RJ-45 Pinout for Straight-through Ethernet Cable

Table 49 Straight-through Ethernet Cable
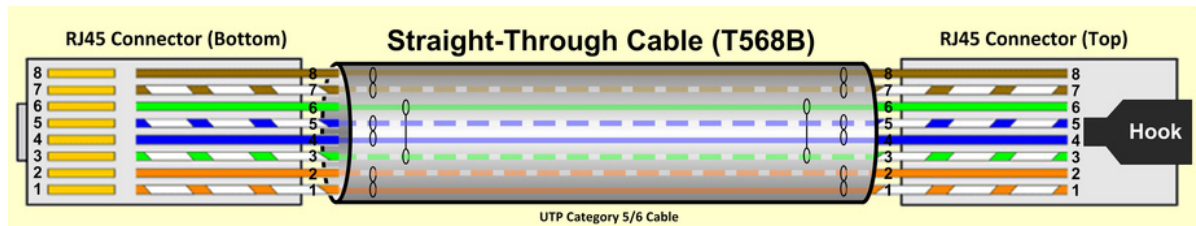

Table 50 RJ-45 pinout for straight-through Ethernet cable

Pin	Signal	Pair	Color
1	TP1+	2	White/orange stripe
2	TP1-	2	Orange solid
3	TP2+	3	White/green stripe
4	TP3-	1	Blue solid
5	TP3+	1	White/blue stripe
6	TP2-	3	Green solid
7	TP4+	4	White/brown stripe
8	TP4-	4	Brown solid

RJ-45 Pinout for Crossover Ethernet Cable
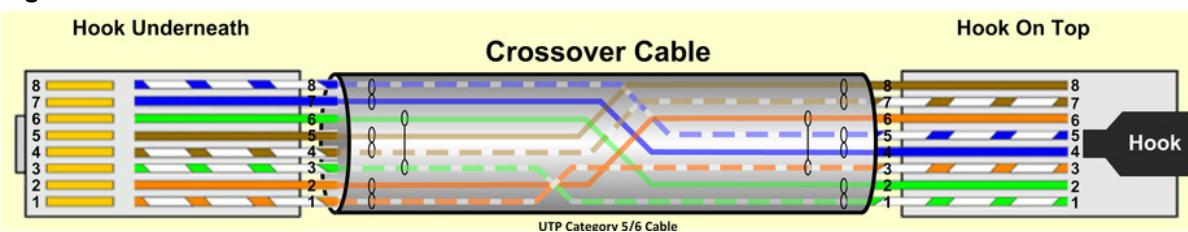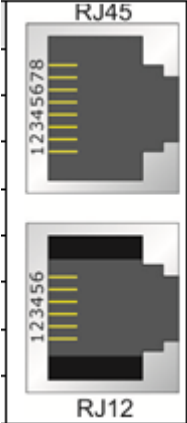
Figure 28 Crossover Ethernet Cable

Table 51 RJ-45 pinout for crossover Ethernet cable

Pin	Connection 1			Connection 2		
	Signal	Pair	Color	Signal	Pair	Color
1	TP2+	3	White/green stripe	TP1+	2	White/orange stripe
2	TP2-	3	Green solid	TP1-	2	Orange solid
3	TP1+	2	White/orange stripe	TP2+	3	White/green stripe
4	TP3-	1	Blue solid	TP3-	1	Blue solid
5	TP3+	1	White/blue stripe	TP3+	1	White/blue stripe
6	TP1-	2	Orange solid	TP2-	3	Green solid
7	TP4+	4	White/brown stripe	TP4+	4	White/brown stripe
8	TP4-	4	Brown solid	TP4-	4	Brown solid

AP/BHM to uGPS cable

The AP/BHM to uGPS cable can be constructed from RJ12 to RJ 45 cable using the ping configuration described in Table 51.

Table 52 AP/BHM to uGPS cable pinout

Pin	450i AP RJ 45 Connector	Pin	UGPS RJ 12 Connector	Connector
1	NC	1	8 on RJ 45	
2	NC	2	NC	
3	NC	3	5 on RJ 45	
4	4 on RJ 12	4	4 on RJ 45	
5	3 on RJ 12	5	NC	
6	NC	6	7 on RJ 45	
7	6 on RJ 12			
8	1 on RJ 12			

> **Note**
> The AP/BHM will only power up the uGPS if it configured to do so.

Configuring Link for Test

It is important to stage the AP/BHM and SM/BHS units first to verify proper registration before deploying the modules to the site. To begin configuring the modules for test, see the sections below:

Configuring the management PC

To configure the local management PC to communicate with the AP, SM, BHM or BHS, proceed as follows:

Powering the AP/SM/BH for test configuration

Perform the following steps to power on the ODU.

Procedure 1 Powering the ODU

1   Plug one end of a CAT 5 Ethernet cable into the ODU.

2   Plug the Ethernet cable connector labeled To Radio into the jack in the pig tail that hangs from the power supply.

3   Plug the other connector of the pig tail (this connector labeled To Computer) into the Ethernet jack of the computing device.

4   Plug the power supply into an electrical outlet.

> **Warning**
>
> From this point until you remove power from the ODU, stay at least as far from the AP as the minimum separation distance specified in Minimum separation distances on page 5-3.

5   Power up the computing device

6   Start the browser in the computing device

The AP/BHM interface provides a series of web pages to configure and monitor the unit. Access web-based interface through a computing device that is either directly connected or connected through a network to the AP/BHM. If the computing device is not connected to a network when it is being configured for test environment, and if the computer has used a proxy server address and port to configure a module, then the operator may need to first disable the proxy setting in the computer.

Perform the following procedure to toggle the computer to *not* use the proxy setting.

Procedure 2 Bypassing browser proxy settings to access module web pages

    1   Launch Microsoft Internet Explorer

    2   Select **Tools, Internet Options, Connections, LAN Settings.** Alternate web browser menu selections may differ.

    3   Uncheck the **Use a proxy server** box.

In the address bar of your browser, enter the IP address of the AP/BHM. (For example, enter `http://169.254.1.1` to access the AP/BHM through its default IP address). The AP/BHM responds by opening the General Status tab of its Home page.

Logging into the web interface – AP/SM/BH

Procedure 3 Logging into the web interface

    1   Plug one end of a CAT 5 Ethernet cable into the AP/BHM

    2   Plug the Ethernet cable connector labeled To Radio into the jack in the pig tail that hangs from the power supply.

    3   Plug the other connector of the pig tail (this connector labeled To Computer) into the Ethernet jack of the computing device.

    4   Plug the power supply into an electrical outlet.

> **Warning**
>
> From this point until you remove power from the ODU, stay at least as far from the ODU as the minimum separation distance specified in Minimum separation distances on page 5-3.

Using the Quick Start Configuration Wizard of the AP/BHM

See section Quick link setup on page 7-12.

Chapter 6: Installation

This chapter describes how to install and test the hardware for a PMP/PTP 450i link. It contains the following topics:

- ODU variants and mounting bracket options on page 6-2 provides details of six different bracket options, including the type of ODu and range of pole diameters supported by each option.
- Mount the ODU, LPU and surge suppressor on page 6-3 describes how to mount and ground an integrated or connectorized ODU, how to mount and ground the top LPU.
- Installing the copper Cat5e Ethernet interface on page 6-11 describes how to install the copper Cat5e power over Ethernet interface from the ODU to the PSU.
- Installing external antennas for a connectorized ODU on page 6-15 describes how to install external antennas for a connectorized ODU.
- Installing ODU on page 6-31 describes how to install PTP and PMP ODU radios.
- Installing the AC Power Injector on page 6-36 describes how to install a power supply unit for the PMP/PTP 450i, either the AC Power Injector.
- Installing a GPS receiver on page 6-37 describes how to install a GPS receiver as the timing reference source.
- Supplemental installation information on page 6-42 contains detailed installation procedures that are not included in the above topics, such as how to strip cables, create grounding points and weatherproof connectors.

	Note
	These instructions assume that LPUs are being installed from the PMP/PTP 450i LPU and grounding kit (Cambium part number C000065L007). If the installation does not require LPUs, adapt these instructions as appropriate.
	If LPUs are being installed, only use the five black-capped EMC cable glands supplied in the LPU and grounding kit. The silver-capped cable glands supplied in the ODU kits must only be used in PMP/PTP 450i installations which do not require LPUs.

ODU variants and mounting bracket options

Mounting bracket options

The PMP/PTP 450i series supports various mounting bracket options. Select the optimum mounting bracket arrangement based on the pole diameter and the ODU variant:

Table 53 ODU mounting bracket part numbers

Cambium description	Cambium part number
Mounting bracket – low profile adjustable	N000045L002A

The low profile bracket provides elevation adjustment with the PMP/PTP 450i Integrated ODUs of +10° to –5° or +5° to –10°. A larger adjustment range is available using the standard integrated mounting bracket. The connectorized mounting bracket does not provide elevation adjustment.

	Note
	The connectorized mounting bracket is included with the PMP/PTP 450i Connectorized ODU. Order a bracket separately for PMP/PTP 450i Integrated ODUs.

Mount the ODU, LPU and surge suppressor

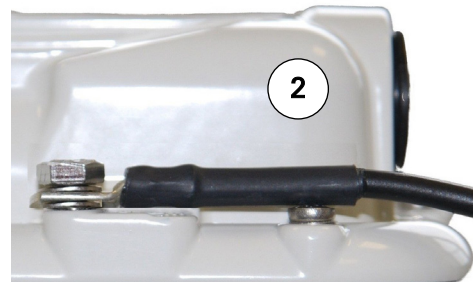To install the ODU and top LPU, use the following procedures:

- Attach ground cables to the ODU on page 6-3
- Mount the ODU on the mast on page 6-4
- Mount the top LPU on page 6-5

Attach ground cables to the ODU

1 Fasten an AWG 10 (or 6mm^2) copper ground
cable to each ODU grounding point using the
M6 (small) lugs

2 Tighten the Ground post locking nut in the
1000SSH onto the copper wire

3 Securely connect the copper wire to the grounding system (Protective Earth) according to
applicable regulations.

Mount the ODU on the mast

| ⚠	**Caution**
	Do not reverse the bracket clamp, as this arrangement may lead to failure of the assembly. Do not over-tighten the bolts as this may lead to failure of the assembly.

1   Use stainless steel hose clamps or equivalent fasteners to lock the ODU into position.

2   Remove the base cover of the ODU

3   Terminate the UV outside grade Category 5 Ethernet cable with an RJ-45 connector, and connect the cable to the ODU.

4   Wrap a drip loop in the cable.

Mount the top LPU

1 For separate LPU mounting, use the U-bolt bracket from the LPU kit to mount the top LPU on the pole below the ODU. Tighten to a torque setting of 7.0 Nm (5.2 lb ft):
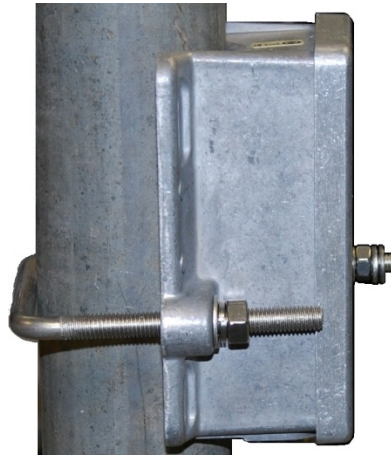
Mount the Surge Suppressor

1   Mount the 1000SSH to the *outside* of the subscriber premises (with the cable openings facing downward), as close to the point where the Ethernet cable penetrates the residence or building as possible, and as close to the grounding system (Protective Earth) as possible.

