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Safety and regulatory information

This section describes important safety and regulatory guidelines that must be observed by personnel installing or operating 450i equipment.

Important safety information

⚠️ WARNING
To prevent loss of life or physical injury, observe the safety guidelines in this section.

Power lines
Exercise extreme care when working near power lines.

Working at heights
Exercise extreme care when working at heights.

Grounding and protective earth
450i units must be properly grounded to protect against lightning. It is the user’s responsibility to install the equipment in accordance with national regulations. In the USA, follow Section 810 of the National Electric Code, ANSI/NFPA No. 70-1984 (USA). In Canada, follow Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit, size of grounding conductors and connection requirements for grounding electrodes. Other regulations may apply in different countries and therefore it is recommended that installation of the outdoor unit be contracted to a professional installer.

Powering down before servicing
Always power down and unplug the equipment before servicing.

Primary disconnect device
The AP, SM, or BHs unit’s power supply is the primary disconnect device.

External cables
Safety may be compromised if outdoor rated cables are not used for connections that will be exposed to the outdoor environment.
**RF exposure near the antenna**

Radio frequency (RF) fields will be present close to the antenna when the transmitter is on. Always turn off the power to the 450i unit before undertaking maintenance activities in front of the antenna.

**Minimum separation distances**

Install the AP/SM/BH so as to provide and maintain the minimum separation distances from all persons.

The minimum separation distances for each frequency variant are specified in *Calculated distances and power compliance margins* in the 14.0 PTP 450i / PMP 450i User Guide.
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General information

Version information

The following shows the issue status of this document since it was first released:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date of issue</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>001v001</td>
<td>August 2015</td>
<td>System Release 14.0</td>
</tr>
</tbody>
</table>

Contacting Cambium Networks

PMP support website: http://www.cambiumnetworks.com/support
Cambium main website: http://www.cambiumnetworks.com/
Sales enquiries: solutions@cambiumnetworks.com
Email support: support@cambiumnetworks.com
Telephone numbers:
   For full list of Cambium support telephone numbers, see: http://www.cambiumnetworks.com/support/contact-support
Address:
   Cambium Networks
   3800 Golf Road, Suite 360
   Rolling Meadows, IL 60008 U.S.A.
Purpose

Cambium Networks documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium equipment and ancillary devices. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or express, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

Cross references

References to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered, but are individually named at the top of each page, and are listed in the table of contents.

Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents. Send feedback to email support (see ‘Contacting Cambium Networks’).
Problems and warranty

Reporting problems

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

1. Search this document and the software release notes of supported releases.
2. Visit the support website. http://www.cambiumnetworks.com/support
3. Ask for assistance from the Cambium product supplier.
4. Gather information from affected units such as:
   - The IP addresses and MAC addresses.
   - The software releases.
   - The configuration of software features.
   - Any available diagnostic downloads.
   - CNUT Support Capture Tool information
5. Escalate the problem by emailing or telephoning support.

See ‘Contacting Cambium Networks’ for URLs, email addresses and telephone numbers.

Repair and service

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the support website.

Warranty

Cambium’s standard hardware warranty is for one (1) year from date of shipment from Cambium or a Cambium distributor. Cambium warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days.

To register PMP products or activate warranties, visit the support website.
Extended warranties are available for PMP products. For warranty assistance, contact the reseller or distributor.
Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.
Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

In certain instances Cambium makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.
Warnings, cautions, and notes

The following describes how warnings and cautions are used in this document and in all documents of the Cambium Networks document set.

Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:

⚠️ WARNING

Warning text and consequence for not following the instructions in the warning.

Cautions

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:

⚠️ CAUTION

Caution text and consequence for not following the instructions in the caution.

Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:

⚠️ NOTE

Note text.
PMP 450i / PTP 450i Release 14.0 Information

Introduction

This document provides information for the Cambium PMP 450i / PTP 450i Series System Release 14.0.

