

Cambium PMP Synchronization Solutions User Guide

System Release 11.2/12.0



Cambium Networks

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Safety and regulatory information

This section describes important safety and regulatory guidelines that must be observed by personnel installing or operating Cambium network synchronization equipment.

Important safety information

WARNING

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

Power lines

Exercise extreme care when working near power lines.

Working at heights

Exercise extreme care when working at heights.

Grounding and protective earth

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

Powering down before servicing

Always power down and unplug the equipment before servicing.

External cables

Safety may be compromised if outdoor rated cables are not used for connections that will be exposed to the outdoor environment.

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General information

Version information

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

Issue	Date of issue	Remarks
001v000	January 2013	First issue
002v000	April 2013	Formatting updates, rack-mount power supply cabling update
003v000 004v000	April 2013	Pinout details for UGPS powering

Contacting Cambium Networks

Support website:	http://www.cambiumnetworks.com/support
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Sales enquiries:	solutions@cambiumnetworks.com
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Address:	Cambium Networks Limited, 3800 Golf Road, Suite 360 Rolling Meadows, IL 60008

Purpose

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

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

Cross references

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

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

Feedback

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

Problems and warranty

Reporting problems

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

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

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

Repair and service

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

Warranty

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

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

Extended warranties are available for PMP products. For warranty assistance, contact the reseller or distributor.

CAUTION

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

 **CAUTION**

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.

Warnings, cautions, and notes

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

Warnings

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



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

Cautions

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



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

Notes

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



Note 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. In the EU, Cambium in conjunction with a recycling partner ensures that equipment is collected and recycled according to the requirements of EU environmental law.

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: Introduction to synchronization

Interference and reliability

In the unlicensed wireless environment, interference can be defined as unwanted, competing radio signals in the same frequency band. These interfering signals can disrupt, delay and reduce the reliability and quality of your network traffic and performance. In licensed frequency bands where no outside signals are competing, the issue is self-interference, i.e., your own network's signals competing with each other. In either case, the results go beyond lower quality transmission; they extend to customer dissatisfaction, loss of competitive advantage and decreased return on investment.

Exclusivity and free use of spectrum

There are two types of frequency bands in which wireless networks operate: the licensed and unlicensed bands. Characteristics of each include:

Licensed frequencies

Licensed frequencies are bands reserved for the exclusive use of a public/private entity. Since the spectrum is clean and clear with no RF emitters (controlled by other entities) operating in the same frequency, wireless system reliability is greatly improved. Interference issues are largely confined to self-interference problems.

Unlicensed frequencies

Frequently described as a "Free Use" environment, unlicensed frequencies provide spectrum that is available to virtually anyone that wants to use it. Signals from different transmitting organizations and entities may compete with one another for space, creating an environment in which interference and ambient noise — as well as self-interference — can be significant impairments to reliable communications. The sheer number of the competing signals in unlicensed spectrum places a premium on ensuring that the equipment you use is of exceptionally high quality and design.

Sources of interference

In general, there are three basic categories of interference:

Self-interference

Emanating from an organization's own operating environment, self-interference is a factor in both licensed and unlicensed frequencies. In either band, self-interference occurs when distinct signals come from a network under your control, whether from the same tower location or from several miles away. Furthermore, the larger and denser the network grows, the more it will be exposed to self-interference and the reliability and performance issues it may cause.

In most cases, it is best dealt with self-interference the network planning stage. In building or extending a wireless network, proper product design, advanced technology (such as Cambium's industry leading use of GPS synchronization) and the ability to reuse a frequency band within the spectrum can in most cases combine to reduce self-interference to a point at which it does not have a significant impact on network performance and reliability.

External interference

In unlicensed frequencies, interference is more difficult to manage, since the interference comes from networks and technology not under your control. Because a single access point can support hundreds of subscribers or end users, interference can have a substantial impact.

Other networks aren't the only culprits; more and more network interference is coming from a wide range of consumer devices — such as surveillance cameras, Wi-Fi hotspots, and microwave ovens — that may operate in or near the same frequency. Furthermore, a network must be designed to not only deal with present interference sources, but must also be prepared to deal with potential future sources as the wireless environment evolves and usage of the spectrum expands.

Ambient Noise

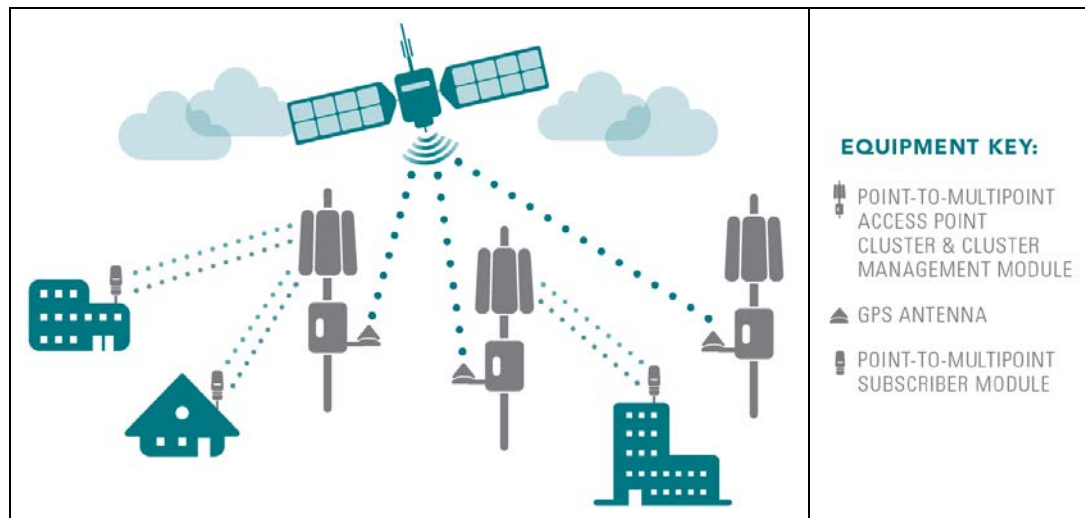
Also called the noise floor, ambient noise is simply background noise that is always present in a frequency band. It is caused by the growing numbers of wireless devices — from garage door openers to other wireless networks — operating in the same unlicensed frequency. These all crowd the spectrum and can be a significant factor in degrading signal and bandwidth. Ambient noise levels increase as more devices and networks are deployed in the spectrum.

Neutralizing interference

GPS synchronization.

Cambium leads the wireless industry in its usage of powerful GPS synchronization capabilities in all its PMP networks. This valuable capability dramatically reduces self-interference in licensed or unlicensed frequency bands. GPS synchronization allows all sites to be set to the exact same clock so network timing is very precise. As shown in the diagram, GPS satellite timing signals reach the GPS receivers in each of the network's access point radios establishing a common timing reference. This allows all the access point radios in the network — whether hundreds or thousands — to transmit at the same time and alter natively receive as all of the subscriber modules in the network transmit at the same time in turn. This helps prevent radio signals transmitted by an access point transceiver to interfere with reception of a user signal by another access point transceiver, perhaps the most onerous kind of self-interference in time-division duplex radio networks. With GPS synchronization, you can be certain your network can scale and grow elegantly to serve increasing numbers of users and applications.

Figure 1 GPS Synchronization



The Navigation Satellite Timing and Ranging (NAVSTAR) Global Positioning System (GPS) uses 24 satellites to relay information for precise derivation of position and time.

The cluster management module (CMM) contains a Cambium GPS Receiver. The CMM is a critical element in the operation of the system. At one AP cluster site or throughout an entire wireless system, the CMM provides a GPS timing pulse to each module, synchronizing the network transmission cycles.

The Oncore GPS Receiver tracks eight or more NAVSTAR satellites. The CMM uses the signal from at least four of these satellites to generate a one-second interval clock that has a rise time of 100 nsec. This clock directly synchronizes APs and which, in turn, synchronize the SMs in the network.

The Oncore GPS Receiver also provides

- the latitude and longitude of the GPS antenna (co-located with the CMM)
- the number of satellites that are being tracked
- the number of satellites that are available
- the date
- the time in Universal Coordinated Time (UCT)
- the altitude of the GPS antenna
- other information that can be used to diagnose network problems.

Configuration options for TDD synchronization

Cambium PMP systems use Time Division Duplexing (TDD) - one channel alternately transmits and receives - rather than using one channel for transmitting and a second channel for receiving. To accomplish TDD, the AP must provide sync to its SMs – it must keep them in sync. Furthermore, co-located APs must be synced together - an unsynchronized AP that transmits during the receive cycle of a co-located AP can prevent that second AP from being able to decode the signals from its SMs. In addition, across a geographical area, APs that can “hear” each other benefit from using a common sync to further reduce self-interference within the network.

The configuration options available for synchronization on the PMP 450 Access Point are:

- **Generate Sync Signal:** This option may be used when the AP is not receiving GPS synchronization pulses from either a CMM or UGPS module, and there are no other APs active within the link range. Using this option will not synchronize transmission of APs that can “hear” each other, it will only generate a sync signal for the local AP and its associated SMs.
- **Sync to Received Signal (Timing Port / UGPS):** This option may be used to set the AP to receive GPS synchronization pulses from an AP in the cluster or a UGPS (Universal Global Positioning System) module via the RJ11 sync port.
- **Sync to Received Signal (Power Port):** This option may be used to set the AP to receive GPS synchronization pulses from a connected CMM via the RJ45 port.

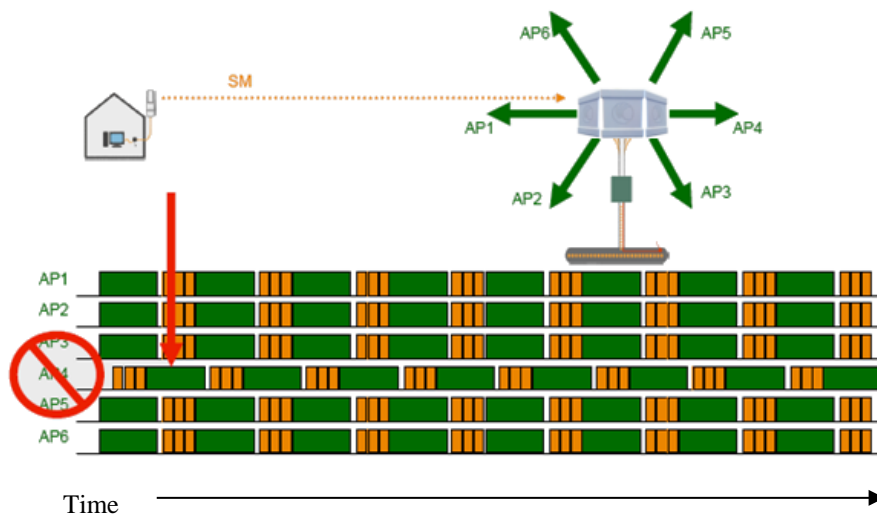
Alternative to GPS synchronization

A link can operate without *GPS* sync, but cannot operate without sync. The alternative to GPS sync is to configure the AP in the link to generate a sync pulse to pass to the SM. Depending on the RF environment in which the link operates, this latter alternative may or may not be plausible.

For example, in [Figure 2](#), AP4

- is not synchronized with any of the other APs.
- is transmitting nearby the other APs while they are expecting to receive SM transmissions from a maximum distance.

Figure 2 One unsynchronized AP in cluster resulting in self-interference



The result is self-interference. In this scenario, the self-interference can be avoided only by synchronizing the TDD transmit cycles of all APs that operate in the same frequency band.

An AP that is isolated by at least 5 miles (8 km) from any other equipment can generate and pass sync pulse without GPS timing and not risk that interference will result from the generated sync. In any other type of link, sync should be derived from GPS timing.

Although the embedded timing generation capability of the AP keeps a precise clock (configuration parameter Sync Source set to **Generate Sync Signal**), no trigger exists to start the clock at the same moment in each AP of a cluster. So, the individual AP can synchronize communications between itself and registered SMs, but cannot synchronize itself with other modules, except by GPS timing.

Cambium's synchronization solutions

Cambium's entire Point-to-Multipoint (PMP) technology portfolio offers GPS synchronization to limit the network's own self-interference. The Cluster Management CMM provides Global Positioning System (GPS) synchronization to the Access Point (AP) and all associated Subscriber Modules (SM). Network operators have a choice of CMM solutions to select the option that works best for the environment.

Universal GPS (UGPS)

The UGPS provides network synchronization for smaller networks where a CMM may not be cost effective. The UGPS provides synchronization for one or two modules so that even remote areas at the edge of the network can operate with synchronization for improved performance. The UGPS works with all Cambium PMP radios. The UGPS has a small footprint and is easy to deploy.



CMM4 (Rack Mount)

The cluster management module (CMM) is the heart of the Cambium system's synchronization capability, which allows network operators to reuse frequencies and add capacity while ensuring consistency in the quality of service to customers. For operators who prefer indoor CMM mounting, Cambium offers the Rack-Mounted Cluster Management Module 4. The unit is designed to be mounted onto a standard 19-inch telecommunications rack and to allow the Cambium CMM4 to be co-located with other telecommunications equipment.



CMMmicro (CMM3)

The Cluster Management Module 3 (CMM3), also known as the CMMmicro, allows network operators to reduce the time and labor cost of system installation and maintenance in AP Clusters. This management module reduces cabling between system modules and provides reliable network synchronization. There is only one cable going from the CMM3 to each module carrying the Ethernet connection, synchronization pulse and GPS data.



CMM4 (Cabinet with switch)

Designed to deliver consistent and reliable wireless broadband service, the PMP system gracefully scales to support large deployments. The cluster management module is the heart of the system's synchronization capability which allows network operators to re-use frequencies and add capacity while ensuring consistency in the quality of service to customers. As a result, subscribers can experience carrier-grade service even those at the outer edge of the network.



CMM4 (Cabinet without switch)

This CMM includes all of the functionality listed above but there is no switch. This provides the network operator the flexibility to use the switch of their choice with the power and synchronization capabilities of the CMM4.

Chapter 2: Cambium Cluster Management Module (CMM)

The CMM4 consists of 3 subsystems, described in the following sections:

- The CMM4 enclosure and controller board
- Power supply(s)
- An EtherWAN switch (contained only in 1090CKHH models - mounted in the CMM4)

CMM4 and Controller Board

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

- Sync over Power over Ethernet and integrated surge suppression on the controller board for up to 8 APs or BHs. Both a custom 30 VDC power scheme and a custom 56 VDC power scheme are available. Neither is the same as the later IEEE Standard 802.3af, and neither is compatible with it.
- Managed switching using a hardened EtherWAN switch (1090CKHH models). The CMM4 ships with a 14-port EtherWAN switch and is also available without a switch. The CMM4 originally shipped with a 9-port EtherWAN switch.
- A weather-tight enclosure with either 4 or 7 glands/ports for Ethernet and power cables (1090 and 1091 models).
- Surge suppression on the controller board for the incoming 30V DC and 56V DC power lines and GPS coax cable.
- Auto-negotiation on the Ethernet ports. Ports will auto-negotiate to match inputs that are either 100Base-T or 10Base-T, and either full duplex or half duplex, when the connected device is set to auto-negotiate. Alternatively, these parameters are settable.
- An always-on NTP (Network Time Protocol) server that can provide date and time to any radio that can reach the CMM's management IP address.

Table 1 shows model numbers and Ethernet switch configurations.

Table 1 CMM4 model numbers and Ethernet switch configurations

CMM4 Model No.	CMM4 Extended Model No.	EtherWAN Switch			Cable glands (ports)
		Total Ports	10/100 Base-TX Ports	10/100/1000 Base-TX Ports	
1090CK	1090CKHH (current units)	14	12	2	7
	1090CKAA (earlier units)	9	8	1	4
1091HH	–	No Switch			7
1092HH (Rackmount)	–	No Switch			–

Inside the CMM4 enclosure is a **controller board**, an **EtherWAN switch** (model 1090CKHH only), and a GPS coax surge suppressor.

The **controller board** injects power and synchronization on up to eight Ethernet ports and provides the equivalent of 600SS surge suppression on each of the eight ports. The controller board is managed using a web browser, Telnet, or SNMP, and is supported by the Prizm Element Management System (EMS). The controller board receives 30 VDC power and/or 56 VDC from external power supplies, and provides 20 VDC power for the EtherWAN switch and other auxiliary equipment. The controller board includes a GPS module, which provides sync and GPS information to the CMM, a management port, an override toggle switch, and an auxiliary sync port for connecting to another CMM.



IMPORTANT!

The controller board does not convert 30 VDC to 56 VDC or 56 VDC to 30 VDC. To power 56 VDC equipment from a CMM4 you must provide a 56 VDC power supply, and to power 30 VDC equipment from a CMM4 you must provide a 30 VDC power supply.

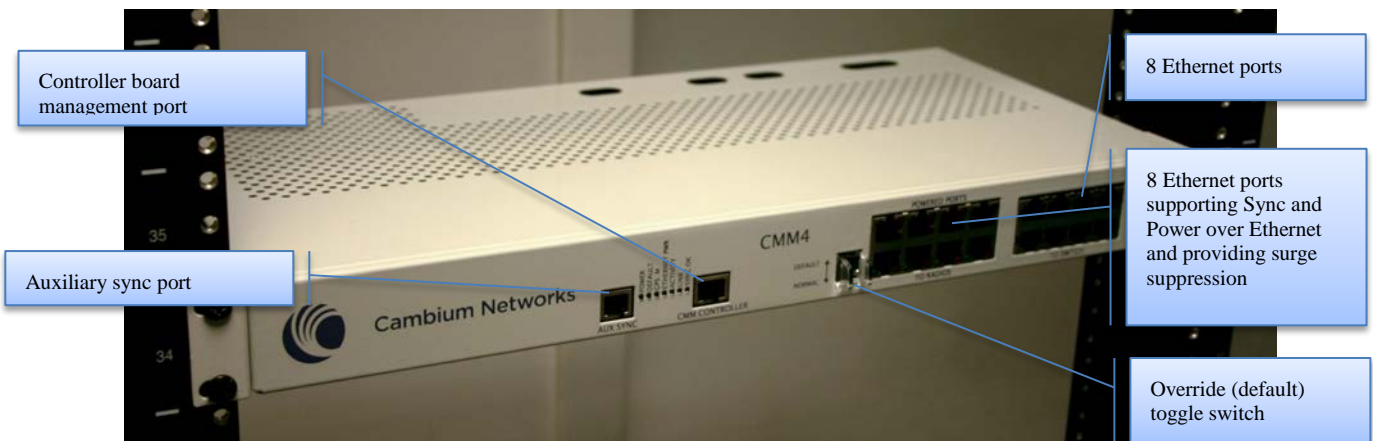
The hardened, managed **EtherWAN switch** (model 1090CKHHonly) provides a full array of networking features. For details on the EtherWAN switch, see page 2-23.

Figure 3 CMM4 internal view, including cable glands





Figure 4 Rackmount CMM4



Outside the enclosure the CMM4 requires a **GPS antenna** and a **power supply**.

The **GPS antenna** requires a good view of the sky, and should not be mounted at the highest point of the tower. For best satellite tracking results a clear view of the southern horizon is required. It is included with the CMM4 and is also available as a replacement item using part number GPSANTPNM03D.

Figure 5 GPS Antenna

The model 1090CKHH and model 1091HH CMM4 as shipped includes:

- Weatherized enclosure containing the controller board, EtherWAN Ethernet Switch, and GPS coax surge suppressor. See page 2-8 for details on EtherWAN switch options.
- Patch cables between the controller board and the EtherWAN Ethernet Switch
- U-bolts and V-brackets for pole-mounting the CMM4
- GPS Antenna
- GPS antenna pole-mount kit
- A 1-hole cable gland insert for use on the DC power cable

The model 1092HH Rackmount CMM4 as shipped includes:

- Rackmounting accessories
- GPS Antenna and pole mount accessories

The CMM4 (all models) as shipped **does not** include:

- Any power supply. The appropriate power supply(s), 30 VDC and/or 56 VDC, must be ordered separately.
- Ethernet cables to connect the CMM4 to APs, backhauls, or terrestrial feeds
- Coax cable connecting the CMM4 to the GPS antenna





Power

The power supply or supplies, 30 VDC and/or 56 VDC, are ordered separately. See [Table 2](#) for pictures of the 30 VDC and 56 VDC supplies and for power supply part numbers.

The **30 VDC power supply** is equipped with an attached 10 ft (3 m) DC cable with flying leads and an IEC C14 AC chassis socket, such as is commonly seen on electronic equipment such as computers and printers. It is orderable either with a 6 ft North American IEC line cord or with no IEC line cord, in which case the operator must obtain the appropriate IEC line cord for their country.

The **56 VDC power supply** is equipped with a cage clamp style terminal and comes with no cables. A data sheet that covers the 56 VDC power supply may be found on the manufacturer's website at <http://www.power-one.com/resources/products/datasheet/x.pdf>.

Table 2 Power supply part numbers

Name	Part Number	
30 VDC Power Supply (6 ft North American IEC AC line cord included)	ACPS120WA	
30 VDC Power Supply (without AC line cord)	ACPS120W-02A	
56 VDC Power Supply (no cables or cords)	N00000L053A (formerly SGPN4076) (DIN Rail Mount)	
	SGPN4075 (Rack Mount)	

This same 30 V power supply is now included with CMMmicros (Cluster Management Module micro). Previously, CMMmicros shipped with a 24-Volt DC power supplies, but all 24 VDC modules and radios are compatible with a 30 Volt system. Note that a 56 VDC CMM power supply will not properly power on 24 VDC radio modules.

Ethernet Switch

The model 1090CKHH CMM4 is available with a hardened, full-featured Ethernet switch made by EtherWAN Systems mounted inside the CMM4 enclosure. The CMM4 ships with a 14-port EtherWAN switch. Earlier units shipped with a 9-port EtherWAN switch.

For details on the EtherWAN switch, including the download site for its separate manual, see page [2-23](#).

Currently CMM4s ship as model number 1090CKHH and include a 14-port EtherWAN switch. Twelve ports support 10/100Base-T Ethernet and two ports supports 1000Base-T (Gigabit) Ethernet. Typically, eight ports are connected to the eight ports on the controller board via eight Ethernet patch cables, one port is connected to the management port of the controller board, and the remaining ports are available for connecting to high speed backhubs, terrestrial feeds, or for local access.

Earlier CMM4s shipped as model number 1090CKHH and included a 9-port EtherWAN switch. Eight ports support 10/100Base-T Ethernet and one port supports 1000Base-T (Gigabit) Ethernet. Typically, eight ports are connected to the eight ports on the controller board via eight Ethernet patch cables, and the Gigabit Ethernet port is connected to the management port of the controller board if the port isn't needed for Gigabit Ethernet.

