Installation Guide

IP-50EX
IP-50EX-P
IP-50EXA

August 2025 | Rev D

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Information to User

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.

Intended Use/Limitation

Fixed point-to-point radio links for private networks.

Authorized to Use

Only entities with individual authorization from the National Regulator to operate the mentioned radio equipment.

The equipment can be used in the following EU countries:

Austria (AT) - Belgium (BE) - Bulgaria (BG) - Switzerland/Liechtenstein (CH) - Cyprus (CY) - Czech Republic (CZ) - Germany (DE) – Denmark (DK) - Estonia (EE) - Finland (FI) - France (FR) -Greece (GR) - Hungary (HU) - Ireland (IE) – Iceland (IS) – Italy (IT) – Lithuania (LT) - Luxembourg (LU) – Latvia (LV) - Malta (MT) - Netherlands (NL) - Norway (NO) - Portugal (PT) - Romania (RO) - Sweden (SE) - Slovenia (SI) - Slovak Republic (SK) – United Kingdom (UK) – Spain (SP) – Poland (PL)

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About This Guide

This guide describes the installation procedures for IP-50EX, IP-50EX-P, and IP-50EXA and provides additional information concerning system parts and frequency bands.

Note: In this document, IP-50EX also refers to IP-50EX-P and IP-50EXA, unless otherwise stated.

What You Should Know

For the warranty to be honored, install the unit in accordance with the instructions in this manual.

Target Audience

This guide contains technical information about IP-50EX installation, and is intended for use by qualified Ceragon technical personnel at all levels.

Related Documents

- Technical Description for IP-50EX, IP-50EX-P, and IP-50EXA
- User Guide for IP-50CX, IP-50EX, IP-50EX-P, and IP-50EXA
- MIB Reference for IP-50 Products

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1. Before You Start

1.1 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.
- IP-50EX is intended for installation in a restricted access location.
- IP-50EX 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 3.2, *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.
- IP-50EX 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

1.2 Safety Precautions & Declared Material

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

Based on the highest nominal output power of the IP-50EX:

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

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- The occupational exposure of compliance boundary distance is 0.

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

1.2.2 General Equipment Precautions

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 Ceragon Networks could void the user's authority to operate the equipment.

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.

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

When working with an IP-50EX, 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.

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

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 IP-50EX 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.

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).

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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.

1.2.3 Précautions générales relatives à l'équipement

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.

L’usage de IP-50EX 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.

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.

1.2.4 Allgemeine Vorsichtsmaßnahmen für die Anlage

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

Beachten Sie beim Arbeiten mit IP-50EX das folgende Stromschlag- und Gefahrenrisiko: Durch Abtrennen einer Stromquelle wird nur ein

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

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

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1.3 Pre-Installation Instructions

1.3.1 Packing

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

1.3.2 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.

1.3.3 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

1.3.4 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 Ceragon representative, by e-mail or fax.

1.4 Torque Requirements

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

- M8 screws: 23 Nm
- M6 screws: 9 Nm
- M3 screws (used with IP-20C and IP-20S twist): 0.8 Nm
- #4-40 Screws (used with IP-50EX and IP-50EX coupler/splitter twist): 0.8 Nm

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1.5 Tips for Installation and Alignment

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

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

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2. Product Hardware Description

2.1 IP-50EX Hardware Overview

IP-50EX 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).

Models with an integrated antenna are planned for future release.

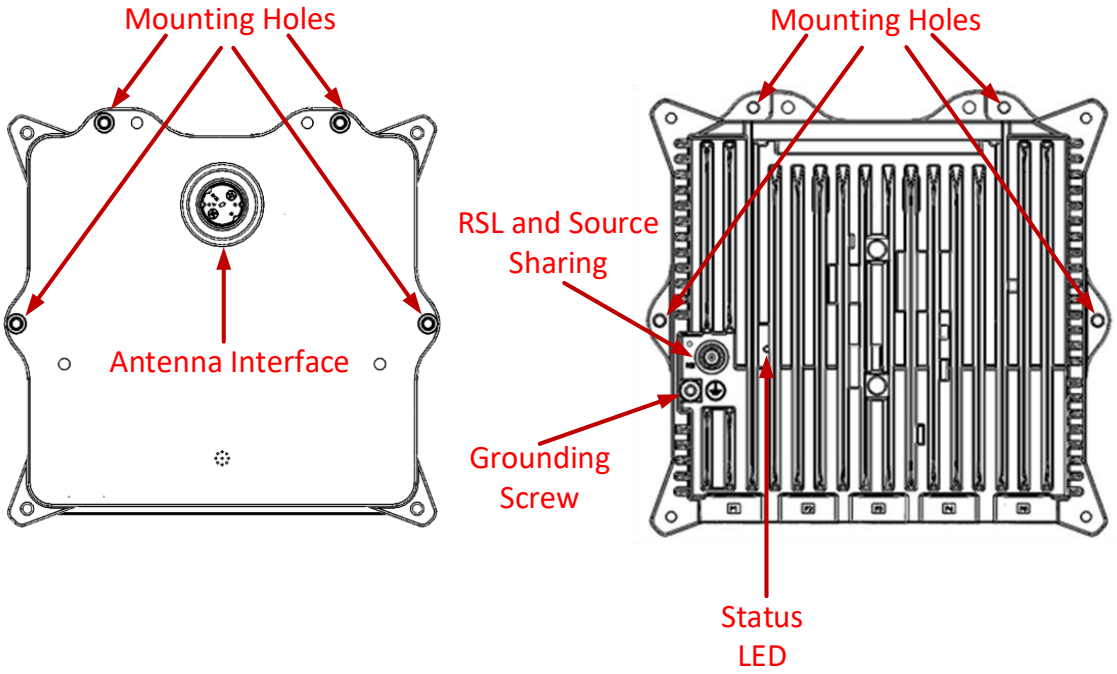

Figure 1: IP-50EX Direct Mount HW Ready – Rear View (Left) and Front View (Right)

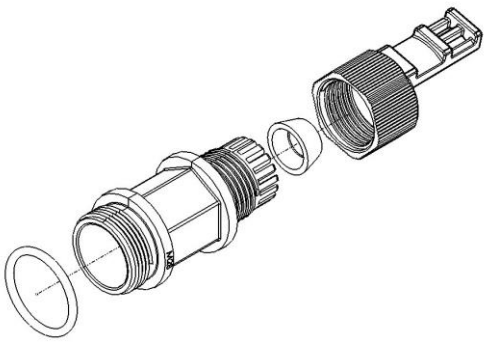

Figure 2: Cable Gland Construction

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2.2 IP-50EX Interfaces

IP-50EX has two optical SFP28 cages for traffic. It also has one QSFP port which can be used as an XPIC/protection port or a 1 x 1GbE or 10GbE traffic port.

With IP-50EXA, the QSFP port can also be converted with a QSFP transceiver and a special cable to 2 x 1/10 GbE traffic ports.

For a list of QSFP adaptors and cables, see *Table 3*. Note the following:

- QSFP+_to_QSFP+_cable is used to connect the two IP-50EX devices in Unit Redundancy and XPIC configurations. This cable is connected directly to P5, without the need for any other adaptor or transceiver.
- To use P5 in 1x1/10Gbps mode, an adaptor is required (QSFP to SFP Kit) An SFP or SFP+ transceiver is inserted in the adaptor. See the Technical Description for IP-50EX, IP-50EX-P, and IP-50EXA for a list of approved SFP and SFP+ transceivers.
- To use P5 in 2x1/10Gbps mode (IP-50EXA only), a QSFP transceiver is required, as well as a special 2x Dual LC cable. See *Table 3* for a list of approved QSFP transceivers and cables.

IP-50EX has an RJ-45 management port, which can also be used for traffic.

Note: Support for traffic over the management port depends on the type of IP-50EX product and the CeraOS version. Check the Release Notes for the CeraOS version you are using.

For power, IP-50EX and IP-50EX-P both have a DC power interface (-48V) (Port 1).

In addition, IP-50EX-P has an option to receive PoE power from a Ceragon-approved PoE injector via the management port, P2.

IP-50EX also has an IP Address reset button, located underneath the DC Power Interface. The user must press the button for 1-3 seconds to reset the device to the default IP Address.

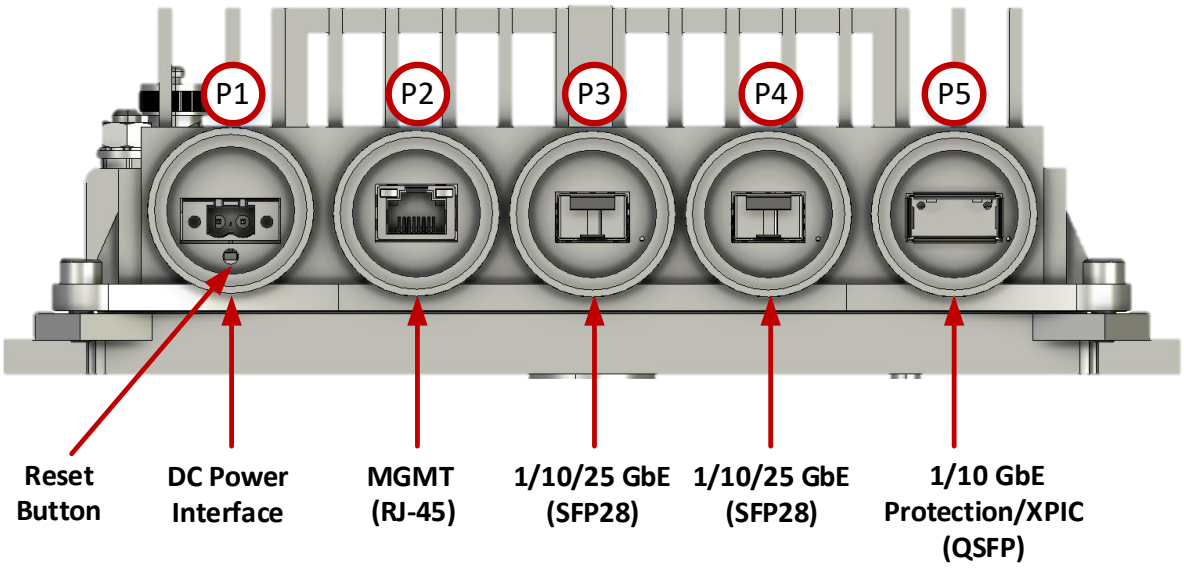

Figure 3: IP-50EX Interfaces

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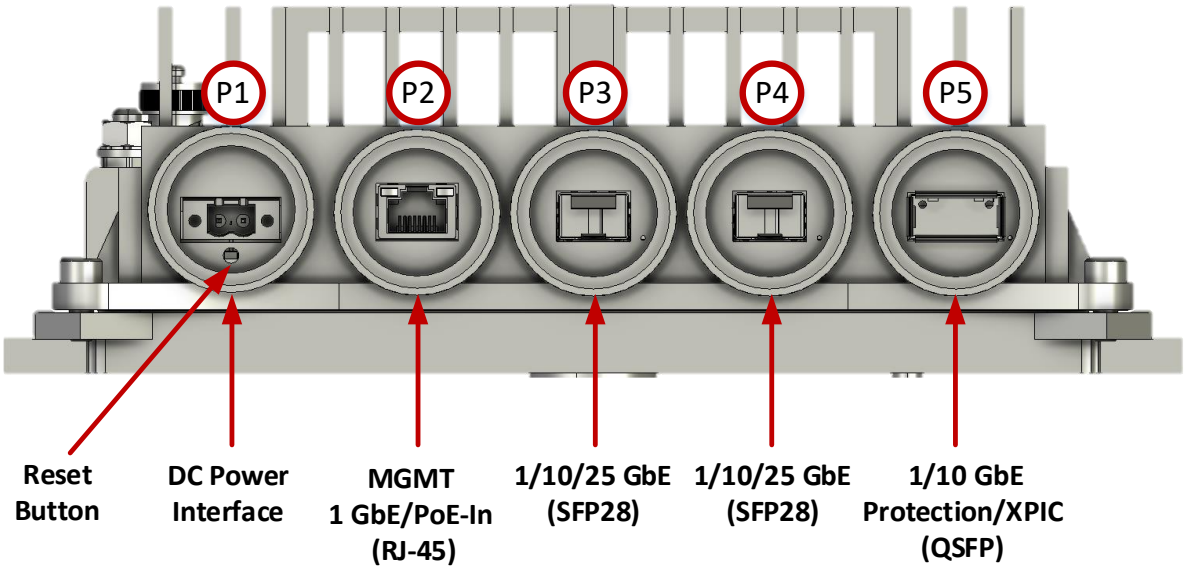

Figure 4: IP-50EX-P Interfaces

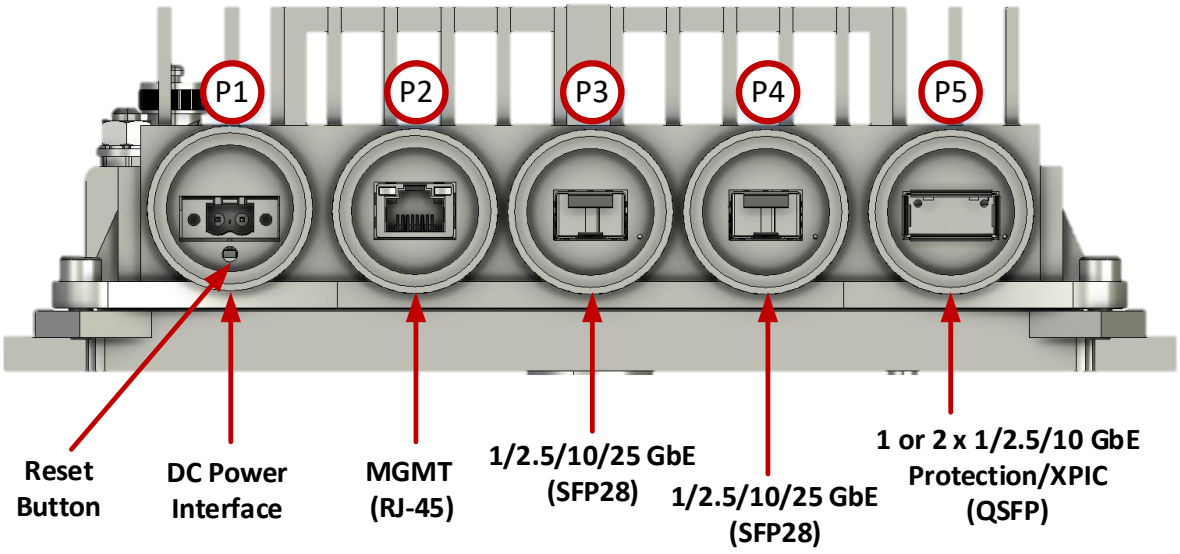

Figure 5: IP-50EXA Interfaces

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- P1 – Power Interface (-48V)
  - Reset button – see *Resetting the IP Address* on page 18
- P2 (MNG 1/Eth 1):
  - Electric: 100/1000Base-T RJ-45
  - Management port
  - 1G Eth traffic[1]
  - PoE (IP-50EX-P only)

Note: PoE-In requires IP-50EX-P.

- P3 (Eth 2):
  - SFP cage which supports SFP28 standard
  - 1/10/25 GbE Eth traffic (user configurable)[2]
- P4 (Eth 3):
  - SFP cage which supports SFP28 standard
  - 1/10/25 GbE Eth traffic (user configurable)[2]
- P5 (Eth 4):
  - QSFP (internal) for XPIC and Unit Redundancy (Protection)
  - QSFP cage which supports QSFP standard
  - Option for SFP or SFP+ (1 x 1 or 10GbE) with adaptor (1+0 configurations only)
  - IP-50EXA only: Option for 2 x 1/2.5/10 GbE with QSFP transceiver and special cable (1+0 configurations only)
- RSL/Source Sharing interface – TNC connector. Use a TNC-to-DVM 6 mm jack cable to measure the RSL with this interface.

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

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

1 Support for traffic over the management port depends on the type of IP-50EX product and the CeraOS version. Check the Release Notes for the CeraOS version you are using..

2 IP-50EXA also supports 2.5 GbE.

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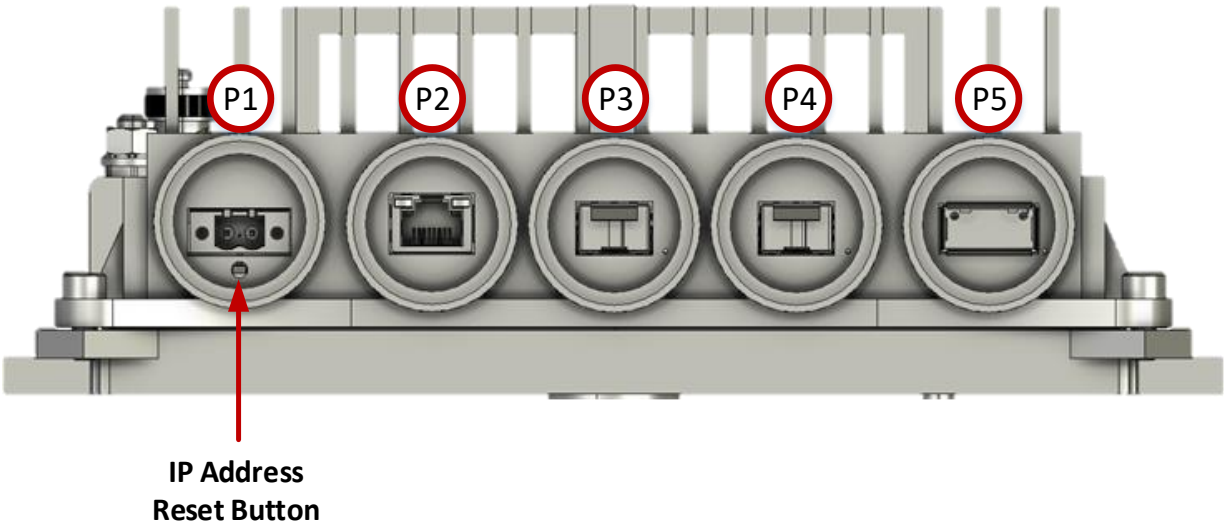
2.2.1 Resetting the IP Address

If the unit's IP address on an IP-50EX has been changed from its default of 192.168.1.1, and you do not know the new IP address, you can reset the IP address by pressing a reset button underneath the DC Power Interface (P1). You must press the button 1-3 seconds.



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2.3 PoE Injector

IP-50EX-P can be used with a Ceragon-approved PoE Injector to provide power via the management port, P2.

The following PoE Injector model is available:

- **PoE_Inj_AO_2DC_24V_48V** – Includes two DC power ports with power input ranges of ±(18-60)V each.

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

Each PoE Injector kit includes the following items:

- PoE injector
- 2 DC power connectors

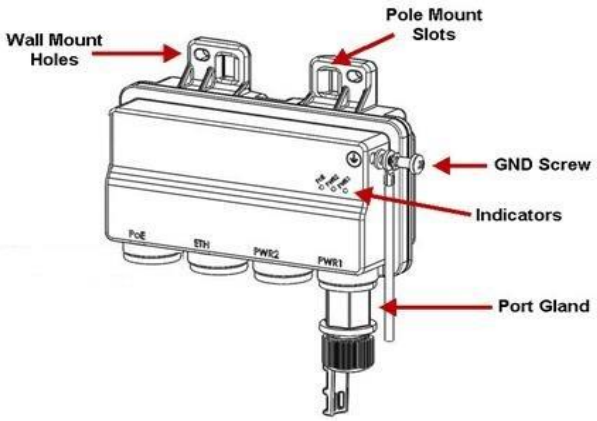

Figure 6: PoE Injector

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2.3.1 PoE Injector Interfaces

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

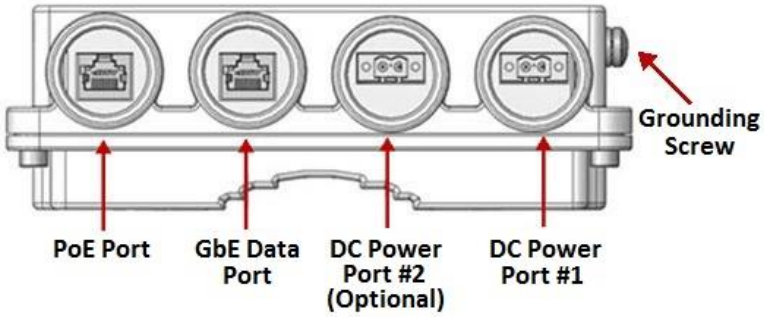

Figure 7: PoE Injector Ports

2.4 System Components

The following figures show the main components used in the IP-50EX installation procedures.

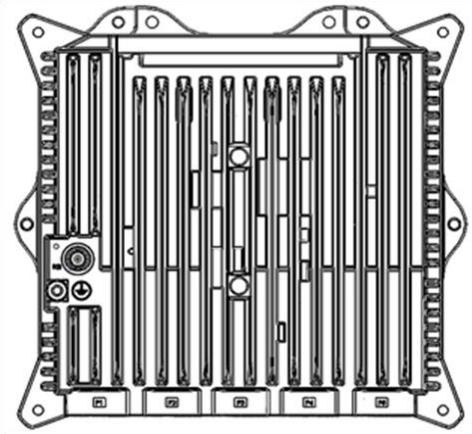

Figure 8: IP-50EX

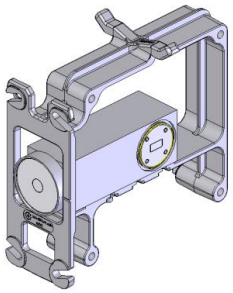

Figure 9: OMT

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2.5 Adaptors and Installation Kits

Note that because the antenna interface on the IP-50EX and IP-50EX-P is located slightly higher than other Ceragon E-band products, the E-band mediation devices have been modified to accommodate all Ceragon E-band products, including the IP-50EX and IP-50EX-P. Before performing the installation, make sure that you have the modified versions of any necessary mediation devices, according to the relevant PCNs that have been issued by Ceragon.

Table 1: IP-50EX Accessories

Marketing Model	Description
IP-20E-OMT-Kit	OMT for IP-20E, IP-50E, and IP-50EX
IP-20E-SPLTR-Kit	Splitter for IP-20E, IP-50E, and IP-50EX
IP-20E-CPLR-Kit	Coupler for IP-20E, IP-50E, and IP-50EX
IP-50EX-ANT-INT-BRKT-KIT	IP-50EX Antenna Interface Adaptor bracket kit
Integrated_Ant_Mounting_Kit[3]	Integrated Antenna Mounting Kit

Table 2: PoE Injector (IP-50EX-P only)

Marketing Model	Description
PoE_Inj_AO_2DC_24V_48V	Includes two DC power ports with power input ranges of ±(18-60)V each.
PoE_Inj_19inch_Rack_Mnt_kit	PoE Injector 19” Rack Mount Kit
PoE_Inj_ETSI_Rack_Mnt_kit	PoE Injector ETSI Rack Mount Kit

Table 3: QSFP Accessories

Marketing Model	Marketing Description	Item Description
QSFP to SFP Kit	Adapter QSFP to SFP For Outdoor kit	Converts the QSFP port to an SFP or SFP+ port. This adaptor is used when P5 is providing a 1x1/10Gbps traffic interface. **Note:** This adaptor supports a temperature range of 0° to +70°C (32° to 158°F).
QSFP+40GE-OPT-EXT-TEMP	QSFP+ MPO MALE 40GE EXT-TEMP	In 2x1/10Gbps configurations with IP-50EXA, the transceiver is attached to the QSFP port (P5), and a 2x Dual LC cable is attached to the transceiver.
QSFP+40GE_OPT_SM_IND-40Deg	QSFP+40GE_OPT_SM_IND-40Deg	In 2x1/10Gbps configurations with IP-50EXA, the transceiver is attached to the QSFP port (P5), and a 2x Dual LC cable is attached to the transceiver.

[3] Planned for future release.

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Marketing Model	Marketing Description	Item Description
FO_SM_MPO_to_2xLC_ARM_100m	CABLE,FO,MPO to 2x Dual LC, 1m breakout,OM3,100M,M28 Gland,outdoor	Connects the QSFP port (P5) to two SFP ports on the external switch or router. One of the QSFP transceivers listed above must be used with this cable.
QSFP+_to_QSFP+_cable	QSFP+ TO QSFP+ DAC 65CM	Used to connect the QSFP ports (P5) of two IP-50EX devices in Unit Redundancy and XPIC configurations.

2.6 Antenna Interface Specifications

Remote Mount Antenna Interface:

Waveguide Standard	Antenna Flange
WR12	UG387/U Ceragon Antenna Interface

Note: Appropriate lubricant or grease can be applied to the screws that connect the IP-50EX to the antenna interface.

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2.7 Power Specifications

2.7.1 Power Input Specifications

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

2.7.2 Power Consumption Specifications

Table 4: Power Consumption – Standard IP-50EX Devices

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

Table 5: Power Consumption –IP-50EX-P Devices

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

Table 6: Power Consumption –IP-50EXA Devices

Unit Configuration	Power Consumption
Typical Power	75W
Maximum Power	82W

2.7.3 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 4 Amp.

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2.8 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

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3. Cable Installation and Grounding

3.1 Minimum and Maximum Cable Diameter

To fit the gland, the outer cable diameter should be between 6-10 mm. This applies to all glands on the IP-50EX unit and the PoE Injector.

3.2 Grounding the Cables

Cables must be grounded as follows:

- For fiber cables (see *Connecting an Optical Fiber Cable and SFP* on page 46), no grounding is required.
- For DC power cables (see *Connecting a DC Power Cable* on page 54), 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.

