

# TELEFONIX PDT

## ***Cabin Ace-2™ User's Manual***

Version 1.0.3



Telefonix  
Inflight Entertainment and Connectivity Systems

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# 1 User Information

This User's Manual describes the features supported by Telefonix PDT Cabin Wireless Access Point (CWAP), Wave 2, branded as *Cabin Ace-2™* and provides detailed instructions for setting up and configuring the Cabin ACe-2 wireless access point.

This guide is intended for administrators who configure and use Cabin ACe-2.

## 1.1 Support Documentation

In addition to this document, the following table describes Telefonix PDT support documentation:

*Table 1: Telefonix PDT Support Documentation*

Document Number	Description
E71-308-01-OL	Outline Drawing, CWAP, Wave 2
PS-E71-308-01	Product Specification, CWAP, Wave 2
CMM-44-20-29	Component Maintenance Manual (CMM), CWAP, Wave 2
ATP-E71-308-01	Acceptance Test Procedure (ATP), CWAP, Wave 2
FMEA-E71-308-01	Failure Modes and Effects Analysis (FMEA), CWAP, Wave 2
QR-E71-308-01ENV (Retrofit)	Environmental Qualification Test Report, CWAP, Wave 2
QR-E71-308-01EMI (Retrofit)	Electromagnetic Interference (EMI) Qualification Test Report (QR), CWAP, Wave 2

Cabin ACe-2 ships with Aruba Instant firmware version 6.4.4.4-4.2.3.2\_54910. The following table describes the applicable Aruba support documentation for this firmware version.

*Table 2: Aruba Support Documentation*

Document Name	Description
Aruba Instant 6.4.4.4-4.2.3.0 User Guide	This User Guide describes the features supported by Aruba Instant and provides detailed instructions for setting up and configuring the Instant network.
Aruba Instant 6.4.4.4-4.2.3.0 CLI Reference Guide	This document describes the Aruba Instant command syntax and provides information for each Command.

## 1.2 Industry Standards

Table 3: Industry Standards

Industry Standard	Description
ARINC 628	Cabin Equipment Interfaces, Part 1, Interfaces, Cabin Management and Entertainment Systems - Peripherals
IEEE 802.11	A set of media access control (MAC) and physical layer (PHY) specifications for implementing wireless local area network (WLAN) computer communication in the 900 MHz and 2.4, 3.6, 5, and 60 GHz frequency bands.
IEEE 802.3	A set of media access control (MAC) and physical layer (PHY) specifications for implementing wired local area network (LAN) computer communication.
RTCA/DO-160G	Environmental Conditions and Test Procedures for Airborne Equipment RTCA/DO-178B Software Considerations in Airborne Systems and Equipment

## 1.3 Warranty

The Cabin ACe-2 is warranted against defects in materials and workmanship for the warranty period from the date of shipment. The warranty does not apply to defects resulting from improper or inadequate maintenance of handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specification of improper installation or maintenance. Telefonix PDT will not be responsible for any defects or damages to other products not supplied by Telefonix PDT that are caused by a faulty Telefonix PDT product.

## 1.4 Exclusion of Liability Notice

Should the user disregard the instructions (specifically the safety instructions) in this manual and possibly on the device, Telefonix PDT shall be exempt from legal liability for accidents.

In the event of damage to the device, which is caused by a failure to observe the instructions (specifically the safety instructions) in this manual and possibly on the device, Telefonix PDT shall not be required to honor the warranty, including during the warranty period, and shall be exempt from legal liability of accidents.

## 2 Important Safety Instructions

The following general instructions should always be followed in order to assure the proper operation of Cabin ACe-2, the safety of operators and the preservation of warranty coverage.

	<b>Warning!</b> All precautions, procedures, and safeguards to prevent damage due to ESD, and promote the safe handling of electronic components must be followed.
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1. Avoid removing any identification plates, serial numbers or warning labels unless specifically authorized by the manufacturer.
2. Please observe all specified dimensions required for mounting included in the Outline Drawing, Telefonix PDT Document E71-308-01-OL.
3. When installing the Cabin ACe-2, there must be at least 1.00" free space to the left, right, top and rear of the unit to prevent the system overheating.
4. Leave at least 3.00" of free space to the front of the unit in order to have access to the connector interfaces to properly connect the peripherals.
5. Attach the Cabin ACe-2 firmly to a clean flat and solid mounting surface. Use proper fastening materials suitable for the mounting surface. Ensure that the mounting surface type and the mounting solution safely support the load of the Cabin ACe-2 and the attached components.
6. Follow the local/national regulations for grounding. A ground bonding measurement between the Cabin ACe-2 and the mounting surface should be conducted to ensure proper safety and EMI characteristics are maintained.
7. The voltage feeds must not be overloaded. Adjust the cabling and external overcharge protection to correspond with the electrical data indicated on the type label. For detailed interconnection of power and signal wiring, refer to the Section 4 (Starting Up) and Section 5 (Physical I/O).
8. Electrostatic Discharge (ESD)



Electrostatic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspection of this product, in order to ensure product integrity at all times. Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.



A sudden electrostatic discharge can destroy sensitive components. Proper packaging and grounding rules must be observed. Always take the following precautions.

- Keep electrostatically sensitive components in their containers, until they arrive at an electrostatically protected workplace.
- Only touch electrostatically sensitive components when you are properly earthed.
- Store electrostatically sensitive components in protective packaging or on anti-static mats.

## 3 Introduction

### 3.1 Product Description

The Telefonix, Inc. Cabin Wireless Access Point (CWAP) is a network distribution system designed specifically for commercial aircraft applications. The CWAP supports IEEE 802.11ac, Wave 2 functionality, and is backwards compatible with 802.11a/b/g/n. The CWAP leverages the use of a COTS wireless access point to facilitate wireless communications to wireless client radios in the aircraft cabin, as well as other devices on the network. The CWAP provides a bridge between IEEE 802.3 wired Ethernet LANs and IEEE 802.11a/b/g/n/ac compliant wireless networks.

The unit is provided with aircraft level discrete inputs and outputs to facilitate event notification to and from other aircraft systems, including remote management of the ON/OFF function. The unit is equipped with an aircraft grade AC power supply capable of operating from 115VAC, 360 Hz – 800 Hz power with a 200 millisecond hold-up capability for power interruptions. The CWAP does not require active cooling system. The unit communicates to a host server by physical connection over a Gigabit Ethernet wired interface either in a “Daisy chain” or “Star” network topology environment.

This Product Specification pertains to a CWAP with integrated antennas supporting both 2.4GHz and 5GHz bands.

This unit is identified as Telefonix PDT/P/N: E71-308-01 and is branded as *Cabin Ace-2<sup>TM</sup>*.

### 3.2 Hardware Architecture

The CWAP leverages a state-of-the-art, commercial enterprise-class Wireless Access Point (AP). The AP selected for this application is manufactured by Aruba Networks, a Hewlett Packard Enterprise company. The Aruba model IAP-325 has been ruggedized and repackaged to meet the operational requirements of commercial aircraft environment. The CWAP meets the electrical and mechanical requirements of ARINC 628.

The Cabin ACe-2 feature set includes:

- IEEE 802.11ac, Wave 2 based architecture.
- Dual radios for 2.4GHz and 5.8GHz (all U-NII channelization) simultaneous operation.
- 4x4 SU-MIMO, 4 spatial stream operation.
- 3x3 MU-MIMO, 3 spatial stream operation.
- Integrated antennas with adaptive beam forming for enhanced throughput capabilities
- Support for up to 255x associated clients devices per radio and 16x BSSID per radio
- Fully autonomous without requiring a separate wireless controller
- Support for World Wide (-WW) operation via the CLI which can automatically configure the CWAP in accordance with location information (provided by the aircraft) to pre-set regulatory domains (country codes) stored within the CWAP
- Discrete Inputs to control remote ON/OFF and RF Enable
- Discrete output for PSU and AP status
- IP Address strapping bits
- Support for input power pass thru to downstream CWAPs
- Aircraft grade AC power supply unit with 200 milliseconds of hold-up capacity

- Support for pass thru Ethernet to downstream CWAPs
- Redundant power supply (on SIB) to support Ethernet by-pass in the event of a CWAP power supply failure
- Lightweight and compact electro-mechanical packaging
- Connectors:
  - EN4165 style connectors for all I/O (per ARINC 628)
  - Micro USB for serial console connection

### 3.3 Key Hardware Components

The CWAP key hardware components include:

- Commercial Aruba AP “engine” with integrated antennas
- Signal Interface Board (SIB)
- Main AC/DC Power Supply Unit (PSU 1)
- SIB AC/DC Power Supply Unit (PSU 2)
- External connectors Interface for Power, Ethernet, Discrete I/O (per ARINC 628)
- Mechanical Housing per ARINC 628

Figure 1 shows the CWAP System Block Diagram.

(Intentionally Left Blank)

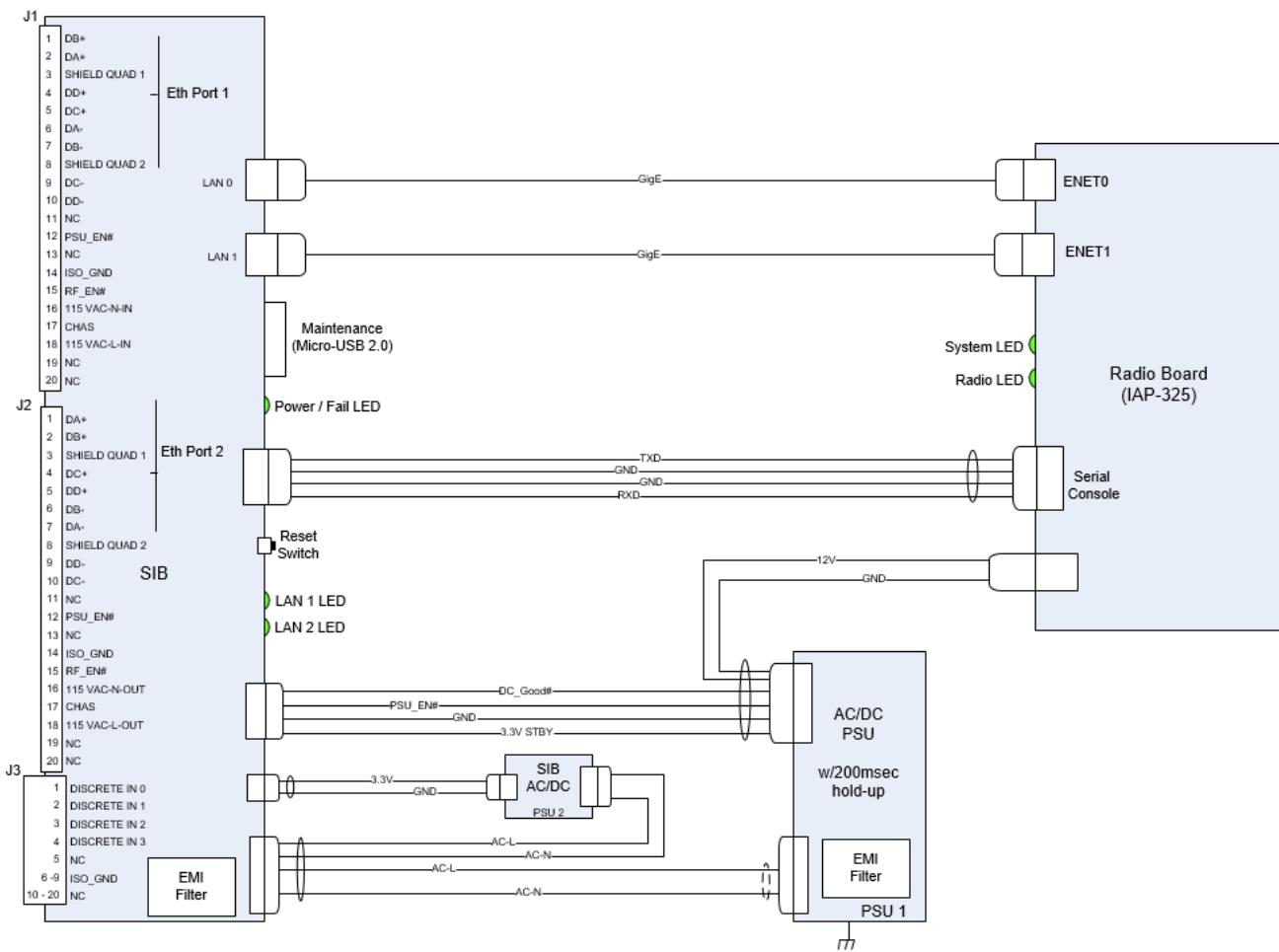
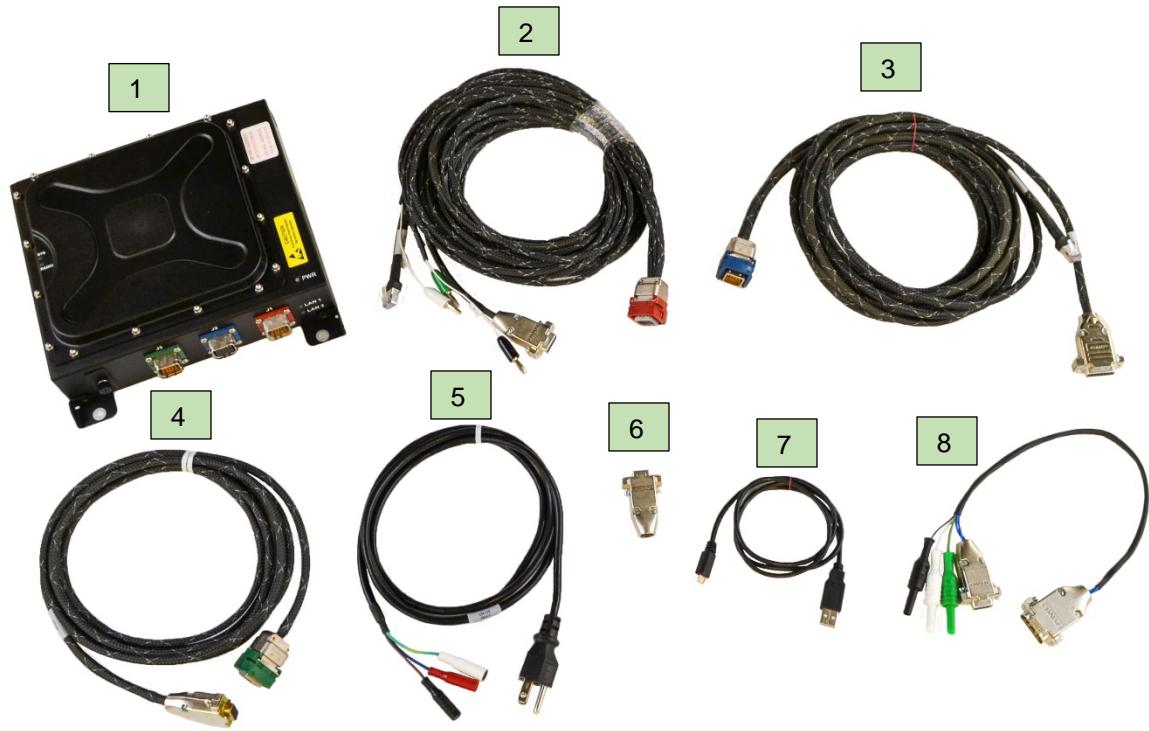