Regardless of CMM4 option chosen, one of the ports on the switch must be cabled to the management port of the controller board or other access to the controller must be provided. The eight Ethernet lines pass through the controller board and have power and sync injected, but do not themselves provide network access to management of the controller board.

CMM4 models 1091HH and 1092HH do not contain an EtherWAN switch, and operators may supply an external switch for Ethernet traffic management (such as switch-based VLAN, MAC-based trunking, port security, port mirroring, QoS, etc.)

Specifications

Table 3 CMM4 specifications

Specification	System Range
Max length from CMM to any radio	328 cable feet (100 meters)
Max length from CMM to GPS antenna	100 cable feet (30.5 meters)
Max length from CMM to another CMM, if GPS sync cable is used	100 cable feet (30.5 meters)
Dimensions	20.75" x 14.75" x 7.75" (52.7 cm x 37.5 cm x 19.7)
Weight	14.0 lbs. (6.4 kg)
Operation Temperature	-40°F to +131°F (-40°C to +55°C)
Humidity	100% condensing
Ethernet, GPS Sync, and GPS Coax Cables	The use of cables that conform to the operational temperature of the product as well as being UV light protected is mandatory. Shielded Ethernet cables are strongly recommended
Input Power	29VDC or 56VDC, max 10.6A (-40°C)

Table 4 Rackmount CMM4 specifications

Specification	System Range
Max length from CMM to any radio	328 cable feet (100 meters)
Max length from CMM to GPS antenna	100 cable feet (30.5 meters)
Max length from CMM to another CMM, if GPS sync cable is used	100 cable feet (30.5 meters)
Dimensions	19" x 9.5" x 1.75" or 1 Rack Space (48.25 cm x 24 cm x 4.5 cm)
Weight	6.8 lbs. (3 kg)
Ethernet, GPS Sync, and GPS Coax Cables	The use of cables that conform to the operational temperature of the product as well as being UV light protected is mandatory. Shielded Ethernet cables are strongly recommended
Input Power	29VDC or 56VDC, max 10.6A (-40°C)

Providing sync to CMM via UGPS Module

A UGPS module may also be used as a GPS synchronization source (or backup GPS synchronization source) for the CMM4 units. The UGPS provides GPS synchronization to the CMM unit via the CMM's Aux Sync port (location data is not provided by the UGPS module). This allows any access points or backhaul masters connected to the CMM to receive sync. *This configuration requires that the CMM4 be configured to "Slave" mode via the CMM GUI.* When using the UGPS as a synchronization source for a CMM4, a special sync cable must be used. This cable may be constructed from an RJ-11 cable using the pin configuration in [Figure 51](#).

CMM Planning

The following sections discuss Ethernet cabling, power, syncing two co-located CMMs together, and engineering and ordering cables.

Typical Ethernet Cabling

Physical connectivity and cabling of the CMM4 is variable and is done per the specific requirements of a given installation. The following sections depict several variations for specific network configurations. Based on these typical layouts, operators should design connectivity and cabling that best meets their site-specific needs.

NOTE

CMM4 models 1091HH and 1092HH do not contain an EtherWAN switch, and operators may supply an external switch for Ethernet traffic management (such as switch-based VLAN, MAC-based trunking, port security, port mirroring, QoS, etc.). This external switch may be cabled similar to the EtherWAN switch in the diagrams below.

Standard Ethernet Cabling Configuration

[Figure 6](#) and [Figure 7](#) show the CMM4's internal ports connected in a standard cabling configuration. In this configuration there are four Ethernet connections to radios and one connection to a terrestrial feed. The four Ethernet ports that are powered (indicated by a red light for 29V or a green light for 56V) were configured using the CMM4 configuration web page. The Ethernet connection to the terrestrial feed is not powered (no red or green light). An Ethernet cable connects the controller board management port to the EtherWAN switch. Four of the eight Ethernet ports to radios are shown as unpowered and unused in this configuration. Local access during local maintenance could be gained by connecting an Ethernet cable from a local computer to any of the unpowered ports or to an unused port on the EtherWAN switch.

Figure 6 CMM4 Standard Configuration

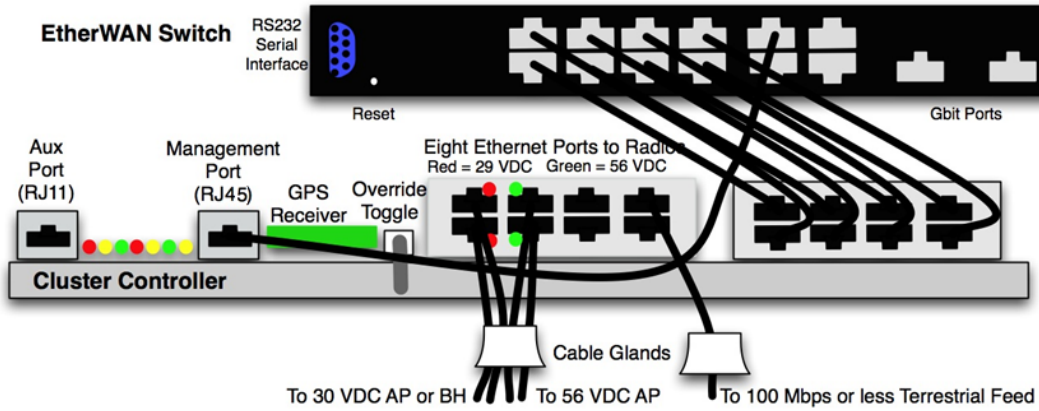
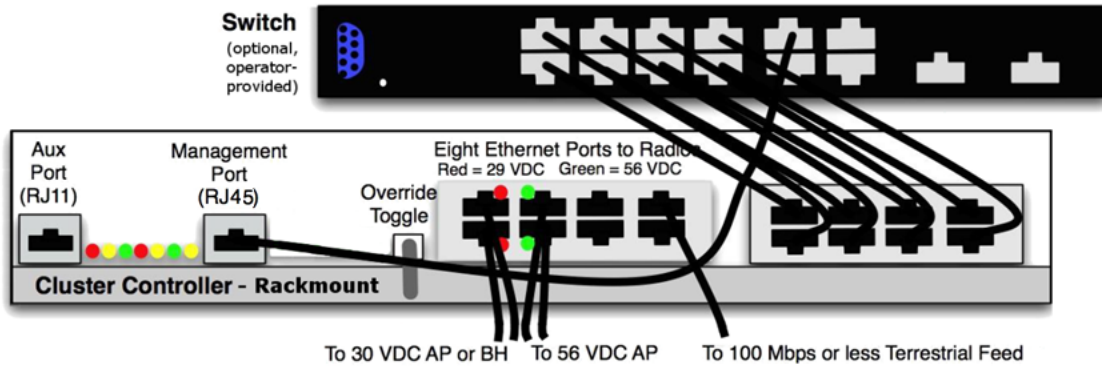


Figure 7 Rackmount CMM4 Standard Configuration



CAUTION!

Do not mis-cable in such a way as to put power on the controller board Management Port.

Configured for 1000Base-T (Gigabit) Ethernet Terrestrial Feed



IMPORTANT!

The surge suppression provided by the controller board does not efficiently pass 1000Base-T (Gigabit) Ethernet. Connections required to support Gigabit Ethernet should not pass through the controller board portion of the CMM4 and should have separate surge suppression.

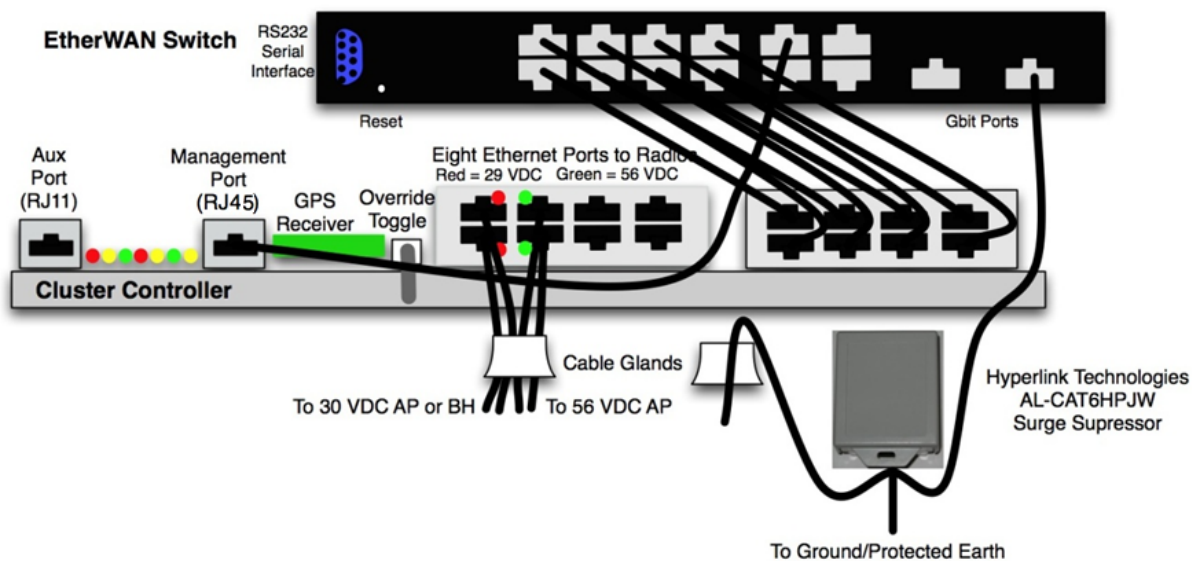
Figure 8 shows typical cabling for supporting a Gigabit Ethernet feed. A Gigabit port of the EtherWAN switch is used for a terrestrial Gigabit Ethernet feed. The surge suppression on the controller board does not efficiently pass 1000Base-T (Gigabit) Ethernet, so the Gigabit Ethernet from the EtherWAN switch needs to

- Be cabled so as not to go through the controller board
- Have surge suppression provided using a HyperLink Technologies AL-CAT6HPJW surge suppressor available from L-Com (<http://www.l-com.com>) or equivalent.

The AL-CAT6HPJW surge suppressor can be either mounted

- inside the CMM4 enclosure (using stick-and-rip tape like Velcro or other secure mounting), with the ground lug on the surge suppressor connected to the ground lug on the inside of the enclosure with 10 AWG (6 mm²) green ground wire.
- outside the CMM4 enclosure, with the ground lug on the surge suppressor connected to known-good ground/protective earth with 10 AWG (6 mm²) green ground wire.
- in the case where the CMM4 is located in a telecommunication hut, mounted outside the hut at the point of cable penetration, with the ground lug on the surge suppressor connected to known-good ground/protective earth with 10 AWG (6 mm²) green ground wire.

Figure 8 CMM4 cabled to use Gigabit Ethernet feed



Configured for Cambium PTP 400, 500, and 600 Series Ethernet Bridges

PTP 400, 500, and 600 Series Ethernet bridges can use the CMM4's EtherWAN switch for their network connectivity.

These units use a different powering scheme and must be powered using their external PIDU (Powered InDoor Unit), not the powering option of the controller board in the CMM4. The PIDU must be located between the CMM4 and the ODU (OutDoor Unit – the radio), so as not to put power on ports of the EtherWAN switch.



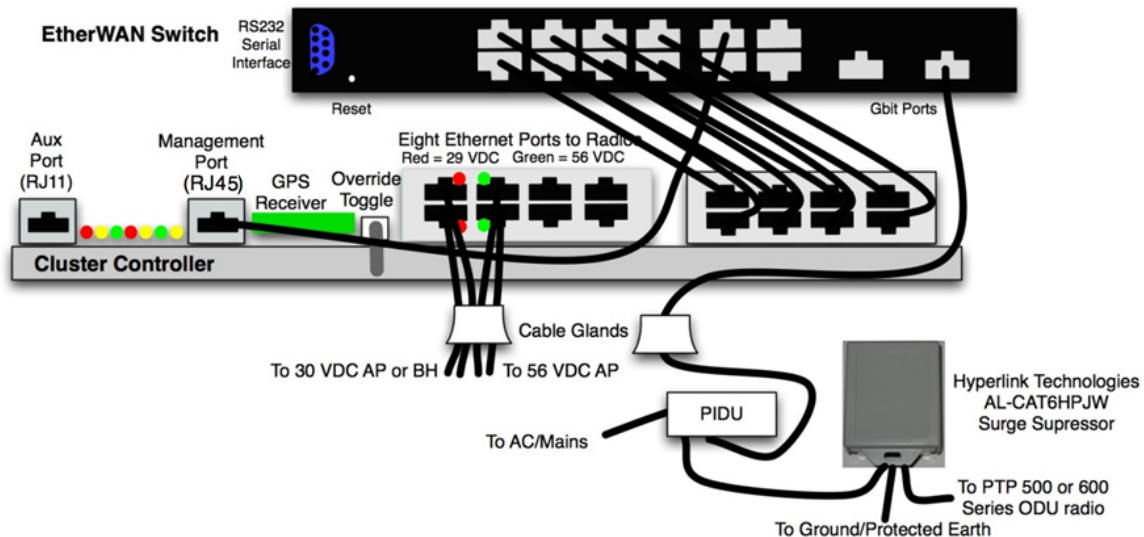
IMPORTANT!

The surge suppression provided by the controller board does not efficiently pass 1000BaseT (Gigabit) Ethernet. Connections required to support Gigabit Ethernet should not pass through the controller board portion of the CMM4 and should have separate surge suppression.

PTP 500 and PTP 600 Series bridges operate at greater than 100 Mbit speeds and so should not be cabled to the controller board portion of the CMM4. Surge suppression to protect the EtherWAN switch should be provided by a Hyperlink Technologies AL-CAT6HP-JW surge suppressor, cabled as shown in Figure 9. The surge suppressor should be mounted

- within 3 ft (1 m) of the CMM4 if the CMM4 is located outdoors
- on the outside of the building or communications hut at the point of cable penetration if the CMM4 is located indoors.

Figure 9 CMM4 cabled to support PTP 500/600



PTP 400 Series bridges operate at less than 100 Mbit speeds and so can be cabled to one of the eight Ethernet ports on the controller board, thus taking advantage of the controller board for surge suppression. The port must be configured to be unpowered. The PTP 400 Series bridge is powered by its own externally located PIDU.

Power Planning



IMPORTANT!

The power supply or supplies for the CMM4 must be separately ordered – no power supplies are included under model numbers 1090CK, 1091, or 1092. (This differs from the CMMmicro where the power supply is included when model number 1070CK is ordered.) See [Table 2](#) for pictures of the 30 VDC and 56 VDC supplies and for power supply part numbers.

A **30 VDC power supply** is needed for the following equipment:

- PMP 100 FSK regular and Advantage APs
- PMP 54400 OFDM APs
- PTP 100 FSK BHs
- PTP 54200 OFDM BHs
- PMP 450 OFDM APs

A **56 VDC power supply** is needed for the following equipment:

- PMP 320 802.16e APs
- PMP 430 OFDM APs
- PMP 49400 OFDM APs
- PTP 49200 OFDM BHs



NOTE:

In most cases SMs use the same voltage as their associated APs. Two exceptions to be aware of are

- PMP 320 SMs use 802.3af power supplies
- PMP 430 SMs use 30 (29.5) VDC power supplies.

There are four input power terminal blocks inside the CMM4. Two of them are for 29/30 VDC input, and the other two are for 56 VDC input. The two 29 VDC terminal blocks and the two 56 VDC terminal blocks allow the CMM4 to be powered from redundant power supplies, if so desired.

The 30 VDC CMM4 power supply is labeled as 30 VDC and typically measures 30 VDC at its output. The associated CMM4 terminal blocks are marked 29 VDC, and associated SM power supplies are labeled 29.5 VDC. All of these components are elements of a nominal 30 VDC system, and can be considered “30 VDC” elements.

The 56 VDC CMM4 power supply is labeled as 51.4 - 58.6 VDC and typically measures 51.5 VDC at its output. The associated CMM4 terminal blocks are marked 56 VDC, and associated SM power supplies are labeled 56 VDC. All of these components are elements of a nominal 56 VDC system, and can be considered “56 VDC” elements.

One of the 56 VDC blocks has 2 terminals while the other has 3. The third terminal provides an additional grounding point, if needed.

If you are using a CMM4 to power both 30 VDC and 56 VDC systems, then you must install both 30 VDC and 56 VDC power supplies along with the CMM4. These power supplies must be wired to the correct terminal blocks (marked 29 VDC and 56 VDC).



IMPORTANT!

This advisory only affects operators using a CMM4 that supplies power to both 30V devices (PMP100 radios) and 56V devices (PMP430 or PMP320 radios). The new 30V replacement model ACPS120WA power supply does NOT require the 1k 5W resistor on the CMM4 29V terminals (This new 30V power supply was made available for order around December 3, 2010). The phased out 30V model ACPS112WA power supply will always require a 1k 5W resistor when a 56V supply is present. Since both power supplies look identical, see the label under the power supply to identify the model.

Power supply model ACPS112WA requires a 1k 5W resistor across the 30V DC input terminal of the CMM4 when both 30V AND 56V are present. Doing so will prevent the 30V power supply to not always come out of sleep mode with a light load. The power supply will attempt to come out of sleep mode, and if it does not see sufficient load it goes into a sleep/recovery cycle that is observable by watching the 30V LED on the port connector turn on and off.

Power supply Model ACPS120WA has been updated to satisfy the European Union's Energy Level 5 requirement and DOES NOT require a 1k 5W resistor.

See [Procedure 7 Installing a special resistor for dual-powered CMM4s](#) for more information.

The 30 VDC and 56 VDC power supplies are rated for outdoor temperatures, but are not weather tight and so must be mounted in a communications hut or enclosure provided by the operator. They should not be mounted inside the CMM4 enclosure, as it is not designed to handle the additional heat load of the power supplies. (Although it appears there is space for the power supplies, the key constraint is the surface area of the enclosure for dissipating heat, not the volume of the enclosure.)

With most of the 30 VDC radios, the radio uses up to 10 W and the input voltage as measured at the "29 VDC" terminals on the CMM4 must be between 22 and 32 VDC to support 8 APs at the maximum 100 m (328 ft) Ethernet cable length.

With PMP 54400 APs, the radio uses up to 12 W at 30 VDC and the input voltage as measured at the "29 VDC" terminals on the CMM4 must be between 28 and 32 VDC to support 8 APs at the maximum 100 m (328 ft) Ethernet cable length.

When supporting 56 VDC systems, the input voltage as measured at the "56 VDC" terminals on the CMM4 must be between 44 and 59 VDC.

The CMM4 controller board provides two 20 VDC outputs – one for the EtherWAN switch, and one optionally available for powering another low power device mounted in the enclosure by the operator, such as a fiber-to-copper media converter. Total 20 VDC accessory power should not exceed 20 W.

In cases where -48 VDC power is available and powering from the -48 VDC is desired (for example, in some telecommunications huts), procure a -48 VDC to +56 VDC converter such as a Mean Well Model SD-350C-48 and install between the -48 VDC source and the +56 VDC power supply.

Syncing Two Co-located CMMs Together

Two CMMs can be synced together to meet either of the following goals:

- Case 1 – One GPS antenna for two CMMs: Use a single GPS antenna to support two CMMs. This can be advantageous for a site with 2 CMMs where the site owner is charging per antenna and the operator wishes to minimize site costs by only installing one GPS antenna.
- Case 2 - Redundant Sync: Take advantage of co-located CMMs, each with its own antenna, to provide “warm spare” redundant sync. If one GPS antenna, coax cable, or GPS module has problems, remote re-configuration can re-establish sync to that CMM.

The CMMs can be any combination of CMMs - either two CMM4s, two CMMmicros, or a CMM4 and a CMMmicro.

Syncing two CMMs together requires connecting their RJ-11 auxiliary ports together with a 6-wire cable and configuring each CMM appropriately. The location of the RJ-11 auxiliary port is shown in [Figure 3](#).

The connection cable is a special cable, not a straight-through cable. See page [2-21](#) for information on the cable and [Figure 11](#) for cable pinouts.

Case 1 – Redundant Sync

In this case, each CMM is connected to its own GPS antenna via coax in the standard way, and the two CMMs are connected via a special cable between the auxiliary sync RJ-11 ports of each CMM. If one CMM loses sync due to problems with its GPS antenna, coax cable, or GPS module, that CMM can be re-configured remotely over the network to get sync from the other CMM by going to the **Configuration > CMM** web page and setting the sync source to **Slave (RJ11 Port)**.

In normal operation, the appropriate web pages of each CMM will display GPS information, as will the appropriate pages of connected APs and BHMs. Each CMM can be used as a NTP (Network Timing Protocol) server for time-of-day information for APs and BHMs, configured at the AP or BHM.

Once reconfigured to get sync over the auxiliary sync RJ-11 Port, a CMM and its connected APs and BHMs will no longer display GPS information. That CMM will no longer be providing NTP server functions, and any AP or BHM configured to point to it for time-of-day will need to be re-configured to point to a different NTP server to get accurate time-of-day information.

Depending on network design and other equipment in the network, the two CMMs may be connected with an Ethernet cable, or may be each fed separately.

Case 2 – One GPS antenna for two CMMs

A typical scenario for the use of Case 2 would be where a site or building owner is charging per antenna, the site requires 2 CMMs, and the operator wishes to minimize site costs by only installing one GPS antenna.

In this case, the GPS antenna connects to one CMM via coax cable, and the two CMMs are connected via a cable between the auxiliary sync RJ11 ports of each CMM. Sync is passed from one CMM to the other via this cable. The Sync Source on the Configuration > CMM page of the CMM connected to the GPS antenna should be set to **Master (GPS Module)**, and the Sync Source on the **Configuration > CMM** page of the other CMM should be set to **Slave (RJ11 Port)**.

The slave CMM and its connected APs and BHMs will not display GPS information and the slave CMM will not function as an NTP (Network Time Protocol) server.

Depending on network design and other equipment in the network, the two CMMs may be connected with an Ethernet cable, or may be each fed separately.

Cables

Ethernet Cables

The operator provides the Ethernet cables between the CMM4 and the radios it supports. They must be engineered to length and are not included with the CMM4. The cable length from the CMM4 to any radio must be under 100 m (328 ft).

Cables are available from Best-Tronics, Inc., <http://best-tronics.com/>. These cables can be ordered in lengths up to 328 ft (100 m) and are listed in [Table 5](#).

