



# INSTALLATION GUIDE

## **PTP 850E**

Release 13.1



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# Before You Start

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## Important Notes

- For the warranty to be honored, install the unit in accordance with the instructions in this manual.
- Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the warranty for such equipment.
- PTP 850E is intended for installation in a restricted access location.
- PTP 850E 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 Section [Grounding the Cables](#).
- Whenever crimp connections are used with cables, the bare conductors must be cleaned and coated with antioxidant before the crimp connections are made.
- PTP 850E is intended to be installed and used in a variety of cell-site 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

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

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

- The public exposure of compliance boundary distance is 3.6m. 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 an PTP 850E, 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 850E 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 850E 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 850E 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 packing case.

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

### Unpacking

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

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

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

### Inspection

Check the packing lists and ensure that correct parts numbers quantities of goods have arrived. Inspect for any damage on the cases and equipment. Report any damage or discrepancy to a Cambium 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: 20 Nm
- M3 screws (used with PTP 820C and PTP 820S twist): 0.6 Nm
- #4-40 Screws (used with PTP 850E and PTP 850E 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.
- For Multiband installations, align the Microwave devices first. Align the PTP 850E devices after aligning the Microwave devices.
- Make sure to connect the antenna evenly to the radio unit. Be carefully to tighten all of the screws evenly but not tightly. Then, tighten the screws firmly in diagonal order.
- Due to a limitation in the PTP 850E, the multimeter will not show an RSL higher than -28 dBm (for System Release versions prior to 12.0.5) or -22 dBm (in System Release 12.0.5 and later), even if the actual RSL is higher.
- Make sure the voltmeter/millimeter rods have the correct thickness. Rods that are too thick can damage the RSL port of the PTP 850E.

# Product Hardware Description

## PTP 850E Hardware Overview

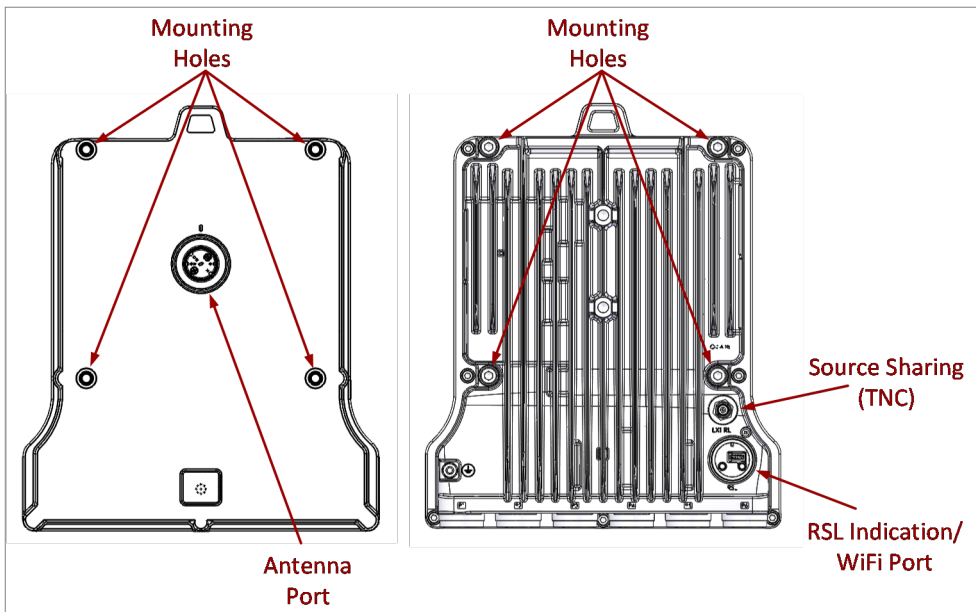
PTP 850E features an all-outdoor architecture consisting of a single unit, which can be either directly mounted on the antenna or supplied with an integrated antenna.



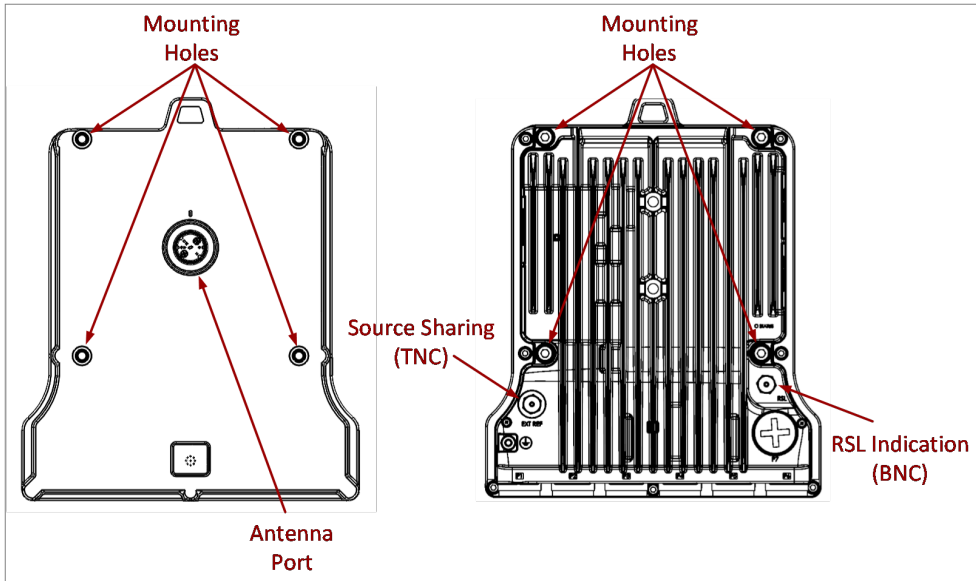
**Note:**

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

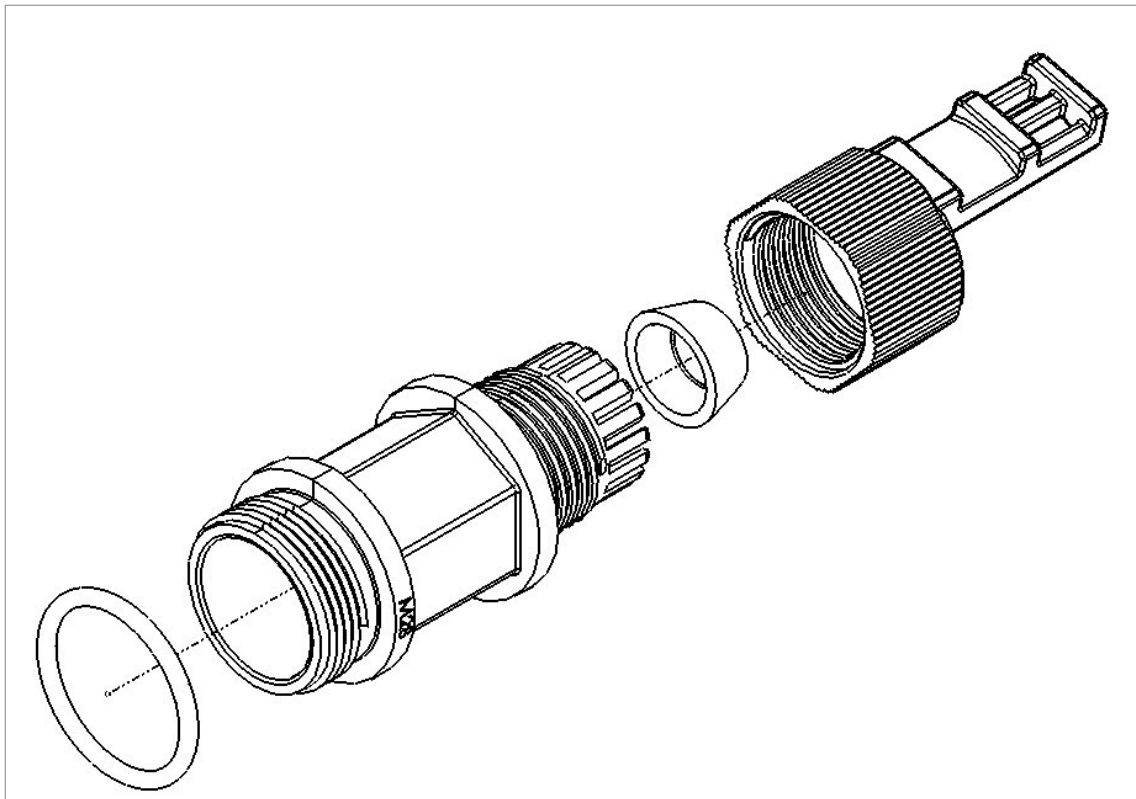
**Figure 1:** PTP 850E Direct Mount HW Ready – Rear View (Left) and Front View (Right) (Old Hardware Design)



**Figure 2:** PTP 850E Direct Mount HW Ready – Rear View (Left) and Front View (Right) (New Hardware Design)



**Figure 3:** Cable Gland Construction



# PTP 850E Interfaces

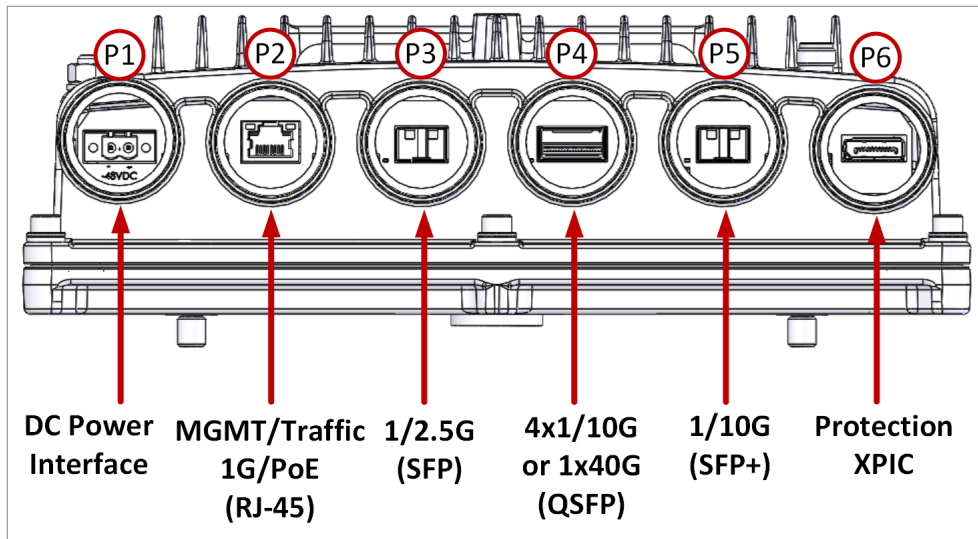
The PTP 850E has an optical SFP cage, an optical SFP/SFP+ cage, and a QSFP cage for traffic and one RJ-45 port for management and PoE.

Optionally, PTP 850E can be used with a CPRI module. The CPRI module is inserted in the QSFP cage, and provides up to 10 Gbps capacity for CPRI traffic.

For power, the PTP 850E has a DC power interface (-48V) (Port 1). The PTP 850E can also receive PoE power from a Cambium-approved PoE injector via Port 2, an RJ-45 port that is also used for management.

Power redundancy can be achieved by using both a DC power input and a passive PoE injector simultaneously. The PTP 850E monitors both power feeds and uses the best power source at any given moment.

**Figure 4:** PTP 850E Interfaces



- Port 1 – Power Interface (-48V)
- Port 2 (MNG 1/Eth 1):
  - Electric: 100/1000Base-T RJ-45.
  - Management port
  - 1GE Eth traffic
  - PoE
- Port 3 (Eth 2):
  - SFP cage which supports SFP standard
  - 1/2.5GE (user-configurable)

- Port 4 (Eth 3, Eth 4, Eth 5, Eth 6):
  - QSFP cage which supports QSFP standard
  - 4x1GE/10GE or 1x40GE Eth traffic (user configurable)
  - Option for SFP and SFP+ (1x1/10GE) with adaptor
  - Option for CPRI
- Port 5 (Eth 7):
  - SFP cage which supports SFP and SFP+ standards
  - 1GE or 10GE Eth traffic (user-configurable)
- Port 6:
  - External Connection – Used for XPIC and Unit Redundancy.



**Note:**

Not all ports are supported in the initial PTP 850E release. For information on supported ports, check the Release Notes for the System Release version you are using.

- Antenna Port – Cambium proprietary flange (flange compliant with UG385/U)
- RSL interface – An interface is available to enable voltage measurements for RSL indication, as follows:
  - Older hardware versions have a DVM interface beneath the M28 cover. The RSL measurement is performed using standard DVM testing probes. To access the RSL interface, the user must remove the port's cover and insert the DVM plugs into the sockets, according to the polarization markings.
  - Newer hardware versions have a BNC connector for voltage measurements. Use a BNC-to-DVM 6 mm jack cable to measure the RSL with this interface.



**Note:**

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

- Grounding screw

## PoE Injector

PTP 850E complies with the 802.3BT standard for PoE and can work with every standard POE injector. PoE offers a single-cable solution for connecting both data and the DC power supply to the PTP 850E.

Two models of the PoE Injector are available:

- **PoE\_Inj\_AO\_2DC\_24V\_48V** – Includes two DC power ports with power input ranges of  $\pm(18-60)V$  each.
- **PoE\_Inj\_AO** – Includes one DC power port (DC Power Port #1), with a power input range of  $\pm(40-60)V$ .



**Note:**

Only PoE\_Inj\_AO\_2DC\_24V\_48V can be used in XPIC configurations.

For power redundancy, a passive PoE injector is required. The following passive PoE Injector model is available for power redundancy:

- **AC\_POE\_STD\_PWR\_INDOOR** – Includes one DC power port with a power input range of 90VAC to 264VAC.



**Note:**

An AC-power PoE Injector option is also available. Contact your Cambium representative for details.

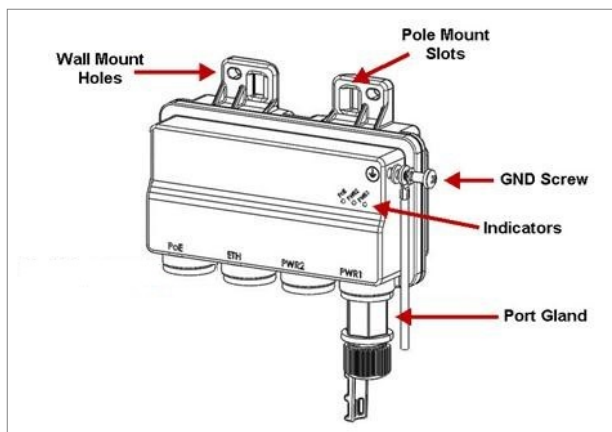
The PoE injector combines 48VDC input and GbE signals via a standard CAT5E cable using a proprietary Cambium design.

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

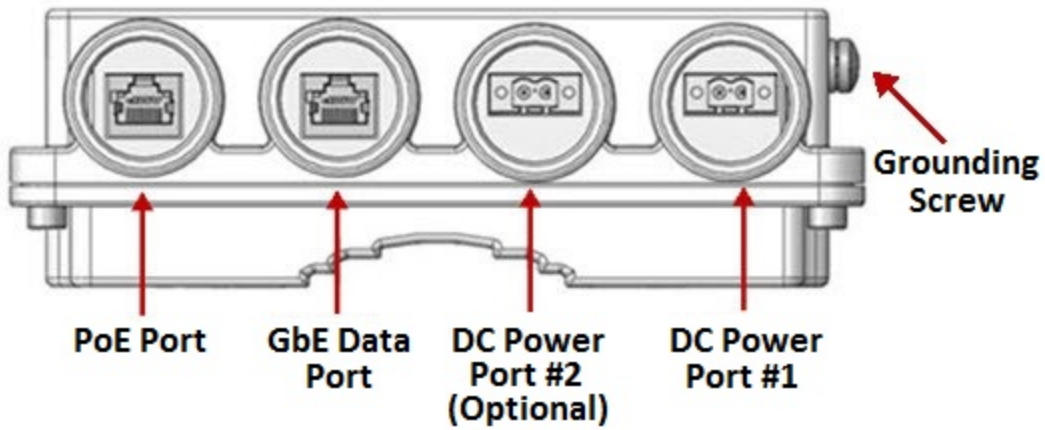
**Figure 5:** *PoE Injector*



## PoE Injector Interfaces – Standard PoE

- 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



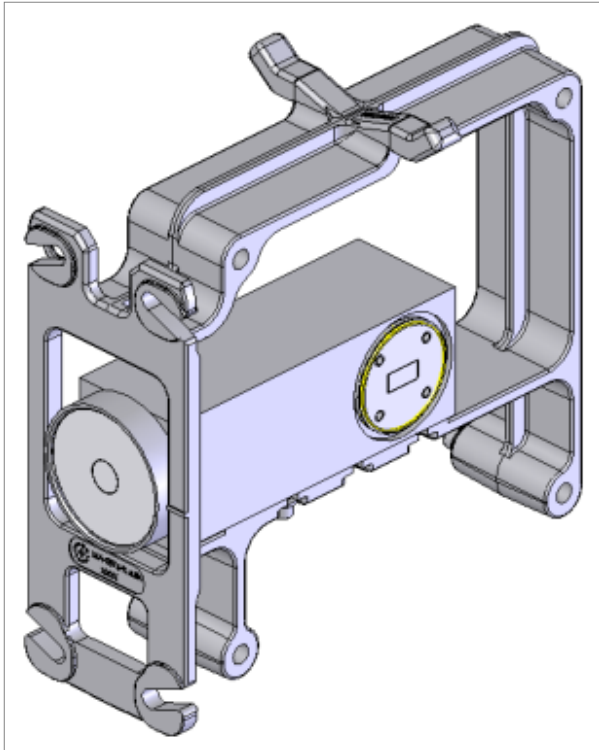
## System Components

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

Figure 7: PTP 850E



Figure 8: OMT



## Adaptors and Installation Kits

Table 1 PTP 850E Accessories

Marketing Model	Description
N800082L001A	PTP 820E and PTP 850E OMT Kit
N800082L002A	PTP 820E and PTP 850E Splitter Kit
N800082L003A	PTP 820E and PTP 850E Coupler Kit
N800082L004A	PTP 820E and PTP 850E Flat Antenna Mounting kit

Table 2 PoE Injector

Marketing Model	Description
N000082L164A	PTP 820C INDOOR AC POE INJECTOR, 90W
N000082L022A	PTP 820 PoE Injector all outdoor, redundant DC input, +24VDC support
N000082L020A	PTP 820 PoE Injector 19inch rack mount KIT
N000082L021A	PTP 820 PoE Injector 23inch rack mount KIT

**Table 3** QSFP Accessories

Component	Marketing Model	Description
QSFP Transceiver (Multi Mode)	QSFP+40GE-OPT-EXT-TEMP	In 1x40Gbps and 4x1/10Gbps configurations, the transceiver is attached to the QSFP port on the PTP 850E.
QSFP Transceiver (Single Mode)	QSFP+40GE_OPT_SM_IND-40Deg	In 1x40Gbps and 4x1/10Gbps configurations, the transceiver is attached to the QSFP port on the PTP 850E.
QSFP Transceiver (Single Mode)	QSFP-40G-PSM-LR4	In 1x40Gbps and 4x1/10Gbps configurations, the transceiver is attached to the QSFP port on the PTP 850E.  Note: DDM is not available for this module.
MPO-MPO Cable	See Section <a href="#">MPO-MPO Cables for QSFP Links</a>	In 1x40Gbps, an MPO-MPO cable is connected between the QSFP transceiver on the PTP 850E and a QSFP transceiver on the customer equipment.  In 4x1/10Gbps configurations, an MPO-MPO cable is connected between the QSFP transceiver on the PTP 850E and a splitter, which is connected to the customer equipment.
Indoor Splitter	QSFP_to_4xLC_module_indoor	In 4x1/10Gbps configurations in which the PTP 850E is connected to an indoor switch, the MPO-MPO cable is connected to this splitter. In turn, four Ethernet cables are connected from the splitter to the switch.
Indoor Splitter Chassis	19in_Chassis_QSFP-4xLC_module	In 4x10Gbps configurations in which the PTP 850E is connected to an indoor switch, the MPO-MPO cable is connected to this splitter. In turn, four Ethernet cables are connected from the splitter to the switch.
Indoor Splitter Chassis (Single Mode)	QSFP_to_4xLC_module_SM_indoor	In 4x10Gbps configurations in which the PTP 850E is connected to an indoor switch, the MPO-MPO cable is connected to this splitter. In turn, four Ethernet cables are connected from the splitter to the switch.
Outdoor Splitter (Multi Mode)	FO_MM_out_distrib_MPO_to_4xLC	In 4x10Gbps configurations in which the PTP 850E is connected to an outdoor switch or radio, the MPO-MPO cable is connected to this splitter. In turn, four Ethernet cables are connected from the splitter to the switch or radio.
Outdoor Splitter (Single Mode)	FO_SM_out_distrib_MPO_to_4xLC	In 4x10Gbps configurations in which the PTP 850E is connected to an outdoor switch or radio, the MPO-MPO cable is connected to this splitter. In turn, four Ethernet cables are connected from the splitter to the switch or radio.
QSFP-to-SFP Adaptor	QSFP to SFP Kit	Converts the QSFP port to an SFP or SFP+ port.  Note: This adaptor supports a temperature range of 0° to +70°C (32° to 158°F).

**Table 4** CPRI Module

Component	Marketing Model	Description
CPRI Module	CPRI_to_QSFP_Module_Kit	CPRI to QSFP Module with Gland extender kit. For CPRI links, module is attached to the QSFP port on the PTP 850E.

## 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 850E 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

Unit Configuration	Power Consumption
Active – XPIC	73W
Active – Non-XPIC	63W
Standby	51W

## Power Connection Options

Power Source and Range	Data Connection Type	Connection Length	DC Cable Type / Gage
Ext DC -(40.5 ÷ 60)VDC (Using an RJ-45 to DC cable adaptor)	Optical	≤ 75m (247ft)	18AWG
		76m ÷ 150m (248ft ÷ 493ft)	14AWG
		151m ÷ 300m (494ft ÷ 984ft)	12AWG
Active PoE Injector	Electrical	≤ 100m (328ft)	CAT5e (24AWG)
Passive PoE Injector for Power Redundancy  Only for use in non-XPIC configurations (≤ 57W)	Electrical	≤ 100m (328ft)	CAT5e (24AWG)



**Note:**

For details and marketing models of the recommended PoE options and when they are used, see [PoE Injector](#).

## PoE Injector Power Input – Standard PoE

The specifications in this section are for the standard PoE Injector units with the following marketing models:

- PoE\_Inj\_AO\_2DC\_24V\_48V
- PoE\_Inj\_AO

<b>Standard Input</b>	<b>-48 or +24VDC (Optional)</b>
DC Input range	±(18/40.5 to 60) VDC



**Note:**

+18VDC extended range is supported as part of the nominal +24VDC support.

## PoE Injector Power Input – Passive PoE

The specifications in this section are for the passive PoE Injector for use with power redundancy, with the following marketing model:

- AC\_POE\_STD\_PWR\_INDOOR
- AC Input range: 90VAC to 264VAC

## Important Notes!

- 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 6 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 both the PTP 850E unit and the PoE injector.

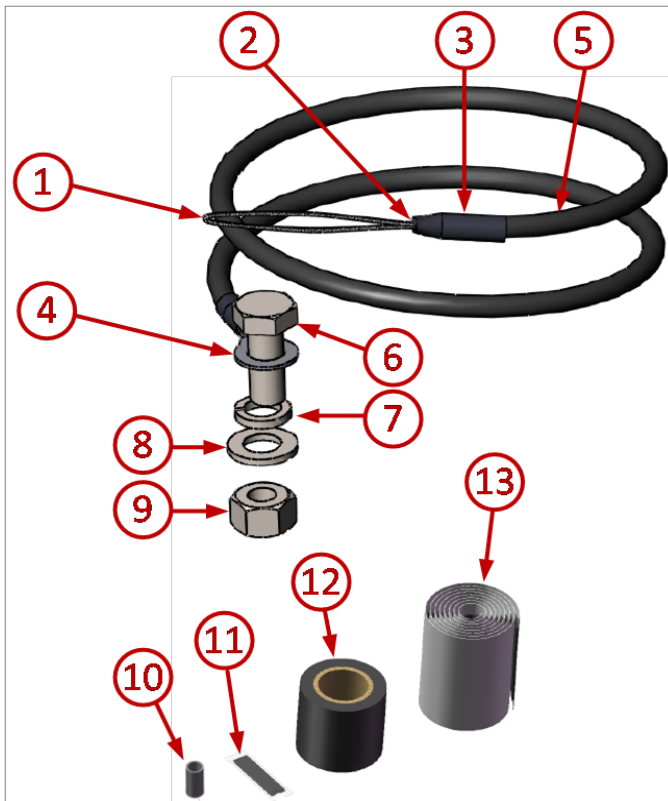
## Grounding the Cables

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 UNIV\_GRD\_KIT\_1/2.

**Figure 9:** Cable Grounding Kit

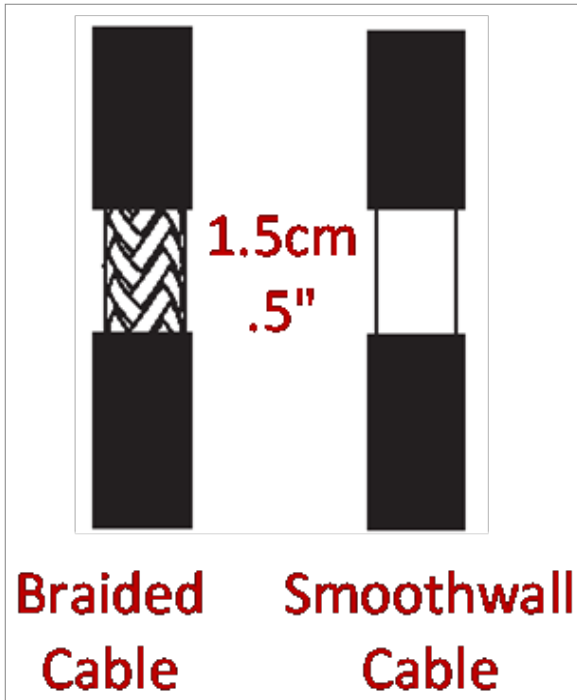


**Table 5** Cable Grounding Kit

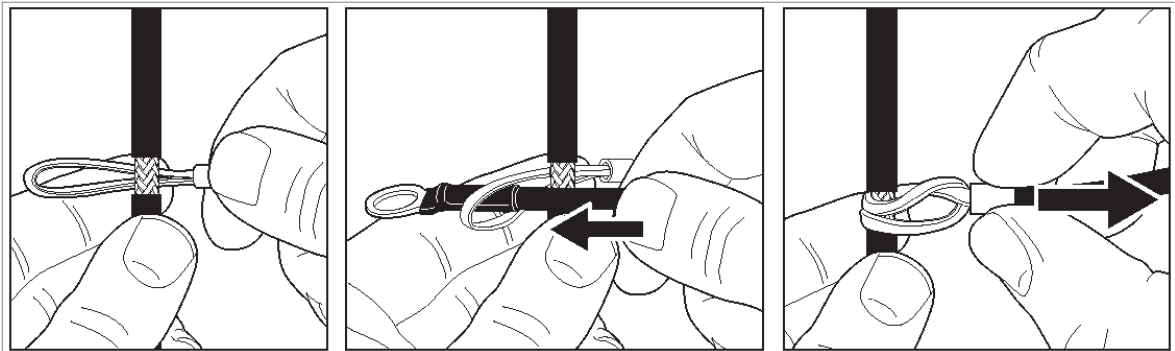
Marketing P/N	Description
UNIV_GRD_KIT_1/2	Universal Grounding Kit up to 1/2" cable

To connect the grounding kit:

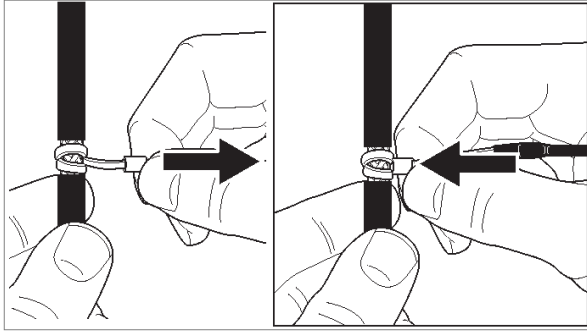
1. Strip the cable jacket about 1.5 cm (.5").



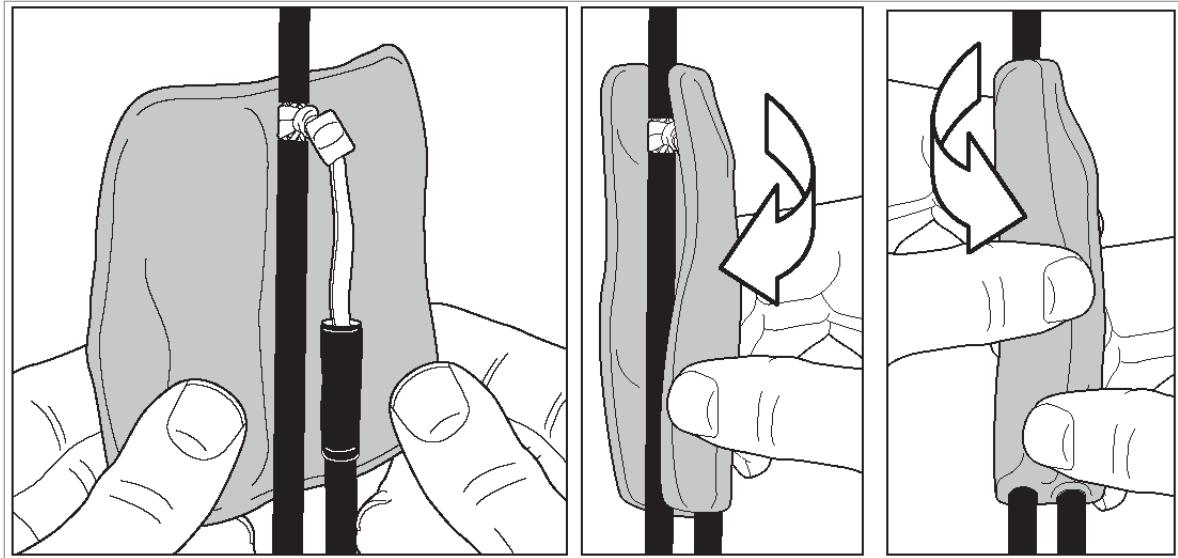
2. Loop the grounding wire's braid belt (1) around the stripped portion of the cable, insert the rest of the grounding wire (5) through the braid belt, and tighten to form a knot, as shown in the figure below.