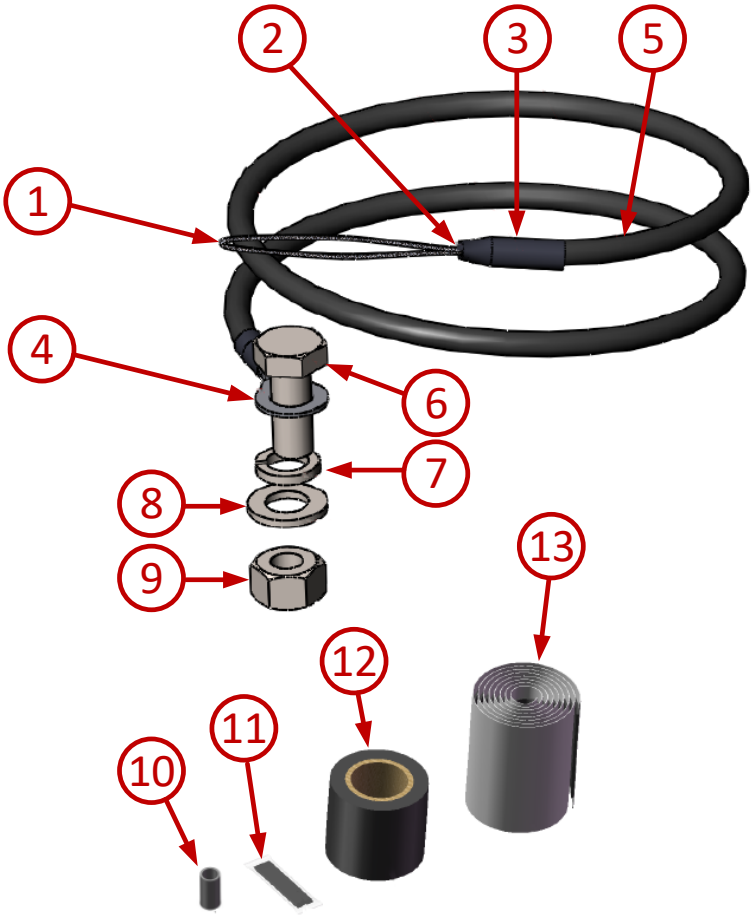

Figure 10: Cable Grounding Kit

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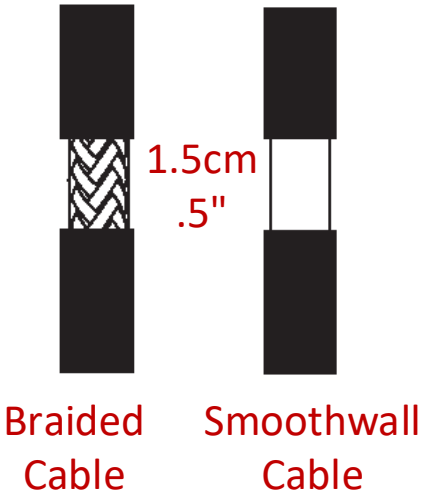
Table 7: Cable Grounding Kit

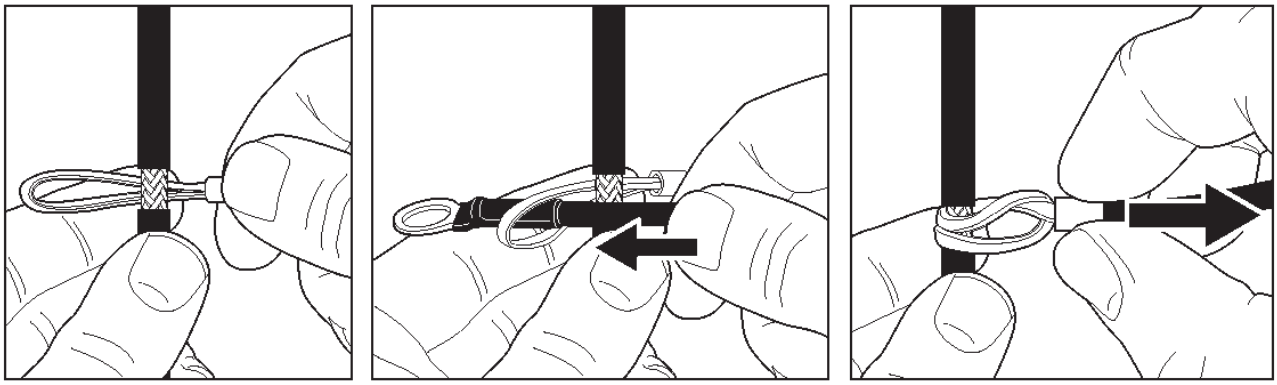
Marketing P/N	Description
UNIV_GRD_KIT_1/2	Universal Grounding Kit up to 1/2” cable

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.



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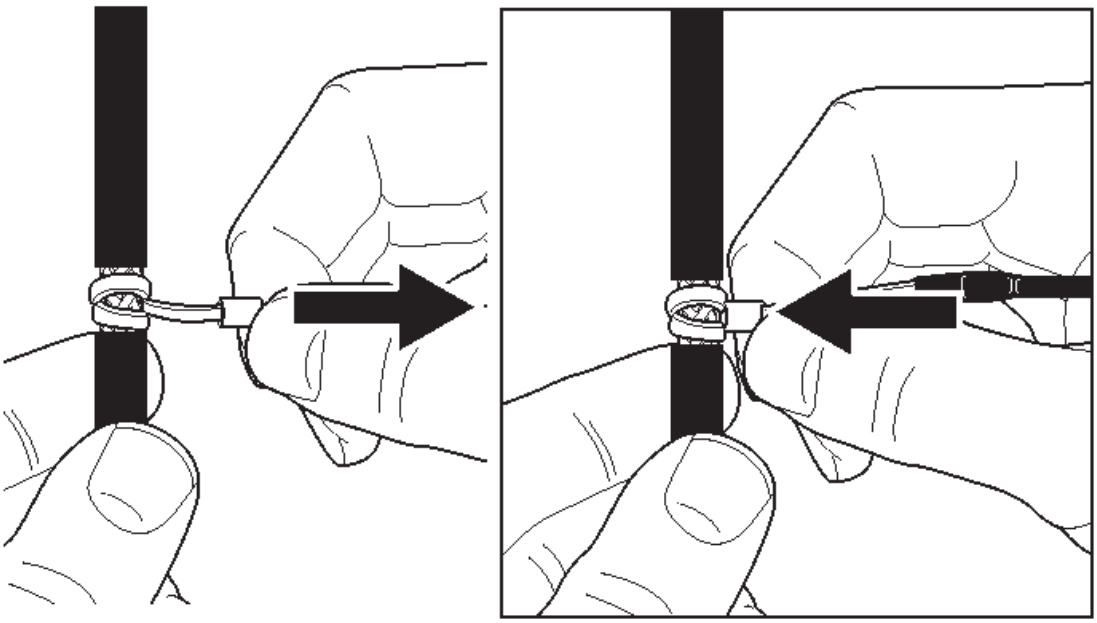
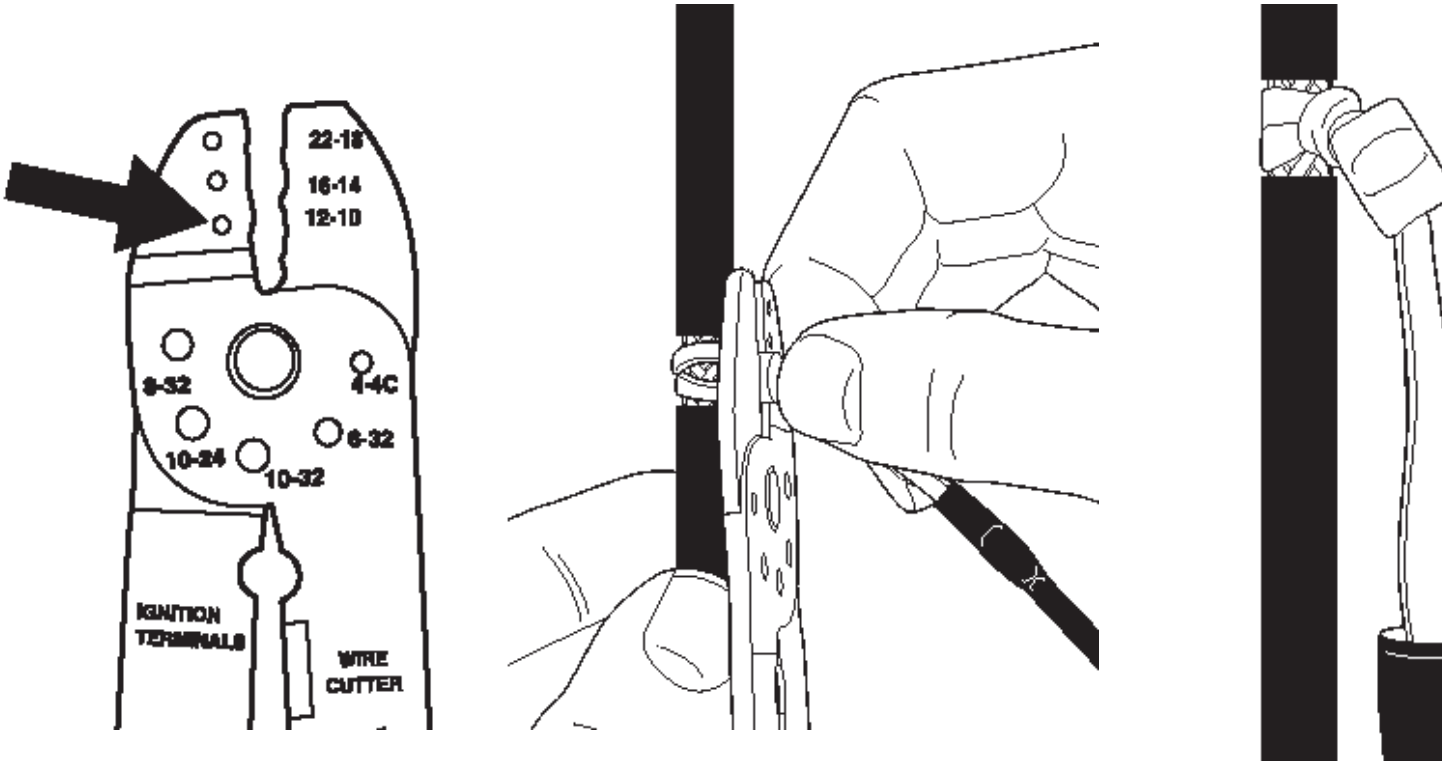
3 Grasp the terminal of the braid belt (2) and slide it flush with the knot around the cable, as shown in the figure below.



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



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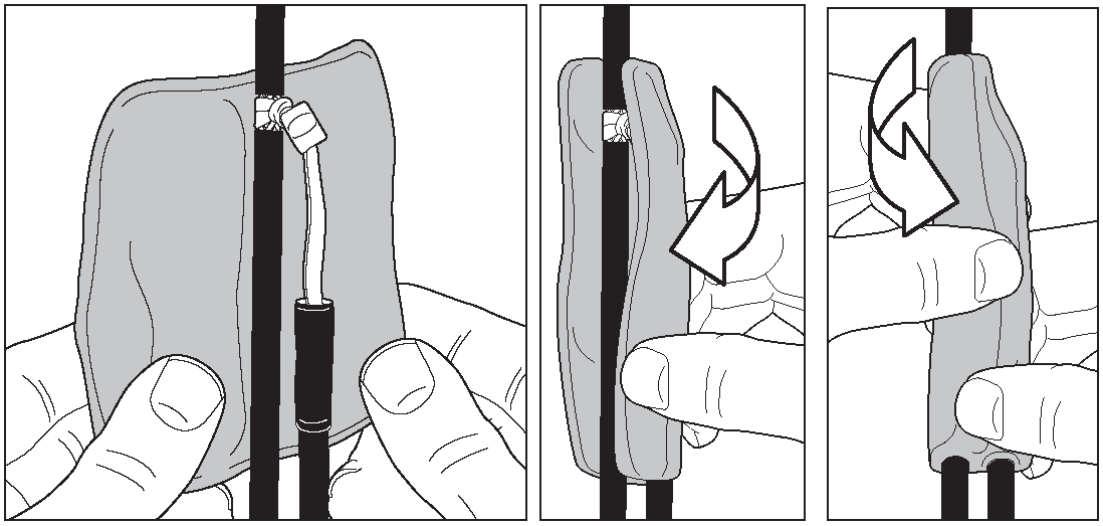
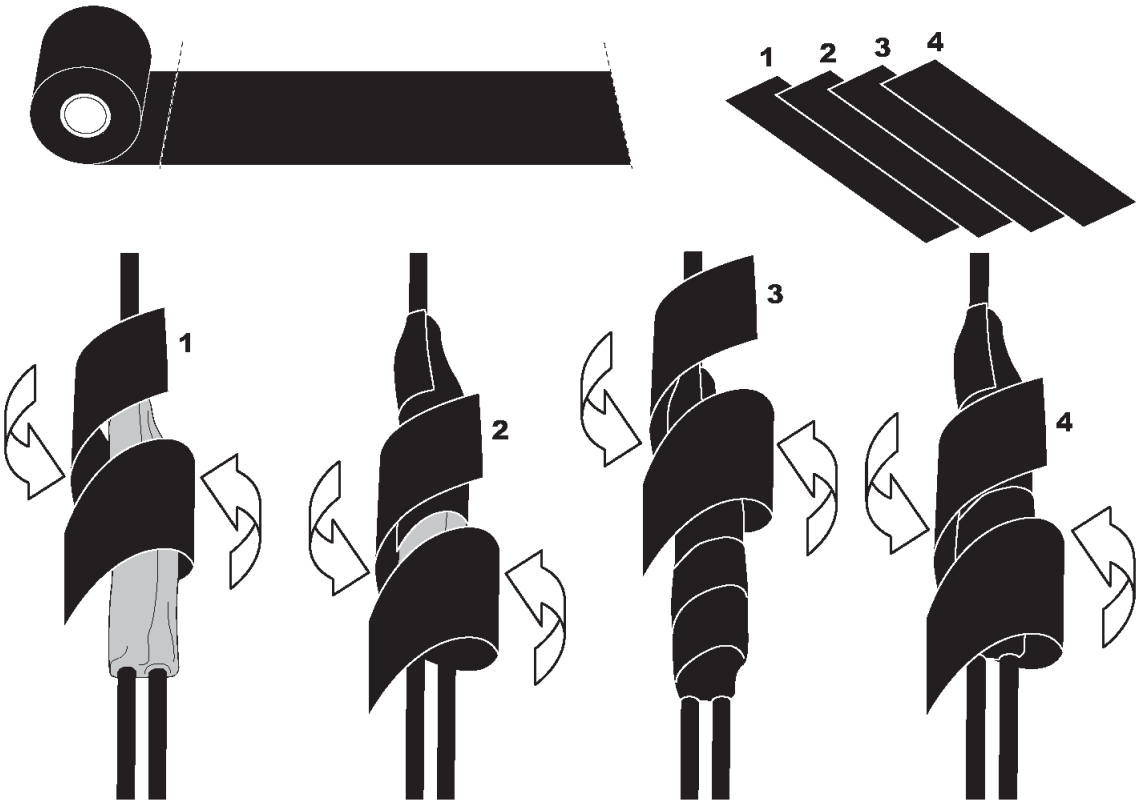
5 Wrap the butyl rubber sealing clay (13) around the cable and the grounding wire, as shown in the figures below.



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.



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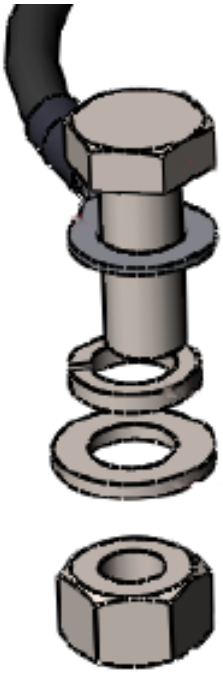
7 Pass the hex bolt (6) through the copper lug at the end of the grounding wire (4), and secure it to the grounding bar using the flat washer (7), the spring washer (8), and the nut (9). Use conductive grease (11) on the bolt and nut to ensure proper contact.



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3.3 Grounding the IP-50EX Unit

The grounding of the IP-50EX 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 IP-50EX chassis is 2.5 mΩ or less, but in any case not more than 10 mΩ.

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

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

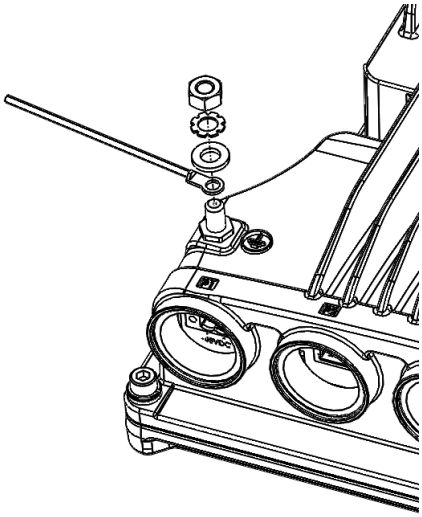
- If the PoE is installed outdoors: 2.5 mΩ or less, but in any case not more than 10 mΩ.
- If the PoE Injector is installed indoors: 5 mΩ or less.

Required Tools

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

Procedure:

1 On the front of each IP-50EX 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 IP-50EX 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.



Notes:

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.

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3.4 Power Source

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

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

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

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

Caution! The user power supply GND must be connected to the positive pole in the IP-50EX power supply.
Any other connection may cause damage to the system!

Note! For the warranty to be honored, you must install the IP-50EX in accordance with the instructions above.

3.5 Surge Protection

IP-50EX includes built-in surge protection for its Ethernet and power interfaces. IP-50EX's surge protection implementation complies with surge immunity standard IEC 61000-4-5, level 2, provided the Ethernet cables were prepared according to the instructions in *Connecting the Ethernet Cable* on page 56.

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 8*.

Note: To provide maximum protection, make sure to prepare the Ethernet cables according to the instructions in *Connecting the Ethernet Cable* on page 56 and to ground the cables in accordance with the instructions in *Grounding the Cables* on page 25.

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 IP-50EX unit.

The following surge protector is available from Ceragon.

Table 8: Surge Protector

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

Note: In order for the surge protection devices to work properly , the IP-50EX unit must be properly grounded according to Section 3.3, *Grounding the IP-50EX Unit*.

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3.6 Available Cable Options

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

3.6.1 Fiber Optic Cables – Single Mode

Table 9: Fiber Optic Cables – Single Mode

Marketing Model	Item Description
IP-20_FO_SM_LC2LC_ARM_90m	CABLE,FO,DUAL LC TO LC,90M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_80m	CABLE,FO,DUAL LC TO LC,80M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_7m	CABLE,FO,DUAL LC TO LC,7M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_70m	CABLE,FO,DUAL LC TO LC,70M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_60m	CABLE,FO,DUAL LC TO LC,60M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_50m	CABLE,FO,DUAL LC TO LC,50M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_40m	CABLE,FO,DUAL LC TO LC,40M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_30m	CABLE,FO,DUAL LC TO LC,30M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_300m	CABLE,FO,DUAL LC TO LC,300M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_20m	CABLE,FO,DUAL LC TO LC,20M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_200m	CABLE,FO,DUAL LC TO LC,200M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_2.2m	CABLE,FO,DUAL LC TO LC,2.2M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_15m	CABLE,FO,DUAL LC TO LC,15M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_150m	CABLE,FO,DUAL LC TO LC,150M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_120m	CABLE,FO,DUAL LC TO LC,120M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_SM_LC2LC_ARM_10m	CABLE,FO,DUAL LC TO LC,10M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR

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Marketing Model	Item Description
IP-20_FO_SM_LC2LC_ARM_100m	CABLE,FO,DUAL LC TO LC,100M,SM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR

3.6.2 Fiber Optic Cables – Multi Mode

Note that this section includes two tables:

- For SFP28 interfaces using SFP28-25GbE-MM-SR-EXT-TEMP, you must use one of the cables in *Table 10: Fiber Optic Cables – Multi Mode – 25GbE Interfaces*.
- For interfaces using other Multi Mode SFP transceivers, you can use any of the cables listed in *Table 10: Fiber Optic Cables – Multi Mode – 25GbE Interfaces* or *Table 11: Fiber Optic Cables – Multi Mode – 1G and 10G Interfaces*. For future compatibility, it is recommended to use one of the cables in *Table 10: Fiber Optic Cables – Multi Mode – 25GbE Interfaces* for all SFP28 interfaces.

For a list of approved SFP, SFP+, and SFP28 transceivers, refer to the Technical Description for IP-50EX.

Table 10: Fiber Optic Cables – Multi Mode – 25GbE Interfaces

Marketing Model	Item Description
FO_MM_OM3_LC2LC_ARM_70m	CABLE,FO,DUAL LC/LC,70M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_60m	CABLE,FO,DUAL LC/LC,60M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_50m	CABLE,FO,DUAL LC/LC,50M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_40m	CABLE,FO,DUAL LC/LC,40M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_30m	CABLE,FO,DUAL LC/LC,30M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_20m	CABLE,FO,DUAL LC/LC,20M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM3_LC2LC_ARM_10m	CABLE,FO,DUAL LC/LC,10M,MM,OM3,M28 GLAND,ARMORED,OUTDOOR
FO_MM_OM4_LC2LC_ARM_100m	CABLE,FO,DUAL LC TO LC,100M,MM,OM4,M28 GLAND,ARMORED,OUTDOOR

Table 11: Fiber Optic Cables – Multi Mode – 1G and 10G Interfaces

Marketing Model	Item Description
IP-20_FO_MM_LC2LC_ARM_90m	CABLE,FO,DUAL LC TO LC,90M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR

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Marketing Model	Item Description
IP-20_FO_MM_LC2LC_ARM_80m	CABLE,FO,DUAL LC TO LC,80M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_7m	CABLE,FO,DUAL LC TO LC,7M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_70m	CABLE,FO,DUAL LC TO LC,70M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_60m	CABLE,FO,DUAL LC TO LC,60M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_50m	CABLE,FO,DUAL LC TO LC,50M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_40m	CABLE,FO,DUAL LC TO LC,40M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_30m	CABLE,FO,DUAL LC TO LC,30M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_300m	CABLE,FO,DUAL LC TO LC,300M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_20m	CABLE,FO,DUAL LC TO LC,20M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_200m	CABLE,FO,DUAL LC TO LC,200M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_2.2m	CABLE,FO,DUAL LC TO LC,2.2M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_15m	CABLE,FO,DUAL LC TO LC,15M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_150m	CABLE,FO,DUAL LC TO LC,150M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_120m	CABLE,FO,DUAL LC TO LC,120M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_10m	CABLE,FO,DUAL LC TO LC,10M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR
IP-20_FO_MM_LC2LC_ARM_100m	CABLE,FO,DUAL LC TO LC,100M,MM,55mm OPEN END,WITH M28 GLAND,ARMORED,OUTDOOR

3.6.3 DC Cable and Connector

Table 12: DC Cable and Connector

Marketing Model	Description
Outdoor_DC_cbl_2x18AWG_drum	CABLE,305M,OUTDOOR_DC_CBL_2X18AWG_DRUM

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Marketing Model	Description
IP-20C_DC_Conn	IP-20C_DC_Conn

3.6.4 Extension Cables for Unit Redundancy and XPIC

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

Table 13: Extension Cables for Unit Redundancy and XPIC

Description	Marketing Model	Marketing Description
QSFP+ TO QSFP+ DAC for outdoor. L=65cm	QSFP+_to_QSFP+_cable	QSFP+ TO QSFP+ DAC 65CM

3.6.5 Clock Sharing Cable for XPIC

Table 14: Clock Sharing Cable for XPIC

Description	Marketing Model	Marketing Description
CABLE,TNC RA TO TNC RA,1M,18Ghz,3/8in,HELIAX	SOURCE_SHARING_1M	Source_Sharing_1m

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3.6.6 Ethernet Cable and Specifications

Table 15: Ethernet Cables

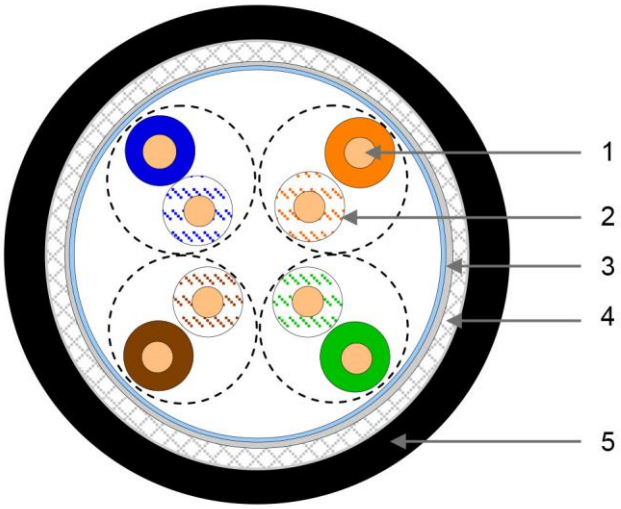
Marketing Model	Description
CAT5E_SFUTP_Outdoor_50m	CABLE,RJ45 TO RJ45 STR 50M,CAT-5E,ETHER,UV RES
CAT5E_SFUTP_Outdoor_75m	CABLE,RJ45 TO RJ45 STR 75M,CAT-5E,ETHER,UV RES
CAT5E_SFUTP_Outdoor_100m_drum	CABLE,MATERIAL,CAT-5E,SFUTP,4X2X24AWG,UV RESISTANCE,100M
CAT5E_SFUTP_Outdoor_305m_drum	CABLE,MATERIAL,CAT-5E,SFUTP,4X2X24AWG,UV 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 11: Cable Design



- [1]Conductor

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

Table 16: 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

3.6.7 Outdoor Ethernet Cable Specifications

Table 17: 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 18: 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 19: Outdoor Ethernet Cable Mechanical/Environmental Requirements

Jacket	UV resistant
Outer diameter	6-10 mm

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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

3.6.8 Outdoor DC Cable Specifications

Table 20: 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 21: 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

3.7 Securing the Cables

All cables should be secured at every meter on-site using either a T-Rups kit, Marketing Model Outdoor Ties (P/N: SI-0027-0) or cable clamps. When using the T-Rups kit, take special care to apply the proper amount of force in order to avoid damage to the cable. This is especially important for optical (SFP) cables.

The following cable clamps are available:

Table 22: 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.

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3.8 Special Instructions for use of Glands

Note: Each IP-50EX unit is supplied with two glands. If additional glands are required, they must be ordered separately, in kits of five glands each.

Table 23: Glands Kit

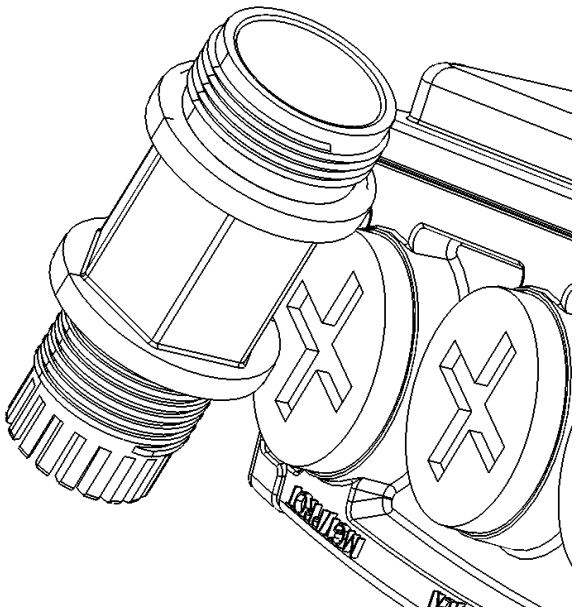
Marketing Model	Marketing Description
IP-20_Glands_kit	IP-20_Glands_x5_kit

In addition, gland caps can be ordered to protect the cable and connector from damage when elevating the cable and gland to the radio unit. See Step 5 in Section 3.8.1, *General Installation Procedure*. Gland caps are ordered separately, in kits of 10 caps each.

Table 24: Gland Cap

Marketing Model	Marketing Description
Cable_Prot_10Caps_kit	Cable protective caps kit 10 pcs, IP-20C/S/E

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.



