Directional Yagi antenna alignment

The directional Yagi antenna horizontal and vertical alignment procedure is shown below. The Yagi antenna can be aligned for +15 to -15 degree.

Figure 118 Yagi antenna alignment - horizontally

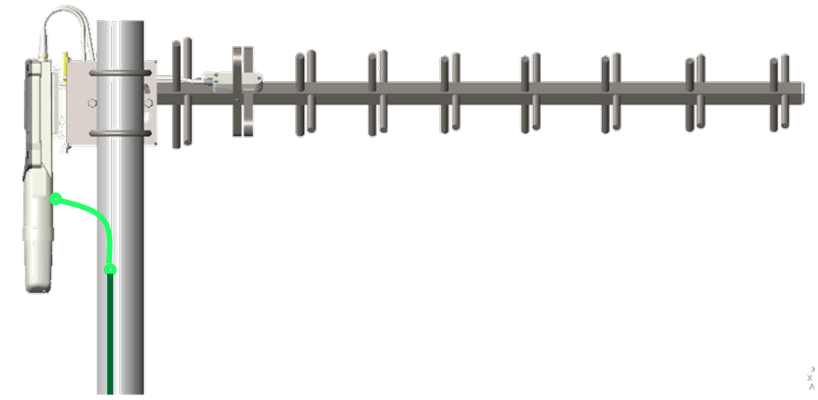


Figure 119 Yagi antenna alignment - upward tilt

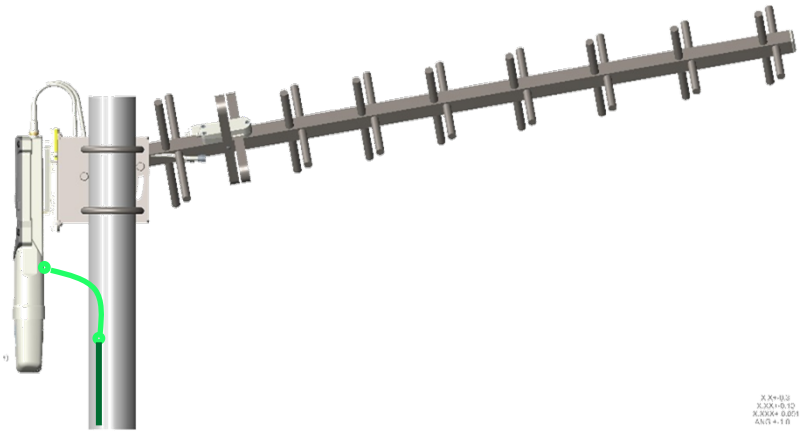
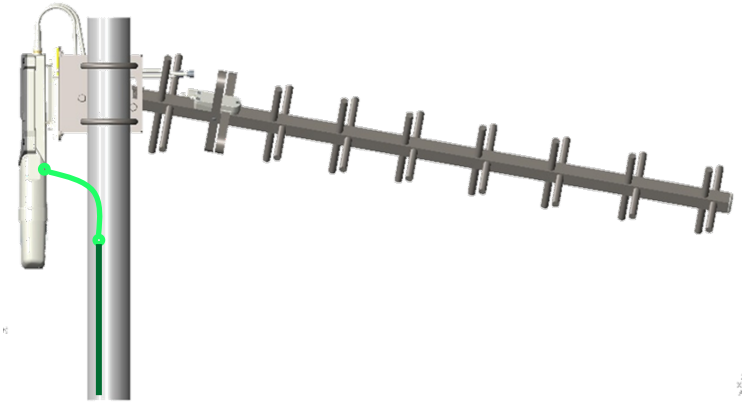


Figure 120 Yagi antenna alignment - downward tilt



Installing an integrated ODU

Caution

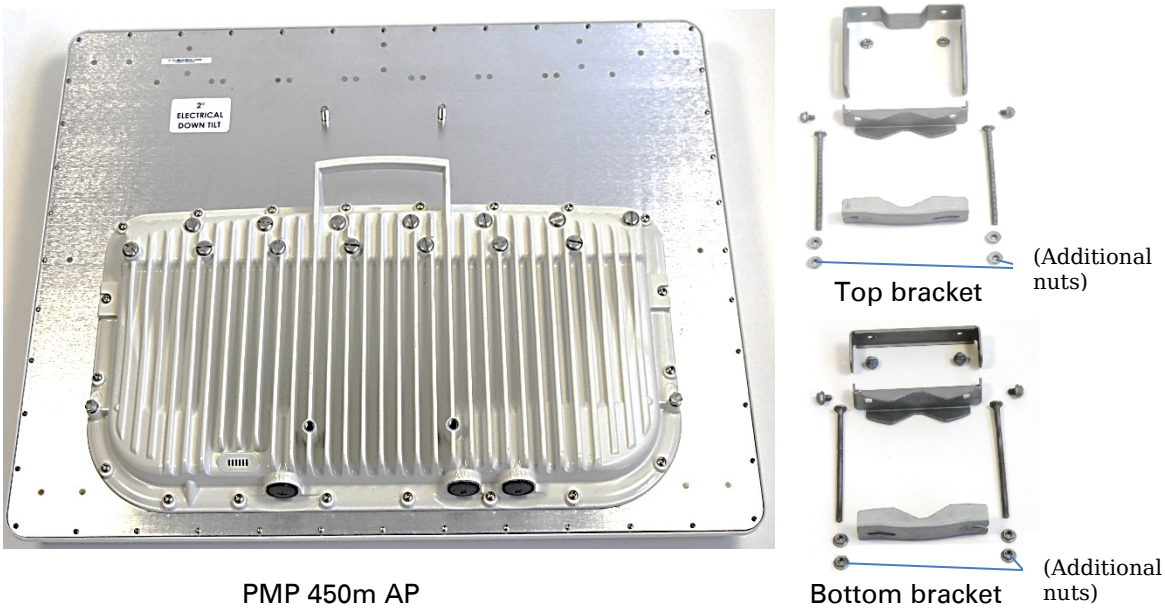
Do not reverse the bracket clamp, as this arrangement may lead to failure of the assembly. Do not over-tighten the bolts as this may lead to failure of the assembly.

PMP 450m Series – AP (5GHz)

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

1 Inventory the parts to ensure that you have them all before you begin. The full set of parts is shown in Figure 121.

Figure 121 PMP 450m Series - AP unbox view

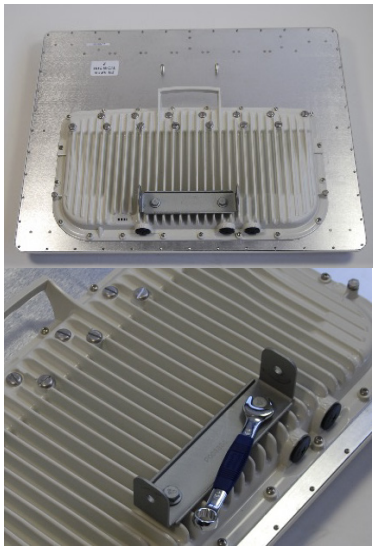


PMP 450m AP

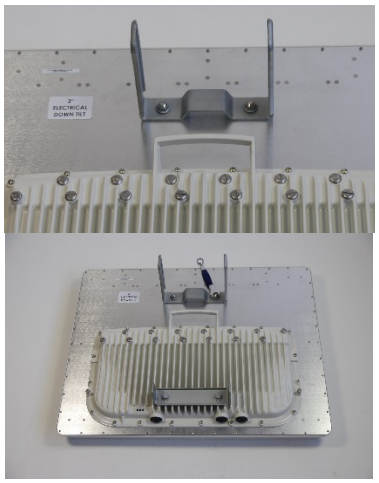
Note

The additional nuts provided for top and bottom brackets are used to hold the long bolts in position during installation.

2 Attach the bottom bracket to the ODU using (2) hex bolts and secure the M8 bolts by applying 5 Nm torque.

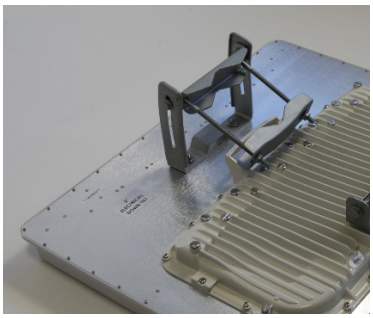


3 Attach the top bracket to the projecting studs on the ODU and secure the top bracket using two M8 nuts by applying 5 Nm torque.

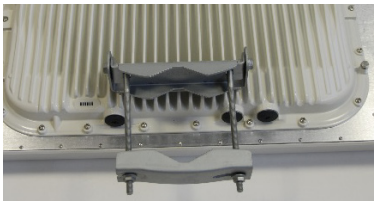


4 Fix the front and rear strap assembly to the upper bracket using two bolts. Do not tighten the nuts now.

Note: The PMP 450m antenna operates with 2 degrees of electrical down-tilt.

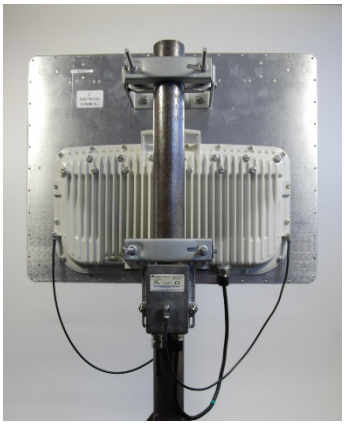


5 Fix the front and rear strap assembly to the bottom bracket using two bolts. Do not tighten the nuts now.



6 See PMP 450m Series – AP on page 6-3 for the grounding procedure.

See PMP 450m Series – AP on page 6-6 for the mounting procedure.

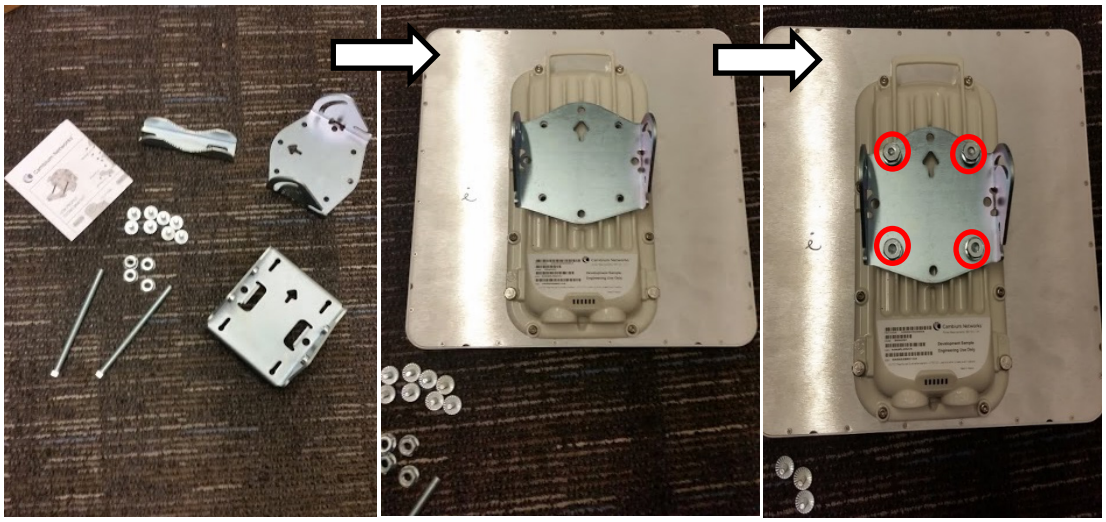


PMP/PTP 450i Series – AP/SM/BH

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

1 Fix the mounting plate to the back of the ODU using the four M6 bolts, and spring and plain washers provided. Tighten the bolts to a torque setting of 5.0 Nm (3.7 lb ft).

Figure 122 Fixing the mounting plate to the back of the ODU



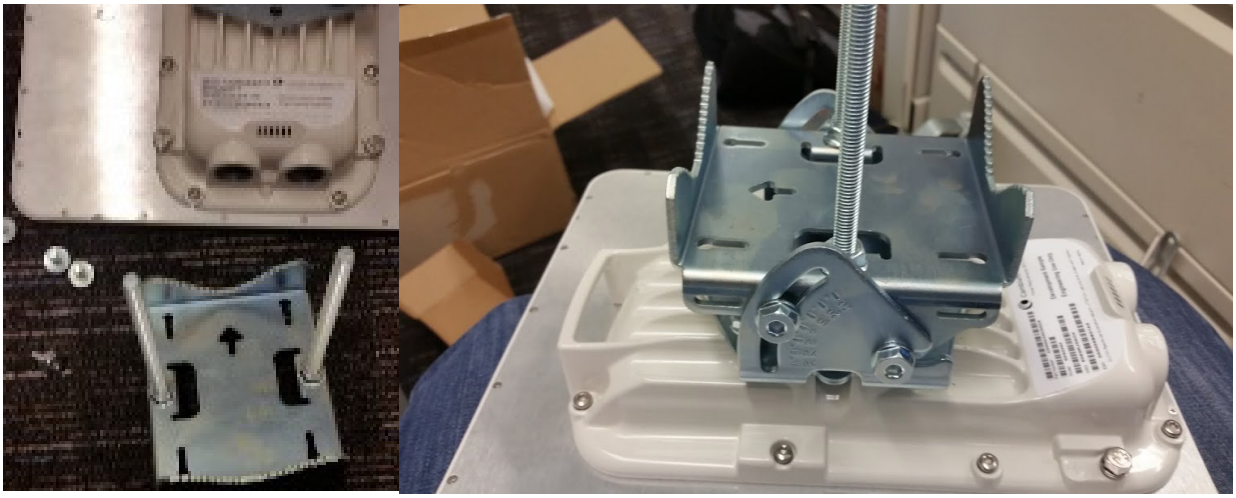
2 Attach the bracket body to the mounting plate using the M8 bolt, spring and plain washers.

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 123 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.

Figure 124 Ethernet cable gland for PMP/PTP 450 Series

Figure 125 Ethernet cable gland for PMP/PTP 450i Series

Disconnecting an RJ45 and gland from a unit

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

1. Hold the 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 a 450 Platform Family AP

To install a 450 Platform Family AP, perform the following steps.

Procedure 5 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 supplied clamps.

   See Installing external antennas to a connectorized ODU on page 6-26 for connecting an external antenna to PMP 450i Series, PMP 450 Series, PMP 450i Series AP 900 MHz and PMP 450 Series SM

   See Installing an integrated ODU on page 6-54
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. Adjust the azimuth to achieve visual alignment, 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 5-17)
6. Waterproof the cables (See section Attaching and weatherproofing an N type connector on page 6-72).

Installing a 450 Platform Family SM

Installing a 450 Platform Family 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 6 Installing an SM

1 Choose the best mounting location for the SM 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.

See Installing external antennas to a connectorized ODU on page 6-26 for connecting external antenna

See Installing an integrated ODU on page 6-54

3 Remove the base cover of the SM.

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

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 N-type antenna connectors to the external antenna, ensuring that the polarity matches between the SM cable labeling and the antenna port labels.

Connectorized SM Antenna Cable Label	Antenna Connection
A	Vertical
B	Horizontal

8 For Connectorized Models, weatherproof the N-type antenna connectors following section Attaching and weatherproofing an N type connector on page 6-72.

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

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

11 Install a surge suppressor as described in the section Mount the Surge Suppressor on page 6-12.

12 Connect the power supply to a power source.

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

14 Connect the drop cable from ODU to the Data+power port of the power suppy.

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 procedure Radio recovery mode on page 1-26

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 on the SM and listen to the alignment tone, which indicates greater SM receive signal power by pitch. By adjusting the SM'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 tool below.

20 When the highest power is achieved, lock the SM 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 450 Platform Family BHM

To install a 450 Platform Family BHM, perform the following steps.

Procedure 7 Installing a BHM

1 Choose the best mounting location for your particular application.

2 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.

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

See Installing external antennas to a connectorized ODU on page 6-26 for connecting external antenna

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

5 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.

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

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

Installing a 450 Platform Family BHS

To install a PTP 450 platform Series BHS, perform the following steps.

Procedure 8 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 5-17)

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

4 Install a surge suppressor as described in the section Mount the Surge Suppressor on page 6-12

5 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 an alignment tone adapter as shown in Figure 195 on page 8-21.

b. Listen to the alignment tone for pitch, which indicates greater signal power (RSSI/dBm) by higher pitch.

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

6 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 7-224.

Monitoring the Link

See Monitoring the Link on page 7-225.

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 Series 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.

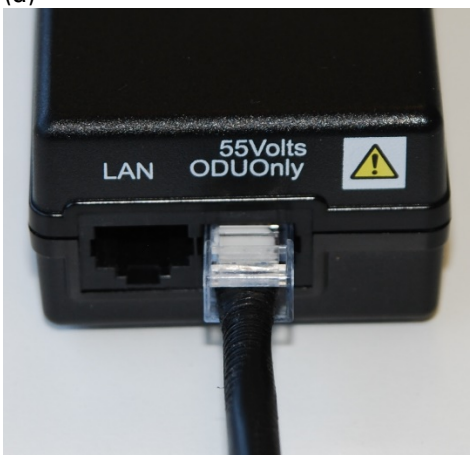
Do not plug any device other than a Cambium 450 Platform PSU into the PSU port of the ODU. Plugging any other device into the PSU port of the ODU may damage the ODU and device.

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 CMM4

Note

For instructions on CMM3 (CMMmicro) or CMM4 installation, including the outdoor temperature range in which it is acceptable to install the unit, tools required, mounting and cabling instructions, and connectivity verification, please see the *PMP Synchronization Solutions User Guide* located on the Cambium website.

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 the CMM-4 software.

450 Series and 450i Series can use the CMM4's EtherWan switch for their network connectivity.

Note

The 56 V of a CMM4 needs to go through the adapter cable (part number N000045L001A) as shown in Figure 40 on page 2-63.

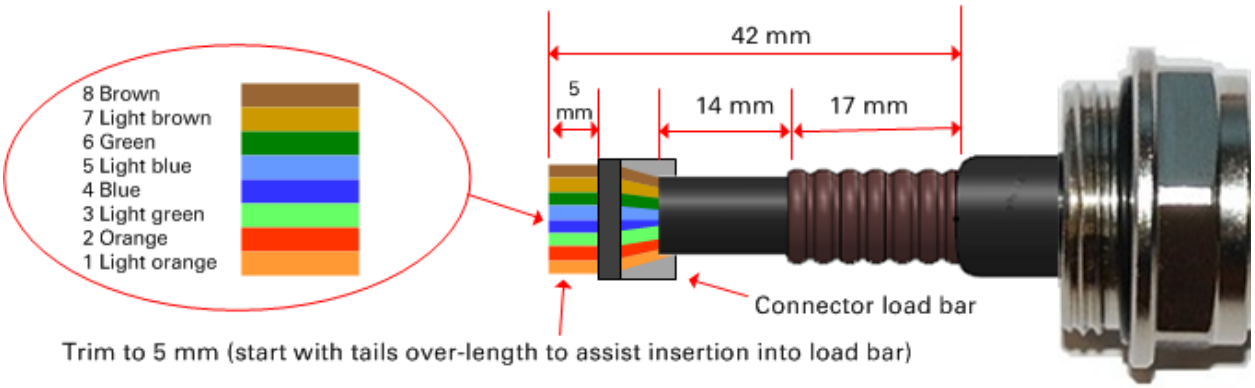
A CMM4 56V power adapter cable can be prepared by swapping pins 5 and 7. See CMM4 56 V power adapter cable pinout on page 2-63 for power adapter cable pinout.

Supplemental installation information

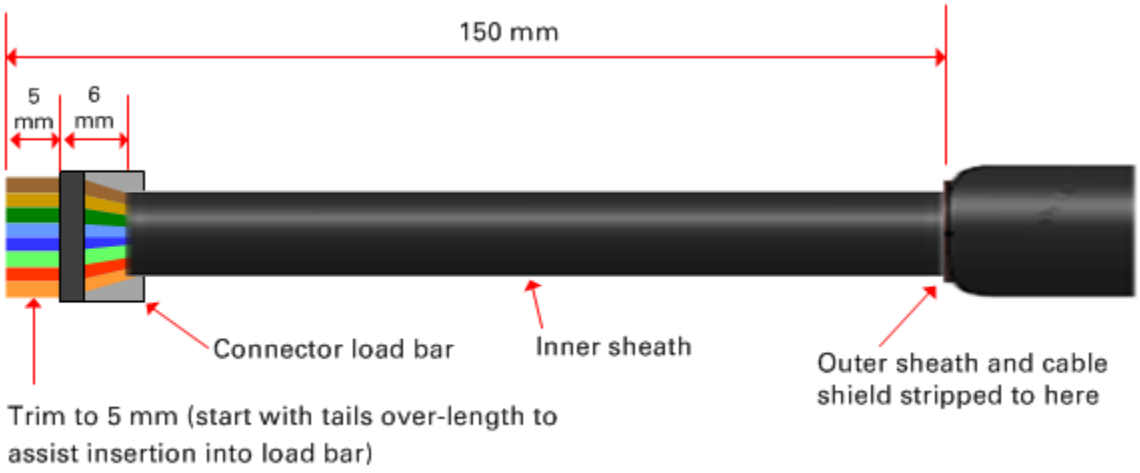
This section contains detailed installation procedures that are not included in the above topics, such as how to strip cables, create grounding points and weatherproof connectors.

