

Aruba AP 60/61 Access Point Installation Guide

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The Aruba AP 60/61 is part of a comprehensive wireless network solution. The device works in conjunction with the Aruba Mobility Controller and can act as a wireless access point or air monitor.

As a wireless Access Point (AP), the Aruba AP 60/61 provides transparent, secure, high-speed data communications between wireless network devices (fixed, portable, or mobile computers with IEEE 802.11a or IEEE 802.11b/g wireless adapters) and the wired LAN.

As a wireless Air Monitor (AM), a feature unique to Aruba products, the Aruba AP 60/61 enhances wireless networks by collecting statistics, monitoring traffic, detecting intrusions, enforcing security policies, balancing wireless traffic load, self-healing coverage gaps, and more.

NOTE: Installing the Aruba AP 60/61 requires setting the antenna power, which requires professional training. The Aruba AP 60/61 installer must be trained to perform this configuration.

Front View

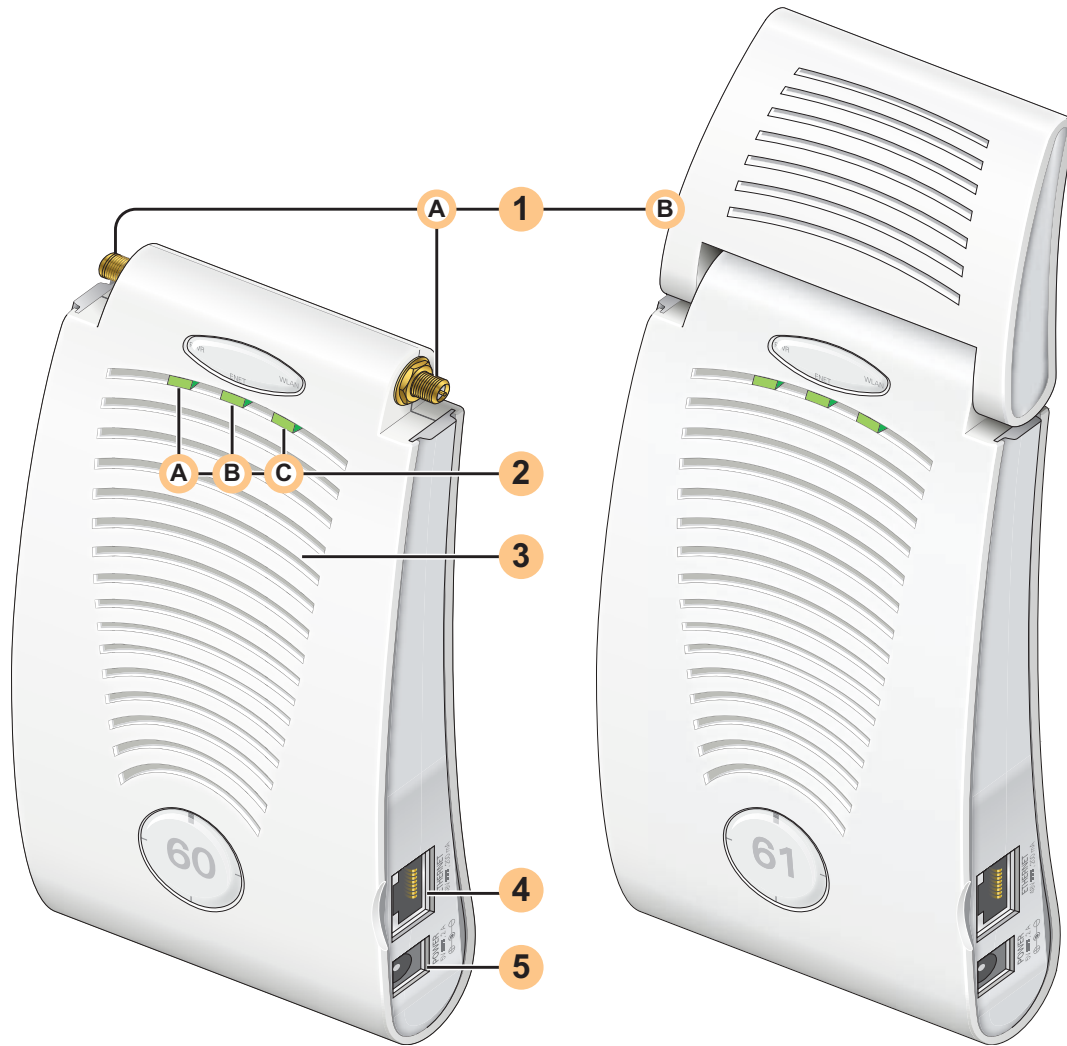


FIGURE 1-1 Aruba AP 60/61 Front View

1 Antenna fixtures for Wireless Communications

Depending on the model, the AP will have one of the following:

- Ⓐ Aruba AP60—Two Reverse Polarity SMA (RP-SMA) connectors for attaching separate antennas (not included). For details, see “[Aruba 60 Detachable Antennas](#)” on [page 22](#). (The AP60 requires that both connectors be used in ArubaOS 2.2 releases or lower. Single antenna operation is supported with ArubaOS 2.3 or higher.)

NOTE: When facing the A60 as shown in [Figure 1-1](#), the antenna connector on the left is for antenna 1, and the connector on the right is for antenna 2 in a diversity configuration.

- Ⓑ Aruba AP61—Built-in swivel array with dual, tri-band, omnidirectional antennas

2 Indicator LEDs

During operation, the Aruba AP 60/61 LEDs provide the following information:

TABLE 1-1 Aruba AP 60/61 LEDs

LED	State	Description
Ⓐ PWR	Off	The device is off - no power.
	Green-Solid	The device is powered and operating.
Ⓑ ENET	Off	No link on the FE port. No connection to the network.
	Green-Solid	Ethernet link detected on the FE port.
	Green-Flashing	Transmitting or receiving data across the FE port. Flashing rate is proportional to network activity.
Ⓒ WLAN	Off	The wireless interface is disabled or down.
	Green-Solid	The wireless interface is enabled and functioning as an Access Point.
	Green-Flashing	The wireless interface is enabled and functioning as an Air Monitor.

NOTE: LEDs on the Mobility Controller provide additional status and security information about connected APs. See the *ArubaOS User Guide* for more information.

3 Air Vents

These vents promote proper air circulation for cooling the device. Do not allow these vents to be obstructed by mounting equipment, network cables, or any other material.

4 FE Port

This port attaches the Aruba AP 60/61 to a 10Base-T/100Base-TX (twisted-pair) Ethernet LAN segment. This port also supports Serial and Power Over Ethernet (SPOE).

See [Appendix C, "Product Specifications."](#) for port and cable specifications.

5 DC Power Socket

This socket is used to connect the optional AC power adapter (not included). If POE is being used to supply power to the Aruba AP 60/61, the power adapter is not necessary.

Back View

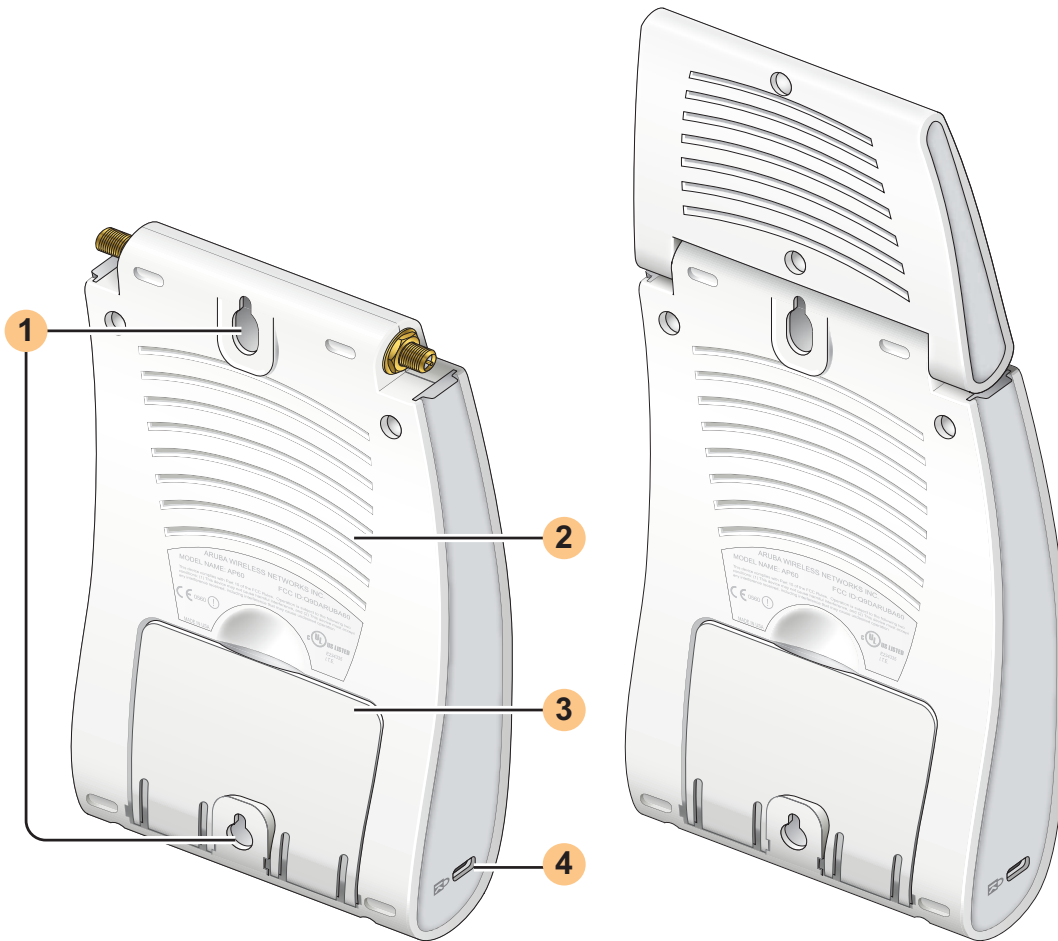


FIGURE 1-2 Aruba AP 60/61 Back View

1 Mounting Slots

The keyhole-shaped slots on the back of the chassis are used for mounting the Aruba AP 60/61.

2 Air Vents

These vents promote proper air circulation for cooling the device. Do not allow these vents to be obstructed by mounting equipment, network cables, or any other material.

3 Fold-Out Stand

This fold-out stand allows the Aruba AP 60/61 to be stood upright on a table or shelf.

4 Kensington Security Slot

This slot is compatible with a Kensington MicroSaver Security Cable (not included) which can be used to prevent the unauthorized removal of the Aruba AP 60/61 from its installed location. To secure the Aruba AP 60/61, wrap a security cable around an immovable object, insert the cable's lock into the Kensington Security Slot, and turn the key.

NOTE: The serial number and model number are on the bottom of the unit.

The Aruba AP Setup Process

Setting up an Aruba AP typically consists of four stages:

WLAN Planning—The administrator determines how many Aruba APs will be needed for their wireless network strategy and where they will be deployed. This can be easily accomplished using Aruba's automated RF Plan site-survey software (available separately).

