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Aruba AP-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless Access Points

with ArubaOS FIPS Firmware


Non-Proprietary Security Policy

FIPS 140-2 Level 2

Version 1.7

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Preface

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1. Purpose of this Document

This release supplement provides information regarding the Aruba AP-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless Access Points with ArubaOS FIPS Firmware FIPS 140-2 Level 2 validation from Aruba Networks. 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless Access Points with ArubaOS FIPS Firmware. This security policy describes how the Access Point (AP) meets the security requirements of FIPS 140-2 Level 2 and how to place and maintain the AP 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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-300 Series Access Points Installation Guide*
- *Aruba AP-310 Series Access Points Installation Guide*
- *Aruba AP-330 Series Access Points Installation Guide*
- *Aruba AP-360 Series Outdoor Access Points Installation Guide*
- *ArubaOS 8.X.0.0 User Guide*
- *ArubaOS 8.X.0.x CLI Reference Guide*
- *ArubaOS 8.X.0.0 Getting Started Guide*
- *ArubaOS 8.X.0.0 Migration Guide*
- *Aruba AP Software Quick Start Guide*

1.2. Additional Product Information

More information is available from the following sources:

- The Aruba Networks Web-site contains information on the full line of products from Aruba Networks:
<http://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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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. Product Overview

This section introduces the Aruba AP-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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 versions of the firmware are: **ArubaOS 8.10.0.2-FIPS**.

Aruba's development processes are such that future releases under ArubaOS 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-300 Series

This section introduces the Aruba AP-300 Series Wireless Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-304 and AP-305 APs, their physical attributes, and their interfaces.



Figure 1 - Aruba AP-304



Figure 2 - Aruba AP-305

These compact and cost-effective dual-radio APs implement a dual radio 802.11ac Access Point with Multi-User MIMO - Supports up to 1,300 Mbps in the 5GHz band (with 3SS/VHT80 clients) and up to 300 Mbps in the 2.4GHz band (with 2SS/VHT40 clients).

When managed by Aruba Mobility Controllers, AP-304 and AP-305 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-304 and AP-305 Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in a hard, opaque plastic case. Each module contains 802.11 a/b/g/n/ac transceivers and support three external antennas through three N-type female connectors for external antennas for the AP-304, or three internal antennas for the AP-305.

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

The AP-300 Series Access Points configuration validated during the cryptographic modules testing included:

- AP-304 HW: AP-304-USF1 (HPE SKU JX937A)
- AP-305 HW: AP-305-USF1 (HPE SKU JX938A)

2.1.2 Dimensions/Weight

The AP-300 Series have the following physical dimensions (unit, excluding mount accessories):

- Dimensions: 165 mm (W) x 165 mm (D) x 38 mm (H)
- Weight: 460 g

2.1.3 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

2.1.4 Interfaces

The module provides the following network interface:

- ENET: One Ethernet network interface (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48 VDC (nominal) 802.3af/at POE

USB 2.0 host interface (Type A connector)

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 3dBm transmit power (class 2) and -92dBm receive sensitivity

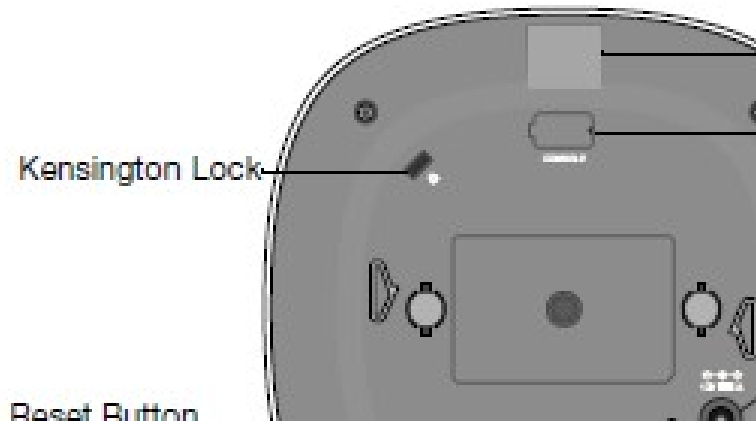


Figure 3 - Aruba AP-300 Series Access Point – Interfaces

DC power interface:

- 12V DC (nominal, +/- 5%)
- 2.1mm/5.5-mm center-positive circular plug with 9.5-mm length

Antenna interfaces:

- 802.11a/b/g/n/ac three external antenna (AP-304) or three internal antenna (AP-305)

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 by TEL)

Table 1 - AP-300 Series Status Indicator LEDs

| LED Type | Color/State | Meaning |
|----------------------|-------------------------|--|
| System Status (Left) | Off | AP powered off |
| | Green/Amber Alternating | 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 * Radio in non-high throughput (HT) 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/Amber Blinking | One radio enabled in access (Green) or monitor (Amber) mode, other radio is disabled |
| | Green/Amber Alternating | One radio enabled in access mode, other in monitor mode |

2.2 AP-310 Series

This section introduces the Aruba AP-310 Series Wireless Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-314 and AP-315 APs, their physical attributes, and their interfaces.



