Cisco Aironet 1540 Series Outdoor Access Points Hardware Installation Guide

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Preface

This section describes the objectives, audience, organization, and conventions of the *Cisco Aironet 1540 Series Outdoor Access Point Hardware Installation Guide.*

Objectives

This publication explains the steps for installing the Cisco Aironet 1540 Series Outdoor Access Points (called the *access point* or *AP* in this document).

Audience

This publication is for the person installing and configuring an access point for the first time. The installer should be familiar with network structures, terms, and concepts.

⚠ Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Organization

This guide contains the following sections:

Chapter	Title	Description
Chapter 1	Overview	Describes the major components and features of the access point.
Chapter 2	Installing the Access Point	Provides warnings, safety information, and mounting information you need to install your access point.
Chapter 3	Troubleshooting	Provides basic troubleshooting procedures for the access point.
Appendix A	Safety Guidelines and Warnings	Provides the safety warnings and guidelines that need to be strictly followed during the deployment of the access point.

Chapter	Title	Description
Appendix B	Declarations of Conformity and Regulatory Information	Describes the regulatory conventions to which the access point conforms and provides guidelines for operating access points in Japan.
Appendix E	Access Point Pinouts	Describes the connector pinouts for the access point.

Conventions

This publication uses the following conventions:

Convention	Description
boldface font	Commands, command options, and keywords are in boldface.
italic font	Arguments for which you supply values are in italics.
[ ]	Elements in square brackets are optional.
screen font	Terminal sessions and information the system displays are in screen font.
boldface screen font	Information you must enter is in boldface screen font.
italic screen font	Arguments for which you supply values are in italic screen font.
^	The symbol ^ represents the key labeled Control. For example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords, are in angle brackets.

Notes use the following convention:

Note   Means *reader take note.* Notes contain helpful suggestions or references to materials not contained in this manual.

Cautions use the following convention:

Caution   Means *reader be careful.* In this situation, you might do something that could result in equipment damage or loss of data.

Warnings use the following convention:

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

Related Documents

To view all support information for the Cisco Aironet 1540 Series, see:

http://www.cisco.com/c/en/us/support/wireless/aironet-1540-series/tsd-products-support-series-home.html

In addition to the documentation available on the support page, you will need to refer to the following guides:

- *Cisco Wireless LAN Controller Configuration Guide*

http://www.cisco.com/c/en/us/support/wireless/wireless-lan-controller-software/products-installation-and-configuration-guides-list.html

- *Release Notes for Cisco Wireless LAN Controllers and Lightweight Access Points*

http://www.cisco.com/c/en/us/support/wireless/wireless-lan-controller-software/products-release-notes-list.html

- *Cisco Mobility Express Configuration and User Guide*

http://www.cisco.com/c/en/us/support/wireless/mobility-express/products-installation-and-configuration-guides-list.html

- *DHCP OPTION 43 for Lightweight Cisco Aironet Access Points Configuration Example*

http://www.cisco.com/c/en/us/support/docs/wireless-mobility/wireless-lan-wlan/97066-dhcp-option-43-00.html

- *Cisco Wireless Mesh Access Points, Design and Deployment Guide*

http://www.cisco.com/c/en/us/td/docs/wireless/technology/mesh/8-0/design/guide/mesh80.html

Obtaining Documentation, Support, and Security Guidelines

For information on obtaining documentation and support, providing documentation feedback, security guidelines, and recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html

To view all new wireless documentation, click on **Wireless**.

1

Overview

The Cisco Aironet 1540 Series Outdoor Access Point (hereafter called the *access point* or *AP*) is a wireless outdoor access point which is designed for use in a variety of network configurations. The access point supports wireless client access, bridging, and mesh wireless connectivity.

About the 1540 Series Access Points

The detailed up-to-date technical specifications for the Cisco Aironet 1540 Series Outdoor Access Points are available in the datasheets at the following URLs:

- AP1542I and AP1542D—*Cisco Aironet 1540 Series Outdoor Access Point Data Sheet*: http://www.cisco.com/c/en/us/products/collateral/wireless/aironet-1540-series/datasheet-c78-738585.html

The 1540 series access points support both 2.4 GHz and 5 GHz radios, and provide client access using the unlicensed RF Wi-Fi spectrum. The radios have 802.11ac Wave 2 capability.

The 2.4 GHz and 5 GHz radios can be used for client access, backhaul traffic, or both. Depending on the model, the access point can support data rates of up to 867 Mbps.

The access point is a standalone unit which can be wall or pole mounted, depending on the model. The access point can also operate as a relay node for other access points that are not directly connected to a wired network.

The access point provides intelligent wireless routing using the patented Adaptive Wireless Path Protocol (AWPP). This enables each access point to identify neighbors and intelligently choose the optimal path to the wired network by calculating the cost of each path in terms of signal strength and the number of hops required to get to a controller.

The access point can be configured, monitored, and operated through a Cisco wireless LAN controller. The controllers use a browser-based management system, a command-line interface (CLI), or the Cisco Prime Infrastructure (PI) network management system to manage the controller and the associated access points. The access point supports hardware-based advanced encryption standard (AES) encryption between wireless nodes to provide end-to-end security.

Note The access point supports Mobility Express, and lightweight deployment modes (using Wireless Controllers) such as Local, Monitor, Sniffer, Bridge (Mesh) on Cisco Wireless release 8.4 and later, and Flexconnect. This access point does not support Flex+Bridge or SE Connect, and autonomous mode.

Access Point Models

The model numbers (or part numbers) and configuration for the Cisco Aironet 1540 Series outdoor access points are described in Table 1-1.

Table 1-1   1540 Series Access Points Model Numbers and Descriptions

Model (or part number)	Configuration
AIR-AP1542D-*x*-K9	The AP1542D has integrated directional antennas and contains a 2.4 GHz and a 5 GHz radio with an option to configure in centralized, Flexconnect, or mesh mode. This model can be mounted vertically, on a wall or pole, to provide a directed 90 degree coverage.
AIR-AP1542I-*x*-K9	The AP1542I has integrated omni antennas and contains a 2.4 GHz and a 5 GHz radio with an option to configure in centralized, Flexconnect, Mobility Express, or mesh mode. This model can be mounted vertically, on a wall or pole, to provide 180 degree coverage; or can be mounted horizontally to provide 360 degree coverage.

Regulatory Domains

The "-*x*" in the 1540 model numbers represent the domain. For example, in AIR-AP1542I-*x*-K9, the *-x* represents a regulatory domain for a specific country. For specific regulatory domains supported by each 1540 series access point model, refer to the Wireless LAN Compliance Status at the following URL:

http://www.cisco.com/go/aironet/compliance

Hardware Features

This section describes the hardware features of the 1540 series access point models. The following hardware features are described in this section:

- Ports and Connectors, page 1-3
- AP1542D Internal Directional Antenna, page 1-5
- AP1542I Internal Omni Antenna, page 1-5
- Power Sources, page 1-5

Ports and Connectors

Figure 1-1   Front and Rear Three-Quarters View of the AP
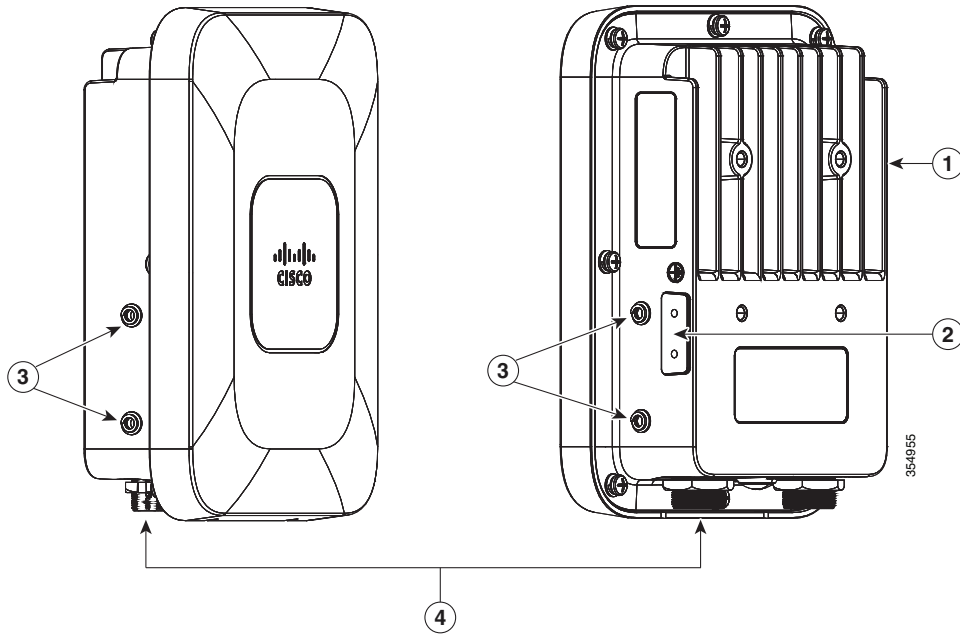
1	Back side of the AP with four screw holes for fastening the pole and wall mount bracket.	3	Screw holes for fastening the optional solar cover.
2	Grounding pad.	4	Reset button, PoE-In / Data port, and Console port, on the base of the AP.

Figure 1-2   *Ports and Reset Button on the Base of the AP*
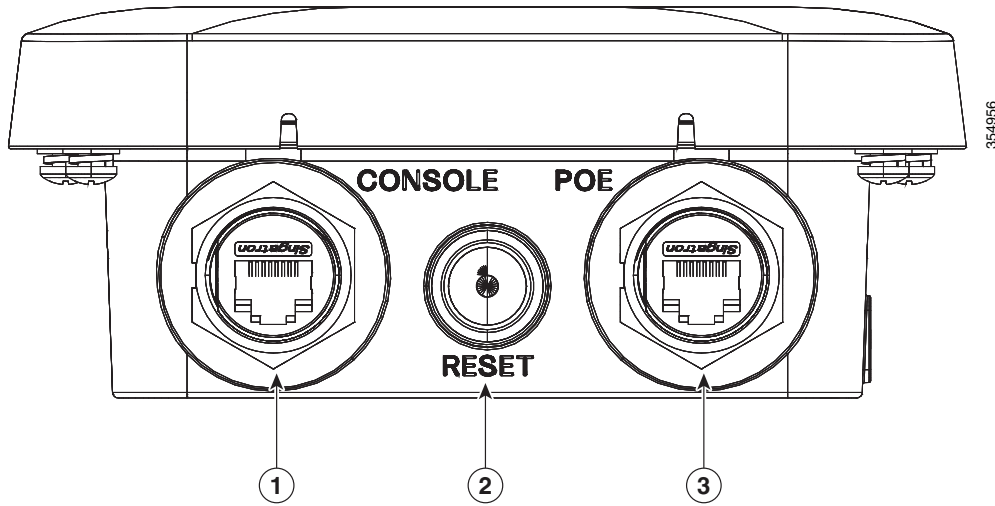
1	Console port.	3	PoE-In / Data port.
	The AP is shipped with a cap covering the console port. Inspect the cap at the time of installation. Every time the cap is removed or replaced, properly tighten it. If you do not tighten properly, it will not meet IP67 criteria, and may lead to water leaking into the unit.		
2	Reset button with the status LED in its center.		