AP Provisioning—Provisioning provides each Aruba AP with initial settings that allow it to locate the host Aruba Mobility Controller. Depending on the network topology and services, AP provisioning can be performed manually for each AP or plug-and-play for batches of APs.

AP provisioning is discussed in [Appendix 2, "Provisioning Access Points."](#)

AP Deployment—Once provisioned, the AP can be physically installed at its intended place of operation.

AP deployment is covered in [Chapter 3, "AP Deployment"](#).

AP Configuration—The administrator defines the operational behavior for each Aruba AP, such as RF characteristics and security features.

For AP configuration information, refer to the *ArubaOS User Guide*.

Access Points are radio broadcast devices and as such are subject to governmental regulation. Network administrators responsible for the configuration and operation of Access Points must comply with local broadcast regulations. Specifically, Access Points must use channel assignment and antenna gain settings (for detachable antennas) appropriate to the location in which the Access Point will be used. Aruba Networks, in compliance with governmental requirements, has designed the AP60 and AP61 such that only authorized network administrators can change these settings. For more information on Access Point configuration, refer to the *ArubaOS User Guide*.

Provisioning provides the AP with initial network settings that allow it to locate the host Aruba Mobility Controller. The following provisioning methods (listed in the order of preference recommended by Aruba Networks) are available:

- **Plug and Play**—Also known as the Aruba Discovery Protocol. This is the easiest method for AP provisioning. With plug and play, Aruba APs can be connected to the network and brought into operation automatically. Although plug and play requires no manual intervention for the APs, this method does require specific services to be configured on your network in advance.
- **AP Provisioning**—Using this AP programming mode, AP configuration parameters are defined on the Mobility Controller (using the CLI or Web interface) and then uploaded to the APs.

This method can be used for adding Aruba APs to a highly customized network, or greatly simplified for the most common provisioning.

- **Manual Provisioning**—APs can be individually provisioned using a serial console terminal connected to the AP. Although this method is complex and requires considerable care, manual provisioning can be used in almost any scenario, with or without access to the Mobility Controller.

NOTE: **Manual provisioning** is intended for use when no Aruba Mobility Controller is available, and is not generally recommended as the primary method of AP provisioning. Plug and play or AP programming mode are the preferred provisioning methods.

Each of these three methods is explained in the following sections. Use these procedures for initial provisioning of APs. To change the configuration for APs that have already been provisioned, go to **Maintenance > Program AP > Re-Provision**. See the *ArubaOS User Guide* for more information on reprovisioning existing APs.



CAUTION: When an AP60 powers up for the first time, the Mobility Controller will recognize that it is detachable-antennas capable. The network administrator must set the antenna gain manually before the AP60 can function as an Access Point. Until the antenna gain is set, the AP60 with detachable antennas will function as an Air Monitor but will not process wireless packets as an Access Point. Refer to the *ArubaOS User Guide* for instructions on manually setting antenna gain.

Aruba Discovery Protocol

Aruba Discovery Protocol (ADP) is a plug and play provisioning tool for Aruba AP 60/61 Access Points. ADP performs two tasks:

- Obtains the IP address of the TFTP server from which it downloads the AP boot image
- It discovers the IP address of the master Aruba Mobility Controller in the network from which the AP can download its configuration.

The address of the TFTP server that ADP discovers is the equivalent of the BOOTROM environment variable *serverip*. The IP address of the Aruba master Mobility Controller is the equivalent of the environment variable *master*.

ADP can discover these values using DHCP or by discovery. In the case of DHCP, ADP relies on a DHCP server which is configured to return the IP address of the Master Mobility Controller using the Vendor Specific Options in DHCP. To facilitate ADP, Aruba APs include this Vendor Specific Option in the requested Option list, and if the DHCP server is configured to return the IP address of the Master Mobility Controller, the IP address will be a part of the DHCP response. This is used by the AP to get its image as well as its configuration.

Discovery of the *serverip* and *master* variables is necessary when the DHCP response does not include the Vendor Specific option. The AP attempts to discover an Aruba Master Mobility Controller by sending multicast packets and broadcast packets on its subnet. To use the ADP discovery method, the ADP discovery mechanism needs to be enabled on the Aruba Master Mobility Controller (using the **adp discovery enable** command).

If multicast routing is enabled in the IP network between the AP and the Master Mobility Controller (which can be any one or more Aruba Mobility Controllers in the network), the IGMP-Join option should be enabled on the Aruba Mobility Controller (using the **adp igmp-join enable** command). If multicast routing is not

enabled on the network, the Aruba Mobility Controllers need to be on the same broadcast domain as the AP or an “IP Helper” must be configured to direct the broadcast ADP packets to the Aruba Mobility Controller.

Once these discovery prerequisites are met, the Mobility Controller will respond to APs with the IP address of the Master Aruba switch. The APs can then obtain their image and configuration.

To enable ADP on an Aruba Mobility Controller, enter:

```
(A5000) (config) #adp discovery enable
```

To enable IGMP-Join on an ADP multicast group on an Aruba Mobility Controller, enter:

```
(A5000) (config) #adp igmp-join enable
```

NOTE: If you have location-specific configurations for your Access Points, you will need to apply this configuration information using AP Reprovisioning. Refer to the *ArubaOS User Guide* for details on AP Reprovisioning and see the feature description below.

AP Reprovisioning

AP Reprovisioning is the process by which APs are assigned, for example, location codes. Location codes are important for recalibration and triangulation. For details on AP Reprovisioning, see the *ArubaOS User Guide*.

AP Provisioning

AP Provisioning is useful for brand new APs with default configurations. To perform AP Provisioning from the WebUI:

1. Go to **Maintenance > Program AP**.

On this window, there are two tabs: **Provisioning** and **Reprovisioning**. The Provisioning tab is selected by default.

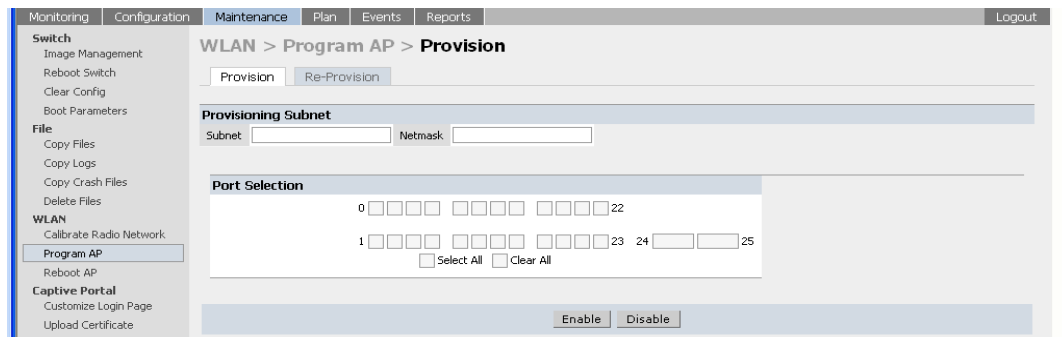


FIGURE 2-1 Provisioning Tab

2. Configure the APs **Subnet** and **Netmask**.

This is the subnet from which the AP gets an IP during provisioning. (This is not the IP address the AP will use when deployed. The provisioning subnet should not be the same as an existing subnet on Mobility Controller.)

3. Select the **Port** or Port range for provisioning.

To set the Port Range, select the first and the last ports of your range. All the ports in between are automatically selected. (Ports have to be sequentially assigned.)

4. Enter the required information and click **Enable**. The Port Range screen displays.

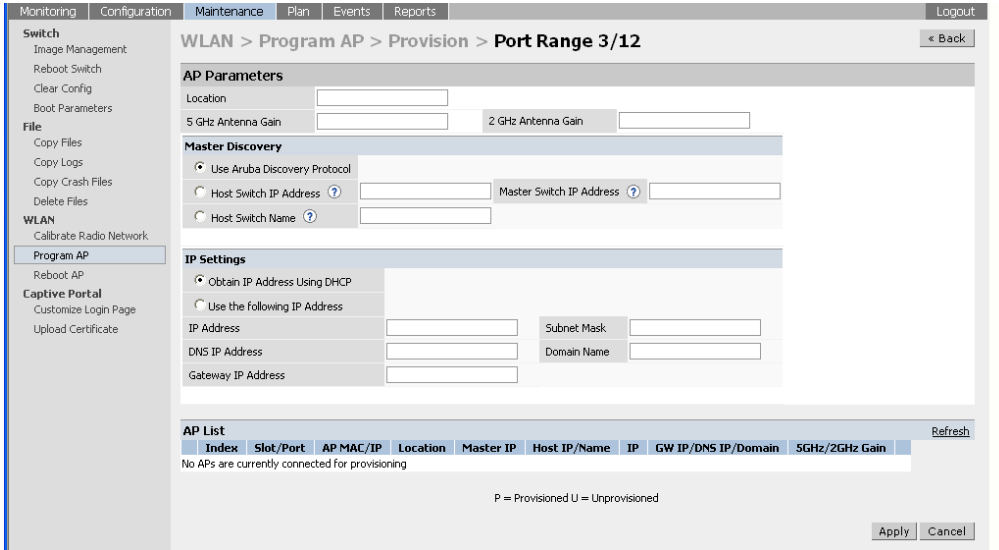


FIGURE 2-2 Port Range Screen

5. Specify the Aruba AP 60/61-specific parameters.

Configure the gain value appropriate for the location in which this AP will be deployed. (See [Table 3-1](#) for appropriate antenna gain values.)

NOTE: If the AP being provisioned is a model with detachable antenna capability (such as an Aruba AP-60), enter the antenna gain in dBi (e.g., 4.0). This is mandatory for all detachable antenna models as the AP will not bring up its radio interface or function as an AP without it.

Complete specifying Master Discovery and IP Settings and click **Apply**.

6. Plug the AP into one of the ports configured for provisioning.

If your AP is already plugged into the port, unplug it and plug it in again. If AP is connected through POE, enter (in interface mode) **no poe** followed by **poe**. The AP will come up with an IP from the provisioning subnet

After the AP comes up it should be in the provisioning list. Provisioning list shows the list of APs which are plugged into the provisioning ports.

7. The **Clear Table** button appears after an entry in the list appears.

To erase all the table entries, click **Clear Table**. (You cannot clear selected entries.) If a number of APs are provisioned and you click **Clear Table**, only the entries which come up afterwards can be provisioned.

If the entry does not show up in the AP list, check network connectivity. Go to the AP console and verify if the AP has come up with the IP from the provisioning subnet.

8. After the entry shows up on the page, configure the **location**, **Host IP/Name**, **Master IP address**.

If AP is going to be assigned a static IP, click **Use the following IP Address** and enter the **IP address**, **Netmask**, **Gateway IP**.

If the AP is going to obtain an IP address using DHCP, click **Use IP Address Using DHCP**.

9. After configuring the required parameters, select the entry from the list (AP to which the configuration has to be applied) and click **Apply**.

The State field changes from **U (Unprovisioned)** to **In Progress**. to **P (Provisioned)**.