Stripping drop cable

When preparing the drop cable for connection to the 450 Platform Family ODU or LPU, use the following measurements:



When preparing the drop cable for connection to the 450 Platform PSU (without a cable gland), use the following measurements:

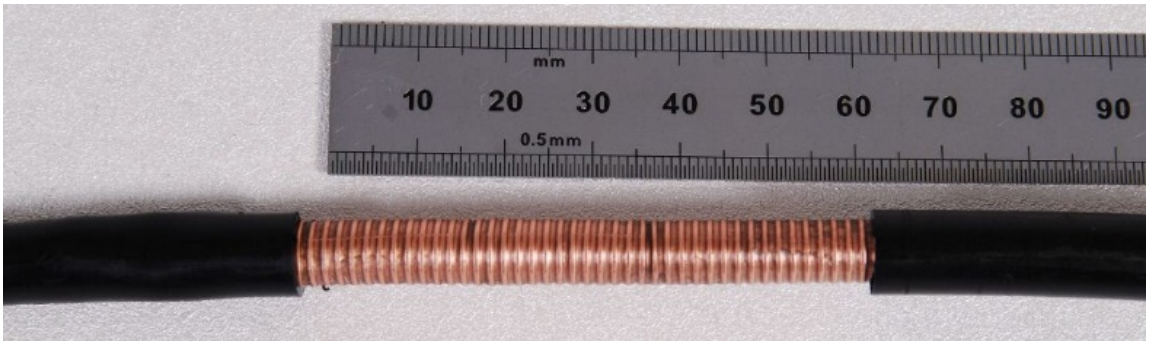


Creating a drop cable grounding point

Use this procedure to connect the screen of the main drop cable to the metal of the supporting structure using the cable grounding kit (Cambium part number 01010419001).

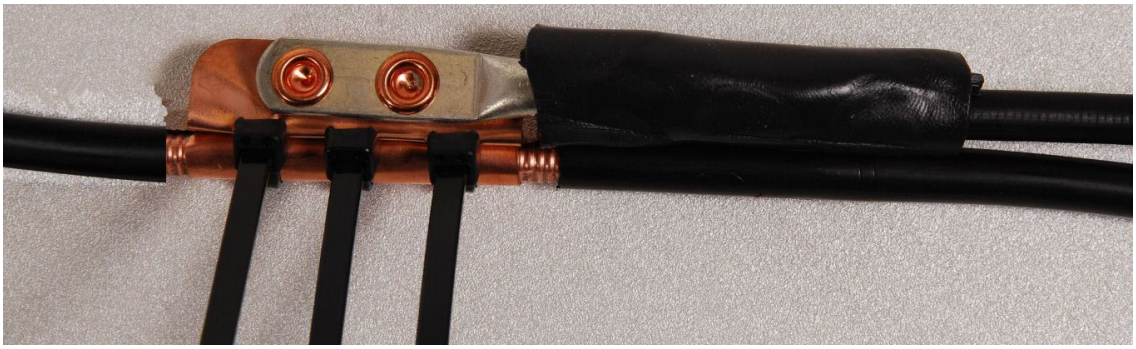
To identify suitable grounding points, refer to Hazardous locations on page 3-15.

1 Remove 60 mm (2.5 inches) of the drop cable outer sheath.



2 Cut 38mm (1.5 inches) of rubber tape (self-amalgamating) and fit to the ground cable lug. Wrap the tape completely around the lug and cable.

3 Fold the ground wire strap around the drop cable screen and fit cable ties.



4 Tighten the cable ties with pliers. Cut the surplus from the cable ties.

5 Cut a 38mm (1.5 inches) section of self-amalgamating tape and wrap it completely around the joint between the drop and ground cables.

6 Use the remainder of the self-amalgamating tape to wrap the complete assembly. Press the tape edges together so that there are no gaps.

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

8 Repeat with a further four layers of PVC tape, always overlapping at half width. Wrap the layers in alternate directions (top to bottom, then bottom to top). The edges of each layer should be 25mm (1 inch) above (A) and 25 mm (1 inch) below (B) the previous layer.

9 Prepare the metal grounding point of the supporting structure to provide a good electrical contact with the grounding cable clamp. Remove paint, grease or dirt, if present. Apply anti-oxidant compound liberally between the two metals.

10 Clamp the bottom lug of the grounding cable to the supporting structure using site approved methods. Use a two-hole lug secured with fasteners in both holes. This provides better protection than a single-hole lug.

Attaching and weatherproofing an N type 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 assembling 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.

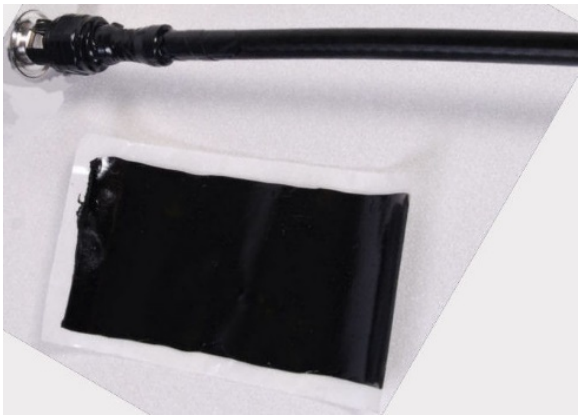
Use this procedure to weatherproof the N type connectors fitted to the connectorized ODU and external antenna (if recommended by the antenna manufacturer).

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 LPU. Avoid making creases or wrinkles:

3 Smooth the tape edges:

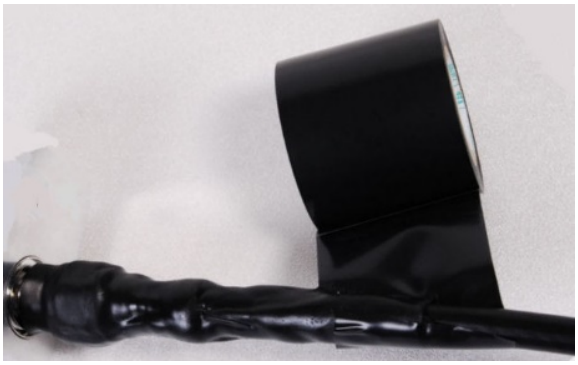
4 Cut a 125mm (5 inches) length of rubber tape (self-amalgamating):



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 25 mm (1 inch) 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 Check the completed weatherproof connection:

Note

A video of this procedure can be found at:

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

Chapter 7: Configuration

This chapter describes how to use the web interface to configure the 450 Platform link. This chapter contains the following topics:

Preparing for configuration

This section describes the checks to be performed before proceeding with unit configuration and antenna alignment.

Safety precautions

All national and local safety standards must be followed while configuring the units and aligning the antennas.

Warning

Ensure that personnel are not exposed to unsafe levels of RF energy. The units start to radiate RF energy as soon as they are powered up. Respect the safety standards defined in Compliance with safety standards on page 4-22, in particular the minimum separation distances.

Observe the following guidelines:

- Never work in front of the antenna when the ODU is powered.
- Always power down the PSU before connecting or disconnecting the drop cable from the PSU, ODU or LPU.

Regulatory compliance

All applicable radio regulations must be followed while configuring the units and aligning the antennas. For more information, refer to Compliance with radio regulations on page 4-36.

Caution

If the system designer has provided a list of channels to be barred for TDWR radar avoidance, the affected channels must be barred before the units are allowed to radiate on site, otherwise the regulations will be infringed.

Attention

Si le concepteur du système a fourni une liste de canaux à interdire pour éviter les radars TDWR, les cannaux concernées doivent être interdits avant que les unités sont autorisées à émettre sur le site, sinon la réglementation peut être enfreinte.

Connecting to the unit

This section describes how to connect the unit to a management PC and power it up.

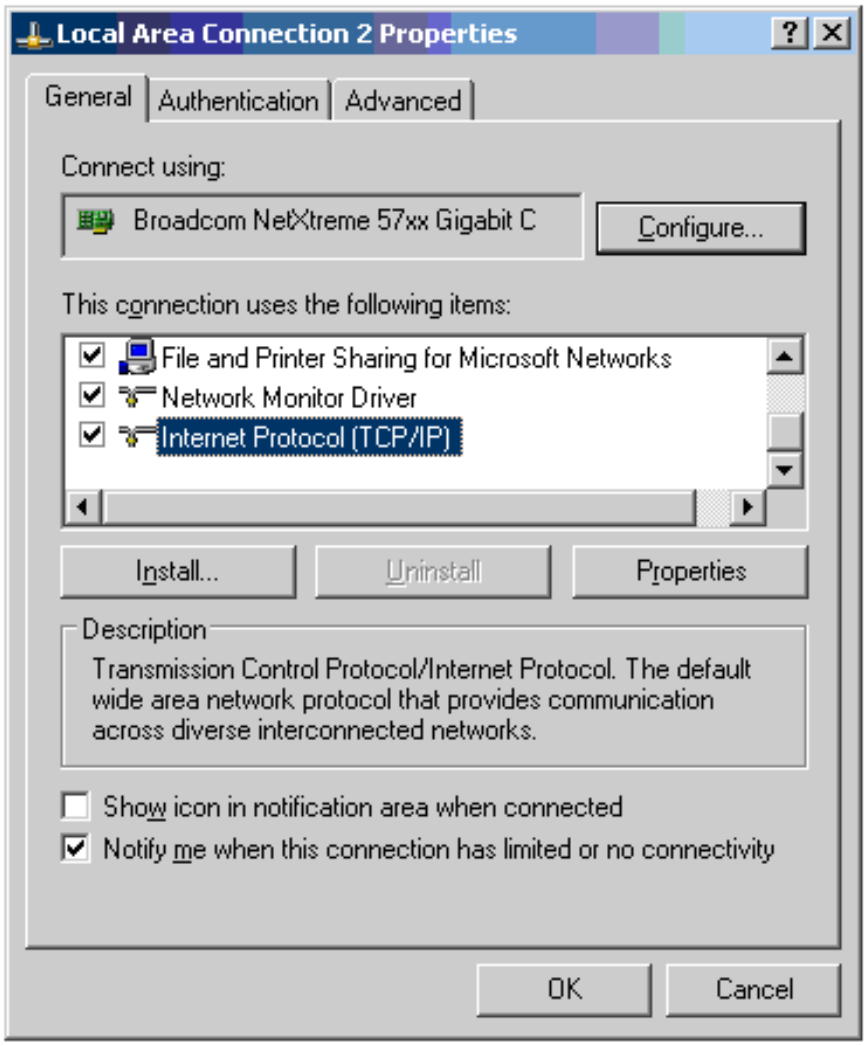
Configuring the management PC

Use this procedure to configure the local management PC to communicate with the 450 Platform ODU.

Procedure 9 Configuring the management PC

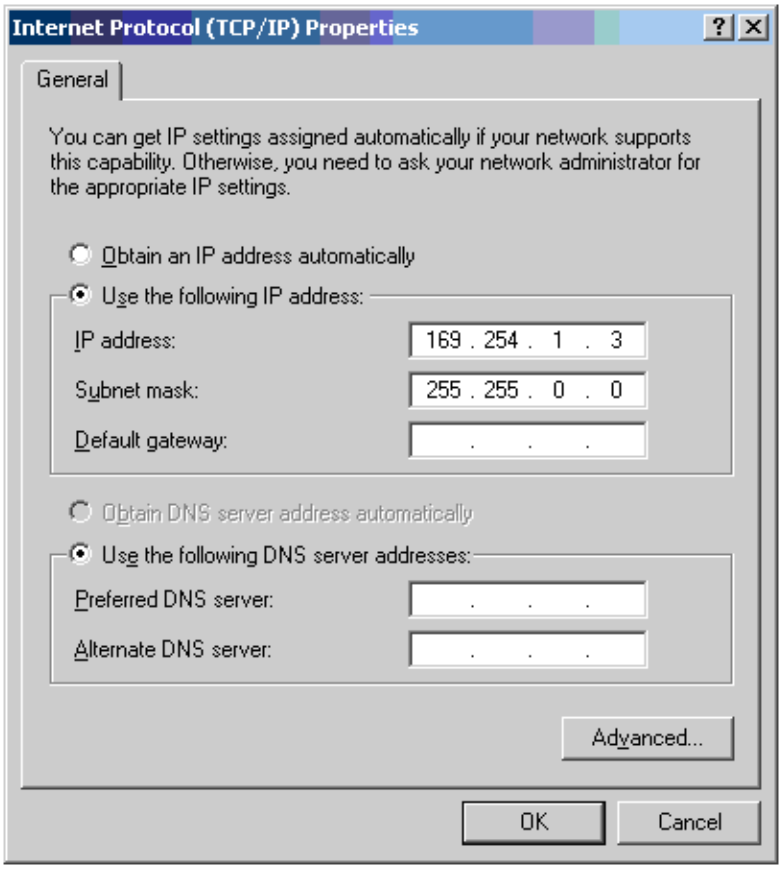
1 Select **Properties** for the Ethernet port. In Windows 7 this is found in **Control Panel > Network and Internet > Network Connections > Local Area Connection**.

2 Select **Internet Protocol (TCP/IP)**:



3 Click **Properties**.

4 Enter an IP address that is valid for the 169.254.X.X network, avoiding 169.254.0.0 and 169.254.1.1. A good example is 169.254.1.3:



5 Enter a subnet mask of 255.255.0.0. Leave the default gateway blank.

Connecting to the PC and powering up

Use this procedure to connect a management PC and power up the 450 platform ODU.

Procedure 10 Connecting to the PC and powering up

1 Check that the ODU and PSU are correctly connected.

2 Connect the PC Ethernet port to the LAN port of the PSU using a standard (not crossed) Ethernet cable.

3 Apply mains or battery power to the PSU. The green Power LED should illuminate continuously.

4 After about several seconds, check that the orange Ethernet LED starts with 10 slow flashes.

5 Check that the Ethernet LED then illuminates continuously.

Using the web interface

This section describes how to log into the 450 Platform Family web interface and use its menus.

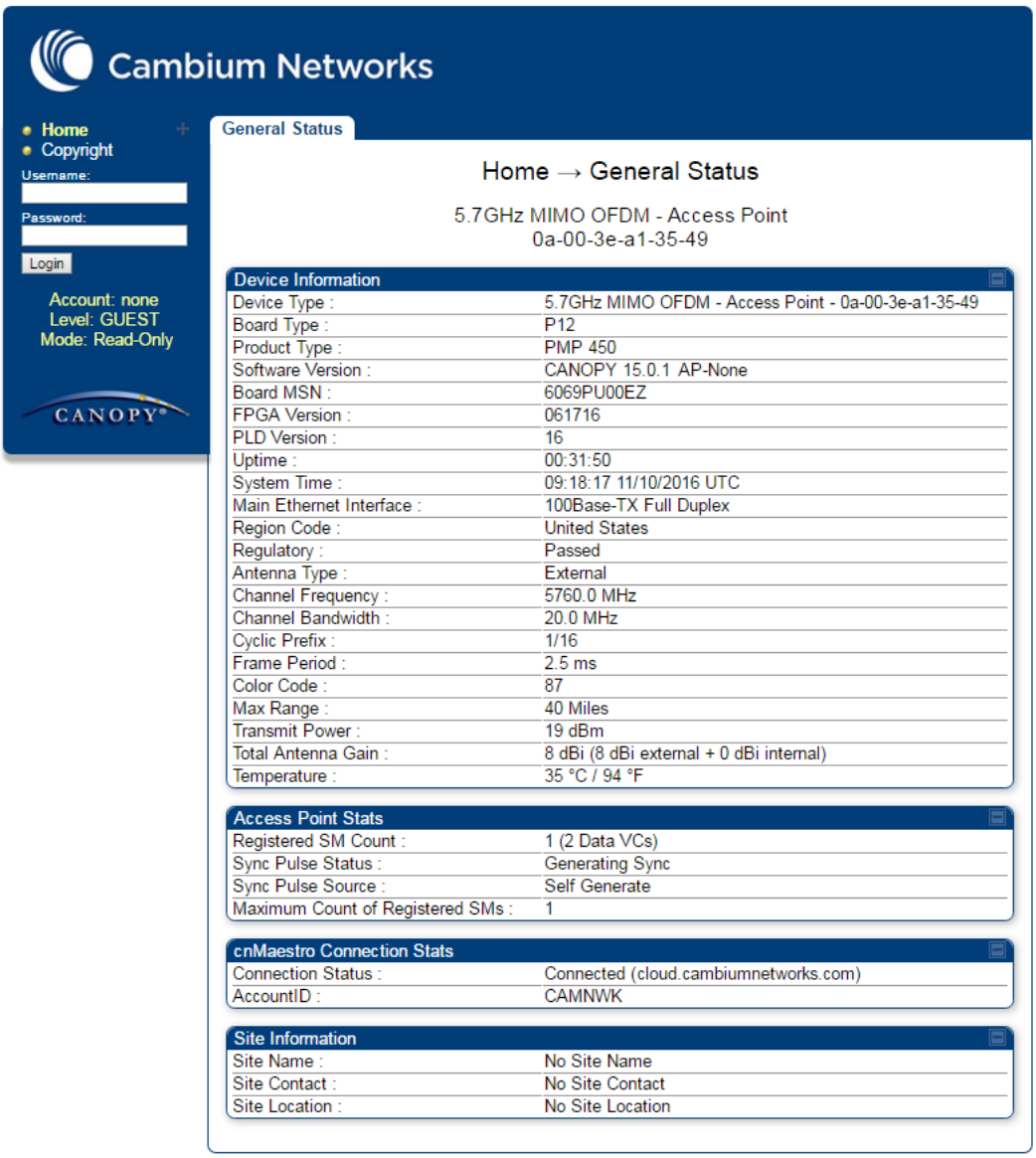
Logging into the web interface

Use this procedure to log into the web interface as a system administrator.

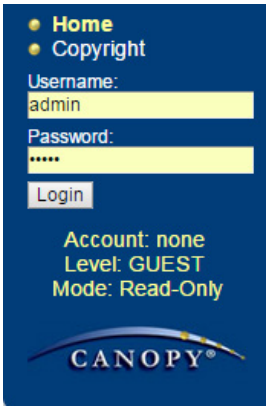
Procedure 11 Logging into the web interface

1 Start the web browser from the management PC.

2 Type the IP address of the unit into the address bar. The factory default IP address is **169.254.1.1**. Press ENTER. The web interface menu and System Summary page are displayed:

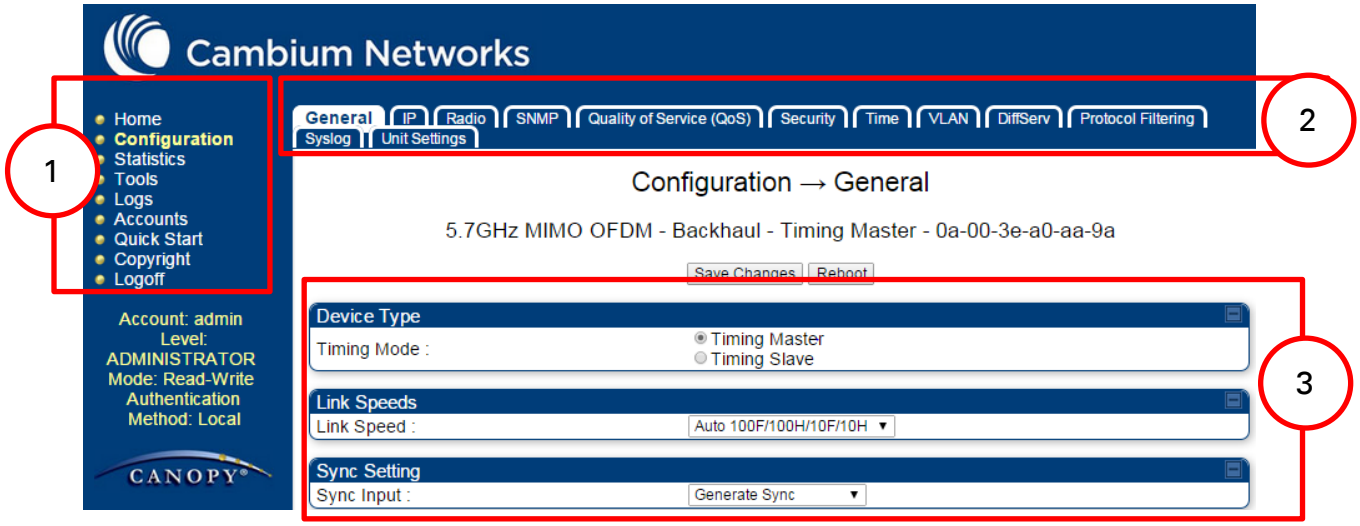


3 On left hand side of home page, the login information is displayed:



4 Enter Username (factory default username is *admin*) and Password (factory default password is *admin*) and click **Login**.

