



USER GUIDE

ePMP (802.11ac/ax)

System Release 4.7



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# Contents

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<b>Contents</b> .....	<b>3</b>
<b>About This User Guide</b> .....	<b>14</b>
Problems and warranty.....	14
Reporting problems.....	14
Repair and service.....	14
Warranty.....	14
Security advice.....	15
Precautionary statements.....	15
Warning.....	15
Federal Communication Commission Interference Statement.....	15
IC Interference Statement.....	16
Attention.....	17
Note.....	17
Caring for the environment.....	17
In EU countries.....	17
In non-EU countries.....	18
<b>Chapter 1: Product Description</b> .....	<b>19</b>
Overview of ePMP.....	19
Purpose – ePMP Portfolio.....	19
ePMP 3000.....	19
ePMP 3000L.....	21
ePMP MP 3000 MicroPoP.....	22
ePMP 4500C.....	22
ePMP 4500.....	23
ePMP 4600.....	24
ePMP 4500L.....	25
ePMP 5/6GHz 4 x 4 sector antenna.....	27
Force 300-25.....	27

Force 300-19.....	28
Force 300-19R.....	29
Force 300-16.....	31
Force 300-13.....	32
Force 300-13L.....	33
Force 300 CSM.....	33
Force 300 CSML.....	35
Force 425.....	35
Force 400C.....	36
Force 4600C.....	36
Force 5/6GHz 2 x 2 dish antenna.....	37
Force 4525.....	37
Force 4525L.....	38
Force 4625.....	38
Typical installation equipment.....	39
Wireless operation.....	40
MU-MIMO.....	40
MIMO.....	40
Smart beamforming (ePMP 2000/3000 series).....	40
Smart antenna key advantages.....	41
Time-division duplexing.....	41
OFDM and channel bandwidth.....	41
Adaptive modulation.....	42
Radar avoidance.....	42
Encryption.....	42
Country codes.....	42
Further reading on the wireless operation.....	43
System management.....	43
Management agent.....	43
Webserver.....	44

SNMP.....	44
Network Time Protocol (NTP).....	44
Software upgrade.....	44
Further reading on system management.....	45
<b>Chapter 2: System Hardware.....</b>	<b>46</b>
Site Planning.....	47
Site installation.....	47
Grounding and lightning protection.....	47
Lightning protection zones.....	49
ePMP 3000 Access Point.....	50
ePMP 3000 Access Point description.....	51
ePMP 3000 Access Point part numbers.....	51
ePMP 3000 Access Point mounting bracket.....	52
ePMP 3000 Access Point interfaces.....	53
ePMP 3000 Access Point specifications.....	53
ePMP 3000 Access Point heater.....	54
ePMP 3000 Access Point wind loading.....	54
ePMP 3000 Access Point software packages.....	55
ePMP 3000L Access Point.....	55
ePMP 3000L Access Point description.....	56
ePMP 3000L Access Point part numbers.....	56
ePMP 3000L Access Point mounting bracket.....	57
ePMP 3000L Access Point interfaces.....	58
ePMP 3000L Access Point specifications.....	58
ePMP 3000L Access Point heater.....	59
ePMP 3000L Access Point wind loading.....	59
ePMP 3000L Access Point software packages.....	60
ePMP 4500C Access Point.....	61
ePMP 4500C Access Point description.....	61
ePMP 4500C Access Point part numbers.....	61

ePMP 4500C Access Point mounting bracket.....	63
ePMP 4500C Access Point interfaces.....	63
ePMP 4500C Access Point specifications.....	64
ePMP 4500C Access Point heater.....	64
ePMP 4500C Access Point wind loading.....	65
ePMP 4500C Access Point mounting instructions.....	66
ePMP 4500C Access Point software packages.....	66
ePMP 4500 Access Point.....	66
ePMP 4500 Access Point description.....	66
ePMP 4500 Access Point part numbers.....	67
ePMP 4500 Access Point mounting bracket.....	69
ePMP 4500 Access Point interfaces.....	69
ePMP 4500 Access Point specifications.....	69
ePMP 4500 Access Point heater.....	70
ePMP 4500 Access Point wind loading.....	71
ePMP 4500 Access Point mounting instructions.....	72
ePMP 4500 Access Point software packages.....	72
ePMP 4600 Access Point.....	72
ePMP 4600 Access Point description.....	73
ePMP 4600 Access Point part numbers.....	73
ePMP 4600 Access Point mounting bracket.....	74
ePMP 4600 Access Point interfaces.....	74
ePMP 4600 Access Point specifications.....	75
ePMP 4600 Access Point heater.....	76
ePMP 4600 Access Point wind loading.....	76
ePMP 4600 Access Point software packages.....	77
ePMP 4500L Access Point.....	77
ePMP 4500L Access Point description.....	77
ePMP 4500L Access Point part numbers.....	78
ePMP 4500L Access Point mounting bracket.....	79

ePMP 4500L Access Point interfaces.....	80
ePMP 4500L Access Point specifications.....	80
ePMP 4500L Access Point heater.....	81
ePMP 4500L Access Point wind loading.....	81
Mounting instructions.....	83
ePMP 4500L Access Point software packages.....	83
ePMP 5/6GHz 4 x 4 sector antenna.....	84
Force 300-25.....	84
Force 300-25 integrated description.....	84
Force 300-25 part numbers.....	85
Force 300-25 mounting bracket.....	86
Force 300-25 interfaces.....	86
Force 300-25 specifications.....	87
Force 300-25 heater.....	87
Force 300-25 wind loading.....	88
Force 300-25 software packages.....	89
Force 300-25L.....	89
Force 300-25L integrated description.....	89
Force 300-25L part numbers.....	90
Force 300-25L interfaces.....	91
Force 300-25L specifications.....	92
Force 300-25L heater.....	92
Force 300-25L wind loading.....	93
Force 300-25L software packages.....	94
Force 300-19.....	94
Force 300-19 integrated description.....	94
Force 300-19 part numbers.....	94
Force 300-19 mounting bracket.....	95
Force 300-19 interfaces.....	96
Force 300-19 specifications.....	96

Force 300-19 heater.....	97
Force 300-19 wind loading.....	97
Force 300-19 software packages.....	98
Force 300-19R.....	98
Force 300-19R integrated description.....	98
Force 300-19R part numbers.....	99
Force 300-19R mounting bracket.....	100
Force 300-19R interfaces.....	100
Force 300-19R specifications.....	101
Force 300-19R heater.....	101
Force 300-19R wind loading.....	102
Force 300-19R software packages.....	103
Force 300-16.....	103
Force 300-16 integrated description.....	103
Force 300-16 part numbers.....	103
Force 300-16 interfaces.....	105
Force 300-16 specifications.....	105
Force 300-16 heater.....	106
Force 300-16 wind loading.....	106
Force 300-16 software packages.....	107
Force 300-13.....	107
Force 300-13 integrated description.....	107
Force 300-13 part numbers.....	108
Force 300-13 interfaces.....	109
Force 300-13 specifications.....	109
Force 300-13 heater.....	110
Force 300-13 wind loading.....	110
Force 300-13 software packages.....	111
Force 300-13L.....	111
Force 300-13L integrated description.....	112



Force 300-13L part numbers.....	112
Force 300-13L interfaces.....	113
Force 300-13L specifications.....	114
Force 300-13L wind loading.....	115
Force 300-13L LEDs.....	115
Force 300-13L software packages.....	116
Force 300 CSM.....	116
Force 300 CSM description.....	116
Force 300 CSM part numbers.....	116
Force 300 CSM interfaces.....	118
Force 300 CSM specifications.....	118
Force 300 CSM heater.....	119
Force 300 CSM wind loading.....	119
Force 300 CSM software packages.....	120
Force 300 CSML.....	120
Force 300 CSML description.....	120
Force 300 CSML part numbers.....	121
Force 300 CSML interfaces.....	122
Force 300 CSML mounting bracket.....	122
Force 300 CSML specifications.....	123
Force 300 CSML wind loading.....	123
Force 300 CSML LEDs.....	124
Force 300 CSML software packages.....	124
ePMP MP3000 MicroPoP.....	124
ePMP MP 3000 integrated description.....	125
ePMP MP 3000 part numbers.....	125
ePMP MP 3000 interfaces.....	126
ePMP MP 3000 specifications.....	127
ePMP MP 3000 heater.....	127
ePMP MP 3000 wind loading.....	128

ePMP MP 3000 software packages.....	129
Force 425.....	129
Force 425 integrated description.....	129
Force 425 part numbers.....	129
Force 425 mounting bracket with Range Extender.....	131
Force 425 interfaces.....	131
Force 425 specifications.....	131
Force 425 heater.....	132
Force 425 wind loading.....	132
Force 425 software packages.....	133
Force 400C.....	133
Force 400C integrated description.....	133
Force 400C part numbers.....	134
Force 400C interfaces.....	135
Force 400C specifications.....	135
Force 400C heater.....	136
Force 400C wind loading.....	136
Force 400C software packages.....	137
Force 4600C.....	137
Force 4600C integrated description.....	137
Force 4600C part numbers.....	138
Force 4600C interfaces.....	139
Force 4600C specifications.....	139
Force 4600C heater.....	140
Force 4600C wind loading.....	140
Force 4600C software packages.....	141
Force 5/6GHz 2 x 2 dish antenna.....	141
Force 4525.....	141
Force 4525 integrated description.....	142
Force 4525 part numbers.....	142

Force 4525 interfaces.....	143
Force 4525 specifications.....	143
Force 4525 heater.....	144
Force 4525 wind loading.....	144
Force 4525 mounting instructions.....	145
Force 4525 software packages.....	146
Force 4525L.....	146
Force 4525L integrated description.....	146
Force 4525L part numbers.....	146
Force 4525L interfaces.....	147
Force 4525L specifications.....	147
Force 4525L heater.....	148
Force 4525L wind loading.....	148
Force 4525L mounting instructions.....	149
Force 4525L software packages.....	150
Force 4625.....	150
Force 4625 integrated description.....	150
Force 4625 part numbers.....	150
Force 4625 interfaces.....	151
Force 4625 specifications.....	152
Force 4625 heater.....	152
Force 4625 wind loading.....	153
Force 4625 software packages.....	153
Power supply.....	154
Power supply description.....	154
Power supply part numbers.....	154
Power supply interfaces.....	154
Power supply specifications.....	155
Power supply location considerations.....	156
Ethernet cabling.....	157

Ethernet standards and cable lengths.....	157
Outdoor Cat5e cable.....	157
Surge suppression unit.....	158
Gigabit Ethernet Surge Suppressor.....	158
cnPulse sync generator.....	159
<b>Chapter 3: System Planning.....</b>	<b>161</b>
Radio spectrum planning.....	161
General wireless specifications.....	161
Regulatory limits.....	162
Conforming to the limits.....	163
Available spectrum.....	163
Channel bandwidth.....	163
Link planning.....	163
Range and obstacles.....	163
Path loss.....	163
Adaptive modulation.....	164
Data network planning.....	164
Ethernet interfaces.....	164
Management VLAN.....	165
Quality of service for bridged Ethernet traffic.....	165
<b>Chapter 4: Using the Device Management Interface.....</b>	<b>166</b>
Preparing for configuration.....	166
Safety precautions.....	166
Regulatory compliance.....	166
Connecting to the unit.....	166
Configuring the management PC.....	167
Connecting to the PC and powering up.....	167
Using the web interface.....	168
Logging into the web interface.....	168
Using the installation wizard - Access Point.....	169

Step 1: Main system parameters.....	169
Step 2: Radio parameters.....	170
Step 3: Network parameters.....	171
Step 4: Security parameters.....	172
Using the installation wizard – Subscriber Module.....	173
Step 1: Main system parameters.....	173
Step 2: Radio parameters.....	174
Step 3: Network parameters.....	175
Installation wizard step 4 – Security parameters.....	176
Using the menu options.....	177
Status page.....	178
Installation page.....	180
Configuration menu.....	181
Monitor menu.....	218
Tools menu.....	234
<b>Chapter 5: Operation and Troubleshooting.....</b>	<b>247</b>
General Planning for troubleshooting.....	247
Upgrading device software.....	248
Testing hardware.....	248
Checking the power supply LED.....	248
Power LED is OFF.....	248
Ethernet LED is OFF.....	249
Troubleshooting the radio link.....	250
The module has lost or does not establish radio connectivity.....	250
Module exhibiting frequent boots or disconnects.....	251
Link is unreliable or does not achieve the data rates required.....	251
Resetting ePMP to factory defaults by power cycling.....	251
<b>Glossary.....</b>	<b>253</b>
<b>Cambium Networks.....</b>	<b>255</b>

# About This User Guide

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This guide describes the planning, installation, configuration, and operation of the Cambium ePMP Series of point-to-multipoint and point-to-point wireless Ethernet systems. It is intended for use by the system designer, system installer, and system administrator.

For radio network design, see:

- [Product Description](#)
- [System Hardware](#)
- [Site Planning](#)
- [Legal and Reference Information](#)

For system configuration, monitoring, and fault finding, see:

- [Using the Device Management Interface](#)

## Problems and warranty

### Reporting problems

At Cambium Networks, we know what it takes to keep a growing network running optimally. We provide multiple layers of support including training, online documentation, technical support, information-sharing with an experienced community of users, software downloads, warranty services, and repair.

Through the Cambium Support Center portal at <https://support.cambiumnetworks.com/> you can:

- Submit support requests
- Submit RMA request
- View support global contact numbers

Additional information including field service bulletins, license key information, warranty details, security advisories, Cambium Care program descriptions, regional codes for PTP solutions, and compliance requirements can be viewed at <https://www.cambiumnetworks.com/support/>.

### Repair and service

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

### Warranty

For products shipped after October 1<sup>st</sup>, 2018 Cambium's standard hardware warranty is for three (3) years from the 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 products will be subject to the original warranty period but not less than thirty (30) days.

To register ePMP products or activate warranties, visit the support website.

For warranty assistance, contact the reseller or distributor.



#### Attention

Do not open the radio housing for repair or diagnostics; there are no serviceable parts within the housing.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

## Security advice

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.

Cambium Networks ePMP equipment is shipped with default web management interface login credentials. It is highly recommended that these usernames and passwords are modified before system installation.

## Precautionary statements

The following describes how precautionary statements are used in this document.

### Warning

Precautionary statements with the Warning tag 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

Text and consequence for not following the instructions in the warning.

## Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



#### Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

#### IMPORTANT NOTE:

This module is intended for OEM integrator. This module is only FCC authorized for the specific rule parts listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. Additional testing and certification may be necessary when multiple modules are used.

The host manufacturer should reference KDB Publication 996369 D04 Module Integration Guide.

#### USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 88cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: Z8H89FT0065 ".

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.



#### IMPORTANT NOTE

##### FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 88cm between the radiator and your body.

FCC MPE distance: 88 cm

## IC Interference Statement

This radio transmitter [IC: 109W-0065] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

*Le présent émetteur radio (IC: 109W-0065) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal d'antenne. Les types d'antennes non inclus dans cette liste qui ont un gain supérieur au gain maximal indiqué pour tout type listé*



*sont strictement interdits pour une utilisation avec cet appareil.*

The maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate.

*le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz)*

*doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.*

**IMPORTANT NOTE:**

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

**NOTE IMPORTANTE:**

*Ce module est destiné aux intégrateurs OEM. L'intégrateur OEM est responsable du respect de toutes les règles qui s'appliquent au produit dans lequel ce module RF certifié est intégré.*

*Des tests et une certification supplémentaires peuvent être nécessaires lorsque plusieurs modules sont utilisés.*

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

*Tout changement ou modification non expressément approuvé par le fabricant peut annuler le droit de l'utilisateur à faire fonctionner cet équipement.*

**USERS MANUAL OF THE END PRODUCT:**

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

**MANUEL D'UTILISATION DU PRODUIT FINAL :**

*Dans le manuel d'utilisation du produit final, l'utilisateur final doit être informé qu'il doit maintenir une séparation d'au moins 20 cm avec l'antenne pendant que ce produit final est installé et utilisé.*

*L'utilisateur final doit être informé que les directives d'exposition aux radiofréquences d'IC pour un environnement non contrôlé peuvent être satisfaites.*

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference (2) this device must accept any interference received, including interference that may cause undesired operation.

*L'utilisateur final doit également être informé que tout changement ou modification non expressément approuvé par le fabricant pourrait annuler le droit de l'utilisateur à utiliser cet équipement. Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférences nuisibles (2) cet appareil doit accepter toute interférence reçue, y compris les interférences susceptibles de provoquer un fonctionnement indésirable.*

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following " Contains IC: 109W-0065 ".

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.

**ÉTIQUETTE DU PRODUIT FINAL :**

*Le produit final doit être étiqueté dans une zone visible avec la mention suivante "Contient IC : 109W-0065".*

*Le numéro de modèle de l'hôte (HMN) doit être indiqué à n'importe quel endroit à l'extérieur du produit final ou de l'emballage du produit ou de la documentation sur le produit qui doit être disponible avec le produit final ou en ligne.*

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

*Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes au (x) RSS (s) exemptés de licence d'Innovation, Sciences et Développement économique Canada. L'opération est soumise aux deux conditions suivantes:*

- (1) Cet appareil ne doit pas provoquer d'interférences.*
- (2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.*



**IMPORTANT NOTE**

**IC Radiation Exposure Statement:**

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

**Antenna List**

<b>Ant. Set</b>	<b>Brand</b>	<b>Model Name</b>	<b>Antenna Type</b>	<b>Gain (dBi)</b>
1	Cambium	5GHz 8x8 Sector Antenna	Sector	18
2	Cambium	5GHz Dipole Antenna	Dipole	2

*Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.*

IC MPE distance: 20 cm

## Attention

Precautionary statements with the Attention tag precede instructions that 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. An attention statement has the following format:



### Attention

Text and consequence for not following the instructions.

## Note

Precautionary statements with the Note tag indicate the possibility of an undesirable situation or provide additional information to help the reader understand a topic or concept. A note has the following format:



### Note

Text.

## Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

### In EU countries



The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium equipment in EU countries.

### Disposal of Cambium equipment

European Union (EU) Directive 2002/96/EC Waste Electrical and Electronic Equipment (WEEE).

Do not dispose of Cambium equipment in landfill sites. For disposal instructions, see <https://support.cambiumnetworks.com>

## Disposal of surplus packaging

Do not dispose of surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

### In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

# Chapter 1: Product Description

---

This chapter provides a high-level description of the ePMP product. It describes the function of the product, the main product variants, and the typical installation. It also describes the main hardware components.

The following topics are described in this chapter:

- The key features, typical uses, product variants, and components of the ePMP are explained in the [Overview of ePMP](#).
- How the ePMP wireless link is operated, including modulation modes, power control, and security is described under [Wireless operation](#).
- The ePMP management system, including the web interface, installation, configuration, alerts, and upgrades is described in [System management](#).

## Overview of ePMP

This section introduces the key features, typical uses, product variants, and components of the ePMP portfolio as a whole (802.11n and 802.11ac products).

### Purpose – ePMP Portfolio

Cambium ePMP Series products are designed for Ethernet bridging over point-to-multipoint and point-to-point microwave links in the unlicensed 2.4 GHz, 2.5 GHz (Brazil only), 5 GHz, and 6 GHz bands. Users must ensure that the ePMP Series complies with local operating regulations.

ePMP devices support point-to-point microwave links in the unlicensed 5 GHz and 6 GHz bands.

The ePMP Series acts as a transparent bridge between two segments of the operator and customers' networks. In this sense, it can be treated as a virtual wired connection between the Access Point (AP) and the Subscriber Module (SM). The ePMP series forwards 802.3 Ethernet packets destined for the other part of the network and filters packets it does not need to forward and can deliver unicast data to unknown destinations as broadcast, similar to a switch functionality.

### ePMP 3000

The ePMP 3000 is a rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP sector throughput of up to 1+ Gbps (when operating with 80 MHz channel bandwidth).

- It is capable of operating in Line-of-Sight (LoS) and near-LoS conditions and supports Quality of Service (QoS) for traffic prioritization.
- It is available as a connectorized unit for use with a separate 4x4 MU-MIMO Sector/Dual-Horn/Omni antenna and optional Smart Antenna (for uplink beam steering).
- ePMP 3000 supports maximum information rate (MIR) further allowing the operator to manage traffic profiles for end customers.
- ePMP 3000 provides Dynamic Frequency Selection (DFS) for North America (FCC) and supports additional DFS tuning balances detection of actual DFS signals vs false detection.

- ePMP 3000 supports backward and forward compatibility with ePMP 802.11n devices to provide an immediate sector upgrade to 802.11ac Wave 2 performance, and also to support future upgrades of networks operating ePMP 1000/2000 APs.
- ePMP 3000 is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard, however, the ePMP 3000 device has a proprietary air interface for the main point-to-multipoint or point-to-point link.
- ePMP 3000 is powered by standard power-over-Ethernet to a 1000BASE-T port.
- Management of the unit is conducted via the same interface as the bridged traffic (in-band Management).

An overview of ePMP 3000 is shown in [Figure 1](#).



**Figure 1:** ePMP 3000

A summary of the main ePMP 3000 characteristics is listed under [Table 1](#).

**Table 1** Main characteristics of the ePMP 3000 Series

Characteristic	Value
Topology	PMP or PTP
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	10 MHz*, 20 MHz, 40 MHz, 80 MHz
Data rate	Up to 1+ Gbps Sector Throughput

\* The 10 MHz Channel Bandwidth is only supported with Force 300-19R SM.

## ePMP 3000L

The ePMP 3000L is the third-generation Access Point (AP) that carries on the interference tolerance mechanisms with an emphasis on high-performance in low-density point to multipoint sectors. The ePMP 3000L is a 2x 2 MIMO connectorized AP that can support a wide variety of deployments including 90/120-degree sectors, narrow-sector horns, or even 360-degree Omni coverage.