The information in this document is subject to change without notice. The recommendations, technical data, configurations and statements in this document are believed to be reliable and accurate, but are presented without implied or express warranty. Users must take full responsibility for their applications of any product specified in this document. The information in this document is proprietary to Cambium Networks Ltd.

Applicability

Cambium Software Release 14.0 is a release for Canopy PMP 450i and PTP 450i modules only.

Key Features

System Release 14.0 has been equipped with all of the features and functionality that you come to expect in the different Cambium product lines.

Some 450i hardware specific features include:

- Next generation chipset, allowing for future software features and performance enhancements.
- Rugged (IP66 & 67) enclosure, industrial design, the toughest, most robust PMP ever built.
- Option for an integrated 90 degree sector antenna for the AP.
- Option for a High Gain integrated directional antenna for the SM.
- Wideband support, including 4.9 GHz through 5.8 GHz (4900-5925 MHz).
- Improved radio characteristics
- Gigabit Ethernet Link Support
- Dynamic Interference Filtering to eliminate off channel noise impact to system
- Processing power improvements compared to the PMP 450
- Improved transmit power, receive sensitivity and link budget
- Auxiliary port supporting the legacy alignment tone and UGPS feature set with the ability for multifunction Aux Ethernet support in future releases.
Cambium’s highest performing point-to-multipoint solution, with up to 90 Mbps usable TCP throughput

For more detailed information on system operation, refer to the PMP 450i / PTP 450i User Guide provided with this release.

System Release 14.0 System Scope

System Release 14.0 supports the following:
- 5 MHz, 10 MHz or 20 MHz channel bandwidth
- 4.9 GHz and 5.7 GHz FCC Spectrum operation
- 4.9 GHz and 5.7 GHz ROW Spectrum operation
- 5.4 GHz ROW Spectrum operation,
- 2.5 ms or 5.0 ms frames
- DES or AES encryption
- GPS-based Synchronization via CMM4 or UGPS (Aux Port)
- DFS regions ARE NOT supported in 14.0
- Using the Aux Port as a secondary Ethernet port IS NOT supported in 14.0

Release 14.0 System Documentation

Provided with Release 14.0 are several documents for your reference:
- PMP 450i / PTP450i Release Notes (This Document): Includes key information regarding the PMP 450i / PTP 450i 14.0 Release
- PMP 450 / PTP450i User Guide: Includes information on all radio configuration parameters and a set of tasks to configure and secure the network
- PMP 450i and PTP 450i Specification Sheets: Includes up-to-date specifications for the 450i product line

Embedded software

Prior to upgrading to PMP 450i / PTP 450i software, please read the special notices below. 14.0 may be installed on PMP 450i APs, PMP 450i SMs, and PTP 450i BH via CNUT (Canopy Network Updater Tool) using the following software package:
- CANOPY14.0BUILDOFFICIAL_PXP45x_S.pkg3

Upgrading to Subsequent Software Releases

Canopy Network Updater Tool (CNUT) 4.9.12 may be used to upgrade PMP 450i APs, PMP 450i SMs, PTP 450i BHMs, and PTP 450i BHSs.
Use version 4.9.12 (or higher) of the Network Updater Tool (CNU) to upgrade to new versions of Release 14.0.
CNUT 4.9.12 also supports legacy Cambium products.
CNUT and its release notes can be downloaded from the Cambium support web site: http://www.cambiumnetworks.com/products/management-tools/cnut

Network Management

Wireless Manager v4.0 SP1 may be used to manage Cambium PMP networks, including managing the RADIUS features. For additional information, see the Wireless Manager website at: http://www.cambiumnetworks.com/products/management-tools/wireless-manager
A RADIUS dictionary file is available from the software site: https://support.cambiumnetworks.com/files/pmp450/

Canopy MIB

The Cambium Enterprise MIB (Management Information Base) consists of 7 MIB definition files and supports SNMP access to Canopy modules. The MIB files are available for download from: https://support.cambiumnetworks.com/files/pmp450/
MIB files are used by Network Management Systems and Element Management Systems, such as the Wireless Manager system to support a host of surveillance, monitoring, control, and operational tasks.
If you are using an SNMP network management system (NMS) or element management system (EMS) other than Wireless Manager: Load the MIBs per the instructions for your NMS or EMS.