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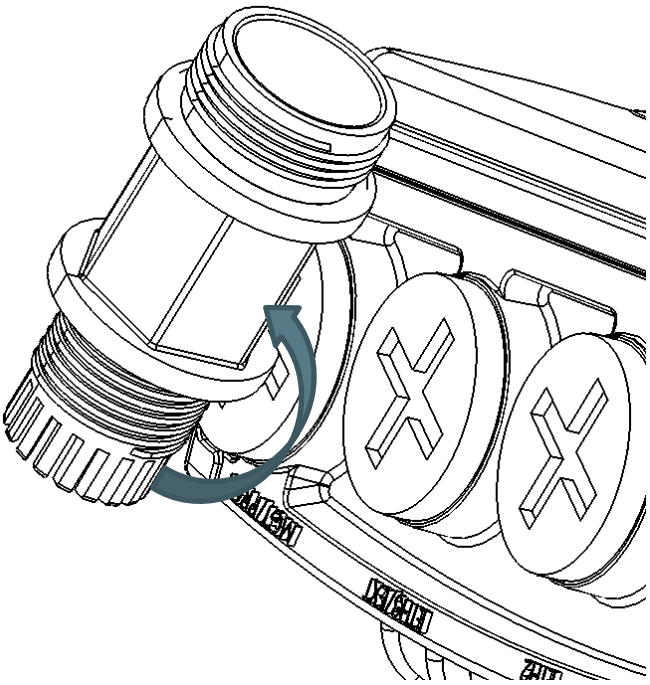


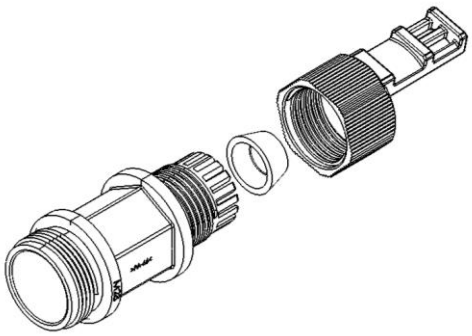
3.8.1 General Installation Procedure

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.



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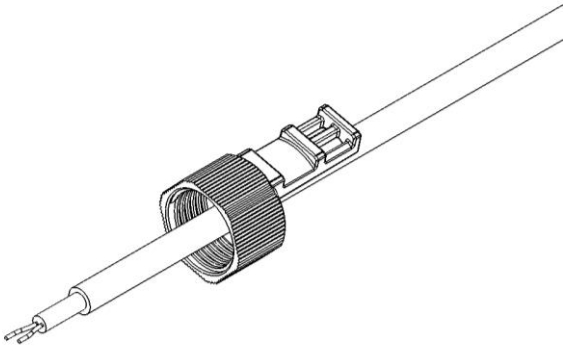
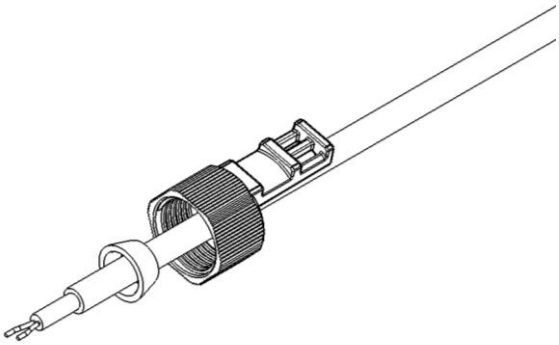
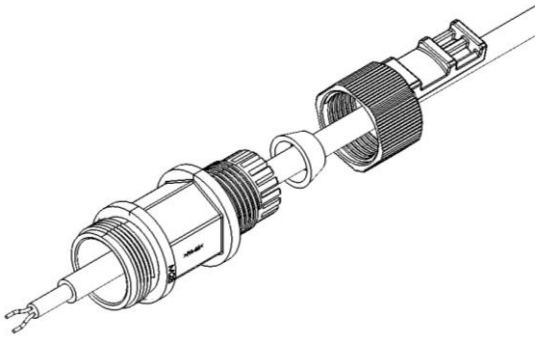
2 Slide the gland cap into the cable.



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.



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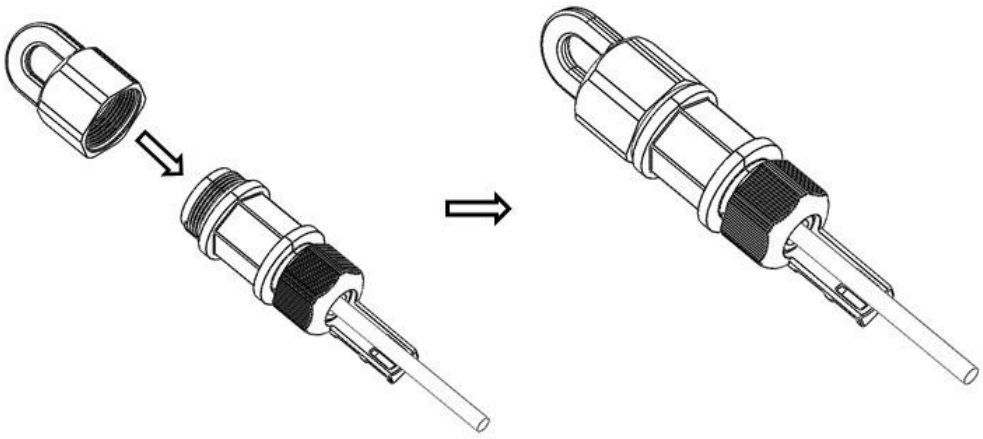
5 Optionally, after securing the cable into the body of the gland, you can close the other side of the gland with an M28 gland cap. The gland cap protects the cable and connector from damage when elevating the cable and gland to the radio unit.



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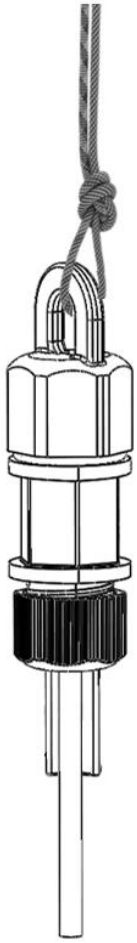
6 The M28 gland cap has hook on top. After attaching the gland cap to the gland, you can connect a rope to the hook and use this to lift the gland and cable up to the radio unit. Before screwing the gland into the radio unit, you must remove the gland cap.



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.

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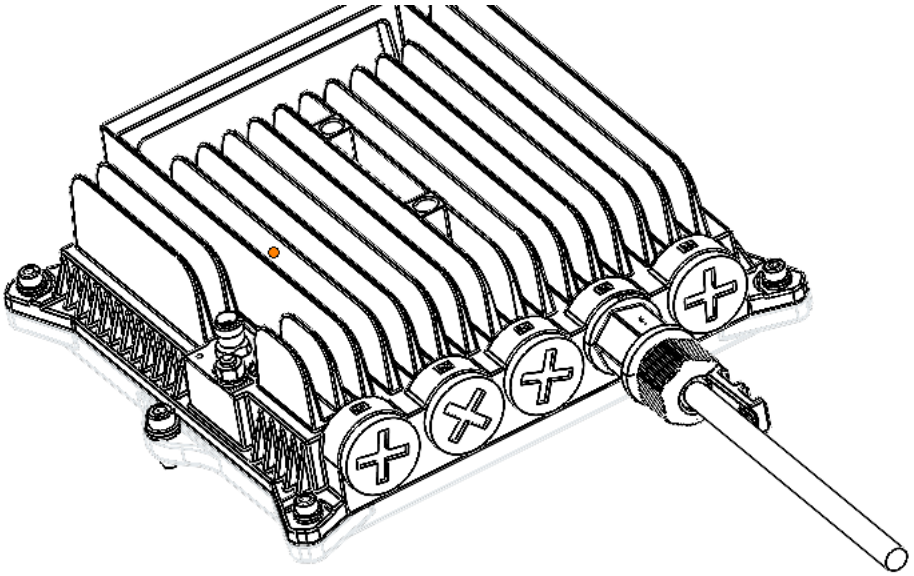
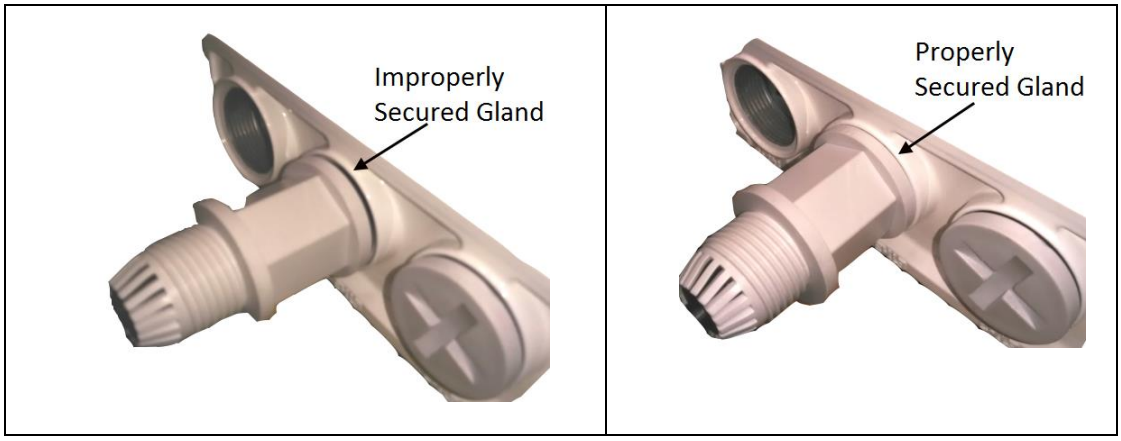
9 Screw the gland into the radio unit until there is full contact between the gland and the radio unit.



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

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.

Important 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.

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

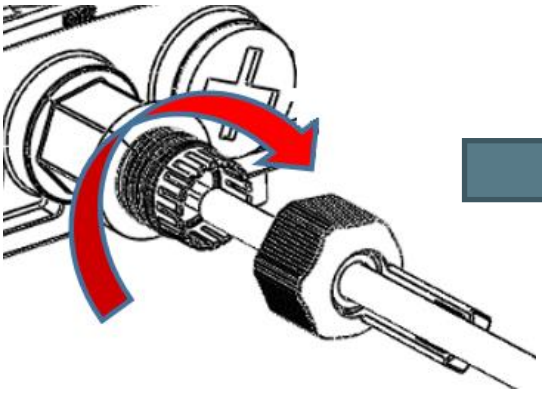


Figure 12: Tightening the Front Portion of the Gland

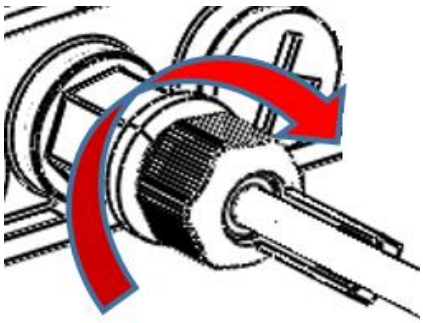
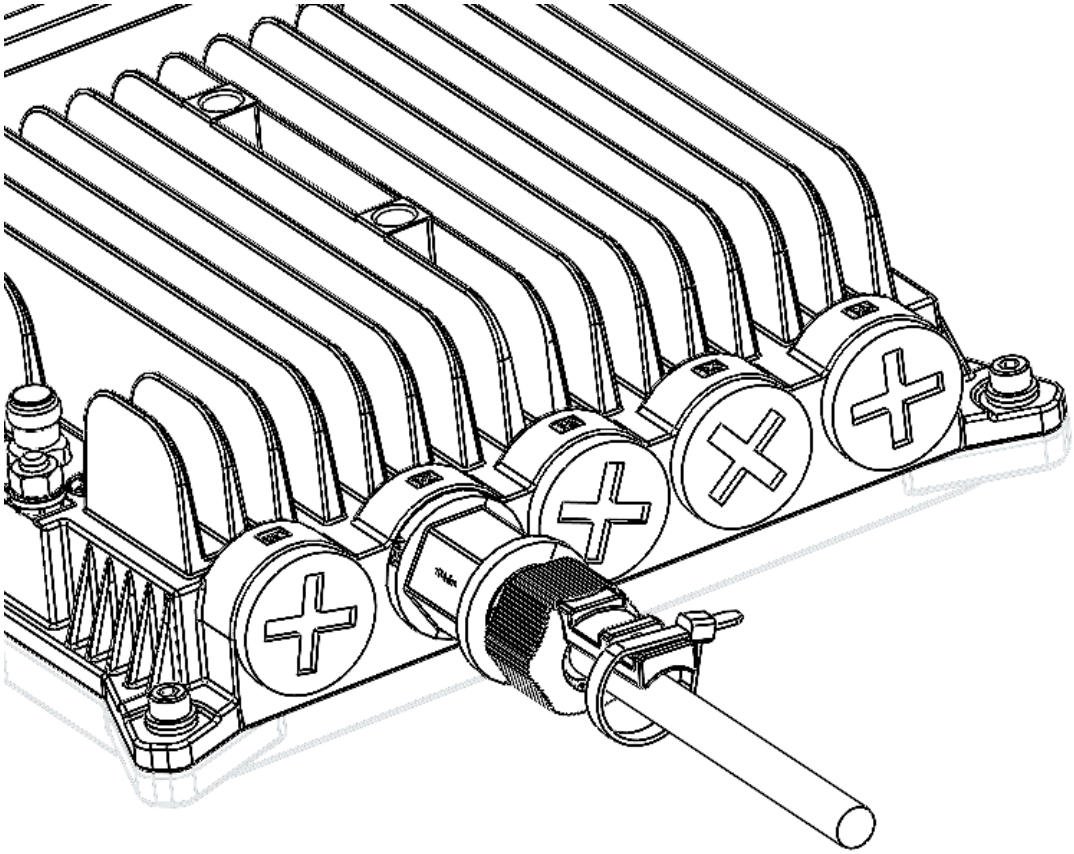


Figure 13: Tightening the Rear Portion of the Gland

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



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3.9 Connecting an Optical Fiber Cable and SFP

3.9.1 Types of SFPs

IP-50EX includes:

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

For a list of QSFP accessories, see *Table 3*.

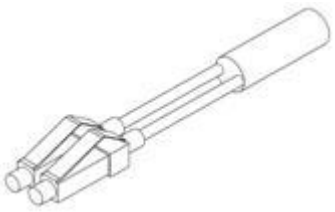
- For instructions on connecting a cable to an SFP port (P3 or P5), see *Connecting Optical Fiber to SFPs*.
- For instructions on connecting a QSFP-to-SFP adaptor and cable to the QSFP port (P4) for 1x1/10G configurations, see *Connecting Optical Fiber and a QSFP-to-SFP Adaptor to the QSFP Port*.

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

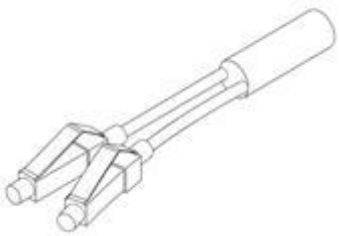
3.9.2 Connecting Optical Fiber to SFPs

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).



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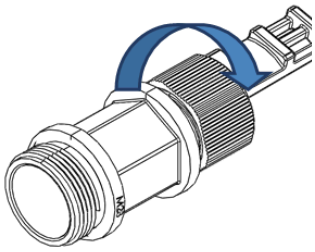
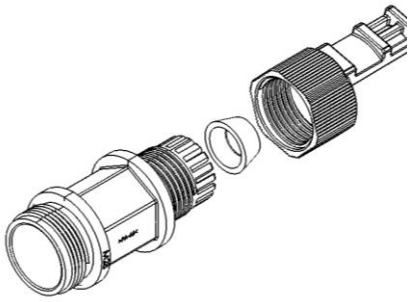
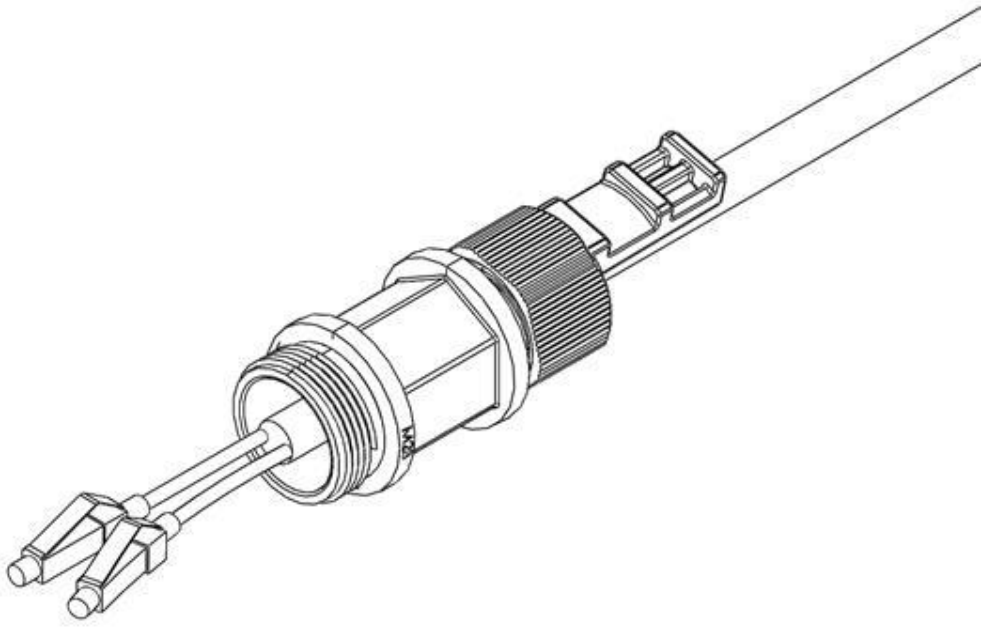
3 Remove the gland cap and rubber from the gland body.





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.



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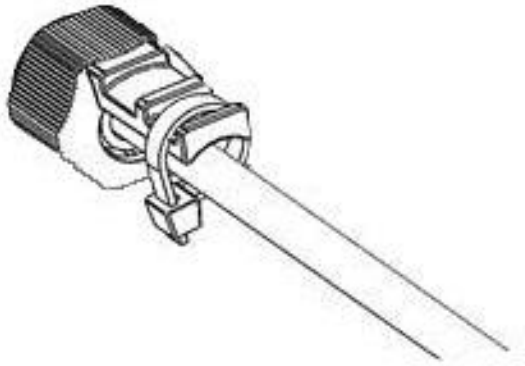
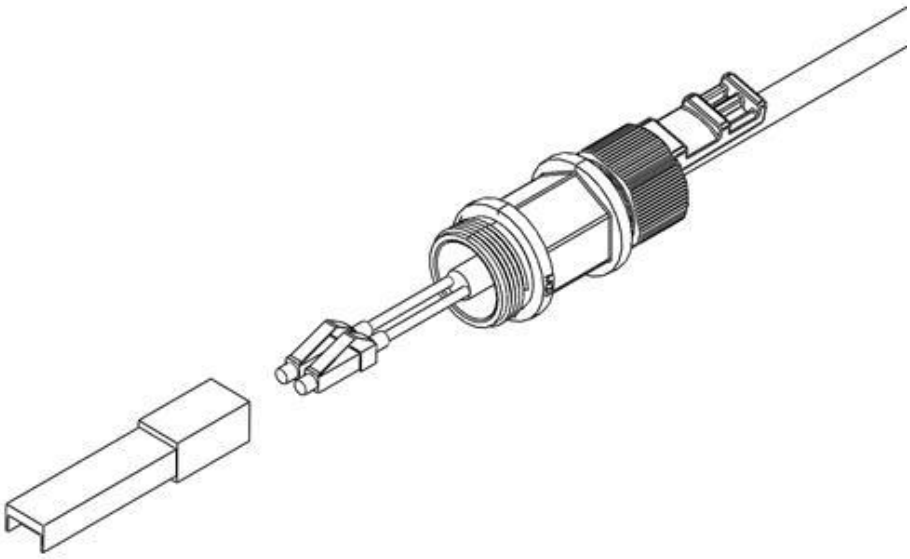
7 Secure the cable to the lip of the gland using a tie wrap.

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



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



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

Note: A new tie wrap must be used to secure the cable to the gland at the end of the procedure, as described in Step 13.

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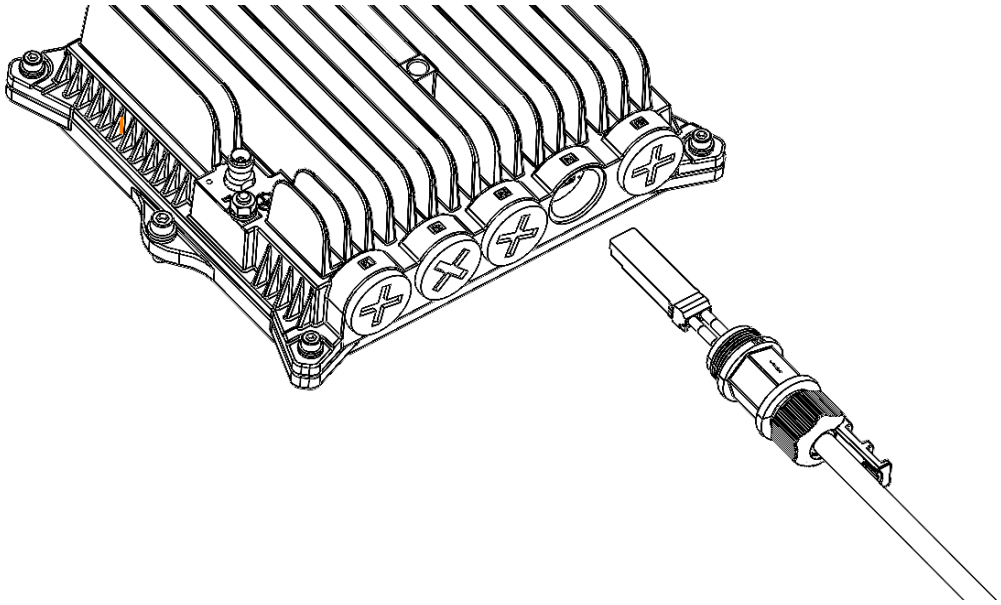
10 Connect the connector to the IP-50EX connector.

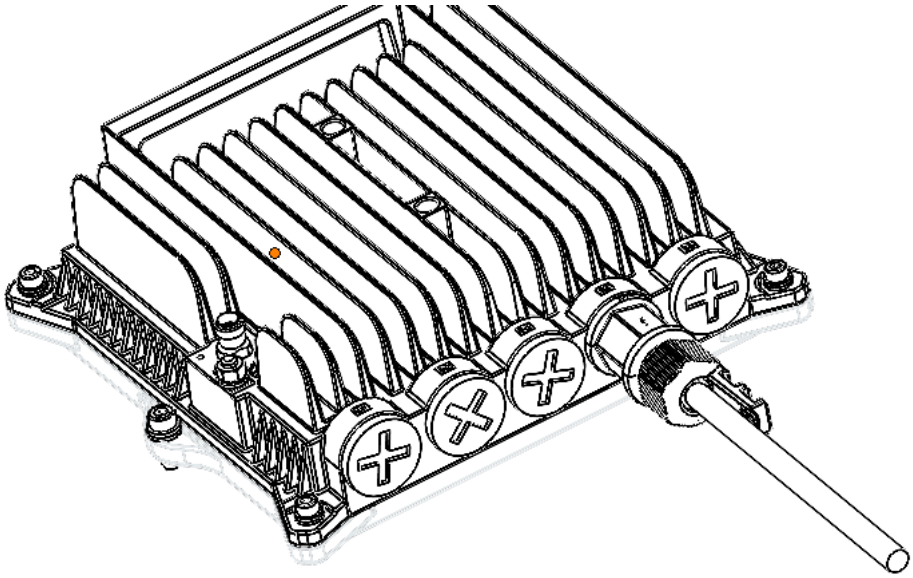


11 Tighten the gland to the radio unit until there is full contact between the gland and the radio unit.
12 Tighten the gland cap.

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

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

If the gland thread is damaged do not use it!



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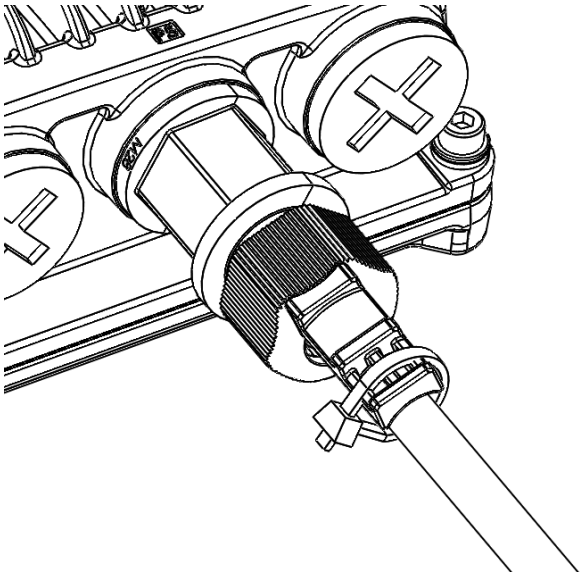
13 Secure the cable to the gland using a tie wrap.



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

The QSFP port on the IP-50EX (P5) 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 (P5) of the IP-50EX:

1 Remove the cap from P5. You can use the side of the gland to unscrew the cap.
2 Perform Steps 1 through 9 in Section 3.9.2, *Connecting Optical Fiber to SFPs*.
3 Tighten the gland extender to the IP-50EX 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*).

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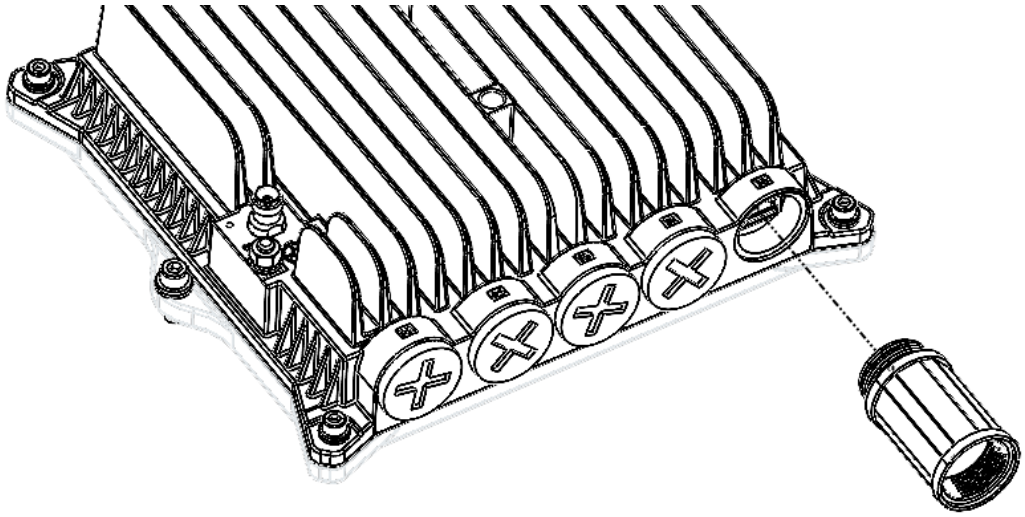
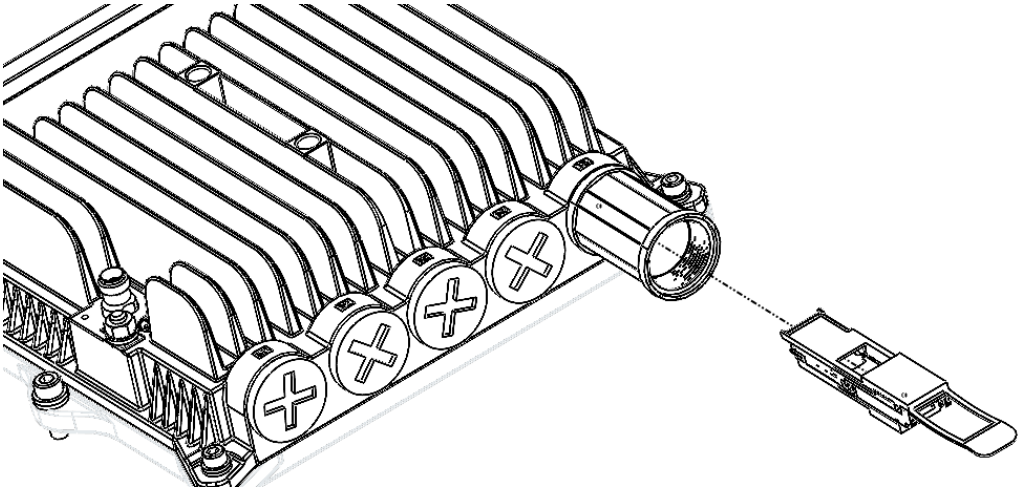


Important Note! Before tightening the gland extender, make sure the gland extender is aligned with the tapped hole in the unit.

