PCTEL

OPERATION GUIDE

AP-WiFi-1200 Access Point

Rugged Dual-Band 2x2 802.11ac Wave 2 WiFi

AP-WIFI-1200

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Revision History

Version	Description	Date
0.2.0	Initial Version	September 29, 2020
0.3.0	Updated terms	October 12, 2020
0.4.0	Updated installation section Phihong Power Injector P.N.	November 3, 2020

Text Format Conventions

Monotype – Palatino Linotype MONOTYPE, Bold

[Command prompt, directories, files]

Courier New, Bold

[Console commands and input]

Terms and Abbreviations

OFDM	Orthogonal Frequency-division Multiplexing
MU-MIMO	Multi-User, Multiple Input, Multiple Output
DSSS	Direct Sequence Spread Spectrum
CCK	Complementary Code Keying

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

Referenced Documents

Document	Description	Version
PCTEL AP-WiFi-1200 Access Point Datasheet	Rugged Dual-Band 2x2 802.11ac Wave 2 WiFi	1.0

1. Overview

The PCTEL AP-WiFi-1200 Outdoor Industrial Access Point is a robust solution designed to meet the challenges of any outdoor or industrial environment. The 2x2 802.11ac Wave 2 WiFi radios operate in both the 2.4 GHz and 5 GHz bands. A Bluetooth 5.1 radio option is standard. All antennas are external to the enclosure to provide flexibility in selecting the antennas for optimal coverage.

The AP-WiFi-1200 1000/100/10 Mbps wired Ethernet interface provides network connectivity along with power per the 802.3at Type 1 Class 3 Power over Ethernet specification. Data rates of 867 Mbps/114 Mbps are achievable over the 5 GHz and 2.4 GHz radios respectively with an aggregate dual-radio rate of up to 1 Gbps. Low power consumption and high WiFi transmit power make the AP-WiFi-1200 a clear choice for deployments where high performance is needed.

The compact enclosure weighs just over 3.2 pounds (1.45 kg) and is only 5.79" x 7.84" x 2.50". The AP-WiFi-1200 can be deployed in extreme weather environments with an operating temperature range between -40°C and +65°C [+55°C with a full solar loading of 1200 W/m2]. It can also withstand wind gusts up to 165 mph. An IP-67 rating offers extended dust and water protection in most conditions.

Deployment is made easy with simple and convenient mounting options.

This Operation Manual covers AP-WiFi-1200 regulatory domain for United States, Canada and Europe.

2. Features

2.1. Summary

Parameter	Specification
Radios (Dual Band Concurrent)	2.4 GHz: 802.11b/g/n, 2x2:2
	5 GHz: 802.11a/n/ac Wave 2, 2x2:2
Channel Bandwidth	2.4 GHz: 20 MHz, 40 MHz
	5 GHz: 20/40/80 MHz
TX Power	2.4 GHz: 26 dBm Total, 23 dBm per path
	5 GHz: 24 dBm Total, 21 dBm per path
PHY Rate	2.4 GHz: 300 Mbps (40 MHz)
	5 GHz: 866.7 Mbps (80 MHz)
Bluetooth	5.1
Memory (DRAM / NAND / NOR)	1 GB / 256 MB / 4 MB
CPU Clock Speed	717 MHz
CPU Cores	Quad-Core CPU / 4x ARM Cortex A7 (IPQ4029)
Power Consumption	< 13 W
Antenna Ports	WiFi: 4 Single Band Ports, N-connectors
	Bluetooth: 1 Single Band Port, N-connector
Ethernet Interface	1 GbE (PoE, 802.3at Type 1 Class 3): -13 W
Mode Button	Software defined function
Console Port	USB 2.0 Type-B Mini
Size	5.79" x 7.84" x 2.50" (148 x 199 x 64 mm)
Temp Range (Operational)	-40°C to +65°C
	-40°C to +55°C with Full Sun Load
Temp Range (Storage)	-40°C to +85°C
Water/Dust Intrusion	IP-67
Color	Pantone 428C
LED Status Indicator	Software defined operation status
Compliance	FCC, ISED, ETSI

