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Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points

with ArubaOS FIPS Firmware


Non-Proprietary Security Policy

FIPS 140-2 Level 2

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Contents

1	Purpose of this Document.....	6
1.1	Related Documents.....	6
1.2	Additional Product Information.....	6
1.3	Acronyms and Abbreviations.....	7
2	Overview.....	8
2.1	AP-318 Series.....	8
2.1.1	Physical Description.....	9
2.1.2	Dimensions/Weight.....	9
2.1.3	Environmental.....	9
2.1.4	Interfaces.....	10
2.2	AP-340 Series.....	11
2.2.1	Physical Description.....	12
2.2.2	Dimensions/Weight.....	12
2.2.3	Environmental.....	12
2.2.4	Interfaces.....	12
2.3	AP-370 Series.....	14
2.3.1	Physical Description.....	15
2.3.2	Dimensions/Weight.....	16
2.3.3	Environmental.....	16
2.3.4	Interfaces.....	16
2.4	AP-387 Series.....	18
2.4.1	Physical Description.....	19
2.4.2	Dimensions/Weight.....	19
2.4.3	Environmental.....	19
2.4.4	Interfaces.....	19
3	Module Objectives.....	21
3.1	Security Levels.....	21
4	Physical Security.....	22
5	Operational Environment.....	22
6	Logical Interfaces.....	22
7	Roles, Authentication and Services.....	23
7.1	Roles.....	23
7.2	Authentication.....	24
7.2.1	Crypto Officer Authentication.....	24
7.2.2	User Authentication.....	24
7.2.3	Wireless Client Authentication.....	25
7.2.4	Strength of Authentication Mechanisms.....	25
7.3	Services.....	26
7.3.1	Crypto Officer Services.....	26
7.3.2	User Services.....	27
7.3.3	Wireless Client Services.....	28
7.3.4	Unauthenticated Services.....	28
7.3.5	Services Available in Non-FIPS Mode.....	28
7.3.6	Non-Approved Services Non-Approved in FIPS Mode.....	28
8	Cryptographic Key Management.....	29
8.1	FIPS Approved Algorithms.....	29
8.2	Non-FIPS Approved but Allowed Cryptographic Algorithms.....	32
8.3	Non-FIPS Approved Cryptographic Algorithms.....	32
9	Critical Security Parameters.....	33
10	Self-Tests.....	38
11	Installing the Wireless Access Point.....	40
11.1	Pre-Installation Checklist.....	40
11.2	Identifying Specific Installation Locations.....	40
11.3	Precautions.....	41
11.4	Product Examination.....	41
11.5	Package Contents.....	41

12	Tamper-Evident Labels.....	42
12.1	Reading TELs.....	42
12.2	Required TEL Locations	43
12.2.1	TELs Placement on the AP-318	43
12.2.2	TELs Placement on the AP-344	44
12.2.3	TELs Placement on the AP-345	45
12.2.4	TELs Placement on the AP-374	46
12.2.5	TELs Placement on the AP-375	47
12.2.6	TELs Placement on the AP-377	48
12.2.7	TELs Placement on the AP-387	49
12.3	Applying TELs.....	50
12.4	Inspection/Testing of Physical Security Mechanisms.....	50
13	Secure Operation	51
13.1	Crypto Officer Management	52
13.2	User Guidance	52
13.3	Setup and Configuration	52
13.4	Setting Up Your Wireless Access Point.....	53
13.5	Enabling FIPS Mode on the Staging Controller.....	53
13.5.1	Enabling FIPS Mode on the Staging Controller with the CLI	53
13.6	Non-Approved FIPS Mode Configurations	54
13.7	Full Documentation	54

Figures

Figure 1 - Aruba AP-318 - Front.....	8
Figure 2 - Aruba AP-318 – Front and Bottom.....	8
Figure 3 - Aruba AP-318 Series Access Point – Interfaces (with weatherproof caps)	10
Figure 4 - Aruba AP-344 Campus Access Point – Front (with and without secondary antenna ports cover)	11
Figure 5 - Aruba AP-345 Campus Access Point - Front.....	11
Figure 6 - Aruba AP-340 Series Access Point – Interfaces	13
Figure 7 - Aruba AP-375, AP-374 and AP-377 Outdoor Access Points – Sides	14
Figure 8 - Aruba AP-374 Outdoor Access Point – Bottom (without Aesthetic Cover).....	14
Figure 9 - Aruba AP-375 Outdoor Access Point – Front	14
Figure 10 - Aruba AP-377 Outdoor Access Point – Bottom.....	14
Figure 11 - Aruba AP-374 Outdoor Access Point – Interfaces (with weatherproof caps)	16
Figure 12 - Aruba AP-375 Outdoor Access Point – Interfaces (with weatherproof caps)	17
Figure 13 - Aruba AP-377 Outdoor Access Point – Interfaces (with weatherproof caps)	17
Figure 14 - Aruba AP-387 Outdoor Access Point – Side	18
Figure 15 - Aruba AP-387 Outdoor Access Point – Front	18
Figure 16 - Aruba AP-387 Series Outdoor Access Point – Interfaces (with weatherproof caps).....	20
Figure 17 - Tamper-Evident Labels.....	42
Figure 18 – Front View of AP-318 with TELs	43
Figure 19 – Left Side View of AP-318 with TEL.....	43
Figure 20 – Right Side View of AP-318 with TEL.....	43
Figure 21 – Bottom View of AP-318 with TEL.....	43
Figure 22 – Top View of AP-344 with TELs	44
Figure 23 – Bottom View of AP-344 with TELs	44
Figure 24 – Top View of AP-345 with TELs	45
Figure 25 – Bottom View of AP-345 with TELs.....	45
Figure 26 – Right Side View of AP-374 with TEL.....	46

Figure 27 – Front View of AP-374 with TEL	46
Figure 28 – Left Side View of AP-374 with TEL	46
Figure 29 – Rear View of AP-374 with TEL	46
Figure 30 – Right Side View of AP-375 with TEL.....	47
Figure 31 – Front View of AP-375 with TEL	47
Figure 32 – Left Side View of AP-375 with TEL.....	47
Figure 33 – Rear View of AP-375 with TEL	47
Figure 34 – Right Side View of AP-377 with TEL.....	48
Figure 35 – Front View of AP-377 with TEL	48
Figure 36 – Left Side View of AP-377 with TELs	48
Figure 37 – Rear View of AP-377 with TELs.....	48
Figure 38 – Front View of AP-387 with TELs	49
Figure 39 – Right Side View of AP-387 with TEL.....	49
Figure 40 – Left Side View of AP-387 with TELs	49
Figure 41 – Rear View of AP-387 with TELs.....	49

Tables

Table 1 - AP-318 Series Status Indicator LEDs	10
Table 2 - AP-340 Series Status Indicator LEDs.....	13
Table 3 - AP-370 Series Status Indicator LEDs.....	17
Table 4 - AP-387 Series Status Indicator LEDs.....	20
Table 5 - Intended Level of Security	21
Table 6 - FIPS 140-2 Logical Interfaces	22
Table 7 - Strength of Authentication Mechanisms.....	25
Table 8 – Crypto Officer Services	26
Table 9 - Wireless Client Services.....	28
Table 10 - ArubaOS OpenSSL Module CAVP Certificates	29
Table 11 - ArubaOS Crypto Module CAVP Certificates.....	30
Table 12 - ArubaOS UBOOT Bootloader CAVP Certificates	31
Table 13 - Aruba AP Hardware CAVP Certificates	32
Table 14 - CSPs/Keys Used in the Module.....	33
Table 15 - Inspection/Testing of Physical Security Mechanisms.....	50
Table 16 - FIPS Approved Mode of Operation	51

Preface

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1 Purpose of this Document

This release supplement provides information regarding the Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points with ArubaOS FIPS Firmware FIPS 140-2 Level 2 validation from Aruba Networks. Aruba Networks is a Hewlett Packard Enterprise company. The material in this supplement modifies the general Aruba hardware and firmware documentation included with this product and should be kept with your Aruba product documentation.

This supplement primarily covers the non-proprietary Cryptographic Module Security Policy for the Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points with ArubaOS FIPS Firmware. This security policy describes how the Wireless Access Points (APs) meet the security requirements of FIPS 140-2 Level 2 and how to place and maintain the APs in the secure FIPS 140-2 mode. This policy was prepared as part of the FIPS 140-2 Level 2 validation of the product.

FIPS 140-2 (Federal Information Processing Standards Publication 140-2, *Security Requirements for Cryptographic Modules*) details the U.S. Government requirements for cryptographic modules. More information about the FIPS 140-2 standard and validation program is available on the National Institute of Standards and Technology (NIST) website at:

<https://csrc.nist.gov/projects/cryptographic-module-validation-program>

In addition, in this document, the Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points with ArubaOS FIPS Firmware are referred to as the Wireless Access Point, the AP, the module, the cryptographic module, Aruba Wireless Access Points, Aruba Wireless APs, Aruba Access Points, Aruba Outdoor APs and AP-3XX Wireless APs.

1.1 Related Documents

The following items are part of the complete installation and operations documentation included with this product:

- *Aruba AP-318 Series Wireless Access Points Installation Guide*
- *Aruba AP-340 Series Campus Access Points Installation Guide*
- *Aruba AP-370 Series Outdoor Access Points Installation Guide*
- *Aruba AP-387 Series Outdoor Access Points Installation Guide*
- *ArubaOS 8.6.0.0 User Guide*
- *ArubaOS 8.6.0.x CLI Reference Guide*
- *ArubaOS 8.6.0.x Getting Started Guide*
- *ArubaOS 8.6.0.0 Migration Guide*

1.2 Additional Product Information

More information is available from the following sources:

- See the Aruba Networks web site for the full line of products from Aruba, a Hewlett Packard Enterprise company:
<https://www.arubanetworks.com>
- The NIST Validated Modules web site contains contact information for answers to technical or sales-related questions for the product:
<https://csrc.nist.gov/projects/cryptographic-module-validation-program/validated-modules/search>

Enter **Aruba** in the Vendor field then select Search to see a list of FIPS certified Aruba products.

Select the Certificate Number for the Module Name 'Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points with ArubaOS FIPS Firmware'.

1.3 Acronyms and Abbreviations

AES	Advanced Encryption Standard
AP	Access Point
CBC	Cipher Block Chaining
CLI	Command Line Interface
CO	Crypto Officer
CPSec	Control Plane Security protected
CSEC	Communications Security Establishment Canada
CSP	Critical Security Parameter
ECO	External Crypto Officer
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FE	Fast Ethernet
GE	Gigabit Ethernet
GHz	Gigahertz
HMAC	Hashed Message Authentication Code
Hz	Hertz
IKE	Internet Key Exchange
IPsec	Internet Protocol security
KAT	Known Answer Test
KEK	Key Encryption Key
L2TP	Layer-2 Tunneling Protocol
LAN	Local Area Network
LED	Light Emitting Diode
SHA	Secure Hash Algorithm
SNMP	Simple Network Management Protocol
SPOE	Serial & Power Over Ethernet
TEL	Tamper-Evident Label
TFTP	Trivial File Transfer Protocol
WLAN	Wireless Local Area Network

2 Overview

This section introduces the Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points, providing a brief overview and summary of the physical features of each model covered by this FIPS 140-2 security policy.

The tested version of the firmware is: **ArubaOS 8.6.0.7-FIPS**.

Aruba's development processes are such that future releases under AOS 8.6 should be FIPS validate-able and meet the claims made in this document. Only the versions that explicitly appear on the certificate, however, are formally validated. The CMVP makes no claim as to the correct operation of the module or the security strengths of the generated keys when operating under a version that is not listed on the validation certificate.

Note: For radio regulatory reasons, part numbers ending with -USF1 are to be sold in the US only. Part numbers ending with -RWF1 are considered 'rest of the world' and must not be used for deployment in the United States. From a FIPS perspective, both -USF1 and -RWF1 models are identical and fully FIPS compliant.

2.1 AP-318 Series

This section introduces the Aruba AP-318 Series Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-318 APs, their physical attributes, and their interfaces.