Table 5 Recommended Ethernet cables

Typical Use	Best-Tronics Part #	Description
Infrastructure Ethernet cable	BT-0781S-XXX	RJ-45 to RJ-45 straight, shielded, UV-resistant Ethernet cable using outdoor STP Cat 5e cable, lower cost than plenum-rated, available only in black.
Infrastructure Ethernet cable for plenums	BT-0562S-XXX	RJ-45 to RJ-45 straight, shielded, UV-resistant, plenum-rated Ethernet cable using outdoor STP Cat 5e cable, available in beige, blue, grey, or white.



IMPORTANT!

Shielded Ethernet cable is strongly recommended for AP and BH installations.

Alternatively, equivalent cables may be procured by the operator, fabricated by the operator in a depot, or fabricated at site. The modules have auto MDX/MDIX and so either straight-through or crossover Ethernet cables may be used. Pinouts for straight-through cables are shown in [Table 6](#) and [Table 7](#). [Figure 10](#) shows the location of Pin 1, relative to the lock tab on the connector.

Table 6 RJ-45 pinouts for straight-through Ethernet cable - 30 VDC

Pin 1 →	white / orange	← Pin 1
Pin 2 →	orange	← Pin 2
Pin 3 →	white / green	← Pin 3
Pin 4 →	blue	← Pin 4
Pin 5 →	white / blue	← Pin 5
Pin 6 →	green	← Pin 6
Pin 7 →	white / brown	← Pin 7
Pin 8 →	brown	← Pin 8

Pins 7 and 8 carry power to the modules.



Table 7 RJ-45 pinouts for straight-through Ethernet cable - 56 VDC

Pin 1 →	white / orange	← Pin 1
Pin 2 →	orange	← Pin 2
Pin 3 →	white / green	← Pin 3
Pin 4 →	blue	← Pin 4
Pin 5 →	white / blue	← Pin 5
Pin 6 →	green	← Pin 6
Pin 7 →	white / brown	← Pin 7
Pin 8 →	brown	← Pin 8

Pins 5 and 8 carry power to the modules.



Figure 10 Location of pin 1



(Lock tab underneath)

Bulk unterminated Ethernet cable can be ordered from Best-Tronics as bulk cable:

- CA-0287S: (shielded, plenum rated)
- CA-0367S: (lower cost, shielded, non-plenum-rated)

GPS Antenna Coaxial Cable

The operator provides the GPS antenna coaxial cable between the CMM4 and the GPS antenna. It must be engineered to length and is not included with the CMM4. In most cases, the cable length from the CMM4 to the GPS antenna must be under 30 m (~100 ft).

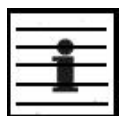
Antenna cables can be ordered from Best-Tronics, Inc., <http://best-tronics.com/>. Antenna cables can be ordered in lengths up to 100 ft (30.4 m), as listed in [Table 8](#).

Table 8 Recommended antenna cable

Best-Tronics Part #	Description
BT-0564	N to N GPS antenna cable

Alternatively, equivalent cables may be procured by the operator, fabricated by the operator in a depot, or fabricated at site using

- Up to 100 feet (30.4 meters) of LMR200 coaxial cable
- 2 Times Microwave N-male connectors (Times Microwave P/N TC-200-NM) or equivalent connectors

**NOTE:**

The CMM4 has a female N-type coax connector on the outside of the enclosure, whereas the CMMmicro has a female BNC-type connector inside the enclosure. Take this into account when ordering or fabricating cables, and when replacing a CMMmicro with a CMM4.

DC Cables

Cambium recommends the use of flame-retardant, moisture and sunlight-resistant cable rated to 75° C wet and bendable at -25° C for the DC cable between the power supply(s) and the CMM4. Examples of such cable include General Cable (<http://www.generalcable.com>), catalog number 234580 for 12 AWG cable and catalog number 236300 for 10 AWG cable, found in the Telecommunications Catalog.

Recommended wire size for the CMM4's DC cable in most systems is shown in [Table 9](#). These wire sizes support up to 8 radios (30 VDC or 56 VDC radios) at up to 100 m (328 ft) Ethernet cable length from the CMM4.

Table 9 Wire size for CMM4 DC cable

DC Power Cord Length	Wire Gauge
Up to 90 ft (3–25 m)	12 AWG (4 mm ²)
91–145 ft (26–45 m)	10 AWG (6 mm ²)
146–230 ft (46–70 m)	8 AWG (10 mm ²)


For supporting 8 PMP 54400 APs or PTP 54200 BHs (which are 12 W 30 VDC radios), reduce either the maximum DC cable length or the Ethernet cable length by half. For example, if the Ethernet cable length from CMM4 to 8 PMP 54400 APs is 50 m (164 ft) or less, the DC lengths in [Table 9](#) can be used. If the Ethernet cable length from CMM4 to 8 PMP 54400 APs is 100 m (328 ft), then halve the lengths shown in [Table 9](#).

CMM Sync and UGPS Sync Cable

As described in on page 2-18, two CMMs (two CMMmicros, two CMM4s, or a CMMmicro and a CMM4) can be connected together with a CMM sync cable to provide either

- The ability to have one GPS antenna support two CMMs
- “Warm spare” redundant sync

Pinouts for the CMM sync cable are shown in Figure 11. Figure 12 shows the location of Pin 1, relative to the lock tab on the connector. When using a UGPS module for providing synchronization pulses to a CMM4 unit, use the pinout configuration shown in Figure 51.



NOTE:
The CMM sync cable used to connect two CMMs for sync purposes has different pinouts than the straight-through sync cable used to connect a “remote AP” to an SM, or an AP or BHM to a CMM2.

Figure 11 CMM sync cable pinout

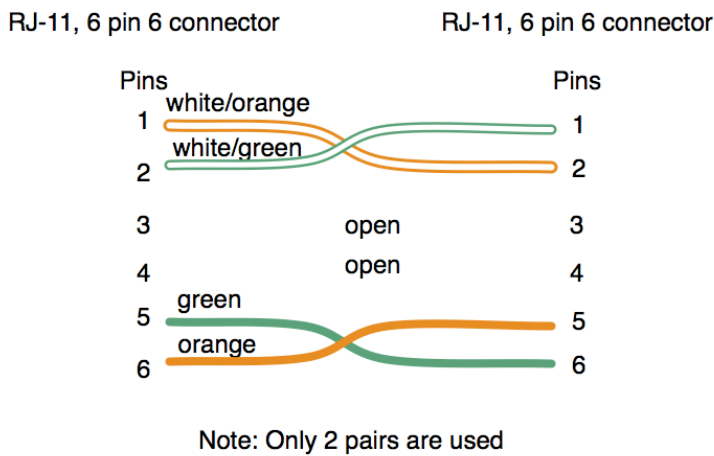
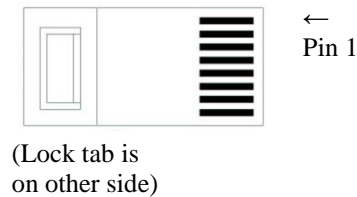


Figure 12 Location of pin 1



EtherWAN Switch Information

This section includes key information on the EtherWAN switch. For full details and configuration information, EtherWAN switch manuals are downloadable from <http://www.etherwan.com/support-mo.php>. Consult [Table 10](#) to obtain the appropriate model number for your EtherWAN switch to use to download the correct manual.

EtherWAN switch management may be accessed in one of three ways:

- Standard web-based browser interface
- External SNMP-based network management using SNMP commands or an Element Management System such as Prizm or One Point Wireless Manager
- Administration console via the switch's RS-232 serial port using Windows Hyperterminal or equivalent

The EtherWAN switch as provided has the IP address, login ID, and password as shown in [Table 10](#).

Table 10 EtherWAN switch details

CMM4 Extended Model No.	EtherWAN Switch				Default IP address	Login ID	Default password
	Total Ports	10/100 Base- TX Ports	10/100/1000 Base-TX Ports	EtherWAN Model No.			
1090CKHH	14	12	2	EX72129A	169.254.1.1	root (not changeable by user)	No password
1090CKAA (earlier versions)	9	8	1	EX96000	192.168.1.10	admin (not changeable by user)	No password

The 14-port EtherWAN switch may be reset (rebooted) either remotely or after gaining physical access to the CMM4:

- remotely: access the CMM4 controller board web page, navigate to **Configuration** > **CMM** and click the **Reset OEM Switch** button to power cycle the switch.
- after gaining physical access to the inside of the CMM4 enclosure: press the inset Reset button on the EtherWAN switch's faceplate using a nail or similar tool.

Either process reboots the switch but *does not* reset it to factory defaults.

The 9-port EtherWAN switch may be reset (rebooted) remotely by accessing the CMM4 controller board web page, navigating to **Configuration** > **CMM** and clicking the **Reset OEM Switch** button. This button power cycles the EtherWAN switch but *does not* reset it to factory defaults.

If you lose or forget the IP address of the EtherWAN switch after configuring it to an address other than the default IP address, gain physical access to the CMM4, access the EtherWAN switch via its RS-232 serial port (which doesn't require an IP address), and proceed to view or set the IP address. Alternatively, you may wish to use Wireshark, Angry IP Scanner, or other tools to discover the missing IP address.

If after configuring a password you lose or forget it, contact Technical Support for assistance, using the contact information on page [viii](#).

Configuring a CMM4

Web pages on the CMM4 provide status information and support configuration. The eight Ethernet ports can be configured, and information is provided on GPS status, Port configuration, FPGA and software revision.

For information on configuring the EtherWAN switch, see the *EtherWAN Switch Manual*. The manual is available for download as described in on page [2-23](#).

Configuring IP Communications Parameters

An example of the CMM4 IP tab is displayed in [Figure 13](#).

Figure 13 IP tab of CMM4

IP Settings	
IP Address :	<input type="text" value="10.120.216.33"/>
Subnet Mask :	<input type="text" value="255.255.255.0"/>
Default Gateway :	<input type="text" value="10.120.216.254"/>

The IP tab allows you to set the IP communications parameters for management of the CMM4.

Table 11 IP tab attributes

Attribute	Meaning
IP Address	This is the IP address of the CMM4 controller board. The EtherWAN Switch has a separate and distinct IP address that is set using the EtherWAN Switch web or serial interface. The default value for this parameter is 169.254.1.1.
Subnet Mask	This is the subnet mask of the CMM4 (controller board). The EtherWAN Switch has a separate subnet mask that is set using the Ethernet Switch web or serial interface. The default value for this parameter is 255.255.255.0.

Attribute	Meaning
Default Gateway	<p>This is the default gateway of the CMM4 (controller board). The EtherWAN Switch has a separate default gateway setting that is set using the Ethernet Switch web or serial interface.</p> <p>The default for this parameter is 169.254.0.0.</p> <p>Since both the controller board and the 14-port EtherWAN switch have the same default IP address, either may respond when using IP address 169.254.1.1 from your PC. You can configure first whichever unit responds first, as easily determined by the distinctive web pages of the controller board or the EtherWAN switch, or you can use Procedure 1 to more deterministically access and configure the EtherWAN switch's and controller board's IP addresses.</p>

Procedure 1 Configuring EtherWAN switch and Controller Board IP Addresses

- 1 Connect an Ethernet cable between your PC and the EtherWAN switch.
- 2 Disconnect the patch cable between the controller board management port and the EtherWAN switch.
- 3 Enter the EtherWAN switch's web pages using your browser and IP address 169.254.1.1 and proceed to configure the EtherWAN switch.
- 4 Reconnect the patch cable between the controller board management port and the EtherWAN switch.
- 5 Enter the controller board's web pages using your browser and IP address 169.254.1.1 and proceed to configure the CMM4 controller board.
- 6 Disconnect your PC from the EtherWAN switch.

Overriding Forgotten IP Addresses, Usernames, or Passwords

By using the toggle switch on the CMM4 controller board, you can temporarily override a lost or unknown IP address, username, or password as follows:

- When the toggle switch is in the “Default” position (up or towards the operator), a power cycle causes the CMM4 to boot with the default IP address and no username or password required. The CMM GUI displays a message indicating that the unit has been powered up in default mode.
- When the toggle switch is in the “Normal” position (down or away from the operator) a power cycle causes the CMM4 to boot with your operator-set IP address, username(s) and password(s).

To override a lost or unknown IP address or password, perform the following steps.

Procedure 2 Overriding forgotten IP addresses, usernames, or passwords



IMPORTANT!

When rebooted into override mode the ports on the CMM4 are temporarily unpowered. APs or BHs connected to the CMM4 will not have power, so you will temporarily lose the ability to access the CMM4 through those APs or BHs.

- 1** Gain physical access to the inside of the CMM4 enclosure.
- 2** Establish direct Ethernet connectivity to the CMM4 (not through an AP or BH).
- 3** Flip the toggle switch to the “Default” position (normally up, toward you).
- 4** Power cycle the CMM4.

RESULT: The module can now be accessed with the default IP address of 169.254.1.1, no username, and no password. Ports are not currently powered due to toggle switch override and are shown unpowered on the **Configuration > Ports** tab.

- 5** View the current IP address or set a new IP address on the **Configuration > IP** tab, view users on the **Account > Change Users Password** tab, add users on the **Account > Add User** tab, or set a new password on the **Account > Change Users Password** tab.

- 6 Change any other configuration values if desired. If you change ANY parameters on the **Configuration > Ports** tab then the displayed parameters (including any unpowered ports) will be used when rebooted with the toggle switch in the “Normal” position. Leave ALL unchanged and the previous port configuration will be used.

**IMPORTANT!**

If you leave the parameters on the **Configuration > Ports** tab unchanged, the ports will return to the state they were in before the override. Those that were powered before will be powered again. However, if you click “Save Changes” on the **Configuration > Ports** page before rebooting then the next boot will come up with the displayed port configuration.

- 7 Click the **Save Changes** button.
- 8 Flip the toggle switch to the “Normal” position (nominally down, away from you).
- 9 Click the **Reboot** button.

**RECOMMENDATION:**

Note or print the IP settings from the **Configuration > IP** tab. Ensure that you can readily associate these IP settings with the module for future use.

**NOTE:**

An override/default plug (an RJ-11 connector with pins 4 and 6 tied together) inserted into the auxiliary port before booting the CMM4 is equivalent to using the toggle switch and will also temporarily override a lost or unknown IP address, username, or password.

Log In

An example of the CMM4 Login page is displayed in [Figure 14](#).

Figure 14 Login page of CMM4

Cambium Networks

- Home
- Copyright

Username:

Password:

Login

Account: none
Level: GUEST

CANOPY® CMM4

General Status

Home → General Status

CMM4 0a-00-3e-e8-04-03

Port Status

Port Number	1	2	3	4	5	6	7	8
Port Text	Port 1 Description	Port 2 Description	Port 3 Description	Port 4 Description	Port 5 Description	Port 6 Description	Port 7 Description	Port 8 Description
Power								
Device Type	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V

Device Information

Device : CMM4 0a-00-3e-e8-04-03
 Software Version : 4.1 (Build 1)
 FPGA Version : 0a1107 CMM4
 FPGA Platform : 05
 PLD Version : 1 (CMM4)
 MAC Address : 0a-00-3e-e8-04-03
 System Time : 01:06:46 01/01/2001
 System Up Time : 01:06:46
 Ethernet Status : 100Base-TX Full Duplex

Sync Status

SYNC Pulse Status : No SYNC
 SYNC Pulse Source : Master (GPS Module)
 Satellites Visible : 0
 Satellites Tracked : 0
 Antenna Connection : Unknown
 Tracking Mode : Reserved
 Latitude : 0° 0' 0.00" N
 Longitude : 0° 0' 0.00" E
 Height : 0 meters

Site Information

Site Name : Blue CMM4
 Site Location : No Site Location
 Site Contact : No Site Contact

With a new CMM4 or one that has been reset to factory defaults, a user can access all web pages and tabs without using a username or password. This unsecure state should be remedied by creating users and passwords as described in on page [2-31](#).

After users have been added, to access the web pages other than the **Home** > **General Status** tab available to GUESTS you must use the Login page to enter a user name and password.

The left side of the web page displays the current user name as **Account** and the permissions level of that user as **Level**.

User Update

An example of the CMM4 User Update tab is displayed in [Figure 15](#).

Figure 15 Changer Users Password tab of CMM4

The Change Users Password tab provides the following options:

Table 12 Change User Password tab attributes

Attribute	Meaning
New Password	Type the new password (up to 32 alphanumeric characters) that you want to use for management access to this CMM4.
Confirm Password	Retype what you typed into the New Password parameter. If the password differs from the password you typed into the New Password field a failure message will be displayed in the Account Status field.
Change Password	To put the new password for the user into immediate effect, click this button.
Account Status	This is a read-only field that provides information on the current activity for that screen. For instance, if changing the password was successful a message will be displayed indicating the new password is active.

Add User

An example of the CMM4 **Add User** tab is displayed in [Figure 16](#).

Figure 16 Add User tab of CMM4

If you are of ADMINISTRATOR level, the Add User Tab provides the following options to you.

Table 13 Add User attributes

Attribute	Meaning
User Name	Type the user name that you want to assign to the user you are adding.
Level	Use the down arrow to select the desired permission level for the user you are adding. Choices include INSTALLER and ADMINISTRATOR with the difference being that a user with INSTALLER permissions can only change their own password and cannot add or delete users, whereas a user with ADMINISTRATOR permissions can change any user's password and can add and delete users.
New Password	Type the new password (up to 32 alphanumeric characters) for management access to this CMM4 by the user you are adding. Leaving this field blank means no password is needed and any password (or no password) will allow the user to log in.

Attribute	Meaning
Confirm Password	Retype what you typed into the New Password parameter. If there is a failure the “Account Status” will indicate that the new password failed.
Account Status	This is a read-only field that provides information on the current activity for that screen. For instance, if adding a new user was successful a message will be displayed indicating the user has been added.

Delete User

An example of the CMM4 Delete User tab is displayed in [Figure 17](#).

Figure 17 Delete User tab of CMM4

If you are of ADMINISTRATOR level and want to remove a user, the Delete Users Password tab allows you to do so as follows:

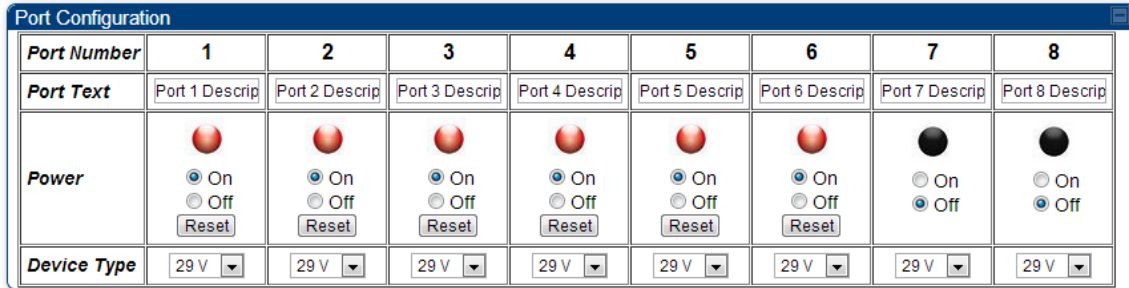
Table 14 Delete User attributes

Attribute	Meaning
User	Use the down arrow to select the user you want to remove. Note that the username used to log into the radio may not be deleted
Delete	Ensure that the intended user is selected. Then click this button.
Account Status	This is a read-only field that provides information on the current activity for that screen. For instance, if deleting the user was successful a message will be displayed indicating the user has been deleted.

Configuring the CMM4 ports

An example of the CMM4 Port Configurations tab is displayed in [Figure 18](#).

Figure 18 Port Configuration tab of CMM4



The Port Configurations tab provides the following parameters.

Table 15 Port Configuration attributes

Attribute	Meaning
Port 1 to 8: Description	This is a user-defined field that identifies the port. It appears in the Home -> General Status page.
Port 1 to 8: Power On or Off	Select Power On to restore power over Ethernet to the device that is connected to this port or Power Off to remove power from it.
Ports 1 to 8: Power Cycle	A button to invoke this feature is visible only when the port is powered up.
Ports 1 to 8: Device Type	Select 29 V or 56 V to identify the type of power supplied to that port. The red light indicates 29 V and the green light indicates 56V on the port status bar.

Configuring General CMM4 Parameters

An example of the CMM4 Configuration tab is displayed in [Figure 19](#).

Figure 19 CMM4 Configuration tab

The screenshot displays the CMM4 Configuration tab with the following sections and settings:

- General Configurations:**
 - Session Timeout : 600
 - Webpage Auto Update : 3 Seconds (0 = Disable Auto Update)
- Ethernet Switch Power:**
 - Reset OEM Switch
- Sync Source:**
 - Sync Source : Master (GPS Module)
 - Verify GPS Message Checksum : Enabled Disabled
- Link Speeds:**
 - Link Speeds : Auto Negotiation
- IP Access Filtering:**
 - IP Access Control : IP Access Filtering Enabled - Only allow access from IP addresses specified below IP Access Filtering Disabled - Allow access from all IP addresses
 - Allowed Source IP 1 : 0.0.0.0
 - Allowed Source IP 2 : 0.0.0.0
 - Allowed Source IP 3 : 0.0.0.0

The CMM4 Configuration tab provides the following parameters.

Table 16 CMM tab attributes

Attribute	Meaning
Session Timeout	Enter the expiry in seconds for remote management sessions via HTTP, telnet, or ftp access to the CMM4 up to a maximum of 2592000 seconds.
Webpage Auto Update	Enter the frequency (in seconds) for the web browser to automatically refresh the web-based interface. The default setting is 0. The 0 setting causes the web-based interface to never be automatically refreshed.
Ethernet Switch Power	If you change this value and then click Save Changes , the change becomes effective immediately and the previous value is lost.