Also, the ePMP 3000L continues interference mitigation techniques with the support of TDD synchronization using GPS and the robust software from the ePMP product line. The ePMP 3000L system consists of the ePMP 3000L AP, an optional 2x2 sector antenna, and a wide variety of subscriber modules with varying form factors and link budgets.

ePMP 3000 supports backward and forward compatibility with ePMP 802.11n devices to provide an immediate sector upgrade to 802.11ac Wave 2 performance, and also to support future upgrades of networks operating ePMP 1000/2000 APs.

The ePMP 3000L system boasts a high packet per second performance, peak throughput of 600 Mbps, and supports subscriber modules with up to 600 Mbps of peak throughput.

An over view of ePMP 3000L is shown in [Figure 2](#)



**Figure 2:** *ePMP 3000L*

A summary of the main ePMP 3000L characteristics are listed under [Table 2](#).

**Table 2** Main characteristics of the ePMP 3000L Series

Characteristic	Value
Topology	PMP or PTP

Characteristic	Value
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 1+ Gbps Sector Throughput

## ePMP MP 3000 MicroPoP

The ePMP MP 3000 MicroPoP is an integrated AP designed to serve short-range, low-density applications. It uses 802.11ac 2x2 architecture and can interoperate with a Force 300 subscriber module.

An overview of ePMP MP 3000 is shown in [Figure 3](#).



**Figure 3:** *ePMP MP 3000 MicroPoP*

## ePMP 4500C

The ePMP 4500C is the third-generation Access Point (AP) that carries on the interference tolerance mechanisms with an emphasis on high-performance in low-density point to multipoint sectors. The ePMP 4500C is a 8 X 8 MU-MIMO connectorized AP that can support a wide variety of deployments including 90/120-degree sectors, narrow-sector horns, or even 360-degree Omni coverage.

The ePMP 4500C system consists of the ePMP 4500C AP, an optional 8x8 sector antenna, and a wide variety of subscriber modules with varying form factors and link budgets.

The ePMP 4500C system boasts a high packet per second performance, peak throughput of 3 Gbps, and supports subscriber modules with up to 3 Gbps of peak throughput.

An over view of ePMP 4500C is shown in [Figure 4](#)





Figure 4: ePMP 4500C

A summary of the main ePMP 4500C characteristics are listed under [Table 2](#).

Table 2 Main characteristics of the ePMP 4500C Series

Characteristic	Value
Topology	PMP
Wireless link condition	LoS, near LoS
Scheduler	WLR, TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	3 Gbps

## ePMP 4500

The ePMP 4500 is the third-generation Access Point (AP) that carries on the interference tolerance mechanisms with an emphasis on high-performance in low-density point to multipoint sectors. The ePMP 4500 is a 2x 2 MIMO connectorized AP that can support a wide variety of deployments including 90/120-degree sectors, narrow-sector horns, or even 360-degree Omni coverage.

The ePMP 4500 system consists of the ePMP 4500 AP, an optional 2x2 sector antenna, and a wide variety of subscriber modules with varying form factors and link budgets.

The ePMP 4500 system boasts a high packet per second performance, peak throughput of 3 Gbps, and supports subscriber modules with up to 3 Gbps of peak throughput.

An over view of ePMP 4500 is shown in [Figure 5](#)



Figure 5: ePMP 4500

A summary of the main ePMP 4500 characteristics are listed under [Table 2](#).

Table 2 Main characteristics of the ePMP 4500 Series

Characteristic	Value
Topology	PMP
Wireless link condition	LoS, near LoS
Scheduler	WLR, TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	3 Gbps

## ePMP 4600

The ePMP 4600 is the third-generation Access Point (AP) that carries on the interference tolerance mechanisms with an emphasis on high-performance in low-density point to multipoint sectors. The ePMP 4600 is a 4 x 4 MIMO connectorized AP that can support a wide variety of deployments including 90/120-degree sectors, narrow-sector horns, or even 360-degree omni coverage.

The ePMP 4600 system consists of the ePMP 4600 AP, an optional 4x4 sector antenna, and a wide variety of subscriber modules with varying form factors and link budgets.

The ePMP 4600 system boasts a high packet per second performance, peak throughput of 4.3 Gbps, and supports subscriber modules with up to 4.3 Gbps of peak throughput.

An over view of ePMP 4600 is shown in [Figure 6](#)



Figure 6: ePMP 4600

A summary of the main ePMP 4600 characteristics are listed under [Table 2](#).

Table 2 Main characteristics of the ePMP 4600 Series

Characteristic	Value
Topology	PTP
Wireless link condition	LoS, near LoS
Scheduler	WLR, TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 6 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz, 160 MHz
Data rate	Up to 4.3 Gbps Sector Throughput

## ePMP 4500L

The ePMP 4500L is the third-generation Access Point (AP) that carries on the interference tolerance mechanisms with an emphasis on high-performance in low-density point to multipoint sectors. The ePMP 4500L is a 2 x 2 MIMO connectorized AP that can support a wide variety of deployments including 90/120-degree sectors, narrow-sector horns, or even 360-degree Omni coverage.

The ePMP 4500L system consists of the ePMP 4500L AP, an optional 2x2 sector antenna, and a wide variety of subscriber modules with varying form factors and link budgets.

The ePMP 4500L system boasts a high packet per second performance, peak throughput of 1 Gbps, and supports subscriber modules with up to 1 Gbps of peak throughput.

An over view of ePMP 4500L is shown in [Figure 7](#)



Figure 7: ePMP 4500L

A summary of the main ePMP 4500L characteristics are listed under [Table 2](#).

Table 2 Main characteristics of the ePMP 4500L Series

Characteristic	Value
Topology	PMP or PTP
Wireless link condition	LoS, near LoS
Scheduler	WLR, TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	1 Gbps

## ePMP 5/6GHz 4 x 4 sector antenna



Figure 8: ePMP 5/6 GHz 4 x 4 sector antenna

## Force 300-25

The Force 300-25 is a rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 500+ Mbps (when operating with 80 MHz channel bandwidth). It is capable of operating in line-of-sight (LoS) and near-LoS conditions. Force 300-25 is available as an integrated unit with a dual-polarized 25 dBi narrow Beamwidth dish antenna.

Force 300-25 is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard, however, the Force 300-25 device has a proprietary air interface for the main point-to-point link.

Force 300-25 is powered by standard power-over-Ethernet to a 1000BASE-T port.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management).

An over view of Force 300-25 is shown in [Figure 9](#)



**Figure 9: Force 300-25**

A summary of the main Force 300-25 characteristics are listed under [Table 3](#).

**Table 3 Main characteristics of the Force 300-25 Series**

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 500+ Mbps

## Force 300-19

The Force 300-19 is a rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless devices in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 500+ Mbps (when operating with 80 MHz channel bandwidth). The Force 300-19 is IP55 rated capable of operating in line-of-sight (LoS) and near-LoS conditions.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management).

An over view of Force 300-19 is shown in [Figure 10](#).



Figure 10: Force 300-19

A summary of the main Force 300-19 characteristics are listed under [Table 4](#).



**Note**

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

Table 4 Main characteristics of the Force 300-19 Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 500+ Mbps

## Force 300-19R

The Force 300-19R is a rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 600+ Mbps (when operating with 80 MHz channel bandwidth). The Force 300-19R is IP67 rated capable of operating in line-of-sight (LoS) and near-LoS conditions. Force 300-19R is available as an integrated unit with a dual-polarized 19dBi integrated flat-panel antenna.

Force 300-19R is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard, however, the Force 300-19R device has a proprietary air interface for the main point-to-point link.

Force 300-19R is powered by standard power-over-Ethernet to a 1000BASE-T port.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management).

An over view of Force 300-19R is shown in [Figure 11](#)



Figure 11: Force 300-19R


A summary of the main Force 300-19R characteristics is listed under [Table 5](#).



**Note**

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

Table 5 Main characteristics of the Force 300-19R Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	10/20/40/80 MHz
Data rate	Up to 500+ Mbps
Environmental	IP67  <div data-bbox="690 1486 760 1516" data-label="Section-Header"> <p><b>Note</b></p> </div> <div data-bbox="690 1533 1424 1631" data-label="Text"> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>
Temperature	-30°C to +60°C (-22°F to 140°F)



## Force 300-16

The Force 300-16 is a rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 500+ Mbps (when operating with 80 MHz channel bandwidth). It is capable of operating in line-of-sight (LoS) and near-LoS conditions. Force 300-16 is available as an integrated unit with a dual-polarized 16 dBi integrated antenna.

Force 300-16 is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard, however, the Force 300-16 device has a proprietary air interface for the main point-to-point link.

Force 300-16 is powered by standard power-over-Ethernet to a 1000BASE-T port.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management). An over view of Force 300-16 is shown in [Figure 12](#).



[Figure 12](#): Force 300-16

A summary of the main Force 300-16 characteristics is listed under [Table 6](#) .

**Table 6** Main characteristics of the Force 300-16 Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS, near LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 500+ Mbps

## Force 300-13

The Force 300-13 is a rugged high-capacity outdoor Point-to-Multipoint or Point-to-Point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 500+ Mbps (when operating with 80 MHz channel bandwidth). It can operate in line-of-sight (LoS). Force 300-13 is available as an integrated unit with a dual-polarized 13 dBi flat-panel antenna.

Force 300-13 is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard, however, the Force 300-13 device has a proprietary air interface for the main point-to-point link.

Force 300-13 is powered by standard power-over-Ethernet to a 1000BASE-T port.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management). An over view of Force 300-13 is shown in [Figure 13](#)



Figure 13: Force 300-13

A summary of the main Force 300-13 characteristics are listed under [Table 7](#).

Table 7 Main characteristics of the Force 300-13 Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 500+ Mbps

## Force 300-13L

The Force 300-13L is an affordable subscriber module in the ePMP Force 300 series. The Force 300-13L uses 802.11ac technology and supports MU-MIMO and other features offered by the ePMP 3000 and ePMP 3000L APs. It is also backward compatible with the ePMP 2000 using backward compatibility features. The Force 300-13L is powered by standard power-over-Ethernet to a 1000BASE-T port. An over view of Force 300-13L is shown in [Figure 14](#)



Figure 14: Force 300-13L



### Note

The ePMP Force 300-13L is available in EMEA, CALA, and APAC regions where type approved. It is NOT available in North America.

A summary of the main Force 300-13L characteristics is listed under [Table 8](#).

Table 8 Main characteristics of the Force 300-13L Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 400+ Mbps

## Force 300 CSM

The Force 300 CSM is an IP67 rugged high-capacity outdoor point-to-multipoint or point-to-point link wireless device in the unlicensed 5 GHz frequency bands with a maximum UDP throughput of 600+ Mbps (when operating with 80 MHz channel bandwidth). It can operate in line-of-sight (LoS). Force 300 CMS is

a Connectorized device with support for RF Element Twistport™ adaptors.

The Force 300 CSM device is based on highly integrated wireless semiconductor components designed to meet the IEEE 802.11ac standard.

Management of the unit is conducted via the same interface as the bridged traffic (in-band Management). An over view of Force 300 CSM is shown in [Figure 15](#).



**Figure 15:** Force 300 CSM

A summary of the main Force 300 CSM characteristics are listed under [Table 10](#) .



**Note**

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be raintight.

**Table 10** Main characteristics of the Force 300 CSM

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 600+ Mbps

## Force 300 CSML

The Force 300CSML is an affordable subscriber module in the ePMP Force 300 series. The Force 300 CSML uses 802.11ac technology and supports MU-MIMO and other features offered by the ePMP 3000 and ePMP 3000L APs. It is also backward compatible with the ePMP 2000 using backward compatibility features. The Force 300 CSML is powered by standard power-over-Ethernet to a 1000BASE-T port.

An over view of Force 300 CSML is shown in [Figure 16](#).



**Figure 16:** Force 300 CSML



### Note

The ePMP Force 300 CSML is available in EMEA, CALA, and APAC regions where type approved. It is NOT available in North America.

A summary of the main Force 300 CSML characteristics is listed under [Table 11](#).

**Table 11** Main characteristics of the Force 300 CSML Series

Characteristic	Value
Topology	PMP, PTP
Wireless link condition	LoS
Scheduler	TDD
Connectivity	Ethernet
Operating frequencies	Unlicensed bands, 5 GHz
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz
Data rate	Up to 400+ Mbps

## Force 425

The Force 425 device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 425 is shown in [Figure 17](#).



Figure 17: Force 425 integrated

## Force 400C

The Force 400C device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 400C is shown in Figure 18.



Figure 18: Force 400C integrated

## Force 4600C

The Force 4600C device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4600C uses 802.11ax technology and supports MU-MIMO. . The Force 4600C is powered by standard power-over-Ethernet to a 1000BASE-T port.

An overview of Force 4600C is shown in Figure 19.



Figure 19: Force 4600C integrated

## Force 5/6GHz 2 x 2 dish antenna



Figure 20: Force 5/6 GHz 2 x 2 dish antenna

## Force 4525

The Force 4525 device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4525 uses 802.11ac technology and supports MU-MIMO. It is also backward compatible with the ePMP XXXX using backward compatibility features. The Force 4525 is powered by standard power-over-Ethernet to a 1000BASE-T port.

An overview of Force 4525 is shown in [Figure 21](#).



Figure 21: Force 4525 integrated

## Force 4525L

The Force 4525L device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4525L uses 802.11ac technology and supports MU-MIMO. It is also backward compatible with the ePMP XXXX using backward compatibility features. The Force 4525L is powered by standard power-over-Ethernet to a 1000BASE-T port.

An overview of Force 4525L is shown in [Figure 22](#).



Figure 22: Force 4525L integrated

## Force 4625

The Force 4625 device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4625 uses 802.11ax technology and supports MU-MIMO. The Force 4625 is powered by standard power-over-Ethernet to a 1000BASE-T port.

An overview of Force 4625 is shown in [Figure 23](#).





Figure 23: Force 4625 integrated

## Typical installation equipment

The ePMP is a solution consisting of integrated outdoor units, indoor power supply units / LAN injectors, cabling, and surge suppression equipment.

The main hardware components of an ePMP installation are as follows:

- **ePMP 3000 Access Point:** A connectorized outdoor transceiver unit containing all the radio, networking, and surge suppression electronics.
- **ePMP 3000L Access Point:** A connectorized \*IP67 outdoor transceiver unit containing all the radio, networking, and surge suppression electronics.
- **ePMP 3000/3000L Access Point Power Supply:** An indoor power supply module providing Power-over-Ethernet (PoE) supply and 1000 / 100 Base-TX to the AP.
- **ePMP 3000/3000L Access Point Radio Cabling and Lightning Protection:** Shielded Cat5e cables, grounding cables, surge suppressors, and connectors.
- **ePMP Smart Antenna and cabling (optional):** For Smart Beamforming, dynamically creates a narrow, targeted beam to each subscriber
- **Force 300-25/Force 300-19/Force 300-19R/Force 300-16/Force 300-13/Force 300 CSM Radio:** Integrated outdoor transceiver units containing all the radio, networking, and surge suppression electronics.
- **Force 300-25/Force 300-19/Force 300-19R/Force 300-16/Force 300-13/Force 300 CSM Power Supply:** An indoor power supply module providing Power-over-Ethernet (PoE) supply and 100/1000 BASE-T to the Force 300-25 device.
- **Force 300-25/Force 300-19/Force 300-19R/Force 300-16/Force 300-13/Force 300 CSM Radio Cabling and Lightning Protection:** Shielded Cat5e cables, grounding cables, surge suppressors, and connectors.

- **ePMP 4x4 MU-MIMO Sector Antenna/ePMP 4x4 MU-MIMO Dual-Horn Antenna/ePMP 4x4 MU-MIMO Omni Antenna:** External Antennas for the ePMP 3000 AP.

For more information about these components, including interfaces, specifications, and Cambium part numbers, see [Chapter 2: System Hardware](#).



#### Note

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## Wireless operation

This section describes how the ePMP wireless link is operated, including modulation modes, power control, and security.

### MU-MIMO

The ePMP 3000 MU-MIMO AP is equipped with either a sector antenna array or a pseudo-Omni antenna. Antenna diversity allows simultaneous DL transmissions for two subscriber modules for MU-MIMO. As such, the ePMP 3000 AP's DL throughput capacity is significantly increased vs. the ePMP 1000/2000 APs.

This is a contrast to a traditional wireless system, where two subscribers cannot communicate on the same channel to the same AP at the same time without causing significant self-interference and degrading the overall wireless network performance.

### MIMO

The Multiple-Input Multiple-Output (MIMO) technique protects against fading and increases the probability of a received decoded signal being usable.

### Smart beamforming (ePMP 2000/3000 series)

Powered by Hypure™ technology, ePMP series APs feature Smart Beamforming. This powerful addition to your network creates narrow, targeted beams to each subscriber, rather than relying on a traditional wide beam, blocking out multiple sources of interference to keep performance high.

The System learns the locations of each served Subscriber Module and forms a narrow beam towards the desired Subscriber Module while that radio is transmitting in the uplink. This reduces the gain on the uplink for on-channel interferers that are transmitting at an azimuth angle different than the Subscriber Module, delivering performance gains never seen before.



Figure 24: Smart beamforming

## Smart antenna key advantages

- Eliminate Uplink Interference: Smart Beamforming delivers dramatic performance improvements when dealing with strong co-channel uplink interference, maximizing network performance.
- Consistent Performance in High Interference: By mitigating significant sources of interference, packet loss and retransmissions are kept to a minimum, keeping your network applications working at their best.
- Improvement in Uplink and Downlink Performance: By eliminating packet loss and retransmissions resulting from co-channel uplink interference, TCP retransmissions are greatly reduced. Other applications also show significant performance benefits.
- Intelligent Filtering improves both receive and transmit performance. It protects the network from off-channel interferers with a filter that dynamically moves around the channel. On the transmit side, it protects the RF environment by reducing off-channel transmission noise.

## Time-division duplexing

### TDD cycle

ePMP links operate using Time Division Duplexing (TDD). The links employ a TDD cycle in which the AP determines which Subscriber Modules may transmit and when based on the configured downlink/uplink ratio (duty cycle). Three fixed Downlink/Uplink frame ratios are available – 75/25, 50/50, and 30/70.

## OFDM and channel bandwidth

ePMP 3000 transmits using Orthogonal Frequency Division Multiplexing (OFDM). This wideband signal consists of many equally spaced sub-carriers. Although each subcarrier is modulated at a low rate using conventional modulation schemes, the resultant data rate from all the sub-carriers is high.

The channel bandwidth of the OFDM signal is 20 MHz, 40 MHz, or 80 MHz, based on operator configuration.

Each channel is offset in center frequency from its neighboring channel by 5 MHz.

## Adaptive modulation

ePMP 3000 can transport data over the wireless link using several different modulation modes ranging from 256-QAM to QPSK. For a given channel bandwidth and TDD frame structure, each modulation mode transports data at a fixed rate. Also, the receiver requires a given signal-to-noise ratio to successfully demodulate a given modulation mode. Although the more complex modulations such as 256-QAM will transport data at a much higher rate than the less complex modulation modes, the receiver requires a much higher signal-to-noise ratio.

ePMP 3000 provides an adaptive modulation scheme where the receiver constantly monitors the quality of the received signal and notifies the far end of the link of the optimum modulation mode with which to transmit. In this way, optimum capacity is achieved at all times.

## Radar avoidance

In regions where the protection of radars is part of the local regulations, ePMP must detect interference from radar-like systems and avoid co-channel operation with these systems.

To meet this requirement, ePMP implements the following features:

- The equipment can only transmit on available channels, of which there are none at initial power-up. The radar detection algorithm will always scan a usable channel for 60 seconds for radar interference before making the channel an available channel.
- This compulsory channel scan will mean that there is at least 60 seconds service outage every time radar is detected, and that the installation time is extended by at least 60 seconds even if there is found to be no radar on the channel.

There is a secondary requirement for bands requiring radar avoidance. Regulators have mandated that products provide a uniform loading of the spectrum across all devices. In general, this prevents operation with fixed frequency allocations. However:

- ETSI regulations do allow frequency planning of networks (as that has the same effect of spreading the load across the spectrum).
- The FCC does allow channels to be avoided if there is actual interference on them.



### Note

When operating in a region that requires DFS, ensure that the AP is configured with alternate frequencies and that the SM is configured to scan for these frequencies to avoid long outages.

## Encryption

ePMP supports optional encryption for data transmitted over the wireless link. The encryption algorithm used is the Advanced Encryption Standard (AES) with a 128-bit key size. AES is a symmetric encryption algorithm approved by U.S. Government organizations (and others) to protect sensitive information.

## Country codes

Some aspects of the wireless operation are controlled, enforced, or restricted according to a country code. ePMP country codes represent individual countries (for example Denmark) or regulatory regions (for example FCC or ETSI).

Country codes affect the following aspects of wireless operation:

- Maximum transmit power
- Radar avoidance (future release)
- Frequency range



#### Attention

To avoid possible enforcement action by the country regulator, always operate links in accordance with local regulations

## Further reading on the wireless operation

For information on planning wireless operation, see:

- The regulatory restrictions that affect radio spectrum usages, such as frequency range and radar avoidance are described under [Radio spectrum planning](#).
- The factors to be taken into account when planning links such as range, path loss, and data throughput are described under [Link planning](#).
- The safety specifications against which the ePMP has been tested are listed under [Compliance with safety standards](#) . It also describes how to keep RF exposure within safe limits.
- How ePMP complies with the radio regulations that are enforced in various countries is explained in [Compliance with radio regulations](#).

For more information on configuring and operating the wireless link, see:

- The configuration parameters of the ePMP devices are described under [Using the menu options](#).
- Post-installation procedures and troubleshooting tips are explained under [Operation and Troubleshooting](#).

## System management

This section introduces the ePMP management system, including the web interface, installation, alerts, and upgrades, configuration, and management software.

### Management agent

ePMP equipment is managed through an embedded management agent. Management workstations, network management systems, or PCs can be connected to this agent using the module's Ethernet port, SFP port, over the air (Subscriber Module connection via AP), or by using the device Wi-Fi management interface.