NOTE: Check that the configured parameters are reflected in the AP list entry.

NOTE: Aruba Networks recommends that you provision each AP for a unique location as suggested by site-survey planning. Label each AP with this location information and place the AP in its proper location. Failure to place APs in the location for which they were provisioned will reduce the effectiveness of such RF features as triangulation.

10. Click **Back** to return to the previous page

We can see that the Subnet is still configured and Port/s are selected.

11. When finished provisioning APs, click **Disable** to disable AP Provisioning.

NOTE: Disable AP Provisioning after all the required APs are provisioned. Ports that are enabled for provisioning do not handle traffic. Therefore plugging an already provisioned AP into a port still set to provisioning mode will prevent that AP from functioning.

Now the AP is configured with the Parameters given

12. Reboot the AP so the AP will come up with the new configured parameters.

Use the Reprovisioning tab for APs which are already deployed but need to be reconfigured. See the *ArubaOS User Guide* for information on reprovisioning.

Manual Provisioning

Requirements

- A console terminal (or workstation with terminal emulation software) with an available serial communications port using a DB-9 male connector.

- An Aruba serial breakout adapter kit, Part Number CA-SPOE-ADAPT-3, (not included). (See [“Connecting the Console Terminal”](#) on [page 14](#).)
- Access to the Aruba AP 60/61 FE port through one of the following:
 - Direct contact with the AP, or
 - If the AP is already deployed, you must have access to the end of the FE cable that leads directly to the AP with no intervening hubs, routers, or other networking equipment.

The cable must be an 8-conductor, Category 5 UTP, straight-through FE cable with RJ-45 connectors.
- A power source for the Aruba AP 60/61. Use one of the following:
 - An optional AC power adapter (not included) and an AC power outlet rated at 100-240 V, 50-60 Hz, or
 - The Aruba AP 60/61 FE port connected to an Aruba 800, 2400, or 5000 Mobility Controller that supports IEEE 802.3af Power Over Ethernet (POE) via a 4- or 8-conductor, Category 5 UTP, straight-through FE cable.¹

NOTE: Only IEEE 802.3af Power Over Ethernet is supported for manual provisioning. “Inline” or “midspan” POE devices require Aruba serial breakout adapter, Part Number CA-SPOE-ADAPT-4.

1. IEEE 802.3af-complaint devices like the AP60 and AP61 use the same wire pairs for data versus for power. Within the 802.3af standard, there are two sub-specifications on how wire pairs are assigned. Aruba conforms to 802.3af, subparagraph a. If your POE installation uses all-Aruba equipment, you are assured proper operation. However, if you use non-Aruba POE equipment, make sure it conforms to the same standard that Aruba uses. Using POE equipment using IEEE 802.3af subparagraph b wiring assignments, or POE equipment not conforming to the 803.2af standard may result in damaged equipment.

Connecting the Console Terminal

Manual provisioning requires this procedure. You must use the serial console breakout adapter cable to be able to access the serial console interface to the Aruba AP 60/61 while allowing the device to be powered by the AC adapter or POE (from an Aruba Mobility Controller).

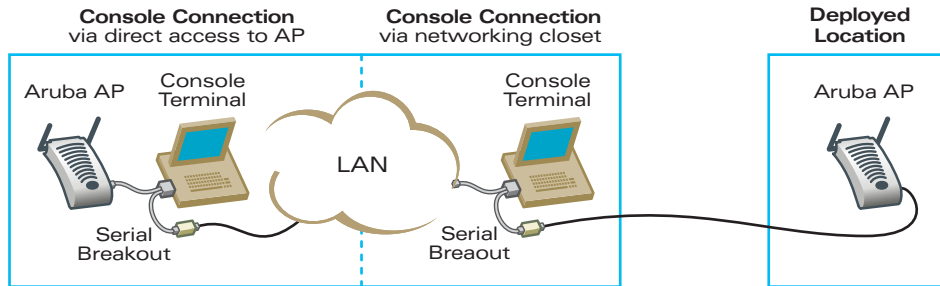


FIGURE 2-3 Aruba AP 60/61 Console Topologies

NOTE: The LAN connections are optional unless POE is used to power the AP.

Console Access to the AP

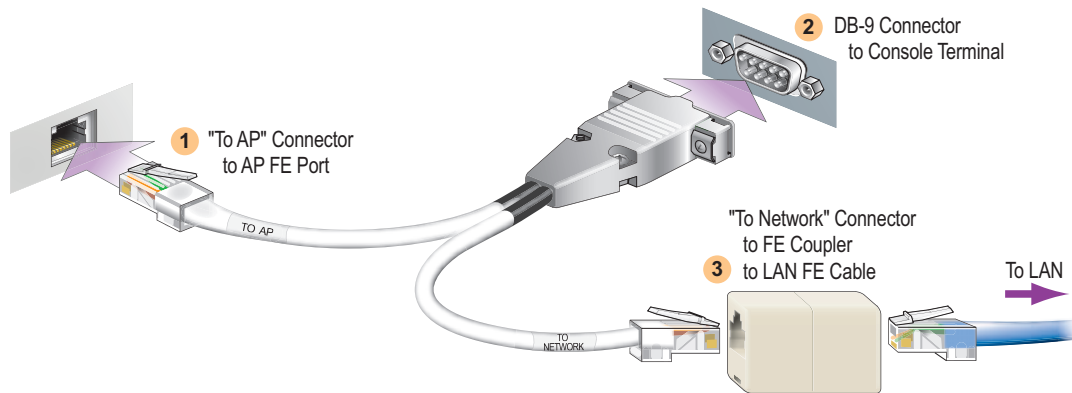


FIGURE 2-4 Connecting Directly to the AP

1. Connect the adapter's "To AP" RJ-45 connector to the Aruba AP 60/61 FE Port.
2. Connect the adapter's DB-9 connector to the serial port on the console terminal.
3. Connect the adapter's "To Network" RJ-45 connector to the LAN.

The LAN connection is optional unless POE is being used to power the AP. For convenience, the adapter kit includes an FE coupler to connect RJ-45 cable ends together.

4. Connect power to the Aruba AP 60/61.



CAUTION: Be sure to comply with electrical grounding standards during all phases of installation and operation of the AP. Do not allow the Aruba AP 60/61 or optional power adapter (if used) to be connected to or make contact with metal or power outlets on a different electrical ground than the device to which it is connected. Also, never connect the AP to external storm grounding sources.

The Aruba AP 60/61 can receive electrical power using the following options:

- POE-If connecting the Aruba AP 60/61 to a device that supplies IEEE 802.3af compliant POE, no additional power connection is necessary.
- Power Outlet

NOTE: When the Aruba AP 60/61 is installed in an air-handling space, as described in NEC (2002) Article 300.22(C), POE must be used instead of a power outlet.

If local regulations and practices permit, connect the optional AC power adapter (not included) to the DC power socket on the rear panel of the Aruba AP 60/61 and plug it into an appropriate power outlet.



CAUTION: To prevent personal injury or damage to equipment, use only the AC power adapter certified for this device in the country where it is used.

NOTE: The indicator LEDs on the Aruba AP 60/61 will remain dark during this procedure.

5. Set your local terminal to use the following communications:

TABLE 2-1 Console Terminal Settings

Baud Rate	Data Bits	Parity	Stop Bits	Flow Control
9600	8	None	1	None

Establish console communication.

Press <Enter> a few times to establish communication between the Aruba AP 60/61 and terminal.

6. From the Aruba AP 60/61 console, access the `apboot` prompt.

Depending on the Aruba AP 60/61 status, you will see one of the following on your terminal:

- **Autoboot countdown**—The countdown prompt allows you to interrupt the normal startup process and access the `apboot` prompt where provisioning is performed.

```
APBoot 1.2.1 (Apr  7 2004 - 08:54:57)
```

```
CPU:   AR2313 MIPS-32 at 180 MHz: 16 kB I-Cache 16 kB D-Cache
Board: Merlot Local Bus at 90 MHz
DRAM:  32 MB
POST:  passed
FLASH: 4 MB
Net:   en0 lo0
```

```
Hit any key to stop autoboot:  0
```

To access the `apboot` prompt, press any key (such as <Enter>) before the timer expires. If the countdown expires before you can interrupt it, turn the device off and then back on.

- **TFTP time out**—If the Aruba AP 60/61 cannot locate an Aruba Mobility Controller on its network port, the following type of output is repeatedly displayed:

```
Loading FLASH image...
Verifying checksum... failed!
BOOTP broadcast 1
DHCP IP address:   10.1.2.250
DHCP subnet mask: 255.255.255.0
DHCP def gateway: 10.1.2.1
DHCP DNS server:  10.1.1.2
DHCP DNS domain:  arubanetworks.com
DHCP Aruba server: 10.1.2.11
Loading elf file: 10.1.2.11:mips.ari
Loading: T T T T T T T T T
Retry count exceeded; starting again
```

Press <Control-C> to interrupt this process and access the `apboot` prompt.

Once the `apboot` prompt is displayed, perform provisioning as described in the next section of this manual.

Setting Aruba AP 60/61 Parameters

1. From the `apboot` prompt, configure the host information, if necessary.

In order to provide centralized management of the APs, each Aruba AP downloads its software image and configuration files from a master Mobility Controller.

Setting the correct host information depends on the following:

- Does your network use direct IP addresses or DNS with host names?
- If using host names, is `aruba-master` acceptable for the master Mobility Controller, or do you need to define a different name?

Depending on your answers, select one of the following steps:

- **My network uses DNS and the `aruba-master` host name is acceptable.**

This is the default. It requires your DNS to be configured to resolve “`aruba-master`” to the IP address of the master Mobility Controller. Unless your system has been previously configured for different settings, you can skip to Step 2.

Otherwise, if your system was previously configured for a different setup, manually set the `servername` environment variable to the default host name:

```
apboot> setenv servername aruba-master
```

NOTE: The `master` and `serverip` environment variables also affect how AP source files are selected and should be cleared when using this approach. To clear a variable, enter the `setenv variable` command with no host name or address value:

```
apboot> setenv master
apboot> setenv serverip
```

When finished, proceed to Step 2.

- **My network uses DNS, but I will use a different host name for the Mobility Controller.**

This requires that the `servername` variable be configured with your chosen host name for the master Mobility Controller. It also requires that your DNS be configured to resolve the specified host name to the IP address of the master Mobility Controller.

To manually set the host name, use the following command:

```
apboot> setenv servername <Mobility Controller host name>
```

NOTE: The `master` and `serverip` environment variables also affect how source files are selected and should be cleared when using this approach. To clear a variable, enter the `setenv variable` command with no host or address value.

When finished, proceed to Step 2.

- **My network uses direct IP addresses instead of DNS.**

If using direct IP addresses in your network, use the following commands:

```
apboot> setenv serverip <Mobility Controller IP address>
apboot> setenv master <Mobility Controller IP address>
```

NOTE: If the `servername` variable is configured in this scenario, it will be ignored.

