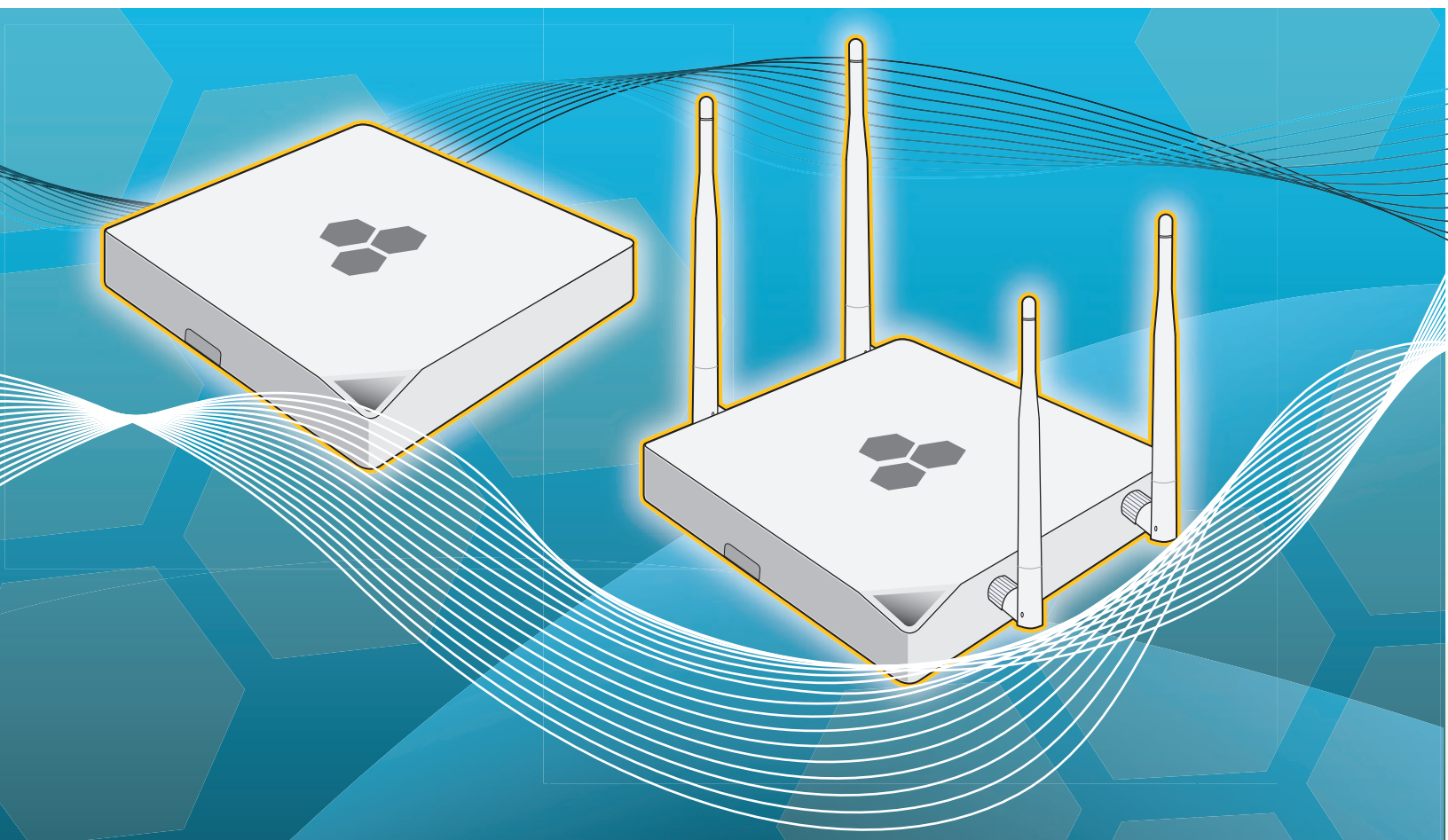


Aerohive AP121 and AP141 User Guide



Aerohive[™]
NETWORKS

Aerohive AP121 and AP141 User Guide



Aerohive Technical Publications

To register, get the latest product documentation, see compliance information, and download software updates, visit www.aerohive.com/support.

Copyright Notice

Copyright © 2012 Aerohive Networks, Inc. All rights reserved.

Aerohive Networks, the Aerohive Networks logo, HiveOS, HiveAP, and HiveManager are trademarks of Aerohive Networks, Inc. All other trademarks and registered trademarks are the property of their respective companies.

Information in this document is subject to change without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without receiving written permission from:

Aerohive Networks, Inc.

330 Gibraltar Drive

Sunnyvale, CA 94089

P/N 330093-01, Rev. A

About This Guide

This guide describes Aerohive AP121 and AP141 devices, including component descriptions, installation and mounting instructions, wiring diagrams, and hardware specifications.

Contents

AP121 and AP141 Platforms	7
AP121 and AP141 Product Overview	8
Ethernet and Console Ports.....	10
Console Port	11
Status Indicator	12
Port LEDs	12
Antennas	12
Configuring Antennas	13
Mounting the AP121 or AP141	15
Ceiling Mount	15
Surface Mount	16
Locking the AP121 and AP141	17
Connecting the AP to the Network	18
Device, Power, and Environmental Specifications.....	19
Index	21



AP121 and AP141 Platforms

The AP121 and AP141 wireless access points are designed for excellent throughput and range. They provide dual concurrent 802.11b/g/n and 802.11a/n radios for 2x2 MIMO (Multiple Input Multiple Output) antenna configurations. When you enable 802.11n high-throughput options such as wide-channel mode (40-MHz channels), A-MPDU and A-MSDU packet aggregation, short guard interval, and MCS15 data rates, they can provide a PHY data rate up to 300 Mbps per radio. The AP121 has four internal antennas, and the AP141 has four detachable external antennas (two 2.4 GHz and two 5 GHz in both cases). Both models have an RJ-45 10/100/1000 Ethernet port, an RJ-45 console port, and a USB modem port (reserved for future use).