Figure 1-3   *Grounding Pad on the Right Side of the AP*

Grounding pad on the left side of AP
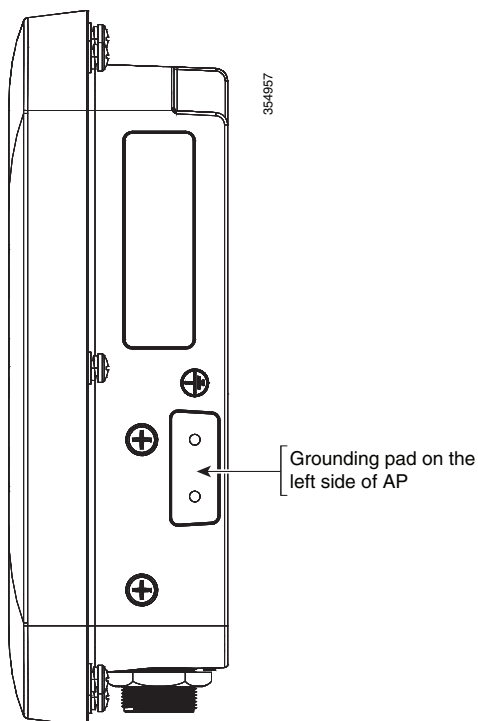
AP1542D Internal Directional Antenna

The AP1542D model has an internal directional antenna. The 1542D model has narrow beamwidth internal directional antennas. The 1542D is ideal for providing narrow client coverage area or as a wireless bridge link between two locations.

The 2.4 GHz b/g/n radio operates in 2.4 GHz ISM band. It has two transmitters with a maximum total output power of 27 dBm for 802.11b/g/n operation. Output power is configurable for 8 levels in 3 dB steps. It has two receivers which enable maximum-ratio combining (MRC).

The 5 GHz a/n radio operates in the UNII-1 band (5.15-5.25 GHz), UNII-2 band (5.25 - 5.35 GHz), UNII-2 Extended/ETSI band (5.47 - 5.725 GHz), and the upper ISM band (5.725 - 5.850 GHz). It has two transmitters with a maximum total output power of 27 dBm depending on the regulatory domain. Tx power settings will change depending on the regulatory domain. Output power is configurable in 3 dB steps. It has two receivers which enable maximum-ratio combining (MRC).

The AP1542D model access point is equipped with the following integrated antennas:

- 2 single band 2.4 GHz antennas with 8 dBi gain for WiFi operation.
- 2 single band 5 GHz antennas with 9 dBi gain for WiFi operation.
- 1 single band 2.4 GHz antenna with 3 dBi gain for BLE operation.

AP1542I Internal Omni Antenna

The AP1542I model has an internal semi-omnidirectional antenna. The AP1542I access point 802.11b/g/n radio is used primarily for local access and its 802.11a/n/ac radio for client or wireless backhaul in the mesh mode.

The 2.4 GHz b/g/n radio operates in 2.4 GHz ISM band. It has two transmitters with a maximum total output power of 27 dBm for 802.11b/g/n operation. Output power is configurable for 8 levels in 3 dB steps. It has two receivers which enable maximum-ratio combining (MRC).

The 5 GHz a/n radio operates in the UNII-1 band (5.15-5.25 GHz), UNII-2 band (5.25 - 5.35 GHz), UNII-2 Extended/ETSI band (5.47 - 5.725 GHz), and the upper ISM band (5.725 - 5.850 GHz). It has two transmitters with a maximum total output power of 27 dBm depending on the regulatory domain. Tx power settings will change depending on the regulatory domain. Output power is configurable in 3 dB steps. It has two receivers which enable maximum-ratio combining (MRC).

The AP1542I model access point is equipped with the following integrated antennas:

- 2 single band 2.4 GHz antennas with 5 dBi gain for WiFi operation.
- 2 single band 5 GHz antennas with 5 dBi gain for WiFi operation.
- 1 single band 2.4 GHz antenna with 3 dBi gain for BLE operation.

Power Sources

The 1540 series access points can be powered only through Power over Ethernet (PoE). The 1540 series access points support the following ANSI/UL/IEC 60950-1 or 62368-1 certified power injectors or DC power sources:

- 802.3af Power Injector AIR-PWRINJ5=
- 802.3at Power Injector AIR-PWRINJ6=
- AIR-PWRINJ-60RGD1=

- AIR-PWRINJ-60RGD2=

- PoE supply rated at 48-56V DC, 350 mA

- Cisco UPoE

Ethernet (PoE) Port

The access point has a PoE-In port. The port uses an RJ45 connector (with weatherproofing) to link the access point to the inline power from the power injector or a suitably powered switch port.

The Ethernet cable must be a shielded outdoor rated Category 5e (CAT5e), or better, cable.

Network Deployment Examples

The access point is a wireless device designed for wireless client access and point-to-point bridging, point-to-multipoint bridging, and point-to-multipoint mesh wireless connectivity. The access point provides 5-GHz backhaul capability to link with another access point to reach a wired network connection or to provide repeater operations for other access points.

The access point plays two primary radio roles: a root access point (hereafter called a RAP) or a mesh (non-root) access point (hereafter called a MAP), which is the default role of all access points. When the access point has a fiber or wired Ethernet connection to the controller (through a switch), the radio role is called a RAP. In order to be considered a RAP, the access point must be configured as a RAP. A RAP is a parent node to any bridging or mesh network. A controller can support one or more RAPs, each one parenting the same or different wireless networks. There can be more than one RAP for the same mesh network for redundancy. RAPs and MAPs can support wireless clients on the 2.4-GHz and 5-GHz band. Client access on 5-GHz is called universal client access.

When the access point does not have a wired Ethernet connection to the controller (through a switch), the radio role is called a MAP. The MAPs have a wireless connection (through the backhaul interface) to other MAPs and finally to a RAP which has an Ethernet connection through a switch to the controller. MAPs may also have a wired Ethernet connection to a local LAN and serve as a bridge endpoint for that LAN (using a point-to-point or point-to-multipoint bridge connection).

Wireless Backhaul

The access point supports wireless backhaul capability using the 5 GHz radio to bridge to another access point to reach a wired network connection to a controller (see Figure 1-4). The access point connected to the wired network is considered a RAP in this configuration. The remote access point is considered a MAP and transfers wireless client traffic to the RAP for transfer to the wired network. Control And Provisioning of Wireless Access Points (CAPWAP) control traffic is also transferred over this bridged link.

Figure 1-4   Access Point Backhaul Example
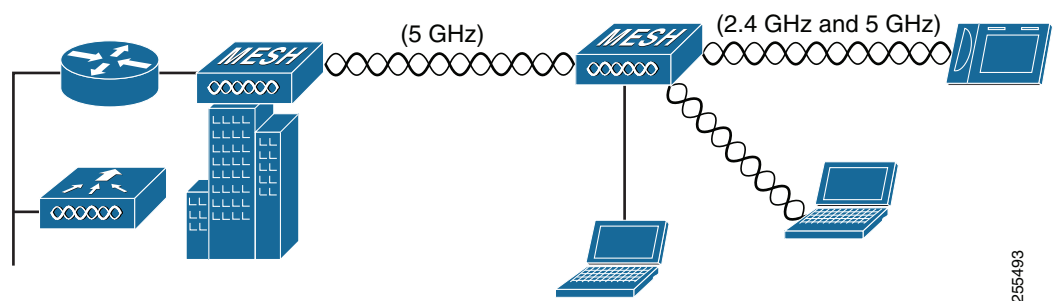
Point-to-Point Bridging

The access points can be used to extend a remote network by using the 5 GHz backhaul radio to bridge the two network segments as shown in Figure 1-5. To support Ethernet bridging, you must enable bridging on the controller for each access point. By default this capability is turned-off for all access points.

Wireless client access is supported; however, if bridging between tall buildings, the 2.4-GHz wireless coverage area may be limited and possibly not suitable for direct wireless client access.

Figure 1-5   Access Point Point-to-Point Bridging Example
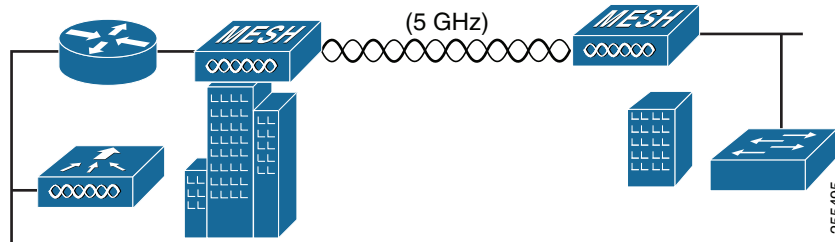
Point-to-Multipoint Bridging

The access points can be used as a RAP to connect multiple remote MAPs with their associated wired networks. By default this capability is turned-off for all access points. To support Ethernet bridging, you must enable bridging on the controller for each access point. Wireless client access can be provided over the bridging link; however, if bridging between tall buildings, the 2.4-GHz wireless coverage area may be limited and possibly not suitable for direct wireless client access. Figure 1-6 illustrates an example of access point-to-multipoint bridging.

Figure 1-6   Access Point to Multipoint Bridging Example
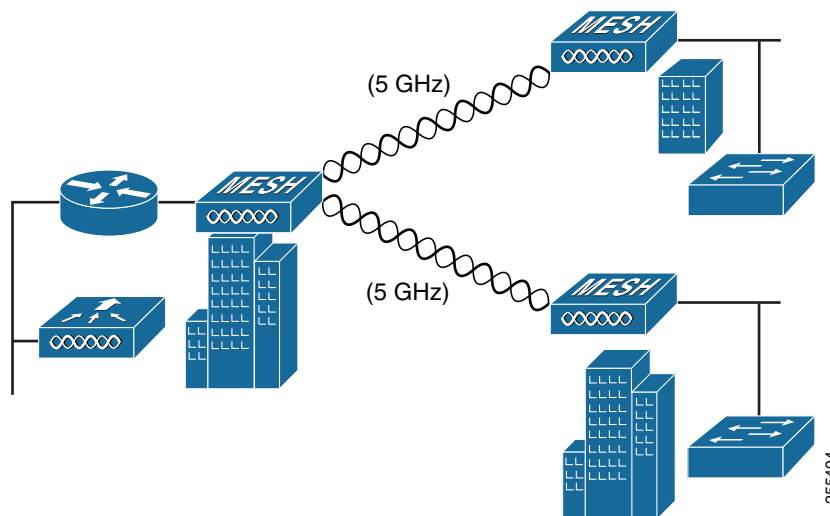
Point-to-Multipoint Mesh Network

The access point is typically deployed in a mesh network configuration. In a typical mesh deployment, one or more RAPs have a wired network connection through a switch to a controller. Other remote MAPs without wired network connections use the backhaul feature to optimally link to a RAP that is connected to the wired network. In the mesh network, the links between the access points are referred to as the *backhaul links*.

Intelligent wireless routing is provided by the Adaptive Wireless Path protocol (AWPP). This enables each MAP to identify its neighbors and intelligently choose the optimal path to the RAP with the wired network connection by calculating the cost of each path in terms of signal strength and the number of hops required to get to a controller with signal strength given priority since signal strength determines the data rate available for backhaul.

Figure 1-7 illustrates a typical mesh configuration using MAPs and RAPs.