Figure 1. Features Summary

2.2. AP-WiFi-1200 WiFi Features

- Supports IEEE 802.11a/b/g/n and ac Wave 2 standards
- Capable of 2x2, two spatial stream communication concurrently on the 2.4 and 5 GHz bands
- Supports 20/40 MHz at 2.4 GHz and 20/40/80 MHz at 5 GHz
- Supports up to 256 QAM
- Data rates of up to 867 Mbps in 802.11ac 80 MHz channels using reduced (short) guard interval (SGI)
- Supports Multiuser MIMO (MU-MIMO) technology
- Supports Dynamic Frequency Selection (DFS) in required 5 GHz bands
- Maximal likelihood (ML) decoding
- Spatial multiplexing, cyclic-delay diversity (CDD), low-density parity check (LDPC), maximal ratio combining (MRC), and space-time block coding (STBC)
- AMSDU and AMPDU frame aggregation
- Compatible with software encryption of AES at 128/256 bits and DES/3DES
- Compatible with WEP, TKIP hardware encryption or WAPI hardware encryption

2.3. AP-WiFi-1200 WiFi Summary

This SoC implements half-duplex OFDM on both the 2.4 GHz and 5 GHz radios. The 5 GHz radio supports up to 867 Mbps when configured in 802.11ac mode with an 80 MHz bandwidth and short guard interval. It also supports data rates and mandatory features for the 802.11a, 802.11n, and 802.11ac standards. The 802.11ac features supported include explicit transmit beamforming, implicit transmit beamforming, MU-MIMO, dynamic bandwidth switching, maximal likelihood decoding, low-density parity check, maximal ratio combining, space-time block coding.

The 2.4 GHz radio supports up to 300 Mbps when configured in 802.11n mode with a 40 MHz bandwidth and short guard interval. It also supports data rates and mandatory features for the 802.11b, 802.11g, and 802.11n standards. This includes DSSS and CCK data rates for the 802.11b standard and OFDM data rates for the 802.11g and 802.11n standards. Support for Multiple Input Multiple Output (MIMO) with multiple spatial streams and 20 or 40 MHz bandwidths are included per the 802.11n standard.

3. Setup and Configuration

The PCTEL AP-WiFi-1200 is designed for ease of setup and configuration. Out of the box, only settings that are particular to system integration need to be changed as needed. A Web User Interface is provided for access to all system settings. Several typical changes are shown below. See **Section 3.5** for details on the Console Interface.

The pushbutton switch provides two functions. A momentary press of the button will indicate WPS mode. Holding the button for at least five seconds will reset the access point to factory settings.

The access point status is provided by the LED Status Indicator built into the weatherproof pushbutton switch. After power is successfully applied, under normal operation, the LED Status Indicator is green.

Note: *This unit can only be configured to operate as an access point. Since the access point can be installed either indoors or outdoors, it can be operated as either an indoor or outdoor access point. Client mode and bridge mode are not currently supported. The unit cannot be configured to operate in either of these two modes.*

3.1. Packing List

- AP-WiFi-1200 Access Point
- Antennas
  - (3) 2.4 GHz 6 dBi Omni Antenna - Part Number BOA24006NM
  - (2) Dual band 7 dBi Antenna (for 5 GHz radio) - Part Number MHODB24490507NM-IP
- Phihong POE29U-1AT(PL)D-R Power Injector
- Ethernet Cable
- Console Cable
- Installation Accessory Kit - Part Number 11-1110-01
- Mount Kit - Part Number 11-1109-01

3.2. Setup

Only a few steps need to be taken to setup the AP-WiFi-1200. For convenience, all the external ports and pushbutton switch are identified on the enclosure. See **Section 4** for installation details.

1. Connect (2) Identified 2.4 GHz WiFi Antennas
2. Connect (2) Identified 5 GHz WiFi Antennas
3. Connect the 2.4 GHz Bluetooth antenna
4. Attach the AP to the Power Injector and connect the Power Injector to the Ethernet network with the supplied Ethernet cables.
5. Apply power to the Power Injector.
6. The LED Status Indicator will turn on green once the access point is operational. It may take a minute or more to fully boot the Access Point.