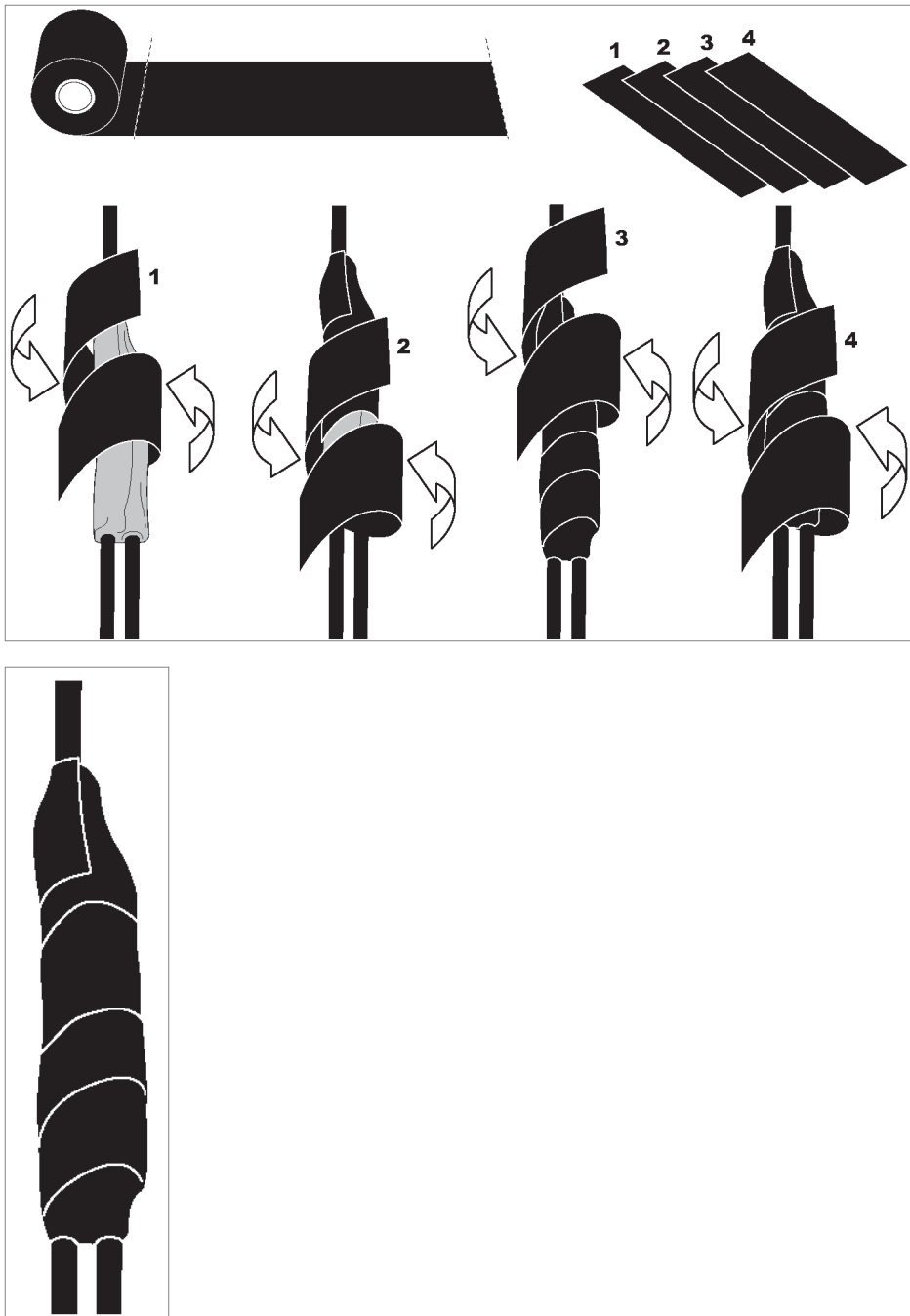
3. Grasp the terminal of the braid belt (2) and slide it flush with the knot around the cable, as shown in the figure below.



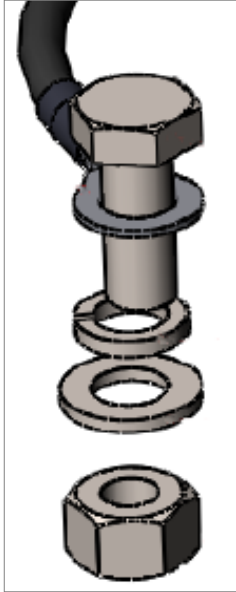
4. Crimp the knotted braid belt (1) and the bare terminal (10) together, as shown in the figures below.



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 850E Unit



**Note:**

The PTP 850E is internally grounded on the positive (+) side (Common DC Return, DC-C).

The grounding of the PTP 850E and the PoE 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 850E chassis is 2.5 m $\Omega$  or less, but in any case not more than 10 m $\Omega$ .

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

If a PoE is used, the recommended resistance between the tower's main grounding point and the PoE chassis is:

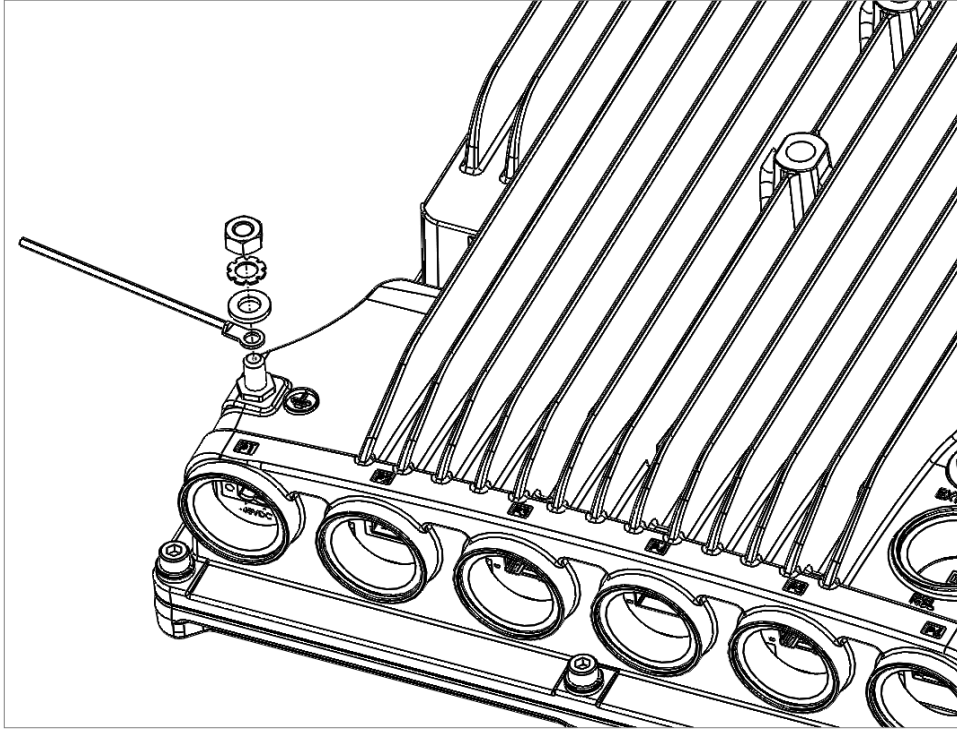
- If the PoE is installed outdoors: 2.5 m $\Omega$  or less, but in any case not more than 10 m $\Omega$ .
- If the PoE is installed indoors: 5 m $\Omega$  or less.

### Required Tools

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

### Procedure

1. On the front of each PTP 850E 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 850E 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:

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

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

**Caution:**

The user power supply GND must be connected to the positive pole in the PTP 850E power supply.

Any other connection may cause damage to the system.

**Note:**

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

## Surge Protection

PTP 850E includes built-in surge protection for its Ethernet and power interfaces. PTP 850E's surge protection implementation complies with surge immunity standard IEC 61000-4-5, level 4, 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 6](#).

**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](#).

**Note:**

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 850E unit.

The following surge protector is available from Cambium.

**Table 6** Surge Protector

Marketing Model	Item Description
Outdoor/LPU/GBE	Outdoor Lightning Protection Unit for 10/100/1000Base-T PoE

## Available Cable Options

**Note:**

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

## Fiber Optic Cables – Single Mode

Part number	Item Description
N000082L186A	Optical CABLE, SM, 2.2m
N000082L187A	Optical CABLE, SM, 10m
N000082L188A	Optical CABLE, SM, 20m
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
N000082L189A	Optical CABLE, SM, 200m
N000082L190A	Optical CABLE, SM, 300m

## Fiber Optic Cables – Multi Mode

Marketing Model	Item Description
N000082L191A	Optical CABLE, MM, 2.2m
N000082L192A	Optical CABLE, MM, 10m
N000082L193A	Optical CABLE, MM, 20m
N000082L194A	Optical CABLE, MM, 30m
N000082L195A	Optical CABLE, MM, 50m
N000082L196A	Optical CABLE, MM, 80m
N000082L197A	Optical CABLE, MM, 100m
N000082L198A	Optical CABLE, MM, 150m
N000082L199A	Optical CABLE, MM, 200m
N000082L200A	Optical CABLE, MM, 300m

## MPO-MPO Cables for QSFP Links

**Table 7** MPO-MPO Cables for QSFP Links – Single Mode

Marketing Model	Description
N000082L203A	PTP 850 QSFP Transceiver
N000082L204A	PTP 850 QSFP to SFP+ adapt 40GE to 1/10 GE temp
N000082L205A	Optical Cable, MPO(F)/MPO(F),4P,Type B,30m,MM,OM4,M28 Gland, ARM
N000082L206A	Optical Cable, MPO(F)/MPO(F),4P,Type B,50m,MM,OM4,M28 Gland, ARM
N000082L207A	Optical Cable, MPO(F)/MPO(F),4P,Type B,80m,MM,OM4,M28 Gland, ARM
N000082L208A	Optical Cable, MPO(F)/MPO(F),4P,Type B,100m,MM,OM4,M28 Gland, ARM
N000082L209A	Optical Cable, MPO(F)/MPO(F),4P,Type B,150m,MM,OM4,M28 Gland, ARM

**Table 8** MPO-MPO Cables for QSFP Links – Multi Mode

Marketing Model	Description
FO_MM_MPO2MPO_ARM_7m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,7M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_10m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,10M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_15m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,15M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_20m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,20M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_30m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,30M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_40m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,40M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_50m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,50M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_60m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,60M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_70m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,70M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_80m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,80M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_90m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,90M,MM,OM4,M28 GLAND,ARM

Marketing Model	Description
FO_MM_MPO2MPO_ARM_100m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,100M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_120m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,120M,MM,OM4,M28 GLAND,ARM
FO_MM_MPO2MPO_ARM_150m	CABLE,FO,MPO(F)/MPO(F),4P,TYPE B,150M,MM,OM4,M28 GLAND,ARM

## DC Cable and Connector

Marketing Model	Description
N000082L019A	PTP 820 Outdoor_DC_cbl_2x18AWG_drum, 305m
N000082L065A	PTP 820 DC Connector

## Extension Cables for Unit Redundancy, and XPIC

Description	Marketing Model	Marketing Description
DP to DP extension cable for protection and XPIC (P6 to P6)	DP2DP_EXT_CBL_XPIC_PROT	CABLE,DP TO DP,0.7M,WITH 2xM28 GLAND,UV RES
Management splitter cable for protection (P2 to P2 and External Management Station)	PTP 850E_PROT-SPLIT_CBL	CABLE,RJ45F TO 2xRJ45M,0.4M, WITH GLANDS, UV PROTECTED,100base

## Clock Sharing Cable for XPIC

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

## Cables for Link Bonding Configurations

**Table 9** Cables for Link Bonding Configurations

Marketing Model	Description
Data_SHARING_CBL_1m	Fiber Protocols cable, 1m
Data_SHARING_SM_CBL_1m	Fiber Data sharing cable, SM, 1m

Marketing Model	Description
Data_SHARING_CBL_5m	Fiber Protocols cable, 5m
Data_SHARING_SM_CBL_7m	Fiber Data sharing cable, 7m
Data_SHARING_CBL_10m	Fiber Protocols cable, 10m
Data_SHARING_SM_CBL_10m	Fiber Data sharing cable, 10m
Data_SHARING_CBL_20m	Fiber Protocols cable, 20m
Data_SHARING_CBL_30m	Fiber Protocols cable, 30m

## Ethernet Cable and Specifications

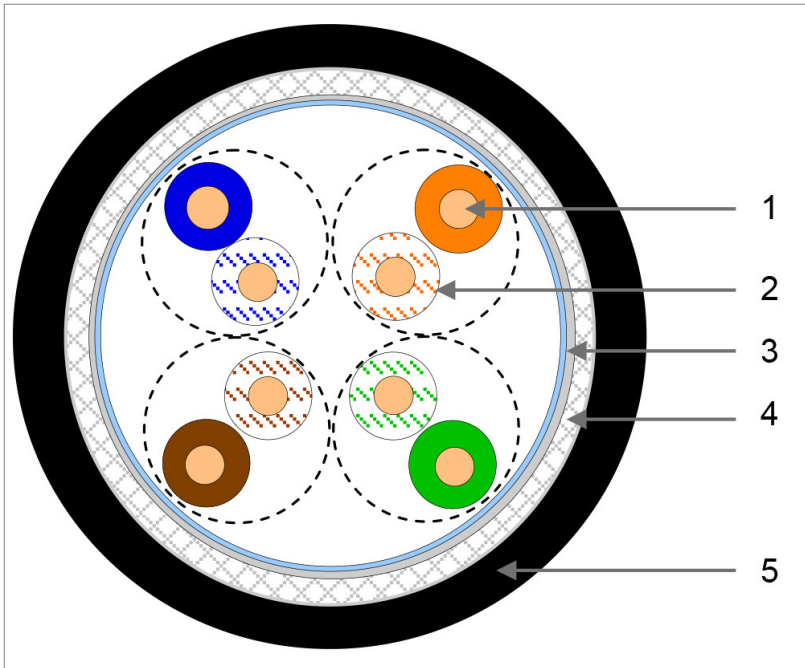
Marketing Model	Description
CAT5E_SFUTP_Outdoor_50m	CABLE,RJ45 TO RJ45 STR 50M,CAT-5E,ETHER,UV RES
CAT5E_SFUTP_Outdoor_75m	CABLE,RJ45 TO RJ45 STR 75M,CAT-5E,ETHER,UV RES
CAT5E_SFUTP_Outdoor_100m_drum	CABLE,MATERIAL,CAT-5E,SFUTP,4X2X24AWG,UV RESISTANCE,100M
CAT5E_SFUTP_Outdoor_305m_drum	CABLE,MATERIAL,CAT-5E,SFUTP,4X2X24AWG,UV RESISTANCE,305M
CAT5E_Arm_50m	CABLE,RJ45 TO RJ45 STR,50M,CAT-5E,M28 GLAN,ARM,UV RESISTANCE
CAT5E_Arm_70m	CAT5E_Arm_75mCABLE,RJ45 TO RJ45 STR,70M,CAT-5E,M28 GLAN,ARM,UV RESISTANCE
CAT5E_Arm_305m_drum	CABLE,MATERIAL,CAT-5E,FTP,4X2X24AWG, ARMORED,UV RESISTANCE,305M

This cable has the following specifications:

- 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 10** 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 11** Outdoor Ethernet Cable Electrical Requirements

Cable type	CAT-5e SFUTP, 4 pairs, according to ANSI/TIA/EIA-568-B-2
Wire gage	24 AWG
Stranding	Solid

Voltage rating	70V
Shielding	Braid + Foil

**Table 12** 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+
8	 Brown	TRD3-

**Table 13** Outdoor Ethernet Cable Mechanical/Environmental Requirements

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 14** Outdoor DC Cable Electrical Requirements

Cable type	2 tinned copper wires
Wire gage	18 AWG (for ≤150m (492ft) installations, optical connections) 14 AWG (for 150m ÷ 300m (492ft ÷ 984ft) installations, optical connections)
Stranding	stranded

Voltage rating	600V
Spark test	4KV
Dielectric strength	2KV AC min

**Table 15** Outdoor DC Cable Mechanical/Environmental Requirements

Jacket	UV resistant
Outer diameter	7-10 mm
Operating & 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, P/N Outdoor Ties (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 16** Cable Clamps

Part Number	Marketing Model	Item Description
SI-1231-0	Fiber_clamp_6cbl_4.0-7.0mm	DUAL FEADER CLAMP FOR 4.0-7.0mm CABLE 6 WAY.

## Special Instructions for use of Glands



**Note:**

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

**Table 17** Glands Kit

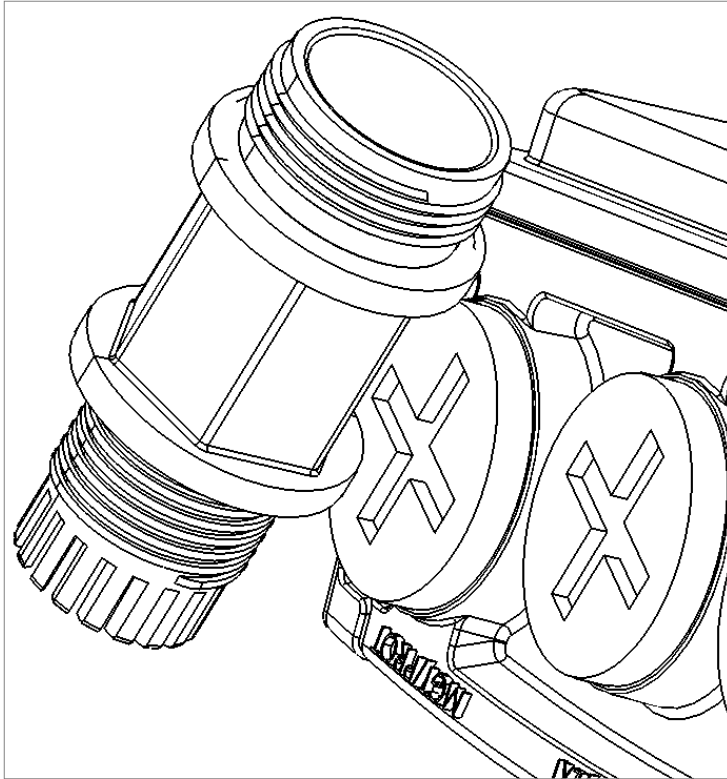
Marketing Model	Marketing Description
N000082L014A	PTP 820 Glands_x5_KIT

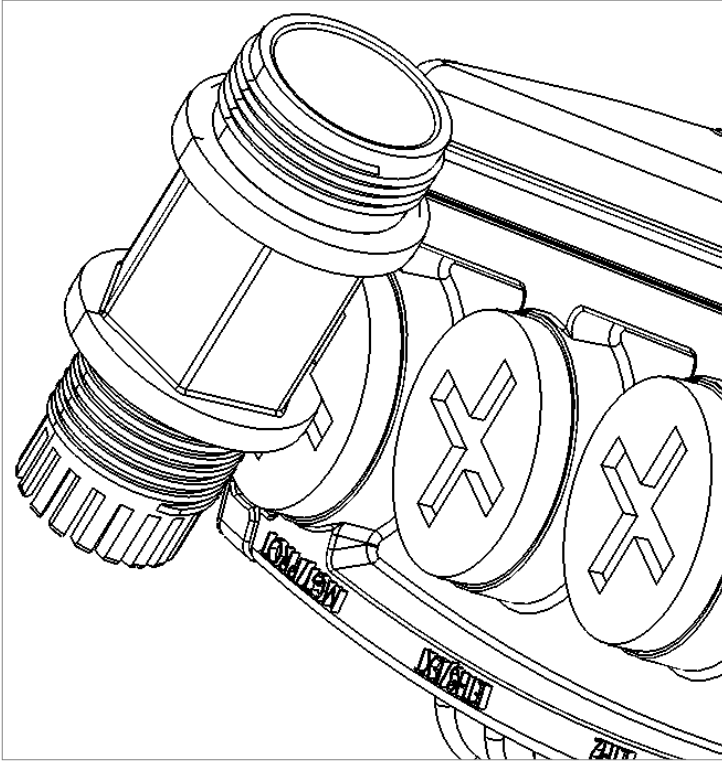
In addition, gland caps can be ordered to protect the cable and connector from damage when elevating the cable and gland to the radio unit. See Step 5. Gland caps are ordered separately, in kits of 10 caps each.

**Table 18** *Gland Cap*

Marketing Model	Marketing Description
N800082L009A	PTP 820E Cable Protection Cap (Qty 10)

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





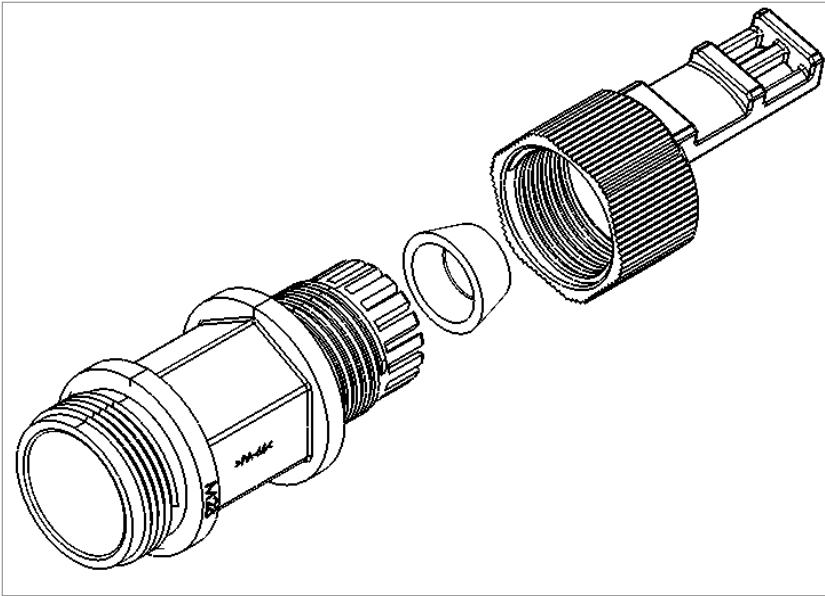
## General Installation Procedure

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

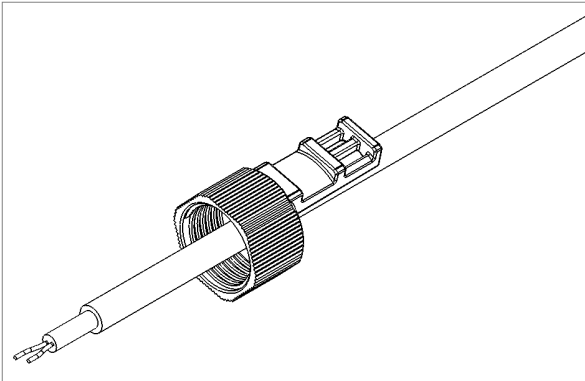
1. Strip off a maximum of 20 mm from the cable jacket.
2. Expose 10 mm at the edge of each of the two wires.

For all installations, perform the following steps:

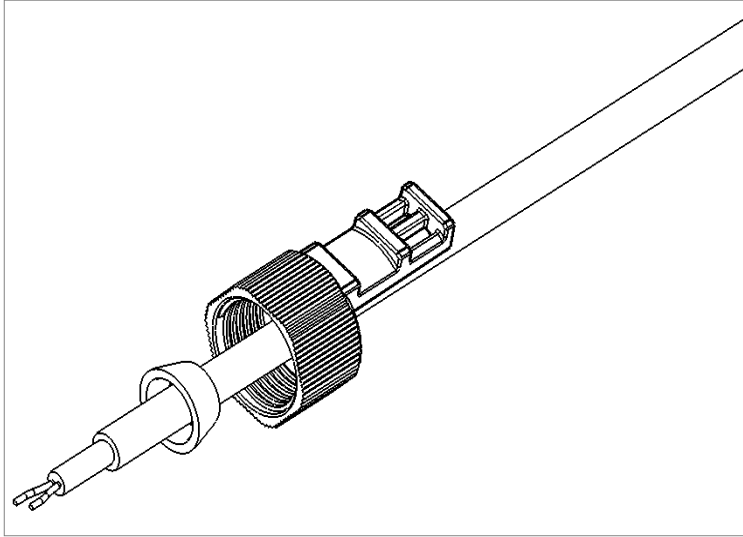
1. Before inserting a cable, you must disassemble the gland cap and gland rubber from the gland body.



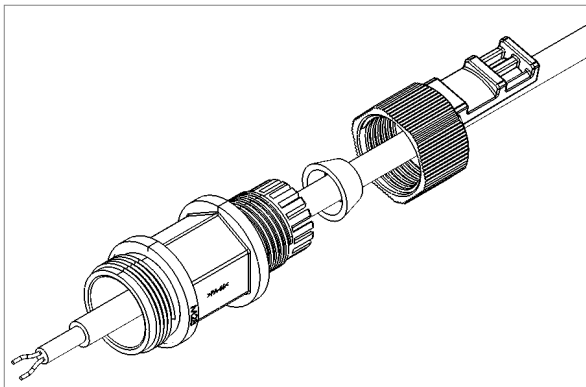
2. Slide the gland cap into the cable.



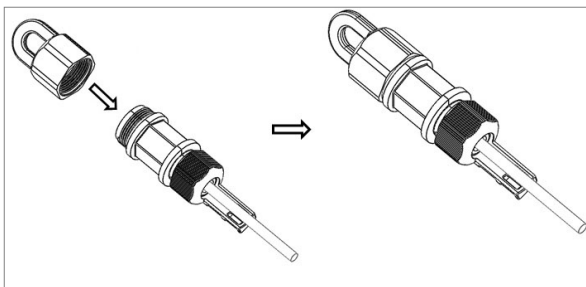
3. Slide the gland rubber into the cable.



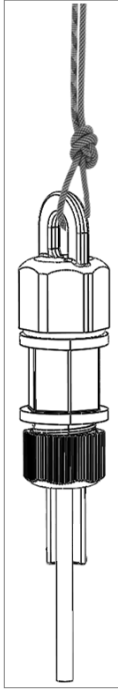
4. Slide the cable into the body of the gland. If you are using a gland cap (see Step 5), make sure to leave enough space for the gland cap to fit into the gland without disturbing the cable.



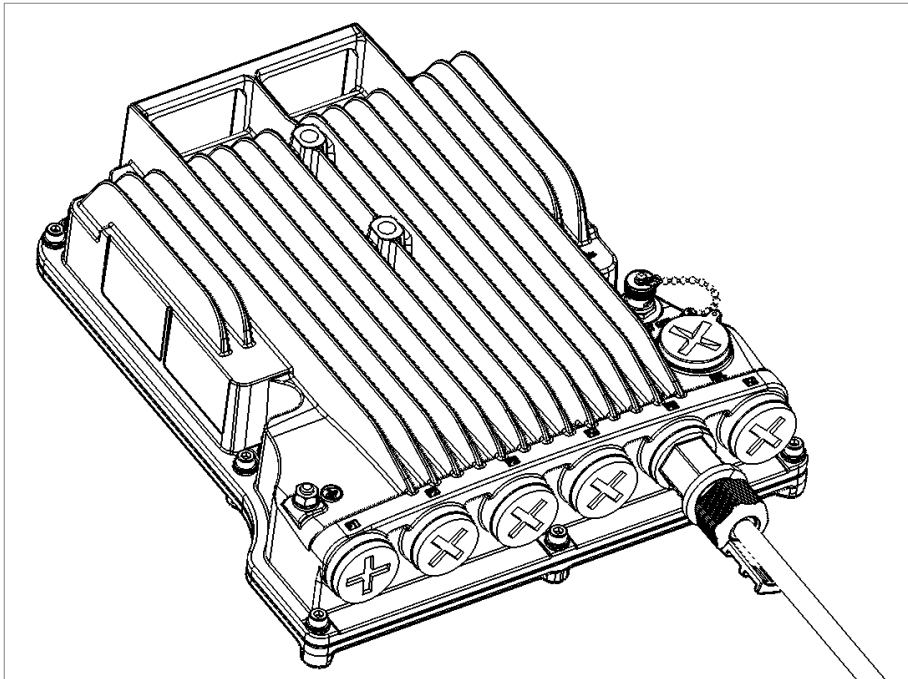
5. 5 Optionally, after securing the cable into the body of the gland, you can close the other side of the gland with an M28 gland cap. The gland cap protects the cable and connector from damage when elevating the cable and gland to the radio unit.



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:**

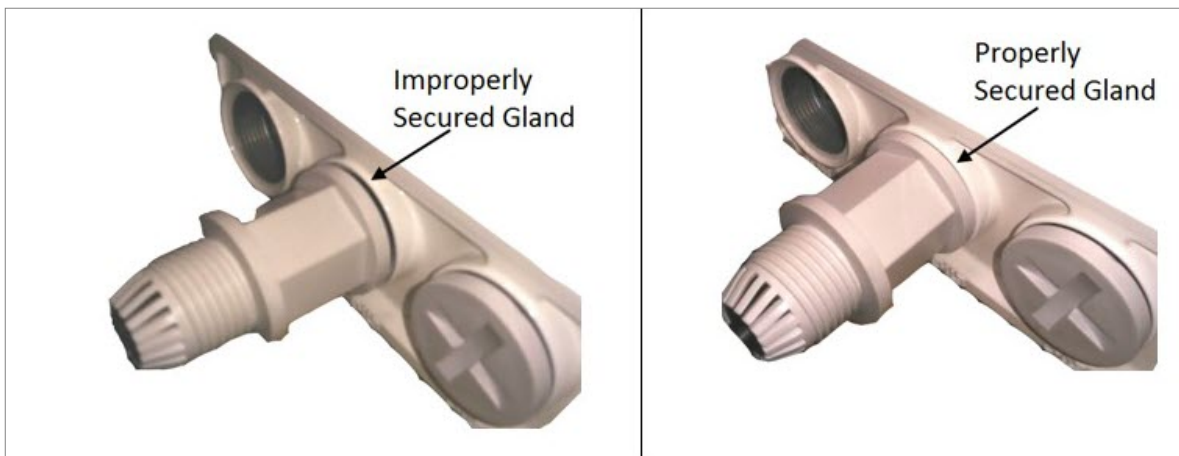
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit. Tightening the gland at an angle can ruin the thread on the gland and prevent proper sealing of the interface.

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.



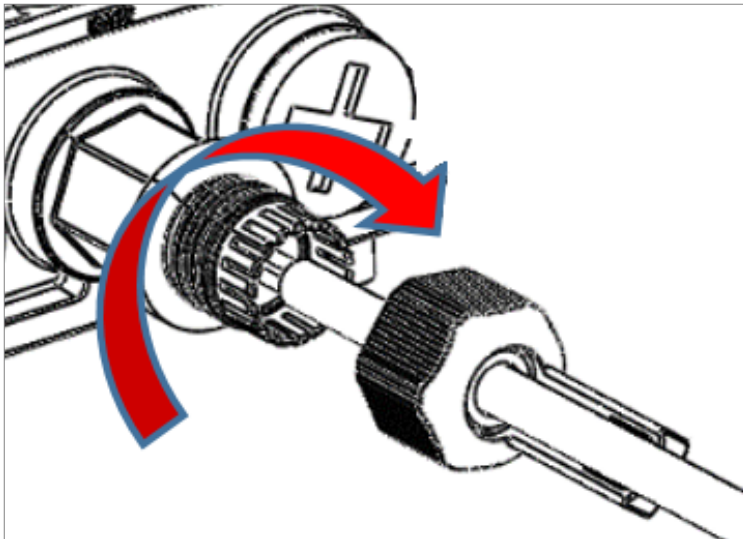
11. Tighten the rear portion of the gland onto the main part of the gland and make sure that the main part of the gland does not have an additional swivel after the rear portion is secured.



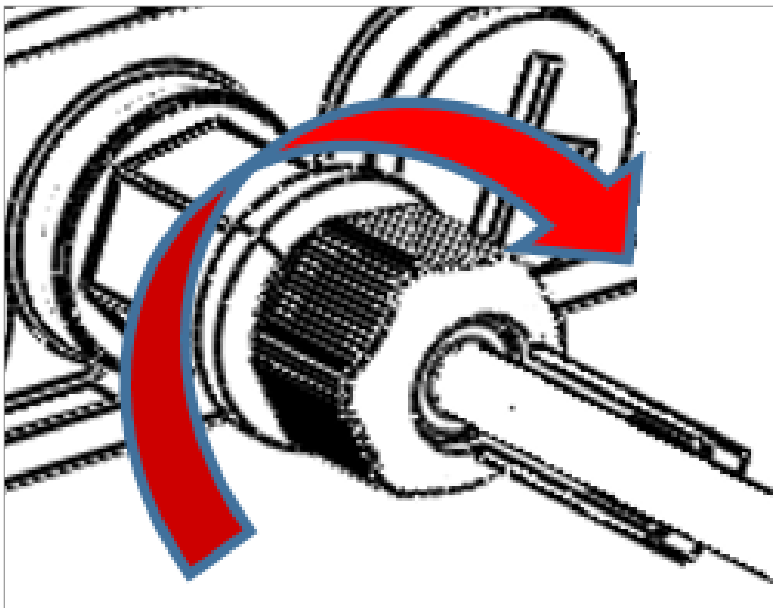
**Note:**

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

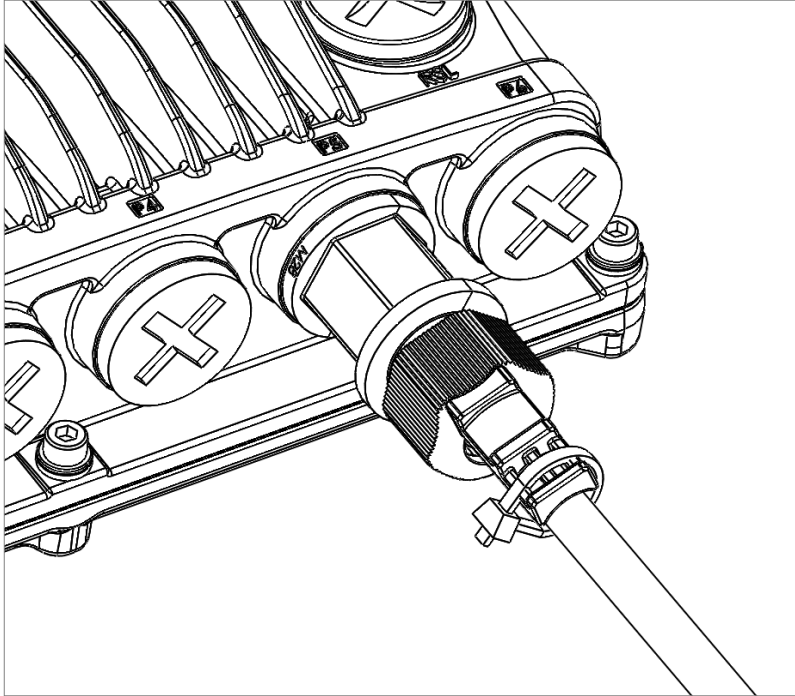
**Figure 11:** *Tightening the Front Portion of the Gland*



**Figure 12:** *Tightening the Rear Portion of the Gland*



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



## Connecting an Optical Fiber Cable and SFP

### Types of SFPs

PTP 850E includes:

- An SFP cage (P3) that supports the SFP standard.
- An SFP cage (P5) that supports SFP and SFP+ standards.