Web GUI



Field Name	Description
Main Menu	Click an option in side navigation bar (area marked as “1”). Multiple options in sub-navigation bars appear
Menu Options	Click top sub-navigation bar to choose one configuration page (area marked as “2”)
Parameters	To configure the parameters (e.g. area marked as “3”)
Save Changes	Press "Save Changes" to confirm and save the changes
Reboot	To reboot the ODU

Using the menu options

Use the menu navigation bar in the left panel to navigate to each web page. Some of the menu options are only displayed for specific system configurations. Use Table 113 to locate information about using each web page.

Table 113 Menu options and web pages

Main menu	Menu options	Applicable module	Description
Home			
	General Status	All	Viewing General Status on page 9-2
	Session Status	AP, BHM	Viewing Session Status on page 9-24
	Event Log	All	Interpreting messages in the Event Log on page 9-33
	Network Interface	AP, BHM	Viewing the Network Interface on page 9-36
	Layer 2 Neighbors	All	Viewing the Layer 2 Neighbors on page 9-37
Configuration			
	General	All	General configuration on page 7-71
	IP	All	Configuring IP and Ethernet interfaces on page 7-23
	Radio	All	Configuring radio parameters on page 7-138
	SNMP	All	Setting up SNMP agent on page 7-209
	cnMaestro	All	Configuring cnMaestroTM Connectivity on page 7-265
	Quality of Service (QoS)	All	Configuring quality of service on page 7-228
	Security	All	Configuring security on page 7-102
	Time	AP, BHM	Setting up time and date Time page of 450 Platform Family - AP/BHM on page 7-98

Main menu	Menu options	Applicable module	Description
	VLAN	All	VLAN configuration for PMP on page 7-45 VLAN configuration for PTP on page 7-55
	DiffServ	All	IPv4 and IPv6 Prioritization on page 7-62
	Protocol Filtering	All	Filtering protocols and ports on page 7-63
	Syslog	All	Configuring syslog on page 7-218
	Ping Watchdog	All	Configuring Ping Watchdog on page 7-312
	Unit Setting	All	Configuring Unit Settings page on page 7-94
Statistics			
	Scheduler	All	Viewing the Scheduler statistics on page 9-38
	Registration Failures	AP, BHM	Viewing list of Registration Failures statistics on page 9-40
	Bridge Control Block	All	Interpreting Bridge Control Block statistics on page 9-23
	Bridging Table	All	Interpreting Bridging Table statistics on page 9-42
	Ethernet	All	Interpreting Ethernet statistics on page 9-43
	Radio	All	Interpreting RF Control Block statistics on page 9-46
	VLAN	All	Interpreting VLAN statistics on page 9-4
	Data Channels	All	Interpreting Data Channels statistics on page 9-5
	MIR/Burst	AP, SM	Interpreting MIR/Burst statistics on page 9-6
	Throughput	AP, BHM	Interpreting Throughput statistics on page 9-10
	Filter	SM	Interpreting Filter statistics on page 9-16

Main menu	Menu options	Applicable module	Description
	ARP	SM	Viewing ARP statistics on page 9-17
	Overload	All	Interpreting Overload statistics on page 9-13
	Syslog Statistics	All	Interpreting syslog statistics on page 9-29
	Translation Table	SM	Interpreting Translation Table statistics on page 9-42
	DHCP Relay	SM	Interpreting DHCP Relay statistics on page 9-15
	NAT Stats	SM	Viewing NAT statistics on page 9-17
	NAT DHCP	SM	Viewing NAT DHCP Statistics on page 9-19
	Pass Through Statistics	AP	Interpreting Pass Through Statistics on page 9-26
	Sync Status	AP	Interpreting Sync Status statistics on page 9-20
	PPPoE	SM	Interpreting PPPoE Statistics for Customer Activities on page 9-21
	SNMPv3 Statistics	All	Interpreting SNMPv3 Statistics on page 9-27
	Frame Utilization		Interpreting Frame Utilization statistics on page 9-27
Tools			
	Link Capacity Test	All	Using the Link Capacity Test tool on page 8-23
	Spectrum Analyzer	All	Spectrum Analyzer tool on page 8-3
	Remote Spectrum Analyzer	All	Remote Spectrum Analyzer tool on page 8-13
	AP/BHM Evaluation	SM, BHS	Using AP Evaluation tool on page 8-34 Using BHM Evaluation tool on page 8-38
	Subscriber Configuration	AP	Using the Subscriber Configuration tool on page 8-47
	OFDM Frame Calculator	AP, BHM	Using the OFDM Frame Calculator tool on page 8-42

Main menu	Menu options	Applicable module	Description
	BER results	SM	Using BER Results tool on page 8-55
	Alignment Tool	SM, BHS	Using the Alignment Tool on page 8-16
	Link Status	AP	Using the Link Status tool on page 8-48
	Sessions	AP	Using the Sessions tool on page 8-56
	Ping Test	All	Using the Ping Test tool on page 8-57
Logs			
Accounts			
	Change User Setting		Changing a User Setting on page 7-104
	Add user		Adding a User for Access to a module on page 7-103
	Delete User		Deleting a User from Access to a module on page 7-104
	User		Users account on page 7-105
Quick Start			
	Quick Start	AP, BHM	Quick link setup on page 7-12
	Region Settings	AP, BHM	Quick link setup on page 7-12
	Radio Carrier Frequency	AP, BHM	Quick link setup on page 7-12
	Synchronization	AP, BHM	Quick link setup on page 7-12
	LAN IP Address	AP, BHM	Quick link setup on page 7-12
	Review and Save Configuration	AP, BHM	Quick link setup on page 7-12
PDA			
	Quick Status	SM	
	Spectrum Results (PDA)	SM	
	Information	SM	

Main menu	Menu options	Applicable module	Description
	BHM Evaluation	SM	The PDA web-page includes 320 x 240 pixel formatted displays of information important to installation and alignment for installers using legacy PDA devices. All device web pages are compatible with touch devices such as smart phones and tablets.
	AIM	SM	
Copyright			
	Copyright Notices	All	The Copyright web-page displays pertinent device copyright information.
Logoff		All	

Quick link setup

This section describes how to use the Quick Start Wizard to complete the essential system configuration tasks that must be performed on a PMP/PTP configuration.

Note

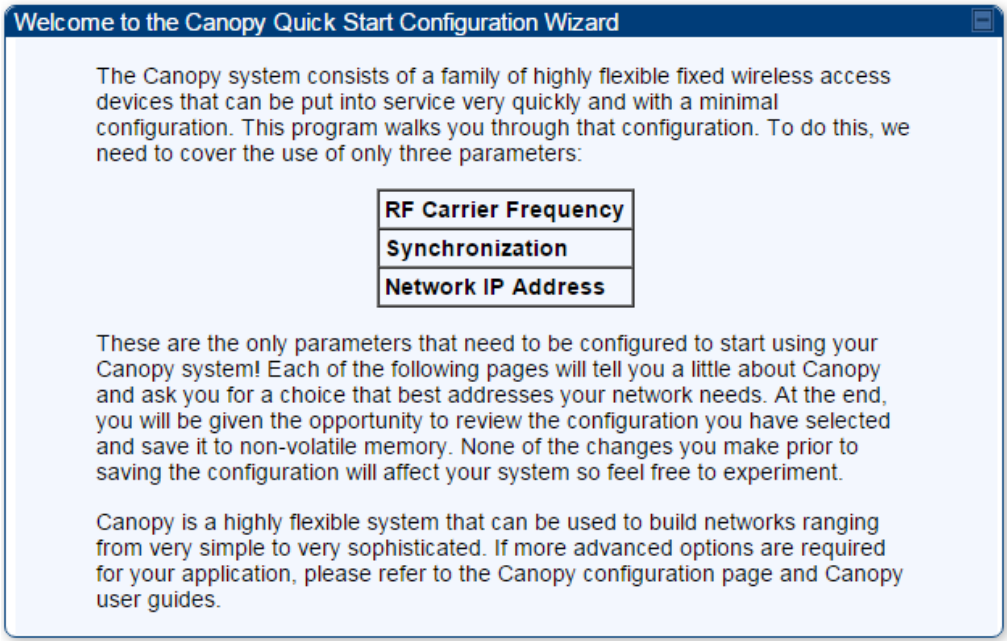
If the IP address of the AP or BHM is not known, See Radio recovery mode on page 1-26.

Initiating Quick Start Wizard

Applicable products	PMP:	☑	AP	PTP:	☑ BHM

To start with Quick Start Wizard: after logging into the web management interface click the **Quick Start** button on the left side of main menu bar. The AP/BHM responds by opening the Quick Start page.

Figure 126 Disarm Installation page (top and bottom of page shown)



Quick Start is a wizard that helps you to perform a basic configuration that places an AP/BHM into service. Only the following parameters must be configured:

- Region Code
- RF Carrier Frequency
- Synchronization
- LAN (Network) IP Address

In each Quick Start page, you can

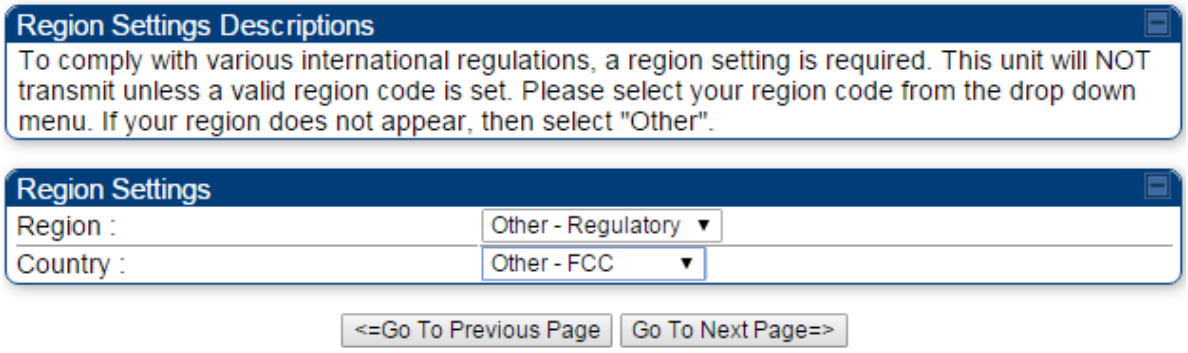
- specify the settings to satisfy the requirements of the network.
- review the configuration selected.
- save the configuration to non-volatile memory.

Procedure 12 Quick start wizard

1 At the bottom of the Quick Start tab, click the **Go To Next Page** button.

2 From the pull-down menu, select the region in which the AP will operate.

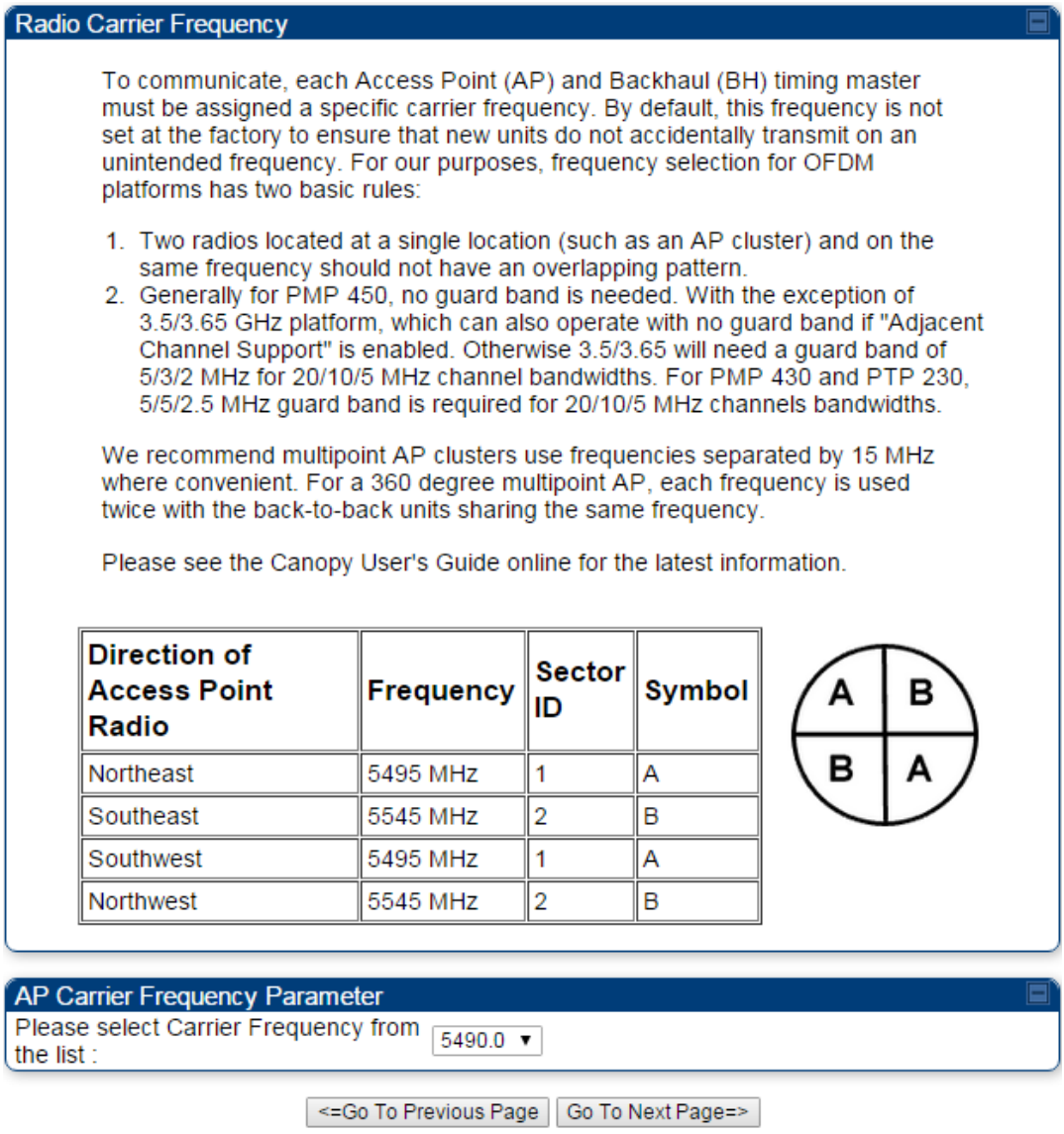
Figure 127 Regional Settings tab of AP/BHM



3 Click the **Go To Next Page** button.

4 From the pull-down menu, select a frequency for the test.

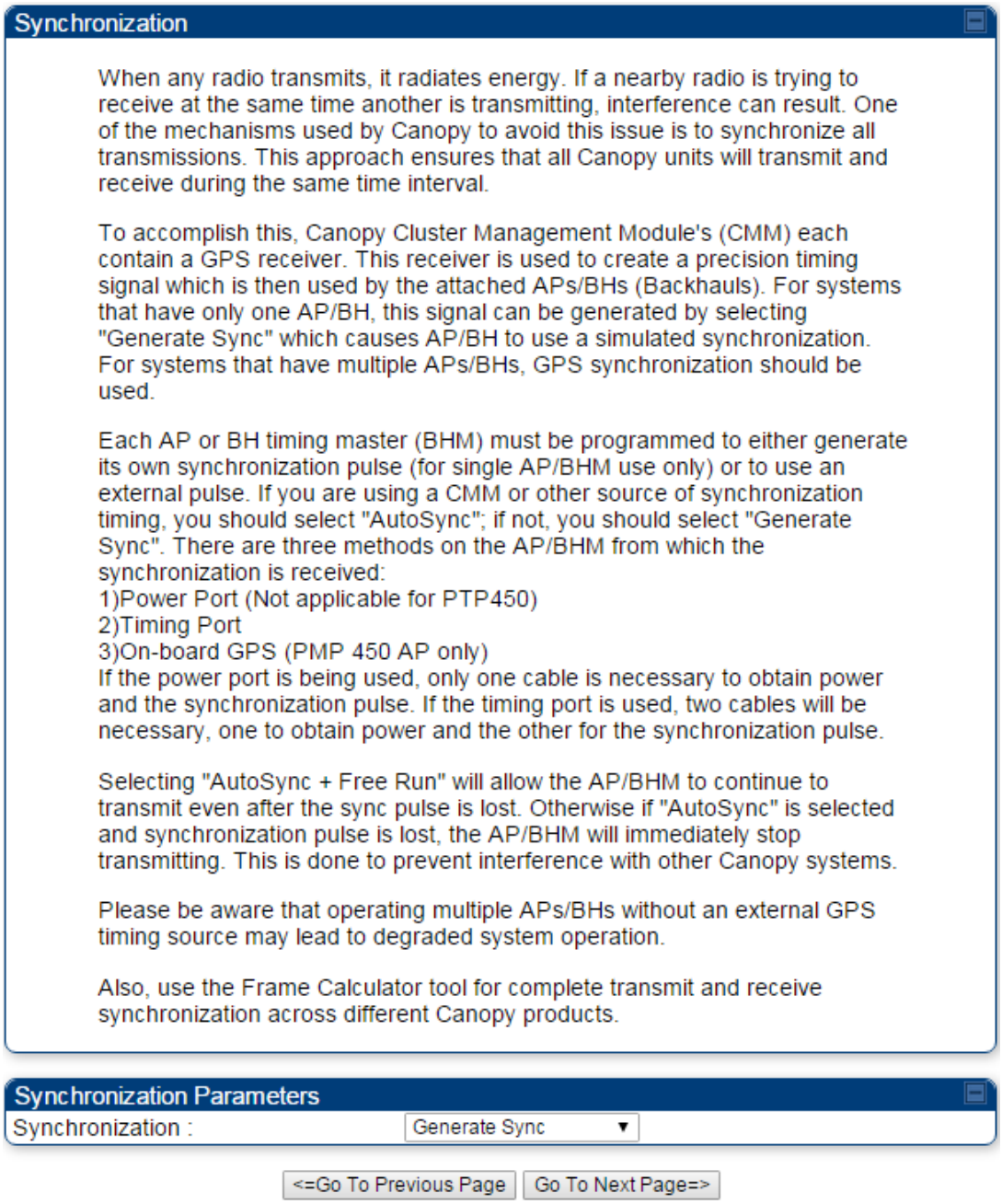
Figure 128 Radio Carrier Frequency tab of AP/BHM



5 Click the **Go To Next Page** button.

6 At the bottom of this tab, select **Generate Sync Signal**.

Figure 129 Synchronization tab of AP/BHM

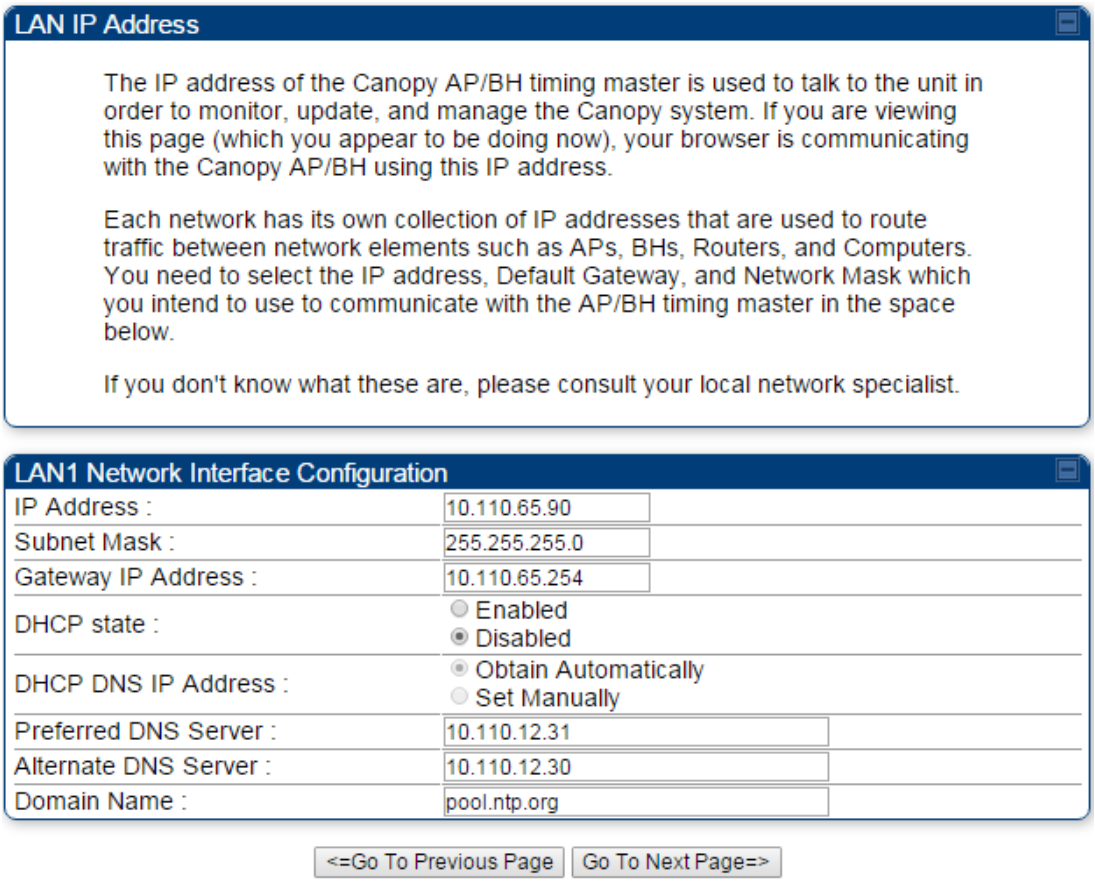


7 Click the **Go To Next Page** button.

8 At the bottom of the IP address configuration tab, either

- specify an **IP Address**, a **Subnet Mask**, and a **Gateway IP Address** for management of the AP and leave the **DHCP state** set to **Disabled**.
- set the **DHCP state** to **Enabled** to have the IP address, subnet mask, and gateway IP address automatically configured by a domain name server (DNS).