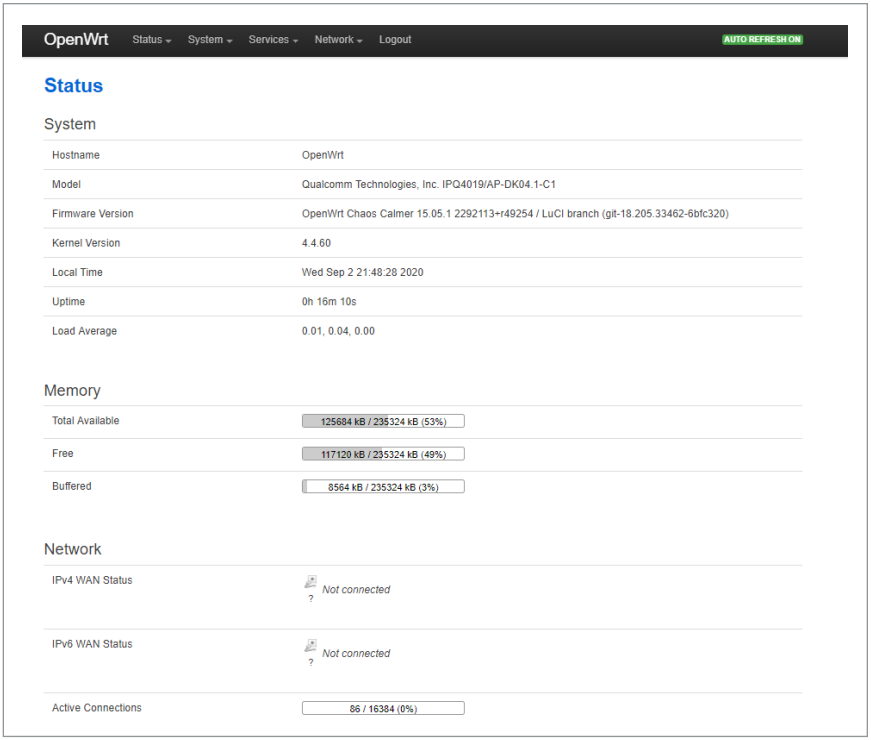
3.3. Web User Interface

To quickly reach the AP-WiFi-1200 information, access the Web UI portal by connecting a computer to the Access Point ethernet port and browse to 192.168.1.1. There you will find everything you need to review the status and modify factory settings.

The default Username is **`root`**. There is no Password set. Be sure to follow the link to set the Username and Password.

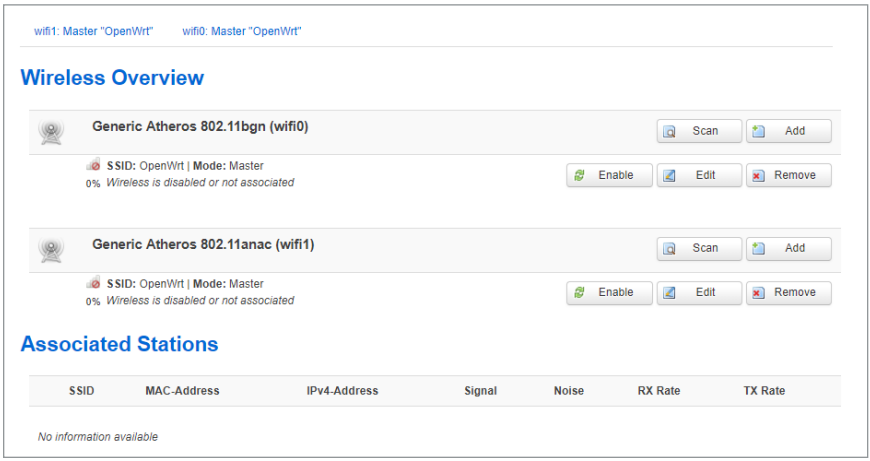
Note: Consider changing the default **192.168.1.1** address so there will not be a conflict once the Access Point is connected to the network.

The Configuration section will explain how to change the Access Point settings.



3.4. Radio Configuration

The PCTEL AP-WiFi-1200 radios can be configured through the Web UI. Be sure the 2.4 GHz radio and the 5 GHz radio are configured as prescribed by the network. From the top bar menu, select Network -> WiFi.



3.5. Console Interface

The Console Interface on the AP-WiFi-1200 uses a weatherproof USB Type-B mini connector. Operating as a serial port, the following settings needed at the connected computer are listed here.