Figure 4 - Aruba AP-314



Figure 5 - Aruba AP-315

These compact and cost-effective dual-radio APs implement a dual radio 802.11ac access point with Multi-User MIMO - Supports up to 1,733Mbps in the 5GHz band (with 4SS/VHT80 or 2SS/VHT160 clients) and up to 300 Mbps in the 2.4 GHz band (with 2SS/VHT40 clients).

When managed by Aruba Mobility Controllers, AP-314 and AP-315 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-314 and AP-315 Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. Each module contains 802.11 a/b/g/n/ac transceivers and support four external antennas through four N-type female connectors for external antennas for the AP-314, or four internal antennas for the AP-315.

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

The AP-310 Series Access Points configuration validated during the cryptographic modules testing included:

- AP-314 HW: AP-314-USF1 (HPE SKU JW796A)
- AP-315 HW: AP-315-USF1 (HPE SKU JW798A)

2.2.2 Dimensions/Weight

The AP-310 Series have the following physical dimensions (unit, excluding mount accessories):

- Dimensions: 182 mm (W) x 180 mm (D) x 48 mm (H)
- Weight: 650 g (23 oz)

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

Each module provides the following network interfaces:

- ENET: One Ethernet network interface (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48 VDC (nominal) 802.3af/at POE

DC power interface:

- 12V DC (nominal, +/- 5%)
- 2.1mm/5.5-mm center-positive circular plug with 9.5-mm length

Antenna interfaces:

- 802.11a/b/g/n/ac four external antenna (AP-314) or four internal antenna (AP-315)

USB 2.0 host interface (Type A connector)

Bluetooth Low Energy (BLE) radio:

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

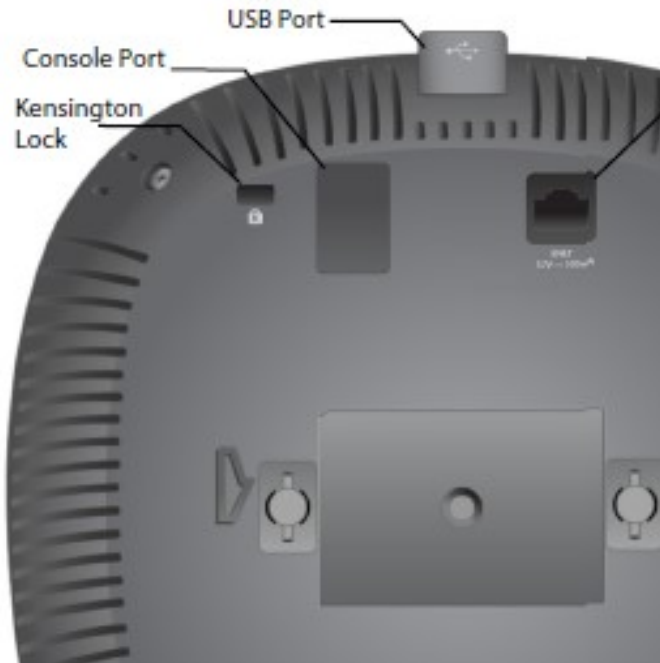


Figure 6 - Aruba AP-310 Series Access Point – Interfaces

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 by TEL)

Table 2 - AP-310 Series Status Indicator LEDs

| LED Type | Color/State | Meaning |
|----------------------|-------------------------|--|
| System Status (Left) | Off | AP powered off |
| | Green/Amber Alternating | 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 * Radio in non-high throughput (HT) 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/Amber Alternating | Green: one radio enabled in access mode, Amber: one radio enabled in monitor mode |

2.3 AP-330 Series

This section introduces the Aruba AP-330 Series Wireless Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-334 and AP-335 APs, their physical attributes, and their interfaces.



Figure 7 - Aruba AP-334



Figure 8 - Aruba AP-335

With a maximum concurrent data rate of 1,733 Mbps in the 5 GHz band and 600 Mbps in the 2.4 GHz band (for an aggregate peak data rate of 2.3Gbps), the 330 Series Access Points deliver a best-in-class, next-generation 802.11ac Wi-Fi infrastructure that is ideal for lecture halls, auditoriums, public venues, and high-density office environments. The high performance and high density 802.11ac 330 Series Access Points support 160 MHz channel bandwidth (VHT160), 4-stream multi-user MIMO (MU-MIMO) and 4 spatial streams (4SS).