Figure 1: CWAP Wave 2 System Block Diagram

### 3.4 Orderable Part Numbers

Table 4: Cabin ACe-2 Orderable Part Numbers

ID	Telefonix P/N	Description
1	E71-308-01	LRU, CWAP Wave 2
2	E54-331	Cable Assy, Power/Signal/GbE, CWAP (J1)
3	E54-332	Cable Assy, Power/Signal/GbE, CWAP (J2)
4	E54-333	Cable Assy, Discretes, CWAP (J3)
5	E54-319	Cable Assy, AC Power Disconnect
6	E54-345	DB-9 Loop-back Test Connector (J1)
7	Assmann WSW Components P/N AK67421-5 or equivalent	USB Type A Male to Micro-USB Type B Male Cable
8	E54-352	Cable Assy, Daisy chain



*Note: Items 2 – 6 are available for test purpose and are not intended to be used in flight.*

*Figure 2: Cabin ACe-2 Equipment*

## 4 Starting Up

### 4.1 Power Up

The J1 power cable assembly, Telefonix PDT P/N E54-331, and DB-9 loop-back connector, Telefonix PDT P/N E54-345, are required to be connected to the Cabin ACe-2 to turn on when power is applied.

	<p><b>WARNING!</b></p> <p>The specified voltage input range is 97 to 134 VAC, 60 – 800 Hz, single-phase power.</p> <p>DO NOT connect to 220 VAC.</p> <p>The power source must supply a minimum of 20W.</p> <p>The power source must be switched off via AC power disconnect, Telefonix PDT P/N E54-319, and must be easily accessible.</p> <p>Ambient temperature must be above -20 °C for the CWAP to turn on.</p> <p>Power is not switched internally and the unit will boot up as soon as power is applied.</p>
---	--

Properly connect Telefonix PDT P/N E54-331 to the CWAP J1 connector. The power source must be switched off via AC Power disconnect, Telefonix PDT P/N E54-319, to make sure that no voltage is present at the terminal during the connecting procedure. Plug the DB-9 loopback connector, Telefonix PDT P/N E54-345, to the mating connector of J1, E54-331 cable assembly.

Connect the other end of the power cord to the power source (not provided). Switch on the power source via the AC power disconnect.

### 4.2 Startup process

The CWAP needs two IP addresses for network connectivity, one for the access point and one for the Signal Interface Board (SIB). The four discrete IP strapping pins in the J3 connector are set to HIGH (+5v DC) by pull up resistors, and can be grounded to set static IP addresses, by default the CWAP is configured as a DHCP client, and will request two IP address from the network DHCP server. If no DHCP server responds to the request then auto configuration will assign an address to the AP on the 169.254.0.0 255.255.0.0 network (the SIB will continue to send DHCP requests).

*Note: The IP strapping bits are read by the CWAP at power up and will over-write any static IP assignment made in the Aruba GUI. This behavior persists even when interface J3 is not connected.*

## 4.2.1 Boot Up

### 4.2.1.1 SIB Boot Up

The SIB runs both the bootloader and application firmware components upon powering on the unit. There is a two (2) second delay before the firmware loads to allow the bootloader to check for the presence of a SIB firmware upgrade.

During startup, the firmware performs a Power On Self-Test (POST), queries the discrete pins, and reads the SIB configuration and manufacturing data from an internal EEPROM. After the boot process completes there is a five (5) second window in which you may be asked to enter SIB command mode by your technical service representative. The console output of the SIB boot process is shown in Figure 3, the **[Boot Complete]** prompt indicates the beginning of the five (5) second delay.

```
SIB: Booting firmware [version]: v1.3.1

SIB: SW Build date: Mar 17 2017 21:01:35
SIB: Disabling switch port 4
SIB: Initializing EEPROM Cache

SIB: Current run time = 16034
SIB: which is 1336 hours, 10 minutes
SIB: Starting POST Tests
SIB: POST: WIZ CHIP Test PASS
SIB: POST: ESWITCH Test PASS
SIB: POST Tests Complete, All Tests Passed

SIB: SIB MAC: f0:ac:d7:44:55:66
SIB: IP Config Mode is: [Set Addr mode - Standard Map]
SIB: Address pins: 0xe offset: 0xe
SIB: Using static IP Addresses
SIB: ARUBA IP Base address: 192.168.10.10 offset: 0x0e
SIB: ARUBA:
SIB: IP      : 192.168.10.24
SIB: Net Mask : 255.255.255.0
SIB: Gateway  : 192.168.10.1
SIB: SIB:
SIB: IP      : 192.168.10.40
SIB: Net Mask : 255.255.255.0
SIB: Gateway  : 192.168.10.1

SIB: PSU EN#      : 0
SIB: RF EN#      : 0
SIB: RESET#      : 1
SIB: TEMP_GOOD#  : 0
SIB: DC_GOOD#    : 0
SIB: ARUBA_POWER_EN# : 0
SIB: ADDR 0       : 0
SIB: ADDR 1       : 1
SIB: ADDR 2       : 1
SIB: ADDR 3       : 1
SIB: BOARDREV 0   : 1
SIB: BOARDREV 1   : 0
SIB: BOARDREV 2   : 0

SIB: [Boot Complete]
```

Figure 3: Example Console Output of the SIB Boot Process

#### 4.2.1.2 Access Point (AP) Boot

Following SIB boot, the firmware boots the Aruba AP. During startup, the AP provides an auto-boot countdown prompt that allows you to interrupt the normal startup process and access **apboot** mode. The SIB firmware uses this mode to set the IP address configuration as defined by the IP strapping pins, then starts a ten (10) second inactivity counter to allow user access to apboot.

The console output of the AP boot process is shown in Figure 4, the **apboot>** prompt indicates the beginning of the ten (10) second counter.

```
APBoot 1.5.5.5 (build 55373)
Built: 2016-06-09 at 11:36:40

Model: AP-32x
DRAM: 491 MB
SF: Detected MX25U3235F with page size 64 kB, total 4 MB
Flash: 4 MB
NAND: 132 MiB
PCIE0: link up
PCIE1: link up
    dev fn venID devID class  rev      MBAR0      MBAR1      MBAR2      MBAR3
    00 00 168c 0040 00002    00 00000004 00000000 00000000 00000000
    dev fn venID devID class  rev      MBAR0      MBAR1      MBAR2      MBAR3
    00 00 168c 0040 00002    00 00000004 00000000 00000000 00000000
Power: DC
In: serial
Out: serial
Err: serial
Net: SIB: checkstate: Aruba links OK
eth0, eth1
Radio: qca9990#0, qca9990#1
Resto stop autoboot: 0
SIB: Current pins: 0x0e
SIB: Setting Aruba for static IP mode

SIB: Setting Aruba IP address to 192.168.10.24
SIB: Setting Aruba IP netmask to 255.255.255.0
SIB: Setting Aruba IP gateway to 192.168.10.1
SIB: Success setting ARUBA IP in apboot mode
setenv ipaddr 192.168.10.24
apboot> setenv netmask 255.255.255.0
apboot> setenv gatewayip 192.168.10.1
apboot> save
Saving Environment to Flash...
Erasing flash...
writing to flash... .....done
apboot>
```

Figure 4: Example Console Output of the AP Boot Process

While in **apboot** mode you have access to the following commands:

?	- alias for 'help'
boot	- boot the OS image
clear	- clear the OS image or other information
date	- get/set/reset date & time
dhcp	- invoke DHCP client to obtain IP/boot params
factory_reset	- reset to factory defaults
help	- print online help
mfginfo	- show manufacturing info
ping	- send ICMP ECHO_REQUEST to network host
printenv	- print environment variables
purgeenv	- restore default environment variables
reset	- Perform RESET of the CPU
saveenv	- save environment variables to persistent storage
setenv	- set environment variables
tftpboot	- boot image via network using TFTP protocol
upgrade	- upgrade the APBoot or OS image
version	- display version

The **setenv** command can be used to set the environment variables listed below. Enter commands one per line, replacing the equal sign with a space. To clear an environment variable, enter the variable name followed by <CR>.

```
bootdelay=2
baudrate=9600
autoload=n
boardname=Talisker
servername=aruba-master
bootcmd=boot ap
autostart=yes
bootfile=mips32.ari
ethaddr=d8:c7:c8:XX:XX:XX
os_partition=0
ethact=eth0
gatewayip=192.168.1.1
netmask=255.255.255.0
dnsip=8.8.8.8
name=IAP105
domainname=arubanetworks.com
ipaddr=192.168.1.101
stdin=serial
stdout=serial
stderr=serial
```

### 4.3 IP Strapping Table

In IP Strapping mode the Cabin ACe-2 will get two IP address assigned on the 192.168.10.0/24 network with the default gateway address 192.168.10.1. The IP addresses that will be assigned are shown in Table 5.

Table 5: IP Strapping Table

Addr 3	Addr 2	Addr 1	Addr 0	AP IP Address	SIB IP Address
OPEN	OPEN	OPEN	OPEN	DHCP	DHCP
OPEN	OPEN	OPEN	GND	192.168.10.24	192.168.10.40
OPEN	OPEN	GND	OPEN	192.168.10.23	192.168.10.39
OPEN	OPEN	GND	GND	192.168.10.22	192.168.10.38
OPEN	GND	OPEN	OPEN	192.168.10.21	192.168.10.37
OPEN	GND	OPEN	GND	192.168.10.20	192.168.10.36
OPEN	GND	GND	OPEN	192.168.10.19	192.168.10.35
OPEN	GND	GND	GND	192.168.10.18	192.168.10.34
GND	OPEN	OPEN	OPEN	192.168.10.17	192.168.10.33
GND	OPEN	OPEN	GND	192.168.10.16	192.168.10.32
GND	OPEN	GND	OPEN	192.168.10.15	192.168.10.31
GND	OPEN	GND	GND	192.168.10.14	192.168.10.30
GND	GND	OPEN	OPEN	192.168.10.13	192.168.10.29
GND	GND	OPEN	GND	192.168.10.12	192.168.10.28
GND	GND	GND	OPEN	192.168.10.11	192.168.10.27
GND	GND	GND	GND	192.168.10.10	192.168.10.26
Open=1	Gnd=0				

### 4.4 Connecting using the Console Port

The integrated USB to UART provides console access via the micro USB port that is located behind the maintenance door. Use these settings to connect to the console:

Port	COM*
Baud rate	9600
Data	8 bit
Parity	None
Stop	1 bit
Flow Control	None

\* Select the newly added USB Serial Port

Connecting to the console port gives you access to SIB boot, AP boot, SIB command mode, and the Aruba Instant Access Point (IAP) Command Line Interface (CLI).

The IAP CLI becomes available after completion of the startup process, and requires administrator credentials to start a session. The default credentials are:

*User:* admin  
*Password:* admin

After login, the privileged command mode is enabled which provides access to **show**, **clear**, **ping**, **traceroute**, and **commit** commands. The configuration commands are available in the configuration (config) mode. To move from privileged mode to the configuration mode, enter the following command at the command prompt:

```
(Cabin Ace) # configure terminal
```

The configure terminal command allows you to enter the basic configuration mode and the command prompt is displayed as follows:

```
(Cabin Ace) (config) #
```

Some commands in configuration mode allow you to enter into a sub-mode to configure the commands specific to that mode. When you are in a configuration sub-mode, the command prompt changes to indicate the current sub-mode.

You can exit a sub-command mode and return to the basic configuration mode or the privileged Exec (enable) mode at any time by executing the **exit** or **end** command.

You can use the question mark (?) to view the commands available for your current mode.

Refer to the *Aruba Instant 6.4.4.4-4.2.3.0 CLI Reference Guide*, for additional information on the IAP CLI.

## 4.5 Connecting using Web-based GUI

You can connect to the web-based GUI by entering the Aruba AP's IP address in a web browser, and entering the Username and Password when prompted as shown below in Figure 5. If the IP strapping pins have not been set, you can use the **show ip interface** CLI command to display the IP address that was assigned by your DHCP server

*Note: The following subsections refer to the [Aruba] IAP, or AP which shall be used interchangeably with the CWAP. The sections are summarized from Aruba Instant documentation and training materials. For additional information refer to the Aruba Instant 6.4.4.4-4.2.3.0 User Guide.*

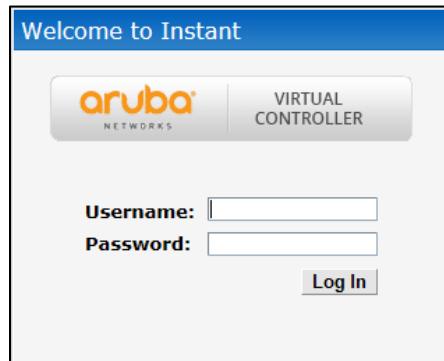


Figure 5: Aruba Instant GUI Login Prompt

You may see a Certificate Error message, this is because the certificates issued to the AP do not match the IP address used to connect to the GUI. It is recommended that you add a certificate issued by your network, to ensure secure administrative communication.