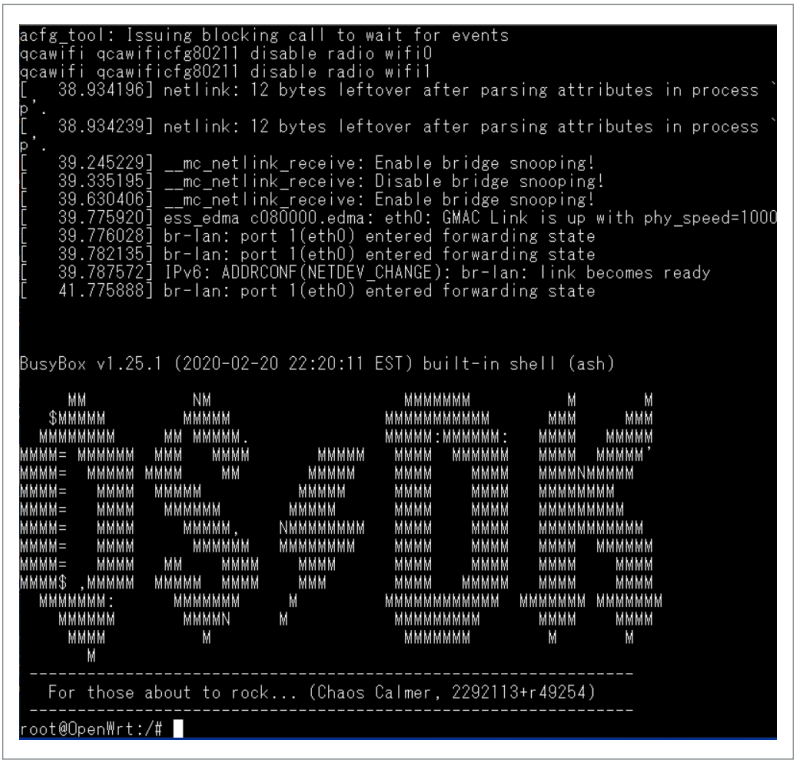
- Baud rate: 115200
- Data: 8 bits
- Parity: none
- Stop: 1 bit
- Flow control: none

After power up, connect the provided USB cable to a computer.

Note: *It is not recommended to connect the USB cable before applying power.*

Set up a console tool like Tera Term with the following information.

Here is OpenWRT displayed on the console.



If you stop Autoboot, you will see U-Boot displayed on the console.

3.6. Factory Configuration

Here is a summary of the Factory Configuration settings. Often these settings are changed to match how and where the Access Point is used.

A. WiFi interfaces are disabled (both 2.4 GHz and 5 GHz radios)

B. Bluetooth radio is disabled.

C. Default Radio Settings

- Radio Mode
- Security
- Channel, 802.11 capability (11n, 11ac, legacy), and channel bandwidth
- SSID
- Enabled/disabled

D. IP address = **192.168.1.1**

If, for any reason, you need to return the Access Point to the out-of-the-box state, follow these instructions.

1. Be sure OpenWRT is running and the LED Status Indicator is green.
2. Press and hold the Pushbutton Switch for at least 5 seconds.
3. Release the Pushbutton Switch.
4. The console will then display:

   RESET TO FACTORY SETTING EVENT DETECTED.
   PLEASE WAIT WHILE REBOOTING THE DEVICE.

5. After rebooting, the Factory Configuration has been restored.

4. Installation

Note: Professional installation only. Follow the guidelines listed.

4.1. Overview

The AP-WiFi-1200 has several features incorporated in the metal enclosure that provide for an excellent outdoor or industrial solution. The access point is IP-67 rated to indicate that the unit is dust-tight (no ingress of dust) and water-tight (no ingress of harmful quantity of water when immersed up to 1 m for 30 minutes). Also, the enclosure has excellent thermal properties for an extended temperature rating.

Other features included are a set of holes for mounting and another set of holes for proper outdoor grounding. There are four mounting holes found on the back of the enclosure for ease of installation. See **Figure 3** for details. In addition, there is a ground pad located on the left side of the enclosure. There grounding wire can be attached as required for proper installation. See **Figure 4** for details.