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.



Important 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.

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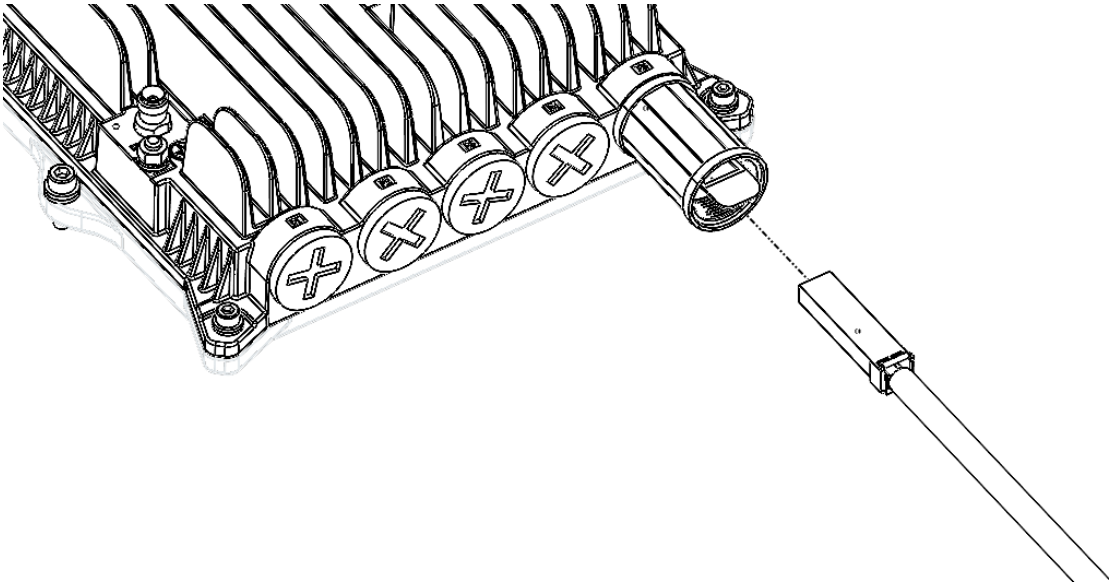
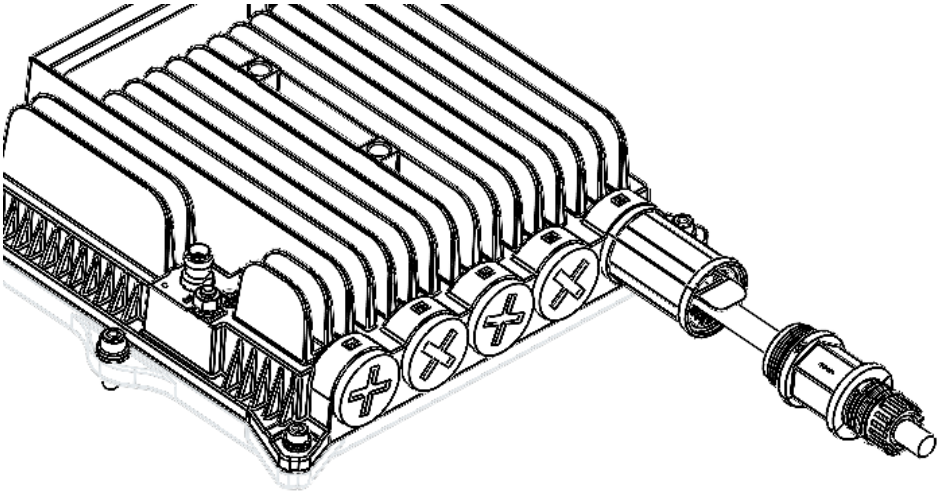
If disassembly of the QSFP-to-SFP adaptor is required, disconnect the QSFP-to-SFP adaptor first, and then disconnect the gland extender.

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.



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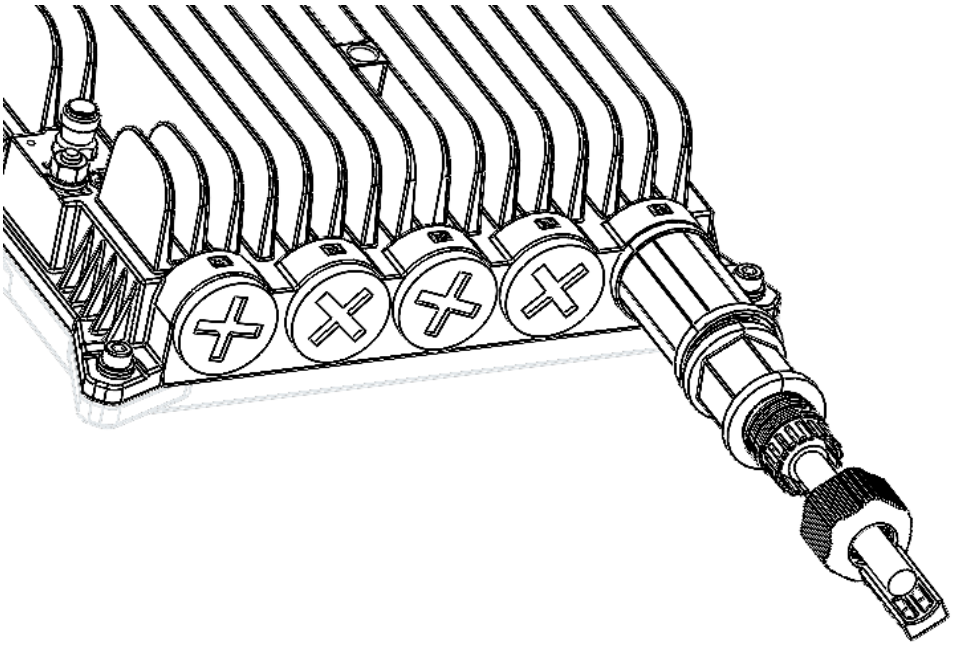
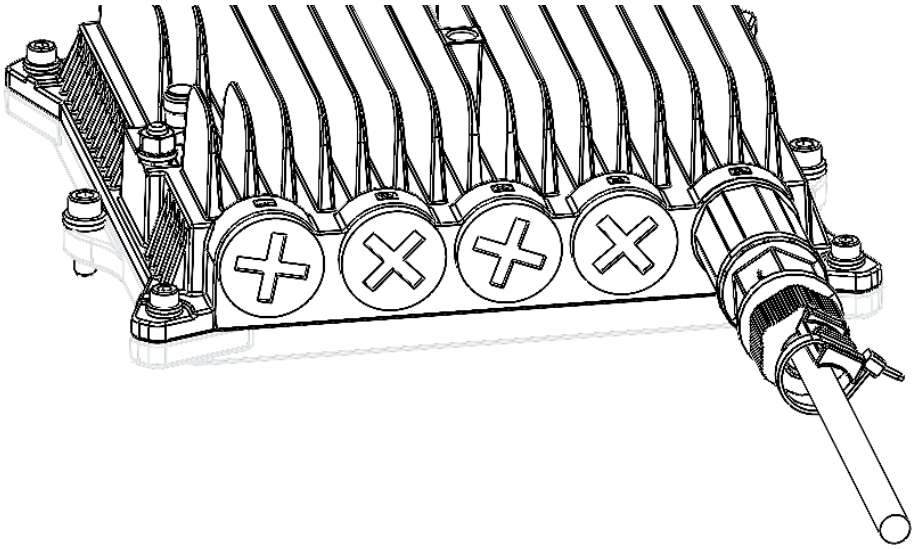
7 Tighten the gland cap.



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



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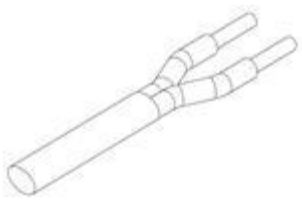
3.10 Connecting a DC Power Cable

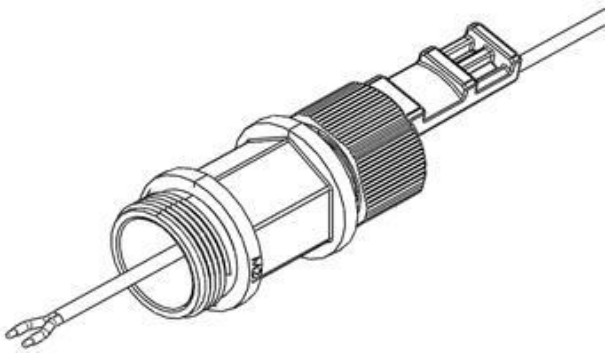
Note: The DC power cable and connector must be ordered separately. See *DC Cable and Connector* on page 34.

To connect a DC power cable:

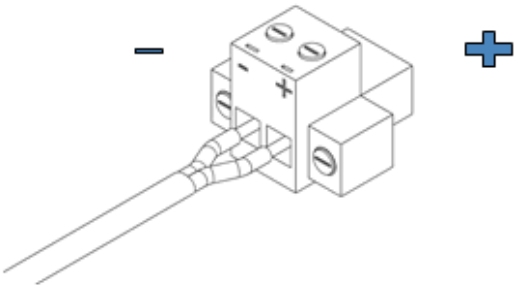
1 Strip off 45 mm from the cable jacket.
2 Expose 10 mm at the edge of each of the two wires.



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.



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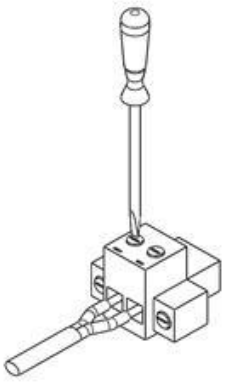
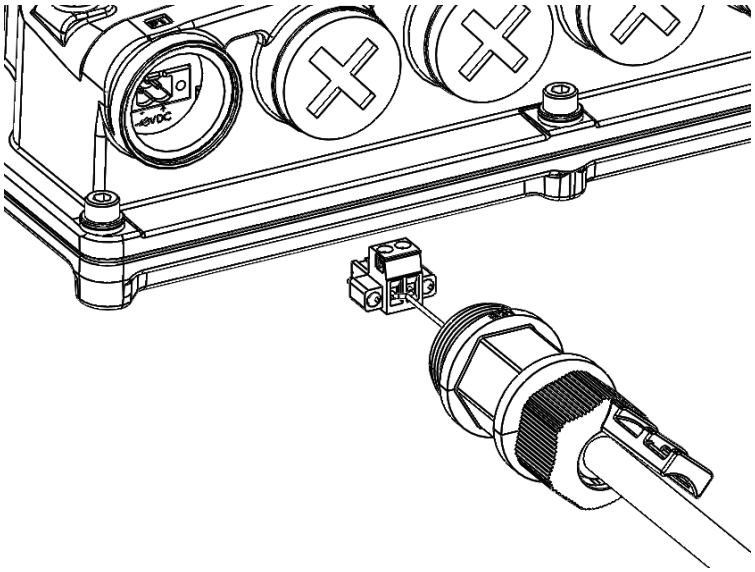
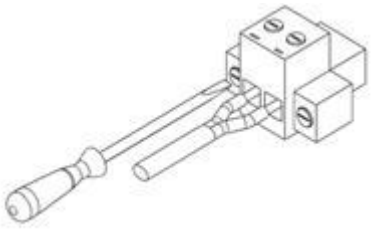
6 Tighten the two top screws.



7 Plug the power cable with connector into the IP-50EX power connector.



8 Tighten the two front screws.



9 Screw the gland into the radio unit

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

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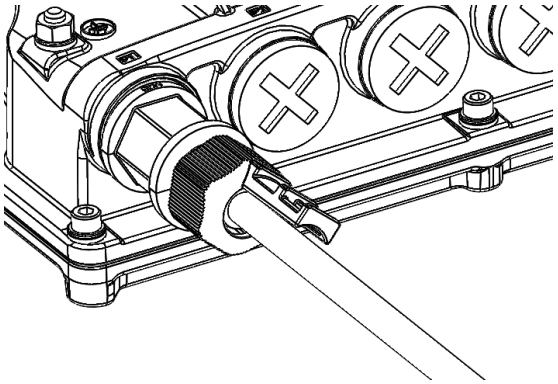
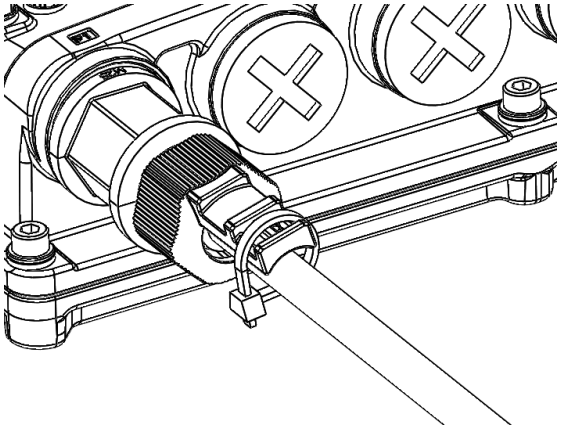


10 Tighten the gland cap.
11 Secure the cable to the gland with a tie wrap.



3.11 Connecting the Ethernet Cable

If you need to assemble the Ethernet cable, follow the instructions in section 3.11.1, *Preparing the Ethernet Cable and Plug-in Field*, then proceed to section 3.11.3, *Connection of Ethernet Cable to IP-50EX*.

If you using a pre-assembled Ethernet cable, follow the instructions in section 3.11.2, *Preparing the Ethernet Cable Already Assembled*, then proceed to section 3.11.3, *Connection of Ethernet Cable to IP-50EX*.

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

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3.11.1 Preparing the Ethernet Cable and Plug-in Field

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

Table 25: Materials for Preparing Ethernet Data Cables

Marketing P/N	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
IP-20_Glands_kit	KIT 5pcs of M28 GLAND (AA-0597-0)
UNIV_GRD_KIT_1/2	Universal Grounding Kit up to 1/2” cable
GBE_connector_kit	RJ45 CAT5E CONNECTORS AND BOOTS KIT (package of 10 connectors)

To prepare the Ethernet cable and plug-in field:

1 Prepare the gland and insert the cable, as described in *General Installation Procedure* on page 40.
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.

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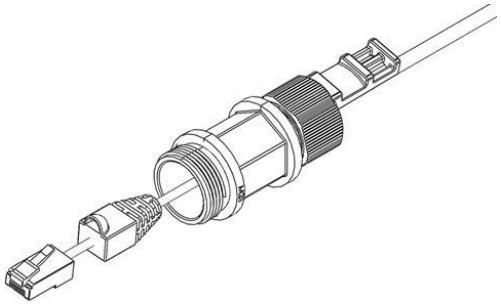
4 Roll back the foil shield insulation and wrap the drain wire around the foil. Do not remove any insulation from the conductors.
5 Align the colored wires.

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 3.6.7, *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.

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

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

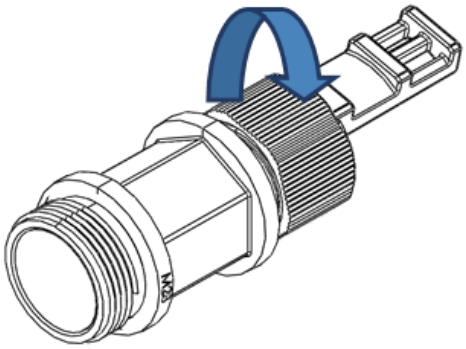
12 Verify that the wires ended up the correct order and that the wires extend to the front of the RJ45 plug and make good contact with the metal contacts in the RJ45 plug.
13 Push back the CAT5E plug cover on the connector plug.

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.

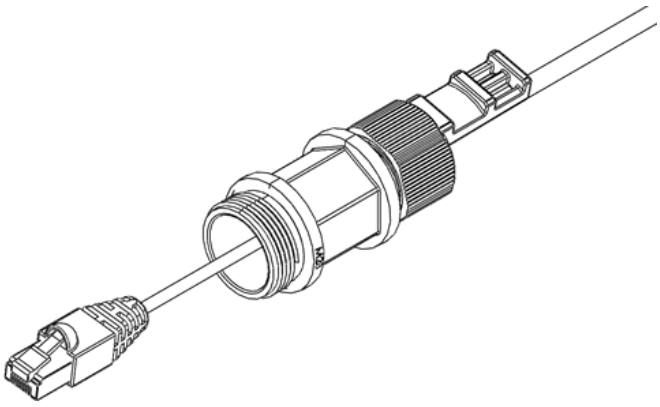
3.11.2 Preparing the Ethernet Cable Already Assembled

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.

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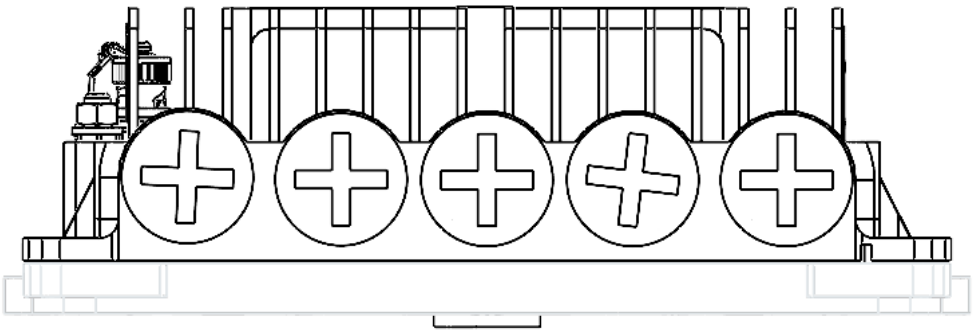
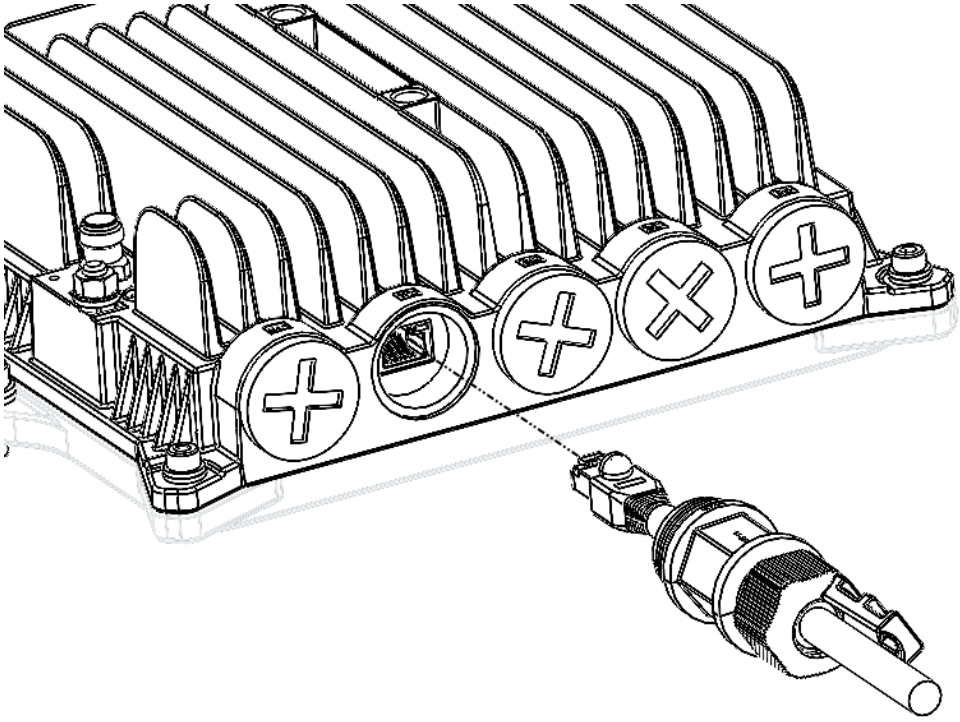
3.11.3 Connection of Ethernet Cable to IP-50EX

To connect the Ethernet cable to the IP-50EX:

1 Remove the relevant cap from the IP-50EX radio. You can use the side of the gland to unscrew the cap.



2 Connect the CAT5E cable to the IP-50EX.



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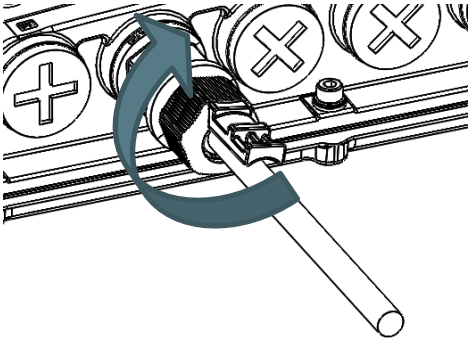
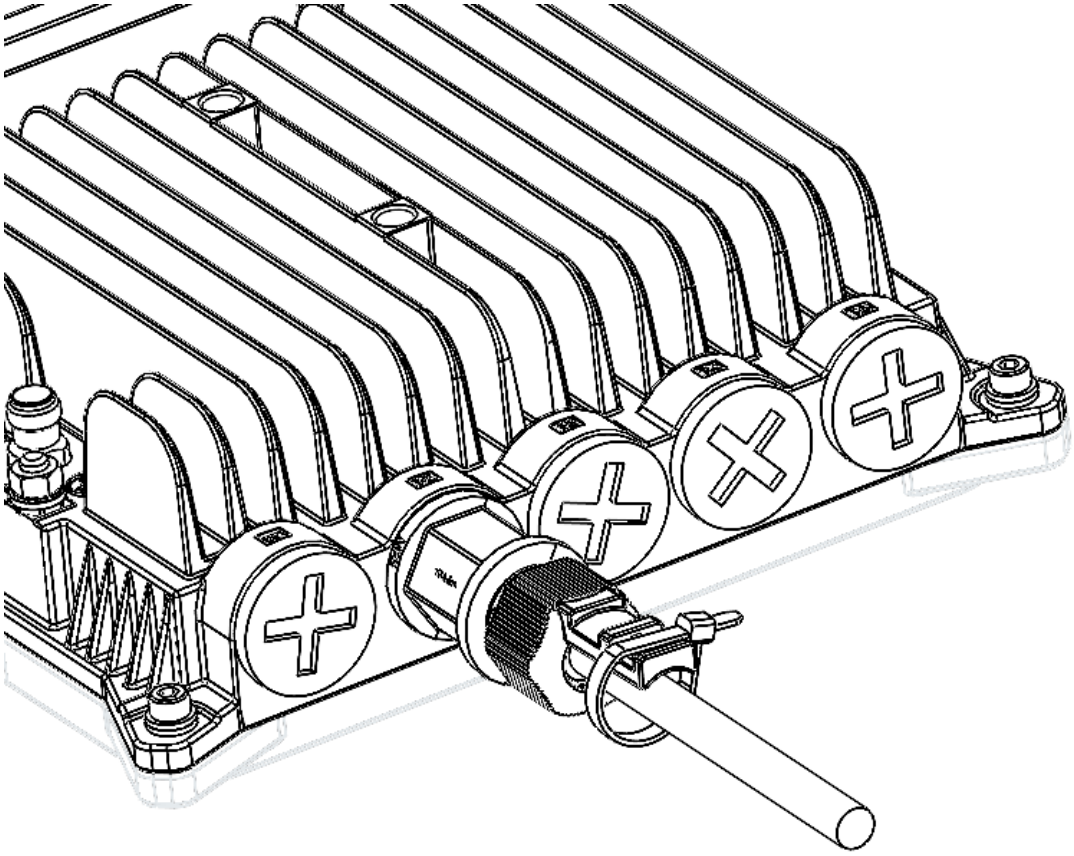
3 Screw the gland into the radio unit.

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



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



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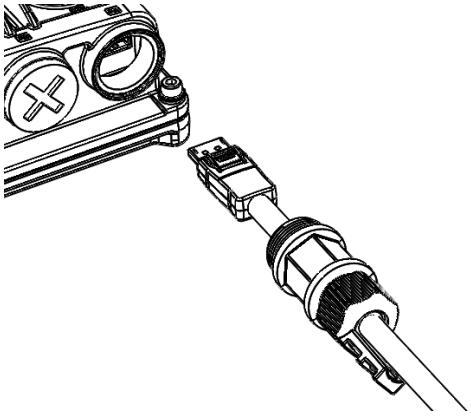
3.11.4 Connection of Protection/XPIC Cable to IP-50EX

In HSB protection and XPIC configurations, the Protection/XPIC port (P5) is used to connect two IP-50EX 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 CeraOS version you are using.

To connect the Protection/XPIC cable to the IP-50EX:

1. Remove the relevant cap from the IP-50EX radio. You can use the side of the gland to unscrew the cap.
2. Connect the XPIC cable to the IP-50EX. For information about the cable, see *Extension Cables for Unit Redundancy and XPIC* on page 35.



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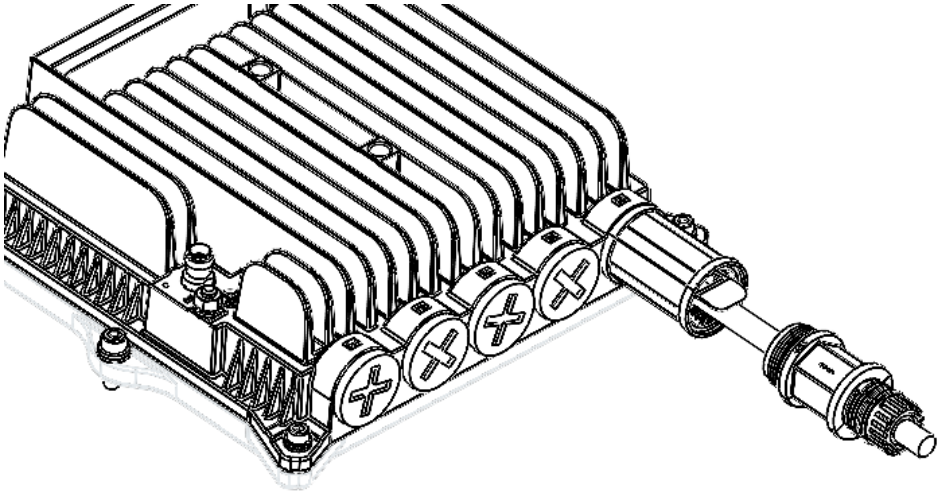
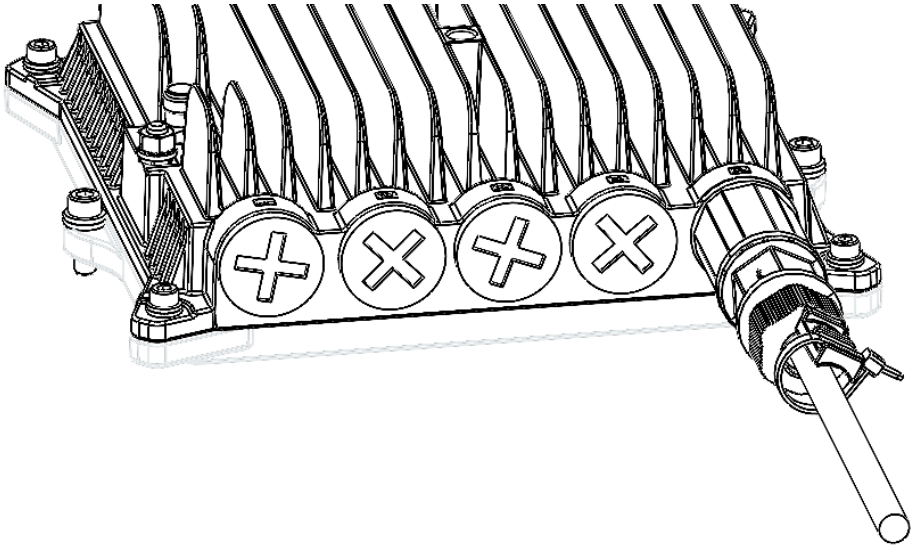
3. Screw the gland into the radio unit.

