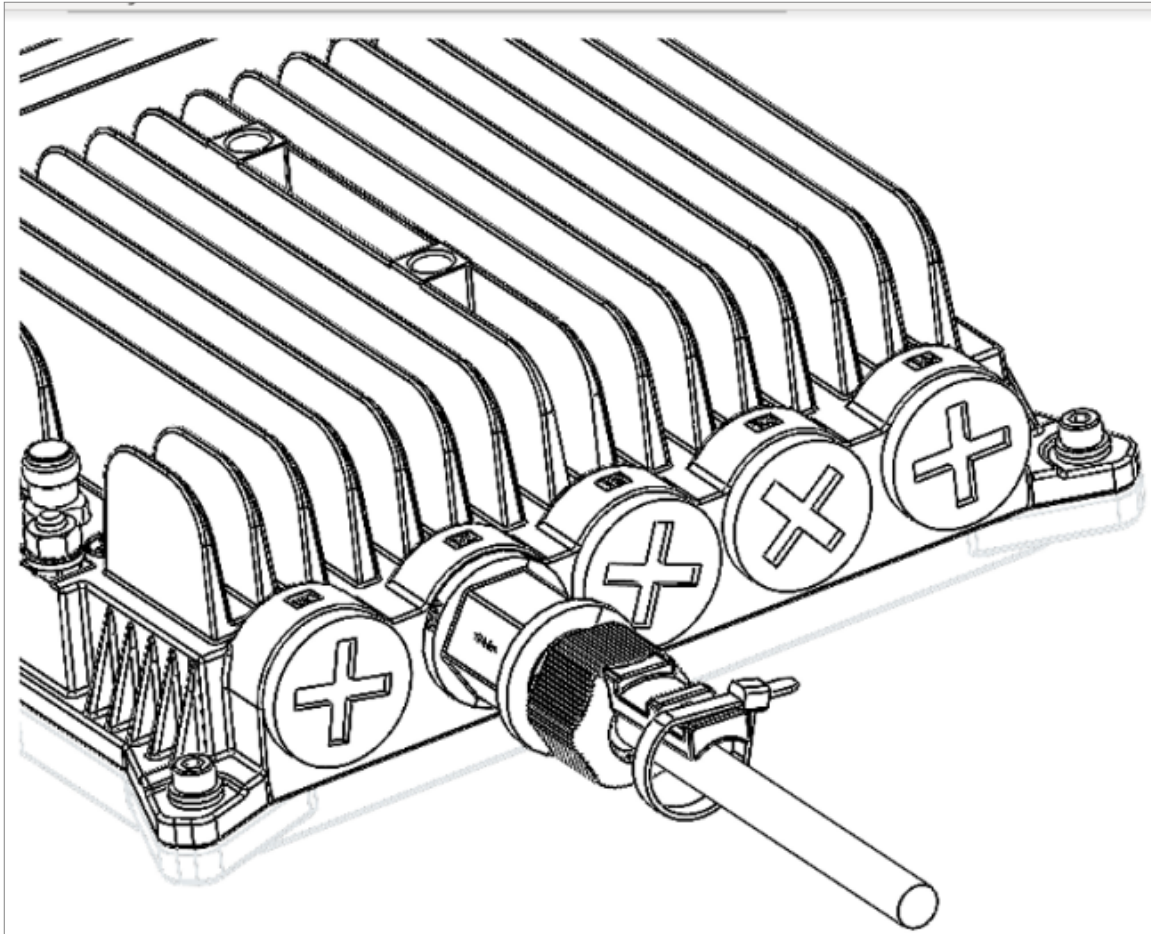


Note

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



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



Connecting an Optical Fiber Cable and SFP

Types of SFPs

PTP 850EX includes:

- Two SFP cages (P3 and P4) that support the SFP28 standard.
- A QSFP cage (P5) for use with XPIC and Unit Redundancy, but which can also be used for 1G or 10G traffic. When this interface is used for traffic, an adaptor is required.

For a list of QSFP accessories, see [Adaptors and Installation Kits](#).

- For instructions on connecting a cable to an SFP port (P3 or P5), see [Connecting Optical Fiber to SFPs](#).
- For instructions on connecting a QSFP-to-SFP adaptor and cable to the QSFP port (P4) for 1x1/10G configurations, see [Connecting Optical Fiber and a QSFP-to-SFP Adaptor to the QSFP Port](#).

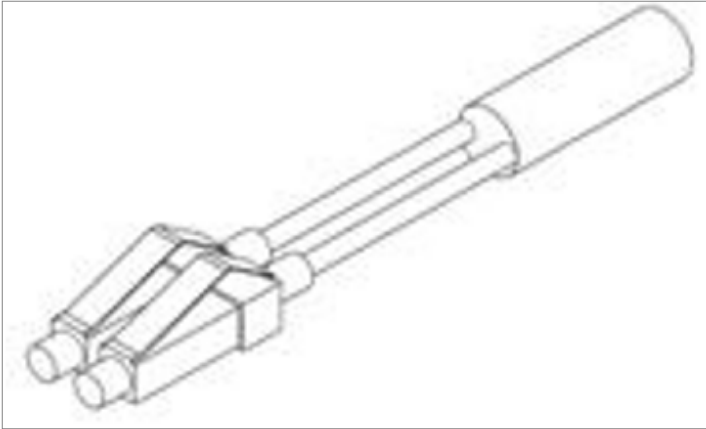
**Note**

Not all configurations are supported with all Cambium releases. For details on which configurations are supported, check the Release Notes for the release you are using.

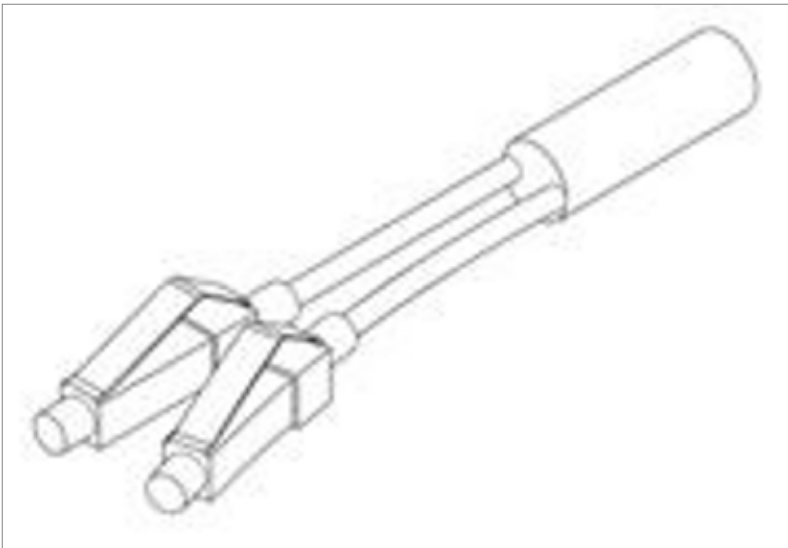
Connecting Optical Fiber to SFPs

To connect an optical fiber cable and the SFP transceiver:

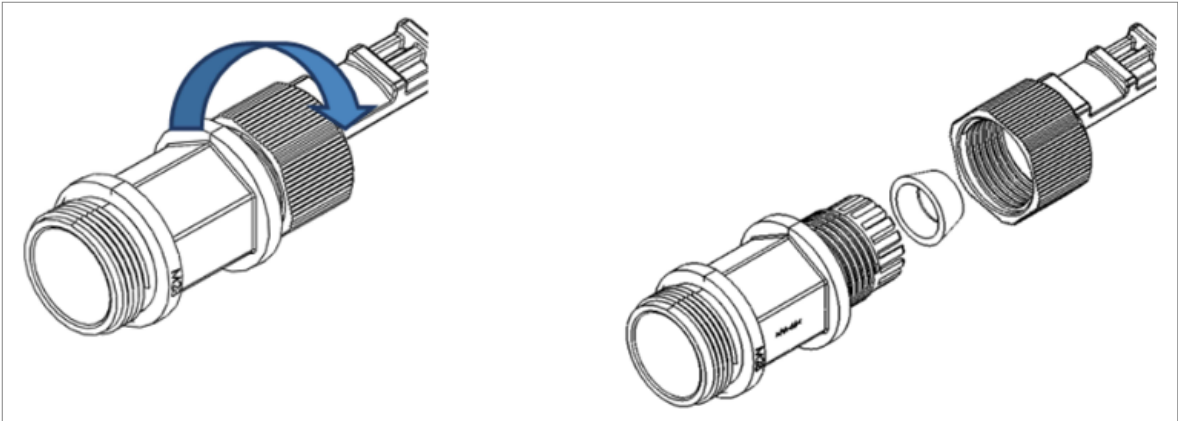
1. Use a pre-assembled cable.



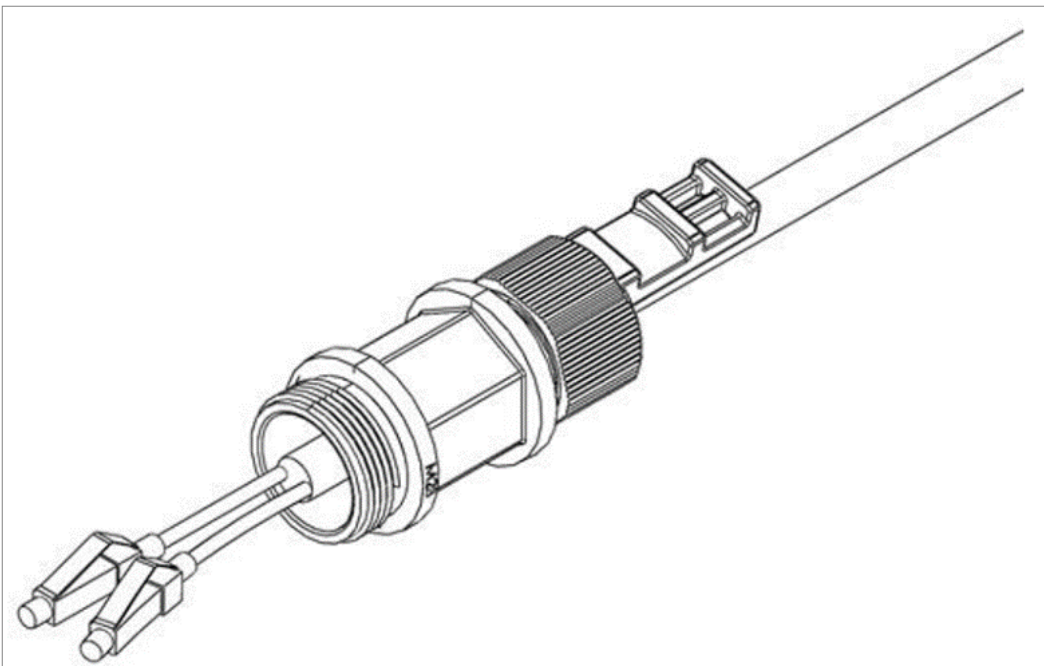
2. Split the connector into two separate LC connectors (one for each fiber).



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, together with the connectors, into the cable gland.

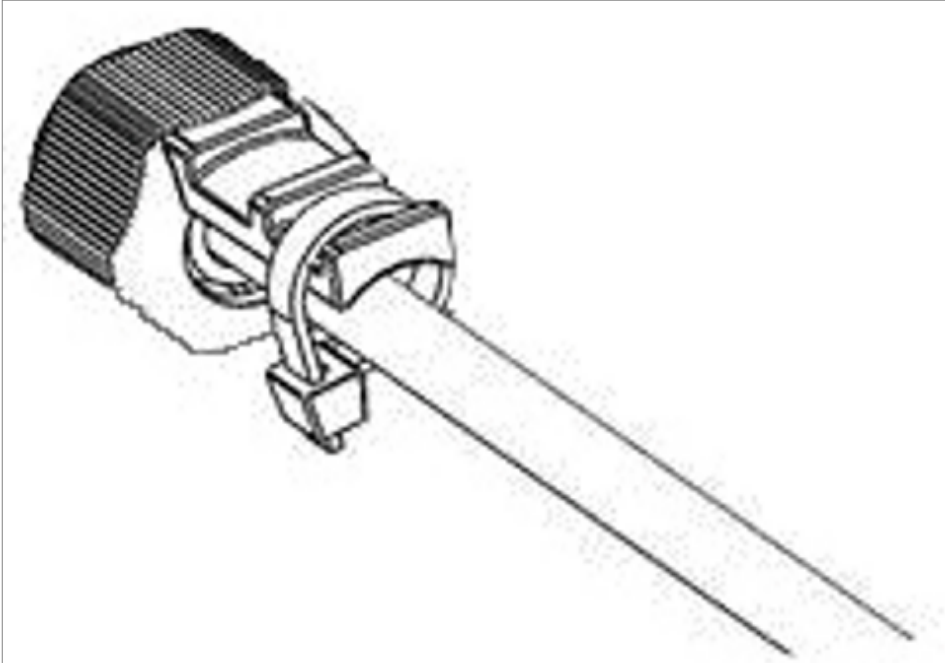


7. Secure the cable to the lip of the gland using a tie wrap.

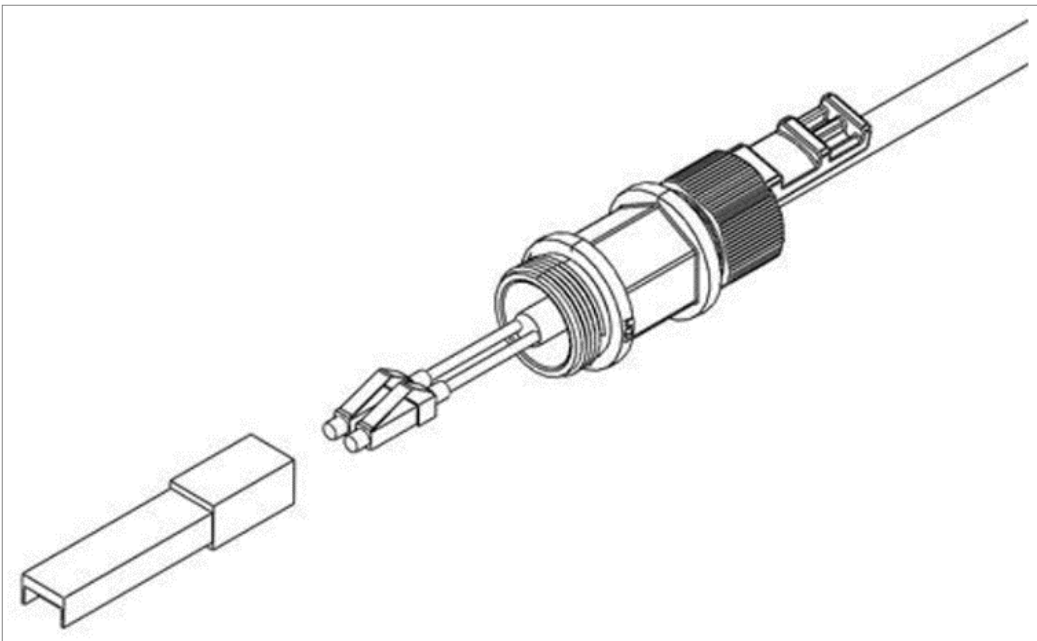


Note

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.

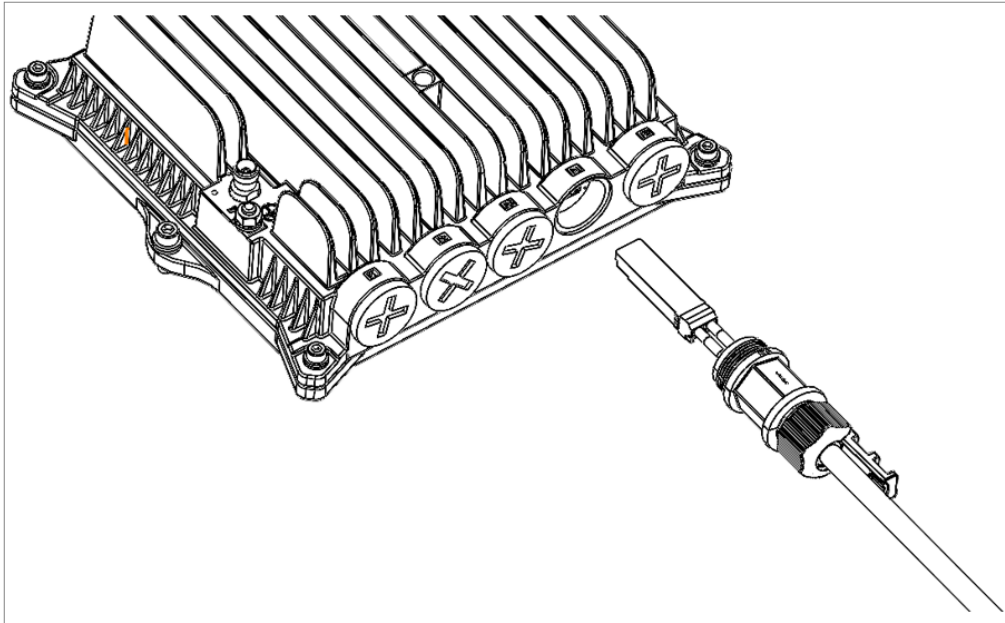


9. Remove the tie wrap securing the cable to the gland.

**Note**

A new tie wrap must be used to secure the cable to the gland at the end of the procedure, as described in [Connecting Optical Fiber to SFPs](#).

10. Connect the connector to the PTP 850EX connector.



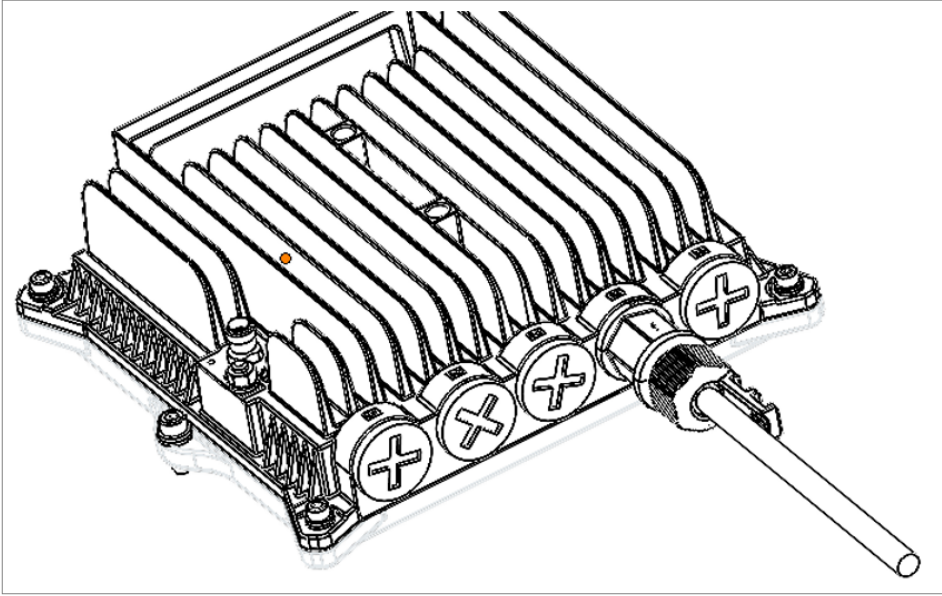
11. Tighten the gland to the radio unit until there is full contact between the gland and the radio unit.
12. Tighten the gland cap.

**Note**

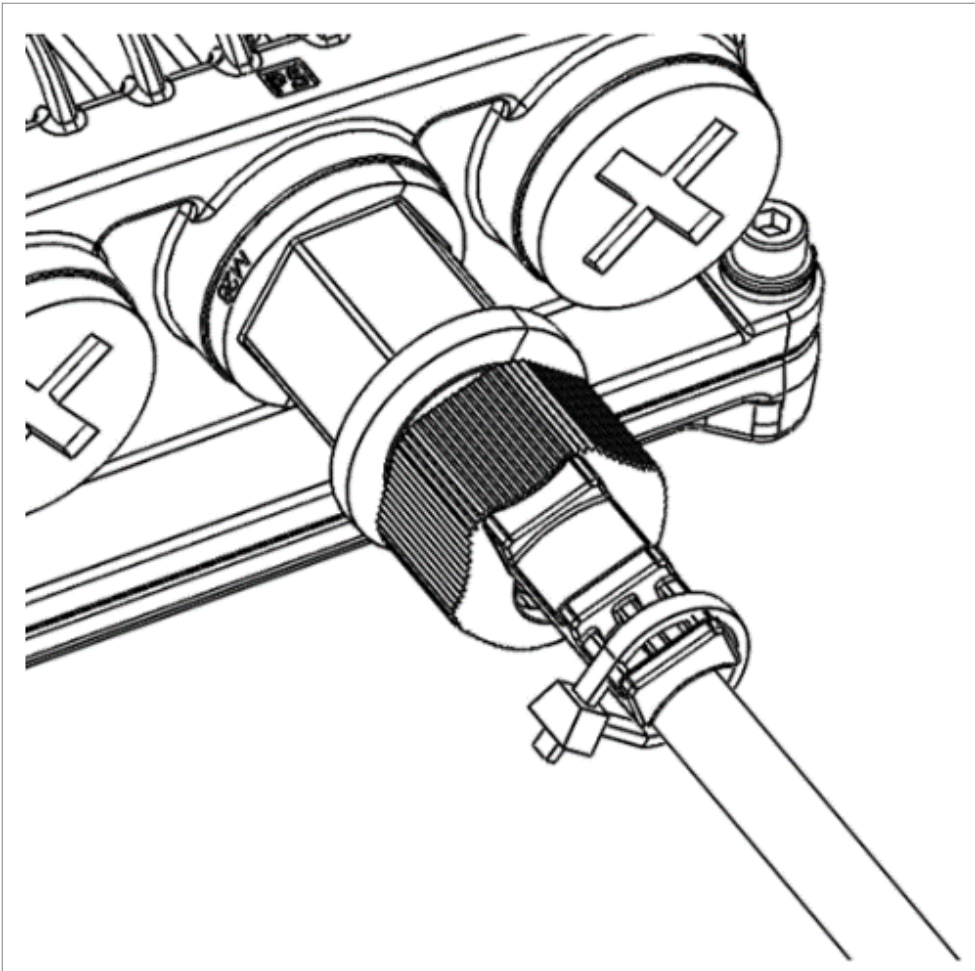
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit.

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 Optical Fiber and a QSFP-to-SFP Adaptor to the QSFP Port

The QSFP port on the PTP 850EX (P5) can be used for 1x1/10G configurations, with a single SFP or SFP+ transceiver in the QSFP port. This configuration requires a QSFP-to-SFP adaptor. See [Adaptors and Installation Kits](#).

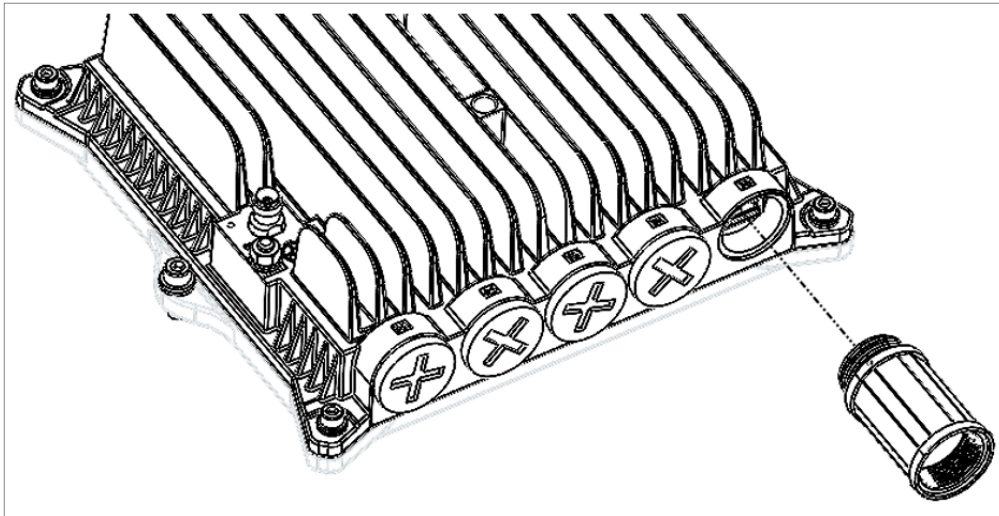
To connect an optical fiber and QSFP-to-SFP adaptor to the QSFP port (P5) of the PTP 850EX:

1. Remove the cap from P5. You can use the side of the gland to unscrew the cap.
2. Perform Steps [1](#) through [9](#) in [Connecting Optical Fiber to SFPs](#).
3. Tighten the gland extender to the PTP 850EX unit until there is full contact between the gland extender and the radio unit.



Note

The gland extender is supplied with the QSFP-to-SFP adaptor kit (QSFP to SFP Kit).



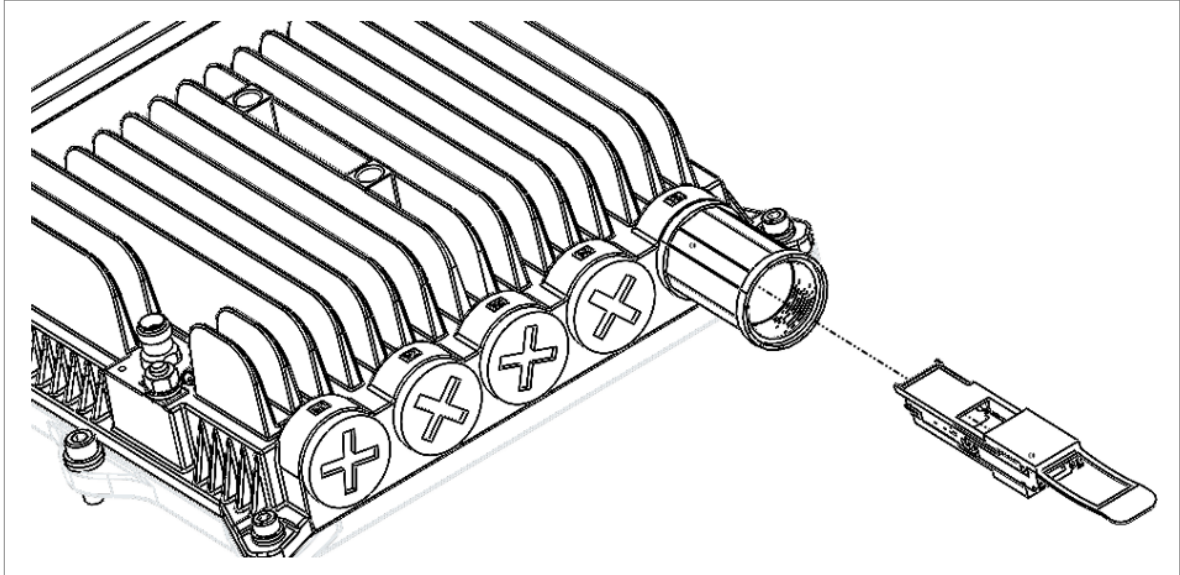
Note

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

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

If the gland extender thread is damaged do not use it.

4. Connect the QSFP-to-SFP adaptor to the QSFP port. Listen for the click to ensure that the adaptor is fully inserted.

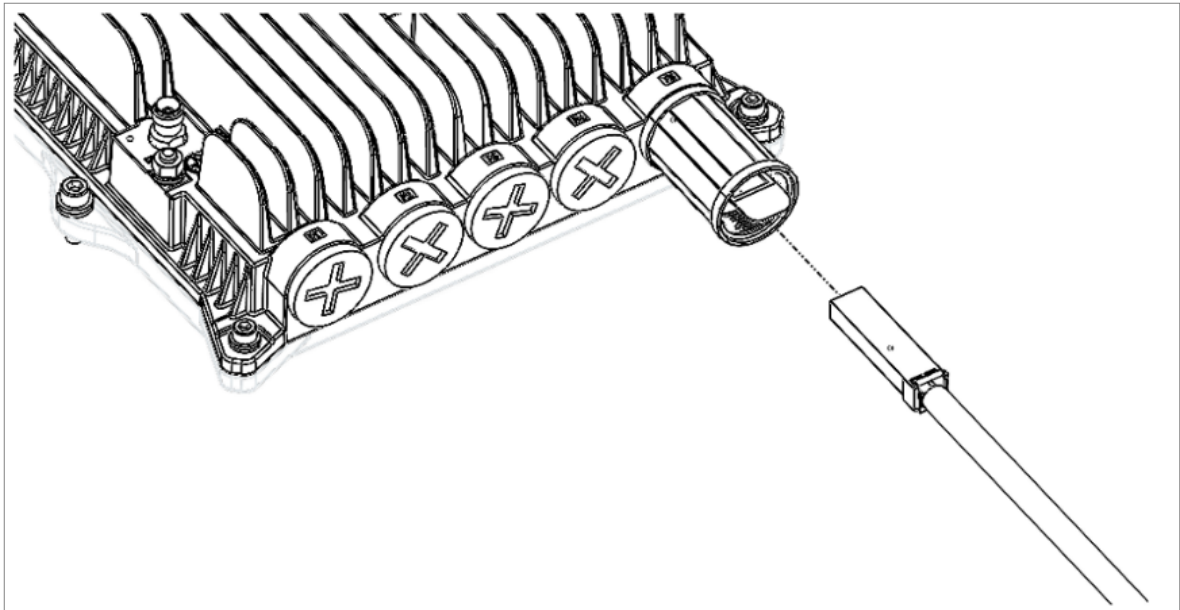


Note

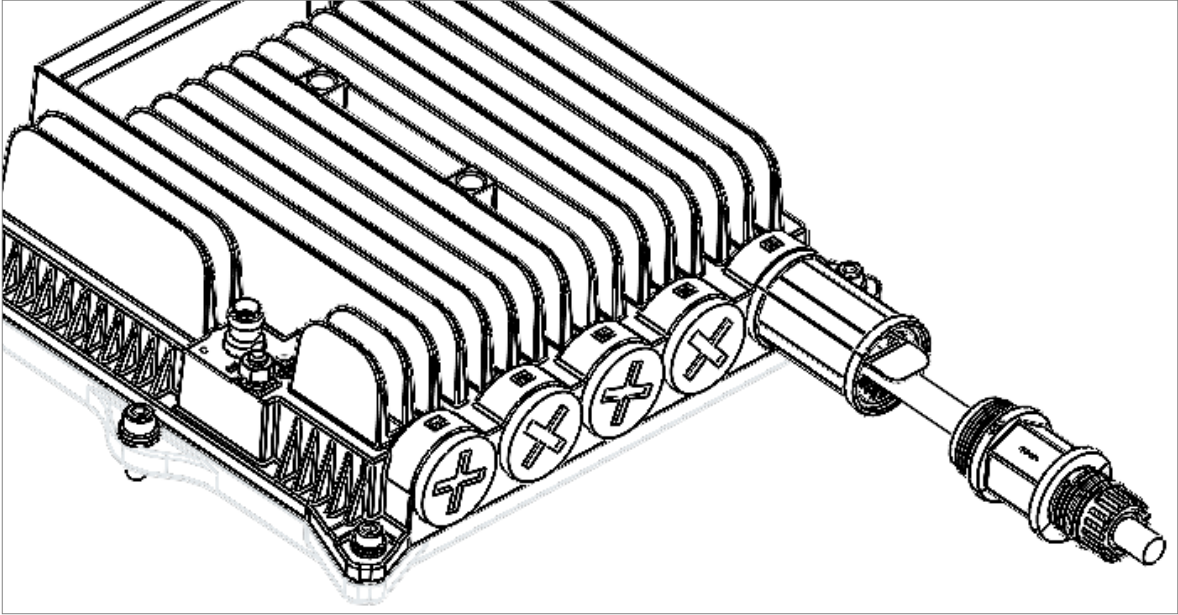
It is important to first connect the gland extender to the port, and only then to insert the QSFP-to-SFP adaptor. Do not connect them in the opposite order.

