Inseego Wavemaker™
5G outdoor CPE FW2000e
INSTALLATION GUIDE

inseego

About the FW2000e

Description

The 5G outdoor CPE FW2000e delivers high-speed data over both 5G and 4G LTE networks using a proprietary high-gain antenna array. The FW2000e connects to the optimal cellular network and provides data connectivity to the existing in-building network.

Durability

The FW2000e has an environmental rating of IP67 for water and dust ingress and can operate within a temperature range of -30°C to 70°C (-22 to 158°F).

Preparing to install the FW2000e

Step one: gather tools and materials

- Appropriate equipment to safely install the device at optimum height, e.g. ladder, scissor lift, bucket truck
- Round 4.5mm to 6.5mm Cat6A PoE* cable (RJ45 fittings attached)
- Smartphone/device for Inseego Mobile™ app
- SIM card (4FF Nano)
- Phillips-head screwdriver
- M6 4mm hex driver
- Drill
- 14mm socket wrench/driver
- Ground wire #10 AWG
- Cat6A shielded outdoor or direct burial cable**
- Bishop tape (roofing sealant)
- Silicone sealant (wall penetrations)
- Flexible cable clips, nail clips, or vinyl siding clips

Your FW2000e package includes: FW2000e device, PoE injector, and SIM tool.

NOTE: Mount installation packages are ordered and shipped separately.

*Power over Ethernet
** Flooded cable is recommended to prevent water intrusion

Step two: install SIM cards

- Unscrew the protective shield over the SIM slots using a Phillips-head screwdriver.

- Ensure that the SIM card is in the correct orientation before inserting it. The notch side of the SIM card should be inserted first with the metal contacts facing the front of the device. Use the included SIM tool to insert a Nano 4FF SIM card into the appropriate SIM slot. Be careful to not use excessive force.
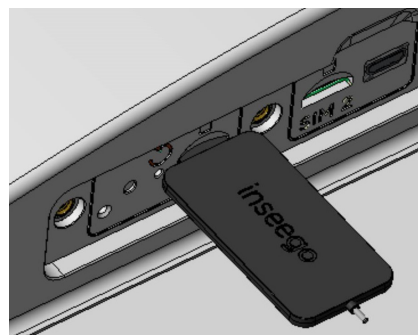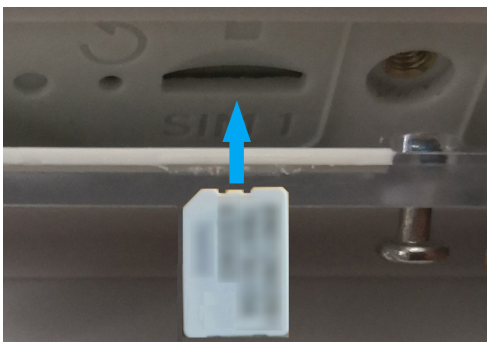
NOTE: This device supports only Nano SIM cards.

- Reattach the protective shield cover to a torque of .3Nm (.221 ft/lb), making sure the tether passes through the hole of the rear housing and is not bent or bunched.

Correct tether placement   *Incorrect tether placement*

WARNING! If the tether is bunched, it could prevent the compartment from being effectively sealed.

Step three: install the PoE cable

NOTE: Make sure your PoE cable wiring is correct (see "**Wiring diagram for the PoE RJ45 fitting**").

- Unscrew the PoE gland cap assembly.

- Thread the PoE cable through the sealing cap, clip, and body of the gland assembly.

Sealing cap

Clip

Body

- Insert the connector into the FW2000e and screw the body of the gland to the FW2000e.

NOTE: When removing the cable from the FW2000e, use a thin tool such as a flathead screwdriver or pen to release the tab on the Ethernet plug.

- Connect the two parts of the sealing around the cable, then slide the sealing into the gland body.

Sealing ———

- Slide the clip and the sealing cap along the cable and screw the sealing cap tightly to the gland body. The sealing cap will keep the PoE connection secure and watertight.

- Insert the other end of the cable into the PoE injector **Data & Power Out** port. Plug the PoE injector into an earthed AC outlet. **NOTE:** Consider using a surge protector when warranted.

NOTE: The PoE injector status LED is green when the FW2000e is **NOT** connected and there is no load. The LED is red when the FW2000e is connected. The LED does not indicate data transmission.

Step four: select a location

- Mount the FW2000e in a location where foliage and current or future construction does not block or partially block the line-of-sight.

- Mount as close to the building ground or other suitable grounding location as possible.

- Contact your service provider to get details on the direction of potential towers relative to the installation site.

- Scan the QR code to download the Inseego Mobile app from Apple Store or Google Play Store, or visit **https://inseego.com/products/cloud-management/inseego-mobile-app/#available-now** to download the app.

- Follow instructions within the Inseego Mobile app to connect to the FW2000e.

- Hold the device near potential mounting locations and point in the direction of potential tower locations obtained from your service provider to check signal quality and identify the best mounting location.

Installing the FW2000e

Step one: review considerations and requirements

Electrical considerations

The FW2000e must be three feet from any electrical light or standard electrical panel and at least twenty feet from overhead power lines. The FW2000e must be bonded to the utility ground. All aspects of the installation must be in full compliance of all applicable local and state codes. Avoid running the cable along other lines or conduit used for AC power, which can cause interference with data transfer through the cable.

Mounting considerations

The FW2000e must be mounted a minimum of five feet above the walking surface and out of reach of small children. Mounting must also adhere to all FCC rules and regulations.