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



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



6. Connect the other side of the cable to the other IP-50EX following steps 1-5.

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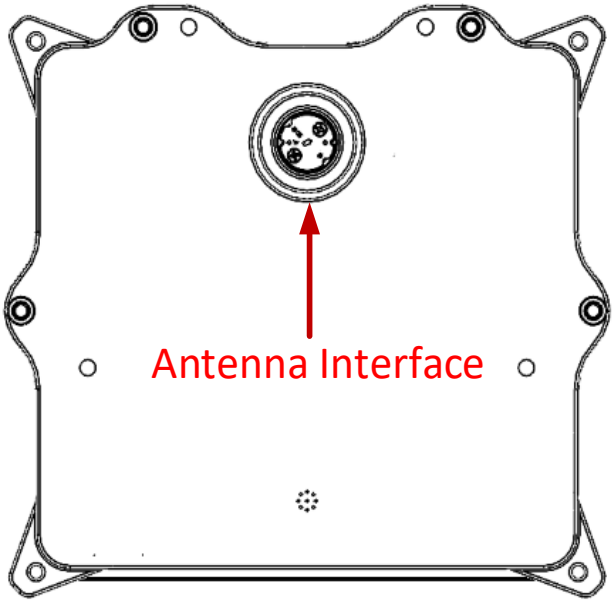
4. Direct Mount Configurations

4.1 Antenna and Radio Polarization

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

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



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

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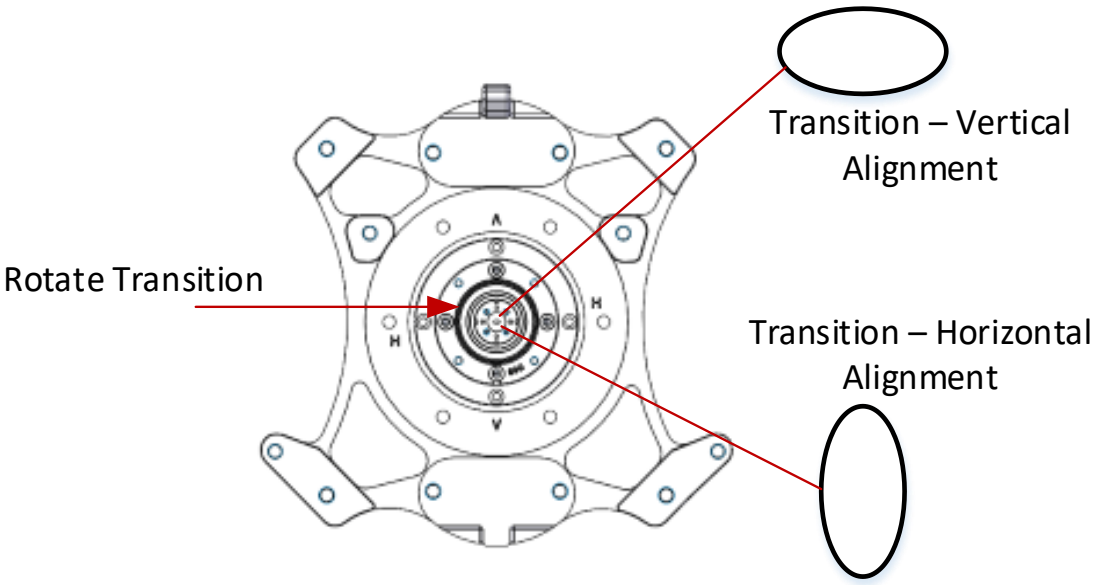
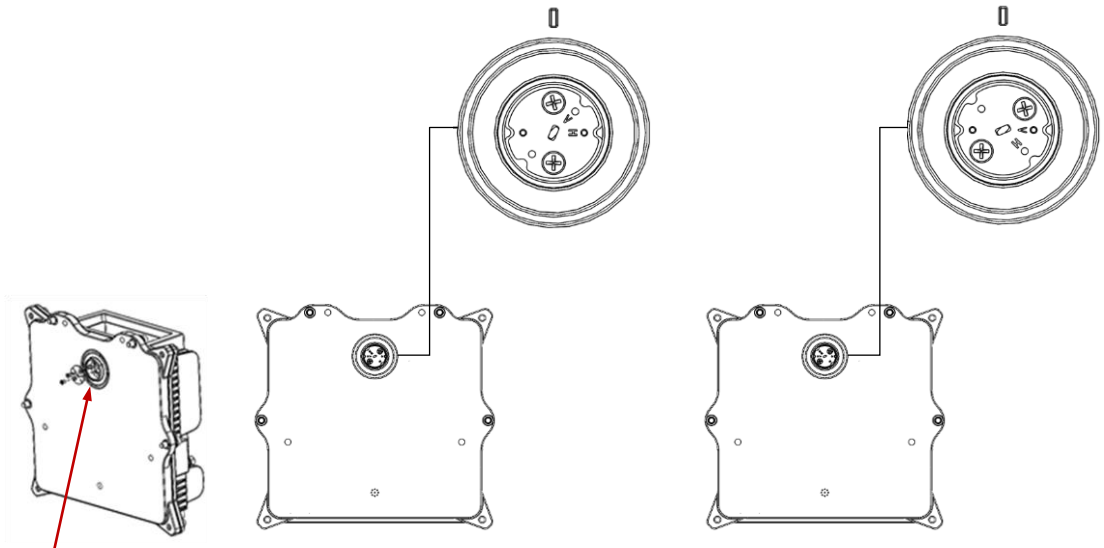


To change the polarization of the radio, adjust the twist as shown below. Use 0.8 Nm torque to tighten the twist.



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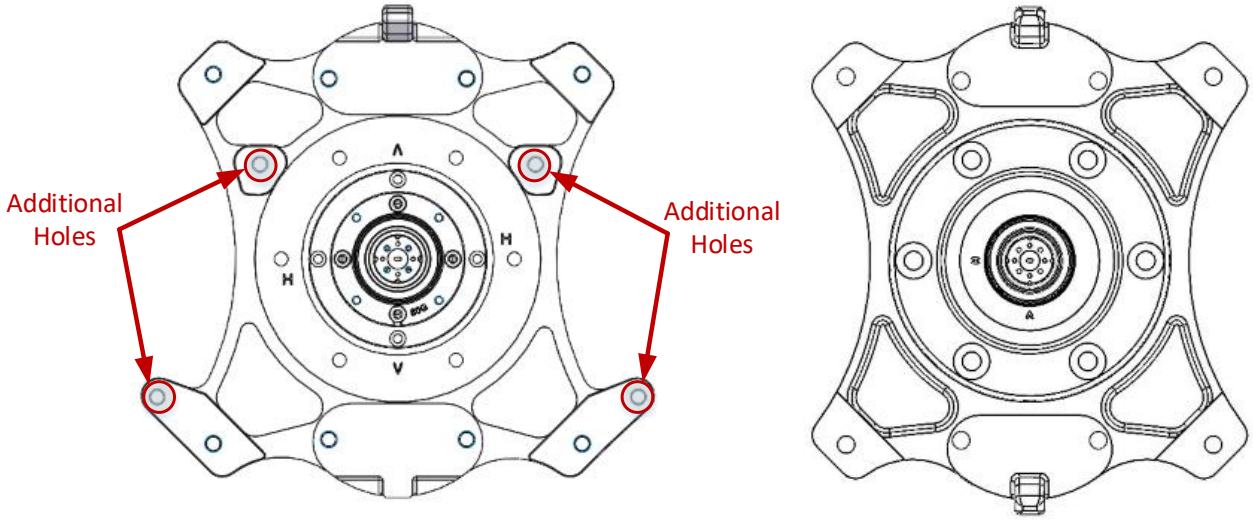
4.2 1+0 Direct Mount Installation

Certain older types of antennas have radio interfaces that lack four holes for screws that are used with IP-50EX. The following figure illustrates the older and newer types of antenna radio interfaces, and show which holes are missing on some of the older types.

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



If the antenna has an old radio interface, you must install an antenna adaptor on the IP-50EX radio before attaching the IP-50EX to the antenna. For instructions, see *1+0 Direct Mount Installation with Antenna Adaptor*.

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

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4.2.1 1+0 Direct Mount Installation without Antenna Adaptor

Torque Requirements

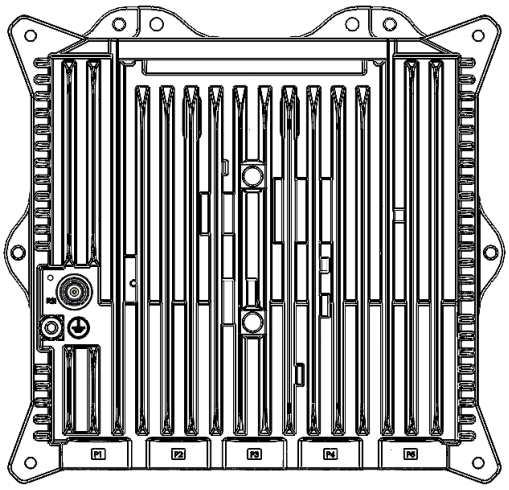
- M6 screws: 9 Nm

Required Tools

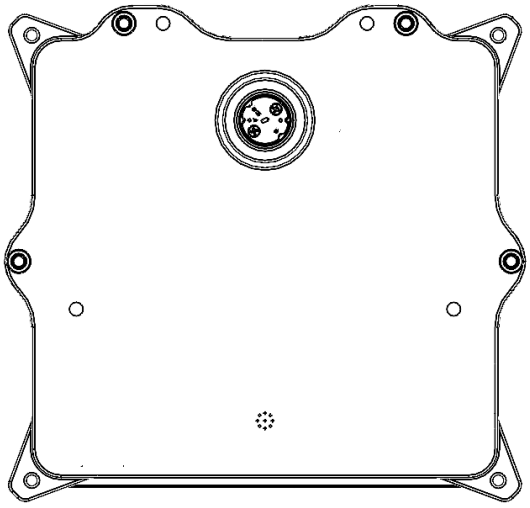
- Metric offset hexagon key wrench #5
- Phillips #2 screwdriver

List of Items Used in IP-50EX 1+0 Direct Mount Configurations

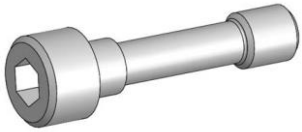
Item	Description	Number	Marketing Model	Remarks
1	IP-50EX Radio	1	IP-50EX-H IP-50EX-L	
2	Captive Screws – M6X22 - 15mm Neck	4	Included already inserted in IP-50EX radio	
3	Washers, Helical	8	Included already inserted in IP-50EX radio	
4	Washers, Plain	8	Included already inserted in IP-50EX radio	



1 - IP-50EX Radio (Front)



1 - IP-50EX Radio (Back)



2 – M6x22 Captive Screws

3 – Washers, Helical spring lock

4 – Washers, Plain

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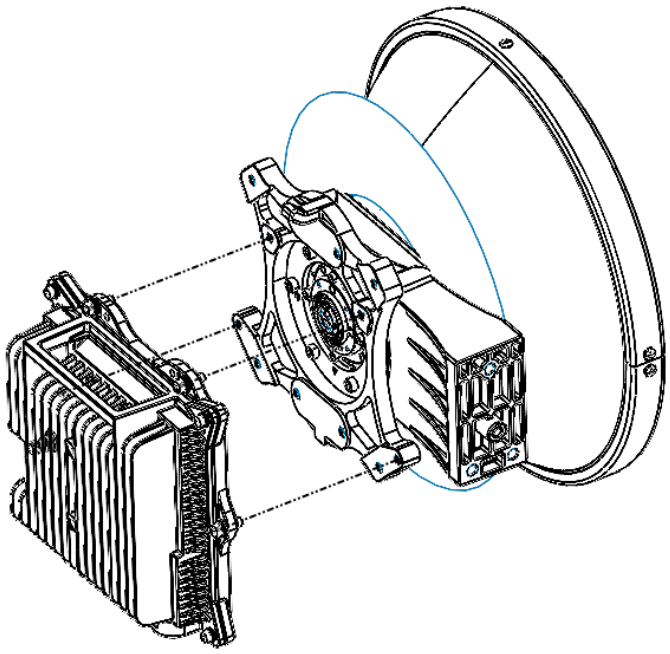
Note: The captive screws and washers are pre-assembled on the IP-50EX.

Procedure

1. Mount the IP-50EX on the antenna using the four M6 captive screws and washers (items 2,3, and 4) that are supplied, assembled, in the IP-50EX, and tighten the screws. Make sure not to exceed the maximum torque (9 Nm).



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4.2.2 1+0 Direct Mount Installation with Antenna Adaptor

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

Torque Requirements

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

Required Tools

- Metric hexagon key stubby tip wrench #5
- Metric hexagon key wrench #6
- Phillips #2 screwdriver

List of Items – Radio

Item	Description	Number	Marketing Model	Remarks
1	IP-50EX Radio	1	IP-50EX-H IP-50EX-L	

List of Items - Antenna Adaptor Kit

Item	Description	Number	Marketing Model	Remarks
2	IP-50EX Antenna Adaptor	1	IP-50EX-ANT-INT-BRKT-KIT	
3	M6-16 Screws	2	Included with Antenna Adaptor Kit	
4	Washers, Helical	2	Included with Antenna Adaptor Kit	
5	Washers, Plain	2	Included with Antenna Adaptor Kit	
6	M8-30 Screws	2	Included with Antenna Adaptor Kit	
7	Washers, Helical	2	Included with Antenna Adaptor Kit	
8	Washers, Plain	2	Included with Antenna Adaptor Kit	
9	M6-25 Screws	2	Included with Antenna Adaptor Kit	
10	Washers, Helical	2	Included with Antenna Adaptor Kit	
11	Washers, Plain	2	Included with Antenna Adaptor Kit	

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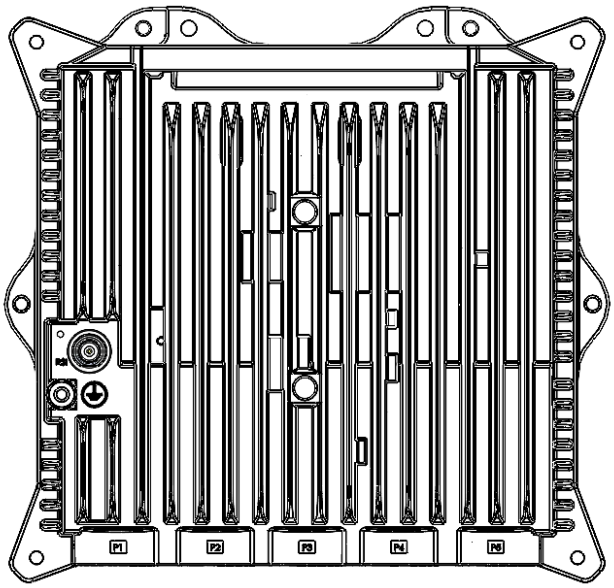
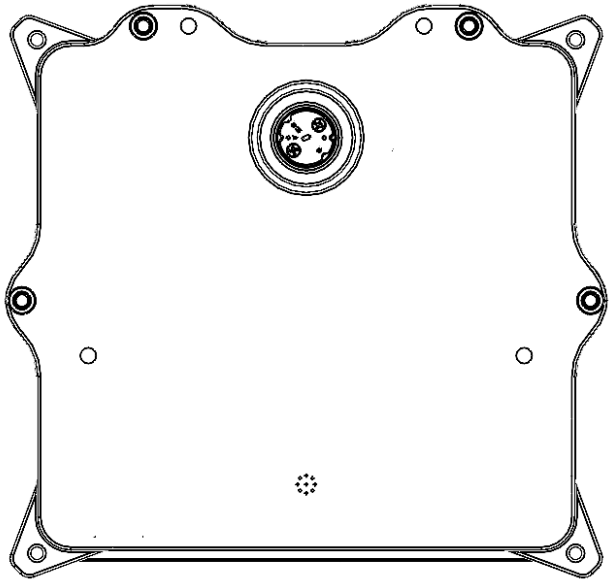
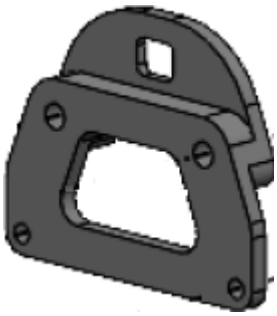


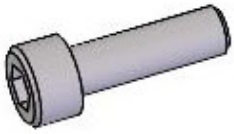
1 - IP-50EX Radio (Front)



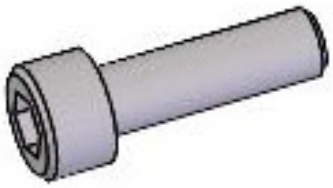
1 - IP-50EX Radio (Back)



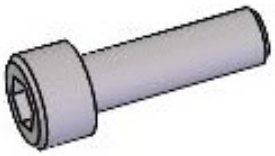
2 - IP-50EX Antenna Adaptor



3 – M6x16 Screws



6 – M8x30 Screws



9 – M6x25 Screws

4, 7, 10 -Washers, Helical spring lock

5, 8, 11 - Washers, Plain

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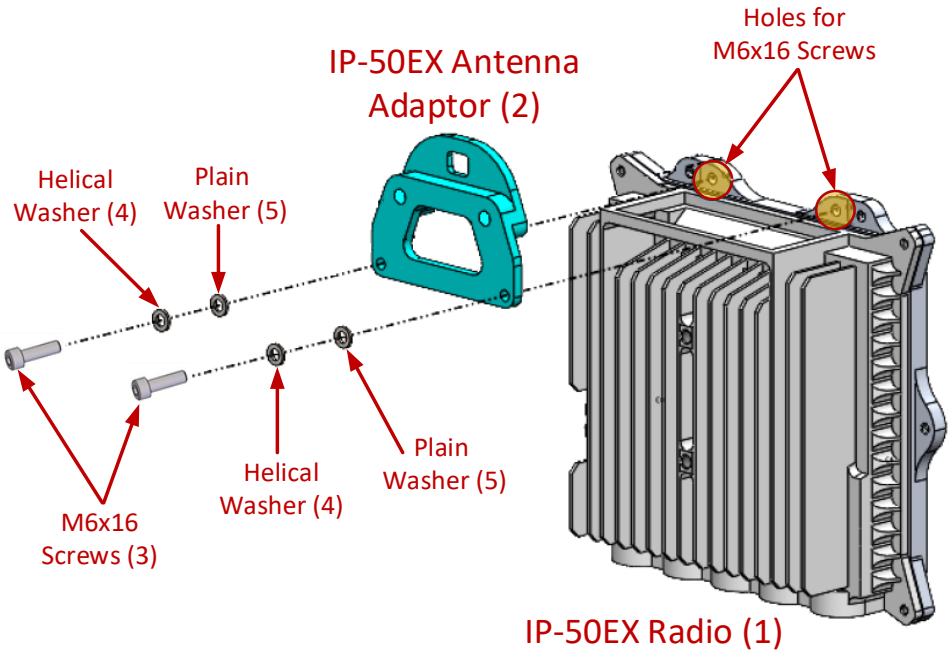
Procedure

1. Using two M6-16 screws, with helical and plain washers (items 3, 4 ,and 5), fasten the adaptor to the IP-50EX via the two lower holes of the adaptor and the two holes on the upper part of the IP-50EX marked in the following figure.



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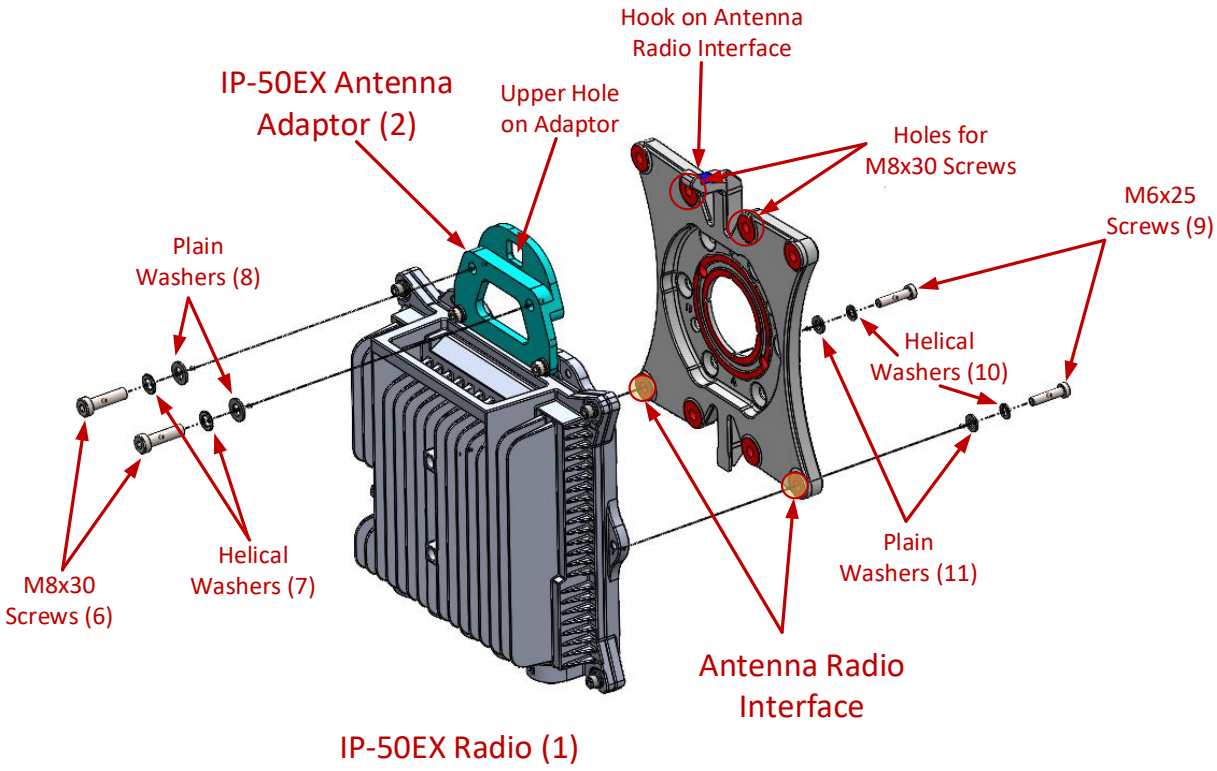
2. Insert the upper hole of the adaptor into the hook on the top of the antenna's radio interface. Then, using two M8x30 screws, with helical and plain washers (items 6, 7, and 8), fasten the adaptor to the antenna via the two upper holes of the adaptor and the two holes on the upper part of the antenna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

Note: For clarity, the pictures below show the antenna's radio interface, but not the antenna itself.



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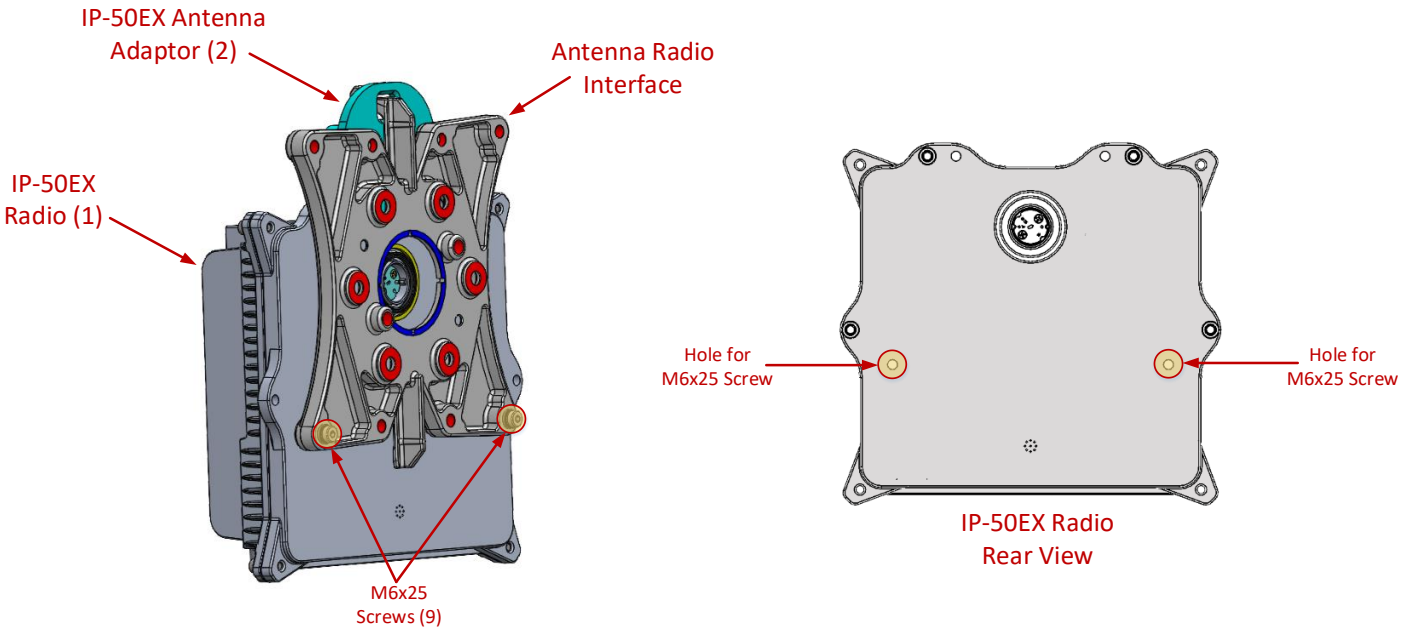
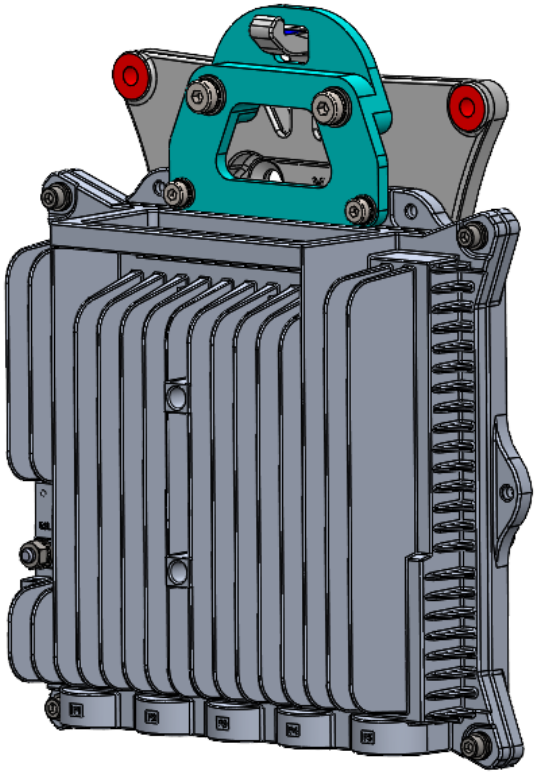
3. From the back of the antenna's radio interface, use two M6x25 screws, with helical and plain washers (item 9, 10, and 11) to connect the antenna directly to the IP-50EX radio via the holes on the lower side of the antenna's radio interface and two holes on either side of the back of the radio.