The management agent supports the following interfaces:

- Hypertext Transfer Protocol (HTTP)
- Hypertext Transfer Protocol Secure (HTTPS)
- Simple Network Management Protocol (SNMP)
- Network Time Protocol (NTP)
- System logging (Syslog)

- cnMaestro™ Cloud-based or On-premises Management System
- Dynamic Host Configuration Protocol (DHCP)

## Webserver

The ePMP management agent contains a web server. The web server supports access via the HTTP and HTTPS interfaces.

Web-based management offers a convenient way to manage the ePMP equipment from a locally connected computer or from a network management workstation connected through a management network, without requiring any special management software. The web-based interfaces are the only interfaces supported for the installation of ePMP, and the majority of ePMP configuration management tasks.

## Identity-based user accounts

When identity-based user accounts are configured, a security officer can define from one to four user accounts, each of which may have one of the four possible roles:

- ADMINISTRATOR (default username/password “admin”), who has full read and write permission.
- INSTALLER (default username/password “installer”), who has permission to read and write parameters applicable to unit installation and monitoring.
- HOME (default username/password “home”), who has permission only to access pertinent information for support purposes
- READONLY (default username/password “readonly”), who has permission to only view the Monitor page.

## SNMP

The management agent supports fault and performance management utilizing an SNMP interface. The management agent is compatible with SNMP v2c using one Management Information Base (MIB) file which is available for download from the Cambium Networks support site:

<https://support.cambiumnetworks.com/files/epmp>.

## Network Time Protocol (NTP)

The clock supplies accurate date and time information to the system. It can be set to run with or without a connection to a network time server (NTP). It can be configured to display local time by setting the time zone and daylight saving on the Time web page.

If an NTP server connection is available, the clock can be set to synchronize with the server time at regular intervals.

ePMP devices may receive NTP data from a CMM module or an NTP server configured in the system’s management network.

The Time Zone option is configurable on the **Configure > System** page and may be used to offset the received NTP time to match the operator’s local time zone.

## Software upgrade

Software upgrades may be issued via the radio web interface (**Tools > Software Upgrade**) or cnMaestro (cloud.cambiumnetworks.com). For software upgrades, see

<https://support.cambiumnetworks.com/files/epmp>.

## Further reading on system management

For more information on system management, see [Operation and Troubleshooting](#).

# Chapter 2: System Hardware

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This chapter describes the site planning and hardware components of an ePMP link.

The following topics are described in this chapter:

- Factors to be considered when planning the proposed network is described under [Site planning](#).
- The ePMP 3000 Access Point hardware, part numbers, mounting equipment, and specifications are described under [ePMP 3000 Access Point](#).
- The ePMP 3000L Access Point hardware, part numbers, mounting equipment, and specifications are described under [ePMP 3000L Access Point](#).
- The ePMP 4500 Access Point hardware, part numbers, mounting equipment, and specifications are described under [ePMP 4500 Access Point](#).
- The ePMP 4500L Access Point hardware, part numbers, mounting equipment, and specifications are described under [ePMP 4500L Access Point](#).
- The ePMP 4600 Access Point hardware, part numbers, mounting equipment, and specifications are described under [ePMP 4600 Access Point](#).
- The ePMP 6GHz 4 x 4 sector antenna hardware, part numbers, mounting equipment, and specifications are described under [ePMP 6GHz 4 x 4 sector antenna](#).
- The ePMP 6GHz 2 x 2 dish antenna hardware, part numbers, mounting equipment, and specifications are described under [ePMP 6GHz 2 x 2 dish antenna](#).
- The Force 300-25 module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-25](#).
- The Force 300-25L module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-25L](#).
- The Force 300-19 module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-19](#).
- The Force 300-19R module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-19R](#).
- The Force 300-16 module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-16](#).
- The Force 300-13 module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-13](#).
- The Force 300-13L module hardware, part numbers, mounting equipment, and specifications are described under [Force 300-13L](#).
- The Force 300 CSM module hardware, part numbers, mounting equipment, and specifications are described under [Force 300 CSM](#).
- The Force 300 CSML module hardware, part numbers, mounting equipment, and specifications are described under [Force 300 CSML](#).



- The ePMP MP 3000 MicroPOP module hardware, part numbers, mounting equipment, and specifications are described under [ePMP MP3000 MicroPoP](#).
- The Force 425 module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 425](#).
- The Force 400C module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 400C](#).
- The Force 4600C module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 4600C](#).
- The Force 4525 module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 4525](#).
- The Force 4525L module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 4525L](#).
- The Force 4625 module hardware, integrated description, part numbers, mounting equipment, and specifications are described under [Force 4625](#).
- The power supply hardware, part numbers, and specifications are described under [Power supply](#).
- Cable standards and lengths are described under [Ethernet cabling](#).
- Surge suppression requirements and recommendations are described under the [Surge suppression unit](#).
- GPS synchronization generation information are described under the [cnPulse sync generator](#).

## Site Planning

Conduct a site survey to ensure that the proposed sites meet the requirements defined in this section.

## Site installation

An ePMP site typically consists of a high supporting structure such as a mast, tower, or building for the devices.

Find a location for the device that meets the following requirements:

- The equipment is high enough to achieve the best radio path.
- People can be kept a safe distance away from the equipment when it is radiating. The safe separation distances are defined in [Calculated distances and power compliance margins](#).
- The equipment is lower than the top of the supporting structure (tower, mast, or building) or its lightning air terminal.
- There is one Ethernet interface, a copper Cat5e connection from the device to the power supply, and network terminating equipment.

## Grounding and lightning protection

Structures, equipment, and people must be protected against power surges (typically caused by lightning) by conducting the surge current to the ground via a separate preferential solid path. The actual degree of protection required depends on local conditions and applicable local regulations. To adequately protect an ePMP installation, both ground bonding and transient voltage surge suppression are required.



### Warning

Electro-magnetic discharge (lightning) damage is not covered under warranty. The recommendations in this guide, when followed correctly, give the user the best protection from the harmful effects of EMD. However, 100% protection is neither implied nor possible.

Details of lightning protection methods and requirements can be found in the international standards IEC 61024-1 and IEC 61312-1, the U.S. National Electric Code ANSI/NFPA No. 70-1984, or section 54 of the Canadian Electric Code.



### Note

International and national standards take precedence over the requirements in this guide.

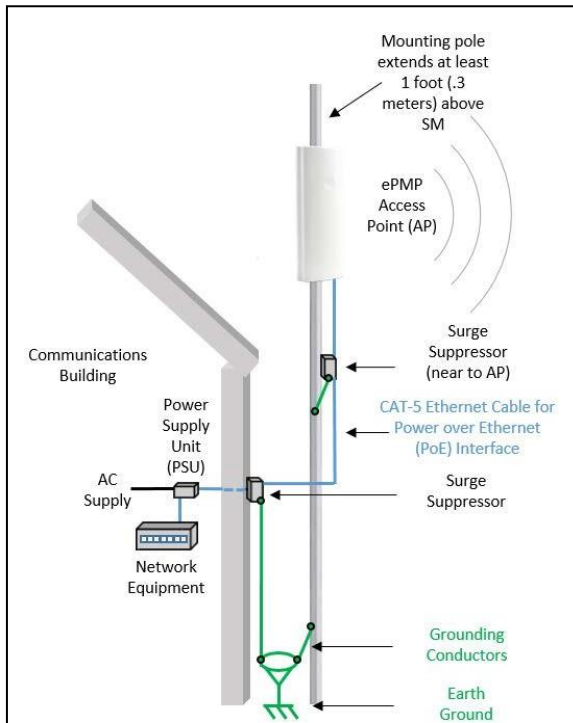


Figure 25: Access Point installation diagram

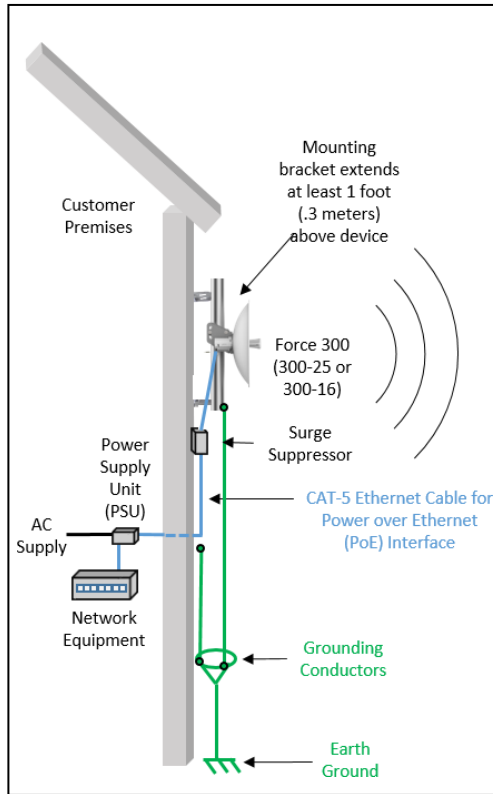


Figure 26: Subscriber / Point-to-Point installation diagram

## Lightning protection zones

Use the rolling sphere method (Figure 27) to determine where it is safe to mount equipment. An imaginary sphere, typically 50 meters in radius, is rolled over the structure. Where the sphere rests against the ground and a strike termination device (such as a finial or ground bar), all the space under the sphere is considered to be in the zone of protection (Zone B). Similarly, where the sphere rests on two finials, the space under the sphere is considered to be in the zone of protection.

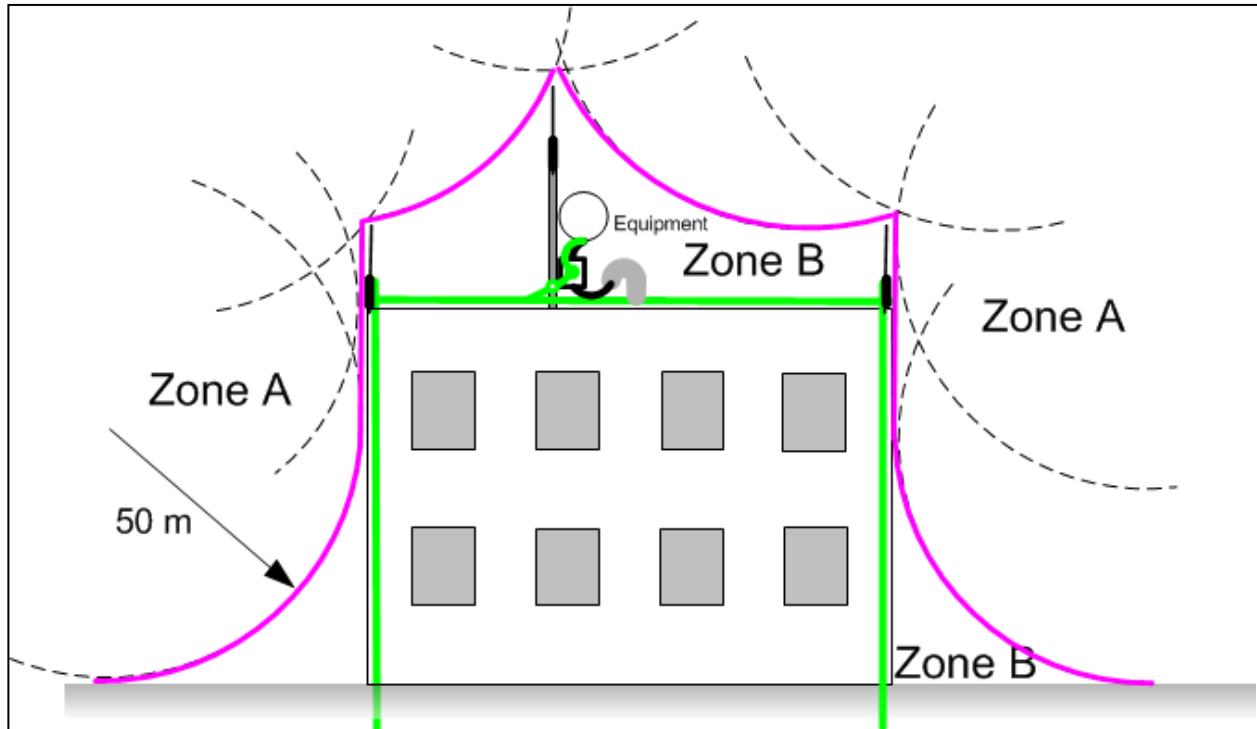


Figure 27: Rolling sphere method to determine the lightning protection zones

Assess locations on masts, towers, and buildings to determine if the location is in Zone A or Zone B:

- **Zone A:** In this zone a direct lightning strike is possible. Do not mount equipment in this zone.
- **Zone B:** In this zone, direct EMD (lightning) effects are still possible, but mounting in this zone significantly reduces the possibility of a direct strike. Mount equipment in this zone.



**Warning**

Do not mount equipment in Zone A which can put the equipment, structures, and life at risk.

## ePMP 3000 Access Point

For details of the ePMP 3000 Access Point hardware, see:

- [ePMP 3000 Access Point description](#)
- [ePMP 3000 Access Point part numbers](#)
- [ePMP 3000 Access Point mounting bracket](#)
- [ePMP 3000 Access Point interfaces](#)
- [ePMP 3000 Access Point specifications](#)
- [ePMP 3000 Access Point heater](#)
- [ePMP 3000 Access Point wind loading](#)
- [ePMP 3000 Access Point software packages](#)

## ePMP 3000 Access Point description

The ePMP 3000 AP is a self-contained transceiver unit that houses both radio and networking electronics.

It is available as a connectorized unit for use with a separate 4x4 MU-MIMO Sector/Dual-Horn/Omni antenna and an optional Smart Antenna (for uplink beam steering).

An overview of ePMP 3000 is shown in [Figure 28](#).



Figure 28: ePMP 3000 Access Point

## ePMP 3000 Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 12](#) and [Table 13](#) includes the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 12 ePMP 3000 Access Point part numbers

Cambium description	Cambium part number
ePMP 3000 5 GHz Access Point Radio (FCC) (US cord)	C058910A102A
ePMP 3000 5 GHz Access Point Radio (IC) (Canada/US cord)	C050910A104A
ePMP 3000 5 GHz Access Point Radio (EU) (EU cord)	C050910A203A
ePMP 3000 5 GHz Access Point Radio (EU) (UK cord)	C050910A303A
ePMP 3000 5 GHz Access Point Radio (ROW) (no cord)	C050910A001A
ePMP 3000 5 GHz Access Point Radio (ROW) (US cord)	C050910A101A
ePMP 3000 5 GHz Access Point Radio (ROW) (EU cord)	C050910A201A
ePMP 3000 5 GHz Access Point Radio (ROW) (UK cord)	C050910A301A
ePMP 3000 5 GHz Access Point Radio (ROW) (India cord)	C050910A401A

Cambium description	Cambium part number
ePMP 3000 5GHz Access Point Radio (India) (India Cord)	C050910A402A
ePMP 3000 5 GHz Access Point Radio (ROW) (China cord)	C050910A501A
ePMP 3000 5 GHz Access Point Radio (ROW) (Brazil cord)	C050910A601A
ePMP 3000 5 GHz Access Point Radio (ROW) (Argentina cord)	C050910A701A
ePMP 3000 5 GHz Access Point Radio (ROW) (ANZ cord)	C050910A801A
ePMP 3000 5 GHz Access Point Radio (ROW) (South Africa cord)	C050910A901A
ePMP 3000 5 GHz Access Point Radio (ROW) (No PSU)	C050910AZ01A
ePMP 4x4 MU-MIMO Sector Antenna (for ePMP3000AP)	C050910D301A
ePMP 4x4 MU-MIMO Dual-Horn Antenna (for ePMP3000AP)	C050900D025A
ePMP 4x4 MU-MIMO Omni Antenna (for ePMP3000AP) <ul style="list-style-type: none"> <li>▪ KP-5QSOMNI-13 (available directly from KP Performance)</li> </ul>	

Table 13 ePMP 3000 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## ePMP 3000 Access Point mounting bracket

The ePMP 3000 AP module is designed to be mounted with a sector antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 3000 AP mounting bracket is shown in [Figure 29](#).




Figure 29: ePMP 3000 Access Point module mounting bracket

## ePMP 3000 Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 14](#).

Table 14 ePMP 3000 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).  <div style="display: flex; align-items: center;">  <div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px;"> <p><b>Note</b></p> <p>All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div> </div>
		100/1000BASE-T Ethernet	Data.
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data.

## ePMP 3000 Access Point specifications


The ePMP 3000 connectorized module conforms to the specifications listed in [Table 15](#) and [Table 16](#).

The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 15 ePMP 3000 Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	0.7 kg (1.5 lbs) without brackets

Table 16 ePMP 3000 Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F)
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 3000 Access Point wind loading</a> for a full description.
Humidity	95% condensing
Environmental	IP55  <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>

## ePMP 3000 Access Point heater

At startup, if the ePMP 3000 AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 17](#).

Table 17 ePMP 3000 AP startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP 3000 Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).



Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 18](#) and [Table 19](#).

Table 18 ePMP 3000 Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
ePMP 3000 AP with Sector Antenna	0.13	21.74 Kg	33.96 Kg	48.91 Kg

Table 19 ePMP 3000 Access Point wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
ePMP 3000 AP with Sector Antenna	1.4	37.63 lb	58.80 lb	84.67 lb

## ePMP 3000 Access Point software packages

ePMP 3000 AP devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## ePMP 3000L Access Point

For details of the ePMP 3000L Access Point hardware, see:

- [ePMP 3000L Access Point description](#)
- [ePMP 3000L Access Point part numbers](#)
- [ePMP 3000L Access Point mounting bracket](#)

- [ePMP 3000L Access Point interfaces](#)
- [ePMP 3000L Access Point specifications](#)
- [ePMP 3000L Access Point heater](#)
- [ePMP 3000L Access Point wind loading](#)
- [ePMP 3000L Access Point software packages](#)

## ePMP 3000L Access Point description

The ePMP 3000L device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of ePMP 3000L is shown in [Figure 30](#).



Figure 30: ePMP 3000L Access Point

## ePMP 3000L Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 20](#)-and [Table 21](#) includes the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 20 ePMP 3000L Access Point part numbers

Cambium description	Cambium part number
ePMP 3000L 5 GHz Access Point Radio (FCC) (US cord)	C058910A122A
ePMP 3000L 5 GHz Access Point Radio (IC) (Canada/US cord)	C050910A124A

Cambium description	Cambium part number
ePMP 3000L 5 GHz Access Point Radio (EU) (EU cord)	C050910A223A
ePMP 3000L 5 GHz Access Point Radio (EU) (UK cord)	C050910A323A
ePMP 3000L 5 GHz Access Point Radio (ROW) (no cord)	C050910A021A
ePMP 3000L 5 GHz Access Point Radio (ROW) (US cord)	C050910A121A
ePMP 3000L 5 GHz Access Point Radio (ROW) (EU cord)	C050910A221A
ePMP 3000L 5 GHz Access Point Radio (ROW) (UK cord)	C050910A321A
ePMP 3000L 5 GHz Access Point Radio (ROW) (India cord)	C050910A421A
ePMP 3000L 5GHz Access Point Radio (India) (India Cord)	C050910A422A
ePMP 3000L 5 GHz Access Point Radio (ROW) (China cord)	C050910A521A
ePMP 3000L 5 GHz Access Point Radio (ROW) (Brazil cord)	C050910A621A
ePMP 3000L 5 GHz Access Point Radio (ROW) (Argentina cord)	C050910A721A
ePMP 3000L 5 GHz Access Point Radio (ROW) (ANZ cord)	C050910A821A
ePMP 3000L 5 GHz Access Point Radio (ROW) (South Africa cord)	C050910A921A
ePMP 3000L 5 GHz Access Point Radio (ROW) (No PSU)	C050910AZ21A

Table 21 ePMP 3000L accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## ePMP 3000L Access Point mounting bracket

The ePMP 3000L AP module is designed to be mounted with a sector antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 3000L Access Point mounting bracket is shown in [Figure 31](#)




Figure 31: ePMP 3000L Access Point module mounting bracket

## ePMP 3000L Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 22](#).

Table 22 ePMP 3000 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).  <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p><b>Note</b></p> <p>All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div> </div>
		100/1000BASE-T Ethernet	Data
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data

## ePMP 3000L Access Point specifications

The ePMP 3000L connectorized module conforms to the specifications listed in [Table 23](#) and [Table 24](#).


The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 23 ePMP 3000L Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	0.7 kg (1.5 lbs) without brackets

Table 24 ePMP 3000L Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F)
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 3000 Access Point wind loading (Kg)</a> for a full description.
Humidity	95% condensing
Environmental	IP67.



**Note**

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## ePMP 3000L Access Point heater

At startup, if the ePMP 3000L AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 25](#).

Table 25 ePMP 3000L Access Point startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP 3000L Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042AV^2$$

Where:	Is:
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 26](#) and [Table 27](#).

Table 26 ePMP 3000L Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
ePMP 3000L Access Point with Sector Antenna	0.13	21.74 Kg	33.96 Kg	48.91 Kg

Table 27 ePMP 3000L Access Point wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
ePMP 3000L Access Point with Sector Antenna	1.4	37.63 lb	58.80 lb	84.67 lb

## ePMP 3000L Access Point software packages

ePMP 3000L AP devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## ePMP 4500C Access Point

For details of the ePMP 4500C Access Point hardware, see:

- [ePMP 4500C Access Point description](#)
- [ePMP 4500C Access Point part numbers](#)
- [ePMP 4500C Access Point mounting bracket](#)
- [ePMP 4500C Access Point interfaces](#)
- [ePMP 4500C Access Point specifications](#)
- [ePMP 4500C Access Point heater](#)
- [ePMP 4500C Access Point wind loading](#)
- [ePMP 4500C Access Point mounting instructions](#)
- [ePMP 4500C Access Point software packages](#)

## ePMP 4500C Access Point description

The ePMP 4500C device is a self-contained transceiver unit that houses both radio and networking electronics. It is available with 8 X 8 MU-MIMO connectorized external antenna.