The main GUI page is broken up into the following six sections. These sections are identified below in Figure 6.

1. **Networks** – Show all the wireless networks associated with this cluster.
2. **Access Points** – Shows all the access points in the cluster, the \* indicates the Virtual Controller.
3. **Clients** – Shows all the clients connected to access points in this cluster.
4. **Instant AP information** – Basic information on the Virtual Controller of this cluster.
5. **RF Dashboard** – Gives you a view of all clients RF signals and other issues.
6. **Usage Trends** – Shows all the clients and throughput generated by all the clients on this cluster.

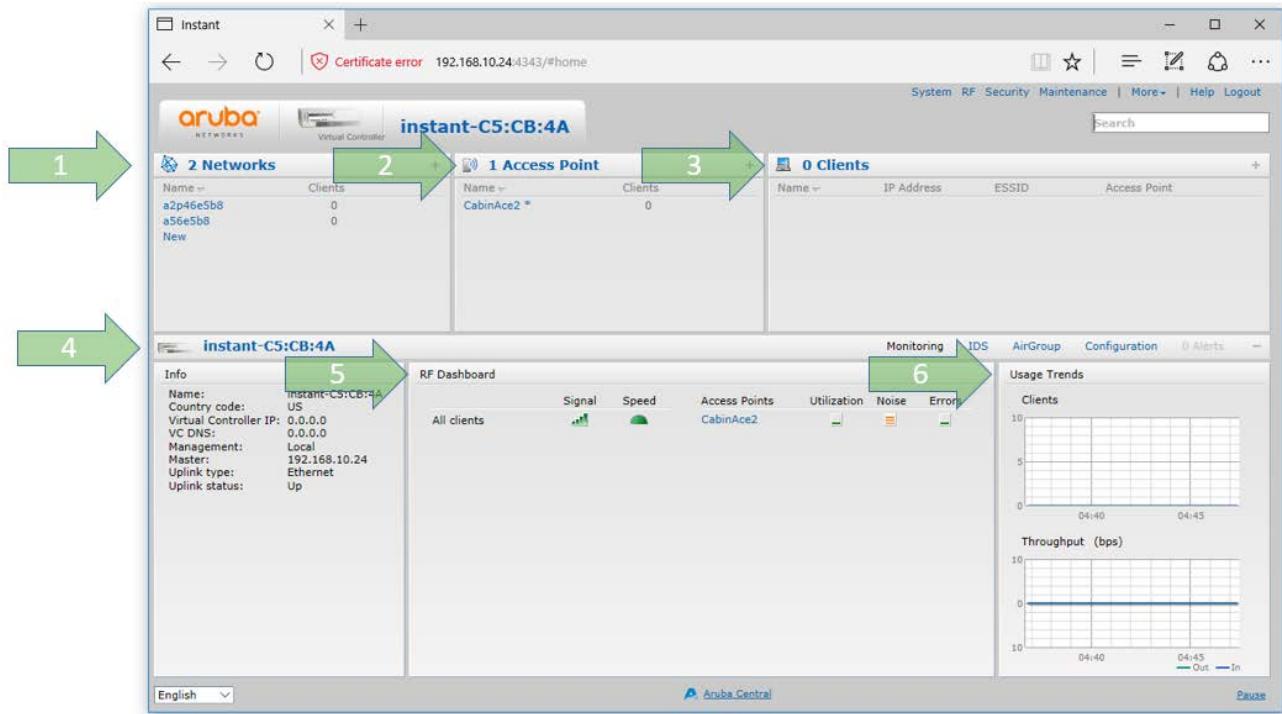


Figure 6: The Six Sections of the Aruba Instant Main GUI Page

#### 4.5.1 System Username and Password

The default system username and password are *admin* / *admin*, it is recommended that these be changed. The system username and password can be changed from the Admin tab of the System dialog box, as shown in Figure 7.

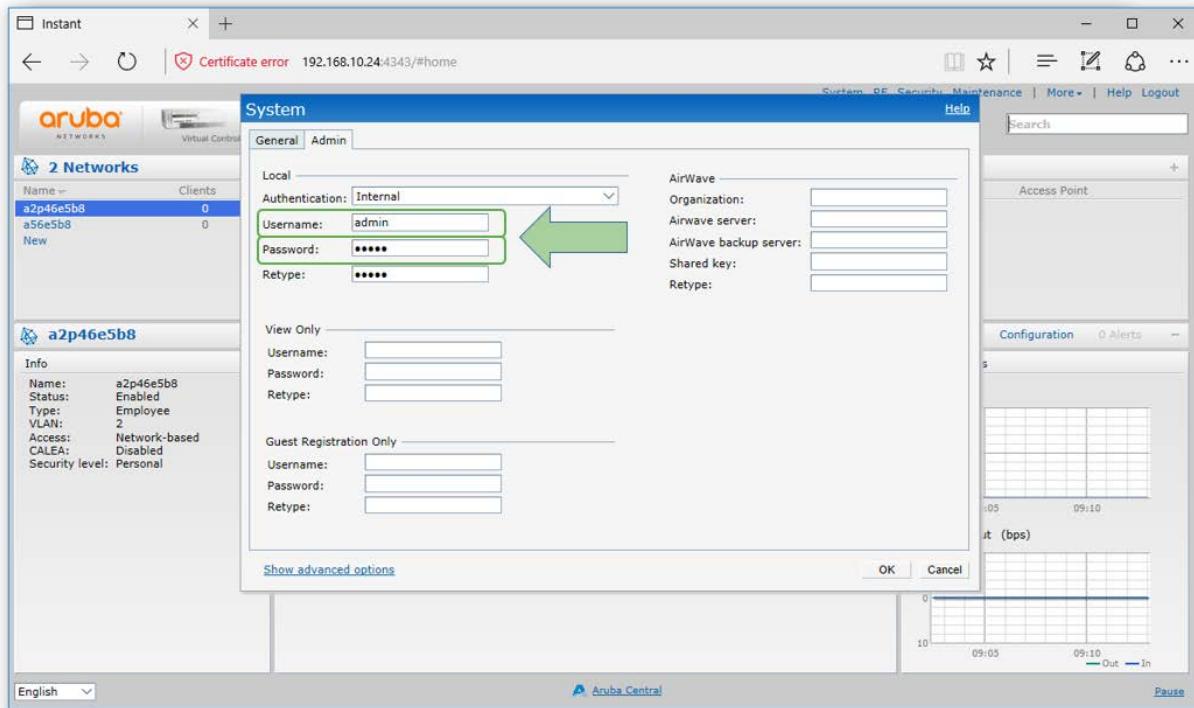


Figure 7: The System Username and Password can be changed on the Admin tab of the System Dialog Box.

## 4.6 Virtual Controller Architecture

The Aruba IAPs use a Virtual Controller architecture for ease of deployment and centralized wireless network management. IAPs in the same subnet will form a cluster, in each cluster a virtual controller is elected. Normally the first IAP in the subnet will become the virtual controller. If the IAP running the virtual controller should fail, then another IAP will elect itself as the virtual controller.

All configuration is done on the virtual controller and pushed down to all the IAPs in the cluster. All the IAPs in the cluster will advertise the same SSIDs. Zones can be created within a cluster to specify specific SSIDs on specific IAPs.

Entering the IP address of any access point in the cluster will redirect you to the virtual controller. You can set the name of the virtual controller along with the virtual controller static address from the General tab of the System dialog box, as shown in Figure 8 below. The name and the IP address of the virtual controller will always be static information no matter which IAP becomes the virtual controller.

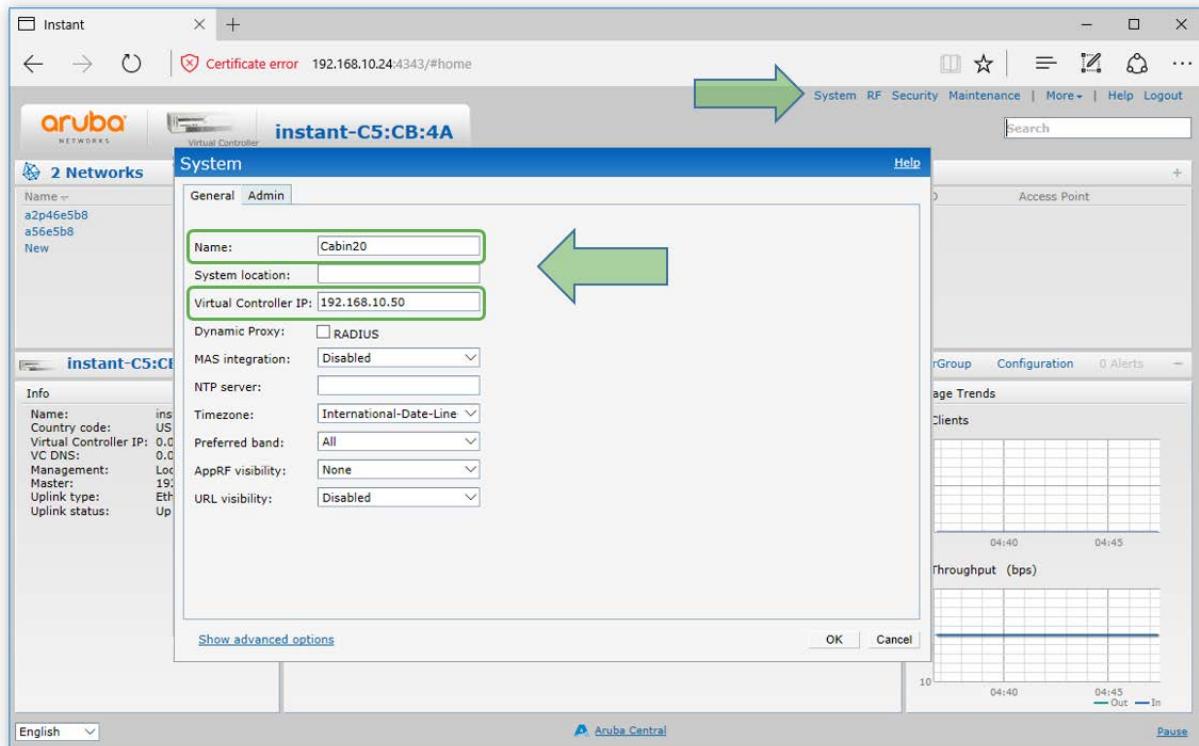


Figure 8: The Virtual Controller Name and Static IP Address can be set in the System Dialog Box.

#### 4.6.1 IAP Configuration

On the main GUI page you can select one of the IAPs and then select edit. You should give each of your IAPs a relevant name for easy identification. You can also select which IAP will be the preferred master. Whichever IAP is configured as the preferred master will also become the virtual controller. If you configure two IAPs as the preferred master then they will split the network, this is not recommended.

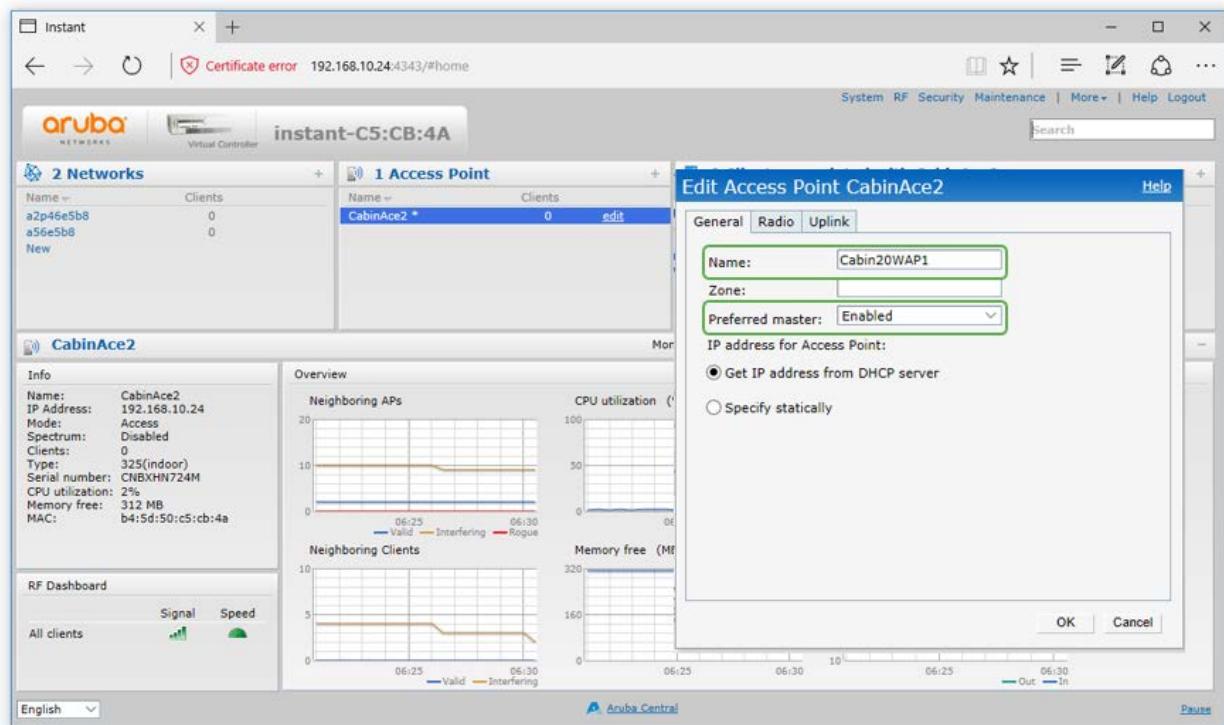


Figure 9: The Edit Access Point Dialog Box.

## 4.7 WLAN Setup

There are four steps to creating an SSID.