2. Specify an IP address for a specific AP, if necessary.

If using DHCP, the AP will obtain its IP address automatically and you can skip this step. Otherwise, configure the AP with a static IP address using the following commands:

```
apboot> setenv ipaddr <static IP address for the AP>
apboot> setenv netmask <static IP address mask>
apboot> setenv gatewayip <default gateway IP address>
```

3. Set the location for the specific AP, if necessary.

Location settings depend on how much control you want over configuring logical groups of APs in the future.

- **Default Locations**

If you wish all APs treated as a single entity for configuration and accounting purposes, you can use the default location profile (255.255.65535) and skip to Step 4.

NOTE: If using default locations during initial provisioning, you can later reconfigure the APs to use specific location IDs using the Aruba Mobility Controller management tools.

- **Specific Locations**

By setting specific location IDs for each AP, you can later apply configuration changes or collect statistics and information for specific groups of APs (for example, all APs on a particular floor in a particular building).

To set a specific location for an individual AP, the following command is used:

```
setenv location <building number>.<floor number>.<device number>
```

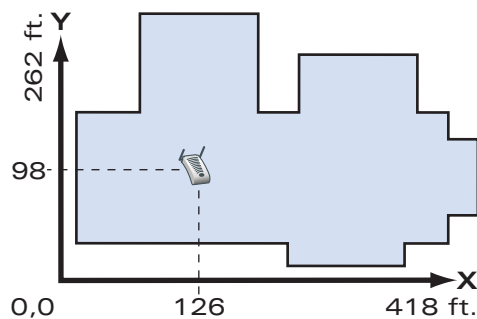
where the following fields are required:

<i>Building Number</i>	A unique number (1-254) is required for each building in your campus.
<i>Floor Number</i>	Within any building, a unique number (1-254) is required for each floor.
<i>Device Number</i>	Within any floor, a unique number (1-65534) is required for each access point or air monitor.

If you performed the recommended site survey using the Aruba RF Plan tool, the location data for all access points and air monitors can be found on the tool's deployment page (see the *ArubaOS User Guide*).

If you prefer to enter the location data manually, record the location ID you set for each access point and air monitor along with the following:

Device Description	Note the intended function of the device (access point or dedicated air monitor) and a brief description of its service location.
X, Y Coordinates	For each access point and air monitor, measure its X and Y position (in feet) relative to the bottom-left corner of the building plan as seen from overhead. For example:



Use the same fixed point and orientation for all floors in a building.

4. Save the configuration and reboot the Aruba AP 60/61.

```
apboot> save
apboot> boot
```

Once the Aruba AP 60/61 boots, disconnect it and mount it in its intended service location (see [Provisioning Access Points](#) on [page 21](#)).

This chapter covers the following topics:

- Physical mounting of the Aruba AP 60/61
- Connecting the required cables

Mounting the Aruba AP 60/61

When provisioning is complete, mount the Aruba AP 60/61 at its intended service location.

The Aruba AP 60/61 Access Points with or without external antennas are intended only for installation in Environment A as defined in IEEE 802.3.af. All interconnected equipment must be contained within the same building, including the interconnected equipment's associated LAN connections. (When using an external antenna, 5.150 to 5.250 MHz are blocked.)

Select a location as close as possible to the center of the intended coverage area. If necessary, use the Aruba RF Plan site survey tool to determine the optimum locations for your access points and air monitors.

The service location should be free from obstructions or obvious sources of interference. Normally, the higher you place an access point or air monitor, the better its performance.

If external antennas are used, make sure that they and their associated wiring are located entirely indoors. The Aruba AP 60/61 and any optional external antennas are not suitable for outside use.

The Aruba AP 60/61 can be mounted **on a wall or suspended from above (not shown) using one of the optional mounting kits (dimensions vary)** in the following ways:

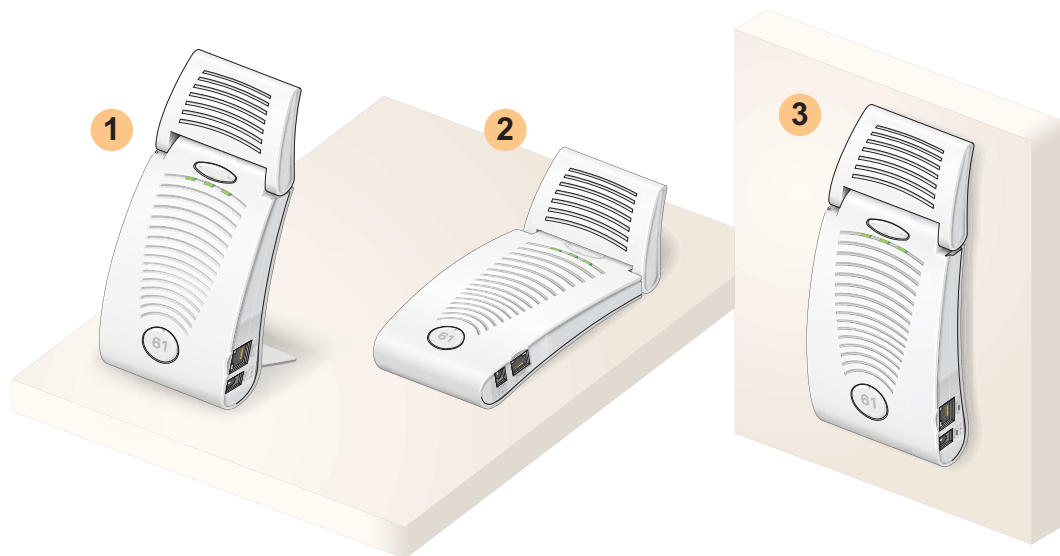


FIGURE 3-1 Aruba AP 60/61 Mounting Options

NOTE: For dimensions, see [Appendix C, "Product Specifications"](#). Allow 5 cm (2") additional space on the right-hand side for cables. Measurements for the Aruba 60 depend on attached antennas, which vary.

Aruba 60 Detachable Antennas

Before deploying the Aruba 60, attach the appropriate antennas (not included). The antenna connections should be tightened by hand to avoid overtightening.

The Aruba 60 has dual Reverse Polarity SMA (RP-SMA) female antenna connectors that accept a variety of high-gain detachable antennas. See [Table 3-1](#) for the list of FCC approved antennas tested for use with the Aruba 60.

Make sure that all external antennas and their associated wiring are located entirely indoors. The Aruba 60 Access Points and their optional external antennas are not suitable for outside use.

FCC-Approved Detachable Antennas

Table 3-1 lists the antennas which are approved for use with the Aruba 60.

TABLE 3-1 FCC-Approved Detachable Antennas

Aruba Part #	Description	Gain dbi	Manufacturer	Man. Part #
MULTI-BAND ANTENNA				
AP-ANT-1	Tri-Band, High-Gain, Omni-Directional Antenna (Indoor) (Swivel Connector)	5	Nearson	T614AH-2.4 5/5.X-S
2.4Ghz (802.11B/G)				
AP-ANT-2	High-Gain, Omni-Directional Cylindrical (Indoor) with RP-SMA Connector	6	Centurion	IG2450-RPS MA
AP-ANT-3	High-Gain, Bi-Directional Patch Antenna (Indoor) with RP-SMA Connector	5	Centurion	IB2450-RPS MA
AP-ANT-4	High-Gain, Directional Patch Antenna (Indoor) with RP-SMA Connector	9	Centurion	ID240-RPSM A/CAF94379
AP-ANT-5	Down-Tilt, Omni-Directional Patch Antenna (Indoor) with RP-SMA Connector	3.5	Cushcraft	SQ2403PG3 6RSM
AP-ANT-7	High-Gain Directional Patch Antenna (Indoor / Outdoor) with RP-SMA Connector	11.5	HD Comms. Corp	PCW24-080 12-AFL/HD1 9656

TABLE 3-1 FCC-Approved Detachable Antennas (Continued)

AP-ANT-8	High-Gain, Omni-Directional Cylindrical (Indoor / Outdoor) with RP-SMA Connector	5	Cushcraft	S2403BPX3 6RSM
5Ghz (802.11A)				
AP-ANT-10	High-Gain, Omni-Directional Cylindrical (Indoor / Outdoor) with RP-SMA Connector	5.5	Cushcraft	S5153WBPX 36RSM
AP-ANT-11	Down-Tilt, Omni-Directional Patch Antenna (Indoor) with RP-SMA Connector	3.5	Cushcraft	SQ5153WP3 6RSM
AP-ANT-12	High-Gain, Directional Patch Antenna (Indoor / Outdoor) with RP-SMA Connector	14	Cushcraft	S52514WP3 6RSM

Free-Standing Placement

To place the Aruba AP 60/61 indoors on a flat table or shelf:

Flip open the stand located on the back of the Aruba AP 60/61:

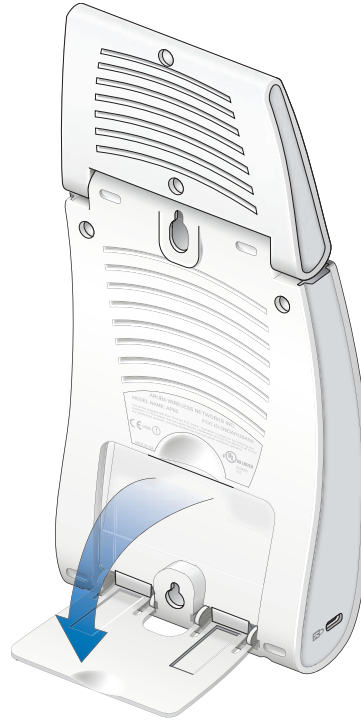


FIGURE 3-2 Aruba AP 60/61 Fold-Out Stand

Place the device on a sturdy table or shelf.



CAUTION: Do not place the Aruba AP 60/61 in any place where it could fall on people or equipment. For more secure installation, use one of the optional mounting kits.

Orient the antennas.

For best performance, swivel the individual antennas (Aruba 60) or antenna array (Aruba AP61) so that they are oriented vertically. Once mounting is complete, connect the required cables (see instructions on [page 28](#)).

Using the Built-In Mounting Slots

The keyhole-shaped slots on the back of the Aruba AP 60/61 can be used to attach the device upright to an indoor wall or shelf.



CAUTION: Do not use the mounting slots to hang the Aruba AP 60/61 from the ceiling, sideways, or in any place where it could fall on people or equipment. For more secure installation, use one of the optional mounting kits.

To hang the Aruba AP 60/61 upright using the mounting slots, perform the following steps.