The following figure shows the installation upon completion.



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4.3 2+0 Direct Mount Dual Polarization (XPIC)

Note: Support for XPIC depends on the type of IP-50EX product and the CeraOS version. Check the Release Notes for the CeraOS version you are using.

List of Items

Item	Description	Quantity	Remarks
1	IP-50EX Radio	2	
2	IP-20E-OMT-Kit	1	
3	XPIC Cable	1	See *Extension Cables for Unit Redundancy and XPIC* on page 35
4	Clock Sharing Cable	1	See *Clock Sharing Cable for XPIC* on page 35

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.

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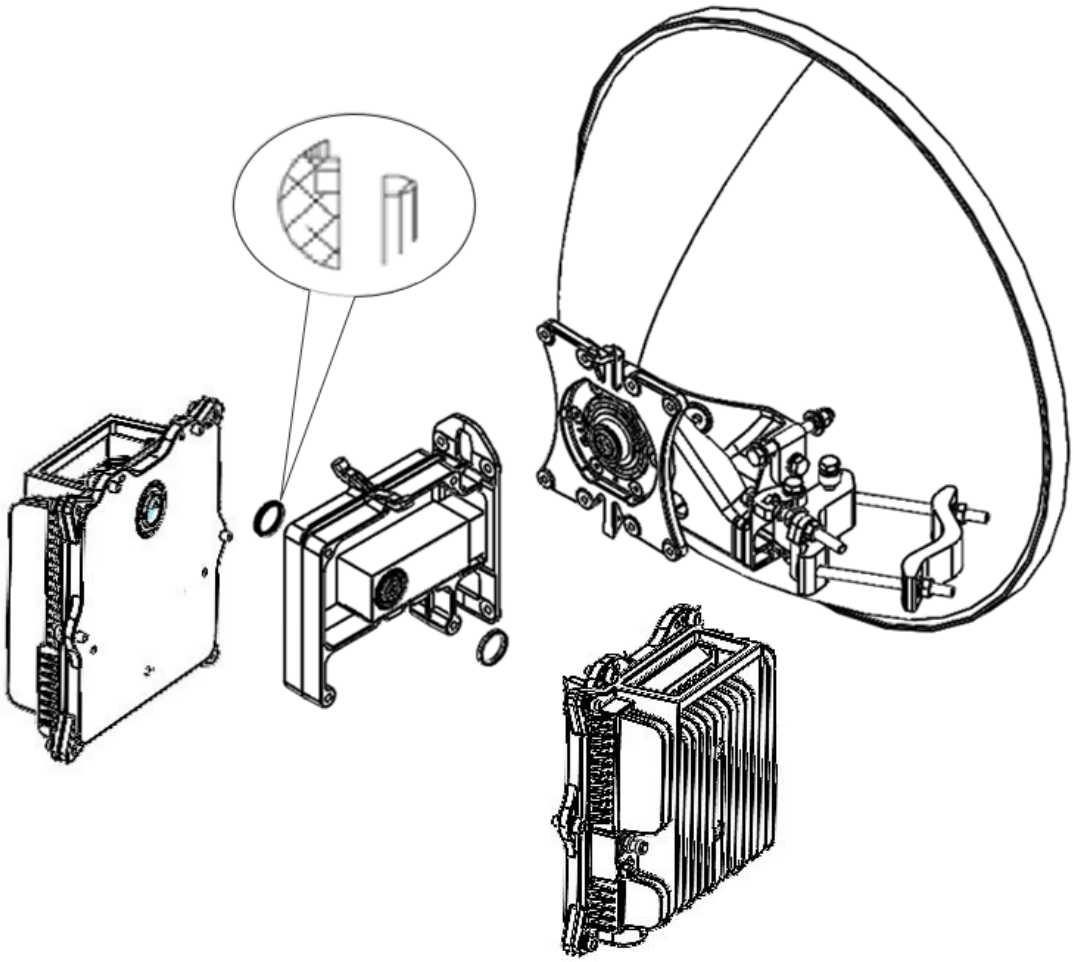
4 Mount the two O-Rings supplied with the OMT kit, as shown in the following figure.



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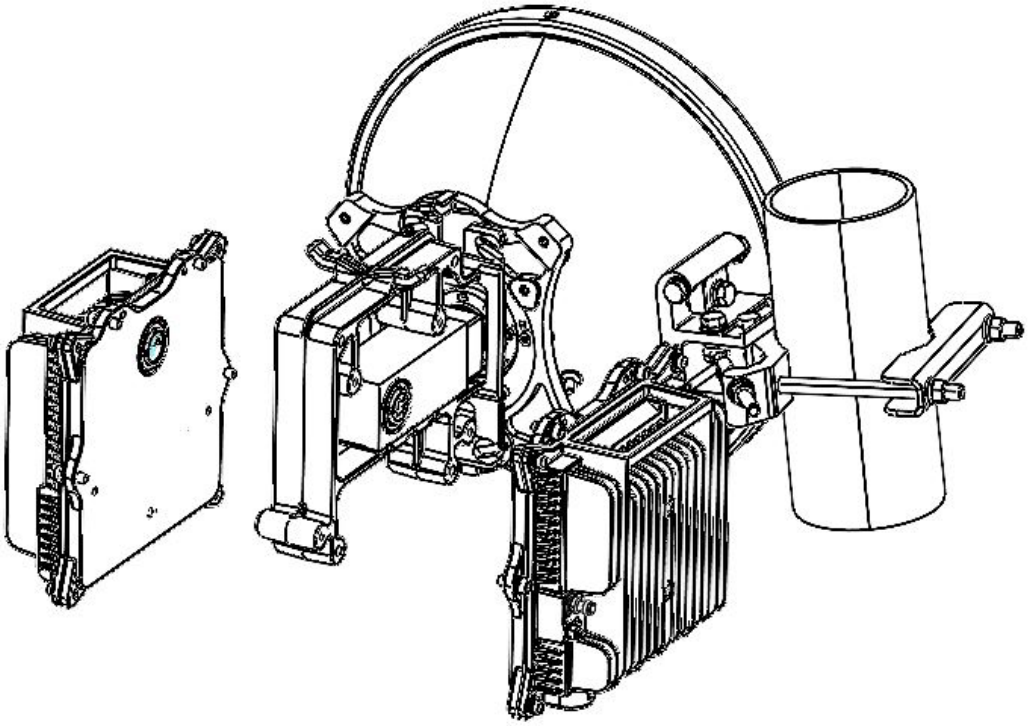
5 Change the polarization of one of the IP-50EX radios to ‘H’ polarization. See *Antenna and Radio Polarization* on page 64.

6 Mount an IP-50EX radio to each side of the OMT. When mounting the radios, make sure that one side is polarized ‘V’ and the other side is polarized ‘H’. Tighten the radios to the OMT kit using the four M6 captive screws and washers that are supplied, assembled, with the IP-50EX radios.



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7 Connect the XPIC cable between the Protection/XPIC ports (P5) of the two units. See *Extension Cables for Unit Redundancy and XPIC* on page 35 and *Connection of Protection/XPIC Cable to IP-50EX* on page 62.

8 Connect the clock sharing cable between the TNC RSL/Source Sharing connectors of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m).

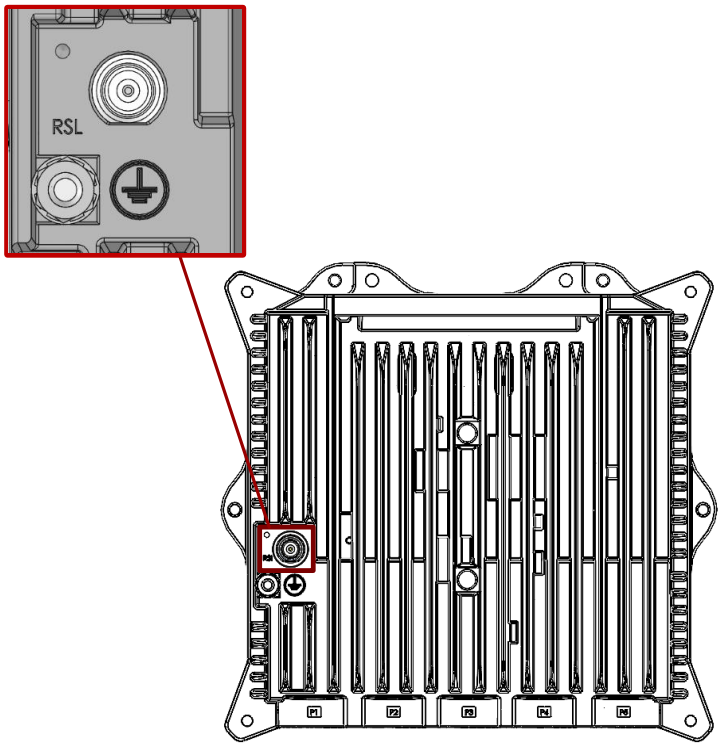

Figure 14: RSL/Source Sharing Connector

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4.4 1+1 HSB (Unit Redundancy)

Note: Support for HSB/Unit Redundancy depends on the type of IP-50EX product and the CeraOS version. Check the Release Notes for the CeraOS version you are using.

List of Items

Item	Description	Quantity	Remarks
1	IP-50EX Radio	2	
2	IP-20E-CPLR-Kit	1	
3	QSFP+_to_QSFP+_cable	1	See *Extension Cables for Unit Redundancy and XPIC* on page 35

Required Tools

The following tools are required for the installation:

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

Procedure

1 Mount the Coupler on the antenna using the four M8 screws and washers supplied with the Coupler kit, and tighten the screws.

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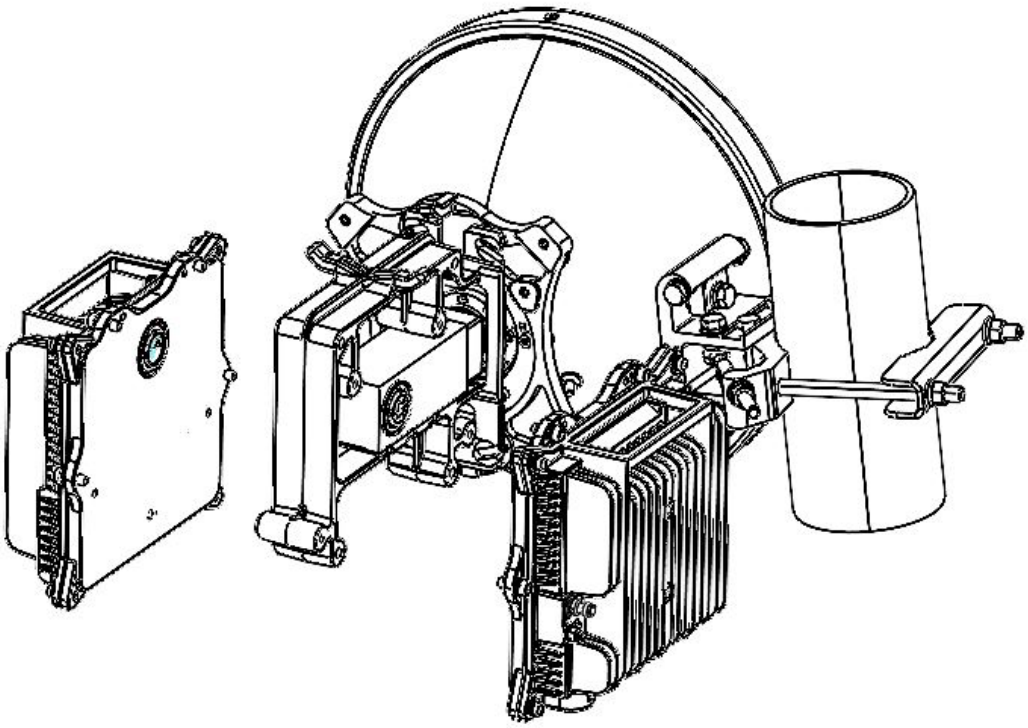
2 Mount an IP-50EX radio to each side of the Coupler. Tighten the radios to the Coupler kit using the four M6 captive screws and washers that are supplied, assembled, with the IP-50EX radios.



3 Connect the protection cable between the Protection/XPIC ports (P5) of the two units. See *Extension Cables for Unit Redundancy and XPIC* on page 35 and *Connection of Protection/XPIC Cable to IP-50EX* on page 62.

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

Note: This configuration is planned for future release.

When you order an IP-50EX 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.

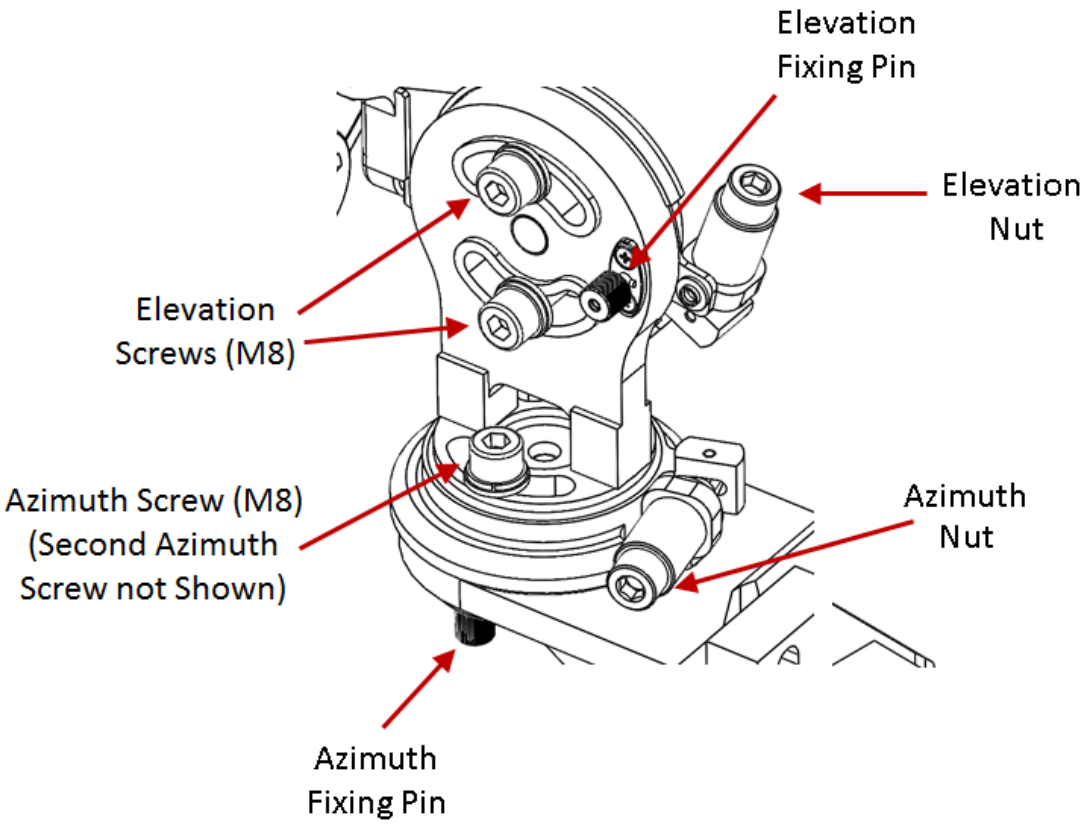

Figure 15: Installation and Alignment Device – Azimuth and Elevation Adjustment Tools

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 15*. 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.

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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.

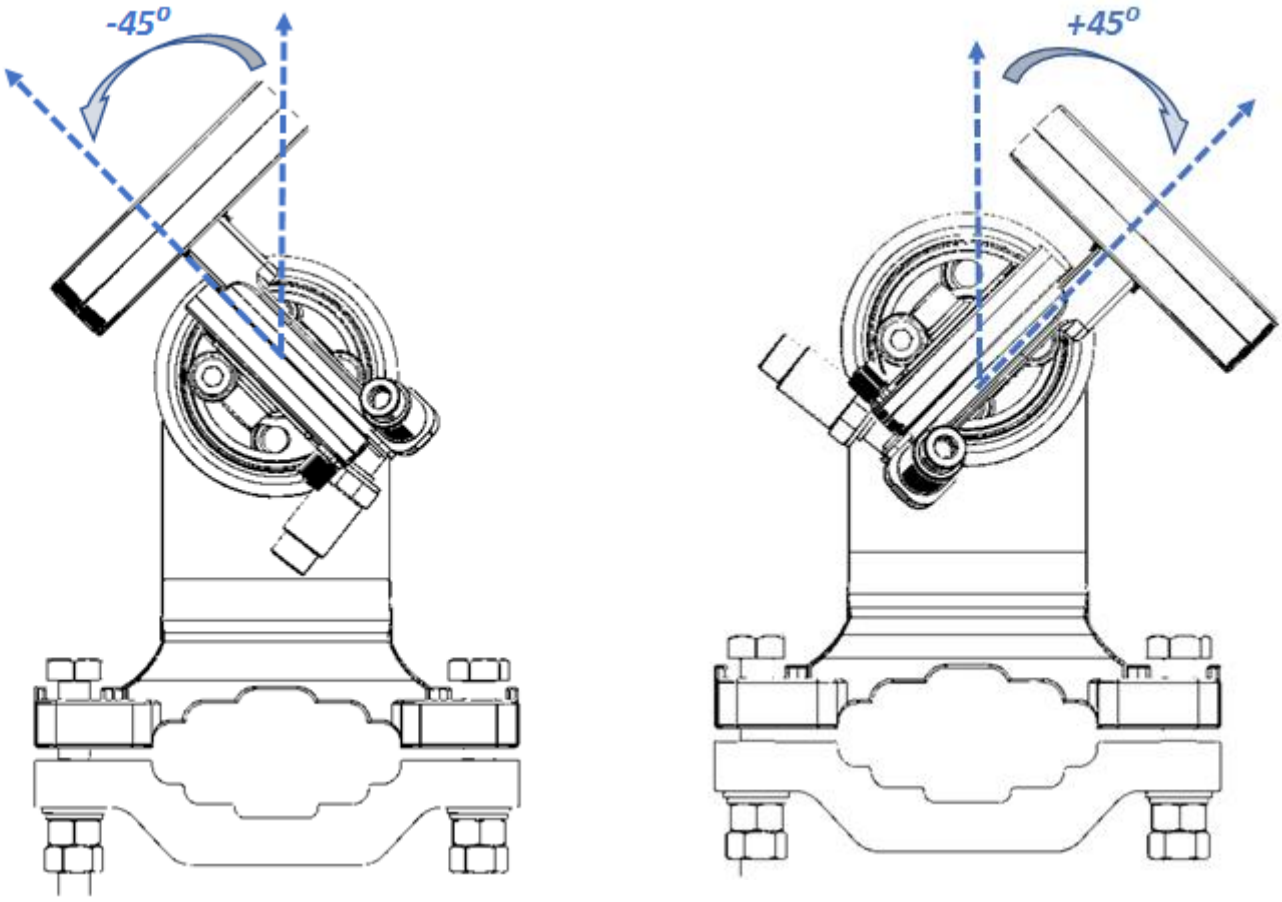

Figure 16: Installation and Alignment Device – Azimuth Range (Pole Mount)

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 IP-50EX radio and antenna to the installation and alignment device *before* adjusting the elevation, otherwise the weight of the radio and antenna might accidently reduce the elevation angle.

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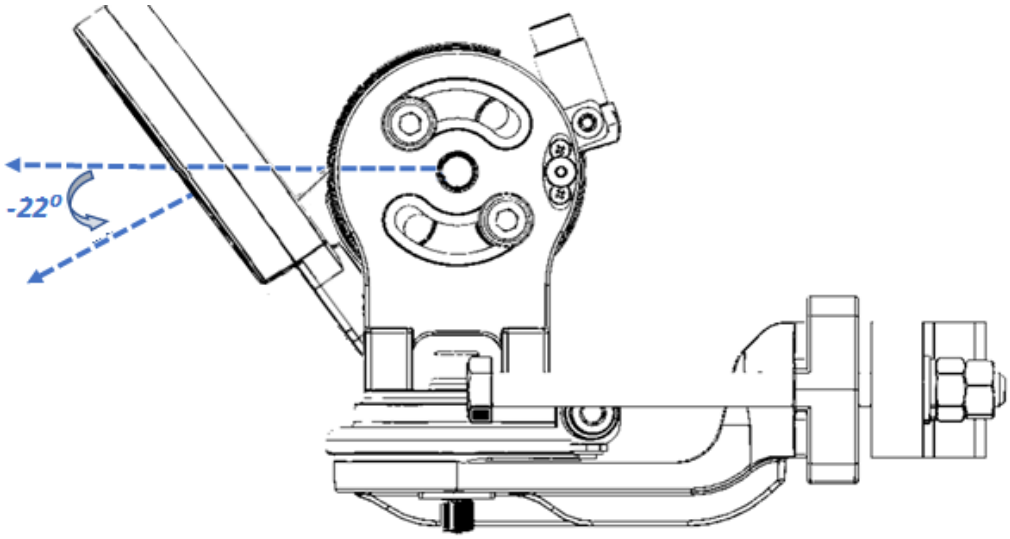

Figure 17: Installation and Alignment Device – Delivery Elevation (22° Downward)

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

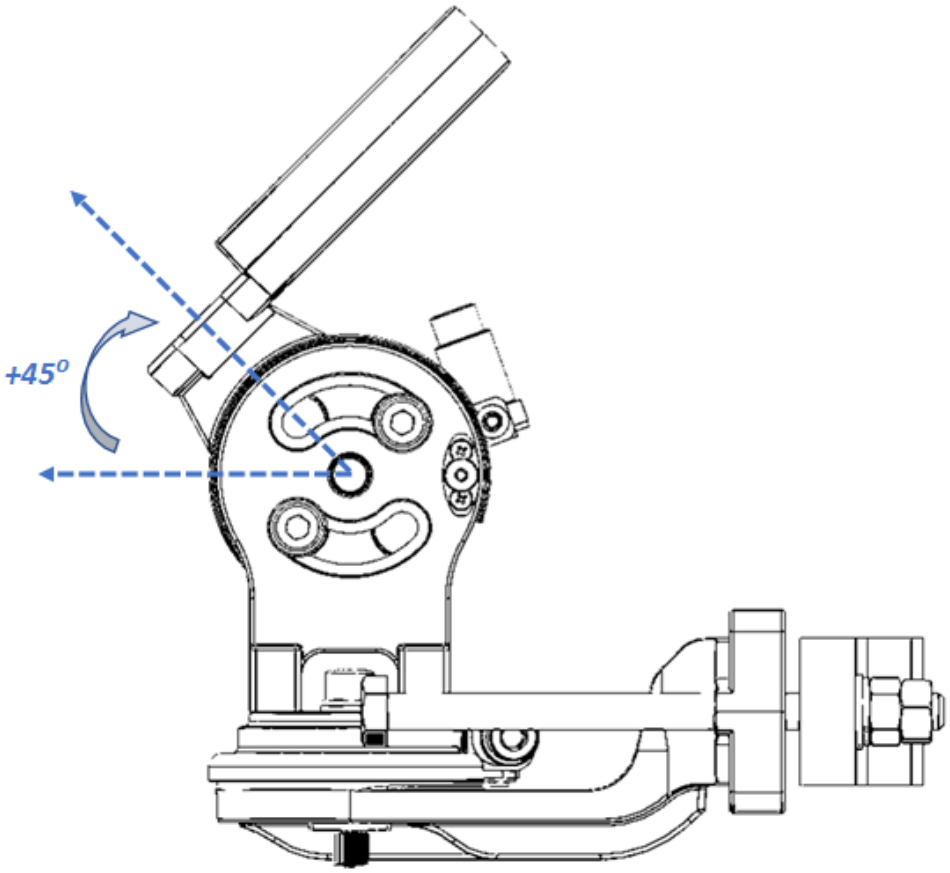

Figure 18: Installation and Alignment Device – Highest Elevation (45° Upward)

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5.1 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 IP-50EX 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 IP-50EX to the Installation and Alignment Device*.

List of Items

Item	Description	Quantity	Remarks
1	IP50E Flat Antenna Mounting Kit	1	
2	IP-50EX radio with 43 dBi Flat Antenna	1	

Required Tools

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

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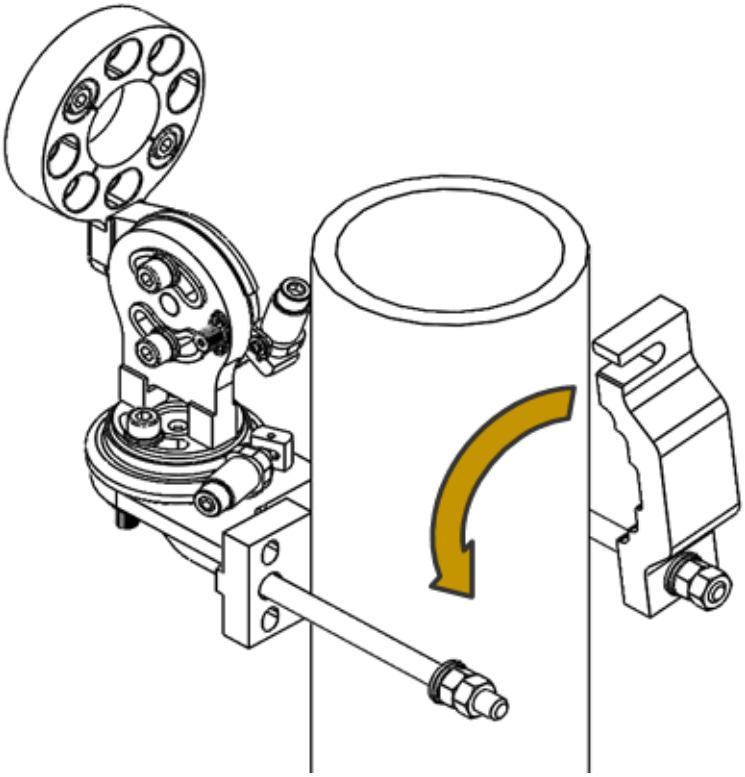
5.1.1 Procedure

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.



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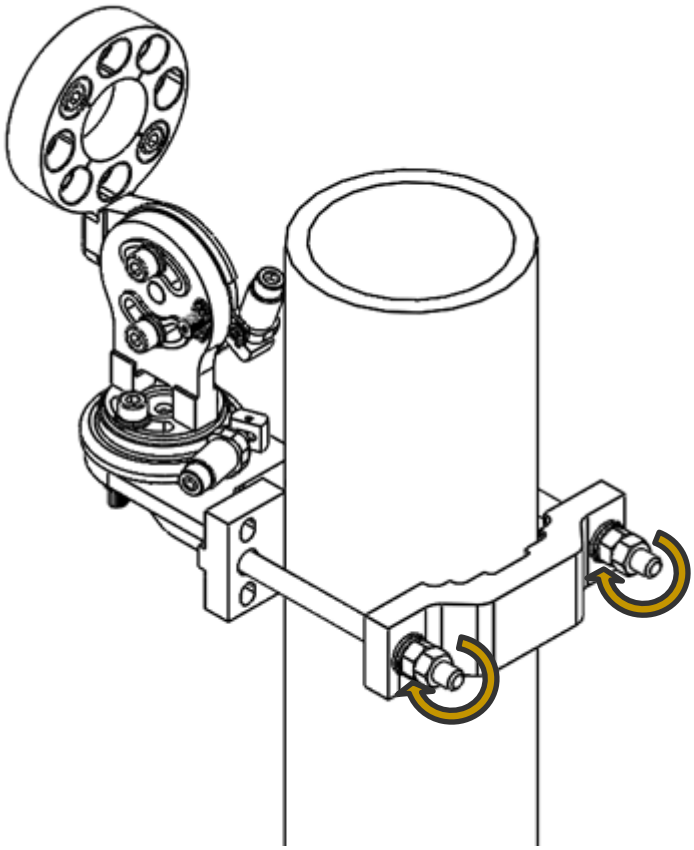
2. To secure the installation and alignment device to the pole, tighten the four nuts on the outer bracket, two on each side as shown in the figure below.