Attribute	Meaning
Sync Source	<p>Specify how the CMM4 should receive timing, either</p> <ul style="list-style-type: none">◦ Master (GPS Module)◦ Slave (RJ11 Port) <p>For additional information on using the Slave sync source, page 2-18.</p>
Verify GPS Message Checksum	<p>When enabled, the device validates GPS messaging to ensure that the radio is properly receiving data from the GPS source. If a GPS source is not calculating and sending checksum data properly, the AP will still receive synchronization pulses but not GPS data (location, data, etc.) and the Invalid Message counter will increase on the radio's Home > GPS Status page. If an AP is receiving synchronization properly from a GPS unit but is not receiving GPS data, operators may set Verify GPS Message Checksum to "Disabled" to ignore checksum failures and to allow the AP to process the GPS data.</p>

Attribute	Meaning												
Link Speeds	<p>If you wish to force the CMM4 to a speed or duplex state, or to return the module to auto-negotiating speed and duplex state, change the selection for the port. The range of selections is defined below:</p> <p>Table 17 Link Speed selections for CMM4</p> <table border="1" data-bbox="786 527 1295 1052"> <thead> <tr> <th data-bbox="786 527 972 579">Selection</th> <th data-bbox="972 527 1295 579">Result</th> </tr> </thead> <tbody> <tr> <td data-bbox="786 579 972 764">Auto Negotiation</td> <td data-bbox="972 579 1295 764">The CMM4 attempts to auto-negotiate speed and duplex state. (This is the default and recommended setting for most network configurations.)</td> </tr> <tr> <td data-bbox="786 764 972 837">10Base T Half Duplex</td> <td data-bbox="972 764 1295 837">The CMM4 is forced to 10 Mbps and half duplex.</td> </tr> <tr> <td data-bbox="786 837 972 911">10Base T Full Duplex</td> <td data-bbox="972 837 1295 911">The CMM4 is forced to 10 Mbps and full duplex.</td> </tr> <tr> <td data-bbox="786 911 972 984">100Base T Half Duplex</td> <td data-bbox="972 911 1295 984">The CMM4 is forced to 100 Mbps and half duplex.</td> </tr> <tr> <td data-bbox="786 984 972 1052">100Base T Full Duplex</td> <td data-bbox="972 984 1295 1052">The CMM4 is forced to 100 Mbps and full duplex.</td> </tr> </tbody> </table> <p>If you change this value for a port and then click Save Changes, the change becomes effective immediately and the previous value is lost.</p>	Selection	Result	Auto Negotiation	The CMM4 attempts to auto-negotiate speed and duplex state. (This is the default and recommended setting for most network configurations.)	10Base T Half Duplex	The CMM4 is forced to 10 Mbps and half duplex.	10Base T Full Duplex	The CMM4 is forced to 10 Mbps and full duplex.	100Base T Half Duplex	The CMM4 is forced to 100 Mbps and half duplex.	100Base T Full Duplex	The CMM4 is forced to 100 Mbps and full duplex.
Selection	Result												
Auto Negotiation	The CMM4 attempts to auto-negotiate speed and duplex state. (This is the default and recommended setting for most network configurations.)												
10Base T Half Duplex	The CMM4 is forced to 10 Mbps and half duplex.												
10Base T Full Duplex	The CMM4 is forced to 10 Mbps and full duplex.												
100Base T Half Duplex	The CMM4 is forced to 100 Mbps and half duplex.												
100Base T Full Duplex	The CMM4 is forced to 100 Mbps and full duplex.												
IP Access Control	<p>You can permit access to the CMM4 from any IP address (IP Access Filtering Disabled) or limit it to access from only one, two, or three IP addresses that you specify (IP Access Filtering Enabled). If you select IP Access Filtering Enabled, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted from any IP address, including access and management by Prizm.</p>												
Allowed Source IP 1 to 3	<p>If you selected IP Access Filtering Enabled for the IP Access Control parameter, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted to the CMM4 from any IP address. You may populate as many as all three.</p>												

Configuring the SNMP parameters

An example of the CMM4 SNMP tab is displayed in [Figure 20](#).

Figure 20 SNMP tab of CMM4

SNMP IP	
Community String :	Canopy
Accessing IP / Subnet Mask 1 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 2 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 3 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 4 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 5 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 6 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 7 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 8 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 9 :	0.0.0.0 / 0
Accessing IP / Subnet Mask 10 :	0.0.0.0 / 0

Permissions	
Read Permissions :	<input type="radio"/> Read Only <input checked="" type="radio"/> Read / Write

Trap Addresses	
Trap Address 1 :	0.0.0.0
Trap Address 2 :	0.0.0.0
Trap Address 3 :	0.0.0.0
Trap Address 4 :	0.0.0.0
Trap Address 5 :	0.0.0.0
Trap Address 6 :	0.0.0.0
Trap Address 7 :	0.0.0.0
Trap Address 8 :	0.0.0.0
Trap Address 9 :	0.0.0.0
Trap Address 10 :	0.0.0.0

Trap Enable	
Sync Status :	<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled

Site Information	
Site Information	<input checked="" type="radio"/> Enabled
Viewable to Guest	<input type="radio"/> Disabled
Users :	
Site Name :	Blue CMM4
Site Contact :	No Site Contact
Site Location :	No Site Location

The SNMP tab provides the following parameters.

Table 18 SNMP tab attributes

Attribute	Meaning
Community String	Specify a control string that allows Prizm or a Element Management System (EMS) to access the CMM4 via SNMP. No spaces are allowed in this string. The default string is Canopy . The value is clear text and is readable by a packet monitor. You can attain additional security by configuring the Accessing Subnet and Read Permissions parameters.
Accessing Subnet	Specify the addresses that are allowed to send SNMP requests to this CMM4. The EMS must have an address that is among these addresses (this subnet). You must enter both <ul style="list-style-type: none"> • The network IP address in the form xxx.xxx.xxx.xxx • The CIDR (Classless Interdomain Routing) prefix length in the form /xx <p>For example</p> <ul style="list-style-type: none"> • the /16 in 198.32.0.0/16 specifies a subnet mask of 255.255.0.0 (the first 16 bits in the address range are identical among all members of the subnet). • 192.168.102.0/24 specifies that any device whose IP address is in the range 192.168.102.0 to 192.168.102.254 can send SNMP requests to the CMM4, presuming that the device supplies the correct Community String value. <p>The default treatment is to allow all networks access.</p>
Read Permissions	Select Read Only if you wish to disallow any parameter value changes by Prizm or an NMS.

Attribute	Meaning
Trap Address 1 to 10	<p>Specify the IP address (xxx.xxx.xxx.xxx) of one to ten servers (Prizm or NMS) to which trap information should be sent. Traps inform the monitoring systems that something has occurred. For example, trap information is sent</p> <ul style="list-style-type: none"> • after a reboot of the module. • when Prizm or an NMS attempts to access agent information but either <ul style="list-style-type: none"> ○ supplied an inappropriate community string or SNMP version number. ○ is associated with a subnet to which access is disallowed.
Trap Enable for Sync Status	Variable to enable/disable GPS sync/out-sync traps.
Site Name	<p>Enter a name for the physical module. What you enter here will be shown on the General Status tab in the Home page of the CMM4. This information is also set into the <i>sysName</i> SNMP MIB-II object and can be polled by an SNMP management server.</p>
Site Contact	<p>Enter contact information for the physical module. What you enter here will be shown on the General Status tab in the Home page of the CMM4. This information is also set into the <i>sysName</i> SNMP MIB-II object and can be polled by an SNMP management server.</p>
Site Location	<p>Enter site information for the physical module. What you enter here will be shown on the General Status tab in the Home page of the CMM4.</p>

Configuring VLAN

An example of the CMM4 802.1Q VLAN tab is displayed in [Figure 21](#).

Figure 21 VLAN tab of CMM4

The screenshot shows two configuration windows. The top window is titled "802.1Q VLAN Configuration" and contains the following settings: "Enable 802.1Q VLAN Tagging" with radio buttons for "Enabled" and "Disabled" (where "Disabled" is selected), and "802.1Q Management VLAN ID (1-4094)" with a text input field containing "1" and a range indicator "(Range : 1 -- 4094)". The bottom window is titled "Active Configuration" and shows the text "Active Configuration VLAN Not Active".

The VLAN tab provides the following parameters.

Table 19 VLAN tab attributes

Attribute	Meaning
Enable VLAN Tagging	If this parameter is set to Enabled and a Management VLAN ID is set in the next parameter, then the controller board's management interface will accept only frames that are VLAN tagged with the configured tag value. All frames outgoing from the management interface will have a VLAN tag, set to the configured VLAN ID.
Management VLAN ID	If Enable VLAN Tagging is set to Enabled and this parameter is set, then the management interface will accept only frames that are VLAN tagged with the configured tag value. All frames outgoing from the management interface of the CMM4 will have a VLAN tag, set to the configured Management VLAN ID .

Attribute	Meaning						
Active Configuration	<p>This field indicates the status of the current configuration. For example, VLAN tagging enabled with “1” set as the management VLAN tag would display the following:</p> <p>Untagged Ingress VID: 1</p> <p>Management VID: 1</p> <p>Current VID Member Set:</p> <table border="1"> <thead> <tr> <th>VID Number</th> <th>Type</th> <th>Age</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Permanent</td> <td>0</td> </tr> </tbody> </table> <p>Note that Management VLAN “1” has special properties that allow untagged VLAN frames to communicate with the device (CMM4 or radio). If the Management VLAN ID is set to 1 the local stack of the unit will accept VLAN 1 or untagged. If the Management VLAN is set to anything but 1, it will only allow that specific VLAN tag to enter the stack; it will not accept untagged frames.</p>	VID Number	Type	Age	1	Permanent	0
VID Number	Type	Age					
1	Permanent	0					

Configuring the Unit Settings

An example of the CMM4 Unit Settings tab is displayed in [Figure 22](#).

Figure 22 Unit Settings Tab of CMM4



The Unit Settings tab provides the following buttons.

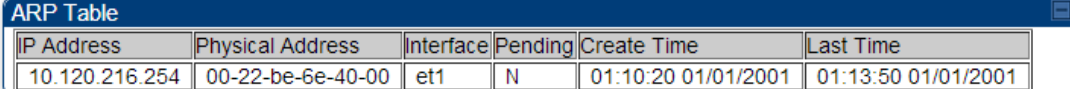
Table 20 Unit Settings tab attributes

Attribute	Meaning
Undo Unit-Wide Saved Changes	When you click this button, any changes that you made in any tab but did not commit by a reboot of the module are undone.
Set to Factory Defaults	When you click this button, <i>all configurable parameters on all tabs</i> are reset to the factory settings.

Viewing the ARP Table (Statistics)

The ARP table provides information on the data devices connected to the CMM4. The ARP Table maps the IP address to the MAC address. The table also shows the age of the entry in the table, the interface (in this case it will always be Ethernet “et1”), and whether the packets are “pending.”

Figure 23 ARP table



IP Address	Physical Address	Interface	Pending	Create Time	Last Time
10.120.216.254	00-22-be-6e-40-00	et1	N	01:10:20 01/01/2001	01:13:50 01/01/2001

This ARP table example displays information on the laptop computer attached to the CMM4 for the purpose of Internet access.

Table 21 ARP Table tab attributes

Attribute	Meaning
IP Address	This field displays the IP address of the device connected to the CMM4.
Physical Address	This field displays the machine address of the device connected to the CMM4. A physical address cannot be changed. The ARP table is used by the system to translate the logical address into a physical address.
Interface	This field displays the type of interface. In the case of the CMM4, the interface will always be an Ethernet interface.
Pending	This field indicates whether the packets are pending “Y” or “N.”
Create Time/Last Time	These fields are used to “age out” the entry in the table in the case where there has been no communication for a period of time.

Viewing General Status

An example of the CMM4 General Status tab is displayed in [Figure 24](#).

Figure 24 General status tab of CMM4

Port Status								
Port Number	1	2	3	4	5	6	7	8
Port Text	Port 1 Description	Port 2 Description	Port 3 Description	Port 4 Description	Port 5 Description	Port 6 Description	Port 7 Description	Port 8 Description
Power								
Device Type	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V	Canopy 29 V

Device Information	
Device :	CMM4 0a-00-3e-e8-04-03
Software Version :	4.1 (Build 1)
FPGA Version :	0a1107 CMM4
FPGA Platform :	05
PLD Version :	1 (CMM4)
MAC Address :	0a-00-3e-e8-04-03
System Time :	01:14:26 01/01/2001
System Up Time :	01:14:26
Ethernet Status :	100Base-TX Full Duplex

Sync Status	
SYNC Pulse Status :	No SYNC
SYNC Pulse Source :	Master (GPS Module)
Satellites Visible :	0
Satellites Tracked :	0
Antenna Connection :	Unknown
Tracking Mode :	Reserved
Latitude :	0° 0' 0.00" N
Longitude :	0° 0' 0.00" E
Height :	0 meters

Site Information	
Site Name :	Blue CMM4
Site Location :	No Site Location
Site Contact :	No Site Contact

The General Status tab provides information on the operation of the CMM4. This is the tab that opens by default when you access the GUI. The General Status tab provides the following read-only fields.

Table 22 General Status tab attributes

Attribute	Meaning
Device	This field indicates the type of module and provides its MAC address.
Software Version	This field indicates the CMM4 release and the time and date of the release. If you request technical support, provide the information from this field.
FPGA Version	This field indicates the version of the field-programmable gate array (FPGA) on the module. When you request technical support, provide the information from this field.
FPGA Platform	This field indicates the hardware platform that the field-programmable gate array (FPGA) runs on.
PLD Version	This field indicates the version of the version of the programmable logic device (PLD).
MAC Address	This field displays the MAC address (or electronic serial number) of the CMM4.
System Time	This field provides GMT (Greenwich Mean Time) and date to all connected devices, which they in turn pass to devices that register to them. Data for this field is from the GPS device.
System Up Time	This field indicates how long the module has operated since power was applied.
Ethernet Status	This field indicates the speed and duplex state of the Ethernet interface to the CMM4.
SYNC Pulse Status	<p>This field indicates the status of synchronization as follows:</p> <p>SYNC OK indicates that the module is receiving a sync pulse.</p> <p>No SYNC indicates that the module is not receiving a sync pulse.</p>

Attribute	Meaning
SYNC Pulse Source	<p>This field indicates the source of sync as follows:</p> <p>Master (GPS Module) indicates that the module is configured to receive sync from its GPS unit.</p> <p>Slave (RJ11 Port) indicates that the module is configured to receive sync through its auxiliary port from another CMM.</p>
Satellites Visible	This field displays the number of satellites whose signals are received by the connected GPS antenna.
Satellites Tracked	This field displays the number of satellites whose signals the CMM4 uses.
Antenna Connection	This field indicates the health of the connection between the CMM4 and the GPS antenna.
Tracking Mode	If the CMM4 receives the signals from a GPS antenna, then this field describes the degree to which the CMM4 is accurately computing position information, given the satellites that it is tracking.
Latitude	If the CMM4 receives the signal from a GPS antenna, then this field displays the latitude of the site.
Longitude	If the CMM4 receives the signal from a GPS antenna, then this field displays the longitude of the site.
Height	If the CMM4 receives the signal from a GPS antenna, then this field displays the elevation (above sea level) of the GPS antenna.
Site Name	This field indicates the name of the physical module. You can assign or change this name in the SNMP tab of the CMM4 Configuration page. This information is also set into the <i>sysName</i> SNMP MIB-II object and can be polled by an SNMP management server.

Attribute	Meaning
Site Location	This field indicates site information for the physical module. You can provide or change this information in the SNMP tab of the CMM4 Configuration page. This information is also set into the <i>sysName</i> SNMP MIB-II object and can be polled by an SNMP management server.
Site Contact	This field indicates contact information for the physical module. You can provide or change this information in the SNMP tab of the CMM4 Configuration page. This information is also set into the <i>sysName</i> SNMP MIB-II object and can be polled by an SNMP management server.

Viewing Sync Status

An example of the CMM4 Sync Status tab is displayed in [Figure 25](#).

Figure 25 Sync Status tab of CMM4

Sync Status	
SYNC Pulse Status :	No SYNC
SYNC Pulse Source :	Master (GPS Module)
Satellites Visible :	0
Satellites Tracked :	0
Date from GPS :	00/00/0000
Time from GPS :	00:00:00
Antenna Connection :	Unknown
Tracking Mode :	Reserved
Latitude :	0° 0' 0.00" N
Longitude :	0° 0' 0.00" E
Height :	0 meters
Invalid Message Count :	0
Restart Count :	0
Reinit Count :	0
Map -- NOTE: This is only an approximation on the physical location.	
Site Map :	Insufficient GPS Information to generate map. Must have 3D fix.
GPS Log	
No entries.	
GPS Receiver Information	
GPS Receiver Information Unknown	

The Sync Status tab provides information on the GPS receiver in the CMM4 and the signals that it is receiving.

Table 23 Sync Status tab attributes

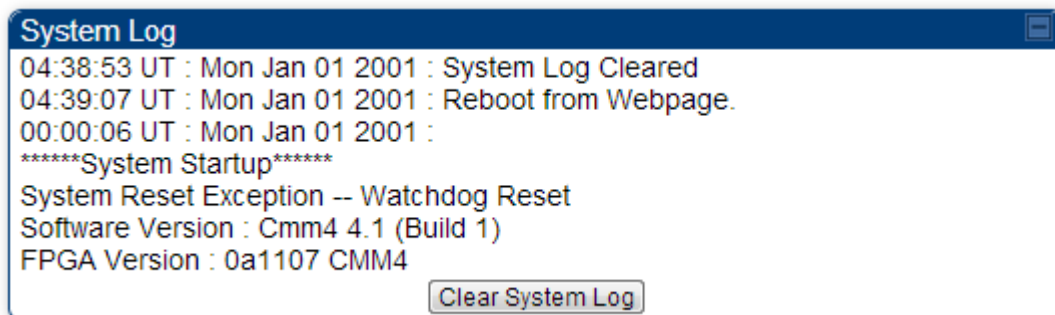
Attribute	Meaning
SYNC Pulse Status	<p>This field indicates the status of synchronization as follows:</p> <p>SYNC OK indicates that the module is receiving a sync pulse from an outside source and is receiving the pulse.</p> <p>No SYNC indicates that the module is set to <i>receive</i> a sync pulse from an outside source and is not receiving the pulse.</p>
SYNC Pulse Source	<p>This field indicates the source of sync as follows:</p> <p>Master (GPS Module) indicates that the module is configured to receive sync from its GPS unit.</p> <p>Slave (RJ11 Port) indicates that the module is configured to receive sync through its auxiliary port from another CMM.</p>
Satellites Visible	<p>This field displays the number of satellites from which the connected GPS antenna <i>receives</i> a signal.</p>
Satellite Tracked	<p>This field displays the number of satellites whose signals the CMM4 <i>uses</i>.</p>
Date from GPS	<p>This field displays the month, day, and year that the CMM4 receives.</p>
Time from GPS	<p>This field displays the hour, minute, and second that the CMM4 receives.</p>
Antenna Connection	<p>This field indicates the health of the connection between the CMM4 and the GPS antenna.</p>
Tracking Mode	<p>If the CMM4 receives the signals from a GPS antenna, then this field indicates the degree to which the CMM4 is accurately computing position information, given the satellites that it is tracking. For example</p> <p>2D Fix indicates that the CMM4 has a lock on information that is sufficient to compute position.</p> <p>Bad Geometry indicates that it does not.</p>

Attribute	Meaning
Latitude	If the CMM4 receives the signal from a GPS antenna, then this field displays the latitude of the site.
Longitude	If the CMM4 receives the signal from a GPS antenna, then this field displays the longitude of the site.
Height	If the CMM4 receives the signal from a GPS antenna, then this field displays the elevation (above sea level) of the GPS antenna.
Invalid Message Count	Number of messages sent from the GPS receiver for which there is no match.
Restart Count	It is incremented when the CMM4 is having difficulty communicating with the GPS module
Reinit Count	The number of times the GPS device has been completely reinitialized

Viewing the System Log

An example of the CMM4 System Log tab is displayed in [Figure 26](#).

Figure 26 System Log tab of the CMM



The System Log tab provides a record of events that have been significant to this CMM4.

Viewing the Network Interface

Figure 27 Network Interface tab of the CMM

LAN1 Network Interface	
Ethernet Interface :	100Base-TX Full Duplex
IP Address :	10.120.216.33
Subnet Mask :	255.255.255.0
Default Gateway :	10.120.216.254

The Network Interface screen allows the operator to view the LAN settings for the CMM4 device. It is a read-only screen.

Table 24 Network Interface tab attributes

Attribute	Meaning
Ethernet Interface	This field displays the Ethernet mode of the LAN port.
IP Address	This field displays the IP address that the operator has set for the CMM4 controller board. This field is set in the CMM4 Configuration tab. The Ethernet Switch has a separate IP address.
Subnet Mask	This field displays the address of the subnet mask. Subnetting allows the network to be logically divided without regard to the physical layout of the network.
Default Gateway	This field displays the address of the default gateway. A default gateway is a node on the network that serves as an access point to another network.

Viewing Layer 2 neighbors

This screen provides information on all of the layer 2 devices communicating with the CMM4 including any devices on an Ethernet connected hub that support LLDP (Link Layer Discovery Protocol).

Figure 28 Layer 2 Neighbors Log



Installing a CMM4

Ensure that you comply with standard local or national electrical and climbing procedures when you install the CMM4.

**WARNING!**

Installing a CMM involves electrical power and can involve height and exposure to RF (Radio Frequency) energy. To avoid personal injury, know and follow applicable national and local safety regulations and industry best practices, and follow the specific guidelines in this document

Avoiding hazards

Use simple precautions to protect staff and equipment. Hazards include exposure to RF waves, lightning strikes, power lines, and power surges. This section specifically recommends actions to abate these hazards.

Grounding Equipment

Effective lightning protection diverts lightning current safely to ground, Protective Earth (PE) ↓. It neither attracts nor prevents lightning strikes.

Grounding Infrastructure Equipment

To protect both your staff and your infrastructure equipment, implement lightning protection as follows:

Observe all local and national codes that apply to grounding for lightning protection.

Before you install your modules, perform the following steps:

- Engage a grounding professional if you have any questions on grounding.
- Install lightning arrestors to transport lightning strikes away from equipment. For example, install a lightning rod on a tower leg other than the leg to which you mount your module.
- Connect your lightning rod to ground.
- Plan to use an appropriate surge suppressor on any Ethernet cable at the point where it enters any building or structure.

Install your modules at least 2 feet (0.6 meters) below the tallest point on the tower, pole, or roof.

Conforming to Regulations

For all electrical purposes, ensure that your network conforms to applicable country and local codes, such as the NEC (National Electrical Code) in the U.S.A. If you are uncertain of code requirements, engage the services of a licensed electrician.

In particular, many codes require that wired electrical devices like the 56 VDC power supply either terminate in a plug connection or be wired with an on/off switch, and not be hard-wired to AC/mains.

Protecting Cables and Connections

Cables that move in the wind can be damaged, impart vibrations to the connected device, or both. At installation time, prevent these problems by securing all cables with cable ties, cleats, or weather-resistant tape.

The cable can be a path for water to follow to enter the cable connector or even the module. You can prevent this problem by including and securing a drip loop where the cable enters the module enclosure.