This chapter covers the following topics relating to the AP121 and AP141:

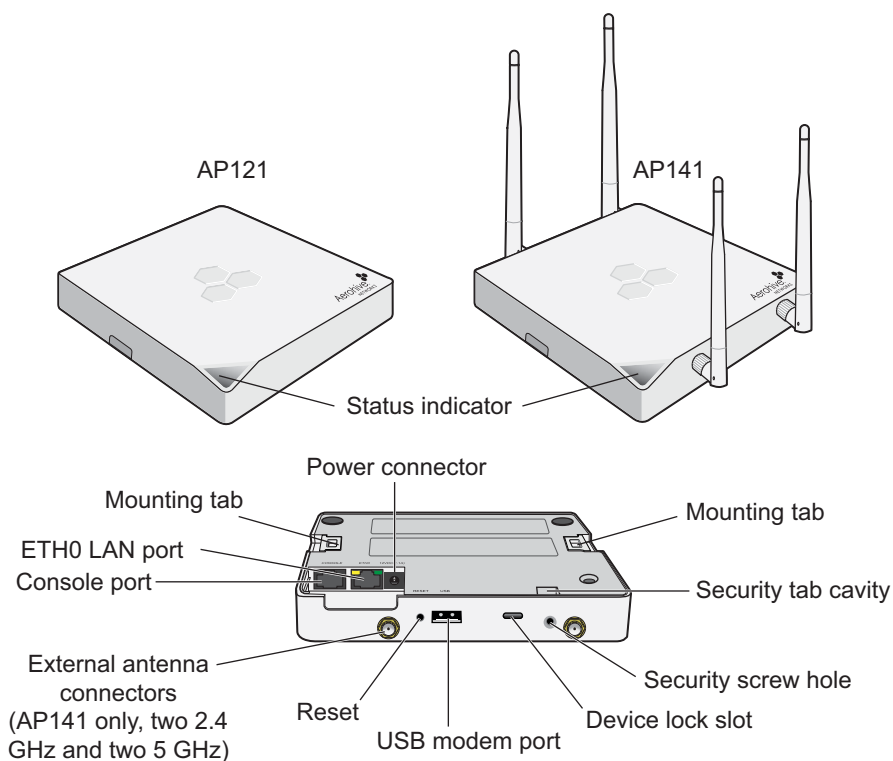
- ["AP121 and AP141 Product Overview" on page 8](#)
 - ["Ethernet and Console Ports" on page 10](#)
 - ["Status Indicator" on page 12](#)
 - ["Port LEDs" on page 12](#)
 - ["Antennas" on page 12](#)
- ["Mounting the AP121 or AP141" on page 15](#)
 - ["Ceiling Mount" on page 15](#)
 - ["Surface Mount" on page 16](#)
 - ["Locking the AP121 and AP141" on page 17](#)
- ["Device, Power, and Environmental Specifications" on page 19](#)

AP121 AND AP141 PRODUCT OVERVIEW

The AP121 and AP141 models provide excellent throughput and coverage. The AP121 has two internal antennas, and the AP141 has four detachable external antennas. You can see these hardware components in [Figure 1](#). Each component is described in [Table 1 "AP121 and AP141 component descriptions"](#).

(I) To meet federal radiation exposure requirements, these devices should be installed at a minimum distance of 23 cm or 9.06" from your body.

Figure 1 AP121 and AP141 hardware components



AP121 and AP141 components (chassis shown upside down)

Table 1 AP121 and AP141 component descriptions

Component	Description
Status Indicator	The status indicator conveys operational states for system power, firmware updates, Ethernet and wireless interface activity, and major alarms. For details, see "Status Indicator" on page 12 .
2.4 and 5 GHz RP-SMA connectors (AP141)	You can connect up to four detachable single-band antennas (two 2.4 GHz and two 5 GHz) to the male 802.11a/b/g/n RP-SMA (reverse polarity-subminiature version A) connectors. The antennas and the connectors are labeled for easy identification. For details, see "Antennas" on page 12 .

Table 1 AP121 and AP141 component descriptions (Continued)

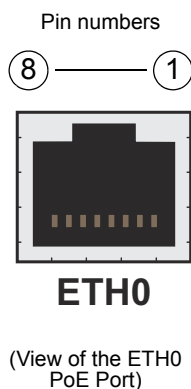
Component	Description
Console Port	You can access the CLI by making a serial connection to the RJ-45 console port. The management station from which you connect to the device must have a VT100 emulation program, such as Tera Term Pro® (a free terminal emulator) or Hilgraeve Hyperterminal® (provided with Windows® operating systems from Windows 95 to Windows XP). The serial connection settings are: bits per second: 9600, data bits: 8, parity: none, stop bits: 1, flow control: none. For details, see "Ethernet and Console Ports" on page 10 .
Power Connector	There are two ways to power an AP121 or AP141 device. You can connect it to a 100 – 240-volt AC power source by connecting an AC/DC power adaptor (available as an extra option) to the 12 V (1.1A) DC connector. You can also power the device through the ETH0 port from PSE (power sourcing equipment) that is compatible with the 802.3af and 802.3at standards. Because there is no on/off switch, these devices automatically power on when you connect them to power.
ETH0 10/100/1000 Mbps Port	<p>The 10/100/1000-Mbps Ethernet port—ETH0—receives an RJ-45 connector. The AP can receive power through an Ethernet connection to the ETH0 port from PSE that is compatible with the 802.3af standard. Aerohive provides suitable PoE injectors as an optional accessory. (If you connect the AP to a power source through the power connector and the ETH0 PoE port simultaneously, the device draws power through the power connector and automatically disables PoE.)</p> <p>The ETH0 port is compatible with 10/100/1000Base-T/TX and automatically negotiates half- and full-duplex connections with the connecting device. It is autosensing and adjusts to straight-through and cross-over Ethernet cables automatically. For details, see "Ethernet and Console Ports" on page 10.</p>
Reset Button	<p>The reset button allows you to reboot the device or reset it to its factory default settings. Insert a paper clip, or similar tool, into the Reset pinhole and press the reset button. To reboot the device, hold the button down for 5 seconds. To return the configuration to the factory default settings, hold it down for at least 10 seconds. After releasing the button, the indicator light goes dark, and then glows steady amber while the firmware loads and the system performs a self-test. After the software finishes loading and the AP has connected to HiveManager, the status indicator glows steady white.</p> <p>To disable the reset button from resetting the configuration, enter this command: no reset-button reset-config-enable Pressing the button for 5 seconds will still reboot the AP, but pressing it for more than 10 seconds will not reset its configuration.</p>
USB Port	Reserved for future use.
Security Tab Cavity and Security Screw	When mounting the AP on a ceiling track or flat surface, insert the security tab extension on the rail mount or mounting plate into the security tab cavity and then fasten the AP to the mounting equipment by inserting the security screw through the security screw hole and tightening it. See "Locking the AP121 and AP141" on page 17 .
Device Lock Slot	You can physically secure the AP by attaching a lock and cable (such as a Kensington® notebook lock) to the device lock slot.