PTP 850E also includes a QSFP cage (P4) that supports one 1/40 GbE or four 1/10 GbE interfaces. When the QSFP cage is configured for 1x40 GbE mode, the interface corresponds to logical port 3. When it is configured for 4x1/10 GbE mode, the interfaces correspond to logical ports 3, 4, 5, and 6.

P4 can also be used with an adaptor to support a single SFP or SFP+ transceiver (1/10 GbE).

For a list of QSFP accessories, see [Table 3](#).

- 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 transceiver and cable to the QSFP port (P4) for 1x40G or 4x1/10G configurations, see [Connecting an MPO-MPO Cable to the QSFP Port for QSFP Links](#).
- 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 System Release releases. For details on which configurations are supported, check the Release Notes for the System Release release you

are using.

For a list of QSFP transceivers and accessories, see [Table 3](#).

The following tables list recommended SFP transceivers that can be used with PTP 850E.

**Table 19** *Approved SFP Transceivers*

Part number	Description
N800082L012A	PTP 820 SFP+, 850nm, MM, 10Gbit, Industrial Grade
N800082L013A	PTP 820 SFP+, 1310nm, SM, 10Gbit, Industrial Grade

**Table 20** *Approved 2.5 GbE SFP Transceivers*

Marketing Model	Marketing Description	Item Description
SFP-3.7G-SX-EXT-TEMP	SFP-3.7G-SX-EXT-TEMP	XCVR,SFP,850nm,MM,3.7 Gbit/s, INDUSTRIAL GRADE
SFP-3.7G-LX-EXT-TEMP	SFP-3.7G-LX-EXT-TEMP	XCVR,SFP,1310nm,SM,10km,3.7 Gbit/s, INDUSTRIAL GRADE

**Table 21** *Approved 10 GbE SFP+ Transceivers*



**Note:**

Approved SFP+ transceivers can also be used with 2.5 GbE interfaces.

Marketing Model	Marketing Description	Item Description
SFP+10GBASE-LR10-EXT-TEMP	SFP+ 10GE OPT 10GBASELR, 10km,EXT-TEMP	XCVR,SFP+,1310nm,SM,10 Gbit/s,10km,INDUSTRIAL GRADE,SINGLE P
SFP+10GBASE-SR10-EXT-TEMP	XCVR,SFP+,850nm,MM,10 Gbit/s, INDUSTRIAL GRADE	SFP+10GBASE-SR10-EXT-TEMP



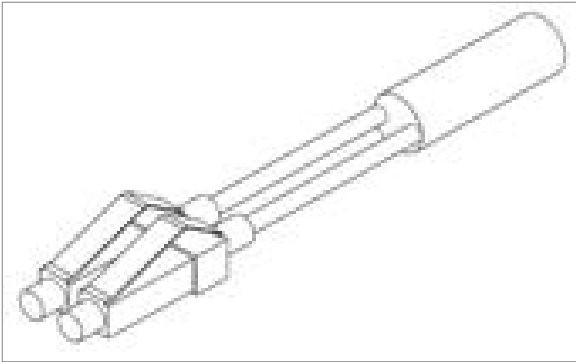
**Note:**

Cambium recommends the use of QSFP, SFP, and SFP+ transceivers certified by Cambium, as listed above.

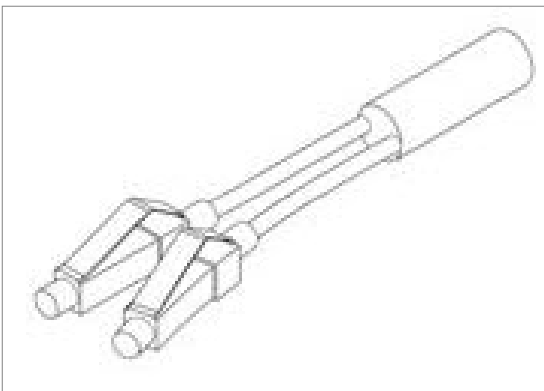
## Connecting Optical Fiber to SFPs

To connect an optical fiber cable and the SFP transceiver:

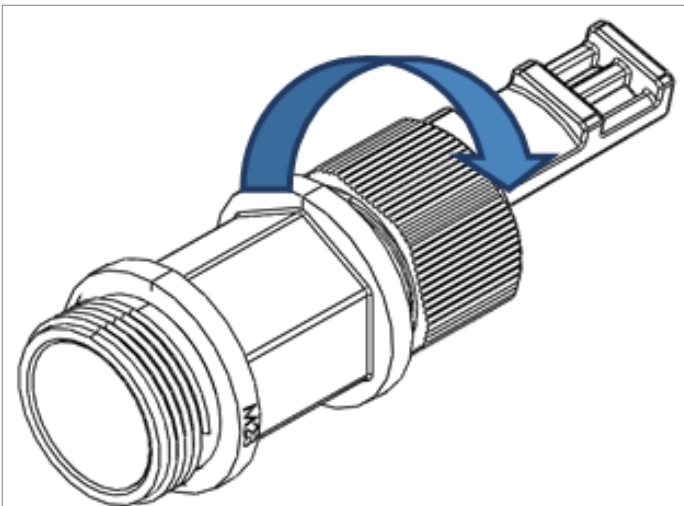
1. Use a pre-assembled cable.

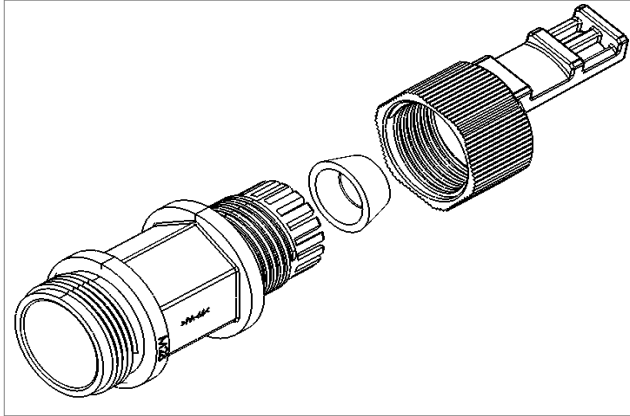


2. Split the connector into two separate LC connectors (one for each fiber).

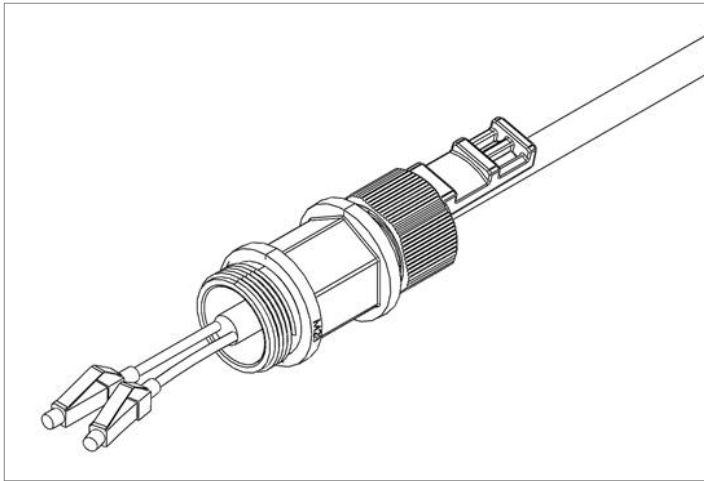


3. Remove the gland cap and rubber from the gland body.





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.

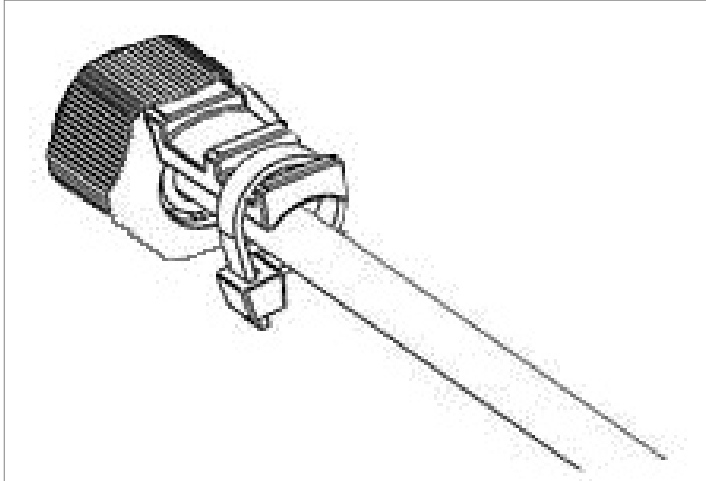


7. Secure the cable to the lip of the gland using a tie wrap

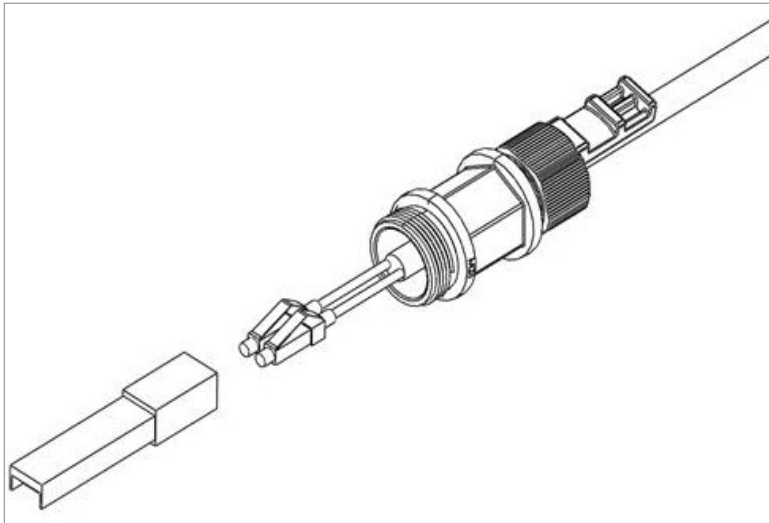


**Note:**

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.



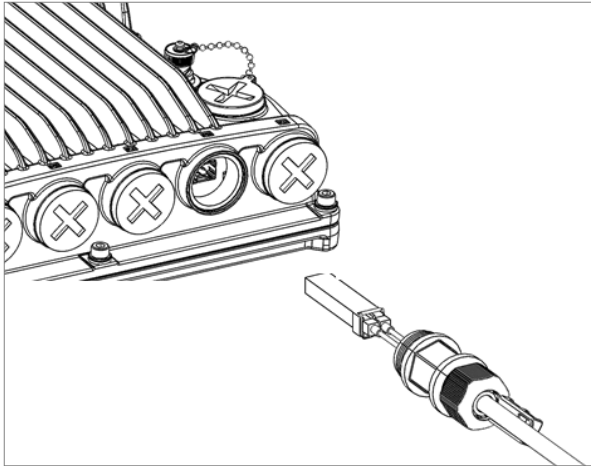
9. Remove the tie wrap securing the cable to the gland.



**Note:**

A new tie wrap must be used to secure the cable to the gland at the end of the procedure, as described in Step [13](#).

10. Connect the connector into the PTP 850E 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.

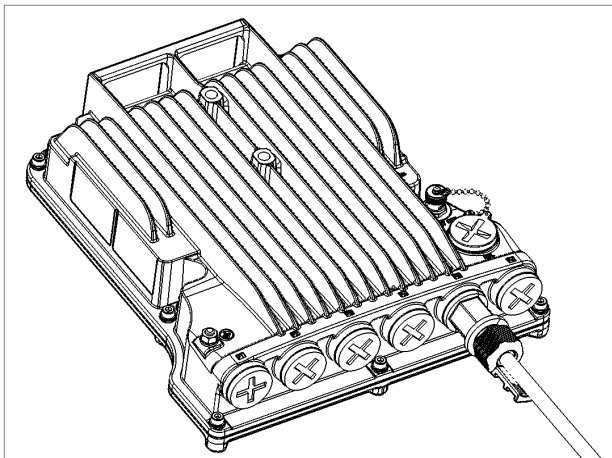


**Note:**

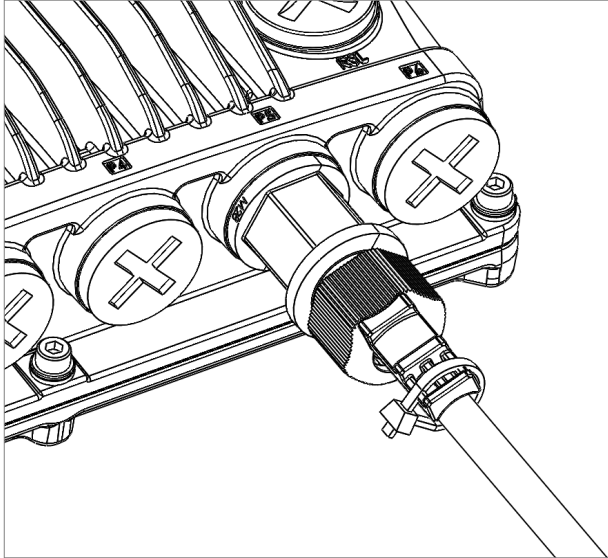
Before tightening the gland, make sure the gland is aligned with the tapped hole in the unit.

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 850E (P4) can be used for 1x1/10G configurations, with a single SFP or SFP+ transceiver in the QSFP port. This configuration requires an QSFP-to-SFP adaptor. See [Table 3](#).

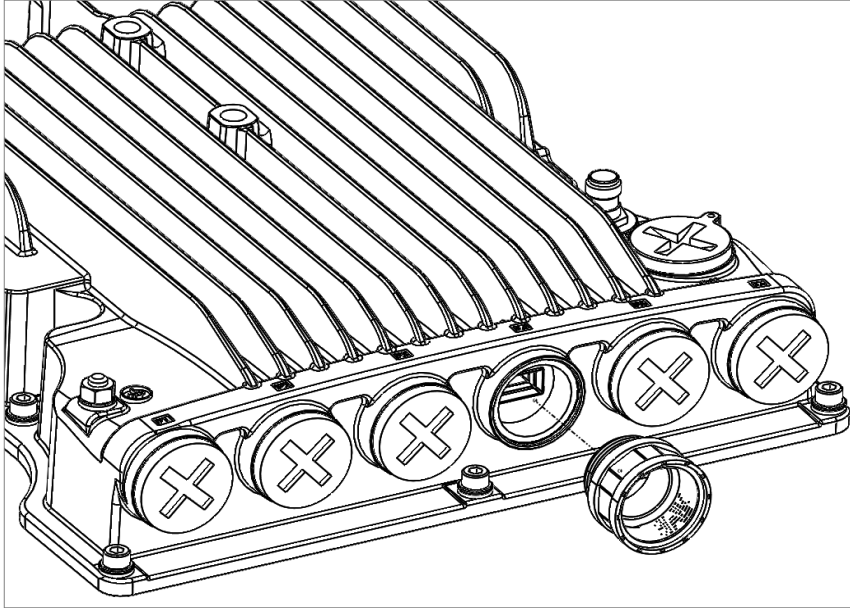
To connect an optical fiber and QSFP-to-SFP adapter to the QSFP port (Port 4) of the PTP 850E:

1. Remove the cap from Port 4. You can use the side of the gland to unscrew the cap.
2. Perform Steps [1](#) through [9](#) in Section [Connecting Optical Fiber to SFPs](#).
3. Tighten the gland extender to the PTP 850E 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*).



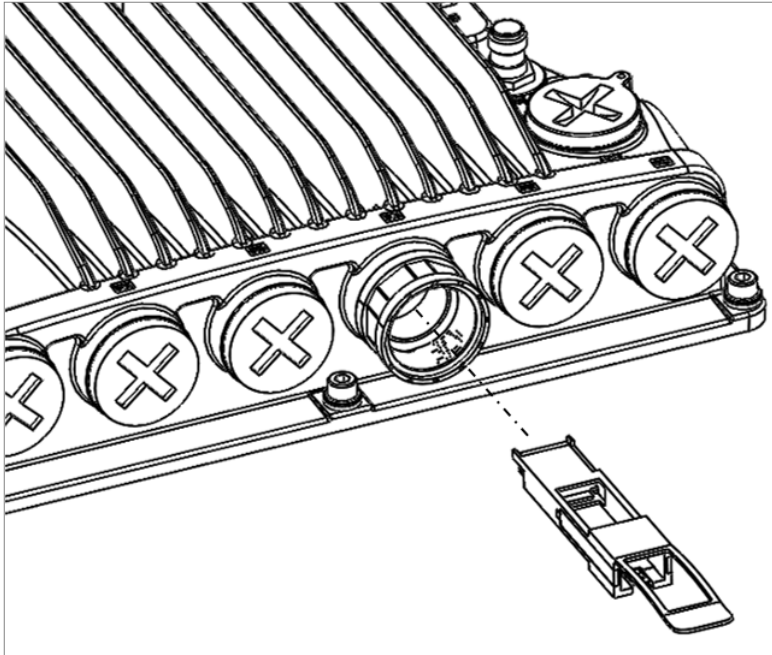
**Note:**

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 to the QSFP port. Listen for the click to ensure that the adaptor is fully inserted.

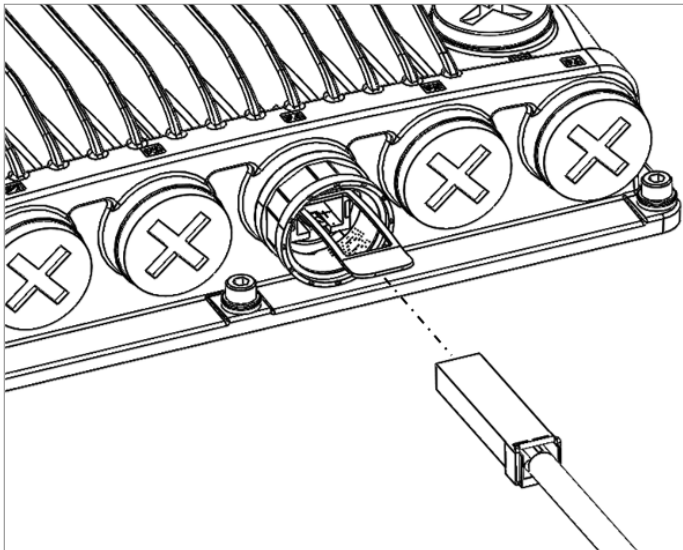


**Note:**

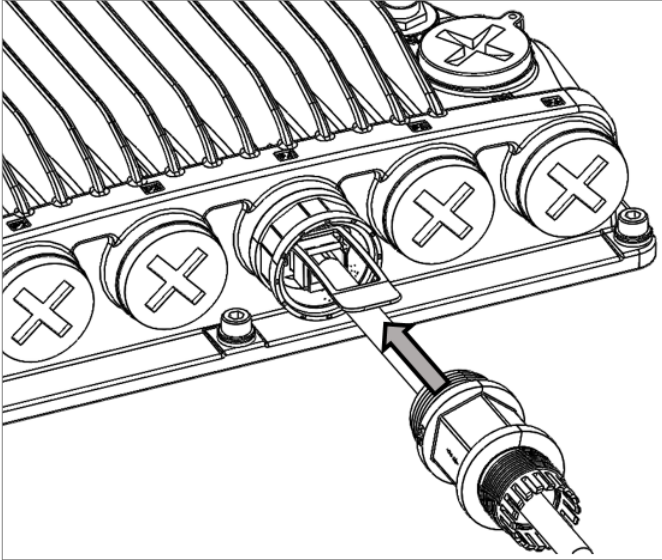
It is important to first connect the gland extender to the port, and only then to insert the QSFP-to-SFP adaptor. Do not connect them in the opposite order.

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

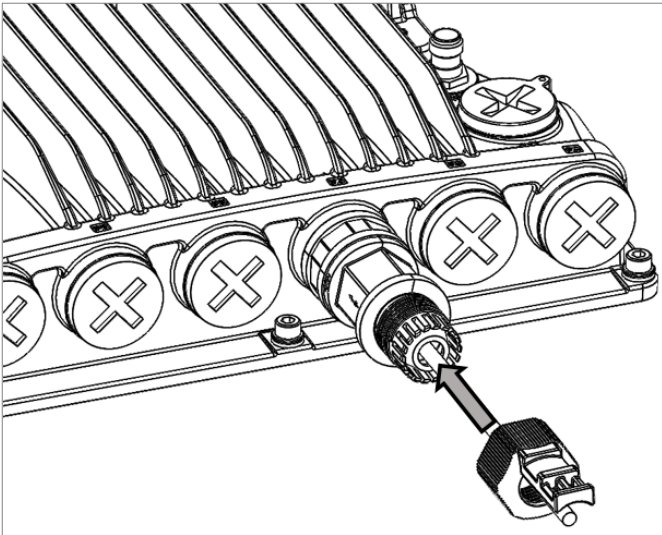
5. Connect the SFP or SFP+ transceiver to the QSFP-to-SFP adaptor.



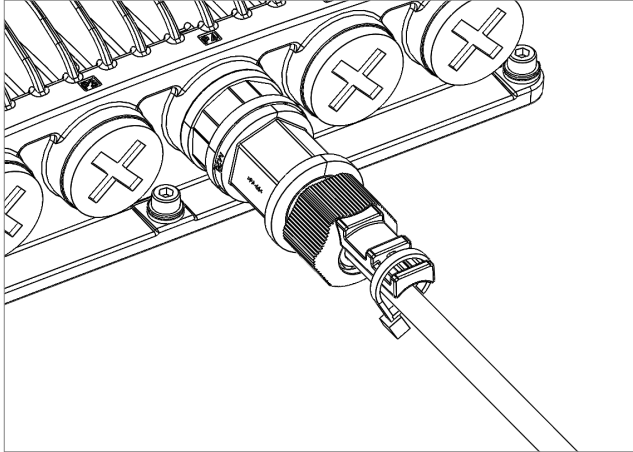
6. Tighten the gland to the gland extender until there is full contact between the gland and the gland extender.



7. Tighten the gland cap.



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



## Connecting an MPO-MPO Cable to the QSFP Port for QSFP Links

The QSFP port on the PTP 850E (P4) can be used for 4x1/10 Gbps configurations. Both 1G and 10G links can be used simultaneously with the same unit.

In a 4x1/10G configuration, the QSFP port can provide four Ethernet interfaces: Eth3, Eth4, Eth 5, and Eth6. In this configuration, a QSFP transceiver is attached to the QSFP port, and an MPO-MPO cable is connected between the transceiver and a splitter on the other side of the link. The splitter splits the traffic between four Ethernet cables connecting the splitter to the customer equipment. These accessories are listed in . For a list of approved MPO-MPO cables, see Section [MPO-MPO Cables for QSFP Links](#) .

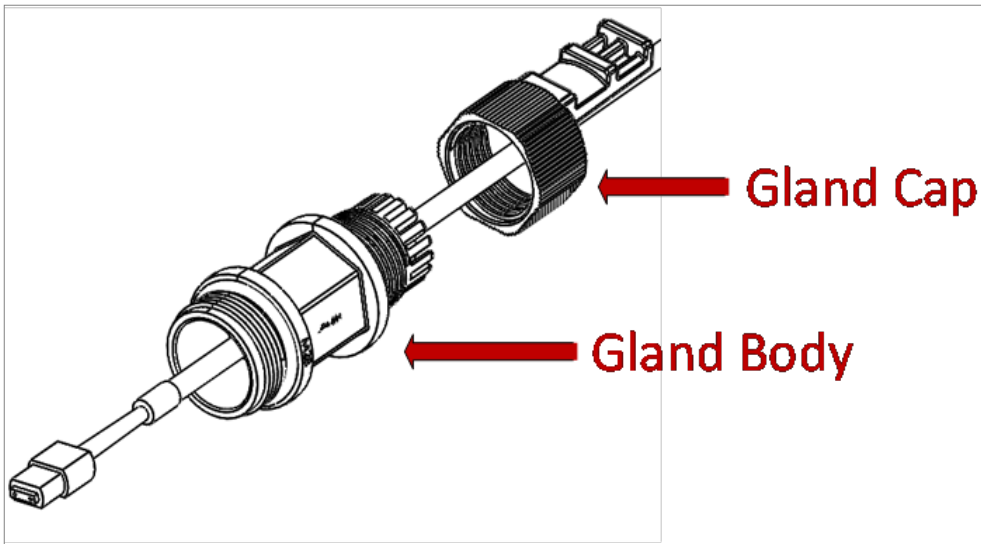


**Note:**

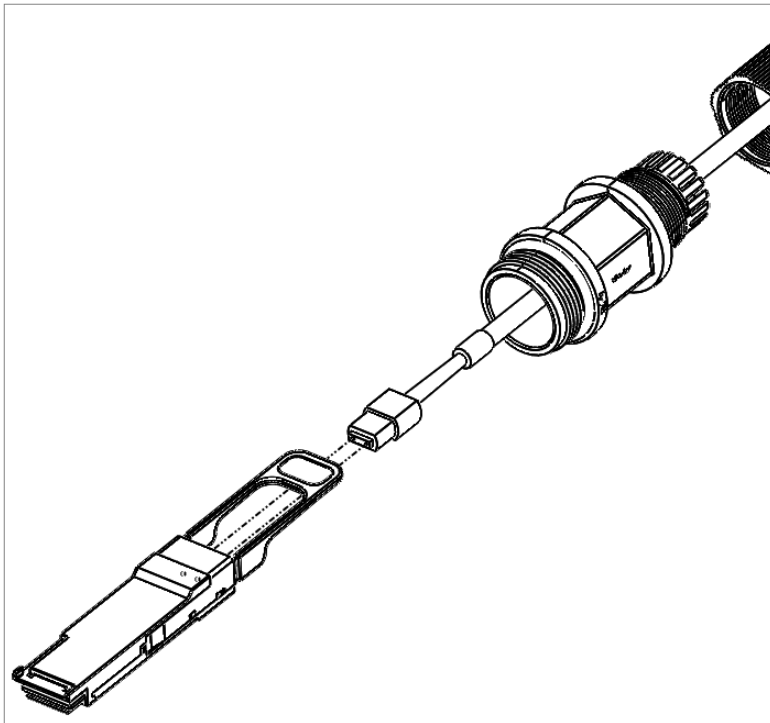
The Ethernet cables connecting the splitter to the customer equipment, and the SFP transceivers attached to the customer equipment, must be multimode type.

To connect an MPO-MPO cable to the QSFP port (Port 4) of the PTP 850E:

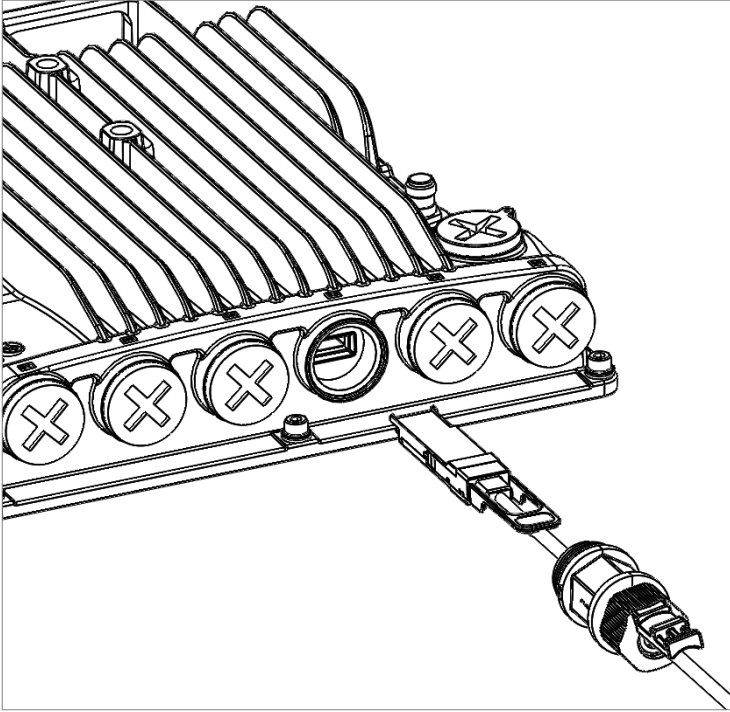
1. Remove the cap from Port 4. You can use the side of the gland to unscrew the cap.
2. Before connecting the cable to the QSFP transceiver, make sure the gland cap is not tightened to the gland body.



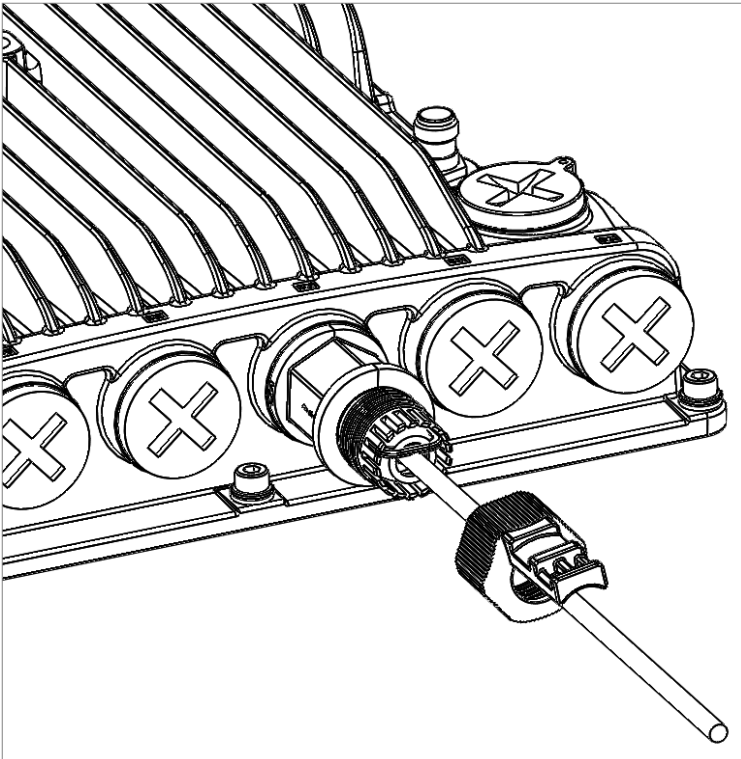
3. Connect the cable to the QSFP transceiver. Listen for the click to ensure that the cable is fully inserted.



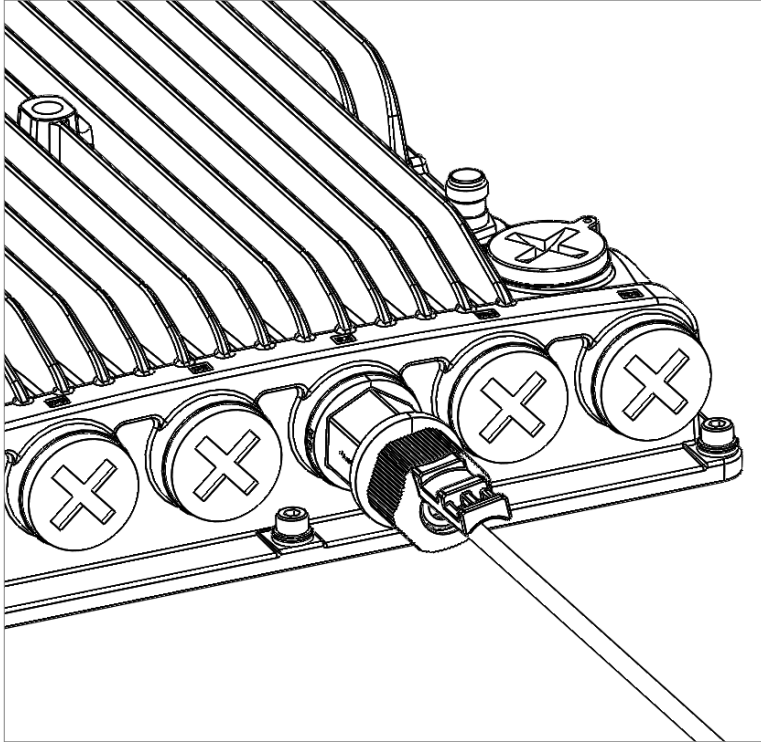
4. Connect the QSFP transceiver to Port 4 of the PTP 850E.