An overview of ePMP 4500C is shown in [Figure 32](#).



*Figure 32: ePMP 4500C Access Point*

## ePMP 4500C Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 20](#) and [Table 21](#) includes the following items:

- One connectorized external unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 20 ePMP 4500C Access Point part numbers

Cambium description	Cambium part number
ePMP 4500C 5 GHz Access Point Radio (FCC) (US cord)	C058910A122A
ePMP 4500C 5 GHz Access Point Radio (IC) (Canada/US cord)	C050910A124A
ePMP 4500C 5 GHz Access Point Radio (EU) (EU cord)	C050910A223A
ePMP 4500C 5 GHz Access Point Radio (EU) (UK cord)	C050910A323A
ePMP 4500C 5 GHz Access Point Radio (ROW) (no cord)	C050910A021A
ePMP 4500C 5 GHz Access Point Radio (ROW) (US cord)	C050910A121A
ePMP 4500C 5 GHz Access Point Radio (ROW) (EU cord)	C050910A221A
ePMP 4500C 5 GHz Access Point Radio (ROW) (UK cord)	C050910A321A
ePMP 4500C 5 GHz Access Point Radio (ROW) (India cord)	C050910A421A
ePMP 4500C 5GHz Access Point Radio (India) (India Cord)	C050910A422A
ePMP 4500C 5 GHz Access Point Radio (ROW) (China cord)	C050910A521A
ePMP 4500C 5 GHz Access Point Radio (ROW) (Brazil cord)	C050910A621A
ePMP 4500C 5 GHz Access Point Radio (ROW) (Argentina cord)	C050910A721A
ePMP 4500C 5 GHz Access Point Radio (ROW) (ANZ cord)	C050910A821A
ePMP 4500C 5 GHz Access Point Radio (ROW) (South Africa cord)	C050910A921A
ePMP 4500C 5 GHz Access Point Radio (ROW) (No PSU)	C050910AZ21A

Table 21 ePMP 4500C accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007



## ePMP 4500C Access Point mounting bracket

The ePMP 4500C AP module is designed to be mounted with an external antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 4500C AP mounting bracket is shown in [Figure 33](#)




Figure 33: ePMP 4500C Access Point module mounting bracket

## ePMP 4500C Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 22](#).

Table 22 ePMP 4500C Series- rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).   <b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.
		100/1000BASE-T Ethernet	Data
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data

## ePMP 4500C Access Point specifications


The ePMP 4500C connectorized module conforms to the specifications listed in [Table 23](#) and [Table 24](#).

The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 23 ePMP 4500C Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	12.5 kg (27.56 lbs) without brackets 14.66 kg (32.32 lbs) with brackets

Table 24 ePMP 4500C Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F).
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 4500C Access Point wind loading (Kg)</a> for a full description.
Humidity	95% condensing.
Environmental	IP67. 

**Note**  
This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## ePMP 4500C Access Point heater

At startup, if the ePMP 4500C AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can begin the operation successfully. The unit's heater is only activated when the unit is powered ON and does not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), then the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 25](#).

Table 25 ePMP 4500C Access Point startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP 4500C Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device subjects the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042AV^2$$

Where:	Is:
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 26](#) and [Table 27](#).

Table 26 ePMP 4500C Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	56
ePMP 4500C Access Point with Sector Antenna	0.249	41.63 Kg	65.05 Kg	81.60 Kg

Table 27 ePMP 4500C Access Point wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	125
ePMP 4500C Access Point with Sector Antenna	2.68	72.03 lb	112.56 lb	175.88 lb





Figure 34: ePMP 4500 Access Point

## ePMP 4500 Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 20](#) and [Table 21](#) includes the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 20 ePMP 4500 Access Point part numbers

Cambium description	Cambium part number
ePMP 4500 5 GHz Access Point Radio (FCC) (US cord)	C058910A122A
ePMP 4500 5 GHz Access Point Radio (IC) (Canada/US cord)	C050910A124A
ePMP 4500 5 GHz Access Point Radio (EU) (EU cord)	C050910A223A
ePMP 4500 5 GHz Access Point Radio (EU) (UK cord)	C050910A323A
ePMP 4500 5 GHz Access Point Radio (ROW) (no cord)	C050910A021A
ePMP 4500 5 GHz Access Point Radio (ROW) (US cord)	C050910A121A
ePMP 4500 5 GHz Access Point Radio (ROW) (EU cord)	C050910A221A
ePMP 4500 5 GHz Access Point Radio (ROW) (UK cord)	C050910A321A
ePMP 4500 5 GHz Access Point Radio (ROW) (India cord)	C050910A421A
ePMP 4500 5GHz Access Point Radio (India) (India Cord)	C050910A422A
ePMP 4500 5 GHz Access Point Radio (ROW) (China cord)	C050910A521A

Cambium description	Cambium part number
ePMP 4500 5 GHz Access Point Radio (ROW) (Brazil cord)	C050910A621A
ePMP 4500 5 GHz Access Point Radio (ROW) (Argentina cord)	C050910A721A
ePMP 4500 5 GHz Access Point Radio (ROW) (ANZ cord)	C050910A821A
ePMP 4500 5 GHz Access Point Radio (ROW) (South Africa cord)	C050910A921A
ePMP 4500 5 GHz Access Point Radio (ROW) (No PSU)	C050910AZ21A

Table 21 ePMP 4500 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## ePMP 4500 Access Point mounting bracket

The ePMP 4500 AP module is designed to be mounted with a sector antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 4500 AP mounting bracket is shown in [Figure 35](#)




Figure 35: ePMP 4500 Access Point module mounting bracket

## ePMP 4500 Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 22](#).

Table 22 ePMP 4500 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).   <b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.
		100/1000BASE-T Ethernet	Data
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data

## ePMP 4500 Access Point specifications


The ePMP 4500 connectorized module conforms to the specifications listed in [Table 23](#) and [Table 24](#).

The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 23 ePMP 4500 Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	12.5 kg (27.56 lbs) without brackets 14.66 kg (32.32 lbs) with brackets

Table 24 ePMP 4500 Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F).
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 4500 Access Point wind loading (Kg)</a> for a full description.
Humidity	95% condensing.
Environmental	IP67.  <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>

## ePMP 4500 Access Point heater

At startup, if the ePMP 4500 AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can begin the operation successfully. The unit's heater is only activated when the unit is powered ON and does not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), then the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 25](#).

Table 25 ePMP 4500 Access Point startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds



## ePMP 4500 Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device subjects the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042AV^2$$

Where:	Is:
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 26](#) and [Table 27](#).

Table 26 ePMP 4500 Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	56
ePMP 4500 Access Point with Sector Antenna	0.249	41.63 Kg	65.05 Kg	81.60 Kg

Table 27 ePMP 4500 Access Point wind loading (lb)

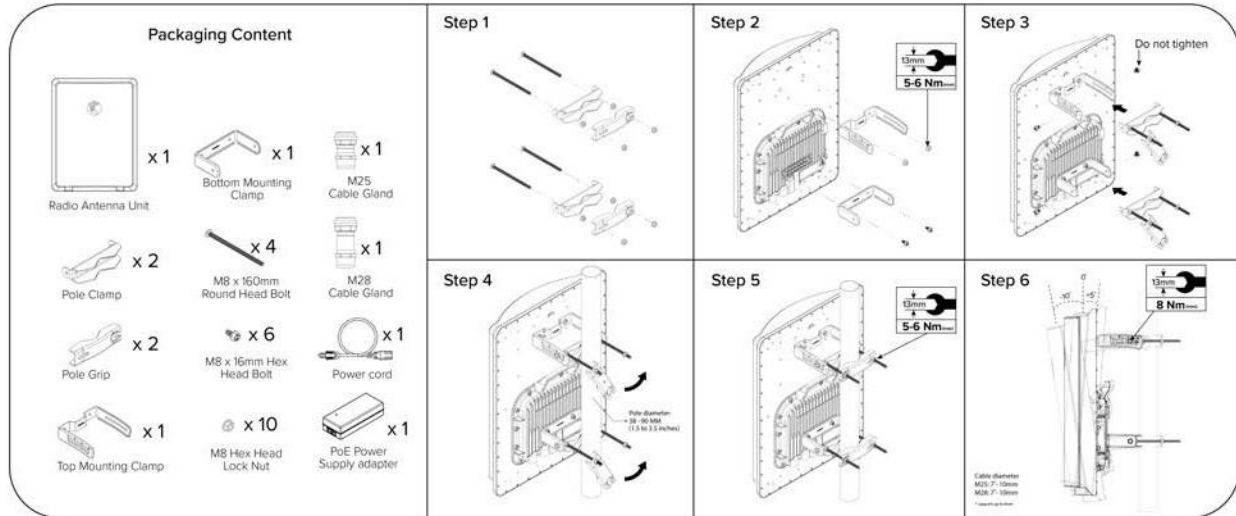
Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	125
ePMP 4500 Access Point with Sector Antenna	2.68	72.03 lb	112.56 lb	175.88 lb

# ePMP 4500 Access Point mounting instructions



## Note

A professional installation is required.



Scan QR code for ePMP 4500 Access Point installation guide and management.



## ePMP 4500 Access Point software packages

ePMP 4500 AP devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AX-v5.x.x.img (or higher version number)

## ePMP 4600 Access Point

For details of the ePMP 4600 Access Point hardware, see:

- [ePMP 4600 Access Point description](#)
- [ePMP 4600 Access Point part numbers](#)
- [ePMP 4600 Access Point mounting bracket](#)
- [ePMP 4600 Access Point interfaces](#)
- [ePMP 4600 Access Point specifications](#)
- [ePMP 4600 Access Point heater](#)

- [ePMP 4600 Access Point wind loading](#)
- [ePMP 4600 Access Point software packages](#)

## ePMP 4600 Access Point description

The ePMP 4600 device is a self-contained transceiver unit that houses both radio and networking electronics. It is available with 4 X 4 MU-MIMO connectorized antenna.

An overview of ePMP 4600 is shown in [Figure 36](#).



Figure 36: ePMP 4600 Access Point

## ePMP 4600 Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 20](#) and [Table 21](#) includes the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 20 ePMP 4600 Access Point part numbers

Cambium description	Cambium part number
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (no cord)	C060940A021A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (US cord)	C060940A121A
ePMP 4600 6 GHz 4x4 Access Point Radio (IC) (Canada/US cord)	C068940A124A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (EU cord)	C060940A221A
ePMP 4600 6 GHz 4x4 Access Point Radio (EU) (EU cord)	C060940A223A

Cambium description	Cambium part number
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (UK cord)	C060940A321A
ePMP 4600 6 GHz 4x4 Access Point Radio (EU) (UK cord)	C060940A323A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (India cord)	C060940A421A
ePMP 4600 6 GHz 4x4 Access Point Radio (India) (India Cord)	C060940A425A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (China cord)	C060940A521A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (Brazil cord)	C060940A621A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (Argentina cord)	C060940A721A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (ANZ cord)	C060940A821A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (South Africa cord)	C060940A921A
ePMP 4600 6 GHz 4x4 Access Point Radio (ROW) (No PSU)	C060940AZ21A
ePMP 4600 6 GHz 4x4 Access Point Radio (FCC) (US cord)	C068940A122B
ePMP 4600 6 GHz 4x4 Access Point Radio (Indonesia) (EU Cord)	C060940A226A

## ePMP 4600 Access Point mounting bracket

The ePMP 4600 AP module is designed to be mounted with a sector antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 4600 AP mounting bracket is shown in [Figure 37](#)




*Figure 37: ePMP 4600 Access Point module mounting bracket*

## ePMP 4600 Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 22](#).

Table 22 ePMP 4600 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).   <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 5px;"> <b>Note</b>                      All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.                 </div>
		100/1000BASE-T Ethernet	Data
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data

## ePMP 4600 Access Point specifications


The ePMP 4600 connectorized module conforms to the specifications listed in [Table 23](#) and [Table 24](#).

The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 23 ePMP 4600 Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	12.5 kg (27.56 lbs) without brackets 14.66 kg (32.32 lbs) with brackets

Table 24 ePMP 4600 Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F)
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 4600 Access Point wind loading (Kg)</a> for a full description
Humidity	95% condensing
Environmental	IP67   <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 5px;"> <b>Note</b>                      This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.                 </div>

## ePMP 4600 Access Point heater

At startup, if the ePMP 4600 AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 25](#).

Table 25 ePMP 4600 Access Point startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP 4600 Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042AV^2$$

Where:	Is:
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 26](#) and [Table 27](#).

Table 26 ePMP 4600 Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
ePMP 4500 Access Point with Sector Antenna	0.13	21.74 Kg	33.96 Kg	48.91 Kg

Table 27 ePMP 4600 Access Point wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
ePMP 4500 Access Point with Sector Antenna	1.4	37.63 lb	58.80 lb	84.67 lb

## ePMP 4600 Access Point software packages

ePMP 4600 AP devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AX-v5.x.x.img (or higher version number)

## ePMP 4500L Access Point

For details of the ePMP 4500L Access Point hardware, see:

- [ePMP 4500L Access Point description](#)
- [ePMP 4500L Access Point part numbers](#)
- [ePMP 4500L Access Point mounting bracket](#)
- [ePMP 4500L Access Point interfaces](#)
- [ePMP 4500L Access Point specifications](#)
- [ePMP 4500L Access Point heater](#)
- [ePMP 4500L Access Point wind loading](#)
- [ePMP 4500L Access Point software packages](#)

## ePMP 4500L Access Point description

The ePMP 4500L device is a self-contained transceiver unit that houses both radio and networking electronics. It is available with 2 X 2 MU-MIMO connectorized antenna.

An overview of ePMP 4500L is shown in [Figure 38](#).



Figure 38: ePMP 4500L Access Point

## ePMP 4500L Access Point part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 20](#) and [Table 21](#) includes the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 20 ePMP 4500L Access Point part numbers

Cambium description	Cambium part number
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (no cord)	C060940A051A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (US cord)	C060940A151A
ePMP 4500L 6 GHz 2x2 Access Point Radio (IC) (Canada/US cord)	C068940A154A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (EU cord)	C060940A251A
ePMP 4500L 6 GHz 2x2 Access Point Radio (EU) (EU cord)	C060940A253A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (UK cord)	C060940A351A
ePMP 4500L 6 GHz 2x2 Access Point Radio (EU) (UK cord)	C060940A353A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (India cord)	C060940A451A
ePMP 4500L 6 GHz 2x2 Access Point Radio (India) (India Cord)	C060940A455A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (China cord)	C060940A551A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (Brazil cord)	C060940A651A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (Argentina cord)	C060940A751A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (ANZ cord)	C060940A851A



Cambium description	Cambium part number
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (South Africa cord)	C060940A951A
ePMP 4500L 6 GHz 2x2 Access Point Radio (ROW) (No PSU)	C060940AZ51A
ePMP 4500L 6 GHz 2x2 Access Point Radio (FCC) (US cord)	C068940A152A
ePMP 4500L 6 GHz 2x2 Access Point Radio (Indonesia) (EU Cord)	C060940A256A

Table 21 ePMP 4500L accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## ePMP 4500L Access Point mounting bracket

The ePMP 4500L AP module is designed to be mounted with a sector antenna or pole-mounted using the mounting bracket provided in the box with the radio.

An overview of ePMP 4500L AP mounting bracket is shown in [Figure 39](#)



Figure 39: ePMP 4500L Access Point module mounting bracket

## ePMP 4500L Access Point interfaces

The Ethernet port is located at the bottom of the unit. This interface is described in [Table 22](#).

Table 22 ePMP 4500L Series- rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).  <div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px; display: inline-block;"> <p><b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div>
		100/1000BASE-T Ethernet	Data
SFP	SFP	Optical or Copper Gigabit Ethernet	Management and/or data

## ePMP 4500L Access Point specifications


The ePMP 4500L connectorized module conforms to the specifications listed in [Table 23](#) and [Table 24](#).

The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 23 ePMP 4500L Access Point physical specifications

Category	Specification
Dimensions (Length x Width x Height)	22.2 cm x 12.4 cm x 4.5 cm (8.75 in x 4.9 in x 1.75 in) without brackets
Weight	12.5 kg (27.56 lbs) without brackets 14.66 kg (32.32 lbs) with brackets

Table 24 ePMP 4500L Access Point environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F)
Wind loading	124 mph (200 kph) maximum. See <a href="#">ePMP 4500L Access Point wind loading (Kg)</a> for a full description.
Humidity	95% condensing
Environmental	IP67. 

**Note**  
This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## ePMP 4500L Access Point heater

At startup, if the ePMP 4500L AP module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 25](#).

Table 25 ePMP 4500L Access Point startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP 4500L Access Point wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

<b>Where:</b>	<b>Is:</b>
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042AV^2$$

<b>Where:</b>	<b>Is:</b>
A	the surface area in square feet
V	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 26](#) and [Table 27](#).

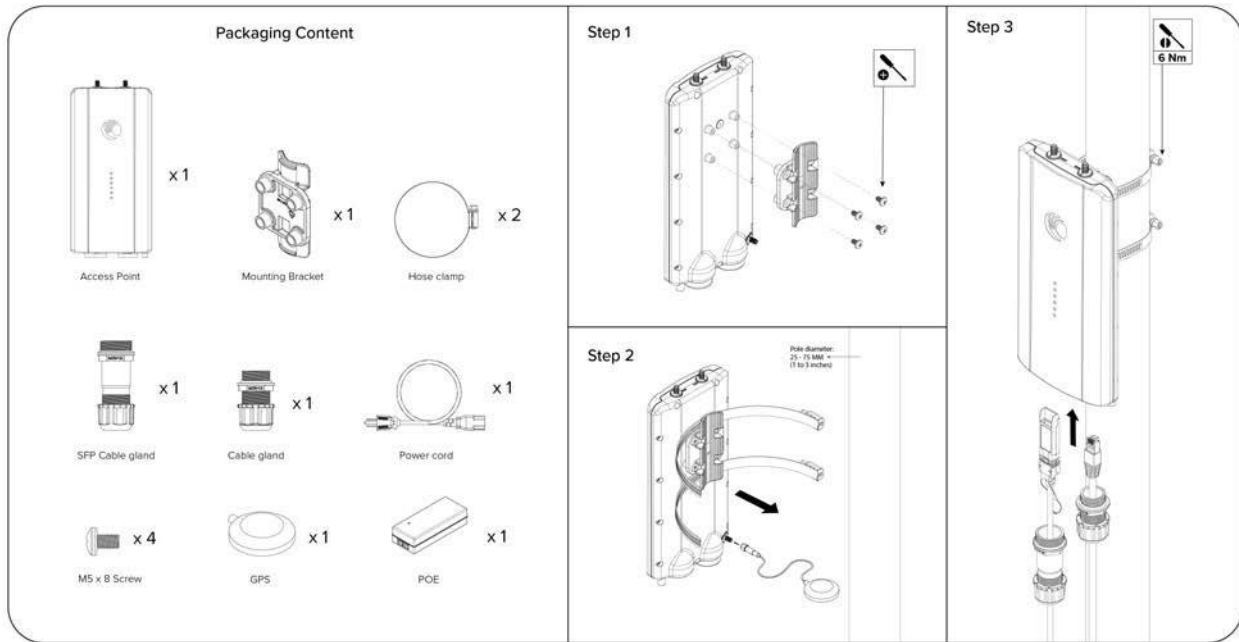
Table 26 ePMP 4500L Access Point wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	56
ePMP 4500 Access Point with Sector Antenna	0.032	5.35 Kg	8.36 Kg	10.49 Kg

Table 27 ePMP 4500L Access Point wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	125
ePMP 4500 Access Point with Sector Antenna	0.344	9.25 lb	14.45 lb	22.58 lb

## Mounting instructions



Scan QR code for **ePMP 4500L Access Point** installation guide and management.



## ePMP 4500L Access Point software packages

ePMP 4500L AP devices may be upgraded by downloading new software packages from the [Cambium Networks site](https://www.cambiumnetworks.com) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AX-v5.x.x.img (or higher version number)

## ePMP 5/6GHz 4 x 4 sector antenna



Figure 40: ePMP 5/6GHz 4 x 4 sector antenna

## Force 300-25

For details of the Force 300-25 hardware, see:

- [Force 300-25 integrated description](#)
- [Force 300-25 part numbers](#)
- [Force 300-25 mounting bracket](#)
- [Force 300-25 interfaces](#)
- [Force 300-25 interfaces](#)
- [Force 300-25 heater](#)
- [Force 300-25 wind loading](#)
- [Force 300-25 software packages](#)

## Force 300-25 integrated description

The Force 300-25 device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 300-25 integrated is shown in [Figure 41](#).



Figure 41: Force 300-25 integrated

## Force 300-25 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 28](#) and [Table 29](#) includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 28 Force 300-25 part numbers

Cambium description	Cambium part number
ePMP Force 300-25-25 5 GHz High Gain Radio (FCC) (US Cord)	C058910C102A
ePMP Force 300-25-25 5 GHz High Gain Radio (IC) (Canada/US Cord)	C050910C104A
ePMP Force 300-25-25 5 GHz High Gain Radio (EU) (EU Cord)	C050910C203A
ePMP Force 300-25-25 5 GHz High Gain Radio (EU) (UK Cord)	C050910C303A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (no Cord)	C050910C001A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (US Cord)	C050910C101A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (EU Cord)	C050910C201A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (UK Cord)	C050910C301A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (India Cord)	C050910C401A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (China Cord)	C050910C501A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (Brazil Cord)	C050910C601A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (Argentina Cord)	C050910C701A

Cambium description	Cambium part number
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (ANZ Cord)	C050910C801A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (South Africa Cord)	C050910C901A
ePMP Force 300-25-25 5 GHz High Gain Radio (RoW) (No PSU)	C050910CZ01A

Table 29 Force 300-25 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-25 mounting bracket

The Force 300-25 module is designed to be pole-mounted using the mounting bracket provided in the box with the radio.

An overview of Force 300-25 mounting bracket is shown in [Figure 42](#).