Roof mounting considerations

- Mounting on a sloped roof requires a structurally sound surface covered with asphalt shingles that can support the weight of the mount and the FW2000e. Other roofing material: metal, slate, tile, or shake may require extra support for secure mounting.

- Mount in an overhang section. Always avoid mounting over living spaces.

- At least two of the mounting screws must be secured in a rafter, and Bishop tape or tar-based sealant must be used for each mounting screw.

- Roofs with less than thirty-five-degree pitch may require the use of a non-standard mount such as a non-penetrating sled.

- Seal any penetrations used to bring cable inside with silicone.

Wall mounting considerations

- Mounting on a wall requires a structurally sound surface that can support the weight of the mount and the FW2000e. Recommended surfaces include: wood or wood-composite panel/lap siding, hollow cinder block, poured concrete, and brick. Other material: vinyl/steel/aluminium siding, covered brick, or stucco may require extra support for secure mounting. NOTE: If metal siding is the only option available, a backer board can be used on the other side to provide a more secure mount.

- At least two screws lined up vertically must be attached to a structural element such as a wall stud, and all screws must be sealed with silicone for weatherproofing.

Cabling requirements

- Cable going from the FW2000e to the PoE must be outdoor-rated, shielded Cat6A Ethernet cable, and provide an end-to-end connection from the FW2000e to the PoE power injector. The total length of cable must not exceed 300 feet in total length, including indoor cables. NOTE: It is recommended that you keep the cable run at 250 feet or less and use a cable tester to verify connectivity at the time of installation.

- Use drip/service loops to properly direct water away at the FW2000e and any penetration locations.

Proper drip loop cabling   *Improper cabling*
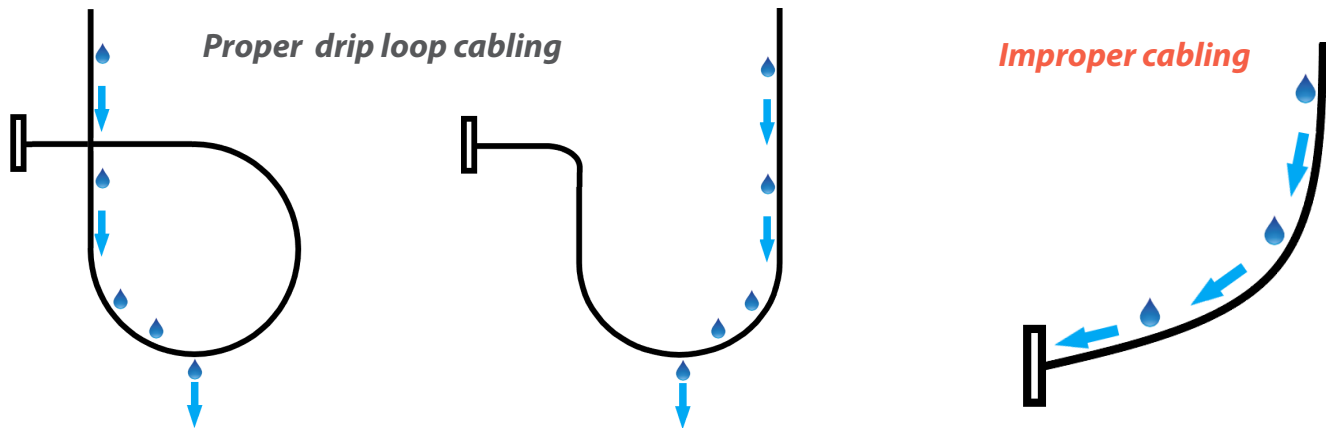
- Secure the cable using screw-type single flexible cable clips, nail clips, or vinyl siding clips. NOTE: T50, T25, or other similar staples are not approved for exterior cable attachment, as they can damage the cable jacket and allow water to enter the cable. Using a flooded cable can help prevent water intrusion should the cable jacket become compromised.

- Run cable along building lines vertically or horizontally and attach it every 18-36 inches. Avoid running cable diagonally.

Grounding requirements

- The FW2000e must be properly bonded to an appropriate location such as the utility ground.
- The ground connection must be unique and not shared with another ground run.
- It is recommended to use #10 solid copper wire for the ground run from the FW2000e. Ensure the ground run is as short and straight as possible.
- Recommended ground/bond connections include:
  - A building utility ground
  - A galvanized ground strap attached to a metal electrical raceway or conduit. Always use like materials for the strap and wire.
  - An electrical panel clamp attached to the top or side of the metal electrical service panel. Ensure it does not impede opening of the service panel door.

Step two: install the device

Mounting options

Ensure you are using the correct mount for the appropriate installation of the FW2000e to ensure stable and safe long-term operation. Always use appropriate fasteners for the material to which you are attaching.

Click on the appropriate mount below to jump instructions for that installation:

- **J-Arm mount installation instructions**
- **Pole mount installation instructions**
- **Wall mount installation instructions**

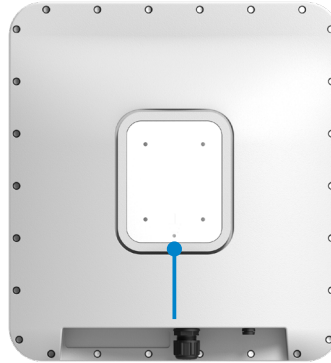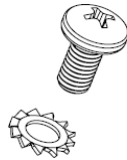# J-Arm mount installation instructions

Hole for M6 21mm bracket
mount bolts and washers (4)