5. Tighten the gland to the port until there is full contact between the gland and the port.



6. Tighten the gland cap.



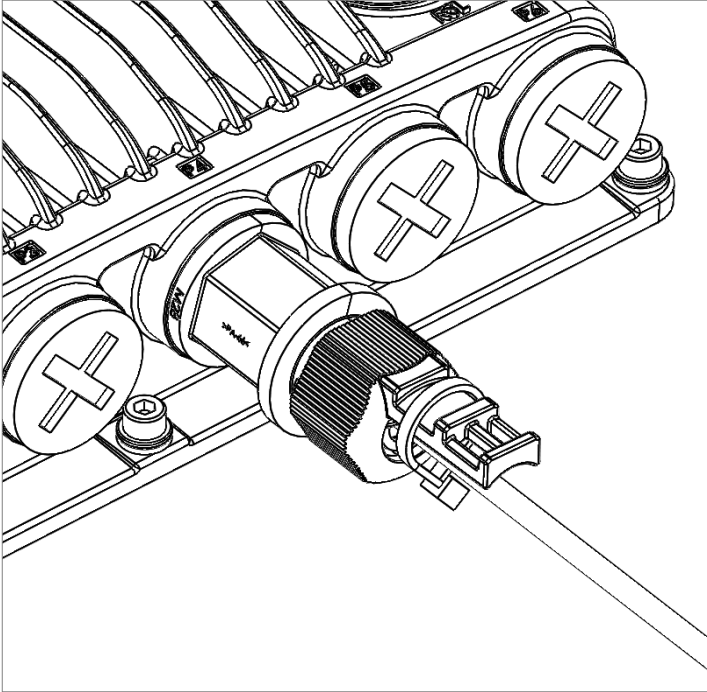
**Note:**

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.

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

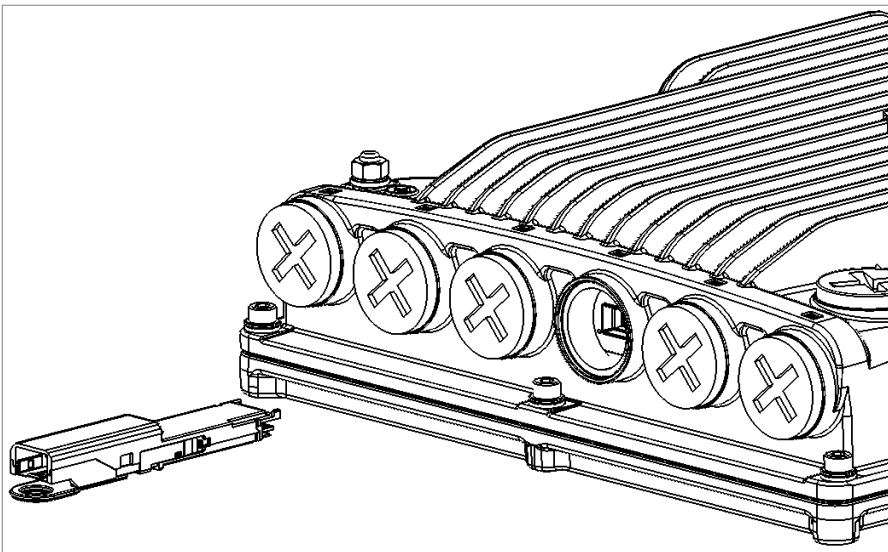


## Connecting a CPRI Module and Cable to the QSFP Port

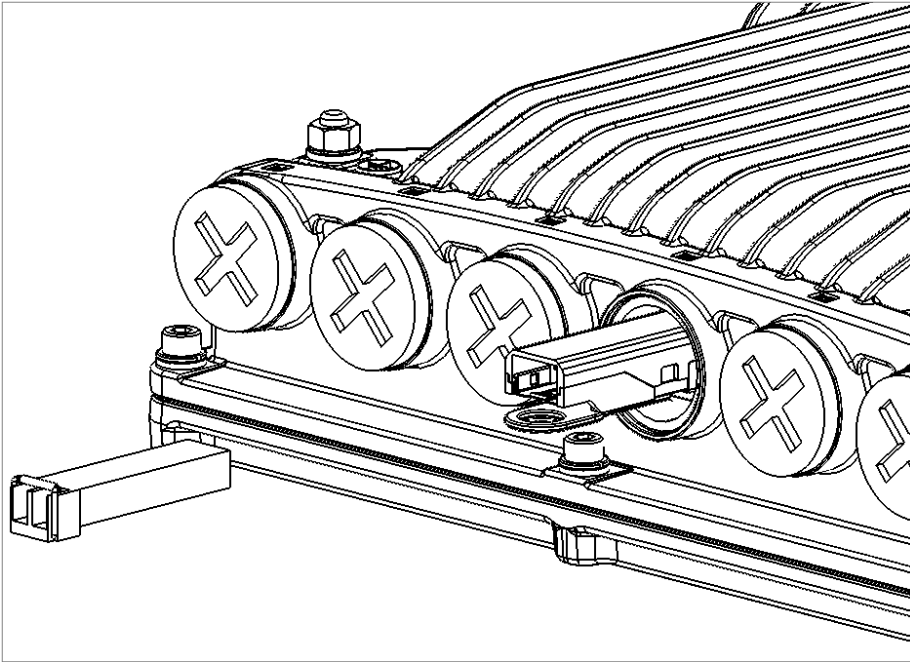
The QSFP port on the PTP 850E (P4) can be used with a CPRI module and extender to provide CPRI links. A CPRI link uses a fiber optic cable. See [Available Cable Options](#).

To connect a CPRI module and cable to the QSFP port (Port 4) of the PTP 850E:

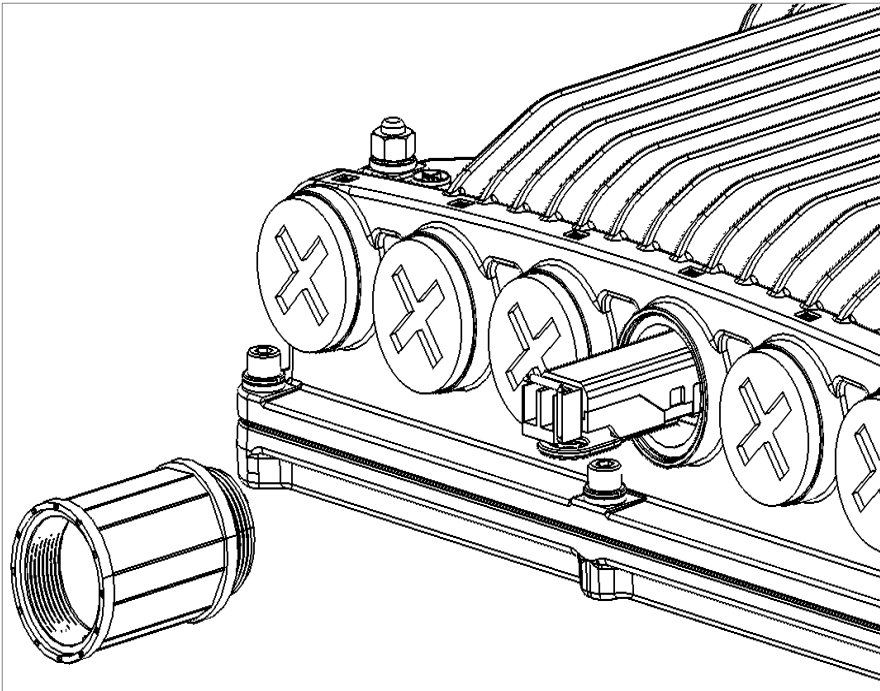
1. Remove the cap from Port 4. You can use the side of the gland to unscrew the cap.
2. Connect the CPRI module to the QSFP port.



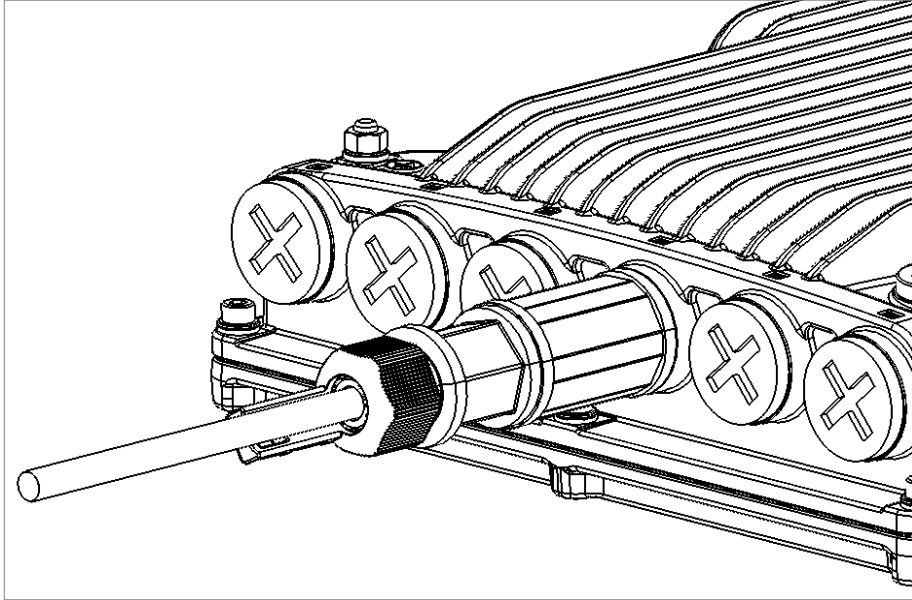
3. Connect an SFP transceiver (not supplied) to the CPRI module.



4. Tighten the CPRI Extender Gland (supplied with the CPRI module) to the QSFP port.



5. Tighten the M28 Gland (supplied with fiber optical cable) over the CPRI Extender Gland and secure the cable.



## Connecting a DC Power Cable

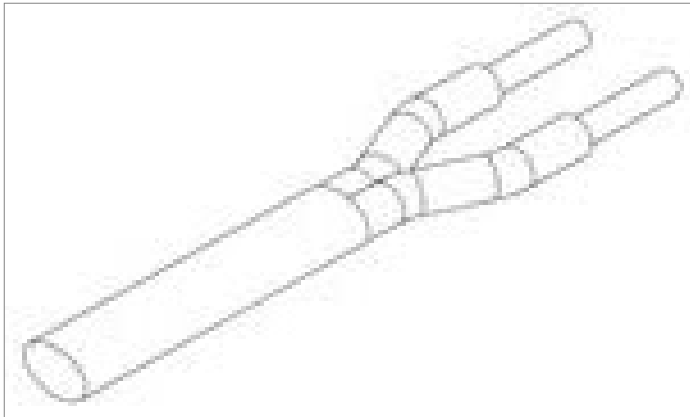


**Note:**

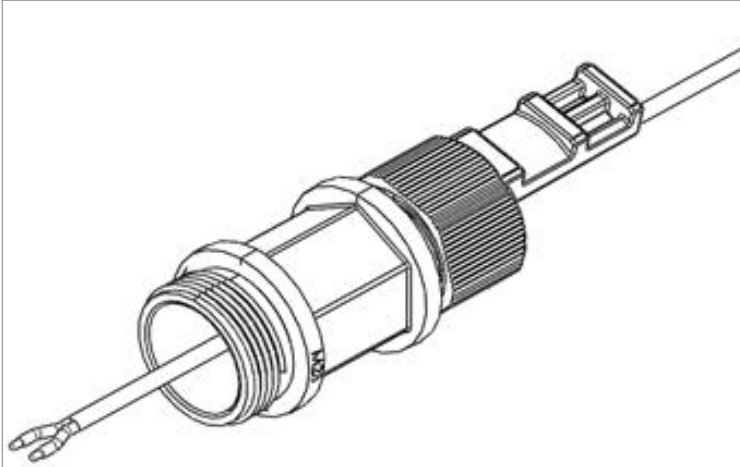
The DC power cable and connector must be ordered separately. See [DC Cable and Connector](#).

To connect a DC power cable:

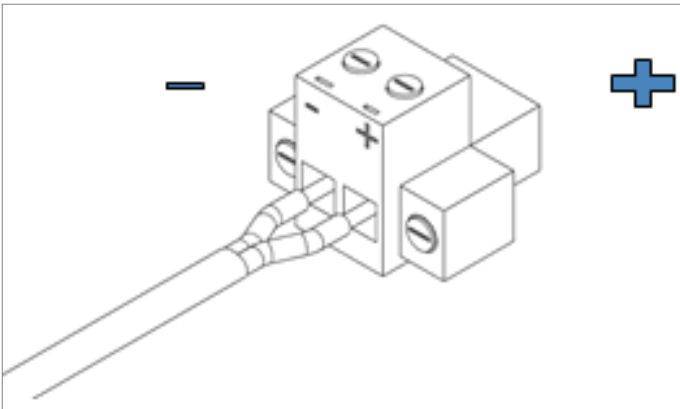
1. Strip off 45 mm from the cable jacket.
2. Expose 10 mm at the edge of each of the two wires.



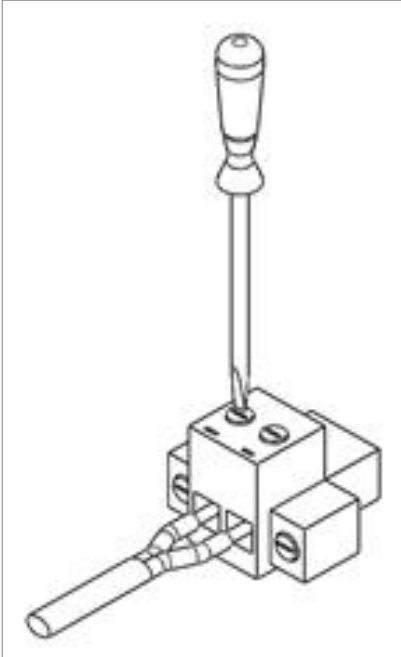
3. Insert the power cable into the gland.



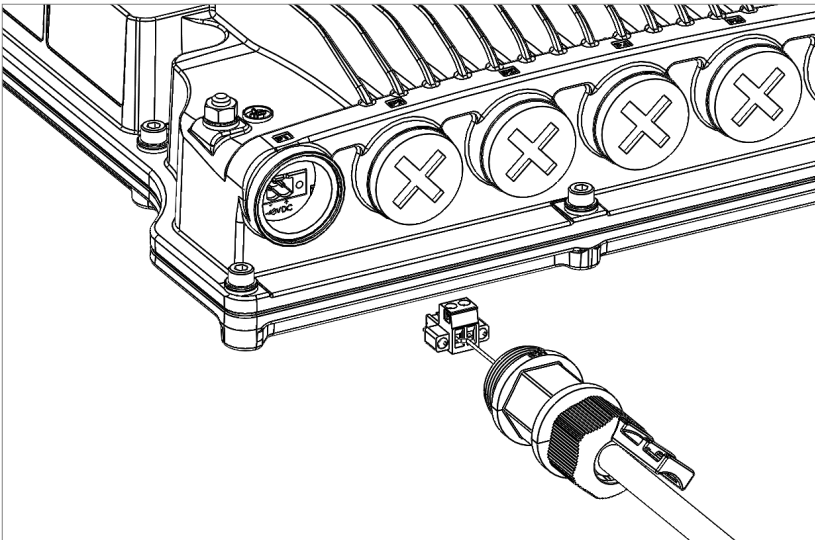
4. Insert the power cable wires into the power connector.
5. Insert the power cable wires into the power connector. Match “+” to the 0V wire and “-” to the -48V wire.



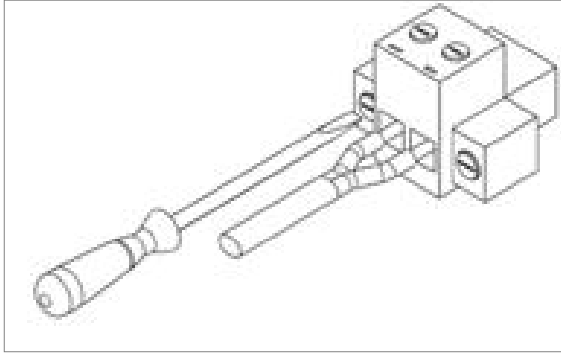
6. Tighten the two top screws.



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



8. Tighten the two front screws.

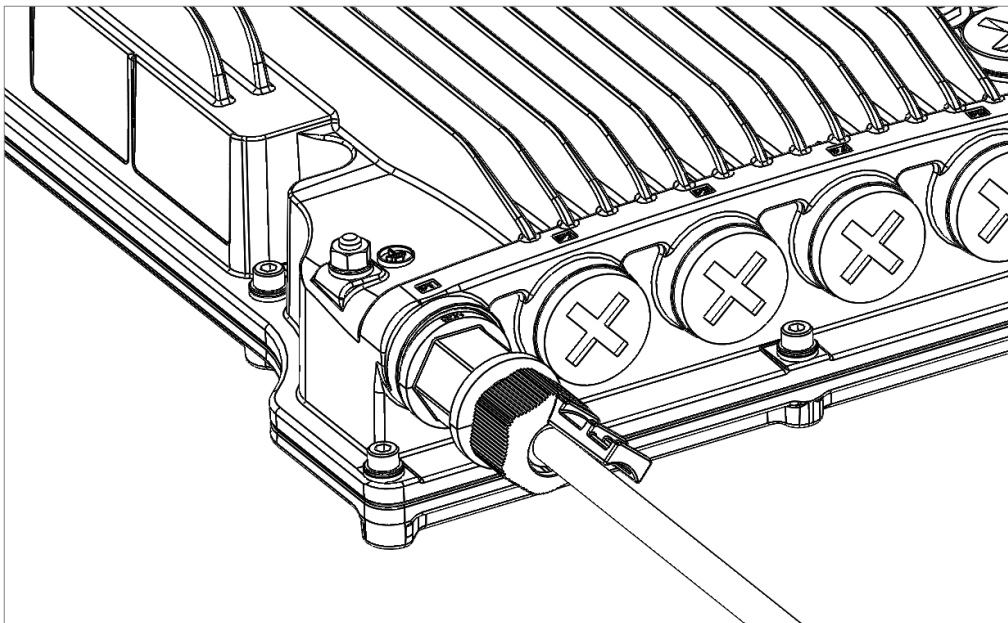


9. Screw the gland into the radio unit.

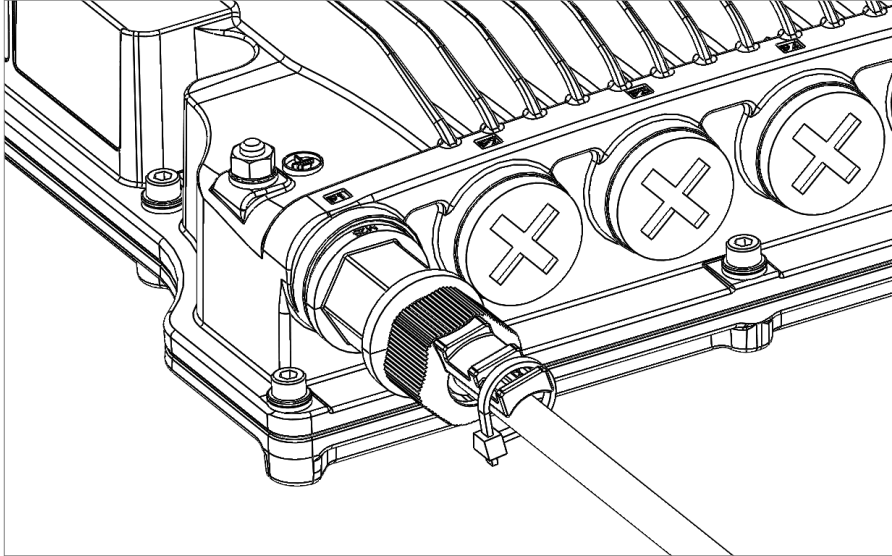


**Note:**

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 section [Preparing the Ethernet Cable and Plug-in Field](#), then proceed to section [Connection of Ethernet Cable to PTP 850E](#).

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



**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.



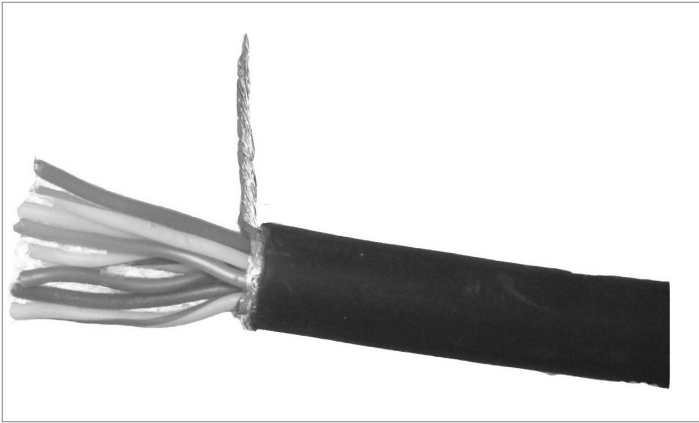
**Table 22** Materials for Preparing Ethernet Data Cables

Marketing P/N	Description
N000082L016A	PTP 820 CAT5E Outdoor 100m drum
N000082L014A	PTP 820 Glands_x5_KIT

Marketing P/N	Description
N000082L017A	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable
N000082L073A	PTP 820 GBE_Connector_kit

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.



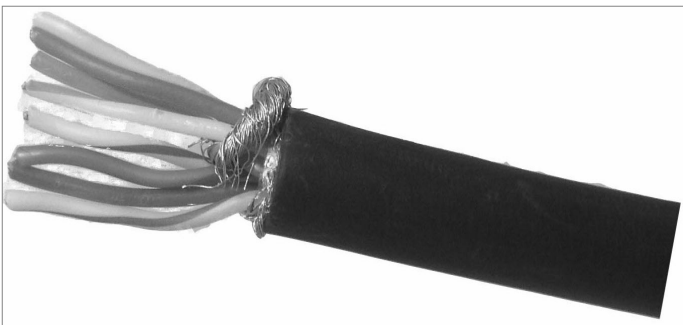
4. Roll back the foil shield insulation and wrap the drain wire around the foil. Do not remove any insulation from the conductors.
5. Align the colored wires.



**Note:**

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

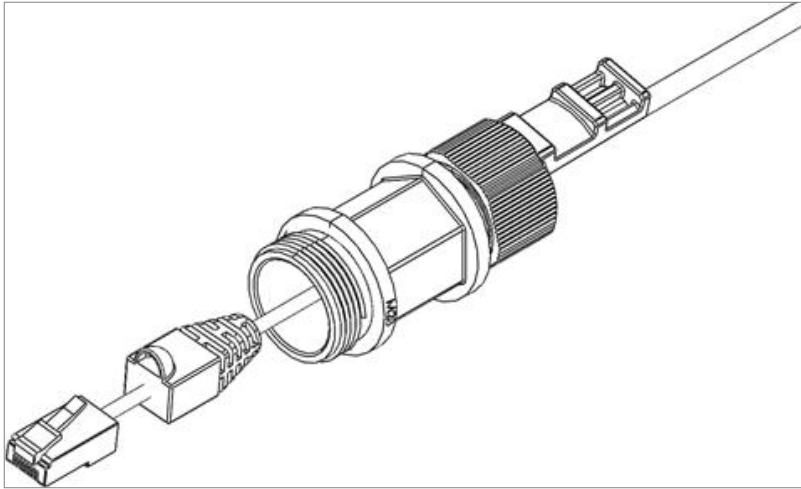
6. Trim all wires to the same length. About 12 mm on the left should be exposed from the inner sheath.
7. Separate the wires and place the twisted shield between the separated wires.



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 Section [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.

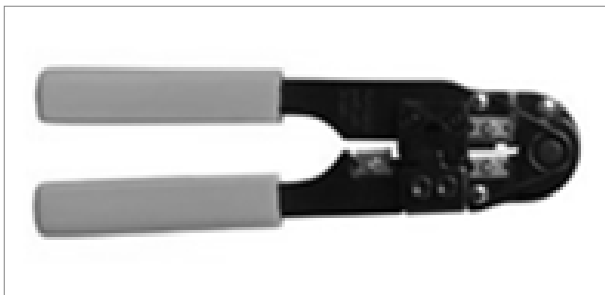


**Note:**

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 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.



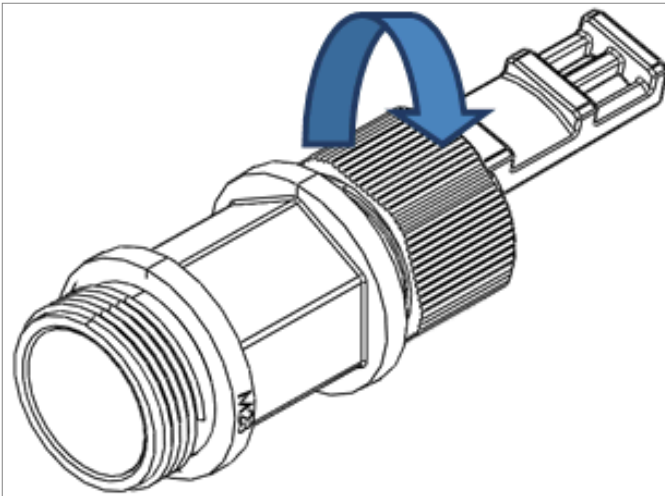
**Note:**

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.

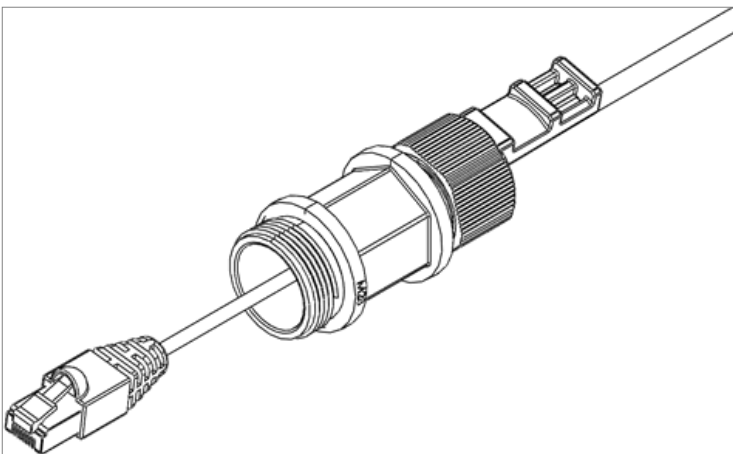
## Preparing the Ethernet Cable Already Assembled

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.

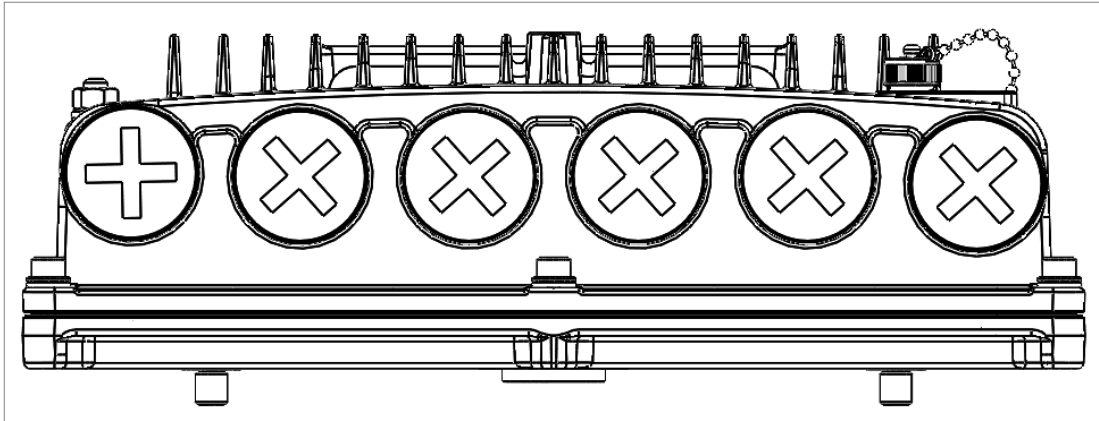


3. Insert the CAT5e cable into the gland body.

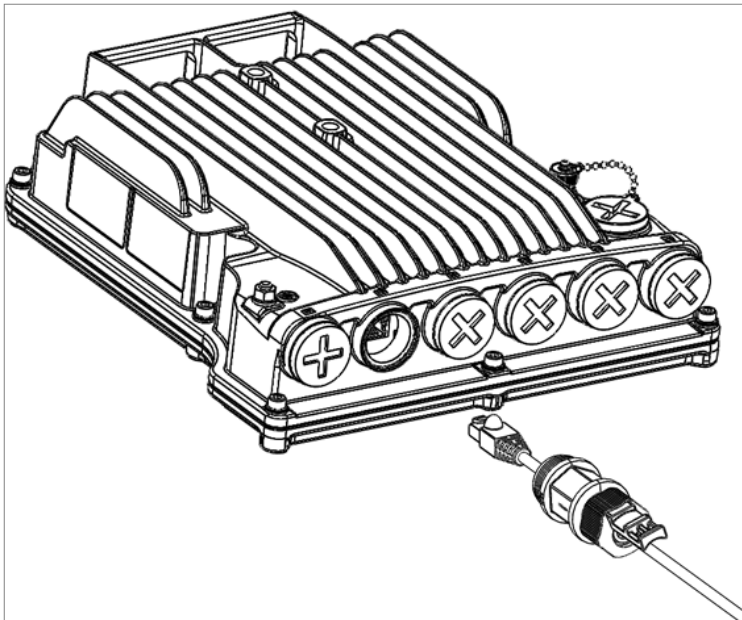
## Connection of Ethernet Cable to PTP 850E

To connect the Ethernet cable to the PTP 850E:

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



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

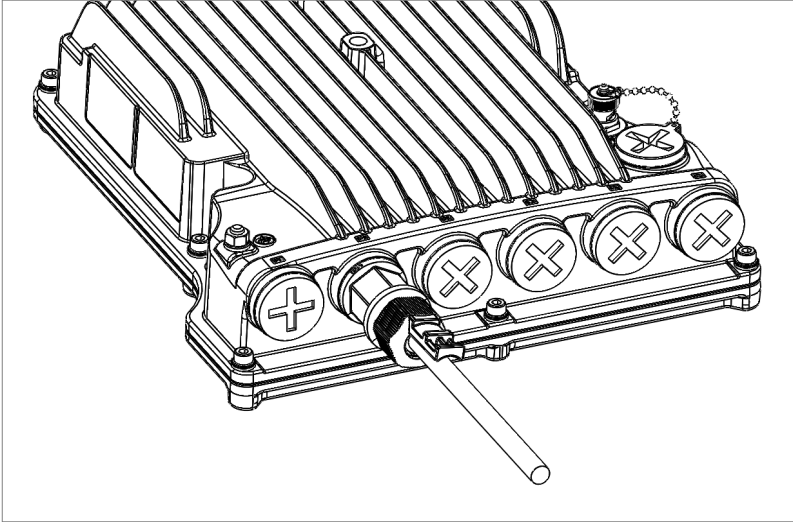


3. Screw the gland into the radio unit.

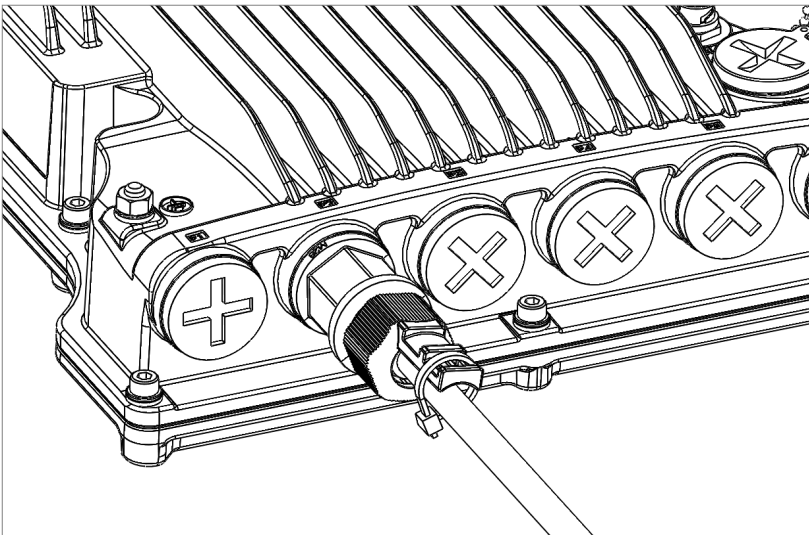


**Note:**

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 850E

In HSB protection and XPIC configurations, the Protection/XPIC port (P6) is used to connect two PTP 850E units. The Protection/XPIC cable is supplied with the glands attached.