If disassembly of the QSFP-to-SFP adaptor is required, disconnect the QSFP-to-SFP adaptor first, and then disconnect the gland extender.

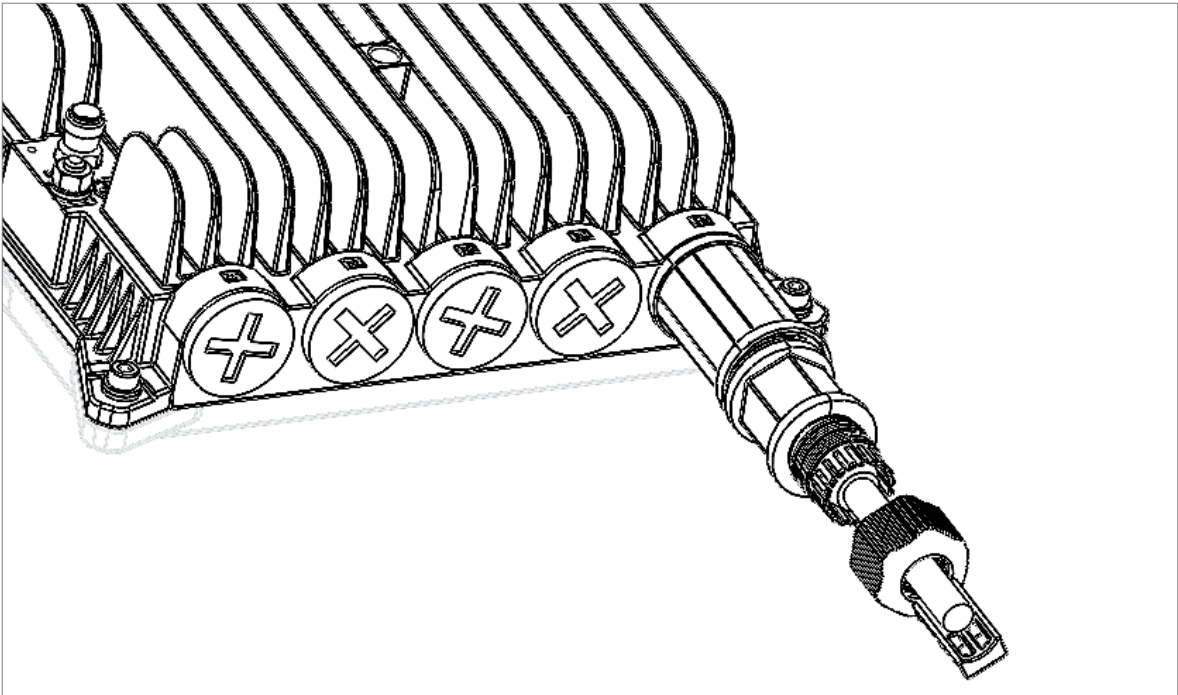
5. Connect the SFP or SFP+ transceiver to the QSFP-to-SFP adaptor.



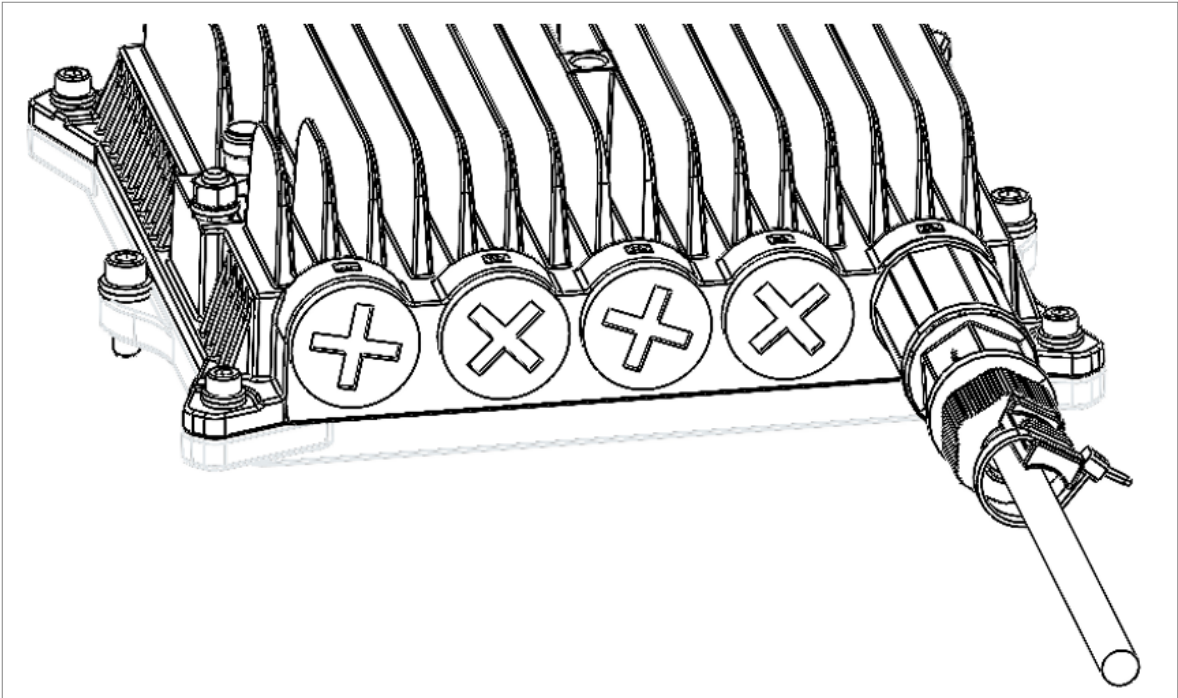
6. Tighten the gland to the gland extender until there is full contact between the gland and the gland extender.



7. Tighten the gland cap.



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



Connecting a DC Power Cable

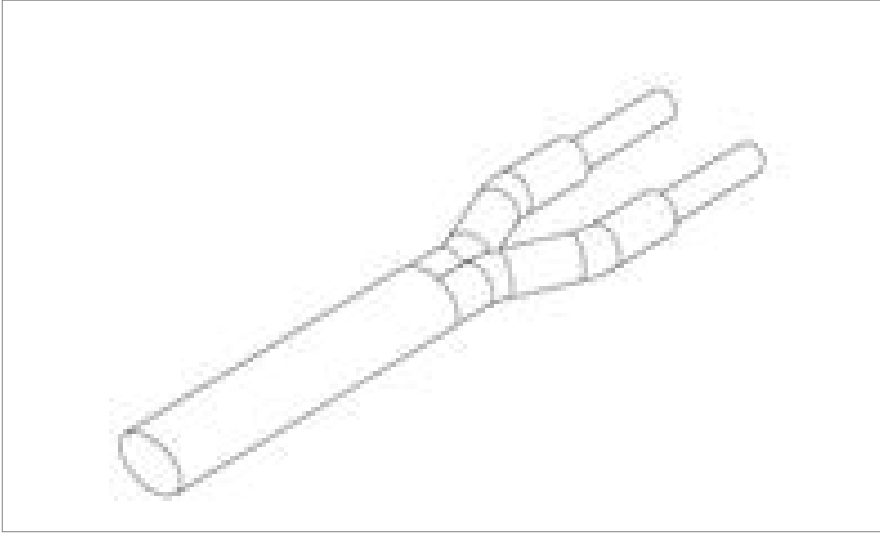


Note

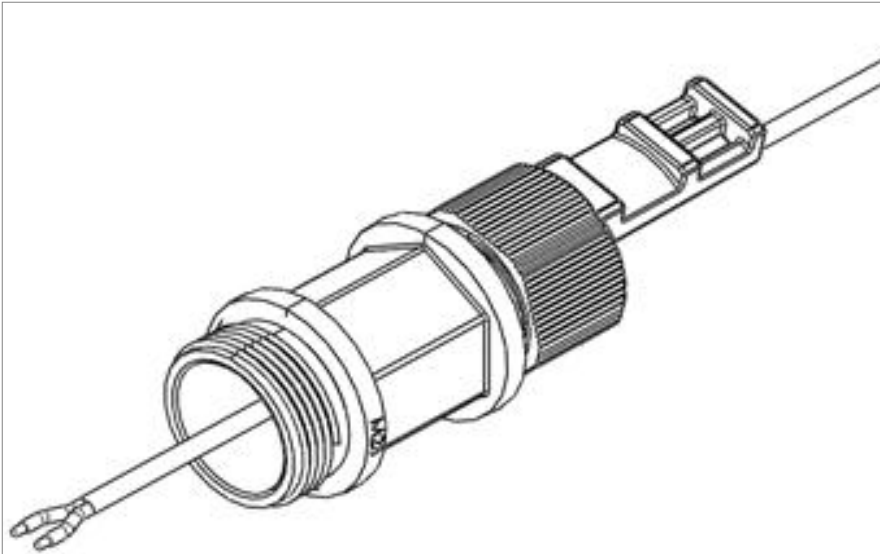
The DC power cable and connector must be ordered separately. See [DC Cable and Connector](#).

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.

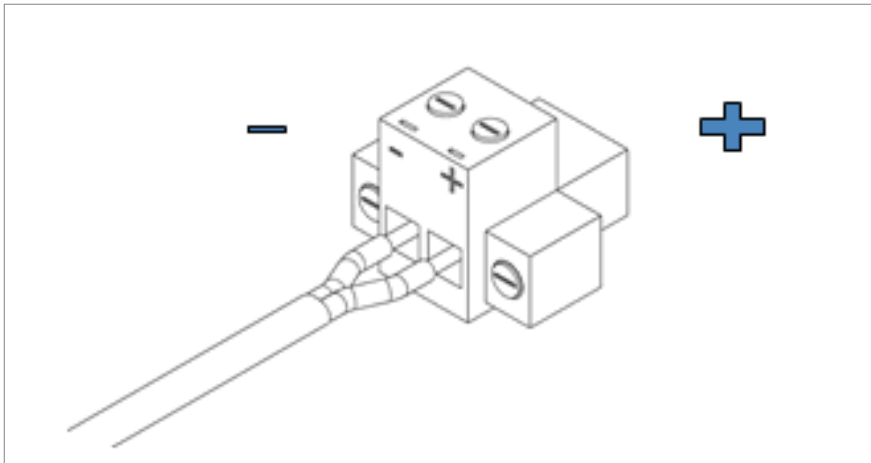


3. Insert the power cable into the gland.

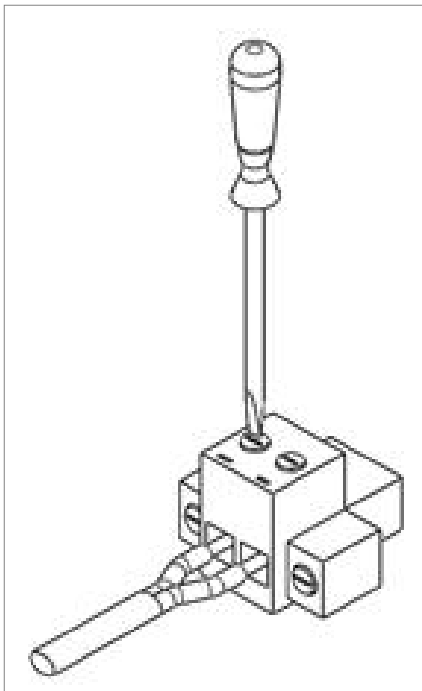


4. Insert the power cable wires into the power connector.
5. Insert the power cable wires into the power connector. Match “+” to the 0V wire and “-“to the -48V

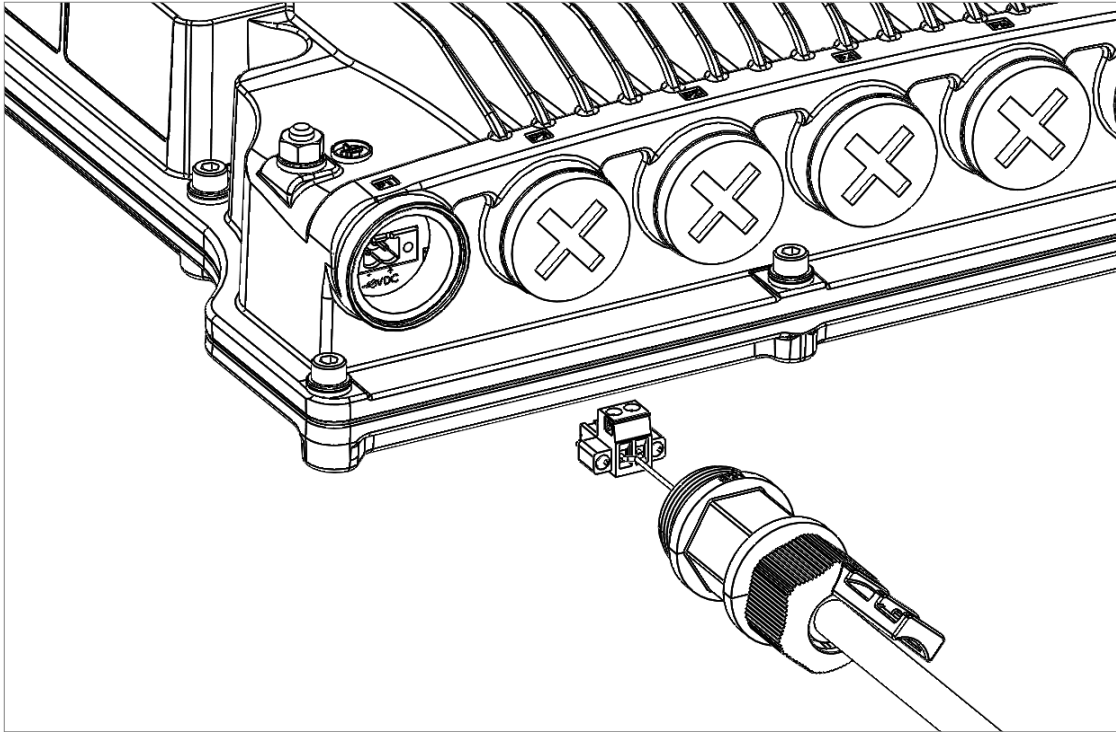
wire.



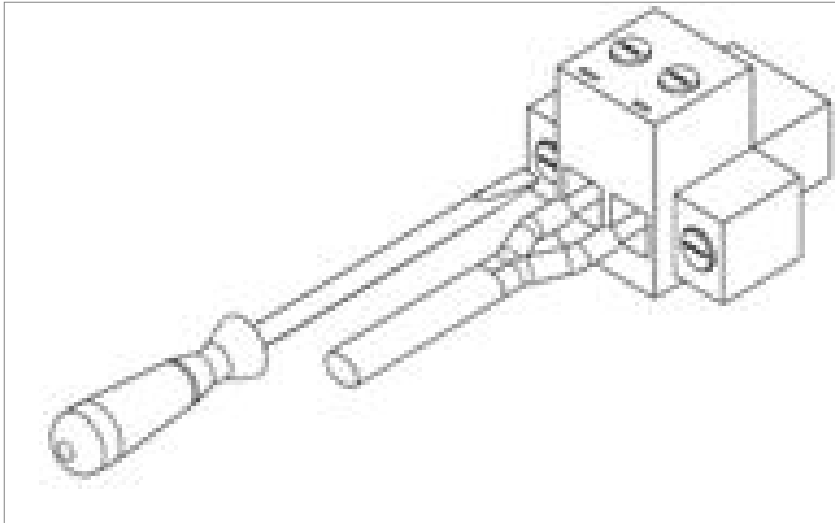
6. Tighten the two top screws.



7. Plug the power cable with connector into the PTP 850EX power connector.



8. Tighten the two front screws.

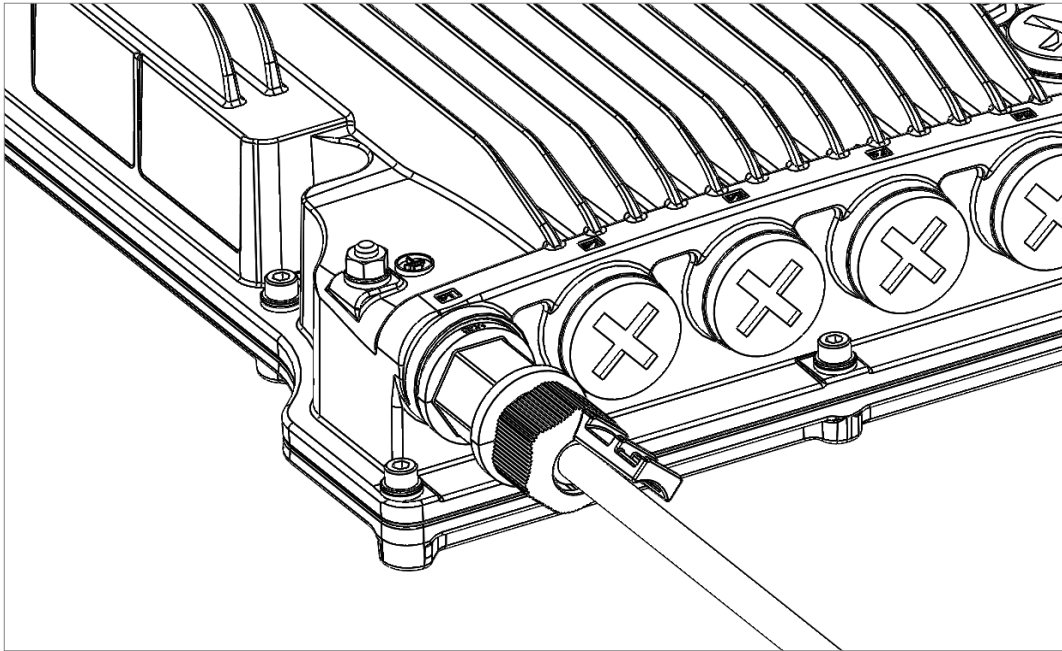


9. Screw the gland into the radio unit.



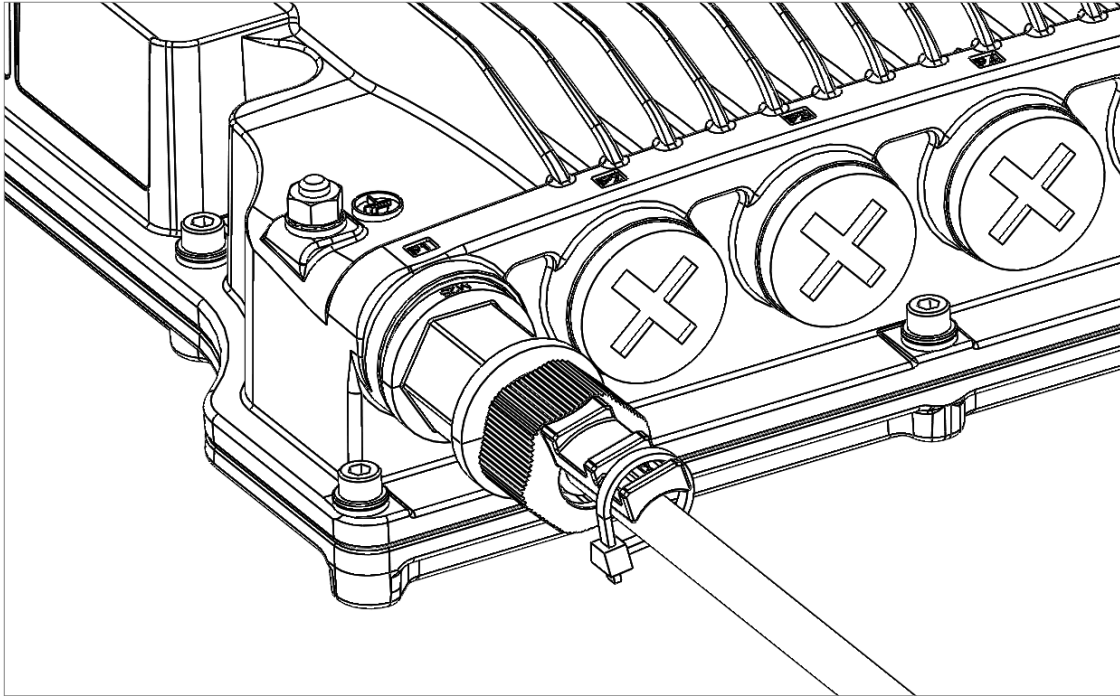
Note

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.



10. Tighten the gland cap.

11. Secure the cable to the gland with a tie wrap.



Connecting the Ethernet Cable

If you need to assemble the Ethernet cable, follow the instructions in [Preparing the Ethernet Cable and Plug-in Field](#), then proceed to the [Connection of Ethernet Cable to PTP 850EX](#) section.

If you are using a pre-assembled Ethernet cable, follow the instructions in [Preparing the Ethernet Cable Already Assembled](#), then proceed to the [Connection of Ethernet Cable to PTP 850EX](#) section.



Note

To ensure proper grounding and connectivity, it is recommended to use pre-assembled Ethernet cables.

Preparing the Ethernet Cable and Plug-in Field



Note

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

Figure 11: Cable Design



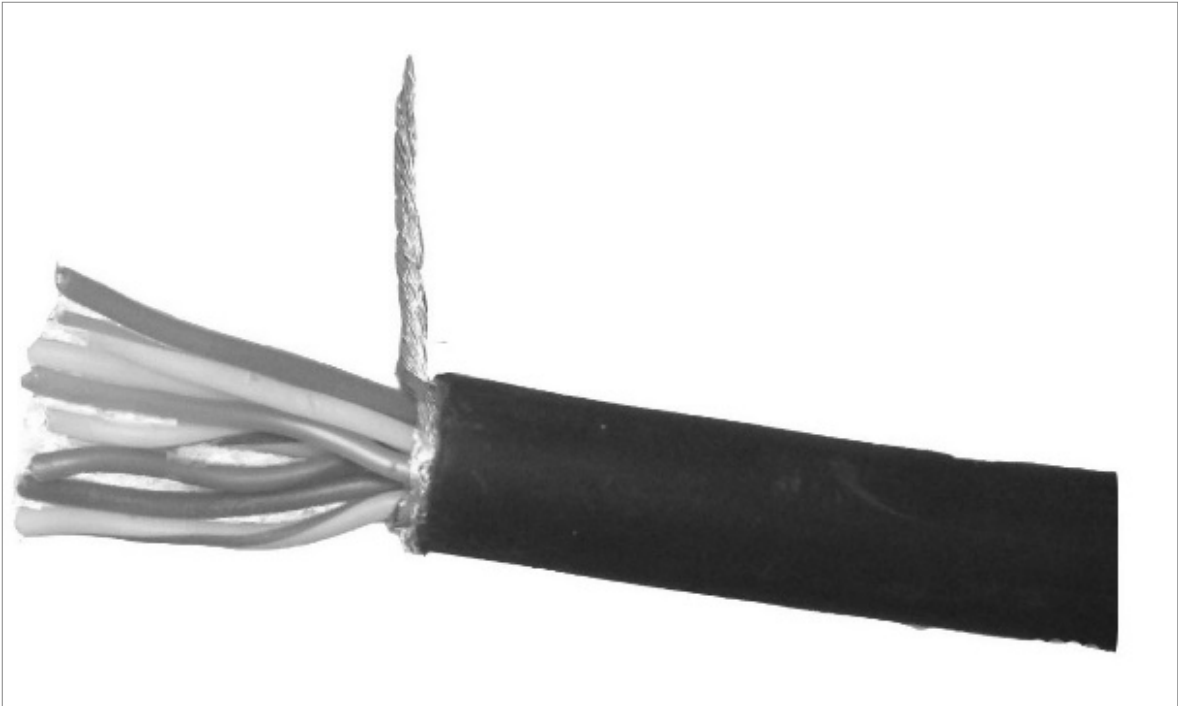
Table 24 Materials for Preparing Ethernet Data Cables

Part Number	Description
N000082L014A	PTP 820 Glands_x5_KIT
N000082L100A	PTP 820 Glands_x3_KIT
N000000L155A	CAT6A Outdoor Cable, 100m
N000082L172B	CAT6A Outdoor Cable, 305m
N000082L065A	PTP 820 DC Connector
N000082L019A	PTP 820 Outdoor_DC_cbl_2x18AWG_drum, 305m
N000082L169A	PTP 820 Outdoor_DC_cbl_2x14AWG_drum, 305m

To prepare the Ethernet 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 CAT5E 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.



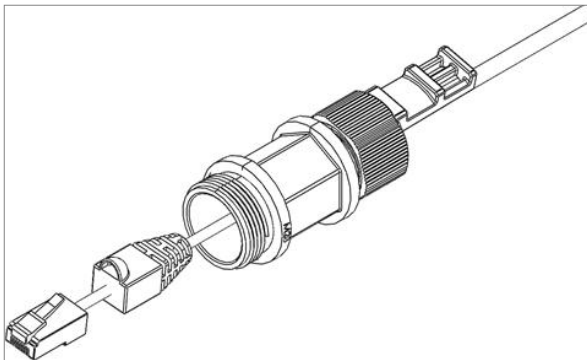
Note

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 Ethernet Cable Specifications](#). The sheath of the Ethernet 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.

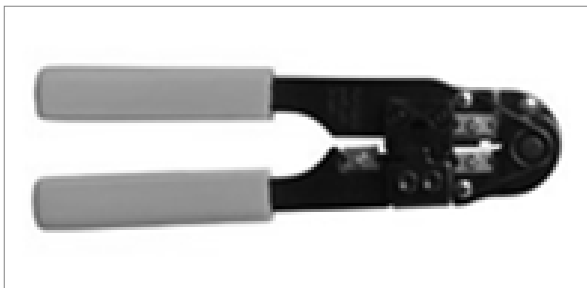


Note

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



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 in 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 CAT5E plug cover on the connector plug.



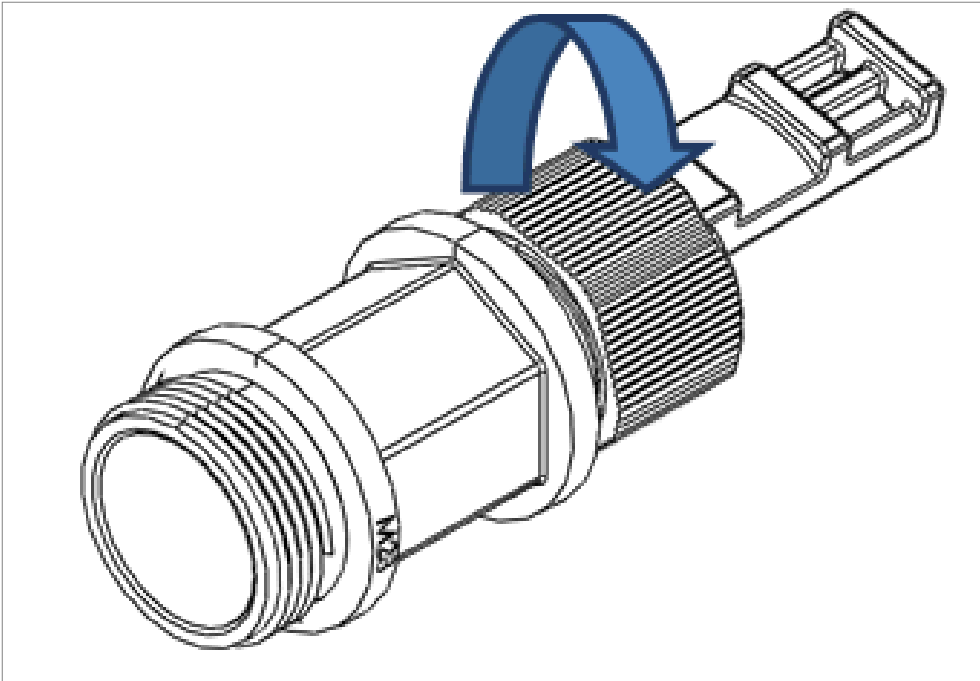
Note

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.