Figure 1-7   Typical Mesh Configuration Using Access Points
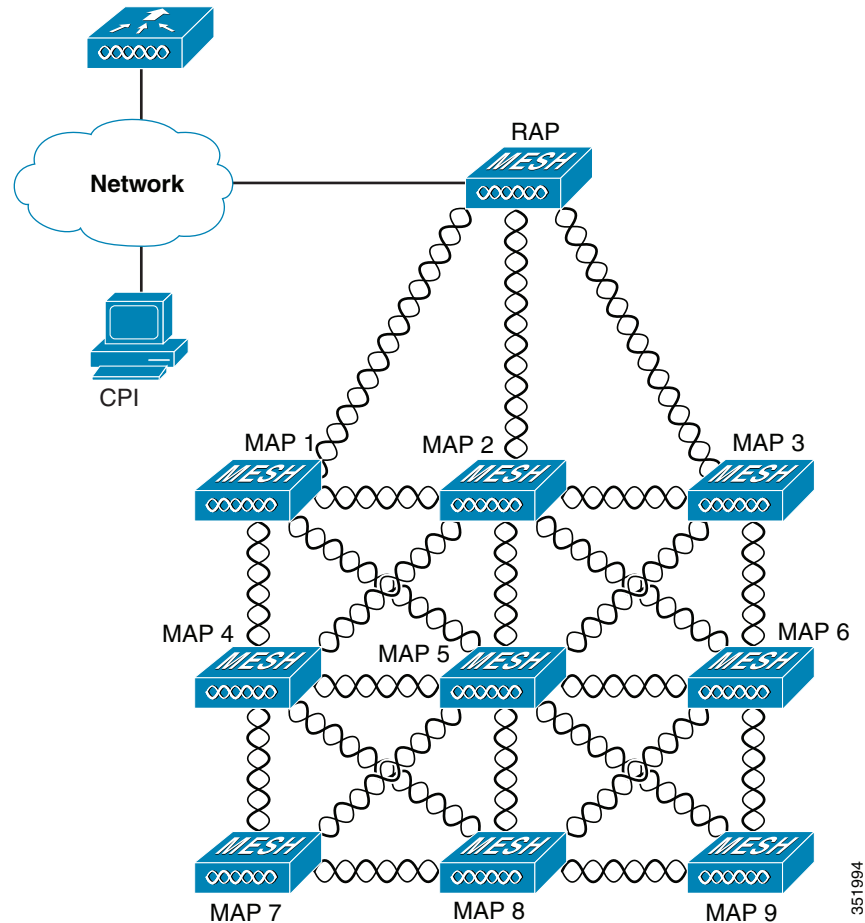
Layer 3 Network Operation

The access points support Layer 3 network operation. Access points and controllers in Layer 3 configurations use IP addresses and UDP packets, which can be routed through large networks. Layer 3 operation is scalable and recommended by Cisco.

Figure 1-8 illustrates a typical Layer-3 wireless network configuration containing access points and a controller.

Figure 1-8   Typical Layer 3 Access Point Network Configuration Example
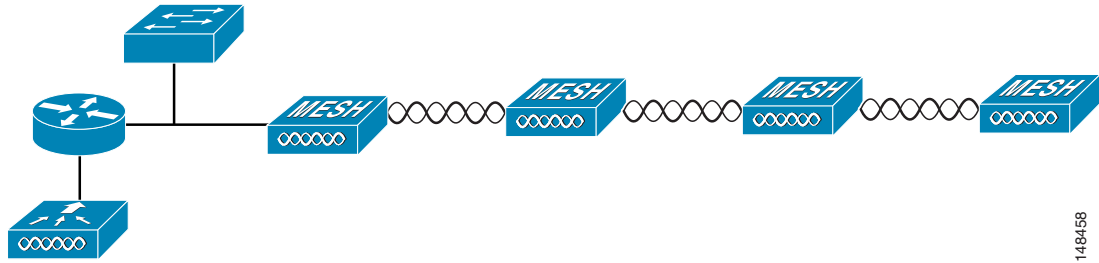
Installing the Access Point

This chapter describes how to install the 1540 series access point and accessories. It contains the following sections:

Warning **Read the installation instructions before connecting the system to the power source.** Statement 1004

Warning **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Unpacking the Access Point

To unpack the access point, follow these steps:

Step 1   Open the shipping container and carefully remove the contents.

Step 2   Return all packing materials to the shipping container, and save it.

Step 3   Ensure that all items listed in "Package Contents" are included in the shipment. If any item is damaged or missing, notify your authorized Cisco sales representative.

Your shipment may also contain additional equipment as per your order, as listed in Optional Tools and Hardware From Cisco, page 2-2.

For additional hardware that is required for installation, see Additional Tools and Hardware Required for Installation, page 2-3.

Package Contents

Each access point package contains the following items:

- One 1540 series access point
- Ground lug and screws with lock washers
- Ethernet field terminator
- Plastic dust cap (installed on console port)
- Weatherization tape and anti-corrosion sealant
- Cisco product documentation and pointer card
- Wall/pole mount bracket kit (AIR-ACC1530-PMK1), for an additional charge, only if selected when you ordered the access point

Optional Tools and Hardware From Cisco

Depending on what you ordered, the following optional equipment may be part of your shipment:

- Power injector AIR-PWRINJ6=
- Power injector AIR-PWRINJ5=
- AP cover / Solar Shield for 1540, AIR-ACC1540-CVR=
- AIR-ACC1540-KIT1= spare parts kit which includes:
    - Ethernet field terminators (qty. 5)
    - Ethernet caps (qty. 2)
    - Ground lug kit (qty. 1)
- AIR-PWRINJ-60RGD1=
- AIR-PWRINJ-60RGD2=

Additional Tools and Hardware Required for Installation

You need to independently procure the following tools and materials which maybe required during various stages of installing the AP:

- 10 mm open end or box wrench
- Ground lug crimping tool (Panduit CT-720 with CD-720-1 die)
- 6 AWG copper ground wire
- Medium flat or Phillips screw driver (for the solar cover)
- Shielded outdoor-rated Ethernet (CAT5e or better) cable of 0.20 to 0.35 inches (0.51 to 0.89 cm) diameter.
- Ethernet RJ45 connector and installation tool
- Ground rod as required by local regulations

Pre-Installation Checks and Installation Guidelines

As the access point is a radio device, it is susceptible to common causes of interference that can reduce throughput and range. Follow these basic guidelines to ensure the best possible performance:

- Thoroughly review the information provided in Safety Guidelines and Warnings, page A-1.
- For information on planning and initially configuring your Cisco Mesh network, refer to the *Cisco Wireless Access Points, Design and Deployment Guide, Release 7.3*.
- Review the FCC guidelines for installing and operating outdoor wireless LAN devices at:

  http://www.cisco.com/c/en/us/products/collateral/routers/3200-series-rugged-integrated-services-routers-isr/data_sheet_c78-647116.html

- Install the access point in an area where structures, trees, or hills do not obstruct radio signals to and from the access point.
- We recommend installing the access points no higher than 40 feet to allow support for wireless clients on the ground. Best throughput is achieved when all the access points are mounted at the same height.
- The console port is shipped with a cap on it. Inspect the cap at the time of installation. Every time the cap is removed or replaced, properly tighten it. If you do not tighten the cap properly, it will not meet IP67 criteria, and may lead to water leaking into the unit.

> **Note** To calculate path loss and to determine how far apart to install access points, consult an RF planning expert.

Before you begin the installation process, ensure the following:

- Perform a site survey. See the "Performing Site Surveys" section on page A-3.
- Your network infrastructure devices must be operational and properly configured.
- Your controllers are connected to switch trunk ports.
- Your switch is configured with untagged access ports for connecting your access points.

- A DHCP server with Option 43 configured is reachable by your access points, or manually configure the controller information in the access point. For information on configuring the DHCP Option 43, visit the following URL:

  http://www.cisco.com/c/en/us/support/docs/wireless-mobility/wireless-lan-wlan/97066-dhcp-option-43-00.html

- Become familiar with the access point installation components. See the "Typical Access Point Installation Components" section on page 2-5.

Typical Access Point Installation Components

The access point is designed to be installed in an outdoor environment, such as the exterior roof overhang of a tall building or a streetlight pole. Carefully review Figure 2-1 to become familiar with the system components, connectors, indicators, cables, system interconnection, and grounding.

Figure 2-1   Components in a Typical Access Point Installation
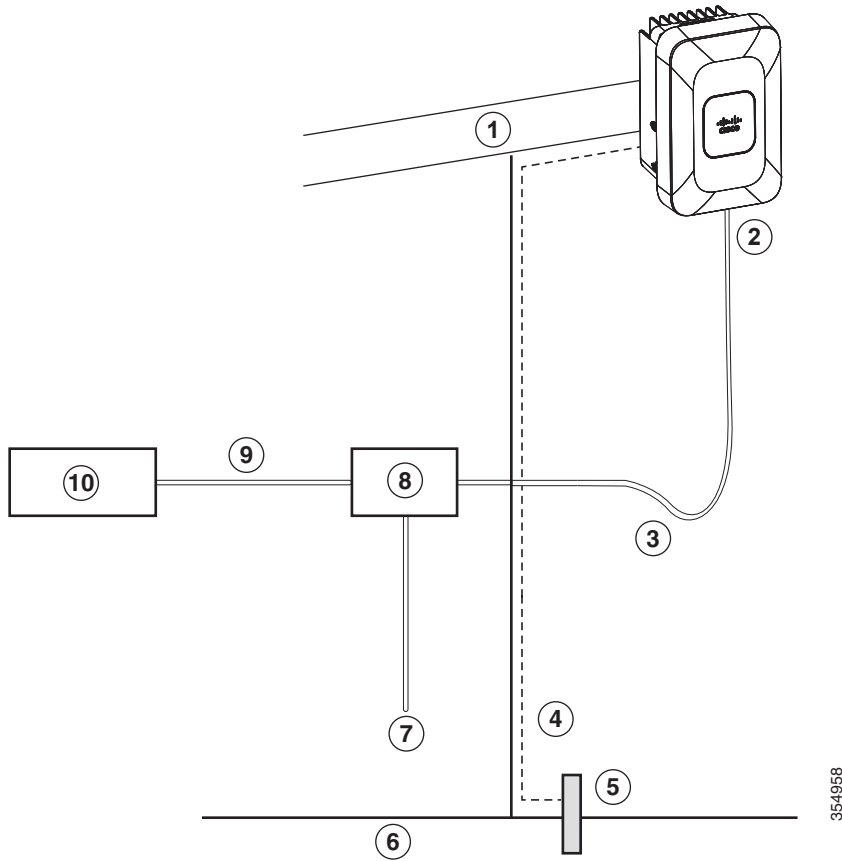
1	Building roof-overhang	**6**	Ground
2	Shielded outdoor-rated Ethernet (CAT5e or better) cable[1]	**7**	Power cord
3	Water drip loop	**8**	Power injector
4	6 AWG copper grounding wire[1]	**9**	Shielded Ethernet (CAT5e or better) cable[1]
5	Ground rod[1]	**10**	Controller (through a switch)

1. Independently sourced by the user.

Mounting the Access Point

This section provides instructions for installing your access points. Personnel installing the access point must have a good understanding of wireless access points, bridging techniques, and grounding methods.

The 1540 Series access points can be wall or pole mounted. The 1540 uses the same mounting brackets as the 1530 and 1560 Series access points, and are listed below.