Ethernet and Console Ports

The AP121 and AP141 have one RJ-45 10/100/1000Base-T/TX Ethernet port and an RJ-45 console port.

The pin assignments in the 10/100/1000Base-T/TX Ethernet port follow the TIA/EIA-568-B standard (see [Figure 2](#)). The port accepts standard types of Ethernet cable—cat3, cat5, cat5e, or cat6—and can receive power over the Ethernet cable from PSE (power sourcing equipment) that is 802.3af-compatible. Such equipment can be embedded in a switch or router, or it can come from purpose-built devices that inject power into the Ethernet line en route to the AP. Because the PoE port has autosensing capabilities, the wiring termination in the Ethernet cable can be either straight-through or cross-over. Aerohive provides several PoE injectors as accessories that you can order: AH-ACC-INJ-20W-EU, AH-ACC-INJ-20W-UK, AH-ACC-INJ-20W-US, AH-ACC-INJ-20W-AU, and AH-ACC-INJ-20W-IL.

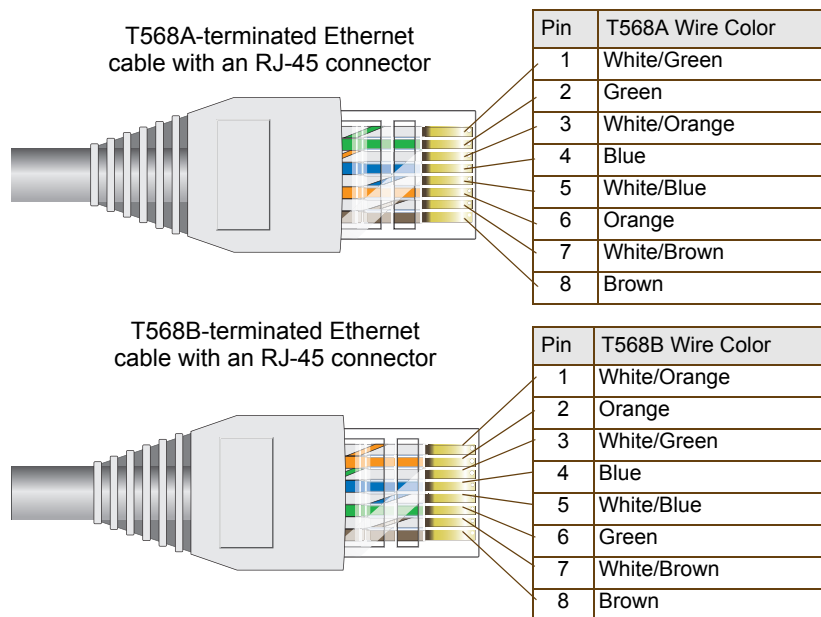
Figure 2 PoE wire usage and pin assignments



Pin	Data Signal	802.3af Alternative A (data and power on the same wires)		802.3af Alternative B (data and power on separate wires)	802.3at wiring options			
		MDI	MDI-X	MDI or MDI-X	1	2	3	4
1	Transmit +	DC+	DC-	---	DC1+	DC1-	DC1+	DC1-
2	Transmit -	DC+	DC-	---	DC1+	DC1-	DC1+	DC1-
3	Receive +	DC-	DC+	---	DC1-	DC1+	DC1-	DC1+
4	(unused)	---	---	DC+	DC2+	DC2+	DC2-	DC2-
5	(unused)	---	---	DC+	DC2+	DC2+	DC2-	DC2-
6	Receive -	DC-	DC+	---	DC1-	DC1+	DC1-	DC1+
7	(unused)	---	---	DC-	DC2-	DC2-	DC2+	DC2+
8	(unused)	---	---	DC-	DC2-	DC2-	DC2+	DC2+

MDI = Medium dependent interface for straight-through connections
MDI-X = Medium dependent interface for cross-over (X) connections

The Eth0 PoE port is auto-sensing and can automatically adjust to transmit and receive data over straight-through or cross-over Ethernet connections. Likewise, it can automatically adjust to 802.3af Alternative A and B power delivery methods. Furthermore, when the Alternative A method is used, the port automatically allows for polarity reversals depending on their role as either MDI or MDI-X. In 802.3at, the 1/2 and 3/6 wire pairs connect to DC source 1 and 4/5 and 7/8 pairs to DC source 2 in PSE. Although the exact polarity depends on the PSE design, the Eth0 PoE port can support all possible options.



T568A and T568B are two standard wiring termination schemes. Note that the only difference between them is that the white/green + solid green pair of wires and the white/orange + solid orange pair are reversed.

For straight-through Ethernet cables—using either the T568A or T568B standard—the eight wires terminate at the same pins on each end.