Figure 1 - Aruba AP-318 - Front



Figure 2 - Aruba AP-318 – Front and Bottom

With a maximum concurrent data rate of 1,733 Mbps in the 5 GHz band and 300 Mbps in the 2.4 GHz band (for an aggregate peak data rate of 2.0 Gbps), the AP-318 Series Access Points deliver gigabit Wi-Fi 5 (802.11ac Wave 2) performance to 802.11ac mobile devices in harsh, weather-protected indoor environments such as warehouses, industrial freezers, or enclosures in extreme environments such as stadiums. The indoor hardened high performance and high density 802.11ac 318 Series Access Points support all mandatory and several optional 802.11ac features, which include Orthogonal Frequency-Division Multiplexing (OFDM) for increased user data rates and reduced latency, Multi-User Multiple Input Multiple Output (MU-MIMO) for improved network capacity with multiples devices capable to transmit simultaneously, 4x4 MIMO with up to four spatial streams (4SS) in 5 GHz and 2x2 with up to two spatial streams (2SS) in 2.4 GHz, channel bandwidths up to 160 MHz (in 5 GHz; 40 MHz in 2.4 GHz), and 256-QAM modulation. Each AP supports up to 256 associated client devices per radio and up to 16 BSSIDs per radio, and has a total of six antennas (four external 5 GHz antennas and two external 2.4 GHz antennas). In addition to 802.11ac standard capabilities, the Wi-Fi 6 AP-318 Series supports unique features like Aruba ClientMatch radio management and an additional radio (Bluetooth Low-Energy (BLE)) for location services, asset tracking services, security solutions and IoT sensors, as well as ArubaOS 8 features like Aruba Activate and AirMatch with machine learning technology to automatically optimize the wireless network performance.

Additionally, Advanced Cellular Coexistence (ACC) minimizes the impact of interference from 3G/4G LTE cellular networks, Dynamic Frequency Selection (DFS) maximizes the use of available RF spectrum, and Maximum Ratio Combining (MRC) improves receiver performance.

When managed by Aruba Mobility Controllers, AP-318 Series APs offer centralized configuration, data encryption, policy enforcement and network services, as well as distributed and centralized traffic forwarding.

2.1.1 Physical Description

The Aruba AP-318 Series Outdoor Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. The modules contain 802.11 a/b/g/n/ac transceivers and support six external RPSMA antennas.

The case physically encloses the complete set of hardware and software components and represents the cryptographic boundary of the module.

The Access Point configurations validated during the cryptographic module testing included:

- AP-318 HW: AP-318-USF1 (HPE SKU JZ158A)
- AP-318 HW: AP-318-RWF1 (HPE SKU JZ157A)

2.1.2 Dimensions/Weight

The AP-318 Series have the following physical dimensions (AP-318 unit, excluding mount accessories):

- Dimensions: 15cm (W) x 22.2cm (D) x 7.5cm (H) / 6" (W) x 8.5" (L) x 2.5" (H)
- Weight: 1.225 kg / 2.7 lbs

2.1.3 Environmental

- Operating:
 - Temperature: -40° C to +60° C (-40° F to +140° F)
 - Humidity: 5% to 95% non-condensing
- Storage and transportation:
 - Temperature: -40° C to +70° C (-40° F to +158° F)
 - Humidity: 5% to 93% non-condensing

2.1.4 Interfaces

The module provides the following network interfaces:

- E0/POE: One HPE Smart Rate port (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 56V DC (nominal) 802.3at POE
- E1/SFP: One SFP port (SFP-LX-EXT and SFP-SX-EXT, 1000BASE-X)

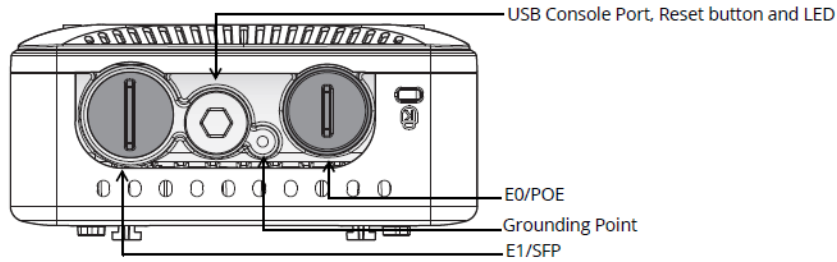


Figure 3 - Aruba AP-318 Series Access Point – Interfaces (with weatherproof caps)

Antenna interfaces:

- 802.11a/b/g/n/ac six external RPSMA antenna

USB Micro-B console port

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 4 dBm transmit power (class 2) and -91 dBm receive sensitivity

Other Interfaces:

- Visual indicators (one multi-color LED): for System and Radio status
- Reset button: factory reset (during device power up)
- Serial console interface (proprietary; adapter cable included in package; disabled in FIPS mode)
- Grounding Point

Table 1 - AP-318 Series Status Indicator LEDs

LED Type	Color/State	Meaning
System Status (during Boot Up)	Off	AP powered off
	Red	Initial power-up
	Green - Flashing	AP booting; not ready
	Green - Solid	AP ready and 1000Mbps Ethernet link established. The LED turns off after 1200 seconds.
System Status (during Operation)	Green / Amber Alternating, 6 seconds period	AP ready and 10/100Mbps Ethernet link established. The LED turns off after 1200 seconds.
	Red - Solid	System error condition
	Red – One blink off every 3 seconds	Radio 0 fault (5 GHz)
	Red – Two quick blinks off 0.5 seconds apart cycled every 3 seconds	Radio 1 fault (2.4 GHz)

2.2 AP-340 Series

This section introduces the Aruba AP-340 Series Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-344 and AP-345 APs, their physical attributes, and their interfaces.



Figure 4 - Aruba AP-344 Campus Access Point – Front (with and without secondary antenna ports cover)



Figure 5 - Aruba AP-345 Campus Access Point - Front

With a maximum concurrent data rate of 2,166 Mbps in the 5 GHz band and 800 Mbps in the 2.4 GHz band (for an aggregate peak data rate of 3.0 Gbps in dual-band and 4.3 Gbps in dual-5GHz), the AP-340 Series Access Points deliver gigabit Wi-Fi 6 (802.11ac Wave 2) performance to 802.11ac mobile devices in lecture halls, auditoriums, public venues, and high-density office environments. The high performance and high density 802.11ac 340 Series Access Points support all mandatory and several optional 802.11ac features, which include Orthogonal Frequency-Division Multiplexing (OFDM) for increased user data rates and reduced latency, Multi-User Multiple Input Multiple Output (MU-MIMO) for improved network capacity with multiples devices capable to transmit simultaneously, 4x4 MIMO with up to four spatial streams (4SS) in each of 5 GHz and 2.4 GHz, channel bandwidths up to 160 MHz (in 5 GHz; 40 MHz in 2.4 GHz), and up to 1024-QAM modulation. Each AP supports up to 256 associated client devices per radio and up to 16 BSSIDs per radio, and has a total of eight dual band antennas. In addition to 802.11ac standard capabilities, the Wi-Fi 6 AP-340 Series supports unique features like Aruba ClientMatch radio management and an additional radio (Bluetooth Low-Energy (BLE)) for Meridian and IOT-based location services, asset tracking, and mobile engagement services, as well as ArubaOS 8 features like Aruba Activate and AirMatch with machine learning technology to automatically optimize the wireless network performance.

The AP-344 has two sets of four (female) RP-SMA connectors for external dual band antennas (Primary A0 - A3, corresponding with radio chains 0 through 3, and Secondary B0 – B3 connected to chains 0 through 3). The AP-345

has eight integrated dual-band downtilt omni-directional antennas (four dual-band for Radio 1 and four 5GHz for Radio 0) for 4x4 MIMO with peak antenna gain of 5.8 dBi in 2.4 GHz and 5.6 dBi in 5 GHz per antenna. Built-in antennas are optimized for horizontal ceiling mounted orientation of the AP. The downtilt angle for maximum gain is roughly 30 degrees.

Additionally, Advanced Cellular Coexistence (ACC) minimizes the impact of interference from 3G/4G LTE cellular networks, Dynamic Frequency Selection (DFS), spectrum analysis and Adaptive Radio Management (ARM) maximize the use of available RF spectrum, and Maximum Ratio Combining (MRC) improves receiver performance.

When managed by Aruba Mobility Controllers, AP-340 Series APs offer centralized configuration, data encryption, policy enforcement and network services, as well as distributed and centralized traffic forwarding.

2.2.1 Physical Description

The Aruba AP-344 and AP-345 Wireless Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. The modules contain 802.11 a/b/g/n/ac transceivers and support eight antennas each.

The case physically encloses the complete set of hardware and software components and represents the cryptographic boundary of the module.

The Access Point configurations validated during the cryptographic module testing included:

- AP-344 HW: AP-344-USF1 (HPE SKU JZ024A)
- AP-344 HW: AP-344-RWF1 (HPE SKU JZ022A)
- AP-345 HW: AP-345-USF1 (HPE SKU JZ034A)
- AP-345 HW: AP-345-RWF1 (HPE SKU JZ032A)

2.2.2 Dimensions/Weight

The AP has the following physical dimensions (AP-344/345 unit, excluding mount accessories):

- Dimensions: 22.5cm (W) x 22.4cm (D) x 5.2cm (H) / 8.9" (W) x 8.9" (D) x 2.0" (H)
- Weight: 1.05kg / 2.31 lbs

2.2.3 Environmental

- Operating:
 - Temperature: 0° C to +50° C (+32° F to +122° F)
 - Humidity: 5% to 93% non-condensing
- Storage and transportation:
 - Temperature: -40° C to +70° C (-40° F to +158° F)
 - Humidity: 5% to 93% non-condensing

2.2.4 Interfaces

The module provides the following network interface:

- E0/POE: One HPE Smart Rate port (RJ-45, Auto-sensing link speed 100/1000/2500BASE-T and MDI/MDX)
 - Maximum 2.5 Gbps speed complies with both NBase-T and 802.3bz specifications
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48V DC (nominal) 802.3at/af PoE
- E1/POE: One Ethernet port (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48V DC (nominal) 802.3at/af PoE
 - Link Aggregation (LACP) support between both network ports for redundancy and capacity

DC power interface:

- 48Vdc nominal, +/- 5%
- 1.35mm/3.5-mm center-positive circular plug with 9.5-mm length



Figure 6 - Aruba AP-340 Series Access Point – Interfaces

Antenna interfaces:

- 802.11a/b/g/n/ac two sets of four external antenna (AP-344) or eight internal antenna (AP-345)

USB 2.0 host interface (Type A connector)

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 4 dBm transmit power (class 2) and -91 dBm receive sensitivity

Other Interfaces:

- Visual indicators (two multi-color LEDs): for System and Radio status
- Reset button: factory reset (during device power up)
- Serial console interface (proprietary; optional adapter cable available; disabled in FIPS mode)

Table 2 - AP-340 Series Status Indicator LEDs

LED Type	Color/State	Meaning
System Status (Left)	Off	AP powered off
	Green - Blinking	Device booting; not ready
	Green - Solid	Device ready
	Amber - Solid	Device ready; power-save mode (802.3af PoE): * Single radio * USB disabled
	Green or Amber Flashing	Device ready, restricted mode: * Uplink negotiated in sub optimal speed; or * Deep sleep mode
	Red	System error condition
Radio Status (Right)	Off	AP powered off, or both radios disabled
	Green - Solid	Both radios enabled in access mode
	Amber - Solid	Both radios enabled in monitor mode
	Green or Amber Blinking	One radio enabled in access (green) or monitor (amber) mode, other disabled
	Green/Amber Alternating	Green: one radio enabled in access mode, Amber: one radio enabled in monitor mode
	Blue - Solid	Both radios enabled in dual 5GHz mode

2.3 AP-370 Series

This section introduces the Aruba AP-370 Series Outdoor Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-374, AP-375 and AP-377 APs, their physical attributes, and their interfaces.



Figure 7 - Aruba AP-375, AP-374 and AP-377 Outdoor Access Points – Sides

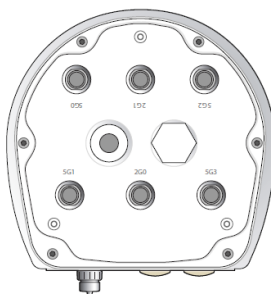


Figure 8 - Aruba AP-374 Outdoor Access Point – Bottom (without Aesthetic Cover)



Figure 9 - Aruba AP-375 Outdoor Access Point – Front



Figure 10 - Aruba AP-377 Outdoor Access Point – Bottom

With a maximum concurrent data rate of 1,733 Mbps in the 5 GHz band and 300 Mbps in the 2.4 GHz band (for an aggregate peak data rate of 2.0 Gbps), the AP-370 Series Access Points deliver 802.11ac Wave 2 Gigabit Wi-Fi 5 performance to outdoor and environmentally challenging locations for high performance areas such as university campuses and stadiums. Purpose-built to survive in the harshest outdoor environments, the 370 Series APs can withstand exposure to extreme high and low temperatures, persistent moisture, precipitation, dust and salt, and are fully sealed to keep out airborne contaminants. All electrical interfaces include industrial strength surge protection.