Figure 42: Force 300-25 module mounting bracket

## Force 300-25 interfaces

The Ethernet port is located on the rear of the integrated unit. This interface is described in [Table 30](#).



Table 30 Force 300-25 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).  <b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.
		100/1000BASE-T Ethernet	Data

## Force 300-25 specifications


The Force 300-25 integrated module conforms to the specifications listed in [Table 31](#) and [Table 32](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 31 Force 300-25 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	47 cm x 31 cm (18.5 in x 12.2 in)
Weight	2.4 kg (5.2 lbs)

Table 32 Force 300-25 environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +55°C (131°F)
Wind loading	124 mph (200 kph) maximum. See <a href="#">Force 300-25 wind loading</a> for a full description.
Humidity	95% condensing
Environmental	IP55  <b>Note</b> This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## Force 300-25 heater

At startup, if the Force 300-25 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 33](#)

Table 33 Force 300-25 startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-25 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 34](#) and [Table 35](#).

Table 34 Force 300-25 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
Force 300-25 Integrated	0.15	25.08 Kg	39.2 Kg	56.43 Kg

Table 35 Force 300-25 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-25 Integrated	1.61	43.28 lb	67.62 lb	97.37 lb

## Force 300-25 software packages

Force 300-25 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-25L

For details of the Force 300-25L hardware, see:

- [Force 300 CSM Connectorized Subscriber Module description](#)
- [Force 300-25L key features](#)
- [Force 300-25L part numbers](#)
- [Force 300-25L interfaces](#)
- [Force 300-25L specifications](#)
- [Force 300-25L heater](#)
- [Force 300-25L wind loading](#)
- [Force 300-25L software packages](#)

## Force 300-25L integrated description

The Force 300-25L is an integrated 802.11ac Wave2 based Subscriber Module with an integrated 25 dBi dish.

The radio supports PTP and ePTP protocols and is compatible with PMP applications with ePMP 3000, ePMP 3000L, and ePMP 2000 APs.

An overview of Force 300-25L integrated is shown in [Figure 43](#).



*Figure 43: Force 300-25L integrated*

### Force 300-25L key features

- Supports up to 400 Mbps usable throughput
- Frequency Range from 4.9 to 6.4 GHz

- Up to 26 dBm Tx Power
- Network management: HTTPS, SNMPv2c, SSH, cnMaestro
- Channel Size: 20 / 40 / 80 MHz

## Force 300-25L part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 36](#) and [Table 37](#) includes the following items:

- One unit
- One Dish
- One Fixed Mounting Bracket
- One unit
- Two Hose Clamps
- One PoE injector
- One Line Cord



### Note

An Optional Tilt Mount Bracket is available separately (N000900L063A).

Table 36 Force 300-25L part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (no cord)	C050910M071A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (US cord)	C050910M171A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (EU cord)	C050910M271A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (EU) (EU cord)	C050910M273A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (UK cord)	C050910M371A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (EU) (UK cord)	C050910M373A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (India cord)	C050910M471A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (India) (India Cord)	C050910M472A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (China cord)	C050910M571A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (Brazil cord)	C050910M671A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (Argentina cord)	C050910M771A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (ANZ cord)	C050910M871A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (South Africa cord)	C050910CM71A

Cambium description	Cambium part number
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (No PSU)	C050910MZ71A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (no cord)	C050910C071A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (US cord)	C050910C171A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (EU cord)	C050910C271A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (EU) (EU cord)	C050910C273A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (UK cord)	C050910C371A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (EU) (UK cord)	C050910C373A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (India cord)	C050910C471A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (India) (India Cord)	C050910C472A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (China cord)	C050910C571A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (Brazil cord)	C050910C671A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (Argentina cord)	C050910C771A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (ANZ cord)	C050910C871A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (South Africa cord)	C050910C971A
ePMP 5 GHz Force 300-25L SM Bulk Packaging (ROW) (No PSU)	C050910CZ71A

Table 37 Force 300-25L accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-25L interfaces

The Ethernet port is located on the rear of the unit.

Table 38 Force 300-25L - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).
		100/1000BASE-T Ethernet	Data


## Force 300-25L specifications

The Force 300-25L integrated module conforms to the specifications listed in [Table 39](#) and [Table 40](#). The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression, but does not provide lightning suppression.

Table 39 Force 300-25L physical specifications

Category	Specification
Dimensions (Diameter x Depth)	TBDmm x TBDmm x TBDmm (TBDin x TBDin x TBDin)
Weight	TBD
Antenna	Integrated dish, 25 dBi,
Pole Diameter Range	3.8 cm – 6.4 cm (1.5 in – 2.5 in)
Power Consumption	12 W Maximum, 9 W Typical
Input Voltage	30 V Passive PoE (14-30V DC input)

Table 40 Force 300-25L environmental specifications

Category	Specification
Temperature	-30°C to +55°C (-22°F to +122°F) ambient op temp
Wind Survival	200 km/hour (124 mi/hour)
Environmental	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">  </div> <div> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div> </div>

## Force 300-25L heater

At start-up, if the Force 300-25L module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 41](#).

Table 41 Force 300-25L startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-25L wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 42](#) and [Table 43](#).

Table 42 Force 300-25L wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 300-25L Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 43 Force 300-25L wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-25L	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 300-25L software packages

Force 300-25L devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-19

For details of the Force 300-19 hardware, see:

- [Force 300-19 integrated description](#)
- [Force 300-19 part numbers](#)
- [Force 300-19 mounting bracket](#)
- [Force 300-19 interfaces](#)
- [Force 300-19 specifications](#)
- [Force 300-19 heater](#)
- [Force 300-19 wind loading](#)
- [Force 300-19 software packages](#)

## Force 300-19 integrated description

The Force 300-19 device is a self-contained transceiver unit that houses both radio and networking electronics.

(FCCID:Z8H89FT0048 | IC:109W-0048)

An overview of Force 300-19 is shown in [Figure 44](#).



*Figure 44: Force 300-19 Access Point*

## Force 300-19 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 44](#) and [Table 45](#) include the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord



Table 44 Force 300-19 part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300-19 SM (FCC) (US cord)	C058900C801A
ePMP 5 GHz Force 300-19 SM (IC) (Canada/US cord)	C050900C801A
ePMP 5 GHz Force 300-19 SM (EU) (EU cord)	C050900C802A
ePMP 5 GHz Force 300-19 SM (EU) (UK cord)	C050900C803A
ePMP 5 GHz Force 300-19 SM (ROW) (no cord)	C050900C804A
ePMP 5 GHz Force 300-19 SM (ROW) (US cord)	C050900C805A
ePMP 5 GHz Force 300-19 SM (ROW) (EU cord)	C050900C806A
ePMP 5 GHz Force 300-19 SM (ROW) (UK cord)	C050900C807A
ePMP 5 GHz Force 300-19 SM (ROW) (India cord)	C050900C808A
ePMP 5 GHz Force 300-19 SM (India) (India cord)	C050900C809A
ePMP 5 GHz Force 300-19 SM (ROW) (China cord)	C050900C810A
ePMP 5 GHz Force 300-19 SM (ROW) (Brazil cord)	C050900C811A
ePMP 5 GHz Force 300-19 SM (ROW) (Argentina cord)	C050900C812A
ePMP 5 GHz Force 300-19 SM (ROW) (ANZ cord)	C050900C813A
ePMP 5 GHz Force 300-19 SM (ROW) (South Africa cord)	C050900C814A
ePMP 5 GHz Force 300-19 SM (ROW) (No PSU)	C050900C815A

Table 45 Force 300-19 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-19 mounting bracket

The Force 300-19 module is designed to be pole-mounted using the mounting bracket provided in the box with the radio.

An overview of Force 300-19 mounting bracket is shown in [Figure 45](#)




Figure 45: Force 300-19 module mounting bracket

## Force 300-19 interfaces

The Ethernet port is located on the rear of the integrated unit. This interface is described in [Table 46](#)

Table 46 Force 300-19 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).   <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 5px;"> <p><b>Note</b></p> <p>All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div>
		100/1000BASE-T Ethernet	Data

## Force 300-19 specifications


The Force 300-19 integrated module conforms to the specifications listed in [Table 47](#) and [Table 48](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 47 Force 300-19 physical specifications

Category	Specification
Dimensions	27.8 cm x 27.8 cm x 4.5cm (10.9 in x 10.9 in x 1.8 in)
Weight	1.45 kg (3.2 lbs) (Including mounting bracket)
Antenna Gain	19 dBi

Table 48 Force 300-19 environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +60°C (140°F)
Wind loading	113 mph (180 kph) maximum. See <a href="#">Force 300-19 wind loading</a> for a full description.
Humidity	95% condensing
Environmental	IP55  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>

## Force 300-19 heater

At startup, if the Force 300-19 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 49](#).

Table 49 Force 300-19 startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-19 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (113 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

<b>Where:</b>	<b>Is:</b>
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 50](#) and [Table 51](#).

Table 50 Force 300-19 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
Force 300-19 Integrated	0.08	13.4 Kg	20.9 Kg	30.1 Kg

Table 51 Force 300-19 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-19 Integrated	0.8281	22.3 lb	34.8 lb	50.1 lb

## Force 300-19 software packages

Force 300-19 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-19R

For details of the Force 300-19R hardware, see:

- [Force 300-19R integrated description](#)
- [Force 300-19R part numbers](#)
- [Force 300-19R mounting bracket](#)
- [Force 300-19R interfaces](#)
- [Force 300-19R specifications](#)
- [Force 300-19R heater](#)
- [Force 300-19R wind loading](#)
- [Force 300-19R software packages](#)

## Force 300-19R integrated description

The Force 300-19R device is a self-contained transceiver unit that houses both radio and networking electronics. (FCCID: Z8H89FT0048 | IC:109W-0048)

## Force 300-19R part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 52](#) and [Table 53](#) include the following items:



Figure 46: Force 300-19R

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 52 Force 300-19R part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300-19R SM (FCC) (US cord)	C058900C901A
ePMP 5 GHz Force 300-19R SM (IC) (Canada/US cord)	C050900C901A
ePMP 5 GHz Force 300-19R SM (EU) (EU cord)	C050900C902A
ePMP 5 GHz Force 300-19R SM (EU) (UK cord)	C050900C903A
ePMP 5 GHz Force 300-19R SM (ROW) (no cord)	C050900C904A
ePMP 5 GHz Force 300-19R SM (ROW) (US cord)	C050900C905A
ePMP 5 GHz Force 300-19R SM (ROW) (EU cord)	C050900C906A
ePMP 5 GHz Force 300-19R SM (ROW) (UK cord)	C050900C907A
ePMP 5 GHz Force 300-19R SM (ROW) (India cord)	C050900C908A
ePMP 5 GHz Force 300-19R SM (India) (India cord)	C050900C909A
ePMP 5 GHz Force 300-19R SM (ROW) (China cord)	C050900C910A
ePMP 5 GHz Force 300-19R SM (ROW) (Brazil cord)	C050900C911A
ePMP 5 GHz Force 300-19R SM (ROW) (Argentina cord)	C050900C912A

Cambium description	Cambium part number
ePMP 5 GHz Force 300-19R SM (ROW) (ANZ cord)	C050900C913A
ePMP 5 GHz Force 300-19R SM (ROW) (South Africa cord)	C050900C914A
ePMP 5 GHz Force 300-19R SM (ROW) (No PSU)	C050900C915A

Table 53 Force 300-19R accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-19R mounting bracket

The Force 300-19R module is designed to be pole-mounted using the mounting bracket provided in the box with the radio.

An overview of Force 300-19R mounting bracket is shown in [Figure 47](#)



Figure 47: Force 300-19R module mounting bracket

## Force 300-19R interfaces

The Ethernet port is located on the rear of the integrated unit. This interface is described in [Table 54](#).

Table 54 Force 300-19R Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).
		100/1000BASE-T Ethernet	Data

## Force 300-19R specifications


The Force 300-19R integrated module conforms to the specifications listed in [Table 55](#) and [Table 56](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 55 Force 300-19R physical specifications

Category	Specification
Dimensions	27.8 cm x 27.8 cm x 4.5cm (10.9 in x 10.9 in x 1.8 in)
Weight	1.45 kg (3.2 lbs) (Including mounting bracket)
Antenna Gain	19 dBi

Table 56 Force 300-19R environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +60°C (140°F)
Wind loading	113 mph (180 kph) maximum. See <a href="#">Force 300-19R wind loading</a> for a full description.
Humidity	95% condensing
Environmental	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">  </div> <div> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div> </div>

## Force 300-19R heater

At startup, if the Force 300-19R module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 57](#).

Table 57 Force 300-19R startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-19R wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (113 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 58](#)-and [Table 59](#).

Table 58 Force 300-19R wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
Force 300-19 Integrated	0.08	13.4Kg	20.9Kg	30.1Kg

Table 59 Force 300-19R wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-19 Integrated	0.8281	22.3 lb	34.8 lb	50.1 lb



## Force 300-19R software packages

Force 300-19R devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-16

For details of the Force 300-16 hardware, see:

- [Force 300-16 integrated description](#)
- [Force 300-16 part numbers](#)
- [Force 300-16 interfaces](#)
- [Force 300-16 specifications](#)
- [Force 300-16 heater](#)
- [Force 300-16 wind loading](#)
- [Force 300-16 software packages](#)

## Force 300-16 integrated description

The Force 300-16 device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 300-16 integrated is shown in [Figure 48](#).



*Figure 48: Force 300-16 integrated*

## Force 300-16 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 60](#) and [Table 61](#) include the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector

- One line cord

Table 60 Force 300-16 part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300-16 Radio (FCC) (US cord)	C058910C112A
ePMP 5 GHz Force 300-16 Radio (IC) (Canada/US cord)	C050910C114A
ePMP 5 GHz Force 300-16 Radio (EU) (EU cord)	C050910C213A
ePMP 5 GHz Force 300-16 Radio (EU) (UK cord)	C050910C313A
ePMP 5 GHz Force 300-16 Radio (ROW) (no cord)	C050910C011A
ePMP 5 GHz Force 300-16 Radio (ROW) (US cord)	C050910C111A
ePMP 5 GHz Force 300-16 Radio (ROW) (EU cord)	C050910C211A
ePMP 5 GHz Force 300-16 Radio (ROW) (UK cord)	C050910C311A
ePMP 5 GHz Force 300-16 Radio (ROW) (India cord)	C050910C411A
ePMP 5 GHz Force 300-16 Radio (India) (India cord)	C050910C412A
ePMP 5 GHz Force 300-16 Radio (ROW) (China cord)	C050910C511A
ePMP 5 GHz Force 300-16 Radio (ROW) (Brazil cord)	C050910C611A
ePMP 5 GHz Force 300-16 Radio (ROW) (Argentina cord)	C050910C711A
ePMP 5 GHz Force 300-16 Radio (ROW) (ANZ cord)	C050910C811A
ePMP 5 GHz Force 300-16 Radio (ROW) (South Africa cord)	C050910C911A
ePMP 5 GHz Force 300-16 Radio (ROW) (No PSU)	C050910CZ11A


Table 61 Force 300-16 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-16 interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 62 Force 300-16 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE). 
		100/1000BASE-T Ethernet	Data

**Note**  
All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.

## Force 300-16 specifications


The Force 300-16 integrated module conforms to the specifications listed in [Table 63](#) and [Table 64](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 63 Force 300-16 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	12.4 cm x 25.1 cm x 11.9 cm (4.9 in x 9.9 in x 4.7 in) – with mounting bracket
Weight	0.5 kg (1.1 lbs) - with mounting bracket

Table 64 Force 300-16 environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +60°C (140°F)
Wind loading	112 mph (180 kph) maximum. See <a href="#">Force 300-16 wind loading</a> for a full description.
Environmental	IP55 

**Note**  
This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## Force 300-16 heater

At startup, if the Force 300-16 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 65](#).

Table 65 Force 300-16 startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-16 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 66](#) and [Table 67](#).

Table 66 Force 300-16 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 300-16 Integrated	0.03	2.8 Kg	5 Kg	7.8 Kg

Table 67 Force 300-16 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-16 Integrated	0.34	9.1 lb	14.3 lb	20.6 lb

## Force 300-16 software packages

Force 300-16 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-13

For details of the Force 300-13 hardware, see:

- [Force 300-13 integrated description](#)
- [Force 300-13 part numbers](#)
- [Force 300-13 interfaces](#)
- [Force 300-13 specifications](#)
- [Force 300-13 heater](#)
- [Force 300-13 wind loading](#)
- [Force 300-13 software packages](#)

## Force 300-13 integrated description

The Force 300-13 device is a self-contained transceiver unit that houses both radio and networking electronics.

(FCCID:Z8H89FT0048 | IC:109W-0048).

An overview of Force 300-13 integrated is shown in [Figure 49](#).



Figure 49: Force 300-13 integrated radio

## Force 300-13 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 68](#) and [Table 69](#) include the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 68 Force 300-13 part numbers

Cambium description	Cambium part number
ePMP 5GHz Force 300-13 SM (FCC) (US cord)	C058900C701A
ePMP 5GHz Force 300-13 SM (IC) (Canada/US cord)	C050900C701A
ePMP 5GHz Force 300-13 SM (EU) (EU cord)	C050900C702A
ePMP 5GHz Force 300-13 SM (EU) (UK cord)	C050900C703A
ePMP 5GHz Force 300-13 SM (ROW) (no cord)	C050900C704A
ePMP 5GHz Force 300-13 SM (ROW) (US cord)	C050900C705A
ePMP 5GHz Force 300-13 SM (ROW) (EU cord)	C050900C706A
ePMP 5GHz Force 300-13 SM (ROW) (UK cord)	C050900C707A
ePMP 5GHz Force 300-13 SM (ROW) (India cord)	C050900C708A
ePMP 5GHz Force 300-13 SM (India) (India cord)	C050900C709A
ePMP 5GHz Force 300-13 SM (ROW) (China cord)	C050900C710A
ePMP 5GHz Force 300-13 SM (ROW) (Brazil cord)	C050900C711A
ePMP 5GHz Force 300-13 SM (ROW) (Argentina cord)	C050900C712A
ePMP 5GHz Force 300-13 SM (ROW) (ANZ cord)	C050900C713A

Cambium description	Cambium part number
ePMP 5GHz Force 300-13 SM (ROW) (South Africa cord)	C050900C714A
ePMP 5GHz Force 300-13 SM (ROW) (No PSU)	C050900C715A


Table 69 Force 300-13 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-13 interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 70 Force 300-13 Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE). 
		100/1000BASE-T Ethernet	Data

**Note**  
All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.

## Force 300-13 specifications


The Force 300-13 integrated module conforms to the specifications listed in [Table 71](#) and [Table 72](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 71 Force 300-13 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	12.4 cm x 25.1 cm x 11.9 cm (4.9 in x 9.9 in x 4.7 in) – with mounting bracket
Weight	0.5 kg (1.1 lbs) - with mounting bracket
Antenna Gain	13 dBi

Table 72 Force 300-13 environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +60°C (140°F)
Wind loading	112 mph (180 kph) maximum. See <a href="#">Force 300-13 wind loading</a> for a full description.
Environmental	IP55  <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>

## Force 300-13 heater

At startup, if the Force 300-13 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 73](#).

Table 73 Force 300-13 startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300-13 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).



Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 74](#) and [Table 75](#).

Table 74 Force 300-13 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 300-13 Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 75 Force 300-13 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300-13 Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 300-13 software packages

Force 300-16 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300-13L

For details of the Force 300-13L hardware, see:

- [Force 300-13L integrated description](#)
- [Force 300-13L part numbers](#)
- [Force 300-13L interfaces](#)

- [Force 300-13L specifications](#)
- [Force 300-13L wind loading](#)
- [Force 300-13L LEDs](#)
- [Force 300-13L software packages](#)

## Force 300-13L integrated description

The Force 300-13L device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 300-13L uses 802.11ac technology and supports MU-MIMO and other features offered by the ePMP 3000 and ePMP 3000L APs. It is also backward compatible with the ePMP 2000 using backward compatibility features.

An overview of Force 300-13L integrated is shown in [Figure 50](#).



*Figure 50: Force 300-13L integrated*

## Force 300-13L part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 76](#) and [Table 77](#) include the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One-line cord

Table 76 Force 300-13L part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300-13L SM (ROW) (no cord)	C050910C031A

Cambium description	Cambium part number
ePMP 5 GHz Force 300-13L SM (ROW) (US cord)	C050910C131A
ePMP 5 GHz Force 300-13L SM (ROW) (EU cord)	C050910C231A
ePMP 5 GHz Force 300-13L SM (EU) (EU cord)	C050910C233A
ePMP 5 GHz Force 300-13L SM (ROW) (UK cord)	C050910C331A
ePMP 5 GHz Force 300-13L SM (EU) (UK cord)	C050910C333A
ePMP 5 GHz Force 300-13L SM (ROW) (India cord)	C050910C431A
ePMP 5 GHz Force 300-13L SM (India) (India Cord)	C050910C432A
ePMP 5 GHz Force 300-13L SM (ROW) (China cord)	C050910C531A
ePMP 5 GHz Force 300-13L SM (ROW) (Brazil cord)	C050910C631A
ePMP 5 GHz Force 300-13L SM (ROW) (Argentina cord)	C050910C731A
ePMP 5 GHz Force 300-13L SM (ROW) (ANZ cord)	C050910C831A
ePMP 5 GHz Force 300-13L SM (ROW) (South Africa cord)	C050910C931A
ePMP 5 GHz Force 300-13L SM (ROW) (No PSU)	C050910CZ31A

Table 77 Force 300-13L accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300-13L interfaces

The Ethernet port is located on the rear of the integrated unit.