1. Install two screws in the wall or shelf as shown in [Figure 3-3](#):

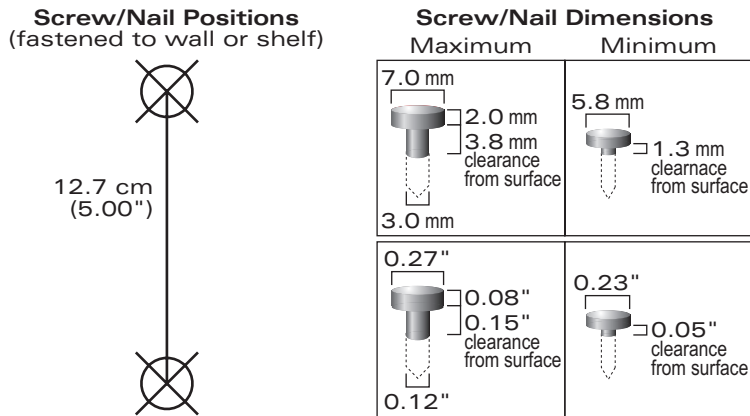


FIGURE 3-3 Mounting Screw Specifications

If attaching the device to drywall, we recommend using appropriate wall anchors (not included) as shown in [Figure 3-4](#) on [page 27](#).

2. Align the Aruba AP 60/61 mounting slots to capture the surface screws.

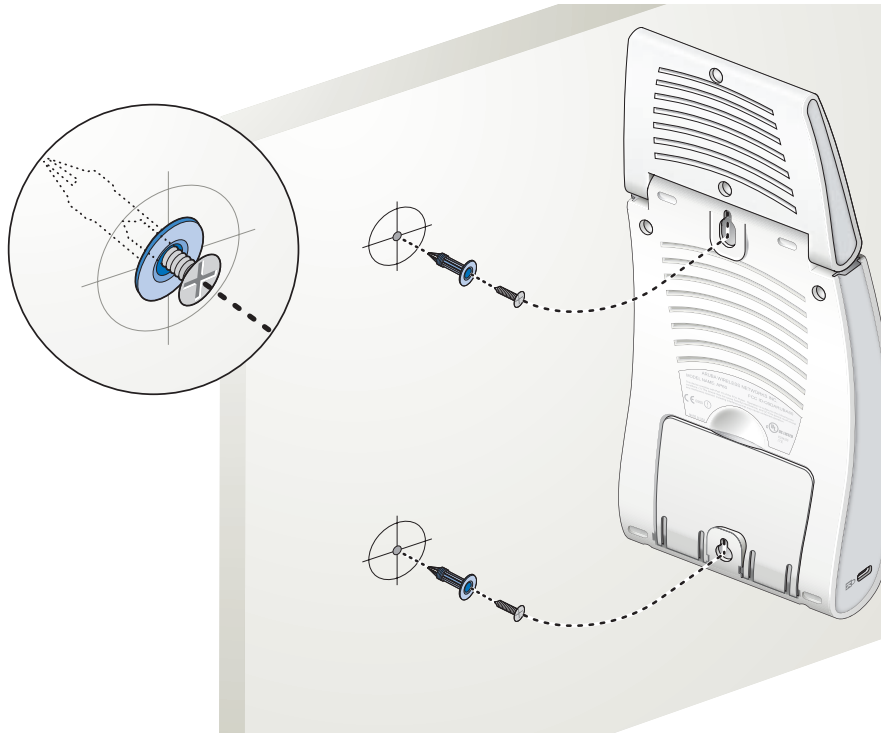


FIGURE 3-4 Hanging the Aruba AP 60/61 on Screws

3. Secure the Aruba AP 60/61, if desired.

To prevent the unauthorized removal of the Aruba AP 60/61 from its installed location, use a Kensington MicroSaver Security Cable (not included). Wrap the security cable around an immovable object, insert the cable's lock into the Kensington Security Slot on the back of the Aruba AP 60/61, and turn the key.

4. Orient the antennas.

For best performance, swivel the individual antennas (Aruba 60) or antenna array (Aruba AP61) so that they are oriented vertically (see [Figure 3-1](#) on [page 22](#)). Once mounting is complete, connect the required cables (see instructions on [page 28](#)).

Using the Optional Mounting Kits

Use the optional mounting kit to attach the Aruba AP 60/61 to a wall, shelf, or ceiling. For installation, see the *Aruba AP 60/61 Mounting Kit Installation Notes* (P/N 0500037-01) provided with each kit.

Connecting Required Cables

The Aruba AP 60/61 Access Points with or without external antennas are intended only for installation in Environment A as defined in IEEE 802.3.af. All interconnected equipment must be contained within the same building, including the interconnected equipment's associated LAN connections.

Selecting an FE Cable

The 10/100 Mbps Ethernet (FE) port is used to connect the AP to a 10Base-T/100Base-TX (twisted-pair) Ethernet LAN segment. The appropriate FE cable depends on the features required of the FE port:

- **SPOE**

When connecting the AP to a device that supports Serial and Power Over Ethernet (SPOE), use an 8-conductor, Category 5 UTP, straight-through FE cable.

The Aruba 5000 (with Line Card LC-5000-24FE-2GE-SPOE), the Aruba 2400, and the Aruba 800 support SPOE.

- **POE**

If the connecting device supports only Power Over Ethernet (POE), use a 4- or 8-conductor, Category 5 UTP, straight-through FE cable.

- **Network Only**

If the connecting device does not support POE, use a 4- or 8-conductor, Category 5 UTP, FE cable. The port detects MDI/MDX and automatically adjusts for straight-through or crossover cables.

The maximum length for FE cables is 100 meters (325 feet).

When the Aruba AP 60/61 is installed in an air-handling space, such as above suspended ceilings, as described in National Electrical Code (2002) Article 300.22(C), and Canadian Electrical Code, Sections 2-128, 12-010(3) and 12-100, Part 1, CSA C22.1, POE is required. Also, any FE cable installed in such spaces should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP, or CMP.

Use the built-in antenna (for the AP61). For the Aruba 60, use Aruba AP-ANT-1. For all other antennas, make sure the antenna cable is UL listed and suitable for use in plenums and air-handling spaces, such as CL2-P, CL3-P, MPP, or CMP, and mount the antenna outside of the air-handling space.

Install cables in accordance with all applicable local and national regulations and practices.

For more port and cable details, see [Appendix B, "Port Specifications."](#)

Connecting Cables & Power



CAUTION: To prevent personal injury or damage to equipment, be sure to comply with electrical grounding standards during all phases of installation and operation of the AP. Do not allow the Aruba AP 60/61 or its attachments to be connected to or make contact with metal or power outlets on a different electrical ground than the device to which it is connected. Also, never connect the AP or Mobility Controller to external storm grounding sources.

1. Connect one end of the FE cable directly to the Aruba AP 60/61 FE port.
2. Connect the other end of the FE cable to one of the following:
 - A To a network port on the Mobility Controller, or
 - B To a network hub, router, or switch that has a routable path to the Mobility Controller.

NOTE: If the connecting device supplies POE, a straight-through cable must connect the Aruba AP 60/61 directly to the powering device without any intervening hubs, routers, or other networking equipment.

3. Connect power, if necessary.

The Aruba AP 60/61 can receive electrical power using the following options:

- POE

If connecting the Aruba AP 60/61 to a device that supplies IEEE 802.3af compliant POE no additional power connection is necessary.

- Power Outlet

NOTE: When the Aruba AP 60/61 is installed in an air-handling space, as described in NEC (2002) Article 300.22(C), POE must be used instead of a power outlet.

If local regulations and practices permit, connect the optional AC power adapter (not included) to the DC power socket on the Aruba AP 60/61 and plug it into an appropriate power outlet.



CAUTION: To prevent personal injury or damage to equipment, use only the AC power adapter certified for this device in the country where it is used.

Selecting an Antenna

There are three ways to select an AP60 antenna:

1. From the AP console (serial or telnet) enter `set_antenna 0|1|2` where 0 specifies auto mode, and 1 or 2 chooses a specific antenna. The antenna selection is not persistent and the AP will lose the antenna selection, if rebooted.
2. From the AP boot prompt (apboot>) enter `a_antenna 0|1|2` or `g_antenna 0|1|2` to specify an antenna. Enter a save command before booting the AP to save the antenna configuration in the AP's Flash memory, along with other provisioning parameters.
3. For releases 2.3 and higher, you can provision the antenna selection from the Mobility Controller.

Maintenance

The AP60 and AP61 require no maintenance beyond keeping the AP clean and dust free. To clean the Aruba AP 60/61, use a static-free, dry cloth.

Aruba recommends that these units be inspected annually for damage, dust buildup, and to verify that all connections are secure.

This appendix discusses troubleshooting tools and procedures available for the Aruba AP 60/61. Troubleshooting should be limited to the information provided below.



CAUTION: This AP contains no user accessible components. Do not attempt to disassemble the Aruba AP 60/61. If this AP does not operate properly, contact Aruba Technical Support (contact information is contained in "[Troubleshooting](#)"). No maintenance (beyond keeping the AP clean and dust free) is required. To clean the Aruba AP 60/61, use a static-free, dry cloth.

After provisioning and deployment, the Aruba AP 60/61 can be configured and managed through the Mobility Controller. However, the Aruba AP 60/61 includes built-in troubleshooting features for situations where the Mobility Controller commands are unable to diagnose AP problems.

This appendix describes using the built-in AP support prompt for troubleshooting.

Accessing the AP Support Prompt

Depending on your network topology, the built-in AP Support prompt can be accessed using the AP serial console port or through the Mobility Controller using the Serial Over Ethernet (SOE) interface or using Telnet from a remote management station.

Direct SPOE Connection to Mobility Controller

This method requires that the Aruba AP 60/61 is connected directly to an SPOE-compatible network port on the Mobility Controller (see "[Connecting Required Cables](#)" on [page 28](#)).

1. Telnet to the Mobility Controller Serial-Over-Ethernet (SOE) interface.

Use a Telnet client on your management workstation to connect to the Mobility Controller IP address using logical port 2300. The connection command may vary depending on the specific software used, but commonly appears as follows:

```
> telnet <Mobility Controller IP address> 2300
```

2. When prompted, log in to the Mobility Controller as the administrator:

```
user: admin  
password: <administrator password (not displayed)>
```

This will present you with the Mobility Controller SOE console prompt:

```
Available commands:  
  baud [9600|19200|38400|57600|115200]  
  connect <slot/port>  
  exit (no args)  
soe>
```

3. Connect to the Mobility Controller port to which the Aruba AP 60/61 is physically attached:

```
soe> connect <slot number> / <port number>
```

where *slot number* is the physical slot of the line card in the Mobility Controller, and *port number* is the physical port.

If the AP has not finished booting, allow the Autoboot timer to expire. When the device has booted, the AP support prompt (#) will appear.

Direct Terminal Connection

This method requires that the Aruba AP 60/61 is connected to a compatible serial console using the Aruba serial breakout adapter (see [“Connecting the Console Terminal”](#) on page 14).

1. Set up your local terminal.

This procedure requires a terminal or computer running terminal emulation software with the following settings:

TABLE A-1 Console Terminal Settings

Baud Rate	Data Bits	Parity	Stop Bits	Flow Control
9600	8	None	1	None

2. Establish console communication.

Press <Enter> a few times to establish communication between the Aruba AP 60/61 and terminal.

If the AP has not finished booting, allow the Autoboot timer to expire. When the device has booted, the AP Support prompt (#) will appear.