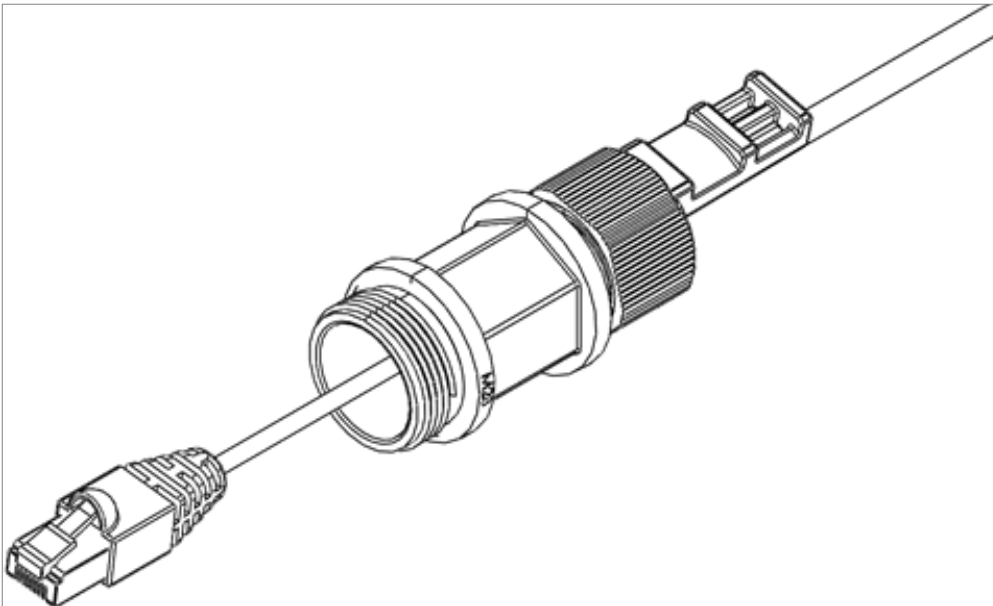
Preparing the Ethernet Cable Already Assembled

To prepare the Ethernet cable already assembled:

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



2. Insert the CAT5E cable into the gland cap and into the rubber gland.

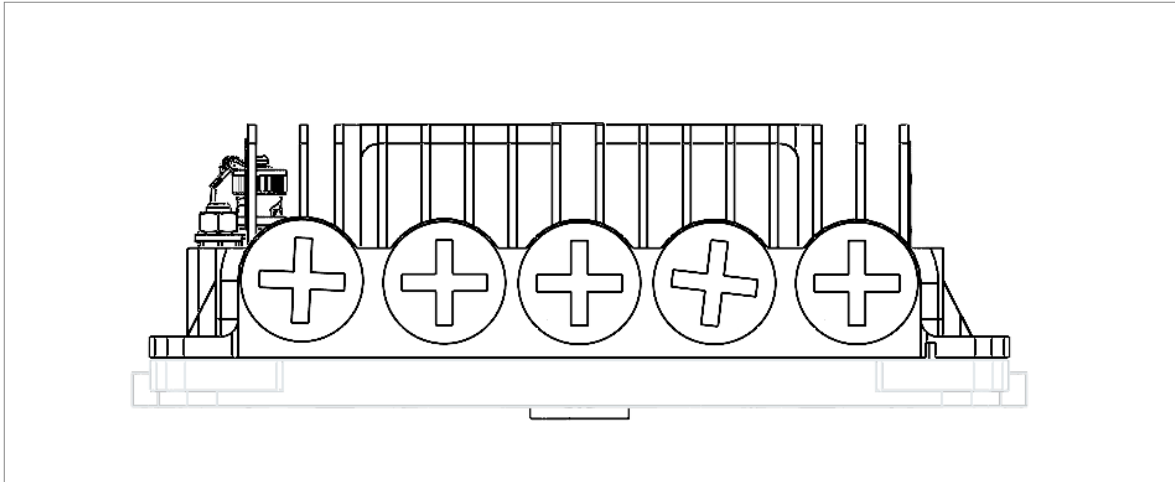


3. Insert the CAT5e cable into the gland body.

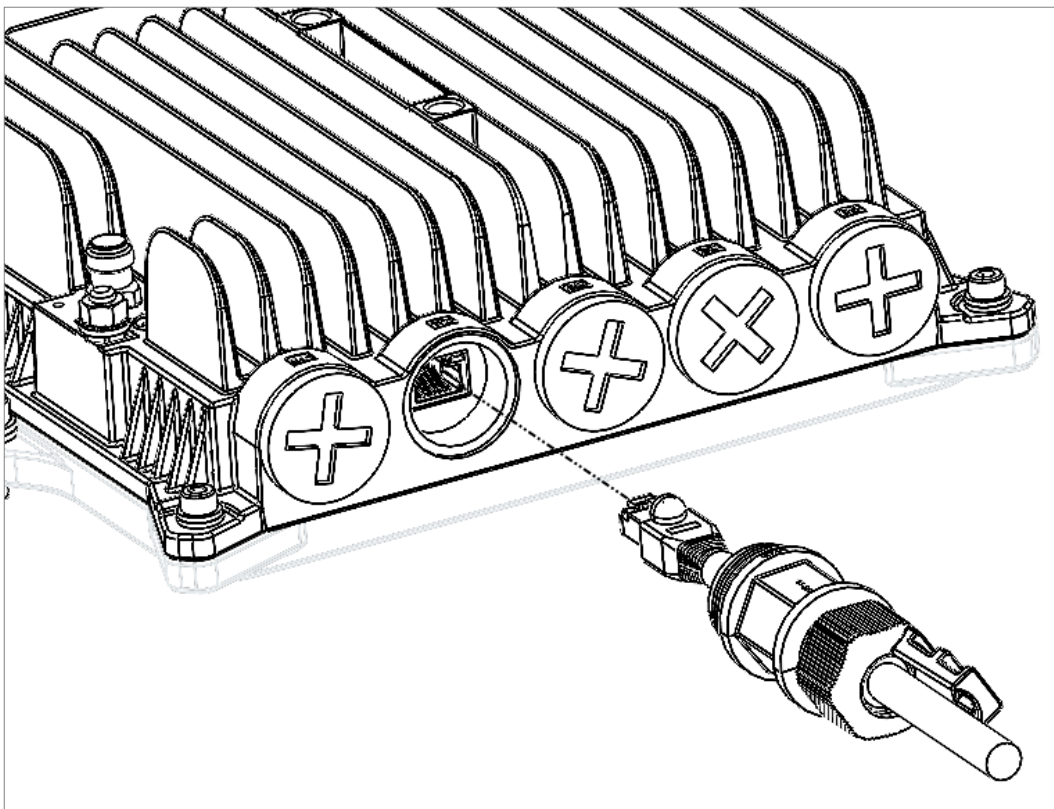
Connection of Ethernet Cable to PTP 850EX

To connect the Ethernet cable to the PTP 850EX:

1. Remove the relevant cap from the PTP 850EX radio. You can use the side of the gland to unscrew the cap.



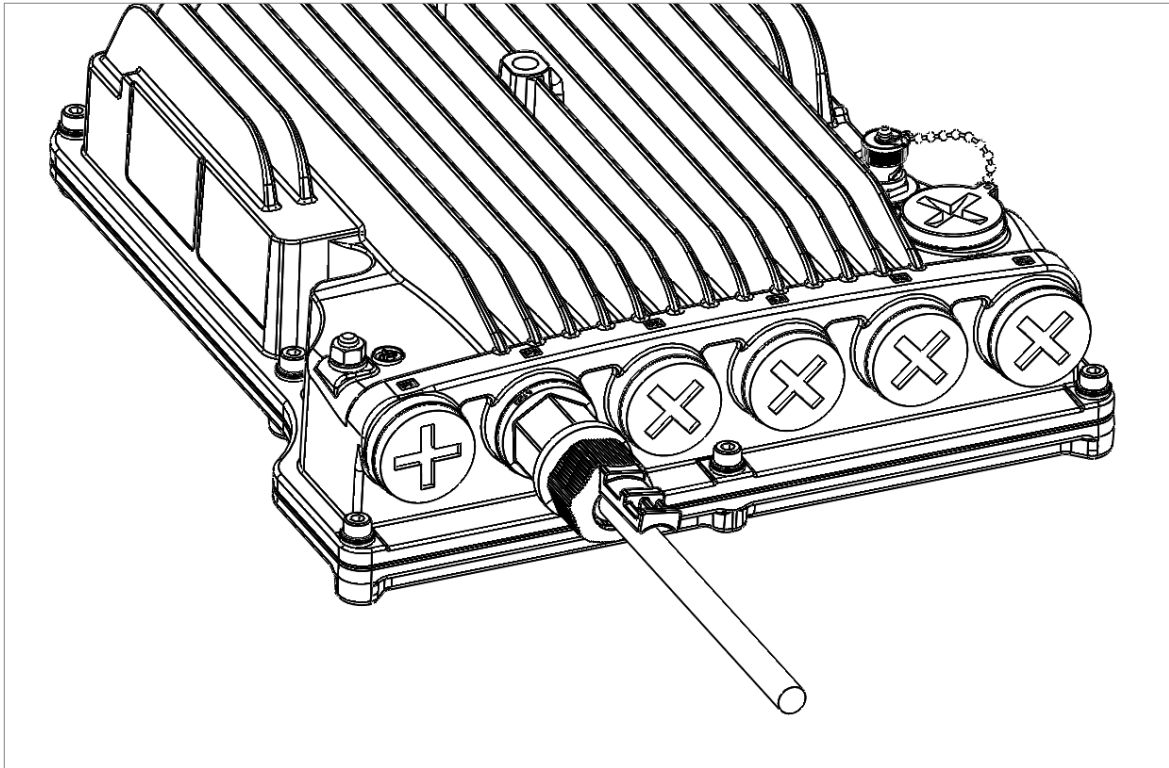
2. Connect the CAT5E cable to the PTP 850EX.



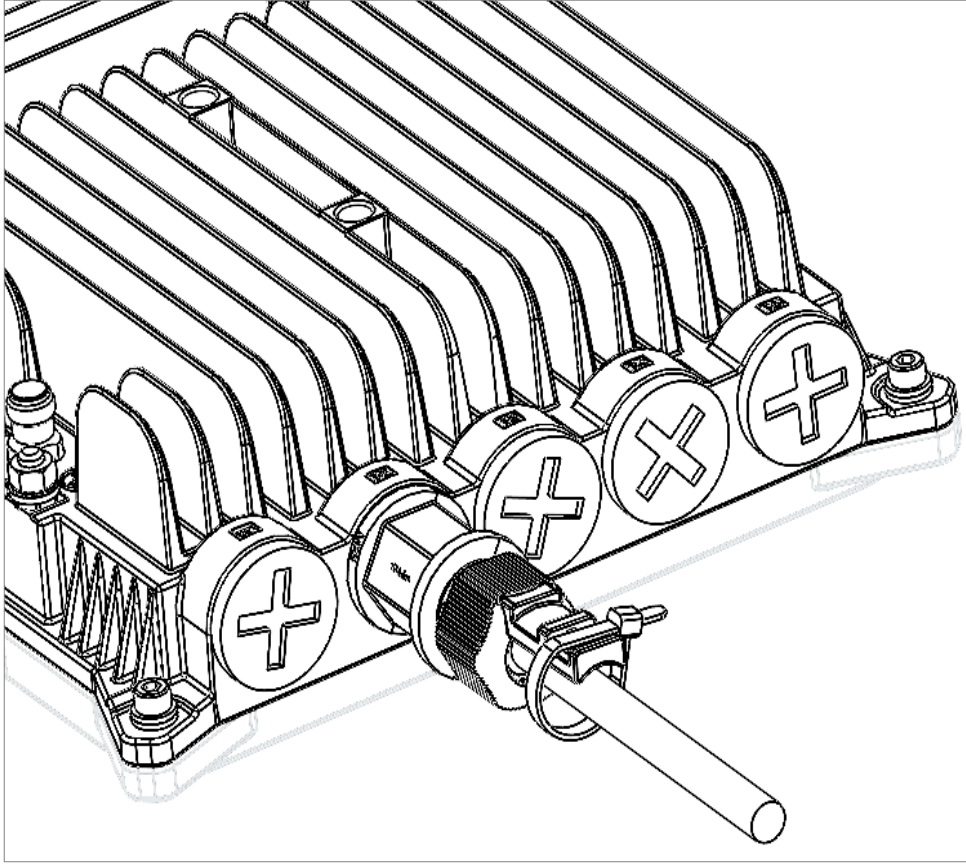
3. Screw the gland into the radio unit.

**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.



Connection of Protection/XPIC Cable to PTP 850EX

In HSB protection and XPIC configurations, the Protection/XPIC port (P5) is used to connect two PTP 850EX units. The Protection/XPIC cable is supplied with the glands attached.



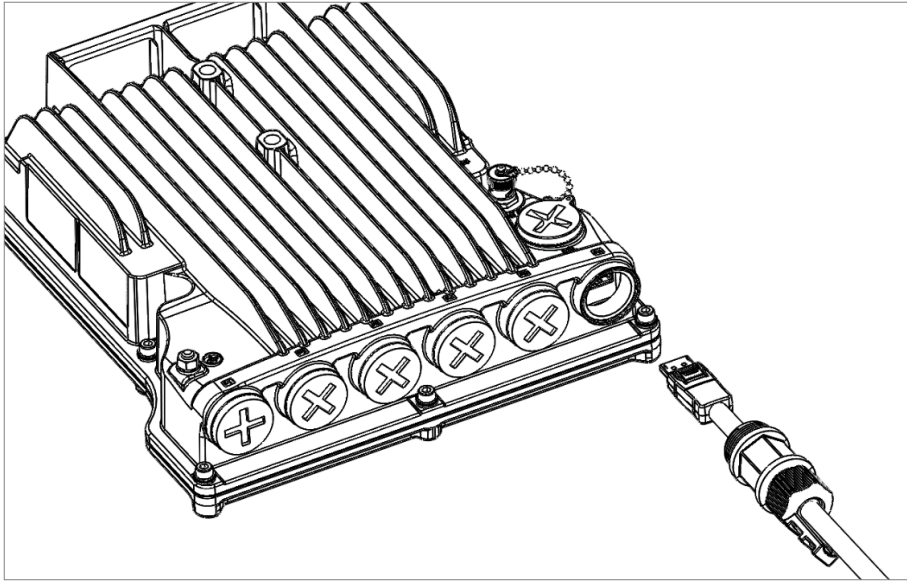
Note

For information on XPIC and HSB availability, check the Release Notes for the Cambium version you are using.

To connect the Protection/XPIC cable to the PTP 850EX:

1. Remove the relevant cap from the PTP 850EX radio. You can use the side of the gland to unscrew the cap.
2. Connect the XPIC cable to the PTP 850EX. For information about the cable, see [Extension Cables for](#)

Unit Redundancy and XPIC.

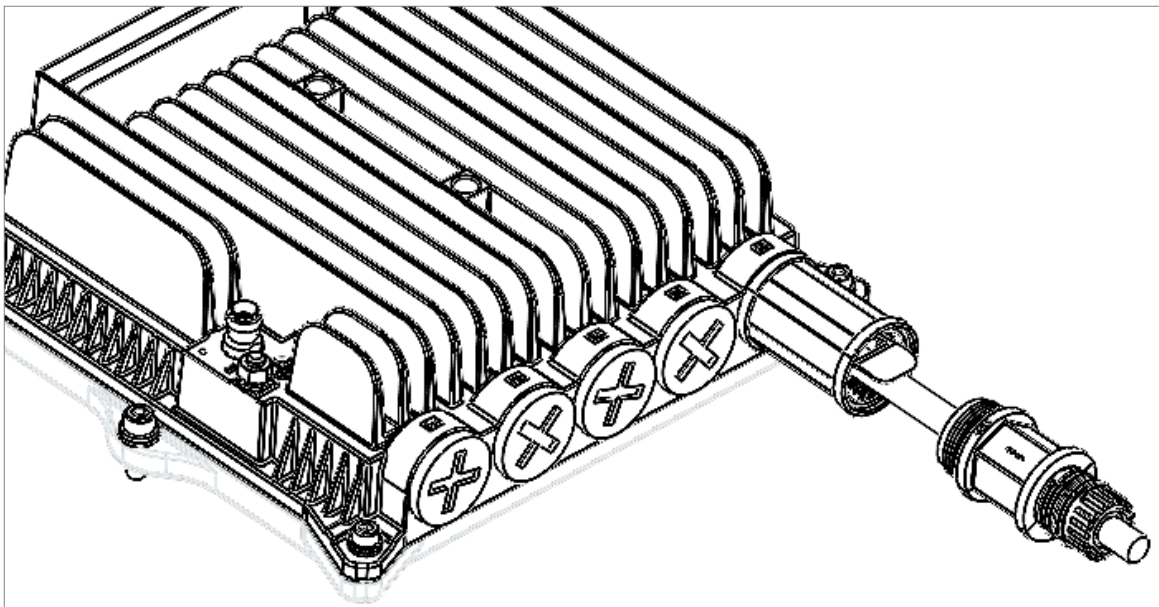


3. Screw the gland into the radio unit.

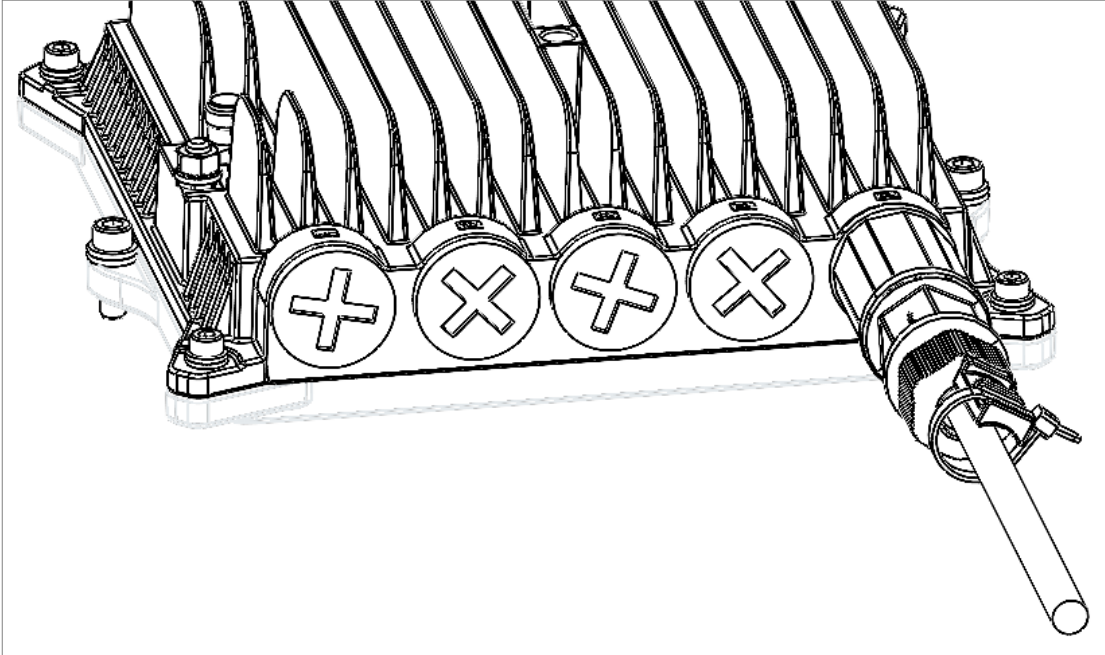


Note

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 with a tie wrap.



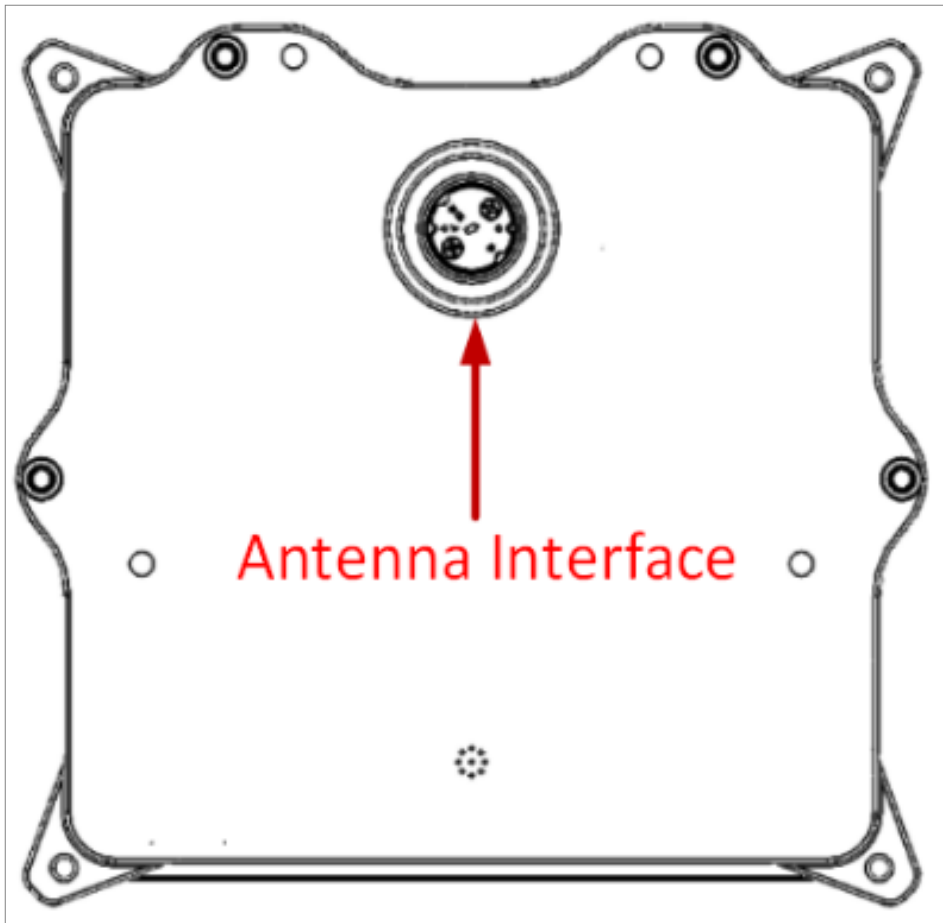
6. Connect the other side of the cable to the other PTP 850EX by following steps 1-5.

Direct Mount Configurations

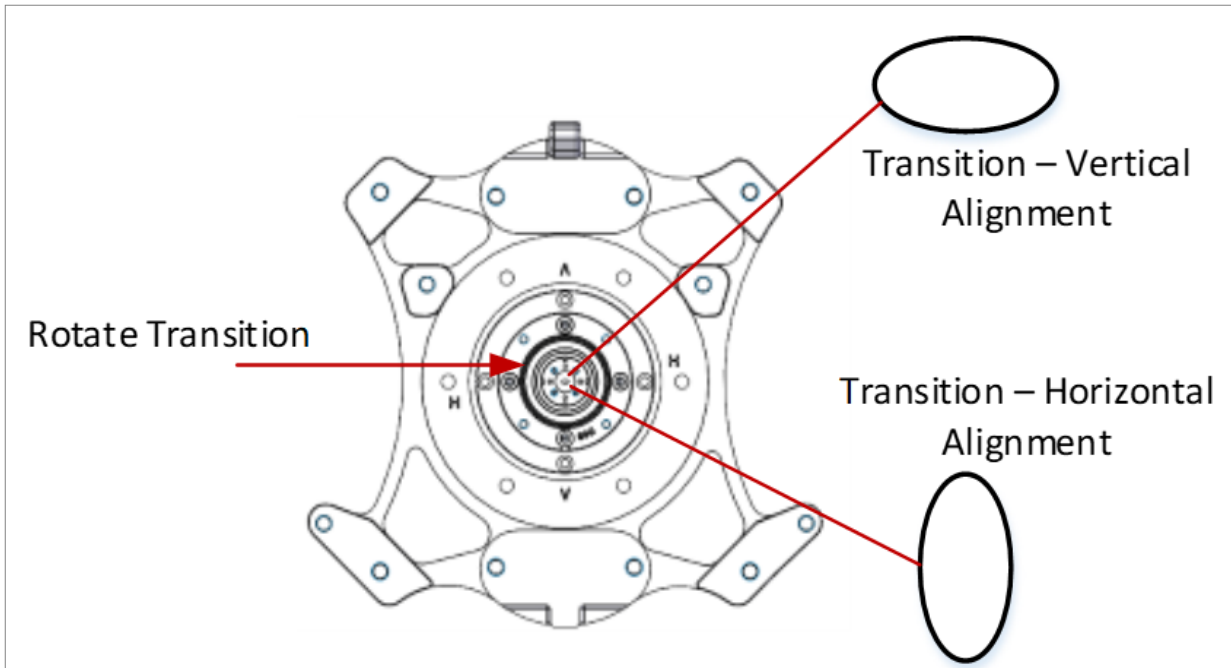
Antenna and Radio Polarization

For all configurations, you must make sure that the polarization on the radio and the antenna is set according to the link design, and that the polarization settings on the radio and antenna are the same.

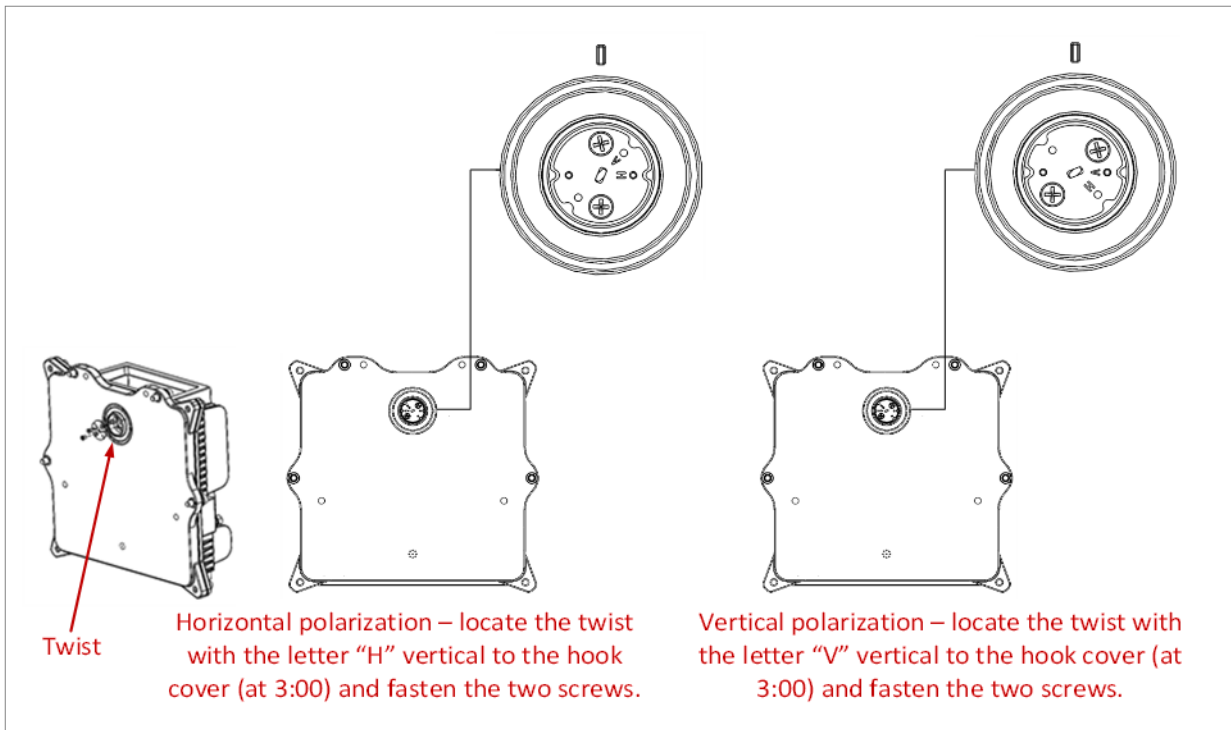
If necessary, change the antenna polarization by rotating the transition of the antenna's radio interface in accordance with the relevant antenna installation guide. For example, in the following figure, the center of the transition is aligned with the V marking in the upper closeup and the H marking in the lower closeup.



For details, refer to the installation instructions for the antenna.



To change the polarization of the radio, adjust the twist as shown below. Use 0.8 Nm torque to tighten the twist.



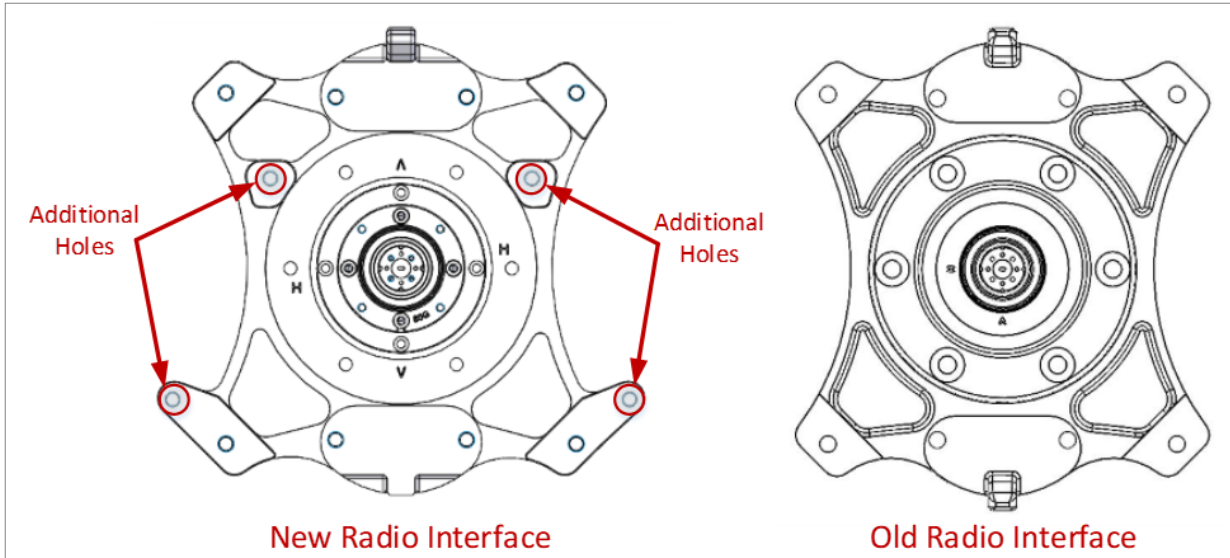
1+0 Direct Mount Installation

Certain older types of antennas have radio interfaces that lack four holes for screws that are used with PTP 850EX. The following figure illustrates the older and newer types of antenna radio interfaces, and shows which holes are missing on some of the older types.



Note

For details as to which antennas have the older and newer antenna interfaces, refer to the Cambium Master Antenna File, updated periodically by Cambium Product Management.



If the antenna has an old radio interface, you must install an antenna adaptor on the PTP 850EX radio before attaching the PTP 850EX to the antenna. For instructions, see [1+0 Direct Mount Installation with Antenna Adaptor](#).

For instructions for configurations with the new radio interface that does not require an antenna adaptor, see [1+0 Direct Mount Installation without Antenna Adaptor](#).