Testing the Components

The best practice is to connect all the components - BHs, APs, GPS antenna, and CMM4 - in a test setting and initially configure and verify them before deploying them to an installation. However, circumstances or local practice may require a different practice.

Unpacking Components

When you receive products, carefully inspect all shipping boxes for signs of damage. If you find damage, immediately notify the transportation company.

As you unpack the equipment, verify that all the components that you ordered have arrived. Save all the packing materials to use later, as you transport the equipment to and from installation sites.

Cables

Information on cable planning, ordering, and design is covered on page [2-16](#).

Installing a GPS Antenna

The following information describes the recommended tools and procedures to mount the GPS antenna.

Recommended Tools for GPS Antenna Mounting

The following tools may be needed for mounting the GPS antenna:

- 3/8" nut driver
- 12" adjustable wrench
- 7/16" wrench
- Needle-nose pliers

Mounting a GPS Antenna

Perform the following procedure to mount a GPS antenna.

Procedure 3 Mounting the GPS antenna

- 1** Ensure that the mounting position
 - has an unobstructed view of the sky to 20° above the horizon.
 - is not the highest object at the site. (The GPS antenna does not need to be particularly high on a site, which would give it more exposure to lightning. It just needs to have an unobstructed view of the sky.)
 - is not further than 100 feet (30.4 meters) of cable from the CMM.
- 2** Select a pole that has an outside diameter of 1.25 to 1.5 inches (3 to 4 cm) to which the GPS antenna bracket can be mounted.
- 3** Place the U-bolts (provided) around the pole as shown in [Figure 28](#).
- 4** Slide the GPS antenna bracket onto the U-bolts.
- 5** Slide the ring washers (provided) onto the U-bolts.
- 6** Slide the lock washers (provided) onto the U-bolts.
- 7** Use the nuts (provided) to securely fasten the bracket to the U-bolts.

Figure 29 Detail of GPS antenna mounting



Cabling the GPS Antenna

Connect the GPS coax cable to the female N-connector on the GPS antenna. Information on the coax cable is covered on page 2-20.

Cabling the UGPS Module

When using the UGPS as a synchronization source for a CMM4, a special sync cable must be used. This cable may be constructed from an RJ-11 cable using the pin configuration in [Figure 51](#). Connect this cable from one of the UGPS module's sync ports to the Aux Sync port of the CMM4 unit.

Installing the power supply for the CMM4



WARNING!

Although the output of the power supply is 29 VDC or 56 VDC, the power rating classifies the converter as a Class 2 electric device. For this reason, whenever you work on power in the CMM4, you must *first* disconnect the DC supply from the AC power source.

Procedure 4 Installing a 56 VDC power supply

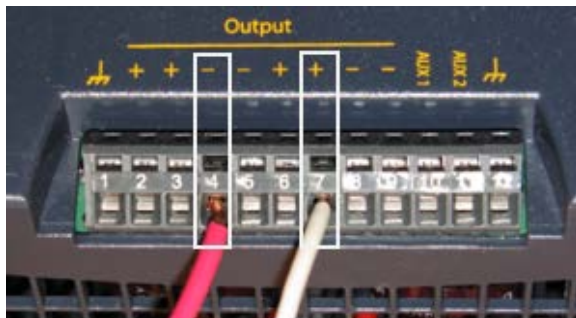
- 1** Install the CMM4 power supply in a hut, wiring closet, or weatherized NEMA-approved enclosure. It is designed for extreme temperatures but it is imperative to keep moisture away from the power converter.
- 2** Do not install the power supply within the CMM4 enclosure as it will increase the heat within the enclosure to an unacceptable level. The CMM4 enclosure is large to provide surface area for heat dissipation without the use of forced convection fans, not to provide space for additional high-power electronics.
- 3** For the DC side of a 56 VDC power supply, engineer the DC cable, selecting the wire gauge from . Use either UV-resistant cable or shield the cable (as in a conduit) from UV rays.

- 4** Connect the DC cable as shown in [Figure 31](#). Insert the +V lead into the terminal 7 cage clamp and insert the GND (ground/return) lead into the terminal 4 cage clamp. To insert a lead into a cage clamp, insert a thin-blade screwdriver in the secondary cage clamp hole and lever the screwdriver away from the main cage clamp hole.

Figure 30 56 VDC power supply - AC connection shown on top, DC connection shown on bottom



Figure 31 56 VDC power supply DC connection



- 5** For the AC side of a 56 VDC power supply, connect an AC cable to the power supply using Ground/protective earth, Neutral (N), and Line (L) as shown in [Figure 32](#). To insert a lead into a cage clamp, insert a thin-blade screwdriver in the secondary cage clamp hole and lever the screwdriver away from the main cage clamp hole.

Figure 32 56 VDC power supply AC connection



- 6** Terminate the other end of the AC cable to a country-specific AC connector or wire to a switch in accordance with local electrical codes.

Procedure 5 Installing a 56 VDC power supply (Rack Mount) for the CMM4

- 1** Install the rackmount CMM4 power supply in a 19" rackspace in a hut, wiring closet, or weatherized NEMA-approved enclosure. It is designed for extreme temperatures but it is imperative to keep moisture away from the power converter.
- 2** For the DC side of a 56 VDC power supply, engineer the DC cable, selecting the wire gauge from [Table 9](#). For powering outdoor CMM4 installations, use either UV-resistant cable or shield the cable (as in a conduit) from UV rays.
- 3** Connect the DC cable as shown in [Figure 33](#). The DC cables should be terminated with ring terminals for connection to the power supply. Connect the +V lead onto the right-hand terminal and connect the GND (ground/return) lead onto the left-hand terminal.

Figure 33 56 VDC power supply DC connection

- 4 For the AC side of a 56 VDC power supply, begin by using a small flathead screwdriver to loosen the cable clamp screws on the top of the unit (see [Figure 35](#)). Connect an AC cable to the power supply using Ground/protective earth, Neutral (N), and Line (L) as shown in [Figure 34](#) then retighten the screws to secure the connection.

Figure 34 56 VDC power supply AC connection

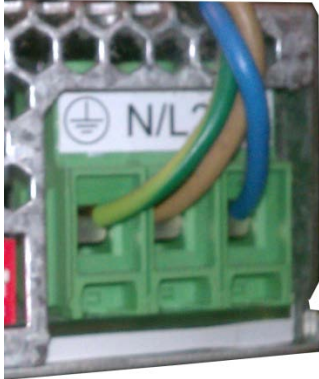
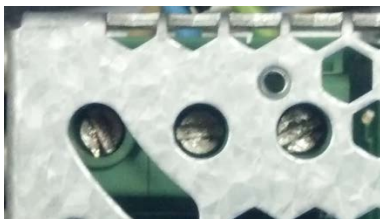


Figure 35 56 VDC cable clamp adjustment screws



- 5 Terminate the other end of the AC cable to a country-specific AC connector or wire to a switch in accordance with local electrical codes.
- 6 Once power is applied to the supply, verify that the LED on the front of the unit is lit green (indicating a “system on” status). If the LED is yellow (indicating system messages) or red (indicating an alarm), refer to the power supply documentation.
- 7 For more information on power supply monitoring and management, refer to the power supply documentation.

Procedure 6 Installing a 30 VDC power supply for the CMM4

- 1** Install the CMM4 power supply in a hut, wiring closet, or weatherized NEMA-approved enclosure. It is designed for extreme temperatures but it is imperative to keep moisture away from the power converter.
- 2** Do not install the power supply within a CMM4 enclosure as it will increase the heat within the enclosure to an unacceptable level. The CMM4 enclosure is large to provide surface area for heat dissipation without the use of forced convection fans, not to provide space for additional high-power electronics.
- 3** For the DC side of a 30 VDC power supply choose and use a DC power cord as follows:
 - If mounting the CMM4 either inside with the power supply or outside within 9 ft (2.7 m) of the power supply, use the 10 ft (3 m) of DC power cable (rated for outdoor use) attached to the power supply.
 - If mounting the unit outside and further than 9 ft (2.7 m) from the power supply, engineer an additional length of cable selecting the wire gauge from [Table 9](#). Use either UV-resistant cable or shield the cable (as in a conduit) from UV rays. Use a terminal block, connector, or splice inside a weatherized enclosure to add the additional length.
- 4** For the AC side of a 30 VDC power supply, connect an IEC AC power cord to the power supply and to AC/mains.

The following procedure is only applicable to operators using a CMM4 that supplies power to both 30V devices (PMP100 radios) and 56V devices (PMP430 or PMP320 radios). The new 30V replacement model ACPS120WA power supply does NOT require the 1k 5W resistor on the CMM4 29V terminals (This new 30V power supply was made available for order around December 3, 2010). The phased out 30V model ACPS112WA power supply will always require a 1k 5W resistor when a 56V supply is present. Since both power supplies look identical, see the label under the power supply to identify the model.

Power supply model ACPS112WA requires a 1k 5W resistor across the 30V DC input terminal of the CMM4 when both 30V AND 56V are present. Doing so will prevent the 30V power supply to not always come out of sleep mode with a light load. The power supply will attempt to come out of sleep mode, and if it does not see sufficient load it goes into a sleep/recovery cycle that is observable by watching the 30V LED on the port connector turn on and off.

Power supply Model ACPS120WA has been updated to satisfy the European Union's Energy Level 5 requirement and DOES NOT require a 1k 5W resistor.

If using both 30 VDC (model ACPS112WA only) and 56 VDC power, to ensure correct operation under all conditions a 1000 Ohm 5 W resistor must be installed across the 30 VDC +V and GND (ground/return) at the terminal block using [Procedure 7](#). The resistor can be purchased locally or call technical support to obtain one.

The resistor prevents the model ACPS112WA 30 VDC converter from getting stuck in sleep mode which can occur in dual-powered CMM4s and result in 30 VDC radios getting low voltage and not booting.

If redundant 30 VDC power supplies are desired along with one or two 56 VDC power supplies, connect one power supply to each of the 29 VDC terminal blocks using the resistor in one of the 29 VDC terminal blocks.

Procedure 7 Installing a special resistor for dual-powered CMM4s (30V model ACPS112WA power supply only)

- 1** **WARNING** - Make absolutely sure 30 VDC and 56 VDC converters are unpowered and disconnected from AC (Mains) before proceeding.
- 2** Ensure white and black 30 VDC leads have 1/2 in (1 cm) of stranded wiring exposed. Strip or cut to 1/2 inch if needed.
- 3** Wrap the stranded wires of the 30 VDC white lead around one of the leads of the 1000 Ohm 5 W resistor.
- 4** Wrap the stranded wires of the 30 VDC black lead around the other resistor lead.
- 5** Insert the wired resistor assembly into either terminal block labeled "+29 V" as shown below ensuring that the powered lead is inserted into the correct termination.

Figure 36 Resistor when using both 56 VDC and 30 VDC power

- 6** Screw terminal block screws down tight. The resistor dissipates 0.9 W and will run warm at room temperature.

Temperature Range

Install the CMM4 outside only when temperatures are above -4°F (-20°C). The gland openings and the bushings and inserts in the gland openings are rated for the full -40° to $+131^{\circ}\text{F}$ (-40° to $+55^{\circ}\text{C}$) range of the CMM4. However, for dynamic operations (loosening, tightening, and inserting), they are compliant at, and rated for, only temperatures at or above -4°F (-20°C).

Installing a CMM4 (Models 1090CKHH and 1091HH)

Prizm and Wireless Manager treat the EtherWAN Switch in a CMM4 as a generic switch. For Prizm or Wireless Manager to correctly associate each EtherWAN Switch with its CMM4

- before you install the CMM4, read and note the MAC address of both the CMM4 controller and EtherWAN switch from the physical units.
- after you discover a CMM4 and its switch, use these MAC addresses for moving the switch to the place in your Prizm or Wireless Manager network view where the CMM4 was discovered.

- always maintain a record that associates these two MAC addresses.

***IMPORTANT!***

When an EMS discovers an EtherWAN switch in your network, it can't tell which CMM4 the switch is associated with, nor can it tell CMM4 EtherWAN switches from any other EtherWAN switches you may have in your network. The pair of MAC addresses you record directly from the CMM4 and its EtherWAN switch are the only means for you to establish the logical connection.

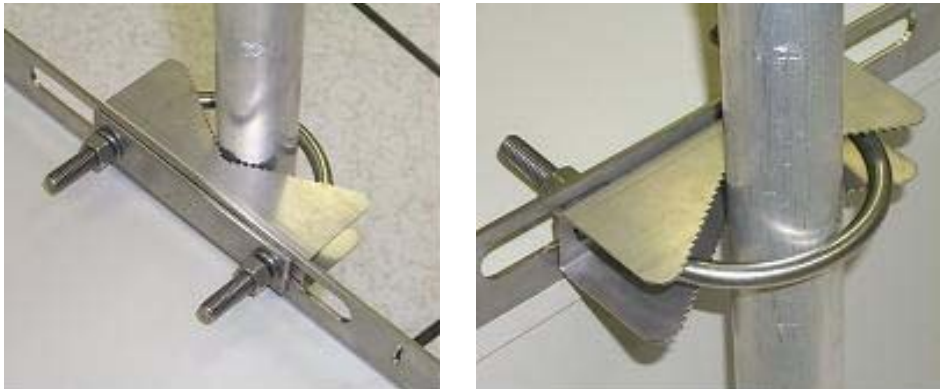
Perform the following procedure to install the CMM4.

Procedure 8 Mounting the CMM4

- 1** Ensure that the mounting position
 - *is not* further than 328 feet (100 meters) from the furthest AP or BH that the CMM4 will serve.
 - *is not* closer than 10 feet (3 meters) to the nearest AP or BH.
 - *is not* further than 100 feet (30.5 meters) of cable from the intended mounting position of the GPS antenna.
 - allows you to fully open the door for service.
- 2** Select a support structure to which the flanges can be mounted.

- 3** If the support structure is a wall, use screws or bolts (neither is provided) to attach the flanges to the wall.
- If the support structure is an irregular-shaped object, use adjustable stainless steel bands (provided) to attach the CMM4 to the object.
- If the support structure is a pole that has an outside diameter of 1.25 to 3 inches (3 to 8 cm), use a toothed V-bracket (provided) to
- attach the V-bracket to the pole as shown below.
 - attach the CMM4 flanges to the V-bracket.

Figure 37 CMM4 V-bracket to pole mounting



Installing a Rackmount CMM4 (Model 1092HH)

Perform the following procedure to install the Rackmount CMM4.

Procedure 9 Mounting the Rackmount CMM4

- 1** Ensure that the mounting position
 - *is not* further than 328 feet (100 meters) from the furthest AP or BH that the CMM4 will serve.
 - *is not* closer than 10 feet (3 meters) to the nearest AP or BH.
 - *is not* further than 100 feet (30.5 meters) of cable from the intended mounting position of the GPS antenna.
- 2** Using a T10 Torx driver, attach the mounting two included mounting brackets to the front sides of the CMM4 module

Figure 38 Attaching the rackmounting brackets



- 3 Select a 19" rack space in which the CMM4 may be mounted and use the (4) provided Phillips head screws to attach the front of the CMM4 to the rack

Figure 39 Rackmount CMM4 rack screws



Cabling a CMM4 (Models 1090CKHH and 1091HH)

Perform the following procedure to cable the CMM4:

Procedure 10 Cabling the CMM4

- 1 Review the diagram inside the door of the CMM4.
- 2 Note that the inserts in the gland openings have precut holes.

- 3 Route Ethernet cables through the cable gland connectors to the Ethernet ports inside the CMM4 cabinet (see the grey cables in [Figure 40](#)). Stagger the cables (see [Figure 41](#)) to make it easier to feed them through the gland.

Figure 40 Ethernet port connections

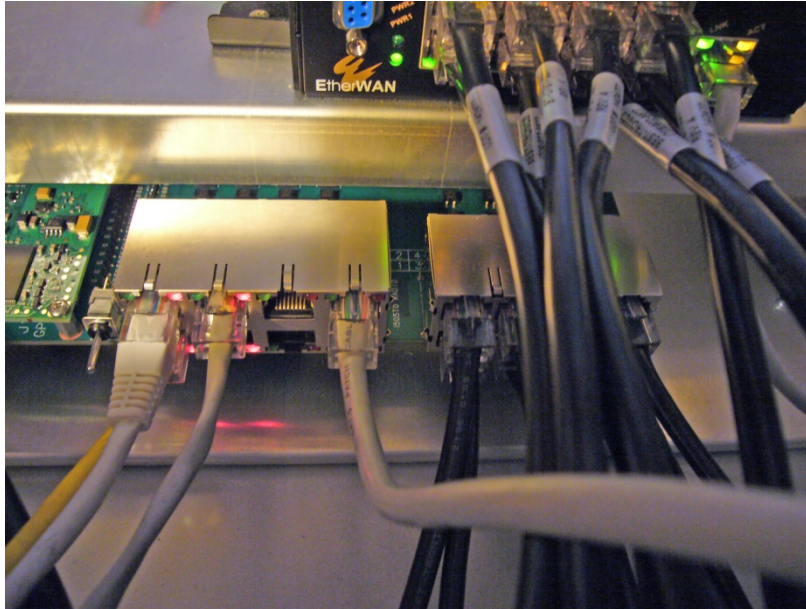
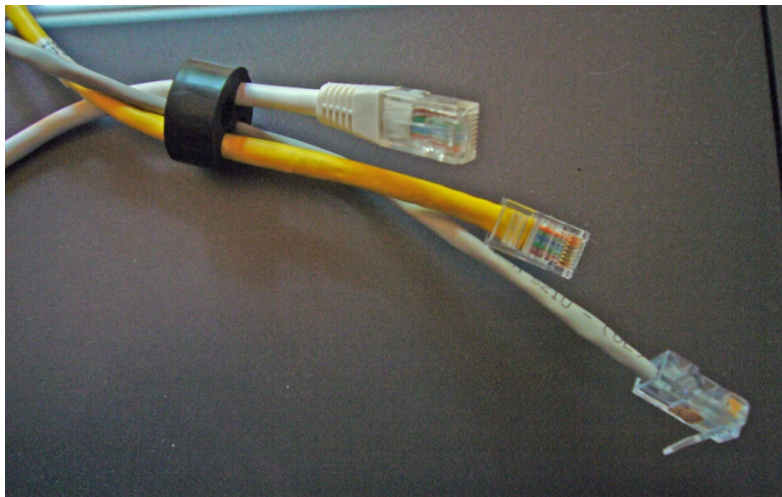


Figure 41 Staggered Ethernet cables

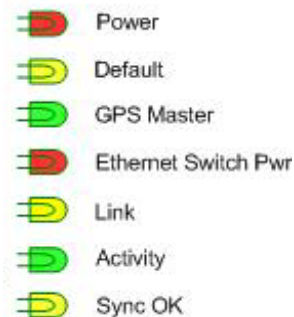


- 4** Connect Ethernet cables as follows (see page 2-12 for typical diagrams and planning information):
 - **APs, BH10s, or BH20s (PTP 100 Series bridges):** cable to powered ports of the controller board. The controller board provides sync, power, and surge suppression for these connections. If the CMM4 is mounted inside a building or communications hut, a Cambium 600SS surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent over-voltages and over-currents from entering the building and potentially damaging other electronic equipment.
 - **Terrestrial feeds under 100 Mbps (10/100BaseT):** cable to an unpowered port of the controller board. The controller board provides surge suppression for these connections. If the CMM4 is mounted inside a building or communications hut, a Cambium 600SS surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent over-voltages and over-currents from entering the building and potentially damaging other electronic equipment.
 - **Terrestrial feeds over 100 Mbps (1000BaseT Gigabit Ethernet):** cable directly to the Gigabit port of the EtherWAN switch, and mount a Cambium PTP-LPU lightning protection unit or equivalent
 - within 3 ft (1 m) of the CMM4 if the CMM4 is located outdoors
 - on the outside of the building or communications hut at the point of cable penetration if the CMM4 is located indoors.
 - **PTP 400 Series bridges:** cable to an unpowered port of the controller board. If the CMM4 is inside a building or communication hut, install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent on the outside of the building or communications hut at the point of cable penetration. If the CMM4 is mounted outside, locate the PIDU in a weather-tight enclosure within 3 ft (1 m) of the CMM4 and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent within 3 ft (1 m) of the PIDU.
 - **PTP 500 and 600 Series bridges:** cable directly to the Gigabit port of the EtherWAN switch. If the CMM4 is inside a building or communication hut, install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent on the outside of the building or communications hut at the point of cable penetration. If the CMM4 is mounted outside, locate the PIDU in a weather-tight enclosure within 3 ft (1 m) of the CMM4 and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent within 3 ft (1 m) of the PIDU.
- 5** On the door label, record the MAC and IP addresses of the CMM4 and all connected equipment.
- 6** Record also the MAC address of the EtherWAN switch.
- 7** Consistent with practices in your company, note the above information to add later to the company equipment database.
- 8** Connect the coax cable from the female N-connector on the GPS antenna to the female N-connector on the outside of the CMM4.
- 9** Ensure there is an Ethernet cable between the management port on the controller board and one of the Ethernet ports on the EtherWAN switch.

- 10** Feed the DC power cord through a cable gland. A 1-hole gland insert is provided, as the DC power cable is too thick to share a gland with other cables. The 1-hole insert is either connected to one of the patch cables or included in the parts bag.
- 11** For 29 V: Connect the white wire to +29V on either of the 29 VDC terminal blocks.
- 12** Connect the black wire to -V (GND) on the same 29 VDC terminal block.
- 13** For 56V: Connect the black and white wire to +56V on either of the 56 VDC terminal blocks.
- 14** Connect the black wire to -V (GND) on the same 56 VDC terminal block.
- 15** Plug the DC power supply into an AC receptacle (AC mains).
- 16** Verify that the LEDs light.

The indicator LEDs are shown in [Figure 42](#). Color indicates position, but not state. For example, the red Power LED, in the left most position, lights when power is applied to the unit, but does not change color at any point.

Figure 42 CMM4 LED indicators



CAUTION!

Surge suppressors should be installed on any cables where they enter a building to reduce the possibility of overvoltages or overcurrents damaging any equipment in the building.