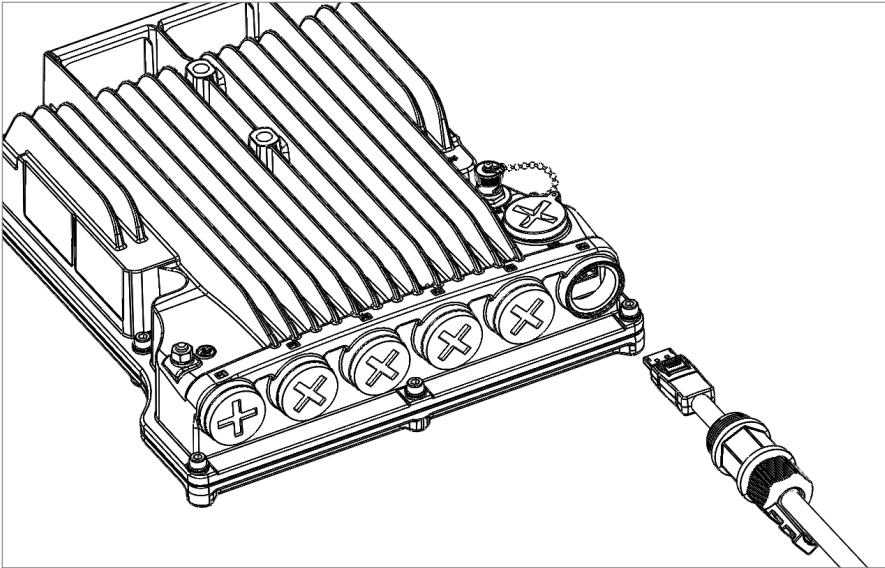


**Note:**

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

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

1. Remove the relevant cap from the PTP 850E radio. You can use the side of the gland to unscrew the cap.
2. Connect the XPIC cable to the PTP 850E.

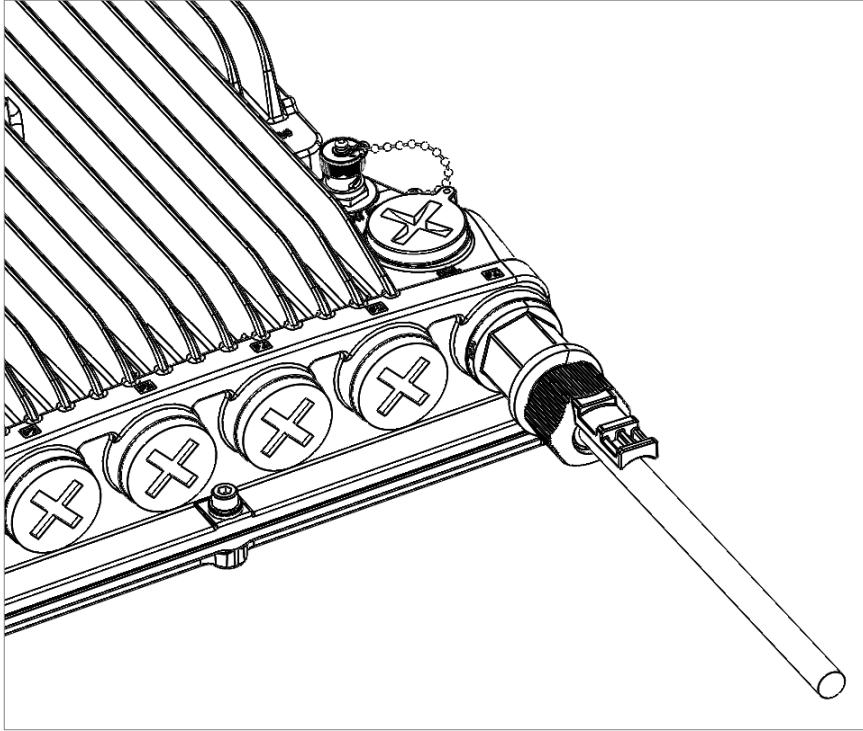


3. Screw the gland into the radio unit.

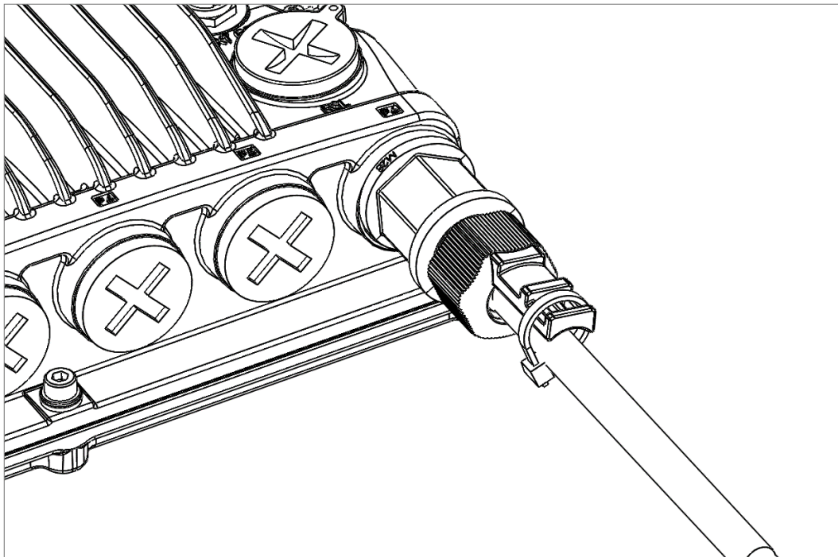


**Note:**

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 850E following steps 1-5.

# Connecting the Traffic and Protocol Cables for Multiband Configurations

## List of Items

Item	Description	Quantity	Remarks
1	SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP	4	SFP transceiver for Protocols and Traffic connections between units (P3 and P5 on each unit).
2	Optical Cables for transmitting traffic and protocols between units	1 or 2	See <a href="#">Table 9</a> . <b>Note:</b> Some configurations can use a single cable for traffic and protocols. For details, refer to the User Guide for the System Release release you are using.

## Procedure

1. P3 on both units requires a special SFP transceiver (SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP) in order to support the Protocols connection between the two units. Make sure to use this SFP transceiver in P3.

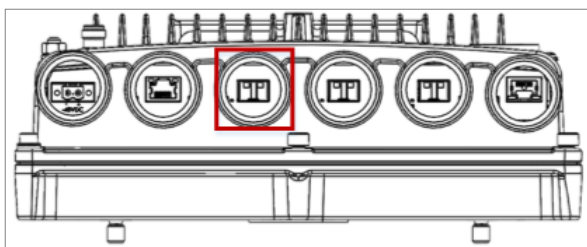
**Note:**

Alternatively, you can also use SFP-3.7G-SX-EXT-TEMP.

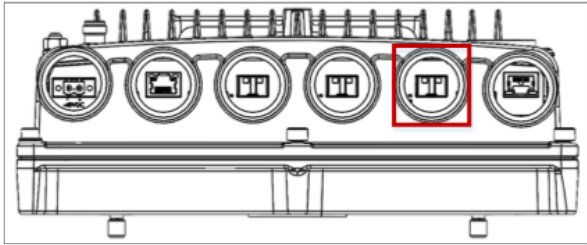
2. P5 on both units requires a special SFP transceiver (SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP) in order to support the Traffic connection between the two units. Make sure to use this SFP transceiver in P5.
3. Connect the Protocols cable between P3 of both units. The interface should be configured to 2.5 Gbps on both units.

**Note:**

Some configurations do not require a separate Protocols cable between the units. In these configurations, L2 protocol data is transmitted between the devices via the same cable that carries traffic. For details, refer to the User Guide for the System Release version you are using.



4. Connect the Traffic cable between P5 of both units. The interface should be configured to 10 Gbps on both units.



# PoE Injector Installation and Connection

---

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

- PoE\_Inj\_AO\_2DC\_24V\_48V
- PoE\_Inj\_AO

## PoE Injector Cable Connection

The PoE Injector cables are connected similar to the PTP 850E cables.

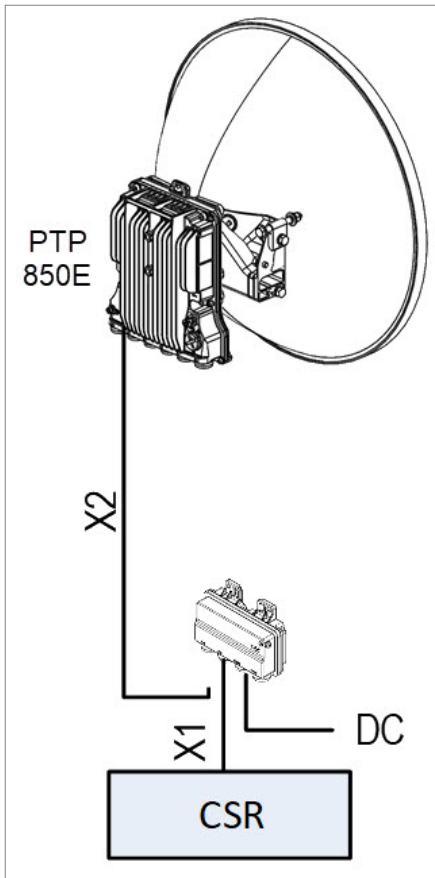
- To connect an Ethernet (CAT5e) cable to the PoE port, refer to [Connection of Ethernet Cable to PTP 850E](#).
- To connect a DC power cable to the power port, refer to [Connecting a DC Power Cable](#). This cable is not supplied with the PoE Injector.
- The total length of the cable between the PTP 850E port and the Switch/Router the device is connected to should not exceed 100m/328ft. This length includes the connection between the PTP 850E 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).

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**

Part number	Marketing Description
N000082L014A	PTP 820 Glands_x5_KIT

**Required Tools**

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

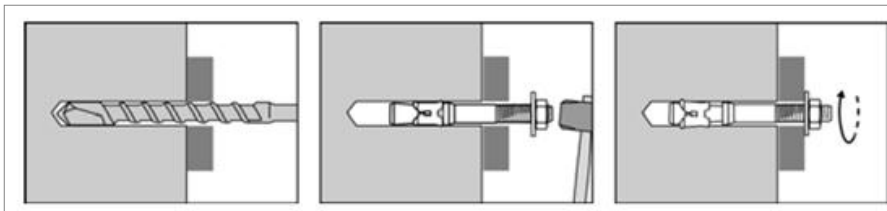
**Procedure**

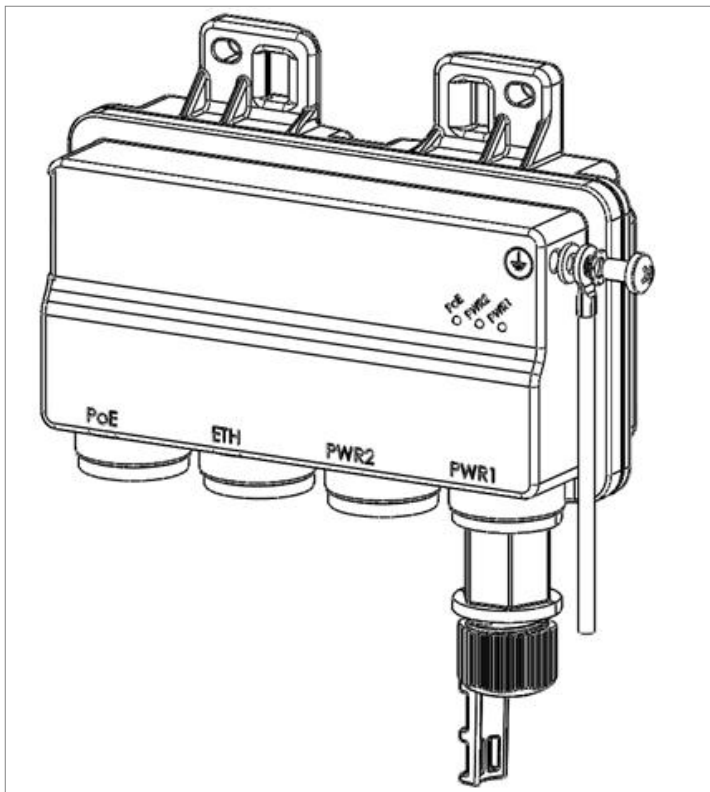
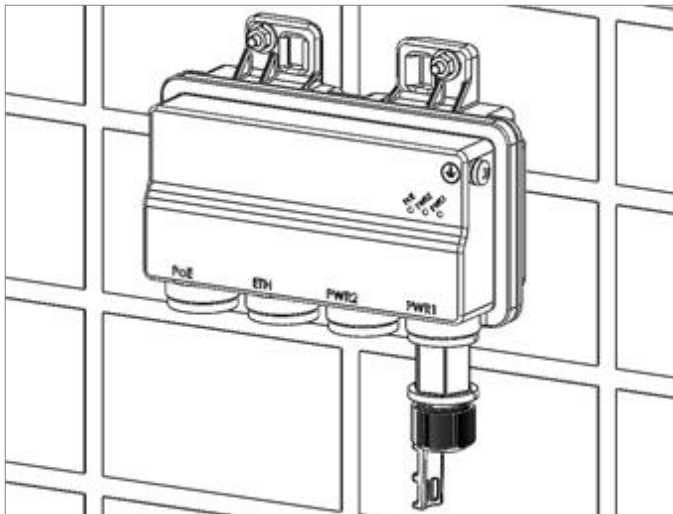
1. Mount and tighten the PoE Injector to a wall using two M6 bolts and anchors. The M6 bolts and anchors must be purchased separately.

**Note:**

Use Anchor Stainless Steel with flanged Hexagonal nut M6X70.

2. Drill two 6mm diameter holes with 100mm 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:

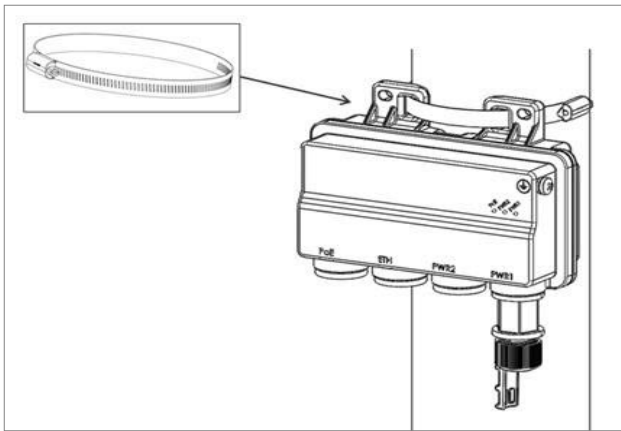
1. Mount and tighten the PoE Injector to a pole with a diameter of 114 mm using a stainless steel hose clamp.
2. Pass the hose clamp through the pole mount slots.



### 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	Remarks
1	PoE Injector	1	
2	PoE Injector 19" Rack Mount Kit	1	

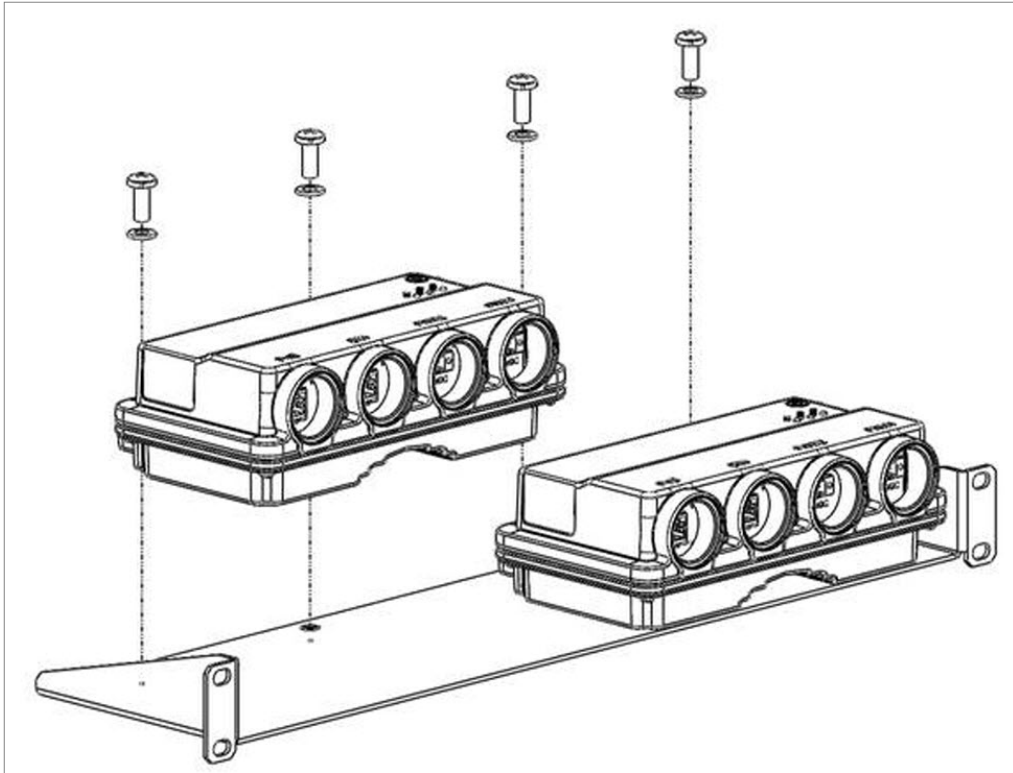
## Required Tools

- Philips Screwdriver

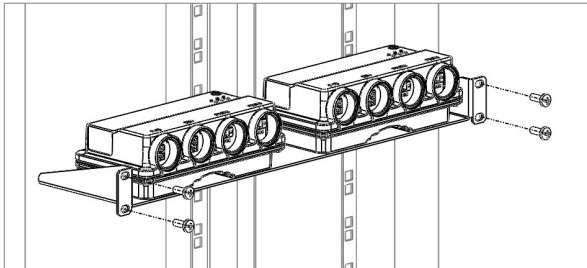
## Procedure

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	Remarks
1	PoE Injector	1	
2	PoE Injector ETSI Rack Mount Kit	1	

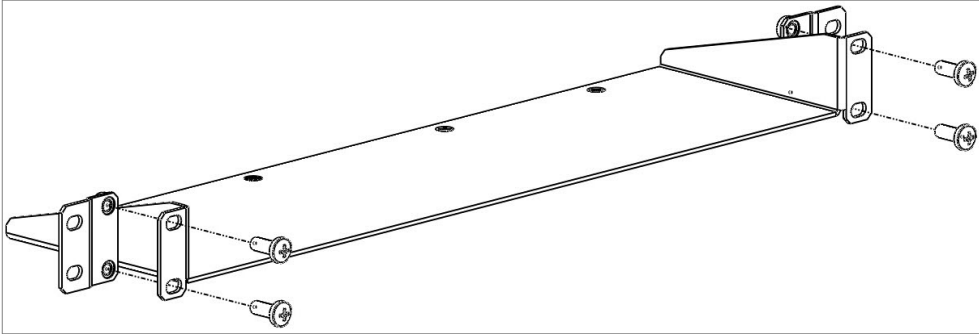
## Required Tools

- Philips Screwdriver

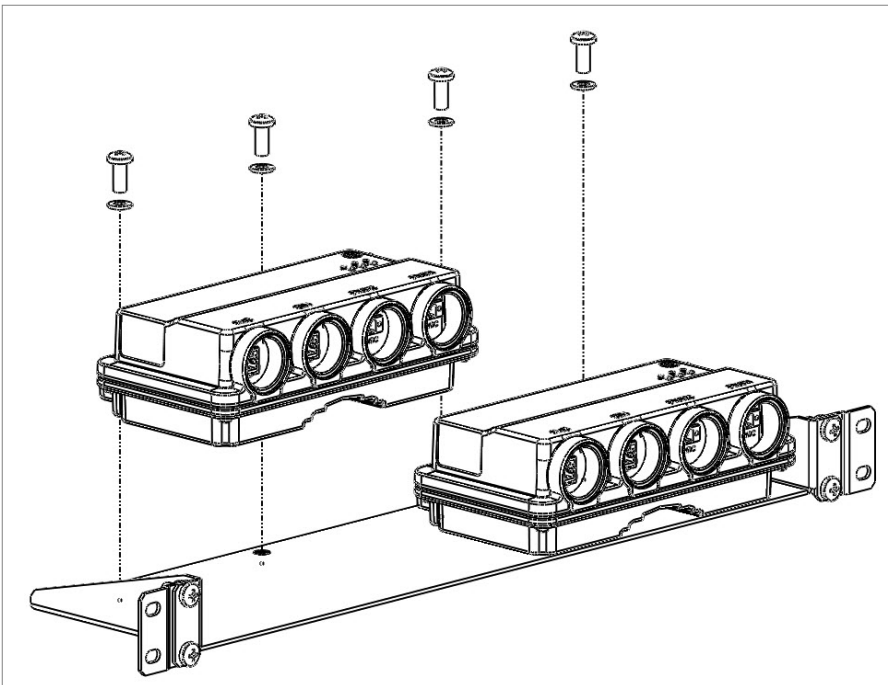
## Procedure

To mount the PoE Injector to an ETSI rack:

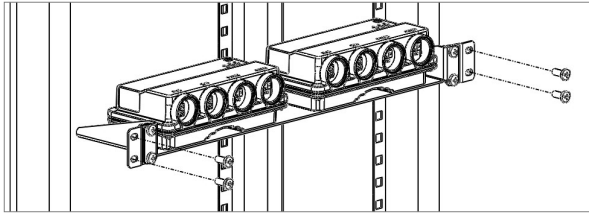
1. Mount the PoE Injector to an ETSI rack using a 19" rack adaptor and ETSI adapting ears.
2. Connect the ETSI adapting ears to a 19" rack adaptor using four M6 screws.



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 nut.



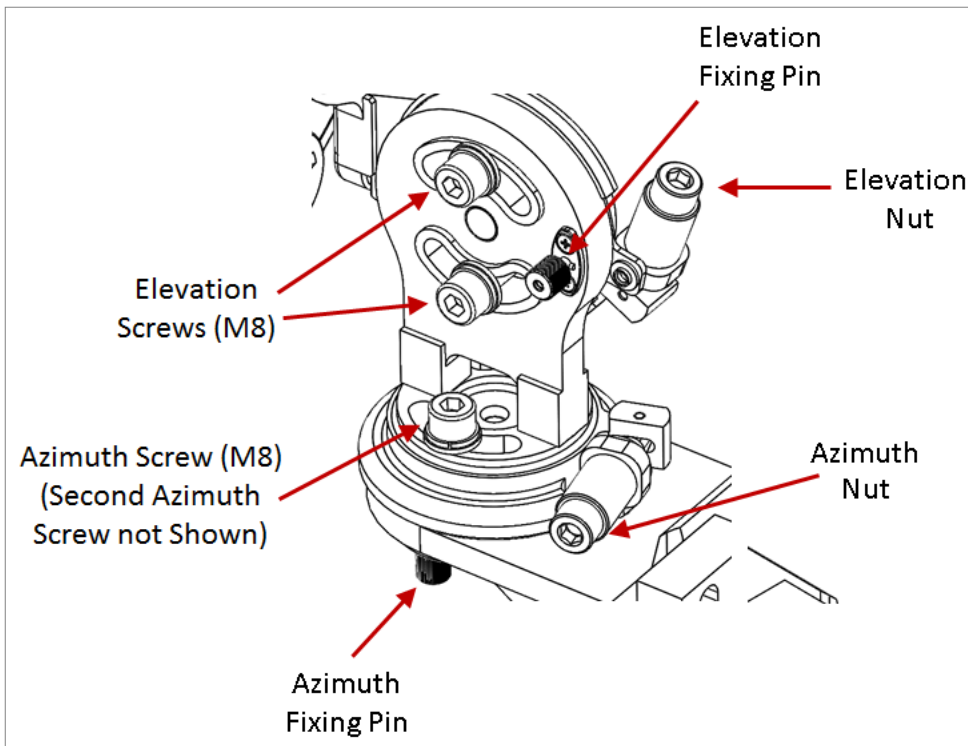
**Note:**

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

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

When you order an PTP 850E 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 Tools*



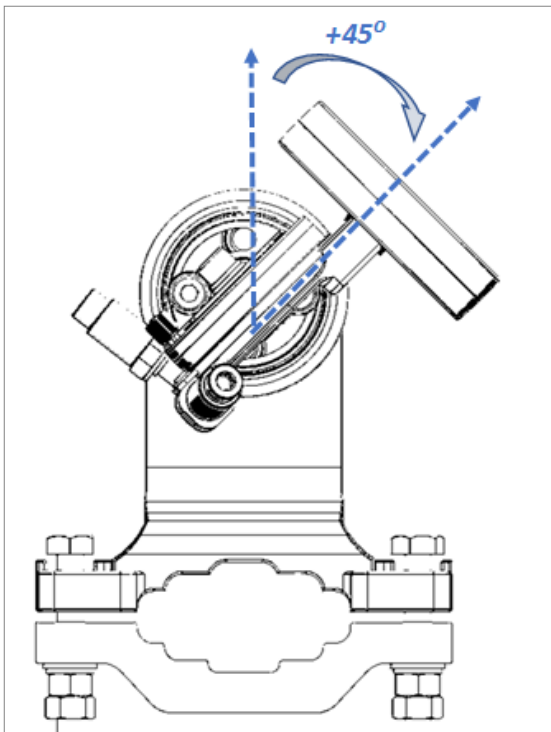
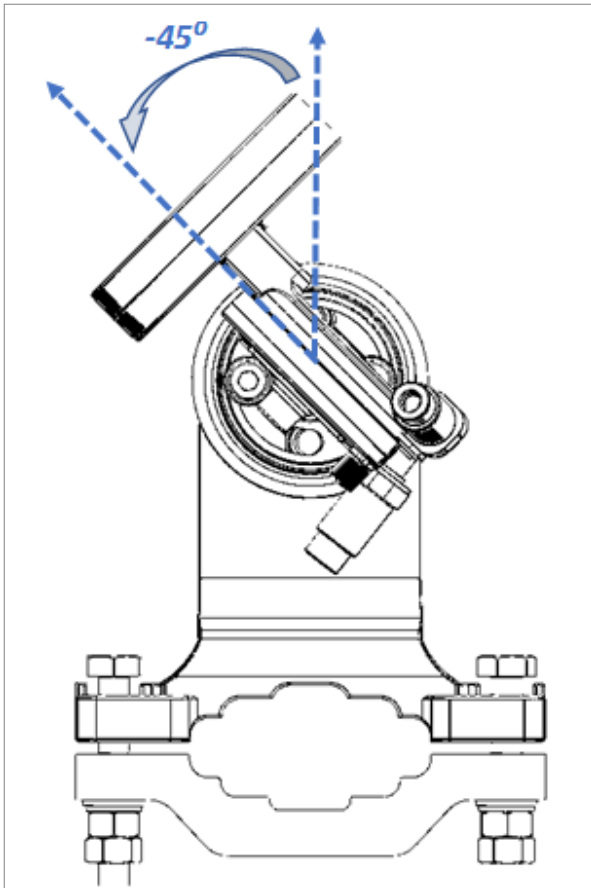
The installation and alignment device enables you to easily adjust the antenna’s azimuth and elevation, in gross and fine intervals. Gross alignment enables you to adjust the azimuth and elevation in 15° increments. Fine alignment enables you to make more precise adjustments by turning the Azimuth and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

There are two M8 Elevation Screws and two M8 Azimuth screws, as shown in [Figure 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.

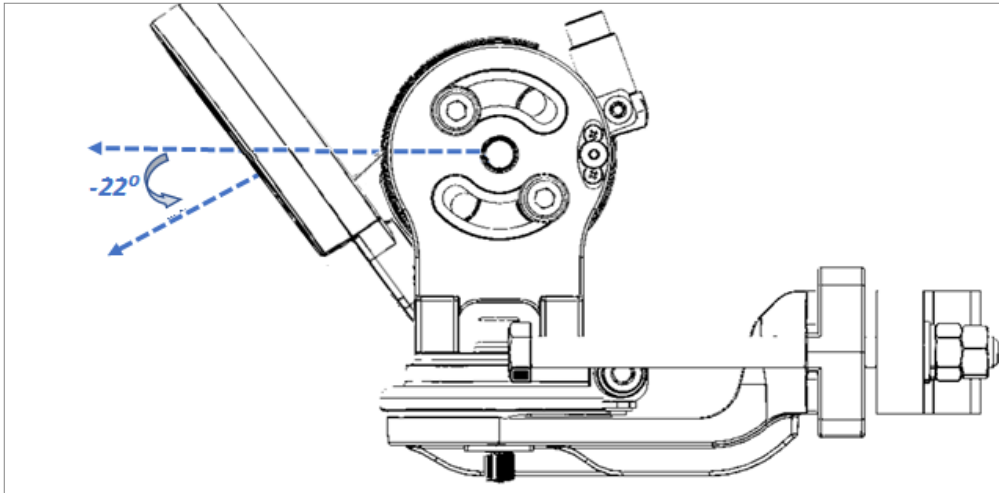
**Figure 14:** Installation and Alignment Device – Azimuth Range (Pole Mount)



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.