5.2 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	IP50E Flat Antenna Mounting Kit	1	
2	IP-50EX 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

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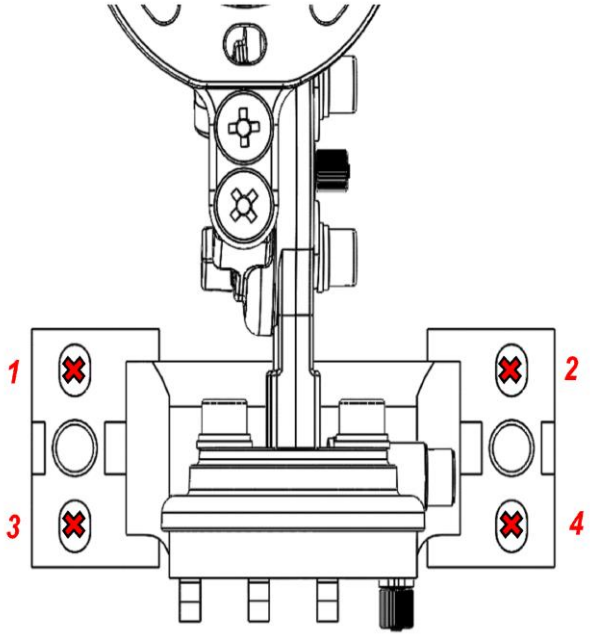
Required Tools

- 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.

5.2.1 Procedure

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



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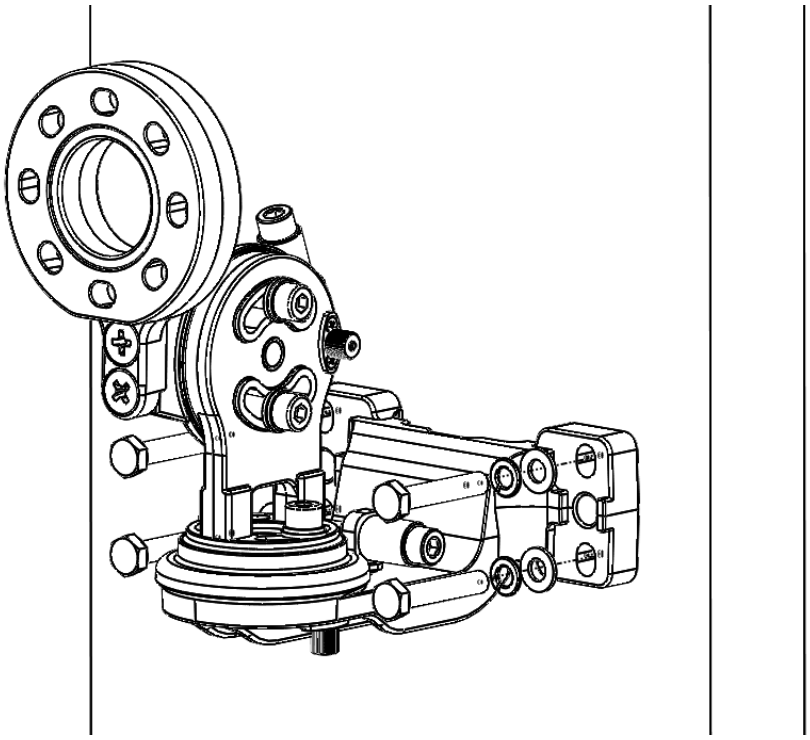
2. Remove the bracket and drill four holes into the wall.
3. Insert the anchor screws into the wall.
4. Place the mounting kit in front of the 4 anchor screws and tighten the 4 M8 screws, spring washers, and flat washers to secure the mounting device to the wall.



5.3 Attaching the IP-50EX to the Installation and Alignment Device

1. Connect the IP-50EX unit to the installation and alignment device, using the two M8 screws and washers supplied with the installation and alignment kit. Attach the IP-50EX 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 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.

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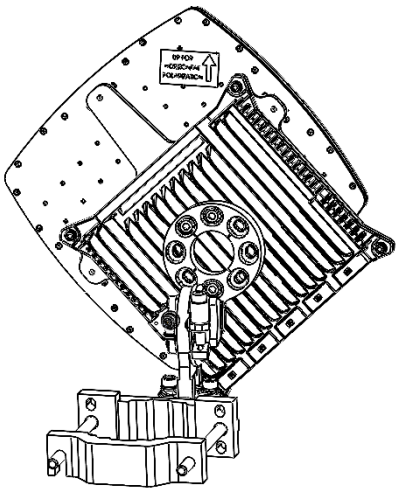

Figure 19: Horizontal Polarization – Radio and Installation and Alignment Kit

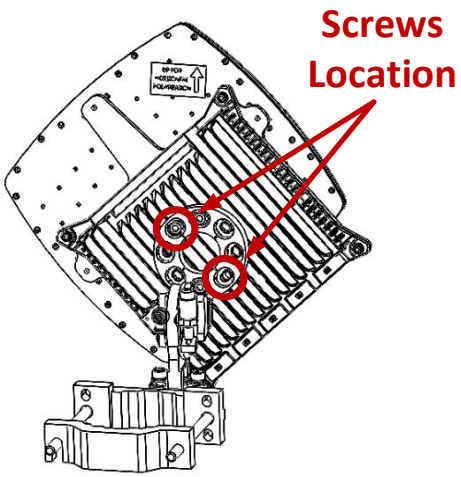

Figure 20: Horizontal Polarization – Screws Location

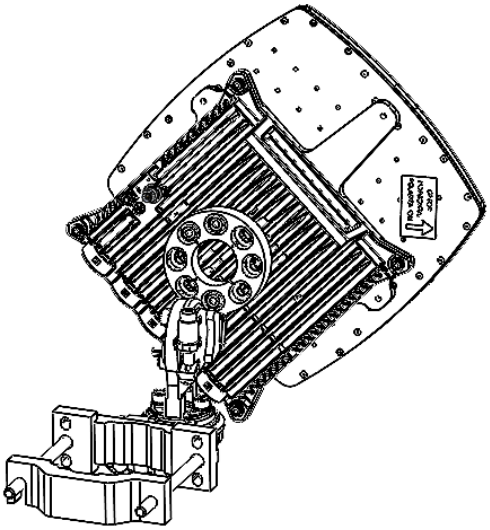

Figure 21: Vertical Polarization – Radio and Installation and Alignment Kit

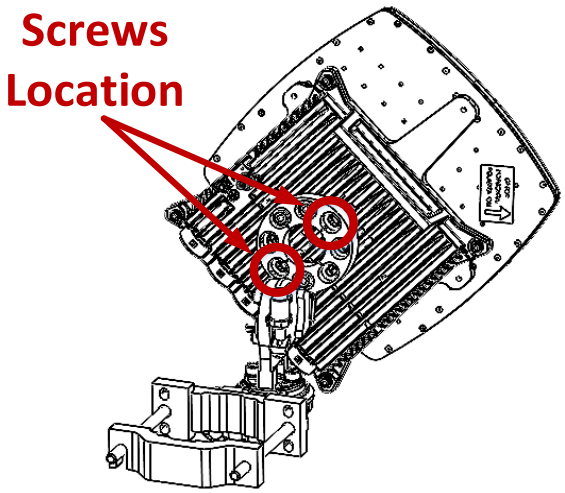

Figure 22: Vertical Polarization – Screws Location

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5.4 Performing Antenna Alignment Using the Enhanced Alignment Kit

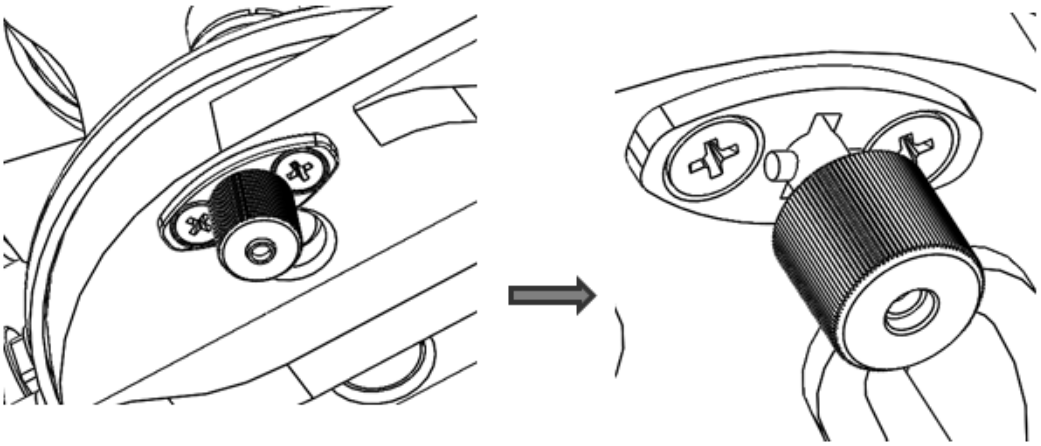
You can easily adjust the azimuth and elevation of the antenna using a number of screws and nuts located on the installation and alignment device (*Figure 15*).

5.4.1 Adjusting the Antenna Azimuth

5.4.1.1 Performing Gross Azimuth Adjustment

To adjust the antenna azimuth:

1 Loosen the Azimuth Fixing Pin (*Figure 15*) by pulling it gently out of its groove and rotating it 90° counter-clockwise..



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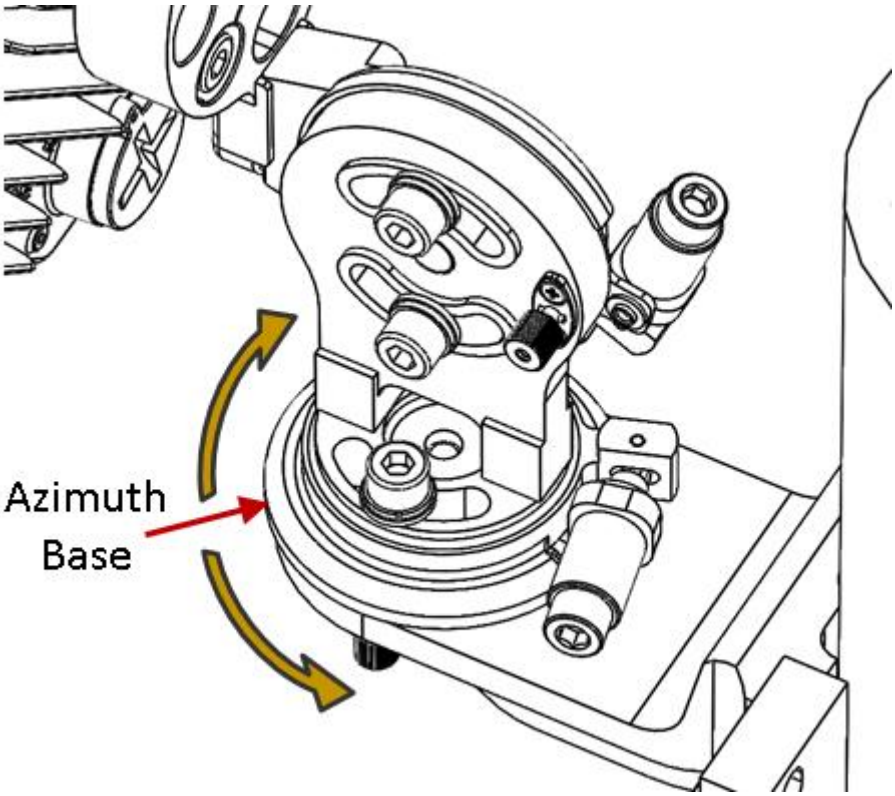
2 Manually adjust the azimuth base to its required location.



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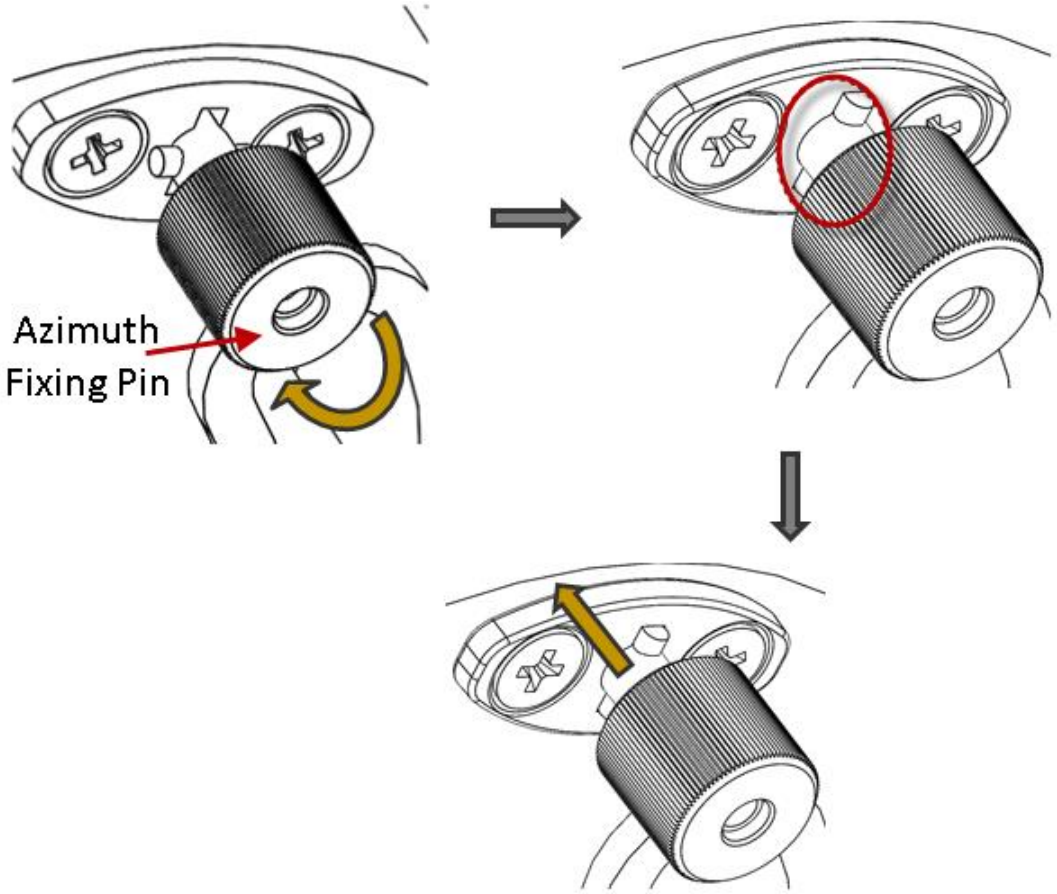
3 Once the azimuth base has been adjusted to its approximate location, lock the azimuth fixing pin by rotating the pin clockwise until it appears to be aligned with its groove. At this point, you must adjust the azimuth base until the fixing pin slips into its groove. There are notches within the device 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.



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5.4.1.2 Performing Fine Azimuth Adjustment

To perform fine azimuth alignment:

1 Turn the Azimuth Nut (*Figure 23*), either by hand or using a key wrench, for fine tuning of the azimuth. Each ¼ turn is equal to an adjustment of 0.25°.
2 Tighten the two M8 Azimuth Screws connected to the azimuth base.

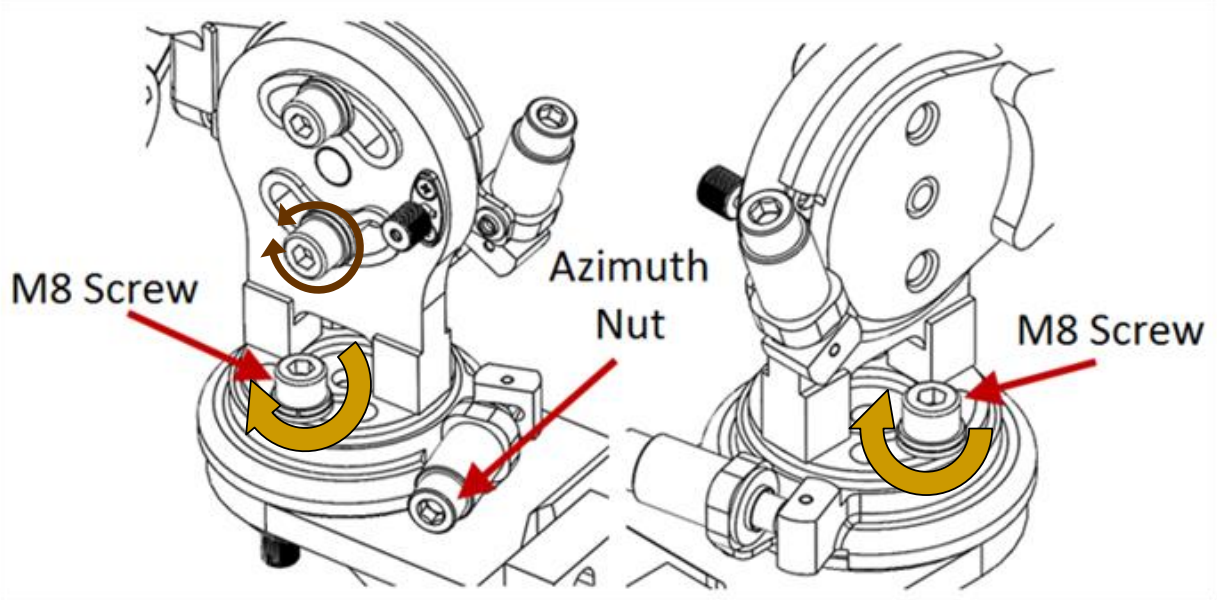


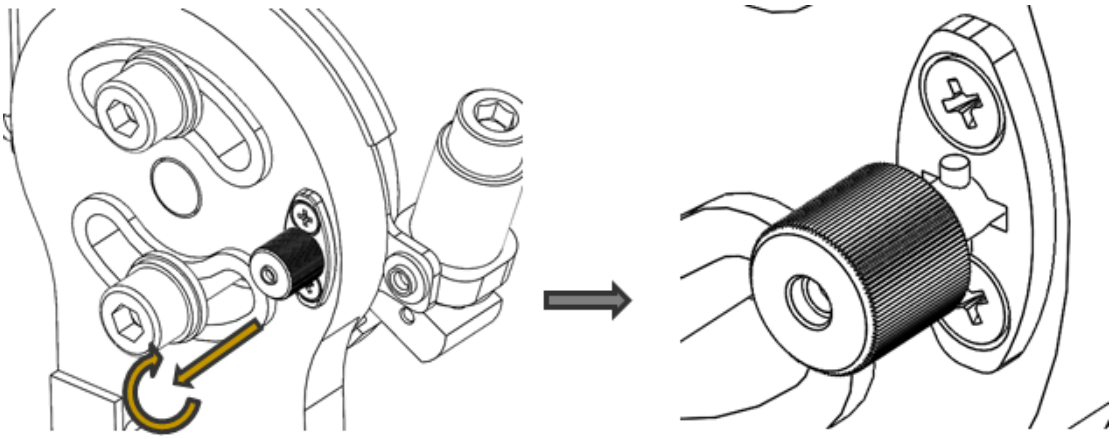
Figure 23: Installation and Alignment Device – Fine Alignment

5.4.2 Adjusting the Antenna Elevation

5.4.2.1 Performing Gross Elevation Adjustment

To perform gross adjustment of the antenna elevation:

1 Loosen the Elevation Fixing Pin (*Figure 15*) by pulling it gently out of its groove and rotating it 90° counter-clockwise.



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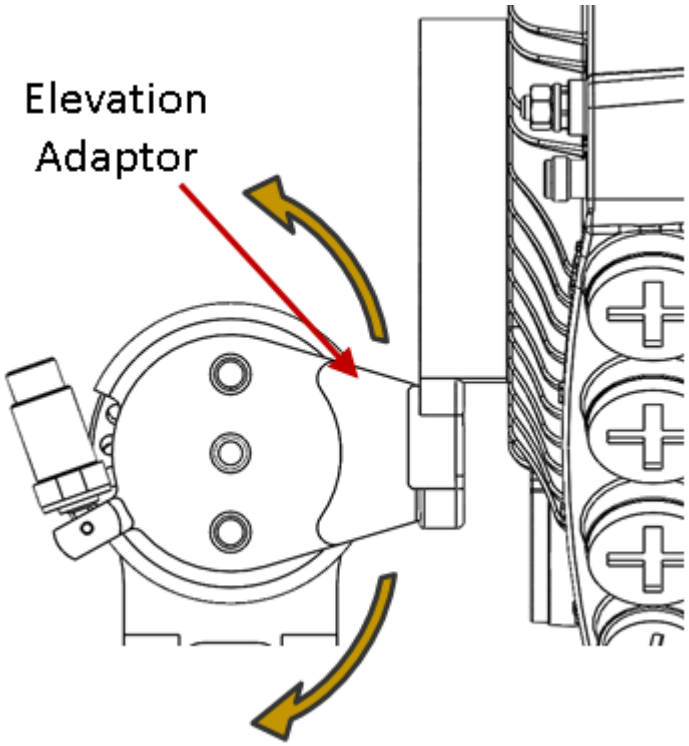
2 Move the Elevation Adaptor to the required location.



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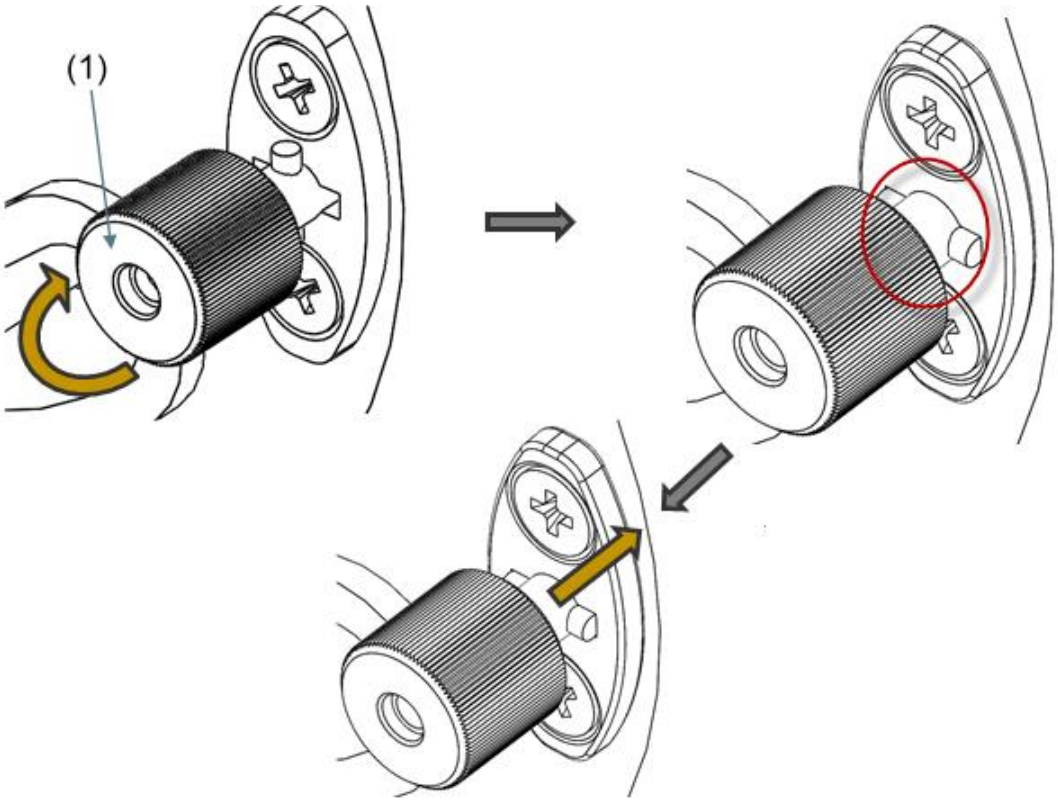
3 Once the Elevation Adaptor has been adjusted to its approximate location, lock the elevation fixing pin by rotating the pin clockwise until it appears to be aligned with its groove. At this point, you must adjust the Elevation Adaptor until the fixing pin slips into its groove. There are notches within 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.



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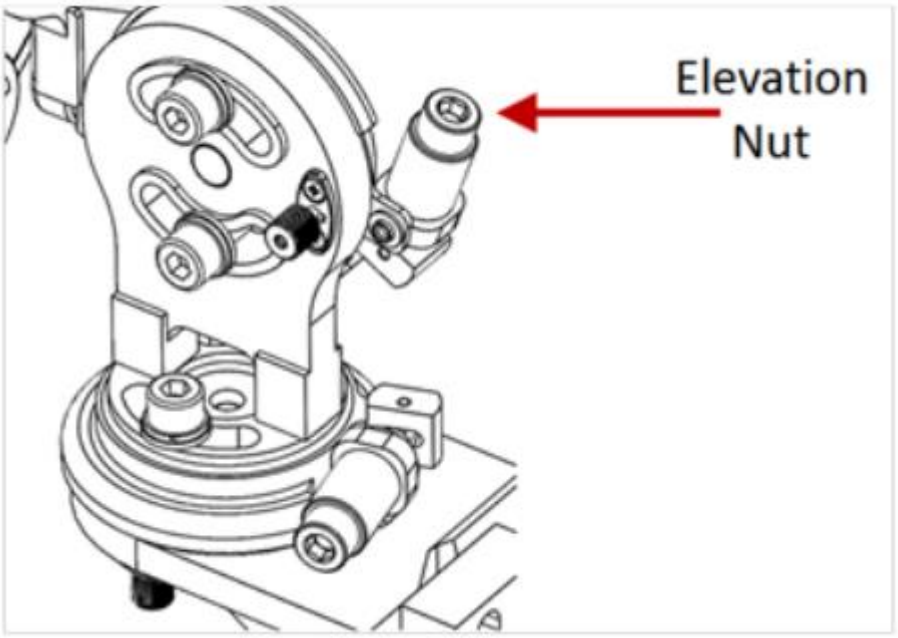
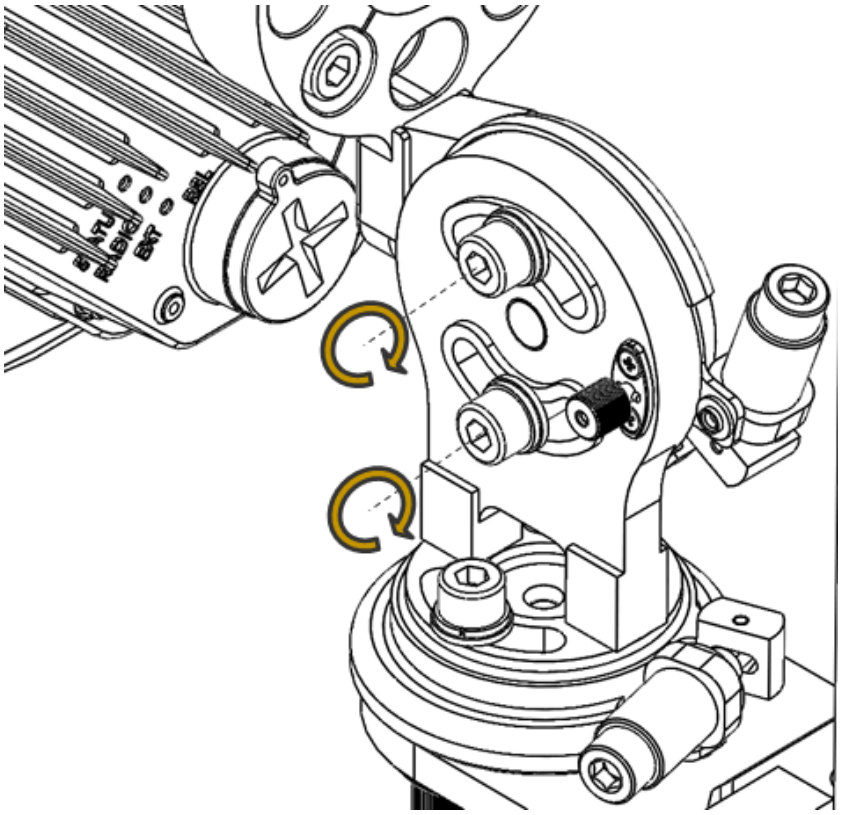
5.4.2.2 Performing Fine Elevation Adjustment

To perform fine elevation alignment:

1 Turn the Elevation Nut, either by hand or using a key wrench, for fine tuning of the elevation. Each ¼ turn is equal to an adjustment of 0.25°.