Figure 130 LAN IP Address tab of the AP/BHM



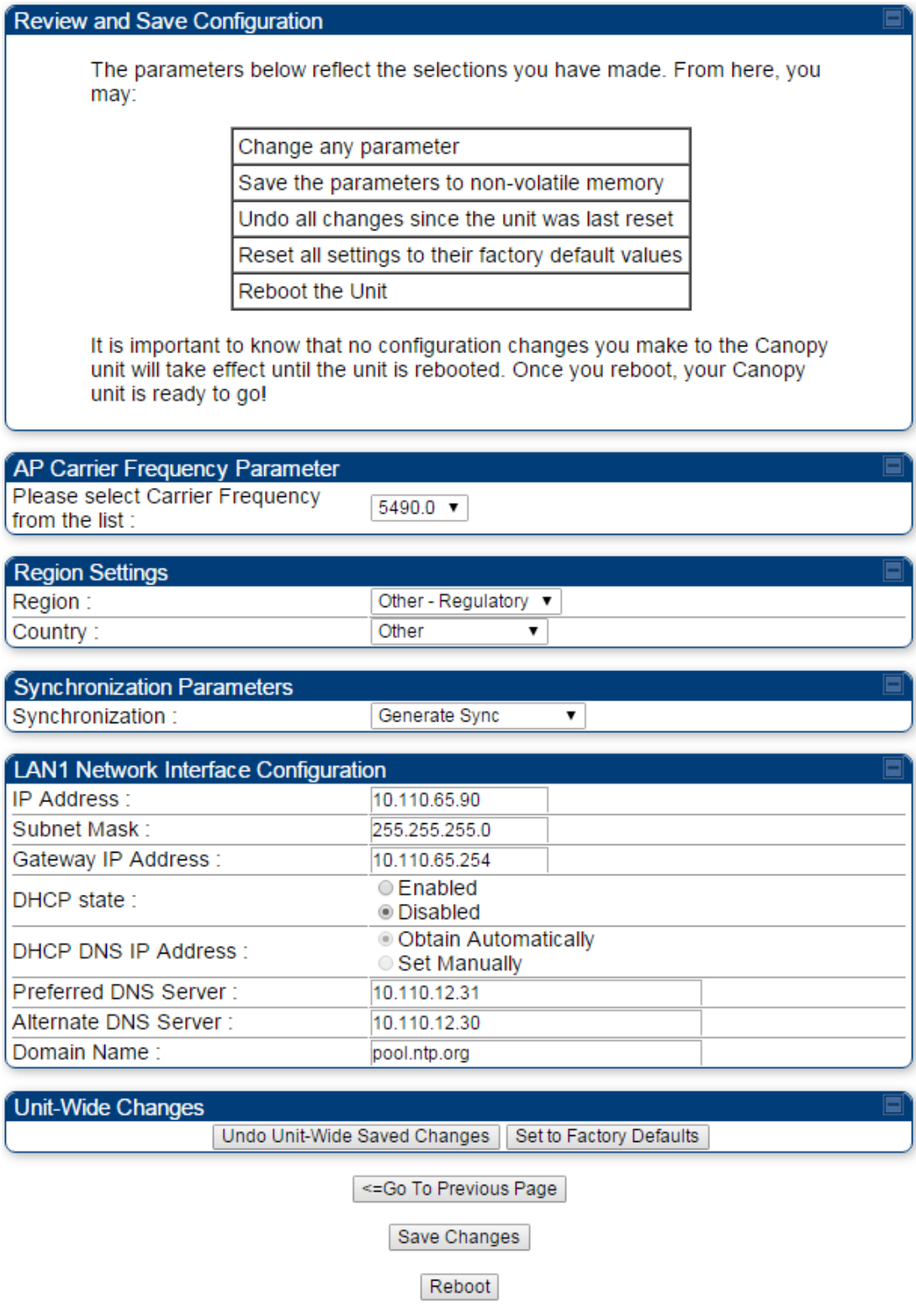
Note

Cambium encourages you to experiment with the interface. Unless you save a configuration and reboot the AP after you save the configuration, none of the changes are affected.

9 Click the **Go To Next Page =>** button.

10 Ensure that the initial parameters for the AP are set as you intended.

Figure 131 Review and Save Configuration tab of the AP/BHM



11 Click the **Save Changes** button.

12 Click the **Reboot** button.
RESULT: The AP responds with the message **Reboot Has Been Initiated...**

13 Wait until the indicator LEDs are not red.

14 Trigger your browser to refresh the page until the AP redisplays the General Status tab.

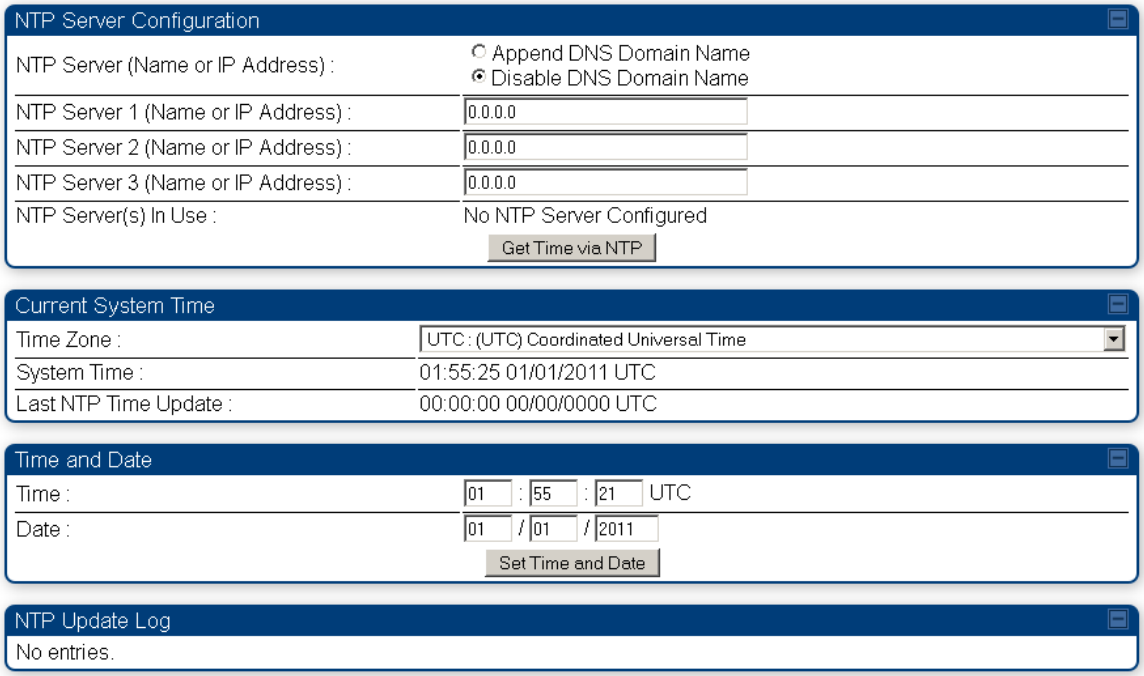
15 Wait until the red indicator LEDs are not lit.

Configuring time settings

Applicable products	PMP:	☑	AP	PTP:	☑ BHM

To proceed with the test setup, click the **Configuration** link on the left side of the General Status page. When the AP responds by opening the Configuration page to the General page, click the Time tab.

Figure 132 Time tab of the AP/BHM



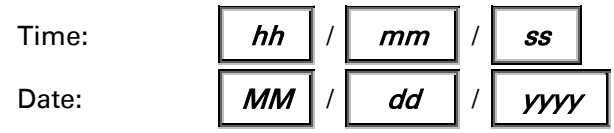
To have each log in the AP/BHM correlated to a meaningful time and date, either a reliable network element must pass time and date to the AP/BHM or you must set the time and date whenever a power cycle of the AP/BHM has occurred. A network element passes time and date in any of the following scenarios:

- A connected CMM4 passes time and date (GPS time and date, if received).
- A separate NTP server is addressable from the AP/BHM.

If the AP/BHM should obtain time and date from a CMM4, or a separate NTP server, enter the IP address of the CMM4 or NTP server on this tab. To force the AP/BHM to obtain time and date before the first (or next) 15-minute interval query of the NTP server, click **Get Time through NTP**.

If you enter a time and date, the format for entry is

Figure 133 Time and date entry formats



where

hh	represents the two-digit hour in the range 00 to 24
mm	represents the two-digit minute
ss	represents the two-digit second
MM	represents the two-digit month
dd	represents the two-digit day
yyyy	represents the four-digit year

Proceed with the time setup as follows.

Procedure 13 Entering AP/BHM time setup information

1. Enter the appropriate information in the format shown above.
2. Then click the **Set Time and Date** button.

> **Note**
> The time displayed at the top of this page is static unless your browser is set to automatically refresh

Powering the SM/BHS for test

Procedure 14 Powering the SM/BHS for test

1. In one hand, securely hold the top (larger shell) of the SM/BHS. With the other hand, depress the lever in the back of the base cover (smaller shell). Remove the base cover.
2. Plug one end of a CAT 5 Ethernet cable into the SM PSU port
3. Plug the other end of the Ethernet cable into the jack in the pig tail that hangs from the power supply
4. Roughly aim the SM/BHS toward the AP/BHM
5. Plug the power supply into an electrical outlet

> **Warning**
> From this point until you remove power from the AP/BHM, stay at least as far from the AP/BHM as the minimum separation distance specified in Error! Reference source not found..

6. Repeat the foregoing steps for each SM/BHS that you wish to include in the test.

Viewing the Session Status of the AP/BHM to determine test registration

Once the SMs/BHS under test are powered on, return to the computing device to determine if the SM/BHS units have registered to the AP/BHM.

Note

In order for accurate power level readings to be displayed, traffic must be present on the radio link.

The Session Status tab provides information about each SM/BHS that has registered to the AP/BHM. This information is useful for managing and troubleshooting a system. All information that you have entered in the **Site Name** field of the SM/BHS displays in the Session Status tab of the linked AP/BHM.

The Session Status tab also includes the current active values on each SM(or BHS) (LUID) for MIR, and VLAN, as well as the source of these values (representing the SM/BHS itself, Authentication Server, or the AP/BHM and cap, if any—for example, APCAP as shown above).. As an SM/BHS registers to the AP/BHM, the configuration source that this page displays for the associated LUID may change. After registration, however, the displayed source is stable and can be trusted.

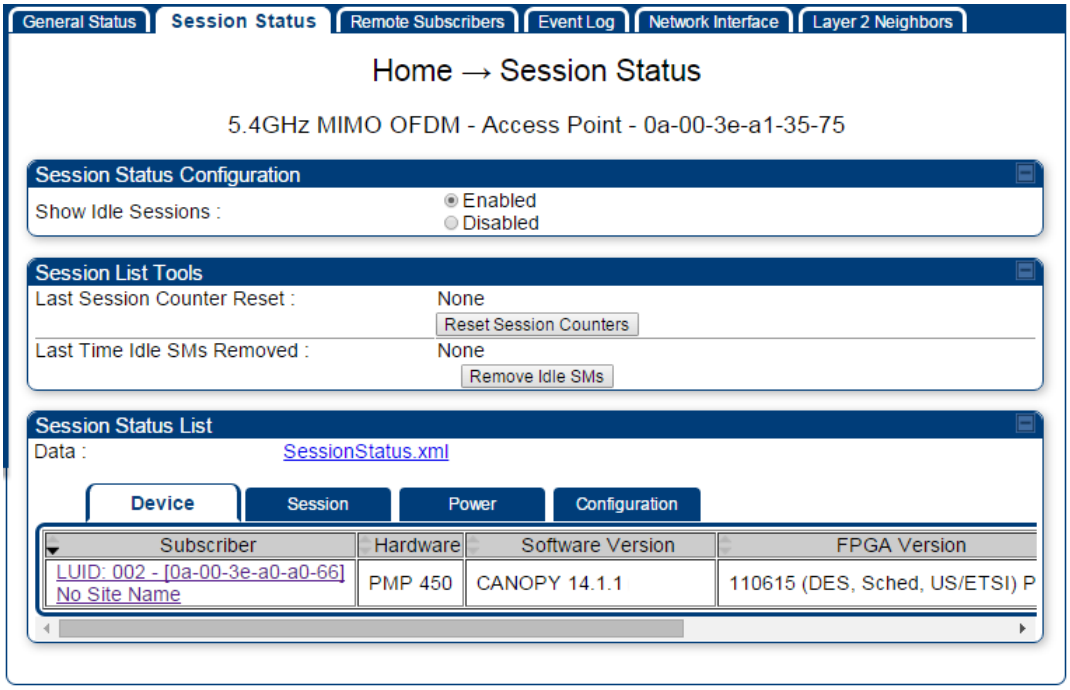
Idle subscribers may be included or removed from the session status display by enabling or disabling, respectively, the **Show Idle Sessions** parameter. Enabling or disabling this parameter only affects the GUI display of subscribers, not the registration status.

The SessionStatus.xml hyperlink allows user to export session status page from web management interface of AP/BHM. The session status page will be exported in xml file.

Procedure 15 Viewing the AP Session Status page

1 On the AP web management GUI, navigate to **Home**, **Session Status**:

Figure 134 Session Status tab of AP



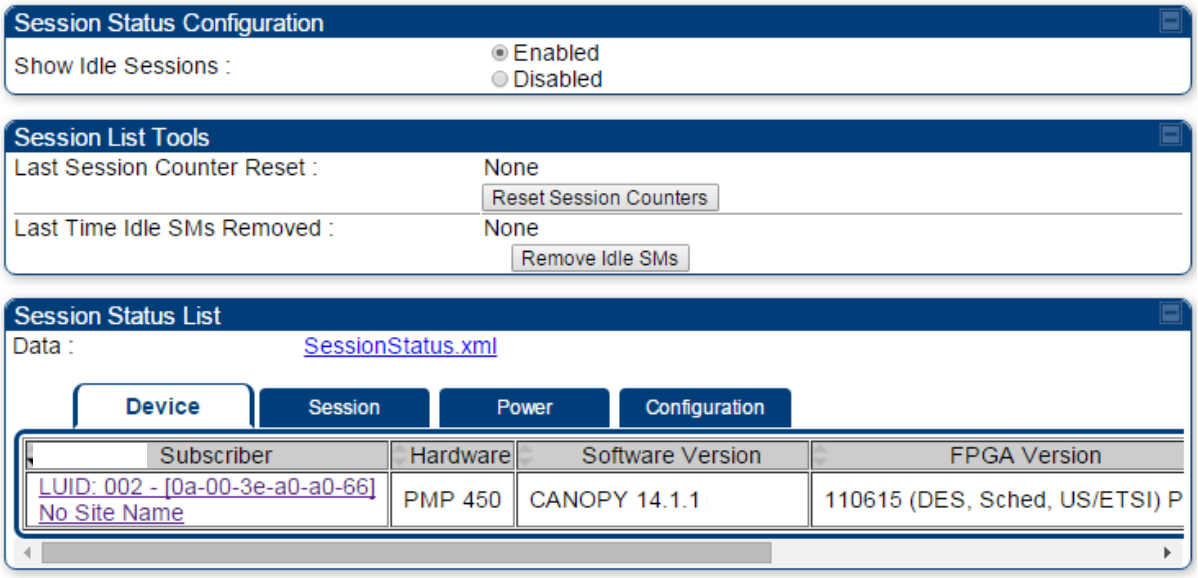
Note

Session status page for BHM is same as AP.

2 Verify that for each SM (or BHS) MAC address (printed on the SM/BHS housing) the AP/BHM has established a registered session by verifying the “State” status of each entry.

The Session Status page of the AP/BHM is explained in Table 114.

Table 114 Session Status Attributes – AP



Attribute	Meaning
Show Idle Sessions	Idle subscribers may be included or removed from the session status display by enabling or disabling, respectively, the **Show Idle Sessions** parameter. Enabling or disabling this parameter only affects the GUI display of subscribers, not the registration status.
Last Session Counter Reset	This field displays date and time stamp of last session counter reset.
Last Time Idle SMs Removed	This field displays date and time stamp of last Idle SMs Removed. On click of “Remove Idle SMs” button, all the SMs which are in Idle state are flushed out.
Data	See Exporting Session Status page of AP/BHM on page 7-254
Device tab	See Device tab on page 9-24
Session tab	See Session tab on page 9-26
Power tab	See Power tab on page 9-27
Configuration tab	See Configuration tab on page 9-29

Configuring IP and Ethernet interfaces

This task consists of the following sections:

Configuring the IP interface

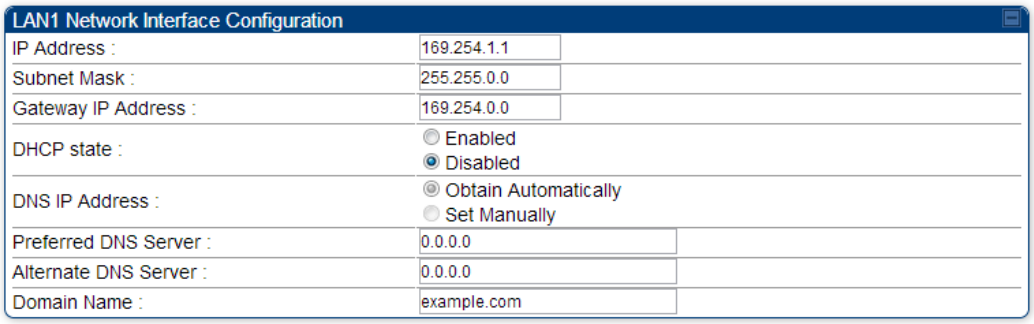
The IP interface allows users to connect to the 450 Platform Family web interface, either from a locally connected computer or from a management network.