Important! When loading the MIB files
- First load the standard MIB files.
- Then load the Radio-specific MIB files.

Some NMSs are not sensitive to order, but some require a specific loading order to build a MIB tree. Loading in the recommended order avoids any problems arising from loading sequence.
Known Problems or Limitations

Known open issues in Release 14.0 are listed in Table 1.

Table 1 System Release 14.0 known problems and limitations

<table>
<thead>
<tr>
<th>Products Affected</th>
<th>Tracking</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>CPY-11694</td>
<td>At weak signals, the V to H reporting may flip for the Receive Signal Level (RSL) value.</td>
</tr>
<tr>
<td>PMP 450i AP PTP 450i BHM</td>
<td>CPY-11683, CPY-11668</td>
<td>AP/BHM accepts a server port number of a port that is already in use.</td>
</tr>
<tr>
<td>PMP 450i</td>
<td>CPY-11682, CPY-11698</td>
<td>VLAN Re-marking not working as expected with QinQ</td>
</tr>
<tr>
<td>PMP 450i PTP 450i</td>
<td>CPY-11667</td>
<td>Config file does not export all of the color codes configured on a SM/BHS</td>
</tr>
<tr>
<td>PMP 450i PTP 450i</td>
<td>CPY-11666</td>
<td>WhispBoxRFPhysicalRadioFrequencies Table on 450i Does Not Look The Same As on 450 Radios</td>
</tr>
<tr>
<td>PTP 450i</td>
<td>CPY-11640</td>
<td>5MHz Channel Bandwidths can take longer to register.</td>
</tr>
<tr>
<td>PMP 450i SM</td>
<td>CPY-11558</td>
<td>Ethernet stats can get incremented when the Ethernet cable on the 450i SM is not connected.</td>
</tr>
<tr>
<td>All</td>
<td>CPY-11466</td>
<td>The SNMP trap for “regFailSeqNum” has the wrong value type.</td>
</tr>
<tr>
<td>PTP 450i BHS</td>
<td>CPY-11401</td>
<td>The CNU “Gather Customer Support” tool might not work on 450i BHS.</td>
</tr>
<tr>
<td>All</td>
<td>CPY-10356</td>
<td>The main GUI page for 450i AP and the 450i BHM shows that DES is being used when the security page for the radio is set to “None”.</td>
</tr>
<tr>
<td>All</td>
<td>CNUT-940</td>
<td>CNUT can state that a software upgrade for a radio has failed. This message can be displayed in error when the radio takes too long to come back into service after upgrading.</td>
</tr>
<tr>
<td>PTP 450i</td>
<td>CPY-11737</td>
<td>450i BHs do not range past 43 miles.</td>
</tr>
</tbody>
</table>
Please see the 14.0 User Guide for the list of the supported Bands, Regions, and Countries.

If 450 SMs try to register to a 450i AP, there will be an “Auth Fail - Status 4, Flag 1” message recorded on the 450i APs “SM Registration Failures” tab. Please contact Cambium Networks if you are interested in Beta testing the “450 SM Interoperability” feature on your 450i AP’s running 14.0.

A new UGPS cable will need to be crafted when connecting a 450i AP or a 450i BHM to a UGPS for Sync. Please refer to the 450i User Guide for information on how to properly craft this cable.

When connecting a 450i AP or a 450i BHM to a 56V CMM4 for sync and power, a “450i to CMM4” Dongle (part number N000045L001A) will be needed. Please refer to the 450i User Guide for more information about this dongle.
Appendix A: Reference information

This chapter contains reference information and regulatory notices that apply to the PMP 450i Series products.