The following equipment, mounted outside of a communications hut or building at the point where the cables penetrate the building, is recommended:

- Cambium 600SS surge suppressors for Ethernet cables
- Cambium 200SS surge suppressors for DC cables
- A PolyPhaser DGXZ+06NFNF-A surge suppressor for the coaxial cable from the GPS antenna

Cabling a Rackmount CMM4

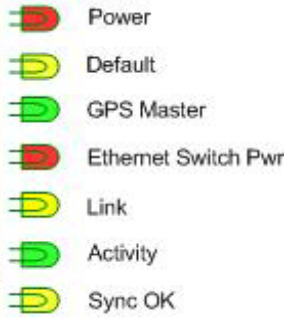
Perform the following procedure to cable the Rackmount CMM4:


Procedure 11 Cabling the Rackmount CMM4

- 1** Connect Ethernet cables as follows (see page 2-12 for typical diagrams and planning information):
 - **APs, BH10s, or BH20s (PTP 100 Series bridges):** cable to powered ports of the controller board. The controller board provides sync, power, and surge suppression for these connections. A Cambium 600SS surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent over-voltages and over-currents from entering the building and potentially damaging other electronic equipment.
 - **Terrestrial feeds under 100 Mbps (10/100BaseT):** cable to an unpowered port of the controller board. The controller board provides surge suppression for these connections. A Cambium 600SS surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent over-voltages and over-currents from entering the building and potentially damaging other electronic equipment.
 - **Terrestrial feeds over 100 Mbps (1000BaseT Gigabit Ethernet):** cable directly to the Gigabit port of the external switch, and mount a Cambium PTP-LPU lightning protection unit or equivalent on the outside of the building or communications hut at the point of cable penetration if the CMM4 is located indoors.
 - **PTP 400 Series bridges:** cable to an unpowered port of the controller board. Install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent on the outside of the building or communications hut at the point of cable penetration.
 - **PTP 500 and 600 Series bridges:** cable directly to the Gigabit port of the external switch. Install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent on the outside of the building or communications hut at the point of cable penetration.
- 2** Connect the coax cable from the female N-connector on the GPS antenna to the female N-connector on the outside of the CMM4.
- 3** For 29 V: Connect the white wire to +29V on either of the 29 VDC terminal blocks.
- 4** Connect the black wire to -V (GND) on the same 29 VDC terminal block.
- 5** For 56V: Connect the black and white wire to +56V on either of the 56 VDC terminal blocks.
- 6** Connect the black wire to -V (GND) on the same 56 VDC terminal block.
- 7** Plug the DC power supply into an AC receptacle (AC mains).
- 8** Verify that the LEDs light.

The indicator LEDs are shown in [Figure 43](#). Color indicates position, but not state. For example, the red Power LED, in the left most position, lights when power is applied to the unit, but does not change color at any point.

Figure 43 LED indicators - rackmount CMM4





CAUTION!

Surge suppressors should be installed on any cables where they enter a building to reduce the possibility of overvoltages or overcurrents damaging any equipment in the building.









The following equipment, mounted outside of a communications hut or building at the point where the cables penetrate the building, is recommended:

- Cambium 600SS surge suppressors for Ethernet cables
- Cambium 200SS surge suppressors for DC cables
- A PolyPhaser DGXZ+06NFNF-A surge suppressor for the coaxial cable from the GPS antenna

Power Faults

If excessive current is drawn on a port, the analog circuitry reports a PoE fault. The system then turns the port power off. The power will be restored when the fault is removed. [Figure 44](#) shows the port status screen with a power fault on port 1.

Figure 44 CMM port status showing power fault

Port Status								
Port Number	1	2	3	4	5	6	7	8
Port Text	Port 1 Description	Port 2 Description	Port 3 Description	Port 4 Description	Port 5 Description	Port 6 Description	Port 7 Description	Port 8 Description
Power	 Power Fault! 0 V	 29 V	 29 V	 29 V	 29 V	 29 V	 29 V	 29 V
Device Type	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy
Power fault on port:1 Please check the devices and port configurations.								

Chapter 3: Universal Global Positioning System Module

UGPS Product Description and Overview

The Cambium Networks Universal Global Positioning System (UGPS) is a stand-alone GPS antenna and receiver with the capability to provide a 1PPS GPS synchronization signal to Cambium Networks access points (APs), backhaul masters (BHM)s, or cluster management modules (CMMs).

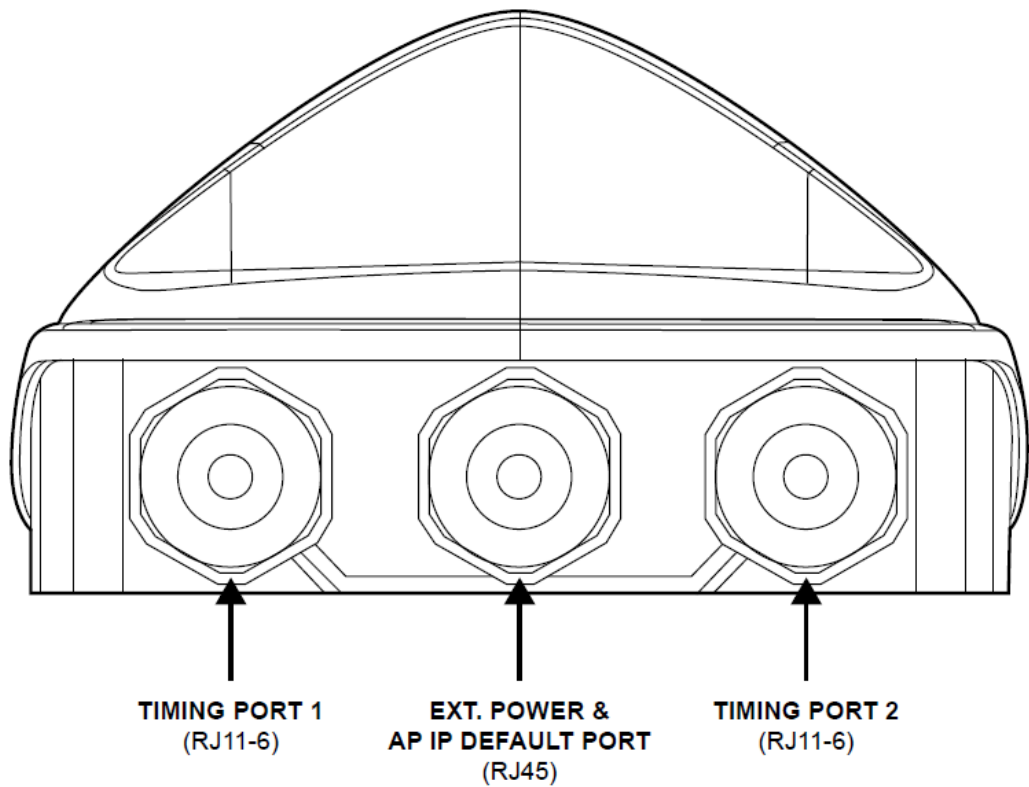
The UGPS features two timing ports for sending GPS timing sync. One or two access points/backhaul masters/cluster management modules may be synchronized directly by the two timing ports.

The UGPS may be used with the following Cambium Networks equipment:

- PMP 100 FSK AP
- PTP 100 FSK BH
- PMP 430 OFDM AP
- PMP 400 OFDM AP
- PTP 200 OFDM BH
- PTP 230 OFDM BH (capable of sourcing power to the UGPS via PTP 230 timing port)
- PMP 320 WiMAX AP (AP Software version e2.2 and later)
- PMP 450 OFDM AP (capable of sourcing power to the UGPS via PMP 450 timing port)
- CMM3 (CMM3 in Slave mode, CMM3 will receive GPS synchronization pulse, but no GPS location data)
- CMM4 (CMM4 in Slave mode, CMM4 will receive GPS synchronization pulse, but no GPS location data)

The connector interface for the UGPS is detailed in [Figure 45](#):

Figure 45 UGPS connector interface



UGPS Power Source Configurations

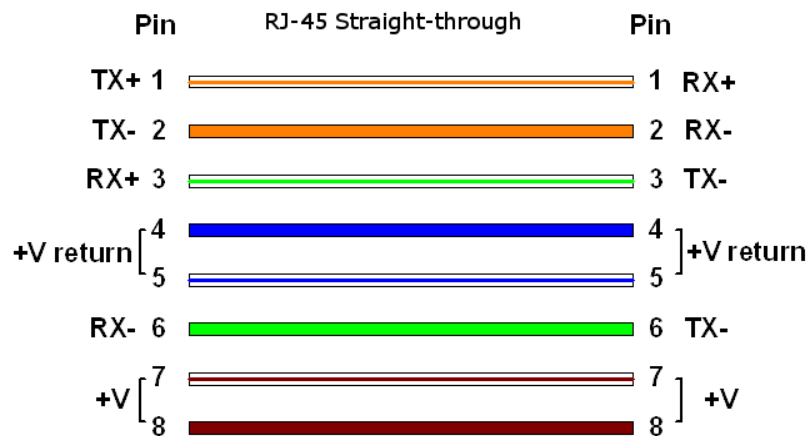
The UGPS module may be powered by an external source via the UGPS External Power Port. Alternately, the UGPS may be powered by a PTP 230 backhaul master or PMP 450 AP via one of the UGPS Timing Ports. When the UGPS is powered by via one of the Timing Ports, the radio provides the necessary power to enable 1 PPS synchronization timing and serial GPS location data by the UGPS (which is sent back to the radio via the associated Timing Port). If the UGPS is receiving power on the External Power Port (via 29.5V DC power supply or CMM port) *and* power on Timing Port 1 or Timing Port 2 simultaneously, the UGPS defaults to using the external power supply.

External Power Only

Shown below are examples of external only powering for PMP 100 and PMP 400/430 units. In this case the UGPS is powered via straight-through RJ-45 cable connected to a Cambium approved 29.5V DC power supply. The UGPS may also receive power through the RJ-45 Power Port via a power-over-Ethernet port on a CMM4. The radios receive their GPS synchronization through a straight-through 6-pin RJ-11 cable connected to either Timing Port 1 or Timing Port 2 of the UGPS.

RJ-45 Pinout for Straight-through Ethernet Power Cable

Figure 46 Power Pinout - UGPS Ethernet Power Cable



Pin 1 → white / orange ← Pin 1

Pin 2 → orange ← Pin 2

Pin 3 → white / green ← Pin 3

Pin 4 → blue ← Pin 4

Pin 5 → white / blue ← Pin 5

Pin 6 → green ← Pin 6

Pin 7 → white / brown ← Pin 7

Pin 8 → brown ← Pin 8

Pins 7 and 8 carry power to the modules.

Figure 47 PMP 100 AP receiving synchronization from external-powered UGPS

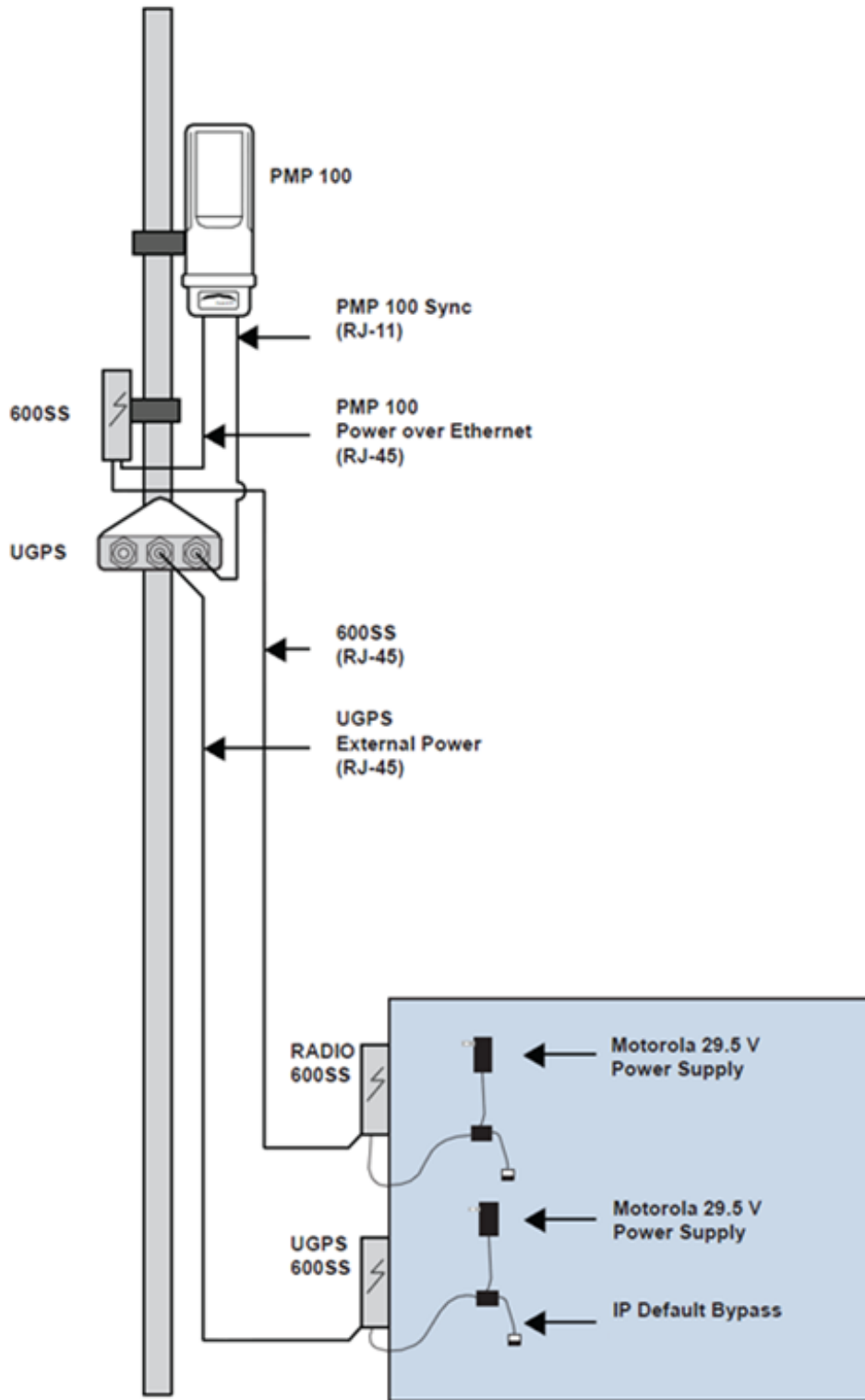


Figure 48 PMP 320 receiving synchronization from external-powered UGPS

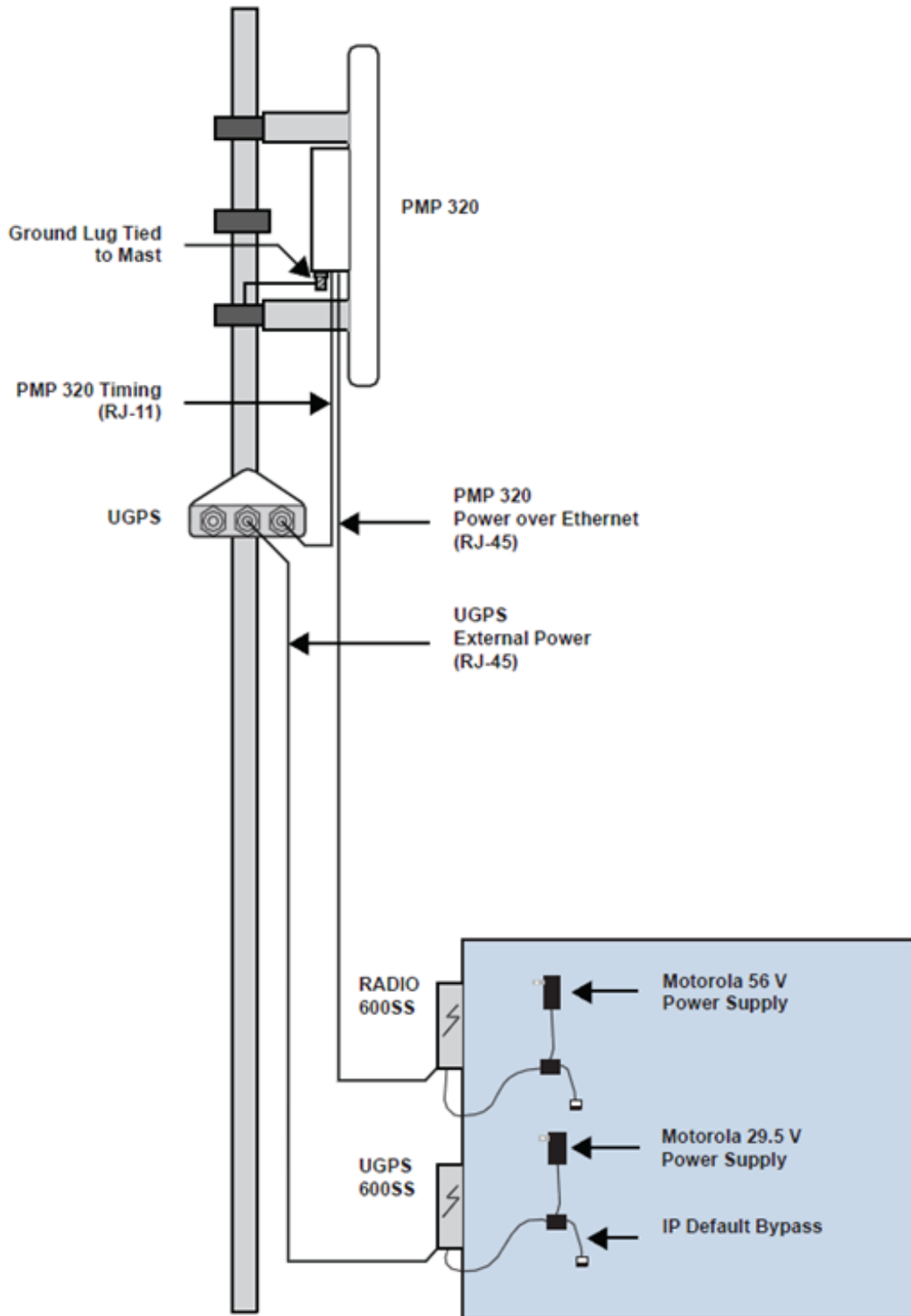
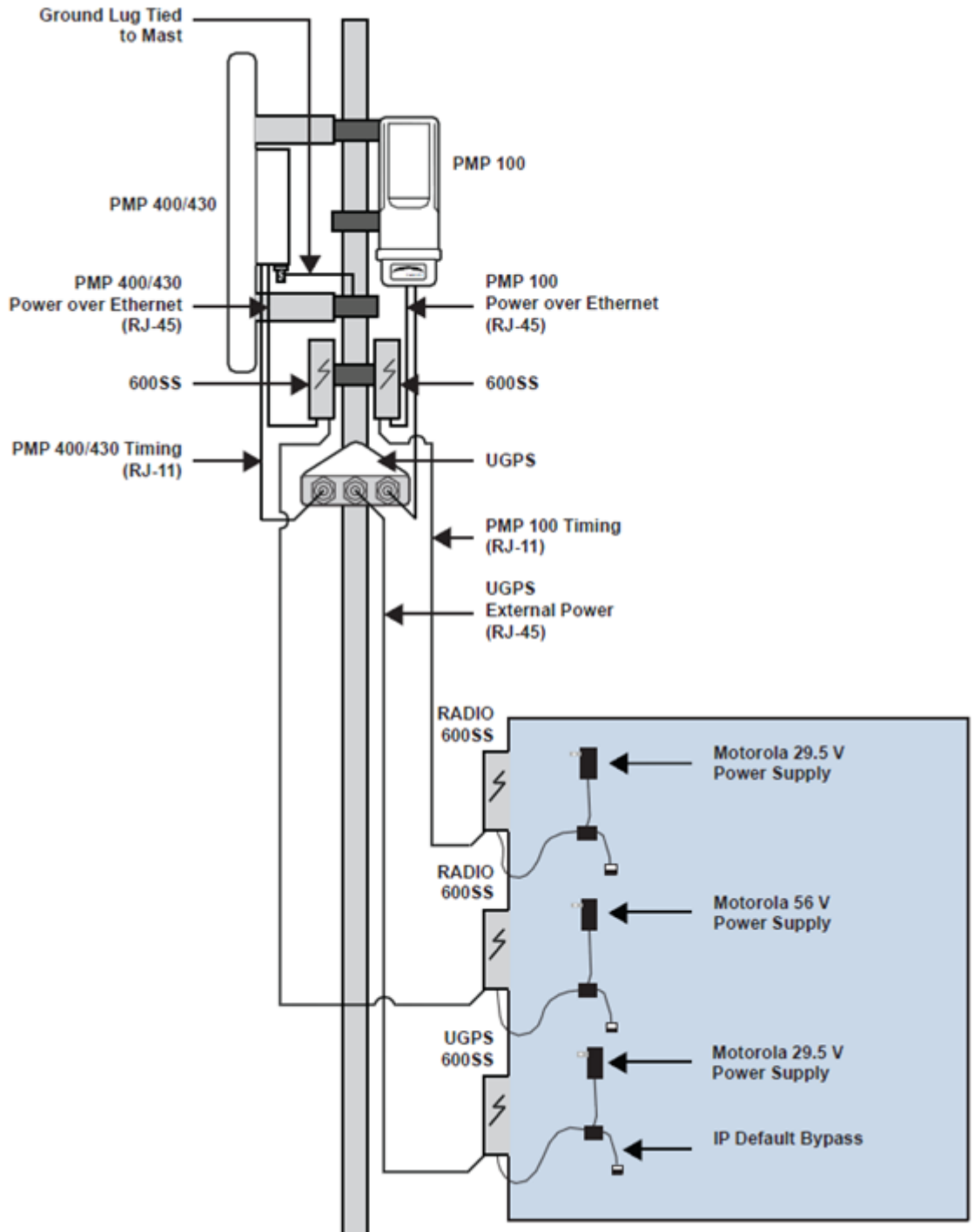


Figure 49 One PMP 400/430 AP and one PMP 100 AP receiving synchronization from external-powered UGPS



Power from the Radio via UGPS Timing Port 1 or UGPS Timing Port 2

Shown below is an example of a UGPS unit powered from a PTP 230 BHM through an RJ-11 cable connected to either Timing Port 1 or Timing Port 2 of the UGPS. The UGPS may be powered by either Timing Port, and up to two radios may receive synchronization over the Timing Ports when the UGPS is powered in this fashion.


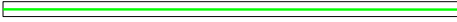




NOTE

This UGPS powering mode is currently supported only by PTP 230 BHM and PMP 450 AP. Future Cambium Networks hardware releases will also support providing power to the UGPS.

When powering the UGPS via AP or BHM, the system uses a straight-through 6-pin RJ-11 cable to provide power to the UGPS and to retrieve GPS synchronization pulses and data from the UGPS. The following diagram shows the wiring of the cable for sync and power.