Square neck bolt

Positioning bolt

Device elevation bracket

J-arm

Positioning bolt

Hole for roof mount lag screws (4)
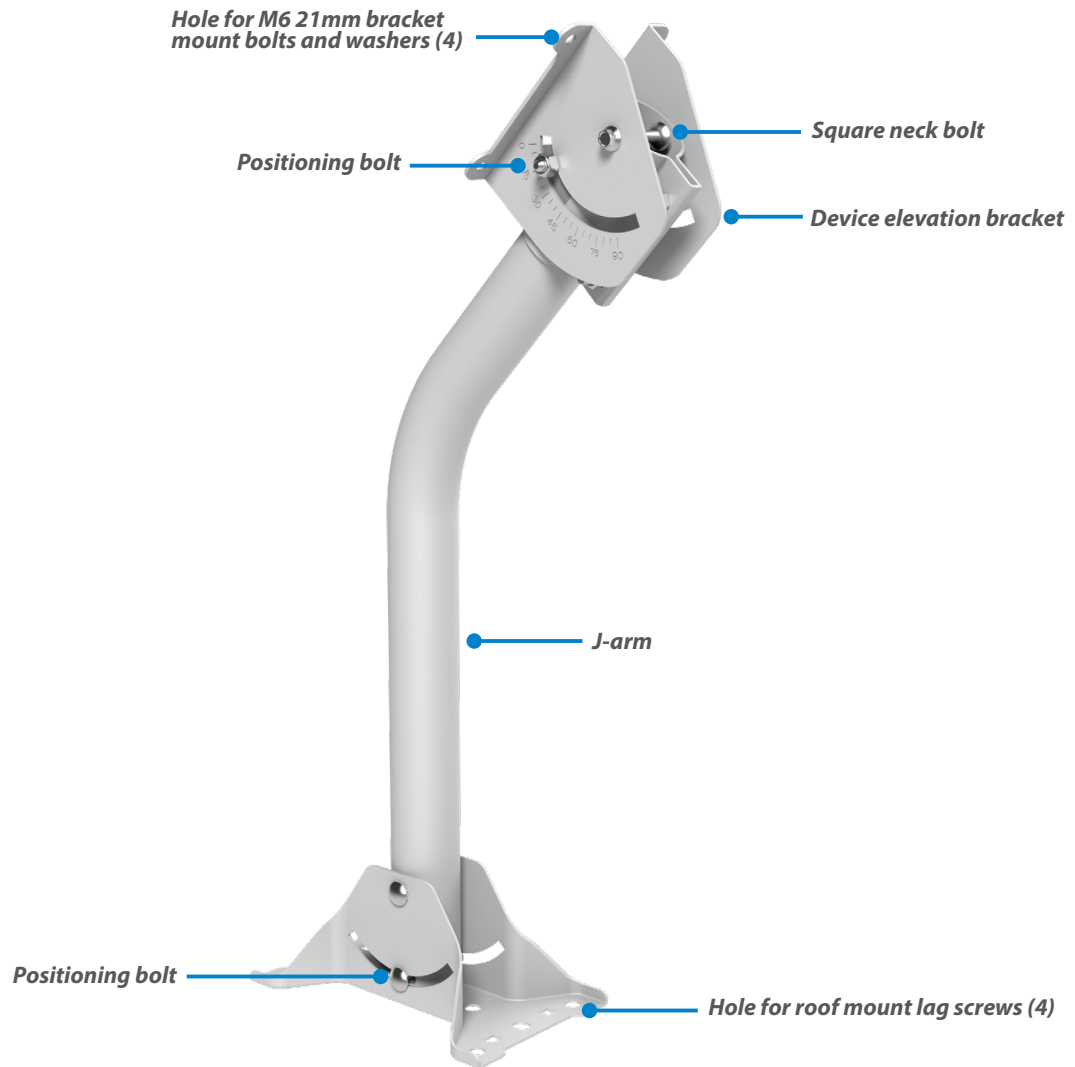
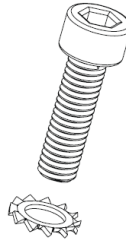## Attach the FW2000e to the device elevation bracket

- Attach a ground wire to the back of the device with the ground screw.

M5 10mm ground screw / washer

- Place the M6 external locking washers on the M6 21mm bracket mount bolts.

M6 21mm bracket mount bolt and washer

- Mount the device to the device elevation bracket using a hex driver to tighten the bolts to 2.0 Nm (1.48 ft/lb).

Secure the J-arm mount

The J-arm mount is adjustable and can be mounted on vertical, horizontal, and slanted exterior surfaces.

The mount is attached using the four roof mount lag screw in the corners of the base.

Roof mount lag screw

- Pre-drill holes in the surveyed location.
- Attach the mount using a hex driver to tighten the lag screws. (Concrete anchors are provided for mounting to concrete or brick.)

  NOTE: Using a longer J-arm to extend the FW2000e higher may require struts attached to the J-arm to increase stability. You may need to use longer lag screws for the mount and ensure it is attached to a structural element such a wall stud.

Attach the device to the J-arm mount

- Attach the device elevation bracket to the J-arm mount and tighten the square neck bolts along the back to 2.0 Nm (1.48 ft/lb) using a ratcheting socket wrench.
- Secure the ground wire to an appropriate earth ground.