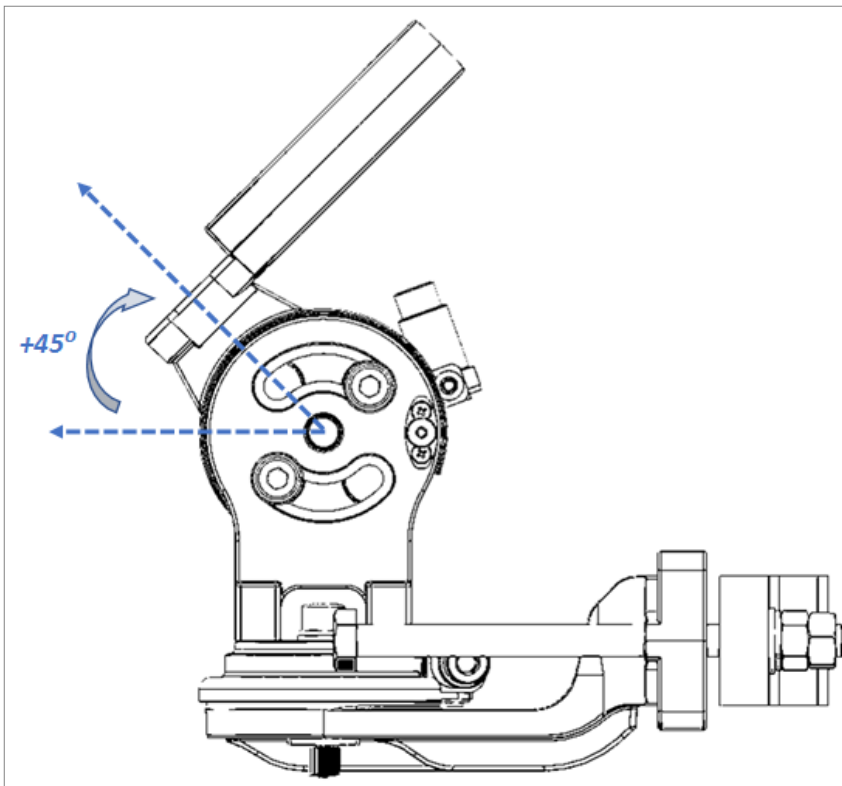
You can adjust the elevation from the delivery position of 22° downward up to a position as far as 45° upward. Be sure to attach the PTP 850E radio and antenna to the installation and alignment device *before* adjusting the elevation, otherwise the weight of the radio and antenna might accidentally reduce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

## List of Items

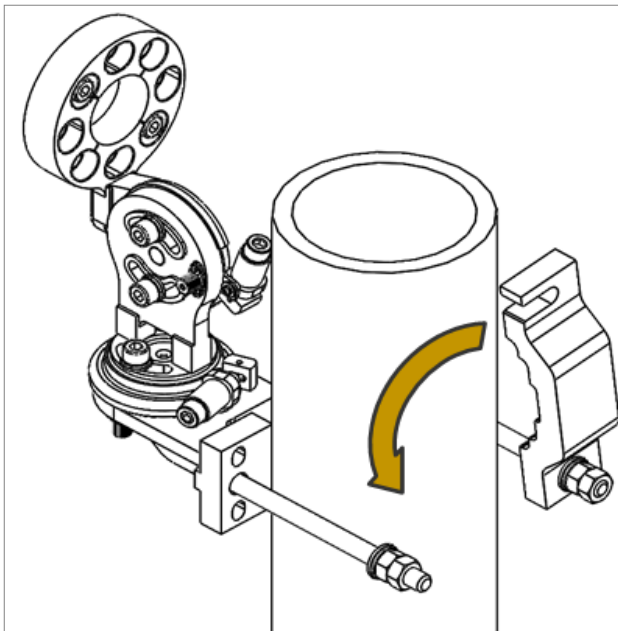
Item	Description	Quantity	Remarks
1	PTP 850E Flat Antenna Mounting Kit	1	
2	PTP 850E radio with 43 dBi Flat Antenna	1	

## Required Tools

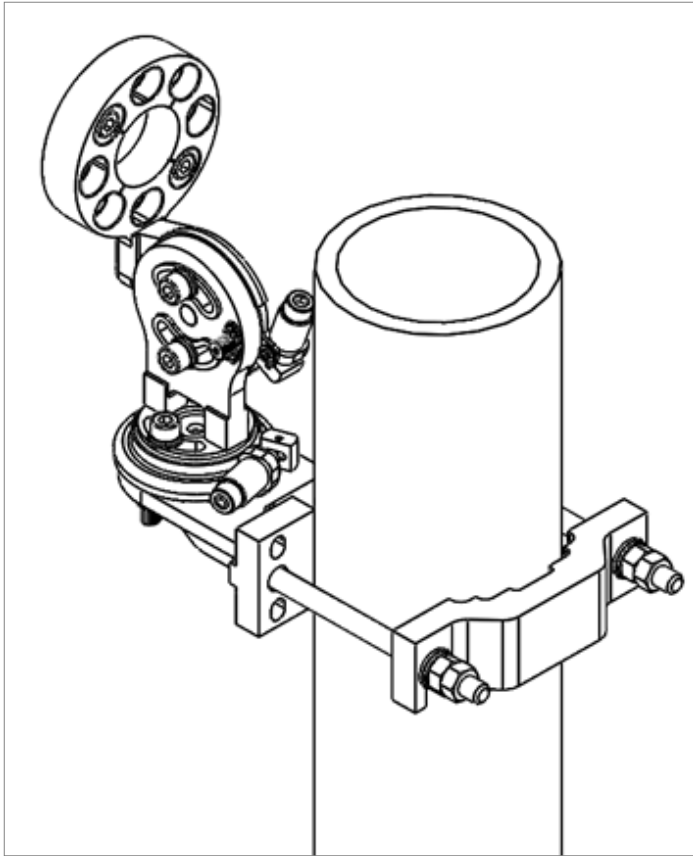
- Socket key wrench inch set
- Socket key wrench metric set
- Open metric wrench set

## 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.



- 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 850E 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

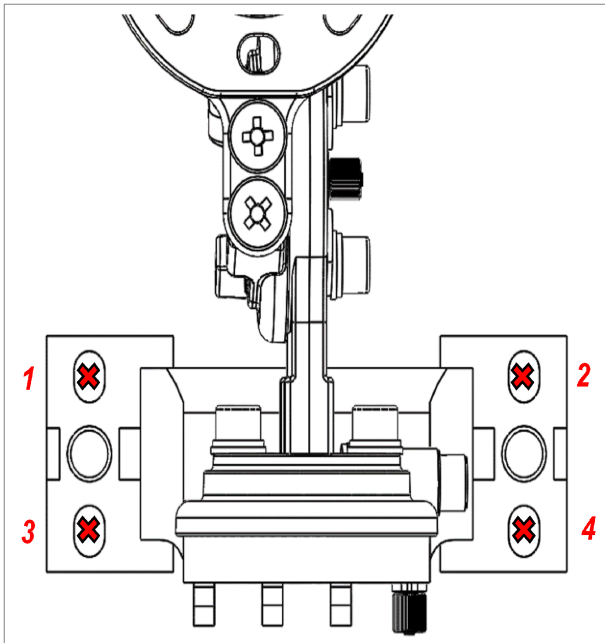


### Note:

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.

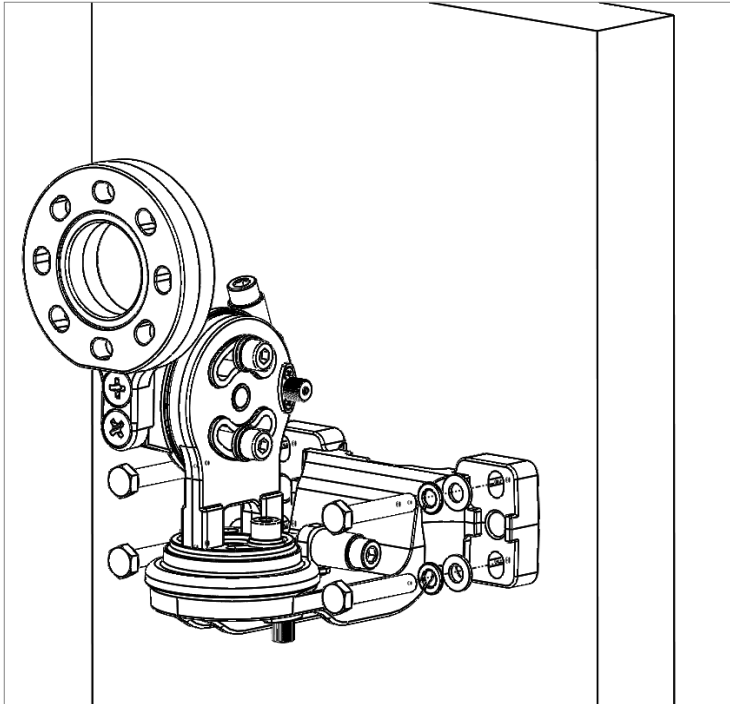
## Procedure

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.

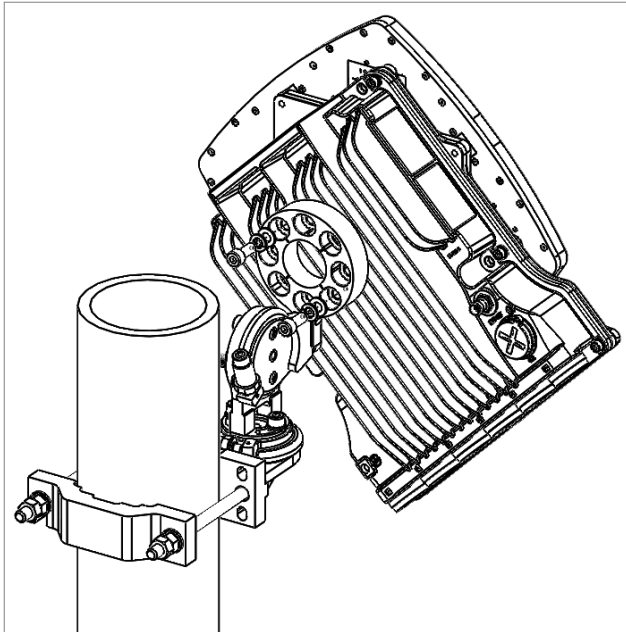


## Attaching the PTP 850E to the Installation and Alignment Device

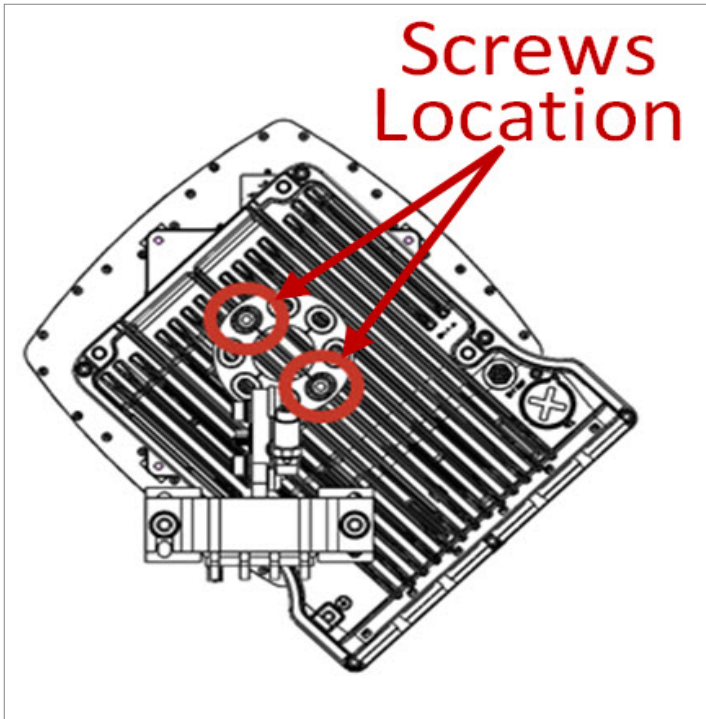
Connect the PTP 850E unit to the installation and alignment device, using the two M8 screws and washers supplied with the installation and alignment kit. Attach the PTP 850E according to the desired polarization, as shown in the figures below. Note that:

- 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.

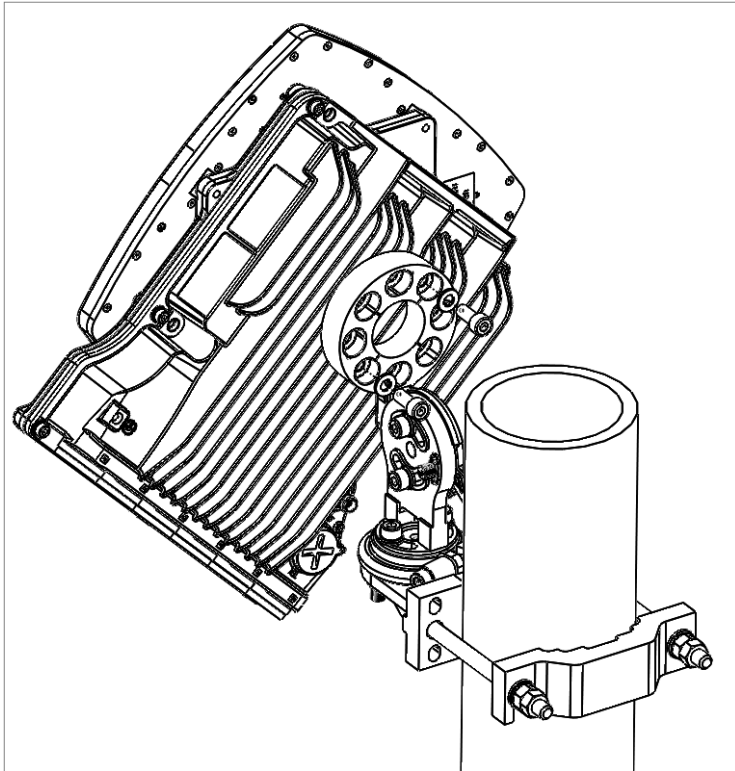
**Figure 17:** Horizontal Polarization – Radio and Installation and Alignment Kit



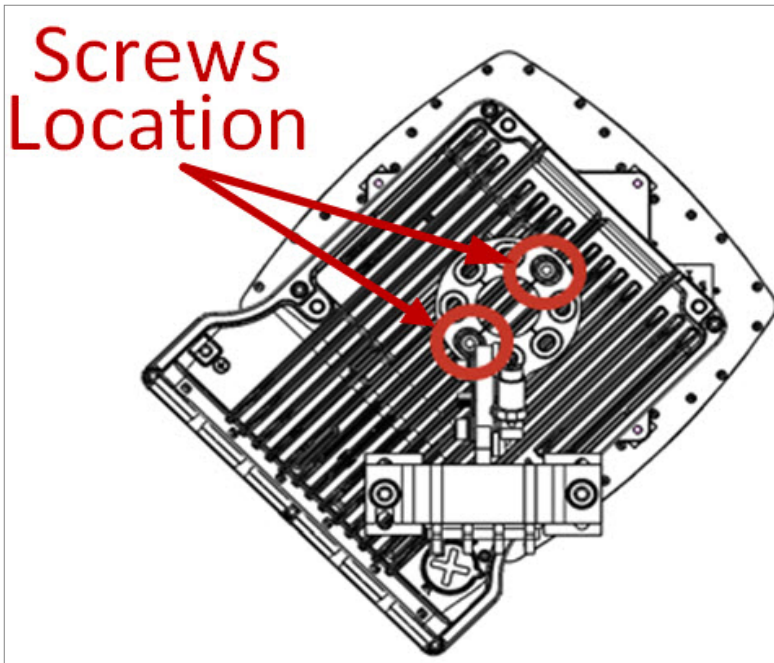
**Figure 18:** Horizontal Polarization – Screws Location



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



**Figure 20:** Vertical Polarization – Screws Location



# Performing Antenna Alignment Using the Enhanced Alignment Kit

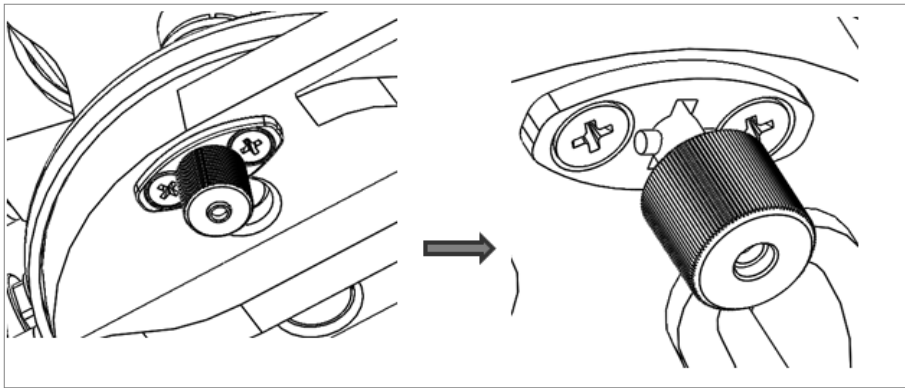
You can easily adjust the azimuth and elevation of the antenna using a number of screws and nuts located on the installation and alignment device as shown in [Figure 13](#).

## Adjusting the Antenna Azimuth

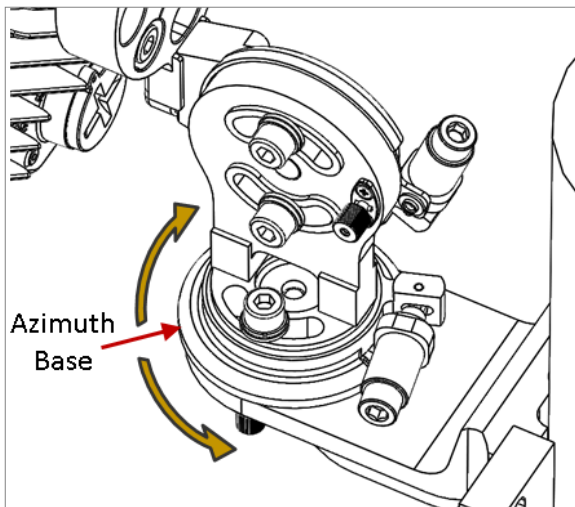
### Performing Gross Azimuth Adjustment

To adjust the antenna azimuth:

1. Loosen the Azimuth Fixing Pin as shown in [Figure 13](#) by pulling it gently out of its groove and rotating it 90° counter-clockwise.



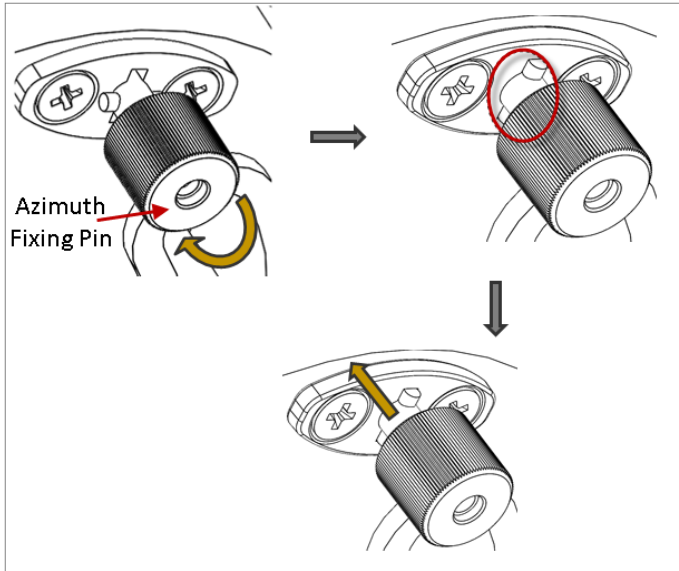
2. Manually adjust the azimuth base to its required location.



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.

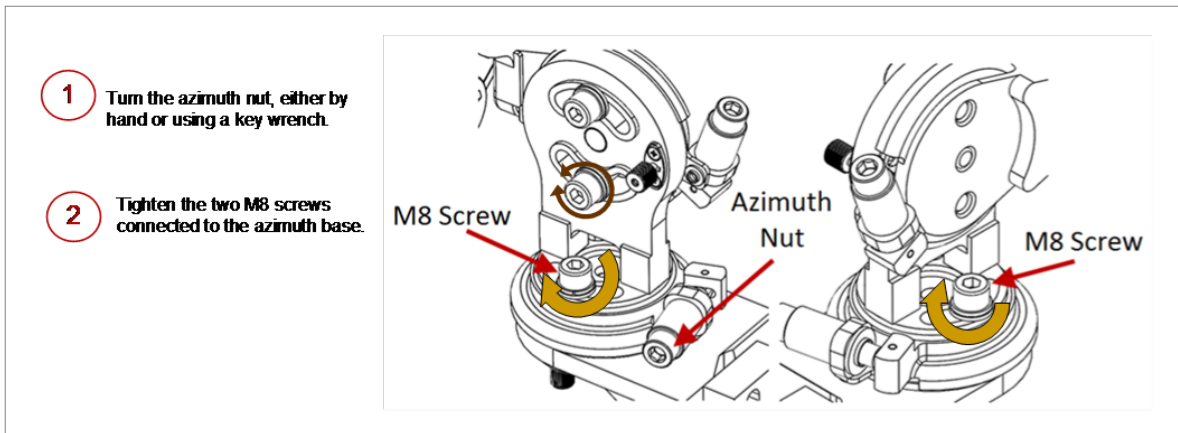
You will hear a click when the pin slips into the groove.



## Performing Fine Azimuth Adjustment

To perform fine azimuth alignment:

1. Turn the Azimuth Nut as shown in [Figure 13](#), 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  $0.25^\circ$ .
2. Tighten the two M8 Azimuth Screws connected to the azimuth base.

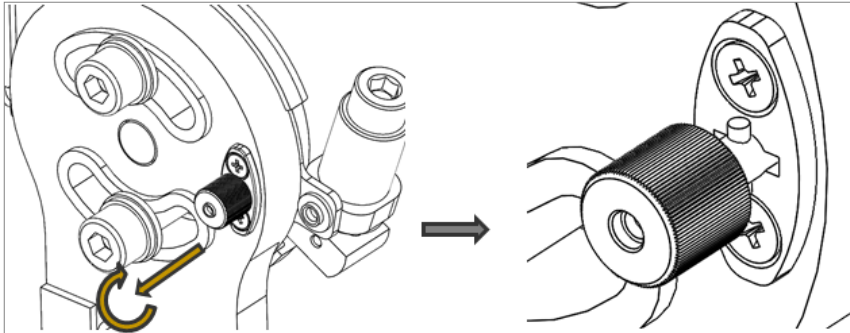


## Adjusting the Antenna Elevation

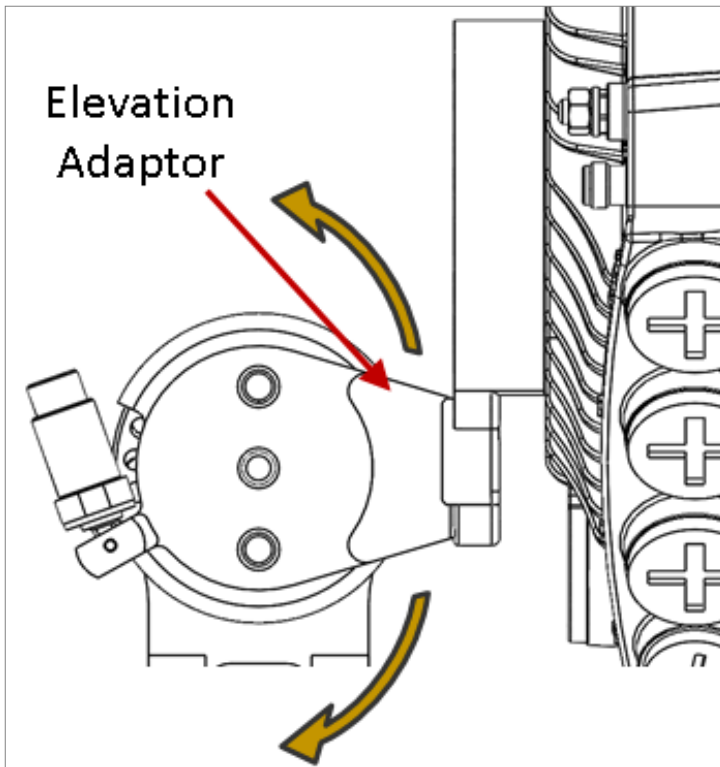
### Performing Gross Elevation Adjustment

To perform gross adjustment of the antenna elevation:

1. Loosen the Elevation Fixing Pin as shown in [Figure 13](#) by pulling it gently out of its groove and rotating it 90° counter-clockwise.



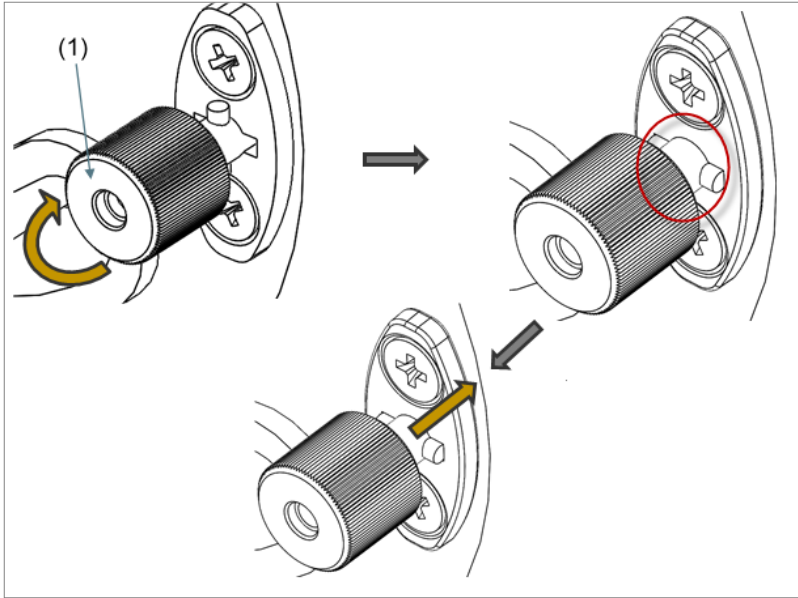
2. Move the Elevation Adaptor to the required location.



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.

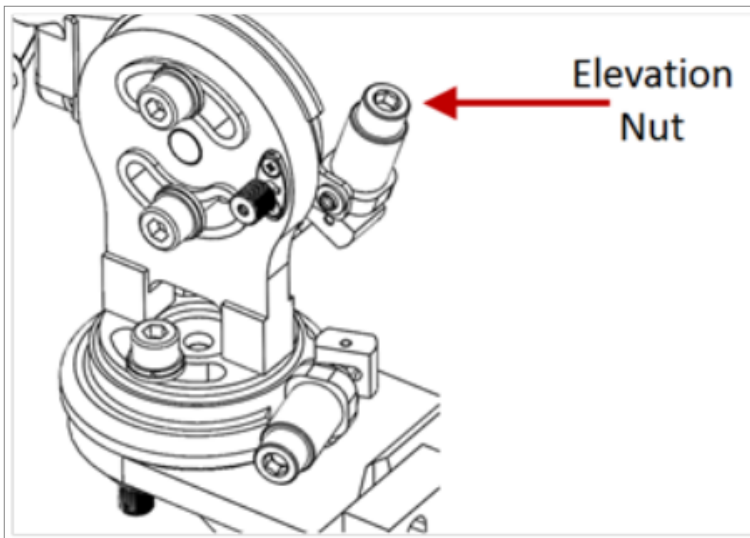
You will hear a click when the pin slips into the groove.



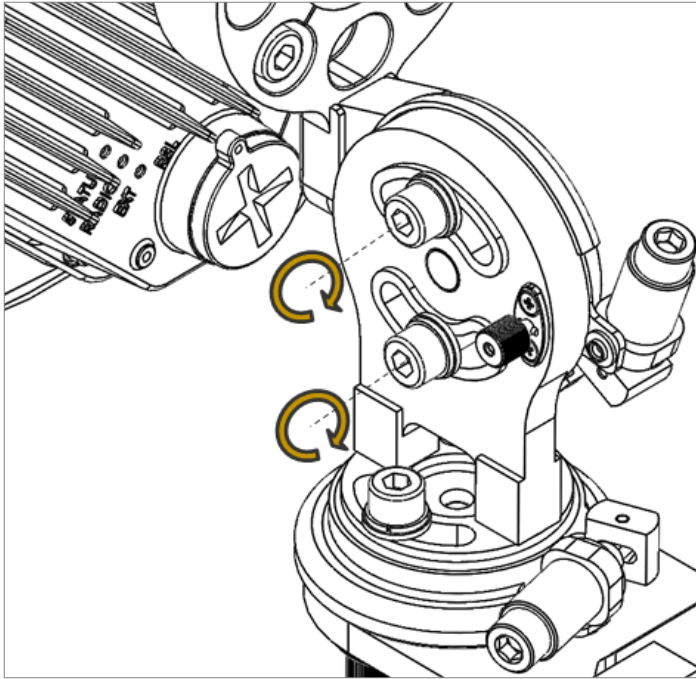
## Performing Fine Elevation Adjustment

To perform fine elevation alignment:

1. Turn the Elevation Nut as shown in [Figure 13](#), 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  $0.25^\circ$ .



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

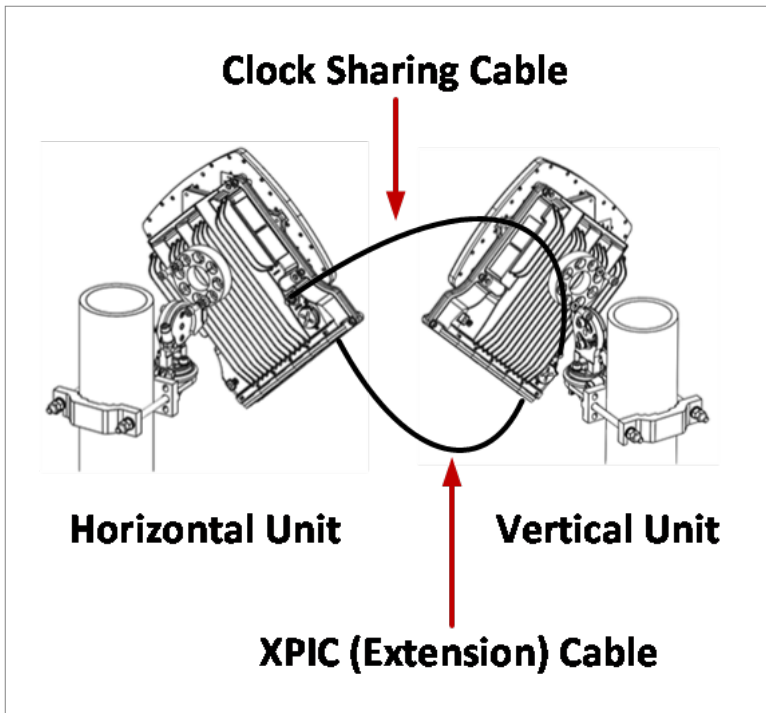
Item	Description	Quantity	Remarks
1	IP50E Flat Antenna Mounting Kit	2	
2	PTP 850E radio with 43 dBi Flat Antenna	2	
3	XPIC Cable	1	See <a href="#">Extension Cables for Unit Redundancy, and XPIC</a> .
4	Clock Sharing Cable	1	See <a href="#">Clock Sharing Cable for XPIC</a> .
5	SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP	4	SFP transceiver for Protocols and Traffic connections between units (P3 and P5 on each unit). This item is only necessary for configurations using Layer 1 Link Bonding.
6	Optical Cables for	1 or 2	See <a href="#">Table 9</a>

Item	Description	Quantity	Remarks
	transmitting traffic and protocols between units		These cables are only necessary for configurations using Layer 1 Link Bonding. Note that some configurations can use a single cable for traffic and protocols. For details, refer to the User Guide for the System Release release you are using.

## 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 850E units. See Section [Pole Mount Assembly and Installation](#), or Section [Wall Mount Assembly and Installation](#).
2. Install an PTP 850E 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 850E to the Installation and Alignment Device](#).



3. Connect the XPIC cable between the Protection/XPIC ports (P6) of the two units. See [Extension Cables for Unit Redundancy, and XPIC](#).
4. Connect the clock sharing cable between the TNC connectors of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m).

**Figure 21:** TNC Connector – Old Hardware Design

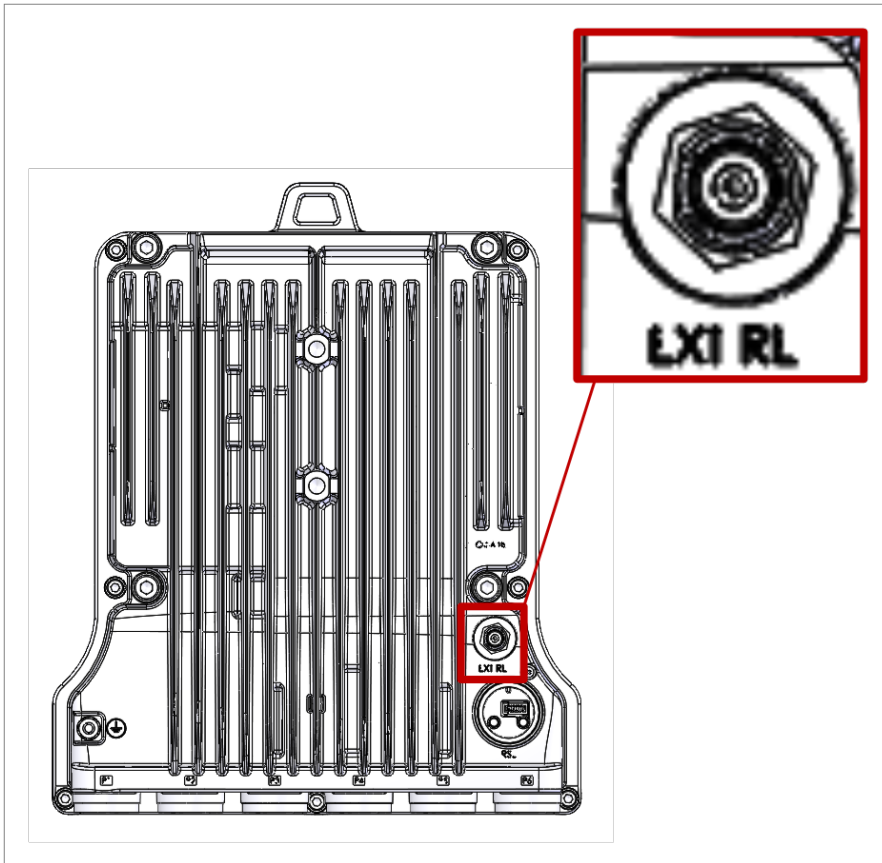
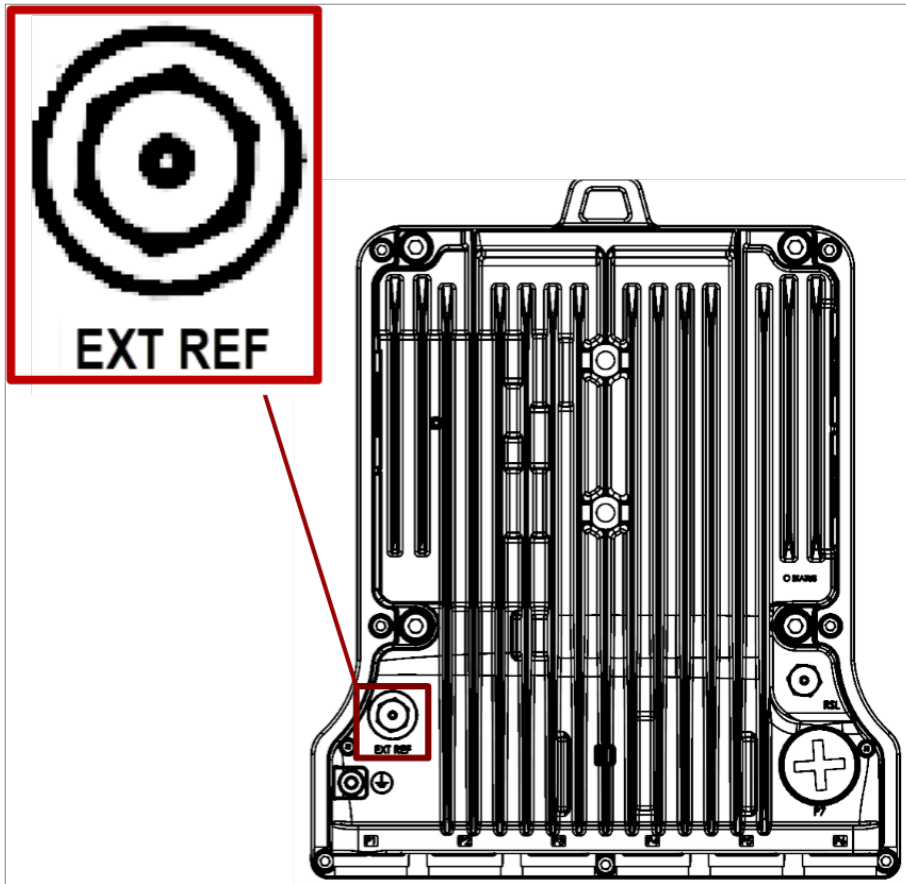


Figure 22: TNC Connector – New Hardware Design



5. If you are using Layer 1 Link Bonding with this configuration, connect the Traffic and Protocol cables. For instructions, see [Connecting the Traffic and Protocol Cables for Multiband Configurations](#).