NOTE: Aruba has two serial cables for the AP 60s. One cable is for Aruba POE and is relatively inexpensive. The other cable requires mid-span power and is relatively expensive. A workaround to having to use the more expensive cable is to have a power supply available to use with the inexpensive serial cable.

Also you can directly connect the AP to a Mobility Controller to correct any provisioning problems.

Remote Telnet Connection

If properly set up, the AP support prompt can be accessed remotely using Telnet. By default, this feature is turned off for security purposes and cannot be turned on using the AP interface.

Setting Telnet Access

Telnet access can only be changed from the Mobility Controller management interface. Log in to the Mobility Controller CLI using the `admin` account, access the configuration (`config`) prompt, and issue the following commands:

```
(Aruba 5000) (config) # ap location <building>.<floor>.<device>
(Aruba 5000) (sap-config location b.f.d) # telnet {enable|disable}
```

Using Telnet to Connect

Use a Telnet client on your management workstation to connect to the Aruba AP 60/61's individual IP address. The connection command may vary depending on the specific software used, but commonly appears as follows:

```
> telnet <Aruba AP 60/61 IP address>
```

When the connection is established, the AP support prompt (#) will be displayed.

AP Support

Access Levels

- **User Access**

User access is a low security level, featuring only the most basic commands. It is available without any additional login after the AP has booted.

- **Privileged Access**

Privileged-level access requires the privileged password (the same privileged password used on the Mobility Controller) to be entered using the user level `enable` command. The privileged access level is available only after the AP has successfully booted and synchronized with Mobility Controller.

User Commands

- **ping** *<host|IP address>*

Verify IP connectivity between the AP and the host address.

- **route**

Display the contents of the AP route table.

- **ifconfig**

Display the AP's IP address settings.

- **enable** *<privileged password>*

Access the AP Support privileged mode.

Privileged Commands

In addition to the user commands, the following commands are available upon successfully entering the privileged mode:

- `ps`
- `show [config|stats|version]`

NOTE: These commands should be used only as directed by Aruba Customer Support.

Resetting the AP to Factory Defaults

In the event you need to reboot the Access Point with the configuration shipped from the factory, from the bootrom prompt, enter:

1. `purge`
2. `save`
3. `reset`
4. Break into the bootrom mode again and enter:
5. `save`

FE Port

The 10/100 Mbps Ethernet (FE) port is located on the right-hand side of the Aruba AP 60/61 and has an RJ-45 female connector. The port pin-outs are shown in Figure B-1:

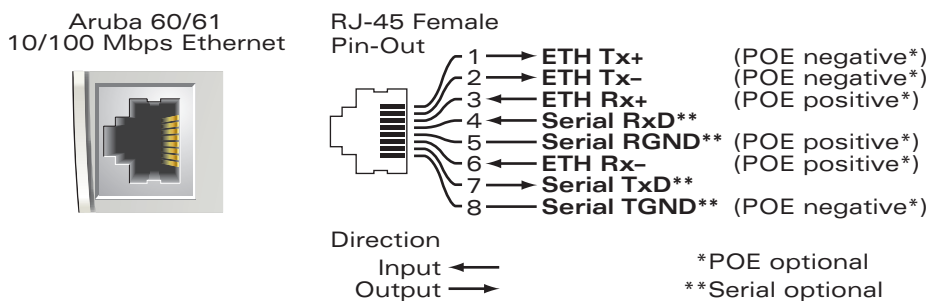


FIGURE B-1 Aruba AP 60/61 FE Port

The appropriate cable depends on the level of connectivity required of the FE port:

- If the connecting device supports Serial and Power Over Ethernet (SPOE), use an 8-conductor, Category 5 UTP, straight-through FE cable with a male RJ-45 connector.
The Aruba 5000 (with Line Card LC-5000-24FE-2GE-SPOE), the Aruba 2400, and the Aruba 800 support SPOE.
- If the connecting device supports only Power Over Ethernet (POE, including IEEE 802.3af POE as well as “inline” or “midspan” POE devices), use an 8- or 4-conductor, Category 5 UTP, straight-through FE cable with male RJ-45 connectors.
- If the connecting device does not support Serial or POE, use a 4- or 8-conductor, Category 5 UTP, FE cable with male RJ-45 connectors. The port detects MDI/MDX and automatically adjusts for straight-through or crossover cables.

The maximum length for FE cables is 100 meters (325 feet).

When the Aruba AP 60/61 is installed in an air-handling space, as described in NEC (2002) Article 300.22 (C), POE is required. Also, any FE cable installed in such spaces should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP or CMP.

Install cables in accordance with all applicable local regulations and practices.

Serial Breakout Adapter

The optional serial breakout adapter is used to separate the serial communications lines from the Aruba AP 60/61 FE+SPOE port. This allows the administrator to connect a local serial console directly to the AP and access the `apboot` prompt for manual provisioning.

The serial breakout adapter pin-outs are shown in [Figure B-2](#):

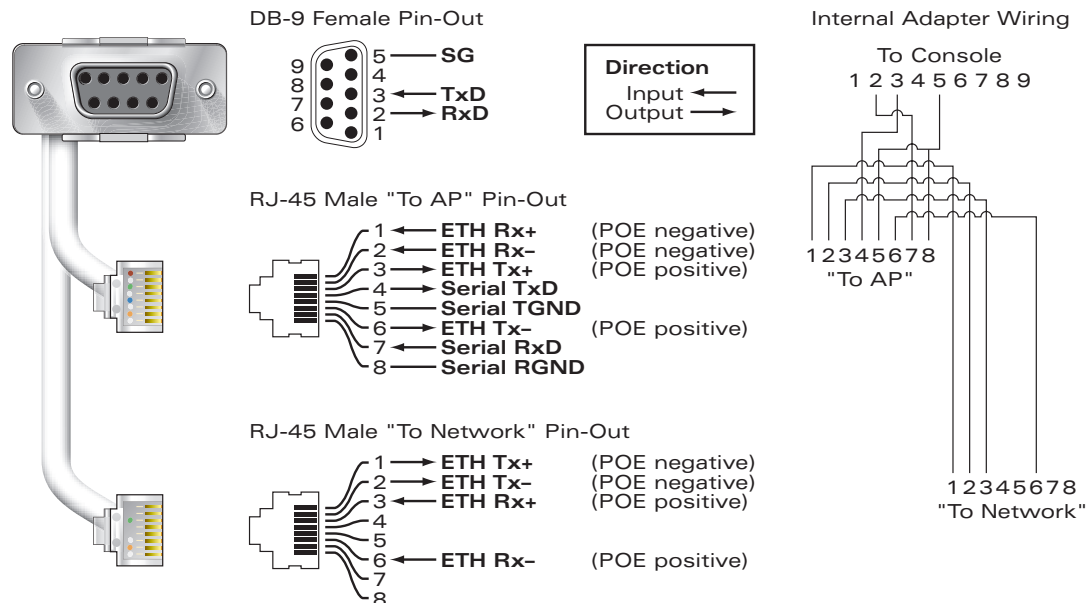


FIGURE B-2 Aruba Serial Breakout Adapter

DB-9 Specification

The DB-9 connector attaches to the serial port of a console terminal. Communication settings for the port are specified in [Table B-1](#):

TABLE B-1 Console Terminal Settings

Baud Rate	Data Bits	Parity	Stop Bits	Flow Control
9600	8	None	1	None

“To AP” Specifications

The RJ-45 connector labeled “To AP” attaches to the Aruba AP 60/61 FE port either directly (if the AP is physically available) or indirectly (if the AP is already deployed).

When connecting indirectly, use a straight-through FE coupler to attach the “To AP” connector to the FE cable leading directly to the AP’s FE port with no intervening hubs, routers, or other network equipment. The cable must be 8-conductor, Category 5 UTP, straight-through FE cable with a maximum length of 100 meters (325 feet).

The Aruba AP 60/61 and serial breakout adapter are plenum rated. When is installed in an air-handling space, as described in NEC (2002) Article 300.22(C), any connecting FE cable should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP or CMP.

Install cables in accordance with all applicable local regulations and practices.

“To Network” Specifications

The RJ-45 connector labeled “To Network” attaches to an FE LAN segment. This connection is optional unless IEEE 802.11af Power Over Ethernet (POE) is used to power the AP during manual provisioning.

A straight-through FE coupler may be used to attach the “To Network” connector to a LAN FE cable. The appropriate cable depends on the level of connectivity required of the FE port:

- If the connecting device supports IEEE 802.3af Power Over Ethernet (POE), use a 4- or 8-conductor, Category 5 UTP, straight-through FE cable with male RJ-45 connectors.

The Aruba 5000 (with Line Card LC-5000-24FE-2GE-SPOE), the Aruba 2400, and the Aruba 800 support SPOE.

- Otherwise, use a 4- or 8-conductor, Category 5 UTP, FE cable with male RJ-45 connectors. The port detects MDI/MDX and automatically adjusts for straight-through or crossover cables.

NOTE: Only IEEE 802.3af Power Over Ethernet is supported for manual provisioning. “Inline” or “midspan” POE devices will not work with the Aruba serial breakout adapter.

The maximum length for FE cables is 100 meters (325 feet).

The Aruba AP 60/61 and serial breakout adapter are plenum rated. When is installed in an air-handling space, as described in NEC (2002) Article 300.22(C), the connecting FE cable should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP or CMP.

Install cables in accordance with all applicable local regulations and practices.

Compliance

This section lists compliance information on a country-by-country basis.

United States

The following compliance statements apply for use of this product in the United States.



FCC - Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for fixed indoor use only. This equipment should be installed and operated with a minimum distance of 38.5 centimeters (15.2 inches) between the radiator and your body for 2.4 GHz and 5 GHz operations. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radio Frequency Interference Requirements

This device is restricted to indoor use due to its operation in the 5.15 to 5.25 GHz frequency range. The FCC requires this product to be used indoors to reduce the potential for harmful interference to co-channel Mobile Satellite systems. High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and/or damage this device.

Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministère des Communications.

The use of this device operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

RSS-210

This device, when operated in the 5150-5250 MHz frequency range, is only for indoor use.



CAUTION: High power radars are allocated as primary users (meaning they have priority) in the 5250-5350 MHz and 5650-5850 MHz frequency ranges, and these radars could cause interference and/or damage to LE-LAN devices.

RSS-Gen

This device has been designed to operate with the antennas listed at [Table 3-1 on page 23](#), and having a maximum gain of 15.0dBi for 2.4GHz and 14.0dBi for 5GHz. Antennas not included in this list or having a gain greater than 15.0dBi for 2.4GHz and 14.0dBi for 5GHz are strictly prohibited for use with this device. The required antenna impedance is 50 Ohms.

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

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Japan

Indoor Restriction for 5GHz Frequency Range

この製品は法律により、5GHz帯での屋外使用を禁じられています。

VCCI - Class B

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると受信障害を引き起こすことがあります。

取り扱い説明書に従って正しい取り扱いをして下さい。

Europe



WARNING: This is a Class B product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

This product complies with Directive 1999/5/EC as well as with EN5022 Class B and EN5024 standards.