2   Wrap an AWG 10 (or 6mm^2) copper wire around the Ground post of the 1000SSH.

3   Tighten the Ground post locking nut in the 1000SSH onto the copper wire.

4   Securely connect the copper wire to the grounding system (Protective Earth) according to applicable regulations.

5   Using diagonal cutters or long nose pliers, remove the knockouts that cover the cable openings to the 1000SSH.

6   Pack both of the surge suppressor Ethernet jacks with dielectric grease.

7   Wrap an AWG 10 (or 6mm^2) copper wire around the Ground post of the 1000SSH.

8   Tighten the Ground post locking nut in the 1000SSH onto the copper wire.

9   Securely connect the copper wire to the grounding system (Protective Earth) according to applicable regulations.

10   Using diagonal cutters or long nose pliers, remove the knockouts that cover the cable openings to the 1000SSH.

11   Pack both of the surge suppressor Ethernet jacks with dielectric grease.

12   Wrap a splice loop in the loose end of the Ethernet cable from the SM/BHS.

13   Connect that cable to one of the Ethernet jacks.

14   Connect an Ethernet cable to the other Ethernet jack of the 1000SSH and to the power adapter.

15   Replace the cover of the 1000SSH.

Figure 29 1000SSH Surge Suppressor
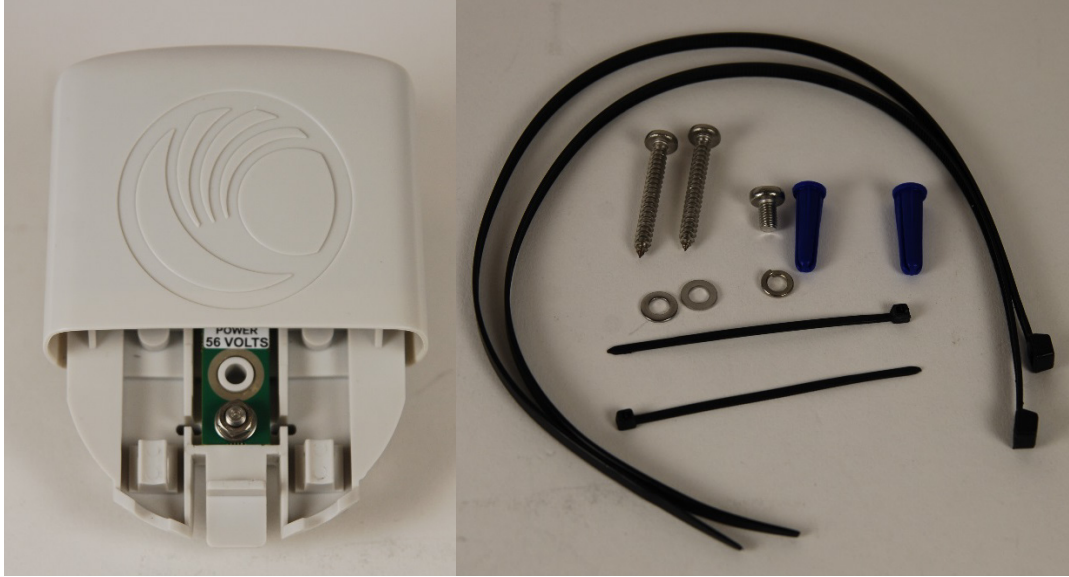
General protection installation

To adequately protect a PMP 450i installation, both ground bonding and transient voltage surge suppression are required.

Basic requirements

The following basic protection requirements must be implemented:

- ODU must be in 'Zone B' (see).
- ODU must be grounded to the supporting structure.
- A surge suppression unit (1000SSH) must be installed on the outside of the building.
- The distance between the ODU and 1000SSH should be kept to a minimum.
- The drop cable must not be laid alongside a lightning air terminal.
- All grounding cables must be a minimum size of 10 mm^2 csa (8AWG), preferably 16 mm^2 csa (6AWG), or 25 mm^2 csa (4AWG).

Grounding cable requirements

When routing, fastening and connecting grounding cables, the following requirements must be implemented:

- Grounding conductors must be run as short, straight, and smoothly as possible, with the fewest possible number of bends and curves.

- Grounding cables must not be installed with drip loops.

- All bends must have a minimum radius of 203 mm (8 in) and a minimum angle of 90° (Figure 30). A diagonal run is preferable to a bend, even though it does not follow the contour or run parallel to the supporting structure.

- All bends, curves and connections must be routed towards the grounding electrode system, ground rod, or ground bar.

- Grounding conductors must be securely fastened.

- Braided grounding conductors must not be used.

- Approved bonding techniques must be used for the connection of dissimilar metals.

Figure 30 Grounding cable minimum bend radius and angle
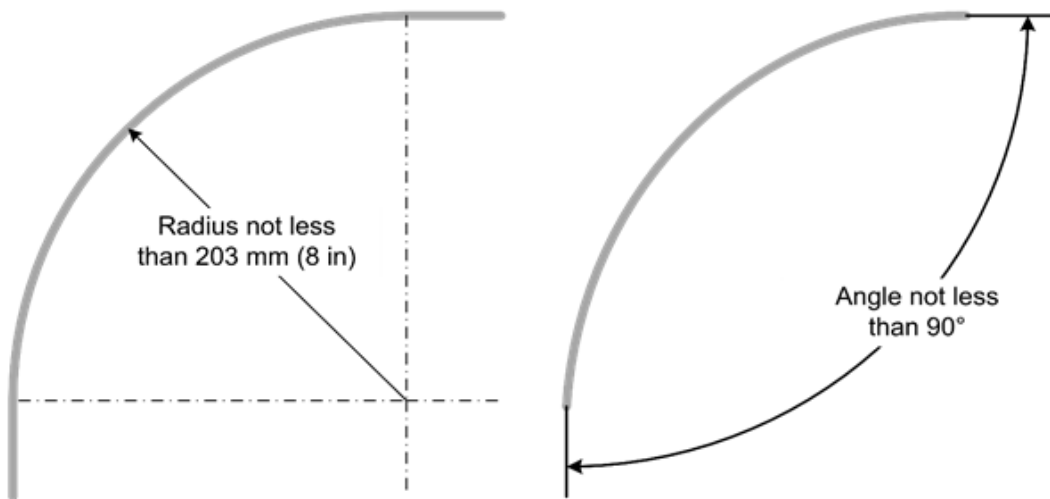
| ⚠	**Caution** Do not attach grounding cables to the ODU mounting bracket bolts, as this arrangement will not provide full protection.

Protection requirements for a mast or tower installation

If the ODU is to be mounted on a metal tower or mast, then in addition to the general protection requirements (above), the following requirements must be observed:

- The equipment must be lower than the top of the tower or its lightning air terminal.
- The metal tower or mast must be correctly grounded.

Schematic examples of mast or tower installations are shown in Figure 31.