AP Mounting Kit	Purpose
AIR-ACC1530-PMK1=	Fixed mounting kit for vertical mounting on wall and pole. See: • Wall Mounting the Access Point with AIR-ACC1530-PMK1=, page 2-7 • Pole Mounting the Access Point with AIR-ACC1530-PMK1=, page 2-10 Mount the access point in such a way that there are no obstructions to accessing the console port.
AIR-ACC1530-PMK2=	Pivoted mounting kit for both vertical and horizontal mounting, on wall and pole. See: • Wall Mounting the AP using AIR-ACC1530-PMK2= Pivoting Mounting Kit, page 2-12 • Pole Mounting the AP using AIR-ACC1530-PMK2= Pivoting Mounting Kit, page 2-16 • Horizontally Mounting the Access Point using AIR-ACC1530-PMK2=, page 2-20

Note   When the AP is vertically mounted, the AP is oriented with the Console and PoE ports, and the status LED, facing downward.

Wall Mounting the Access Point with AIR-ACC1530-PMK1=

The AIR-ACC1530-PMK1= mounting kit contains a mounting bracket for wall mounting or pole mounting.

You can use the mounting bracket as a template to mark the positions of the mounting holes for your installation, install the mounting bracket, and then attach the access point to the bracket.

Table 2-1 lists the materials needed for this installation.

Table 2-1   Materials Required to Mount Access Point Using AIR-ACC1530-PMK1=

Materials Required	In Kit?
Ground lug and screws (provided with access point)	Yes
Wall Mount Bracket	Yes
Four M6 x 12-mm Hex-head Bolts	Yes
Crimping tool for ground lug, Panduit CT-720 with CD-720-1 die (http://www.panduit.com)	No
Four wall mounting screws	No
Four wall anchors (specified for all material)	No
Drill bit for wall anchors	No
Electric drill and standard screwdriver	No
#6 AWG ground wire	No
Shielded outdoor-rated Ethernet (CAT5e or better) cable	No
Grounding block	No
Grounding rod	No
10-mm box-end wrench or socket set	No

⚠

Caution   The mounting wall, attaching screws, and wall anchors must be able to support a 50 lb (22.7 kg) static weight.

To mount the access point vertically on a wall, follow these instructions:

Step 1   Use the mounting bracket as a template to mark four screw hole locations on the mounting wall. The mounting bracket screw hole locations are shown in Figure 2-2. The dimensions of the mounting bracket is shown in Figure 2-3.

Step 2   Use four screws and, if required, wall anchors to attach the mounting plate to the mounting surface. These screws and anchors are to be sourced independently.

✎

Note   You can use an exterior-grade plywood backboard to mount the access point to stucco, cement, or dry wall.

> **Note** The mounting wall, attaching screws, and wall anchors must be able to support a 50 lb (22.7 kg) static weight.

Step 3   Screw an M6 x12 mm bolt into each of the four support bolt holes on the back of the access point. Do not screw the bolt all the way in, but leave a gap of approximately 0.13 inch (3.3 mm).

Step 4   Position the access point against mounting bracket such that the four support bolts on the back of the AP, slot into the keyhole slots on the mounting bracket.

Step 5   Slide the access point down to seat it securely in the keyhole slots on the mounting bracket.

> **Note** The access point should be mounted with the status LED on the base facing downwards.

Step 6   Using a 10mm wrench, tighten the four bolts that connect the access point to the bracket, to a torque of 40 lbf-in.

Step 7   Proceed with connecting the data cables, grounding the access point, powering and configuring the access point.

Figure 2-2   *Mounting Bracket for Wall and Pole Mounting*
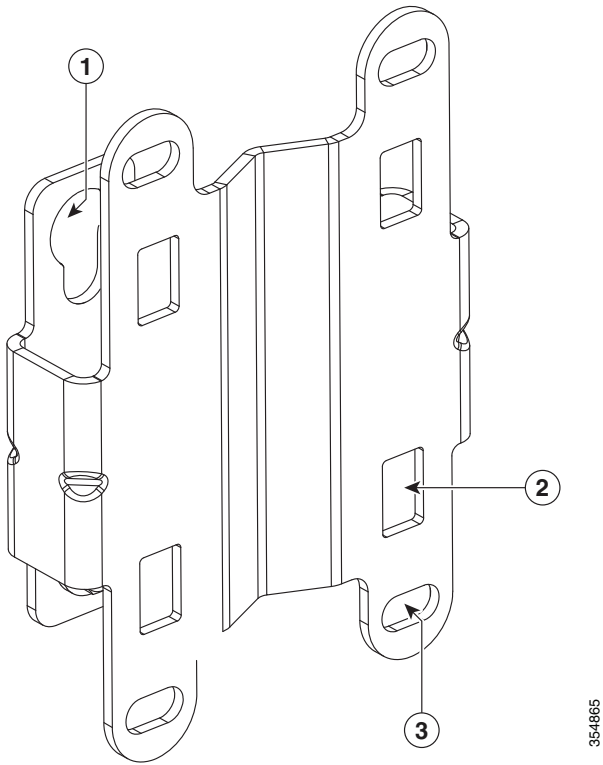
1	One of four keyhole slots for mounting the AP.	3	Bracket mount holes for fastening bracket to the wall. You can use bolts of up to 1/4 inch or 6 mm in diameter.
2	One of four slots for steel band clamps, used for pole mounting only.		

Figure 2-3   *Mounting Bracket Dimensions in inches [and millimeters]*
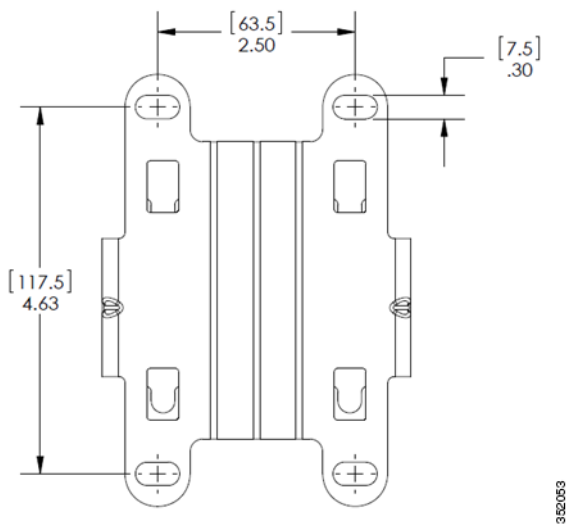
Pole Mounting the Access Point with AIR-ACC1530-PMK1=

The AIR-ACC1530-PMK1= mounting kit contains a mounting bracket that can be used for both wall mounting and pole mounting. This kit can be used to install the access point on a pole, mast or streetlight. It supports metal, wood or fiberglass poles from 2 to 8 inches in diameter.

Table 2-2   **Materials Needed to Mount the AP on a Vertical Pole**

Materials Needed	In Kit?
One wall mount bracket	Yes
Four M6 x12mm hex head bolts	Yes
Two stainless steel band clamps (adjustable 2"–5", 51–127 mm)	Yes
Two stainless steel band clamps (adjustable 5"–8", 127–203 mm)	Yes
10 mm box-end wrench	No
Outdoor rated shielded Ethernet cable	No
Ground lug (provided with the access point)	Yes
Ground block and rod	No
Crimping tool for ground lug, Panduit CT-720 with CD-720-1 die (http://www.panduit.com)	No
#6 AWG ground wire	No

To mount the access point onto a vertical pole, follow these steps:

Step 1   Select a mounting location on the pole to mount the access point. You can attach the access point to a pole having a diameter of 2 to 8 inches (5.1 to 20.1 cm).

Step 2   Hold the bracket up against the pole, and slide the two band straps through the top and bottom sets of mounting slots on the mounting bracket (see Figure 2-4).

Step 3   Wrap the band straps around the pole, lock them, and then lightly tighten the clamps using a wrench. Only tighten them enough to keep the bracket from sliding down the pole

Step 4   Screw an M6 bolt into each of the four bolt holes on the back side of the access point. Do not screw the bolt in all the way. Leave a gap of about 0.13-inch (3.3 mm).

Step 5   Position the four bolts on the access point into the bracket keyhole slots. Check to be sure that the access point is properly seated in the slots (see Figure 2-4).

> **Note**   The access point should be mounted with the status LED on the base facing downwards.

Step 6   Using a 10 mm wrench, tighten the four bolts that connect the access point to the bracket to a torque of 40 lbf-in.

Step 7   Locate the access point to the final position. Tighten the band clamps with the wrench so that the access point does not slide on the pole. Ensure that the clamps are tight enough to not let the AP move.

Step 8   Proceed with connecting the data cables, grounding the access point, powering and configuring the access point.

Figure 2-4   AP Mounted on a Pole

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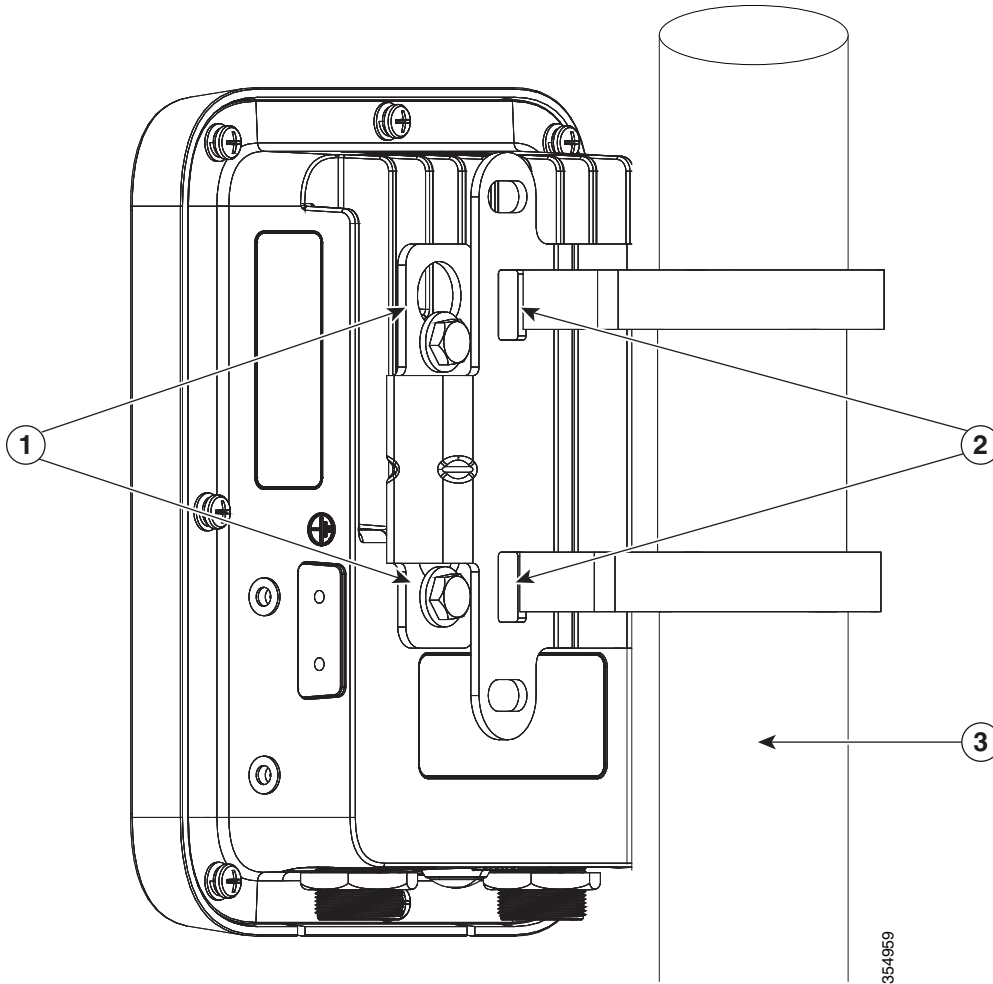
1	Two of four M6 keyhole slots for mounting the AP on the bracket.	**3**	Pole (wood, metal, or fiberglass), 2-inches to 8-inches (50 mm to 203 mm) diameter.
2	Top and bottom steel band clamps passing through band clamp slots on the bracket.		