RJ-11 Pinout for Straight-through Sync / Power Cable

Figure 50 Power Pinout - UGPS to AP/BHM Timing Port (6-pin RJ-11)

	Pin	RJ-11 Straight-Through	Pin	
1 PPS Sync Pulse (8Vo-p)	1		1	1 PPS Sync Pulse (8Vo-p)
N/A	2		2	N/A
GPS Location Data (8Vo-p)	3		3	GPS Location Data (8Vo-p)
V+ (4V DC – 6V DC)	4		4	V+ (4V DC – 6V DC)
N/A	5		5	N/A
Ground (V+ Return)	6		6	Ground (V+ Return)

Pin 1 → white / orange	← Pin 1
Pin 2 → white / green	← Pin 2
Pin 3 → white / blue	← Pin 3
Pin 4 → green	← Pin 4
Pin 5 → blue	← Pin 5
Pin 6 → orange	← Pin 6

Figure 51 PTP 230 backhaul master powering UGPS and receiving synchronization

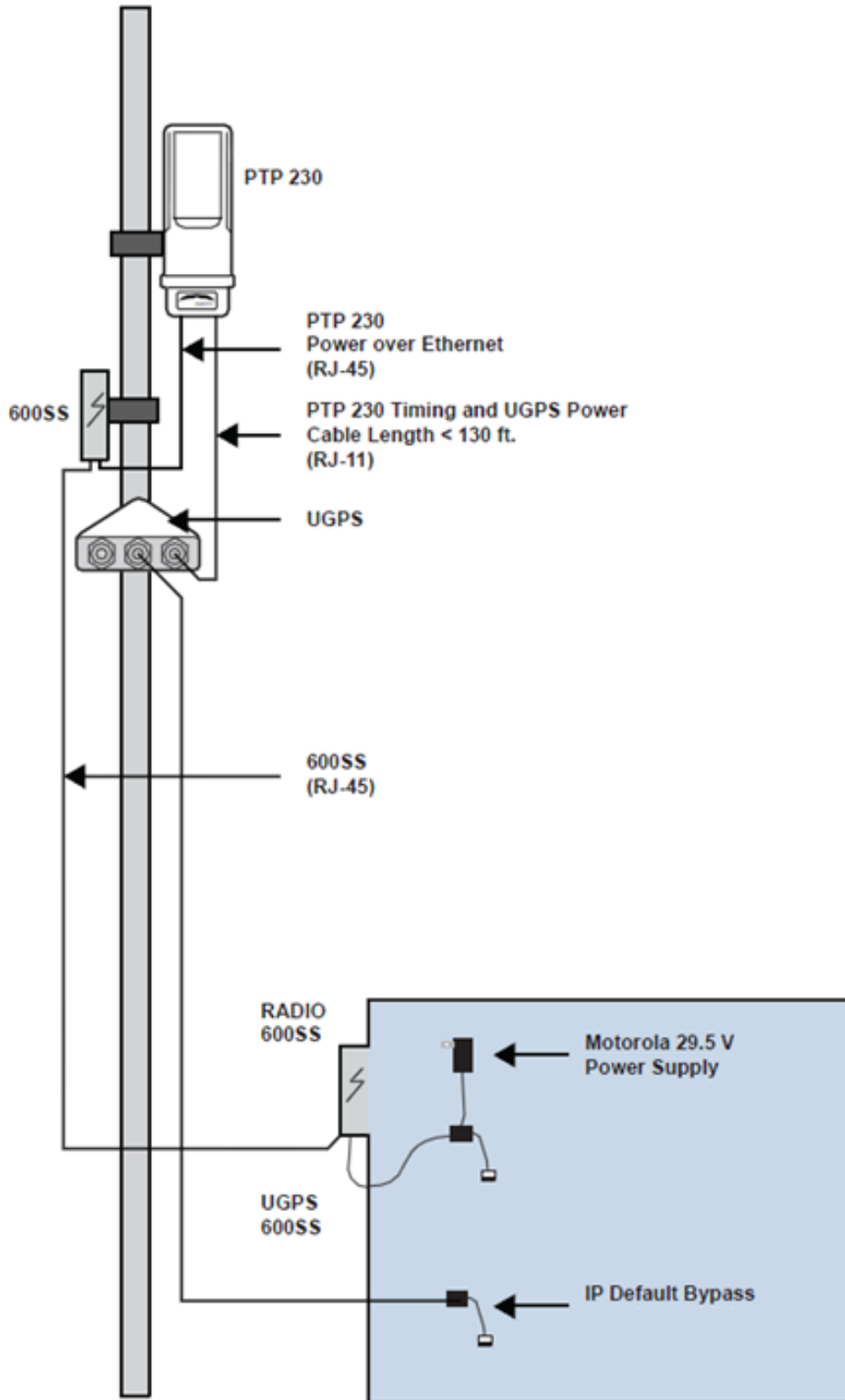


Figure 52 PMP 450 AP powering UGPS and receiving synchronization

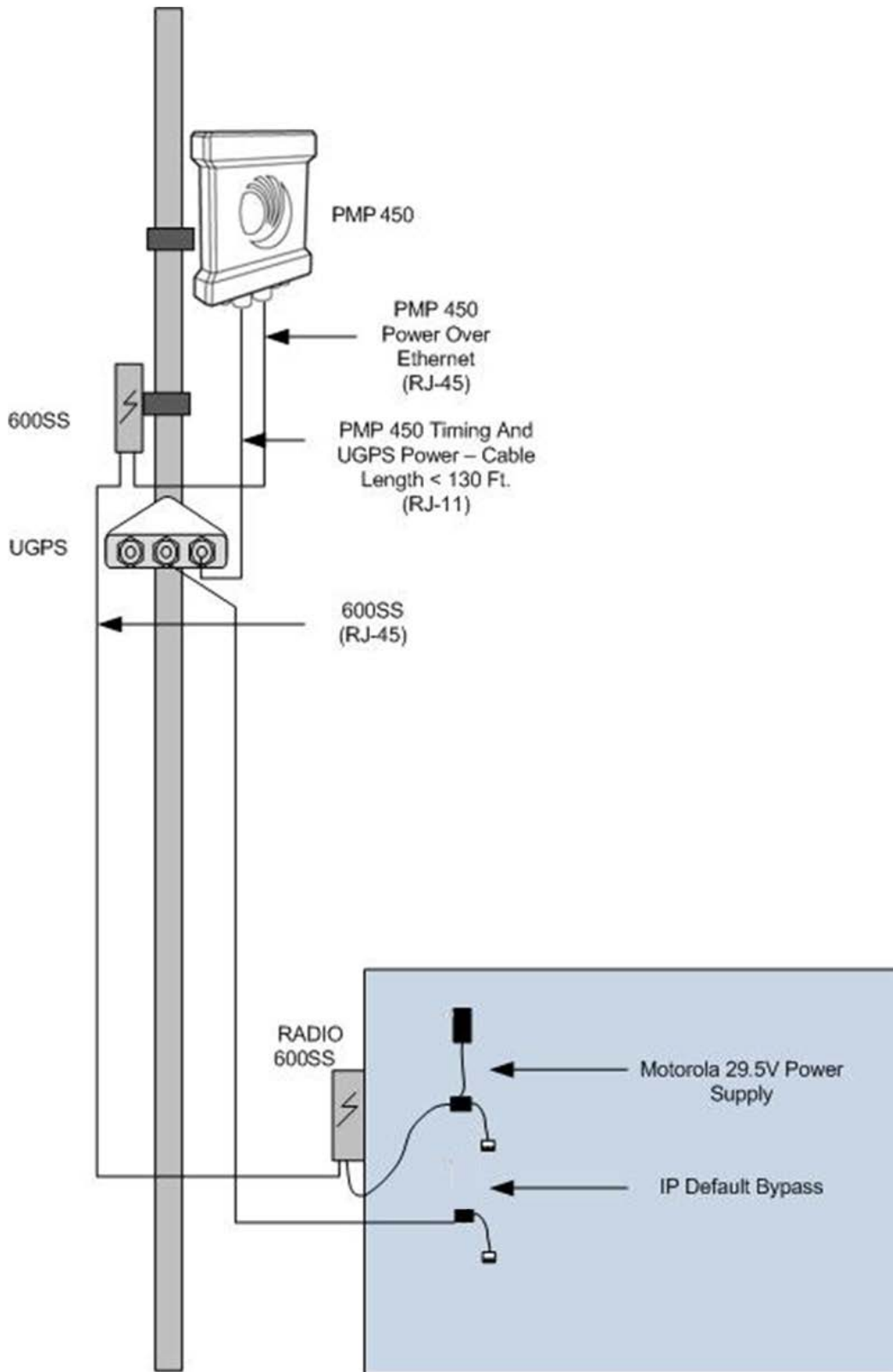


Figure 53 Two PTP 230 backhaul master units powering UGPS and receiving synchronization

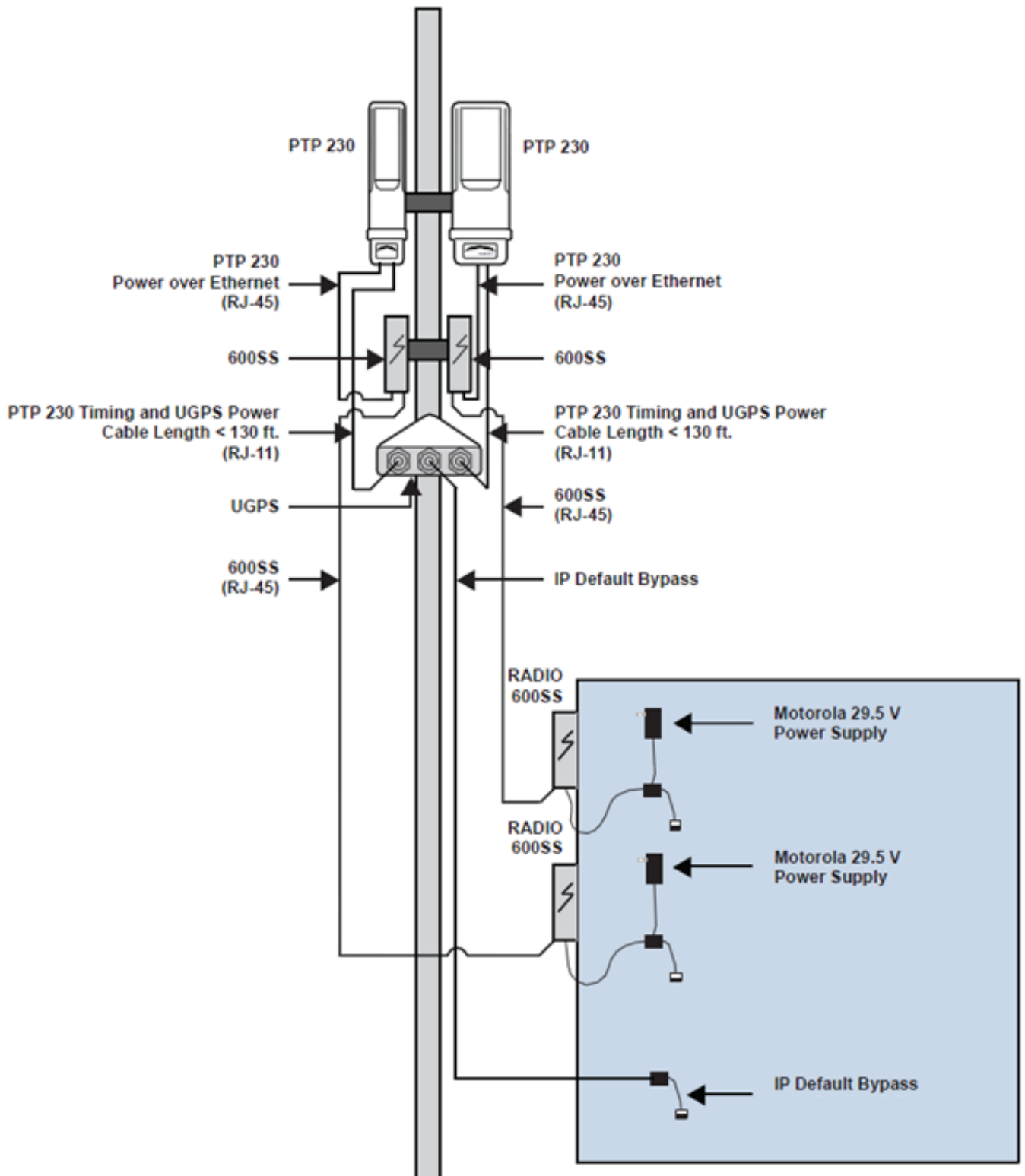
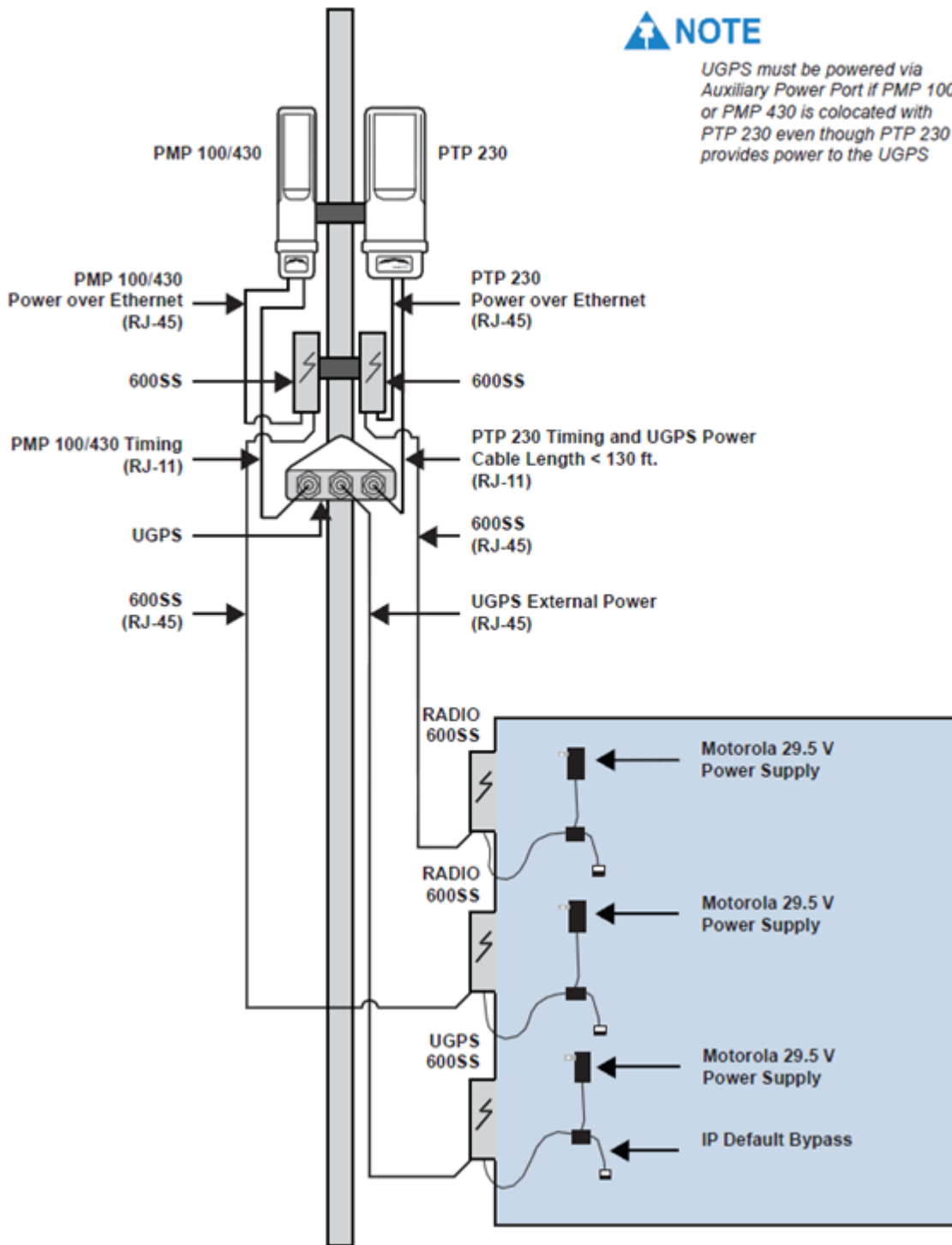


Figure 54 PTP 230 backhaul master powering UGPS/receiving synchronization and PMP 100/430 receiving synchronization



UGPS and CMM Configurations

The UGPS may be used as a GPS synchronization source for Cambium Networks CMM3 and CMM4 (Cluster Management Module) units. The UGPS provides GPS synchronization to the CMM unit via the CMM's sync port. This allows any access points or backhaul masters connected to the CMM to receive sync. This configuration requires that the CMM3 or CMM4 be configured to "Slave" mode via the CMM GUI. When using the UGPS as a synchronization source for a CMM3 or CMM4, a special sync cable must be used. This cable may be constructed from an RJ-11 cable using the pin configuration in [Figure 11](#).

When using a CMM unit, the UGPS may also be used as a redundant sync source for the CMM. If a CMM encounters an issue with the primary, coaxial-connected GPS receiver an operator may remotely login to the CMM and set the synchronization source to "Slave" to begin receiving sync from the UGPS (connected via RJ-11 cable with the pin configuration in [Figure 55](#)).

NOTE

PMP 320 Systems - When using both the UGPS for timing and a CMM4 for timing in a PMP 320 network (same AP site or an adjacent AP site), timing discrepancies between the UGPS and CMM4 can cause interference between the sites. To address this issue, operators may opt to use one type of timing in the network (either UGPS or CMM4). Alternatively, operators may contact technical support to set up remote access to troubleshoot the AP units that are exhibiting the issue. A future PMP 320 software release will address this timing issue.

Product Specifications

Antenna

Frequency Band	L1 (1575.42 ±10 MHz)
Polarization	Patch

Receiver

Tracking Channels	12 (Min.) Continuous Tracking
Update Rate.....	1 Hz (NMEA)
Timing Accuracy (1PPS)	100ns RMS
Position Accuracy	<3 m (Vertical), <10m (Horizontal)

Data Interface

Communications Standard	NMEA-0183
Interface Technology	1PPS (8Vp-p Level-Shifted Pulse, 100ms Duty Cycle) TX GPS LOCATION DATA (8Vp-p Level-Shifted – Serial 8/N/1 9600bps)

Acquisition

Cold Start	35 seconds (Typical and under open clear sky)
------------------	---

Sensitivity

Acquisition	-148dBm
Tracking.....	-165dBm

Electrical

Voltage.....	4.3V - 6V DC (Timing Ports 1 & 2: +Vap) 10V - 30V DC (External Power Port: +Vext)
Power	250mW (2 APs Loaded; Vap=4.3V DC) 500mW (2 APs Loaded; Vap=0V DC; Vext=30V DC)
Cable Length.....	35m (120 ft.) 2 APs Loaded; Vap(min) = 4.3V DC 100m. (330 ft.) 2 APs Loaded; Vap=0V; Vext=30V DC

Environmental

Operating Temperature	-40C to +85C
Humidity	95%
Ingress Protection.....	IP67

Mechanical

Dimensions	6 inch(Length) x 3.5 inch(Width) x 4 inch(Dome Height)
Electrical Interface	RJ11-6 Position Shielded(x2), RJ45-8 Position Shielded
Connector.....	IP67 Rated Connector (Lapp Cord Grip Style)
Weight.....	15 Oz.

UGPS installation and operation

Observe the following guidelines when installing a UGPS module:

- The unit may be pole mounted or surface mounted (on a horizontal surface with an unobstructed view of the sky).
- The UGPS should NOT be installed as the highest object at the site.
- Orient the GPS antenna so that it has clear access to the southern horizon (if installed north of the equator) or clear access to the northern horizon (if installed south of the equator).
- Note locations of 600SS surge suppressors when installing the UGPS unit. Reference [UGPS Power Source Configurations](#) diagrams. Compatible power supplies for the UGPS are listed in [Table 25](#).
- Observe cable length specifications in [Table 26](#).
- Cambium Networks recommends using shielded Category 5E cables for outdoor installations.
- The UGPS Power over Ethernet pinout (External Power Port) differs from IEEE Standard 803.3af, and the two should not be intermixed. The UGPS Power over Ethernet pinout is the same as Cambium Networks FSK broadband radios.

Table 25 Compatible 29.5V Power Supplies

Model	Description
ACPSSW-09B	US, UK and EU clips included
ACPSSW-10B	Argentina clip
ACPSSW-11A	Australia clip
ACPSSW-12A	Fixed Blade China
ACPSSW-13B	Fixed Blade US
ACPSSW-14A	Brazil clip
ACPSSW-20A	Infrastructure grade (shielded cable), US, UK and EU clips
ACPSSW-21A	Infrastructure grade (shielded cable), AC adapter clip (IEC 2-wire AC cord also required)

Table 26 Cable Length Specification

Configuration	Powering Method	Maximum Cable Length (feet)
External power source, up to two access points/backhaul masters	29.5V DC AC/DC Adapter (see Table 25) via UGPS Ext. Power Port	330
Access point/backhaul master power source, up to two access points/backhaul masters	Access Point/Backhaul master RJ-11 GPS power via UGPS Timing Port	130

NOTE

This UGPS powering mode is supported only by PMP 450 AP and PTP 230 BHM . Future Cambium Networks hardware releases will also support providing power to the UGPS.

NOTE

When using the UGPS as a synchronization source for a CMM3 or CMM4, a special sync cable must be used. This cable may be constructed from the an RJ-11 cable using the pin configuration in [Figure 55](#).

Figure 55 UGPS to CMM cable pin configuration

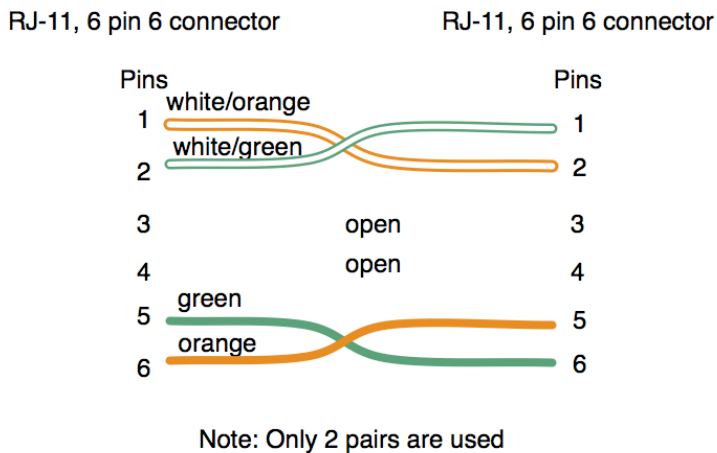
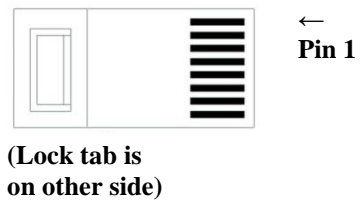


Figure 56 Location of pin 1



UGPS Installation Procedure

Use the following procedure to install the UGPS module and to verify operation.