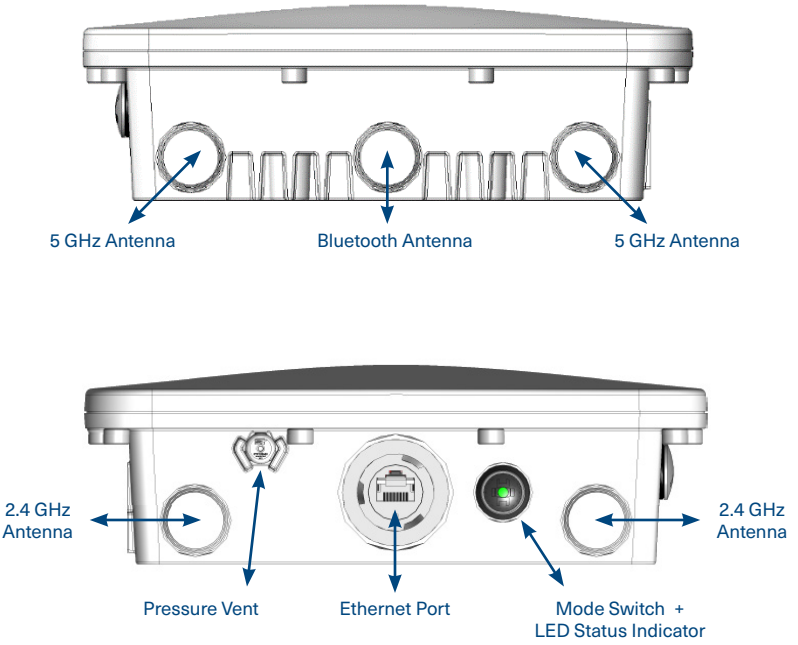


Figure 2. Access Point enclosure Top and Bottom views*

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

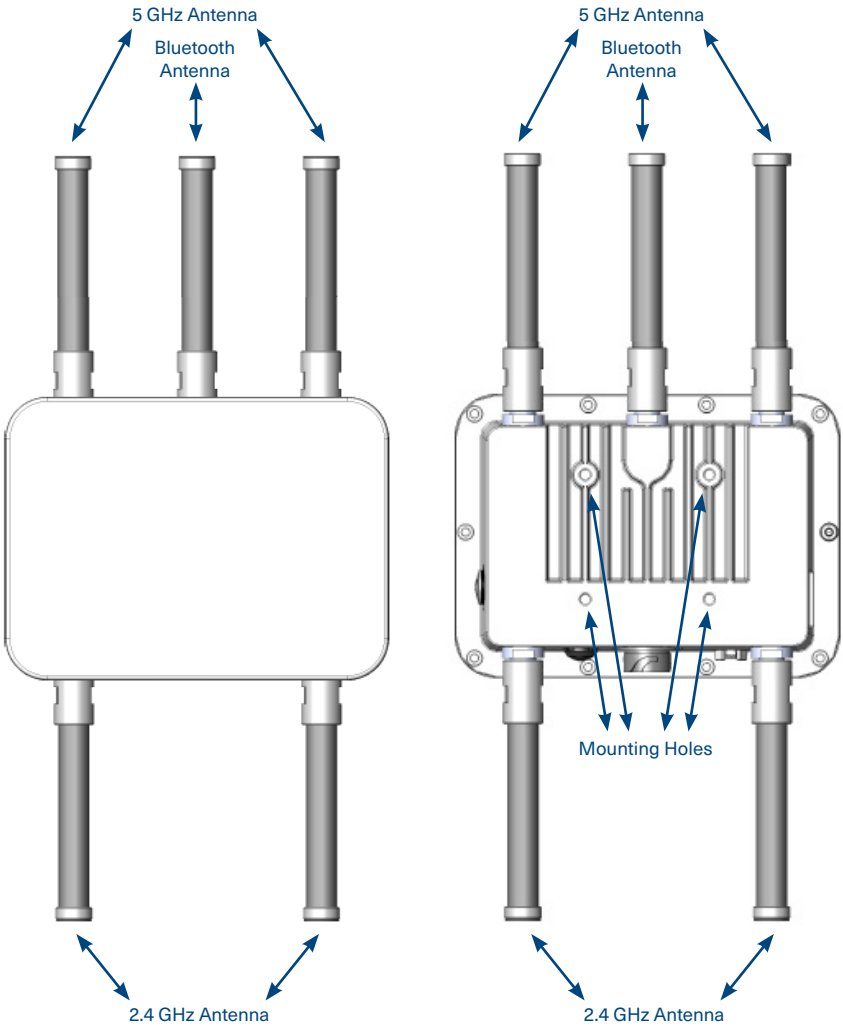


Figure 3. Access Point enclosure Front and Rear views*

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

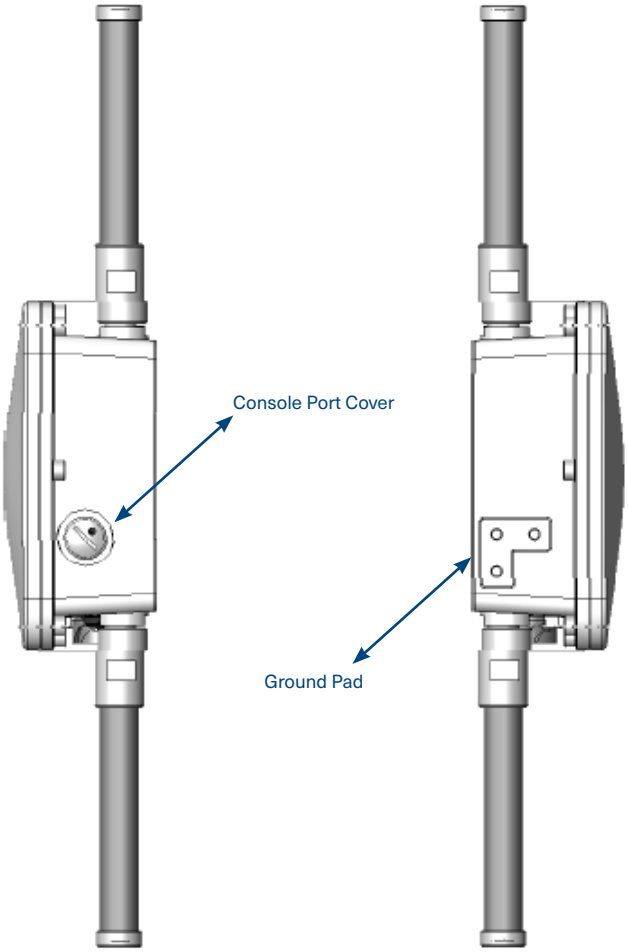


Figure 4. Access Point enclosure Left-side and Right-side views*

4.2. Antenna Installation

In order to properly install and protect the external antennas, a couple of simple steps are recommended. The AP-WiFi-1200 Installation Kit includes Butyl Tape and Joint Compound. Follow package directions to properly seal the antennas and protect them from the outdoor environment.

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

4.3. Mounting Bracket Installation