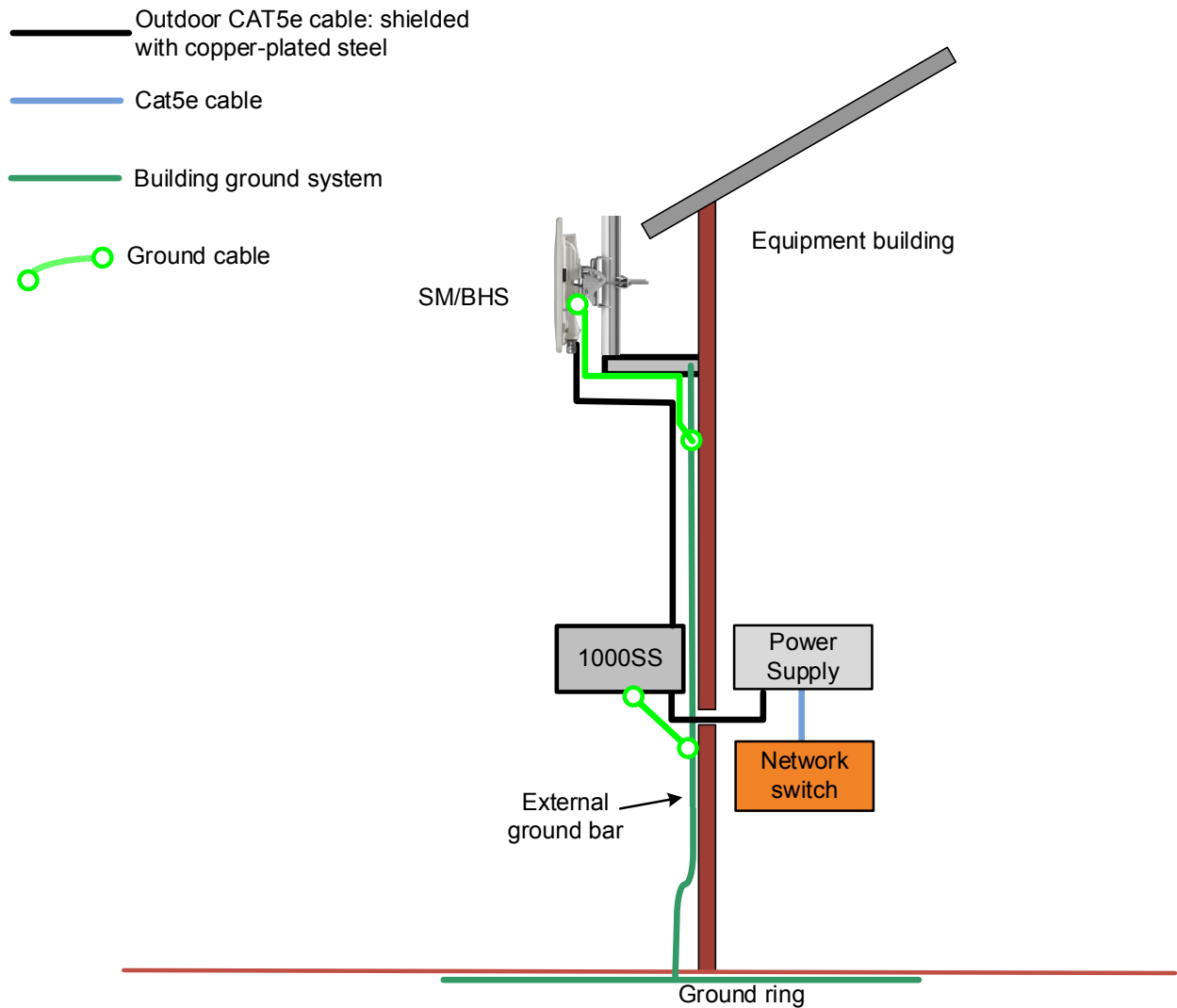**Figure 31** Grounding and lightning protection on mast or tower
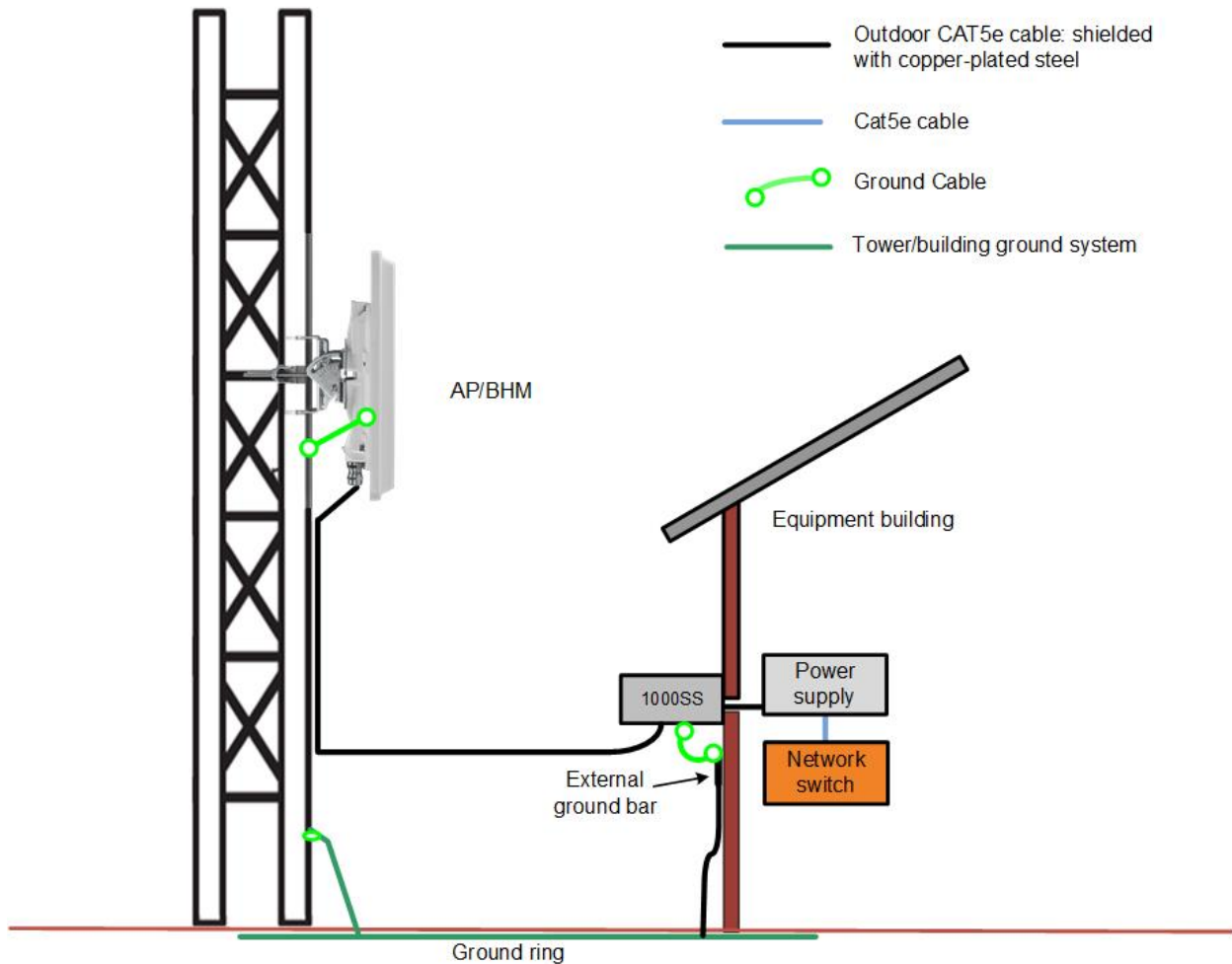
Protection requirements for a wall installation

If the ODU is to be mounted on the wall of a building, then in addition to the general protection requirements (above), the following requirements must be observed:

- The equipment must be lower than the top of the building or its lightning air terminal.
- The building must be correctly grounded.

Schematic examples of wall installations are shown in Figure 32.

Figure 32 Grounding and lightning protection on wall

Outdoor CAT5e cable: shielded with copper-plated steel

Cat5e cable

Building ground system

Ground cable

SM/BHS

Equipment building

1000SS

Power Supply

Network switch

External ground bar

Ground ring

Protection requirements on a high rise building

If the ODU is to be mounted on a high rise building, it is likely that cable entry is at roof level (Figure 17) and the equipment room is several floors below. The following additional requirements must be observed:

- The ODU must be below the lightning terminals and finials.
- A grounding conductor must be installed around the roof perimeter to form the main roof perimeter lightning protection ring.
- Air terminals are typically installed along the length of the main roof perimeter lightning protection ring typically every 6.1m (20ft).
- The main roof perimeter lightning protection ring must contain at least two down conductors connected to the grounding electrode system. The down conductors should be physically separated from one another, as far as practical.

Figure 33 Grounding and lightning protection on building
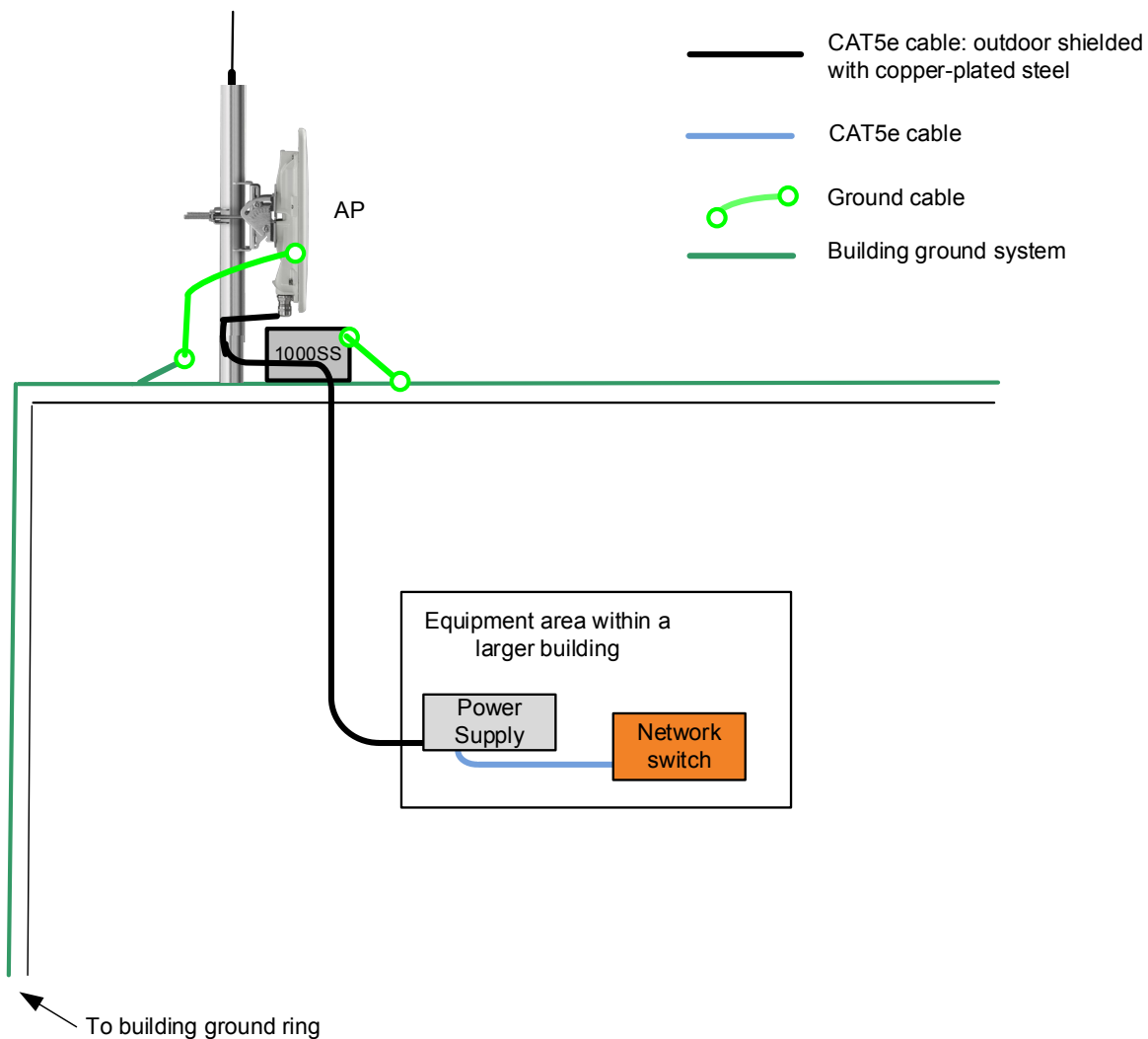
Installing the copper Cat5e Ethernet interface

To install the copper Cat5e Ethernet interface, use the following procedures:

⚠	**Caution**
	To avoid damage to the installation, do not connect or disconnect the drop cable when power is applied to the PSU or network terminating equipment.

⚠	**Caution**
	Always use Cat5e cable that is gel-filled and shielded with copper-plated steel. Alternative types of Cat5e cable are not supported by Cambium Networks. Cambium Networks supply this cable (Cambium part numbers WB3175 and WB3176), RJ45 connectors (Cambium part number WB3177) and a crimp tool (Cambium part number WB3211). The LPU and grounding kit contains a 600 mm length of this cable.

Install the main drop cable

⚠	**Warning**
	The metal screen of the drop cable is very sharp and may cause personal injury.
	• ALWAYS wear cut-resistant gloves (check the label to ensure they are cut resistant).
	• ALWAYS wear protective eyewear.
	• ALWAYS use a rotary blade tool to strip the cable (DO NOT use a bladed knife).

⚠	**Warning**
	Failure to obey the following precautions may result in injury or death:
	• Use the proper hoisting grip for the cable being installed. If the wrong hoisting grip is used, slippage or insufficient gripping strength will result.
	• Do not reuse hoisting grips. Used grips may have lost elasticity, stretched, or become weakened. Reusing a grip can cause the cable to slip, break, or fall.
	• The minimum requirement is one hoisting grip for each 60 m (200 ft) of cable.

Cut to length and fit hoisting grips

1   Cut the main drop cable to length from the top LPU to the bottom LPU.

2   Slide one or more hoisting grips onto the top end of the drop cable.

3   Secure the hoisting grip to the cable using a special tool, as recommended by the manufacturer.

Terminate with RJ45 connectors

> ⚠️ **Caution**
>
> Check that the crimp tool matches the RJ45 connector, otherwise the cable or connector may be damaged.

1   Strip the cable outer sheath and fit the RJ45 connector load bar.

2   Fit the RJ45 connector housing as shown. To ensure there is effective strain relief, locate the cable inner sheath under the connector housing tang.