Underwriter Labs

These products have been Listed and tested for fire resistant and low-smoke-producing characteristics, and are suitable for use in environmental air space, such as above suspended ceilings, in accordance with Section 300-22(C) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1.


Peut être utilisé dans des gaines transportant de l'air traité, conformément à la section 300-22(c) du National Electrical Code et aux articles 2-128, 12-010(3) et 12-100 du Code Canadien de l'électricité, Première partie, CSA C22.1.

EMC Compliance and Warning Statement

This equipment has been tested and found to comply with the limits of the standard for medical devices, IEC 60601-1-2:2001. The unit also complies with the requirements of EN 60601-1-2:1998, providing the presumption of compliance to the European Union's Medical Device Directive 93/42/EEC. The limits are designed to provide reasonable protection against harmful interference in a typical medical installation. This equipment generates, uses and can radiate radio frequency energy, and, if not installed and used in accordance with the manufacturer's instructions may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes interference with other devices, which may be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the device receiving the interference.
- Increase the separation between the equipment.
- Connect the equipment into an outlet on a circuit different from that to which the other device(s) are connected.
- Consult the manufacturer or field service technician for help.

Certifications

Item	Measurement
Electromagnetic Compatibility	<p>FCC Part 15 Class B, FCC Part 15 Class C (15.207/15.247) FCC Part 15 Class E 15.407 RSS 210 (CAN) ICES-003 Class B VCCI Class B TELEC ARIB STD-T66 AS/NZS 3548 Class B</p> <p>EN 61000-3, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11, EN 55022, EN 55024</p> <p>IEC 60601-1-2:2001(AP 60) EN 60601-1-2:2001 (AP 60)</p> <div style="display: flex; align-items: center;">  <p>The CE approval mark on back of the product indicates that it meets European Directives 73/23/EEC and 89/336/EEC</p> </div> <p>R&TTE Directive: EN 300 328, EN 301 489, EN 301 893</p> <p>Medical Directive: EN 60601-1-2</p>
Safety	<p>UL Listed (UL60950) UL Listed (Canadian Electrical Code/CSA 22.2 No. 60950) EN60950 / IEC60950 National Electrical Code Section 300-22(C) Canadian Electrical Code, Part 1, CSA C22.1 Sections 2-128, 12-010(3), and 12-100 IEC 60601-1:1988 and Amendments 1 and 2 EN 60601-1-1:2001 UL 2043</p>

Product Label

The product label is affixed to the chassis of the Aruba AP 60/61. The symbols on the label are explained in this chapter.

Product Features

- Wireless dual-band transceiver
- Varied antenna options:
 - The Aruba AP60 has dual Reverse Polarity SMA (RP-SMA) antenna connectors that accept a variety of high-gain detachable antennas (not included).
 - The Aruba AP61 has a built-in swivel array with dual, tri-band, omnidirectional antennas for reception diversity.
- Protocol-independent networking functionality
- Supports IEEE 802.11a or IEEE 802.11b/g operation as an AP
- Supports IEEE 802.11a and IEEE 802.11b/g operation as an AM
- Compatible with IEEE 802.3af Power Over Ethernet (POE)
- Seamless connectivity to wired LANs augments existing networks quickly and easily
- Can be centrally managed, configured, and upgraded through the Mobility Controller to take advantage of network changes and security improvements

Ethernet Compatibility

The Aruba AP 60/61 attaches to 10/100 Mbps Ethernet (FE) LAN segments that utilize 10Base-T/100Base-TX (twisted-pair) wiring. The device appears as an Ethernet node and performs a routing function by moving packets between the wired LAN and remote workstations on the wireless infrastructure.

Radio Characteristics

The Aruba AP 60/61 can be configured to support IEEE 802.11a or IEEE 802.11b/g operation as an AP, and supports both IEEE 802.11a and IEEE 802.11b/g operation as an AM:

- 802.11a provides a high data rate and reliable wireless connectivity
802.11a operation uses a radio modulation technique known as Orthogonal Frequency Division Multiplexing (OFDM), and a shared collision domain (CSMA/CA). It operates in the 5GHz Unlicensed National Information Infrastructure (UNII) band. Data is transmitted over a half-duplex radio channel operating at up to 54 Megabits per second (Mbps).
- 802.11b provides an alternative to wired LANs that can dramatically cut costs

802.11b operation uses the IEEE 802.11 High-Rate Direct Sequence (HRDS) specification, and a shared collision domain (CSMA/CA). It operates in the 2.4GHz Industrial/Scientific/Medical (ISM) band. The ISM band is available worldwide for unlicensed use. Data is transmitted at speeds of up to 11 Mbps.

- 802.11g provides a high data rate and is backwards compatible with 802.11b. 802.11g operation uses OFDM and a shared collision domain (CSMA/CA). It operates in the 2.4GHz Industrial/Scientific/Medical (ISM) band. The ISM band is available worldwide for unlicensed use. Data is transmitted at speeds of up to 54 Mbps.

Power Over Ethernet

The Aruba AP 60/61 supports the IEEE 802.3af standard for Power Over Ethernet (POE). With this feature, the Aruba AP 60/61 can accept electrical power from a compatible POE-capable device (such as the Aruba 5000 (with Line Card LC-5000-24FE-2GE-SPOE), Aruba 2400, or Aruba 800) directly over the FE cable. POE eliminates the need to provide separate power outlets in environments that are difficult or undesirable to wire for electricity.

The Aruba AP 60/61 also supports "inline" and "midspan" POE devices for normal operation. Inline power is POE that is integrated into FE ports and provides POE directly to devices. Non-POE ports can have POE added by means of a mid-span device that provides POE. The non-POE port is connected to a mid-span POE port, and this mid-span port is connected to the device that requires POE.

Physical Description

Package Contents

The Aruba AP 60/61 package includes:

- One Aruba AP 60/61 Access Point
- Assorted documentation

Inform your supplier if there are any incorrect, missing or damaged parts. If possible, retain the carton, including the original packing materials. Use them to repack the product in case there is a need to return it.

Optional Items

The following optional items can also be ordered for the Aruba AP 60/61:

- Detachable antennas (Aruba AP60 only)
- AC power adapter (5 VDC, 3 A) and power cord

- Serial breakout adapter for direct access to the AP console
- Mounting kit (modular cradle for walls and suspended ceilings)

Check with your Aruba sales representative for the availability of optional items.

The following specifications apply to the Aruba AP60 and Aruba AP61 Access Points.

Aruba AP-60 Access Point



FIGURE C-1 Part Number: AP-60

TABLE C-1 AP-60 802.11 Specifications

Description	802.11a	802.11b	802.11g
Antenna	Dual, diversity supporting Reverse Polarity-SMA (RP-SMA) detachable antenna interfaces suitable for acceptance of single-band or tri-band 802.11a/b/g detachable antennas of various pattern types and gain. For information on third-party antennas, go to the Interoperability section of the Products page at: http://www.arubanetworks.com		
Frequency Band	<ul style="list-style-type: none"> ● 5.250 ~ 5.350Ghz (middle band) 4 channels ● 5.725 ~ 5.825Ghz (higher band) 4 channels 	<ul style="list-style-type: none"> ● 2.4 ~ 2.483Ghz (US, Canada & ETSI) ● 2.4 ~ 2.497Ghz (Japan) Complete country list available at http://www.arubanetworks.com/products/aps/certification	<ul style="list-style-type: none"> ● 2.412 ~ 2.462Ghz (US, Canada) ● 2.412 ~ 2.472Ghz (ETSI) ● 2.412 ~ 2.484Ghz (Japan) Complete country list available at http://www.arubanetworks.com/products/aps/certification
Radio Technology	Orthogonal Frequency Division Multiplexing (OFDM)	Direct Sequence Spread Spectrum (DSSS)	Orthogonal Frequency Division Multiplexing (OFDM)
Modulation Type	BPSK, QPSK, 16-QAM, 64-QAM	CCK, BPSK, QPSK	CCK, BPSK, QPSK, 16-QAM, 64-QAM
Transmit Power	Configurable by system administrator/professional installer	Configurable by system administrator/professional installer	Configurable by system administrator

TABLE C-1 AP-60 802.11 Specifications (Continued)

Description	802.11a	802.11b	802.11g
Media Access Control	CSMA/CA with ACK	CSMA/CA with ACK	CSMA/CA with ACK
Operating Channels	<ul style="list-style-type: none"> ● US & Canada: 8 ● ETSI: 13 ● Japan: 5 <p>Complete country list available at http://www.arubanetworks.com/products/aps/certification</p>	<ul style="list-style-type: none"> ● US & Canada: 11 ● ETSI: 13 ● Japan: 13 <p>Complete country list available at http://www.arubanetworks.com/products/aps/certification</p>	<ul style="list-style-type: none"> ● US & Canada: 11 ● ETSI: 13 ● Japan: 13 <p>Complete country list available at http://www.arubanetworks.com/products/aps/certification</p>
Data Rates	6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel	1, 2, 5.5, 11 Mbps per channel	6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel

TABLE C-2 AP-60 Characteristics

Description	
Maximum Clients	64
Multi-mode Radio Band	Selectable via software
Manageability:	<ul style="list-style-type: none"> ● Management of all 802.11 parameters ● Network Wide AP Management via: <ul style="list-style-type: none"> CLI WEB GUI SNMPv3 ● Access Point Profiles, Management by: <ul style="list-style-type: none"> Geographical Location BSSID Radio Type
Encryption Support (AP and Mobility Controller)	40bit / 64bit / 128bit / 152bit WEP, TKIP, AES
Physical (HxWxD):	<ul style="list-style-type: none"> ● 159 x 99 x 31 mm / 6.26 x 3.90 x 1.22 in^a ● Weight 198 grams / 7 oz
Interfaces (Electrical):	<ul style="list-style-type: none"> ● 1 x 10/100 Base-TX auto-sensing Ethernet RJ-45 Interface (Auto-sensing MDI/MDX) ● Serial and Power Over Ethernet - 48V DC / 200mA Power Over Ethernet (802.3af compliant) ● 1 x 5V DC Power Interface
Interfaces (Mechanical):	<ul style="list-style-type: none"> ● Standard Kensington MicroSaver Security Cable Interface (cable not supplied) ● Wall and ceiling mount kit (optional - part number AP-60-MNT) interface
Visual Indicators (LEDs)	<p>Ready -- Power</p> <p>Ethernet link status / Activity</p> <p>WLAN Activity</p>

TABLE C-2 AP-60 Characteristics (Continued)

Description	
Power	<ul style="list-style-type: none"> ● Optional AC Power Adapter Input— 100-240 AC, 50-60 Hz ● Access Point Input— 5 VDC, 3 A (AC adapter), or 48 VDC, 200 mA (POE)
Power Requirements	<ul style="list-style-type: none"> ● 5V DC / 2A supplied externally via optional AC adapter kit ● 48V DC / 200mA Power Over Ethernet (802.3af compliant) ● Auto-sensing externally supplied AC power or Power Over Ethernet
Output Power	100 mW maximum (or lower as configured on the Aruba Mobility Controller to comply with local regulatory requirements)
Power Consumption	10W maximum
Operating Environment	<ul style="list-style-type: none"> ● 0 °C to 50 °C (32 °F to 122 °F) AP ● 0 °C to 40 °C (32 °F to 104 °F) AC Mains Power Adapter Kit
Storage Environment	<ul style="list-style-type: none"> ● 0 °C to 70 °C (32 °F to 158 °F) AP ● -20 °C to 70 °C (-4 °F to 158 °F) AC Mains Power Adapter Kit
Humidity	<ul style="list-style-type: none"> ● 5 to 95%, non-condensing AP ● 15 to 85% RH AC Mains Power Adapter Kit ● 5 to 90% RH Storage Humidity AC Mains Power Adapter Kit
Altitude	3,048 m (10,000 feet) maximum
Standards Compliance	<ul style="list-style-type: none"> ● Ethernet IEEE 802.3 / IEEE 802.3u ● Power Over Ethernet IEEE 802.3af ● Wireless IEEE 802.11 a/b/g
Mains Connections	<ul style="list-style-type: none"> ● Class II (ungrounded equipment)
Protection Against Egress of Water	<ul style="list-style-type: none"> ● The unit is protected against falling liquids with a protection class of IPX0 as defined by IEC 60601-1 and IEC 60529.