**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.

# Direct Mount Configurations

## 1+0 Direct Mount Installation

### List of Items

Item	Description	Quantity	Remarks
1	PTP 850E RADIO	1	

### Required Tools

The following tools are required for the PTP 850E installation:

- Metric offset hexagon key wrench #6
- Phillips #2 screwdriver

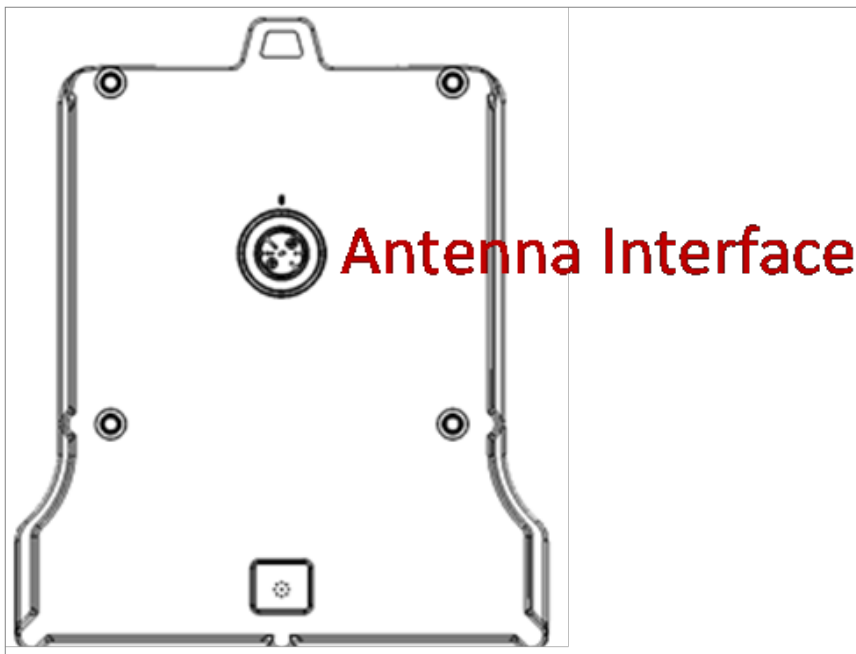
### Procedure

To install the PTP 850E in a direct mount 1+0 configuration:



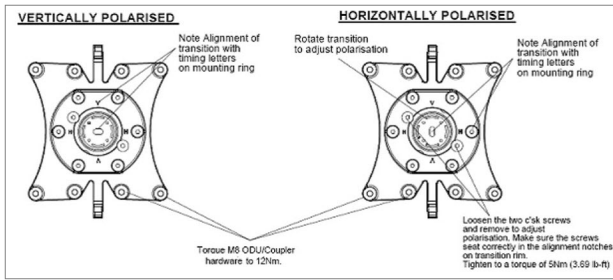
**Note:**

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

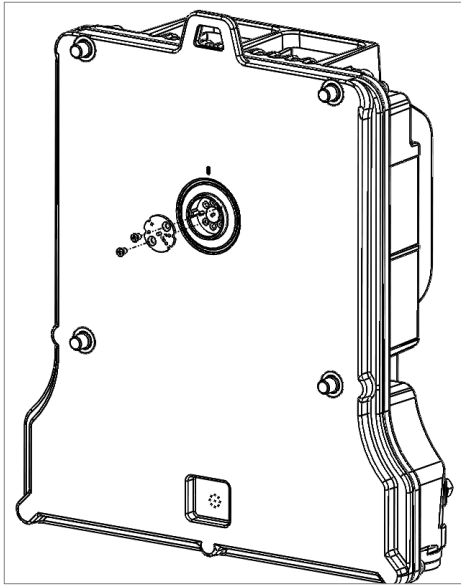


**Note:**

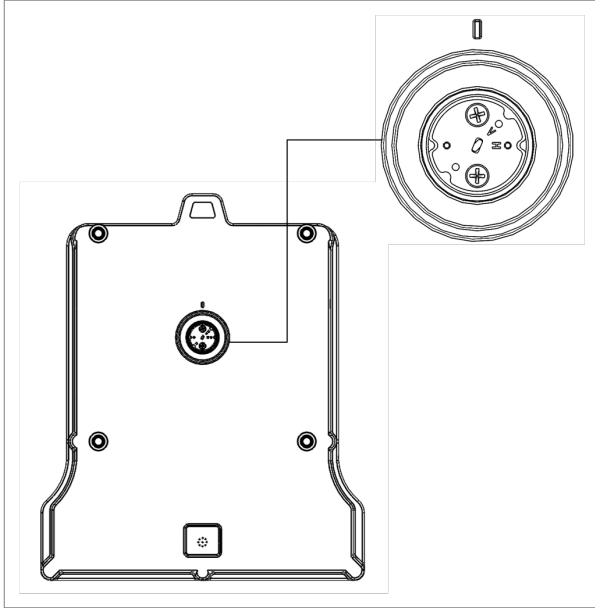
If necessary, change the antenna polarization by rotating the unit in accordance with the relevant antenna installation guide.



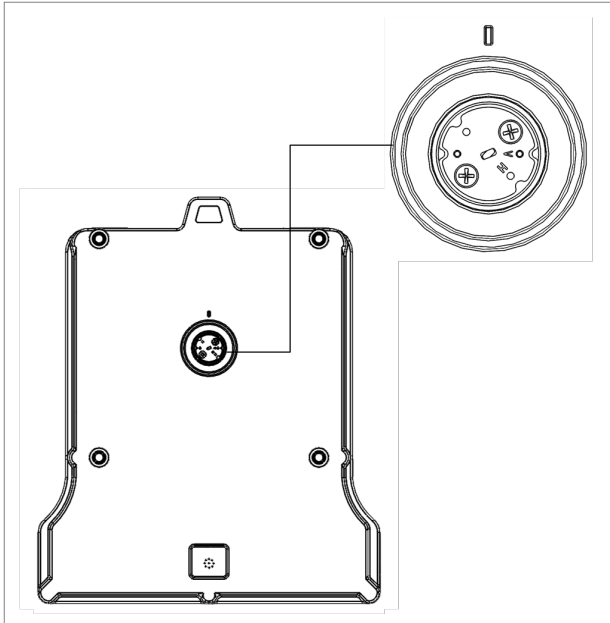
To change the polarization of the radio, adjust the twist as shown below. Use 0.8 Nm torque to tighten the twist.



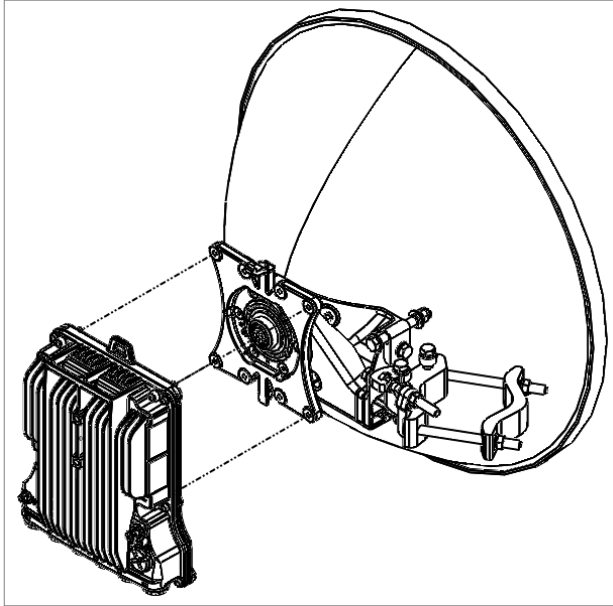
- For horizontal polarization, locate the twist with the letter “H” vertical to the hook cover (at 3:00) and fasten the two screws.



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



- Mount the PTP 850E on the antenna using the four M8 captive screws and washers that are supplied, assembled, in the PTP 850E, and tighten the screws.



**Note:**

Make sure the polarization mounting direction of the PTP 850E is correct.

## 1+1 HSB and 2+0 Single Polarization

### List of Items

Item	Description	Quantity	Remarks
1	PTP 850E Radio	2	
2	PTP 820E-CPLR-Kit or PTP 820E-SPLTR-Kit kit	1	For 1+1 HSB, use a Coupler. For 2+0 Single Polarization, use a Splitter.

### Required Tools

The following tools are required for the installation:

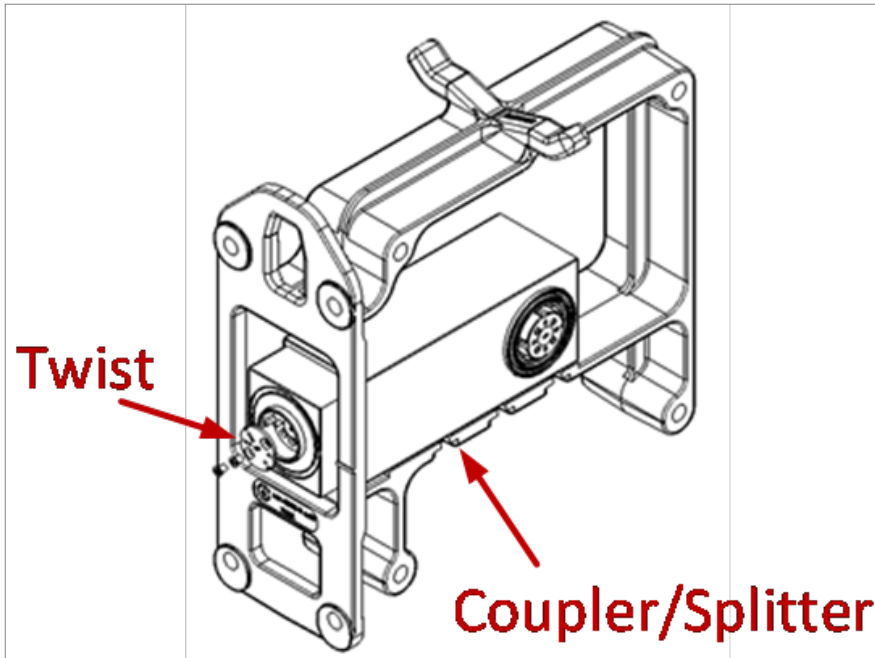
- Metric offset hexagon key wrench #6
- Phillips #2 screwdriver
- Metric offset hexagon key wrench #2.5 and #3

### Procedure

To install an PTP 850E in a direct mount 1+1 or 2+0 SP configuration:

1. If necessary, change the polarization of the coupler or splitter to the desired polarization by loosening the twist, changing the polarization as indicated below, and re-tightening the screws. Use 0.8 Nm

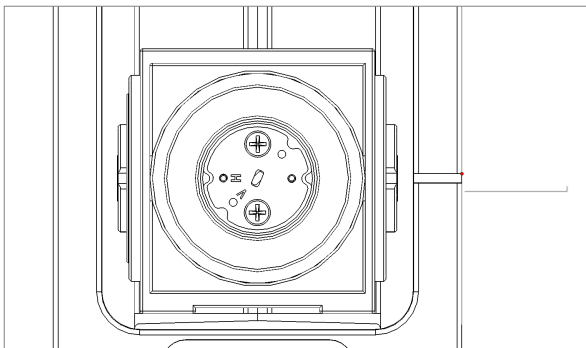
torque for the #4-40 screws on the twist.



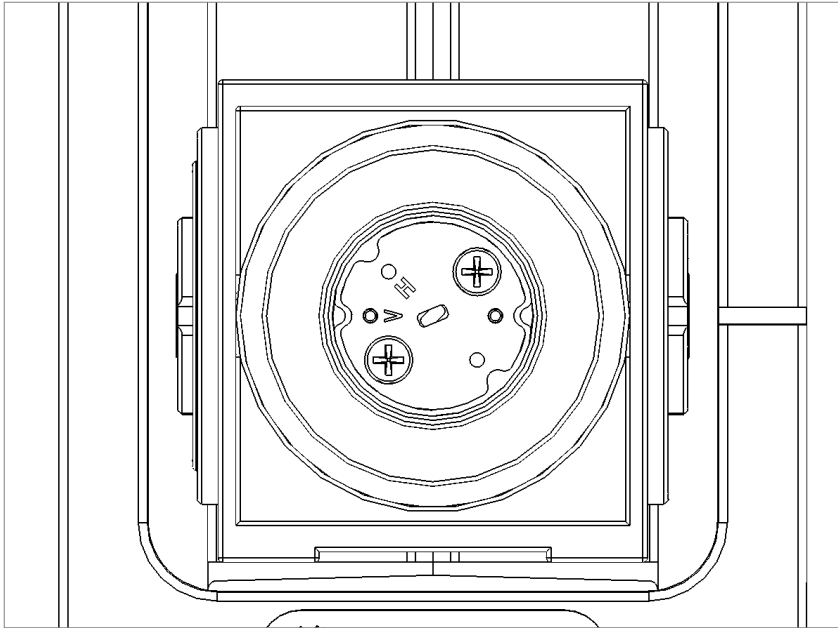
**Note:**

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

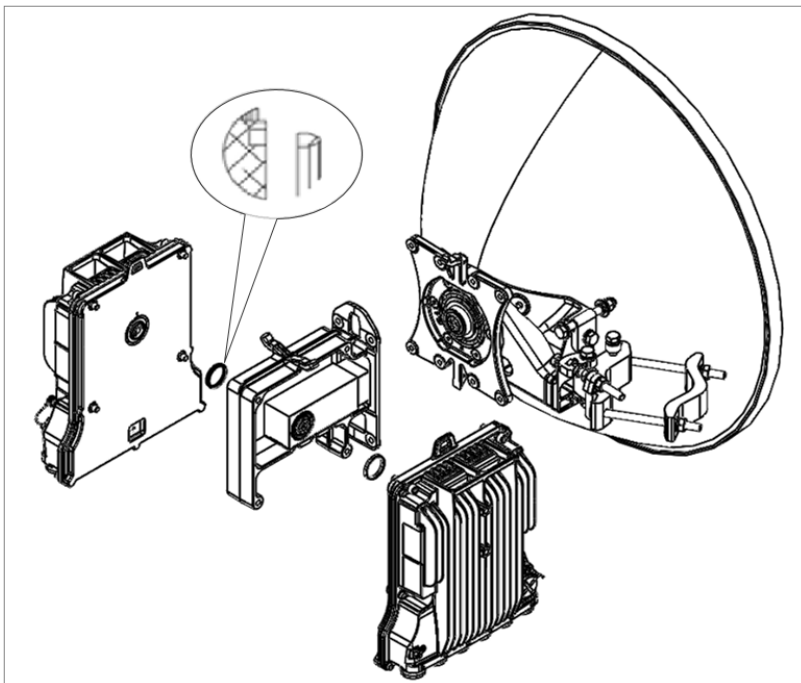
**Figure 23:** *Horizontal Polarization*



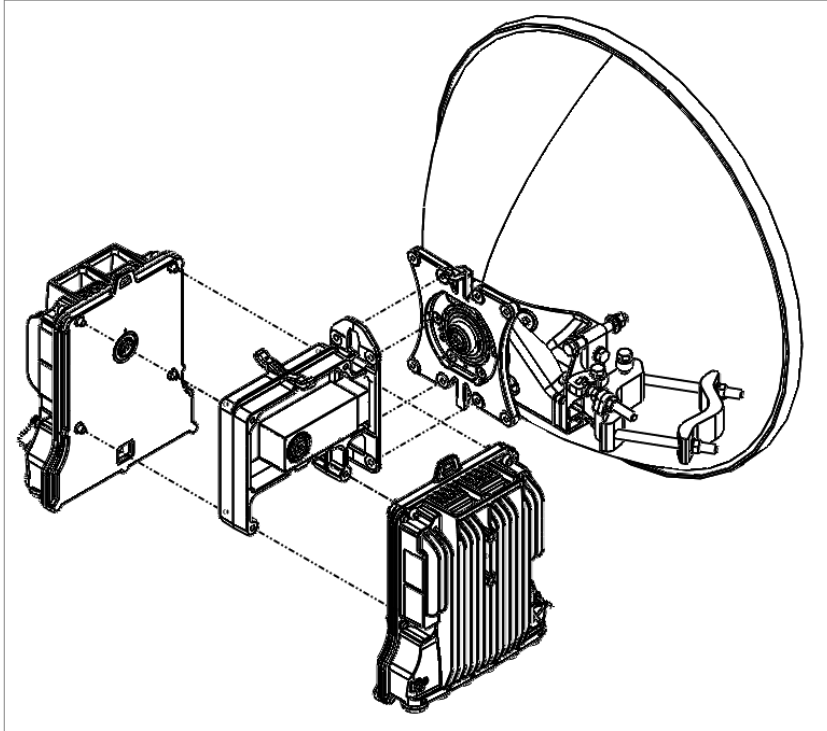
**Figure 24:** *Vertical Polarization*



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



4. Mount the PTP 850E to the body of the coupler or splitter using the four M8 captive screws and washers that are supplied, assembled, with the PTP 850E, and tighten the screws.
5. Repeat Step [5](#) for the second PTP 850E.



6. For 1+1 HSB protection, connect the protection cable between the Protection/XPIC ports (P6) of the two units. See [Extension Cables for Unit Redundancy, and XPIC](#) and [Connection of Protection/XPIC Cable to PTP 850E](#).

## 2+0 Direct Mount Dual Polarization (XPIC)

### List of Items

Item	Description	Quantity	Remarks
1	PTP 850E Radio	2	
2	PTP 820E-OMT-Kit	1	
3	XPIC Cable	1	See <a href="#">Extension Cables for Unit Redundancy, and XPIC</a> .
4	Clock Sharing Cable	1	See <a href="#">Clock Sharing Cable for XPIC</a> .
5	SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP	4	SFP transceiver for Protocols and Traffic connections between units (P3 and P5 on each unit). This item is only necessary for configurations using Layer 1 Link Bonding.
6	Optical Cables for transmitting traffic and protocols	1 or 2	See <a href="#">Table 9</a> These cables are only necessary for configurations using

Item	Description	Quantity	Remarks
	between units		Layer 1 Link Bonding. Note that some configurations can use a single cable for traffic and protocols. For details, refer to the User Guide for the System Release release you are using.

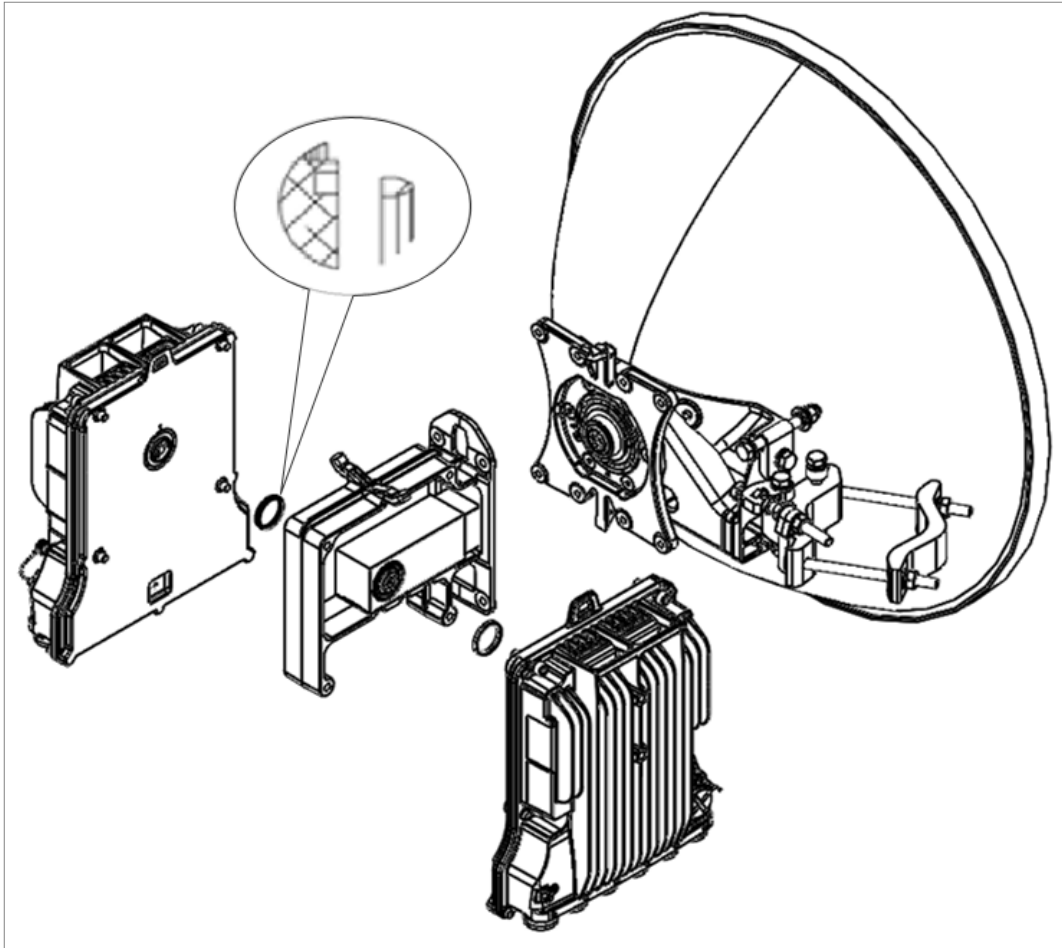
### Required Tools

The following tools are required for the installation:

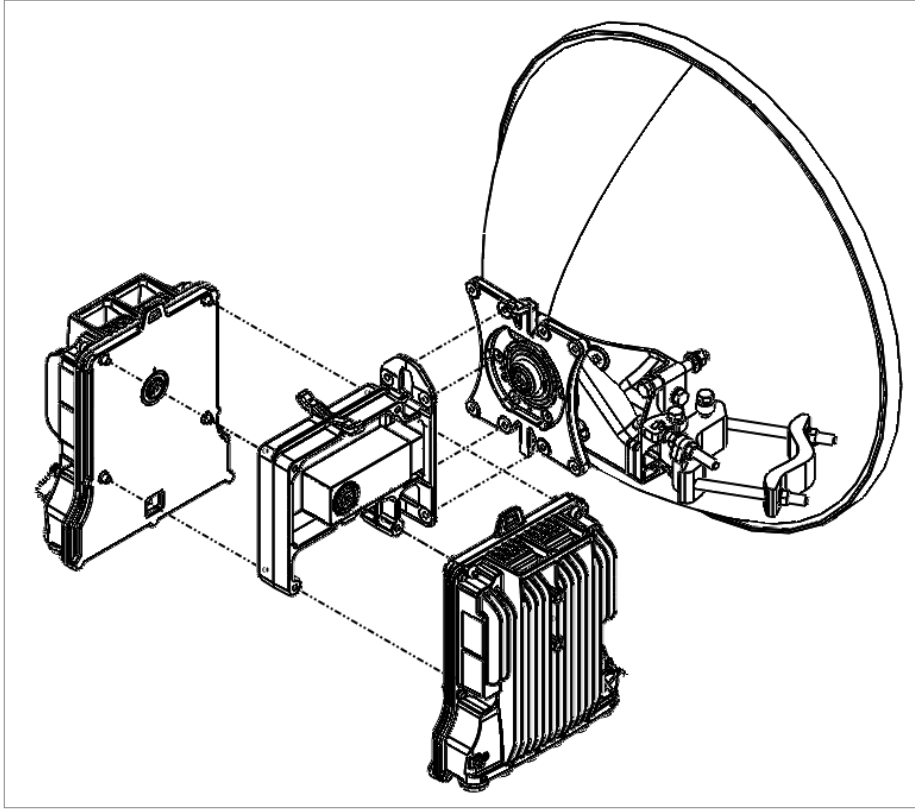
- Metric offset hexagon key wrench #6
- Phillips #2 screwdriver
- Metric offset hexagon key wrench #2.5 and #3

### 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 850E radios to 'H' polarization. See [1+0 Direct Mount Installation](#).
6. Mount an PTP 850E 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 M8 captive screws and washers that are supplied, assembled, with the PTP 850E radios.



7. Connect the XPIC cable between the Protection/XPIC ports (P6) of the two units. See [Extension Cables for Unit Redundancy, and XPIC](#) and [Connection of Protection/XPIC Cable to PTP 850E](#).
8. Connect the clock sharing cable between the TNC connectors of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m). See [Figure 21](#) and [Figure 22](#).
9. If you are using Layer 1 Link Bonding with this configuration, connect the Traffic and Protocol cables. For instructions, see [Connecting the Traffic and Protocol Cables for Multiband Configurations](#).

# Multiband Configurations

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PTP 850E can be used in Multiband configurations with PTP 850C, PTP 820C, PTP 820S, or third-party microwave radios.

For configurations with PTP 850E and PTP 850C, PTP 820C, or PTP 820S, a special Multiband antenna can be used. This antenna transmits and receives both E-band and microwave signals. Both units (PTP 850E and PTP 850C, PTP 820C, or PTP 820S) are connected to this antenna via direct mount.

The marketing model for Multiband antennas uses the following syntax:

Am-B3-d-ff/80-pl/ph-vn

Where:

- d – Size of the antenna (1 or 2 ft)
- ff – The microwave band (11, 13, 15, 18, 23, 28, etc.)
- pl – Interface of the microwave antenna
- SP – single polarization (rectangular interface)
- DP – dual polarization (circular interface)
- ph – Interface of the E-Band antenna:
- SP – single polarization (rectangular interface)
- DP – dual polarization (circular interface)
- vn – Antenna Vendor (MT: MTI, A: Commscope, RS: Rosenberger, etc.)

For example, the following marketing model applies to a 2-foot antenna for an 18 GHz Microwave radio together with an E-band device, where both radios are operating with Single Polarization. The manufacturer is MTI.

- Am-2-18/80-SP/SP-MT

For a full list of available Multiband antennas, refer to the Price List or check with your Cambium representative.

If the Multiband antenna is not used, the PTP 850E and the paired Microwave unit can be installed in ordinary 1+0 and/or 2+0 configurations, as described in this Installation Guide and the installation guide for the relevant paired Microwave unit.



**Note:**

In addition to the Multiband configurations described in this manual, PTP 850E can also be used in Link Bonding configurations with PTP 820N and PTP 820A. The physical configuration of the PTP 850E is the same as for standalone 1+0 and 2+0 PTP 850E configurations, as described in this manual. However, cables for transferring traffic and protocol data between the PTP 820N/PTP 820A and the PTP 850E must be connected according to the instructions in the *User Guide for PTP 820N and PTP 820A*, System Release 11.7.5 and later.

# Multiband with PTP 850E and PTP 850C with 2+0 Single Polarization

## List of Items

Item	Description	Quantity	Remarks
1	Multiband Antenna	1	Optional.
2	PTP 850E Radio	1	
3	PTP 850C Radio	1	
4	PTP 820C Splitter Kit	1	
5	SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP	4	SFP transceiver for Protocols and Traffic connections between units (P3 and P5 on each unit).
6	Optical Cables for transmitting traffic and protocols between units	1 or 2	See <a href="#">Table 9</a> . <b>Note:</b> that some configurations can use a single cable for traffic and protocols. For details, refer to the User Guide for the System Release release you are using.

## Required Tools

The following tools are required for the installation:

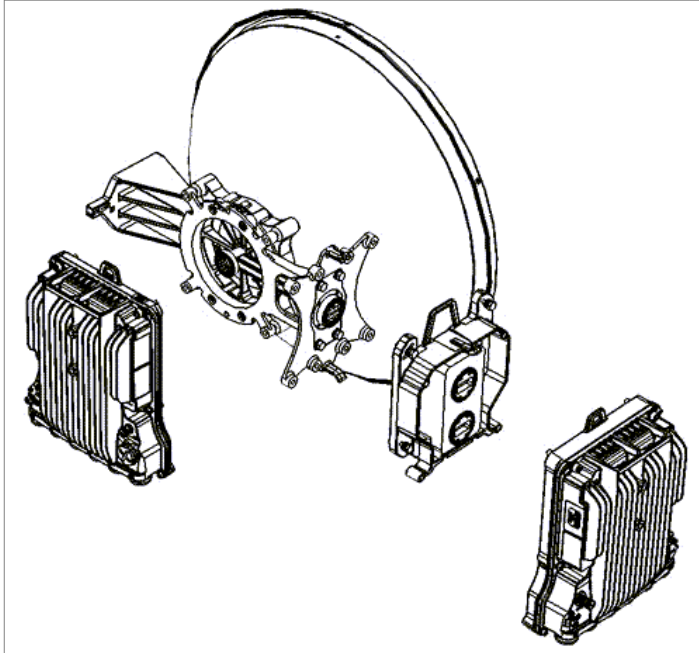
- Metric offset hexagon key set
- Phillips #1, #2 screwdriver

## Procedure

If you are not using a Multiband antenna, install the PTP 850E in an ordinary 1+0 installation and install the PTP 850C in an ordinary 2+0 single or dual polarization configuration, as described in the Installation Guide for PTP 850C.

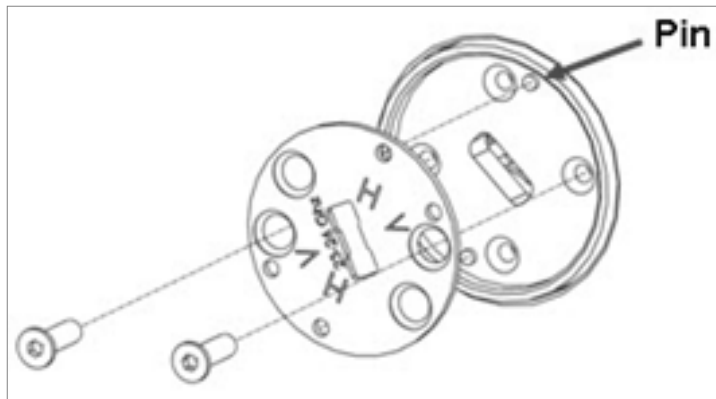
Once you have installed the units, you must install special SFP transceivers, then Protocols and Traffic cables between the units. For instructions, start at Step [6](#) of this procedure.

1. Assemble the antenna according to the instructions provided with the antenna.
2. Install the PTP 850E directly to the back of the antenna, as shown in the figure below. Use the procedure described in [1+0 Direct Mount Installation](#).