1+0 Direct Mount Installation without Antenna Adaptor

Torque Requirements

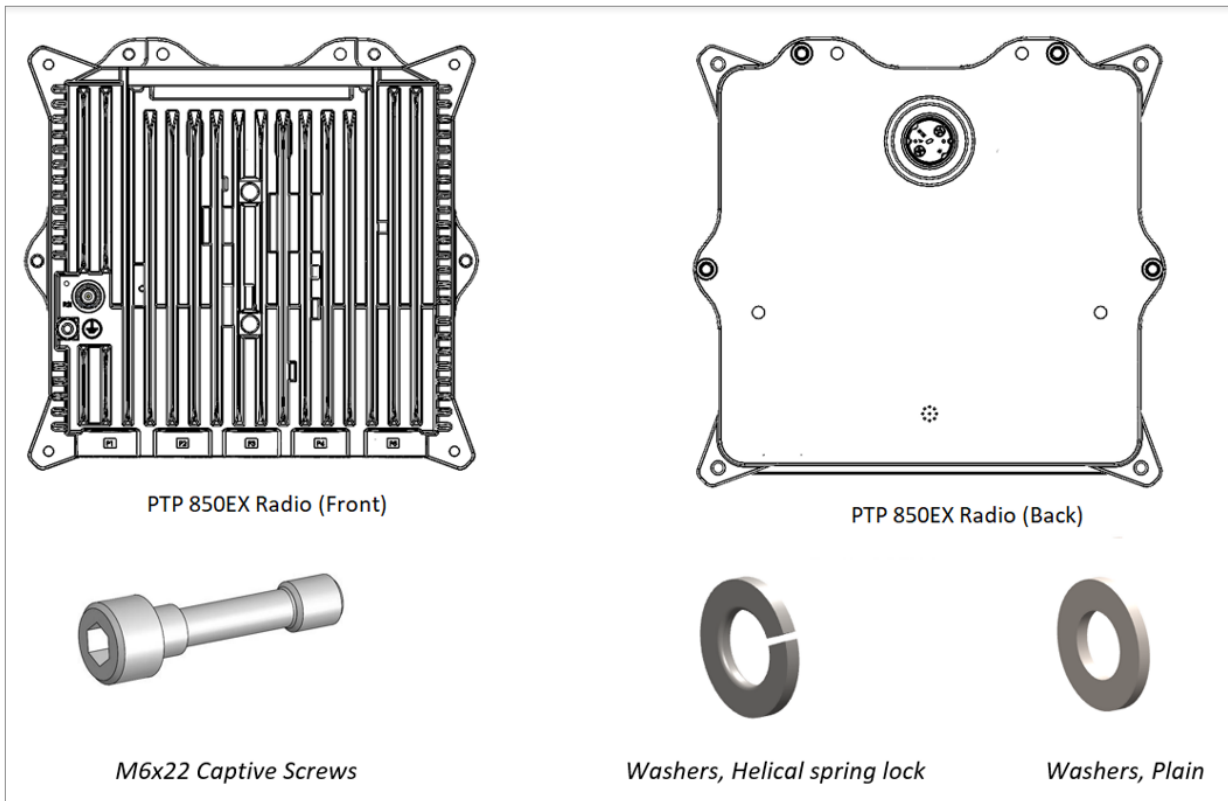
- M6 screws: 9 Nm

Required Tools

- Metric offset hexagon key wrench #5
- Phillips #2 screwdriver

List of Items Used in PTP 850EX 1+0 Direct Mount Configurations

Part Number	Description
C800085B007A	PTP 850EX Radio, 10Gbps, Lo, TX 71-76GHz, RX 81-86 GHz
C800085B008A	PTP 850EX Radio, 10Gbps, Hi, TX 81-86GHz, RX 71-76 GHz
Captive Screws – M6X22 - 15mm Neck	Included already inserted in PTP 850EX radio
Washers, Helical	Included already inserted in PTP 850EX radio
Washers, Plain	Included already inserted in PTP 850EX radio

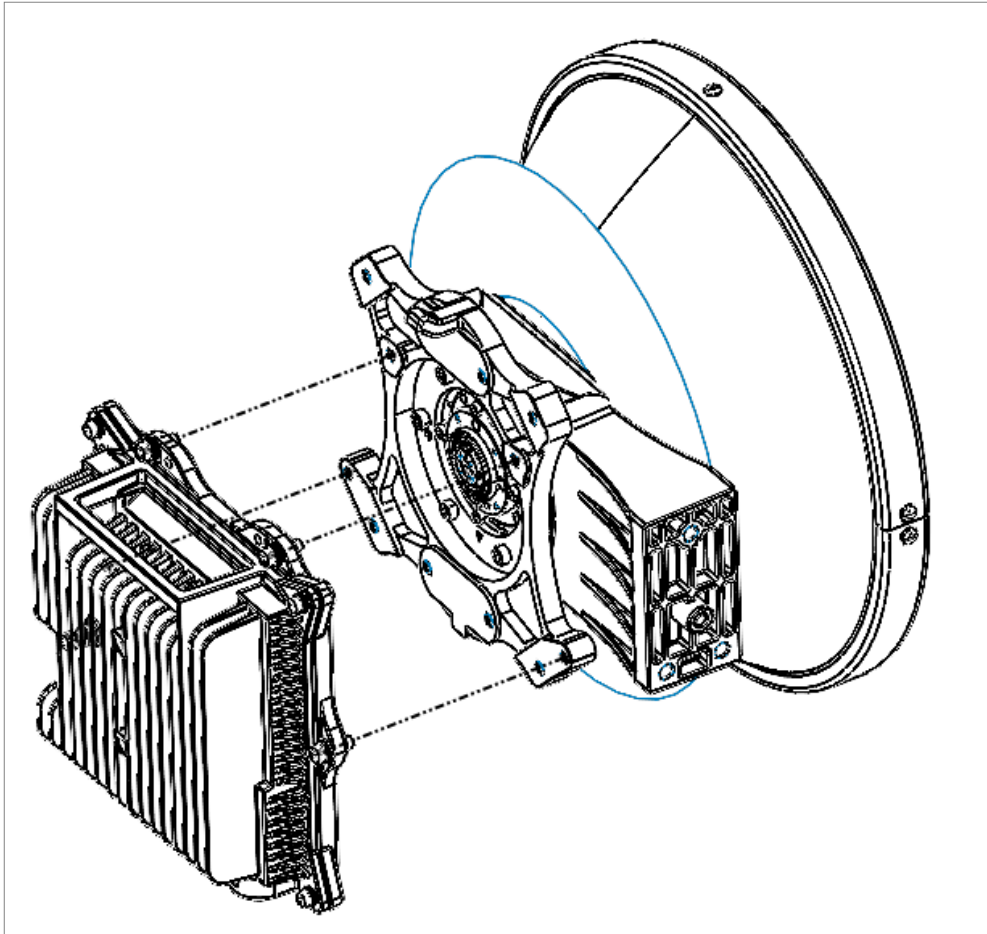


Note

The captive screws and washers are pre-assembled on the PTP 850EX.

Procedure

1. Mount the PTP 850EX on the antenna using the four M6 captive screws and washers (items 2,3, and 4) that are supplied, assembled, in the PTP 850EX, and tighten the screws.



2. Make sure not to exceed the maximum torque (9 Nm).

1+0 Direct Mount Installation with Antenna Adaptor



Note

It is recommended to install the antenna adaptor on the radio on the ground, before climbing the tower to install the radio.

Torque Requirements

- M8 screws: 20 Nm
- M6 screws: 9 Nm

Required Tools

- Metric hexagon key stubby tip wrench #5
- Metric hexagon key wrench #6

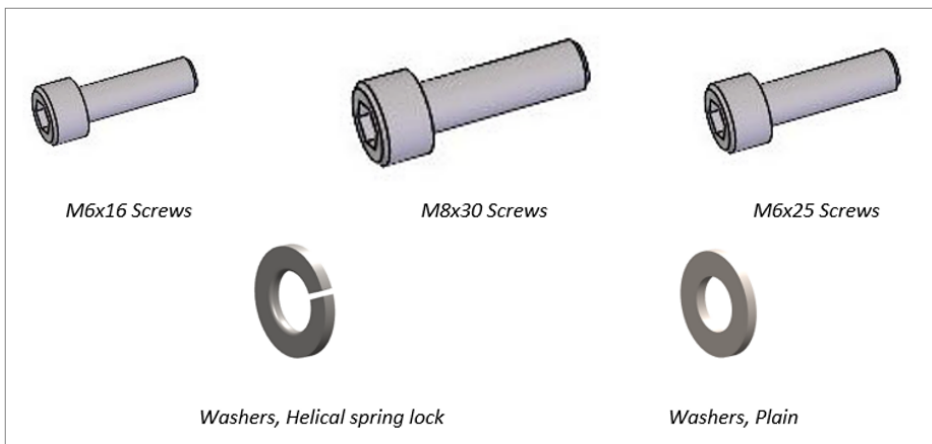
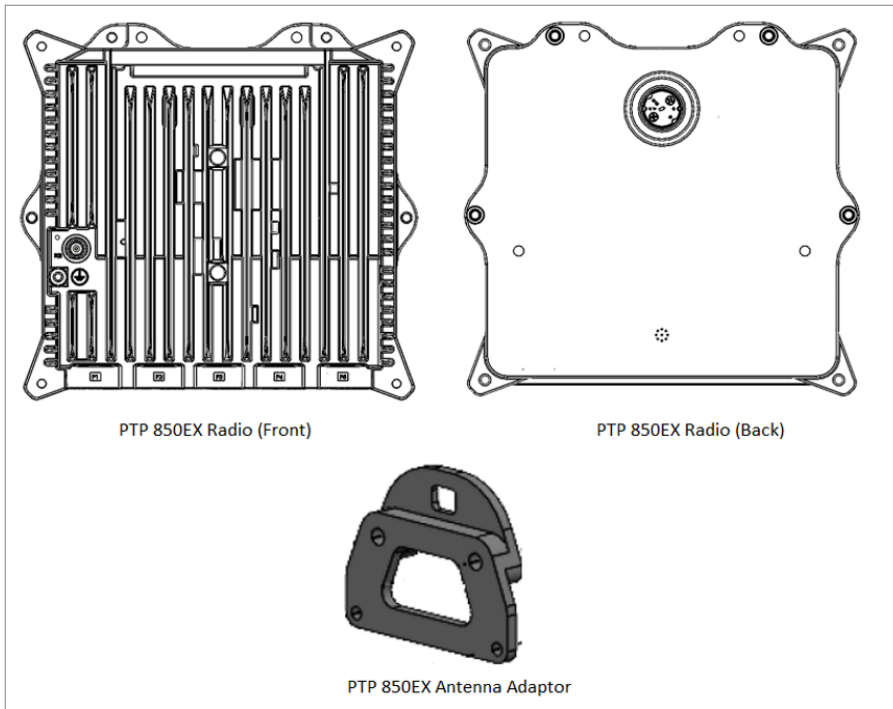
- Phillips #2 screwdriver

List of Items – Radio

Part Number	Description
C800085B007A	PTP 850EX Radio, 10Gbps, Lo, TX 71-76GHz, RX 81-86 GHz
C800085B008A	PTP 850EX Radio, 10Gbps, Hi, TX 81-86GHz, RX 71-76 GHz

List of Items - Antenna Adaptor Kit

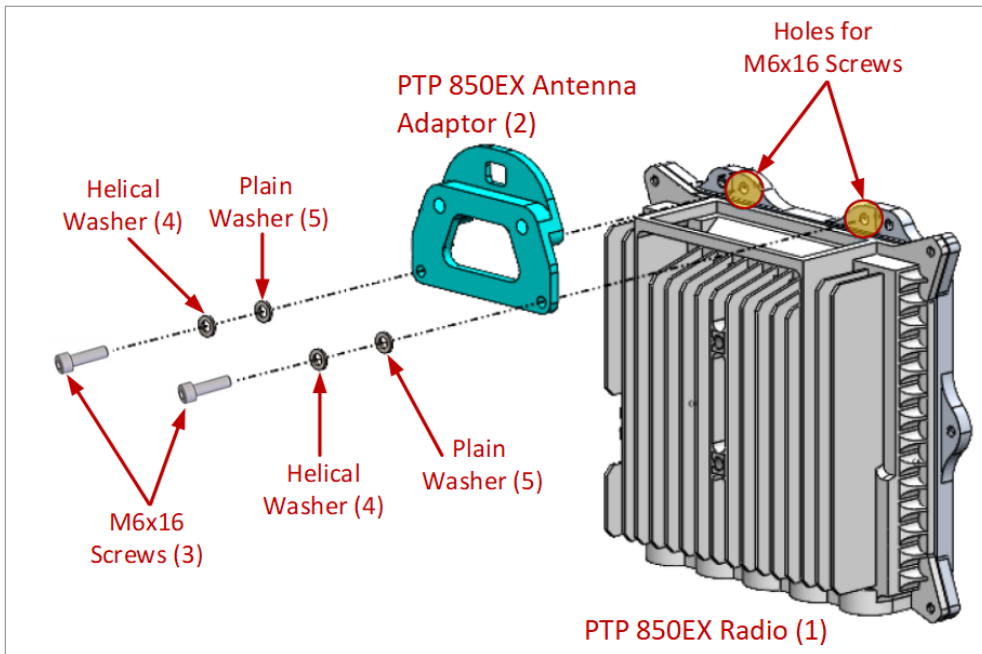
Item	Description	Number	Marketing Model
2	PTP 850EX Antenna Adaptor	1	PTP 850EX-ANT-INT-BRKT-KIT
3	M6-16 Screws	2	Included with Antenna Adaptor Kit
4	Washers, Helical	2	Included with Antenna Adaptor Kit
5	Washers, Plain	2	Included with Antenna Adaptor Kit
6	M8-30 Screws	2	Included with Antenna Adaptor Kit
7	Washers, Helical	2	Included with Antenna Adaptor Kit
8	Washers, Plain	2	Included with Antenna Adaptor Kit
9	M6-25 Screws	2	Included with Antenna Adaptor Kit
10	Washers, Helical	2	Included with Antenna Adaptor Kit
11	Washers, Plain	2	Included with Antenna Adaptor Kit



Procedure

1. Using two M6-16 screws, with helical and plain washers (items 3, 4, and 5), fasten the adaptor to the PTP 850EX via the two lower holes of the adaptor and the two holes on the upper part of the PTP

850EX marked in the following figure.

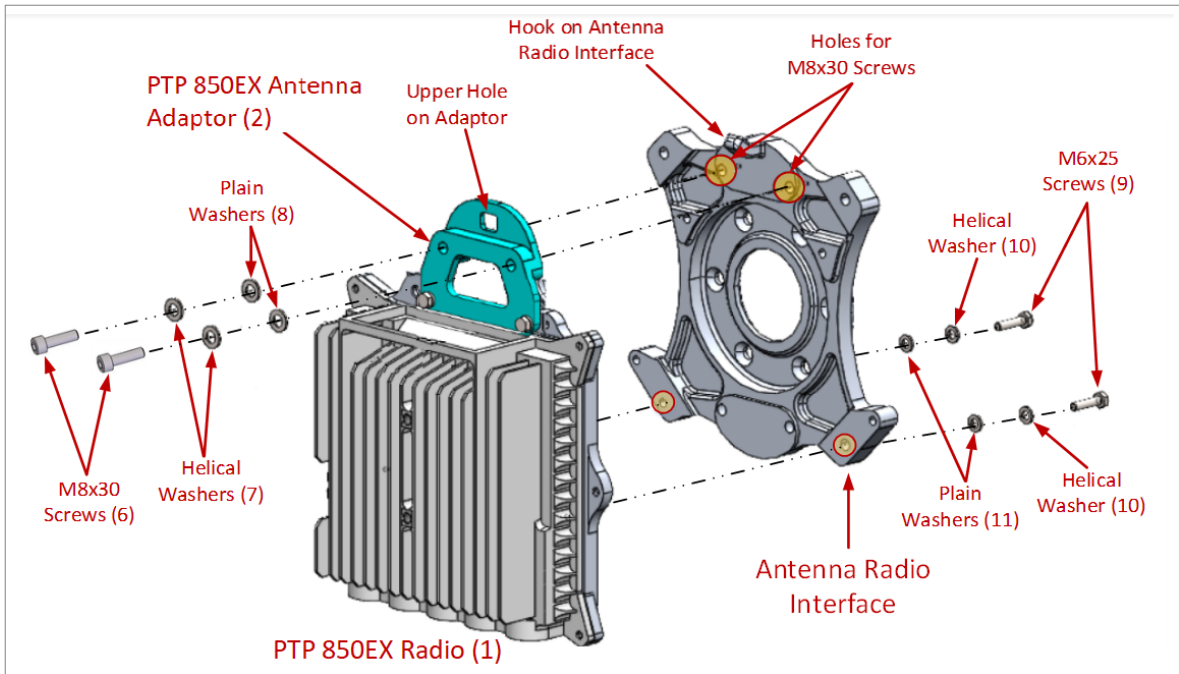


2. Insert the upper hole of the adaptor into the hook on the top of the antenna's radio interface. Then, using two M8x30 screws, with helical and plain washers (items 6, 7, and 8), fasten the adaptor to the antenna via the two upper holes of the adaptor and the two holes on the upper part of the antenna marked in the following figure.

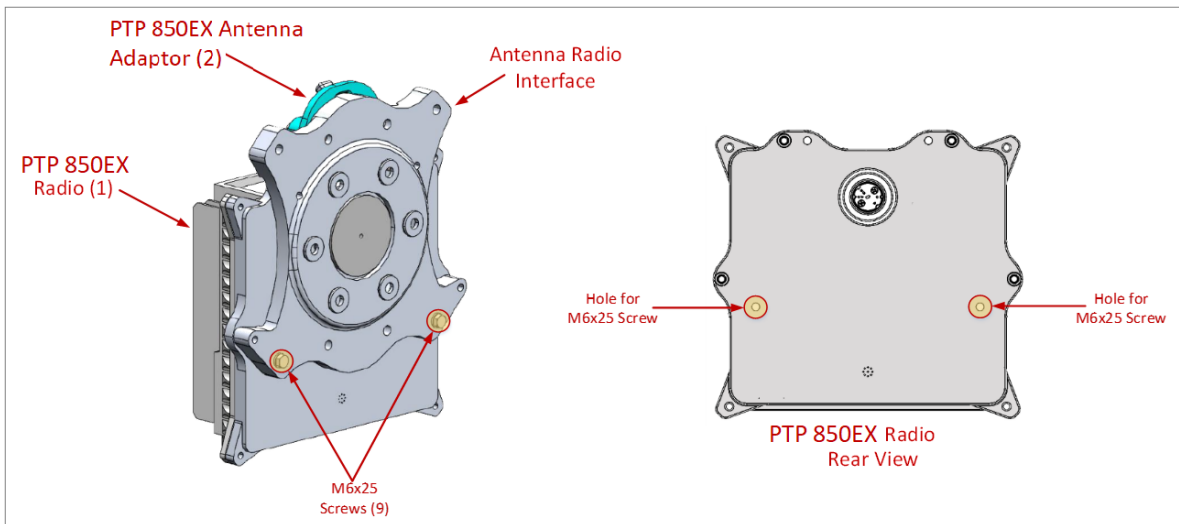


Note

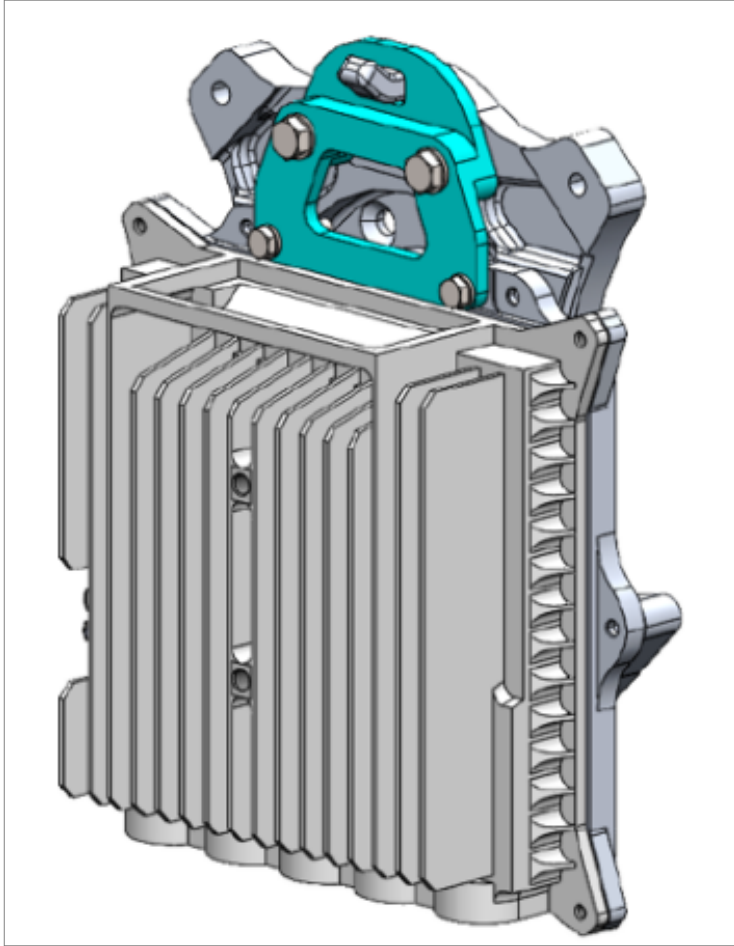
For clarity, the new two pictures show the antenna's radio interface, but not the antenna itself.



- From the back of the antenna's radio interface, use two M6x25 screws, with helical and plain washers (item 9, 10, and 11) to connect the antenna directly to the PTP 850EX radio via the holes on the lower side of the antenna's radio interface and two holes on either side of the back of the radio.



The following figure shows the installation upon completion.



2+0 Direct Mount Dual Polarization (XPIC)

List of Items

Item	Description	Quantity	Remarks
1	PTP 850EX Radio	2	
2	PTP 820E-OMT-Kit	1	
3	XPIC Cable	1	See Extension Cables for Unit Redundancy and XPIC
4	Clock Sharing Cable	1	See Clock Sharing Cable for XPIC

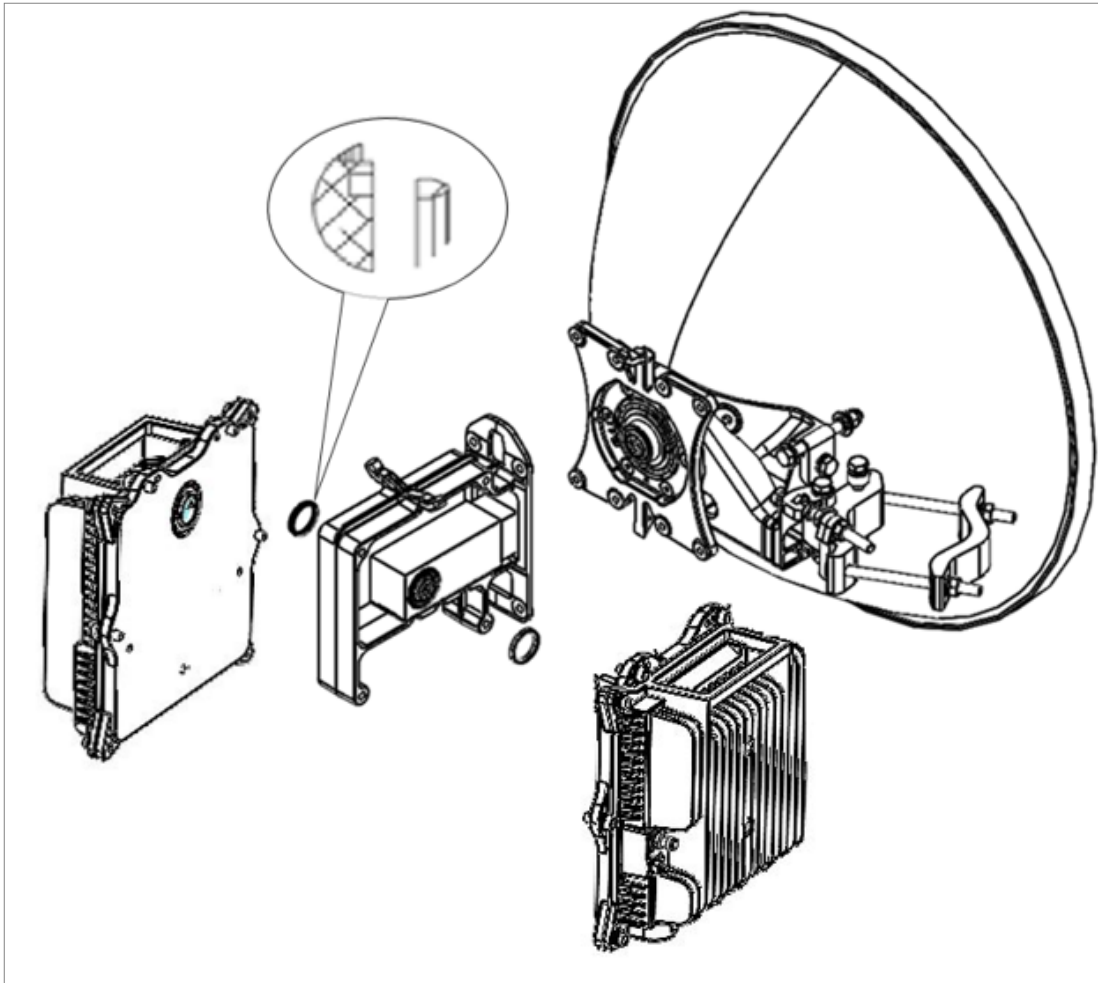
Required Tools

The following tools are required for the installation:

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

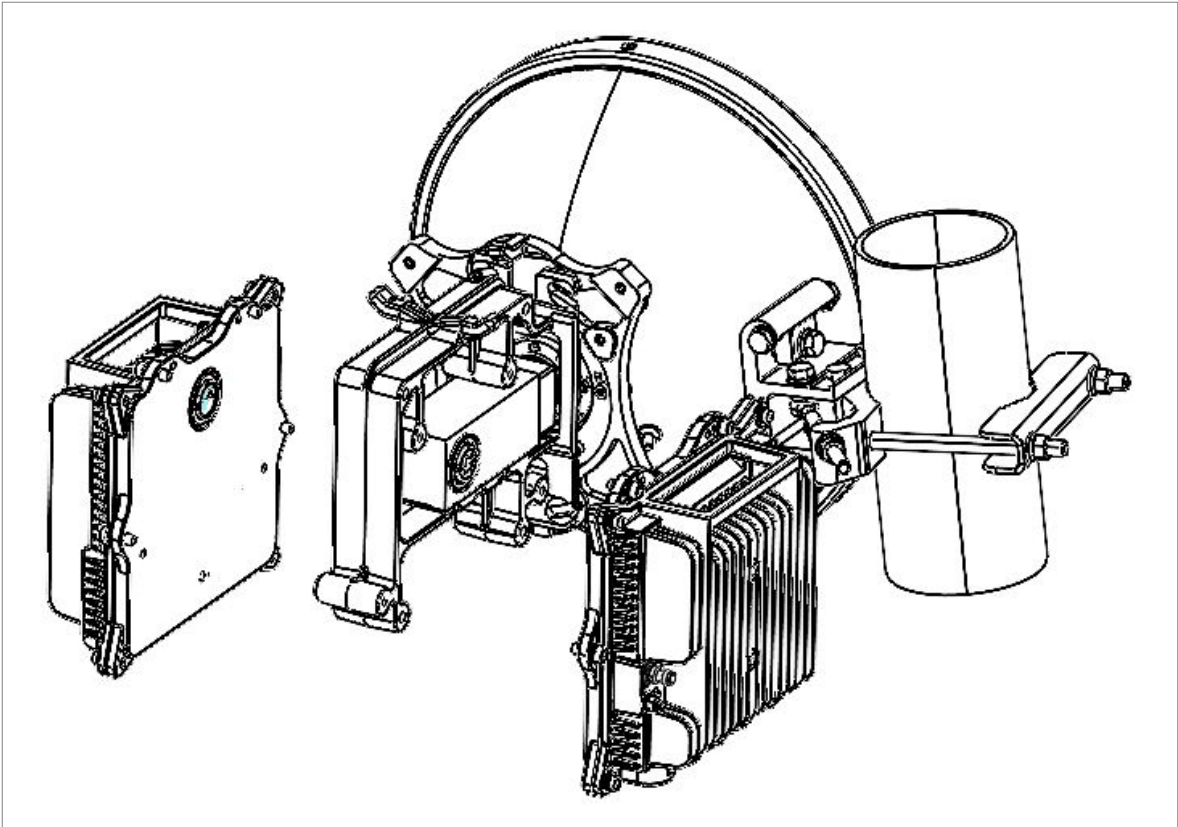
Procedure

1. Make sure the antennas have been properly leveled on both sides of the link. Proper leveling is crucial in order to optimize XPIC performance.
2. Make sure the antenna port is circular.
3. Mount the OMT on the antenna using the four M8 screws and washers supplied with the OMT kit, and tighten the screws.
4. Mount the two O-Rings supplied with the OMT kit, as shown in the following figure.