The high performance and high density 802.11ac 370 Series Access Points support all mandatory and several optional 802.11ac features, which include Orthogonal Frequency Division Multiplexing (OFDM) for increased user data rates and reduced latency, Multi-User Multiple Input Multiple Output (MU-MIMO) for improved network capacity with multiples devices capable to transmit simultaneously, 4x4 MIMO with up to four spatial streams (4SS) in 5 GHz and 2x2 with up to two spatial streams (2SS) in 2.4 GHz, channel bandwidths up to 160 MHz (in 5 GHz; 40 MHz in 2.4 GHz), and 256-QAM modulation. Each AP supports up to 256 associated client devices per radio and up to 16 BSSIDs per radio. The AP-374 has a total of six N-type external antennas (four external 5 GHz antennas and two external 2.4 GHz antennas), the AP-375 has five internal Omni antennas for 2x2 MIMO in 2.4 GHz with peak antenna gain of 4.0 dBi and 4x4 MIMO in 5 GHz with peak antenna gain of 4.6 dBi, and the AP-377 has four internal 80°H x 80°V directional antennas for 2x2 MIMO in 2.4 GHz with peak antenna gain of 6.4 dBi and 4x4 MIMO in 5 GHz with peak antenna gain of 6.3 dBi. In addition to 802.11ac standard capabilities, the Wi-Fi 6 AP-370 Series supports unique features like Aruba ClientMatch radio management and an additional radio (Bluetooth Low-Energy (BLE)) for location services, asset tracking services, security solutions and IoT sensors, as well as ArubaOS 8 features like Aruba Activate and AirMatch with machine learning technology to automatically optimize the wireless network performance.

Additionally, Advanced Cellular Coexistence (ACC) minimizes the impact of interference from 3G/4G LTE cellular networks, Dynamic Frequency Selection (DFS) maximizes the use of available RF spectrum, and Maximum Ratio Combining (MRC) improves receiver performance.

When managed by Aruba Mobility Controllers, AP-370 Series APs offer centralized configuration, data encryption, policy enforcement and network services, as well as distributed and centralized traffic forwarding.

2.3.1 Physical Description

The Aruba AP-374, AP-375 and AP-377 Outdoor Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. The modules contain 802.11 a/b/g/n/ac transceivers and support both external antennas (AP-374) and internal integrated omni-directional antennas (AP-375 and AP-377).

The case physically encloses the complete set of hardware and software components and represents the cryptographic boundary of the module.

The AP-370 Series Access Points configurations validated during the cryptographic modules testing included:

- AP-374 HW: AP-374-USF1 (HPE SKU JZ168A)
- AP-374 HW: AP-374-RWF1 (HPE SKU JZ167A)
- AP-375 HW: AP-375-USF1 (HPE SKU JZ178A)
- AP-375 HW: AP-375-RWF1 (HPE SKU JZ177A)
- AP-377 HW: AP-377-USF1 (HPE SKU JZ188A)
- AP-377 HW: AP-377-RWF1 (HPE SKU JZ187A)

2.3.2 Dimensions/Weight

The AP-370s have the following physical dimensions (AP-374/375/377 unit, excluding mount, with aesthetic cover):

- AP-374 unit Dimensions: 23cm (W) x 24cm (D) x 19cm (H) / 9.0" (W) x 9.4" (D) x 7.5" (H)
- AP-374 unit Weight: 2.7 kg / 6 lbs
- AP-375 unit Dimensions: 23cm (W) x 24cm (D) x 27cm (H) / 9.0" (W) x 9.4" (D) x 10.6" (H)
- AP-375 unit Weight: 2.4 kg / 5.3 lbs
- AP-377 unit Dimensions: 23cm (W) x 22cm (D) x 13cm (H) / 9.0" (W) x 8.7" (D) x 5.1" (H)
- AP-377 unit Weight: 2.1 kg / 4.6 lbs

2.3.3 Environmental

- Operating:
 - Temperature: -40° C to +60° C (-40° F to +140° F)
 - Humidity: 5% to 95% non-condensing
- Storage and transportation:
 - Temperature: -40° C to +70° C (-40° F to +158° F)
 - Humidity: 5% to 93% non-condensing

2.3.4 Interfaces

Each module provides the following network interfaces:

- E0/POE: One HPE Smart Rate port (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 56V DC (nominal) 802.3at POE
- E1/SFP: One SFP port (SFP-LX-EXT and SFP-SX-EXT, 1000BASE-X)

AC power interface:

- 100-240V 50/60Hz AC (power cord or power connector kit sold separately)

Antenna interfaces:

- 802.11a/b/g/n/ac six external antenna (AP-374) or five (AP-375) and four (AP-377) internal antenna

USB Micro-B console port

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 4 dBm transmit power (class 2) and -91 dBm receive sensitivity

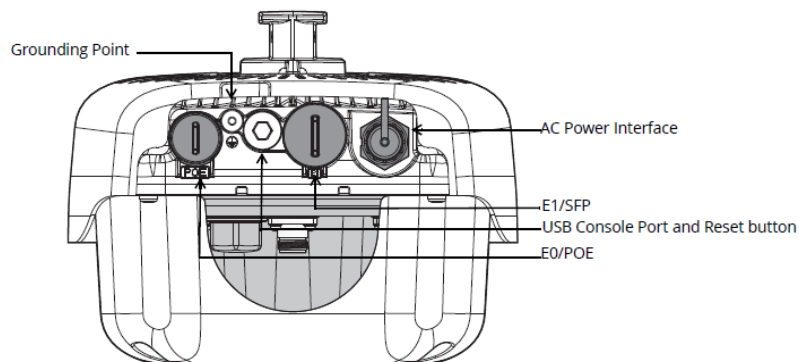


Figure 11 - Aruba AP-374 Outdoor Access Point – Interfaces (with weatherproof caps)

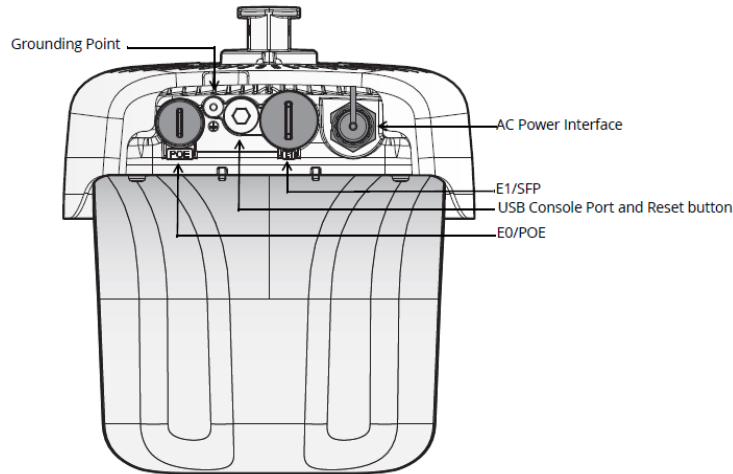


Figure 12 - Aruba AP-375 Outdoor Access Point – Interfaces (with weatherproof caps)

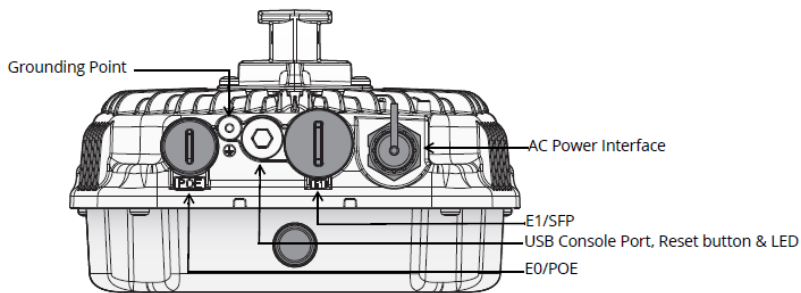


Figure 13 - Aruba AP-377 Outdoor Access Point – Interfaces (with weatherproof caps)

Other Interfaces:

- Visual indicator (one multi-color LED on front): for System and Radio status
- Reset button: factory reset (during device power up)
- Serial console interface (proprietary; adapter cable included in package; disabled in FIPS mode)
- Grounding Point

Table 3 - AP-370 Series Status Indicator LEDs

LED Type	Color/State	Meaning
System Status (during Boot Up)	Off	AP powered off
	Red	Initial power-up
	Green - Flashing	AP booting; not ready
	Green - Solid	AP ready and 1000Mbps Ethernet link established. The LED turns off after 1200 seconds.
	Green / Amber Alternating, 6 seconds period	AP ready and 10/100Mbps Ethernet link established. The LED turns off after 1200 seconds.
System Status (during Operation)	Red - Solid	System error condition
	Red – One blink off every 3 seconds	Radio 0 fault (5 GHz)
	Red – Two quick blinks off 0.5 seconds apart cycled every 3 seconds	Radio 1 fault (2.4 GHz)

2.4 AP-387 Series

This section introduces the Aruba AP-387 Series Outdoor Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-387 APs, their physical attributes, and their interfaces.



Figure 14 - Aruba AP-387 Outdoor Access Point – Side



Figure 15 - Aruba AP-387 Outdoor Access Point – Front

With a maximum concurrent data rate of 867 Mbps in the 5 GHz band and 2.5 Gbps in the 60 GHz band (for an aggregate peak data rate of 3.37 Gbps) at distances up to 400 meters (0.25 miles), the AP-387 Series Outdoor Access Points deliver 802.11ad and 802.11ac Wave 2 Gigabit Wi-Fi performance to outdoor and environmentally challenging locations for highly reliable point-to-point solutions between two campus buildings or structures (e.g. parking garage or annex), or providing high bandwidth to a temporary event site, or for local disaster recovery. Purpose-built to survive in the harshest outdoor environments, the 387 Series APs can withstand exposure to extreme high and low temperatures, high winds up to 165 mph, persistent moisture, precipitation, dust and salt, and are fully sealed to keep out airborne contaminants. All electrical interfaces include industrial strength surge protection. Also, the 60GHz radios can automatically adjust and align the point-to-point connection.

The high performance and cost effective 802.11ac and 802.11ad 387 Series Access Points support all mandatory and several optional 802.11ac features, which include Multi-User Multiple Input Multiple Output (MU-MIMO) for improved network capacity with multiples devices capable to transmit simultaneously, 2x2 MIMO with up to two spatial streams (2SS) in 5 GHz and 1x1 with one spatial streams (1SS) in 60 GHz, and 256-QAM modulation. In

In addition to 802.11ac standard capabilities, the Wi-Fi 6 AP-387 Series supports an additional integrated radio (Bluetooth Low-Energy (BLE)) for location services, asset tracking services, security solutions and IoT sensors, as well as ArubaOS 8 features like Aruba AirWave.

The AP-387 has one internal scanning antenna for 1x1 MIMO in 60 GHz and one internal directional antenna for 2x2 MIMO in 5 GHz with peak antenna gain of 9 dBi.

Additionally, Advanced Cellular Coexistence (ACC) minimizes the impact of interference from 3G/4G LTE cellular networks, Dynamic Frequency Selection (DFS) maximizes the use of available RF spectrum, and Maximum Ratio Combining (MRC) improves receiver performance.

When managed by Aruba Mobility Controllers, AP-387 Series APs offer centralized configuration, data encryption, policy enforcement and network services, as well as distributed and centralized traffic forwarding.

2.4.1 Physical Description

The Aruba AP-387 Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. The modules contain 802.11 a/b/g/n/ac transceivers and support two internal scanning and directional antennas.

The case physically encloses the complete set of hardware and software components and represents the cryptographic boundary of the module.