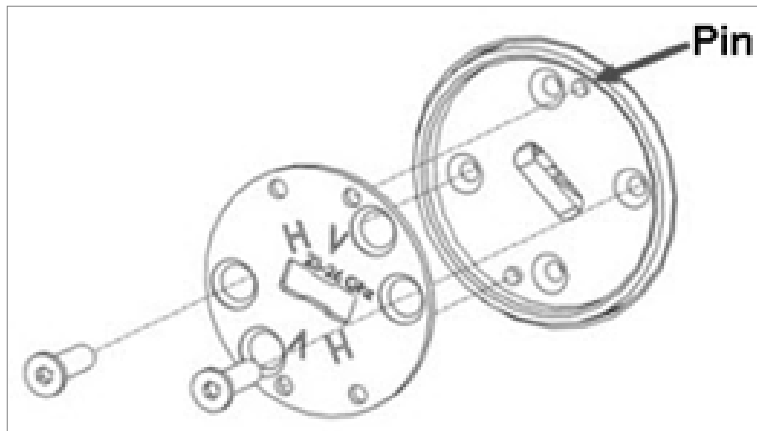
3. Adjust the twist on the PTP 820C Splitter Kit. Perform one of the following steps, according to the required polarization (horizontal or vertical).

- For horizontal polarization, locate the holes above and below the letter “H” on the pins and fasten the two screws.

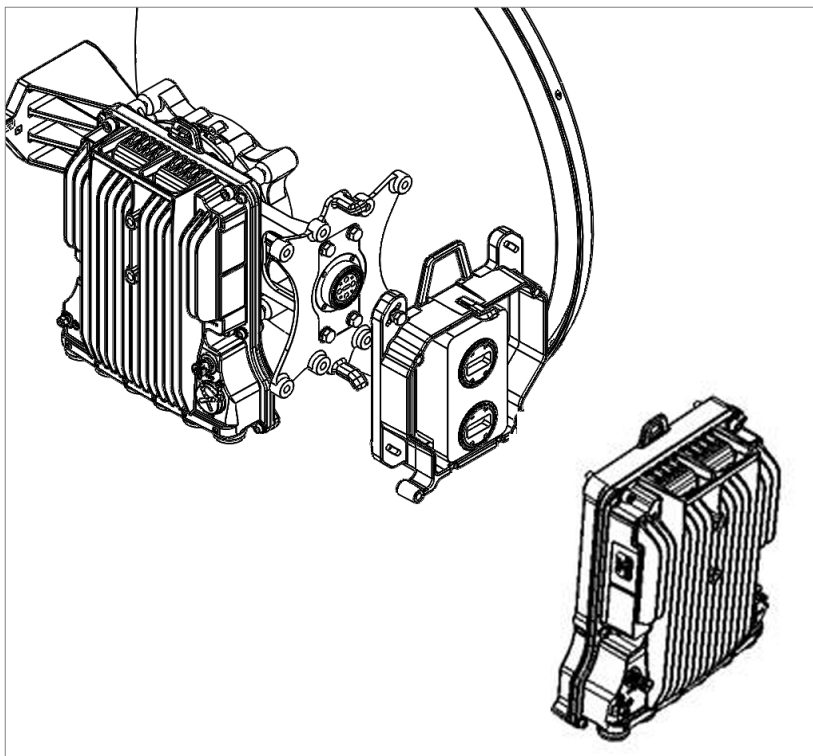


- For vertical polarization, locate the holes above and below the letter “V” on the pins and fasten

the two screws.



4. Mount and tighten the PTP 820C Splitter Kit at a 90° angle to the antenna using the four M8 screws and washers.
5. Mount and tighten the PTP 850C radio to the PTP 820C Splitter Kit using the four M8 captive screws and washers supplied with the PTP 850C radio.



6. Connect the Traffic and Protocol cables. For instructions, see [Connecting the Traffic and Protocol Cables for Multiband Configurations](#).

# Multiband with PTP 850E and PTP 850C with 2+0 Dual Polarization

## List of Items

Item	Description	Quantity	Remarks
1	Multiband Antenna	1	Optional.
2	PTP 850E Radio	1	
3	PTP 850C Radio	1	
4	PTP 820C OMT Kit	1	
5	SFP+10GBASE-SR10-EXT-TEMP or SFP+10GBASE-LR10-EXT-TEMP	4	SFP transceiver for Protocols and Traffic connections between units (P3 and P5 on each unit).
6	Optical Cables for transmitting traffic and protocols between units	1 or 2	See <a href="#">Table 9</a> . <b>Note:</b> Some configurations can use a single cable for traffic and protocols. For details, refer to the User Guide for the System Release release you are using.

## Required Tools

The following tools are required for the installation:

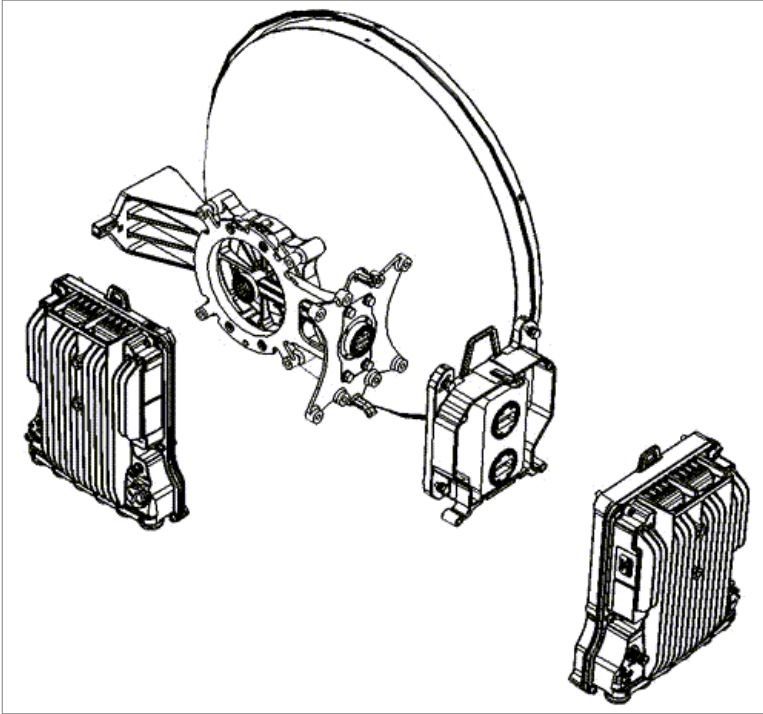
- Metric offset hexagon key set
- Phillips #1, #2 screwdriver

## Procedure

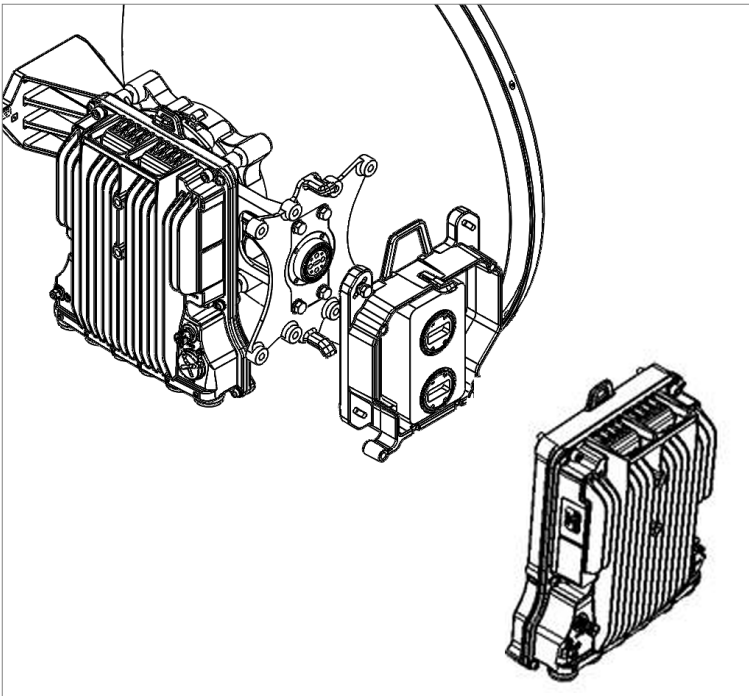
If you are not using a Multiband antenna, install the PTP 850E in an ordinary 1+0 installation and install the PTP 850C in an ordinary 2+0 single or dual polarization configuration, as described in the Installation Guide for PTP 850C.

Once you have installed the units, you must install special SFP transceivers, then Protocols and Traffic cables between the units. For instructions, start at [Step 6](#) of this procedure.

1. Assemble the antenna according to the instructions provided with the antenna.
2. Install the PTP 850E directly to the back of the antenna, as shown in the figure below. Use the procedure described in [1+0 Direct Mount Installation](#).



3. Connect the PTP 820C OMT Kit to the antenna and secure it with four screws. Verify existence of the O-ring.
4. Mount and tighten the PTP 850C radio to the PTP 820C OMT Kit using the four M8 captive screws and washers supplied with the PTP 850C radio.



5. Connect the Traffic and Protocol cables. For instructions, see [Connecting the Traffic and Protocol Cables for Multiband Configurations](#).

## Multiband with PTP 850E and PTP 820C or RFU-D with 2+0 Single Polarization

### List of Items

Item	Description	Quantity	Remarks
1	Multiband Antenna	1	
2	PTP 850E Radio	1	
3	PTP 820C or RFU-D Radio	1	
4	PTP 820C Splitter Kit	1	

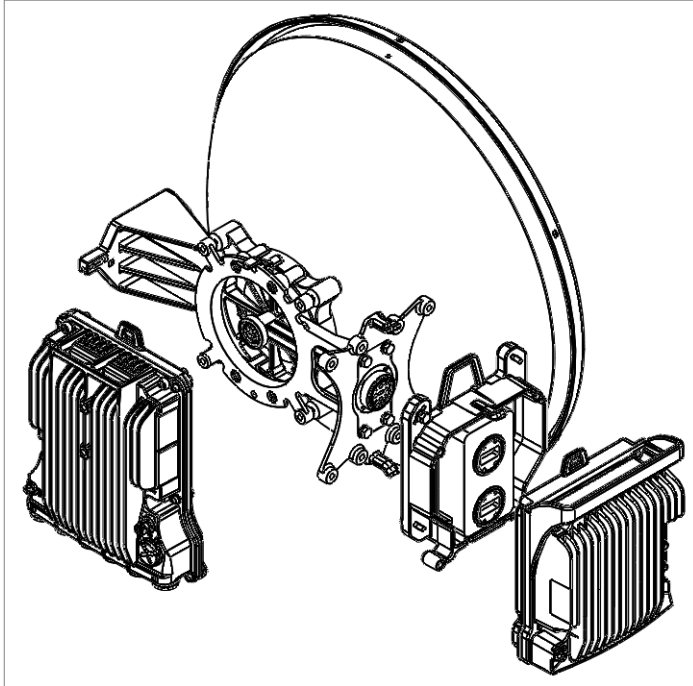
### Required Tools

The following tools are required for the installation:

- Metric offset hexagon key set
- Phillips #1, #2 screwdriver

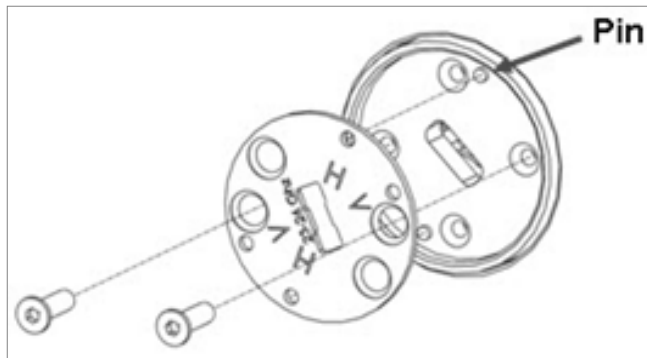
### Procedure

1. Assemble the antenna according to the instructions provided with the antenna.
2. Install the PTP 850E directly to the back of the antenna, as shown in the figure below. Use the procedure described in [1+0 Direct Mount Installation](#).



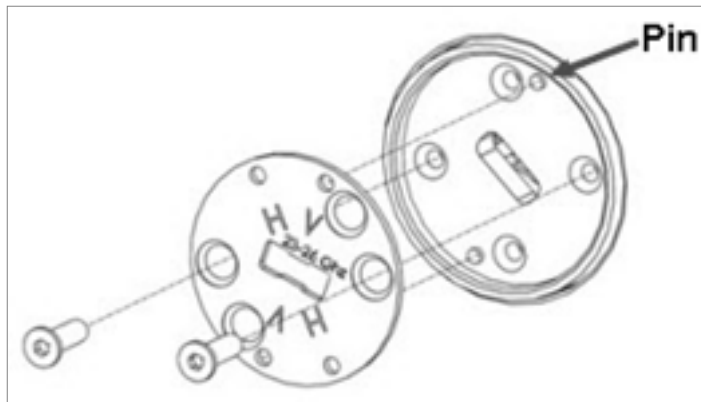
3. Adjust the twist on the PTP 820C Splitter Kit. Perform one of the following steps, according to the required polarization (horizontal or vertical).

- For horizontal polarization, locate the holes above and below the letter “H” on the pins and fasten the two screws.

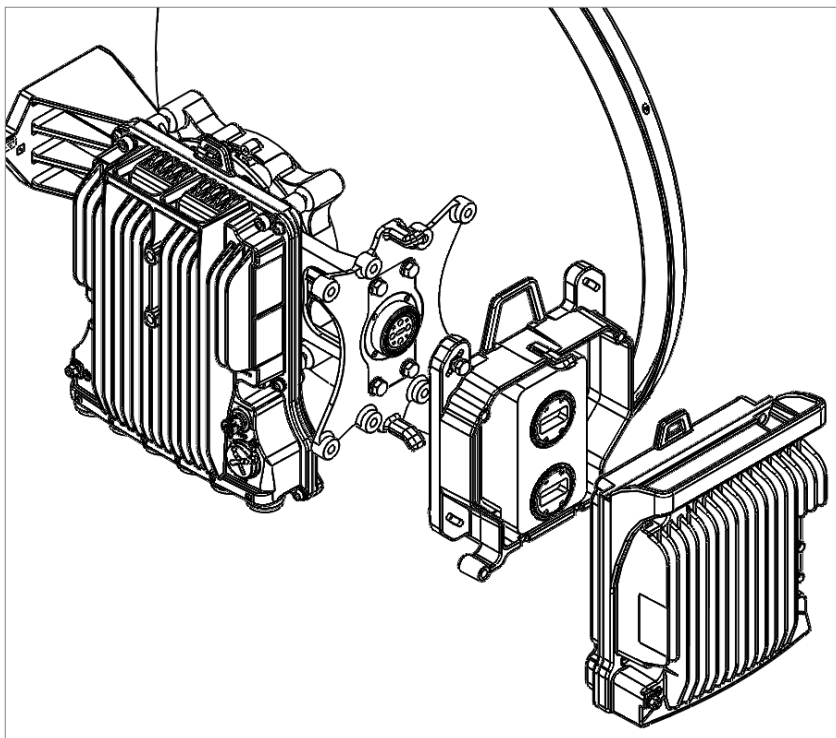


- For vertical polarization, locate the holes above and below the letter “V” on the pins and fasten

the two screws.



4. Mount and tighten the PTP 820C Splitter Kit at a 90° angle to the antenna using the four M8 screws and washers.
5. Mount and tighten the PTP 820C or RFU-D to the PTP 820C Splitter Kit using the four M8 captive screws and washers supplied with the PTP 820C or RFU-D radio.



# Multiband with PTP 850E and PTP 820C or RFU-D with 2+0 Dual Polarization

## List of Items

Item	Description	Quantity	Remarks
1	Multiband Antenna	1	
2	PTP 850E Radio	1	
3	PTP 820C or RFU-D Radio	1	
4	PTP 820C OMT Kit	1	
5	CIRC./CIRC. ADAPTOR	1	Per Antenna Vendor

## Required Tools

The following tools are required for the installation:

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

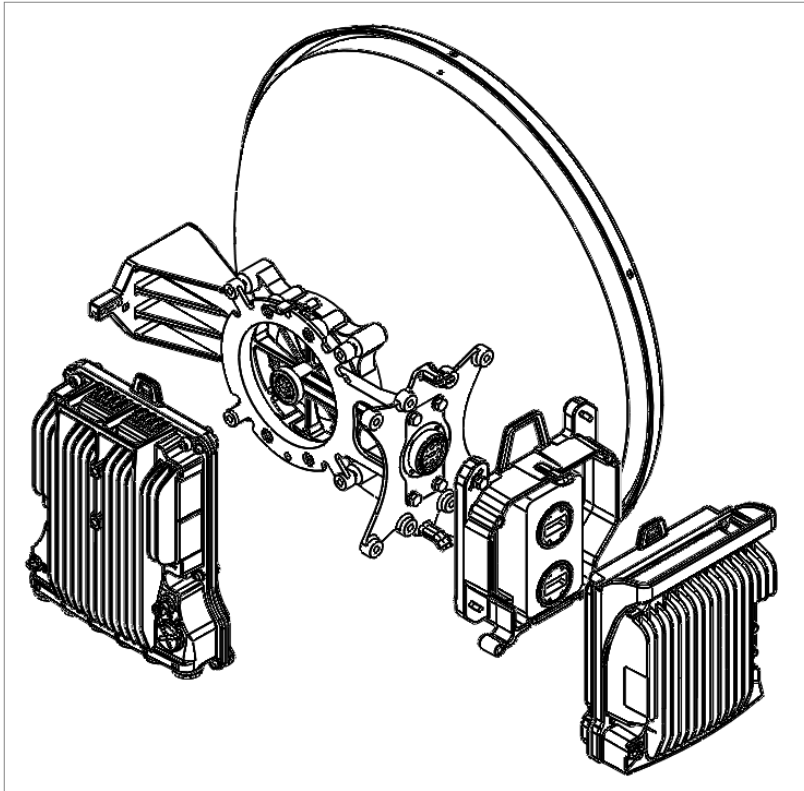
## Procedure

1. Prior to the installation, follow the antenna manufacturer's instructions to use the circular adaptor. Remove the existing rectangular transition, swap the O-ring, and install the circular transition instead.

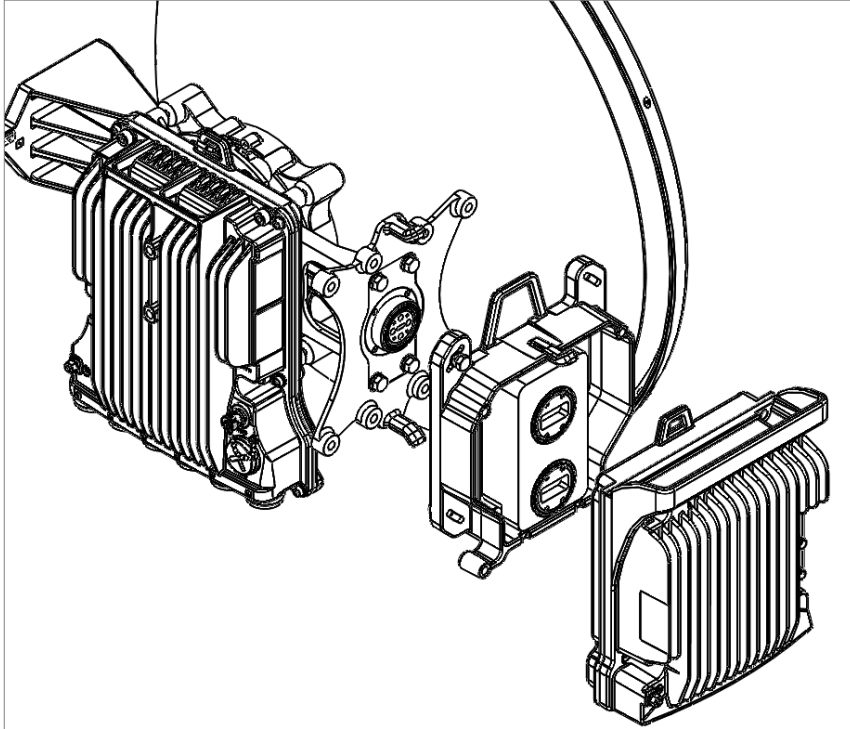


2. Assemble the antenna according to the instructions provided with the antenna.

3. Install the PTP 850E directly to the back of the antenna, as shown in the figure below. Use the procedure described in [1+0 Direct Mount Installation](#).



4. Connect the OMT at a 90° angle to the antenna and secure it with four screws supplied with the OMT kit. Verify the existence of the O-ring.
5. Connect the PTP 820C or RFU-D unit to the OMT Kit using the four M8 captive screws and washers supplied, and tighten the screws.



## Multiband with PTP 850E and 1+0 PTP 820S, RFU-SX, or RFU-C

### List of Items

Item	Description	Quantity	Remarks
1	Multiband Antenna	1	
2	PTP 850E Radio	1	
3	PTP 820S or RFU-C Radio	1	

### Required Tools

The following tools are required for the installation:

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

### Procedure



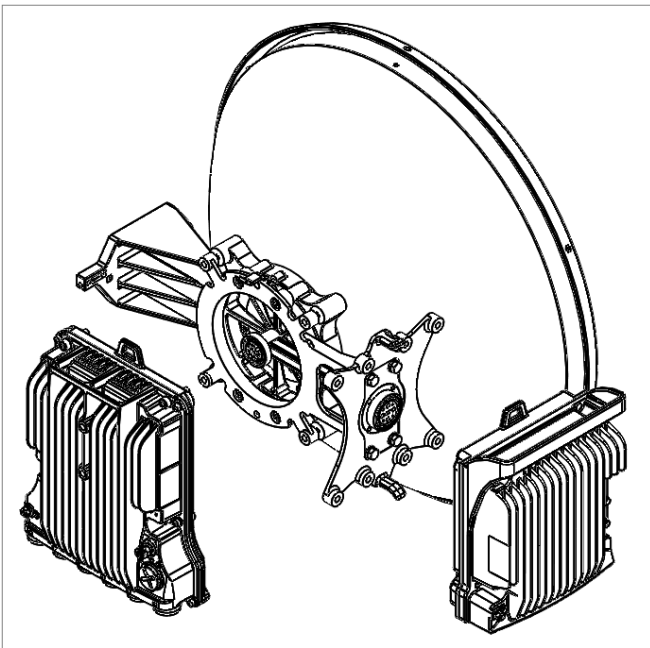
**Note:**

Although the pictures in this section show PTP 820S, the exact same procedure is used to install an RFU-SX or RFU-C.

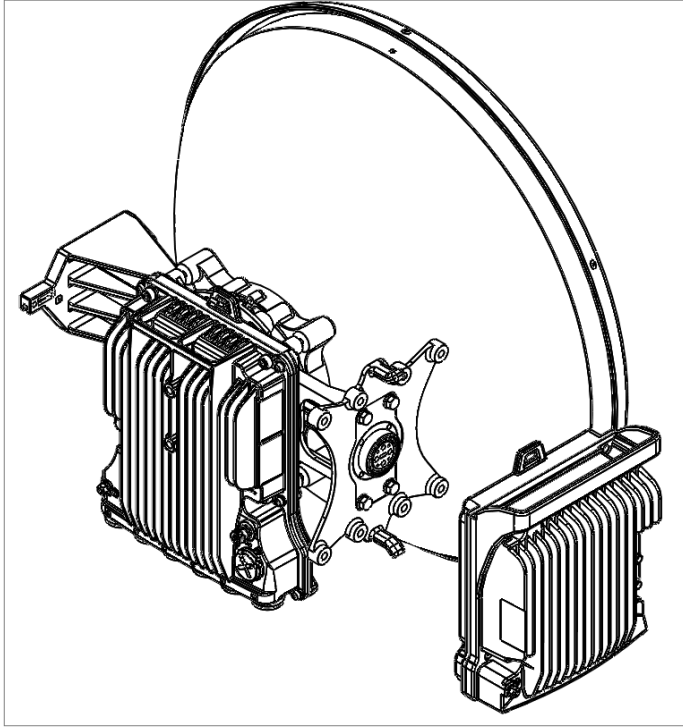
1. Prior to the installation, follow the antenna manufacturer's instructions to use the circular adaptor. Remove the existing rectangular transition, swap the O-ring, and install the circular transition instead.



2. Assemble the antenna according to the instructions provided with the antenna.
3. Install the PTP 850E directly to the back of the antenna, as shown in the figure below. Use the procedure described in [1+0 Direct Mount Installation](#).



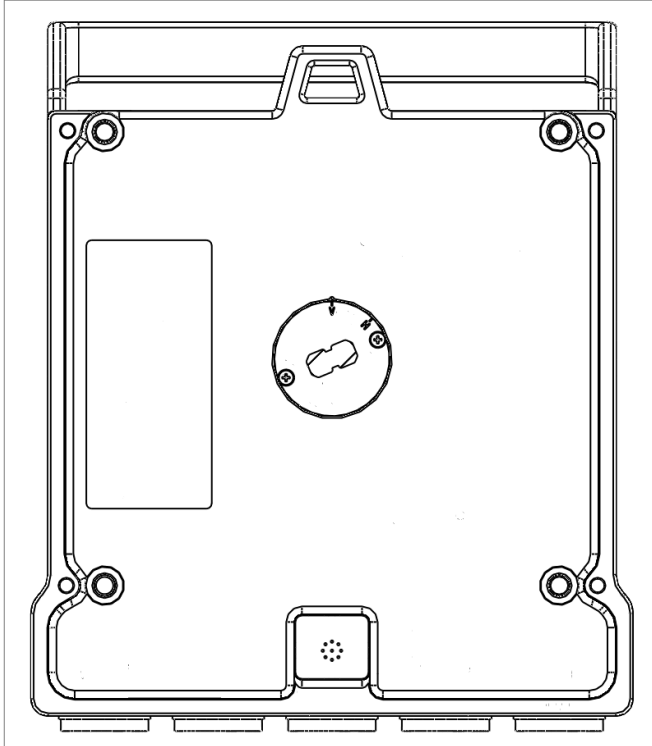
4. Mount the PTP 820S, RFU-SX, or RFU-C radio on the antenna using the four M8 captive screws and washers that are supplied, assembled, in the radio, and tighten the screws.



**Note:**

Make sure the polarization mounting direction of the PTP 820S, RFU-SX, or RFU-C is correct.

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



5. If necessary, change the antenna polarization by rotating the unit in accordance with the relevant antenna installation guide.
6. If necessary, change the polarization of the radios. For PTP 820E, RFU-SX, and PTP 820S, change the polarization by adjusting the twist. For PTP 850E, see [1+0 Direct Mount Installation](#). For PTP 820S and RFU-SX, refer to the Installation Guide for the product you are using.

For RFU-SX and RFU-C, rotate the entire unit by 90° to change the polarization. Refer to the RFU-C Installation Guide.

# Special Procedure for FIPS-Compliant Installations

PTP 850E can be configured to be FIPS 140-3 level-2 compliant, in specific hardware and software configurations. For a full list of FIPS requirements, refer to the *FIPS 140-3 Non-Proprietary Security Policy*, available upon request.



**Note:**  
Only certain System Release versions support FIPS. For details, refer to the Release Notes for the System Release version you are using.

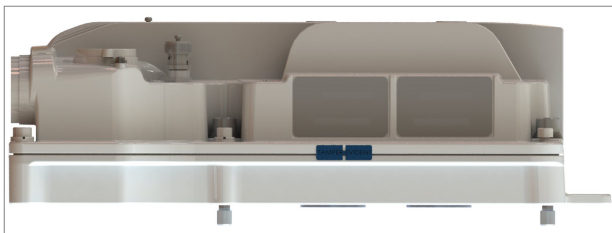
It is the responsibility of the user to ensure that the above FIPS requirements are met.

For an PTP 850E node to be FIPS-compliant, the unit must be FIPS-compliant hardware. A FIPS-compliant PTP 850E unit has a unique marketing model ending in the letters AF, in the following format:

- PTP 850E-\*\*\*-AF

Three special labels, included with the PTP 850E radio kit, must be affixed to a FIPS-compliant PTP 850E unit once the diplexer unit has been attached to the radio unit. These labels are tamper-evident and must be applied in such a way that it is not possible to remove the diplexer unit from the radio unit without also removing a label and leaving evidence that the label was tampered with. The labels must be replaced if the radio or diplexer is replaced. Replacement labels can be ordered from Cambium Networks, part number BS-0341-2. Tamper-evident labels should be inspected for integrity at least once every six months.

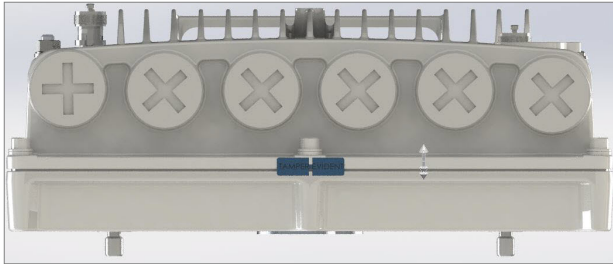
**Figure 25:** *Applying Tamper-Evident FIPS Labels – PTP 850E – Left Side*



**Figure 26:** *Applying Tamper-Evident FIPS Labels – PTP 850E – Top*



**Figure 27:** *Applying Tamper-Evident FIPS Labels – PTP 850E – Bottom*



When applying a FIPS label, make sure to follow these guidelines:

- Use caution to avoid touching the adhesive in such a way as to leave fingerprints and damage the labels.
- The curing time (drying time) for the labels is at least sixty minutes.
- When replacing a label, gently cut the label, replace the module, and apply a new label in place of the previous label.

# Appendix A: Acceptance & Commissioning Procedures

This chapter provides Cambium's recommended Acceptance and Commissioning Procedure for PTP 850E. Acceptance and commissioning should be performed after 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's 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
Mount is secure and perpendicular	OK

<b>SITE ACCEPTANCE CHECKLIST</b>	
Mount is grounded as per site specifications	OK
All steelwork is Galvanized or Stainless Steel as appropriate	OK
<b>3. ANTENNA</b>	
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
<b>4. OUTDOOR UNIT</b>	
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
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
<b>6. CAT5/Fiber Optic CABLE</b>	
Overall cable length:	
Cable type:	
CAT5 connectors assembled properly on the cable	OK
Cable connected securely to ODU and IDU	OK
Cable connector is covered by gland and secure by cable tie at the ODU	OK

<b>SITE ACCEPTANCE CHECKLIST</b>	
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
<b>7. DC POWER SUPPLY - Two Inputs</b>	
Measured DC voltage input to the IDU:OK	(-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
<b>8. RACK INSTALLATION</b>	
Rack is mounted to the shelter floor with four screws	
Rack is mounted to the shelter wall with two screws	
<b>9. REMARKS/NOTES</b>	
<b>10. GENERAL INFORMATION</b>	
Site accepted by:	Name:
	Title:
	Company:
	Signature:
	Date:

SITE ACCEPTANCE CHECKLIST	
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. ODU (Outdoor Unit)

- 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 850E 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 BNC port is 1.XX where XX is the RSL level. For example: 1.59V means an RSL of -59 dBm. Note that the voltage measured at the BNC 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's 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's 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 850E 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, send the log to Cambium support center at [support@Cambium.com](mailto:support@Cambium.com).

PTP 850E LINK COMMISSIONING LOG
1. GENERAL INFORMATION

<b>PTP 850E LINK COMMISSIONING LOG</b>		
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		
Antenna vendor and model:		
Antenna size:		
Mounting type:		
Mounting losses:		
4. LINK PARAMETERS		
Link distance:		
Rain zone:		
Expected RSL (dBm):		
Expected Diversity RSL (dBm):		
RSL Main (dBm):		

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

# Cambium Networks

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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	<a href="https://support.cambiumnetworks.com">https://support.cambiumnetworks.com</a>
Support enquiries	
Technical training	<a href="https://learning.cambiumnetworks.com/learn">https://learning.cambiumnetworks.com/learn</a>
Main website	<a href="https://www.cambiumnetworks.com">https://www.cambiumnetworks.com</a>
Sales enquiries	<a href="mailto:solutions@cambiumnetworks.com">solutions@cambiumnetworks.com</a>
Warranty	<a href="https://www.cambiumnetworks.com/support/standard-warranty/">https://www.cambiumnetworks.com/support/standard-warranty/</a>
Telephone number list	<a href="https://www.cambiumnetworks.com/contact-us/">https://www.cambiumnetworks.com/contact-us/</a>
User Guides	<a href="https://www.cambiumnetworks.com/guides">https://www.cambiumnetworks.com/guides</a>
Address	Cambium Networks Limited, Unit B2, Linhay Business Park, Eastern Road, Ashburton, Devon, TQ13 7UP United Kingdom



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