TABLE C-2 AP-60 Characteristics (Continued)

Description	
Mode of Operation	<ul style="list-style-type: none">As defined by IEC 60601-1, this unit is considered "Continuous Operation" equipment.

- a. Measurements indicate only the Access Point chassis. Size and weight do not include other materials (such as detachable antennas, mounting kits, and cables) which may vary

Aruba AP-61 Access Point



FIGURE C-2 Part Number: AP-61

TABLE C-3 AP-61 802.11 Specifications

Description	802.11a	802.11b	802.11g
Antenna	Integral, diversity supporting dual, tri-band 802.11a/b/g omni-directional high-gain antennas with 90 degrees rotational movement Integral antenna gain: 2.4 Ghz / 2.8dBi 5.150-5.350 Ghz / 3.9dBi 5.6 Ghz / 4 dBi		
Frequency Band	<ul style="list-style-type: none"> ● 5.150 ~ 5.250Ghz (lower band) 4 channels ● 5.250 ~ 5.350Ghz (middle band) 4 channels ● 5.725 ~ 5.825Ghz (higher band) 4 channels 	<ul style="list-style-type: none"> ● 2.4 ~ 2.483Ghz (US, Canada & ETSI) ● 2.4 ~ 2.497Ghz (Japan) Complete country list available at http://www.arubanetworks.com/products/aps/certification	<ul style="list-style-type: none"> ● 2.412 ~ 2.462Ghz (US, Canada) ● 2.412 ~ 2.472Ghz (ETSI) ● 2.412 ~ 2.484Ghz (Japan) Complete country list available at http://www.arubanetworks.com/products/aps/certification
Radio Technology	Orthogonal Frequency Division Multiplexing (OFDM)	Direct Sequence Spread Spectrum (DSSS)	Orthogonal Frequency Division Multiplexing (OFDM)
Modulation Type	BPSK, QPSK, 16-QAM, 64-QAM	CCK, BPSK, QPSK	CCK, BPSK, QPSK, 16-QAM, 64-QAM
Transmit Power	Configurable by system administrator/professional installer	Configurable by system administrator/professional installer	Configurable by system administrator
Media Access Control	CSMA/CA with ACK	CSMA/CA with ACK	CSMA/CA with ACK

TABLE C-3 AP-61 802.11 Specifications (Continued)

Description	802.11a	802.11b	802.11g
Operating Channels	<ul style="list-style-type: none"> ● US, Canada & ETSI: 12 ● Japan: 5 Complete country list available at http://www.arubanetworks.com/products/aps/certification	<ul style="list-style-type: none"> ● US & Canada: 11 ● ETSI: 13 ● Japan: 13 Complete country list available at http://www.arubanetworks.com/products/aps/certification	<ul style="list-style-type: none"> ● US & Canada: 11 ● ETSI: 13 ● Japan: 13 Complete country list available at http://www.arubanetworks.com/products/aps/certification
Data Rates	6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel	1, 2, 5.5, 11 Mbps per channel	6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel

TABLE C-4 AP-61 Characteristics

Description	
Maximum Clients	64
Multi-mode Radio Band	Selectable via software
Manageability:	<ul style="list-style-type: none"> ● Management of all 802.11 parameters ● Network Wide AP Management via: <ul style="list-style-type: none"> CLI WEB GUI SNMPv3 ● Access Point Profiles, Management by: <ul style="list-style-type: none"> Geographical Location BSSID Radio Type

TABLE C-4 AP-61 Characteristics (Continued)

Description	
Encryption Support (AP and Mobility Controller)	40bit / 64bit / 128bit / 152bit WEP, TKIP, AES
Physical (HxWxD):	<ul style="list-style-type: none"> ● Antenna up, stand closed—216 x 99 x 31 mm / 8.50 x 3.90 x 1.22 in^a ● Antenna up, stand open—209 x 99 x 74 mm / 8.23 x 3.90 x 2.91 in ● Antenna 90°, stand closed— 159 x 99 x 71 mm / 6.26 x 3.90 x 2.80 in ● Weight 255 grams / 9 oz
Interfaces (Electrical):	<ul style="list-style-type: none"> ● 1 x 10/100 Base-TX auto-sensing Ethernet RJ-45 Interface (Auto-sensing MDI/MDX) ● Serial and Power Over Ethernet - 48V DC / 200mA Power Over Ethernet (802.3af compliant) ● 1 x 5V DC Power Interface
Interfaces (Mechanical):	<p>Standard Kensington MicroSaver Security Cable Interface (cable not supplied)</p> <p>Wall and ceiling mount kit (optional - part number AP-60-MNT) interface</p>
Visual Indicators (LEDs)	<p>Ready -- Power</p> <p>Ethernet link status / Activity</p> <p>WLAN Activity</p>
Power	<ul style="list-style-type: none"> ● Optional AC Power Adapter Input— 100-240 AC, 50-60 Hz ● Access Point Input— 5 VDC, 3 A (AC adapter), or 48 VDC, 200 mA (POE)
Power Requirements	<ul style="list-style-type: none"> ● 5V DC / 2A supplied externally via optional AC adapter kit ● 48V DC / 200mA Power Over Ethernet (802.3af compliant) ● Auto-sensing externally supplied AC power or Power Over Ethernet

TABLE C-4 AP-61 Characteristics (Continued)

Description	
Output Power	100 mW maximum (or lower as configured on the Aruba Mobility Controller to comply with local regulatory requirements)
Power Consumption	10W maximum
Operating Environment	<ul style="list-style-type: none"> ● 0 °C to 50 °C (32 °F to 122 °F) AP ● 0 °C to 40 °C (32 °F to 104 °F) AC Mains Power Adapter Kit
Storage Environment	<ul style="list-style-type: none"> ● 0 °C to 70 °C (32 °F to 158 °F) AP ● -20 °C to 70 °C (-4 °F to 158 °F) AC Mains Power Adapter Kit
Humidity	<ul style="list-style-type: none"> ● 5 to 95%, non-condensing AP ● 15 to 85% RH AC Mains Power Adapter Kit ● 5 to 90% RH Storage Humidity AC Mains Power Adapter Kit
Altitude	3,048 m (10,000 feet) maximum
Standards Compliance	<ul style="list-style-type: none"> ● Ethernet IEEE 802.3 / IEEE 802.3u ● Power Over Ethernet IEEE 802.3af ● Wireless IEEE 802.11a/b/g

- a. Measurements indicate only the Access Point chassis. Size and weight do not include other materials (such as detachable antennas, mounting kits, and cables) which may vary

Related Documents

The following items are part of the complete documentation for the Aruba system:

- *Aruba Quick Start Guide*
- *Aruba AP 60/61 Wireless Access Point Installation Guide* (this document)
- *ArubaOS User Guide*
- *Aruba Mobility Controller installation guide*

For the current versions of these manuals, or to obtain the latest product release notes, visit the support section of the Aruba Web site (see [page 60](#)).

Text Conventions

The following conventions are used throughout this manual to emphasize important concepts:

TABLE C-5 Text Conventions

Type Style	Description
<i>Italics</i>	This style is used to emphasize important terms and to mark the titles of books.
System items	This fixed-width font depicts the following: <ul style="list-style-type: none">● Sample screen output● System prompts● Filenames, software devices, and certain commands when mentioned in the text.
Commands	In the command examples, this bold font depicts text that the user must type exactly as shown.
<Arguments>	<p>In the command examples, italicized text within angle brackets represents items that the user should replace with information appropriate to their specific situation. For example:</p> <pre># send <text message></pre> <p>In this example, the user would type "send" at the system prompt exactly as shown, followed by the text of the message they wish to send. Do not type the angle brackets.</p>
[Optional]	In the command examples, items enclosed in brackets are optional. Do not type the brackets.
{ Item A Item B }	In the command examples, items within curled braces and separated by a vertical bar represent the available choices. Enter only one choice. Do not type the braces or bars.

TABLE C-5 Text Conventions (Continued)

NOTE:	Useful tips or information about the topic under discussion.
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Indicates that protection against electrical shock is required. This symbol indicates that a danger to personal safety exists.



Indicates caution is required. Failure to heed these cautions may result in damaged equipment or loss of data.

Contacting Aruba Networks

Web Site

- Main Site <http://www.arubanetworks.com>
- Support <http://www.arubanetworks.com/support>

E-mail

- Sales sales@arubanetworks.com
- Support support@arubanetworks.com

Telephone Numbers

- Main 408-227-4500
- Fax 408-227-4550
- Sales 408-754-1201
- Support
 - In the US: 800-WI-FI-LAN (800-943-4526)+
 - France: 33 (0) 170725559+44 (0)
 - UK: 2071275989+49 (0)
 - Germany: 69380977228+ 00 1
 - All Other: 408-754-1200

Proper Disposal of Aruba Equipment



This product at end of life is subject to separate collection and treatment in the EU Member States, Norway, and Switzerland and therefore is marked with the symbol shown at the left. Treatment applied at end of life of these products in these countries shall comply with the applicable national laws implementing Directive 2002/96EC on Waste of Electrical and Electronic Equipment (WEEE).

The WEEE Directive 2002/96/EC and RoHS (Restriction of Hazardous Substances) Directive 2002/95/EC sets collection, recycling and recovery targets for various categories of electrical products and their waste.

The Restriction on Hazardous Substances Directive (RoHS) (2002/95/EC), which accompanies the WEEE Directive, bans the use of heavy metals and brominated flame-retardants in the manufacture of electrical and electronic equipment. Specifically, restricted materials under the RoHS Directive are Lead (including Solder used in PCB's), Cadmium, Mercury, Hexavalent Chromium, and Bromine.

Aruba declares compliance with the European Union (EU) WEEE Directive (2002/96/EC). For more information on WEEE, refer to:

<http://www.dti.gov.uk/sustainability/weee/>

Notes



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