Orient the device

- Run the PoE cable to the desired location of the PoE injector and insert the cable into the **Data & Power Out** port.
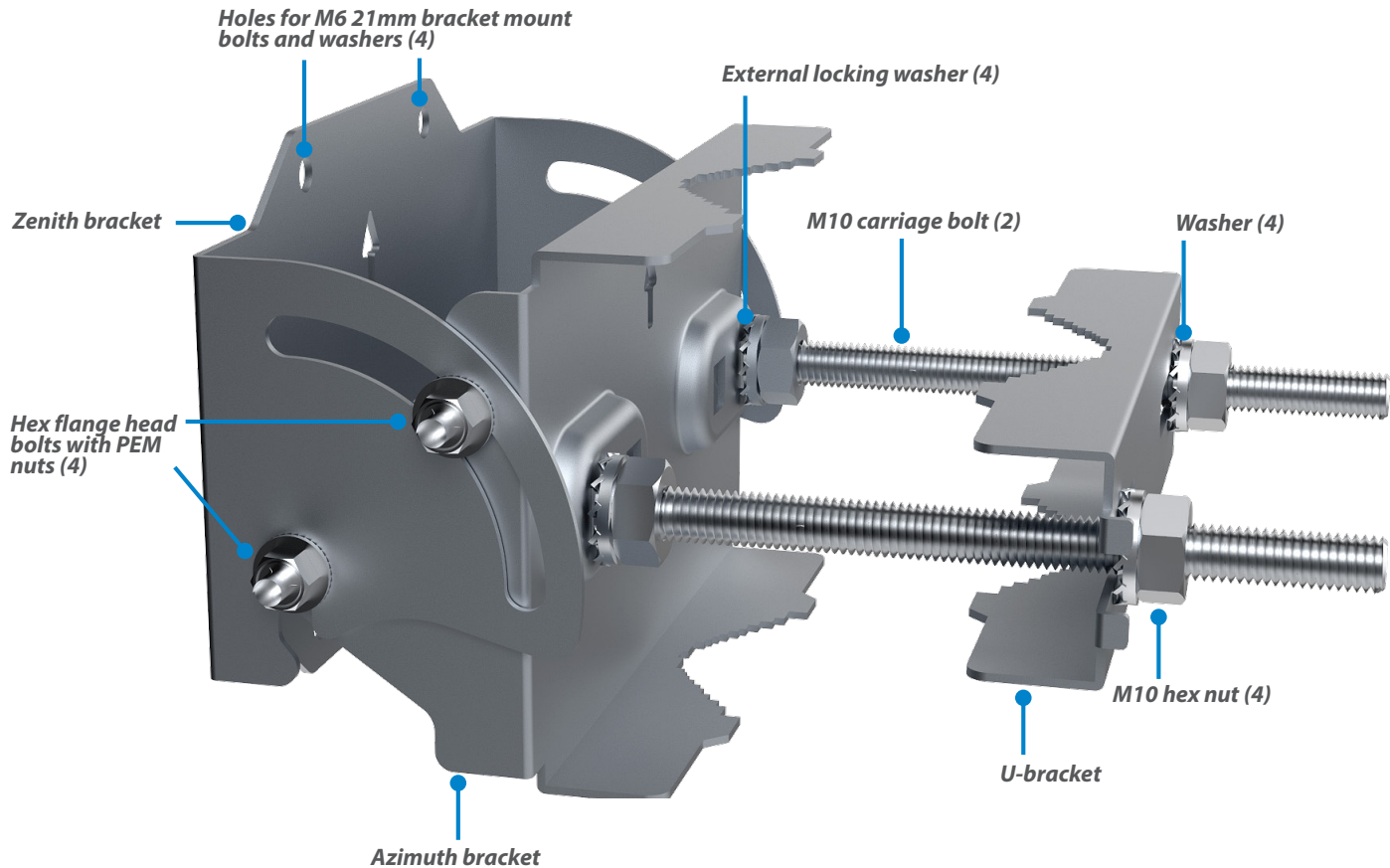
Data In   Data & Power Out

- Take a racheting socket wrench and device/smartphone with the Inseego Mobile app to the FW2000e location.

- Use the Inseego Mobile app and the positioning bolts on the device elevation bracket and bottom of the mount to fine tune the horizontal and vertical angle of the FW2000e for the best signal.

- Tighten the positioning bolts to 15.0 Nm (11 ft/lb).
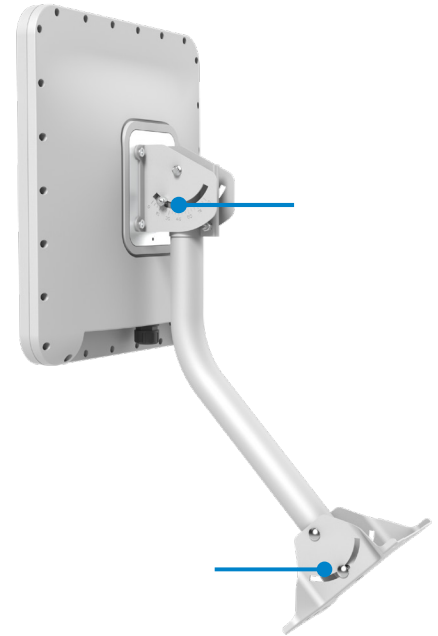
- Use sealing/weatherproofing material to seal any holes drilled in the structure to run the PoE cable.

Pole mount installation instructions

Holes for M6 21mm bracket mount bolts and washers (4)

External locking washer (4)

M10 carriage bolt (2)

Washer (4)

Zenith bracket

Hex flange head bolts with PEM nuts (4)

M10 hex nut (4)

U-bracket

Azimuth bracket

Assemble the pole mount bracket

> **NOTE:** The pole mount bracket can accommodate a maximum pole diameter of 4 inches.

- Attach the azimuth bracket to the zenith bracket using the four hex flange head bolts and PEM nuts.