Procedure 12 UGPS installation – external-powered

- 1 Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.
- 2 For PMP 100/400/430/450 and PTP 100/200 series, configure (via web management interface) the access points/backhaul masters to sync to received GPS signal (via the timing port). Navigate to **Configuration > General** and set the **Sync Input** to **Sync to Received Signal (Timing Port/UGPS)**. Since the UGPS will be configured with an external power source, set the **UGPS Power** value to **Disabled**.

Figure 57 Configuring the sync input and disabling UGPS power - PMP 100/400/430 and PTP 100/200 series

Sync Setting	
Sync Input :	Sync to Received Signal (Timing Port/UGPS)
uGPS Power :	<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled
Verify GPS Message Checksum :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled

For PMP 320 series, configure (via web management interface) the access point to sync to received GPS signal (via the AP's RJ-11 port). Navigate to **Configuration > Settings** and set the **Sync Source** to **UGPS** and **Serial Type** to **uGPS**.

Figure 58 Configuring the sync source - PMP 320 series

AP Configuration / General / Settings	
Operation mode	Internal AAA
CPE Isolation	Disable CPE Isolation
AP GUI access from PC below CPE	Air Mng Disable
Serial Type	uGPS
Sync Source	uGPS
Location Statistics	Disabled
Sync Holdoff Interval [sec]	60
Maximum Supported CPEs	200
Maximum Service Flow per AP	800
Maximum Service Flow per CPE	8

[Update](#)

- 3** For PMP 100/400/430/450 and PTP 100/200 series, click **Save Changes** and reboot the radio. For PMP 320 series, click **Update**, click the **Save** icon and reboot the radio.
- 4** If connecting the UGPS to a CMM3 or CMM4, configure the CMM (via the CMM web management interface) to Slave mode (access points/backhaul masters connected to the CMM will need to be set to receive GPS sync signal from the power port). Navigate to **Configuration > CMM** and set **Sync Source** to **Slave (RJ11 Port)**. A reboot on the CMM is required for these changes to take effect.
- 5** Connect an RJ-11 6 pin cable from Timing Port 1 of the UGPS to the RJ-11 utility port of the access point/backhaul master to receive GPS sync signal. If applicable, repeat this step for additional access points and backhaul masters. If the UGPS is to send sync to a CMM, use a special sync cable constructed per [Figure 55](#).
- 6** Install a 600SS surge suppressor between the power supply and the UGPS module. Reference the diagrams in section [UGPS Power Source Configurations](#).
- 7** Connect an RJ-45 8 pin Ethernet cable from the UGPS power port to the 600SS surge suppressor.
- 8** Connect an RJ-45 8 pin Ethernet cable from the 600SS surge suppressor to the power supply.
- 9** Verify on the access point/backhaul master/CMM that the GPS synchronization signal is being received properly. Reference section [GPS Status and Location Data Readout](#).

Procedure 13 UGPS Installation – Powered by AP/BH Timing Port (PMP 450/PTP 230 Only)

- 1** Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.

- 2 Configure (via the web management interface) the access point / backhaul master to sync to received signal (timing port). Navigate to **Configuration > General** and set the **Sync Input** to **Sync to Received Signal (Timing Port/UGPS)**. Since the UGPS will be configured to receive power over the UGPS Timing Ports, set the **UGPS Power** value to **Enabled** to configure the radio to power the UGPS.

Figure 59 Configuring the sync input and enabling UGPS power - PTP 230 series

Sync Setting	
Sync Input :	Sync to Received Signal (Timing Port/uGPS)
uGPS Power :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled
Verify GPS Message Checksum :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled

- 3 Click **Save Changes** and reboot the radio.
- 4 Connect an RJ-11 6 pin cable from Timing Port 1 or 2 of the UGPS to the timing port of the access point/backhaul master providing power and receiving sync.

NOTE

This UGPS powering mode is currently supported only by PMP 450 AP and PTP 230 BHM . Future Cambium Networks hardware releases will also support providing power to the UGPS.

- 5 Verify on the access point/backhaul master that the GPS synchronization signal is being received properly. Reference section [GPS status and location data readout](#).

Procedure 14 UGPS installation – powered by CMM PoE port

- 1 Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.
- 2 Verify that the CMM is powered by a 29.5V Cambium Networks power supply. This ensures that the CMM can provide the proper power-over-Ethernet output via CMM ports.
- 3 Connect an RJ-45 8 pin Ethernet cable from the External Power Port of the UGPS to an Ethernet port on the CMM4.

- 4 On the CMM4 web management GUI navigate to **Configuration > Ports**. In this configuration the CMM4 port connected to the UGPS via RJ-45 cable must be configured with **Power On** and **Device Type Canopy 29V** as Port 1 in [Figure 60](#).

NOTE

The CMM Ethernet port will only provide 29V power to the UGPS if the CMM is powered by a 29V power supply. If the CMM is powered by a 56V power supply, it will not provide 29V power via the PoE ports.

Figure 60 CMM port configuration for UGPS power

Configuration => Ports
CMM4 0a-00-3e-e8-04-12
Changes take effect after clicking "Save Changes" (no Reboot needed)

Port Number	1	2	3	4	5	6	7	8
Port Text	Port 1 Description	Port 2 Description	Port 3 Description	Port 4 Description	Port 5 Description	Port 6 Description	Port 7 Description	Port 8 Description
Power			0 V	0 V				
Device Type	Canopy 29 V	Canopy 56 V	Non-Powered	Non-Powered	Canopy 29 V	Canopy 56 V	Canopy 56 V	Canopy 29 V

Port Configurations

Description: Port 1 Description

Port 1 : Power On Power Off
 Device Type:

IP default bypass

Since the UGPS is connected to the access point/backhaul master timing port, the UGPS module provides a bypass to perform an IP Default to a device connected on UGPS Timing Port 1 or 2. To perform an IP Default for a radio connected to the UGPS follow the procedures below:

Procedure 15 IP default procedure – UGPS receiving external power

- 1 Using the power adapter providing UGPS power, plug the “To Computer” RJ-45 plug of the power adapter cable into an RJ-45 coupler.
- 2 Attach an RJ-45 8 pin Ethernet cable to the coupler listed in Step 1, and pin out the loose end of the cable.
- 3 Jumper the RJ-45 pins per the wiring table below:

Table 27 UGPS IP default bypass wiring

AP to Default	Wiring on External Power Connector
Timing Port 1	Connect Pins 3 and 6
Timing Port 2	Connect Pins 1 and 2

- 4 For PMP 100/400/430 and PTP 100/200/230 series, reboot the radio to be defaulted while the RJ-45 pins are jumpered. After the radio has finished rebooting, the software will be restored to a factory default configuration.

For PMP 320 series, once the RJ-45 pins are jumpered while the radio is powered up, the pin contacts may then be separated and the radio may be rebooted. When the radio powers back up, the software will be restored to a factory default configuration.

Procedure 16 IP Default Procedure – UGPS receiving power from backhaul master timing port

- 1 With the UGPS unit powered by the backhaul master’s timing ports, connect an RJ-45 8 pin Ethernet cable to the External Power Port on the UGPS and pin out the loose end of the cable.
- 2 Jumper the RJ-45 pins per the wiring table below:

Table 28 UGPS IP default bypass wiring

AP to Default	Wiring on External Power Connector
Timing Port 1	Connect Pins 3 and 6
Timing Port 2	Connect Pins 1 and 2

- 3** Reboot the radio to be defaulted while the RJ-45 pins are jumpered. After the radio has finished rebooting, the software will be restored to a factory default configuration.

Figure 61 IP default bypass - default radio on timing port 1

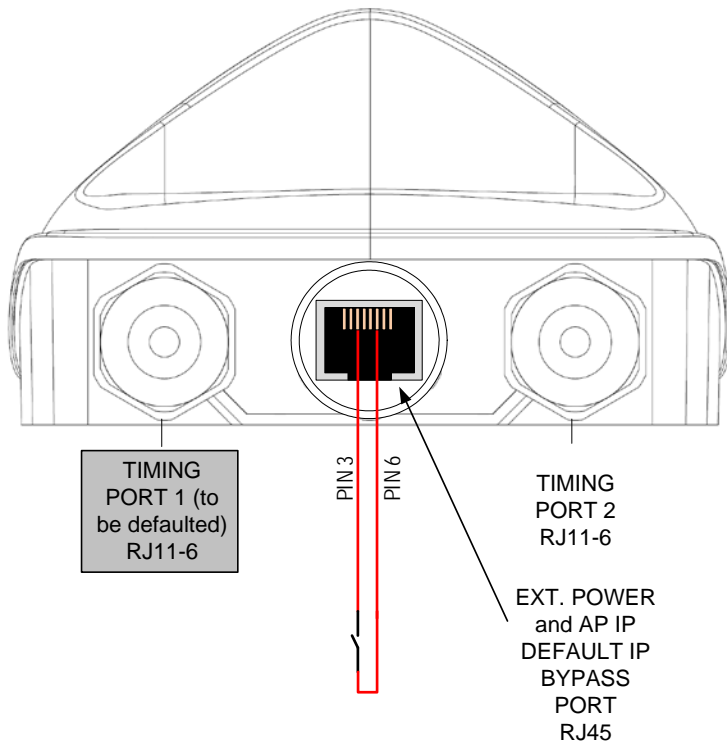
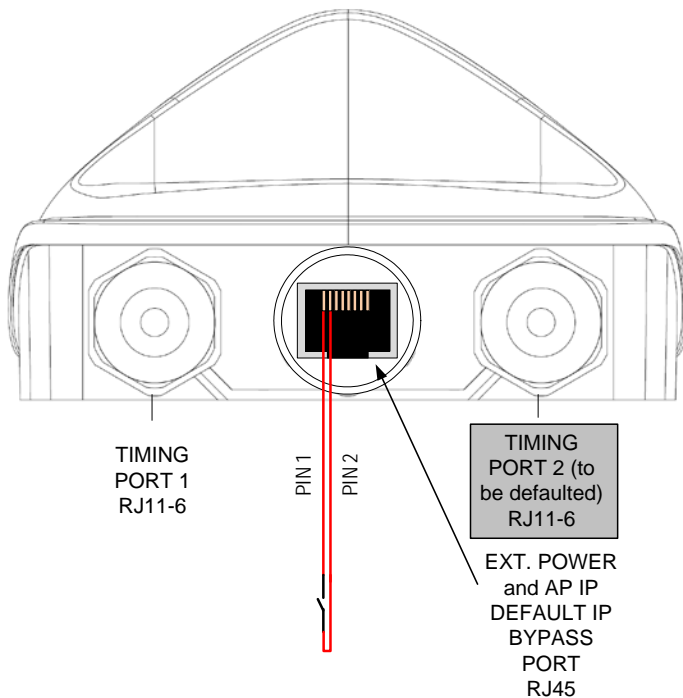


Figure 62 IP default bypass - default radio on timing port 2



GPS status and location data readout

The UGPS provides location data to connected synchronized devices and may be retrieved by the access point/backhaul/cluster management module web GUI or by SNMP. GPS status and location data readout is currently available on PMP 100/320/400/430, and PTP 100/200/230, series radios.

Retrieving GPS Status and Location Data via Radio Web Management GUI

Procedure 17 Retrieving GPS status and location data via radio web management GUI – PMP 100/400/430 and PTP 100/200/230 Series

- 1 With the UGPS powered and connected to the radio, navigate to **Home > GPS Status**.
- 2 GPS Location Data is displayed in section **GPS Status**.

Figure 63 GPS status and location data - PMP 430 example

The screenshot displays the 'GPS Status' page in the Radio Web Management GUI. The page title is 'Home → GPS Status' and the device identifier is '5.7GHz OFDM - Backhaul - Timing Master - 0a-00-3e-38-25-98'. The 'GPS Status' section shows the following data:

Pulse Status :	Receiving Sync
Satellites Visible :	15
Satellites Tracked :	7
GPS Date :	04/01/2011
GPS Time :	18:09:16
Tracking Mode :	3D Fix
Latitude :	42° 4' 1.96" N
Longitude :	88° 3' 24.00" W
Height :	275.4 meters
Invalid Message Count :	4

Below the status table, there is a note: 'Map -- NOTE: This is only an approximation on the physical location.' and a link for 'Site Map : [Map \[UGPS TEST AP\]](#)'. The 'GPS Receiver Information' section shows: 'GPS Receiver Information : Motorola uGPS'.

Procedure 18 Retrieving GPS status and location data via radio web management GUI – PMP 320

- 1 With the UGPS powered and connected to the radio, navigate to **Configuration > General > Properties**.
- 2 GPS Location Data is displayed as below:

Figure 64 GPS status and location data - PMP 320

AP Configuration / General / Properties

Description	Motorola PMP 320 Access Point
Name	PMP320AP
Contact	No contact specified
Location	Cambium Networks
Sync Status	Sync
Tracking Mode	3D
Satellites Used	9
GPS Time	23:09:23
Satellites Visible	11
GPS Latitude	4203.1985 N
GPS Longitude	08801.5311 W
Altitude (m)	243.1
Speed (km/h)	0.00

Retrieving GPS status and location data via SNMP

To retrieve GPS Status and Location Data via SNMP (Simple Network Management Protocol) from synchronized devices operators may use the following procedures.

Procedure 19 Retrieving GPS Status and Location Data via SNMP – PMP 100/400/430 and PTP 100/200/230 Series

- 1 With the UGPS powered and connected to the radio, on the radio web management GUI navigate to **Configuration > SNMP**.
- 2 Verify that the **Community String** and **Accessing Subnet** values are set as desired.

- 3** Perform a “snmpget” command for the OID desired based on [Table 29](#).

Table 29 GPS SNMP OIDs - PMP 100/400/430 and PTP 100/200/230 series

Object Name, OID	Description
whispGPSStatus, .1.3.6.1.4.1.161.19.3.1.3.1	GPS synchronization info (1: GPS Synchronized, 2: GPS Lost Sync, 3: Generating Sync)
gpsSyncSource, .1.3.6.1.4.1.161.19.3.1.3.2	Source of GPS sync pulse
gpsSyncStatus, .1.3.6.1.4.1.161.19.3.1.3.3	Current GPS sync status
gpsTrackingMode, .1.3.6.1.4.1.161.19.3.1.3.4	GPS tracking mode
gpsTime, .1.3.6.1.4.1.161.19.3.1.3.5	GPS time
gpsDate, .1.3.6.1.4.1.161.19.3.1.3.6	GPS date
gpsSatellitesTracked, .1.3.6.1.4.1.161.19.3.1.3.7	Current number of satellites GPS is tracking
gpsSatellitesVisible, .1.3.6.1.4.1.161.19.3.1.3.8	Number of satellites visible to the GPS
gpsHeight, .1.3.6.1.4.1.161.19.3.1.3.9	GPS height
gpsLatitude, .1.3.6.1.4.1.161.19.3.1.3.11	GPS latitude
gpsLongitude, .1.3.6.1.4.1.161.19.3.1.3.12	GPS Longitude

Procedure 20 Retrieving GPS status and location data via SNMP – PMP 320

- 1** With the UGPS powered and connected to the radio, on the radio web management GUI navigate to **Administration > User Management** and verify SNMP user data.
- 2** Perform a “snmpget” command for the OID desired based on [Table 30](#)

Table 30 GPS SNMP OIDs - PMP 320 series

Object Name, OID	Description
danSyncStatus, .1.3.6.1.4.1.32584.1.1.3.2	Source of GPS sync pulse (0: No sync, 1: Sync present, 2: External sync missing – operating on internal clock, 3: Transition state - about to lose sync)
danLatitude, .1.3.6.1.4.1.32584.1.1.1.5	System installation Latitude, Range -90 to 90
danLongitude, .1.3.6.1.4.1.32584.1.1.1.6	System installation Longitude, Range -180 to 180

UGPS Power Port and Timing Port Pinouts

See [Table 31](#) and [Table 32](#) below for UGPS pinout information.

Table 31 UGPS Power Port Pinout

Pin	Function
1	Ground (for IP Default jumper to Pin 2)
2	Timing Port 2 AP IP Default Pin
3	Ground (For IP Default jumper to Pin 6)
4	Ground (+Vaux Return)
5	Ground (+Vaux Return)
6	Timing Port 1 AP IP Default Pin
7	+Vaux (10V-30V DC)
8	+Vaux (10V-30V DC)

Table 32 UGPS Timing Port Pinout

Pin	Function
1	1 PPS Sync Pulse (8V _{o-p})
2	N/A
3	GPS Location Data – Serial 9600 bps (8V _{o-p})
4	V+ (4V DC – 6V DC)
5	N/A
6	Ground (V+ Return)

Chapter 4: CMM Regulatory and Legal Notices

Important Note on Modifications

Intentional or unintentional changes or modifications to the equipment must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and will void the manufacturer's warranty.

National and Regional Regulatory Notices

U.S. Federal Communication Commission (FCC) Notification

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the US 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 these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

Industry Canada (IC) Notification

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to RSS-210 of Industry Canada. 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 these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

To reduce potential radio interference to other users, the antenna type and its gain should be chosen so its Equivalent Isotropic Radiated Power (EIRP) is not more than that permitted for successful communication.

Equipment Disposal



Waste (Disposal) of Electronic and Electric Equipment

Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or service center for information about the waste collection system in your country.

EU Declaration of Conformity for RoHS Compliance

Cambium hereby, declares that these Cambium products are in compliance with the essential requirements and other relevant provisions of Directive 2002/95/EC, Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

The relevant Declaration of Conformity can be found at <http://www.cambiumnetworks.com/doc.php>

Labeling and Disclosure Table for China

The People's Republic of China requires that Cambium's products comply with China Management Methods (CMM) environmental regulations. (China Management Methods refers to the regulation *Management Methods for Controlling Pollution by Electronic Information Products*.) Two items are used to demonstrate compliance; the label and the disclosure table.

The label is placed in a customer visible position on the product.

- Logo 1 means that the product contains no substances in excess of the maximum concentration value for materials identified in the China Management Methods regulation.
- Logo 2 means that the product may contain substances in excess of the maximum concentration value for materials identified in the China Management Methods regulation, and has an Environmental Friendly Use Period (EFUP) in years, fifty years in the example shown.

Logo 1



Logo 2



The Environmental Friendly Use Period (EFUP) is the period (in years) during which the Toxic and Hazardous Substances (T&HS) contained in the Electronic Information Product (EIP) will not leak or mutate causing environmental pollution or bodily injury from the use of the EIP. The EFUP indicated by the Logo 2 label applies to a product and all its parts. Certain field-replaceable parts, such as battery modules, can have a different EFUP and are marked separately.

Table 33 Disclosure Table for China

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴苯 (PBB)	多溴二苯 (PBDE)
金属部件	×	○	×	×	○	○
□路模□	×	○	×	×	○	○
□□及□□组件	×	○	×	×	○	○
塑料和聚合物部件	○	○	○	○	○	×

表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。

表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。

The Disclosure Table is intended only to communicate compliance with China requirements; it is not intended to communicate compliance with EU RoHS or any other environmental requirements.

RF Exposure Separation Distances

To protect from overexposure to radio frequency (RF) energy, install Cambium radios so as to provide and maintain the minimum separation distances from all persons shown in Table 35.

Table 34 Exposure separation distances

Module Type	Separation Distance from Persons
Radio Module with integrated antenna	At least 20 cm (approx 8 in)
Module with Reflector Dish	At least 1.5 m (approx 60 in or 5 ft)
Module with LENS	At least 0.5 m (approx 20 in)
Antenna of connectorized 5.7 GHz AP	At least 30 cm (approx 12 in)
Antenna of connectorized or integrated 900 MHz module	At least 60 cm (24 in)
Indoor 900 MHz SM	At least 10 cm (4 in)
PMP 320 AP	At least 50 cm (20 in)

For details and discussion of the associated calculations, see the Canopy System Release 9.4.2 User's Guide, available at <http://www.cambiumnetworks.com/support>

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Hardware Warranty in U.S.

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

For warranty assistance, contact the reseller or distributor.

CAUTION

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

CAUTION

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

Limit of Liability

IN NO EVENT SHALL CAMBIUM BE LIABLE TO YOU OR ANY OTHER PARTY FOR ANY DIRECT, INDIRECT, GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR OTHER DAMAGE ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR ANY OTHER PECUNIARY LOSS, OR FROM ANY BREACH OF WARRANTY, EVEN IF CAMBIUM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.) IN NO CASE SHALL CAMBIUM'S LIABILITY EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT.

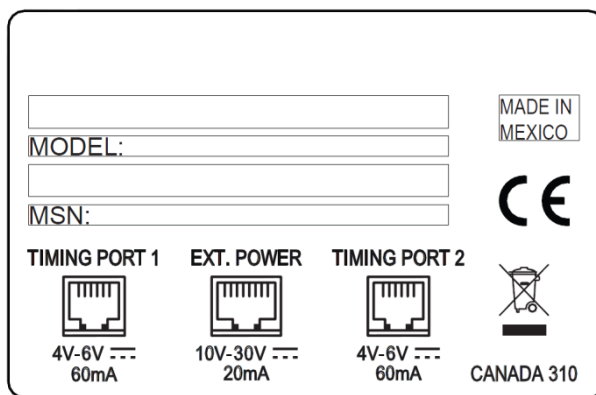
Chapter 5: UGPS Regulatory, Legal, and Safety Notices

IMPORTANT NOTE ON MODIFICATIONS

Intentional or unintentional changes or modifications to the equipment must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and voids the manufacturer's warranty.

Universal GPS module label

Figure 65 UGPS label



NATIONAL AND REGIONAL REGULATORY NOTICES

U.S. Federal Communication Commission (FCC) Notification

This device complies with Part 15 of the US FCC Rules and Regulations. 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the US 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 these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

Industry Canada Notification

This Category II radio communication device complies with Industry Canada Standard RSS-310.

Ce dispositif de radiocommunication de catégorie II respecte la norme CNR-310 d'Industrie Canada.

Operation is subject to the following two conditions:

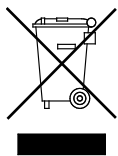
- This device may not cause harmful interference and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device. 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 these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help

Equipment Disposal

Figure 66 Waste disposal of electronic and electric equipment



Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or service center for information about the waste collection system in your country.

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