The Access Point configuration validated during the cryptographic module testing included:

- AP-387 HW: AP-387-USF1 (HPE SKU R0K14A)
- AP-387 HW: AP-387-RWF1 (HPE SKU R0K13A)

2.4.2 Dimensions/Weight

The AP-387s have the following physical dimensions (AP-387 unit, excluding mount adapter):

- Dimensions: 18cm (W) x 18cm (D) x 10.1cm (H)
- Weight: 1.198 kg

2.4.3 Environmental

- Operating:
 - Temperature: -40° C to +60° C (-40° F to +140° F)
 - Humidity: 5% to 95% non-condensing
- Storage and transportation:
 - Temperature: -40° C to +70° C (-40° F to +158° F)
 - Humidity: 5% to 93% non-condensing

2.4.4 Interfaces

Each module provides the following network interfaces:

- E0/POE: One HPE Smart Rate port (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 56V DC (nominal) 802.3at POE

USB Micro-B console port

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 4 dBm transmit power (class 2) and -91 dBm receive sensitivity

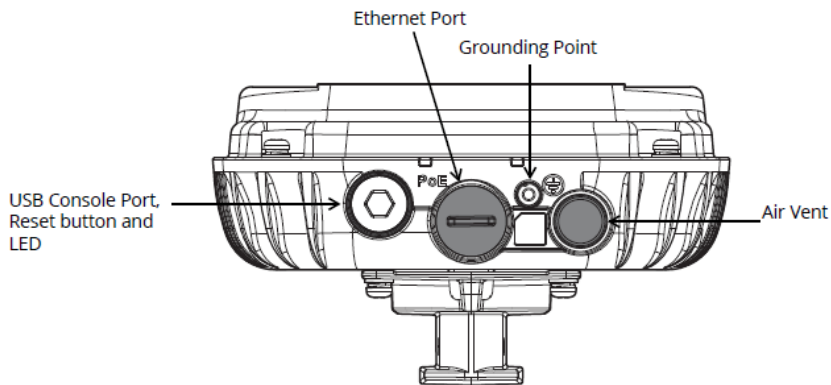


Figure 16 - Aruba AP-387 Series Outdoor Access Point – Interfaces (with weatherproof caps)

Antenna interfaces:

- 802.11a/b/g/n/ac two internal antenna

Other Interfaces:

- Visual indicator (one multi-color LED on front): for System and Radio status
- Reset button: factory reset (during device power up)
- Serial console interface (proprietary; adapter cable included in package; disabled in FIPS mode)
- Grounding Point

Table 4 - AP-387 Series Status Indicator LEDs

LED Type	Color/State	Meaning
System Status (during Boot Up)	Off	AP powered off
	Red	Initial power-up
	Green - Flashing	AP booting; not ready
	Green - Solid	AP ready and 1000Mbps Ethernet link established. The LED turns off after 1200 seconds.
System Status (during Operation)	Green / Amber Alternating, 6 seconds period	AP ready and 10/100Mbps Ethernet link established. The LED turns off after 1200 seconds.
	Red - Solid	System error condition
	Red – One blink off every 3 seconds	Radio 0 fault (5 GHz)
	Red – Two quick blinks off 0.5 seconds apart cycled every 3 seconds	Radio 1 fault (2.4 GHz)

3 Module Objectives

This section describes the assurance levels for each of the areas described in the FIPS 140-2 Standard.

3.1 Security Levels

The Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points and associated modules are intended to meet overall FIPS 140-2 Level 2 requirements as shown in the following table.

Table 5 - Intended Level of Security

Section	Section Title	Security Level
1	Cryptographic Module Specification	2
2	Cryptographic Module Ports and Interfaces	2
3	Roles, Services, and Authentication	2
4	Finite State Model	2
5	Physical Security	2
6	Operational Environment	N/A
7	Cryptographic Key Management	2
8	EMI/EMC	2
9	Self-Tests	2
10	Design Assurance	2
11	Mitigation of Other Attacks	N/A
Overall	Overall module validation level	2

4 Physical Security

The Aruba Wireless Access Point is a scalable, multi-processor standalone network device and is enclosed in a hard, opaque plastic case. The AP enclosure is resistant to probing (please note that this feature has not been validated as part of the FIPS 140-2 validation) and is opaque within the visible spectrum. The enclosure of the AP has been designed to satisfy FIPS 140-2 Level 2 physical security requirements.

The Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points require Tamper-Evident Labels (TEs) to allow the detection of the opening of the device and to block the Serial console port. To protect the Access Points from any tampering with the product, TEs should be applied by the Crypto Officer as covered under section 12, [Tamper-Evident Labels](#).

5 Operational Environment

The operational environment is non-modifiable. The control plane Operating System (OS) is Linux, a real-time, multi-threaded operating system that supports memory protection between processes. Access to the underlying Linux implementation is not provided directly. Only Aruba Networks provided interfaces are used, and the Command Line Interface (CLI) is a restricted command set. The module only allows the loading of trusted and verified firmware that is signed by Aruba. Any firmware loaded into this module that is not shown on the module certificate is out of the scope of this validation and requires a separate FIPS 140-2 validation.

6 Logical Interfaces

All of these physical interfaces are separated into logical interfaces defined by FIPS 140-2, as described below.

Table 6 - FIPS 140-2 Logical Interfaces

FIPS 140-2 Logical Interface	Module Physical Interface
Data Input Interface	<ul style="list-style-type: none">• 10/100/1000 Ethernet Ports• SFP Ports (AP-318/374/375/377)• 802.11 a/b/g/n/ac Antenna Interfaces
Data Output Interface	<ul style="list-style-type: none">• 10/100/1000 Ethernet Ports• SFP Ports (AP-318/374/375/377)• 802.11 a/b/g/n/ac Antenna Interfaces
Control Input Interface	<ul style="list-style-type: none">• 10/100/1000 Ethernet Ports• SFP Ports (AP-318/374/375/377)• 802.11 a/b/g/n/ac Antenna Interfaces• Reset button
Status Output Interface	<ul style="list-style-type: none">• 10/100/1000 Ethernet Ports• SFP Ports (AP-318/374/375/377)• 802.11 a/b/g/n/ac Antenna Interfaces• LED Status Indicators
Power Interface	<ul style="list-style-type: none">• Power Input• Power-Over-Ethernet (POE)

Data input and output, control input, status output, and power interfaces are defined as follows:

- Data input and output are the packets that use the networking functionality of the module.
- Control input consists of manual control inputs for power and reset through the power interfaces (power supply or POE). It also consists of all of the data that is entered into the access point while using the management interfaces. A reset button is present which is used to reset the AP to factory default settings.
- Status output consists of the status indicators displayed through the LEDs, the status data that is output from the module while using the management interfaces, and the log file.
 - LEDs indicate the physical state of the module, such as power-up (or rebooting), utilization level, and activation state. The log file records the results of self-tests, configuration errors, and monitoring data.
- The module may be powered by an external power supply. Operating power may also be provided via a Power Over Ethernet (POE) device, when connected, where the power is provided through the connected Ethernet cable.
- The Console port is disabled when operating in FIPS Approved mode by a Tamper-Evident Label (TEL).

The module distinguishes between different forms of data, control, and status traffic over the network ports by analyzing the packets header information and contents.

7 Roles, Authentication and Services

7.1 Roles

The module supports the role-based authentication of Crypto Officer, User, and Wireless Client; no additional roles (e.g., Maintenance) are supported. Administrative operations carried out by the Aruba Mobility Controller or Aruba Mobility Master map to the Crypto Officer role. The Crypto Officer has the ability to configure, manage, and monitor the module, including the configuration, loading, and zeroization of CSPs. Configuration can be performed through a standalone Mobility Controller or by a Mobility Master if deployed in the environment. The Mobility master also acts as a CO for the APs.

Defining characteristics of the roles depend on whether the module is configured as in either Remote AP FIPS mode, Control Plane Security (CPSec) Protected AP FIPS mode or Mesh AP FIPS Mode. There are four FIPS approved modes of operations, which are Remote AP FIPS mode, Control Plane Security (CPSec) Protected AP FIPS mode and the two Mesh Modes, Mesh Portal FIPS Mode and Mesh Point FIPS Mode. Please refer to section 13, [Secure Operation](#) in this documentation for more information.

- **Remote AP FIPS mode:**
 - Crypto Officer role: the Crypto Officer is the Aruba Mobility Controller or Mobility Master that has the ability to configure, manage, and monitor the module, including the configuration, loading, and zeroization of CSPs.
 - User role: in the configuration, the User operator shares the same services and authentication techniques as the Mobility Controller in the Crypto Officer role.
 - Wireless Client role: in Remote AP FIPS mode configuration, a wireless client can create a connection to the module using WPA2/WPA3 and access wireless network access/bridging services. When Remote AP cannot communicate with the controller, the wireless client role authenticates to the module via WPA2/WPA3 Pre-shared secret only.

- **CPSec Protected AP FIPS mode:**
 - Crypto Officer role: the Crypto Officer is the Aruba Mobility Controller or Mobility Master that has the ability to configure, manage, and monitor the module, including the configuration, loading, and zeroization of CSPs.
 - User role: in the configuration, the User operator shares the same services and authentication techniques as the Mobility Controller in the Crypto Officer
 - Wireless Client role: in CPsec Protected AP FIPS mode configuration, a wireless client can create a connection to the module using WPA2/WPA3 Pre-shared secret and access wireless network access services.
- **Mesh Portal FIPS mode:**
 - Crypto Officer role: the Crypto Officer is the Aruba Mobility Controller or Mobility Master that has the ability to configure, manage, and monitor the module, including the configuration, loading, and zeroization of CSPs.
 - User role: the adjacent Mesh Point APs in a given mesh cluster. Please notice that Mesh Portal AP must be physically wired to Mobility Controller.
 - Wireless Client role: in Mesh Portal FIPS AP configuration, a wireless client can create a connection to the module using WPA2 and access wireless network access services.
- **Mesh Point FIPS mode:**
 - Crypto Officer role: the Crypto Officer role is the Aruba Mobility Controller or Mobility Master that has the ability to configure, manage, and monitor the module, including the configuration, loading, and zeroization of CSPs. The first mesh AP configured is the only AP with the direct wired connection.
 - User role: the adjacent Mesh APs in a given mesh cluster. Please notice that User role can be a Mesh Point AP or a Mesh Portal AP in the given mesh network.
 - Wireless Client role: in Mesh Mesh Point FIPS AP configuration, a wireless client can create a connection to the module using WPA2 and access wireless network access services.

7.2 Authentication

7.2.1 Crypto Officer Authentication

In each of FIPS approved modes, the Aruba Mobility Controller or Mobility Master implements the Crypto Officer role. Connections between the module and the mobility controller are protected using IPsec. Crypto Officer's authentication is accomplished via either Pre-shared secret (IKEv1), RSA digital certificate (IKEv1/IKEv2) or ECDSA digital certificate (IKEv2). The Mobility Master interacts with the APs through the Mobility Controller through provisioning of configurations.

7.2.2 User Authentication

Authentication for the User role depends on the module configuration. When the module is configured in Mesh Portal FIPS mode or Mesh Point FIPS mode, the User role is authenticated via the WPA2 pre-shared key or EAP. When the module is configured as a Remote AP FIPS mode and CPsec protected AP FIPS mode, the User role is authenticated via the same IKEv1 pre-shared key or RSA/ECDSA certificate that is used by the Crypto Officer.

7.2.3 Wireless Client Authentication

The wireless client role defined in each of FIPS approved modes authenticates to the module via WPA2/WPA3. Please notice that WEP and TKIP configurations are not permitted in FIPS mode. When Remote AP cannot communicate with the controller, the wireless client role authenticates to the module via WPA2/WPA3 Pre-shared secret only.

7.2.4 Strength of Authentication Mechanisms

The following table describes the relative strength of each supported authentication mechanism.

Table 7 - Strength of Authentication Mechanisms

Authentication Type	Role(s)	Mechanism Strength
IKEv1 Pre-shared secret based authentication	Crypto Officer and User	<p>Passwords are required to be a minimum of eight ASCII characters and a maximum of 64 with a minimum of one letter and one number, or the password must be exactly 64 HEX characters. Assuming the weakest option of 8 ASCII characters with the listed restrictions, the probability of randomly guessing the correct sequence is one (1) in 3,608,347,333,959,680 (this calculation is based on the assumption that the typical standard American QWERTY computer keyboard has 10 Integer digits, 52 alphabetic characters, and 32 special characters providing 94 characters to choose from in total. The calculation should be 94^8 (Total number of 8-digit passwords) – 84^8 (Total number of 8-digit passwords without numbers) – 42^8 (Total number of 8-digit passwords without letters) + 32^8 (Total number of 8-digit passwords without letters or numbers, added since it's double-counted in the previous two subtractions) = 3,608,347,333,959,680). At optimal network conditions (assuming 1ms round-trip latency), an attacker would only get 60,000 guesses per minute. Therefore the associated probability of a successful random attempt during a one-minute period is $60,000/3,608,347,333,959,680$, which is less than 1 in 100,000 required by FIPS 140-2.</p>
WPA2/WPA3 Pre-shared secret based authentication	Wireless Client and Mesh AP User	<p>Passwords are required to be a minimum of eight ASCII characters and a maximum of 63 with a minimum of one letter and one number, or the password must be exactly 64 HEX characters. Assuming the weakest option of 8 ASCII characters with the listed restrictions, the probability of randomly guessing the correct sequence is one (1) in 3,608,347,333,959,680 (this calculation is based on the assumption that the typical standard American QWERTY computer keyboard has 10 Integer digits, 52 alphabetic characters, and 32 special characters providing 94 characters to choose from in total. The calculation should be 94^8 (Total number of 8-digit passwords) – 84^8 (Total number of 8-digit passwords without numbers) – 42^8 (Total number of 8-digit passwords without letters) + 32^8 (Total number of 8-digit passwords without letters or numbers, added since it is double-counted in the previous two subtractions) = 3,608,347,333,959,680). At optimal network conditions (assuming 1ms round-trip latency), an attacker would only get 60,000 guesses per minute. Therefore the associated probability of a successful random attempt during a one-minute period is $60,000/3,608,347,333,959,680$, which is less than 1 in 100,000 required by FIPS 140-2.</p>

RSA Certificate based authentication	Crypto Officer and User	The module supports 2048-bit RSA key authentication during IKEv1 and IKEv2. RSA 2048 bit keys correspond to 112 bits of security. Assuming the low end of that range, the associated probability of a successful random attempt is 1 in 2^{112} , which is less than 1 in 1,000,000 required by FIPS 140-2. At optimal network conditions (assuming 1ms round-trip latency), an attacker would only get 60,000 guesses per minute. Therefore the associated probability of a successful random attempt during a one-minute period is $60,000/2^{112}$, which is less than 1 in 100,000 required by FIPS 140-2.
ECDSA Certificate based authentication	Crypto Officer and User	ECDSA signing and verification is used to authenticate to the module during IKEv1/IKEv2. Both P-256 and P-384 curves are supported. ECDSA P-256 provides 128 bits of equivalent security, and P-384 provides 192 bits of equivalent security. Assuming the low end of that range, the associated probability of a successful random attempt is 1 in 2^{128} , which is less than 1 in 1,000,000 required by FIPS 140-2. At optimal network conditions (assuming 1ms round-trip latency), an attacker would only get 60,000 guesses per minute. Therefore the associated probability of a successful random attempt during a one-minute period is $60,000/2^{128}$, which is less than 1 in 100,000 required by FIPS 140-2.