1. Select the type of SSID you want to create. The Employee and Voice selections will lead you to 802.1X and PSK authentication. The Guest option will lead you to Captive Portal authentication.
2. Configure the Vlan and client IP assignment.
3. The security stage depends on your wireless LAN setting selections. Enterprise will give you 802.1x selections, personal will give you PSK or WEP selections. If you select guest you will receive captive portal options.
4. The last stage is the settings for the firewall with the user rights.

These stages are shown below in Figure 10.

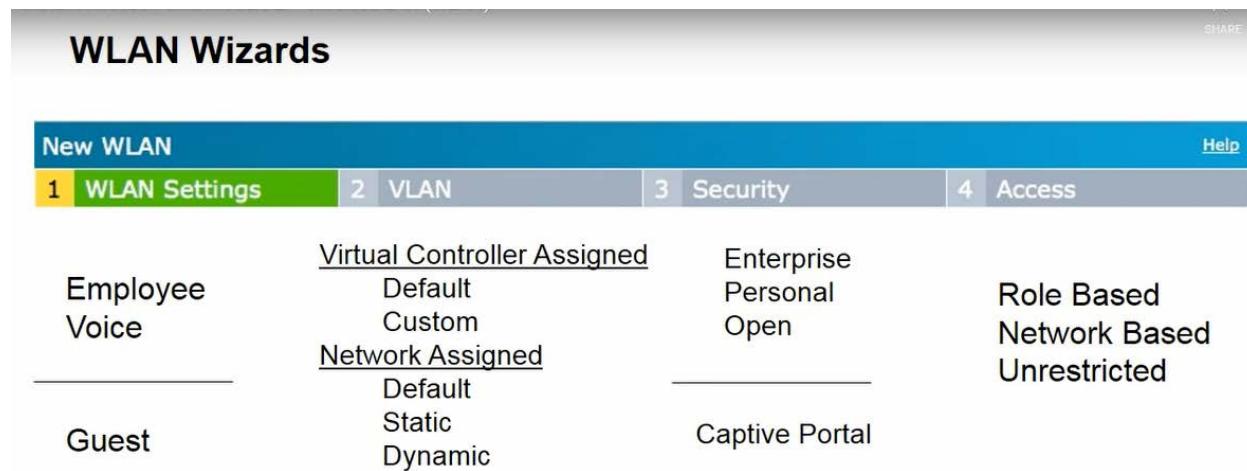


Figure 10: The Four Stages to Creating an SSID

### Step 1

You create SSIDs using the WLAN Wizard. You launch the WLAN Wizard by selecting **New** from the **Networks** section on the main GUI page. This will bring up the WLAN Settings tab of the New WLAN dialog box. The WLAN Settings tab is where you select the type of SSID you want to create, and name the SSID, as shown below in Figure 11.

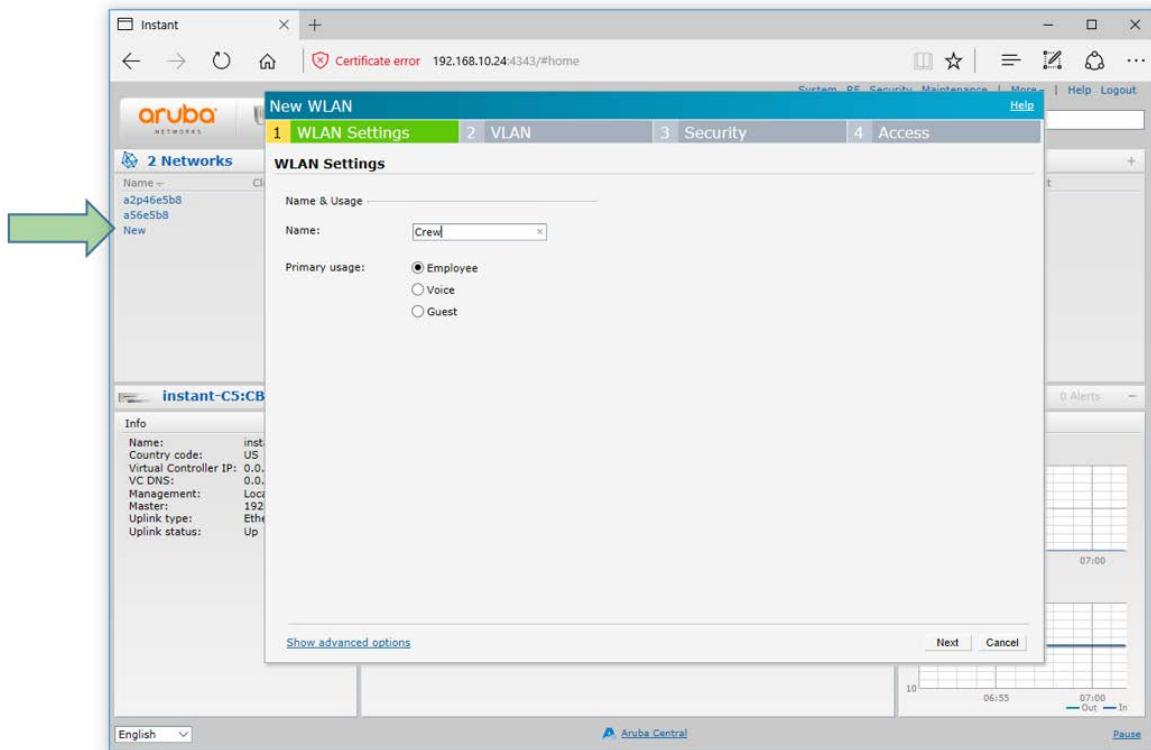


Figure 11: The WLAN Settings Tab of the New WLAN Dialog Box

## Step 2

The VLAN Tab is where you configure the VLAN assignment, and client IP assignment. There available VLAN and client IP assignment options are shown below in Figure 12.

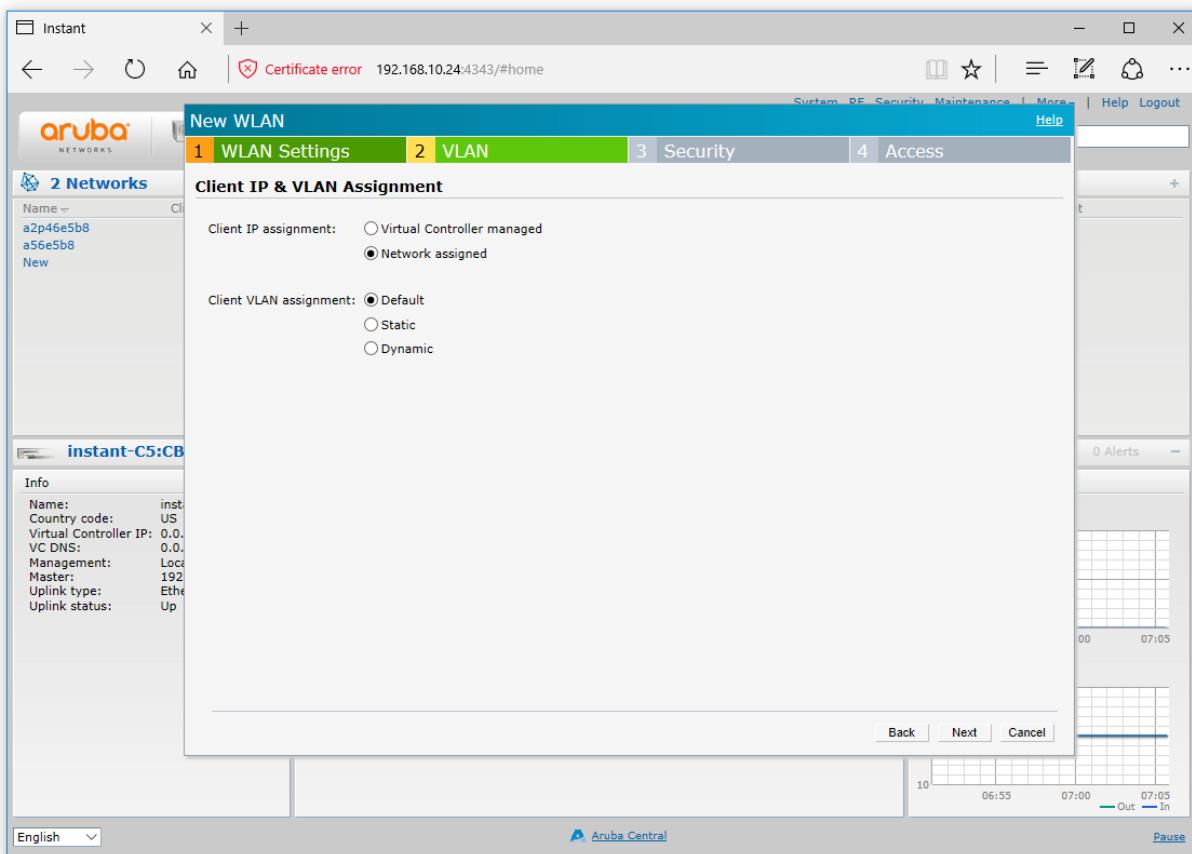


Figure 12: The VLAN Tab of the New WLAN Dialog Box

The two client IP assignment options are virtual controller Managed, and Network assigned.

### Virtual controller managed

The client will associate and authenticate to the access point. The access point will act as a relay agent to the virtual controller, and the virtual controller will provide and act as the DHCP server.

- The access points will be providing DHCP for any wireless clients that connect to this SSID.
- The SSID and IAPs will source NAT all client traffic onto the wire.

### Network assigned

The client will associate and authenticate to the access point. The access points will act as a bridge and pass the traffic without modifying the original payload. DHCP will be provided by the DHCP server on the LAN. The APs will bridge the client traffic onto the wire without manipulating, or modifying the packets.

- The AP will bridge the client traffic on to the wire
- The AP turns the wireless frame into an Ethernet frame

### Step 3

The Security tab is where you set the security level. There are three levels, Open, Personal, and Enterprise. Selecting the Enterprise level allows you to configure an external RADIUS authentication server, as shown below in Figure 13.

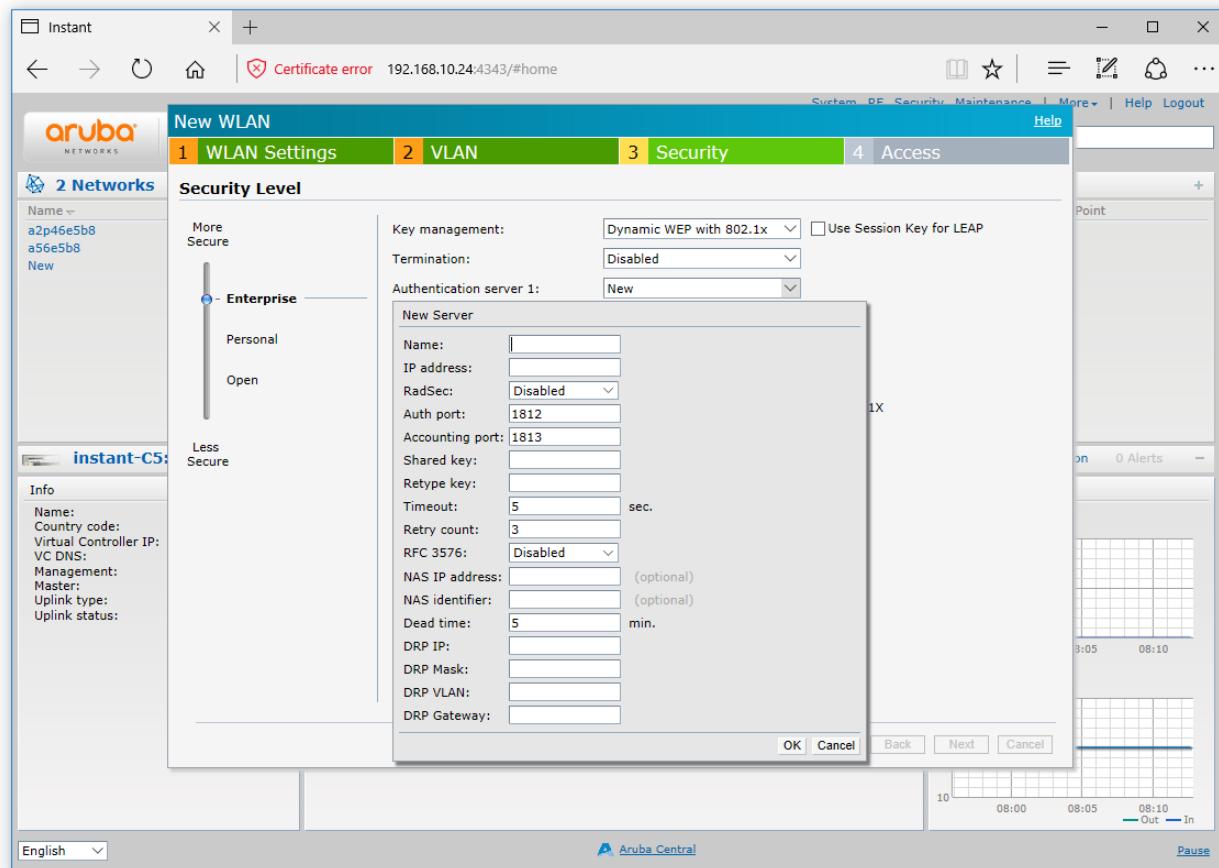


Figure 13: Configuring an External RADIUS Server from the Security Tab of the New WLAN Dialog Box

### Step 4

The Access tab is where you configure the firewall rules and user rights. The Access tab allows you to create Network-Based rules and Role-Based rules. You also have the option to leave the SSID Unrestricted. Figure 14 shows an example of creating a rule that denies all DNS traffic except to the DNS server with the IP address of 192.168.10.1.