Table 54 RJ45 connector and cable color code

| Pin	Color (Supplied cable)	Color (Conventional)	Pins on plug face
1	Light Orange	White/Orange	
2	Orange	Orange	
3	Light Green	White/Green	
4	Blue	Blue	
5	Light Blue	White/Blue	
6	Green	Green	
7	Light Brown	White/Brown	
8	Brown	Brown	

Install the bottom LPU to PSU drop cable

Install the bottom LPU

Install the bottom LPU, ground it, and connect it to the main drop cable.

1   Select a mounting point for the bottom LPU within 600 mm (24 in) of the building entry point. Mount the LPU vertically with cable glands facing downwards.
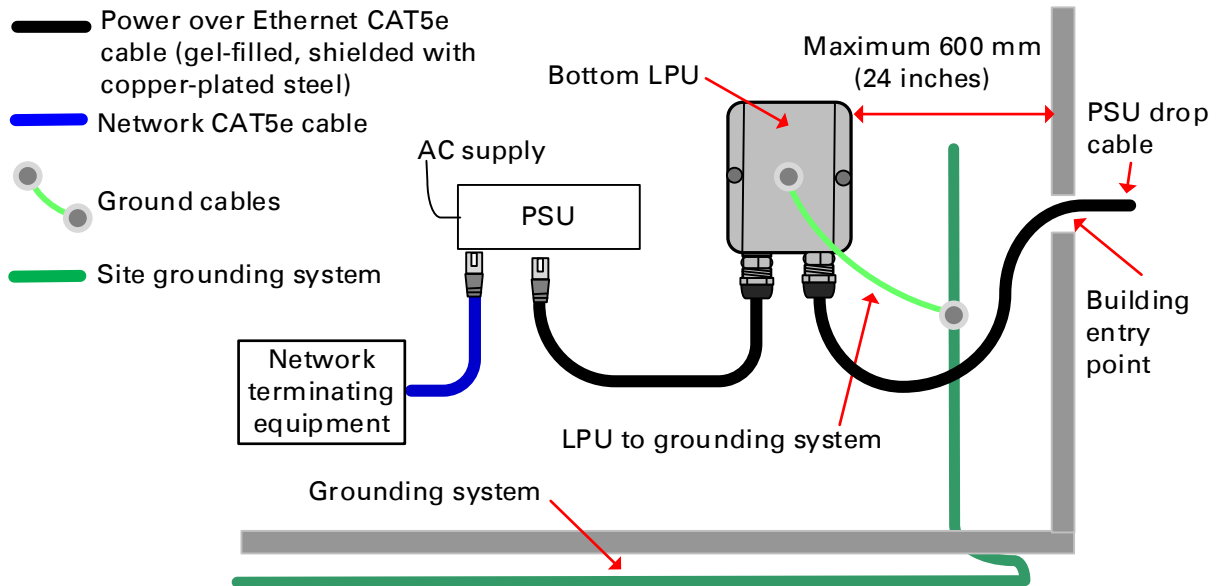
2   Connect the main drop cable to the bottom LPU.

3   Fasten one ground cable to the bottom LPU using the M6 (small) lug. Tighten both nuts to a torque of 5 Nm (3.9 lb ft):
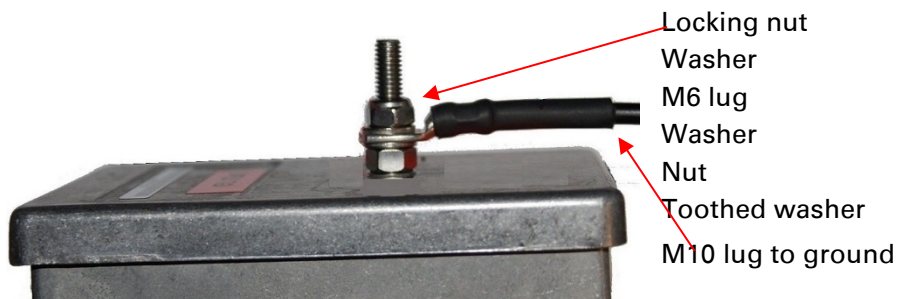
4   Select a building grounding point near the LPU bracket. Remove paint from the surface and apply anti-oxidant compound. Fasten the LPU ground cable using the M10 (large) lug.

Install the LPU to PSU drop cable

Use this procedure to terminate the bottom LPU to PSU drop cable with RJ45 connectors at both ends, and with a cable gland at the LPU end.

|	
⚠️	**Warning** The metal screen of the drop cable is very sharp and may cause personal injury. ALWAYS wear cut-resistant gloves (check the label to ensure they are cut resistant). ALWAYS wear protective eyewear. ALWAYS use a rotary blade tool to strip the cable, not a bladed knife.
⚠️	**Caution** Check that the crimp tool matches the RJ45 connector, otherwise the cable or connector may be damaged.

1 Cut the drop cable to the length required from bottom LPU to PSU.

2 **At the LPU end only**:
   - Fit one cable gland and one RJ45 connector by following the procedure Terminate with RJ45 connectors on page 6-12.
   - Connect this cable and gland to the bottom LPU.

4 **At the PSU end only**: Do not fit a cable gland. Strip the cable outer sheath and fit the RJ45 connector load bar. Fit the RJ45 connector housing. To ensure there is effective strain relief, locate the cable inner sheath under the connector housing tang:
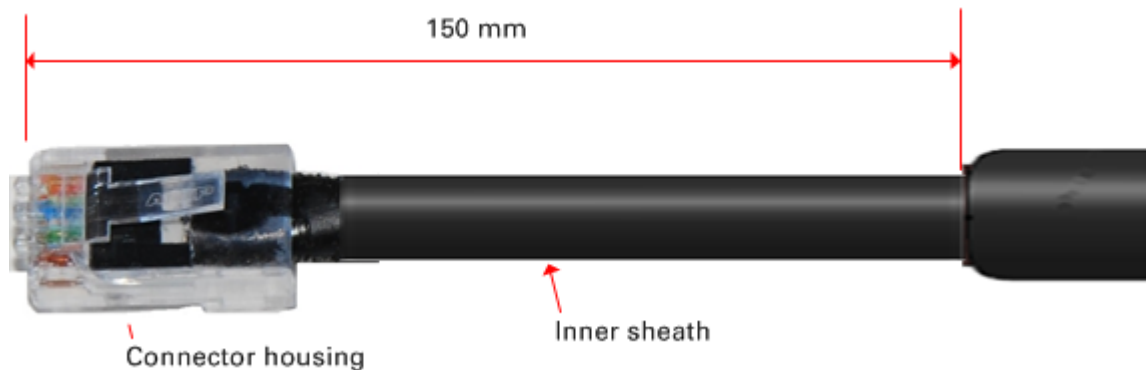
Installing external antennas for a connectorized ODU

To mount and connect an external antenna for the connectorized ODU, proceed as follows:

1. Mount the antenna(s) according to manufacturer's instructions.

2. Connect the ODU A and B interfaces to the antenna(s) with RF cable of type LMR-400 (Cambium part numbers 30010194001 and 30010195001) and N type connectors (Cambium part number 09010091001). Tighten the N type connectors to a torque setting of 1.7 Nm (1.3 lb ft).

3. If the ODU is mounted indoors, install lightning arrestors at the building entry point:

4. Form drip loops near the lower ends of the antenna cables. These ensure that water is not channeled towards the connectors.

5. If the ODU is mounted outdoors, weatherproof the N type connectors (when antenna alignment is complete) using PVC tape and self-amalgamating rubber tape.

6. Weatherproof the antenna connectors in the same way (unless the antenna manufacturer specifies a different method).
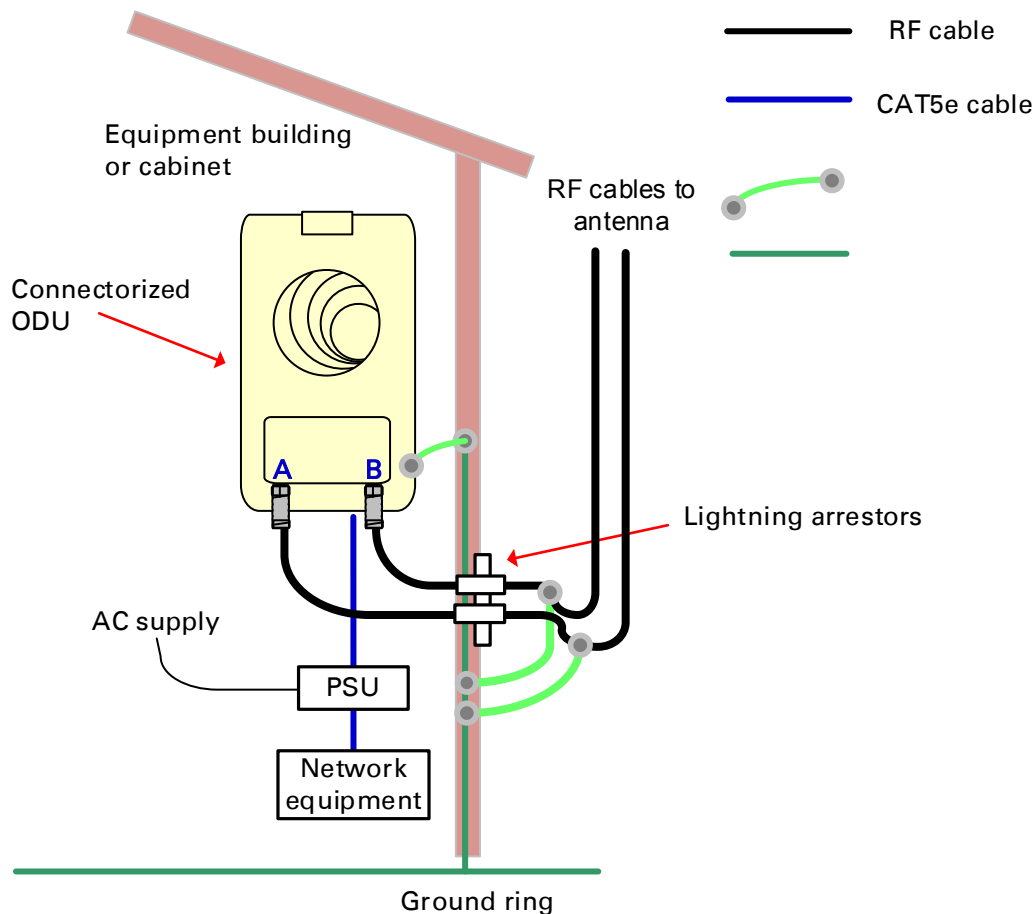
7 Ground the antenna cables to the supporting structure within 0.3 meters (1 foot) of the ODU and antennas using the Cambium grounding kit (part number 01010419001):