For the AP-334, four RP-SMA connectors for external dual band antennas, with internal loss between radio interface and external antenna connectors (due to diplexing circuitry): 2.3 dB in 2.4 GHz and 1.2 dB in 5 GHz. For the AP-335, four (vertically polarized) integrated 2.4 GHz downtilt omni-directional antennas for 4x4 MIMO with peak antenna gain of 3.8 dBi per antenna. Each 5 GHz radio chain has both a vertically and a horizontally polarized antenna element; AP software automatically and dynamically selects the best set of elements for each data packet transmitted or received. Four integrated vertically polarized 5 GHz downtilt omni-directional antennas for

4x4 MIMO with peak antenna gain of 4.9 dBi per antenna, plus four integrated horizontally polarized 5 GHz downtilt omni-directional antennas for 4x4 MIMO with peak antenna gain of 5.7 dBi 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. Combining the patterns of each of the antennas of the MIMO radios, the peak gain of the effective per-antenna pattern is 1.6dBi in 2.4 GHz and 2.5 dBi (vertical) or 2.1 dB (horizontal) in 5 GHz.

When managed by Aruba Mobility Controllers, AP-334 and AP-335 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-334 and AP-335 Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. Each module contains 802.11 a/b/g/n/ac transceivers and support four external antennas through four N-type female connectors for external antennas for the AP-334, or twelve integrated omni-directional downtilt internal antennas for the AP-335.

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

The AP-330 Series Access Points configuration validated during the cryptographic modules testing included:

- AP-334 HW: AP-334-USF1 (HPE SKU JW800A)
- AP-335 HW: AP-335-USF1 (HPE SKU JW802A)

2.3.2 Dimensions/Weight

The AP-330 Series have the following physical dimensions (unit, excluding mount accessories):

- Dimensions: 225 mm (W) x 224 mm (D) x 52 mm (H) / 8.9" (W) x 8.9" (D) x 2.0" (H)
- Weight: 1150 g / 41 oz

2.3.3 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

2.3.4 Interfaces

Each module provides the following network interfaces:

- ENET0: One HPE Smart Rate port (RJ-45, Auto-sensing link speed 100/1000/2500/5000BASE-T and MDI/MDX)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48 VDC (nominal) 802.3at POE
- ENET1: One Ethernet network interface (RJ-45, Auto-sensing link speed 10/100/1000BASE-T and MDI/MDX)
 - Link Aggregation (LACP) support for redundancy and to achieve platform throughput up to 2 Gbps
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48 VDC (nominal) 802.3at POE

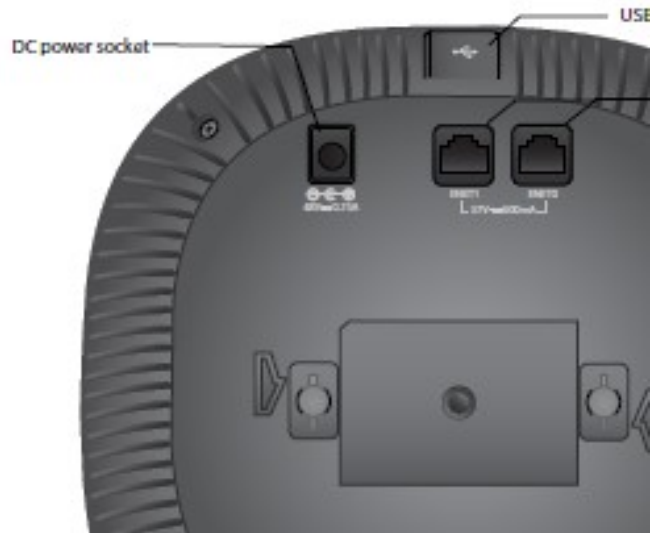


Figure 9 - Aruba AP-330 Series Access Point – Interfaces

DC power interface:

- 48V DC (nominal, +/- 5%)
- 1.35mm/3.5-mm center-positive circular plug with 9.5-mm length

Antenna interfaces:

- 802.11a/b/g/n/ac four external antenna (AP-334) or twelve internal antenna (AP-335)

USB 2.0 host interface (Type A connector)

Bluetooth Low Energy (BLE) radio:

- Bluetooth: up to 4dBm transmit power (class 2) and -91dBm 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 (standard RJ-45 female connector; disabled in FIPS mode by TEL)

Table 3 - AP-330 Series Status Indicator LEDs

| LED Type | Color/State | Meaning |
|----------------------|-------------------------|--|
| System Status (Left) | Off | AP powered off |
| | Green/Amber Alternating | 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 * Radio in non-high throughput (HT) 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/Amber Alternating | Green: one radio enabled in access mode, Amber: one radio enabled in monitor mode |

2.4 AP-360 Series

This section introduces the Aruba AP-360 Series Outdoor Access Points (APs) with FIPS 140-2 Level 2 validation. It describes the purpose of the AP-365 and AP-367 APs, their physical attributes, and their interfaces.