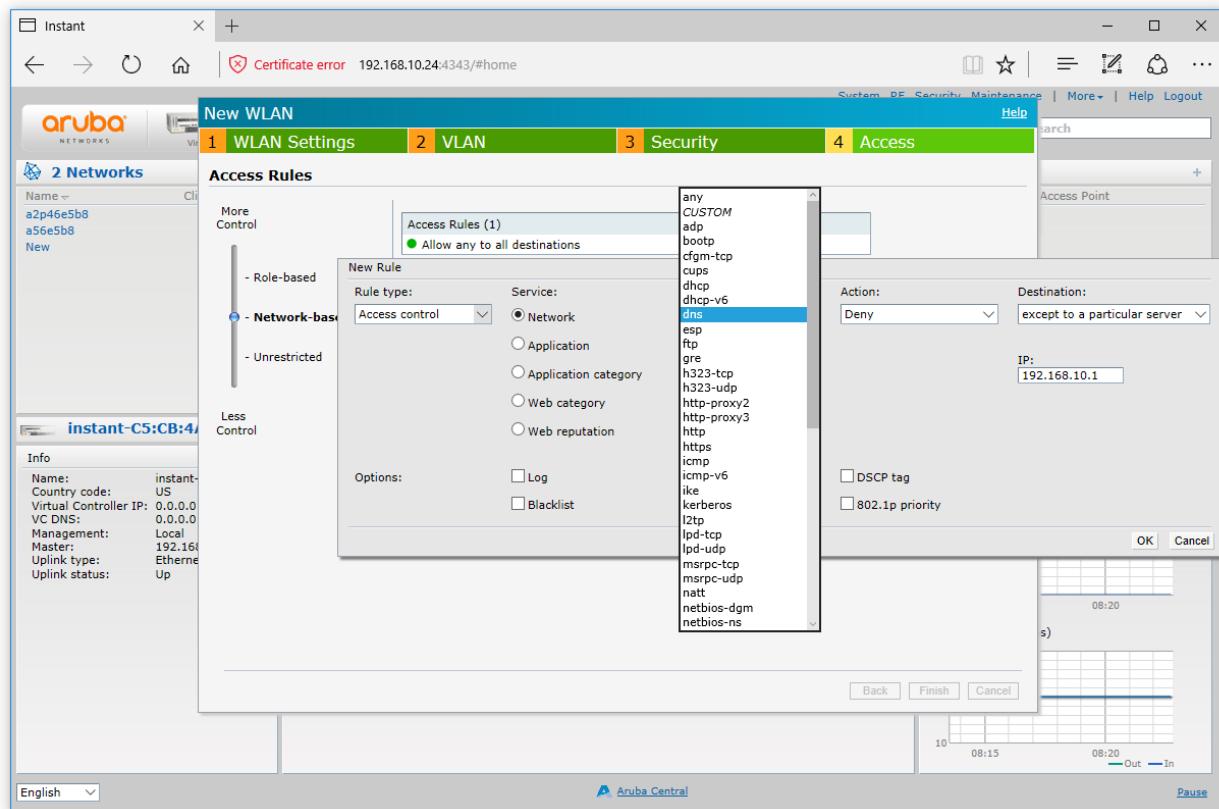


Figure 14: Configuring Firewall Rules from the Access Tab of the New WLAN Dialog Box

Refer to the *Aruba Instant 6.4.4.4-4.2.3.0 Users Guide* for additional information on the IAP GUI.

## 5 Physical I/O

### 5.1 Connections and Cabling

Table 6 lists the CWAP's external connector Interfaces (per ARINC 628).

Table 6: CWAP External Connector Interfaces

Ref Des.	Shell	Insert	Mating Shell	Mating Insert
J1	EN4165M01AA	EN4165A20-22-1NA	EN4165M61AA	EN4165A20-22-1NB
J2	EN4165M01AB	EN4165A20-22-1NB	EN4165M61AB	EN4165A20-22-1NA
J3	EN4165M01AC	EN4165A20-22-1NA	EN4165M61AC	EN4165A20-22-1NB

#### 5.1.1 Connector Definition J1

The J1 connector carries the input power, connects the CWAP to the upstream server/network, and carries both the Power Enable, and RF Enable discrete signals, to the unit.

Figure 15 shows connector layout and pin definitions for the CWAP's J1 external aircraft connection.

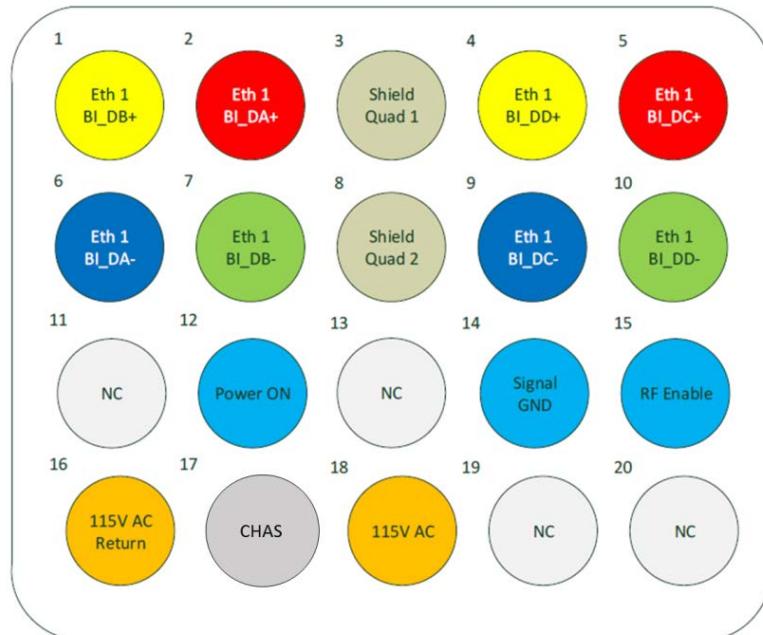


Figure 15: J1 (Pins) Connector Layout and Pin Definitions

#### 5.1.2 Connector Definition J2

The J2 connector passes power, Ethernet and both the Power Enable, and RF Enable discrete signals to the next downstream CWAP when the units are in a Daisy Chain configuration.

Figure 16 shows connector layout and pin definitions for the CWAP's J2 external aircraft connection.

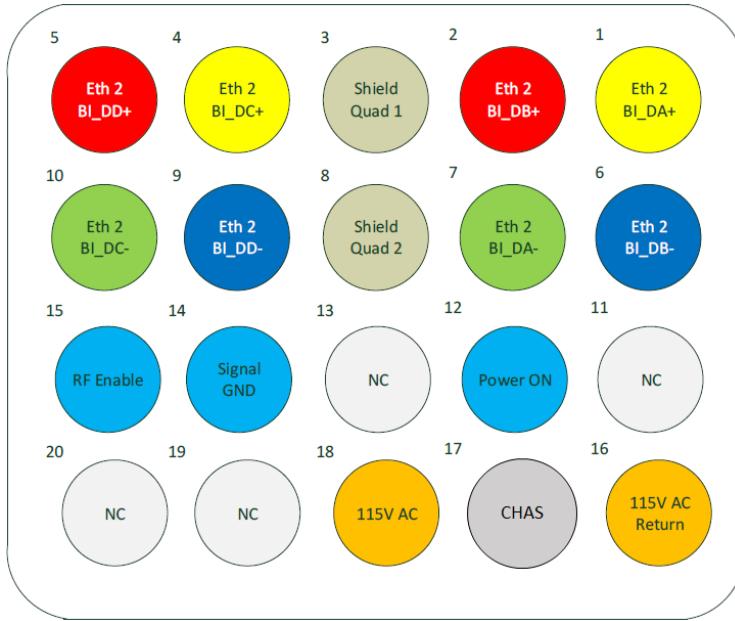


Figure 16: J2 (Socket) Connector Layout and Pin Definitions

### 5.1.3 Connector Definition J3

The J3 carries the discrete IP strapping signals from the aircraft to the CWAP. Figure 17 shows connector layout and pin definitions for the CWAP's J3 external aircraft connection. Please see Table 5 for IP Address information.

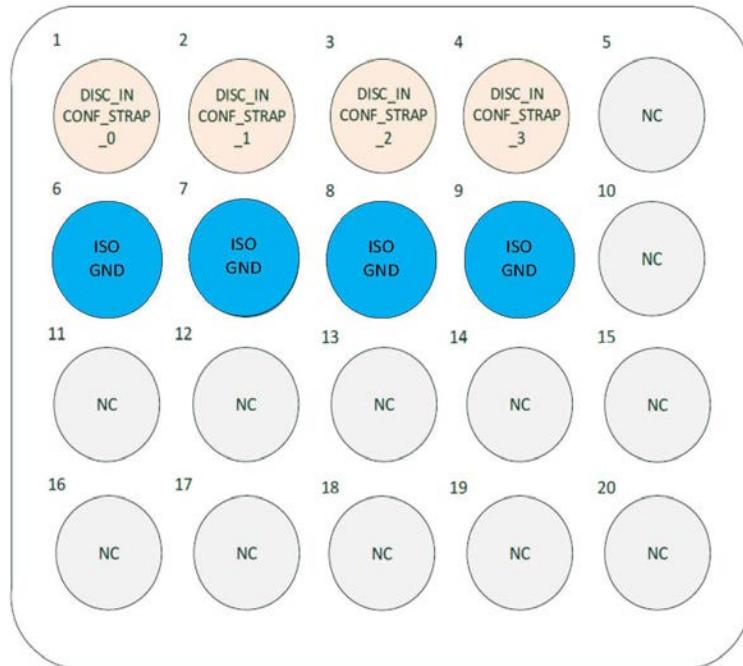


Figure 17: J3 (Socket) Connector Layout and Pin Definitions

## 5.2 Maintenance Connectors

Two maintenance connectors are located on the front of the unit behind the maintenance door.

### 5.2.1 Connector Definition J10 USB 2.0 connector

The J10 connector is a female micro USB that provides a serial interface to both the SIB and the AP.

### 5.2.2 Programming Header

A four pin SIB programming header is located below the J10 connector. This programming header provides an interface for programming the SIB bootloader.

### 5.2.3 Reset button

The reset button is located behind the maintenance door. Holding the reset button for 5 seconds, until the power LED rapidly blinks, will factory reset the Aruba AP.

## 5.3 Status Indicators

### 5.3.1 AP Status

The CWAP has AP status indicators that are visible on the top (radome) of the CWAP and are be used to indicate the AP status and activity. The meanings of these indicators are defined in Table 7 below.

*Table 7: AP LED Operation*

Indicator	Color/State	Meaning
System Status	Off	CWAP Powered OFF
	Green/Amber- Alternating	Device Booting; not ready
	Green - Solid	Device ready
	Amber - Solid	Device ready; power-save mode (802.3af PoE) <ul style="list-style-type: none"><li>Single radio,</li></ul>
	Green or Amber - Flashing	Restricted Mode; <ul style="list-style-type: none"><li>Uplink negotiated in sub optimal speed; or</li><li>Radio in non-high throughput (HT) mode</li></ul>
	Red	System error condition
Radio Status	Off	CWAP powered off, or both radios disabled
	Green - Solid	Both radios enabled in access mode
	Amber - Solid	Both radios enabled in monitor mode
	Green/Amber - Alternating	One radio enabled in access mode, one radio enabled in monitor mode

### 5.3.2 Power LED

Green: When AC is present and the CWAP has not detected a fault condition.

Red: When the CWAP has detected a fault condition.

Blinking: Power on self-test.

### 5.3.3 Link LEDs

The CWAP includes two Link LEDs visible on the front panel. The LEDs indicate Ethernet activity on either LAN 1 (J1 connector) or LAN 2 (J2 connector).

(Intentionally Left Blank)

## 6 Performance Data

### 6.1 Radio Characteristics

*Table 8: Radio Characteristics*

Feature	Description
Supported frequency bands (country-specific restrictions apply)	-2.400 to 2.4835 GHz -5.150 to 5.250 GHz -5.250 to 5.350 GHz -5.470 to 5.725 GHz -5.725 to 5.850 GHz
Operating Channels	Dependent on configured regulatory domain
Supported radio technologies	-802.11b: Direct-sequence spread-spectrum (DSSS) -802.11a/g/n/ac: Orthogonal frequency-division multiplexing (OFDM)
Supported Modulation Types	-802.11b: BPSK, QPSK, CCK -802.11a/g/n/ac: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM
Transmit Power Adjustment	Configurable in increments of 0.5 dBm
Maximum Available Transmit Power	Maximum (aggregate, conducted total) transmit power (limited by local regulatory requirements): -2.4GHz band: +24 dBm (18 dBm per chain) -5 GHz band: +24 dBm (18 dBm per chain) -Note: conducted transmit power levels exclude antenna gain. For total (EIRP) transmit power, add antenna gain
Supported data rates (Mbps)	802.11b: 1, 2, 5.5, 11 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 802.11n: 6.5 to 450 (MCS0 to MCS23) 802.11ac: 6.5 to 1,733 (MCS0 to MCS9, NSS = 1 to 4)
Wi-Fi Antennas	Eight integrated downtilt omnidirectional antennas for 4x4 MIMO with maximum antenna gain of 4.0 dBi in 2.4GHz and 5.5 dBi in 5GHz. Built-in antennas are optimized for horizontal overhead orientation of the AP. The downtilt angle for maximum gain is ~ 30 degrees.

## 6.2 RF Performance Table

The 2.4GHz transmitter has a maximum conducted output power as follows:

*Table 9: 2.4GHz Maximum Conducted Output Power*

Frequency Range	Mode	Average Output Power (dBm)	Tolerance (dBm)
2412-2462	802.11b	23	±1
2412-2462	802.11g	23	±1
2412-2462	802.11nHT20	23.5	±1
2422-2452	802.11nHT40	22	±1

The 5GHz transmitter has a maximum conducted output power as follows:

*Table 10: 5GHz Maximum Conducted Output Power*

Frequency Range	Mode	Average Output Power (dBm)	Tolerance (dBm)
5180-5240	802.11a	21	±1
5180-5240	802.11nHT20	15	±1
5190-5230	802.11nHT40	17.5	±1
5210	802.11acHT80	16.5	±1
5745-5825	802.11a	24.5	±1
5745-5825	802.11nHT20	21	±1
5755-5795	802.11nHT40	22	±1
5775	802.11acHT80	21	±1

### 6.3 Country Codes

The IEEE 802.11/b/g/n Wi-Fi networks operate in the 2.4GHz spectrum and IEEE 802.11a/n operates in the 5.0GHz spectrum. The spectrum is divided into channels. The 2.4GHz spectrum is divided into 14 overlapping, staggered 20 MHz wireless carrier channels. These channels are spaced 5 MHz apart. The 5GHz spectrum is divided into more channels. The channels that can be used in a particular country differ based on the regulations of that country.