Antenna

RF cable

PMP/PTP 450i ground cable

Connectorized ODU

A   B
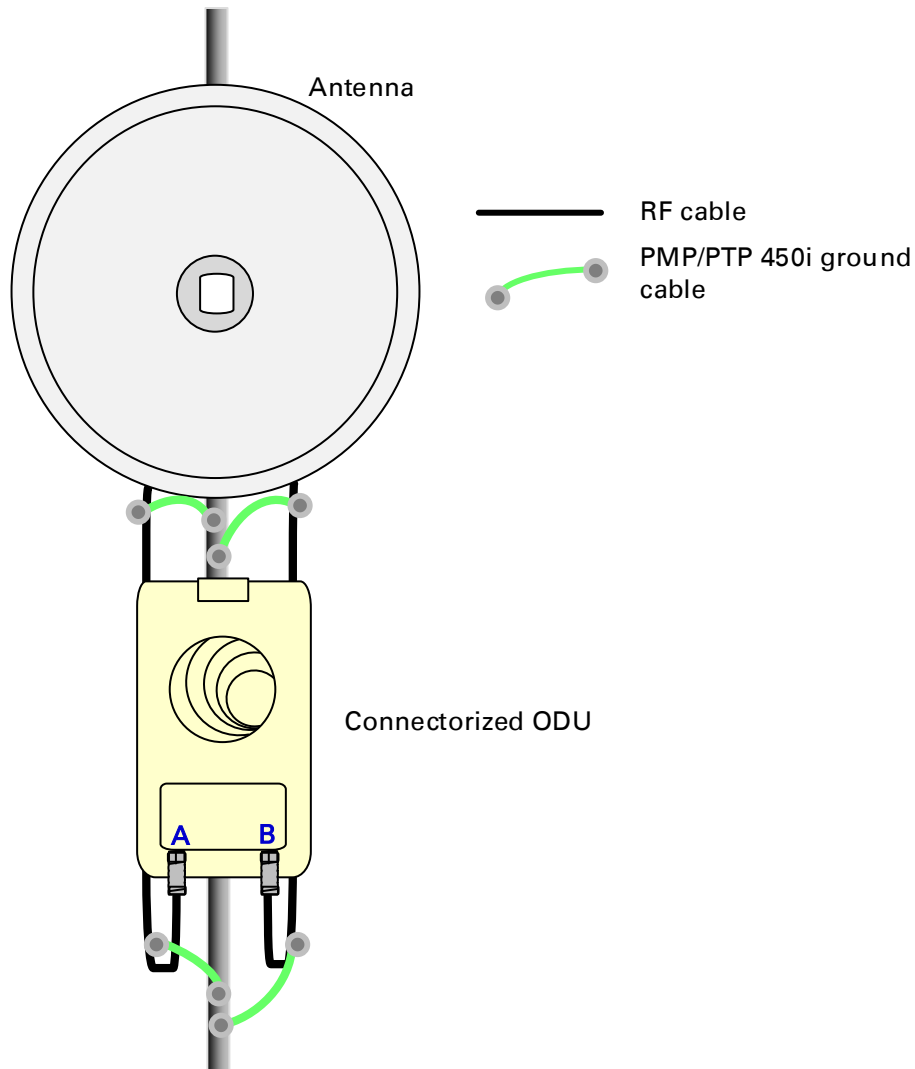
8 Fix the antenna cables to the supporting structure using site approved methods. Ensure that no undue strain is placed on the ODU or antenna connectors. Ensure that the cables do not flap in the wind, as flapping cables are prone to damage and induce unwanted vibrations in the supporting structure.

Assembling the AP antenna and attaching to the AP

To assemble a PMP 450i Series AP antenna, perform the following steps.

|	**Note**
	Cambium recommends to assemble the antenna, attach the AP and cabling, and to seal the RF connections before installing the unit at the deployment site.

---

1   Inventory the parts to ensure that you have them all before you begin. The full set of parts is shown below.

Figure 34 AP antenna parts
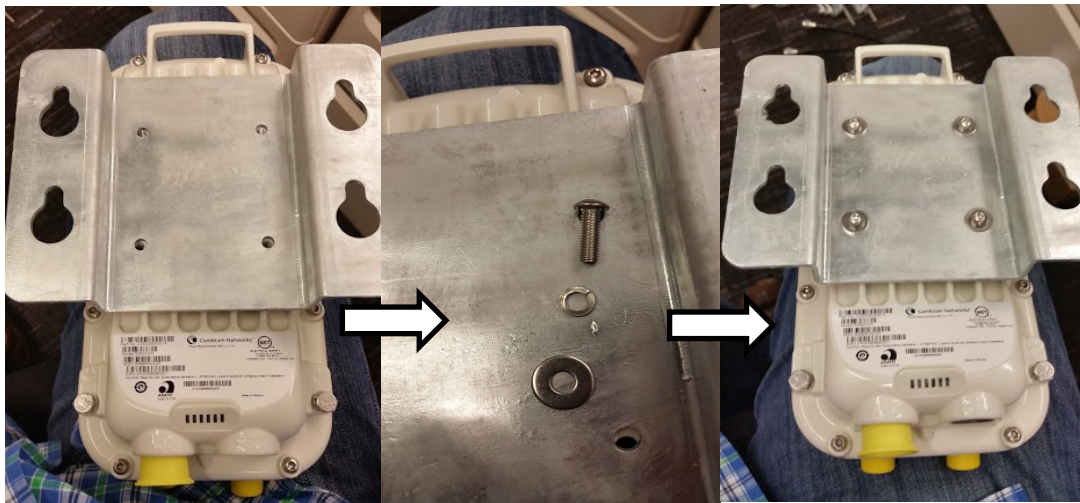
2   Remove top plate from antenna as shown in Figure 35.

Figure 35 Antenna top plate
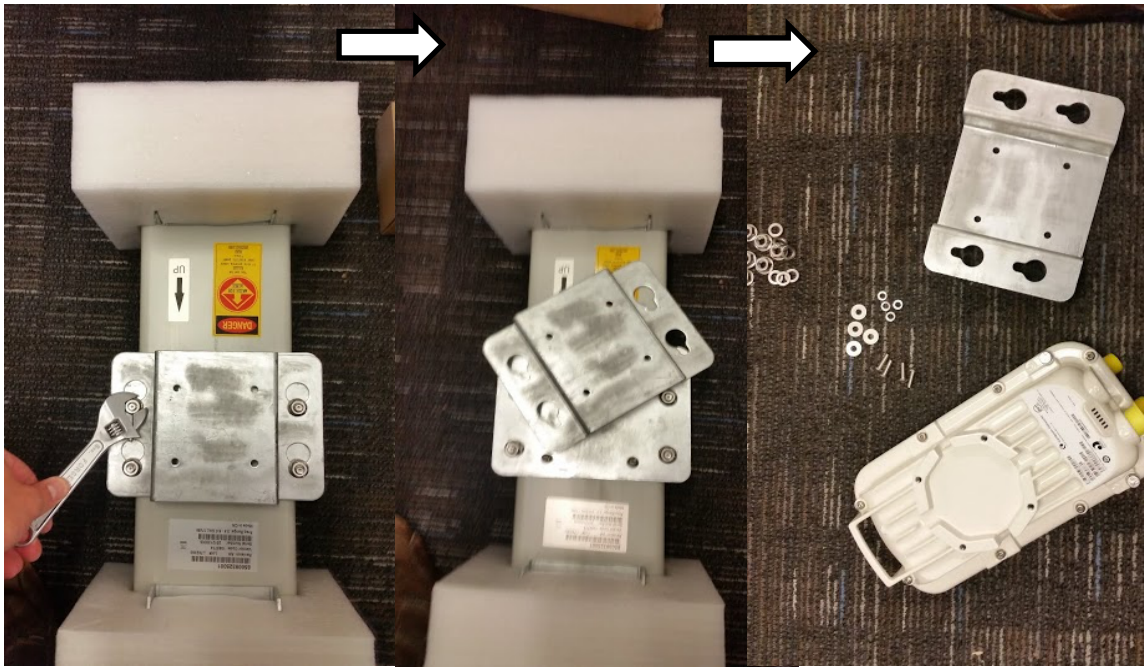
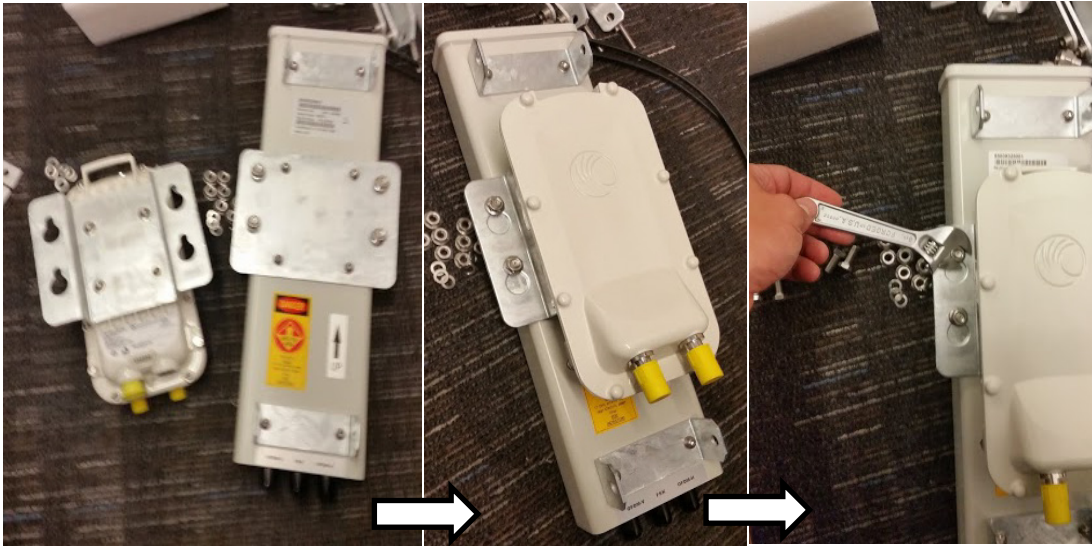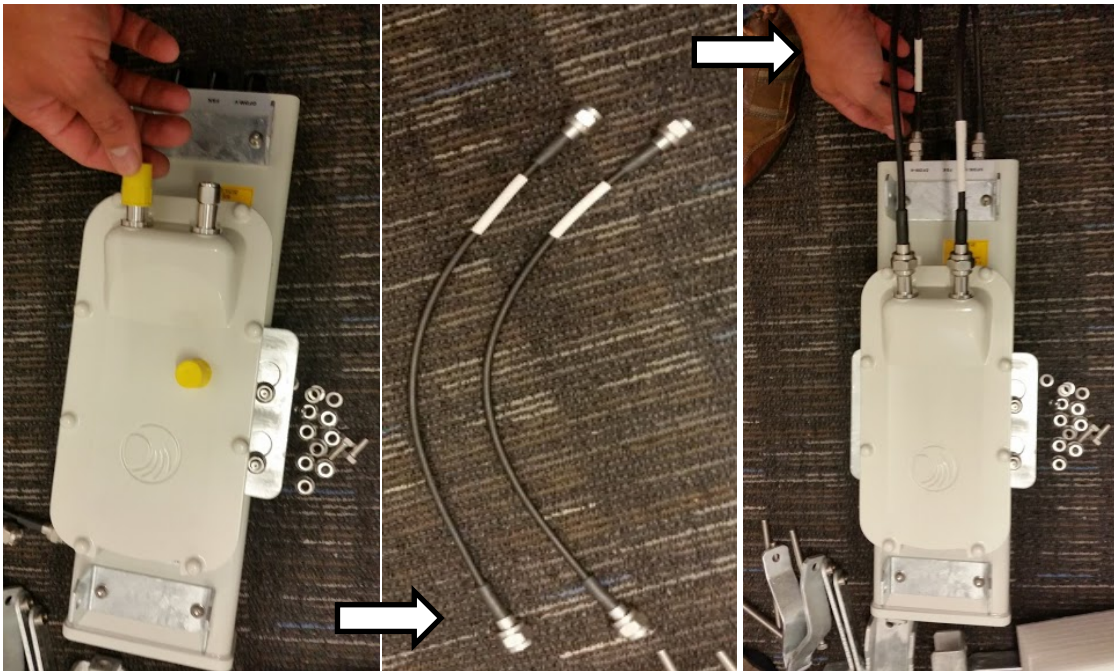**3**   Attach antenna plate to the AP as shown in Figure 36.