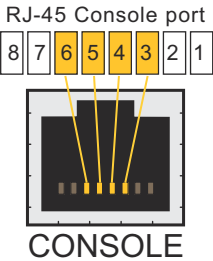
For cross-over Ethernet cables, the wires terminate at one end according to the T568A standard and at the other according to T568B.

If an AP is connected to both an AC power source and PSE, the AC power source takes priority. If the AP loses power from that source, it automatically switches to PoE. If the AC power comes back online, the AP automatically switches back to AC. Each time it switches from one power source to another, it must reboot.

Console Port

Through the RJ-45 console port, you can make a serial connection from your management system to the AP. The pin-to-signal mapping in the RJ-45 console port is shown below.

Table 2 Console port pin assignments

Console Port	Pin	Signal	Direction
 <p>RJ-45 Console port</p> <p>CONSOLE</p>	1	RTS (Request to Send)	Output, unused
	2	DTR (Data Terminal Ready)	Output, unused
	3	TXD (Transmitted Data)	Output
	4	Ground	Ground
	5	Ground	Ground
	6	RXD (Received Data)	Input
	7	DSR (Data Set Ready)	Input, unused
	8	CTS (Clear to Send)	Input, unused
Because this is a console port, only pins 3, 4, 5, and 6 are currently in use.			

To make a serial connection from your management system to the AP, you can use the console cable that is available as an extra accessory. Insert the RJ-45 connector into the console port, and attach the DB-9 connector to the serial (or COM) port on your management system. The management system must have a VT100 terminal emulation program, such as Tera Term Pro® (a free terminal emulator) or Hilgraeve Hyperterminal®. To make your own serial cable and adapter, see below.

Figure 3 Wiring details for making a serial cable with an RJ-45-to-Female DB-9 adapter

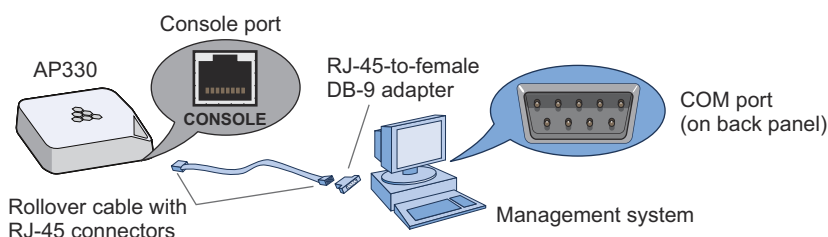


Table 3 Wiring information for a serial cable with RJ-45-to-female DB-9 adapter

Console Port (AP340)	RJ-45 to RJ-45 rollover cable		RJ-45 to female DB-9 adapter		Management signal
Signal	Pin	Pin	Pin	DB-9 Pin	Signal
RTS (Request to Send)	1	8	1	8	CTS (unused)
DTR (Data Terminal Ready)	2	7	2	6	DSR (unused)
TXD (Transmitted Data)	3	6	3	2	RXD
Ground	4	5	4	5	Ground
Ground	5	4	5	5	Ground
RXD (Received Data)	6	3	6	3	TXD
DSR (Data Set Ready)	7	2	7	4	DTR (unused)
CTS (Clear to Send)	8	1	8	7	RTS (unused)
-	-	-	-	9	RI (Ring Indicator, unused)

Status Indicator

The AP121 and AP141 have a triangular status indicator light on the top left corner of the chassis. The colors of this light indicate the following states of activity:

- **Dark:** There is no power or the status indicator is disabled.
- **Amber** (flashing): This is an alert that indicates that the device is performing a firmware upgrade. Do not power off the device during this process.
- **Amber** (steady): This is an alert that indicates that the CAPWAP connection has not been successfully established, or the device is booting or shutting down.
- **White:** The device is powered on, a successful CAPWAP connection has been made, and the firmware is operating normally.

Port LEDs

The ETH0 port has two status LEDs to indicate port operation (yellow for 10/100 Mbps and green for 1000 Mbps). The meanings of the LED colors and patterns are described here:

- **Dark:** No link is detected for this port.
- **Yellow** (steady): This port has made a successful 10/100 Mbps link.
- **Yellow** (flashing): This port is sending and receiving traffic at 10/100 Mbps.
- **Green** (steady): This port has made a successful 1000 Mbps link.
- **Green** (flashing): This port is sending and receiving traffic at 1000 Mbps.

Antennas

The antennas for the AP121 and AP141 are described below.

AP121

The AP121 has four internal single-band antennas with 50-ohm impedance. The 2.4 GHz band antennas (IEEE 802.11b/g/n) have a peak gain of 4 dBi. The 5 GHz antennas (IEEE 802.11a/n) have a peak gain of 6 dBi. All antennas are omnidirectional and provide fairly equal coverage in all directions.