The supplied mounting bracket provides the option to easily wall mount or pole mount the Access Point. The recommended mounting height is 10 feet [minimum] to 40 feet [maximum]. The Mount Kit includes the hardware called out in this section.

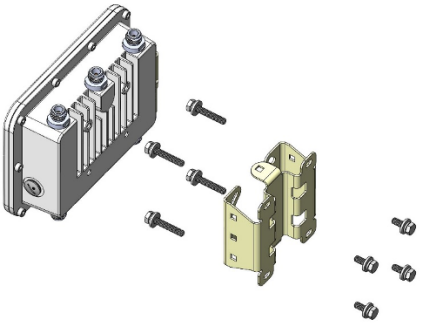
Attach the mounting bracket with included [4x] ¼ -20 x 0.75-inch screws with flat washers and lock washers [included with requested bracket] to the Access Point as shown in the drawings below.

Specific wall mounting screws 4 – [¼ -20 x 1.5-inch] are not supplied as the fastener/ anchor must be adequate for the given building material or mounting structure.

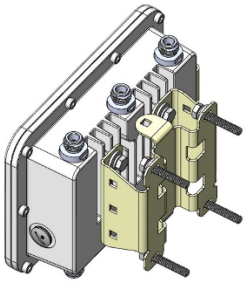
Professional installation is required in order to meet location specific mounting scenarios and options.

4.3.1. Wall Mounting

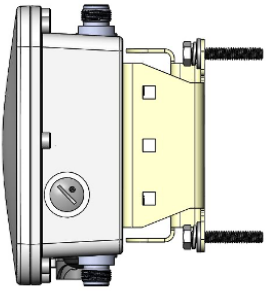
Pictures below shown with suggested wall mounting screws [not included].