Figure 36 Attaching antenna plate to the AP

4   Attach the plate mounted AP to the antenna and tighten the (4) serrated flange nuts using a spanner wrench

5   Connect the AP A and B interfaces to the antenna with RF cable. Tighten the N type connectors to a torque setting of 1.7 Nm (1.3 lb ft).

6   Assembling the upper bracket by attaching the (2) 7" hex bolts to the bracket using (2) serrated flange nuts

Figure 37 AP antenna upper bracket assembly
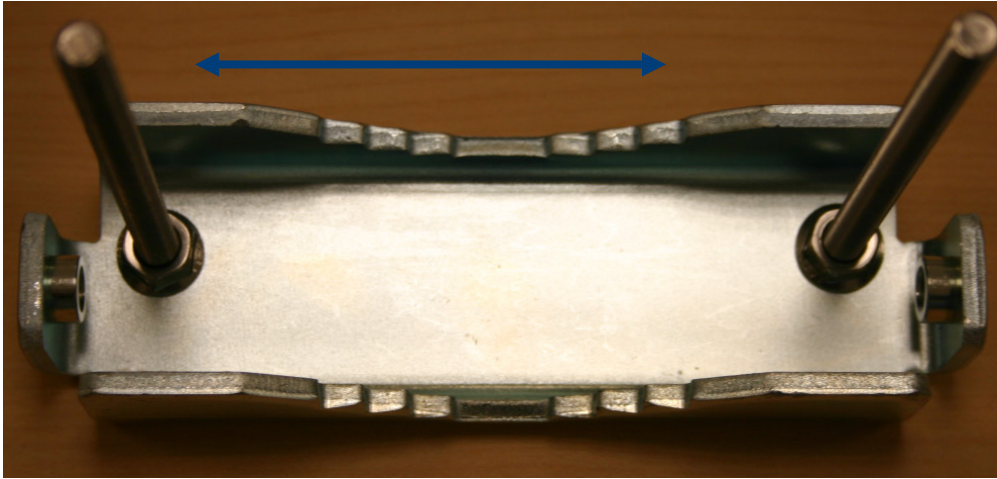
7   Attach the upper bracket to the adjustment arms using (2) hex bolts, (2) flat washers and (2) lock washers. Feed the bolt through the lock washer then flat washer, then thread the bolt into the upper bracket's threaded receptacle.

Figure 38 AP antenna upper bracket attached to upper adjustment arms

8 Attach the rear strap to the upper bracket using (2) serrated flange nuts and (1) retaining bracket. Do not tighten the nuts now.

Figure 39 Rear strap connected to upper AP antenna bracket

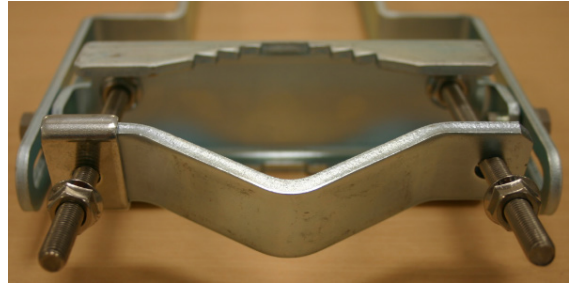**9** Attach the entire upper bracket to the antenna using (2) hex bolts, (2) flat washers and (2) lock washers. Feed the bolt through the lock washer then flat washer, then thread the bolt into the upper bracket's threaded receptacle.

Figure 40 Assembled upper bracket connected to AP antenna

10 Begin assembling the lower bracket by attaching the (2) 7″ hex bolts to the bracket using (2) serrated flange nuts

Figure 41 AP Antenna Lower Bracket Assembly

11 Attach the rear strap to the bracket using (2) serrated flange nuts and (1) retaining bracket. Do not tighten the nuts now.

Attach the entire lower bracket to the antenna using (2) hex bolts, (2) flat washers and (2) lock washers.

Figure 42 Lower bracket attached to AP antenna

Figure 43 Completed AP and antenna assembly

Attaching and weatherproofing a N-type antenna connector

The following procedure should be used to weatherproof the N type connectors fitted to the connectorized ODU (AP/SM/BH) and antenna. This procedure must be followed to ensure that there is no moisture ingress at the radio ports. Failure to properly seal N-type antenna connectors can result in poor link performance or complete loss of radio communication.

	Note
	Cambium recommends to assemble the antenna, attach the ODU and cabling, and to seal the RF connections before installing the unit at the deployment site.
	Note
	N type connectors should be tightened using a torque wrench, set to 15 lb in or 1.7 Nm. If a torque wrench is not available, N type connectors may be finger tightened.

To weatherproof an N type connector, proceed as follows:

1   Ensure the connection is tight. A torque wrench should be used if available.

2   Wrap the connection with a layer of 19 mm
     (0.75 inch) PVC tape, starting 25 mm
     (1 inch) below the connector body. Overlap
     the tape to half-width and extend the
     wrapping to the body of the AP. Avoid
     making creases or wrinkles:

3   Smooth tape edges:

4   Cut a 125mm (5 inches) length of rubber
     tape (Scotch 3M Professional Grade: D.C.J.
     No. 06147 or equivalent):

5   Expand the width of the tape by stretching
     it so that it will wrap completely around the
     connector and cable:

6   Press the tape edges together so that there are no gaps. The tape should extend 25mm (1inch) beyond the PVC tape:

7   Wrap a layer of 50 mm (2 inch) PVC tape from bottom to top, starting from 25 mm (1 inch) below the edge of the self-amalgamating tape, overlapping at half width.

8   Repeat with a further four layers of 19 mm (0.75 inch) PVC tape, always overlapping at half width. Wrap the layers in alternate directions:

>   Second layer: top to bottom.
>
>   Third layer: bottom to top.
>
>   Fourth layer: top to bottom.
>
>   Fifth layer: bottom to top.

The bottom edge of each layer should be 25 mm (1 inch) below the previous layer.

9   Completed weatherproof connection:

![Note icon] **Note**

A video of this procedure can be found at:

https://www.youtube.com/watch?v=a-twPfCVq4A

Attaching the AP and antenna to the mount point

1   Attach the upper bracket of the antenna to the mount point by closing the rear strap around the pole and tightening the (2) serrated flange nuts using a 13mm spanner wrench. These must be tightened evenly on the pol to avoid jumping/stripping threads.

Figure 44 Attaching the AP antenna upper bracket to the pole

2   Attach the lower bracket of the antenna to the mount point by closing the rear strap around the pole and tightening the (2) serrated flange nuts using a 13mm spanner wrench. These must be tightened evenly on the pole to avoid jumping/stripping threads.

Figure 45 Attaching the AP antenna lower bracket to the pole
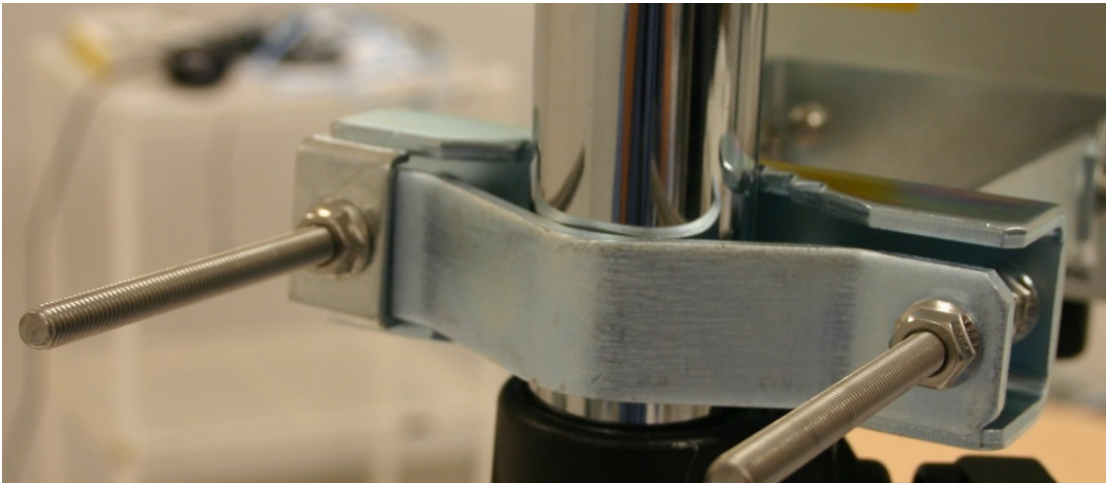
3   Use a local map, compass, and/or GPS device as needed to determine the direction that one or more APs require to each cover the 90° sector.

4   Choose the best mounting location for your particular application.

> **Note**
>
> Use the embedded spectrum analyzer or a commercial analyzer to evaluate the frequencies present in various locations. OFDM APs need not be mounted next to each other. They can be distributed throughout a given site. However, the 90° offset must be maintained. If you want to collocate these APs with PMP 100 Series APs of the 5.4-GHz frequency band range, plan to allow at least 25 MHz of separation between their center channels.

5   Secure a ground strap to the ground lug on the back of the AP.

6   Secure the ground strap to the pole, tower, or other trusted ground.

7   The bracket of the standard antenna has provision for measured down tilt. The recommended practice is to use one of the many radio analysis and mapping tools or on-line tools to calculate down tilt based on antenna height above the service area.

The proper angle of tilt can be calculated as a factor of both the difference in elevation and the distance that the link spans. Even in this case, a plumb line and a protractor can be helpful to ensure the proper tilt. This tilt is typically minimal.

The number of degrees to offset (from vertical) the mounting hardware leg of the support tube is equal to the angle of elevation from the lower module to the higher module (<B in the example provided in Figure 46**Error! Reference source not found.**).