Figure 10 - Aruba AP-365



Figure 11 - Aruba AP-367

By supporting dual radio operation, the 360 Series APs deliver a maximum data rate of 867 Mbps in the 5-GHz band and 300 Mbps in the 2.4-GHz band, while supporting MU-MIMO operation for simultaneous transmission for up to two 802.11ac Wave 2 devices.

Able to survive in harsh outdoor environments, the 360 Series can withstand exposure to high and low temperatures, persistent moisture and precipitation, and are fully sealed to keep out airborne contaminants. All electrical interfaces include industrial strength surge protection.

The outdoor 360 Series have integrated Aruba ClientMatch™ technology to eliminate sticky clients and enhanced Wave 2 WLAN performance. These outdoor APs continuously gather session performance metrics and utilize the data to steer mobile devices to the best AP and radio on the WLAN, even while users roam. The enhanced ClientMatch technology enables the 360 Series to automatically detect, classify and group 802.11ac Wave 2 capable mobile devices under a single Wave 2 radio, increasing network capacity and efficiency.

2.4.1 Physical Description

The Aruba AP-365 and AP-367 Access Points are multi-chip standalone cryptographic modules consisting of hardware and software, all contained in hard, opaque plastic cases. Each module contains 802.11 a/b/g/n/ac transceivers and support four omni-directional internal antennas for the AP-365, and four directional internal antennas for the AP-367.

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

The AP-360 Series Access Points configuration validated during the cryptographic modules testing included:

- AP-365 HW: Aruba AP-365-F1 (US) FIPS/TAA (HPE SKU JX969A)
- AP-367 HW: Aruba AP-367-F1 (US) FIPS/TAA (HPE SKU JX976A)

2.4.2 Dimensions/Weight

The AP-360 Series have the following physical dimensions (unit, excluding mount accessories):

- Dimensions: 165 mm (W) x 165 mm (D) x 110 mm (H) / 6.5" (W) x 6.5" (D) x 4.3" (H)
- Weight: AP-365: 807 g (1.78 lbs) / AP-367: 815 g (1.80 lbs)

2.4.3 Environmental

- Operating:
 - Temperature: -40° C to +55° C (-40° F to +131° F)
 - Humidity: 5% to 95% non-condensing
- Storage and transportation:
 - Temperature: -40° C to +70° C (-40° F to +158° F)
 - Humidity: 5% to 95% non-condensing

2.4.4 Interfaces

Each module provides the following network interfaces:

- ENET/PoE: One Ethernet network interface (RJ-45, Auto-sensing link speed 10/100/1000BASE-T)
 - 802.3az Energy Efficient Ethernet (EEE)
 - PoE-PD: 48 VDC (nominal) 802.3af POE

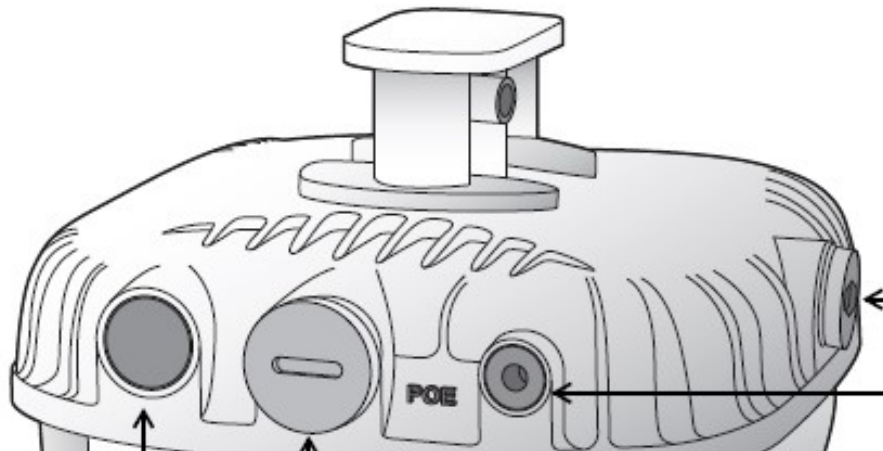


Figure 12 - Aruba AP-360 Series Outdoor Access Point – Interfaces (with weatherproof caps)

Antenna interfaces:

- 802.11a/b/g/n/ac four internal antenna (AP-365) or four internal antenna (AP-367)

Bluetooth Low Energy (BLE) radio

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 (micro-USB; adapter cable included in package; disabled in FIPS mode)
- Grounding Point

Table 4 - AP-360 Series Status Indicator LEDs

| LED Type | Color/State | Meaning |
|-------------------------------------|---|---|
| System Status (during Boot Up) | Off | No power to AP |
| | Red | Initial power-up |
| | Green - Flashing | Device booting; not ready |
| | Green - Solid | Device ready in 1000Mbps mode (LED turns off after 1200 seconds) |
| | Green / Amber Alternating, 6 seconds period | Device ready in 1000Mbps mode (LED turns off after 1200 seconds) |
| System Status (during Operation) | Red - Solid | General Fault |
| | Red – 1 blink off every 3 seconds | Radio 0 fault (5 GHz) |
| | Red – 2 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless Access Points require Tamper-Evident Labels (TEs) to allow the detection of the opening of the device and to block the Serial console port (on the bottom of the device).