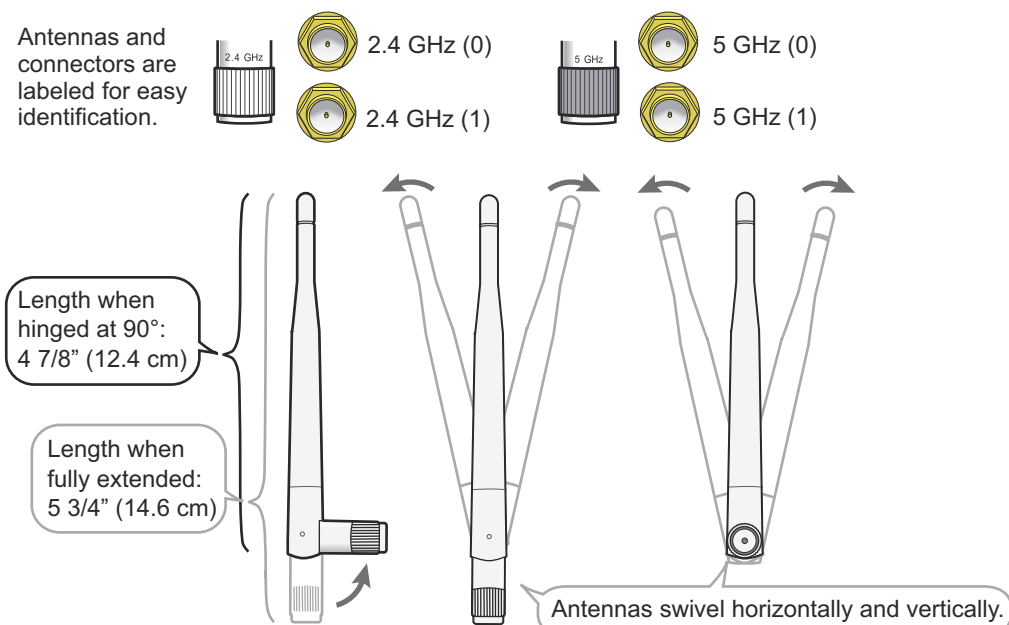
AP141

The AP141 has four male 802.11a/b/g/n RP-SMA (reverse polarity-subminiature version A) external antenna connectors and four external articulated antennas (two 2.4 GHz and two 5 GHz). All the external antennas have a peak gain of 4 dBi, are omnidirectional, and provide fairly equal coverage in all directions in a toroidal (donut-shaped) pattern. The impedance for the antennas is 50 ohms. The antennas and connectors are labeled for easy identification and connection, and swivel in all directions, as shown in [Figure 4](#).



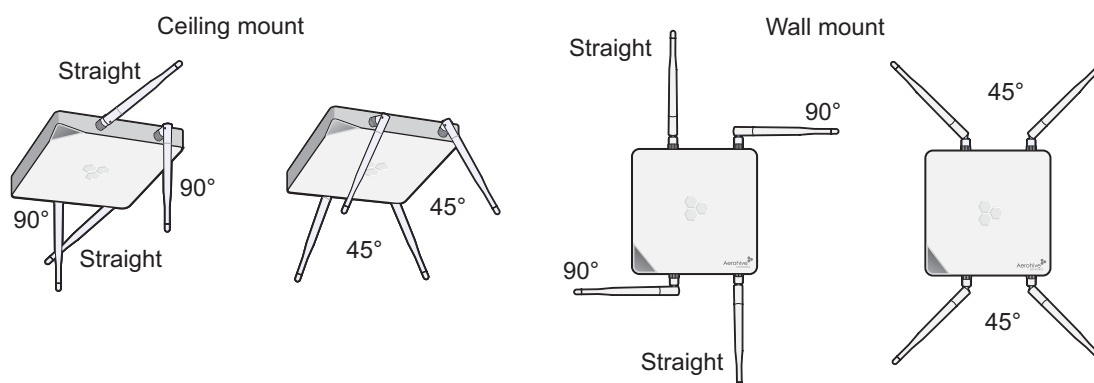
The AP121 and AP141 use a 2.4 GHz WLAN power amplifier from Richwave Technology (p/n RTC6691E) and a 5 GHz WLAN power amplifier from Skyworks (p/n SE5005L).

Figure 4 AP141 antenna articulation and labels



For optimal coverage, align the antennas as shown in [Figure 5](#). For more information about configuring antennas for the best coverage, see ["Configuring Antennas"](#).

Figure 5 Aligning the articulated antennas for AP141 devices



Configuring Antennas

As anyone who has administered a WLAN system knows, configuring the antennas correctly at the outset can save you lots of trouble. The external antennas on the AP141 are adjustable, and can be patch, directional (single-direction), and omnidirectional antennas. The type of antenna you use determines the coverage pattern.

Single-direction Antennas

The most common external antennas are directional patch antennas that provide coverage in a single direction. Most commonly they have a transmission pattern similar to that shown in [Figure 6 on page 14](#). Based on the gain, the signal will be wide (like the low gain antenna shown on top) or narrow and long (like the high gain antenna shown on the bottom).

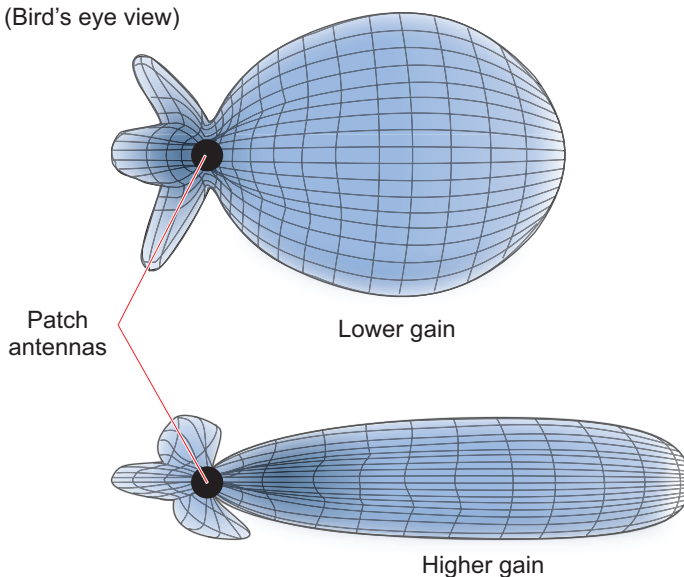
AP141 devices accommodate external antennas via coaxial jacks on the chassis (see [Figure 4 on page 13](#)). These jacks are standard male RP-SMA connectors.



RF coverage patterns are not perfect for these antennas and they often broadcast slightly in directions other than the primary one. These extra "lobes" can be seen in both of the patterns shown below.