- Insert the M10 carriage bolts through the azimuth bracket and secure with external locking washers, washers, and M10 hex nuts.
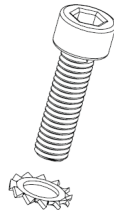
Attach the FW2000e to the pole mount bracket

- Attach a ground wire to the back of the device with the ground screw.
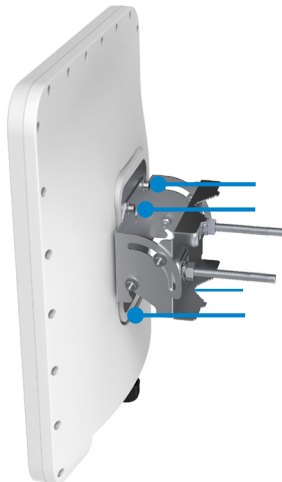
M5 10mm ground screw / washer
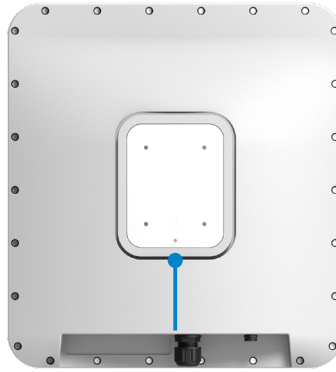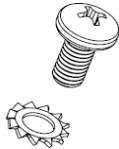
- Place the M6 external locking washers on the four M6 21mm bracket mount bolts.
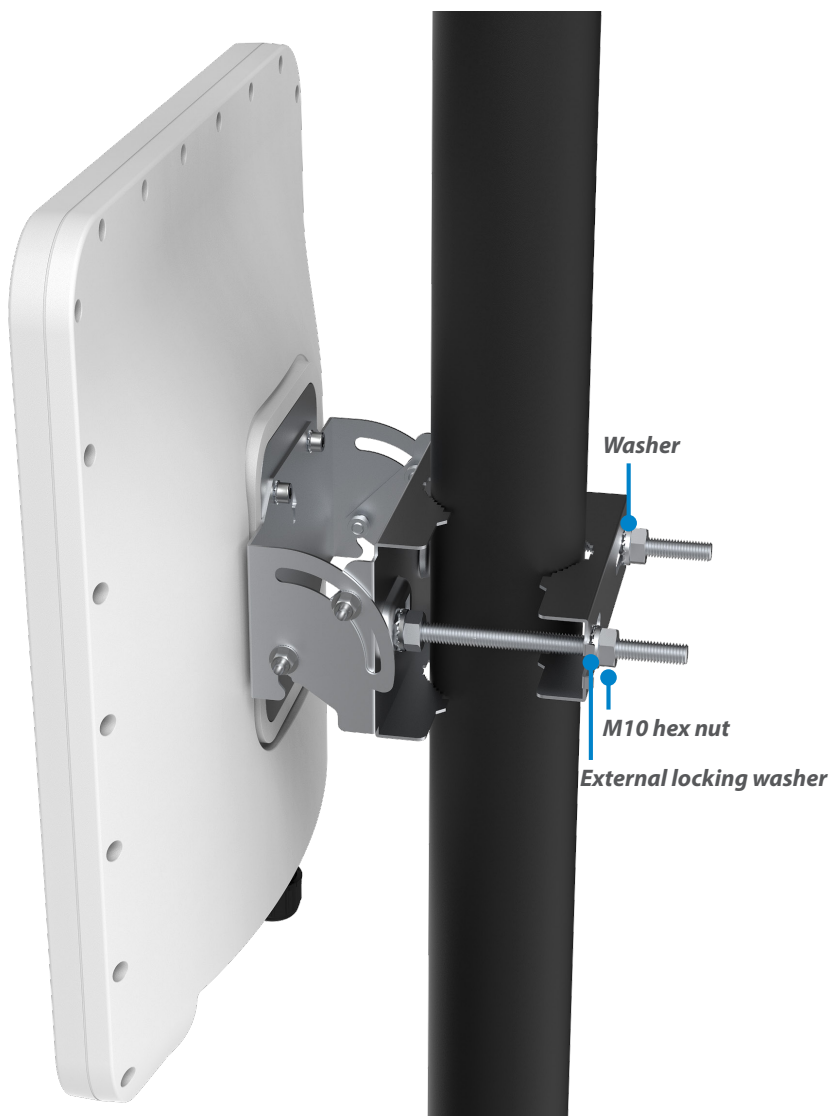
M6 21mm bracket mount bolt and washer

- Attach the pole mount bracket to the FW2000e using a hex driver to tighten the bolts to 2.0 Nm (1.48 ft/lb).

Secure the device to the pole

- Place the device against the pole.

- Slide the U-bracket onto the M10 carriage bolts and secure with external locking washers, washers, and M10 hex nuts tightened to 4.0 Nm (2.95 ft/lb).


Washer

M10 hex nut

External locking washer

- Secure the ground wire to an appropriate earth ground.