To protect the Aruba AP-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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 in this table:

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 Ports802.11a/b/g/n/ac Antenna Interfaces |
| Data Output Interface | <ul style="list-style-type: none">10/100/1000 Ethernet Ports802.11a/b/g/n/ac Antenna Interfaces |
| Control Input Interface | <ul style="list-style-type: none">10/100/1000 Ethernet Ports802.11a/b/g/n/ac Antenna InterfacesReset button |
| Status Output Interface | <ul style="list-style-type: none">10/100/1000 Ethernet Ports802.11a/b/g/n/ac Antenna InterfacesLED Status Indicators |
| Power Interface | <ul style="list-style-type: none">Power InputPower-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, the power is provided through the connected Ethernet cable.
- The Console port is disabled when operating in FIPS mode by a 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 802.11i and access wireless network access/bridging services. When Remote AP cannot communicate with the controller, the wireless client role authenticates to the module via 802.11i 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 802.11i 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 802.11i. 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 802.11i 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> |
| 802.11i 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 | <p>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.</p> |

| | | |
|--|-------------------------|---|
| 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 802.11i 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 802.11i. | 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 802.11i Pre-Shared Key) stored in the flash can be zeroized by using command 'ap wipe out flash' or by overwriting with a new secret. 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 802.11i cryptographic keys | In all FIPS modes, the links between the module and wireless client are secured with 802.11i. | 1, 25 (read) 26, 27, 28, 29, 30 (read/write) |
| Use of 802.11i Pre-shared secret for establishment of IEEE 802.11i keys | When the module is in advanced Remote AP configuration, the links between the module and the Wireless Client are secured with 802.11i. 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 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.
- WPA3
- WPA-2 Multiple Pre-Shared Key (MPSK), where every client connected to the WLAN SSID may have its own unique PSK.
- IPSec/IKE using Triple-DES
- Remote AP Termination on Mobility Master Virtual Appliance

8. Cryptographic Algorithms

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:

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.

- ArubaOS OpenSSL Module algorithm implementation
- ArubaOS Crypto Module algorithm implementation
- ArubaOS Bootloader 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.

Table 10 - ArubaOS OpenSSL Module CAVP Certificates

| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
|-----------------------|----------------------------|----------------------|---|---|---|
| A2690 | AES | FIPS 197, SP 800-38A | ECB, CBC, CTR (192, 256, ext only, encryption only) | 128, 192, 256 | Data Encryption/Decryption |
| Vendor Affirmed | CKG | SP 800-133 | CTR_DRBG | N/A | Cryptographic Key Generation (using output from DRBG ⁴ as per IG D.12) |
| A2690 | CVL ⁵ IKEv1 KDF | SP 800-135 Rev1 | IKEv1: DSA, PSK | IKEv1: DH 2048-bit; SHA-256, SHA-384 | Key Derivation |
| A2690 | CVL IKEv1 KDF | SP 800-135 Rev1 | IKEv1 | IKEv1: SHA-1 | Key Derivation |
| A2690 | DRBG | SP 800-90A | AES CTR | 256 | Deterministic Random Bit Generation |
| A2690 | DSA | FIPS 186-4 | keyGen, pqgGen | L=2048, N=256, SHA2-256 | Key Generation, Digital Key Generation |
| A2690 | ECDSA | 186-4 | KeyGen, KeyVer, SigGen, SigVer | KeyGen: P-256, P-384 KeyVer: P-256, P-384 SigGen: P-256, P-384 with SHA2-256, SHA2-384, SHA2-512 SigVer: P-256, P-384 with SHA-1, SHA2-256, SHA2-384, SHA2-512 | Key Generation and Verification, Digital Signature Generation and Verification |

⁴ Resulting symmetric keys and seeds used for asymmetric key generation are unmodified output from SP 800-90A DRBG.

⁵ IKEv1 protocol has not been reviewed or tested by the CAVP and CMVP.

| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
|-----------------------|-----------|------------------------------------|---|---|---|
| A2690 | HMAC | FIPS 198-1 | HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512 | Key Size < Block Size | Message Authentication |
| A2690 | KBKDF | SP 800-108 | CTR | HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384 | Deriving Keys |
| A2690 | KAS-SSC | SP 800-56A Rev3 | FFC: dhEphem, ECC: Ephemeral Unified | FFC: FC with SHA2-256 ECC: P-256 with SHA2-256 KAS Roles - initiator, responder | Key Agreement Scheme – Shared Secret Computation |
| N/A | KAS | SP 800-56A Rev3 SP 800-135 | KAS-SSC Cert A2690 CVL Cert A2690 | N/A | Key Agreement Scheme – IG D.8, scenario X1 (2) |
| N/A | KAS | SP 800-56A Rev3 SP 800-56C Rev1 | KAS-SSC Cert A2690 KDA Cert A2690 | N/A | Key Agreement Scheme – IG D.8, scenario X1 (2) |
| A2690 | KDA | SP 800-56C Rev1 | Two-step key derivation | HMAC-SHA-1, HMAC-SHA2-256, HMAC-SHA2-384 | Key Derivation Algorithm |
| A2690 | RSA | FIPS 186-2 | SigVer: SHA-1 ⁶ , SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 | 1024 (for legacy SigVer only), 2048 | Digital Signature Verification |
| A2690 | RSA | FIPS 186-4 | KeyGen, SigGen: SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 SigVer: SHA-1 ⁷ , SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 | KeyGen: 2048 SigGen: 2048 SigVer: 1024 (for legacy SigVer only), 2048 | Key Generation, Digital Signature Generation and Verification |
| A2690 | SHS | FIPS 180-4 | SHA-1, SHA-256, SHA-384, SHA-512 Byte Only | 160, 256, 384, 512 | Message Digest |

⁶ SHA-1 is only Approved for use with Signature Verification.

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

| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
|--|-------------------------|----------------|---|--|--|
| A2690 | Triple-DES ⁸ | SP 800-67 Rev2 | ECB | 192 | Data Encryption/Decryption |
| AES A2690 and HMAC A2690 | KTS | SP 800-38F | AES-CBC ⁹ 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 Module¹⁰ CAVP Certificates

| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
|-----------------------|-----------------------------|----------------------------------|--|---|--|
| A2689 | AES | FIPS 197, SP 800-38A, SP 800-38D | CBC, GCM | 128, 192, 256 | Data Encryption/Decryption |
| A2689 | CVL ¹¹ IKEv2 KDF | SP800-135 Rev1 | IKEv2 | IKEv2: 2048-bit; SHA-256, SHA-384 | Key Derivation |
| A2689 | CVL IKEv2 KDF | SP800-135 Rev1 | IKEv2 | IKEv2: SHA-1 | Key Derivation |
| A2689 | DSA | FIPS 186-4 | keyGen, pqgGen | L=2048, N=256, SHA2-256 | Key Generation, Digital Key Generation |
| A2689 | ECDSA | 186-4 | KeyGen, KeyVer, SigGen, SigVer | KeyGen: P-256, P-384 KeyVer: P-256, P-384 SigGen: P-256, P-384 with SHA2-256, SHA2-384, SHA2-512 SigVer: P-256, P-384 with SHA-1, SHA2-256, SHA2-384, SHA2-512 | Key Generation and Verification, Digital Signature Generation and Verification |
| A2689 | HMAC | FIPS 198-1 | HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512 ¹² | Key Size < Block Size | Message Authentication |
| A2689 | KAS-SSC | SP 800-56A Rev3 | FFC: dhEphem, ECC: Ephemeral Unified | FFC: FC with SHA2-256 ECC: P-256 with SHA2-256 KAS Roles - initiator, responder | Key Agreement Scheme – Shared Secret Computation |

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

⁹ key establishment methodology provides between 128 and 256 bits of encryption strength

¹⁰ The algorithms in the table are not used when the module is configured into Mesh Point FIPS mode

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.

| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
|--|--------------------------|-------------------------------|---|---|---|
| N/A | KAS | SP 800-56A Rev3 SP 800-135 | KAS-SSC Cert A2689 CVL Cert. A2689 | N/A | Key Agreement Scheme – IG D.8, scenario X1 (2) |
| A2689 | RSA | FIPS 186-2 | SigVer: SHA-1 ¹³ , SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 | 1024 (for legacy SigVer only), 2048 | Digital Signature Verification |
| A2689 | RSA | FIPS 186-4 | KeyGen, SigGen: SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 SigVer: SHA-1 ¹⁴ , SHA2-256, SHA2-384, SHA2-512 PKCS1 v1.5 | KeyGen: 2048 SigGen: 2048 SigVer: 1024 (for legacy SigVer only), 2048 | Key Generation, Digital Signature Generation and Verification |
| A2689 | SHS | FIPS 180-4 | SHA-1, SHA-256, SHA-384, SHA-512 ¹⁵ Byte Only | 160, 256, 384, 512 | Message Digest |
| A2689 | Triple-DES ¹⁶ | SP 800-67 Rev2 | CBC | 192 | Data Encryption/Decryption |
| AES A2689 | KTS | SP 800-38F | AES-GCM ¹⁷ | 128, 256 | Key Wrapping/Key Transport via IKE/IPSec |
| AES A2689 HMAC A2689 | KTS | SP 800-38F | AES-CBC ¹⁸ HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512 ¹⁹ | 128, 192, 256 Key Size < Block Size | Key Wrapping/Key Transport via IKE/IPSec |

Table 12 - ArubaOS Bootloader CAVP Certificates

| ArubaOS Bootloader | | | | | |
|-----------------------|-----------|------------|-----------------|-----------------------------|--------------------------------|
| CAVP Certificate # | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | Use |
| A2688 | RSA | FIPS 186-4 | SHA-1, SHA2-256 | 2048 | Digital Signature Verification |

¹³ SHA-1 is only Approved for use with Signature Verification.