Applicable products	PMP: ☑ AP ☑ SM	PTP: ☑ BHM ☑ BMS

To configure the IP interface, follow these instructions:

Procedure 16 Configuring the AP/BHM IP interface

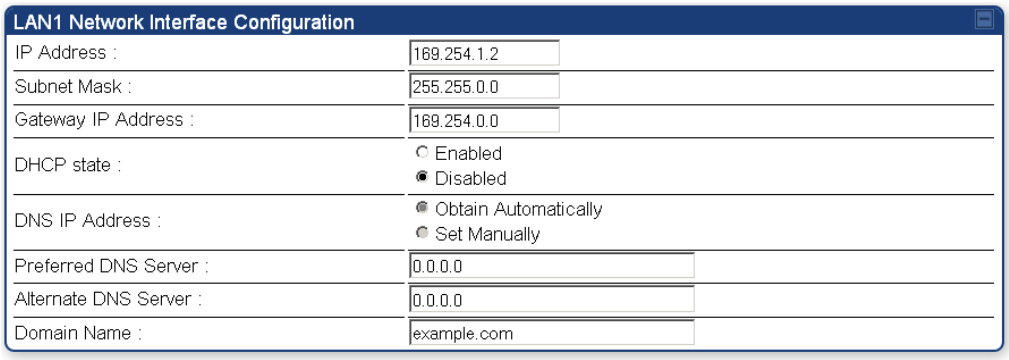
1 Select menu option **Configuration** > **IP**. The LAN configuration page is displayed:



2 Update IP Address, Subnet Mask and Gateway IP Address to meet network requirements (as specified by the network administrator).

3 Review the other IP interface attributes and update them, if necessary (see Table 115 **IP interface attributes**).

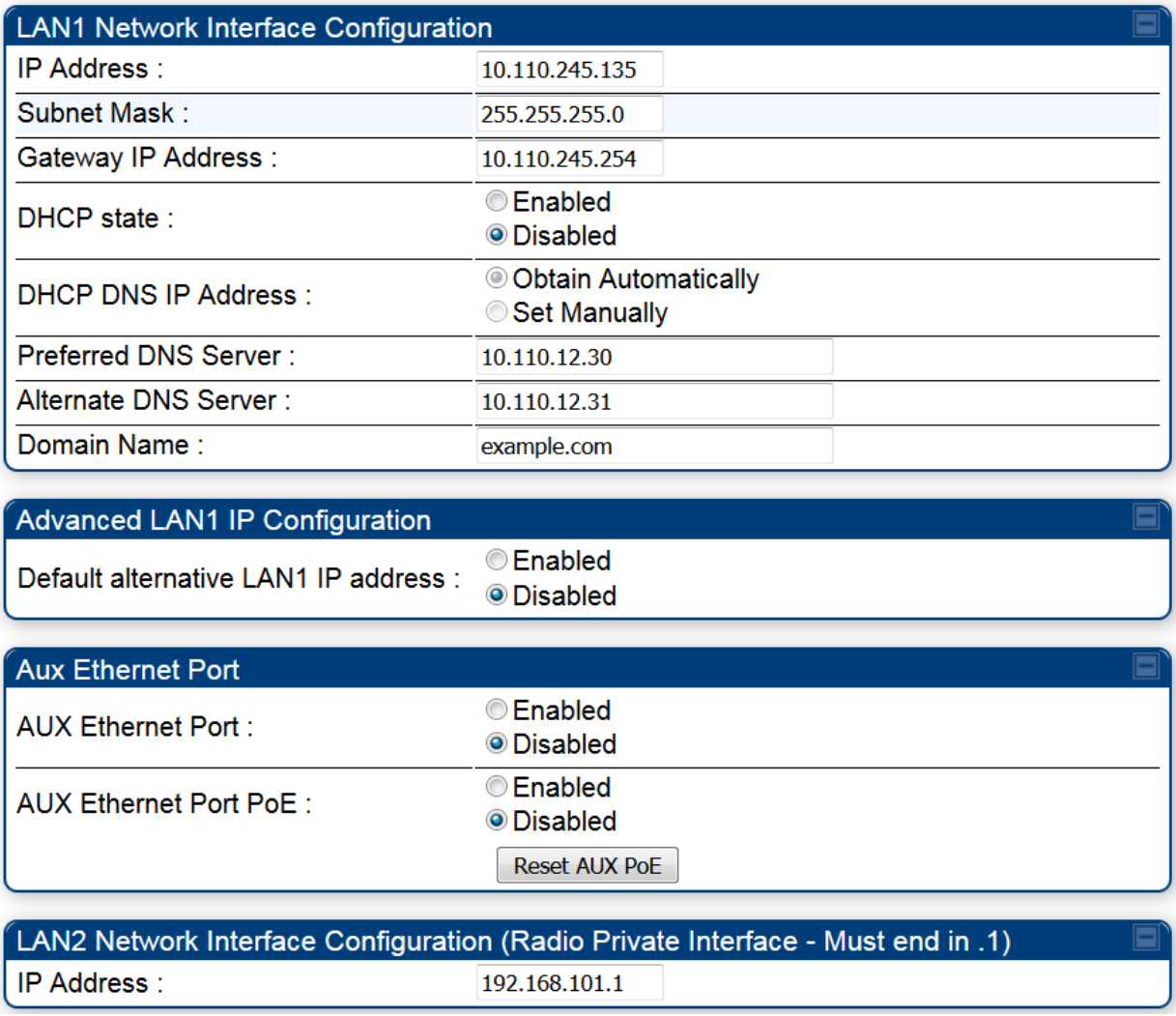
4 Click **Save**. "Reboot Required" message is displayed:



5 Click **Reboot**.

The IP page of AP/SM/BHM/BHS is explained in Table 115.

Table 115 IP interface attributes



Attribute	Meaning
IP Address	Internet Protocol (IP) address. This address is used by family of Internet protocols to uniquely identify this unit on a network.
Subnet Mask	Defines the address range of the connected IP network.
Gateway IP Address	The IP address of a computer on the current network that acts as a gateway. A gateway acts as an entrance and exit to packets from and to other networks.
DHCP state	If **Enabled** is selected, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable (read only), in the Network Interface tab of the Home page.
DNS IP Address	Canopy devices allow for configuration of a preferred and alternate DNS server IP address either automatically or manually. Devices must set DNS server IP address manually when DHCP is disabled for the

	management interface of the device. DNS servers may be configured automatically from the DHCP response when DHCP is enabled for the management interface of the device. Optionally devices may be configured to set the DNS server IP address manually when DHCP is enabled for the management interface. The default DNS IP addresses are 0.0.0.0 when configured manually.
Preferred DNS Server	The first address used for DNS resolution.
Alternate DNS Server	If the Preferred DNS server cannot be reached, the Alternate DNS Server is used.
Domain Name	The operator's management domain name may be configured for DNS. The domain name configuration can be used for configuration of the servers in the operator's network. The default domain name is example.com, and is only used if configured as such.
Advanced LAN1 IP Configuration – Default alternate LAN1 IP address	Hardcoded default alternate IP address (169.254.1.1) that is available only when connected to the Ethernet port. When enabled, user can configure a second IP address for the bridge which is other than the hardcoded IP address (169.254.1.1).
AUX Ethernet Port – AUX Ethernet Port	Enabled: Data is enabled for Auxiliary port Disabled: Data is disabled for Auxiliary port
AUX Ethernet Port – AUX Ethernet Port PoE	Enabled: PoE out is enable for Auxiliary port Disabled: PoE out is disabled for Auxiliary port
LAN2 Network Interface Configuration (Radio Private Interface) – IP Address	It is recommended not to change this parameter from the default AP/BHM private IP address of 192.168.101.1. A /24 CIDR subnet is used to communicate with each of the SMs/BHS that are registered. The AP/BHM uses a combination of the private IP and the LUID (logical unit ID) of the SM/BHS. It is only displayed for AP and BHM.

Table 116 SM/BHS private IP and LUID

SM/BHS	LUID	Private IP
First SM/BHS registered	2	192.168.101.2
Second SM/BHS registered	3	192.168.101.3

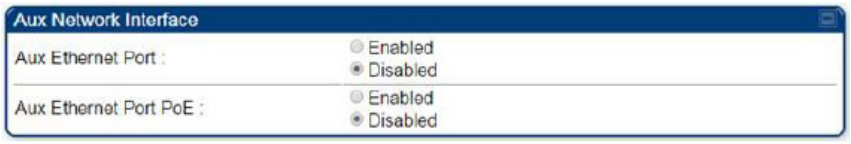
Auxiliary port

An additional Ethernet port labeled “Aux” for Auxiliary port is implemented for downstream traffic. This feature is supported only for PTP/PMP 450i ODUs.

To enable the Aux port, follow these instructions:

Procedure 17 Enabling Aux port interface

1 Select menu option **Configuration > IP > Aux Network Interface** tab.:



2 Click Enable button of Aux Ethernet Port parameter to enable Aux Ethernet port

3 Click Enable button of Aux Ethernet Port PoE parameter to enable Aux port PoE out.

4 Click **Save**. “Reboot Required” message is displayed.

5 Click **Reboot**.

Table 117 Aux port attributes

Attribute	Meaning
Aux Ethernet Port	Enabled: Data is enabled for Auxiliary port Disabled: Data is disabled for Auxiliary port
Aux Ethernet Port PoE	Enabled: PoE out is enable for Auxiliary port Disabled: PoE out is disabled for Auxiliary port

By disabling this feature, the data at the Auxiliary port will be disabled.

NAT, DHCP Server, DHCP Client and DMZ

Applicable products	**PMP:**	☑ SM

The system provides NAT (Network Address Translation) for SMs in the following combinations of NAT and DHCP (Dynamic Host Configuration Protocol):

- NAT Disabled
- NAT with DHCP Client (**DHCP** selected as the **Connection Type** of the WAN interface) and DHCP Server
- NAT with DHCP Client(**DHCP** selected as the **Connection Type** of the WAN interface)
- NAT with DHCP Server
- NAT without DHCP

NAT

NAT isolates devices connected to the Ethernet or wired side of a SM from being seen directly from the wireless side of the SM. With NAT enabled, the SM has an IP address for transport traffic (separate from its address for management), terminates transport traffic and allows you to assign a range of IP addresses to devices that are connected to the Ethernet or wired side of the SM.

In the Cambium system, NAT supports many protocols, including HTTP, ICMP (Internet Control Message Protocols), and FTP (File Transfer Protocol). For virtual private network (VPN) implementation, L2TP over IPSec (Level 2 Tunneling Protocol over IP Security) and PPTP (Point to Point Tunneling Protocol) are supported.

Note

When NAT is enabled, a reduction in throughput is introduced in the system (due to processing overhead).

DHCP

DHCP enables a device to be assigned a new IP address and TCP/IP parameters, including a default gateway, whenever the device reboots. Thus, DHCP reduces configuration time, conserves IP addresses, and allows modules to be moved to a different network within the Cambium system.

In conjunction with the NAT features, each SM provides the following:

- A DHCP server that assigns IP addresses to computers connected to the SM by Ethernet protocol.
- A DHCP client that receives an IP address for the SM from a network DHCP server.

DMZ

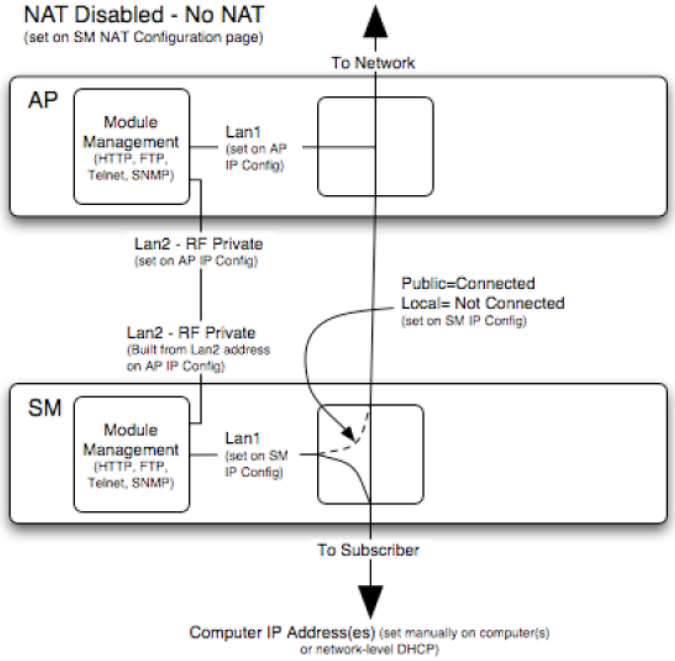
In conjunction with the NAT features, a DMZ (Demilitarized Zone) allows the allotment of one IP address behind the SM for a device to logically exist outside the firewall and receive network traffic. The first three octets of this IP address must be identical to the first three octets of the NAT private IP address.

- A DHCP server that assigns IP addresses to computers connected to the SM by Ethernet protocol.
- A DHCP client that receives an IP address for the SM from a network DHCP server.

NAT Disabled

The NAT Disabled implementation is illustrated in Figure 135.

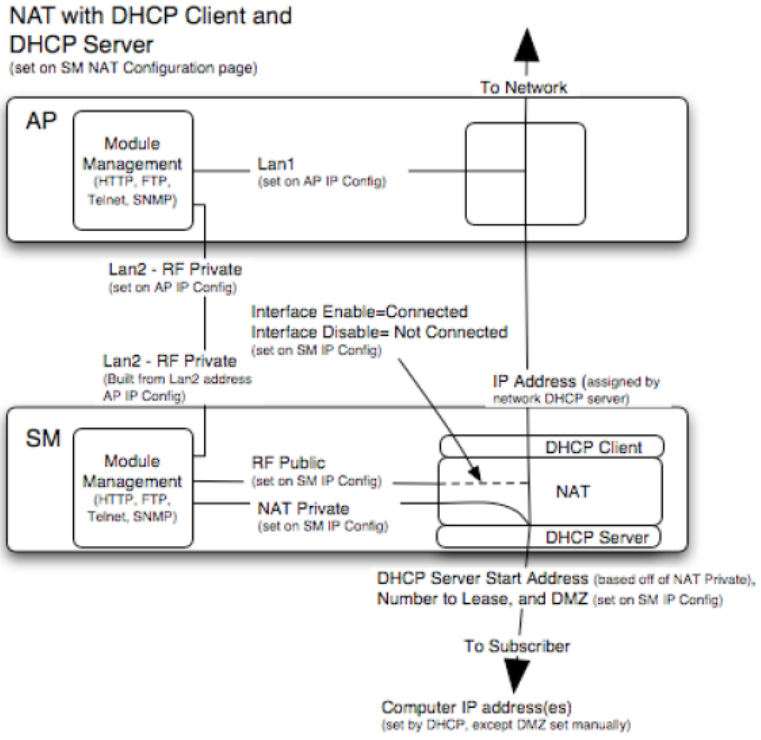
Figure 135 NAT disabled implementation



NAT with DHCP Client and DHCP Server

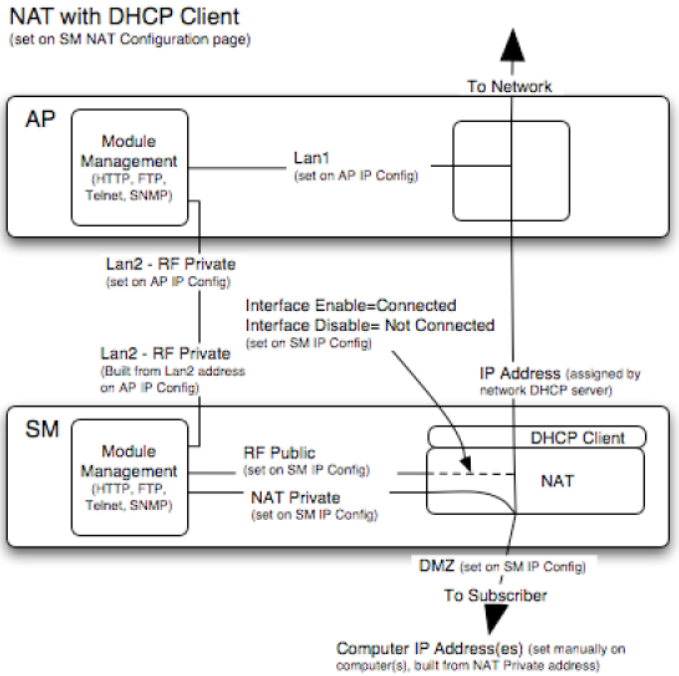
The NAT with DHCP Client and DHCP server is illustrated in Figure 136.

Figure 136 NAT with DHCP client and DHCP server implementation



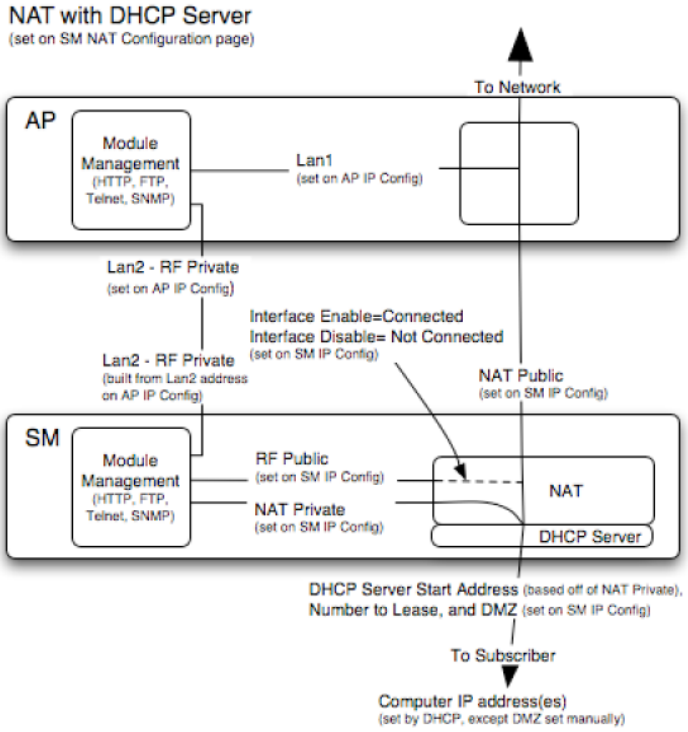
NAT with DHCP Client

Figure 137 NAT with DHCP client implementation



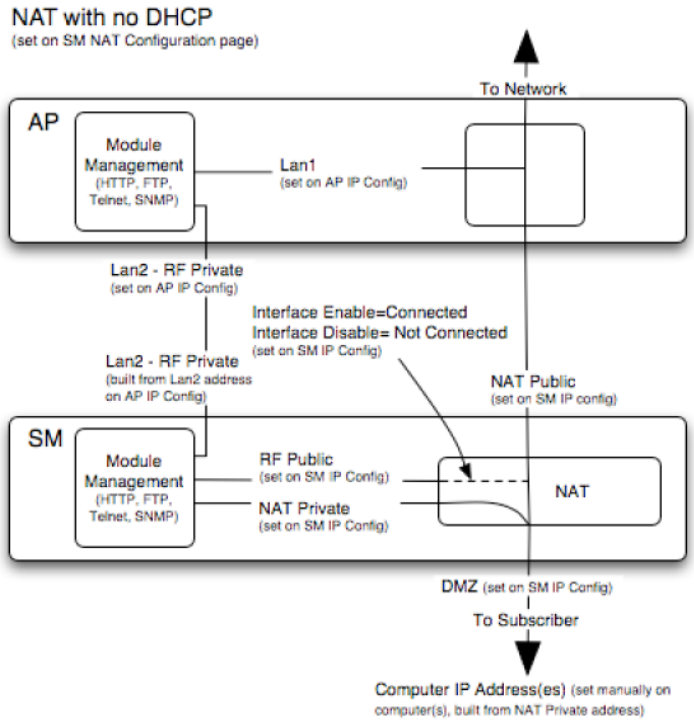
NAT with DHCP Server

Figure 138 NAT with DHCP server implementation



NAT without DHCP

Figure 139 NAT without DHCP implementation



NAT and VPNs

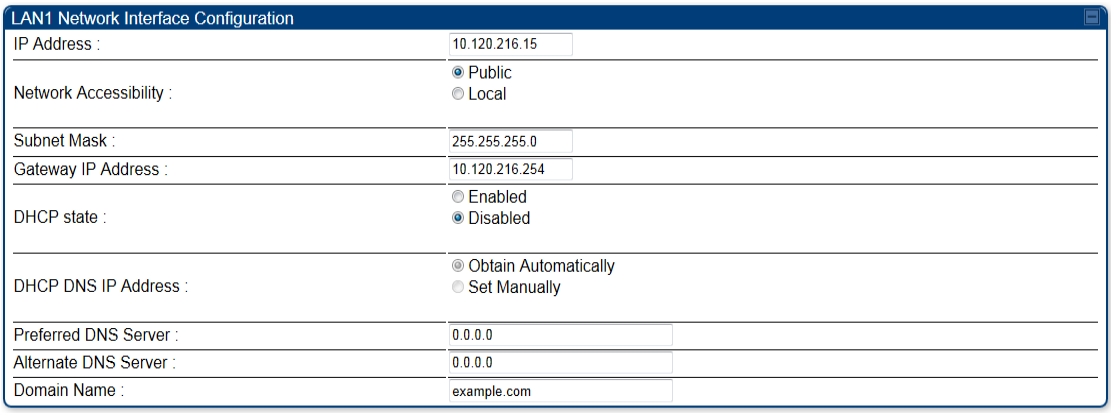
VPN technology provides the benefits of a private network during communication over a public network. One typical use of a VPN is to connect employees remotely (who are at home or in a different city), with their corporate network through a public Internet. Any of several VPN implementation schemes is possible. By design, NAT translates or changes addresses, and thus interferes with a VPN that is not specifically supported by a given NAT implementation.