Orient the device

- Run the PoE cable to the desired location of the PoE injector and insert the cable into the **Data & Power Out** port.
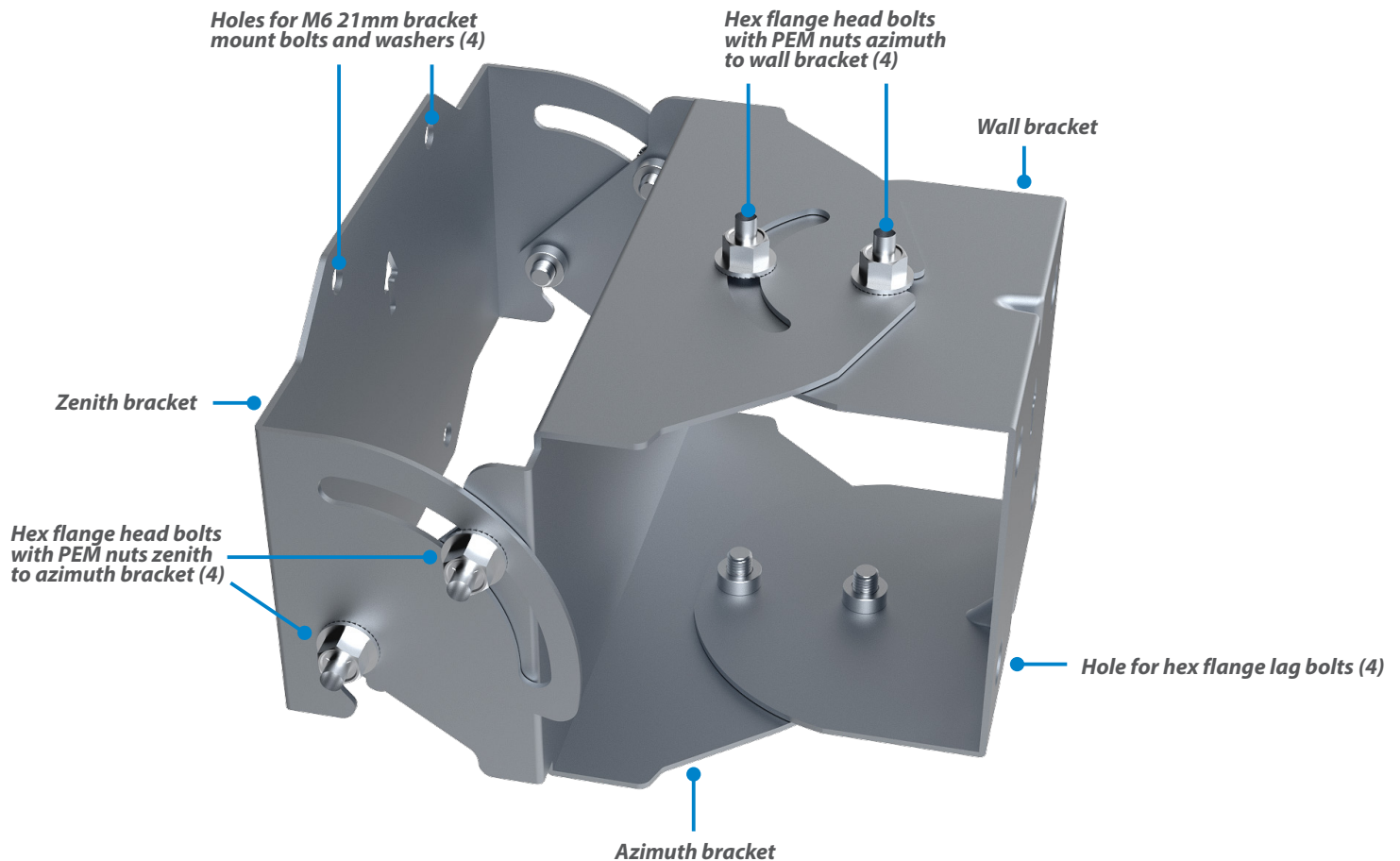

- Take a racheting socket wrench and device/smartphone with the Inseego Mobile app to the FW2000e location.

- Use the Inseego Mobile app and the positioning bolts on the pole mount bracket to fine tune the angle of the FW2000e for the best signal.
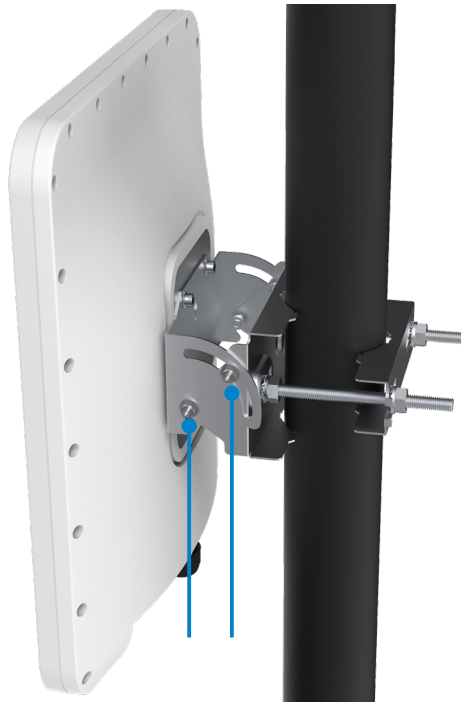
- Tighten the positioning bolts to 15.0 Nm (11 ft/lb).

Wall mount installation instructions

Holes for M6 21mm bracket mount bolts and washers (4)

Hex flange head bolts with PEM nuts azimuth to wall bracket (4)

Wall bracket

Zenith bracket

Hex flange head bolts with PEM nuts zenith to azimuth bracket (4)

**Hole for hex flange lag bolts (4)**

Azimuth bracket

Assemble the wall mount bracket

• Attach the azimuth bracket to the zenith bracket using four flange head bolts and PEM nuts.

• Attach the azimuth bracket to the wall bracket using four flange head bolts and PEM nuts.