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

¹⁵ In FIPS Mode, HMAC-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.

| | | | | | |
|-----------------------|-----|------------|-----------------------------|--|----------------|
| A2688 | SHS | FIPS 180-4 | SHA-1, SHA-256 Byte Only | | 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.

Table 13 – Aruba AP Hardware CAVP Certificates

| CAVP Certificate # | Aruba AP Hardware | | | | Use |
|--|-------------------|--|--|-----------------------------|----------------------------|
| | Algorithm | Standard | Mode/Method | Key Lengths, Curves, Moduli | |
| 5412 5664 | AES | FIPS 197, SP 800-38A, SP 800-38C | ECB, CCM, GCM (used for self-test only) | 128, 256 | Data Encryption/Decryption |

8.2. Non-FIPS Approved Algorithms Allowed in FIPS Mode

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 Algorithms used only in Non-FIPS 140 Mode

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

- DES
- HMAC-MD5
- MD5
- RC4
- RSA (non-compliant less than 112 bits of encryption strength)
- Null Encryption (Disallowed by Policy)
- Triple-DES as used in IKE/IPSec (Non-Approved by Policy)

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 (unless explicitly specified, a CSP is applicable to all approved modes of operation). 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 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. |

Table 14 - CSPs/Keys Used in 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. |
| 9 | EC Diffie-Hellman Private Key | EC Diffie-Hellman (Curves: P-256 or P-384) | Generated internally by calling FIPS Approved DRBG 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' or by overwriting with a new secret |
| 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) and it will be 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 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 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'. |
| 802.11i²² | | | | | |
| 25 | 802.11i Pre-Shared Secret | Shared secret (8-63 ASCII or 64 HEX characters) | Entered by CO role. Used for 802.11i client/server authentication. | Stored in Flash memory (obfuscated with KEK). | Zeroized by using command 'ap wipe out flash' or by overwriting with a new secret. |
| 26 | 802.11i 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 802.11i communications. | Stored in SDRAM (plaintext). | Zeroized by rebooting the module. |
| 27 | 802.11i Pairwise Transient Key (PTK) | HMAC (384 bits) | This key is used to derive 802.11i session key by using the KDF defined in SP800-108 and SP800-56C Rev1. | 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 802.11. RAP and CPsec modes use both Certificate-based and PSK-based 802.11

Table 14 - CSPs/Keys Used in the Module

| | | | | | |
|----|-----------------------------------|--------------------------|---|-------------------------------------|-----------------------------------|
| 28 | 802.11i Session Key | AES-CCM (128 bits) | Derived during 802.11i 4-way handshake by using the KDF defined in SP800-108 and SP800-56C Rev1 then used as the session key. | Stored in SDRAM memory (plaintext). | Zeroized by rebooting the module. |
| 29 | 802.11i Group Master Key (GMK) | Shared secret (256 bits) | Generated by calling DRBG. Used to derive 802.11i Group Transient Key GTK. | Stored in SDRAM memory (plaintext) | Zeroized by rebooting the module |
| 30 | 802.11i Group Transient Key (GTK) | AES-CCM (256 bits) | Derived from 802.11 GMK by using the KDF defined in SP800-108. The GTK is the 802.11i 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. FIPS approved DRBG (Cert. #2017) is used for IV generation and 96 bits of IV is supported.
- 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 **Power On Self-Tests (POSTs)**:

- ArubaOS OpenSSL Module:
 - AES (Encrypt/Decrypt) KATs
 - DRBG KATs
 - ECDSA (P-256, P-384) (Sign/Verify) KATs
 - HMAC (HMAC-SHA-1, HMAC-SHA2-256, HMAC-SHA2-384 and HMAC-SHA2-512) KATs
 - KAS-SSC (SP 800-56A Rev3) KATs (FFC and ECC)
 - KDA (SP 800-56C Rev1) KAT (two-step KDF with HMAC)
 - KBKDF KAT
 - KDF135 KATs (IKEv1 KDF, TLS KDF, SSH KDF, SNMP KDF)
 - RSA (2048) (Sign/Verify) KATs
 - SHS (SHA-1, SHA2-256, SHA2-384 and SHA2-512) KATs
 - Triple-DES (Encrypt/Decrypt) KATs
- ArubaOS Crypto Module:
 - AES (Encrypt/Decrypt) KATs
 - AES-GCM (Encrypt/Decrypt) KATs
 - KAS-SSC (SP 800-56A Rev3) KATs (FFC and ECC)
 - 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 Bootloader:
 - 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-ECB (Encrypt/Decrypt) KATs
 - AES-GCM (Encrypt/Decrypt) KATs