7.3 Services

The module provides various services depending on role. These are described below.

7.3.1 Crypto Officer Services

See the table below for descriptions of the services available to the Crypto Officer role. The services are the same in each of the four (4) FIPS approved modes of operation.

Table 8 – Crypto Officer Services

Service	Description	CSPs Accessed (see section 9 below for a complete description to each CSP and the associated cryptographic algorithms)
FIPS mode enable/disable	The CO enables FIPS mode by following the procedures under Section 13 to ensure the AP is configured for Secure Operations. The CO can disable FIPS mode by reverting these changes.	None
Key Management	The CO can cause the module to generate the SKEYSEED and can configure/modify the IKEv1 shared secret and the WPA2/WPA3 Pre-shared secret (used in advanced Remote AP configuration). The CO can add/overwrite IKEv1/IKEv2 certificates (the RSA and ECDSA private keys are protected by non-volatile memory and cannot be modified). Also, the CO implicitly uses the KEK to read/write configuration to non-volatile memory.	1, 13, 16, 22, 24, and 25 (read), 13, 16, 22, 24 and 25 (write)
Remotely reboot module	The CO can remotely trigger a reboot.	None

Self-test triggered by CO/User reboot	The CO can trigger a programmatic reset leading to self-test and initialization.	None
Update module firmware ¹	The CO can trigger a module firmware update.	1, 12 (read)
Configure non-security related module parameters	CO can configure various operational parameters that do not relate to security.	None
Creation/use of secure management session between module and CO ²	The module supports use of IPSec for securing the management channel.	2, 3, 4, 5, 6, 7, 8, 9, 10, 11 (read, write) 12 (read) 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 (read, write)
System Status	CO may view system status information through the secured management channel.	See creation/use of secure management session above.
Creation/use of secure mesh channel ³	The module requires secure connections between mesh points using WPA2/WPA3.	1, 25 (read) 26, 27, 28, 29, 30 (read/write)
Openflow Agent	Agent run on device for use with Mobility Master SDN. Leveraged by the SDN for discovering of hosts and networks, configuration of networks, and collection of statistics.	None
Zeroization	The cryptographic keys stored in SDRAM memory can be zeroized by rebooting the module. The cryptographic keys (IKEv1 Pre-shared key and WPA2/WPA3 Pre-Shared Key) stored in the flash can be zeroized by using command 'ap wipe out flash'. The 'no' command in the CLI can be used to zeroize IKE, IPSec CSPs. Please See CLI guide for details. The other keys/CSPs (RSA/ECDSA public key/private key and certificate) stored in Flash memory can be zeroized by using command 'ap wipe out flash'.	All CSPs (not including the Factory CA Public Key) will be destroyed.

7.3.2 User Services

The User role for Remote AP FIPS mode and Control Plane Security (CPSec) Protected AP FIPS mode supports the same services listed in the Section 7.3.1 Crypto Officer Services.

The User role for Mesh Portal FIPS mode and Mesh Point FIPS mode supports the services listed in Section 7.3.3 Wireless Client Services.

¹ Any firmware loaded into this module that is not shown on the module certificate is out of the scope of this validation and requires a separate FIPS 140-2 validation.

² This service is *not* available in Mesh Point mode. In Mesh Point mode, the IPSec tunnel will be between the Mesh Portal and the controller, not the Mesh Point and the controller.

³ This service is only applicable in the Mesh Portal mode and Mesh Point mode. It is not applicable in Control Plane Security (CPSec) Protected AP FIPS mode and Remote AP FIPS mode.

7.3.3 Wireless Client Services

The following module services are provided for the Wireless Client role in Remote AP FIPS mode, CPsec protected AP FIPS mode, Mesh Portal FIPS mode and Mesh Point FIPS mode.

Table 9 - Wireless Client Services

Service	Description	CSPs Accessed (see section 9 below for a complete description to each CSP and the associated cryptographic algorithms)
Generation and use of WPA2/WPA3 cryptographic keys	In all FIPS modes, the links between the module and wireless client are secured with WPA2/WPA3.	1, 25 (read) 26, 27, 28, 29, 30 (read/write)
Use of WPA2/WPA3 Pre-shared secret for establishment of WPA2/WPA3 keys	When the module is in advanced Remote AP configuration, the links between the module and the Wireless Client are secured with WPA2/WPA3. This is authenticated with a shared secret only.	1, 25 (read)
Wireless bridging services	The module bridges traffic between the wireless client and the wired network.	None

7.3.4 Unauthenticated Services

The module provides the following unauthenticated services, which are available regardless of role:

- System status – module LEDs
- Reboot module by removing/replacing power
- Self-test and initialization at power-on.

7.3.5 Services Available in Non-FIPS Mode

The following services are available in Non-FIPS mode:

- All of the services that are available in FIPS mode are also available in non-FIPS mode.
- If not operating in the Approved mode as per the procedures in sections 13.1, [Crypto Officer Management](#), 13.4, [Setting Up Your Wireless Access Point](#) and 13.5, [Enabling FIPS Mode on the Staging Controller](#), then non-Approved algorithms and/or sizes are available.
- Upgrading the firmware via the console port (Non-Approved).
- Debugging via the console port (Non-Approved).

For additional non-security-relevant services offered by the module, please refer to the *ArubaOS User Guide* listed in section 13.7.

7.3.6 Non-Approved Services Non-Approved in FIPS Mode

The following non-Approved services are available in FIPS mode but are non-Approved:

- IPSec/IKE using Triple-DES.
- The Suite-B (bSec) protocol is a pre-standard protocol that has been proposed to the IEEE 802.11 committee as an alternative to 802.11i.

8 Cryptographic Key Management

8.1 FIPS Approved Algorithms

The firmware in each module contains the following cryptographic algorithm implementations/crypto libraries to implement the different FIPS Approved cryptographic algorithms that will be used for the corresponding security services supported by the module in FIPS mode:

- ArubaOS OpenSSL Module algorithm implementation
- ArubaOS Crypto Module algorithm implementation
- ArubaOS UBOOT Bootloader library algorithm implementation
- Aruba AP Hardware algorithm implementation

Below are the detailed lists for the FIPS Approved algorithms and the associated certificates implemented by each algorithm implementation/crypto library.

Note that not all algorithm modes that appear on the module's CAVP certificates are utilized by the module, and the tables below list only the algorithm modes that are utilized by the module.

The firmware supports the following cryptographic implementations.

Table 10 - ArubaOS OpenSSL Module CAVP Certificates

ArubaOS OpenSSL Module					
CAVP Certificate #	Algorithm	Standard	Mode/Method	Key Lengths, Curves, Moduli	Use
C1253	AES	FIPS 197, SP 800-38A	ECB, CBC, CTR (256, ext only, encryption only)	128, 256	Data Encryption/Decryption
C1253	CVL IKEv1 ⁴	SP 800-135 Rev1	IKEv1: DSA, PSK	IKEv1: DH 2048-bit; SHA-1, SHA-256, SHA-384	Key Derivation
C1253	DRBG	SP 800-90A	AES CTR	256	Deterministic Random Bit Generation
C1253	ECDSA	FIPS 186-4	PKG, PKV, SigGen, SigVer	P-256, P-384	Digital Key Generation and Verification, Signature Generation and Verification
C1253	HMAC	FIPS 198-1	HMAC-SHA1, HMAC-SHA2-256, HMAC-SHA2-384, HMAC-SHA2-512	Key Size < Block Size	Message Authentication
Vendor Affirmed	KAS-SSC ⁵	SP 800-56A Rev3	dhEphem, Ephemeral Unified	P-256, P-384, DH 2048-bit	Key Agreement Scheme – Shared Secret Computation
C1253	KBKDF	SP 800-108	CTR	HMAC-SHA2-384	Deriving Keys
A768 A769	KBKDF	SP 800-108	CTR	HMAC-SHA2-384	Deriving Keys
Vendor Affirmed	KDA ⁶	SP 800-56C Rev2	Two-step key derivation	HMAC-SHA-256, HMAC-SHA-384	Key Derivation Algorithm

⁴ IKEv1 protocol has not been reviewed or tested by the CAVP and CMVP.

⁵ Vendor affirming the module to SP 800-56A Rev3.

⁶ Vendor affirming the Key Derivation Algorithm to SP 800-56C Rev2.

C1253	RSA	FIPS 186-2	SHA-1 PKCS1 v1.5	2048	Digital Signature Verification
C1253	RSA	FIPS 186-4	SHA-1 ⁷ , SHA-256, SHA-384 PKCS1 v1.5	2048	Digital Key Generation, Signature Generation and Verification
C1253	SHS	FIPS 180-4	SHA-1, SHA-256, SHA-384, SHA-512 Byte Only	160, 256, 384, 512	Message Digest
C1253	Triple-DES ⁸	SP 800-67 Rev2	TECB, TCBC	192	Data Encryption/Decryption
AES C1253	KTS	SP 800-38F	AES-GCM ⁹	128, 256	Key Wrapping/Key Transport via IKE/IPSec
AES C1253 HMAC C1253	KTS	SP 800-38F	AES-CBC ¹⁰ HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512	128, 192, 256 Key Size < Block Size	Key Wrapping/Key Transport via IKE/IPSec

Table 11 - ArubaOS Crypto Module CAVP Certificates

ArubaOS Crypto Module					
CAVP Certificate #	Algorithm	Standard	Mode/Method	Key Lengths, Curves, Moduli	Use
C1254	AES	FIPS 197, SP 800-38A, SP 800-38D	CBC, GCM	128, 192, 256	Data Encryption/Decryption
C1254	CVL IKEv2 ¹¹ (KDF)	SP800-135 Rev1	IKEv2	IKEv2: DH 2048-bit; SHA-1, SHA2-256, SHA2-384	Key Derivation
C1254	ECDSA	FIPS 186-4	PKG, PKV, SigGen, SigVer	P-256, P-384	Digital Key Generation and Verification, Signature Generation and Verification
C1254	HMAC	FIPS 198-1	HMAC-SHA-1, HMAC-SHA2-256, HMAC-SHA2-384, HMAC-SHA2-512 ¹² HMAC-SHA-1-96, HMAC-SHA-256-128, HMAC-SHA-384-192	Key Size < Block Size	Message Authentication

⁷ SHA-1 is only approved for use with Signature Verification.

⁸ In FIPS Mode, Triple-DES is only used in the Self-Tests and with the KEK.

⁹ key establishment methodology provides 128 or 256 bits of encryption strength

¹⁰ key establishment methodology provides between 128 and 256 bits of encryption strength

¹¹ IKEv2 protocol has not been reviewed or tested by the CAVP and CMVP.

¹² In FIPS Mode, HMAC-SHA-512 is only used in the Self-Tests.