With NAT enabled, SM supports L2TP over IPSec (Level 2 Tunneling Protocol over IP Security) VPNs and PPTP (Point to Point Tunneling Protocol) VPNs. With NAT disabled, SM supports all types of VPNs.

IP interface with NAT disabled - SM

The IP page of SM with NAT disabled is explained in Table 118.

Table 118 IP attributes - SM with NAT disabled



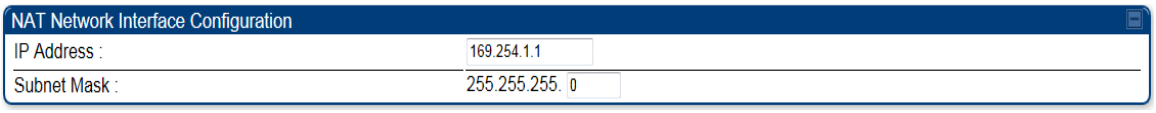
Attribute	Meaning
IP Address	Enter the non-routable IP address to associate with the Ethernet connection on this SM. (The default IP address from the factory is 169.254.1.1.) If you forget this parameter, you must both: • physically access the module. • use recovery mode to access the module configuration parameters at 169.254.1.1. See Radio recovery mode on page 1-26 **Note** Note or print the IP settings from this page. Ensure that you can readily associate these IP settings both with the module and with the other data that you store about the module.
Network Accessibility	Specify whether the IP address of the SM must be visible to only a device connected to the SM by Ethernet (**Local**) or be visible to the AP/BHM as well (**Public**).
Subnet Mask	Enter an appropriate subnet mask for the SM to communicate on the network. The default subnet mask is 255.255.0.0.
Gateway IP Address	Enter the appropriate gateway for the SM to communicate with the network. The default gateway is 169.254.0.0.
DHCP state	If you select **Enabled**, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable, but not settable, in the Network Interface tab of the Home page.

	In this tab, DHCP State is settable only if the **Network Accessibility** parameter in the IP tab is set to **Public**. This parameter is also settable in the NAT tab of the Configuration web page, but only when NAT is enabled. If the **DHCP state** parameter is set to **Enabled** in the **Configuration > IP** sub-menu of the SM/BHS, do not check the **BootpClient** option for **Packet Filter Types** in its Protocol Filtering tab, because doing so can block the DHCP request. (Filters apply to all packets that leave the SM via its RF interface, including those that the SM itself generates.) If you want to keep DHCP enabled and avoid the blocking scenario, select the **Bootp Server** option instead. This will result in responses being appropriately filtered and discarded.
DHCP DNS IP Address	Canopy devices allow for configuration of a preferred and alternate DNS server IP address either automatically or manually. Devices must set DNS server IP address manually when DHCP is disabled for the management interface of the device. DNS servers may be configured automatically from the DHCP response when DHCP is enabled for the management interface of the device. Optionally devices may be configured to set the DNS server IP address manually when DHCP is enabled for the management interface. The default DNS IP addresses are 0.0.0.0 when configured manually.
Preferred DNS Server	The first DNS server used for DNS resolution.
Alternate DNS Server	The second DNS server used for DNS resolution.
Domain Name	The operator's management domain name may be configured for DNS. The domain name configuration can be used for configuration of the servers in the operator's network. The default domain name is example.com, and is only used if configured as such.

IP interface with NAT enabled - SM

The IP page of SM with NAT enabled is explained in Table 119.

Table 119 IP attributes - SM with NAT enabled

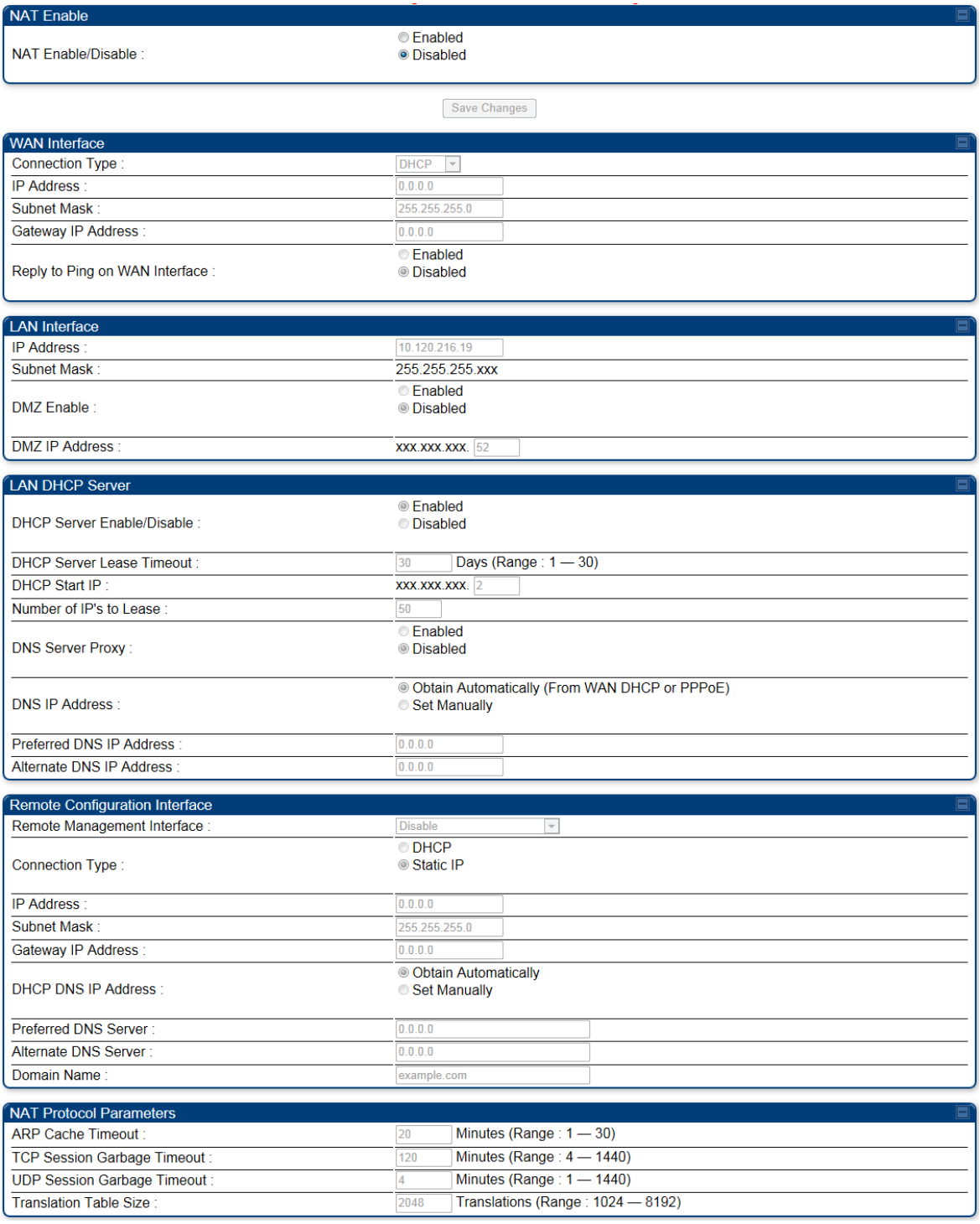


Attribute	Meaning
IP Address	Assign an IP address for SM/BHS management through Ethernet access to the SM/BHS. Set only the first three bytes. The last byte is permanently set to 1. This address becomes the base for the range of DHCP-assigned addresses.
Subnet Mask	Assign a subnet mask of 255.255.255.0 or a more restrictive subnet mask. Set only the last byte of this subnet mask. Each of the first three bytes is permanently set to 255.

NAT tab with NAT disabled - SM

The NAT tab of SM with NAT disabled is explained in Table 120.

Table 120 NAT attributes - SM with NAT disabled



Attribute	Meaning
NAT Enable/Disable	This parameter enables or disables the Network Address Translation (NAT) feature for the SM. NAT isolates devices connected to the Ethernet or wired side of a SM from being seen directly from the wireless side of the SM. With NAT enabled, the SM has an IP address for transport traffic separate from its address for management, terminates transport traffic, and allows you to assign a range of IP addresses to devices that are connected to the Ethernet or wired side of the SM. When NAT is enabled, VLANs are not supported on the wired side of that SM. You can enable NAT in SMs within a sector where VLAN is enabled in the AP/BHM, but this may constrain network design.
IP Address	This field displays the IP address for the SM. DHCP Server *will not* automatically assign this address when NAT is disabled.
Subnet Mask	This field displays the subnet mask for the SM. DHCP Server *will not* automatically assign this address when NAT is disabled.
Gateway IP Address	This field displays the gateway IP address for the SM. DHCP Server *will not* automatically assign this address when NAT is disabled.
ARP Cache Timeout	If a router upstream has an ARP cache of longer duration (as some use 30 minutes), enter a value of longer duration than the router ARP cache. The default value of this field is 20 minutes.
TCP Session Garbage Timeout	Where a large network exists behind the SM, you can set this parameter to lower than the default value of 120 minutes. This action makes additional resources available for greater traffic than the default value accommodates.
UDP Session Garbage Timeout	You may adjust this parameter in the range of 1 to 1440 minutes, based on network performance. The default value of this parameter is 4 minutes.
Translation Table Size	Total number of minutes that have elapsed since the last packet transfer between the connected device and the SM/BHS.

Note

When NAT is disabled, the following parameters are not required to be configurable:

WAN Inter face > Connection Type, IP Address, Subnet Mask, Gateway IP address

LAN Interface > IP Address

LAN DHCP Server > DHCP Server Enable/Disable, DHCP Server Lease Timeout, Number of IP's to Lease, DNS Server Proxy, DNS IP Address, Preferred DNS IP address, Alternate DNS IP address

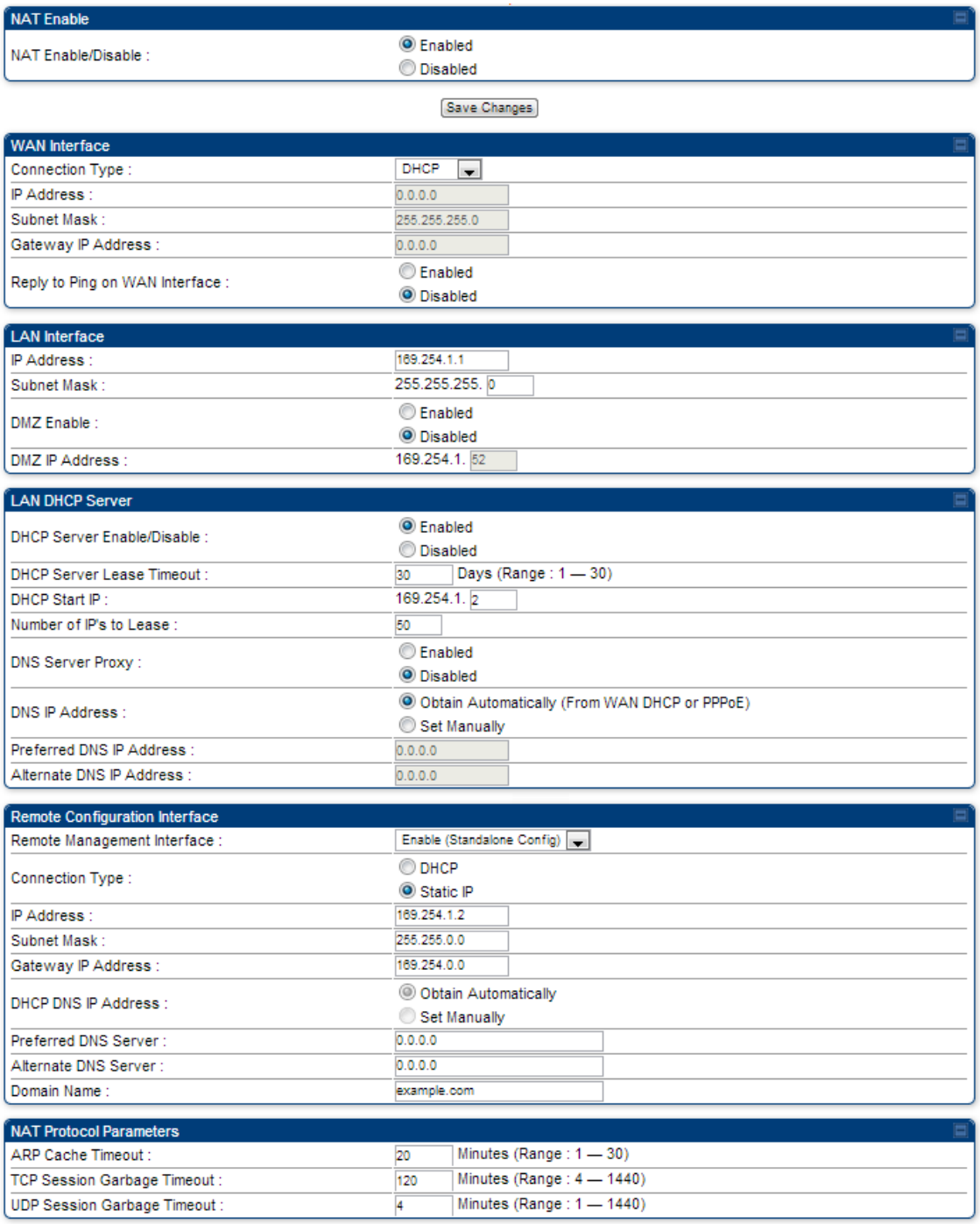
Remote Management Interface > Remote Management Interface, IP address, Subnet Mask, DHCP DNS IP Address, Preferred DNS Server, Alternate DNS Server, Domain Name

NAT Protocol Parameters > ARP Cache Timeout, TCP Session Garbage Timeout, UDP Session Garbage Timeout, Translation Table Size

NAT tab with NAT enabled - SM

The NAT tab of SM with NAT enabled is explained in Table 121.

Table 121 NAT attributes - SM with NAT enabled



Attribute	Meaning
NAT Enable/Disable	This parameter enables or disabled the Network Address Translation (NAT) feature for the SM. NAT isolates devices connected to the Ethernet or wired side of a SM from being seen directly from the wireless side of the SM. With NAT enabled, the SM has an IP address for transport traffic separate from its address for management, terminates transport traffic, and allows you to assign a range of IP addresses to devices that are connected to the Ethernet or wired side of the SM. When NAT is enabled, VLANs are not supported on the wired side of that SM. You can enable NAT in SMs within a sector where VLAN is enabled in the AP, but this may constrain network design.
WAN Interface	The WAN interface is the RF-side address for transport traffic.
Connection Type	This parameter may be set to **Static IP**—when this is the selection, all three parameters (**IP Address**, **Subnet Mask**, and **Gateway IP Address**) must be properly populated. **DHCP**—when this is the selection, the information from the DHCP server configures the interface. **PPPoE**—when this is the selection, the information from the PPPoE server configures the interface.
Subnet Mask	If **Static IP** is set as the **Connection Type** of the WAN interface, then this parameter configures the subnet mask of the SM for RF transport traffic.
Gateway IP Address	If **Static IP** is set as the **Connection Type** of the WAN interface, then this parameter configures the gateway IP address for the SM for RF transport traffic.
Reply to Ping on WAN Interface	By default, the radio interface *does not* respond to pings. If you use a management system (such as WM) that will occasionally ping the SM, set this parameter to **Enabled**.
LAN Interface	The LAN interface is both the management access through the Ethernet port and the Ethernet-side address for transport traffic. When NAT is enabled, this interface is redundantly shown as the **NAT Network Interface Configuration** on the IP tab of the Configuration web page in the SM.
IP Address	Assign an IP address for SM/BHS management through Ethernet access to the SM. This address becomes the base for the range of DHCP-assigned addresses.
Subnet Mask	Assign a subnet mask of 255.255.255.0 or a more restrictive subnet mask. Set only the last byte of this subnet mask. Each of the first three bytes is permanently set to 255.
DMZ Enable	Either enable or disable DMZ for this SM/BHS.

DMZ IP Address	If you enable DMZ in the parameter above, set the last byte of the DMZ host IP address to use for this SM when DMZ is enabled. Only one such address is allowed. The first three bytes are identical to those of the NAT private IP address. Ensure that the device that receives network traffic behind this SM is assigned this address. The system provides a warning if you enter an address within the range that DHCP can assign.
DHCP Server	This is the server (in the SM) that provides an IP address to the device connected to the Ethernet port of the SM.
DHCP Server Enable/Disable	Select either **Enabled** or **Disabled**. **Enable** to: • Allow this SM to assign IP addresses, subnet masks, and gateway IP addresses to attached devices. • Assign a start address for DHCP. • Designate how many IP addresses may be temporarily used (leased). **Disable** to: • Restrict SM/BHS from assigning addresses to attached devices.
DHCP Server Lease Timeout	Based on network performance, enter the number of days between when the DHCP server assigns an IP address and when that address expires. The range of values for this parameter is 1 to 30 days. The default value is 30 days.
DHCP Start IP	If you enable DHCP Server below, set the last byte of the starting IP address that the DHCP server assigns. The first three bytes are identical to those of the NAT private IP address.
Number of IPs to Lease	Enter how many IP addresses the DHCP server is allowed to assign. The default value is 50 addresses.
DNS Server Proxy	This parameter enables or disables advertisement of the SM/BHS as the DNS server. On initial boot up of a SM with the NAT WAN interface configured as DHCP or PPPoE, the SM module will not have DNS information immediately. With **DNS Server Proxy** disabled, the clients will renew their lease about every minute until the SM has the DNS information to give out. At this point the SM will go to the full configured lease time period which is 30 days by default. With **DNS Server Proxy** enabled, the SM will give out full term leases with its NAT LAN IP as the DNS server.
DNS IP Address	Select either: **Obtain Automatically** to allow the system to set the IP address of the DNS server *or* **Set Manually** to enable yourself to set both a preferred and an alternate DNS IP address.
Preferred DNS IP Address	Enter the preferred DNS IP address to use when the **DNS IP Address** parameter is set to **Set Manually**.

Alternate DNS IP Address	Enter the DNS IP address to use when the **DNS IP Address** parameter is set to **Set Manually** and no response is received from the preferred DNS IP address.
Remote Management Interface	To offer greater flexibility in IP address management, the NAT-enabled SM's configured WAN Interface IP address may now be used as the device Remote Management Interface (unless the SM's PPPoE client is set to Enabled) **Disable**: When this interface is set to "Disable", the SM is not directly accessible by IP address. Management access is only possible through either the LAN (Ethernet) interface or a link from an AP web page into the WAN (RF-side) interface. **Enable (Standalone Config)**: When this interface is set to "Enable (Standalone Config)", to manage the SM/BHS the device must be accessed by the IP addressing information provided in the Remote Configuration Interface section. **Note** When configuring PPPoE over the link, use this configuration option (PPPoE traffic is routed via the IP addressing specified in section Remote Configuration Interface). **Enable (Use WAN Interface)**: When this interface is set to "Enable (Use WAN Interface)", the Remote Configuration Interface information is greyed out, and the SM is managed via the IP addressing specified in section WAN Interface). **Note** When using this configuration, the ports defined in section Configuration, Port Configuration are consumed by the device. For example, if **FTP Port** is configured as 21 by the SM, an FTP server situated below the SM must use a port other than 21. This also applies to DMZ devices; any ports specified in section Configuration, Port Configuration will not be translated through the NAT, they are consumed by the device's network stack for management.
Connection Type	This parameter can be set to: **Static IP**—when this is the selection, all three parameters (**IP Address**, **Subnet Mask**, and **Gateway IP Address**) must be properly populated. **DHCP**—when this is the selection, the information from the DHCP server configures the interface.
IP Address	If **Static IP** is set as the **Connection Type** of the WAN interface, then this parameter configures the IP address of the SM for RF management traffic.
Subnet Mask	If **Static IP** is set as the **Connection Type** of the WAN interface, then this parameter configures the subnet mask of the SM for RF management traffic.