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

- ArubaOS OpenSSL Module:
 - 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 DRBG (Instantiate, Generate and Reseed)
 - DSA 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 Crypto Module:
 - ECDSA Pairwise Consistency Test
 - RSA Pairwise Consistency Test
 - Diffie-Hellman Pairwise Consistency Test
 - DSA 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 BootLoader:
 - Firmware Load Test - RSA PKCS#1 v1.5 (2048 bits) signature verification with SHA2-256 (this test is applied by the ArubaOS Bootloader on boot).

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 KAT
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 Aruba AP-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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 Wireless 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-304, AP-314 or AP-334).
- Phillips or cross-head screwdriver.
- (Optional) a compatible 12V DC (AP-304, AP-305, AP-314 or AP-315) or 48V DC (AP-334 or AP-335) AC-to-DC power adapter with power cord.
- (Optional) a compatible PoE midspan injector with power cord.
- One USB Micro-B console cable (AP-365 or AP-367).
- 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 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 (TELs) to the Wireless Access Point. When applied properly, the TELs allow the Crypto Officer to detect the opening of the device, or physical access to restricted ports (i.e. the serial console port). Aruba Networks provides **FIPS 140** 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 keeping 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 13 - 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless Access Points). Refer to the next section for guidance on applying the TELs.

12.2.1 TELs Placement on the AP-304

The AP-304 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 14 and 15 for placement.



Figure 14 – Top View of AP-304 with TELs



Figure 15 – Bottom View of AP-304 with TELs

12.2.2 TELs Placement on the AP-305

The AP-305 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 16 and 17 for placement.



Figure 16 – Top View of AP-305 with TELs



Figure 17 – Bottom View of AP-305 with TELs

12.2.3 TELs Placement on the AP-314

The AP-314 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 and 19 for placement.



Figure 18 – Top View of AP-314 with TELs



Figure 19 – Bottom View of AP-314 with TELs

12.2.4 TELs Placement on the AP-315

The AP-315 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 20 and 21 for placement.



Figure 20 – Top View of AP-315 with TELs



Figure 21 – Bottom View of AP-315 with TELs

12.2.5 TELs Placement on the AP-334

The AP-334 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-334 with TELs



Figure 23 – Bottom View of AP-334 with TELs

12.2.6 TELs Placement on the AP-335

The AP-335 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-335 with TELs



Figure 25 – Bottom View of AP-335 with TELs

12.2.7. TELs Placement on the AP-365/367

The AP-365 and AP-367 require 3 TELs each: 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 26 and 27 for placement.



Figure 26 – Top View of AP-365/AP-367 with TELs



Figure 27 – Bottom View of AP-365/AP-367 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.
- Ensure that TEL placement is not defeated by simultaneous removal of multiple modules.
- 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 Aruba Networks 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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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 only the following FIPS Approved modes of operation via corresponding Aruba Mobility Controllers that have been certified to FIPS level 2:

Table 16 - FIPS Approved Modes of Operation

| FIPS-Approved Modes of Operation | Description |
|---|---|
| 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. |
| 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. |
| 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 802.11i session. The Crypto Officer role is the Mobility Controller that authenticates via IKEv1 pre-shared key or RSA/ECDSA certificate authentication method, and Users are the "n" Mesh Points that authenticate via 802.11i 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 802.11i and an IPsec tunnel via the Mesh Portal to the Controller. |

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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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 Mode Configurations](#) for non-Approved configurations in a FIPS-Approved mode.
- The user is responsible for zeroizing all CSPs when switching modes.

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-304, AP-305, AP-314, AP-315, AP-334, AP-335, AP-365, and AP-367 Wireless 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.X 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.X 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.X 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.X 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. Disallowed FIPS Mode Configurations

When you enable FIPS mode, the following configuration options are forcibly disallowed:

- All WEP features
- WPA
- TKIP mixed mode
- Any combination of DES, MD5, and PPTP

When you enable FIPS mode, the following configuration options are disallowed by policy:

- USB CSR-Key Storage
- Telnet
- Firmware images signed with SHA- 1
- Enhanced PAPI Security
- Null Encryption
- EAP-TLS Termination
- IPSec/IKE using Triple-DES
- Remote AP Termination on Mobility Master Virtual Appliance
- bSec
- WPA-2 MPK
- WPA3

13.7. Full Documentation

Full ArubaOS documentation can be found at the link provided below.

<https://asp.arubanetworks.com/downloads;fileTypes=DOCUMENT;products=Aruba%20Mobility%20Controllers%20%28AOS%29>