Figure 6 Directional antenna patterns

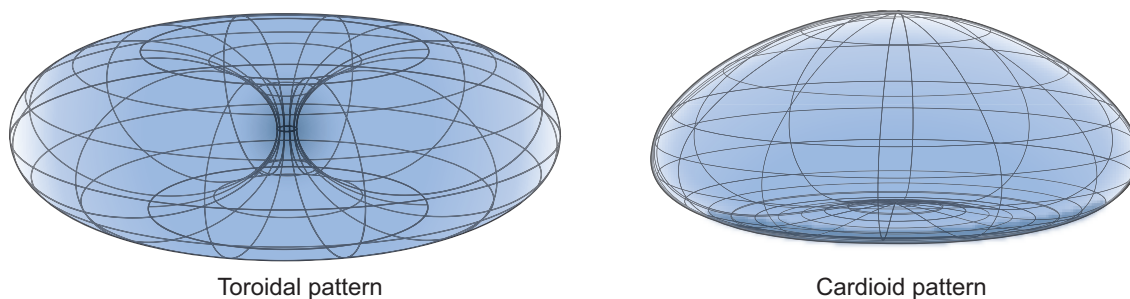
(Bird's eye view)



Omnidirectional Antennas

You typically orient omnidirectional antennas vertically, positioning them on all devices in the same direction. Omnidirectional antennas create coverage areas that can be toroidal (doughnut-shaped) or cardioid (heart- or plum-shaped), broadcasting to the sides much more effectively than up or down (see [Figure 7](#)). In general, this is good for most office environments because you have large flat floors. However, it can be a problem in environments with high ceilings.

Figure 7 Omnidirectional antenna radiation patterns



MOUNTING THE AP121 OR AP141

Use the rail mounting brackets to mount the AP121 or AP141 to the tracks of a dropped ceiling grid. Use the mounting plate to mount the AP to any surface that can support its weight (AP121: 11.6 oz or 0.36 kg; AP141: 13.5 oz or 0.42 kg).

Ceiling Mount

To mount the AP121 or AP141 to a standard 15/16"-wide track (2.38 cm) in a dropped ceiling, use one of the two rail mounting brackets that ship with the product, depending on whether the ceiling track is flush with the ceiling tiles or recessed:

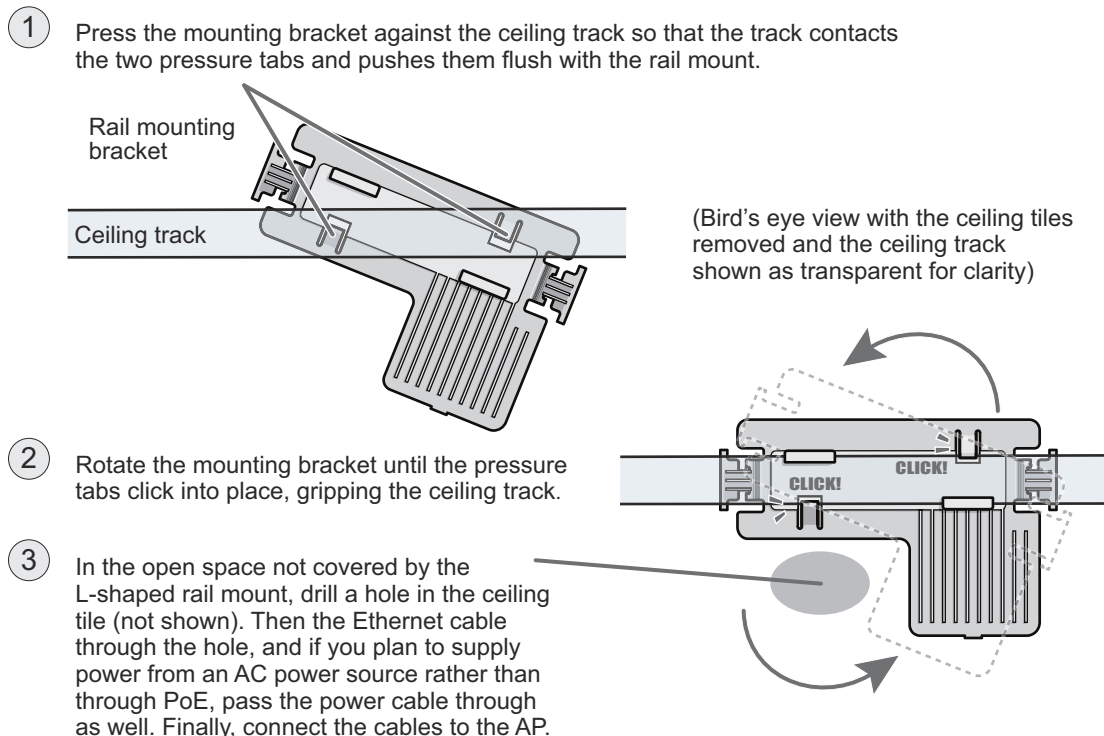
- 15/16" flush ceiling rail mounting bracket
- 15/16" recessed ceiling rail mounting bracket



For narrower tracks, you can order a pair of 9/16" rail mounts for AP121, AP141, AP330, and AP350 models from Aerohive (AH-ACC-9-16-CLIP-330-AP350). The kit contains a bracket for flush ceilings and a bracket for recessed ceilings.

Nudge the adjacent ceiling tiles slightly away from the track to clear some space and then attach the appropriate rail mounting bracket to the track. When you have the mounting bracket in the correct location, cut or drill a hole in the ceiling tile, through which you will pass the power and Ethernet cables, as shown in Figure 8.