Table 11: Country Codes

Country	Code	Country	Code	Country	Code
Åland Islands	AX	Germany	DE	Nigeria	NG
Albania	AL	Ghana	GH	North Korea	KP
Algeria	DZ	Greece	GR	Northern Mariana Islands	MP
American Samoa	AS	Greenland	G	Norway	NO
Andorra	AD	Grenada	GD	Oman	OM
Angola	AO	Guam	GU	Panama	PA
Antigua and Barbuda	AG	Guatemala	GT	Papua New Guinea	PG
Argentina	AR	Guernsey	GG	Paraguay	PY
Armenia	AM	Haiti	HT	Peru	PE
Aruba	AW	Honduras	HN	Philippines	PH
Australia	AU	Hong Kong	HK	Poland	PL
Austria	AT	Hungary	HU	Portugal	PT
Azerbaijan	AZ	Iceland	IS	Puerto Rico	PR
Bahamas	BS	India	IN	Qatar	QA
Bahrain	BH	Indonesia	ID	Republic of Korea (South Korea)	KR
Bangladesh	BD	Iran	IR	Reunion	RE
Barbados	BB	Iraq	IQ	Romania	RO
Belarus	BY	Ireland	IE	Russia	RU
Belgium	BE	Islamic Republic of Pakistan	PK	Saint Barthelemy	BL
Belize	Z	Isle of Man	IM	Saint Helena	SH
Bermuda	BM	Israel	IL	Saint Kitts and Nevis	KN
Bolivia	BO	Italy	IT	Saint Lucia	LC
Bonaire, Sint Eustatius and Saba	BQ	Jamaica	JM	Saint Martin	MF
Bosnia and Herzegovina	BA	Japan	JP	Saint Pierre and Miquelon	PM
Botswana	BW	Jersey	JE	Saint Vincent and the Grenadines	VC
Brazil	BR	Jordan	JO	Samoa	WS
Brunei Darussalam	BN	Kazakhstan	KZ	San Marino	SM
Bulgaria	BG	Kenya	KE	Saudi Arabia	SA
Cambodia	KH	Kuwait	KW	Senegal	SN
Cameroon	CM	Laos People's Democratic Republic	LA	Serbia	RS
Canada	CA	Latvia	LV	Serbia and Montenegro	CS
Chad	TD	Lebanon	LB	Singapore	SG
Chile	CL	Liberia	LR	Slovak Republic	SK
China	CN	Liechtenstein	LI	Slovenia	SL

Colombia	CO	Lithuania	LT	Solomon Islands	SB
Comoros	KM	Luxembourg	LU	Somalia	SO
Congo	CD	Macau	MO	South Africa	ZA
Costa Rica	CR	Macedonia	MK	Spain	ES
Cote D'Ivoire	CI	Malaysia	MY	Sri Lanka	LK
Croatia	H	Maldives	MV	Svalbard and Jan Mayen	SJ
Cuba	CU	Mali	ML	Sweden	SE
Curacao	CW	Malta	MT	Switzerland	CH
Cyprus	CY	Maritime Forward Operating Base	MB	Syrian Arab Republic	SY
Czech Republic	CZ	Maritime Offshore	MMI	Taiwan	TW
Denmark	DK	Marshall Islands	MH	Thailand	TH
Dominican Republic	DO	Martinique	MQ	Trinidad and Tobago	TT
Ecuador	EC	Mauritania	MR	Tunisia	TN
Egypt	EG	Mauritius	MU	Turkey	TR
El Salvador	SV	Mayotte	YT	Uganda	UG
Estonia	EE	Mexico	MX	Ukraine	UA
Ethiopia	ET	Monaco	MX	United Arab Emirates	AE
Faroe Islands	FO	Mongolia	MC	United Kingdom	GB
Federated States of Micronesia	FM	Montenegro	ME	United States	US
Fiji	FJ	Montserrat	MS	Uruguay	UY
Finland	FI	Morocco	MA	US Virgin Islands	VI
France	FR	Nepal	NP	Uzbekistan	UZ
French Guiana	GF	Netherlands	NL	Vatican City	VA
French Polynesia	PF	New Caledonia	NC	Venezuela	VE
French Southern Territories	TF	New Zealand	NZ	Vietnam	VN
Gambia	GM	Nicaragua	NI	Yemen	YE
Georgia	GE	Niger	NE	Zimbabwe	ZW

## 6.4 RF testing

### 6.4.1 Antenna Pattern Testing for both bands 2.4GHz and 5GHz

The Cabin ACe™ E71-308-01 antenna testing was performed with only one antenna transmitting for a total of one spatial stream.

Each of the antennas was measured independently with gain readings collected for every degree. The data from the four antennas is combined by averaging the linear gains.

Qualcomm QSPR software with Aruba supplied test settings was used to perform the antenna pattern testing.

Tx power level was set at 15 dBm.

Test setup Horizontal plane.

Showing azimuth (0 degrees) orientation.

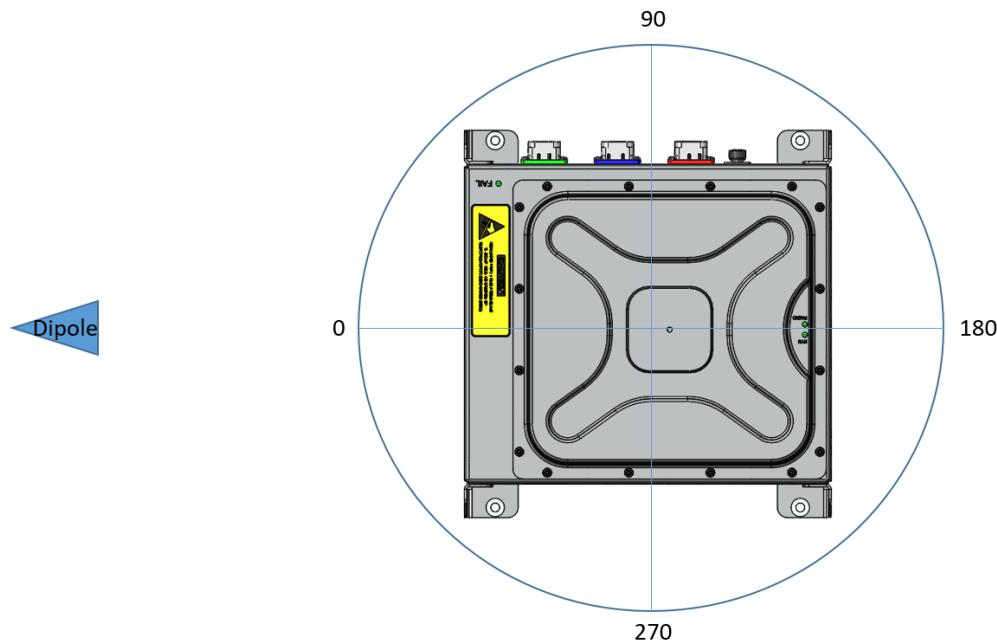


Figure 18: Azimuth test setup (top view)

## 6.4.2 2.4 GHz Horizontal plane

Showing 2.4GHz azimuth (0 degrees).

Average of antenna 1-4.

Values represent antenna gain plus conducted power (resulting in Effective Isotropic Radiated Power). Measured power of antennas 1, 2, 3, 4....9.9 dBm, 12.8 dBm, 11.7 dBm, 12.8 dBm +43 db correction for average reading of 0 dBi reference antenna.

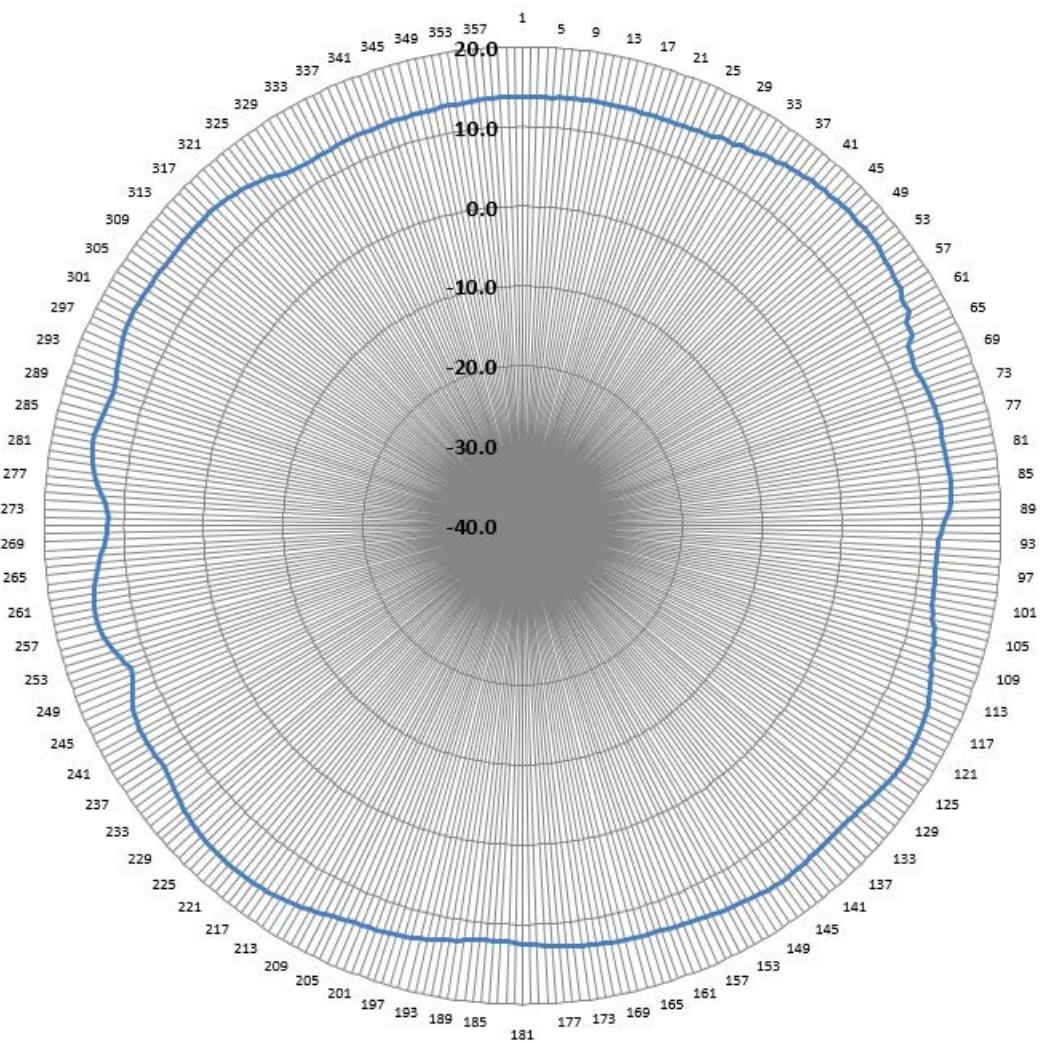


Figure 19: 2.45GHz Wi-Fi Average Azimuth (antennas 1, 2, 3, 4)

### 6.4.3 5GHz Horizontal plane

Showing 5GHz azimuth (0 degrees)

Average of antenna A-D.

Values represent antenna gain plus conducted power (resulting in Effective Isotropic Radiated Power).

Measured power of antennas A, B, C, D...6.8 dBm, 6.0 dBm, 5.3 dBm, 5.2 dBm  
+49.1 dB correction for average reading of 0 dBm reference antenna.

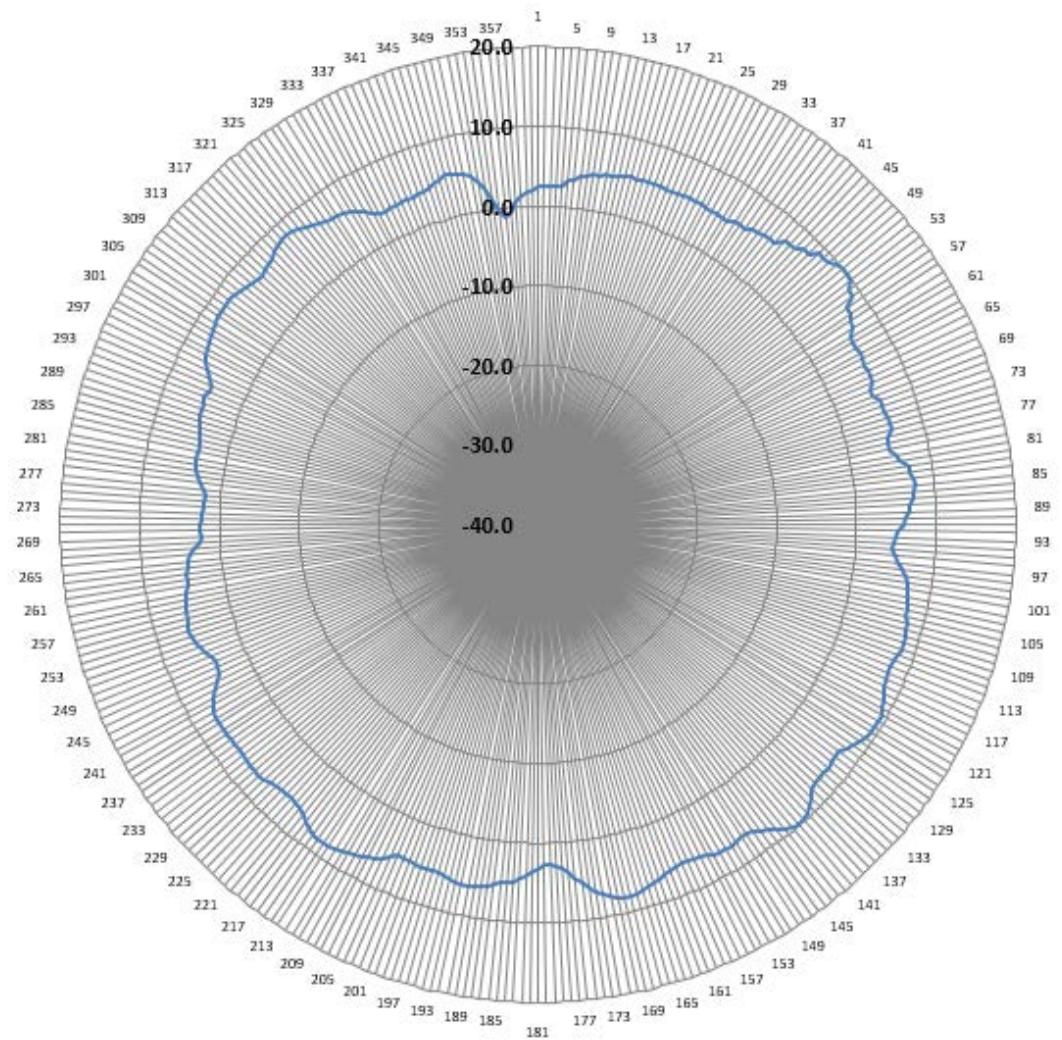


Figure 20: 5GHz WiFi Average Azimuth (antennas A, B, C, D)

## 7 Technical Data

### 7.1 Electrical and Environmental Specifications

The CWAP meets the electrical and environmental test categories per Table 12 and Table 13.