Wall Mounting the AP using AIR-ACC1530-PMK2= Pivoting Mounting Kit

The optional pivoting mounting kit AIR-ACC1530-PMK2= contains a pivoting mounting bracket for both wall and pole mounting. This kit allows for adjusting the position of the AP by pivoting the AP along its vertical plane.

Table 2-3   Materials for Mounting on Wall with Pivoting Mounting Kit

Materials Required for mounting AP vertically on a wall with pivoting mounting kit	In Kit
Ground lug and screws (provided with access point)	Yes
Pivoting mount kit and hardware	Yes
(8) M6 x 12-mm Hex-head Bolts	Yes
Adapter bracket for option horizontal mount	Yes
Two stainless steel band clamps (adjustable 2"-5", 51 mm - 127 mm)	Yes
Two stainless steel band clamps (adjustable 5"-8", 127 mm - 203 mm)	Yes
Crimping tool for ground lug, Panduit CT-720 with CD-720-1 die (http://www.panduit.com)	No
Four wall mounting screws (6mm max)	No
Four wall anchors (specified for all material)	No
Drill bit for wall anchors	No
Electric drill and standard screwdriver	No
#6 AWG ground wire	No
Shielded outdoor-rated Ethernet (CAT5e or better) cable	No
Grounding block	No
Grounding rod	No
13-mm box-end wrench or socket set	No
10-mm box-end wrench	No

⚠

Caution   The mounting surface, attaching screws and optional wall anchors must be able to support a 50-lb (22.7 kg) static weight.

To mount the access point vertically on a wall, follow these instructions:

Step 1   Disassemble the pivot kit, if not already disassembled. See Figure 2-5.

Step 2   Use the wall-plate end of the mounting bracket as a template to mark four screw hole locations on the mounting surface. See Figure 2-5 for the mounting bracket screw hole locations (screw holes of maximum 6 mm in size).

See Figure 2-6 for the dimensions of the pivoting mounting bracket.

Step 3   Use four screws and, if required, wall anchors to attach the wall-plate end of the mounting bracket to the mounting surface. These screws and anchors are to be sourced independently.

> ✎
> **Note**   You can use an exterior-grade plywood backboard to mount the access point to stucco, cement, or drywall.

> ✎
> **Note**   The mounting wall, attaching screws, and wall anchors must be able to support a 50-lb (22.7 kg) static weight.

Step 4   Align the AP-plate end of the bracket with the screw holes in the back of the access point.

Step 5   Fasten the bracket plate to the AP by using four M6 x12 mm bolts and a 10 mm box or socket wrench. Torque the bolts to 40 lbf-in.

Step 6   Using the 90.0 mm M8 long screw and the hardware supplied with the pivoting bracket, bolt the AP and bracket plate, to the wall plate mounted on the wall. See Figure 2-5 for this assembly. Do not fully tighten the assembly.

> ✎
> **Note**   The access point should be mounted with the status LED on the base facing downwards.

Step 7   Pivot the AP as required, and then fully tighten the 90.0 mm M8 long screw using a 13 mm wrench.

Step 8   Proceed with installing antennas (only for external antenna models), connecting the data cables, grounding the access point, powering and configuring the access point.

Figure 2-5   *Pivoting Mounting Bracket*

1	One of four bolt holes for fastening to the back of the AP.	3	Screw holes for wall mounting.
	This is the AP-plate end of the bracket, and is fastened to the back of the AP.		These screw holes can also be used as slots for steel band clamps in pole-mount installations.
2	Wall-plate end of the bracket. This plate is fastened to the wall.		

Figure 2-6   *Pivoting Mounting Bracket Dimensions*
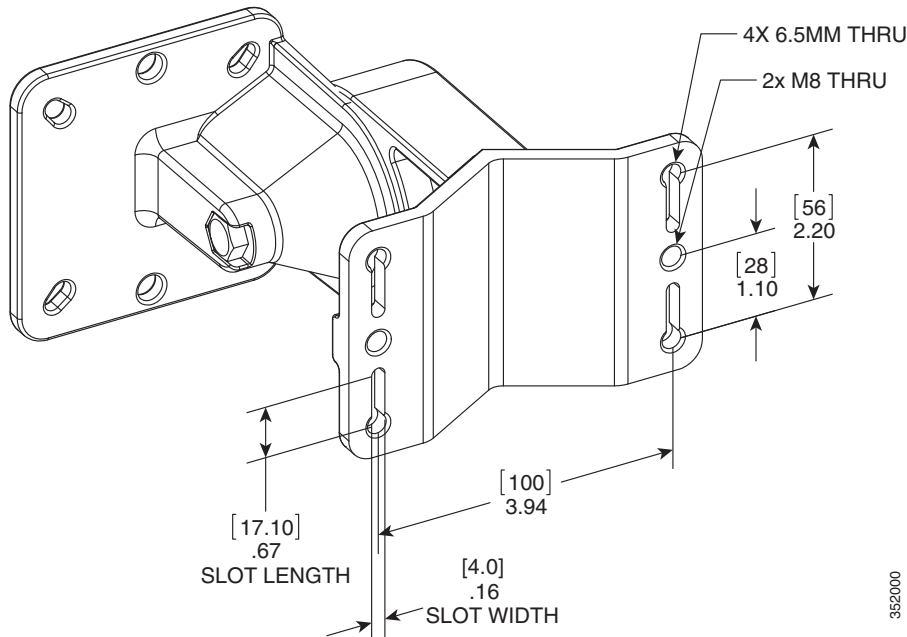
Figure 2-7   *Visualization of AP Fastened to the Pivoting Mounting Kit*
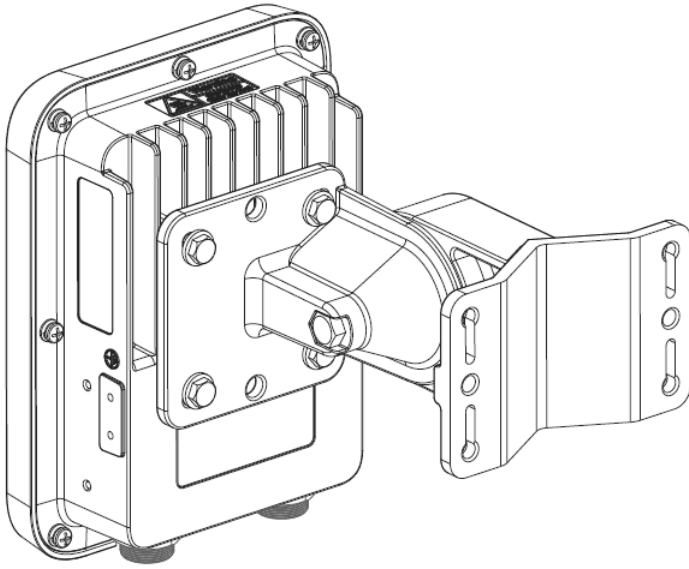
Pole Mounting the AP using AIR-ACC1530-PMK2= Pivoting Mounting Kit

The optional pivoting mounting kit AIR-ACC1530-PMK2= contains a pivoting mounting bracket for both wall and pole mounting. This kit can be used to install the access point on a pole, mast, or streetlight. It supports metal, wood or fiberglass poles from 2 to 8 inches in diameter.

The AIR-ACC1530-PMK2= pivoting mounting kit allows for adjusting the position of the AP by pivoting the AP along its vertical plane.

Table 2-4   Materials for Mounting the AP on a Pole using AIR-ACC1530-PMK2=

Materials Required	In Kit?
Ground lug and screws (provided with access point)	Yes
Pivoting mount kit and hardware	Yes
(8) M6 x 12-mm Hex-head Bolts	Yes
Adapter bracket for option horizontal mount	Yes
Two stainless steel band clamps (adjustable 2"-5", 51 mm - 127 mm)	Yes
Two stainless steel band clamps (adjustable 5"-8", 127 mm - 203 mm)	Yes
Crimping tool for ground lug, Panduit CT0720 with CD-720-1 die (http://www.panduit.com)	No
Four wall mounting screws (6mm max)	No
Four wall anchors (specified for all material)	No
Drill bit for wall anchors	No
Electric drill and standard screwdriver	No
#6 AWG ground wire	No
Shielded outdoor-rated Ethernet (CAT5e or better) cable	No
Grounding block	No
Grounding rod	No
13-mm box-end wrench or socket set	No
10-mm box-end wrench	No

To mount the access point on a pole, follow these steps:

Step 1 Select a mounting location on the pole to mount the access point. You can attach the access point to any pole with a diameter from 2 to 8 inches (5.1 to 40.6 cm).

Note If you will be using a streetlight power tap adapter, position the access point within 3 ft (1 m) of the outdoor light control.

Step 2 Disassemble the pivot kit, if not already disassembled. See Figure 2-8.

Step 3   Fasten the pivot bracket base plate to the pole using either one set of the adjustable band clamps or the screw clamp (the screw clamp can be used only on poles that are 2-3 inches (50-76 mm) in diameter).

Step 4   Position the pivot bracket base plate and clamp(s) on the pole. Tighten only enough to hold the bracket base plate in place, so as to prevent it from sliding along the pole but still pivot on the pole. Fully tighten only after the access point is mounted and positioned.

Step 5   Align the AP-plate end of the bracket with the screw holes in the back of the access point.

Step 6   Fasten the bracket plate to the AP by using four M6 x12 mm bolts and a 10 mm box or socket wrench. Torque the bolts to 40 lbf-in (4.5Nm).

Step 7   Using the 90.0 mm M8 long screw and the hardware supplied with the pivoting bracket, bolt the AP and bracket plate, to the base plate mounted on the pole. See Figure 2-7. Do not fully tighten the assembly.
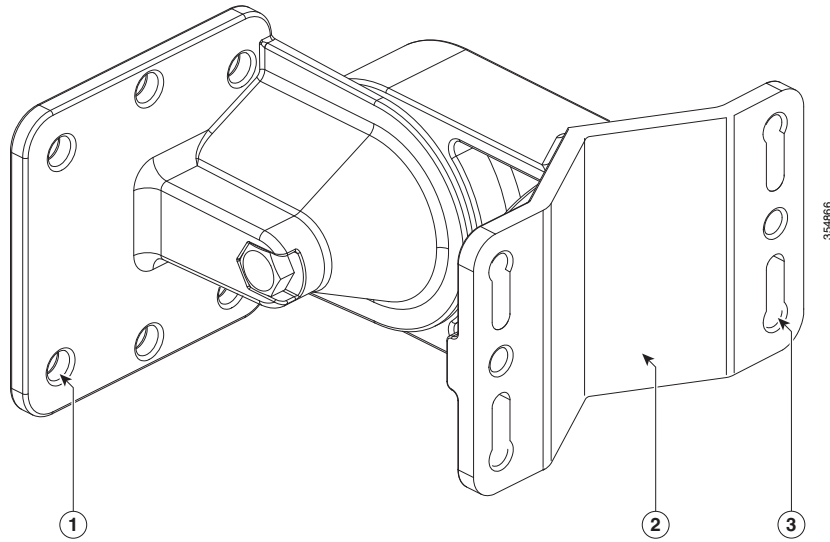
> **Note**   The access point should be mounted with the status LED on the base facing downwards.