Attach the FW2000e to the wall mount bracket

- Attach a ground wire to the back of the device with the ground screw.
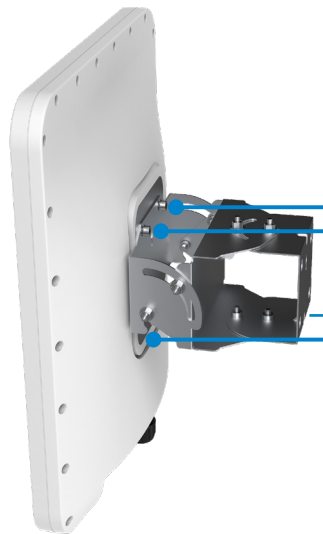
M5 10mm ground screw / washer
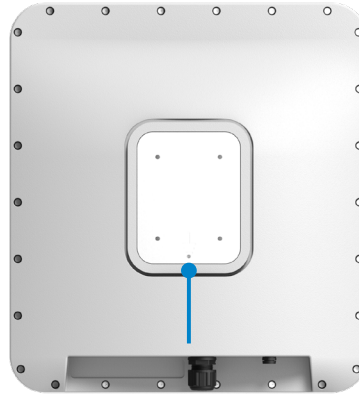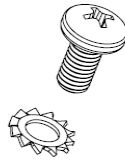
- Place M6 external locking washers on four M6 21mm bracket mount bolts.
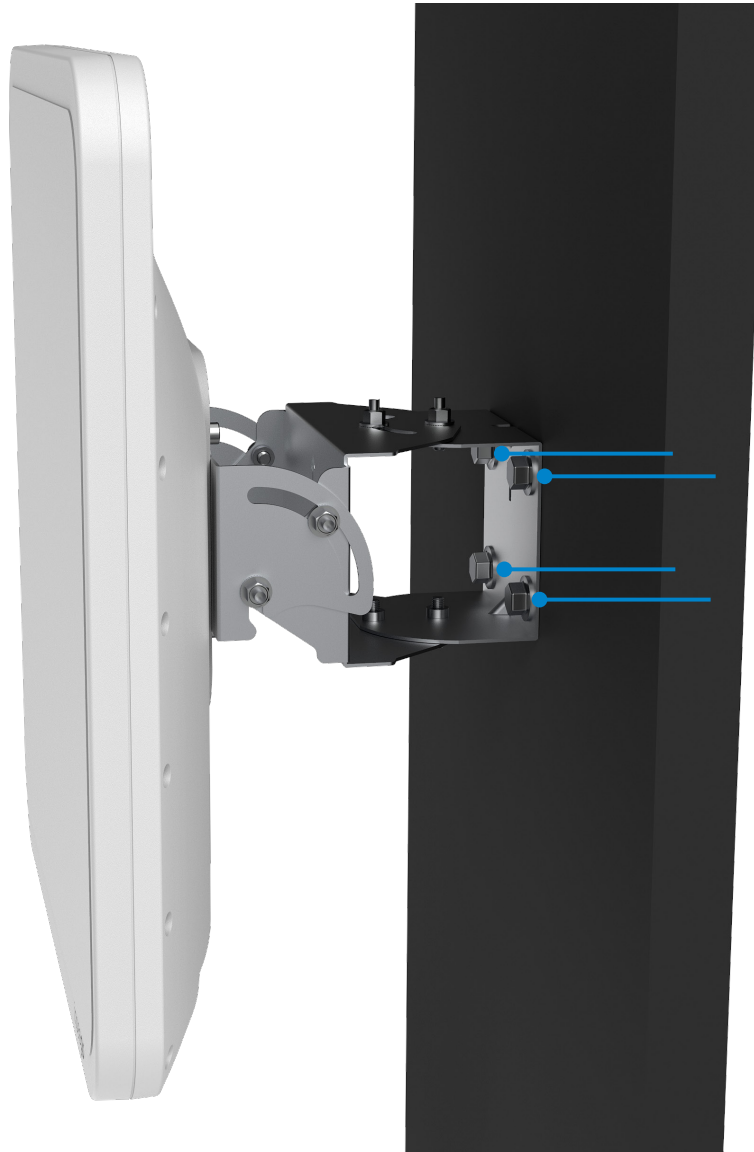
M6 21mm bracket mount bolt and washer

- Attach the device to the wall mount bracket using a hex driver to tighten the bolts to 2.0 Nm (1.48 ft/lb).

Secure the device to the wall

- Use four hex flange head lag bolts to attach the wall bracket to the wall.

- Secure the ground wire to an appropriate earth ground.

Orient the device

- Run the PoE cable to the desired location of the PoE injector and insert the cable into the **Data & Power Out** port.

- Take a racheting socket wrench and device/smartphone with the Inseego Mobile app to the FW2000e location.

- Use the Inseego Mobile app and the positioning bolts on the wall mount bracket to fine tune the horizontal and vertical angle of the FW2000e for the best signal.
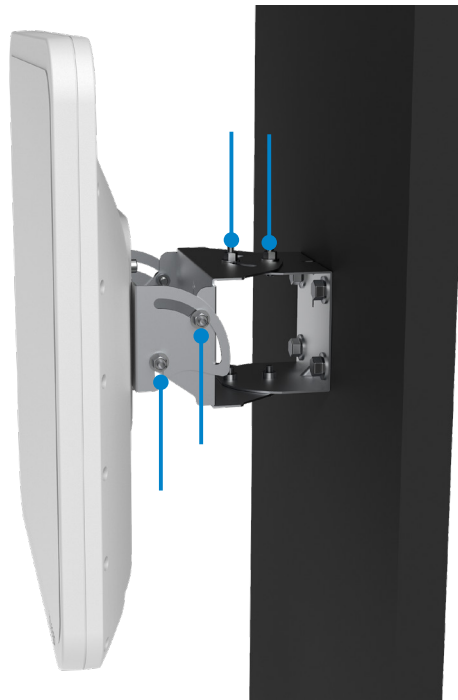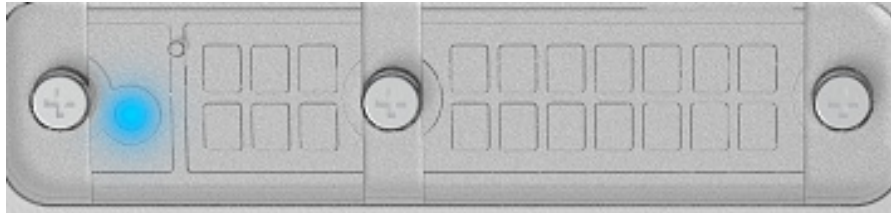
- Tighten both sets of positioning bolts to 15.0 Nm (11 ft/lb).