Gateway IP Address	If **Static IP** is set as the **Connection Type** of the WAN interface, then this parameter configures the gateway IP address for the SM for RF management traffic. Note or print the IP settings from this page. Ensure that you can readily associate these IP settings both with the module and with the other data that you store about the module.
DHCP DNS IP Address	Select either: **Obtain Automatically** to allow the system to set the IP address of the DNS server. *or* **Set Manually** to enable yourself to set both a preferred and an alternate DNS IP address.
Preferred DNS Server	Enter the preferred DNS IP address to use when the **DNS IP Address** parameter is set to **Set Manually**.
Alternate DNS Server	Enter the DNS IP address to use when the **DNS IP Address** parameter is set to **Set Manually** and no response is received from the preferred DNS IP address.
Domain Name	Domain Name to use for management DNS configuration. This domain name may be concatenated to DNS names used configured for the remote configuration interface.
ARP Cache Timeout	If a router upstream has an ARP cache of longer duration (as some use 30 minutes), enter a value of longer duration than the router ARP cache. The default value of this field is *20* (minutes).
TCP Session Garbage Timeout	Where a large network exists behind the SM, you can set this parameter to lower than the default value of *120* (minutes). This action makes additional resources available for greater traffic than the default value accommodates.
UDP Session Garbage Timeout	You may adjust this parameter in the range of 1 to 1440 minutes, based on network performance. The default value of this parameter is *4* (minutes).

NAT DNS Considerations - SM

SM DNS behavior is different depending on the accessibility of the SM. When NAT is enabled the DNS configuration that is discussed in this document is tied to the RF Remote Configuration Interface, which must be enabled to utilize DNS Client functionality. Note that the WAN DNS settings when NAT is enabled are unchanged with the addition of the management DNS feature discussed in this document.

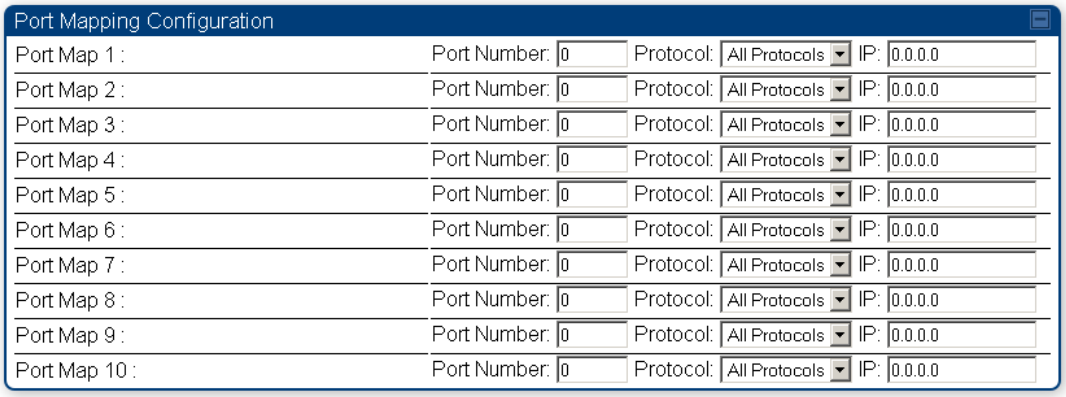
Table 122 SM DNS Options with NAT Enabled

NAT Configuration	Management Interface Accessibility	DHCP Status	DNS Status
NAT Enabled	RF Remote Management Interface Disabled	N/A	DNS Disabled
	RF Remote Management Interface Enabled	DHCP Disabled	DNS Static Configuration
		DHCP Enabled	DNS from DHCP or DNS Static Configuration

NAT Port Mapping tab - SM

The NAT Port Mapping tab of the SM is explained in Table 123.

Table 123 NAT Port Mapping attributes - SM



Attribute	Meaning
Port Map *1 to 10*	Separate parameters allow you to distinguish NAT ports from each other by assigning a unique combination of port number, protocol for traffic through the port, and IP address for access to the port

DHCP – BHS

Applicable products	PTP: ☑ BHM

DHCP enables a device to be assigned a new IP address and TCP/IP parameters, including a default gateway, whenever the device reboots. Thus, DHCP reduces configuration time, conserves IP addresses, and allows modules to be moved to a different network within the Cambium system.

In conjunction with the NAT features, each BHS provides:

- A DHCP server that assigns IP addresses to computers connected to the BHS by Ethernet protocol.
- A DHCP client that receives an IP address for the BHS from a network DHCP server.

Reconnecting to the management PC

If the IP Address, Subnet Mask and Gateway IP Address of the unit have been updated to meet network requirements, then reconfigure the local management PC to use an IP address that is valid for the network. See Configuring the management PC on page 7-3.

Once the unit reboots, log in using the new IP address. See Logging into the web interface on page 7-5.

VLAN configuration for PMP

Applicable products	PMP: ☑ AP ☑ SM

VLAN Remarking

VLAN Remarking feature allows the user to change the VLAN ID and priority of both upstream and downstream packets at the Ethernet Interface. The remarking configuration is available for:

1. VLAN ID re-marking
2. 802.1p priority re-marking

Note

For Q-in-Q VLAN tagged frame, re-marking is performed on the outer tag.

VLAN ID Remarking

SM supports the ability to re-mark the VLAN ID on both upstream and downstream VLAN frames at the Ethernet interface. For instance, a configuration can be added to re-mark VLAN ID ‘x’ to VLAN ID ‘y’ as shown in Table 124. AP does not support VLAN ID remarking.

Table 124 VLAN Remarking Example

VLAN frame direction	Remarking
Upstream	SM receives VLAN ID ‘x’ frame at the Ethernet interface, checks the configuration and re-marks to VLAN ID ‘y’. So VLAN ID ‘y’ frame comes out of AP’s Ethernet interface. When SM re-marks, a dynamic entry in VLAN membership table for ‘y’ is added to allow reception of VLAN ID ‘y’ downstream packet.
Downstream	AP receives VLAN ID ‘y’ frame at the Ethernet interface and sends to SM. SM accepts the frame as it has an entry in the membership table and re-marks to VLAN ID ‘x’. This reverse re- marking is necessary because the downstream devices do not know of re-marking and are expecting VLAN ‘x’ frames. This remarking is done just before sending the packet out on Ethernet interface.

802.1P Remarking

AP/BHM and SM/BHS allow re-marking of 802.1p priority bits for the frames received at the Ethernet interface. Priority bits are not re-marked for the packets sent out of Ethernet interface (reverse direction).

Configuration must be added at SM/BHS for upstream frames and at AP/BHM for downstream frames.

VLAN Priority Bits configuration

VLAN Priority Bits Configuration feature allows the user to configure the three 802.1p bits upon assigning VLAN to an ingress packet. The priority bits configuration is available for:

- Default Port VID
- Provider VID
- MAC Address mapped Port VID
- Management VID

Default Port VID

This VID is used for untagged frames and will correspond to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is QinQ).

The priority bits used in the Q-tag/C-tag are configurable.

The configuration can be:

- **Promote IPv4/IPv6 priority** – The priority in the IP header is copied to the Q-tag/C-tag.
- **Define priority** – Specify the priority in the range of 0 to 7. This value is used as priority in the Q-tag/C-tag.

MAC Address Mapped VID

If a packet arrives at the SM/BHS that is sourced from a device whose MAC address is in the table, then the corresponding VID is used for that frame's Q-tag (Q port) or C-tag (QinQ port). The priority bits used in the Q-tag/C-tag are configurable similar to default port VID.

Provider VID

The provider VID is used for the S-tag. The priority bits used in the S-tag are configurable similar to default port VID. Provider VID has an extra priority configuration:

- **Copy inner tag 802.1p priority** – The priority in the C-tag is copied to the S-tag.

Management VID

This VID is used to communicate with AP/BHM and SM/BHS for management purposes. The priority bits used in the Q-tag are configurable similar to default port VID.

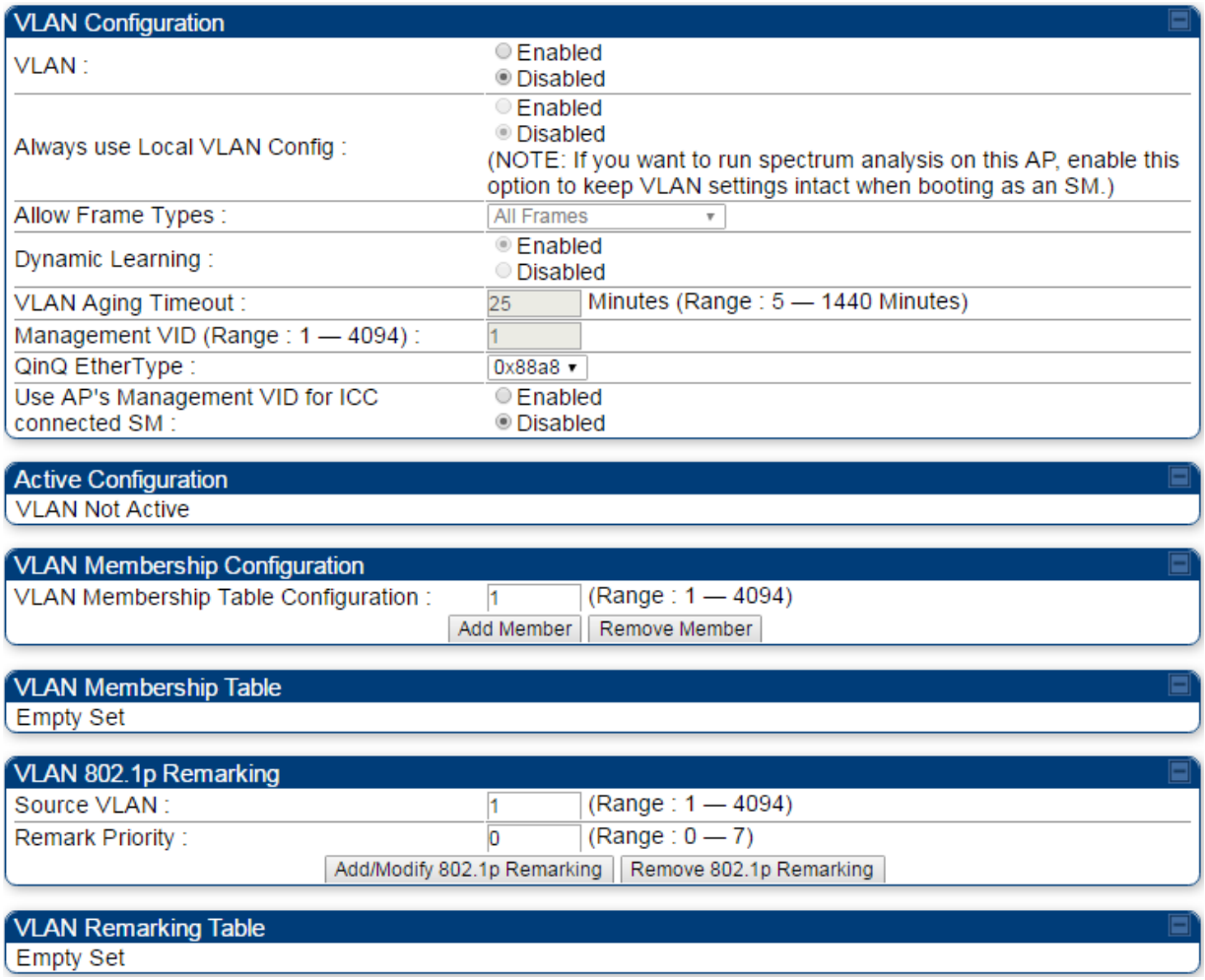
Use AP's Management VID for ICC connected SM

This feature allows the SM to use the AP's management VLAN ID when the SM is registered to the AP via ICC. This feature is useful for the customer who uses a different management VID for the SM and AP and Zero Touch feature is enabled for configuration. This parameter may be accessed via the **Configuration > VLAN** page on the AP's web management interface.

VLAN page of AP

The **VLAN** tab of the AP/BHM is explained in Table 125.

Table 125 AP/BHM VLAN tab attributes



Attribute	Meaning
VLAN	Specify whether VLAN functionality for the AP and all linked SMs must (**Enabled**) or may not (**Disabled**) be allowed. The default value is **Disabled**.
Always use Local VLAN Config	Enable this option before you reboot this AP as a SM to use it to perform spectrum analysis. Once the spectrum analysis completes, disable this option before you reboot the module as an AP,
Allow Frame Types	Select the type of arriving frames that the AP must tag, using the VID that is stored in the **Untagged Ingress VID** parameter. The default value is **All Frames**.
Dynamic Learning	Specify whether the AP must (**Enabled**) or not (**Disabled**) add the VLAN IDs (VIDs) of upstream frames to the VID table. (The AP passes frames with VIDs that are stored in the table both upstream and downstream.). The default value is **Enabled**.

<table>
<tr><th>Attribute</th><th>Meaning</th></tr>
<tr><td>VLAN Aging Timeout</td><td>Specify how long the AP must keep dynamically learned VIDs. The range of values is 5 to 1440 (minutes). The default value is 25 (minutes).

 
Note
VIDs that you enter for the Management VID and VLAN Membership parameters do not time out.</td></tr>
<tr><td>Management VID</td><td>Enter the VID that the operator wishes to use to communicate with the module manager. The range of values is 1 to 4095. The default value is 1.</td></tr>
<tr><td>QinQ EtherType</td><td>Modules can be configured with 802.1ad Q-in-Q DVLAN (Double-VLAN) tagging which is a way for an operator to put an 802.1Q VLAN inside of an 802.1ad VLAN. A nested VLAN, which is the original 802.1Q tag and a new second 802.1ad tag, allows for bridging of VLAN traffic across a network and segregates the broadcast domains of 802.1Q VLANs. Q-in-Q can be used with PPPoE and/or NAT.

The 802.1ad standard defines the S-VLAN as the Service Provider VLAN and the C-VLAN as the customer VLAN. The radio software does 2 layer Q-in-Q whereby the C-VLAN is the 802.1Q tag and the S-VLAN is the second layer Q tag as shown below:

Table 126 Q-in-Q Ethernet frame
<table><tr><td>Ethernet Header</td><td>S-VLAN EthType 0x88a8</td><td>C-VLAN EthType 0x8100</td><td>IP Data EthType 0x0800</td></tr></table>
The 802.1ad S-VLAN is the outer VLAN that is configurable on the Configuration > VLAN web page of the AP. The Q-in-Q EtherType parameter is configured with a default EtherType of 0x88a8 in addition to four alternate EtherTypes that can be configured to aid in interoperability with existing networks that use a different EtherType than the default.

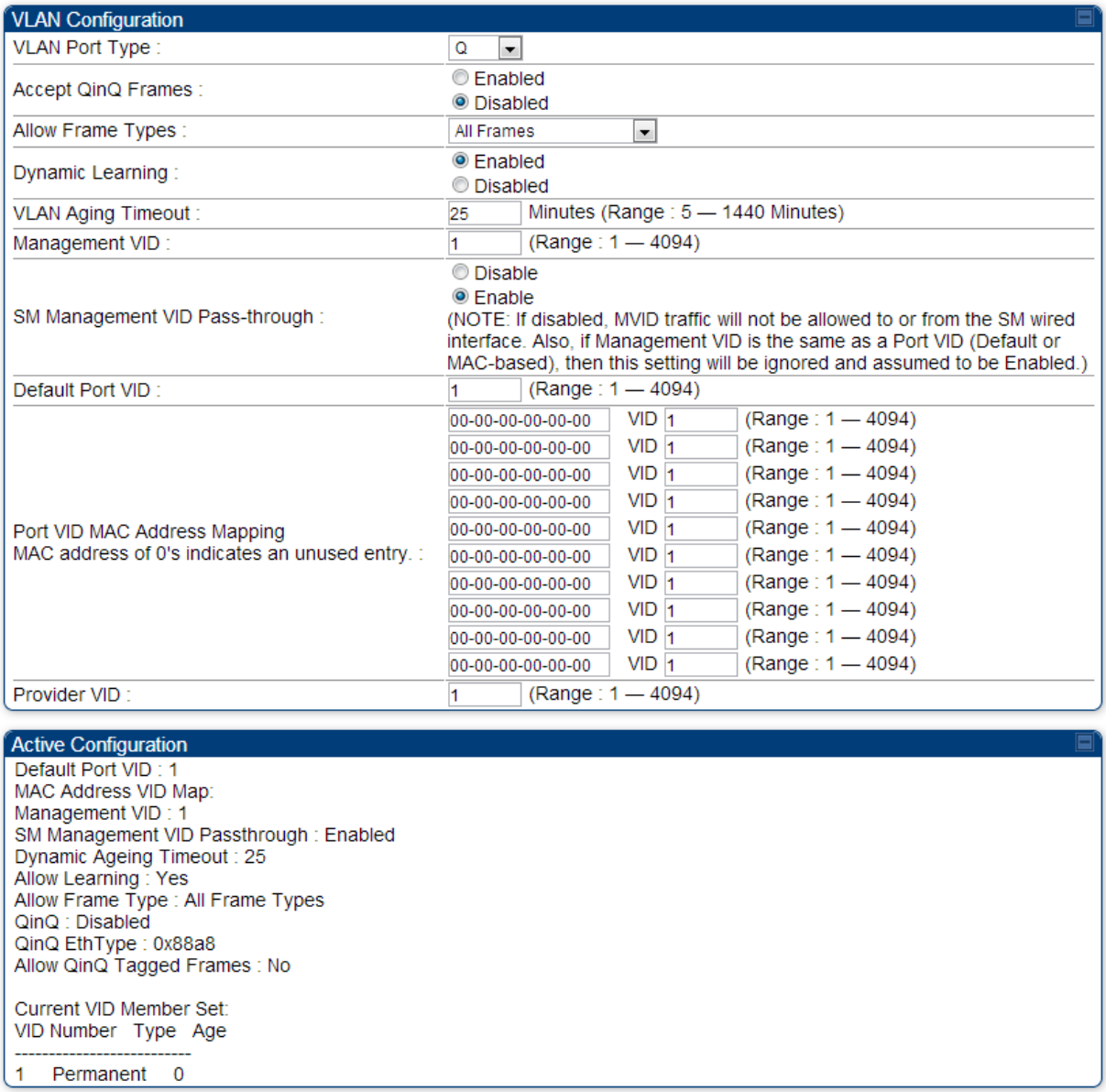
The C-VLAN is the inner VLAN tag, which is the same as 802.1Q. As a top-level concept, this operates on the outermost tag at any given time, either “pushing” a tag on or “popping” a tag off. This means packets will at most transition from an 802.1Q frame to an 801.ad frame (with a tag “pushed” on) or an untagged 802.1 frame (with the tag “popped” off. Similarly, for an 802.1ad frame, this can only transition from an 802.1ad frame to an 802.1Q frame (with the tag “popped” off) since the radio software only supports 2 levels of tags.</td></tr>
<tr><td>Use AP's Management VID for ICC connected SM</td><td>This field allows the SM to use the AP’s management VLAN ID when the SM is registered to the AP via ICC.</td></tr>
</table>

VLAN Not Active	When VLAN is enabled in the AP, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.
VLAN Membership Table Configuration	For each VLAN in which you want the AP to be a member, enter the VLAN ID and then click the **Add Member** button. Similarly, for any VLAN in which you want the AP to no longer be a member, enter the VLAN ID and then click the **Remove Member** button.
VLAN Membership table	This field lists the VLANs that an AP is a member of. As the user adds a number between 1 and 4094, this number is populated here.
Source VLAN (Range: 1-4094)	Enter the VID for which the operator wishes to remark the 802.1p priority for the downstream packets. The range of values is 1 to 4094. The default value is 1.
Remark Priority (Range 0-7)	This is the priority you can assign to the VLAN Tagged packet. Priority of 0 is the highest.
VLAN Remarking table	As the user enters a VLAN and a Remarking priority, this information is added in this table.

VLAN page of SM

The **VLAN** tab of SM/BHS is explained in Table 127.

Table 127 SM VLAN attributes



Attribute	Meaning
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the SM/BHS. Currently, the internal management interfaces will always operate as Q ports.