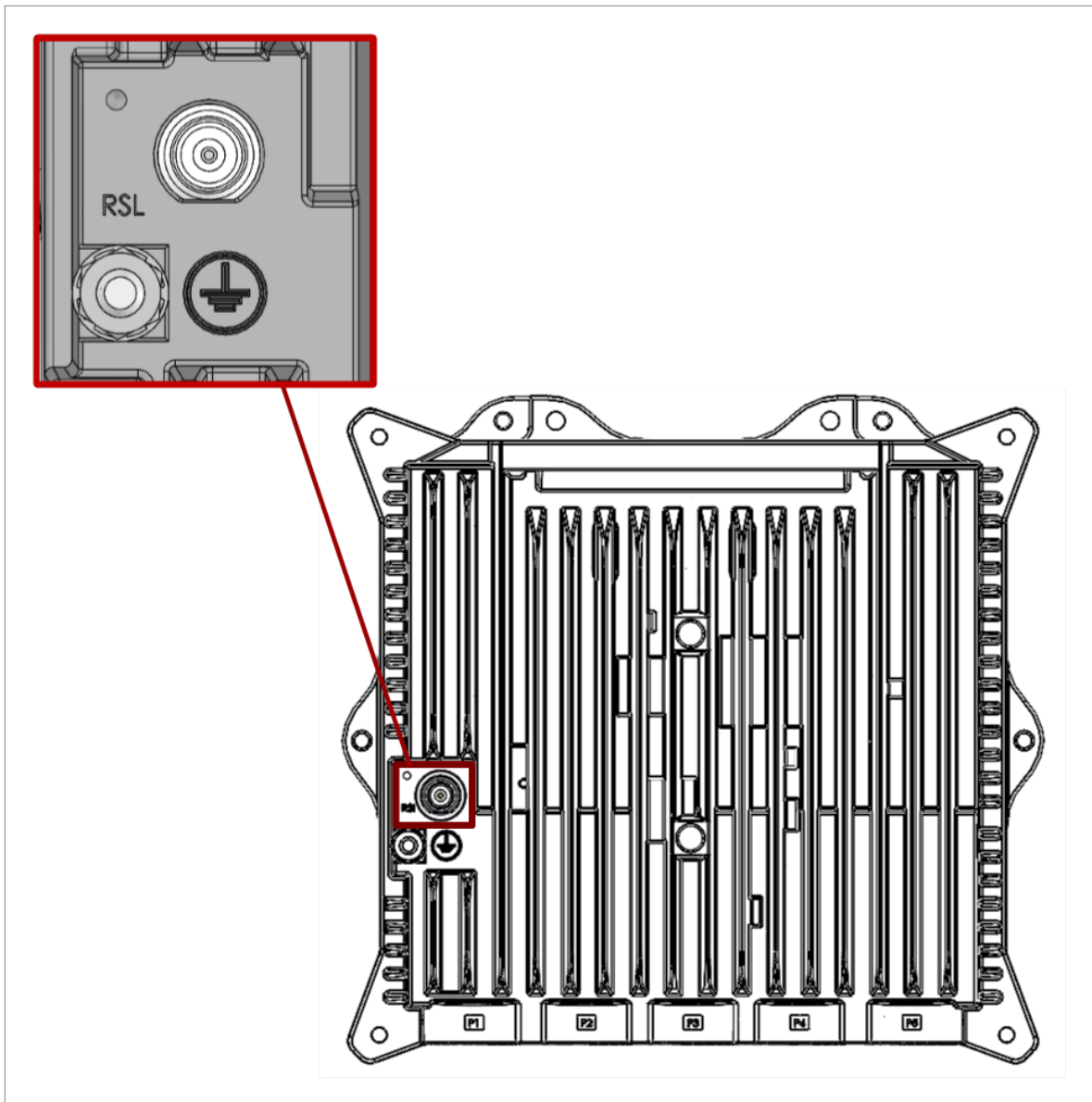
5. Change the polarization of one of the PTP 850EX radios to 'H' polarization. See [Antenna and Radio Polarization](#).
6. Mount an PTP 850EX radio to each side of the OMT. When mounting the radios, make sure that one side is polarized 'V' and the other side is polarized 'H'. Tighten the radios to the OMT kit using the four

M6 captive screws and washers that are supplied, assembled, with the PTP 850EX radios.



7. Connect the XPIC cable between the Protection/XPIC ports (P5) of the two units. See [Extension Cables for Unit Redundancy and XPIC](#) and on [Connection of Protection/XPIC Cable to PTP 850EX](#).
8. Connect the clock sharing cable between the TNC RSL/Source Sharing connectors of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m).

Figure 12: RSL/Source Sharing Connector



1+1 HSB (Unit Redundancy)

List of Items

Item	Description	Quantity	Remarks
1	PTP 850EX Radio	2	
2	PTP 820E-CPLR-Kit	1	
3	QSFP+_to_QSFP+_cable	1	See Extension Cables for Unit Redundancy and XPIC.

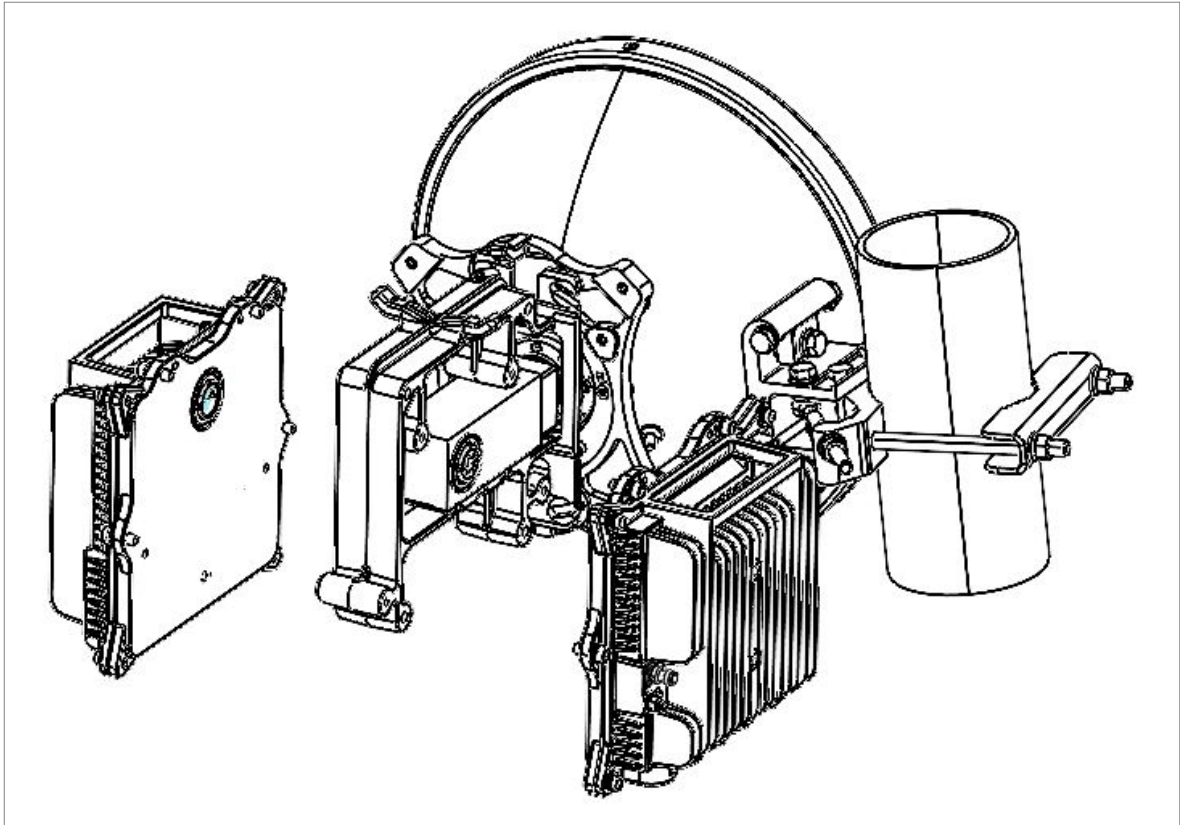
Required Tools

The following tools are required for the installation:

- Metric offset hexagon key wrench #5
- Metric offset hexagon key wrench #6
- Phillips #2 screwdriver
- Metric offset hexagon key wrench #2.5 and #3

Procedure

1. Mount the Coupler on the antenna using the four M8 screws and washers supplied with the Coupler kit, and tighten the screws.
2. Mount an PTP 850EX radio to each side of the Coupler. Tighten the radios to the Coupler kit using the four M6 captive screws and washers that are supplied, assembled, with the PTP 850EX radios.



3. Connect the protection cable between the Protection/XPIC ports (P5) of the two units. See [Extension Cables for Unit Redundancy and XPIC](#) and on [Connection of Protection/XPIC Cable to PTP 850EX](#).

Installation Procedure and Antenna Alignment with 43 dBi Flat Antenna and Alignment Device

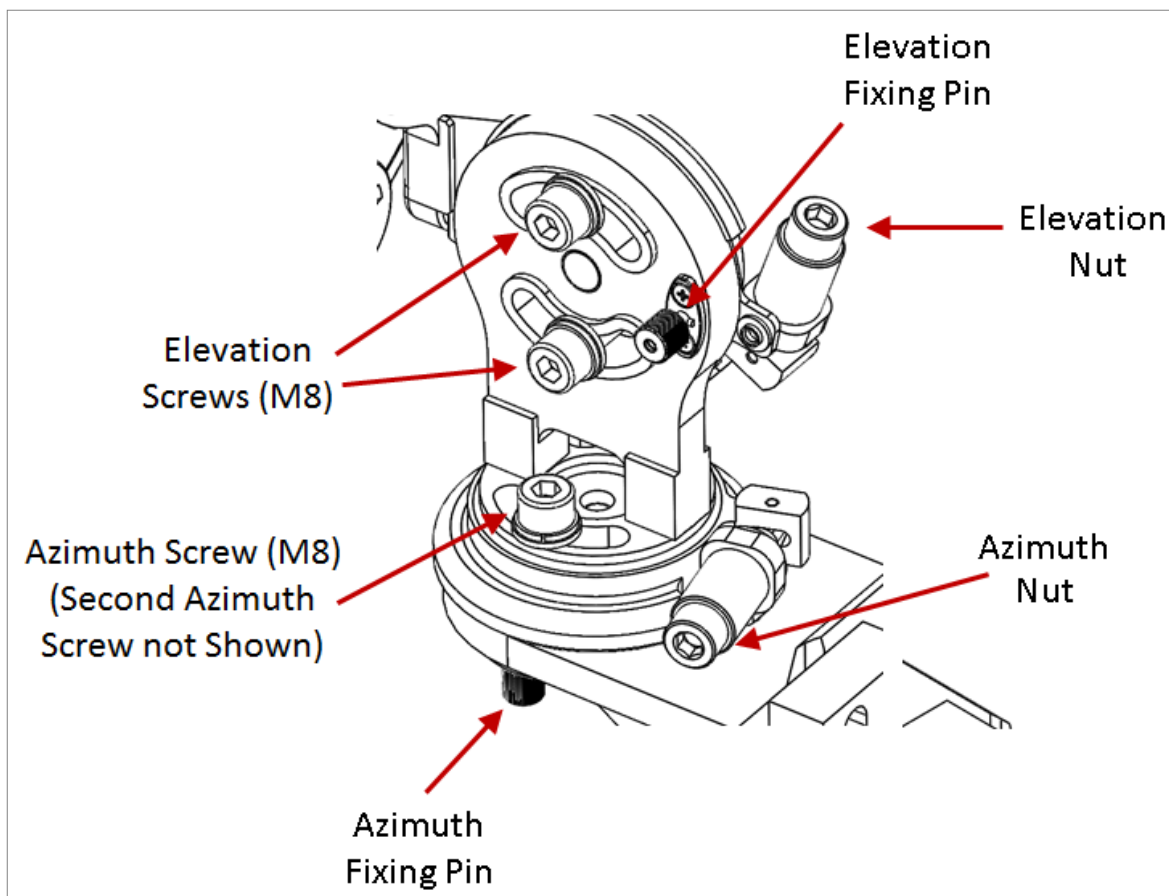


Note:

This configuration is planned for future release

When you order an PTP 850EX 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 13: *Installation and Alignment Device – Azimuth and Elevation Adjustment Tool*



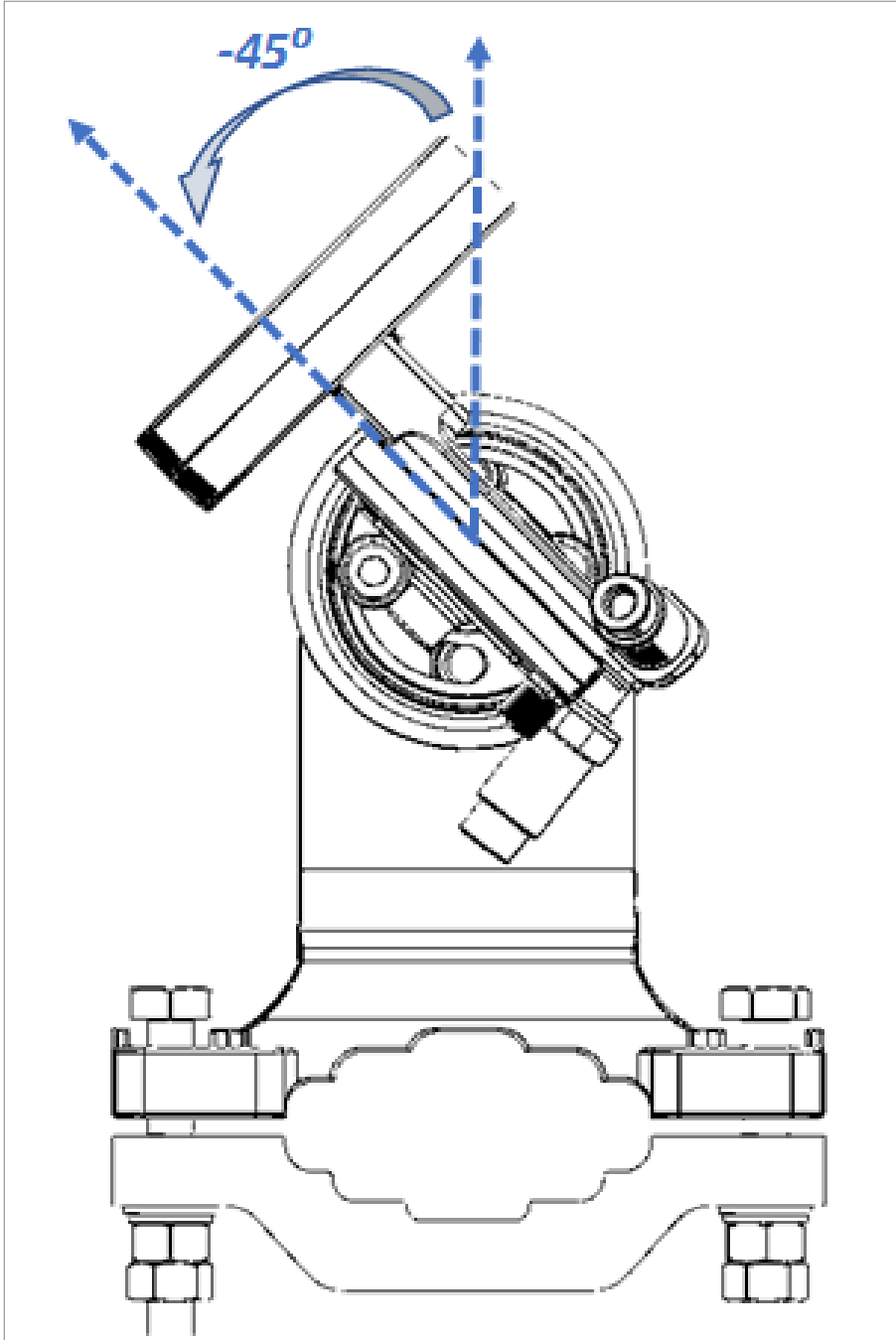
The installation and alignment device enables you to easily adjust the antenna's azimuth and elevation, in gross and fine intervals. Gross alignment enables you to adjust the azimuth and elevation in 15° increments. Fine alignment enables you to make more precise adjustments by turning the Azimuth and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

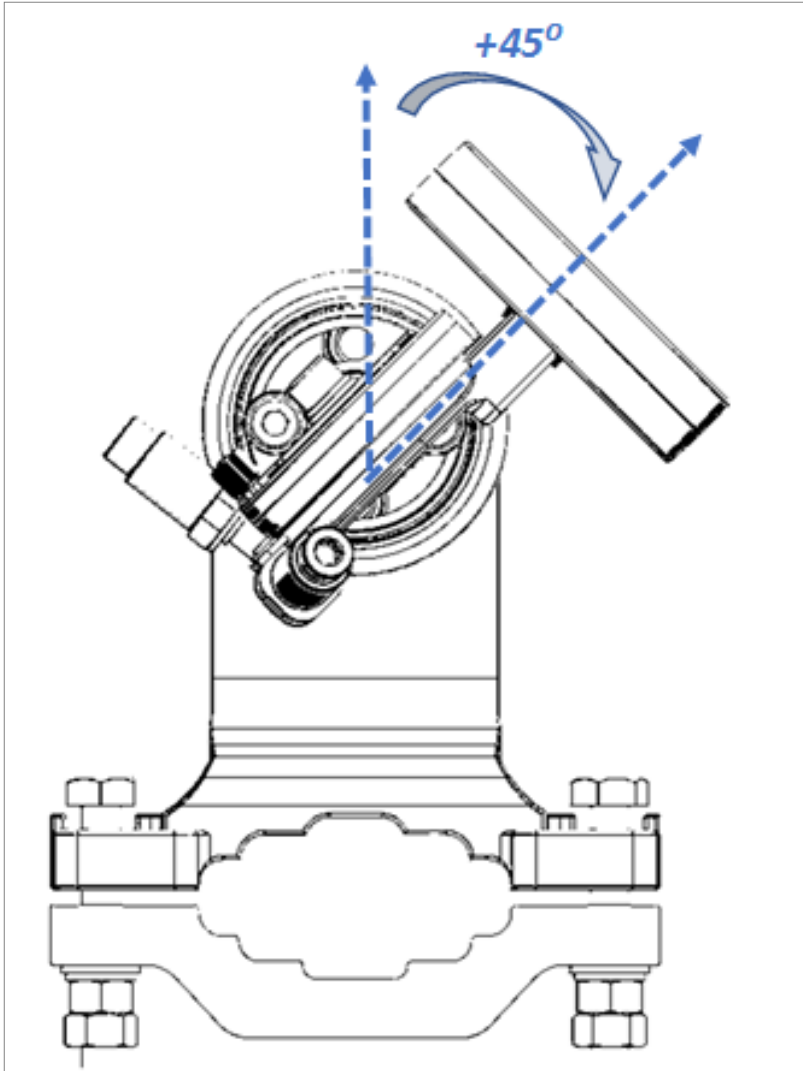
There are two M8 Elevation Screws and two M8 Azimuth screws, as shown in [Figure 13](#). Before starting the alignment, make sure these screws are securely in place so they will not fall out during the procedure, but not too tight, so as to enable you to manually adjust the azimuth and elevation to the approximate position you want, before performing exact antenna alignment as described in the following sections.

Upon delivery, the installation and alignment device is aligned 22° downward (elevation) and straight ahead (azimuth).

For pole mount installations, you can adjust the azimuth up to 45° in either direction by manually turning the azimuth base.

Figure 14: *Installation and Alignment Device – Azimuth Range (Pole Mount)*

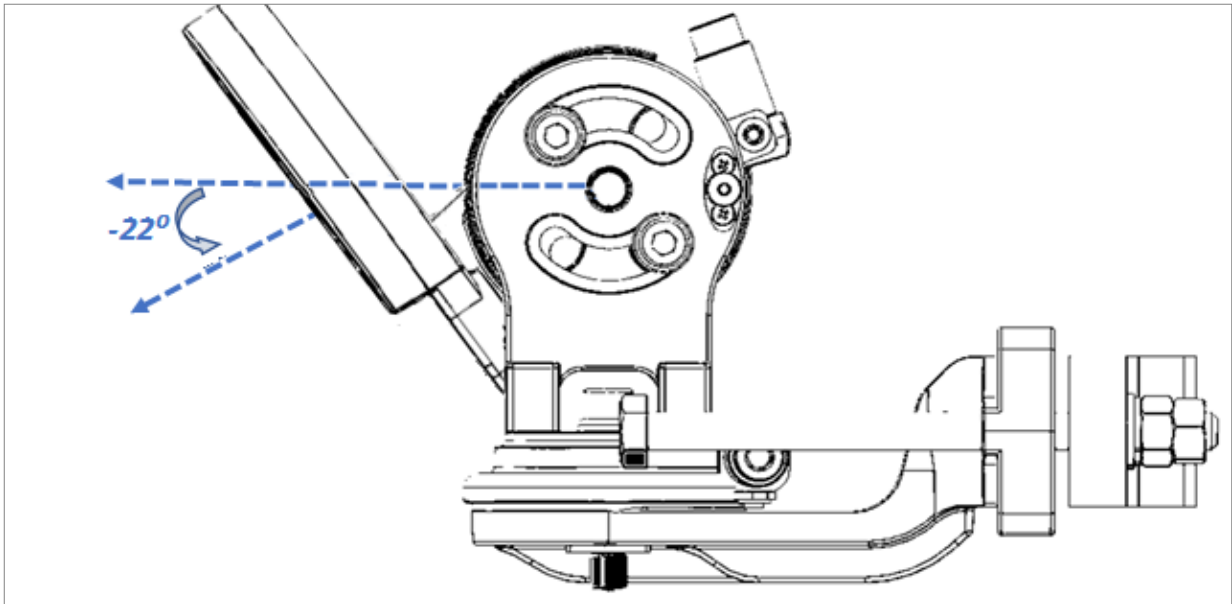




For wall mount installations, you can adjust the azimuth up to 30° in either direction by manually turning the azimuth base. The size of the radio unit and its glands do not permit wider adjustment.

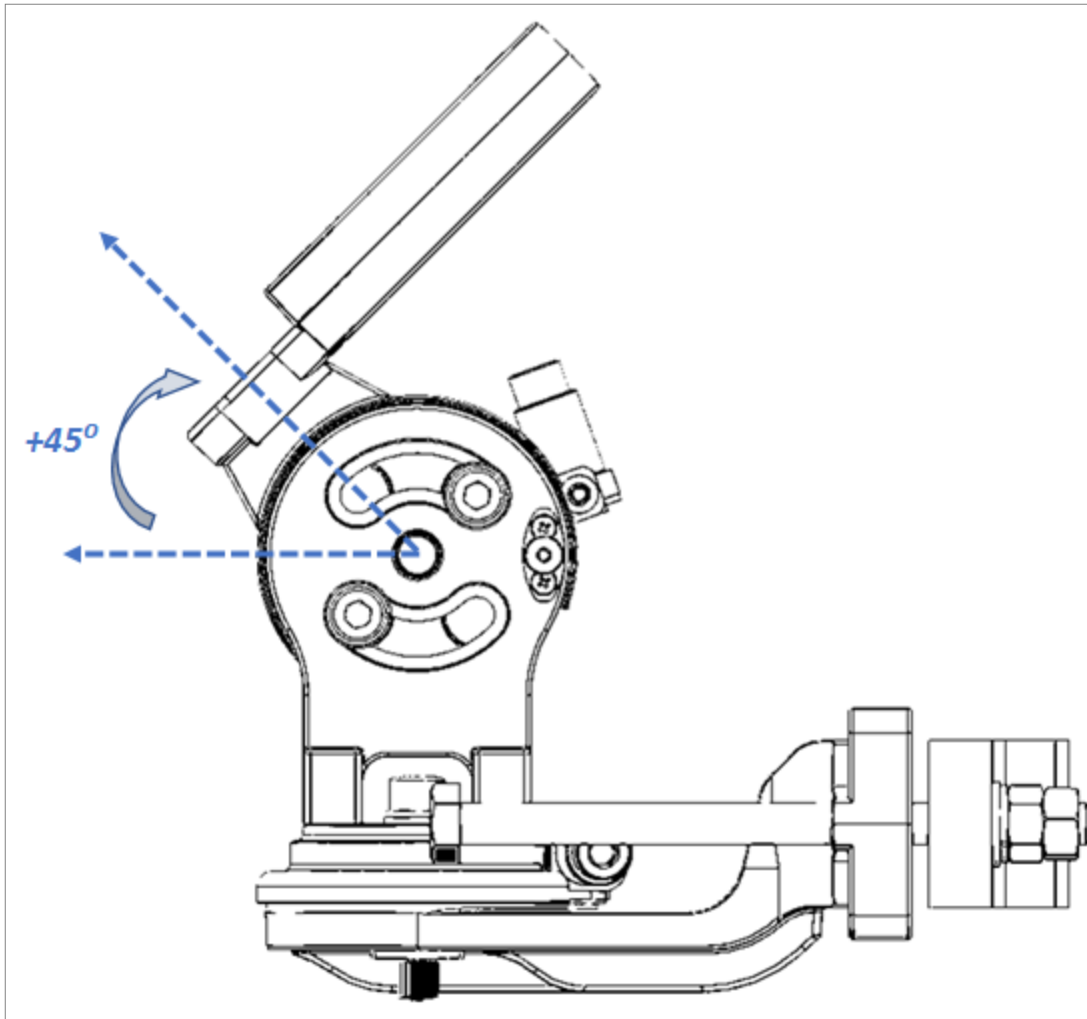
You can adjust the elevation from the delivery position of 22° downward up to a position as far as 45° upward. Be sure to attach the PTP 850EX radio and antenna to the installation and alignment device *before* adjusting the elevation, otherwise the weight of the radio and antenna might accidentally reduce the elevation angle.

Figure 15: Installation and Alignment Device – Delivery Elevation (22° Downward)



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

Figure 16: 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 PTP 850EX 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 PTP 850EX to the Installation and Alignment Device](#).

List of Items

Item	Description	Quantity
1	PTP 850E Flat Antenna Mounting Kit	1

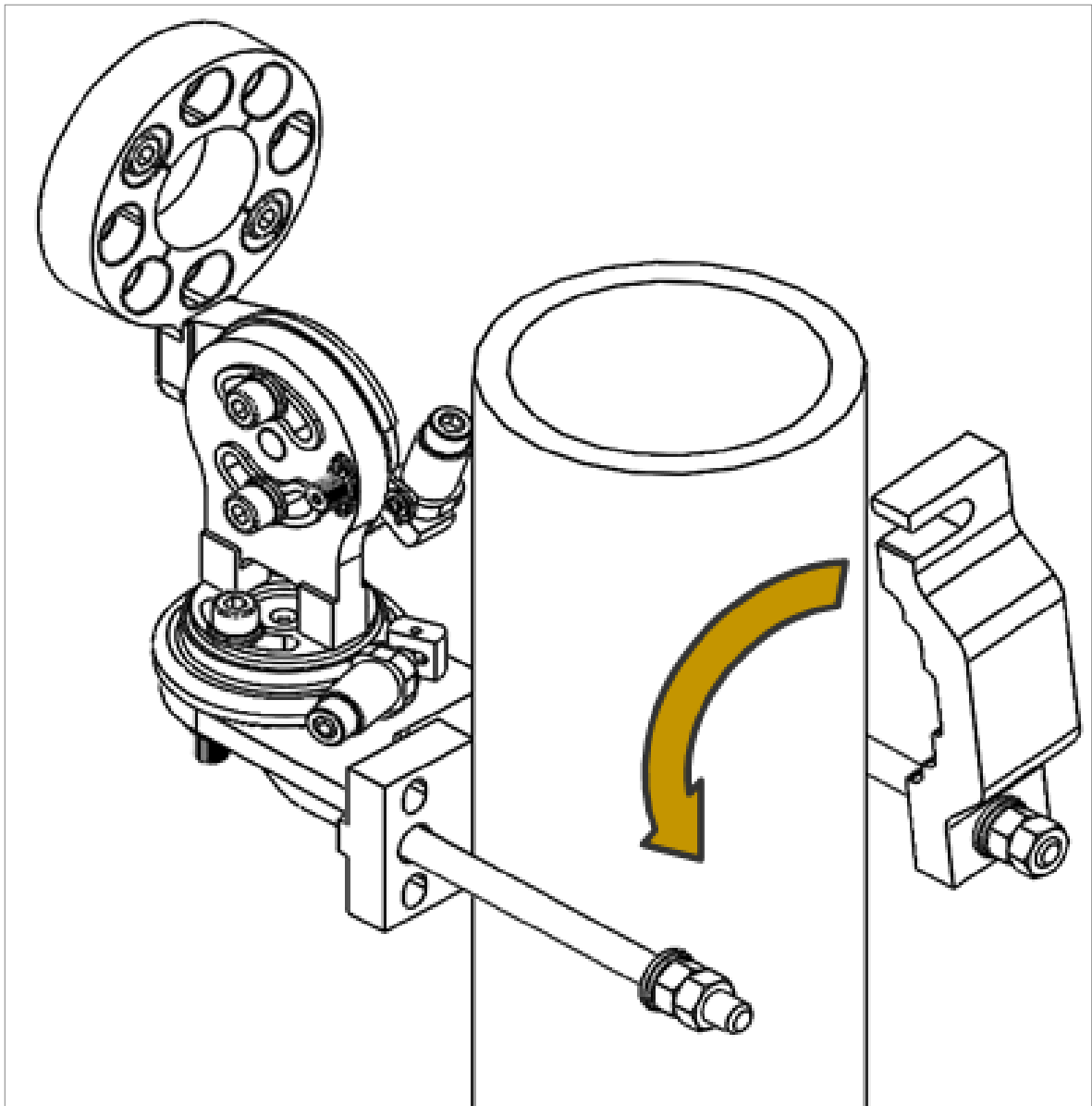
Item	Description	Quantity
2	PTP 850EX radio with 43 dBi Flat Antenna	1