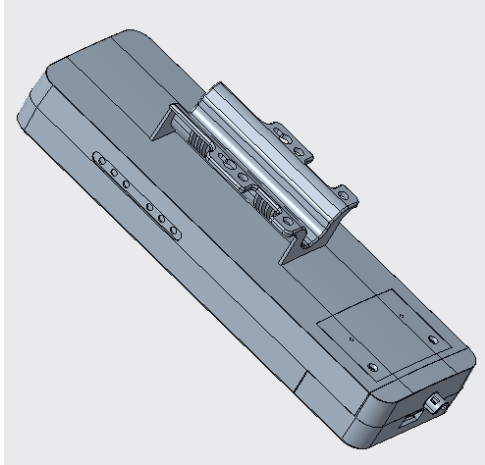


Figure 51: Rear Interfaces

Table 78 Force 300-13L Series - rear interfaces

Port name	Connector	Interface	Description
Ethernet	RJ45	24V PoE input	10/100 BASE-T
		100 BASE-TX Ethernet	Management and data
Reset Button	Physical button	N/A	For resetting the radio and for setting the radio back to its factory default configuration. See <a href="#">Using the device external reset button</a> .

## Force 300-13L specifications


The Force 300-13L integrated module conforms to the specifications listed in [Table 79](#) and [Table 80](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 79 Force 300-13L physical specifications

Category	Specification
Dimensions (Diameter x Depth)	235 x 77 x 58 mm
Weight	0.35 kg (0.88 lbs)
Antenna Gain	13 dBi

Table 80 Force 300-13L environmental specifications

Category	Specification
Temperature	-30°C to +55°C (-22°F to +122°F)
Wind loading	125 km/hour (78 mi/hour)
Environmental	IP55  <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 10px;"> <b>Note</b>                          This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be raintight.                     </div>

## Force 300-13L wind loading

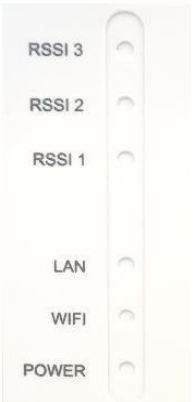


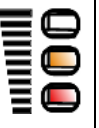

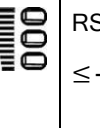
Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 125 kph (78 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and surface area.

## Force 300-13L LEDs

Table 81 Force 300-13L LED Functions

	LED	Function	
	POWER	Green: Power is applied to the device  Unlit: No power is applied to the device or improper power source	
	WiFi	XXX	
	LAN	XXX	
	 RF SIGNAL	Radio scanning: LEDs light in an ascending sequence to indicate that the radio is scanning  Radio registered: LEDs light to indicate the RSSI level at the device.	
 RSSI > -60 dBm	 -70 dBm < RSSI ≤ -60 dBm	 -80 dBm < RSSI ≤ -70 dBm	 RSSI ≤ -80 dBm

## Force 300-13L software packages

Force 300-13L devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP- NonGPS\_Synced-[version].tar.gz (or higher version number)

## Force 300 CSM

For details of the Force 300 CSM hardware, see:

- [Force 300 CSM Connectorized Subscriber Module description](#)
- [Force 300 CSM part numbers](#)
- [Force 300 CSM interfaces](#)
- [Force 300 CSM specifications](#)
- [Force 300 CSM heater](#)
- [Force 300 CSM wind loading](#)
- [Force 300 CSM software packages](#)

## Force 300 CSM description

The Force 300 CSM device is a connectorized subscriber module transceiver unit that houses both radio and networking electronics.

An overview of Force 300 CSM is shown in [Figure 52](#).



Figure 52: Force 300 CSM

## Force 300 CSM part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 82](#) and [Table 83](#) includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 82 Force 300 CSM part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300 CSM SM (FCC) (US cord)	C058910C122A
ePMP 5 GHz Force 300 CSM SM (IC) (Canada/US cord)	C050910C124A
ePMP 5 GHz Force 300 CSM SM (EU) (EU cord)	C050910C223A
ePMP 5 GHz Force 300 CSM SM (EU) (UK cord)	C050910C323A
ePMP 5 GHz Force 300 CSM SM (ROW) (no cord)	C050910C021A
ePMP 5 GHz Force 300 CSM SM (ROW) (US cord)	C050910C121A
ePMP 5 GHz Force 300 CSM SM (ROW) (EU cord)	C050910C221A
ePMP 5 GHz Force 300 CSM SM (ROW) (UK cord)	C050910C321A
ePMP 5 GHz Force 300 CSM SM (ROW) (India cord)	C050910C421A
ePMP 5 GHz Force 300 CSM SM (India) (India cord)	C050910C422A
ePMP 5 GHz Force 300 CSM SM (ROW) (China cord)	C050910C521A
ePMP 5 GHz Force 300 CSM SM (ROW) (Brazil cord)	C050910C621A
ePMP 5 GHz Force 300 CSM SM (ROW) (Argentina cord)	C050910C721A
ePMP 5 GHz Force 300 CSM SM (ROW) (ANZ cord)	C050910C821A
ePMP 5 GHz Force 300 CSM SM (ROW) (South Africa cord)	C050910C921A
ePMP 5 GHz Force 300 CSM SM (ROW) (No PSU)	C050910CZ21A


Table 83 Force 300 CSM accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## Force 300 CSM interfaces

The Ethernet port is located on the rear of the unit.

Table 84 Force 300 CSM Series - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE). 
		100/1000BASE-T Ethernet	Data

**Note**  
All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.

## Force 300 CSM specifications


The Force 300 CSM connectorized module conforms to the specifications listed in [Table 85](#) and [Table 86](#).

The module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 85 Force 300 CSM physical specifications

Category	Specification
Dimensions (Diameter x Depth)	220mm x 80mm x 25mm (8.7in x 3.15in x 1.0in)
Weight	0.5 kg (1.1 lbs) - with mounting bracket

Table 86 Force 300 CSM environmental specifications

Category	Specification
Temperature	-30°C (-22°F) to +60C (140°F)
Wind loading	112 mph (180 kph) maximum. See <a href="#">Force 300 CSM wind loading</a> for a full description.
Environmental	IP67 

**Note**  
This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.



## Force 300 CSM heater

At startup, if the Force 300 CSM module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 87](#).

Table 87 Force 300 CSM startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 300 CSM wind loading

Ensure that the device and the structure on which it is mounted can withstand the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 88](#) and [Table 89](#).

Table 88 Force 300 CSM wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 300 CSM Connectorized	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 89 Force 300 CSM wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 300 CSM Connectorized	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 300 CSM software packages

The Force 300 CSM devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 300 CSML

For details of the Force 300 CSML hardware, see:

- [Force 300 CSML description](#)
- [Force 300 CSML part numbers](#)
- [Force 300 CSML interfaces](#)
- [Force 300 CSML mounting bracket](#)
- [Force 300 CSML specifications](#)
- [Force 300 CSML wind loading](#)
- [Force 300 CSML LEDs](#)
- [Force 300 CSML software packages](#)

## Force 300 CSML description

The Force 300 CSML device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 300 CSML uses 802.11ac technology and supports MU-MIMO and other features offered by the ePMP 3000 and ePMP 3000L APs. It is also backward compatible with the ePMP 2000 using backward compatibility features.

An overview of Force 300 CSML is shown in [Figure 53](#).



Figure 53: Force 300 CSML

## Force 300 CSML part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 90](#) and [Table 91](#) include the following items:

- One connectorized unit
- One power supply 1000/100 BASE-TX LAN injector
- One-line cord

Table 90 Force 300 CSML part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 300 CSML SM (ROW) (no cord)	C050910C061A
ePMP 5 GHz Force 300 CSML SM (ROW) (US cord)	C050910C161A
ePMP 5 GHz Force 300 CSML SM (ROW) (EU cord)	C050910C261A
ePMP 5 GHz Force 300 CSML SM (EU) (EU cord)	C050910C263A
ePMP 5 GHz Force 300 CSML SM (ROW) (UK cord)	C050910C361A
ePMP 5 GHz Force 300 CSML SM (EU) (UK cord)	C050910C363A
ePMP 5 GHz Force 300 CSML SM (ROW) (India cord)	C050910C461A
ePMP 5 GHz Force 300 CSML SM (India) (India Cord)	C050910C462A
ePMP 5 GHz Force 300 CSML SM (ROW) (China cord)	C050910C561A
ePMP 5 GHz Force 300 CSML SM (ROW) (Brazil cord)	C050910C661A
ePMP 5 GHz Force 300 CSML SM (ROW) (Argentina cord)	C050910C761A
ePMP 5 GHz Force 300 CSML SM Bulk Packaging (ROW) (ANZ cord)	C050910C861A
ePMP 5 GHz Force 300 CSML SM (ROW) (South Africa cord)	C050910C961A
ePMP 5 GHz Force 300 CSML SM (ROW) (No PSU)	C050910CZ61A

Table 91 Force 300 CSML accessories part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008

## Force 300 CSML interfaces

The Ethernet port is located on the rear of the connectorized unit.



Figure 54: Rear interfaces

Table 92 Force 300 CSML Series - Rear interfaces

Port name	Connector	Interface	Description
Ethernet	RJ45	24V PoE input	10/100BASE-T
		100 BASE-TX Ethernet	Management and data
Reset Button	Physical button	N/A	For resetting the radio and for setting the radio back to its factory default configuration.

## Force 300 CSML mounting bracket

The Force 300 CSML module is designed to be pole-mounted using the mounting bracket provided in the box with the radio.

An overview of Force 300 CSML mounting bracket is shown in [Figure 55](#).



Figure 55: Force 300 CSML module mounting bracket

## Force 300 CSML specifications

The Force 300 CSML module conforms to the specifications listed in [Table 93](#) and [Table 94](#). The connectorized module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 93 Force 300 CSML physical specifications

Category	Specification
Dimensions (Diameter x Depth)	227 x 88 x 33 mm
Weight	0.521 kg (1.15 lbs) without antenna

Table 94 Force 300 CSML environmental specifications

Category	Specification
Temperature	-30°C to +55°C (-22°F to +122°F)
Wind loading	125 km/hour (78 mi/hour)
Environmental	IP55

**Note**  
This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

## Force 300 CSML wind loading




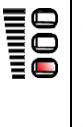
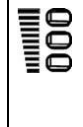
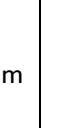
Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting brackets are capable of withstanding wind speeds of up to 125 kph (78 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and surface area.

## Force 300 CSML LEDs

Table 95 Force 300 CSML LED functions

	LED	Function	
	POWER	Green: Power is applied to the device  Unlit: No power is applied to the device or improper power source	
	WiFi	XXX	
	LAN	XXX	
	RF SIGNAL	 Radio scanning: LEDs light in an ascending sequence to indicate that the radio is scanning  Radio registered: LEDs light to indicate the RSSI level at the device.	
 RSSI > -60 dBm	 -70 dBm < RSSI ≤ -60 dBm	 -80 dBm < RSSI ≤ -70 dBm	 RSSI ≤ -80 dBm

## Force 300 CSML software packages

Force 300 CSML devices may be upgraded by downloading new software packages from the [Cambium Networks site](https://www.cambiumnetworks.com) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-F300-[Radio Model]-[version].tar.gz (or higher version number)

## ePMP MP3000 MicroPoP

For details of the Force 300 CSM hardware, see:

- [ePMP MP 3000 integrated description](#)
- [ePMP MP 3000 part numbers](#)
- [ePMP MP 3000 interfaces](#)
- [ePMP MP 3000 specifications](#)
- [ePMP MP 3000 heater](#)

- [ePMP MP 3000 wind loading](#)
- [ePMP MP 3000 software packages](#)

## ePMP MP 3000 integrated description

The ePMP MP 3000 MicroPoP is an integrated AP designed to serve short-range, low-density applications. It uses 802.11ac 2x2 architecture and can interoperate with a Force 300 subscriber module.

An overview of ePMP MP 3000 is shown in [Figure 56](#).



Figure 56: ePMP MP 3000 integrated

## ePMP MP 3000 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 96](#) and [Table 97](#) includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 96 ePMP MP 3000 part numbers

Cambium description	Cambium part number
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (no cord)	C050910A031A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (US cord)	C050910A131A
ePMP 5 GHz MP 3000 MicroPOP Radio (IC) (Canada/US cord)	C058910A134A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (EU cord)	C050910A231A
ePMP 5 GHz MP 3000 MicroPOP Radio (EU) (EU cord)	C050910A233A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (UK cord)	C050910A331A

Cambium description	Cambium part number
ePMP 5 GHz MP 3000 MicroPOP Radio (EU) (UK cord)	C050910A333A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (India cord)	C050910A431A
ePMP 5 GHz MP 3000 MicroPOP Radio (India) (India Cord)	C050910A432A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (China cord)	C050910A531A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (Brazil cord)	C050910A631A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (Argentina cord)	C050910A731A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (ANZ cord)	C050910A831A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (South Africa cord)	C050910A931A
ePMP 5 GHz MP 3000 MicroPOP Radio (ROW) (No PSU)	C050910AZ31A
ePMP 5 GHz MP 3000 MicroPOP Radio (FCC) (US cord)	C058910A132A


Table 97 ePMP MP 3000 accessory part numbers

Cambium description	Cambium part number
PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply	N000900L001
CABLE, UL POWER SUPPLY CORD SET, ARGENTINA	N000900L013
CABLE, UL POWER SUPPLY CORD SET, AUS/NZ	N000900L011
CABLE, UL POWER SUPPLY CORD SET, Brazil	N000900L010
CABLE, UL POWER SUPPLY CORD SET, CHINA	N000900L015
CABLE, UL POWER SUPPLY CORD SET, EU	N000900L008
CABLE, UL POWER SUPPLY CORD SET, INDIA	N000900L012
CABLE, UL POWER SUPPLY CORD SET, UK	N000900L009
CABLE, UL POWER SUPPLY CORD SET, US	N000900L007

## ePMP MP 3000 interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 98 ePMP MP 3000 - rear interfaces

Port name	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).  <b>Note</b>



Port name	Connector	Interface	Description
			All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.
		100/1000BASE-T Ethernet	Data


## ePMP MP 3000 specifications

The ePMP MP 3000 integrated module conforms to the specifications listed in [Table 99](#) and [Table 100](#). The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 99 ePMP MP 3000 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	220mm x 80mm x 25mm (8.7in x 3.15in x 1.0in)
Weight	0.5 kg (1.1 lbs) - with mounting bracket
Antenna	Integrated dual-polarized, Omni-direction 8dBi

Table 100 ePMP MP 3000 environmental specifications

Category	Specification
Temperature	-40°C (-40°F) to +65C (149°F) ambient op temp
Wind loading	224 kph 320mm x 215mm x 65mm 1100g
Environmental	IP67  <div style="border: 1px solid black; background-color: #e1f5fe; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.</p> </div>

## ePMP MP 3000 heater

At startup, if the ePMP MP 3000 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 101](#).

Table 101 ePMP MP 3000 startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## ePMP MP 3000 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 102](#) and [Table 103](#).

Table 102 ePMP MP 3000 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
ePMP MP 3000 Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 103 ePMP MP 3000 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
ePMP MP 3000	0.28	7.53 lb	11.76 lb	16.93 lb

## ePMP MP 3000 software packages

ePMP MP 3000 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AC-v4.5-GA.img (or higher version number)

## Force 425

For details of the Force 425 hardware, see:

- [Force 425 integrated description](#)
- [Force 425 part numbers](#)
- [Force 425 mounting bracket with Range Extender](#)
- [Force 425 interfaces](#)
- [Force 425 specifications](#)
- [Force 425 heater](#)
- [Force 425 software packages](#)

## Force 425 integrated description

The Force 425 device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 425 is shown in [Figure 57](#).



*Figure 57: Force 425 integrated*

## Force 425 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed in [Table 102](#) includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector

- One line cord

Table 102 ePMP Force 425 part numbers

Cambium description	Cambium part number
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (no cord) - Priced per radio	C050940M001A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (US cord) - Priced per radio	C050940M101A
ePMP 5 GHz Force 425 SM 2-pack packaging (IC) (Canada/US cord) - Priced per radio	C058940M104A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (EU cord) - Priced per radio	C050940M201A
ePMP 5 GHz Force 425 SM 2-pack packaging (EU) (EU cord) - Priced per radio	C050940M203A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (UK cord) - Priced per radio	C050940M301A
ePMP 5 GHz Force 425 SM 2-pack packaging (EU) (UK cord) - Priced per radio	C050940M303A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (India cord) - Priced per radio	C050940M401A
ePMP 5 GHz Force 425 SM 2-pack packaging (India) (India Cord) - Priced per radio	C050940M402A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (China cord) - Priced per radio	C050940M501A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (Brazil cord) - Priced per radio	C050940M601A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (Argentina cord) - Priced per radio	C050940M701A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (ANZ cord) - Priced per radio	C050940M801A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (South Africa cord) - Priced per radio	C050940M901A
ePMP 5 GHz Force 425 SM 2-pack packaging (ROW) (No PSU) - Priced per radio	C050940MZ01A
ePMP 5 GHz Force 425 SM 2-pack packaging (FCC) (US Cord) - Priced per radio	C058940M102A

Table 103 Force 425 accessory part numbers

Cambiumdescription	Cambium partnumber
ePMP Force 425 Range Extender Dish Accessory 4-Pack Packaging, priced per unit	N000900L062A

## Force 425 mounting bracket with Range Extender

The Force 425 module is designed to be pole-mounted using the mounting bracket provided in the box with the radio.

An overview of Force 425 mounting bracket is shown in [Figure 58](#)



Figure 58: Force 425 module mounting bracket with Range Extender

## Force 425 interfaces

The Ethernet port is located on the rear of the integrated unit. This interface is described in [Table 104](#).

Table 104 Force 425 Series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE).
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 425 specifications

The Force 425 integrated module conforms to the specifications listed in [Table 105](#) and [Table 106](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 105 Force 425 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	470 mm diameter x 285 mm depth (18.5 in diameter x 11.2 in depth)
Weight	4.8 kg (10.6 lbs.)

Table 106 Force 425 environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)
Wind loading	200 km/hour (124 mph)
Humidity	95% condensing
Environmental	IPx0

## Force 425 heater

At startup, if the Force 425 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated, and the unit continues its startup sequence.

The effect on device startup time at various temperatures is defined in [Table 107](#).

Table 107 Force 425 startup times based on ambient temperature

InitialTemperature	Startuptime(frompowerontooperational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 425 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the dominant wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 200 kph (124 mph).

Wind blowing on the device subjects the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

<b>Where:</b>	<b>Is:</b>
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

<b>Where:</b>	<b>Is:</b>
---------------	------------

A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 108](#) and [Table 109](#).

Table 108 Force 425 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		40	50	60
Force 425 Integrated	0.15	25.08 Kg	39.2 Kg	56.43 Kg

Table 109 Force 425 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 425 Integrated	1.61	43.28 lb	67.62 lb	97.37 lb

## Force 425 software packages

Force 425 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named:

- ePMP-AX-v5.0.img (or higher version number)

## Force 400C

For details of the Force 400C hardware, see:

- [Force 400C integrated description](#)
- [Force 400C part numbers](#)
- [Force 400C interfaces](#)
- [Force 400C specifications](#)
- [Force 400C heater](#)
- [Force 400C wind loading](#)
- [Force 400C software packages](#)

## Force 400C integrated description

The Force 400C device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 400C is shown in [Figure 59](#).



Figure 59: Force 400C integrated

## Force 400C part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 110 Force 400C part numbers

Cambium description	Cambium partnumber
ePMP 5 GHz Force 400C (ROW) (no cord)	C050940C021A
ePMP 5 GHz Force 400C (ROW) (US cord)	C050940C121A
ePMP 5 GHz Force 400C (IC) (Canada/US cord)	C058940C124A
ePMP 5 GHz Force 400C (ROW) (EU cord)	C050940C221A
ePMP 5 GHz Force 400C (EU) (EU cord)	C050940C223A
ePMP 5 GHz Force 400C (ROW) (UK cord)	C050940C321A
ePMP 5 GHz Force 400C (EU) (UK cord)	C050940C323A
ePMP 5 GHz Force 400C (ROW) (India cord)	C050940C421A
ePMP 5 GHz Force 400C (India) (India Cord)	C050940C422A
ePMP 5 GHz Force 400C (ROW) (China cord)	C050940C521A



Cambium description	Cambium partnumber
ePMP 5 GHz Force 400C (ROW) (Brazil cord)	C050940C621A
ePMP 5 GHz Force 400C (ROW) (Argentina cord)	C050940C721A
ePMP 5 GHz Force 400C (ROW) (ANZ cord)	C050940C821A
ePMP 5 GHz Force 400C (ROW) (South Africa cord)	C050940C921A
ePMP 5 GHz Force 400C (ROW) (No PSU)	C050940CZ21A
ePMP 5 GHz Force 400C (FCC) (US Cord)	C058940C122A

Table 111 Force 400C accessory part numbers

Cambiumdescription	Cambiumpartnumber
ePMP Force 400 spares kit	N000900L061A

## Force 400C interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 112 Force 400C series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE)
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 400C specifications

The Force 400C integrated module conforms to the specifications listed in [Table 113](#) and [Table 114](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 113 Force 400C physical specifications

Category	Specification
Dimensions (Diameter x Depth)	256 mm x 125 mm x 46 mm (10.1 in x 4.9 in. x 1.8 in.)
Weight	1.3 kg (2.9 lbs.)

Table 114 Force 400C environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)

Category	Specification
Wind loading	200 km/hour (124 mph)
Environmental	IPx0

## Force 400C heater

At startup, if the Force 400C module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 115](#).

Table 115 Force 400C startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 400C wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 116](#) and [Table 117](#).

Table 116 Force 400C wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 400C Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 117 Force 400C wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 400C Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 400C software packages

Force 400C devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named.

- ePMP-AX-v5.x.x.img (or higher version number)

## Force 4600C

For details of the Force 4600C hardware, see:

- [Force 4600C integrated description](#)
- [Force 4600C part numbers](#)
- [Force 4600C interfaces](#)
- [Force 4600C specifications](#)
- [Force 4600C heater](#)
- [Force 4600C wind loading](#)
- [Force 4600C software packages](#)

## Force 4600C integrated description

The Force 4600C device is a self-contained transceiver unit that houses both radio and networking electronics.