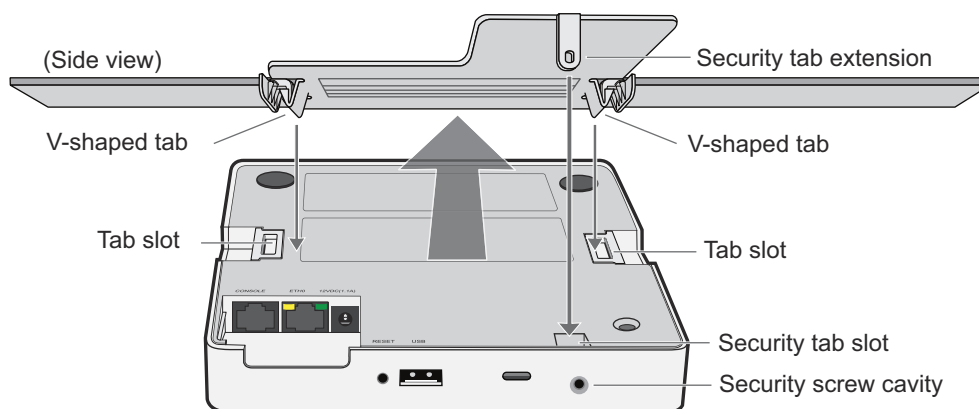
Figure 8 Attaching the rail mounting bracket to a ceiling track



You can slide the mounting bracket along the ceiling track if you need to adjust its location.

With the AP upside down, align the two flexible V-shaped tabs and the security tab extension on the rail mounting bracket with the two tab slots and the security screw cavity on the underside of the AP, and then push the AP upward until it clicks into place as shown in [Figure 9](#).

Figure 9 Attaching the AP to the rail mount



When you are done, adjust the ceiling tiles back into their former position.

Surface Mount

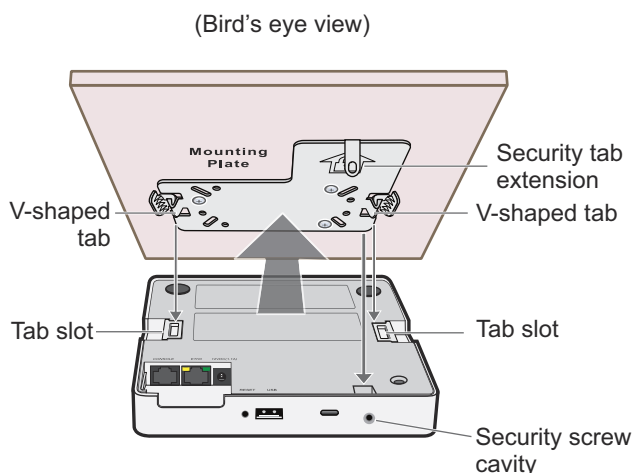
You can use the flat mounting plate to attach the AP121 or AP141 to any surface that supports its weight (AP121: 11.6 oz or 0.36 kg; AP141: 13.5 oz or 0.42 kg), and to which you can screw or nail the plate. First, mount the plate to the surface, and then attach the device to the plate, as shown in [Figure 10](#).

Figure 10 Mounting the AP on a wall

- 1 With the two flexible V-shaped tabs at the sides of the plate extending away from the surface, attach the mounting plate to a secure object such as a wall, ceiling, post, or beam.
- 2 Cut or drill a hole in the space not covered by the L-shaped mounting plate, pass the cables through to the AP, and connect them. (You can also run the cables along the wall to the AP instead of through a hole.)

Depending on how the AP is powered and how it connects to the network, connect a power cable and an Ethernet cables. (The cable is not shown in this illustration.)

- 3 Align the tabs and security tab extension on the mounting plate with the tab slots and security screw cavity on the AP.
- 4 Push the AP against the mounting plate until the tabs click inside the tab slots. For the AP141, attach and align the antennas.



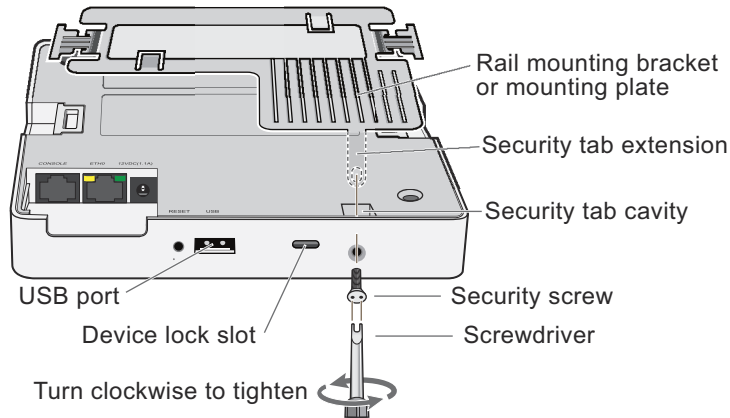
LOCKING THE AP121 AND AP141

To lock the AP to the rail mount or mounting plate, use either a Kensington lock or the security screw that is included with the mounting kit. To use a Kensington lock, loop the cable attached to the lock around a secure object, insert the T-bar component of the lock into the device lock slot on the AP, and then turn the key to engage the lock mechanism.

To lock the AP to the rail mounting bracket or mounting plate, you can use either the slotted screw or the pan-head security screw, both of which are included in the mounting kit. If you use the security screw, you will need a drilled spanner insert bit for size #6 security screws and a screw driver that will accept the bit. The correct bits are available from Aerohive in sets of three for AP121, AP141, AP330, and AP350 models (AH-ACC-SEC-BIT-330-AP350-3PK). If you use the slotted screw, you can install it with a standard flat-blade screwdriver or pan-head driver bit.

1. Insert the security screw or slotted screw through the hole in the chassis.
2. Use a screwdriver with a drilled spanner bit or a flat-blade screwdriver to tighten the screw to the security tab extension on the rail mount, as depicted in [Figure 11](#), which shows the AP121.