Vendor Affirmed	KAS-SSC ¹³	SP 800-56A Rev3	dhEphem, Ephemeral Unified	P-256, P-384, DH 2048-bit	Key Agreement Scheme – Shared Secret Computation
C1254	RSA	FIPS 186-2	SHA-1, SHA2-256, SHA2-384 PKCS1 v1.5	2048	Digital Signature Verification
C1254	RSA	FIPS 186-4	SHA-1 ¹⁴ , SHA2-256, SHA2-384 PKCS1 v1.5	2048	Key Generation, Digital Signature Generation and Verification
C1254	SHS	FIPS 180-4	SHA-1, SHA-256, SHA-384, SHA-512 ¹⁵ Byte Only	160, 256, 384, 512	Message Digest
C1254	Triple-DES ¹⁶	SP 800-67 Rev2	TCBC	192	Data Encryption/Decryption
AES C1254	KTS	SP 800-38F	AES-GCM ¹⁷	128, 256	Key Wrapping/Key Transport via IKE/IPSec
AES C1254 HMAC C1254	KTS	SP 800-38F	AES-CBC ¹⁸ HMAC-SHA-1, HMAC-SHA2-256, HMAC-SHA2-384, HMAC-SHA2-512 ¹⁹	128, 192, 256 Key Size < Block Size	Key Wrapping/Key Transport via IKE/IPSec

Table 12 - ArubaOS UBOOT Bootloader CAVP Certificates

ArubaOS UBOOT Bootloader					
CAVP Certificate #	Algorithm	Standard	Mode/Method	Key Lengths, Curves, Moduli	Use
C1255	RSA	FIPS 186-4	SHA-1, SHA2-256 PKCS1 v1.5	2048	Digital Signature Verification
C1255	SHS	FIPS 180-4	SHA-1, SHA-256 Byte Only	160, 256	Message Digest

Note:

- Only Firmware signed with SHA-256 is permitted in the Approved mode. Digital signature verification with SHA-1, while available within the module, shall only be used while in the non-Approved mode.

¹³ Vendor affirming the module to SP 800-56A Rev3.

¹⁴ SHA-1 is only Approved for use with Signature Verification

¹⁵ In FIPS Mode, SHA-512 is only used in the Self-Tests.

¹⁶ In FIPS Mode, Triple-DES is only used in the Self-Tests.

¹⁷ key establishment methodology provides 128 or 256 bits of encryption strength

¹⁸ key establishment methodology provides between 128 and 256 bits of encryption strength

¹⁹ In FIPS Mode, HMAC-SHA-512 is only used in the Self-Tests.

Table 13 - Aruba AP Hardware CAVP Certificates

Aruba AP Hardware					
CAVP Certificate #	Algorithm	Standard	Mode/Method	Key Lengths, Curves, Moduli	Use
4748 5412	AES	FIPS 197, SP 800-38A	ECB, CBC, CCM, GCM (used for self-test only)	128, 192, 256	Data Encryption/Decryption

8.2 Non-FIPS Approved but Allowed Cryptographic Algorithms

The cryptographic module implements the following non-FIPS Approved algorithms that are allowed for use in the FIPS 140-2 mode of operations:

- NDRNG (used solely to seed the Approved DRBG)

8.3 Non-FIPS Approved Cryptographic Algorithms

The cryptographic module implements the following non-FIPS Approved algorithms that are not permitted for use in the FIPS 140-2 mode of operations:

- DES
- HMAC-MD5
- MD5
- RC4
- RSA (non-compliant less than 112 bits or when used with SHA-1 for signature generation or when other than 2048-bit modulus sizes are used)
- Null Encryption
- Diffie-Hellman (key agreement; non-compliant less than 112 bits of encryption strength)
- EC Diffie-Hellman (key agreement; non-compliant less than 112 bits of encryption strength)
- ECDSA (non-compliant when using 186-2 signature generation)
- Triple-DES as used in IKE/IPSec.

Note: DES, MD5, HMAC-MD5 and RC4 are used for older versions of WEP in non-FIPS mode.

9 Critical Security Parameters

The following are the Critical Security Parameters (CSPs) used in the module. The user is responsible for zeroizing all CSPs when switching modes.

Table 14 - CSPs/Keys Used in the Module

#	Name	Algorithm / Key Size	Generation/Use	Storage	Zeroization
General Keys/CSPs					
1	Key Encryption Key (KEK) – Not considered a CSP	Triple-DES (192 bits)	Hardcoded during manufacturing. This is used only to obfuscate keys.	Stored in Flash memory (plaintext)	The zeroization requirements do not apply to this key as it is not considered a CSP.
2	DRBG Entropy Input	SP800-90A CTR_DRBG (512 bits)	Entropy inputs to the DRBG function used to construct the DRBG seed. 64 bytes are retrieved from the entropy source on each call by any service that requires a random number.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
3	DRBG Seed	SP800-90A CTR_DRBG (384 bits)	Input to the DRBG that determines the internal state of the DRBG. Generated using DRBG derivation function that includes the entropy input from the entropy source.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
4	DRBG Key	SP800-90A CTR_DRBG (256 bits)	This is the DRBG key used for SP800-90A CTR_DRBG.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
5	DRBG V	SP800-90A CTR_DRBG V (128 bits)	Internal V value used as part of SP800-90A CTR_DRBG.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
6	Diffie-Hellman Private Key	Diffie-Hellman Group 14 (224 bits)	Generated internally by calling FIPS Approved DRBG (Cert. #C1253) to derive Diffie-Hellman shared secret used in both IKEv1 and IKEv2.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
7	Diffie-Hellman Public Key	Diffie-Hellman Group 14 (2048 bits)	Derived internally in compliance with Diffie-Hellman key agreement scheme. Used for establishing Diffie-Hellman Shared Secret.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
8	Diffie-Hellman Shared Secret	Diffie-Hellman Group 14 (2048 bits)	Established during Diffie-Hellman Exchange. Used for deriving IPsec/IKE cryptographic keys.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.

Table 14 - CSPs/Keys Used in the Module

9	EC Diffie-Hellman Private Key	EC Diffie-Hellman (Curves: P-256 or P-384)	Generated internally by calling FIPS Approved DRBG (Cert. #C1253) during EC Diffie-Hellman Exchange. Used for establishing EC Diffie-Hellman Shared Secret.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
10	EC Diffie-Hellman Public Key	EC Diffie-Hellman (Curves: P-256 or P-384)	Derived internally in compliance with EC Diffie-Hellman key agreement scheme. Used for establishing EC Diffie-Hellman Shared Secret.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
11	EC Diffie-Hellman Shared Secret	EC Diffie-Hellman (Curves: P-256 or P-384)	Established during EC Diffie-Hellman Exchange. Used for deriving IPsec/IKE cryptographic keys.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
12	Factory CA Public Key	RSA (2048 bits)	This is RSA public key. Loaded into the module during manufacturing. Used for Firmware verification.	Stored in TPM	Since this is a public key, the zeroization requirements do not apply.
IPsec/IKE²⁰					
13	IKE Pre-shared secret ²¹	Shared secret (8 - 64 ASCII or 64 HEX characters)	Entered by CO role. Used for IKEv1 peers authentication.	Stored in Flash memory obfuscated with KEK	Zeroized by using command 'ap wipe out flash'.
14	skeyid	Shared Secret (160/256/384 bits)	A shared secret known only to IKEv1 peers. It was established via key derivation function defined in SP800-135 KDF (IKEv1). Used for deriving other keys in IKEv1 protocol implementation.	Stored in SDRAM memory (plaintext)	Zeroized by rebooting the module.
15	skeyid_d	Shared Secret (160/256/384 bits)	A shared secret known only to IKEv1 peers. It was derived via key derivation function defined in SP800-135 KDF (IKEv1). Used for deriving IKEv1 session authentication key.	Stored in SDRAM memory (plaintext)	Zeroized by rebooting the module.

²⁰ Not used in Mesh Point modes of operation

²¹ Applicable only to Remote AP and Mesh Portal modes

Table 14 - CSPs/Keys Used in the Module

16	SKEYSEED	Shared Secret (160/256/384 bits)	A shared secret known only to IKEv2 peers. It was derived via key derivation function defined in SP800-135 KDF (IKEv2). Used for deriving other keys in IKEv2 protocol.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
17	IKE Session Authentication Key	HMAC-SHA-1/256/384 (160/256/384 bits)	The IKE session (IKE Phase I) authentication key. This key is derived via key derivation function defined in SP800-135 KDF (IKEv1/IKEv2). Used for IKEv1/IKEv2 payload integrity verification.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
18	IKE Session Encryption Key	AES (CBC) (128/192/256 bits)	The IKE session (IKE Phase I) encrypt key. This key is derived via key derivation function defined in SP800-135 KDF (IKEv1/IKEv2). Used for IKE payload protection.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
19	IPSec Session Encryption Key	AES (CBC) (128/192/256 bits) and AES-GCM (128/256 bits)	The IPSec (IKE phase II) encryption key. This key is derived via a key derivation function defined in SP800-135 KDF (IKEv1/IKEv2). Used for IPSec traffics protection. IPSec session encryption keys can also be used for the Double Encrypt feature.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
20	IPSec Session Authentication Key	HMAC-SHA-1 (160 bits)	The IPSec (IKE Phase II) authentication key. This key is derived via using the KDF defined in SP800-135 KDF (IKEv1/IKEv2). Used for IPSec traffics integrity verification.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
21	IKE RSA Private Key	RSA Private Key (2048 bits)	This is the RSA private key. This key is generated by the module in compliance with FIPS 186-4 RSA key pair generation method. In both IKEv1 and IKEv2, DRBG (Cert. #C1253) is called for key generation. It is used for RSA signature signing in either IKEv1 or IKEv2. This key can also be entered by the CO.	Stored in Flash memory obfuscated with KEK	Zeroized by using command 'ap wipe out flash'.

Table 14 - CSPs/Keys Used in the Module

22	IKE RSA Public Key	RSA Public Key (2048 bits)	This is the RSA public key. This key is derived in compliance with FIPS 186-4 RSA key pair generation method in the module. It is used for RSA signature verification in either IKEv1 or IKEv2. This key can also be entered by the CO.	Stored in Flash memory (plaintext)	Zeroized by using command 'ap wipe out flash'.
23	IKE ECDSA Private Key	ECDSA suite B (Curves: P-256 or P-384)	This is the ECDSA private key. This key is generated by the module in compliance with FIPS 186-4 ECDSA key pair generation method. In IKEv2, DRBG (Cert. #C1253) is called for key generation. It is used for ECDSA signature signing in IKEv2. This key can also be entered by the CO.	Stored in Flash memory obfuscated with KEK	Zeroized by using command 'ap wipe out flash'.
24	IKE ECDSA Public Key	ECDSA suite B (Curves: P-256 or P-384)	This is the ECDSA public key. This key is derived in compliance with FIPS 186-4 ECDSA key pair generation method in the module. It is used for ECDSA signature verification in IKEv2. This key can also be entered by the CO.	Stored in Flash memory obfuscated with KEK	Zeroized by using command 'ap wipe out flash'.
WPA2/WPA3²²					
25	WPA2/WPA3 Pre-Shared Secret	Shared secret (8-63 ASCII or 64 HEX characters)	Entered by CO role. Used for WPA2/WPA3 client/server authentication.	Stored in Flash memory (obfuscated with KEK).	Zeroized by using command 'ap wipe out flash'.
26	WPA2/WPA3 Pair-Wise Master Key (PMK)	Shared secret (256 bits)	The PMK is transferred to the module, protected by IPSec secure tunnel. Used to derive the Pairwise Transient Key (PTK) for WPA2/WPA3 communications.	Stored in SDRAM (plaintext).	Zeroized by rebooting the module.
27	WPA2/WPA3 Pairwise Transient Key (PTK)	HMAC (384 bits)	This key is used to derive WPA2/WPA3 session key by using the KDF defined in SP800-108 and SP800-56C Rev2.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.

²² While operating in Mesh Point or Mesh Portal mode, the AP will only use PSK for WPA2/WPA3. RAP and CPSec modes use both Certificate-based and PSK-based WPA2/WPA3.