*Table 12: Qualification Test Matrix - Environment*

Test Description	Test Spec	Test Section / Category
Temperature		
Ground Survival Low Temp and Short Time Operating Low Temp	DO-160G	4.5.1, CAT A1
Operating Low Temperature	DO-160G	4.5.2, CAT A1
Ground Survival High Temp. and Short Time Operating High Temp.	DO-160G	4.5.3, CAT A1
Operating High Temperature	DO-160G	4.5.4, CAT A1
Temperature Variation (5°/min )	DO-160G	5.0 CAT B (B787)
Loss of Cooling Certification	D6-36440G	7.2.1.2
Altitude	DO-160G D6-36440G	4.6.1 CAT A1 7.2.1.3
Decompression (6,000 FT/45,100 FT)	DO-160G D6-36440G	4.6.2 CAT A1 7.2.1.3
Overpressure (-19,000 FT)	DO-160G D6-36440G	4.6.3 CAT A1 7.2.1.3
Touch Temperature	D6-36440G	7.2.2
Humidity	DO-160G	6.3.1, CAT A
Waterproofness ( 140 l/m <sup>2</sup> /Hr)	DO-160G	10.3.2, CAT W
Fluids Susceptibility (B787 only)	D6-36440G DO-160G	7.2.6.3 11.4.1
Vibration – Random	DO-160G	8.5.2, Curve C
Operational Shock	DO-160G	7.2.1, CAT A
Crash Safety – Impulse	D6-36440G	7.3.2, CAT E
Crash Safety –Sustained <sup>(1)</sup>	D6-36440G	7.3.3,CAT E
Fungus Resistance <sup>(2)</sup>	DO-160G	13.0, CAT F

Notes:

- (1) Crash Safety – Sustained satisfied by structural substantiation analysis and test, STP-E71-308-01 (Telefonix)
- (2) Fungus Resistance verified by analysis, FAS-E71-308 (Telefonix)

Table 13: Qualification Test Matrix - EMI

Test Description	Test Spec	Test Section / Category
Magnetic Effect	D0-160G	15.0, CAT Z
Power Input – Normal Operating		
Individual Phase Voltage	787B3-0147 DO-160G	3.3.2.1 B1.1a 16.5.1.1 Cat A (CF)
AC Voltage Modulation	787B3-0147 DO-160G	3.3.2.1 B1.5a 16.5.1.2 Cat A (WF)
Voltage Waveform – Total Harmonic Content	787B3-0147 DO-160G	3.3.2.1 B1.6.1a 16.5.1.8.2 Cat A (WF)
Voltage Waveform – Individual Harmonic Content	787B3-0147	3.3.2.1 B1.6.2a
Voltage Waveform – DC Content	787B3-0147 DO-160G	3.3.2.1 B1.6.3a 16.5.1.7 Cat A (WF)
Voltage Waveform – Crest Factor	787B3-0147	Not Required
Steady State Frequency	787B3-0147	Not Required
Normal Voltage Transients	787B3-0147	3.3.2.1 B2.1a
Frequency Modulation (ac)	DO-160G	16.5.1.3, CAT A(CF)
Momentary Power Interruptions (ac)	787B3-0147 DO-160G	3.3.2.1.1, Table 3.3.2-3B 16.5.1.4, CAT A(CF)
Normal Surge Voltage (ac)	DO-160G	16.5.1.5.1, CAT A(CF)
Normal Frequency Transients (ac)	DO-160G	16.5.1.5.2
Frequency Variations – Maximum Ramp Rate	787B3-0147	3.3.2.1 B2.3.1a
Frequency Variations – Frequency Transients	787B3-0147	Not Required
Multiple Stroke Power Interrupts	787B3-0147	3.3.2.1 B2.4a
Power Input – Abnormal Operating		
Individual Phase Voltage	787B3-0147 DO-160G	3.3.2.2 B3.1a 16.5.2.1 Cat A (CF)
Abnormal Voltage Transients	787B3-0147 DO-160G	3.3.2.2 B4.1a 16.5.2.2 Cat A (CF)
Abnormal Frequency Transients	DO-160G	16.5.2.3.2b Cat A (CF)
Frequency Variation – Maximum Ramp Rate	787B3-0147	3.3.2.2 B4.2.1a
Frequency Variation – Frequency Transients	787B3-0147	3.3.2.2 B4.2.2a
Abnormal DC Content	787B3-0147	3.3.2.2 B4.3a
Maximum Power Demand (Inrush)	787B3-0147	3.4.3.1 B1
Load Switching Transients	787B3-0147	3.4.3.3 B1
Load Demand Variation	787B3-0147 D6-44588	3.4.3.4 3.4.5.4
Current Harmonics	787B3-0147	Not Required (1)
Power Factor	787B3-0147	3.4.3.7B
Input Capacitance	787B3-0147	3.4.3.8B

Test Description	Test Spec	Test Section / Category
Voltage Spikes	DO-160G	17.4, CAT A
Audio Frequency Conducted Susceptibility – Power Inputs	DO-160G	18.3.2, CAT K (CF)
Induced Signal Susceptibility		
AF Electric Field Susceptibility – Wiring	D6-16050-5	7.2.1, Level E
AF Magnetic Field Susceptibility – Wiring	D6-16050-5	7.2.2
AF Magnetic Field Susceptibility – Equipment	D6-16050-5	7.2.3
Induced Spikes Susceptibility	D6-16050-5	7.5
Radio Frequency Susceptibility		
Conducted Susceptibility (10 KHz to 400 MHz )	DO-160G	20, CAT T
Radiated Susceptibility (100 MHz to 8 GHz)	DO-160G	20, CAT T
Audio Frequency Emissions		
AF Capacitive Coupling	D6-16050-5	8.1.1
AF Inductive Coupling	D6-16050-5	8.1.2
Conducted RF Emissions		
Power Wiring – Broadband	D6-16050-5	8.2.1 (Figure 8.2-1)
Power Wiring – Narrowband	D6-16050-5	8.2.1 (Figure 8.2-2)
Interconnecting Cables – Broadband	D6-16050-5	8.2.1 (Figure 8.2-3)
Interconnecting Cables – Narrowband	D6-16050-5	8.2.1 (Figure 8.2-4)
Radiated RF Emissions		
Narrowband	DO-160E	21. CAT M (Modified)
Broadband	D6-16050-5	8.2.2 (Figure 8.2-6)
Lightning Induced Transient Susceptibility		
Ground – Injection	D6-16050-5	7.4, Table 7.4-1, Interior Fuselage (Level E)
Pin– Injected	D6-16050-5	
Cable – Injected	D6-16050-5	
Multiple – Burst	D6-16050-5	
Electrostatic Discharge	D6-36440E	7.3.3.8
Grounding and Bonding	D6-44588	4.8

Notes:

(1) UUT less than 35VA and 150VA for similar equipment per installation.

## 7.2 Mechanical Design and Dimensions

The CWAPs metal components shall include a proper finish to offer maintenance-free service over the life of the CWAP. The CWAP's internal chassis, circuit cards, wiring and cabling, and other major components shall be mounted and secured to provide maximum protection against imposed shock and vibration