Testing the connection

Step one: check the LED on the device

The LED is located in the SIM compartment and is visible through the protective shield.

LED Color		Operation	Meaning
Blue*	🟦	Solid Blinking	Strong 5G connection (3 – 5 bars) Weak 5G connection (1 – 2 bars)
Green*	🟩	Solid Blinking	Strong 4G connection (3 – 5 bars) Weak 4G connection (1 – 2 bars)
Yellow**	🟨	Solid	Software update is in progress
Red	🟥	Solid Blinking	Device is booting up No service, SIM error, or locked SIM card

*If the LED is blue or green and the SIM appears active but you cannot browse the internet, contact your service provider to check the status of the SIM and troubleshoot any APN issues.

** This color can look more lime green than yellow.

Step two: connect a device

You can connect any router or device with Ethernet capability and an internet browser to the FW2000e. Connect an Ethernet cable from the **Data In** port on the PoE power injector to the connecting device.

NOTE: If your device is configured for IP passthrough, any time you switch the device you are connecting to the FW2000e, you must first disconnect the existing connected device and power cycle the FW2000e before connecting the new device.

Step three: monitor and manage your FW2000e

You can use multiple options to monitor and manage your 5G outdoor CPE:

- **FW2000e Admin web UI** - Access the web UI for a full set of device management features. Typically, **http://192.168.1.1** provides web UI access, however under certain conditions **http://inseego.local/** [*] is required. The initial sign in password is: "**Fast5G!**".

  NOTE: You cannot connect to the web UI through a router. Your computer must be directly connected by Ethernet cable to the Data In port on the FW2000e PoE power injector.

- **Inseego Connect™** - Go to **connect.inseego.com** to sign up for a free Inseego Connect account that lets you configure the settings, monitor status, and update the firmware on your device. Additional functionality can be obtained with a subscription to Inseego Connect Standard or Advanced.

- **Inseego Mobile app** - Use the same mobile app you used to install your FW2000e for routine device monitoring and management.

[*] This local address relies on having IPv6 enabled on your connecting device.

Wiring diagram for the PoE RJ45 fitting

The recommended PoE cable is Cat6A with T568B on both ends.
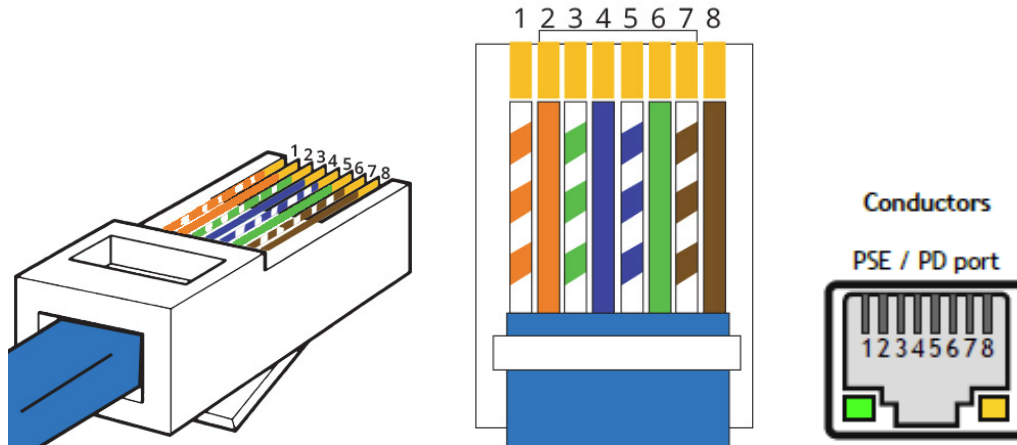
Important information

Inseego Mobile app requirements

Smartphone or device on iOS 13 or above, or Android 9.0 or above.

System requirements

Any device with Ethernet capability and an internet browser. The FW2000e is compatible with the latest major operating systems and versions of web browsers.

Approved firmware versions

This device will only operate with firmware versions that have been approved for use by your service provider and the device manufacturer. If unauthorized firmware is placed on the device it will not function.

5G

Not all devices, signals, or uses are compatible; check device specifications. See your service provider's website for 5G coverage, access, and network management details.

Information about safeguarding devices

We encourage customers to take appropriate measures to secure their devices and invite them to take advantage of the features available on this device to help secure it from theft and/or other unauthorized access and use. This device has a locking function (e.g., user-defined codes or patterns) that can serve as a first line of defense against unauthorized use or access to stored information. Preloaded security applications that allow customers to track or locate misplaced devices can be found on several devices. Lost or stolen devices should be immediately reported to your service provider so that proper measures can be taken to protect accounts. For additional information, visit your service provider's Privacy Policy.

Support and more

More information

To access a User Guide, go to:
https://inseego.com/resources/product-documentation/

Customer service and troubleshooting
Please contact your reseller.