Step 8   Pivot and position the AP as required, and then fully tighten the 90.0 mm M8 long screw using a 13 mm wrench, and then tighten the clamps on the pole.

> **Note**   Use caution when tightening the 80 mm bolts on the pole-mount screw clamp. See Figure 2-8. Ensure the clamp face remains parallel to the bracket base plate while tightening the bolts. Torque the M8 x 80 mm bolts to 52-61 lbf-in (5.9-6.9 Nm).

> ⚠️ **Caution**   Misalignment and over torquing can result in breaking the screw clamp.

Step 9   Proceed with installing antennas (only for external antenna models), connecting the data cables, grounding the access point, powering and configuring the access point.

Figure 2-8   ***Exploded View of the Pivoting Mounting Kit***
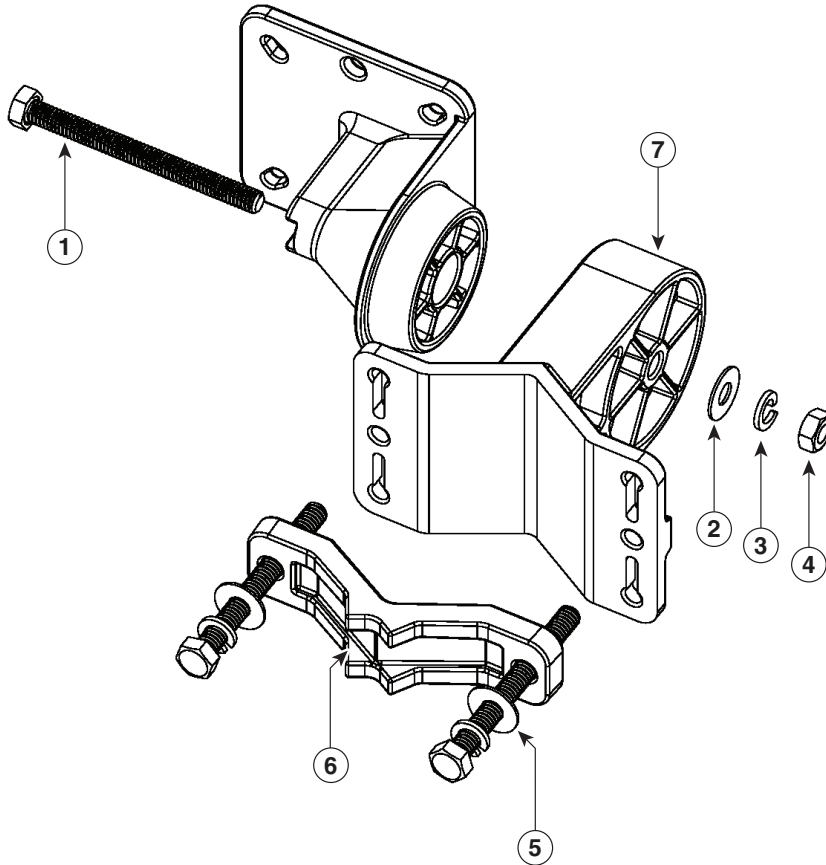
1	90.0 mm M8 screw	5	80.0 mm M8 screw with washer and spring washer, for fastening the pole-mount screw clamp to the pivoting bracket base plate.
2	M8 washer		
3	M8 spring washer	6	Pole-mount screw clamp
4	M8 nut	7	Pivoting bracket base plate

Figure 2-9 ___ *Pivoting Mounting Kit with Pole Mount Clamp*
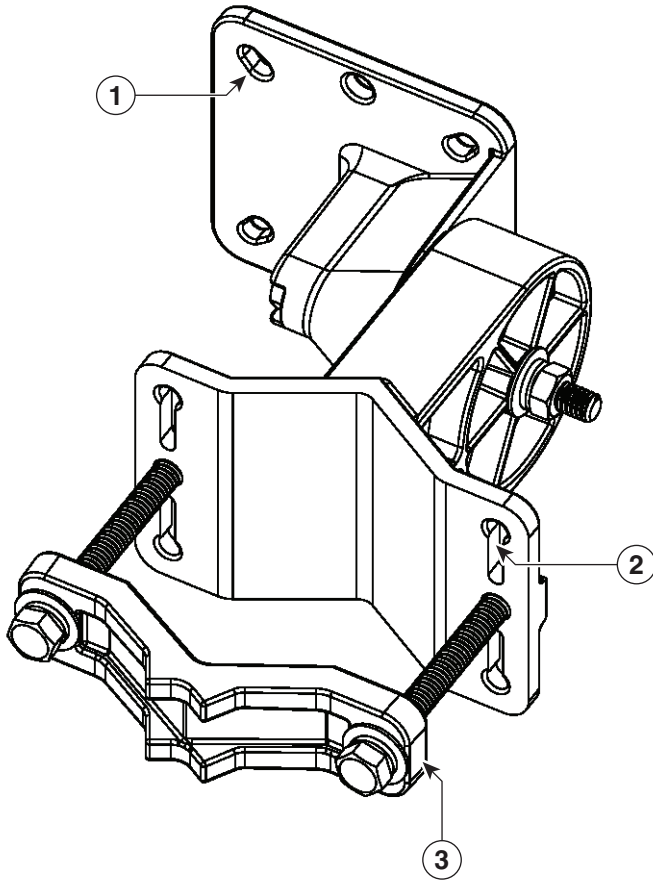
1	One of four mounting holes for the access point. This is the AP-plate end of the bracket, and is fastened to the back of the AP.	3	Pole mount screw clamp. It can fit poles having a diameter of up to 2-3 in. (50-76mm).
2	One of four slots for band clamps. This is the pivot bracket base plate, and is fastened to the pole.		

Horizontally Mounting the Access Point using AIR-ACC1530-PMK2=

The AIR-ACC1530-PMK2= pivoting pole mount kit contains a horizontal mount plate that allows the AP to be mounted horizontally, as shown in Figure 2-11. The horizontal mounting provides better omni antenna coverage.

Table 2-5   Materials Needed for Horizontally Mounting the AP using AIR-ACC1530-PMK2=

Materials Required	In Kit?
Ground lug and screws (provided with access point)	Yes
Pivoting mount kit and hardware	Yes
8 M6 x 12-mm Hex-head Bolts	Yes
Adapter bracket for option horizontal mount	Yes
Two stainless steel band clamps (adjustable 2"-5", 51 mm - 127 mm)	Yes
Two stainless steel band clamps (adjustable 5"-8", 127 mm - 203 mm)	Yes
Crimping tool for ground lug, Panduit CT0720 with CD-720-1 die (http://www.panduit.com)	No
Four wall mounting screws (6mm max)	No
Four wall anchors (specified for all material)	No
Drill bit for wall anchors	No
Electric drill and standard screwdriver	No
#6 AWG ground wire	No
Shielded outdoor-rated Ethernet (CAT5e or better) cable	No
Grounding block	No
Grounding rod	No
13-mm box-end wrench or socket set	No
10-mm box-end wrench	No

To mount the AP horizontally using AIR-ACC1530-PMK2=, follow these steps:

Step 1   Mount the pivot bracket to a wall or a pole as shown in the previous procedures. However, stop before mounting the pivot bracket plate directly to the access point.

Step 2   Using four M6 x 12 mm bolts, fasten the horizontal adapter plate to the pivot bracket plate.

Step 3   Using the remaining four M6 x 12 mm bolts, mount the other side of the horizontal mounting plate to the AP. See Figure 2-10 for the exploded view.

Step 4   Using a 10 mm wrench or socket, tighten all M6 bolts to 40 lbf-in (4.5 Nm).

Step 5   Position and orient the access point as needed and tighten the mount kit bolts using a 13 mm wrench or socket. See Figure 2-11.

Figure 2-10   Exploded View of the Pivot Bracket Parts with Horizontal Mount Plate

354858
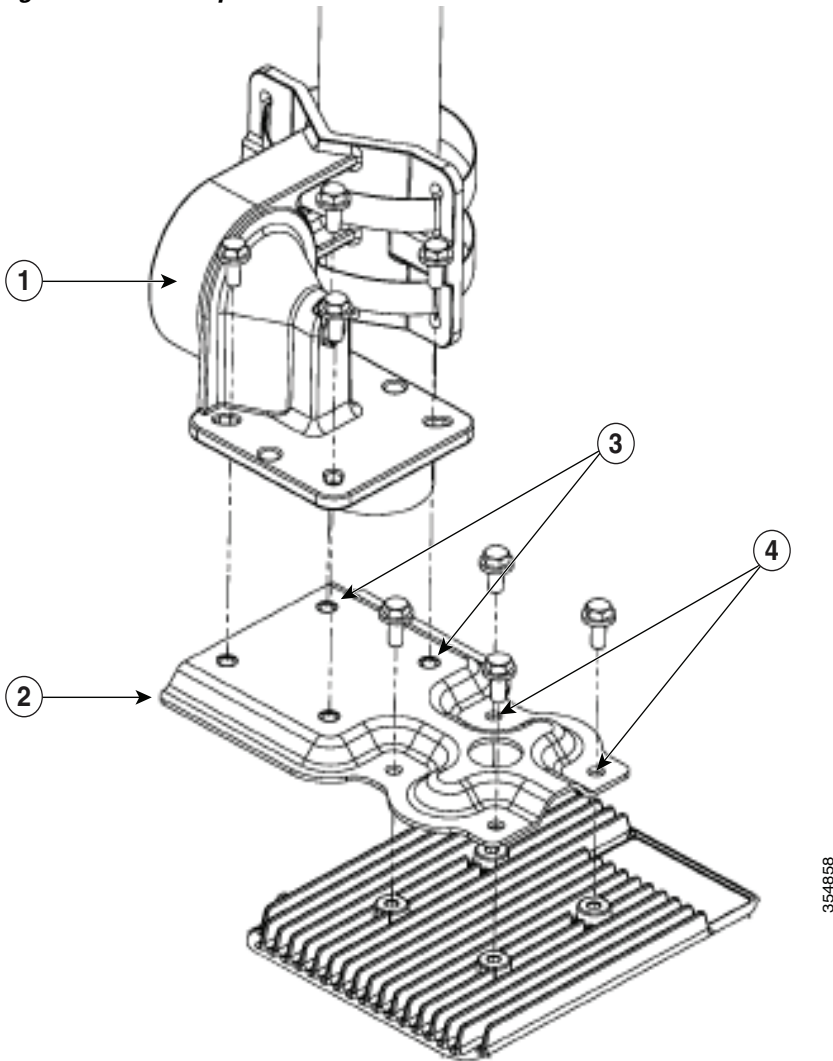
1	Pivoting bracket. Can be mounted on a pole or a wall.	**3**	Two out of four screw holes for mounting the horizontal mounting plate to the pivoting bracket.
2	Horizontal mounting plate.	**4**	Two out of four screw holes for mounting the access point to the horizontal mounting plate.