Required Tools

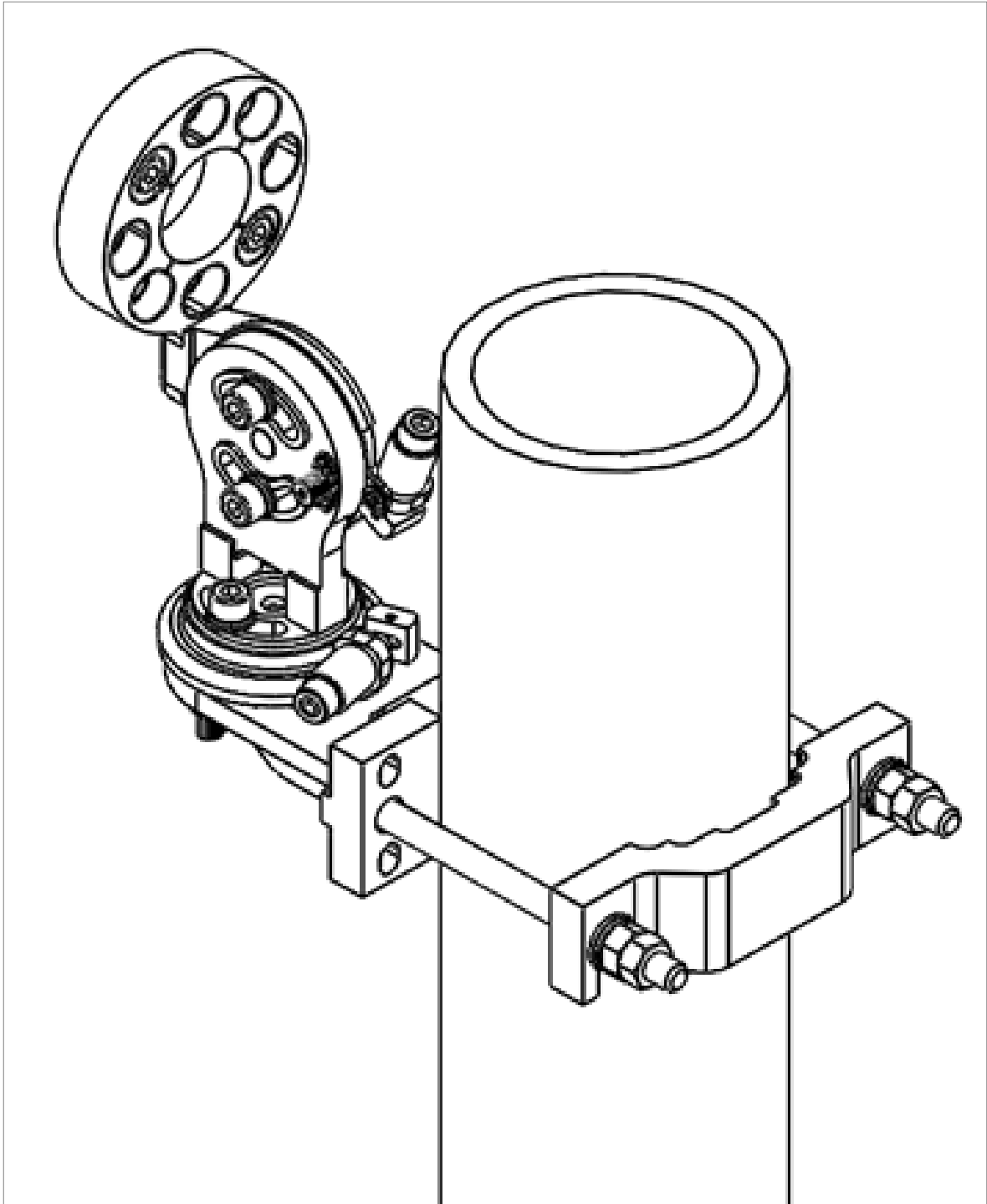
- Socket key wrench inch set
- Socket key wrench metric set
- Open metric wrench set

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	PTP 850E Flat Antenna Mounting Kit	1	
2	PTP 850EX 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

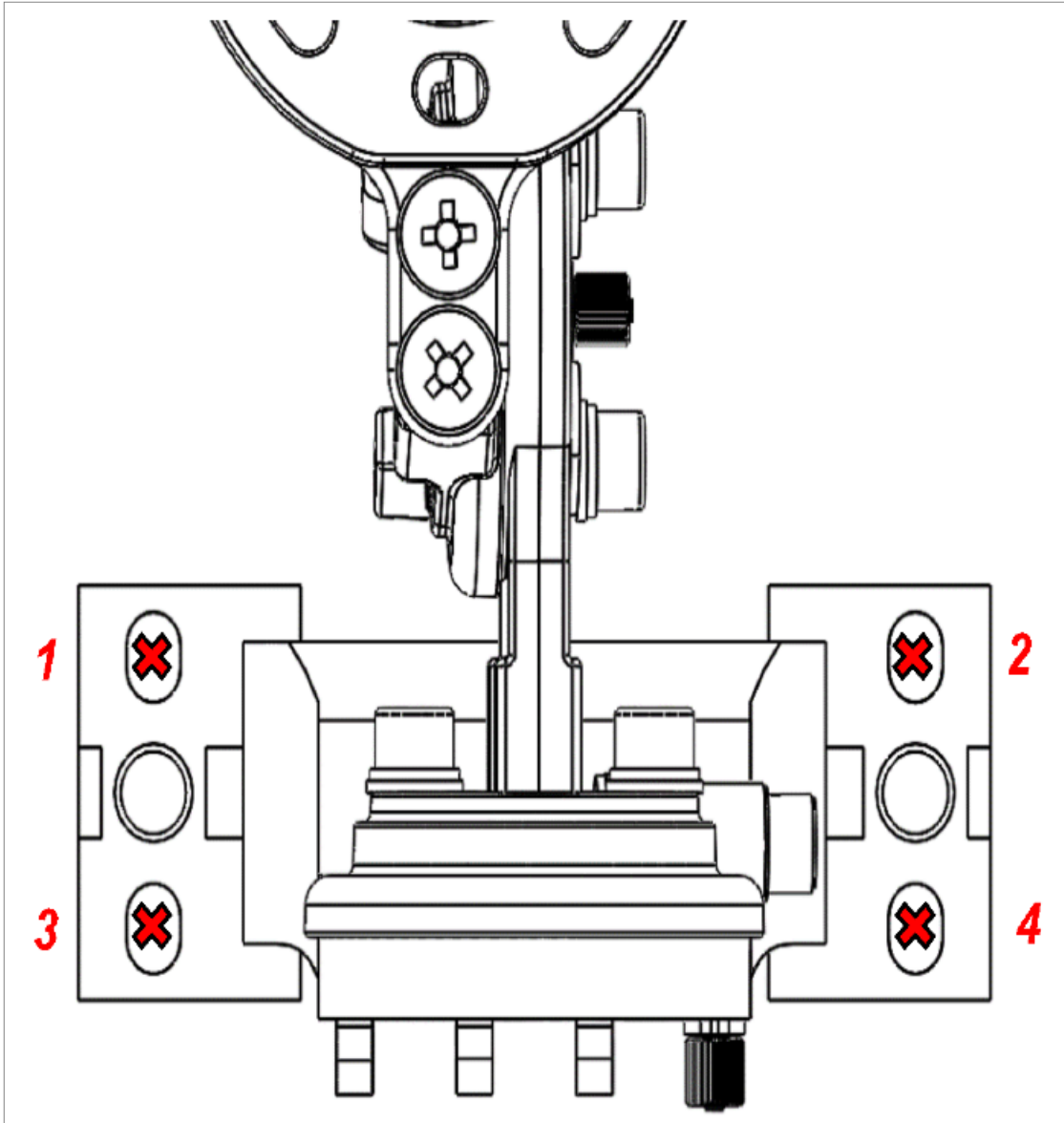


Note:

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.

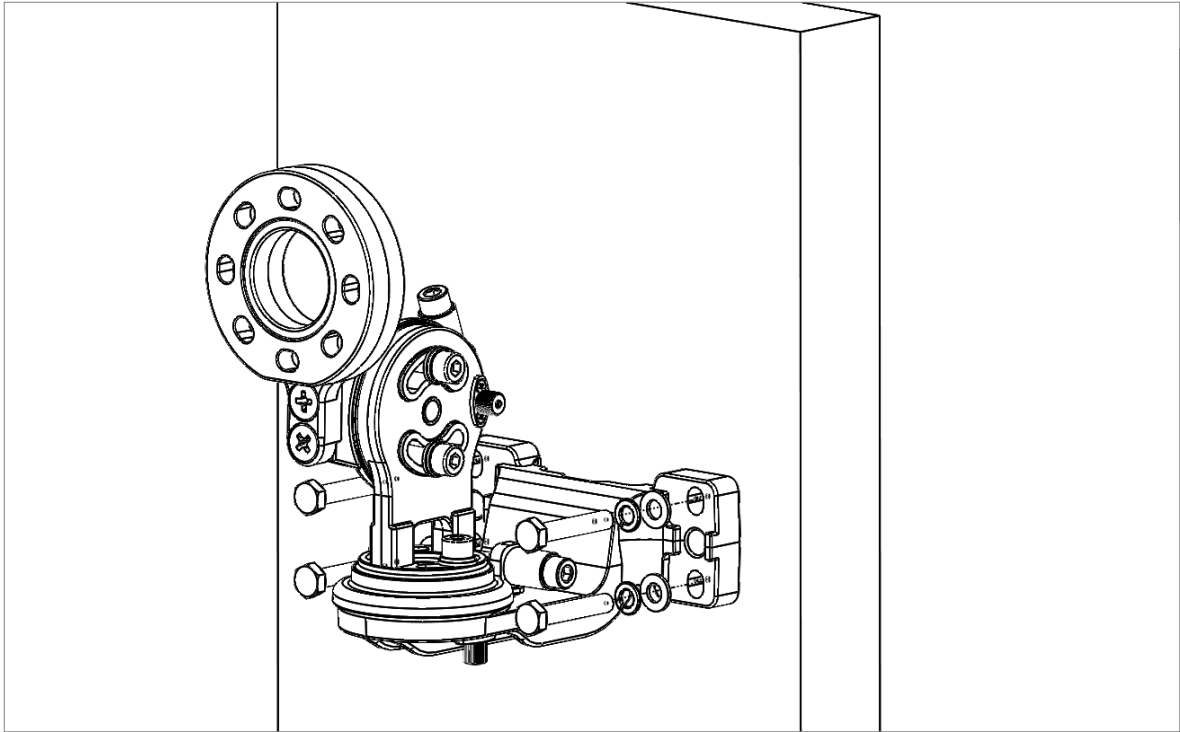
Procedure

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 PTP 850EX to the Installation and Alignment Device

1. Connect the PTP 850EX unit to the installation and alignment device, using the two M8 screws and washers supplied with the installation and alignment kit. Attach the PTP 850EX according to the desired polarization, as shown in the figures below.
 - 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 to the right of and slightly lower than the bottom screw.
 - 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 the bottom.

Figure 17: Horizontal Polarization – Radio and Installation and Alignment Kit

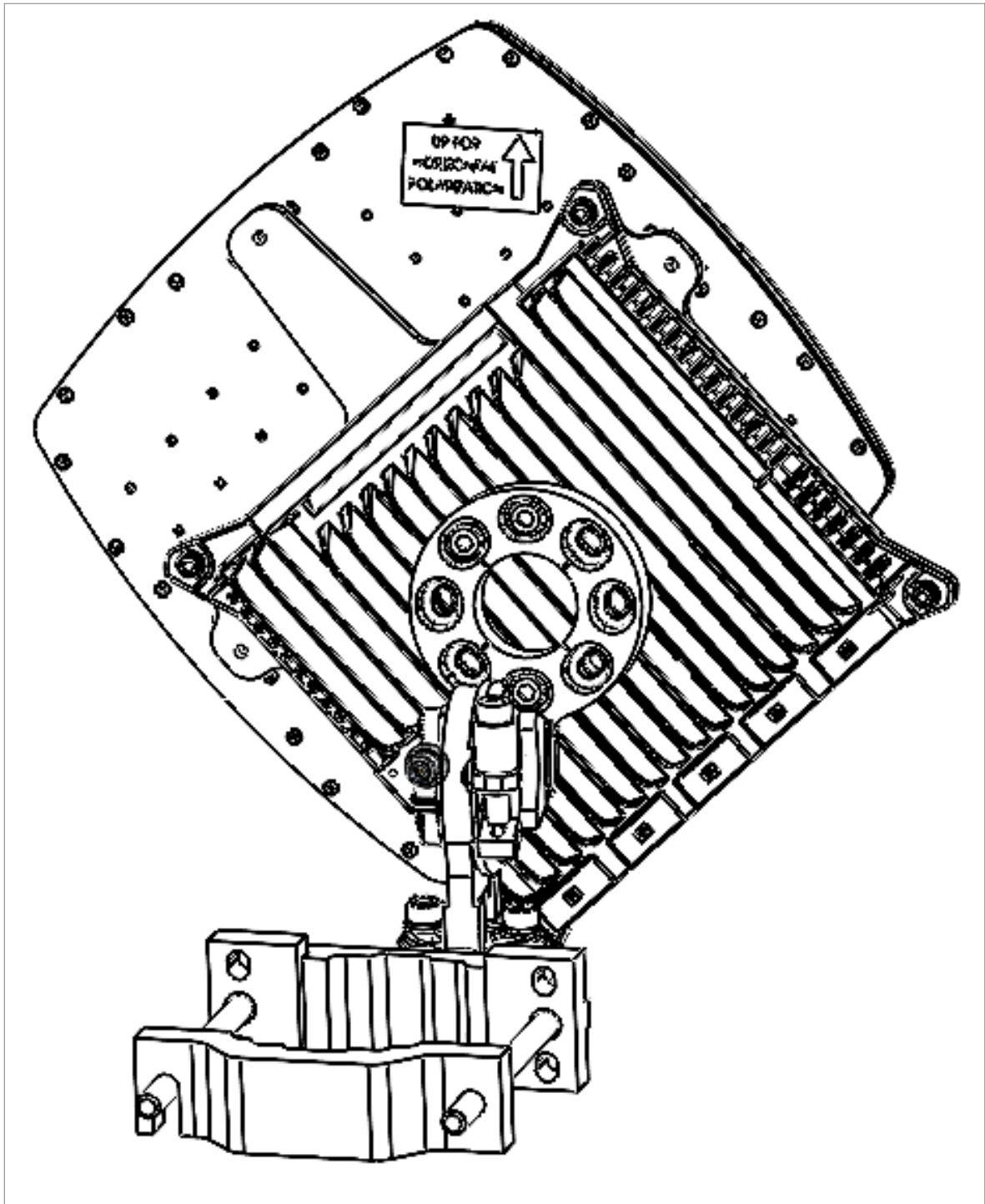


Figure 18: Horizontal Polarization – Screws Location

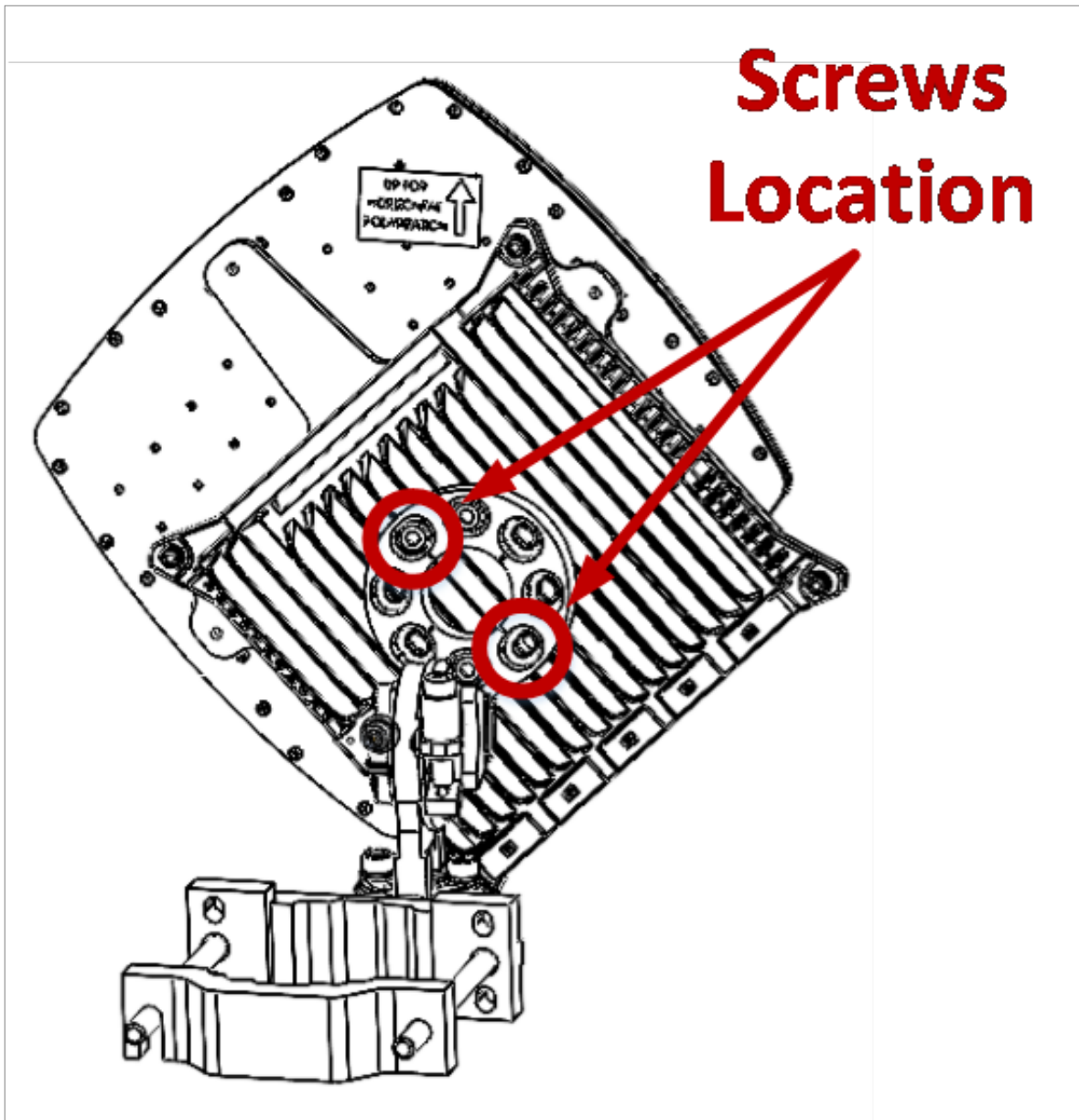


Figure 19: Vertical Polarization – Radio and Installation and Alignment Kit

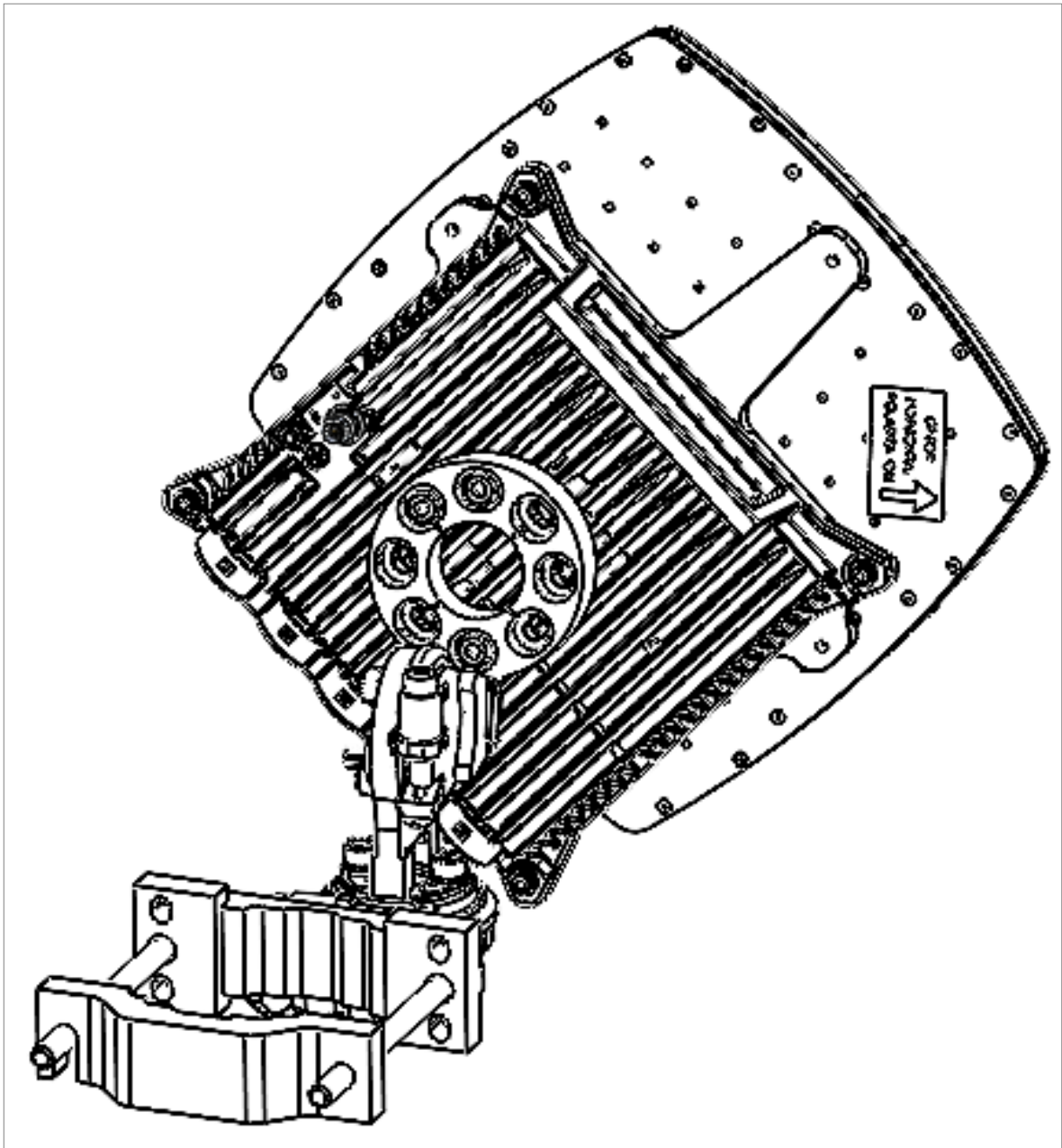
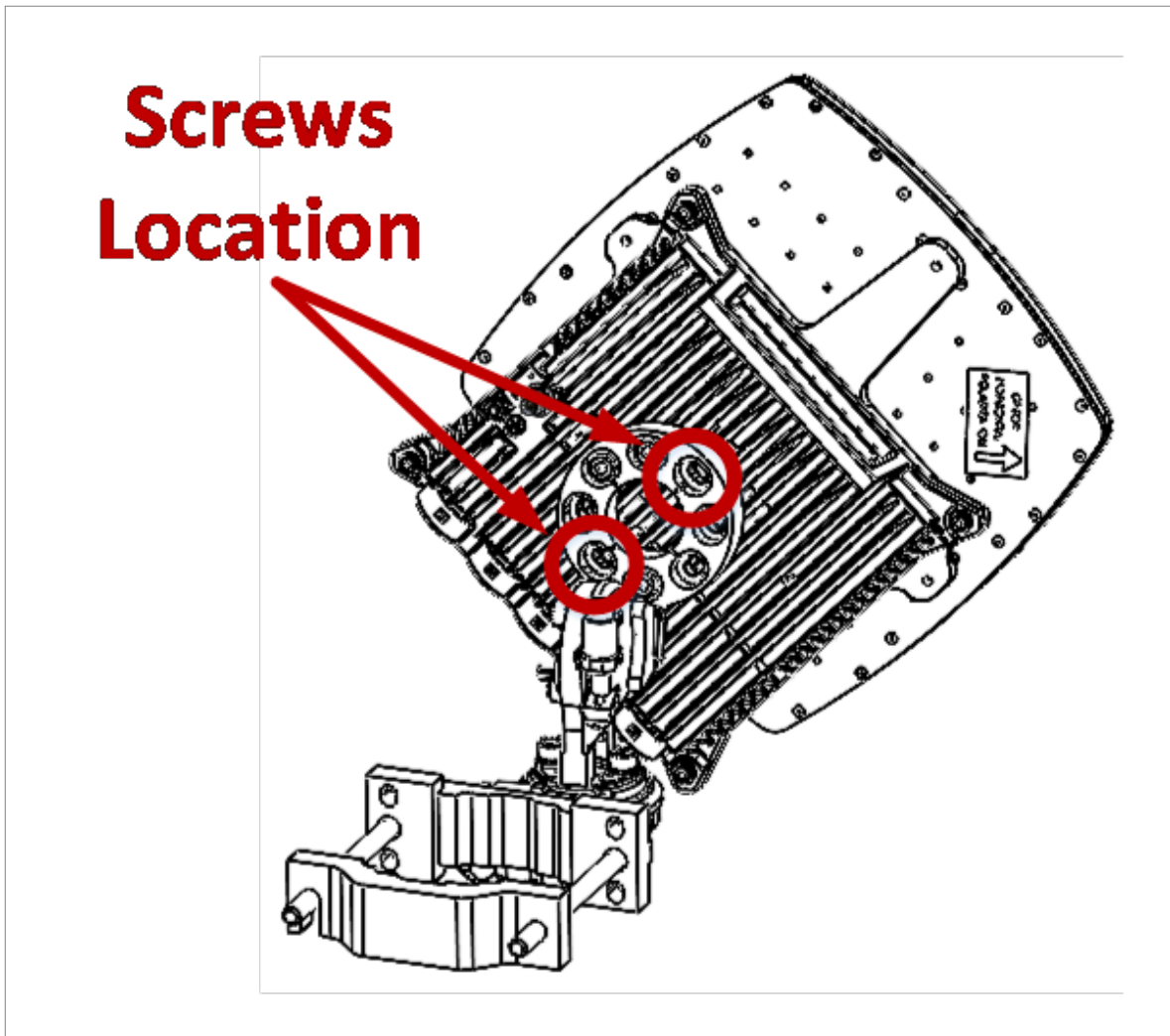


Figure 20: Vertical Polarization – Screws Location



Performing Antenna Alignment Using the Enhanced Alignment Kit

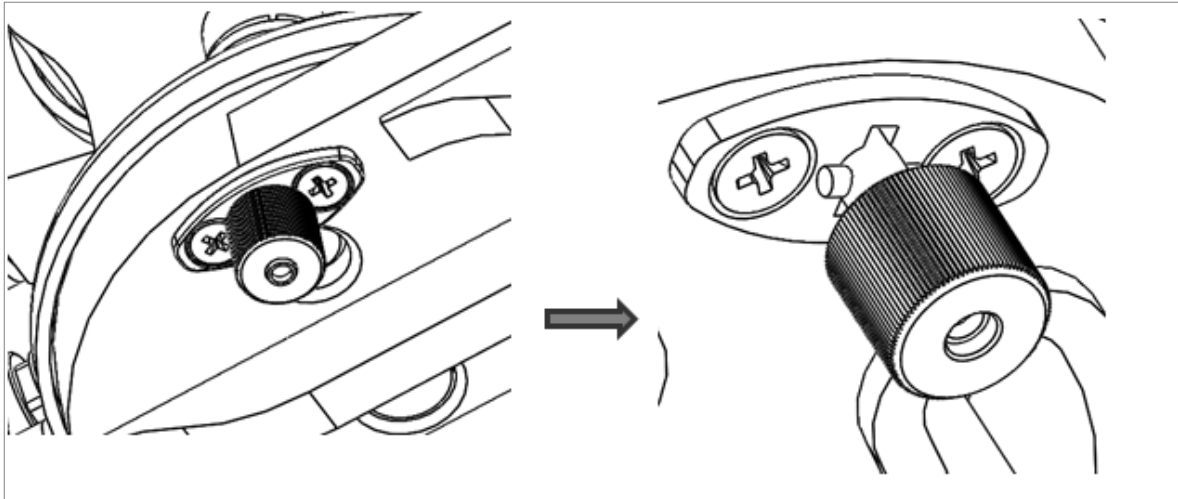
You can easily adjust the azimuth and elevation of the antenna using a number of screws and nuts located on the installation and alignment device ([Installation and Alignment Device – Azimuth and Elevation Adjustment Tool](#)).

Adjusting the Antenna Azimuth

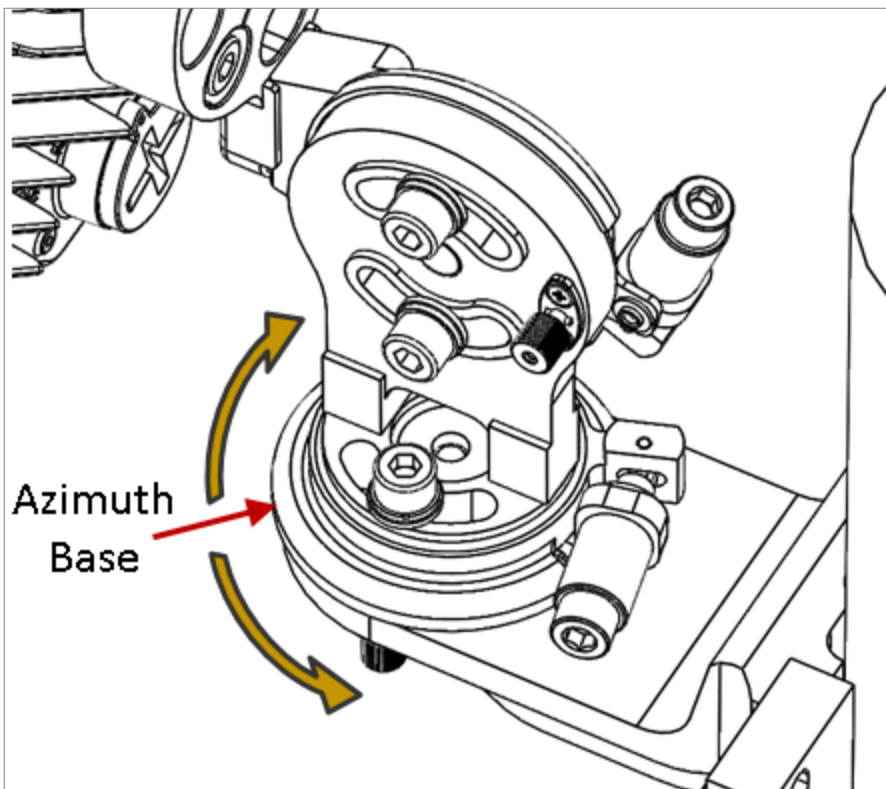
Performing Gross Azimuth Adjustment

To adjust the antenna azimuth:

1. Loosen the Azimuth Fixing Pin ([Installation and Alignment Device – Azimuth and Elevation Adjustment Tool](#)) by pulling it gently out of its groove and rotating it 90° counter-clockwise.