Figure 46 Variables for calculating angle of elevation (and depression)
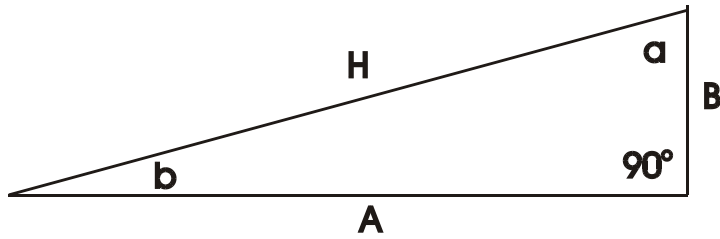
Where:	Is:
b	angle of elevation
B	vertical difference in elevation
A	horizontal distance between modules

To use metric units to find the angle of elevation, use the following formula:

$$\tan b = \frac{B}{1000A}$$

Where:	Is:
B	expressed in meters
A	expressed in kilometers

To use English standard units to find the angle of elevation, use the following formula:

$$\tan b = \frac{B}{5280A}$$

Where:	Is:
B	expressed in feet
A	expressed in miles

The angle of depression from the higher module is identical to the angle of elevation from the lower module.

8   Connect the coax cables to the antenna and to the AP

9   Weatherproof the connector on the coax cables (see section Attaching and weatherproofing a N-type antenna connector on page 6-22)

Installing an integrated ODU

⚠️	**Caution**
	Do not reverse the bracket clamp, as this arrangement may lead to failure of the assembly. Do not over-tighten the bolts as this may lead to failure of the assembly.

To mount and connect an integrated ODU, proceed as follows:

1   Fix the mounting plate to the back of the ODU using the four bolts, and spring and plain washers provided. Tighten the bolts to a torque setting of 5.0 Nm (3.7 lb ft).

   Figure 47 Fixing the mounting plate to the back of the ODU
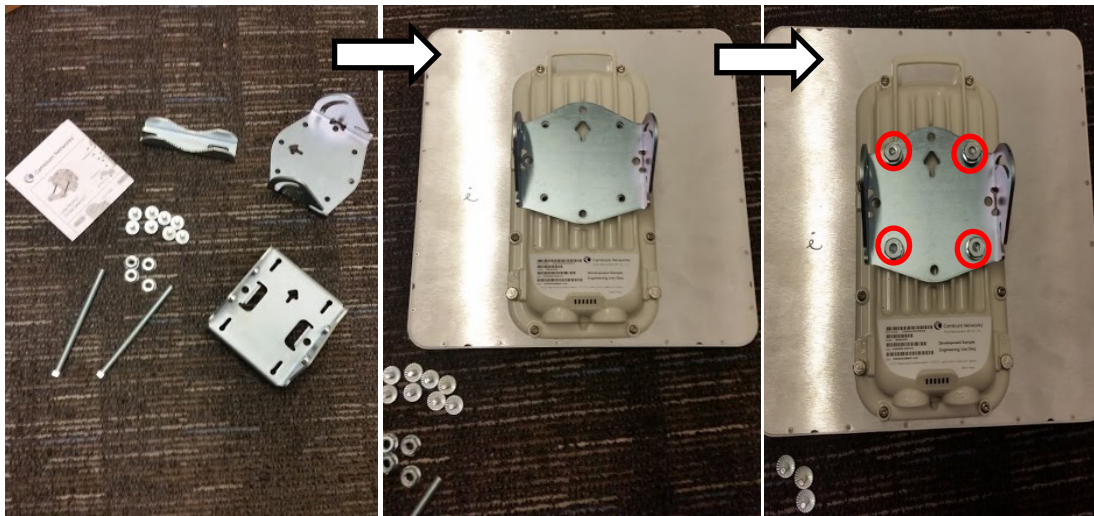
2   Attach the bracket body to the mounting plate using the M8 bolt, spring and plain washers.

3   Hoist the ODU to the mounting position.

4   Attach the bracket body to the pole using the bracket clamp, M8 bolts, and spring and plain washers.

5   If the ODU is mounted outdoors, weatherproof the N type connectors (when antenna alignment
    is complete) using PVC tape and self-amalgamating rubber tape.

Figure 48 Attaching the bracket body
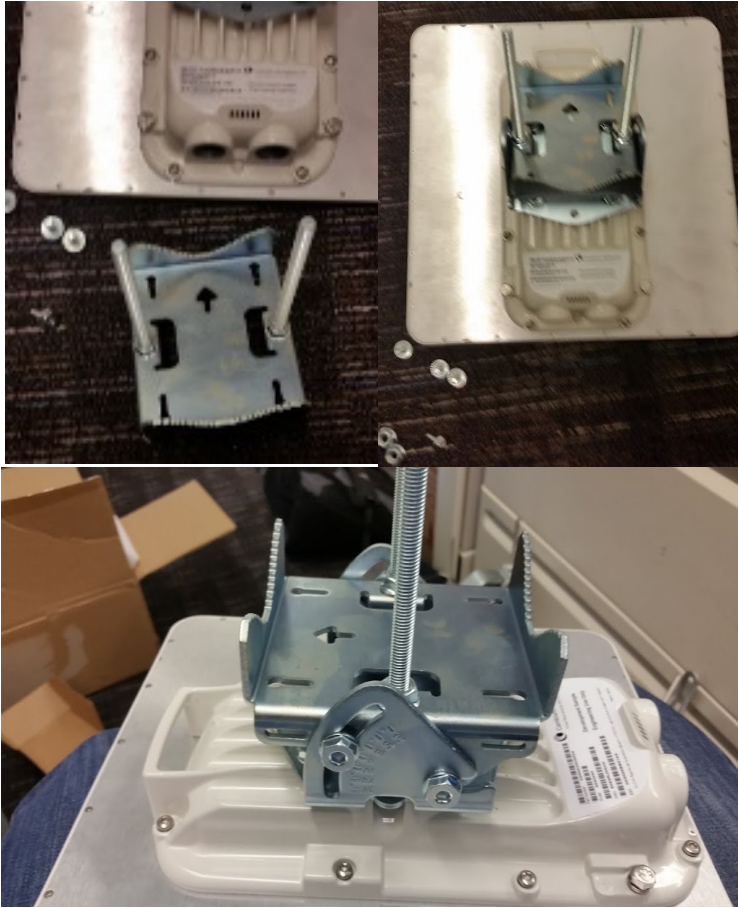
Connecting Cat5e Ethernet cable

Connecting an RJ45 and gland to a unit

Perform this task to connect the Ethernet cable to an AP.

To connect the Ethernet cable with a gland to an AP unit, proceed as follows:

1   Insert the RJ45 cable through the gland components

2   Insert the RJ45 plug into the socket in the unit, making sure that the locking tab snaps home.

3   Support the drop cable and gently hand screw the gland body into the unit until the bushing seal is flush to the unit body.

> **Note**
>
> Do not fit the back shell prior to securing the gland body.

4   Once the gland is fully hand screwed into the unit, tighten it one full rotation only with a 1 1/8 inch spanner wrench.

5   When the gland body has been fitted, tighten the gland back shell.

> **Caution**
>
> Do not over-tighten the gland back shell, as the internal seal and structure or RJ45 port may be damaged.

Disconnecting an RJ45 and gland from a unit

Perform this task to disconnect the Ethernet cable and watertight gland from ODU.

To disconnect the Ethernet cable and gland from a unit, proceed as follows:

1   Hold Ethernet cable and remove the gland back shell

2   Use a small flathead screwdriver (0.2"/5mm wide or greater) to gently release the black plastic watertight bushing from the compression fins, being careful not to damage the bushing.

3   Unscrew the gland body from the AP, making sure that the Ethernet cable is not rotating while disengaging the gland body from the AP housing

4   Use a small screwdriver to depress the RJ45 locking clip

5   Unplug the RJ45 cable

6   Remove the gland from the cable, if necessary

Installing ODU

Installing an AP

To install a PMP 450i AP, perform the following steps.

Procedure 4 Installing an AP

1   Begin with the AP in the powered-down state.

2   Choose the best mounting location for your particular application. Modules need not be mounted next to each other. They can be distributed throughout a given site. However, the 60° offset must be maintained. Mounting can be done with stainless steel hose clamps or another equivalent fastener.

3   Align the AP as follows:

    a.   Move the module to where the link will be unobstructed by the radio horizon and no objects penetrate the Fresnel zone.

    b.   Use a local map, compass, and/or GPS device as needed to determine the direction that one or more APs require to each cover the intended 60° sector.

    c.   Apply the appropriate degree of downward tilt.

    d.   Ensure that the nearest and furthest SMs that must register to this AP are within the beam coverage area.

4   Using stainless steel hose clamps or equivalent fasteners, lock the AP in the proper direction and downward tilt.

5   Attach the cables to the AP (See Powering the AP/SM/BH for test configuration on Page 5-15)

6   Perform waterproof the cables. (See Attaching and weatherproofing a N-type antenna connector on page 6-22)

Installing a SM

Installing a PMP 450i Series SM consists of two procedures:

•   Physically installing the SM on a residence or other location and performing a coarse alignment using the alignment tool or alignment tone.

•   Verifying the AP to SM link and finalizing alignment using review of power level, link tests, and review of registration and session counts.

Procedure 5 Installing an SM/BHS

1   Choose the best mounting location for the SM/BHS based on section ODU and external antenna location on page 3-10.

2   Use stainless steel hose clamps or equivalent fasteners to lock the SM into position.

3   Remove the base cover of the SM/BHS.

4   Terminate the UV outside grade Category 5 Ethernet cable with an RJ-45 connector, and connect the cable to the SM/BHS.

5   Wrap a drip loop in the cable.

6   For Connectorized Models, Install the external antenna according to the manufacturer's instructions.

7   For Connectorized Models, connect the SM's/BHS N-type antenna connectors to the external antenna, ensuring that the polarity matches between the SM/BHS cable labeling and the antenna port labels.

Connectorized SM Antenna Cable Label	5.8 Antenna Connection
A	Vertical
B	Horizontal

8   For Connectorized Models, weatherproof the N-type antenna connectors following section Attaching and weatherproofing a N-type antenna connector.

9   Wrap an AWG 10 (or 6mm^2) copper wire around the Ground post of the SM/BHS

10   Securely connect the copper wire to the grounding system (Protective Earth) according to applicable regulations.

12   Install an surge supporessor as describe in section Mount the Surge Suppressor on page 6-5

13   Connect the power supply to a power source.

14   Connect the Ethernet output from the power supply to the Ethernet port of your laptop.

15   Launch your web browser. In the URL address bar, enter **169.254.1.1**. then press Enter.

16   If the browser in laptop fails to access the interface of the SM, follow the procedureRadio recovery mode – Radio Recovery Console / Default Mode (fka Default Plug) on page 1-16

17   Log in as admin on the ODU. Configure a password for the admin account and log off.

18   Log back into the SM as admin or root, using the password that you configured.

19   For coarse alignment of the SM, use the Alignment Tool located at **Tools**, **Alignment Tool**.

Optionally, connect a headset to the AUX/SYNC port the SM and listen to the alignment tone, which indicates greater SM/BHS receive signal power by pitch. By adjusting the SM/BHS's position until the highest frequency pitch is obtained operators and installers can be confident that the SM is properly positioned. For information on device GUI tools available for alignment, see sections Using the Alignment Tool, Using the Link Capacity Test tool, and Using AP Evaluation toolbelow.