Figure 11 Locking the AP121 to the mounting plate

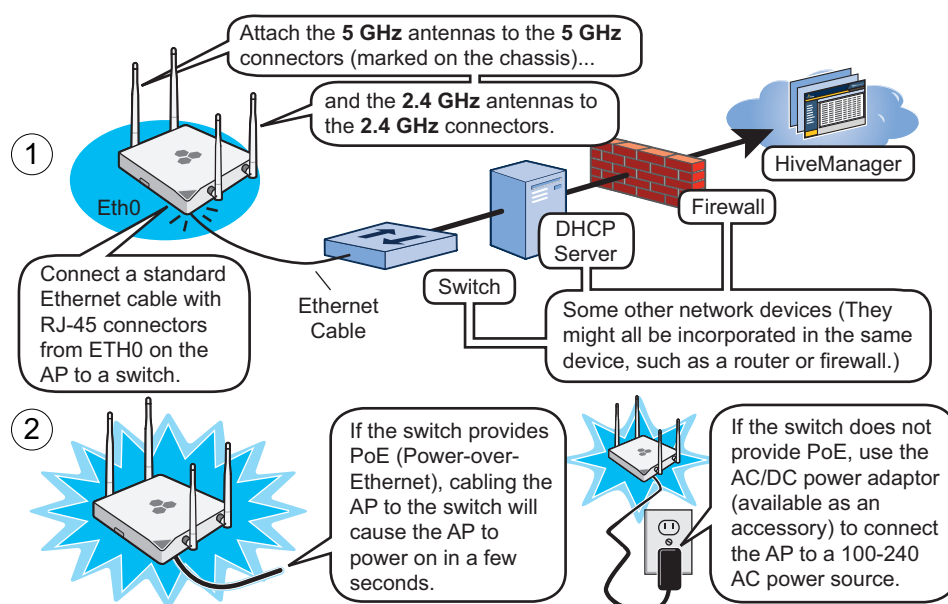


CONNECTING THE AP TO THE NETWORK

Run an Ethernet cable from the eth0 port on the AP to a switch so that on the network. You can use an AC/DC power adaptor to connect it to a 100-240 VAC power source or allow it to obtain power through PoE (Power over Ethernet) from PSE (power sourcing equipment) on the network. (Power adaptors and PoE injectors are available from Aerohive as options.)

After you cable the AP to an Ethernet network and power it on, it automatically attempts to get its network settings through DHCP and contact HiveManager. The process typically takes about five minutes to complete. If you see the AP listed on the *All Devices* page in the *Monitor* section of the HiveManager GUI, the initial setup is complete and you can now begin managing the AP through HiveManager. This process is shown in Figure 12, which shows the AP141 but applies equally to the AP121.

Figure 12 Cabling and powering the AP



If the AP does not appear in the HiveManager GUI after about ten minutes, see Aerohive product documentation and free online training videos to understand how the AP attempts to contact HiveManager and what you can do to help establish a connection between them. They are available for free at www.aerohive.com/techdocs.



To configure the AP121 and AP141 to provide wireless access to the network, refer to the technical documentation for HiveManager, the Aerohive device management system.

DEVICE, POWER, AND ENVIRONMENTAL SPECIFICATIONS

Understanding the range of specifications for the AP121 and AP141 is necessary for optimal deployment and device operation. The following specifications describe the physical features and hardware components, the power adapter and PoE (Power over Ethernet) electrical requirements, and the temperature and humidity ranges in which the devices can operate.

Device Specifications

- Chassis dimensions:
 - AP121: 6.69" W x 1.63" H x 6.69" D (170 mm W x 41 mm H x 170 mm D)
 - AP141: 6.69" W x 1.63" H x 7.3 (with antenna connectors) D - (170 mm W x 41 mm H x 185.6 mm D)
- Weight
 - AP121: 11.6 oz (0.36 kg)
 - AP141: 13.5 oz (0.42 kg)
- Antennas:
 - AP121: Two internal omnidirectional 802.11b/g/n antennas, and two internal omnidirectional 802.11a/n antennas
 - AP141: Two 2.4 GHz and two 5 GHz external omnidirectional 802.11b/g/n articulated antennas
- Console serial port: RJ-45 (9600 bits per second, 8 data bits, parity: none, 1 stop bits, no flow control)
- Ethernet port
 - Eth0: autosensing 10/100/1000Base-T/TX Mbps, with IEEE 802.3af-compliant PoE
- USB port: (reserved for future use)

Power Specifications

- AC/DC power adapter:
 - Input: 100 – 240 VAC
 - Output: 12V/1.1A
- PoE nominal input voltages: 48 V
- RJ-45 power input pins: Wires 4, 5, 7, 8 or 1, 2, 3, 6

Environmental Specifications

- Operating temperature: 32 to 104° F (0 to 40° C)
- Storage temperature: -40 to 185° F (-40 to 85° C)
- Relative Humidity: 5 to 95% RH (noncondensing)

Index

A

- antennas
 - configuring 13
 - directional antennas 14
 - omnidirectional 14
 - patch 13
 - single-direction 13
- AP121 7-19
 - antennas 12
 - console port 9, 11, 19
 - environmental specifications 19
 - Ethernet port 9, 10, 19
 - Ethernet port LED 12
 - hardware specifications 19
 - locking 9, 17
 - mounting, ceiling 15
 - mounting, surface 16
 - peak gain 12
 - PoE 9
 - power connector 9
 - power specifications 19
 - reset button 9
 - security tab cavity 9
 - status indicator 8, 12
 - WLAN power amplifiers 12
- AP141 7-19
 - antenna connectors 8
 - console port 9, 11, 19
 - environmental specifications 19
 - Ethernet port 9, 10, 19
 - Ethernet port LED 12
 - external antenna alignment 13
 - hardware specifications 19
 - locking 9, 17
 - mounting, ceiling 15
 - mounting, surface 16
 - peak gain 12
 - PoE 9

- power connector 9
- power specifications 19
- reset button 9
- security tab cavity 9
- status indicator 8, 12
- WLAN power amplifiers 12

C

- CLI, resetting the configuration 9
- connecting to the network 18
- console port 9, 11, 19

D

- DHCP 18

E

- Ethernet port 9, 10, 19

M

- mounting
 - ceiling 15
 - surface 16

N

- network connection 18

P

- PoE 10, 18
- PSE 18

R

- reboot, APs 9
- reset config 9
- RF coverage patterns 14
 - directional antennas 14
 - omnidirectional antennas 14