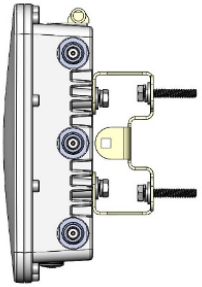
Kit hardware with wall mounting screws [not supplied]



Assembled wall mounting option



Wall mounting option [side view]

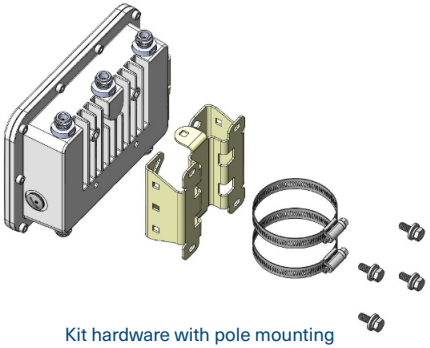


Wall mounting option [top view]

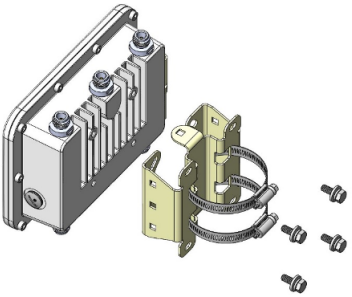
Figure 5. Access Point wall mounting options*

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

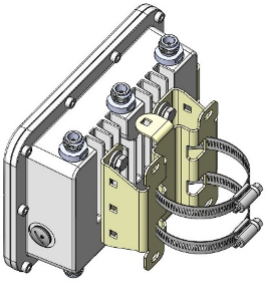
4.3.2. Pole Mounting



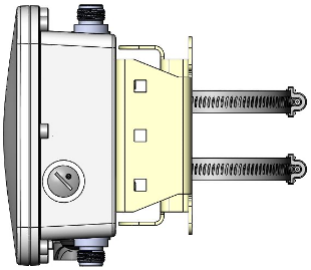
Kit hardware with pole mounting straps shown



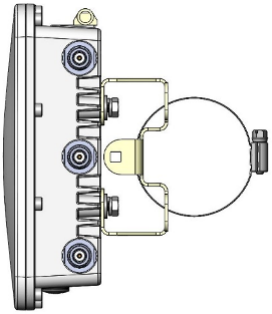
Kit hardware with pole mounting straps installed



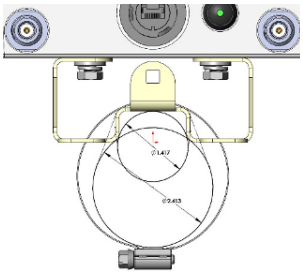
Assembled pole mounting option



Pole mounting option [side view]



Pole mounting option [top view]



Pole mounting option [small and large pole]

Figure 6. Access Point pole mounting options*

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

4.4. Grounding

The Access Point must be grounded before applying power. The following grounding instructions must be followed. See local electrical codes for any additional installation requirements.

Using a 6 AWG copper wire, strip back insulation and connect to the supplied wire ground lug [Panduit LCD6-10A-L]. Attach the ground lug to the AP ground pad using the supplied silicone grease and two screws [#10-32 x 3/8-inch]. Different ground lugs (not supplied) can be used to provide 90° and 45° angle options if needed.

Connect the ground wire to a suitable metal grounding rod. Securely connect the ground wire to provide proper grounding protection. Once the Access Point ground connection is completed, power can then be applied safely.