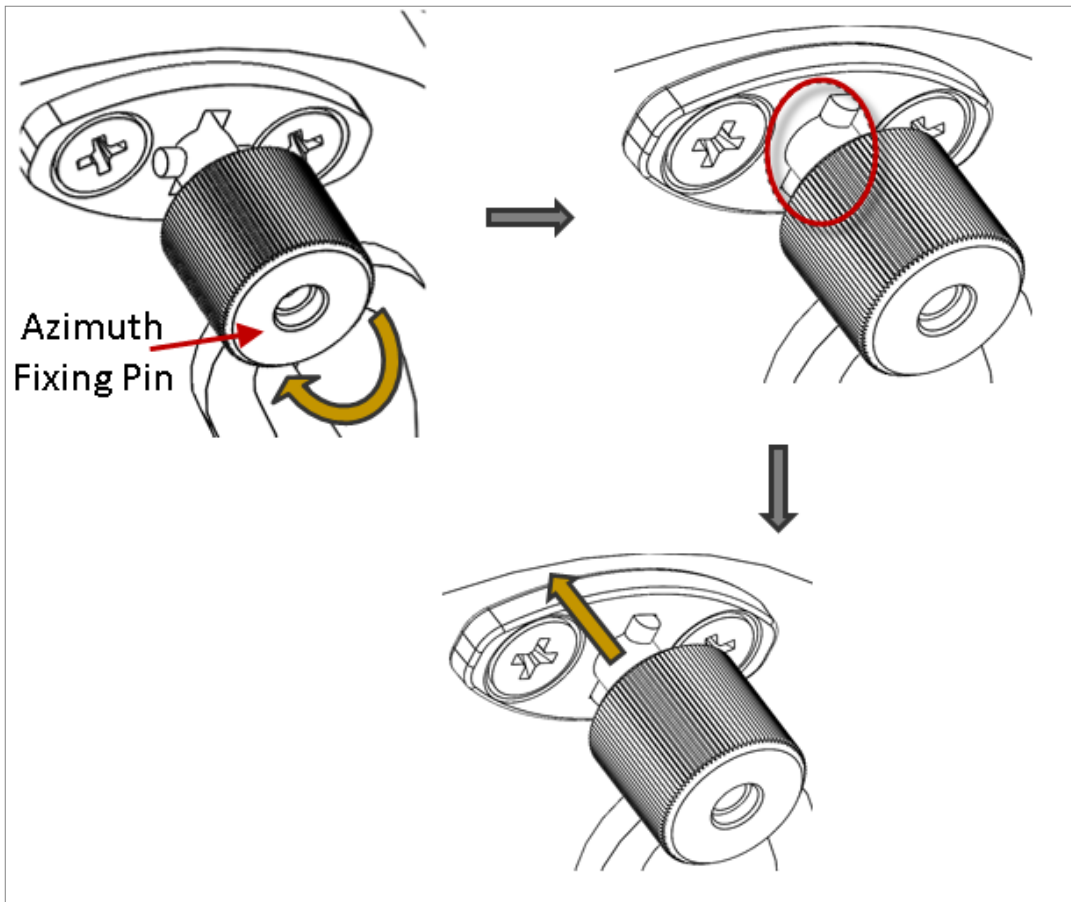


2. Manually adjust the azimuth base to its required location.



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.

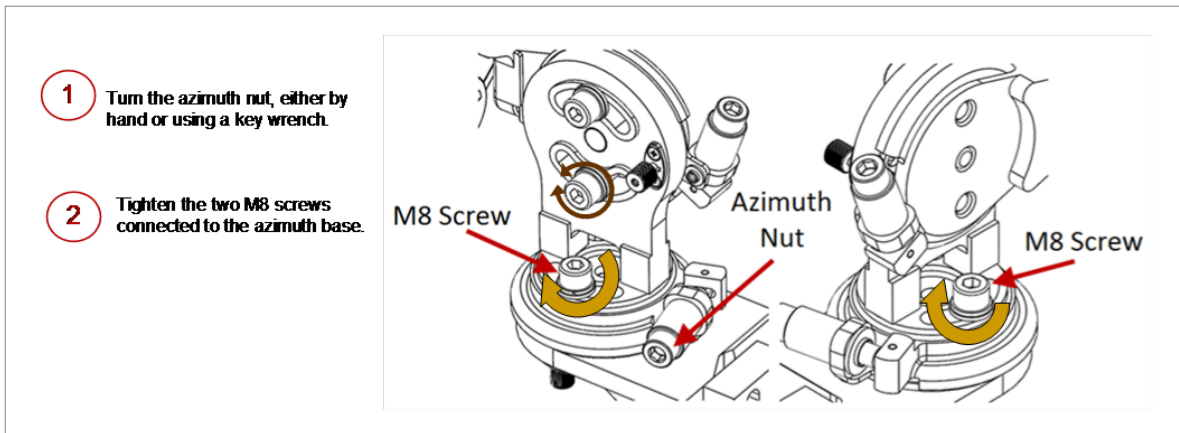


Performing Fine Azimuth Adjustment

To perform fine azimuth alignment:

1. Turn the Azimuth Nut ([Installation and Alignment Device – Fine Alignment](#)), 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.

Figure 21: *Installation and Alignment Device – Fine Alignment*

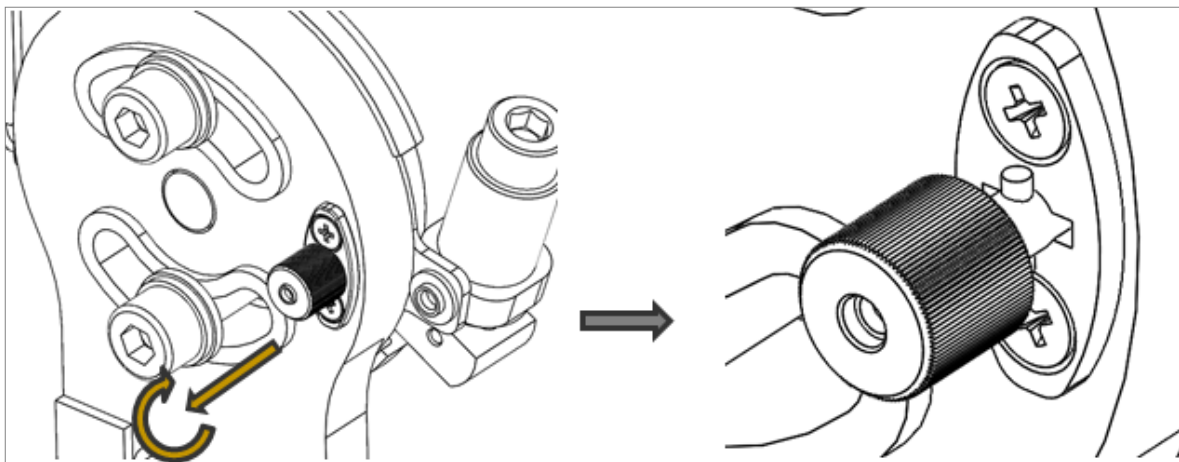


Adjusting the Antenna Elevation

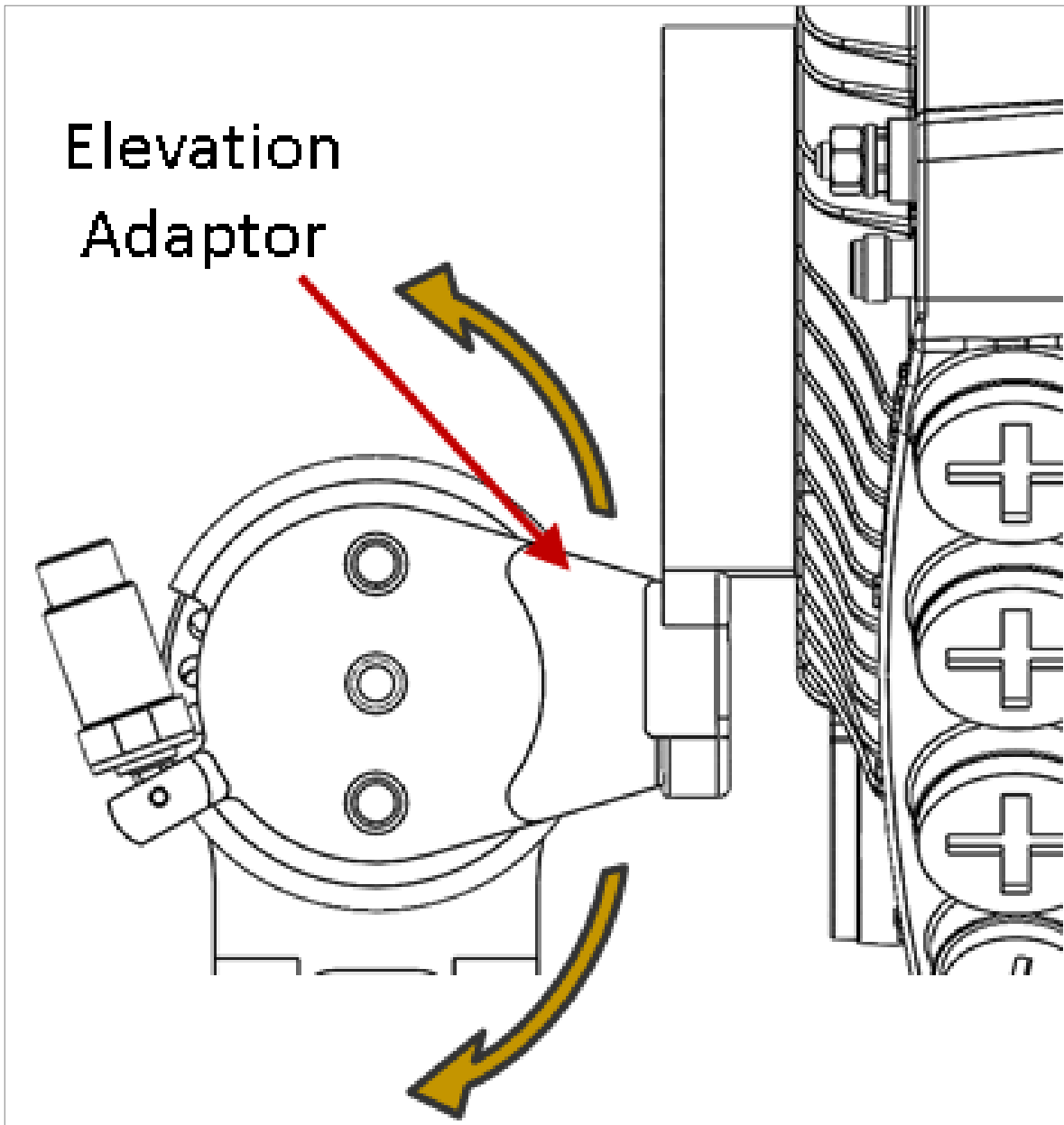
Performing Gross Elevation Adjustment

To perform gross adjustment of the antenna elevation:

1. Loosen the Elevation Fixing Pin ([Installation and Alignment Device – Azimuth and Elevation Adjustment Tool](#)) by pulling it gently out of its groove and rotating it 90° counter-clockwise.

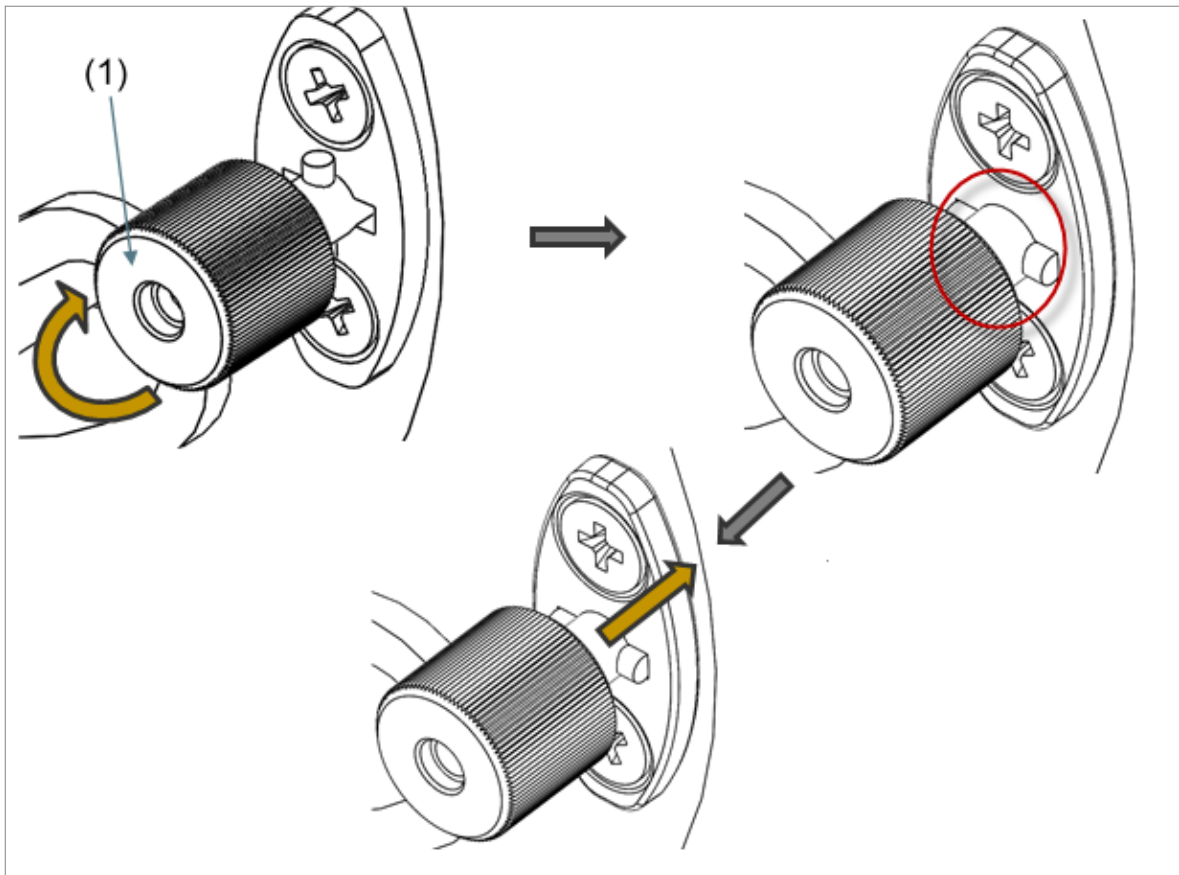


2. Move the Elevation Adaptor to the required location.



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.

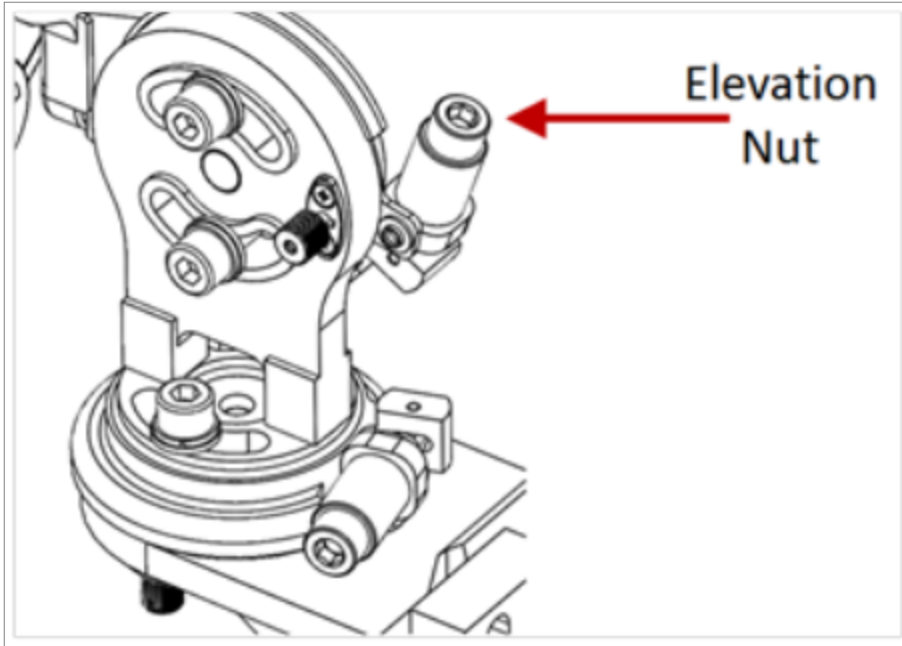
You will hear a click when the pin slips into the groove.



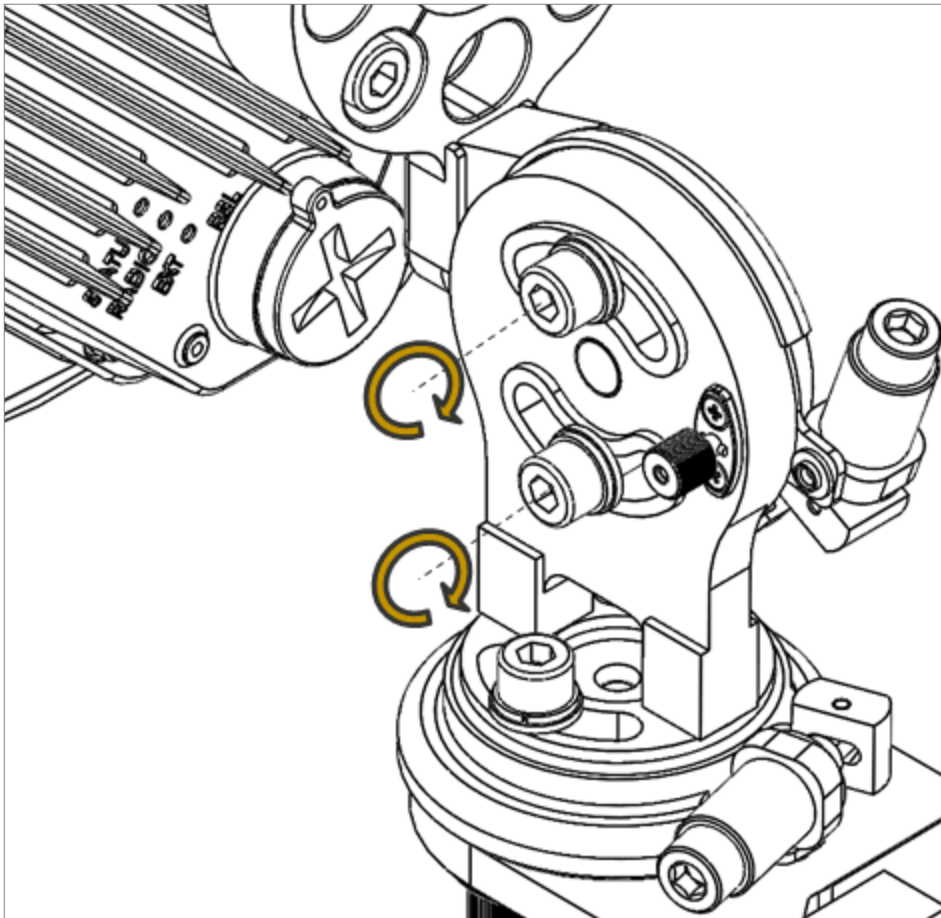
Performing Fine Elevation Adjustment

To perform fine elevation alignment:

1. Turn the Elevation Nut, 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.



2+0 (XPIC) with 43 dBi Flat Antenna and Alignment Device

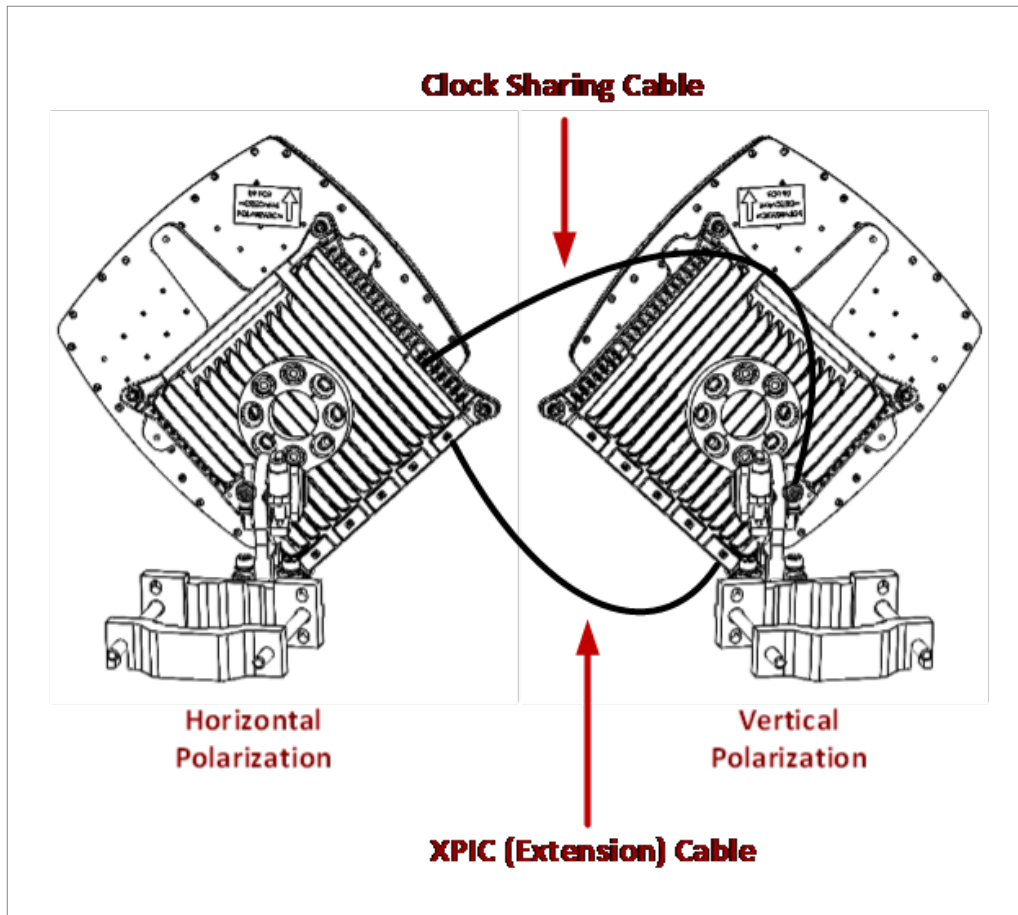
List of Items

Item	Description	Quantity	Remarks
1	PTP 850EX Flat Antenna Mounting Kit	2	
2	PTP 850EX radio with 43 dBi Flat Antenna	2	
3	XPIC Cable	1	See Extension Cables for Unit Redundancy and XPIC
4	Clock Sharing Cable	1	See Clock Sharing Cable for XPIC

Procedure

To install a 2+0 XPIC configuration with flat antennas and alignment devices:

1. Install two pole mount or wall mount assemblies. Make sure the assemblies are placed closely enough to enable connection of the XPIC Extension cable (0.7m) between the Protection/XPIC ports (P6) of the two PTP 850EX units. See Section [Pole Mount Assembly and Installation](#) or Section [Wall Mount Assembly and Installation](#).
2. Install an PTP 850EX unit to each of the installation and alignment devices installed in [Step 1](#). Make sure to install one unit with horizontal polarization and the other unit with vertical polarization. See Section [Attaching the PTP 850EX to the Installation and Alignment Device](#).
3. Connect the XPIC cable between the Protection/XPIC ports (P5) of the two units. See [Extension Cables for Unit Redundancy and XPIC](#).
4. Connect the clock sharing cable between the TNC RSL/Source Sharing connectors of the two units of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m). See



Caution:

Extra care should be taken when aligning the polarization of each antenna. The polarization of each antenna must be adjusted independently. The XPD between the antennas must be adjusted on both sides of the link simultaneously.

PoE Injector Installation and Connection

These instructions apply to the standard PoE Injector units with the following marketing model:

- PoE_Inj_AO_2DC_24V_48V

PoE Injector Cable Connection

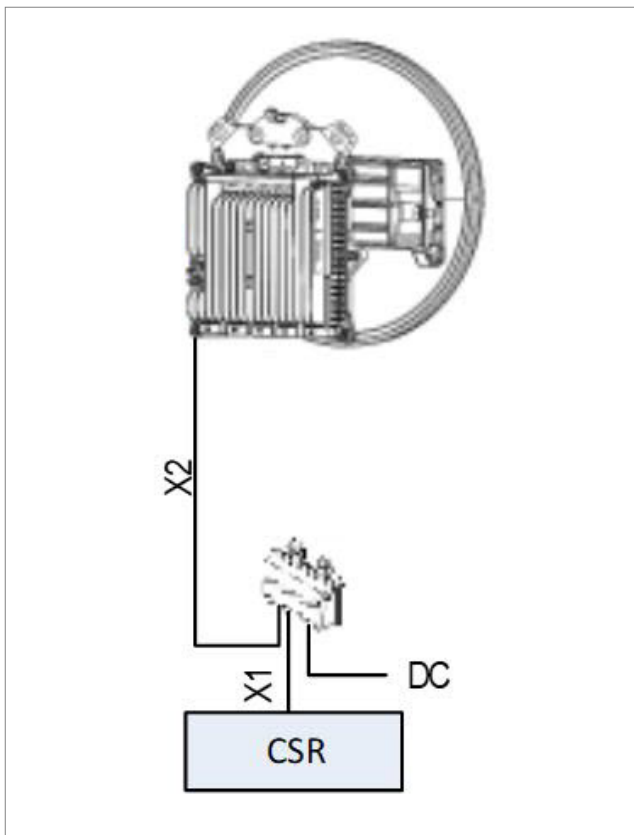
The PoE Injector cables are connected similar to the PTP 850EX-P cables.

- To connect an Ethernet (CAT5e) cable to the PoE port, refer to [Connection of Ethernet Cable to PTP 850EX](#).
- To connect a DC power cable to the power port, refer to [Connecting a DC Power Cable](#). This cable is not supplied with the PoE Injector.
- The total length of the cable between the PTP 850EX port and the Switch/Router the device is connected to should not exceed 100m/328ft. This length includes the connection between the PTP 850EX-P and the PoE Injector ($X1 + X2 \leq 100\text{m}/328\text{ft}$ in the figure below).



Note:

The length of the cable connecting the customer equipment to the PoE injector should not be longer than 10m (according to ANSI/TIA-568 standard).



**Note:**

For the warranty to be honored, the connection must be through the glands only. Do not open the PoE injector box cover.

PoE Injector Grounding

To ground the PoE Injector:

1. On the right side of each PoE Injector, loosen the screw, plain washer, and serrated washer.
2. Place the cable lug (supplied with the PoE injector kit) between the plain and serrated washer.
3. Tighten the screw.
4. Perform a resistance test between the 2 lugs of the GND cable. Verify that the result is 0-2 ohms.

PoE Injector Wall Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	PoE Injector	1	
1	Glands Kit	1	For outdoor installations.

**Note:**

Glands are required for outdoor installations. The glands kit (three or five glands) is not supplied with the PoE Injector, and must be ordered separately.

Glands Kit

Marketing Model	Marketing Description
PTP 820_3xGlands_kit	PTP 820_3xGlands_kit
PTP 820_Glands_kit	PTP 820_Glands_x5_kit

Required Tools

- Metric offset wrench key wrench set
- Hammer
- Drilling Machine

Procedure

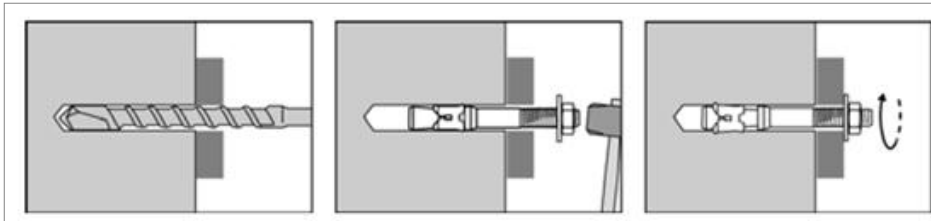
1. Mount and tighten the PoE Injector to a wall using two M6 bolts and anchors. The M6 bolts and anchors must be purchased separately.

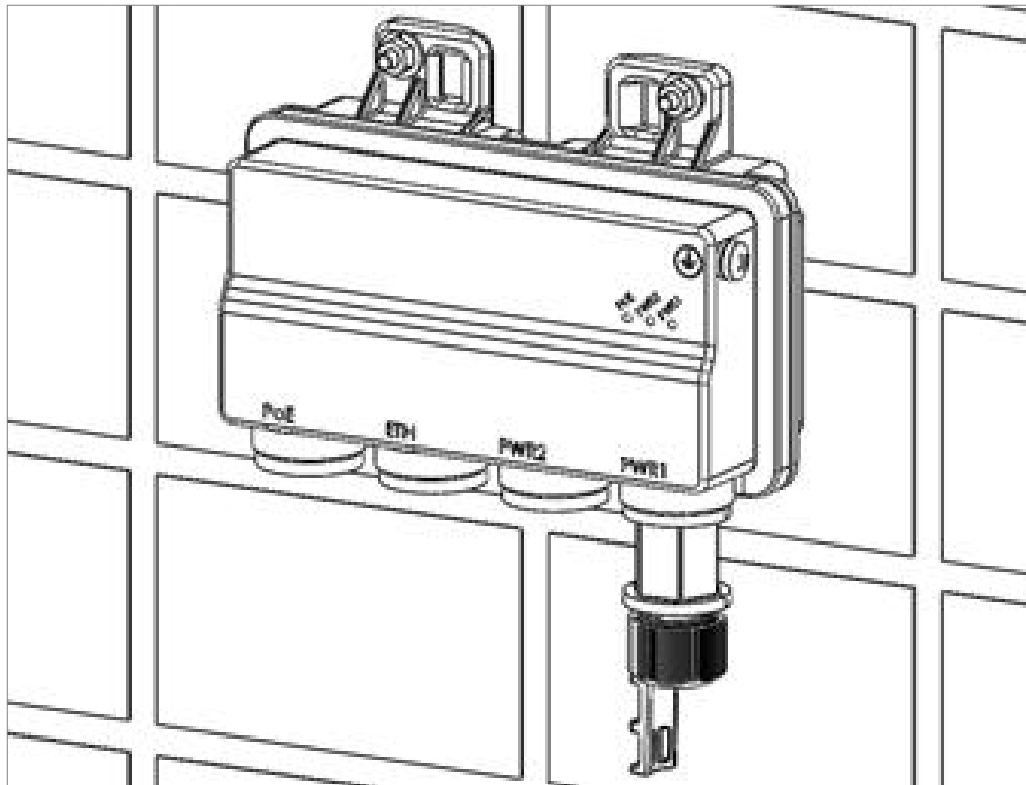


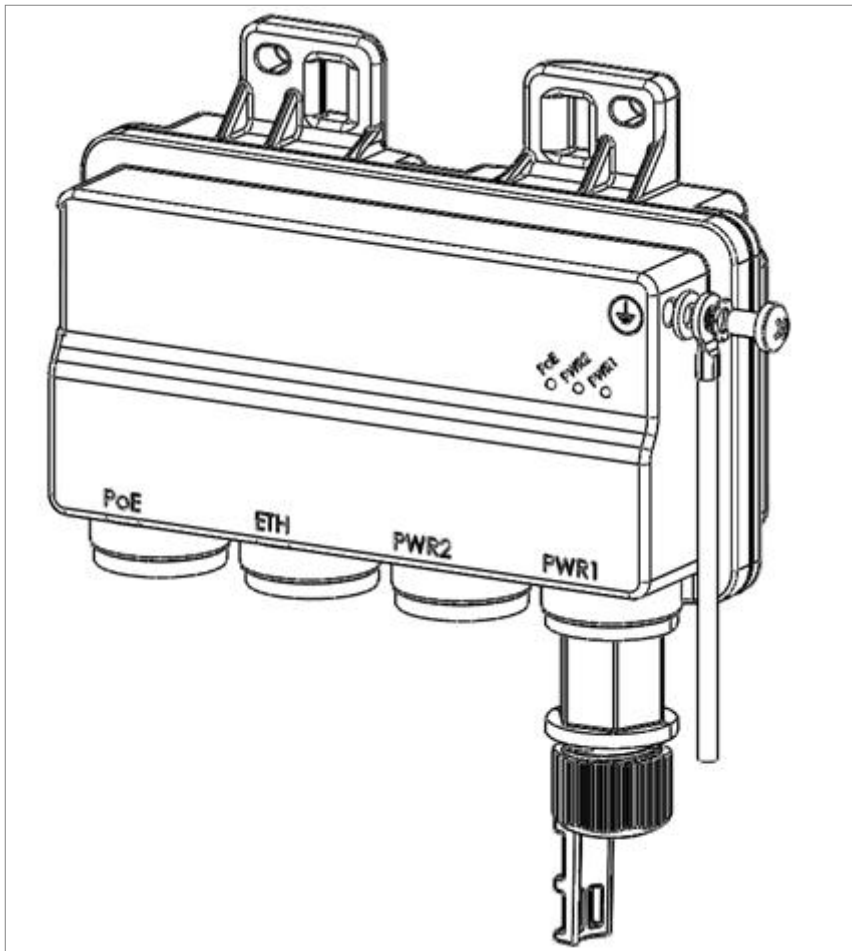
Note:

Use Anchor Stainless Steel with flanged Hexagonal nut M6X70.