An overview of Force 4600C is shown in [Figure 60](#).



Figure 60: Force 4600C integrated

## Force 4600C part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 110 Force 4600C part numbers

Cambiumdescription	Cambium partnumber
ePMP 6 GHz Force 4600C SM Radio (ROW) (no cord)	C060940C021A
ePMP 6 GHz Force 4600C SM Radio (ROW) (US cord)	C060940C121A
ePMP 6 GHz Force 4600C SM Radio (IC) (Canada/US cord)	C068940C124A
ePMP 6 GHz Force 4600C SM Radio (ROW) (EU cord)	C060940C221A
ePMP 6 GHz Force 4600C SM Radio (EU) (EU cord)	C060940C223A
ePMP 6 GHz Force 4600C SM Radio (ROW) (UK cord)	C060940C321A
ePMP 6 GHz Force 4600C SM Radio (EU) (UK cord)	C060940C323A
ePMP 6 GHz Force 4600C SM Radio (ROW) (India cord)	C060940C421A
ePMP 6 GHz Force 4600C SM Radio (India) (India Cord)	C060940C425A
ePMP 6 GHz Force 4600C SM Radio (ROW) (China cord)	C060940C521A
ePMP 6 GHz Force 4600C SM Radio (ROW) (Brazil cord)	C060940C621A
ePMP 6 GHz Force 4600C SM Radio (ROW) (Argentina cord)	C060940C721A

Cambiumdescription	Cambium partnumber
ePMP 6 GHz Force 4600C SM Radio (ROW) (ANZ cord)	C060940C821A
ePMP 6 GHz Force 4600C SM Radio (ROW) (South Africa cord)	C060940C921A
ePMP 6 GHz Force 4600C SM Radio (ROW) (No PSU)	C060940CZ21A
ePMP 6 GHz Force 4600C SM Radio (FCC) (US Cord)	C068940C122B
ePMP 6 GHz Force 4600C SM Radio (Indonesia) (EU Cord)	C060940C226A

Table 111 Force 4600C accessory part numbers

Cambiumdescription	Cambiumpartnumber
ePMP 6 GHz Force 4625 Spare Feedhorn Only (ROW)	C060940F041A
ePMP 6 GHz Force 4625 Spare Feedhorn Only (IC)	C068940F144A
ePMP 6 GHz Force 4625 Spare Feedhorn Only (EU)	C060940F243A
ePMP 6 GHz Force 4625 Spare Feedhorn Only (India)	C060940F445A
ePMP 6 GHz Force 4625 Spare Feedhorn Only (FCC)	C068940F142A
ePMP 6 GHz Force 4625 Spare Feedhorn Only (Indonesia)	C060940F446A
ePMP 5 and 6 GHz Force 4525 and 4625 Spare Dish 2-Pack	C050940M140A

## Force 4600C interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 112 Force 4600C series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE)
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 4600C specifications

The Force 4600C integrated module conforms to the specifications listed in [Table 113](#) and [Table 114](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 113 Force 4600C physical specifications

Category	Specification
Dimensions (Diameter x Depth)	256 mm x 125 mm x 46 mm (10.1 in x 4.9 in. x 1.8 in.)
Weight	1.3 kg (2.9 lbs.)

Table 114 Force 4600C environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)
Wind loading	200 km/hour (124 mph)
Environmental	IPx0

## Force 4600C heater

At startup, if the Force 4600C module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 115](#).

Table 115 Force 4600C startup times based on ambient temperature

Initial Temperature	Startup time (from power on to operational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 4600C wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 116](#) and [Table 117](#).

Table 116 Force 4600C wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 4600C Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 117 Force 4600C wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 4600C Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 4600C software packages

Force 4600C devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named.

- ePMP-AX-v5.x.x.img (or higher version number)

## Force 5/6GHz 2 x 2 dish antenna



Figure 61: Force 5/6GHz 2 x 2 dish antenna

## Force 4525

For details of the Force 4525 hardware, see:

- [Force 4525 integrated description](#)
- [Force 4525 part numbers](#)
- [Force 4525 interfaces](#)
- [Force 4525 specifications](#)

- [Force 4525 heater](#)
- [Force 4525 wind loading](#)
- [Force 4525 mounting instructions](#)
- [Force 4525 software packages](#)

## Force 4525 integrated description

The Force 4525 device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4525 uses 802.11ac technology and supports MU-MIMO. It is also backward compatible with the ePMP XXXX using backward compatibility features.

An overview of Force 4525 is shown in [Figure 62](#).



Figure 62: Force 4525 integrated

## Force 4525 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 110 Force 4525 part numbers

Cambium description	Cambium partnumber
ePMP 6 GHz Force 4600C SM Radio (ROW) (no cord)	C060940C021A
ePMP 6 GHz Force 4600C SM Radio (ROW) (US cord)	C060940C121A
ePMP 6 GHz Force 4600C SM Radio (IC) (Canada/US cord)	C068940C124A
ePMP 6 GHz Force 4600C SM Radio (ROW) (EU cord)	C060940C221A
ePMP 6 GHz Force 4600C SM Radio (EU) (EU cord)	C060940C223A



Cambiumdescription	Cambium partnumber
ePMP 6 GHz Force 4600C SM Radio (ROW) (UK cord)	C060940C321A
ePMP 6 GHz Force 4600C SM Radio (EU) (UK cord)	C060940C323A
ePMP 6 GHz Force 4600C SM Radio (ROW) (India cord)	C060940C421A
ePMP 6 GHz Force 4600C SM Radio (India) (India Cord)	C060940C425A
ePMP 6 GHz Force 4600C SM Radio (ROW) (China cord)	C060940C521A
ePMP 6 GHz Force 4600C SM Radio (ROW) (Brazil cord)	C060940C621A
ePMP 6 GHz Force 4600C SM Radio (ROW) (Argentina cord)	C060940C721A
ePMP 6 GHz Force 4600C SM Radio (ROW) (ANZ cord)	C060940C821A
ePMP 6 GHz Force 4600C SM Radio (ROW) (South Africa cord)	C060940C921A
ePMP 6 GHz Force 4600C SM Radio (ROW) (No PSU)	C060940CZ21A
ePMP 6 GHz Force 4600C SM Radio (FCC) (US Cord)	C068940C122B
ePMP 6 GHz Force 4600C SM Radio (Indonesia) (EU Cord)	C060940C226A

Table 111 Force 4525 accessory part numbers

Cambiumdescription	Cambiumpartnumber
ePMP Force 4525 spares kit	XXXXXXXXXXXXXX

## Force 4525 interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 112 Force 4525 series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE)
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 4525 specifications

The Force 4525 integrated module conforms to the specifications listed in [Table 113](#) and [Table 114](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 113 Force 4525 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	256 mm x 125 mm x 46 mm (10.1 in. x 4.9 in. x 1.8 in.)
Weight	1.3 kg (2.9 lbs.)

Table 114 Force 4525 environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)
Wind loading	200 km/hour (124 mph)
Environmental	IPx0

## Force 4525 heater

At startup, if the Force 4525 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 115](#).

Table 115 Force 4525 startup times based on ambient temperature

InitialTemperature	Startuptime(frompowerontooperational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 4525 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 116](#) and [Table 117](#).

Table 116 Force 4525 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 4525 Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 117 Force 4525 wind loading (lb)

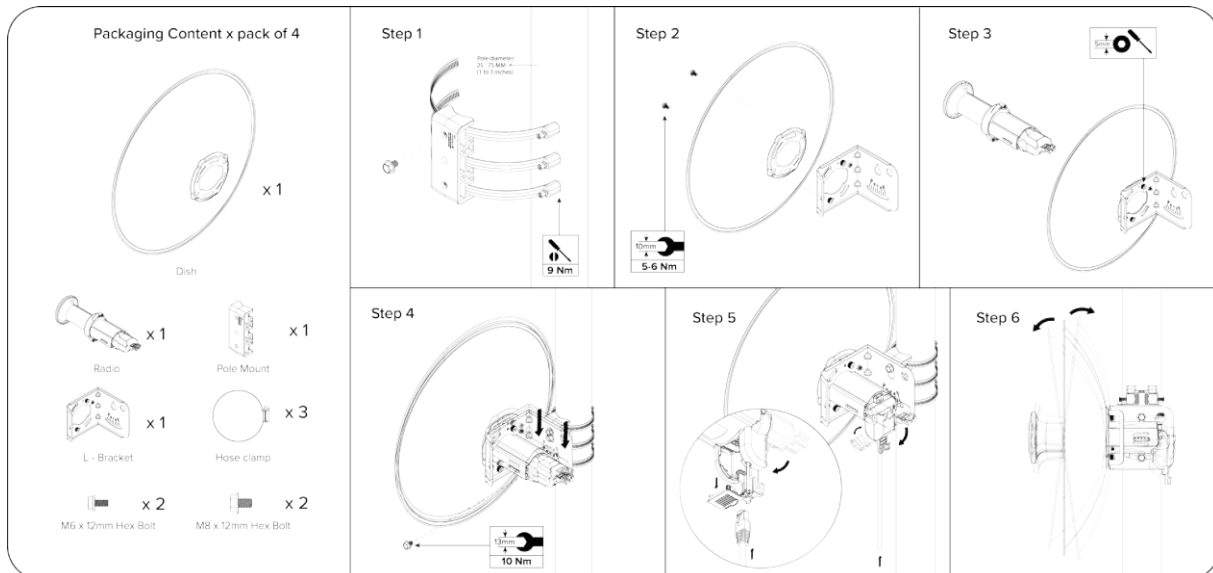
Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 4525 Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 4525 mounting instructions



### Note

A professional installation is required.



## Force 4525 software packages

Force 4525 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named.

- ePMP-AX-v5.x.x.img (or higher version number)

## Force 4525L

For details of the Force 4525L hardware, see:

- [Force 4525L integrated description](#)
- [Force 4525L part numbers](#)
- [Force 4525L interfaces](#)
- [Force 4525L specifications](#)
- [Force 4525L heater](#)
- [Force 4525L wind loading](#)
- [Force 4525L mounting instructions](#)
- [Force 4525L software packages](#)

## Force 4525L integrated description

The Force 4525L device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4525L uses 802.11ac technology and supports MU-MIMO. It is also backward compatible with the ePMP XXXX using backward compatibility features.

An overview of Force 4525L is shown in [Figure 63](#).



*Figure 63: Force 4525L integrated*

## Force 4525L part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed includes the following items:

- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 110 Force 4525L part numbers

Cambiumdescription	Cambium partnumber
ePMP 6 GHz Force 4525L Radio (ROW) (no cord)	C060940C021A
ePMP 6 GHz Force 4525L Radio (ROW) (US cord)	C060940C121A
ePMP 6 GHz Force 4525L Radio (IC) (Canada/US cord)	C068940C124A
ePMP 6 GHz Force 4525L Radio (ROW) (EU cord)	C060940C221A
ePMP 6 GHz Force 4525L Radio (EU) (EU cord)	C060940C223A
ePMP 6 GHz Force 4525L Radio (ROW) (UK cord)	C060940C321A
ePMP 6 GHz Force 4525L Radio (EU) (UK cord)	C060940C323A
ePMP 6 GHz Force 4525L Radio (ROW) (India cord)	C060940C421A
ePMP 6 GHz Force 4525L Radio (India) (India Cord)	C060940C425A
ePMP 6 GHz Force 4525L Radio (ROW) (China cord)	C060940C521A
ePMP 6 GHz Force 4525L Radio (ROW) (Brazil cord)	C060940C621A
ePMP 6 GHz Force 4525L Radio (ROW) (Argentina cord)	C060940C721A
ePMP 6 GHz Force 4525L Radio (ROW) (ANZ cord)	C060940C821A
ePMP 6 GHz Force 4525L Radio (ROW) (South Africa cord)	C060940C921A
ePMP 6 GHz Force 4525L Radio (ROW) (No PSU)	C060940CZ21A
ePMP 6 GHz Force 4525L Radio (FCC) (US Cord)	C068940C122B
ePMP 6 GHz Force 4525L Radio (Indonesia) (EU Cord)	C060940C226A

## Force 4525L interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 112 Force 4525L series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE)
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 4525L specifications

The Force 4525L integrated module conforms to the specifications listed in [Table 113](#) and [Table 114](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 113 Force 4525L physical specifications

Category	Specification
Dimensions (Diameter x Depth)	256 mm x 125 mm x 46 mm (10.1 in x 4.9 in. x 1.8 in.)
Weight	1.3 kg (2.9 lbs.)

Table 114 Force 4525L environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)
Wind loading	200 km/hour (124 mph)
Environmental	IPx0

## Force 4525L heater

At startup, if the Force 4525L module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 115](#).

Table 115 Force 4525L startup times based on ambient temperature

InitialTemperature	Startuptime(frompowerontoperational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 4525L wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

<b>Where:</b>	<b>Is:</b>
a	the surface area in square meters
V	wind speed in meters per second

Force (in pounds) =  $0.0042Av^2$

<b>Where:</b>	<b>Is:</b>
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 116](#) and [Table 117](#).

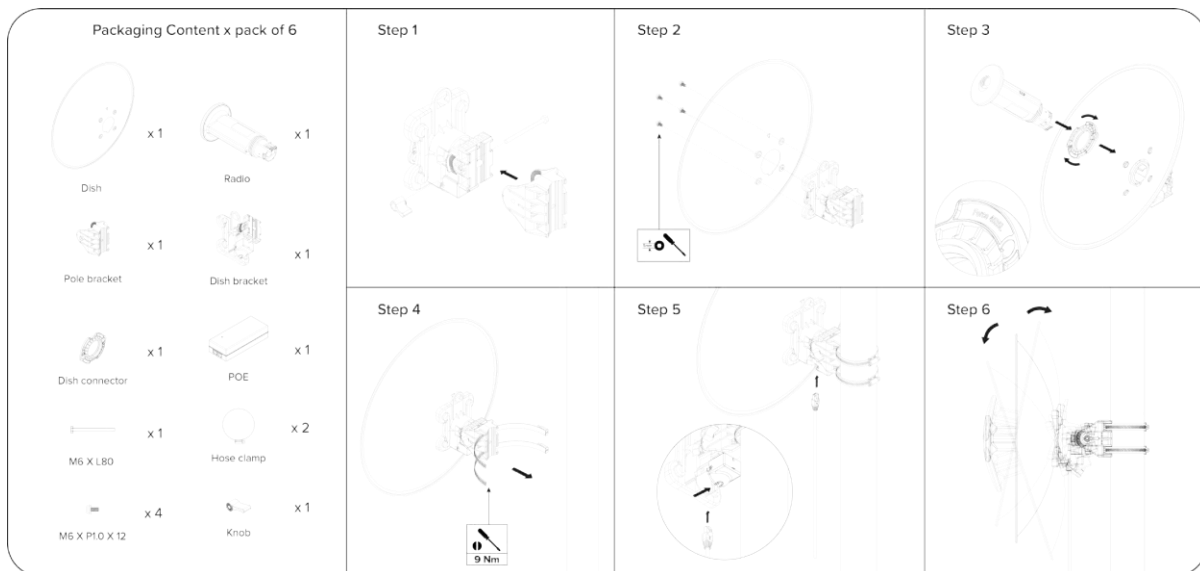
Table 116 Force 4525L wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 4525L Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 117 Force 4525L wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 4525L Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 4525L mounting instructions



## Force 4525L software packages

Force 4525L devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named.

- ePMP-AX-v5.x.x.img (or higher version number)

## Force 4625

For details of the Force 4625 hardware, see:

- [Force 4625 integrated description](#)
- [Force 4625 part numbers](#)
- [Force 4625 interfaces](#)
- [Force 4625 specifications](#)
- [Force 4625 heater](#)
- [Force 4625 wind loading](#)
- [Force 4625 software packages](#)

## Force 4625 integrated description

The Force 4625 device is a self-contained transceiver unit that houses both radio and networking electronics. The Force 4625 uses 802.11ac technology and supports MU-MIMO. It is also backward compatible with the ePMP XXXX using backward compatibility features.

An overview of Force 4625 is shown in [Figure 64](#).



Figure 64: Force 4625 integrated

## Force 4625 part numbers

Select the correct regional variant to adhere to local licensing restrictions.

Each of the parts listed includes the following items:



- One integrated unit
- One power supply 1000/100 BASE-TX LAN injector
- One line cord

Table 110 Force 4625 part numbers

Cambiumdescription	Cambium partnumber
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (no cord)	C060940M041A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (US cord)	C060940M141A
ePMP 6 GHz Force 4625 SM Bulk packaging (IC) (Canada/US cord)	C068940M144A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (EU cord)	C060940M241A
ePMP 6 GHz Force 4625 SM Bulk packaging (EU) (EU cord)	C060940M243A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (UK cord)	C060940M341A
ePMP 6 GHz Force 4625 SM Bulk packaging (EU) (UK cord)	C060940M343A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (India cord)	C060940M441A
ePMP 6 GHz Force 4625 SM Bulk packaging (India) (India Cord)	C060940M445A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (China cord)	C060940M541A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (Brazil cord)	C060940M641A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (Argentina cord)	C060940M741A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (ANZ cord)	C060940M841A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (South Africa cord)	C060940M941A
ePMP 6 GHz Force 4625 SM Bulk packaging (ROW) (No PSU)	C060940MZ41A
ePMP 6 GHz Force 4625 SM Bulk packaging (FCC) (US Cord)	C068940M142A
ePMP 6 GHz Force 4625 SM Bulk packaging (Indonesia) (EU Cord)	C060940M246A

Table 111 Force 4625 accessory part numbers

Cambiumdescription	Cambiumpartnumber
ePMP 5 and 6 GHz Force 4525 and 4625 Spare Dish 2-Pack	C050940M140A
ePMP Force 4000 series Spares Kit	N000900L071A

## Force 4625 interfaces

The Ethernet port is located on the rear of the integrated unit.

Table 112 Force 4625 series - rear interfaces

Portname	Connector	Interface	Description
Eth	RJ45	PoE input	Power over Ethernet (PoE)
		100/1000BASE-T Ethernet	Data
	SFP	10 Gigabit cage	Optional 10 Gigabit SFP cage for SFP module

## Force 4625 specifications

The Force 4625 integrated module conforms to the specifications listed in [Table 113](#) and [Table 114](#).

The integrated module meets the low-level static discharge specifications identified in [Electromagnetic compatibility \(EMC\) compliance](#) and provides internal surge suppression but does not provide lightning suppression.

Table 113 Force 4625 physical specifications

Category	Specification
Dimensions (Diameter x Depth)	256 mm x 125 mm x 46 mm (10.1 in x 4.9 in. x 1.8 in.)
Weight	1.3 kg (2.9 lbs.)

Table 114 Force 4625 environmental specifications

Category	Specification
Temperature	-30°C to 65°C (-22°F to 149°F)
Wind loading	200 km/hour (124 mph)
Environmental	IPx0

## Force 4625 heater

At startup, if the Force 4625 module temperature is at or below 32°F (0°C), an internal heater is activated to ensure that the device can successfully begin operation. The unit's heater is only activated when the unit is powered on and will not apply heat to the device once the startup is complete. When the unit temperature is greater than 32°F (0°C), the heater is deactivated and the unit continues its start-up sequence.

The effect on device startup time at various temperatures is defined in [Table 115](#).

Table 115 Force 4625 startup times based on ambient temperature

InitialTemperature	Startuptime(frompowerontooperational)
-22°F (-30°C) H	20 minutes
-4°F (-20°C)	6 minutes
14°F (-10°C)	2 minutes, 30 seconds

## Force 4625 wind loading

Ensure that the device and the structure on which it is mounted are capable of withstanding the prevalent wind speeds at a proposed ePMP site. Wind speed statistics are available from national meteorological offices.

The device and its mounting bracket are capable of withstanding wind speeds of up to 180 kph (124 mph).

Wind blowing on the device will subject the mounting structure to significant lateral force. The magnitude of the force depends on both wind strength and the surface area of the device. Wind loading is estimated using the following formulae:

$$\text{Force (in kilograms)} = 0.1045aV^2$$

Where:	Is:
a	the surface area in square meters
V	wind speed in meters per second

$$\text{Force (in pounds)} = 0.0042Av^2$$

Where:	Is:
A	the surface area in square feet
v	wind speed in miles per hour

Applying these formulae to the ePMP device at different wind speeds, the resulting wind loadings are shown in [Table 116](#) and [Table 117](#).

Table 116 Force 4625 wind loading (Kg)

Type of ePMP device	Largest surface area (square meters)	Wind speed (meters per second)		
		30	40	50
Force 4625 Integrated	0.03	2.82 Kg	5.02 Kg	7.84 Kg

Table 117 Force 4625 wind loading (lb)

Type of ePMP device	Largest surface area (square feet)	Wind speed (miles per hour)		
		80	100	120
Force 4625 Integrated	0.28	7.53 lb	11.76 lb	16.93 lb

## Force 4625 software packages

Force 4625 devices may be upgraded by downloading new software packages from the [Cambium Networks site](#) or by using cnMaestro. The software packages applicable to ePMP integrated radios are named.

- ePMP-AX-v5.x.x.img (or higher version number)

# Power supply

For details of the ePMP power supply units, see:

- [Power supply description](#)
- [Power supply part numbers](#)
- [Power supply interfaces](#)
- [Power supply specifications](#)
- [Power supply location considerations](#)

## Power supply description

The power supply unit that is connected to the ePMP modules is rated for indoor use. The ePMP modules are installed outdoors and terminated to network equipment using Cat5e cables with RJ45 connectors. The Cat5e cables are plugged into an AC or DC power supply to inject Power over Ethernet (PoE) into the module. The Cat5e cables connected to the power supply transitioning from indoors to outdoors must be rated for outdoor use.



### Attention

All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.

## Power supply part numbers

Each module requires one power supply and one power supply line cord (line cord included with radio device, see [Table 118](#)).