Figure 2-11   *Access Point Horizontally Mounted using the Optional Horizontal Mount Plate*
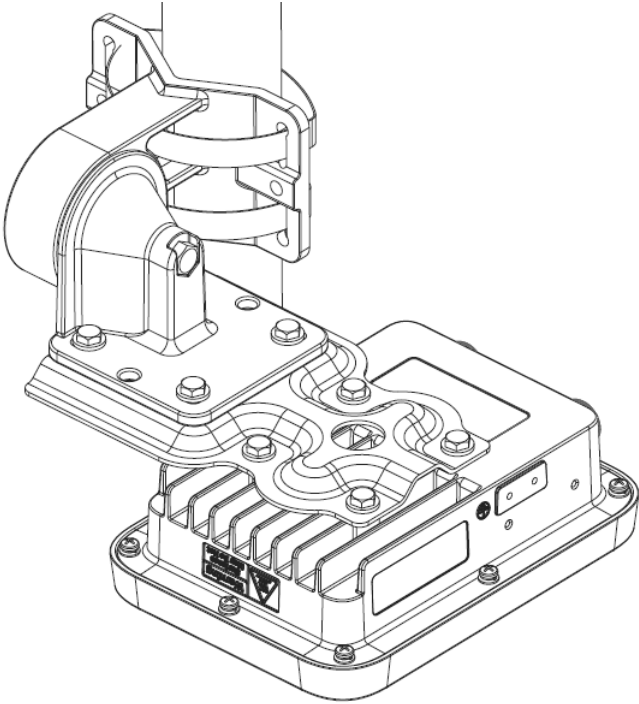
Installing AP Cover AIR-ACC1540-CVR=

You can install a cover AIR-ACC1540-CVR=, which also acts as a a solar shield. The cover can be installed before or after all connections are made.

Step 1   Position and slide the cover over the AP as shown in Figure 2-12.

Step 2   Align the two holes on each side of the cover with the screw holes on corresponding side of the AP.

Step 3   Insert and fasten #6-32 screws through the screw holes in the cover, into the AP. Tighten the screws to 10 lb-in.

Figure 2-12   Installing the Cover on the AP
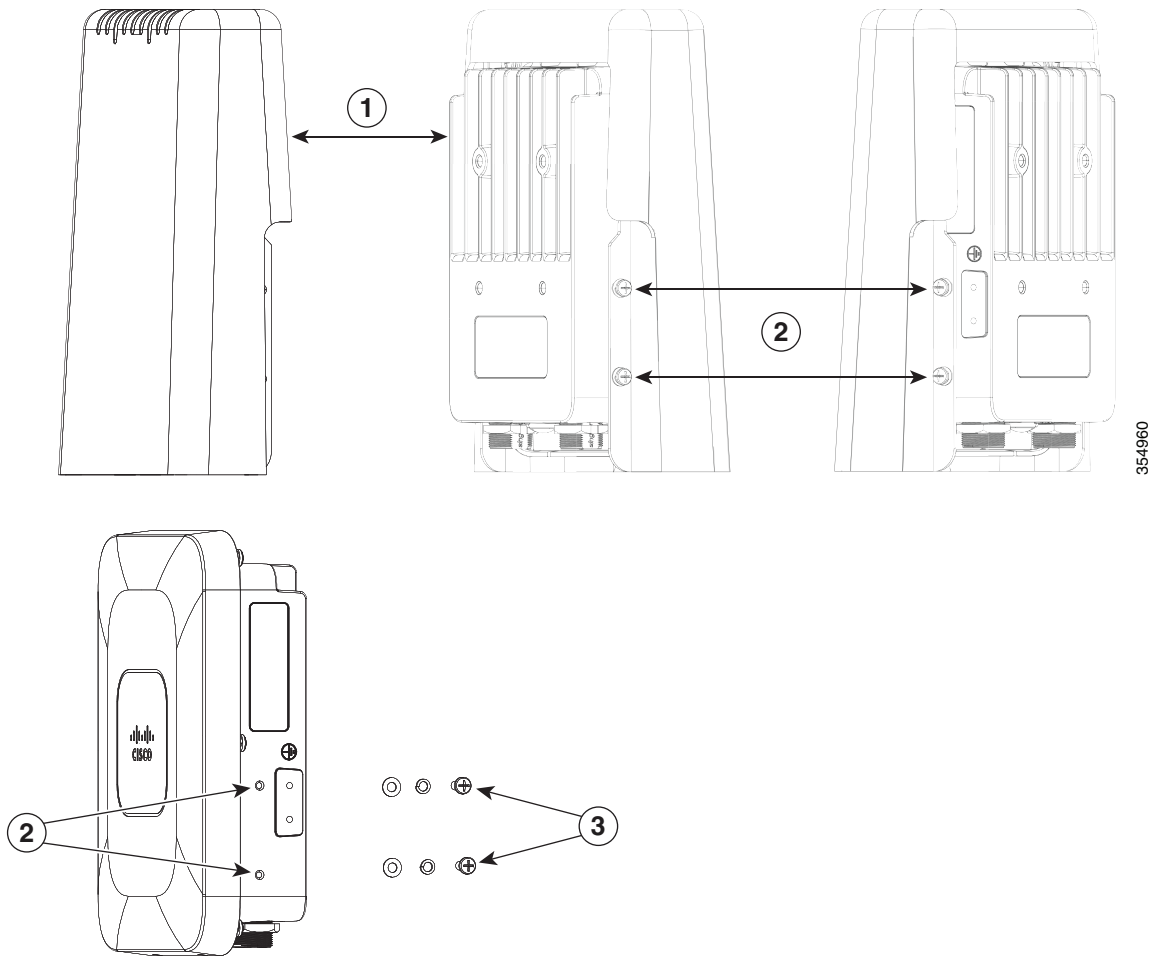
1	Solar Shield	**3**	Two of four #6-32 screws
2	Four screw holes for fastening the solar cover, with two on each side of the AP		

Grounding the Access Point

⚠

Warning   **Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first.** Statement 1026

The access point must be grounded before connecting power.

In all outdoor installations, you must follow these instructions to properly ground the case:

Step 1   If you are using insulated 6 AWG copper ground wire, strip the insulation as required for the grounding lug.

Step 2   Use the appropriate crimping tool to crimp the bare 6 AWG copper ground wire to the supplied grounding lug.

✎

Note   The grounding lug and hardware used must comply with local and national electrical codes.

Step 3   Open the anti-corrosion sealant (supplied), and apply a liberal amount over the metal surface, called the Ground Pad, where the ground strap screw holes are located (see Figure 1-3).

Step 4   Connect the grounding lug to the access point grounding screw holes (see Figure 1-3) using the supplied two Phillips head screws (M4 x10 mm) with lock washers. Tighten the grounding screw to 22 to 24 lb-in (2.49 to 2.71 Nm).

Step 5   If necessary, strip the other end of the ground wire and connect it to a reliable earth ground, such as a grounding rod or an appropriate grounding point on a metal streetlight pole that is grounded.

Powering the Access Point

The 1540 series access points can be powered only through Power-over-Ethernet (PoE), using 802.3af or 802.3at power, or UPoE, from in-line power injector or a suitably powered switch port. Power for full operation is provided by 802.3af (or higher), and operates at 2x2:2 for both 2.4 GHz and 5 GHz radios.

The 1540 series access point supports the following power injectors:

- AIR-PWRINJ5 (provides 802.3af power)
- AIR-PWRINJ6 (provides 802.3at power). This power injector can only be used in an indoor environment. Therefore the cable from the injector must travel from the indoor location to the access point mounted outdoor.
- AIR-PWRINJ-60RGD1
- AIR-PWRINJ-60RGD2
- PoE supply rated at 48-56V DC, minimum 350 mA
- Cisco UPoE

Connecting a Power Injector

When your access point is powered by a power injector, follow these steps to complete the installation:

Step 1   Before applying PoE to the access point, ensure that the access point is grounded (see the "Grounding the Access Point" section on page 2-24).

Step 2   See the "Typical Access Point Installation Components" section on page 2-5, to identify the components needed for the installation.

Step 3   Connect a CAT5e or better Ethernet cable from your wired LAN network to the power injector.

> ✎
> **Note**   The installer is responsible for ensuring that powering the access point from this type of power injector is allowed by local and/or national safety and telecommunications equipment standards.

> 🔎
> **Tip**   To forward bridge traffic, add a switch between the power injector and controller. Refer to the *Cisco Wireless Mesh Access Points, Design and Deployment Guide, Release 7.0* for more information.

Step 4   Ensure that the access point is grounded before you apply power to the access point.

Step 5   Connect a shielded outdoor-rated Ethernet (CAT5e or better) cable between the power injector and the PoE-in connector of the access point.

Step 6   Connect the Ethernet cable to the access point PoE-In port. See "Connecting an Ethernet Cable to the Access Point" section on page 2-26.

For details on installing Ethernet, see Connecting an Ethernet Cable to the Access Point, page 2-26.

Connecting an Ethernet Cable to the Access Point

You need to supply these tools and materials:

- Shielded outdoor-rated Ethernet (CAT5e or better) cable with a diameter of 0.2 to 0.35 inch (0.51 to 0.89 cm)
- RJ45 connector and installation tool
- Adjustable Wrench or 28 mm box wrench

To connect the shielded Ethernet cable to the access point, follow these steps:

Step 1   Disconnect power to the power injector, and ensure all power sources to the access point are turned off.

Step 2   Ensure a 6 AWG ground wire is connected to the access point (see the "Grounding the Access Point" section on page 2-24).

Step 3   Remove the covering cap from the PoE port.

Step 4   Loosen the Thread-Lock sealing nut of the cable gland by turning it counter clockwise, but do not remove it (see Figure 2-13).

✎
Note   Verify that the cable gland has a rubber seal and ensure that it is not damaged.

⚠
Caution   Failure to install the cable gland and rubber gasket properly will cause the cable grip to leak.

Figure 2-13   *Cable Gland Assembly*
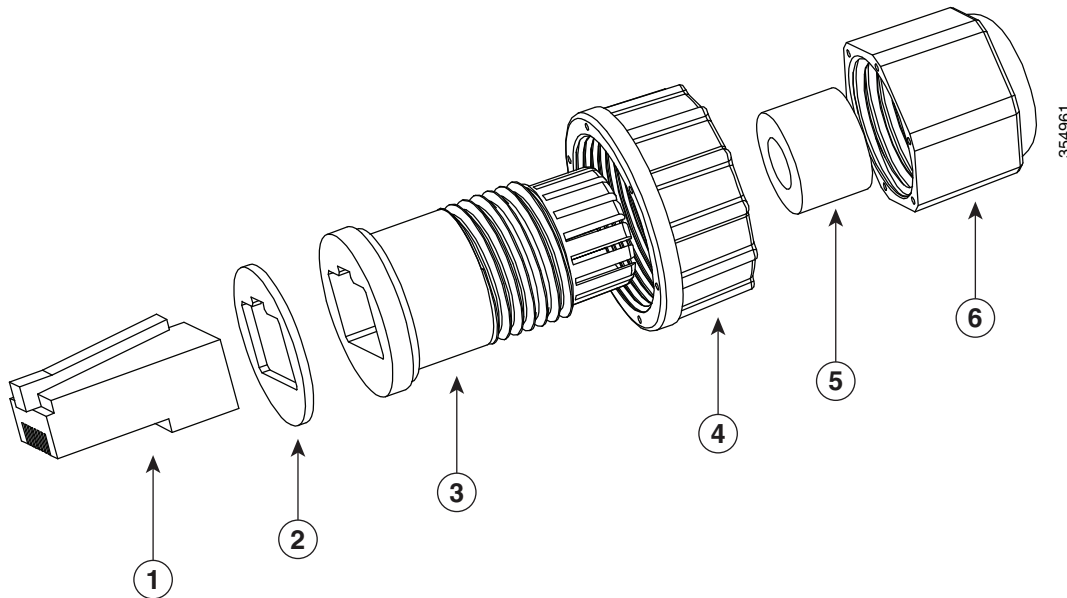
1	RJ45 Plug	4	Screw nut
2	Gasket	5	Seal
3	Clamp ring	6	Thread-lock sealing nut

Step 5 Insert the unterminated end of the Ethernet cable through the sealing nut-end of the cable gland (see Figure 2-13), and pull several inches of cable through.