The following topics are described in this chapter:

- **Equipment specifications** on page 18 contains specifications for the AP, SM, and BH equipment.
- **Wireless specifications** on page 19 contains specifications of the 450i wireless interface, including RF bands, channel width and link loss.
- **Data network specifications** on page 20 contains specifications of the 450i Ethernet interface.
Equipment specifications

This section contains specifications of the AP, SM, and associated supplies required for PMP 450i installations.

**450i Integrated or Connectorized ODU**

The 450i is supplied in a connectorized or radiated configuration. The connectorized unit is connected with external antennas which can cope with different radio conditions.

**Access Point (AP):**
- ODU with an integrated 16 dBi Sector antenna for 4.9 to 5.925 GHz
- AP Connectorized ODU intended to work with separately mounted external antenna.

**Subscriber Module (SM):**
- SM Integrated ODU with an integrated 23 dBi flat panel antenna for 4.9 to 5.925 GHz
- SM Connectorized ODU intended to work with separately mounted external antenna.

**Backhaul (BH):**
- BH Integrated ODU with an integrated 23 dBi flat panel antenna for 4.9 to 5.925 GHz
- BH Connectorized ODU intended to work with separately mounted external antenna.

**450i AP, 450i SM and 450i BH specifications**

Please see the Spec Sheets listed on the Cambium Networks website for the most up-to-date 450i specifications.

http://www.cambiumnetworks.com/resources/pmp-450i-ap-specs/
http://www.cambiumnetworks.com/resources/pmp-450i-sm-specs/
http://www.cambiumnetworks.com/resources/ptp-450i-specs/
This section contains specifications of the 450i wireless interface. These specifications include RF bands, channel bandwidth, spectrum settings, maximum power and link loss.

### General wireless specifications

Table 4 lists the wireless specifications that apply to all 450i variants.

**Table 2  450i wireless specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel selection</td>
<td>Manual selection (fixed frequency).</td>
</tr>
<tr>
<td>Duplex scheme</td>
<td>Adaptive TDD</td>
</tr>
<tr>
<td>Range*</td>
<td>40 mi/64.37 km</td>
</tr>
<tr>
<td></td>
<td>* CPY-11737 will allow BHs to range further</td>
</tr>
<tr>
<td>Over-the-air encryption</td>
<td>DES/AES</td>
</tr>
<tr>
<td>Error Correction</td>
<td>FEC</td>
</tr>
</tbody>
</table>
Data network specifications

This section contains specifications of the 450i Ethernet interface (PSU Port).

**Ethernet interface**

The 450i Ethernet port conforms to the specifications listed in Table 5.

**Table 3  PMP 450 Ethernet bridging specifications**

<table>
<thead>
<tr>
<th>Ethernet Bridging</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>IEEE 802.3 compatible</td>
</tr>
<tr>
<td>QoS</td>
<td>IEEE 802.1p, IEEE 802.1Q, IEEE 802.1ad, DSCP IPv4</td>
</tr>
<tr>
<td>Interface</td>
<td>10/100/1000BaseT, half/full duplex, rate auto negotiated</td>
</tr>
<tr>
<td>Maximum Ethernet Frame Size</td>
<td>1700 Bytes</td>
</tr>
</tbody>
</table>

**NOTE**

Practical Ethernet rates will depend on network configuration, higher layer protocols and platforms used.

Over the air throughput is restricted to the rate of the Ethernet interface at the receiving end of the link.
**Cambium Networks**

Cambium Networks provides professional grade fixed wireless broadband and microwave solutions for customers around the world. Our solutions are deployed in thousands of networks in over 153 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that’s easy to deploy and proven to deliver outstanding metrics.

Our flexible Point-to-Multipoint (PMP) solutions operate in the licensed, unlicensed and federal frequency bands, providing reliable, secure, cost effective access networks. With more than three million modules deployed in networks around the world, our PMP access network solutions prove themselves day-in and day-out in residential access, leased line replacement, video surveillance and smart grid infrastructure applications.

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