Table 118 Power supply part numbers

Cambium description	Cambium part number	Device Compatibility
ePMP Power Supply for GPS Radio - no cord (spare)	N000900L001	ePMP MP 3000 Access Point
POWER SUPPLY, 30W, 56V - Gbps support	N000000L034	ePMP 3000 Access Point



### Attention

Each ePMP device must be powered by the corresponding power supply listed in [Table 118](#). This product is intended to be supplied by a UL Listed Power Supply Unit marked "LPS" or "PS2" and providing power over the Ethernet (PoE) supply.

## Power supply interfaces

The power supply interfaces are illustrated in [Power supply interfaces](#) and described in [Table 119](#) and [Table 120](#)

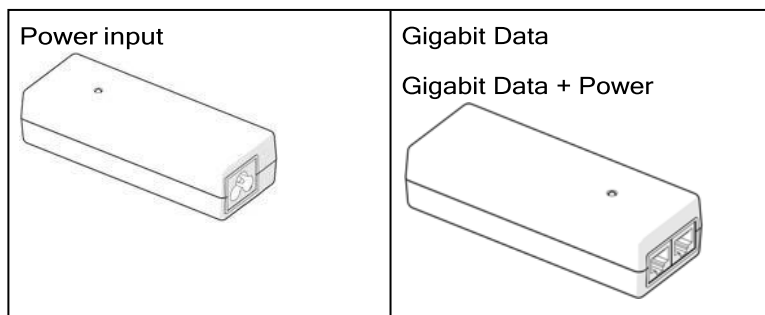


Figure 65: Power supply interfaces

Table 119 Power supply interface functions - N000900L001


Interface	Function
Power input	Mains power input.
Power output	30V
Gigabit Data + Power	RJ45 socket for connecting Cat5e cable to the radio. <div style="display: flex; align-items: center;">  <div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px;"> <p><b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div> </div>
Gigabit Data	RJ45 socket for connecting Cat5e cable to the network.

Table 120 Power supply interface functions - N000000L034


Interface	Function
Power input	Mains power input.
Power output	56V
Gigabit Data + Power	RJ45 socket for connecting Cat5e cable to the radio. <div style="display: flex; align-items: center;">  <div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px;"> <p><b>Note</b> All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.</p> </div> </div>
Gigabit Data	RJ45 socket for connecting Cat5e cable to the network.

Table 121 Power Supply LED functions

LED	Function
Power (green)	Power supply detection

## Power supply specifications

The ePMP power supply conforms to the specifications listed in [Table 122](#), [Table 123](#), and [Table 124](#).

Table 122 Power supply physical specifications

Category	Specification
Dimensions (H x W x D)	14 x 6.5 x 3.6 cm (5.5 x 2.55 x 1.42 in)
Weight	0.26 lbs

Table 123 Power supply environmental specifications

Category	Specification
Ambient Operating Temperature	0°C to +40°C
Humidity	20% - 90%

Table 124 Power supply electrical specifications

Category	Specification
AC Input	100 to 240 VAC
Efficiency	Meets Energy Level 6
Over Current Protection	Short circuit, with auto-recovery
Hold uptime	10 ms minimum at maximum load, 120 VAC

## Power supply location considerations

Find a location for the power supply that meets the following requirements:

- The power supply is rated for indoor use and can be mounted on a wall or other flat surface.
- The power supply must be kept dry, with no possibility of condensation, flooding, or rising dampness.
- The power supply can be accessed to view status indicators.
- The power supply can be connected to the ePMP module drop cable and network terminating equipment.
- The power supply can be connected to a mains or DC power supply that meets the requirements defined in [Table 124](#).

# Ethernet cabling

For more information on the Ethernet cabling components of an ePMP installation, see:

- [Ethernet standards and cable lengths](#)
- [Outdoor Cat5e cable](#)

## Ethernet standards and cable lengths

All configurations require a copper Ethernet connection from the power supply port to the power supply and network terminating equipment.



**Attention**

All cables used for outdoor installations must be suitable to be used for that environment and rated accordingly.

For each power supply, the maximum permitted drop cable length is specified in [Table 125](#).

Table 125 Power supply drop cable length restrictions

Part number	Description	Maximum cable length (*1)
N000900L001	Power Supply for Radio with Gigabit Ethernet (no cord)	330 feet (100m)
N000000L034		

(\*1) The maximum length of Ethernet cable from the device to the network device needs to follow 802.3 standards. If the power supply is not the network device the cable from the power supply to the network device must be included in the total maximum cable length.

## Outdoor Cat5e cable

### Cambium Industrial Cable

Cambium Industrial Cable uses 24-gauge solid bare copper conductors, covered by bonded-pair polymer insulation. The conductors are protected by double-layer shielding consisting of a solid foil layer under the braided tinned copper mesh, providing excellent shielding while maximizing flexibility. And, the cable is jacketed by industrial-grade UV-resistant, abrasion-resistant, and oil-resistant PVC.

Cambium’s Industrial RJ45 connectors are specifically designed to work optimally with Cambium Industrial Cable.

The connectors are fully shielded with integrated strain relief for greater pull strength, utilize a staggered contact design that minimizes crosstalk, and maximizes electrical performance, and the contacts are plated with 50 micro-inch thick 24-carat gold, exceeding TIA-1096 specifications and ensuring the best possible connection and oxidation resistance.

Cambium Networks’ industrial-grade cable is well suited for high-quality durable installations of subscriber modules, APs, and enterprise point-to-point links as well as in tactical non-permanent deployments of infrastructure.

Table 126 Cambium Industrial Cable part numbers

Cambium description	Cambium part number
Industrial Grade CAT 5 Cable 50 meter unterminated	N000000L106A
Industrial Grade CAT 5 Cable 100 meter unterminated	N000000L106A
Industrial Grade CAT 5 Cable 300 meter unterminated	N000000L108A
Industrial Grade RJ45 Connector 100 Pack	C000000L109A
Termination Tool for C000000L109A RJ45 connectors	C000000L110A



**Attention**

All RJ45 Ethernet LAN cables used for providing power or are connected to power ports (PoE) must be UL certified with VW-1 markings.

## Surge suppression unit

Structures, equipment, and people must be protected against power surges (typically caused by lightning) by conducting the surge current to the ground via a separate preferential solid path.

The actual degree of protection required depends on local conditions and applicable local regulations. To adequately protect an ePMP installation, both ground bonding and transient voltage surge suppression are required.

Network operators should always follow best practices for grounding and lightning protection. Doing so will minimize network outages and reduce the associated costs of tower climbs and equipment repair/replacement.



**Note**

Lightning-prone installations can be improved by:

- Installing a surge suppressor near the device (transient surge suppression)
- Grounding the device to the pole (ground bonding)
- Lowering the device/dish such that it is not the highest metallic object on the pole.

## Gigabit Ethernet Surge Suppressor

The Gigabit Ethernet surge suppressor is critical for lightning protection to minimize the potential for damage.





Figure 66: Gigabit Ethernet Surge Suppressor

Table 127 Surge suppressor part numbers

Cambium description	Cambium part number	Device Compatibility
Gigabit Surge Suppressor (30V)	C000000L065A	Force 300-25 Force 300-19(R) Force 300-16 Force 300-13
Gigabit Surge Suppressor (56V)	C000000L033A	ePMP 3000 Access Point



**Attention**

Choose the 30V or 56V surge suppressor option based on your installed device power rating. Installing a 30V surge suppressor for a 56V device or a 56V surge suppressor for a 30V device may result in inadequate surge protection. Refer to [Table 127](#) for more details.

## cnPulse sync generator

cnPulse is the latest GPS synchronization generation device designed specifically for Cambium Networks PMP and PTP radios. The cnPulse module is \*IP67 (weatherproof and supports a wide temperature range for rugged environments). The GPS receiver is highly reliable and supports both GPS and GNSS signals.



Figure 67: *cnPulse sync generator*

cnPulse receives its power from the CAT-5 drop cable in mode 2 so no external power supply is required. There are no configuration or software settings required. For ePMP 3000, cnPulse is deployed in-line with the radio's CAT-5 drop cable.

For more information, see: <http://community.cambiumnetworks.com/t5/cnPulse/bd-p/cnPulse>



**Note**

This product meets the UL/cUL 62368 / IEC 62368 edition 2 specification, and the radio housings are designed to be rain-tight.

# Chapter 3: System Planning

This chapter provides information to help the user to plan an ePMP link.

The following topics are described in this chapter:

- How to plan ePMP links to conform to the regulatory restrictions that apply in the country of operation is explained under [Radio spectrum planning](#)
- Factors to be considered when planning links such as range, path loss, and throughput are described under [Link planning](#)
- The grounding and lightning protection requirements of an ePMP installation are described under [Grounding and lightning protection](#)
- Factors to be considered when planning ePMP data networks are described under [Data network planning](#)

## Radio spectrum planning

This section describes how to plan ePMP links to conform to the regulatory restrictions that apply in the country of operation.



### Attention

The user must ensure the ePMP product operates in accordance with local regulatory limits.



### Note

Contact the applicable radio regulator to check if the registration of the ePMP link is required.

## General wireless specifications

The wireless specifications that apply to ePMP 802.11ac variants are listed under [Table 128](#). The wireless specifications that are specific to each frequency variant are listed in [Table 129](#).

Table 128 Wireless specifications (all variants)

Item	Specification
Channel selection	Manual selection (fixed frequency) Automatic Channel Selection
Manual power control	To avoid interference with other users of the band, maximum power can be set lower than the default power limit.
Maximum transmit power	ePMP 3000 Access Point: 33 dBm Force 300-25: 29 dBm Force 300-19(R): 28dBm

Item	Specification
	Force 300-16: 29 dBm Force 300-13: 28dBm
Integrated device antenna type	Force 300-25: Dish antenna Force 300-19(R): Integrated patch Force 300-16: Integrated patch Force 300-13: Integrated patch
Duplex scheme	Adaptive TDD
Over-the-air encryption	AES
Error Correction	FEC

Table 129 Wireless specifications, 5 GHz band

Item	5 GHz
RF band (GHz)	4.910 - 5.970 MHz
Channel bandwidth	20 MHz, 40 MHz, or 80 MHz
Typical antenna gain	Integrated dish antenna – 25 dBi Integrated patch antenna – 16 dBi Sector antenna – 17 dBi Dual-Horn antenna – 13 dBi Omni antenna – 13 dBi
Antenna 3dB Beamwidth	Integrated Dish: 6-10° azimuth, 6-10° elevation Integrated Patch: 15° azimuth, 30° elevation Sector antenna: 70° azimuth, 6° elevation Dual-Horn antenna: 45° azimuth/elevation Omni antenna: 360° azimuth, 7° elevation

## Regulatory limits

The local regulator may restrict frequency usage and channel width and may limit the amount of conducted or radiated transmitter power.

Many countries impose EIRP limits (Allowed EIRP) on products operating in the bands used by the ePMP Series. For example, in the 5 GHz band, these limits are calculated as follows:

- In the 5.8 GHz band (5725 MHz to 5875 MHz), the EIRP must not exceed the lesser of 36 dBm or  $(23 + 10 \times \text{Log Channel width in MHz})$  dBm.

Some countries (for example the USA) impose conducted power limits on products operating in the 5 GHz band.

## Conforming to the limits

Ensure the link is configured to conform to local regulatory requirements by configuring the correct country code (located in the web management interface, under **Configure > Radio**). In the following situations, the country code does not automatically prevent operation outside the regulations:

- When operating in ETSI regions, it is required to enter a license key in the ePMP web management interface to unlock valid country-specific frequencies. This key may be obtained from <https://support.cambiumnetworks.com/licensekeys/epmp>.

## Available spectrum

The available spectrum for the operation depends on the region. When configured with the appropriate country code, the unit will only allow operation on those channels which are permitted by the regulations.

Certain regulations have allocated certain channels as unavailable for use:

- Some European countries have allocated part of the 5.8 GHz band to Road Transport and Traffic Telematics (RTTT) systems.

Where regulatory restrictions apply to certain channels, these channels are barred automatically by the use of the correct country code. For example, at 5.8 GHz in some European countries, the RTTT band 5795 MHz to 5815 MHz is barred. With the appropriate country code configured for this region, the ePMP will not operate on channels within this band.

The number and identity of channels barred by the license key and country code are dependent on the channel bandwidth.

## Channel bandwidth

Select the required channel bandwidth for the link. The selection depends upon the ePMP frequency variant and country code.

The wider a channel bandwidth the greater is its capacity. As narrower channel bandwidths take up less spectrum, selecting a narrow channel bandwidth may be a better choice when operating in locations where the spectrum is very busy.

Both ends of the link must be configured to operate on the same channel bandwidth.

## Link planning

This section describes factors to be taken into account when planning links, such as range, obstacles path loss, and throughput.

### Range and obstacles

Calculate the range of the link and identify any obstacles that may affect radio performance.

Perform a survey to identify all the obstructions (such as trees or buildings) in the path and to assess the risk of interference. This information is necessary to achieve an accurate link feasibility assessment.

### Path loss

Path loss is the amount of attenuation the radio signal undergoes between the two ends of the link. The path loss is the sum of the attenuation of the path if there were no obstacles in the way (Free Space Path

Loss), the attenuation caused by obstacles (Excess Path Loss), and a margin to allow for possible fading of the radio signal (Fade Margin). The following calculation needs to be performed to judge whether a particular link can be installed:

$L_{free\_space} + L_{excess} + L_{fade} + L_{seasonal} < L_{capability}$	
Where:	Is:
$L_{free\_space}$	Free Space Path Loss (dB)
$L_{excess}$	Excess Path Loss (dB)
$L_{fade}$	Fade Margin Required (dB)
$L_{seasonal}$	Seasonal Fading (dB)
$L_{capability}$	Equipment Capability (dB)

Free space path loss is a major determinant in received (Rx) signal level. Rx signal level, in turn, is a major factor in the system operating margin (fade margin), which is calculated as follows:

$$\text{System Operating Margin (fade margin) dB} = \text{Rx signal level (dB)} - \text{Rx sensitivity (dB)}$$

Thus, the fade margin is the difference between the strength of the received signal and the strength that the receiver requires for maintaining a reliable link.

## Adaptive modulation

Adaptive modulation ensures that the highest throughput that can be achieved instantaneously will be obtained, taking account of propagation and interference. When the link has been installed, web pages provide information about the link loss currently measured by the equipment, both instantaneously and averaged.

## Data network planning

This section describes factors to be considered when planning ePMP data networks.

### Ethernet interfaces

The ePMP Ethernet ports conform to the specifications listed in [Table 130](#).

Table 130 Ethernet bridging specifications

Ethernet Bridging	Specification
Protocol	10BASE-Te/100BASE-Tx/1000BASE-T IEEE 802.3 IEEE 802.3at (PoE) IEEE802.3u compliant Auto-negotiation

Ethernet Bridging	Specification
Interface	10/100/1000BASE-T (RJ-45)
Maximum Ethernet Frame Size	1700 bytes
Service classes for bridged traffic	3 classes



#### Note

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

Over the air, throughput will be capped to the rate of the Ethernet interface at the receiving end of the link.

## Management VLAN

Decide if the IP interface of the device management agent will be connected in a VLAN. If so, decide if this is a standard (IEEE 802.1Q) VLAN or provider bridged (IEEE 802.1ad) VLAN, and select the VLAN ID for this VLAN.

The use of a separate management VLAN is strongly recommended. The use of the management VLAN helps to ensure that the device management agent cannot be accessed by customers.

## Quality of service for bridged Ethernet traffic

Decide how the quality of service will be configured in ePMP to minimize frame loss and latency for high-priority traffic. Wireless links often have lower data capacity than wired links or network equipment like switches and routers, and quality of service configuration is most critical at network bottlenecks.

ePMP provides three priority types for traffic waiting for transmission over the wireless link - Voice, High and Low. Low is the lowest priority and Voice is the highest priority. Traffic is scheduled using strict priority; in other words, traffic in a given priority is transmitted when all higher-priority transmissions are complete.

# Chapter 4: Using the Device Management Interface

---

This chapter describes all configuration and alignment tasks that are performed when an ePMP system is deployed.

Configure the units by performing the following tasks:

- [Preparing for configuration](#)
- [Connecting to the unit](#)
- [Using the web interface](#)
- [Using the installation wizard - Access Point](#)
- [Using the installation wizard - Subscriber Module](#)
- [Using the menu options](#)

## Preparing for configuration

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

### Safety precautions

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



#### Warning

Ensure that personnel is not exposed to unsafe levels of RF energy. The units start to radiate as soon as they are powered up. Respect the safety standards defined in [Compliance with safety standards](#), in particular, the minimum separation distances.

Observe the following guidelines:

- Never work in front of the antenna when the device is powered.
- Always power down the power supply before connecting or disconnecting the Ethernet cable from the module.

## Regulatory compliance

All applicable radio regulations must be followed while configuring the units and aligning the antennas. For more information, refer to [Compliance with safety standards](#) section.

## Connecting to the unit

To connect the unit to a management PC, perform the following procedures:

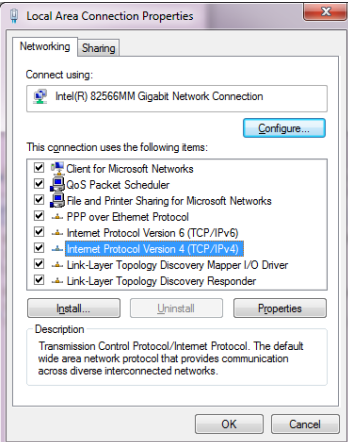
- [Configuring the management PC](#)
- [Connecting to the PC and powering up](#)



## Configuring the management PC

Perform the following procedure to configure the local management PC to communicate with the ePMP module.

Procedure

1	<p>Select <b>Properties</b> for the Ethernet port.</p> <p>In Windows 7 this is found in <b>Control Panel &gt; Network and Internet &gt; Network Connections &gt; Local Area Connection</b>.</p>	
2	<p>Select the <b>Internet Protocol (TCP/IP)</b> menu.</p>	
3	<p>Click <b>Properties</b>.</p>	
4	<p>Enter an IP address that is valid for the 169.254.1.x network, avoiding 169.254.1.1. A good example is 169.254.1.100.</p>	<p><b>Figure 68: Local Area Connection Properties dialog box</b></p>
5	<p>Enter a subnet mask of 255.255.255.0.</p> <p>Leave the default gateway blank.</p>	
6	<p>Click <b>OK</b> and then click <b>Close</b>.</p>	

## Connecting to the PC and powering up

Perform the following procedure to connect a management PC directly to the ePMP for configuration and alignment purposes and to power up the ePMP device.

Procedure

1. Verify that the device and power supply are connected correctly (the device Ethernet port is connected to the power supply Ethernet power port (*Gigabit Data+Power* or *10/100Mbit Data+Power*)).
2. Connect the PC Ethernet port to the LAN (*Gigabit Data* or *10/100Mbit Data*) port of the power supply using a standard (not crossed) Ethernet cable.
3. Apply main or battery power to the power supply. The Green power LED must blink continuously.



### Note

If the power and Ethernet LEDs do not blink continuously, refer to [Testing hardware](#) section to troubleshoot.

## Using the web interface

This section describes how to use the ePMP web interface.

- [Logging into the web interface](#)

### Logging into the web interface

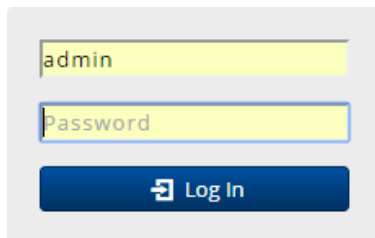
Perform the following procedure to log into the web interface as a system administrator.

#### Equipment and tools

- ePMP device connected to the power supply by Ethernet cable.
- PC is connected to the power supply by Ethernet cable.
- Power supply powered up.
- Minimum supported browser version - Chrome v29, Firefox v24, Internet Explorer 10, Safari v5.

#### Procedure

1. Verify that the device and power supply are connected correctly (the device Ethernet port is connected to the power supply Ethernet power port (*Gigabit Data+Power* or *10/100Mbit Data+Power*)).
2. Configure the host machine with an IP address in the 169.254.1.x subnet (excluding 169.254.1.1).
3. Configure the host machine with an IP address in the 169.254.1.x subnet (excluding 169.254.1.1).
4. Connect the power supply to power mains.
5. From the browser, navigate to the device's default IP address **169.254.1.1**.



The image shows a login form with two input fields and a button. The first input field contains the text 'admin'. The second input field contains the text 'Password'. Below the input fields is a blue button with a white icon of a person and the text 'Log In'.

6. Log in with **admin** username and **admin** password.



#### Note

If **Device IP address Mode** is set to **DHCP** and the device is unable to retrieve IP address information via DHCP, the device management IP is set to 192.168.0.1 (AP Mode), 192.168.0.2 (SM mode), or the previously-configured static Device IP Address. Units may always be accessed via the Ethernet port at 169.254.1.1.



### Note

All the new ePMP devices contain default username and password configurations. It is recommended to change the password configurations immediately. These passwords may be configured in the management UI in section **Configuration > System > Account Management**.

## Using the installation wizard – Access Point

The ePMP device provides a guided configuration mechanism for configuring key parameters for the link operation.

This setup can be accessed from the **Installation** page by clicking the **Start Setup** button.

Click **Finish Setup** to commit the changes to the device.

### Step 1: Main system parameters

Quick Start

Cancel Setup Finish Setup

Main Radio Network Security

Main

Device Name \* ePMP3000

Backward Compatibility  Disabled  Enabled

SSID GetElevated

Figure 69: Quick Start page

Attribute	Description
Main	
Device Name	The configured identifier used in an NMS such as cnMaestro
Backward Compatibility	<b>Enabled:</b> 802.11n ePMP subscribers can register to the AP (requires subscriber software upgrade). <b>Disabled:</b> 802.11n ePMP subscribers are not able to register to the AP.
SSID	SSID is a unique identifier for a wireless LAN which is specified in the AP's beacon. (Access Point Mode). SSID must be the same at both ends and different from the site name.