20   When the highest power achieved, lock the SM/BHS mounting bracket in place.

21   Log off of the SM web interface.

22   Disconnect the Ethernet cable from your laptop.

23   Replace the base cover of the SM.

24   Connect the Ethernet cable to the computer that the subscriber will be using.

Installing a BHM

To install a PMP 450i BHM, perform the following steps.

Procedure 6 Installing a BHM

1   Access the General tab of the Configuration page in the BHM

2   Choose the best mounting location for your particular application.

3   Align the BHM as follows:

    a.   Move the module to where the link will be unobstructed by the radio horizon and no objects penetrate the Fresnel zone.

    b.   Use a local map, compass, and/or GPS device as needed to determine the direction to the BHS.

    c.   Apply the appropriate degree of downward or upward tilt.

    d.   Ensure that the BHS is within the beam coverage area.

4   Using stainless steel hose clamps or equivalent fasteners, lock the BHM into position.

5   If this BHM will not be connected to a CMM, optionally connect a utility cable to a GPS timing source and then to the SYNC port of the BHM.

6   Either connect the BHM's Aux to the CMM or connect the DC power converter to the BHM and then to an AC power source.

    RESULT: When power is applied to a module or the unit is reset on the web-based interface, the module requires approximately 25 seconds to boot. During this interval, self-tests and other diagnostics are being performed.

7   Access **Configuration > General** page of the BHM for Synchronization configuration.

8   If a CMM4 is connected, set the **Sync Input** parameter to the AutoSync or Autosync + Free Run selection.

Installing a BHS

To install a PMP 450i BHS, perform the following steps.

Procedure 7 Installing a BHS

1   Choose the best mounting location for the BHS.

2   Terminate the UV outside grade Category 5 Ethernet cable with an RJ-45 connector, and connect the cable to the BHS. (See Powering the AP/SM/BH for test configuration on Page 5-15)

3   Use stainless steel hose clamps or equivalent fasteners to lock the BHS into position.

4   Remove the cover of the 1000SS Surge Suppressor.

5   With the cable openings facing downward, mount the 1000SS as close to the grounding system (Protective Earth) as possible.

6   Using diagonal cutters or long nose pliers, remove the knockouts that cover the cable openings to the 1000SS.

7   Connect an Ethernet cable from the power adapter to either RJ-45 port of the 1000SS

8   Connect another Ethernet cable from the other RJ-45 port of the 1000SS to the Ethernet port of the BHS

9   Connect ground cable to BHS (see Attach ground cables to the ODU on page 6-3)

10   Wrap an AWG 10 (or 6mm2) copper wire around the Ground post of the1000SS.

11   Tighten the Ground post locking nut in the 1000SS onto the copper wire

11   Securely connect the copper wire to the grounding system (Protective Earth) according to applicable regulations

12   Connect a ground wire to the 1000SS

13   Replace the cover of the 1000SS surge suppressor

14   For coarse alignment of the BHS, use the Audible Alignment Tone feature as follows:

a.   At the BHS, connect the RJ-45 connector of the Alignment Tool Headset to the Aux port via alignment tone adapter as shown in Figure 89 on page 8-17.

   Alternatively, instead of using the Alignment Tool Headset, use an earpiece or small battery-powered speaker connected to Aux port of BHS as cable pinout shown in Figure 90.on page 8-18.

b.   Listen to the alignment tone for:

   •   pitch, which indicates greater signal power (RSSI/dBm) by higher pitch.

   •   volume, which indicates better signal quality (lower jitter) by higher volume.

Adjust the module slightly until you hear the highest pitch and highest volume

15   When you have achieved the best signal (highest pitch, loudest volume), lock the BHS in place with the mounting hardware

Configuring the Link

See Configuring remote access on page 7-147.

Monitoring the Link

See Monitoring the Link on page 7-150.

Installing the AC Power Injector

	Caution
⚠	As the PSU is not waterproof, locate it away from sources of moisture, either in the equipment building or in a ventilated moisture-proof enclosure. Do not locate the PSU in a position where it may exceed its temperature rating.
⚠	**Caution** Do not plug any device other than a PMP/PTP 450i ODU into the ODU port of the PSU. Other devices may be damaged due to the non-standard techniques employed to inject DC power into the Ethernet connection between the PSU and the ODU. Do not plug any device other than a Cambium PMP/PTP 450i PSU into the PSU port of the ODU. Plugging any other device into the PSU port of the ODU may damage the ODU and device.

Installing the AC Power Injector

Follow this procedure to install the AC Power Injector:

1   Form a drip loop on the PSU end of the LPU to PSU drop cable. The drip loop ensures that any moisture that runs down the cable cannot enter the PSU.

2   (a) Place the AC Power Injector on a horizontal surface. Plug the LPU to PSU drop cable into the PSU port labeled ODU. (b) When the system is ready for network connection, connect the network Cat5e cable to the LAN port of the PSU:

(a)   (b)

Installing a GPS receiver

To install a GPS receiver as the timing reference source, use the following procedures:

- Mounting the GPS receiver on page 6-38
- Cabling the GPS Antenna o on page 6-39
- Installing and connecting the GPS LPU on page 6-39

> ⚠️ **Caution**
>
> Prior to power-up of equipment, ensure that all cables are connected to the correct interfaces of the CMM4 unit and the UGPS receiver module. Failure to do so may result in damage to the equipment.

GPS receiver location

Mount the GPS receiver at a location that meets the following requirements:

- It must be possible to protect the installation as described in Grounding and lightning protection on page 3-8.
- It must have an un-interrupted view of at least half of the southern sky. For a receiver mounted on a wall there must be no other significant obstructions in the view of the sky.
- It must be mounted at least 1 m (3 ft), preferably 2 m (6 ft), away from other GPS receiving equipment.
- It must not be sited in the field of radiation of co-located radio communications equipment and should be positioned at a distance of at least 3 m (10 ft) away.

Mount the UGPS receiver on the wall of the equipment building if there is a suitable location on the wall that can meet these requirements.

Mounting the GPS receiver module on the equipment building

If mounting the GPS receiver on the equipment building (Figure 18), select a position on the wall that meets the following requirements:

- It must be below the roof height of the equipment building or below the height of any roof-mounted equipment (such as air conditioning plant).
- It must be below the lightning air terminals.
- It must not project more than 600mm (24 inches) from the wall of the building.

If these requirements cannot all be met, then the module must be mounted on a metal tower or mast.

## Mounting the GPS receiver module on a metal tower or mast

If mounting the GPS receiver module on a metal tower or mast (Figure 19), select a position that meets the following requirements:

- It must not be mounted any higher than is necessary to receive an adequate signal from four GPS satellites.
- It must be protected by a nearby lightning air terminal that projects farther out from the tower than the GPS receiver module.

Mounting the GPS receiver

Mount the UGPS receiver (following manufacturer's instructions) upon either an external wall (Figure 18) or a metal tower or mast (Figure 19).

Figure 49 GPS antenna mounting
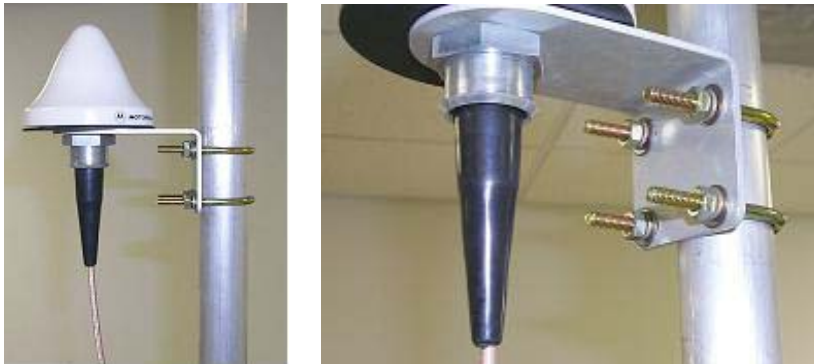
Procedure 8 Mounting the GPS receiver

1. Ensure that the mounting position
   - has an unobstructed view of the sky to 20° above the horizon.
   - is not the highest object at the site. (The GPS antenna does not need to be particularly high on a site, which would give it more exposure to lightning. It just needs to have an unobstructed view of the sky.)
   - is not further than 100 feet (30.4 meters) of cable from the CMM.

2. Select a pole that has an outside diameter of 1.25 to 1.5 inches (3 to 4 cm) to which the GPS antenna bracket can be mounted.

3. Place the U-bolts (provided) around the pole as shown in Figure 28..

4. Slide the GPS antenna bracket onto the U-bolts.

5. Slide the ring washers (provided) onto the U-bolts.

6. Slide the lock washers (provided) onto the U-bolts.

7. Use the nuts (provided) to securely fasten the bracket to the U-bolts.

Please refer to the *PMP Synchronization Solutions User Guide* located on the Cambium website (http://www.cambiumnetworks.com/resources/pmp-synchronization-solutions).

Cabling the GPS Antenna

Connect the GPS coax cable to the female N-connector on the GPS antenna. Please refer to the *PMP Synchronization Solutions User Guide* located on the Cambium website (http://www.cambiumnetworks.com/resources/pmp-synchronization-solutions).

Installing and connecting the GPS LPU

Install and ground the GPS drop cable LPU at the building (or cabinet) entry point, as described in Install the bottom LPU on page 6-13.

Installating CMM4

The Cluster Management Module 4 (CMM4) provides power, sync, and network connectivity for up to eight APs, backhauls, and Ethernet terrestrial feeds in a variety of configurations. The CMM4 provides

- Sync over Power over Ethernet and integrated surge suppression on the controller board for up to 8 APs or BHs. Both a custom 30 VDC power scheme and a custom 56 VDC power scheme are available. Neither is the same as the later IEEE Standard 802.3af, and neither is compatible with it.

- Managed switching using a hardened EtherWAN switch (1090CKHH models). The CMM4 ships with a 14-port EtherWAN switch and is also available without a switch. The CMM4 originally shipped with a 9-port EtherWAN switch.

- Surge suppression on the controller board for the incoming 30V DC and 56V DC power lines and GPS coax cable.

- Auto-negotiation on the Ethernet ports. Ports will auto-negotiate to match inputs that are either 100Base-T or 10Base-T, and either full duplex or half duplex, when the connected device is set to auto-negotiate. Alternatively, these parameters are settable.

- An always-on NTP (Network Time Protocol) server that can provide date and time to any radio that can reach the CMM's management IP address.

- CNUT can be used to upgrade th CMM-4 software.

PMP/PTP 450i can use the CMM4's EtherWan switch for their network connectivity.

	Note
	The 56V of a CMM4 needs to go through the adapter cable (part number N000045L001A) as shown in Figure 13 on page 2-24.
	The CMM4 56V power adapter cable can be prepared by swapping pins 5 and 7.

Figure 50 CMM4 cabled to support PMP/PTP 450i