Accept QinQ Frames	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.
Allow Frame Types	Select the type of arriving frames that the SM must tag, using the VID that is stored in the **Untagged Ingress VID** parameter. The default value is **All Frames**. **Tagged Frames Only**: The SM only tags incoming VLAN-tagged frames **Untagged Frames Only**: The SM will only tag incoming untagged frames
Dynamic Learning	Specify whether the SM must (**Enable**) or not (**Disable**) add the VIDs of upstream frames (that enter the SM through the wired Ethernet interface) to the VID table. The default value is **Enable**.
VLAN Aging Timeout	Specify how long the SM/BHS must keep dynamically learned VIDs. The range of values is 5 to 1440 (minutes). The default value is *25* (minutes).  **Note** VIDs that you enter for the Untagged Ingress VID and Management VID parameters do not time out.
Management VID	Enter the VID that the SM/BHS must share with the AP/BHM. The range of values is 1 to 4095. The default value is **1**.
SM Management VID Pass-through	Specify whether to allow the SM/BHS (**Enabled**) or the AP/RADIUS (**Disabled**) to control the VLAN settings of this SM. The default value is **Enabled**. When VLAN is enabled in the AP to whom this SM is registered, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not. If disabled, MVID traffic is not allowed to or from the SM wired interface. Also, if Management VID is the same as a Port VID (Default or MAC-based), then this setting is ignored and assumed to be Enabled.
Default Port VID	This is the VID that is used for untagged frames and will correspond to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in- Q).

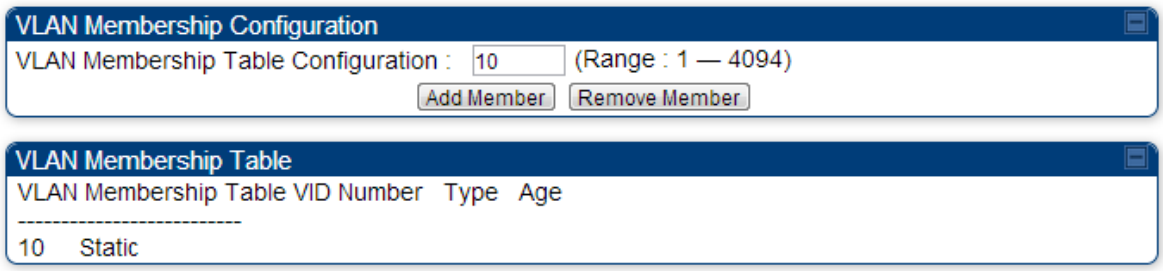
Port VID MAC Address Mapping	These parameters allow operators to place specific devices onto different VLANs (802.1Q tag or 802.1ad C-tag) based on the source MAC address of the packet. If the MAC address entry is 00-00-00-00-00-00 then that entry is not used. If a packet arrives at the SM that is sourced from a device whose MAC address is in the table, then the corresponding VID is used for that frame's Q-tag (Q port) or C-tag (Q-in-Q port). If there is no match, then the Default Port VID is used. This table is also used in the downstream direction for removal of the tag based on the destination MAC address so that an untagged (for Q port) or Q-Tagged (for Q-in-Q port) frame is delivered to the end device. You may use wildcards for the non-OUI (Organizationally Unique Identifier) portion of the MAC address, which is the last 3 bytes. MAC addresses contain 6 bytes, the first 3 of which are the OUI of the vendor that manufactured the device and the last 3 are unique to that vendor OUI. If you want to cover all devices from a known vendor's OUI, you have to specify 0xFF for the remaining 3 bytes. So, for example, if you wanted all devices from a specific vendor with an OUI of 00-95-5b (which is a Netgear OUI) to be on the same VID of 800, you have to specify an entry with MAC address 00-95-5b-ff-ff-ff. Then, any device underneath of the SM with MAC addresses starting with 00-95-5b is put on VLAN 800.
Provider VID	The provider VID is used for the S-tag. It is only used if the **Port Type** is **Q-in-Q** and will always be used for the S-tag. If an existing 802.1Q frame arrives, the **Provider VID** is what is used for adding and removing of the outer S-tag. If an untagged frame arrives to a Q-in-Q port, then the **Provider VID** is the S-tag and the **Default Port VID** (or **Port VID MAC Address Mapping**, if valid) is used for the C-tag.
Active Configuration, Default Port VID	This is the value of the parameter of the same name, configured above.
Active Configuration, MAC Address VID Map	This is the listing of the MAC address VIDs configured in **Port VID MAC Address Mapping**.
Active Configuration, Management VID	This is the value of the parameter of the same name, configured above.
Active Configuration, SM Management VID Pass-Through	This is the value of the parameter of the same name, configured above.
Active Configuration, Dynamic Aging Timeout	This is the value of the **VLAN Aging Timeout** parameter configured above.
Active Configuration, Allow Learning	**Yes** is displayed if the value of the **Dynamic Learning** parameter above is **Enabled**. No is displayed if the value of **Dynamic Learning** is **Disabled**.

Active Configuration, Allow Frame Type	This displays the selection that was made from the drop-down list at the **Allow Frame Types** parameter above.
Active Configuration, QinQ	This is set to **Enabled** if **VLAN Port Type is** set to **QinQ**, and is set to **Disabled** if **VLAN Port Type** is set to **Q**.
Active Configuration, QinQ EthType	This is the value of the QinQ EtherType configured in the AP.
Active Configuration, Allow QinQ Tagged Frames	This is the value of **Accept QinQ Frames**, configured above.
Active Configuration, Current VID Member Set, VID Number	This column lists the ID numbers of the VLANs in which this module is a member, whether through assignment or through dynamic learning.
Active Configuration, Current VID Member Set, Type	For each VID number in the first column, the entry in this column correlates the way in which the module became and continues to be a member: **Permanent**—This indicates that the module was assigned the VID number through direct configuration by the operator. **Dynamic**—This indicates that the module adopted the VID number through enabled dynamic learning, when a tagged packet from a SM behind it in the network or from a customer equipment that is behind the SM in this case, was read.
Active Configuration, Current VID Member Set, Age	For each VID number in the first column of the table, the entry in this column reflects whether or when the VID number will time out: **Permanent** type - Number never times out and this is indicated by the digit 0. **Dynamic** type - **Age** reflects what is configured in the **VLAN Aging Timeout** parameter in the **Configuration** => **VLAN** tab of the AP or reflects a fewer number of minutes that represents the difference between what was configured and what has elapsed since the VID was learned. Each minute, the Age decreases by one until, at zero, the AP deletes the learned VID, but can it again from packets sent by elements that are beneath it in the network.  **Note** Values in this Active Configuration block can differ from attempted values in configurations: The AP can override the value that the SM has configured for SM Management VID Pass-Through.

VLAN Membership tab of SM

The **Configuration > VLAN > VLAN Membership** tab is explained in Table 128.

Table 128 SM VLAN Membership attributes



Attribute	Meaning
VLAN Membership Table Configuration	For each VLAN in which you want the AP to be a member, enter the VLAN ID and then click the **Add Member** button. Similarly, for any VLAN in which you want the AP to no longer be a member, enter the VLAN ID and then click the **Remove Member** button.

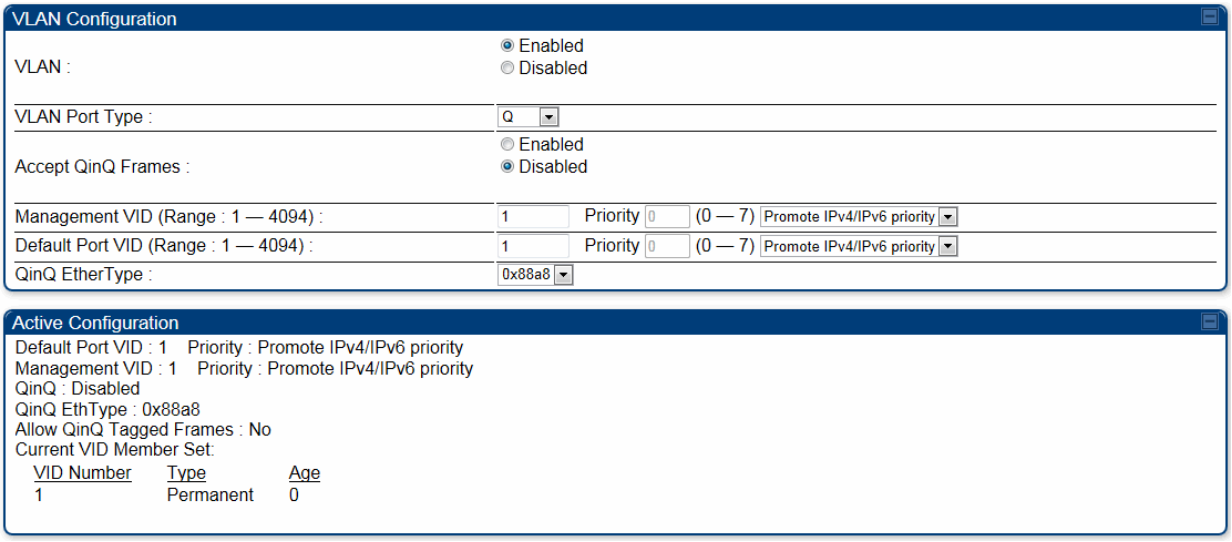
VLAN configuration for PTP

Applicable products	**PTP:** ☑ BHM ☑ BMS

VLAN page of BHM

The VLAN tab of BHS is explained in Table 129.

Table 129 BHM VLAN page attributes



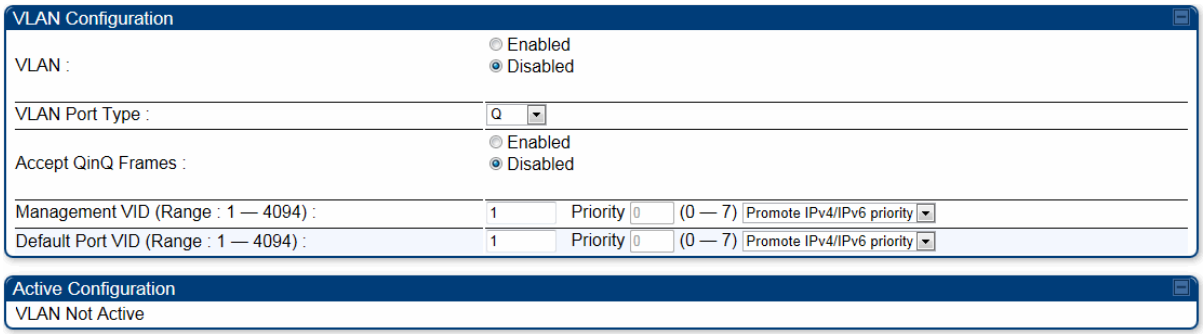
Attribute	Meaning
VLAN	Specify whether VLAN functionality for the BHM and all linked BHS must be (**Enabled**) or may not (**Disabled**) be allowed. The default value is **Disabled**.
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the BHS. Currently, the internal management interfaces will always operate as Q ports.
Accept QinQ Frames	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.
Management VID (Range 1-4094)	Enter the VID that the BHS must share with the BHM. The range of values is 1 to 4095. The default value is **1**.
Default Port VID (Range 1-4094)	This is the VID that is used for untagged frames and corresponds to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in- Q).
QinQ Ether Type	Modules can be configured with 802.1ad Q-in-Q DVLAN (Double-VLAN) tagging which is a way for an operator to put an 802.1Q VLAN inside of an 802.1ad VLAN. A nested VLAN, which is the original 802.1Q tag and a new second 802.1ad tag, allows for bridging of VLAN traffic across a network and segregates the broadcast domains of 802.1Q VLANs. Q-in-Q can be used with PPPoE and/or NAT. The 802.1ad standard defines the S-VLAN as the Service Provider VLAN and the C-VLAN as the customer VLAN. The radio software does 2-layer Q-in-Q whereby the C-VLAN is the 802.1Q tag and the S-VLAN is the second layer Q tag as shown below: Ethernet Header | S-VLAN EthType 0x88a8 | C-VLAN EthType 0x8100 | IP Data EthType 0x0800 The 802.1ad S-VLAN is the outer VLAN that is configurable on the **Configuration > VLAN** web page of the BHM. The Q-in-Q EtherType parameter is configured with a default EtherType of 0x88a8 in addition to four alternate EtherTypes that can be configured to aid in interoperability with existing networks that use a different EtherType than the default.

	The C-VLAN is the inner VLAN tag, which is the same as 802.1Q. As a top-level concept, this operates on the outermost tag at any given time, either “pushing” a tag on or “popping” a tag off. This means packets will at most transition from an 802.1Q frame to an 801.ad frame (with a tag “pushed” on) or an untagged 802.1 frame (with the tag “popped” off. Similarly, for an 802.1ad frame, this can only transition from an 802.1ad frame to an 802.1Q frame (with the tag “popped” off) since the radio software only supports 2 levels of tags.
VLAN Not Active	When VLAN is enabled in the BHM, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.

VLAN page of BHS

The VLAN tab of BHS is explained in Table 130.

Table 130 BHS VLAN page attributes



Attribute	Meaning
VLAN	Specify whether VLAN functionality for the BHM and all linked BHS must be (Enabled) or may not (Disabled) be allowed. The default value is Disabled.
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the BHS. Currently, the internal management interfaces will always operate as Q ports.
Accept QinQ Frames	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.
Management VID (Range 1-4094)	Enter the VID that the BHS must share with the BHM. The range of values is 1 to 4095. The default value is 1.
Default Port VID (Range 1-4094)	This is the VID that is used for untagged frames and corresponds to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in- Q).
VLAN Not Active	When VLAN is enabled in the BHM, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.

PPPoE page of SM

Applicable products	PMP:	☑ SM

Point-to-Point Protocol over Ethernet (PPPoE) is a protocol that encapsulates PPP frames inside Ethernet frames (at Ethernet speeds). Benefits to the network operator may include

- Access control
- Service monitoring
- Generation of statistics about activities of the customer
- Re-use of infrastructure and operational practices by operators who already use PPP for other networks

PPPoE options are configurable for the SM only, and the AP indicates whether or not PPPoE is enabled for a specific subscriber.

When PPPoE is enabled, once the RF session comes up between the SM and the AP, the SM will immediately attempt to connect to the PPPoE Server. You can monitor the status of this by viewing the PPPoE Session Log in the Logs section (Administrator only). Every time the RF session comes up, the SM will check the status of the link and if it is down, the SM will attempt to redial the link if necessary depending on the Timer Type. Also, on the Configuration page, the user may 'Connect' or 'Disconnect' the session manually. This can be used to override the session to force a manual disconnect and/or reconnect if there is a problem with the session.

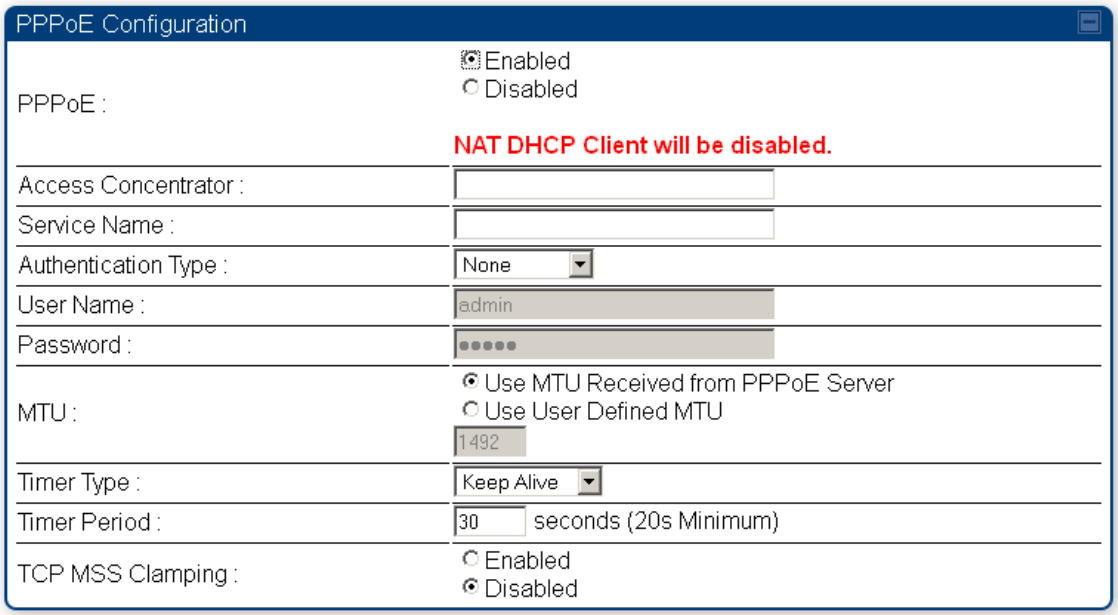
In order to enable PPPoE, NAT MUST be enabled on the SM and Translation Bridging MUST be disabled on the AP. These items are strictly enforced for you when you are trying to enable PPPoE. A message will indicate any prerequisites not being met. Also, the NAT Public IP DHCP client cannot be enabled, because the NAT Public IP is received through the IPCP process of the PPPoE discovery stages.

The pre-requisites are:

- NAT MUST be enabled on the SM
  - NAT DHCP Client is disabled automatically. The NAT public IP is received from the PPPoE Server.
  - NAT Public Network Interface Configuration will not be used and must be left to defaults. Also NAT Public IP DHCP is disabled if it is enabled.
- Translation Bridging MUST be DISABLED on the AP
  - This will only be determined if the SM is in session since the SM won't know the AP configuration otherwise. If the SM is not in session, PPPoE can be enabled but if the SM goes into session to a Translation Bridge-enabled AP, then PPPoE will not be enabled.

The PPPoE configuration parameters are explained in Table 131.

Table 131 SM PPPoE attributes



Attribute	Meaning
Access Concentrator	An optional entry to set a specific access concentrator to connect to for the PPPoE session. If this is blank, the SM will accept the first access concentrator which matches the service name (if specified). This is limited to 32 characters.
Service Name	An optional entry to set a specific service name to connect to for the PPPoE session. If this is left blank the SM will accept the first service option that comes back from the access concentrator specified above, if any. This is limited to 32 characters.
Authentication Type	**None** means that no PPPoE authentication is implemented **CHAP/PAP** means that CHAP authentication is attempted first, then PAP authentication. The same password is used for both types.
User Name	This is the CHAP/PAP user name that is used if CHAP/PAP authentication is selected. If **None** is selected for authentication then this field is unused. This is limited to 32 characters.
Password	This is the CHAP/PAP password that is used if PAP authentication is selected. If **None** is selected for authentication then this field is unused. This is limited to 32 characters.
MTU	**Use MTU Received from PPPoE Server** causes the SM to use the MRU of the PPPoE server received in LCP as the MTU for the PPPoE link.

	Use User Defined MTU allows the operator to specify an MTU value to use to override any MTU that may be determined in the LCP phase of PPPoE session setup. If this is selected, the user is able to enter an MTU value up to 1492. However, if the MTU determined in LCP negotiations is less than this user-specified value, the SM will use the smaller value as its MTU for the PPPoE link.
Timer Type	**Keep Alive** is the default timer type. This timer will enable a keepalive that will check the status of the link periodically. The user can set a keepalive period. If no data is seen from the PPPoE server for that period, the link is taken down and a reconnection attempt is started. For marginal links, the keep alive timer can be useful so that the session will stay alive over periodic dropouts. The keepalive timer must be set such that the session can outlast any session drop. Some PPPoE servers will have a session check timer of their own so that the timeouts of the server and the SM are in sync, to ensure one side does not drop the session prematurely. **Idle Timeout** enables an idle timer that checks the usage of the link from the customer side. If there is no data seen from the customer for the idle timeout period, the PPPoE session is dropped. Once data starts flowing from the customer again, the session is started up again. This timer is useful for users who may not be using the connection frequently. If the session is idle for long periods of time, this timer will allow the resources used by the session to be returned to the server. Once the connection is used again by the customer, the link is reestablished automatically.
Timer Period	The length in seconds of the PPPoE keepalive timer.
TCP MSS Clamping	If this is enabled, then the SM will alter TCP SYN and SYN-ACK packets by changing the Maximum Segment Size to be compatible with the current MTU of the PPPoE link. This way, the user does not have to worry about MTU on the client side for TCP packets. The MSS is set to the current MTU – 40 (20 bytes for IP headers and 20 bytes for TCP headers). This will cause the application on the client side to not send any TCP packets larger than the MTU. If the network is exhibiting large packet loss, try enabling this option. This may not be an option on the PPPoE server itself. The SM will NOT reassemble IP fragments, so if the MTUs are incorrect on the end stations, then MSS clamping will solve the problem for TCP connections.