Table 14 - CSPs/Keys Used in the Module

28	WPA2/WPA3 Session Key	AES-CCM (128 bits), AES-GCM (WPA3 only, 128/256 bits)	Derived during WPA2/WPA3 4-way handshake by using the KDF defined in SP800-108 and SP800-56C Rev2 then used as the session key.	Stored in SDRAM memory (plaintext).	Zeroized by rebooting the module.
29	WPA2/WPA3 Group Master Key (GMK)	Shared secret (256 bits)	Generated by calling DRBG (Cert. #C1253). Used to derive WPA2/WPA3 Group Transient Key GTK.	Stored in SDRAM memory (plaintext)	Zeroized by rebooting the module
30	WPA2/WPA3 Group Transient Key (GTK)	AES-CCM, AES-GCM (256 bits)	Derived from WPA2/WPA3 GMK by using the KDF defined in SP800-108 and SP800-56C Rev2. The GTK is the WPA2/WPA3 session key used for broadcast communications protection.	Stored in SDRAM memory (plaintext)	Zeroized by rebooting the module

Notes:

- AES GCM IV generation is performed in compliance with the Implementation Guidance A.5 scenario 1. The module is compliant with RFC 4106 and 7296. Specifically, the module uses RFC 7296 compliant IKEv2 to establish the shared secret SKEYSEED from which the AES GCM encryption keys are derived. When the “nonce” (the IV in RFC 5282) for IKEv2 exhausts the maximum number of possible values for a given security association for IKEv2, either party to the security association for IKEv2 that encounters this condition triggers a rekeying with IKEv2 to establish a new encryption key.
- AES GCM IV generation is performed in compliance with the Implementation Guidance A.5 scenario 4 for WPA3. The session is reauthenticated by the module after 24 hours which resets the AES GCM IV counter. The 24 hour (86400 seconds) interval is the default setting and shall not be changed while in FIPS mode.
- CKG (vendor affirmed to SP 800-133 Rev2): For keys identified as being “Generated internally by calling FIPS approved DRBG”, the generated seed used in the asymmetric key generation is an unmodified output from the DRBG.
- The module generates a minimum of 256 bits of entropy for use in key generation.
- In Remote AP FIPS mode, all CSPs are applicable.
- In CPsec Protected AP FIPS mode, the IKEv1 PSK CSPs are not applicable.
- In Mesh Point FIPS modes, all IPsec/IKE CSPs are not applicable.
- CSPs labeled as “Entered by CO” are transferred into the module from the Mobility Controller via IPsec.
- CSPs generated in FIPS mode cannot be used in non-FIPS mode, and vice versa.

10 Self-Tests

The module performs Power On Self-Tests regardless the modes ((non-FIPS mode, Remote AP FIPS mode, Control Plane Security (CPSec) Protected AP FIPS mode, Mesh Portal FIPS mode or Mesh Point FIPS mode). In addition, the module also performs Conditional tests after being configured into either Remote AP FIPS mode, Control Plane Security (CPSec) Protected AP FIPS mode, Mesh Portal FIPS mode or Mesh Point FIPS mode. In the event any self-test fails, the module will enter an error state, log the error, and reboot automatically.

The module performs the following **POSTs (Power On Self-Tests)**:

- ArubaOS OpenSSL Module:
 - AES (Encrypt/Decrypt) KATs
 - DH (2048) KAT
 - DRBG KATs
 - ECDH (P-256) KAT
 - ECDSA (Sign/Verify) KATs
 - HMAC (HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384 and HMAC-SHA-512) KATs
 - KDF108 KAT
 - RSA (Sign/Verify) KATs
 - SHS (SHA-1, SHA-256, SHA-384 and SHA-512) KATs
 - Triple-DES (Encrypt/Decrypt) KATs

- ArubaOS Crypto Module:
 - AES (Encrypt/Decrypt) KATs
 - AES-GCM (Encrypt/Decrypt) KATs
 - DH (2048) Pairwise Consistency Test
 - ECDH (P-256, P-384) Pairwise Consistency Tests
 - ECDSA (Sign/Verify) KATs
 - HMAC (HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384 and HMAC-SHA-512) KATs
 - RSA (Sign/Verify) KATs
 - SHS (SHA-1, SHA-256, SHA-384 and SHA-512) KATs
 - Triple-DES (Encrypt/Decrypt) KATs

- ArubaOS UBOOT Bootloader Module:
 - Firmware Integrity Test: RSA PKCS#1 v1.5 (2048 bits) signature verification with SHA-256 (the integrity test is the KAT)

- Aruba AP Hardware:
 - AES-CCM (Encrypt/Decrypt) KATs
 - AES-CBC (Encrypt/Decrypt) KATs
 - AES-GCM (Encrypt/Decrypt) KATs

The module performs the following **Conditional Tests**:

- ArubaOS OpenSSL Module algorithm implementation:
 - CRNG Test on Approved DRBG
 - CRNG Test for NDRNG
 - ECDSA Pairwise Consistency Test
 - RSA Pairwise Consistency Test
 - SP800-90A Section 11.3 Health Tests for CTR_DRBG (Instantiate, Generate and Reseed)
 - SP800-56A Rev3 assurances as per SP 800-56A Rev3 Sections 5.5.2, 5.6.2 and 5.6.3.
- ArubaOS Crypto Module algorithm implementation:
 - ECDSA Pairwise Consistency Test
 - RSA Pairwise Consistency Test
 - SP800-56A Rev3 assurances as per SP 800-56A Rev3 Sections 5.5.2, 5.6.2 and 5.6.3.
- ArubaOS UBOOT BootLoader Module algorithm implementation:
 - Firmware Load Test - RSA PKCS#1 v1.5 (2048 bits) signature verification with SHA-256

These self-tests are run for the hardware cryptographic implementation as well as for the Aruba OpenSSL and ArubaOS cryptographic module implementations.

Self-test results are written to the serial console.

In the event of a KATs failure, the AP logs different messages, depending on the error:

- For an ArubaOS OpenSSL AP module and ArubaOS cryptographic module KAT failure:

```
AP rebooted [DATE][TIME] : Restarting System, SW FIPS KAT failed
```
- For an AES Atheros hardware POST failure:

```
Starting HW SHA1 KAT ...Completed HW SHA1 AT
Starting HW HMAC-SHA1 KAT ...Completed HW HMAC-SHA1 KAT
Starting HW AES KAT ...Restarting system.
```

11 Installing the Wireless Access Point

This chapter covers the physical installation of the AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points with FIPS 140-2 Level 2 validation. The Crypto Officer is responsible for ensuring that the following procedures are used to place the Wireless Access Point in a FIPS-Approved mode of operation.

This chapter covers the following installation topics:

- Precautions to be observed during installation.
- Requirements for the Wireless Access Point components.
- Selecting a proper environment for the Wireless Access Point.
- Connecting power to the Wireless Access Point.

11.1 Pre-Installation Checklist

You will need the following during installation:

- Aruba AP-3XX Outdoor Access Point components.
- A mount kit compatible with the AP and mount surface (sold separately).
- A compatible Category 5 UTP Ethernet cable.
- External antennas (when using the AP-318, AP-344 or AP-374).
- Phillips or cross-head screwdriver.
- (Optional) a compatible 48V DC (AP-318, AP-344 or AP-345) or 120-240V AC (AP-374, AP-375, AP-377 or AP-387) AC-to-DC power adapter with power cord.
- (Optional) a compatible PoE midspan injector with power cord.
- One USB Micro-B console cable
- Adequate power supplies and electrical power.
- Management Station (PC) with 10/100 Mbps Ethernet port and SSHv2 software.

Also make sure that (at least) one of the following network services is supported:

- Aruba Discovery Protocol (ADP).
- DNS server with an "A" record.
- DHCP Server with vendor-specific options.

11.2 Identifying Specific Installation Locations

For detailed instructions on identifying AP installation locations, refer to the specific *Aruba 3XX Series Wireless Access Points Installation Guide*, and the section, Identifying Specific Installation Locations.

11.3 Precautions

- All Aruba access points should be professionally installed by an Aruba-Certified Mobility Professional (ACMP).
- Electrical power is always present while the device is plugged into an electrical outlet. Remove all rings, jewelry, and other potentially conductive material before working with this product.
- Never insert foreign objects into the device, or any other component, even when the power cords have been unplugged or removed.
- Main power is fully disconnected from the Wireless Access Point only by unplugging all power cords from their power outlets. For safety reasons, make sure the power outlets and plugs are within easy reach of the operator.
- Do not handle electrical cables that are not insulated. This includes any network cables.
- Keep water and other fluids away from the inside of the product.
- Comply with electrical grounding standards during all phases of installation and operation of the product. Do not allow the Wireless Access Point chassis, network ports, power cables, or mounting brackets to contact any device, cable, object, or person attached to a different electrical ground. Also, never connect the device to external storm grounding sources.
- Installation or removal of the device or any module must be performed in a static-free environment. The proper use of anti-static body straps and mats is strongly recommended.
- Keep modules in anti-static packaging when not installed in the chassis.
- Do not ship or store this product near strong electromagnetic, electrostatic, magnetic or radioactive fields.
- Do not disassemble chassis or modules. They have no internal user-serviceable parts. When service or repair is needed, contact Aruba Networks.

11.4 Product Examination

The units are shipped to the Crypto Officer in factory-sealed boxes using trusted commercial carrier shipping companies. The Crypto Officer should examine the carton for evidence of tampering. Tamper-evidence includes tears, scratches, and other irregularities in the packaging.

11.5 Package Contents

The product carton should include the following:

- AP-3XX Wireless Access Point.
- Mounting kit (sold separately).
- Tamper-Evident Labels.

Inform your supplier if there are any incorrect, missing, or damaged parts. If possible, retain the carton, including the original packing materials. Use these materials to repack and return the unit to the supplier if needed.

12 Tamper-Evident Labels

After testing, the Crypto Officer must apply Tamper-Evident Labels (TEs) to the Access Point (AP). When applied properly, the TELs allow the Crypto Officer to detect the opening of the device, or physical access to restricted ports like the serial console port (on the bottom of the device). Aruba Networks provides FIPS 140-2 designated TELs which have met the physical security testing requirements for tamper evident labels under the FIPS 140-2 Standard. TELs are not endorsed by the Cryptographic Module Validation Program (CMVP).



The tamper-evident labels shall be installed for the module to operate in a FIPS Approved mode of operation.



Aruba Networks provides double the required amount of TELs. If a customer requires replacement TELs, please call customer support and Aruba Networks will provide the TELs (Part # 4011570-01 - HPE SKU JY894A).



The Crypto officer shall be responsible for securing the extra TELs at a safe location and managing the use of the TELs.

12.1 Reading TELs

Once applied, the TELs included with the Wireless Access Point cannot be surreptitiously broken, removed, or reapplied without an obvious change in appearance:



Figure 17 - Tamper-Evident Labels

If evidence of tampering is found with the TELs, the module must immediately be powered down and the administrator must be made aware of a physical security breach.

Each TEL also has a unique serial number to prevent replacement with similar labels. To protect the device from tampering, TELs should be applied by the Crypto Officer as pictured below.

12.2 Required TEL Locations

This section displays the locations of all TELs on each module (AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points).

12.2.1 TELs Placement on the AP-318

The AP-318 requires 3 TELs: one on each side edge (labels 1 and 2) to detect opening the device and one covering the console port (label 3) to detect access to a restricted port. See figures 18 to 21 for placement.



Figure 18 – Front View of AP-318 with TELs



Figure 19 – Left Side View of AP-318 with TEL



Figure 20 – Right Side View of AP-318 with TEL



Figure 21 – Bottom View of AP-318 with TEL

12.2.2 TELs Placement on the AP-344

The AP-344 requires 3 TELs: one on each side edge (labels 1 and 2) to detect opening the device and one covering the console port (label 3) to detect access to a restricted port. See figures 22 and 23 for placement.



Figure 22 – Top View of AP-344 with TELs



Figure 23 – Bottom View of AP-344 with TELs

12.2.3 TELs Placement on the AP-345

The AP-345 requires 3 TELs: one on each side edge (labels 1 and 2) to detect opening the device and one covering the console port (label 3) to detect access to a restricted port. See figures 24 and 25 for placement.



Figure 24 – Top View of AP-345 with TELs



Figure 25 – Bottom View of AP-345 with TELs

12.2.4 TELs Placement on the AP-374

The AP-374 requires 4 TELs: one on each side and front edge (labels 1, 2 and 3) to detect opening the device and one covering the console port (label 4) to detect access to a restricted port. See figures 26 to 29 for placement.



Figure 26 – Right Side View of AP-374 with TEL



Figure 27 – Front View of AP-374 with TEL



Figure 28 – Left Side View of AP-374 with TEL



Figure 29 – Rear View of AP-374 with TEL

12.2.5 TELs Placement on the AP-375

The AP-375 requires 4 TELs: one on each side and front edge (labels 1, 2 and 3) to detect opening the device and one covering the console port (label 4) to detect access to a restricted port. See figures 30 to 33 for placement.