2. Drill two 6 mm diameter holes with 100 mm distance between the center of the holes.
3. Insert the anchors with the bolts.
4. Place the washers on the bolt.
5. Tighten the nuts.







PoE Injector Pole Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	PoE Injector	1	

Required Tools

- Slot Screwdriver

Procedure

To mount the PoE Injector on a pole:

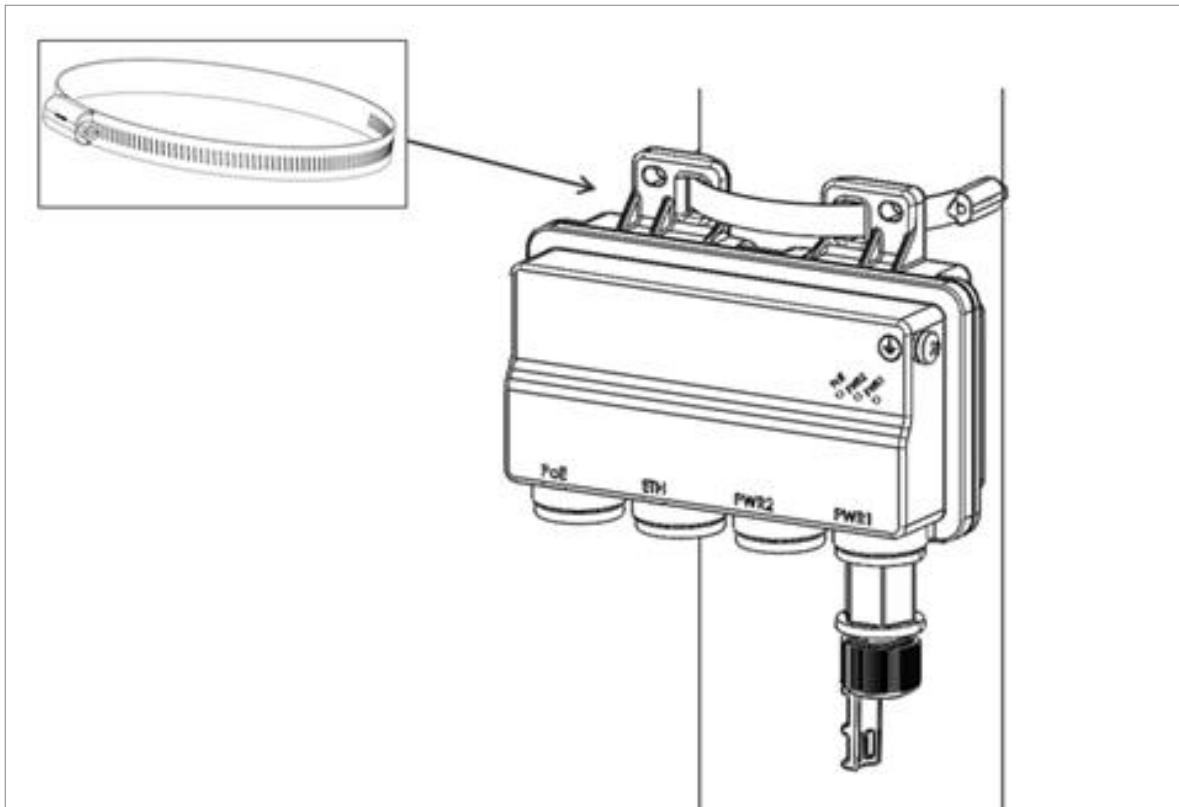
1. Mount and tighten the PoE Injector to a pole with a diameter of 114 mm using a stainless steel hose clamp.
2. Pass the hose clamp through the pole mount slots.



Note:

The Hose Clamp is not supplied with PoE injector kit.

3. Attach the PoE injector to the pole.
4. Connect the ends of the hose clamp.
5. Tighten the hose clamp using the captive screw.



PoE Injector 19 Rack Installation

List of Items

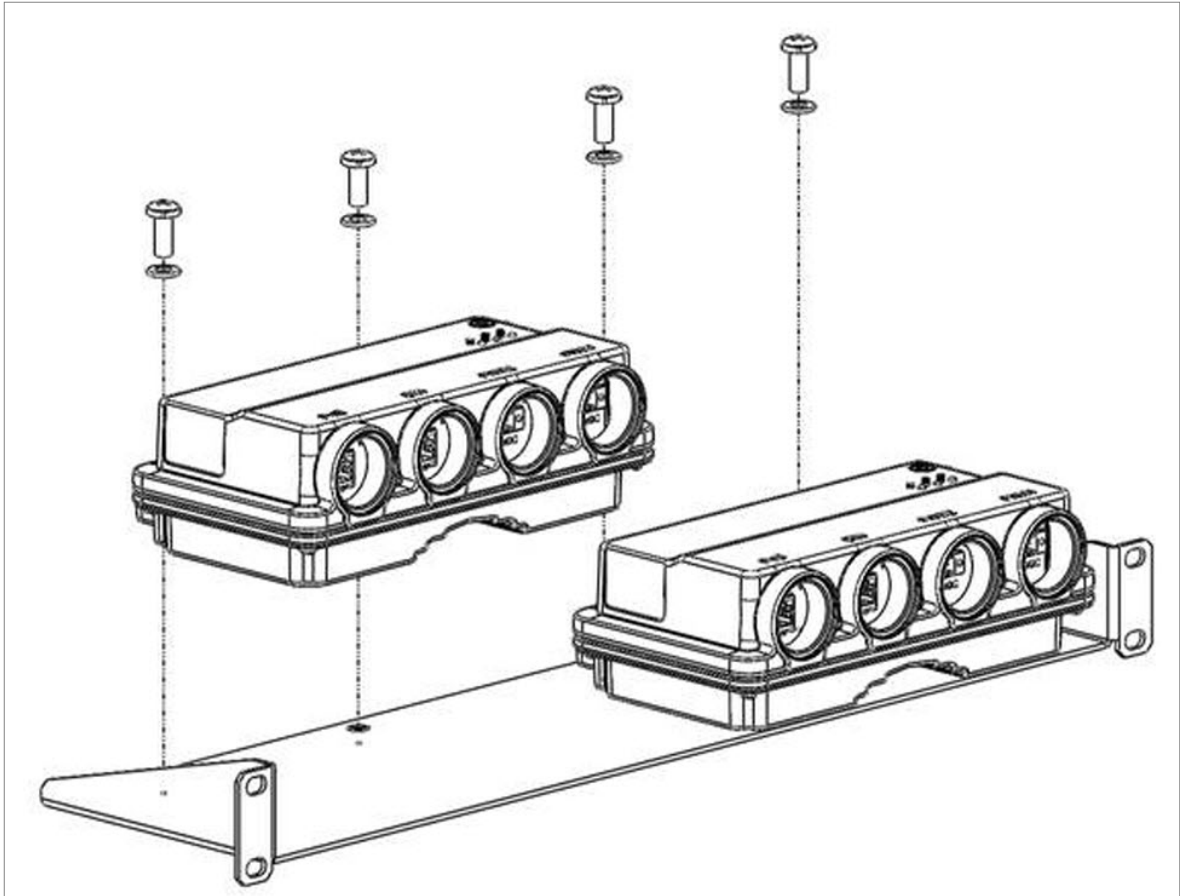
Item	Description	Quantity
1	PoE Injector	1
2	PoE Injector 19" Rack Mount Kit	1

Required Tools

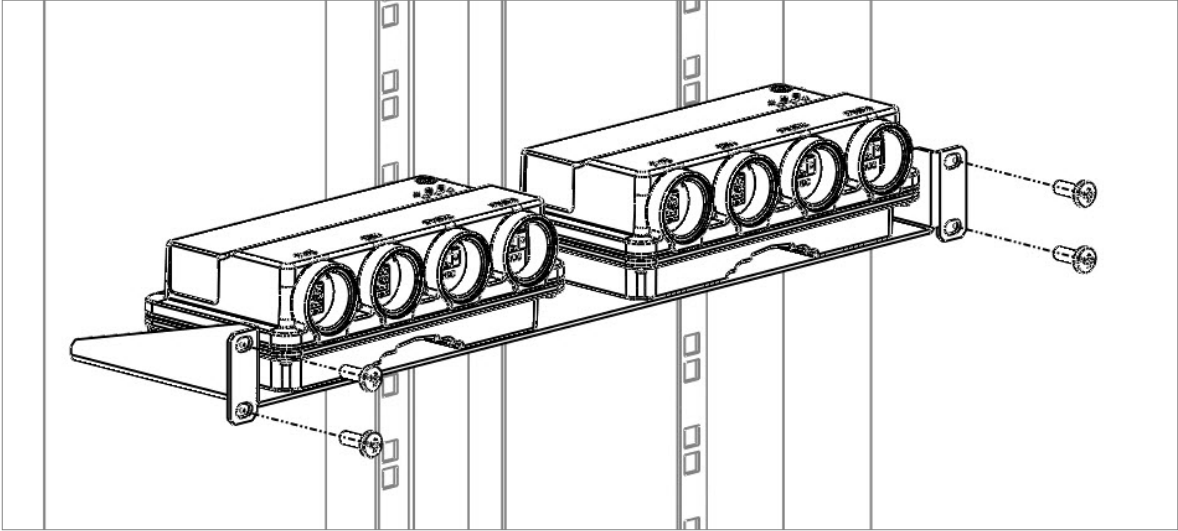
- Philips Screwdriver

To mount the PoE Injector on a rack:

1. Mount the PoE Injector to a 19" rack using a 19" rack adaptor.
2. Mount the PoE Injector on the 19" adaptor through the wall mounting holes, using M6 screws and washers.



3. Mount the 19" rack adaptor to a 19" rack using four M6 screws and cage nuts.



PoE Injector ETSI Rack Installation

List of Items

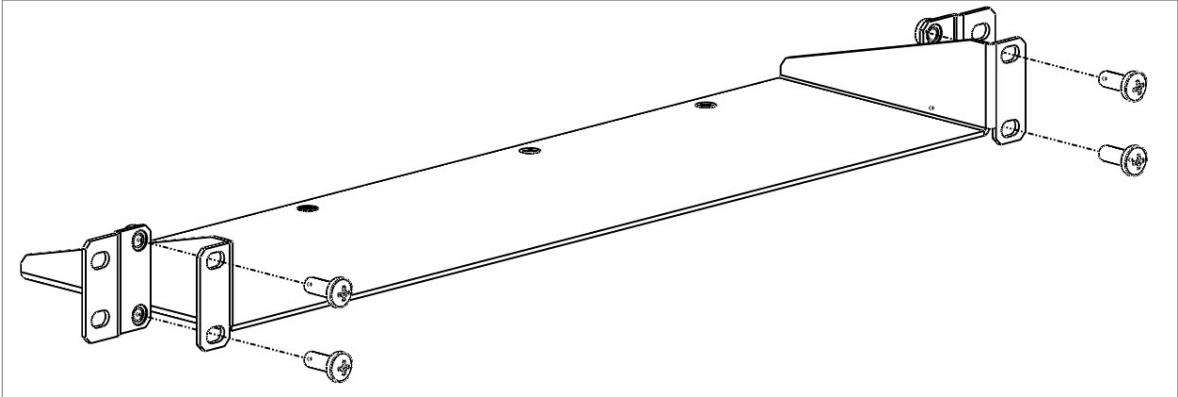
Item	Description	Quantity
1	PoE Injector	1
2	PoE Injector ETSI Rack Mount Kit	1

Required Tools

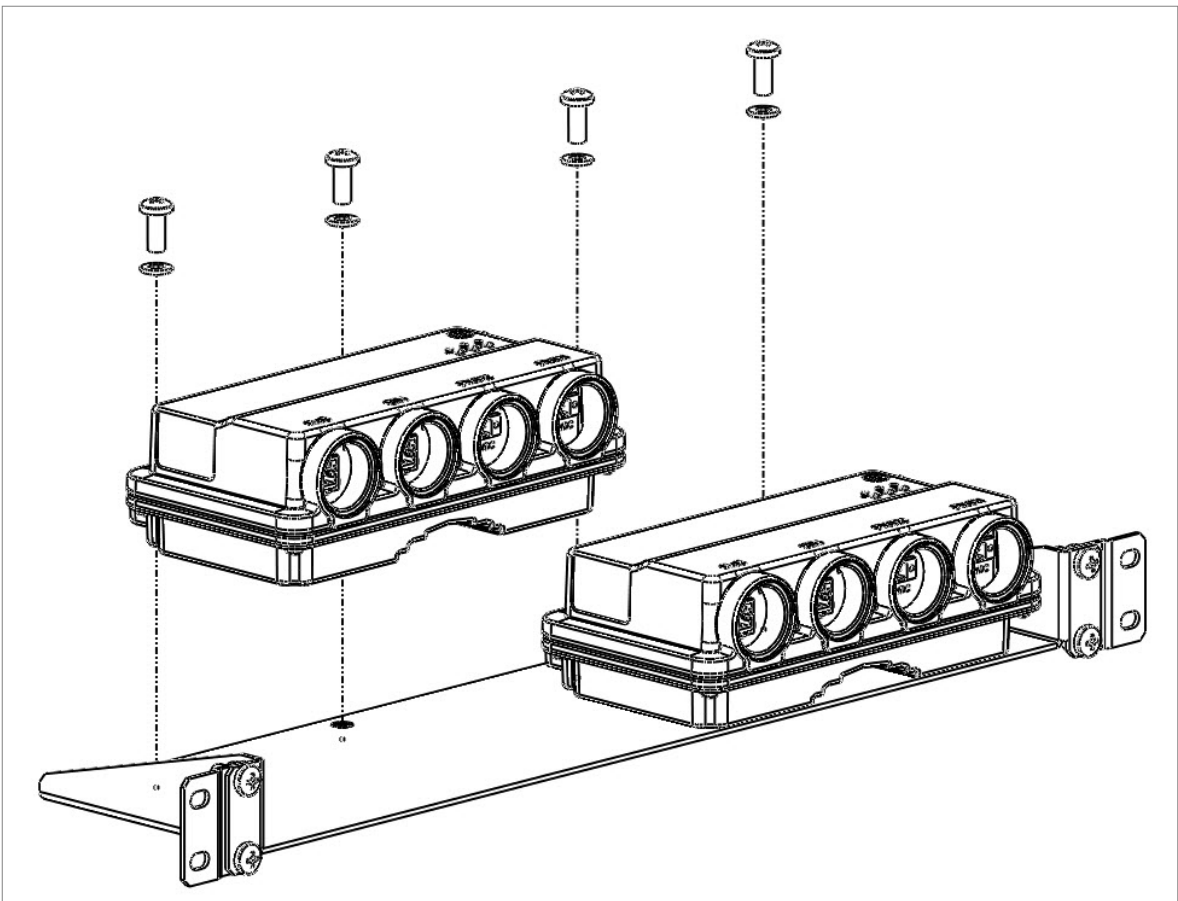
- Philips Screwdriver

To mount the PoE Injector to an ETSI rack:

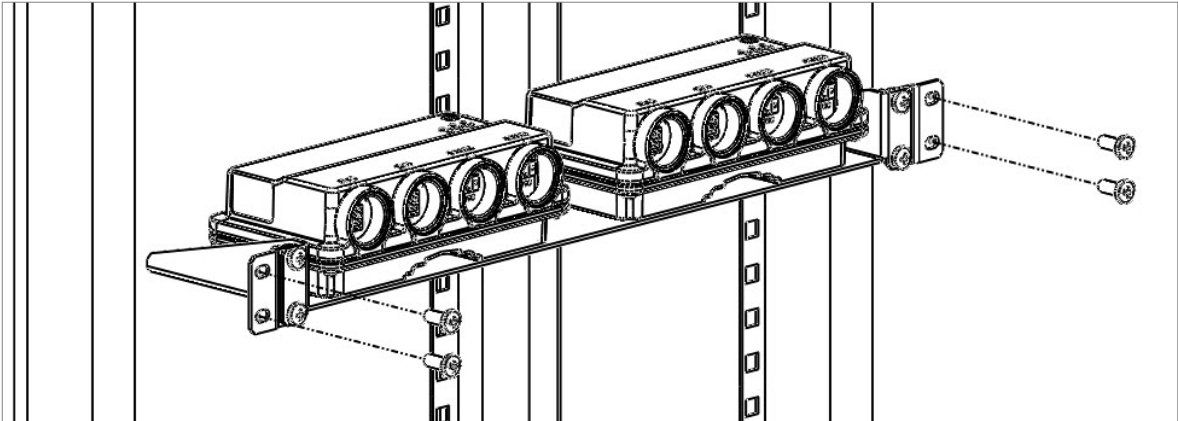
1. Mount the PoE Injector to an ETSI rack using a 19" rack adaptor and ETSI adapting ears.
2. Connect the ETSI adapting ears to a 19" rack adaptor using four M6 screws.



3. Mount the PoE Injector on the adaptor through the wall mounting holes using M6 screws and washers.



4. Mount the 19" rack adaptor with the ETSI ears on the ETSI rack using four M6 screws and cage nuts.



Note:

For this type of installation, a 2RU space is required.

Appendix A: Acceptance & Commissioning Procedures

This chapter provides Cambium Networks recommended Acceptance and Commissioning Procedure for PTP 850EX. Acceptance and commissioning should be performed after the initial setup is complete.

The purpose of this procedure is to verify correct installation and operation of the installed link and the interoperability with customer end equipment.

Cambium Acceptance and Commissioning procedure includes the following stages:

- Site Acceptance Procedure
- Commissioning of Radio Link

The Site Acceptance Procedure is a checklist that summarizes the installation requirements of the site at which the products were installed.

The commissioning tests cover the required configuration information that should be recorded, and the tests that should be performed on the radio link.

Site Acceptance Procedure

The purpose of the following procedures is to verify that all installation requirements were noted and checked. Following this procedure will ensure proper, long-lasting, and safe operation of the product.

The checklist below summarizes the installation requirements of the site.

Site Acceptance Checklist	
1 Site Information	
Customer:	
Radio model:	
Site name:	
Site code:	
Radio link code:	
Site address:	
2 Antenna Mounting	
Antenna mount type:	
Mount is of sufficient height to clear local obstructions	OK
Mount is safely positioned to not cause a safety hazard	OK

Site Acceptance Checklist	
Mount is secure and perpendicular	OK
Mount is grounded as per site specifications	OK
All steelwork is Galvanized or Stainless Steel as appropriate	OK
3 Antenna	
Antenna type (model and size):	
Antenna is securely fixed to mount	OK
Antenna is grounded as per site specifications	OK
Antenna sway braces are installed correctly (where applicable)	OK
Antenna Radome is securely fitted (where applicable)	OK
Water drain plugs are fitted and removed, as appropriate	OK
Antenna sealing O-Ring is properly fitted and not damaged	OK
Antenna/Launch unit polarization is as per link requirements	OK
4 Outdoor Unit	
Type of ODU mount:	(Direct or Remote mount)
ODU is securely mounted to the antenna or pole	OK
ODU is grounded as per installation instructions	OK
ODU's polarization is as per link requirements	OK
ODU is installed properly and has no physical damage	OK
5 For Remote-Mount Only:	
Remote mount kit is securely mounted to the pole	OK
Flexible waveguide has no physical damage and connectors are sealed	OK
All flexible waveguide bolts are secured using washers and lock-washers, as appropriate	OK
Flexible waveguide is secured to the pole	OK
6 CAT5/Fiber Optic Cable	
Overall cable length:	
Cable type:	OK
CAT5 connectors assembled properly on the cable	OK

Site Acceptance Checklist	
Cable connected securely to ODU and IDU	OK
Cable connector is covered by gland and secure by cable tie at the ODU	OK
At the ODU, cable has a service/drip loop to prevent moisture from entering the connector	OK
Cable is secured using suitable restraints to fixed points at regular intervals (0.5 m recommended)	OK
Cable has no sharp bends, kinks, or crushed areas. All bends are per manufacturer specifications	OK
Grounding is as per site specifications	OK
Cable point-of-entry to building/shelter is weather-proof	OK
Cable ends are properly labeled	OK
7 DC Power Supply – Two Inputs	
Measured DC voltage input to the IDU:	(-40.5 to -60 VDC)
Power-Supply maximum current:	
Power-Supply is properly grounded	OK
DC power backup type:	
IDU DC connector is secure, and the DC input leads are correctly terminated (no bare wires are visible)	OK
IDU DC connector (+) and (GND) leads are shorted and GND is grounded	OK
8 Rack Installation	
Rack is mounted to the shelter floor with four screws	OK
Rack is mounted to the shelter wall with two screws	OK
9 Remarks/Notes	
10 General Information	
Site accepted by:	
Name:	
Title:	
Company:	
Signature:	

Site Acceptance Checklist	
Date:	
Site approved by:	
Name:	
Title:	
Company:	
Signature:	
Date:	

Site Acceptance Checklist Notes

The following notes provide important additional information about the Site Acceptance Checklist.

1. Antenna Mounting

- Mounting pole is of sufficient height to clear local obstructions, such as parapets, window cleaning gantries, and lift housings.
- Mounting Pole is of sufficient height, and is safely positioned, so as not to cause a safety hazard. No person should be able to walk in front of or look directly into the path of the microwave radio beam. Where possible, the pole should be away from the edge of the building.
- Mounting pole is secure and perpendicular. A pole that is not perpendicular may cause problems during antenna alignment.
- Mounting pole is grounded as per site specifications. All operators and site owners have specific requirements regarding the grounding of installations. As a minimum, typical requirements are such that any metal structure must be connected to the existing lightning protection ground of the building. Where it extends beyond the 45 degree cone of protection of existing lightning conductors, additional lightning protectors should be installed.
- All steelwork is Galvanized or Stainless Steel, as appropriate to prevent corrosion.

2. Antenna

- Antenna is grounded as per site specifications. See the third point in the Antenna Mounting section above.
- Antenna sway braces are fitted and installed correctly, where applicable. Typically, for an antenna of 1.2 m or larger, an extra sway brace is fitted to the mounting frame of the antenna. This sway brace should not be mounted to the same pole as the antenna but should be installed directly back to the tower or an alternative point.
- Antenna Water Drain Plugs are fitted and removed, where appropriate. Some antennas have moisture drain plugs installed at various points around the antenna. The purpose of these plugs is to allow any moisture that forms on the inside of the antenna or radome to drip out and prevent a pool within the

antenna. Only the plugs at the bottom of the antenna, after installation, should be removed. All other plugs should be left in position.

3. Outdoor Unit (ODU)

- The ODU is grounded as per installation instructions. See the third point in the Antenna Mounting section above.
- The ODU polarization is as per link requirements and matches the polarization of the antenna.
- The main traffic connections are correctly terminated and crimped as per cable and connector manufacturer instructions. All fiber optic patch leads should be routed carefully and efficiently, using conduits to prevent damage to the cables.
- All other user terminations are secure and correctly terminated.
- All labeling is complete as per site requirements. Labeling is specific to each customer. At a site with only one installation, labeling may be unnecessary. However, at sites with multiple installations, correct and adequate labeling is essential for future maintenance operations.

Typical labeling requirements include:

- Antenna labels - for link identity and bearing.
- ODU labels - for link identity, frequency, and polarization.
- Cat5/Fiber cable labels - for link identity, close to the ODU, switch, and either end of any joint.
- Switch labels - for link identity.

Radio Link Commissioning Procedure

Scope

This section describes the recommended commissioning tests for PTP 850EX radio link in a 1+0 configuration.

The purpose of the commissioning tests is to verify correct and proper operation of the product.

Commissioning Test

The following tests should be performed on each installed link.

Link Verification

- Received Signal Level (RSL) is up to +/- 4 dB from the expected (calculated) level at both ends of the link.



Note

The voltage at the RSL port is 0.XX where XX is the RSL level. For example: 0.59V means an RSL of -59 dBm. Note that the voltage measured at the RSL port is not

accurate and should be used only as an aid.

- Radio Bit Error Rate (BER) is $10E^{-11}$ or lower.
- If working with ATPC, ATPC is operating as expected (RSL = reference level).

Ethernet Line Interfaces Test

- Connect Ethernet Packet Analyzer to the GbE port. Use physical loop at remote end (or connect second analyzer). Run Packet Loss test for at least one hour (load rate as per Cambium Networks specifications for the chosen MRMC).
- Connect Ethernet Packet Analyzer to the FE port. Use physical loop at remote end (or connect second analyzer). Run Packet Loss test for at least one hour (load rate as per Cambium Networks specifications for the chosen MRMC).

Interoperability Verification

- Connect customer end equipment to the line interfaces and verify correct operation.
- Further interoperability tests should be performed in accordance with the specific requirements of the connected end equipment.

Management Verification

- Launch the HTTP management and verify that you can manage the link and that you are able to perform changes to the link configuration (frequency channel, Tx power, system name, time & date, etc.)
- Verify that correct parameters are reported when performing the above.
- Verify that there are no active alarms on the link.
- If the management station is located at a remote site (Network Operation Center), verify that the management station can manage the link and receive traps.

PTP 850EX Commissioning Log

The Commissioning Log is an integral part of the commissioning procedure and should be filled in for each installed link.

The Commissioning Log gathers all relevant information regarding the installed link and contains a checklist of all recommended commissioning tests.

Maintaining the Commissioning Log is important for tracking your installations, and to provide essential data for Cambium Networks.

Upon completing the Commissioning Log, log in to <https://support.cambiumnetworks.com/> and generate a support ticket.

PTP 850EX LINK COMMISSIONING LOG

1. GENERAL INFORMATION

PTP 850EX LINK COMMISSIONING LOG		
Customer:		
Radio model:		
Configuration:		
Radio link code:		
Site 1 name & add:		
Site 2 name & add:		
2. ODU/RFU	Site 1	Site 2
ODU model:		
ODU p/n:		
ODU s/n:		
ODU SW:		
Tx frequency (MHz):		
Rx frequency (MHz):		
Link ID:		
Tx power (dBm):		
ATPC on/off:		
ATPC ref level:		
ODU Polarization:		
3. ANTENNA AND ODU MOUNT	Site 1	Site 2
Antenna vendor and model:		
Antenna size:		
Mounting type:		
Mounting losses:		
4. LINK PARAMETERS	Site 1	Site 2
Link distance:		
Rain zone:		
Expected RSL (dBm):		
Expected Diversity RSL (dBm):		
RSL Main (dBm):		

PTP 850EX LINK COMMISSIONING LOG		
RSL Diversity (dBm):		
Deviation from exp?		
RSL \leq 4 dB?		
5. COMMISSIONING TESTS	Site 1	Site 2
Line loopback:	Pass	Pass
ODU loopback:	Pass	Pass
Radio BER:	Pass	Pass
FE test:	Pass	Pass
GbE test:	Pass	Pass
6. MANAGEMENT CONFIGURATION	Site 1	Site 2
Eth IP Address:		
Eth IP mask:		
Default router:		
In-band VLAN		
7. REMARKS/NOTES		
8. INSTALLATION INFORMATION		
Installed by:	Name:	
	Company:	
	Date:	
	Signature:	
Commissioned by:	Name:	
	Company:	
	Date:	
	Signature:	

Cambium Networks

Cambium Networks delivers wireless communications that work for businesses, communities, and cities worldwide. Millions of our radios are deployed to connect people, places, and things with a unified wireless fabric that spans multiple standards and frequencies of fixed wireless and Wi-Fi, all managed centrally via the cloud. Our multi-gigabit wireless fabric offers a compelling value proposition over traditional fiber and alternative wireless solutions. We work with our Cambium certified Connected Partners to deliver purpose built networks for service provider, enterprise, industrial, and government connectivity solutions in urban, suburban, and rural environments, with wireless that just works.

Support website	https://support.cambiumnetworks.com
Support enquiries	
Technical training	https://learning.cambiumnetworks.com/learn
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