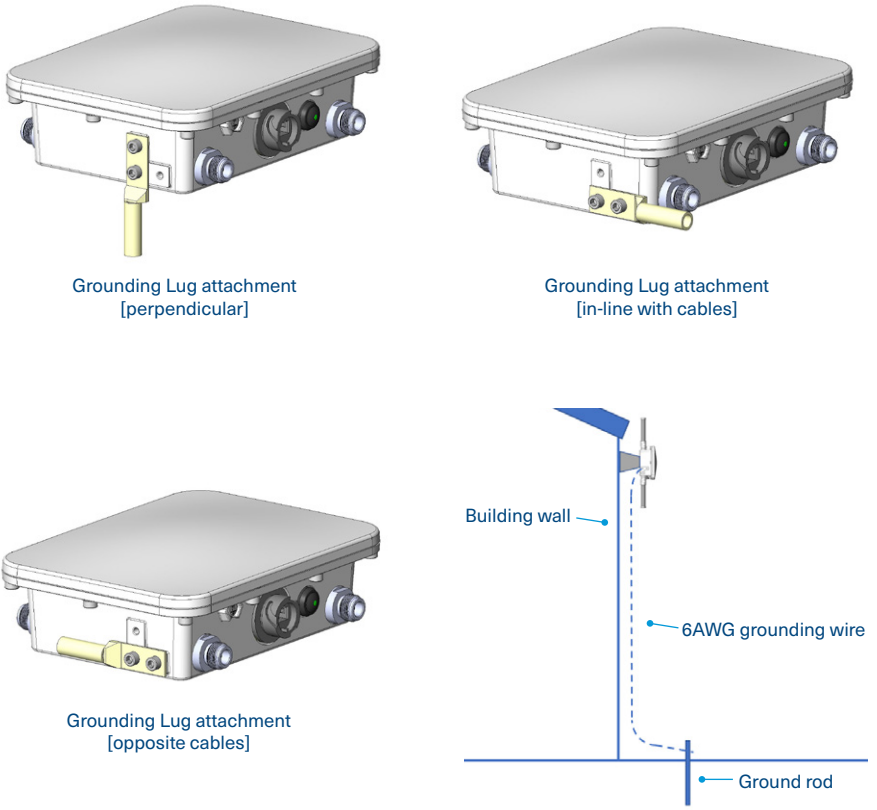


Figure 7. Grounding Lug attachment options*

** This representation of the PCTEL AP-WiFi-1200 enclosure shows the product as currently proposed and is subject to change.*

5. Compliance

Safety
IEC 62368-1
UL/CSA 62368-1

Radio Approvals
FCC Part 15.247, 15.407
EN 300 328
EN 301 893
RSS-210
RSS-247

EMI and Susceptibility
FCC Part 15.107, 15.109
EN 301 489-1, 301 489-17
ICES-003

Figure 8. Compliance

Changes or modifications not expressly approved by PCTEL could void the user's authority to operate the equipment.

FCC Compliance Statement

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

Canadian Compliance Statements

This device contains license-exempt transmitters/receivers that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) L'appareil ne doit pas produire de brouillage. (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fontionnement.

This radio transmitter, 26584-WiFiAP1200, has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio, 26584-WiFiAP1200, a été approuvé par Innovation, Sciences et Développement Économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

PCTEL Model Number	Antenna Type	Gain at 2.4 GHz	Gain at 5 GHz
MHODB24490507NM-IP	Dual-band omni-directional antenna	5 dBi	7 dBi
BOA24006NM	2.4 GHz omni-directional antenna	6 dBi	NA

Note: *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

6. Safety Notices

This section lists the product safety notices for the AP-WiFi-1200. Please follow all safety notices to ensure proper installation and operation.

A. Only trained and qualified personnel should be allowed to install, replace or service this product.

B. Before connecting the product to the power source, read all installation instructions.

C. Per Section 5, this product must be properly grounded before operating. Follow local guidelines per an electrician.

D. The ground connection must always be made first when installing the product and disconnected last when removing the product.

E. Product installation must comply with all national and local electrical codes.

F. Do not install or remove the product, and do not connect or disconnect any cables or antennas during the time when lightning activity is present.

G. Product disposal should be handled in accordance with all laws and regulations.

7. Product Usage

THE PRODUCTS ARE NOT DESIGNED, MANUFACTURED, OR INTENDED FOR USE, ALONE OR WITH OTHER PRODUCTS, IN ANY APPLICATION REQUIRING FAIL-SAFE PERFORMANCE OF THE PRODUCTS AND/OR IN WHICH A MALFUNCTION OR A FAILURE OF THE PRODUCTS COULD LEAD TO DEATH, PERSONAL INJURY, OR SERIOUS PHYSICAL OR ENVIRONMENTAL DAMAGE, INCLUDING BUT NOT LIMITED TO (A) LIFE SUPPORT MACHINES OR OTHER LIFE PRESERVING MEDICAL DEVICES OR SYSTEMS; (B) AIR TRAFFIC CONTROL OR AIRCRAFT SYSTEMS; (C) CONTROL EQUIPMENT FOR NUCLEAR OR OTHER POWER GENERATION FACILITIES; OR (D) MISSILE, NUCLEAR, BIOLOGICAL, OR CHEMICAL WEAPONS, OR OTHER MILITARY APPLICATIONS (EACH A "PROHIBITED USE").

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Need help?

For additional information on the AP-WiFi-1200 Access Point, please contact

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