Figure 30 – Right Side View of AP-375 with TEL



Figure 31 – Front View of AP-375 with TEL



Figure 32 – Left Side View of AP-375 with TEL



Figure 33 – Rear View of AP-375 with TEL

12.2.6 TELs Placement on the AP-377

The AP-377 requires 4 TELs: one on each side and front edge (labels 1, 2 and 3) to detect opening the device and one covering the console port (label 4) to detect access to a restricted port. See figures 34 to 37 for placement.



Figure 34 – Right Side View of AP-377 with TEL



Figure 35 – Front View of AP-377 with TEL



Figure 36 – Left Side View of AP-377 with TELs



Figure 37 – Rear View of AP-377 with TELs

12.2.7 TELs Placement on the AP-387

The AP-387 requires 3 TELs: one on each side edge (labels 1 and 2) to detect opening the device and one covering the console port (label 3) to detect access to a restricted port. See figures 38 to 41 for placement.



Figure 38 – Front View of AP-387 with TELs

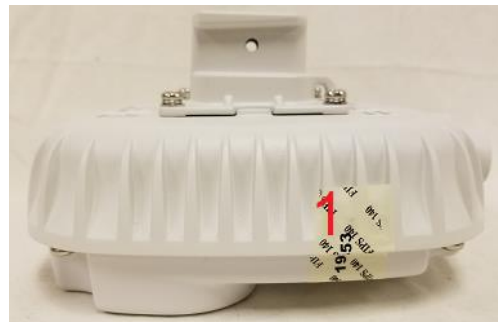


Figure 39 – Right Side View of AP-387 with TEL



Figure 40 – Left Side View of AP-387 with TELs



Figure 41 – Rear View of AP-387 with TELs

12.3 Applying TELs

The Crypto Officer should employ TELs as follows:

- Before applying a TEL, make sure the target surfaces are clean and dry. Clean with alcohol and let dry.
- Do not cut, trim, punch, or otherwise alter the TEL.
- Apply the wholly intact TEL firmly and completely to the target surfaces.
- Press down firmly across the entire label surface, making several back-and-forth passes to ensure that the label securely adheres to the device.
- Allow 24 hours for the TEL adhesive seal to completely cure.
- Record the position and serial number of each applied TEL in a security log.
- To obtain additional or replacement TELS, please call customer support and request FIPS Kit, part number 4011570-01 (HPE SKU JY894A).

Once the TELs are applied, the Crypto Officer (CO) should perform initial setup and configuration as described in the next chapter.

12.4 Inspection/Testing of Physical Security Mechanisms

The Crypto Officer should inspect/test the physical security mechanisms according to the recommended test frequency.

Table 15 - Inspection/Testing of Physical Security Mechanisms

Physical Security Mechanism	Recommended Test Frequency	Guidance
Tamper-evident labels (TELS)	Once per month	Examine for any sign of removal, replacement, tearing, etc.. See images above for locations of TELs. If any TELS are found to be missing or damaged, contact a system administrator immediately.
Opaque module enclosure	Once per month	Examine module enclosure for any evidence of new openings or other access to the module internals. If any indication is found that indicates tampering, contact a system administrator immediately.

13 Secure Operation

The Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points meet FIPS 140-2 Level 2 requirements. The information below describes how to keep the Wireless Access Point in a FIPS-Approved mode of operation.

The module can be configured to be in one of the following FIPS-Approved modes of operations via corresponding Aruba Mobility Controllers that have been certified to FIPS level 2:

Table 16 - FIPS Approved Mode of Operation

FIPS-Approved Mode of Operation	Description
Control Plane Security (CPSec) Protected AP FIPS mode	When the module is configured as a Control Plane Security protected AP it is intended to be deployed in a local/private location (LAN, WAN, MPLS) relative to the Mobility Controller. The module provides cryptographic processing in the form of IPsec for all Control traffic to and from the Mobility Controller.
Remote AP FIPS mode	When the module is configured as a Remote AP, it is intended to be deployed in a remote location (relative to the Mobility Controller). The module provides cryptographic processing in the form of IPsec for all traffic to and from the Mobility Controller.
Mesh Portal FIPS mode	When the module is configured in Mesh Portal mode, it is intended to be connected over a physical wire to the Mobility Controller. These modules serve as the connection point between the Mesh Point and the Mobility Controller. Mesh Portals communicate with the Mobility Controller through IPsec and with Mesh Points via WPA2/WPA3 session. The Crypto Officer role is the Mobility Controller that authenticates via IKEv2 pre-shared key or RSA/ECDSA certificate authentication method, and Users are the "n" Mesh Points that authenticate via WPA2/WPA3 pre-shared key.
Mesh Point FIPS mode	When the module is configured in Mesh Point mode, it is an AP that establishes an all wireless path to the Mesh portal over WPA2/WPA3 and an IPsec tunnel via the Mesh Portal to the Controller. Note: for an AP-387 in Mesh Point mode, it can only connect to another AP-387 in Mesh Portal mode.

In addition, the module also supports a non-FIPS mode – an un-provisioned AP, which by default does not serve any wireless clients.

Note: To change configurations from any one mode to any other mode requires the module to be re-provisioned and rebooted before any new configured mode can be enabled.

The Crypto Officer must ensure that the Wireless Access Point is kept in a FIPS-Approved mode of operation.

13.1 Crypto Officer Management

The Crypto Officer must ensure that the Wireless Access Point is always operating in a FIPS-Approved mode of operation. This can be achieved by ensuring the following:

- The Crypto Officer must first enable and then provision the AP into a FIPS AP mode of operation before Users are permitted to use the Wireless Access Point (see section 13.5, [Enabling FIPS Mode on the Staging Controller](#)).
- Only firmware updates signed with SHA-256/RSA 2048 are permitted.
- Passwords must be at least eight (8) characters long.
- Only FIPS-Approved algorithms can be used for cryptographic services. Please refer to section 8.1, [FIPS Approved Algorithms](#), for the list of Approved algorithms.
- The Wireless Access Point logs must be monitored. If a strange activity is found, the Crypto Officer should take the Wireless Access Point offline and investigate.
- The Tamper-Evident Labels (TEs) must be regularly examined for signs of tampering. Refer to Table 15 in section 12.4, [Inspection/Testing of Physical Security Mechanisms](#), for the recommended frequency.
- When installing expansion or replacement modules for the Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points, use only FIPS-Approved modules, replace TEs affected by the change, and record the reason for the change, along with the new TE locations and serial numbers, in the security log.
- All configuration performed through the Mobility Master when configured as a managed device must ensure that only the approved algorithms and services are enabled on the FIPS-enabled Wireless Access Point.
- Refer to section 13.6, [Non-Approved FIPS Mode Configurations](#) for non-Approved configurations in a FIPS-Approved mode.
- The user is responsible for zeroizing all CSPs when switching modes.
- The guidelines in this SP's section 8.3, [Non-FIPS Approved Cryptographic Algorithms](#) and section 13, [Secure Operation](#) must be adhered to.

13.2 User Guidance

Although outside the boundary of the Wireless Access Point, the User should be directed to be careful not to provide authentication information and session keys to others parties.

13.3 Setup and Configuration

The Aruba AP-318, AP-344, AP-345, AP-374, AP-375, AP-377 and AP-387 Outdoor Access Points meet FIPS 140-2 Security Level 2 requirements. The sections below describe how to place and keep the Wireless Access Point in a FIPS-Approved mode of operation. The Crypto Officer (CO) must ensure that the Wireless Access Point is kept in a FIPS-Approved mode of operation.

The Wireless Access Point can operate in one of four FIPS-Approved modes: Control Plane Security (CPSec) Protected AP FIPS mode, Remote AP FIPS mode and the two (2) Mesh modes, Mesh Portal FIPS mode and Mesh Point FIPS mode (see Table 16 above). By default, the Wireless Access Point operates in the standard non-FIPS mode.

The Access Point is managed by an Aruba Mobility Controller in FIPS mode, and access to the Mobility Controller's administrative interface via a non-networked general purpose computer is required to assist in placing the module in FIPS mode. The Controller used to provision the AP is referred to as the "staging controller". The staging controller must be provisioned with the appropriate firmware image for the module, which has been validated to FIPS 140-2, prior to initiating AP provisioning. Additionally, if a Mobility Master Appliance is deployed in the environment, provisioning of the APs can be performed by passing policies down from the Mobility Master to the Mobility Controller which then provisions the AP.

13.4 Setting Up Your Wireless Access Point

The Crypto Officer shall perform the following steps to ensure the APs are placed in the secure operational state:

1. Review the *Aruba AP Software Quick Start Guide*. Select the deployment scenario that best fits your installation and follow the scenario's deployment procedures. Also see the procedures described in the *Aruba 8.6 Getting Started Guide*.
2. Apply TELs according to the directions in section 12, [Tamper-Evident Labels](#).
3. Enable FIPS mode on the staging controller: Log into the staging controller via SSH and enter the commands shown in section 13.5.1 below.
4. Connect the module via an Ethernet cable to the staging controller - note that this should be a direct connection, with no intervening network or devices. If PoE is being supplied by an injector, this represents the only exception; that is, nothing other than a PoE injector should be present between the module and the staging controller.
5. Provision the AP into one of four FIPS-Approved modes, (see Table 16 above), following the guidance in the *ArubaOS 8.6 User Guide*.
6. Via the logging facility of the staging controller, ensure that the module (the AP) is successfully provisioned with firmware and configuration. To verify that the image is being run, the CO can enter 'show ap image' on the controller to verify the correct image is present on the device.
7. Terminate the administrative session.
8. Disconnect the module from the staging controller, and install it on the deployment network. When power is applied, the module (the AP) will attempt to discover and connect to an Aruba Mobility Controller on the network.

Once the AP has been provisioned, it is considered to be in FIPS mode provided that the guidelines on services, algorithms, physical security and key management found in this Security Policy are followed.

13.5 Enabling FIPS Mode on the Staging Controller

For FIPS compliance, users cannot be allowed to access the Wireless Access Point until the CO changes the mode of operation on the staging controller to a FIPS mode. There is only one way to enable FIPS mode on the staging controller:

- Use the CLI via SSHv2.
- For more information on using the CLI, refer to the *ArubaOS 8.6 Command-Line Interface Reference Guide*.

13.5.1 Enabling FIPS Mode on the Staging Controller with the CLI

Login to the staging controller using an SSHv2 client. Enable FIPS mode using the following commands:

```
#configure terminal
Enter Configuration commands, one per line. End with CNTL/Z
(config) #fips enable
(config) #exit
#write memory
Saving Configuration...

Configuration Saved.
```

To verify that FIPS mode has been enabled, issue the command "show fips".

If logging in to the staging controller via the Mobility Master, please reference the *ArubaOS 8.6 User Guide* on how to access a managed device. Once connected to the staging controller, the above commands will successfully execute.

Please abide by sections 13.1, [Crypto Officer Management](#) and 13.6, [Non-Approved FIPS Mode Configurations](#).

13.6 Non-Approved FIPS Mode Configurations

When you enable a FIPS mode, the following configuration options are non-Approved:

- The following configurations are forcibly disabled by the module:
 - All WEP features.
 - WPA.
 - TKIP mixed mode.
 - Any combination of DES, MD5, and PPTP.
- The following configurations are non-Approved by policy only:
 - Firmware images signed with SHA- 1.
 - Enhanced PAPI Security.
 - Null Encryption.
 - USB CSR-Key Storage.
 - Certificates with less than 112 bits security strength as used with IKEv2, IPSec, and/or user authentication.
 - Telnet.
 - EAP-TLS Termination.
 - bSec.
 - IPSec/IKE using Triple-DES.

13.7 Full Documentation

Documentation for any Aruba, a Hewlett Packard Enterprise company product can be found on the Aruba Support Portal (ASP). Filters can be used to limit the displayed results by Product(s), Product Series, Version(s), and File Category.

Full ArubaOS documentation (including 8.2.x.x, 8.5.x.x and 8.6.x.x) can be found at the link provided below.

<https://asp.arubanetworks.com/downloads:pageIndex=5:search=arubaos:fileTypes=DOCUMENT:softwareMajorVersions=8.6.8.5.8.2>

Full Aruba Access Points documentation can be found at the link provided below.

<https://asp.arubanetworks.com/downloads:products=Aruba%20Access%20Points:productSeries=Aruba%20550%20Series%20Campus%20Access%20Points,Aruba%20530%20Series%20Campus%20Access%20Points,Aruba%20510%20Series%20Campus%20Access%20Points,Aruba%20500H%20Series%20Hospitality%20Access%20Points,Aruba%20500%20Series%20Campus%20Access%20Points,Aruba%20310%20Series%20Campus%20Access%20Points,Aruba%20340%20Series%20Campus%20Access%20Points,Aruba%20370%20Series%20Outdoor%20Access%20Points;fileContents=Installation%20Guide>