### 7.2.1 Top View

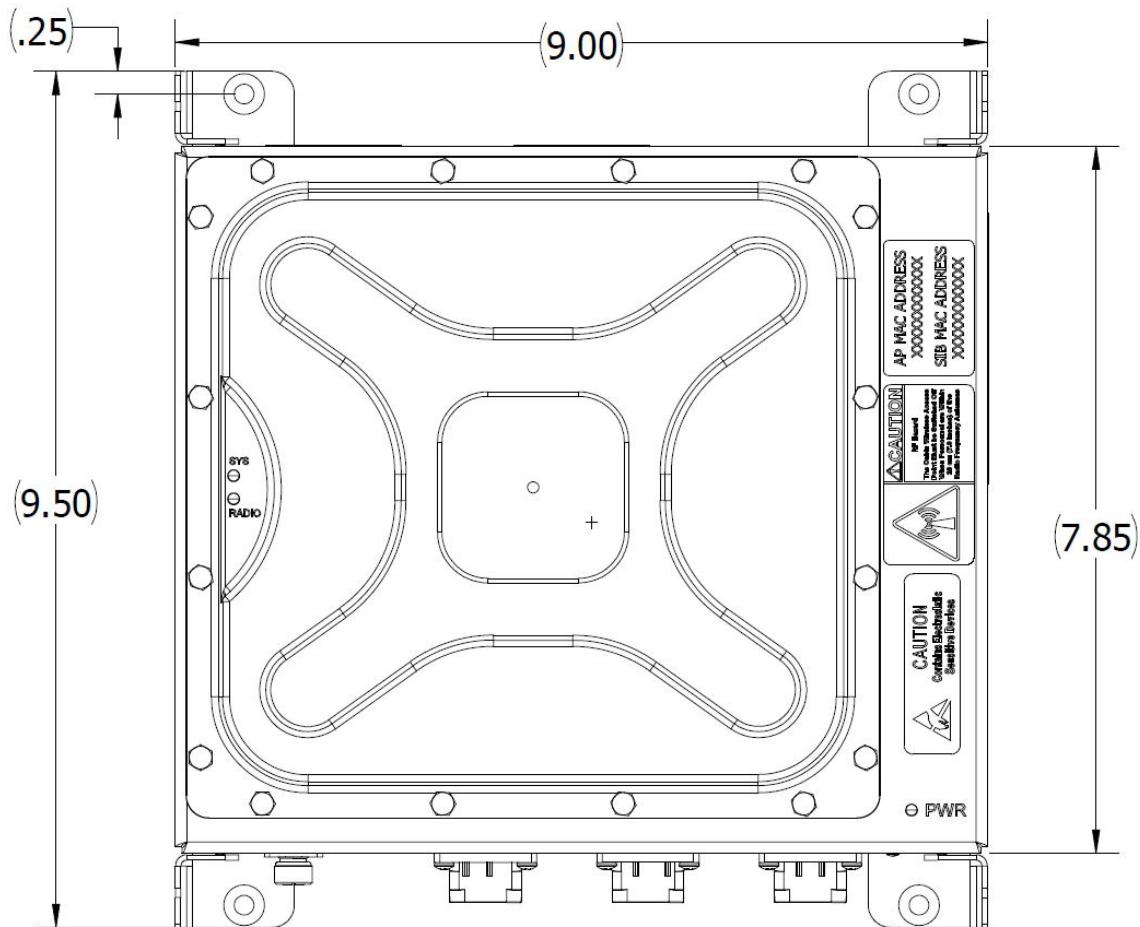


Figure 21: CWAP Top View

### 7.2.2 I/O Front View

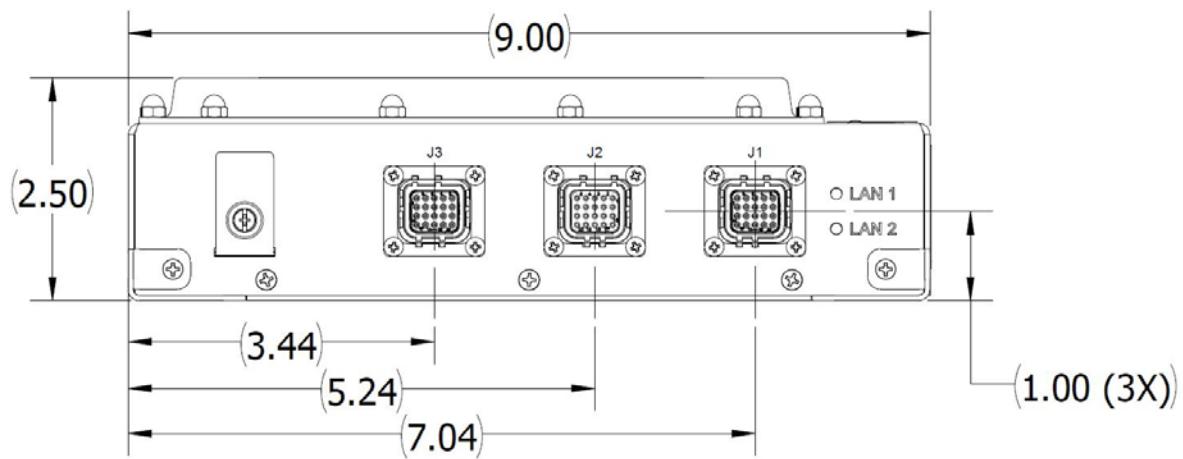


Figure 22: CWAP I/O Front View

### 7.2.3 Side View - Right

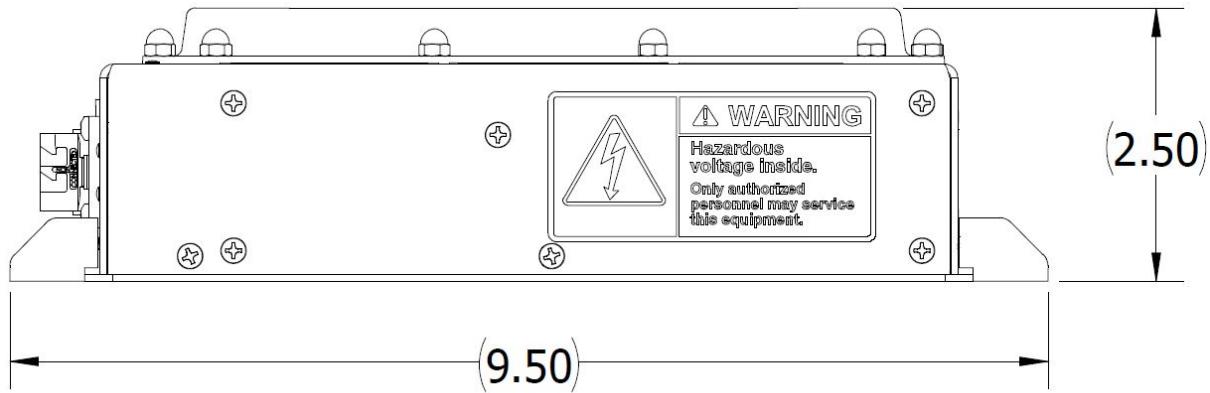


Figure 23: CWAP Side View - Right

### 7.2.4 Side View – Left

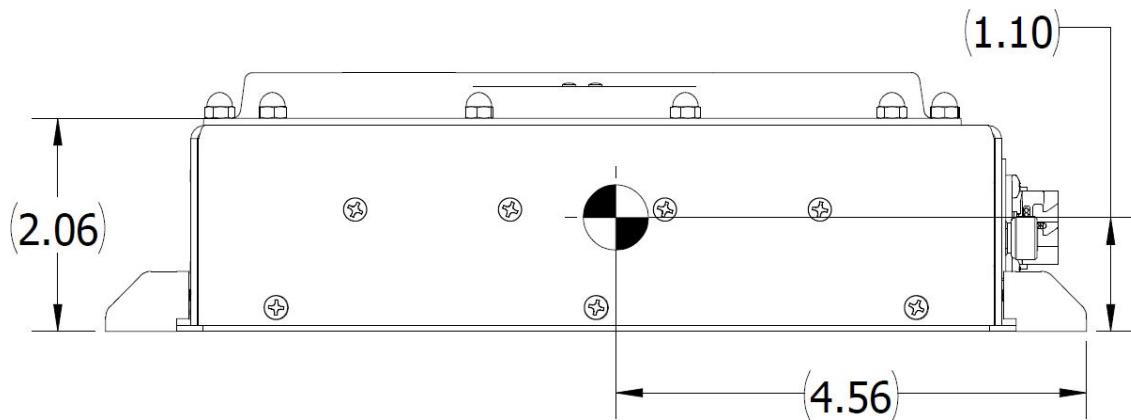


Figure 24: CWAP Side View - Left

### 7.2.5 Rear View

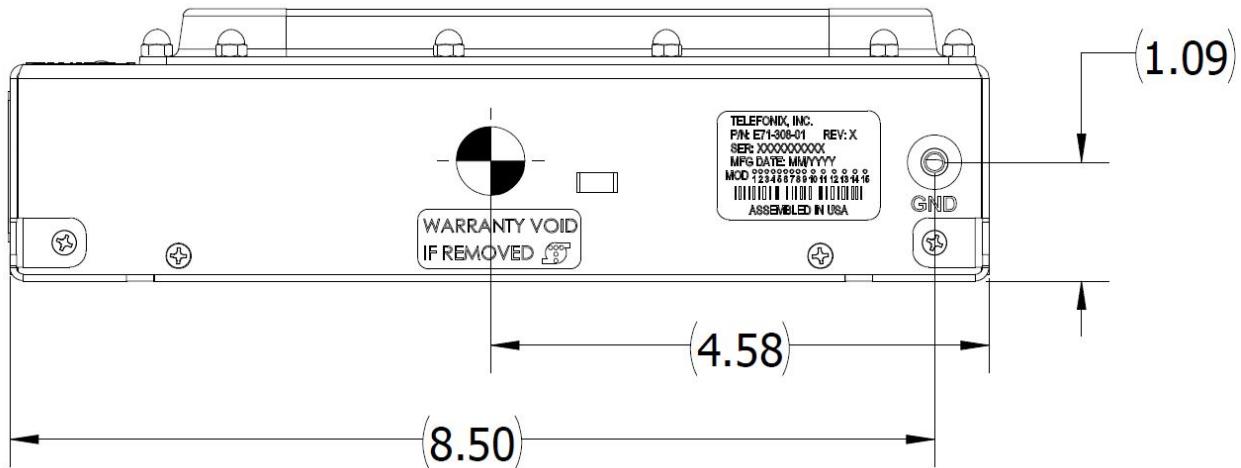


Figure 25: CWAP Rear View

### 7.2.6 Bottom View

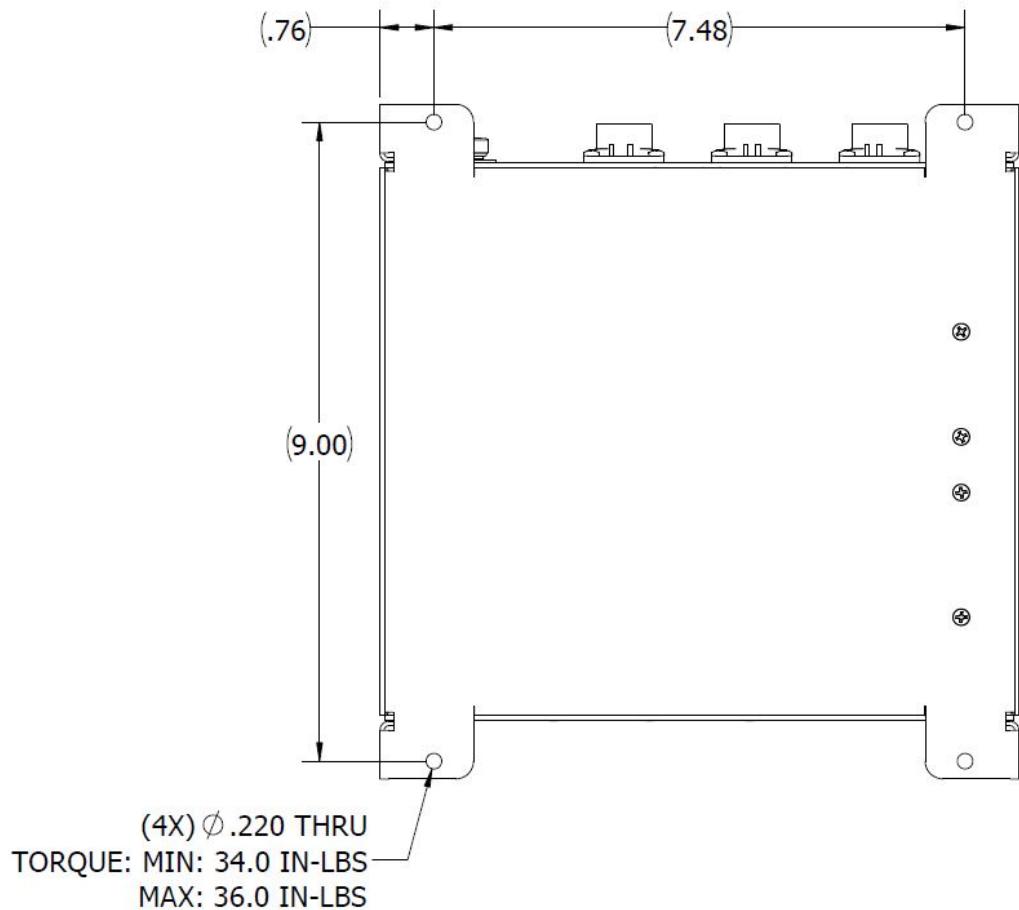


Figure 26: CWAP Bottom View

## 7.2.7 Product Identification

The Part Number Identification Label for each CWAP LRU is located on the rear panel and contains the following information as shown in Figure 25.

## 7.2.8 Finish and Color

The paint color of the CWAP is medium texture black. The bottom surface of the mounting plate is unpainted and contains a clear, RoHS compliant coating per MIL-DTL-5541, Type II, Class 3. The unpainted surface is provided for bonding of the CWAP enclosure to the aircraft airframe.

## 7.2.9 Materials

All materials used in the construction of the CWAP are inherently non-nutrient to fungus and do not support combustion. The materials are of the best commercial quality, and will not blister, corrode, crack, soften, or show other immediate latent defects that affect the storage, operation, or environmental capabilities of the unit after any or all of the test specified.

Materials used in the CWAP have been selected in accordance with the appropriate flammability requirements of Code of Federal Regulations FAR-25.853a.

## 7.2.10 Weight

The CWAP weighs 3.66 lbs.

## 7.2.11 Cooling Characteristics

The CWAP is designed with passive cooling.

- Operational Power Dissipation: 20.0 W Max
- Operational Power Dissipation: 13.5 W Nominal

## 7.2.12 Installation limitations

The CWAP is intended to be installed in the crown of the cabin to provide adequate RF coverage of the WiFi signal. An installation where there is a potential for falling water requires a drip shield. Installations per ARINC 628 part 7 (Stand Alone) shall always have the minimum air gap spacing as follows:

- Bottom (G1) = 0.00"
- Left (G2) = 1.00"
- Right (G3) = 1.00"
- Top (G4) = 1.00"
- Front (G5) = 3.00"
- Rear (G6) = 1.00"

Installations violating the above air gap spacing must be approved by Telefonix PDT engineering.

There are no minimum installation distances between CWAPs. The maximum distance shall be determined by aircraft type and configuration and content, e.g. throughput considerations.

Radiation Hazard: Maintain a safe distance when in operation. The device should be installed to provide a minimum distance of 27cm to nearby persons while in operation. Remove power if working within these distances.

## 7.3 Grounding and Bonding

Electrical grounding and bonding of the CWAP unit follow standard avionics industry design practices, ensuring proper grounding for electrical safety and for Electromagnetic Interference (EMI) control and compliance.

## 7.4 Workmanship

Workmanship, including ANSI/IPC-A-620 soldering, is designed to meet ANSI/J-STD-002 and RTCA/DO-254.

## 7.5 Safety

The CWAP is designed to meet the safety requirements of RTCA/DO-254.

## 7.6 Protective Devices

The CWAP contains a power line fuse that provides electrical separation between the airplane AC power and the CWAP system in the event of a circuit upset per the recommendations of RTCA/DO-254. All input/output signals within the CWAP contains ESD (TVS) protective Diodes and/or isolation transformers that will provide protection from external noise/ESD/lightning. The protection devices have fail-safe features, ensuring that any failure does not create hazardous condition to the CWAP.

The CWAP has a dual output temperature sensor to protect the internal electronics from an over-temperature or under-temperature condition. Additionally, a separate temperature sensor is in place to enable/disable the unit based on low ambient temperatures (below -20°C).

## 8 Reliability and Maintainability

### 8.1 Reliability

The Mean Time Between Failure (MTBF) for the CWAP is a minimum of 200,000 operating hours calculated using the RIAC 217+ (AIC, +30°C, 65% duty cycle, 1428 cycles per year).

### 8.2 Maintainability

The CWAP is considered an LRU and is repairable only by Telefonix PDT or an authorized repair facility. Periodic maintenance of the CWAP is not required.

### 8.3 Mean Time to Repair (MTTR)

Repair time will not exceed 30 minutes, which entails replacement of the LRU.

### 8.4 Failure Detection and Fault Isolation

LED indicators located on the system enclosure provide functional status of the CWAP.

### 8.5 Production Testing

Production units are subjected to Environmental Stress Screening (ESS), and a production Acceptance Test Procedure (ATP) prior to shipment. These tests are intended to ensure that all elements of the product are functional and capable of performing at both high and low temperature extremes and that they are free of manufacturing defects. The Acceptance Test Procedure is run pre- and post-ESS to test the functional characteristics of the product.

## 9 Support and Service

### 9.1 Technical Support

For technical support, please contact support@telefonixpdt.com

### 9.2 Returning Defective Equipment

All equipment returned to Telefonix PDT must have a Return Material Authorization (RMA) number assigned exclusively by Telefonix PDT. Telefonix PDT cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The Buyer accepts responsibility for all freight charges for the return of goods to Telefonix's designated facility. Telefonix PDT will pay return freight charges back to the Buyer's location in the event that the equipment is repaired or replaced within the warranty period stipulated herewith.

#### Contact and Delivery Address

Telefonix PDT  
2340 Ernie Krueger Circle  
Waukegan, IL 60087  
Attn: RMA number

Revision History				
Date	Revision Level	Description of Change	Written By	Approved By
05-26-17	A	Initial Release	Mike O'Connor	Chris Hinojosa
06-29-17	B	Updated per TCB comments: - Added min distance exposure limit in Sec 7.2.12. - Updated conducted power tables in Sec 6.2.	Lyn Tan	Chris Hinojosa
07-10-17	C	Updated per TCB comments: - Revise exposure statement in Sec 7.2.12. The device should be installed to provide a minimum distance of 27cm to nearby persons while in operation - Update conducted power tables in Sec 6.2 to values from Aruba TUV report.	Lyn Tan  <b>Approved</b> <i>By Doc. Control – July 10, 2017</i>	Chris Hinojosa