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



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5.5 2+0 (XPIC) with 43 dBi Flat Antenna and Alignment Device

List of Items

Item	Description	Quantity	Remarks
1	IP50EX Flat Antenna Mounting Kit	2	
2	IP-50EX radio with 43 dBi Flat Antenna	2	
3	XPIC Cable	1	See *Extension Cables for Unit Redundancy and XPIC* on page 35
4	Clock Sharing Cable	1	See *Clock Sharing Cable for XPIC* on page 35

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 IP-50EX units. See Section 5.1, *Pole Mount Assembly and Installation* or Section 5.2, *Wall Mount Assembly and Installation*.
2. Install an IP-50EX 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 5.3, *Attaching the IP-50EX to the Installation and Alignment Device*.
3. Connect the XPIC cable between the Protection/XPIC ports (P5) of the two units. See *Extension Cables for Unit Redundancy and XPIC* on page 35.

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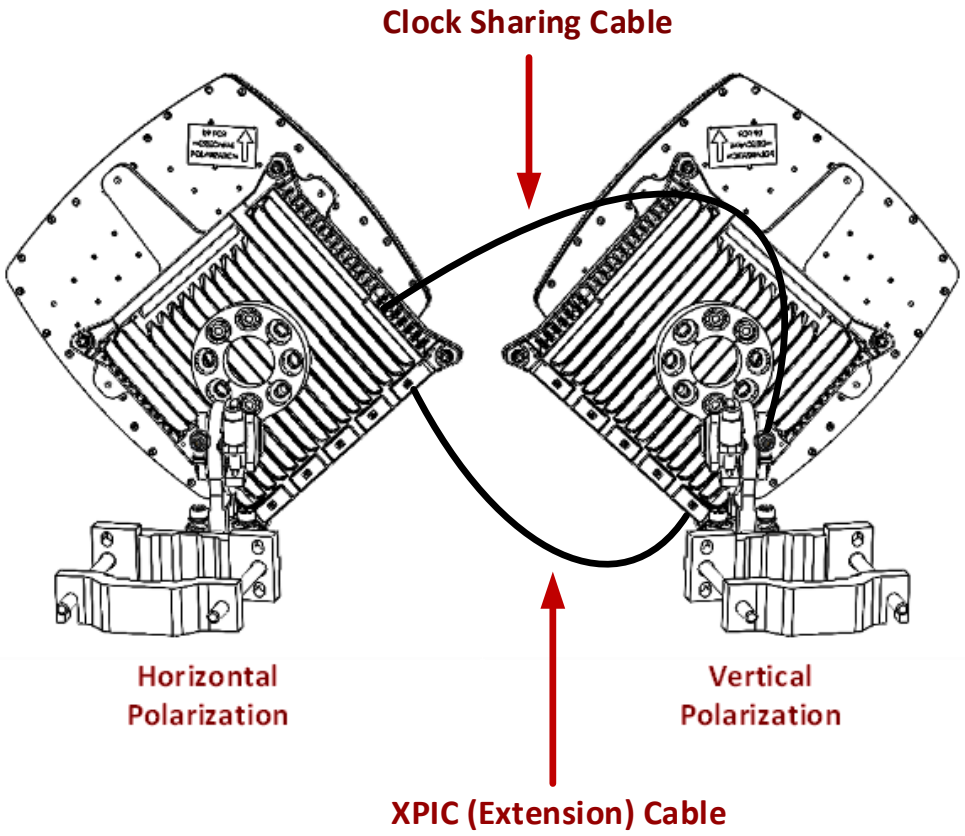
4. Connect the clock sharing cable between the TNC RSL/Source Sharing connectors of the two units of the two units. The maximum torque for connecting this cable to the radio is 5Lb.in (0.5N.m). See *Figure 14*.



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.

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6. PoE Injector Installation and Connection

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

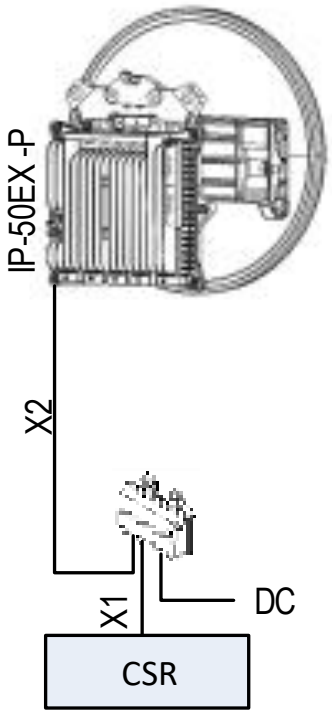
- PoE_Inj_AO_2DC_24V_48V

6.1 PoE Injector Cable Connection

The PoE Injector cables are connected similar to the IP-50EX-P cables.

- To connect an Ethernet (CAT5e) cable to the PoE port, refer to *Connection of Ethernet Cable to IP-50EX* on page 60.
- To connect a DC power cable to the power port, refer to *Connecting a DC Power Cable* on page 54. This cable is not supplied with the PoE Injector.
- The total length of the cable between the IP-50EX port and the Switch/Router the device is connected to should not exceed 100m/328ft. This length includes the connection between the IP-50EX-P and the PoE Injector (X1 + X2 ≤ 100m/328ft in the figure below).

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



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

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6.2 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.

6.3 PoE Injector Wall Mount Installation

List of Items

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

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

Glands Kit

Marketing Model	Marketing Description
IP-20_3xGlands_kit	IP-20_3xGlands_kit
IP-20_Glands_kit	IP-20_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.

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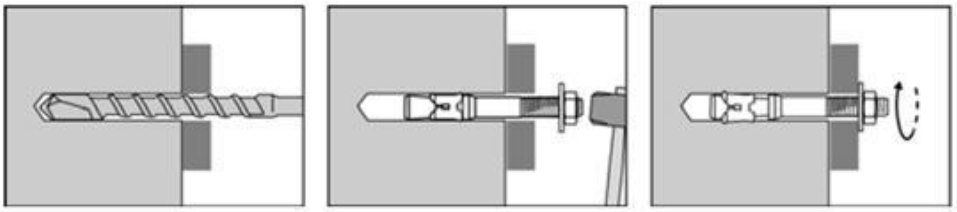
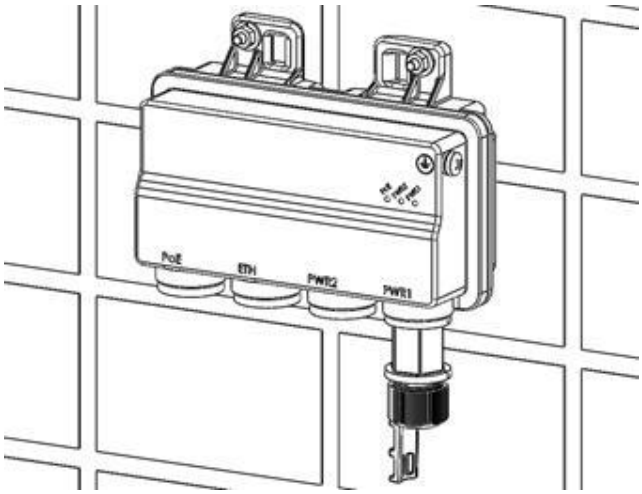
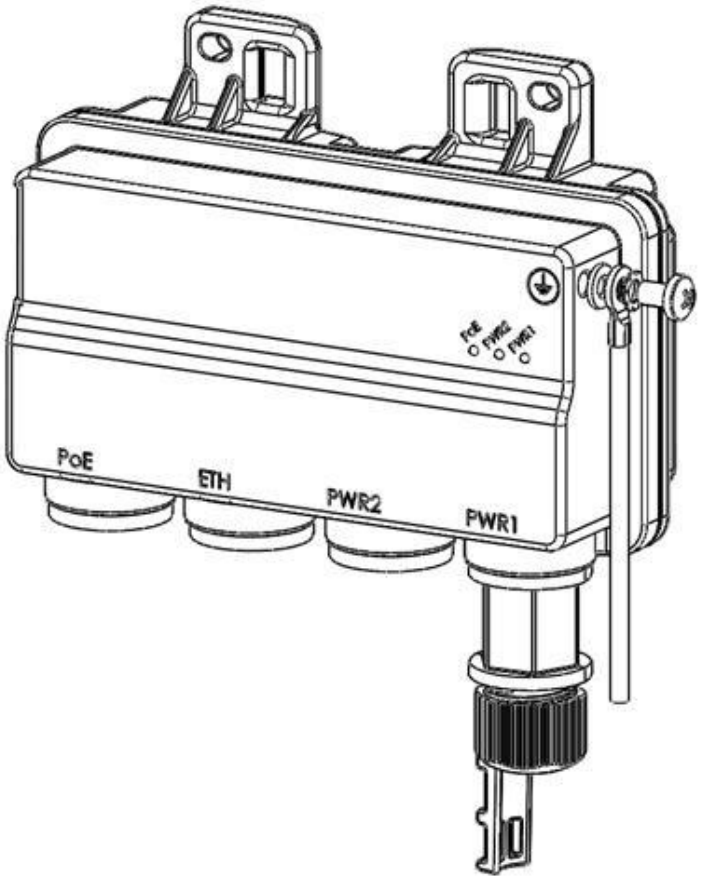
4 Place the washers on the bolt.
5 Tighten the nuts.







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6.4 PoE Injector Pole Mount Installation

List of Items

Item	Description	Quantity	Remarks
1	PoE Injector	1	

Required Tools

- Slot Screwdriver

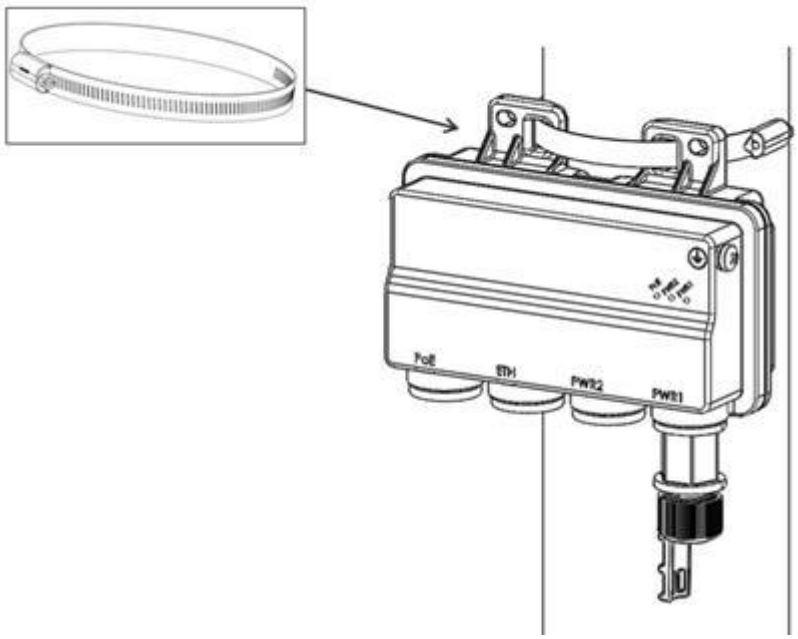
Procedure

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.



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6.5 PoE Injector 19” Rack Installation

List of Items

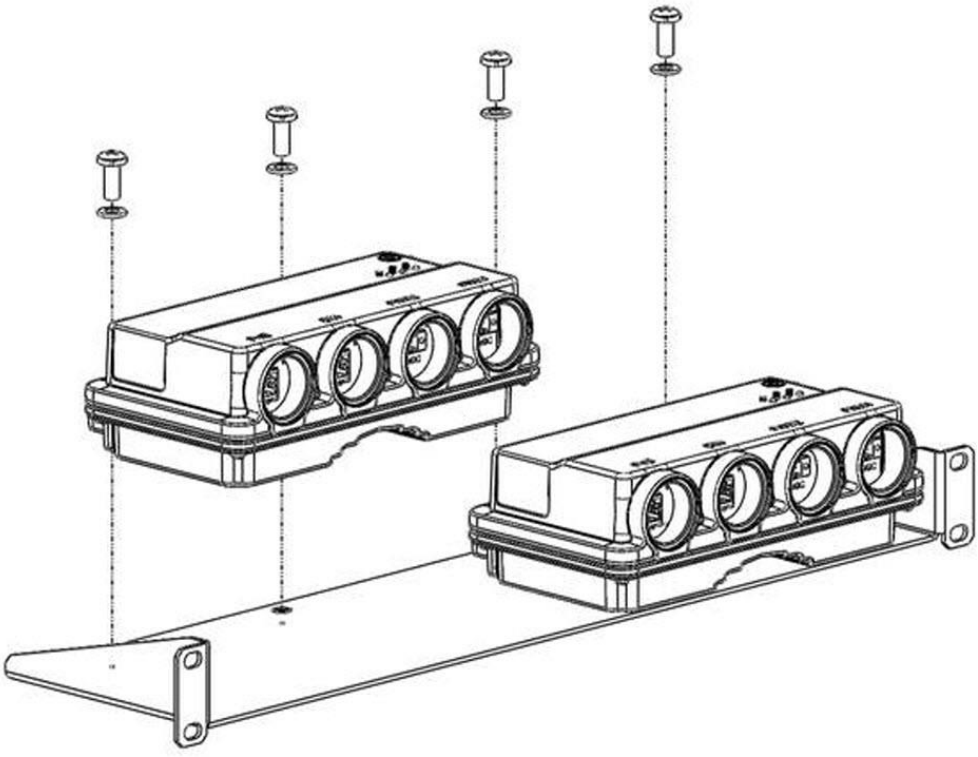
Item	Description	Quantity	Remarks
1	PoE Injector	1	
2	PoE Injector 19” Rack Mount Kit	1	

Required Tools

- Philips Screwdriver

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.

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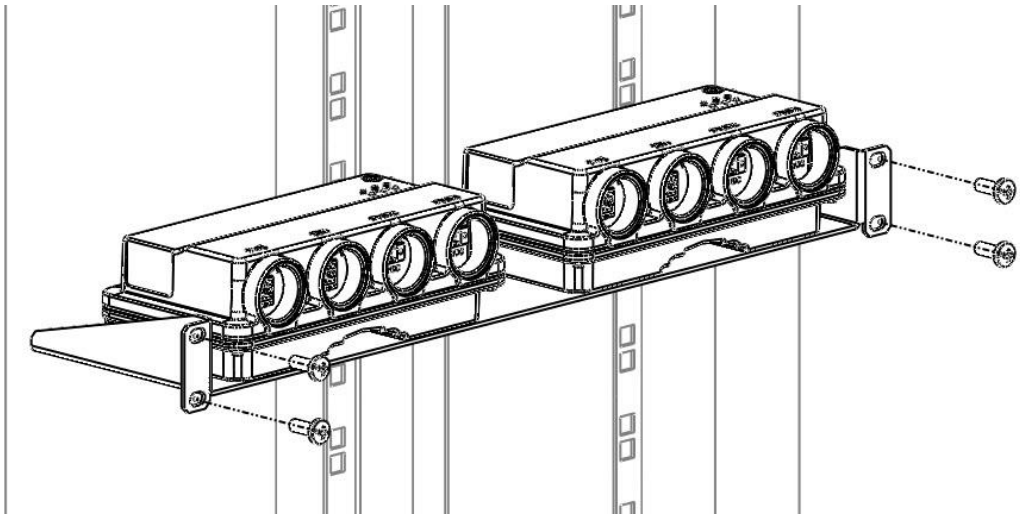


6.6 PoE Injector ETSI Rack Installation

List of Items

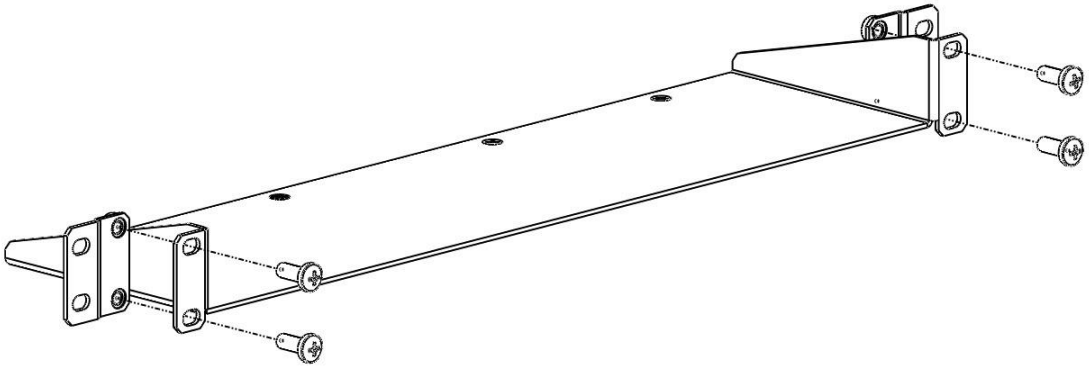
Item	Description	Quantity	Remarks
1	PoE Injector	1	
2	PoE Injector ETSI Rack Mount Kit	1	

Required Tools

- Philips Screwdriver

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.



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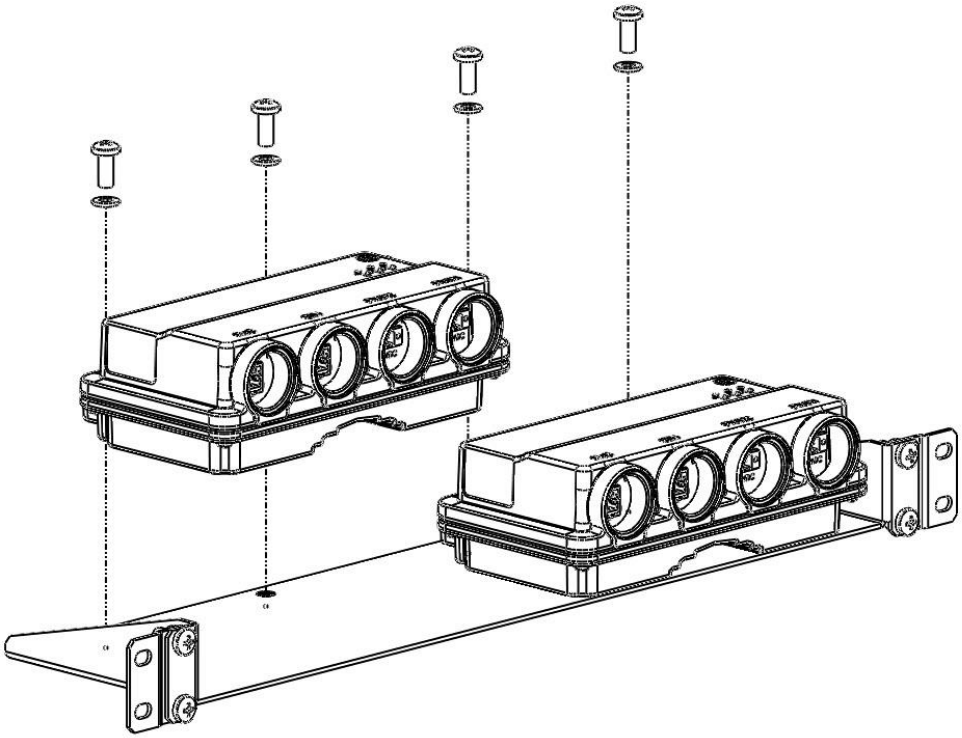
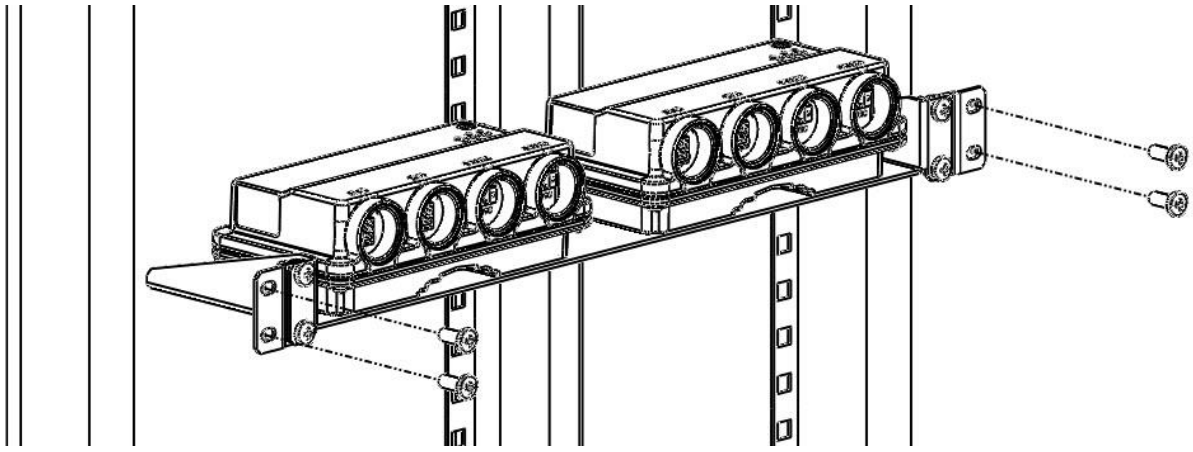
3 Mount the PoE Injector on the adaptor through the wall mounting holes using M6 screws and washers.



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



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

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7. Appendix A: Acceptance & Commissioning Procedures

This chapter provides Ceragon's recommended Acceptance and Commissioning Procedure for IP-50EX. 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.

Ceragon'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.

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7.1 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
Mount is grounded as per site specifications	OK
All steelwork is Galvanized or Stainless Steel as appropriate	OK
3. ANTENNA	
Antenna type (model and size):	
Antenna is securely fixed to mount	OK
Antenna is grounded as per site specifications	OK
Antenna sway braces are installed correctly (where applicable)	OK
Antenna Radome is securely fitted (where applicable)	OK
Water drain plugs are fitted and removed, as appropriate	OK
Antenna sealing O-Ring is properly fitted and not damaged	OK
Antenna/Launch unit polarization is as per link requirements	OK

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SITE ACCEPTANCE CHECKLIST (continued)	
4. OUTDOOR UNIT	
Type of ODU mount:	(Direct or Remote mount)
ODU is securely mounted to the antenna or pole	OK
ODU is grounded as per installation instructions	OK
ODU's polarization is as per link requirements	OK
ODU is installed properly and has no physical damage	OK
For Remote-Mount Only:	
Remote mount kit is securely mounted to the pole	OK
Flexible waveguide has no physical damage and connectors are sealed	OK
All flexible waveguide bolts are secured using washers and lock-washers, as appropriate	OK
Flexible waveguide is secured to the pole	OK
6. CAT5/Fiber Optic CABLE	
Overall cable length:	
Cable type:	
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
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

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SITE ACCEPTANCE CHECKLIST (continued)	
7. DC POWER SUPPLY - Two Inputs	
Measured DC voltage input to the IDU:	(-40.5 to -60 VDC)
Power-Supply maximum current:	
Power-Supply is properly grounded	OK
DC power backup type:	
IDU DC connector is secure and the DC input leads are correctly terminated (no bare wires are visible)	OK
IDU DC connector (+) and (GND) leads are shorted and GND is grounded	OK
9. RACK INSTALLATION	
Rack is mounted to the shelter floor with four screws	OK
Rack is mounted to the shelter wall with two screws	OK

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SITE ACCEPTANCE CHECKLIST (continued)	
10. REMARKS/NOTES	
11. GENERAL INFORMATION	
Site accepted by:	Name:
	Title:
	Company:
	Signature:
	Date:
Site approved by:	Name:
	Title:
	Company:
	Signature:
	Date:

7.2 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.

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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

7.3 Radio Link Commissioning Procedure

7.3.1 Scope

This section describes the recommended commissioning tests for IP-50EX radio link in a 1+0 configuration.

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

7.3.2 Commissioning Test

The following tests should be performed on each installed link.

7.3.2.1 Link Verification

- Received Signal Level (RSL) is up to +/- 4 dB from the expected (calculated) level at both ends of the link.[4]
- Radio Bit Error Rate (BER) is $10E^{-11}$ or lower.
- If working with ATPC, ATPC is operating as expected (RSL = reference level).

7.3.2.2 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 Ceragon'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 Ceragon's specifications for the chosen MRMC).

7.3.2.3 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.

[4] The voltage at the RSL port is 0.XX where XX is the RSL level. For example: 0.59V means an RSL of -59 dBm. Note that the voltage measured at the RSL port is not accurate and should be used only as an aid).

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7.3.2.4 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.

7.4 IP-50EX 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 Ceragon Networks.

Upon completing the Commissioning Log, send the log to Ceragon support center at support@ceragon.com.

IP-50EX LINK COMMISSIONING LOG		
1. GENERAL INFORMATION		
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):		

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ATPC on/off:		
ATPC ref level:		
ODU Polarization:		
3. ANTENNA AND ODU MOUNT	**Site 1**	**Site 2**
Antenna vendor and model:		
Antenna size:		
Mounting type:		
Mounting losses:		
4. LINK PARAMETERS	**Site 1**	**Site 2**
Link distance:		
Rain zone:		
Expected RSL (dBm):		
Expected Diversity RSL (dBm):		
RSL Main (dBm):		
RSL Diversity (dBm):		
Deviation from exp?		
RSL ≤4 dB?		
5. COMMISSIONING TESTS	**Site 1**	**Site 2**
Line loopback:	Pass	Pass
ODU loopback:	Pass	Pass
Radio BER:	Pass	Pass
FE test:	Pass	Pass
GbE test:	Pass	Pass
6. MANAGEMENT CONFIGURATION	**Site 1**	**Site 2**
Eth IP Address:		
Eth IP mask:		
Default router:		
In-band VLAN		
7. REMARKS/NOTES		

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8. INSTALLATION INFORMATION	
Installed by:	Name:
	Company:
	Date:
	Signature:
Commissioned by:	Name:
	Company:
	Date:
	Signature:

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