Step 6 Install an RJ45 connector on the unterminated end of the Ethernet cable using your Ethernet cable installation tool.

Step 7 Carefully connect the RJ45 cable connector to the PoE port on the access point.

Step 8 Slide the cable gland with the rubber seal towards the access point, and screw the threaded end of the body into the access point, and hand-tighten.

Step 9 Use an adjustable wrench or a 28 mm wrench to tighten the threaded end of the body into the enclosure. Tighten to 15 lb-in.

Step 10 Use an adjustable wrench and tighten the thread-lock seal nut to 15 lb-in.

Step 11 Route your Ethernet cable, and cut off any excess cable.

Step 12 Install an RJ45 connector on the unterminated cable end, and insert it into the power injector.

Step 13 Turn on the power to the power injector.

Configuring the Access Point

When you power up an AP that is not connected to a wired Ethernet, fiber-optic, or cable network to the controller, the access point uses the Cisco Adaptive Wireless Path Protocol (AWPP) to bind to another mesh access point with the best path to a root access point (RAP) connected to the wired network to a controller. The access point sends a discovery request when powered up. If you have configured the access point in the controller correctly, the controller sends back a discovery response to the access point. When that happens, the access point sends out a join request to the controller, and the controller responds with a join confirmation response. Then the access point establishes a Control And Provisioning of Wireless Access Points (CAPWAP) connection to the controller and gets the shared secret configured on the controller.

For information on configuring the access point, see the following documents:

- For Lightweight Access Points and Mesh Access Points, see the *Cisco Wireless LAN Controller Configuration Guide*, which is available at:

  http://www.cisco.com/c/en/us/support/wireless/wireless-lan-controller-software/products-installation-and-configuration-guides-list.html

- For a Mobility Express deployment, see the *Cisco Mobility Express Configuration and User Guide,* available at:

  http://www.cisco.com/c/en/us/support/wireless/mobility-express/products-installation-and-configuration-guides-list.html

- For Mesh Access Points, see the *Cisco Wireless Mesh Access Points, Design and Deployment Guide*, which is available at:

  http://www.cisco.com/c/en/us/td/docs/wireless/technology/mesh/8-0/design/guide/mesh80.html

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Note   The AP does not support daisy chaining.

Troubleshooting

This chapter provides troubleshooting procedures for basic problems with the access point. For the most up-to-date, detailed troubleshooting information, refer to the Cisco Technical Support and Documentation website at the following URL:

http://www.cisco.com/cisco/web/support/index.html

Sections in this chapter include:

Guidelines for Using the Access Point

- The access point only supports Layer 3 CAPWAP communications with the controllers.

  In Layer 3 operation, the access point and the controller can be on the same or different subnets. The access point communicates with the controller using standard IP packets. A Layer 3 access point on a different subnet than the controller requires a DHCP server on the access point subnet and a route to the controller. The route to the controller must have destination UDP ports 12222 and 12223 open for CAPWAP communications. The route to the primary, secondary, and tertiary controllers must allow IP packet fragments.

- Before deploying your access points, ensure that the following has been done:
  - Your controllers are connected to switch ports that are configured as trunk ports.
  - Your access points are connected to switch ports that are configured as untagged access ports.
  - A DHCP server is reachable by your access points and has been configured with Option 43. Option 43 provides the IP addresses of the management interfaces of your controllers. Typically, a DHCP server can be configured on a Cisco switch.
  - Optionally, a DNS server can be configured to enable CISCO-CAPWAP-CONTROLLER. Use *local domain* to resolve to the IP address of the management interface of your controller.
  - Your controllers are configured and reachable by the access points.
  - Your controllers are configured with the access point MAC addresses and the MAC filter list is enabled.
  - Your switch must forward DHCP requests.

- After the access points are associated to the controller, you should change the bridge group name (BGN) from the default value. With the default BGN, the mesh access points (MAPs) can potentially try to connect with other mesh networks and slow down the convergence of the network.

Convergence Delays

During deployment, the access points can experience convergence delays due to various causes. The following list identifies some operating conditions that can cause convergence delays:

- A root access point (RAP) attempts to connect to a controller using any of the wired ports (cable, fiber-optic, PoE-in). If the wired ports are operational, the RAP can potentially spend several minutes on each port prior to connecting to a controller.
- If a RAP is unable to connect to a controller over the wired ports, it attempts to connect using the wireless network. This results in additional delays when multiple potential wireless paths are available.
- If a MAP is unable to connect to a RAP using a wireless connection, it then attempts to connect using any available wired port. The access point can potentially spend several minutes for each connection method, before attempting the wireless network again.

Bridge Loop

The access point supports packet bridging between wired and wireless network connections. The same network must never be connected to multiple wired ports on an access point or on two bridged access points. A bridge loop causes network routing problems.

Controller DHCP Server

The controller DHCP server only assigns IP addresses to lightweight access points and wireless clients associated to an access point. It does not assign an IP address to other devices, including Ethernet bridging clients on the mesh access points.

MAP Data Traffic

If the signal on the access point backhaul channel has a high signal-to-noise ratio, it is possible for a MAP to connect to the controller, via parent node, but not be able to pass data traffic, such as pinging the access point. This can occur because the default data rate for backhaul control packets is set to 6 Mb/s, and the backhaul data rate set to auto by the user.

Controller MAC Filter List

Before activating your access point, you must ensure that the access point MAC address has been added to the controller MAC filter list and that **Mac Filter List** is enabled.

Note   The access point MAC address and barcode is located on the bottom of the unit. When two MAC addresses are shown, use the top MAC address.

To view the MAC addresses added to the controller MAC filter list, you can use the controller CLI or the controller GUI:

- Controller CLI—Use the **show macfilter summary** controller CLI command to view the MAC addresses added to the controller filter list.

- Controller GUI—Log into your controller web interface using a web browser, and choose **SECURITY > AAA > MAC Filtering** to view the MAC addresses added to the controller filter list.

Using DHCP Option 43

You can use DHCP Option 43 to provide a list of controller IP addresses to the access points, enabling the access point to find and join a controller. Refer to the product documentation for your DHCP server for instructions on configuring DHCP Option 43. To see sample configurations for DHCP Option 43 for, go to the following URL:

http://www.cisco.com/c/en/us/support/docs/wireless-mobility/wireless-lan-wlan/97066-dhcp-option-43-00.html

Monitoring the Access Point Status LED

If your access point is not working properly, look at the LED on the Reset button, on the base of the unit. You can use them to quickly assess the status of the unit.

Note It is expected that there will be small variations in LED color intensity and hue from unit to unit. This is within the normal range of the LED manufacturer specifications and is not a defect.

The access point LED signals are listed in Table 3-1.

Table 3-1   Access Point LED Signals

LED Message Type	Color	Meaning
Boot loader status sequence	Blinking Green	Boot loader status sequence: • DRAM memory test in progress • DRAM memory test OK • Board initialization in progress • Initializing FLASH file system • FLASH memory test OK • Initializing Ethernet • Ethernet OK • Starting AP OS • Initialization successful
Boot loader warnings	Blinking Amber	Configuration recovery is in progress (the Reset button has been pushed for 2-3 seconds)
	Red	There is an Ethernet failure or an image recovery (the Reset button has been pushed for 20-30 seconds)
	Blinking Green	An image recovery is in progress (the Reset button has been released)
Boot loader errors	Red	There has been a DRAM memory test failure
	Blinking Red and Amber	There has been a FLASH file system failure
	Blinking Red and Off	This sequence may indicate any of the following: • Environment variable failure • Bad MAC address • Ethernet failure during image recovery • Boot environment failure • No Cisco image file • Boot failure

Table 3-1   Access Point LED Signals

LED Message Type	Color	Meaning
AP OS errors	Red	There has been a software failure; a disconnect then reconnect of the unit power may resolve the issue
	Cycling through Red, Green, Amber and Off	This is a general warning of insufficient inline power.
Association status	Chirping (short blips) Green	This status indicates a normal operating condition. The unit is joined to a controller, but no wireless client is associated with it.
	Solid Green	Normal operating condition with at least one wireless client associated with the unit
Operating Status	Blinking Amber	A software upgrade is in progress
	Cycling through Green, Red and Amber	Discovery/join process is in progress
	Rapidly cycling through Red, Green, Amber and Off	This status indicates that the Access Point location command has been invoked.
	Blinking Red	This status indicates that an Ethernet link is not operational

Resetting the Access Point

The reset button is located on the base of the AP (see Figure 1-2). Using the Reset button you can:

- Reset the AP to the default factory-shipped configuration.
- Clear the AP internal storage, including all configuration files.

To use the Reset button, press, and keep pressed, the Reset button on the access point during the AP boot cycle. Wait until the AP status LED changes to Amber. During this, the AP console shows a seconds counter, counting the number of seconds the Reset button is pressed. Then:

- To reset the AP to default factory-shipped configuration, keep the Reset button pressed for less than 20 seconds. The AP configuration files are cleared.

  This resets all configuration settings to factory defaults, including passwords, WEP keys, the IP address, and the SSID.

- To clear the AP internal storage, including all configuration files, keep the Reset button pressed for more than 20 seconds, but less than 60 seconds.

  The AP status LED changes from Amber to Red, and all the files in the AP storage directory are cleared.

If you keep the Reset button pressed for more than 60 seconds, the Reset button is assumed faulty and no changes are made.

Verifying Controller Association

To verify that your access point is associated to the controller, follow these steps:

Step 1   Log into your controller web interface using a web browser.

You can also use the controller CLI **show ap summary** command from the controller console port.

Step 2   Click **Wireless,** and verify that your access point MAC address is listed under Ethernet MAC.

Step 3   Log out of the controller, and close your web browser.

Changing the Bridge Group Name

The bridge group name (BGN) controls the association of the access points to a RAP. BGNs can be used to logically group the radios to avoid different networks on the same channel from communicating with each other. This setting is also useful if you have more than one RAP in your network in the same area.

If you have two RAPs in your network in the same area (for more capacity), we recommend that you configure the two RAPs with different BGNs and on different channels.

The BGN is a string of ten characters maximum. A factory-set bridge group name (NULL VALUE) is assigned during manufacturing. It is not visible to you, but allows new access point radios to join a network of new access points. The BGN can be reconfigured from the Controller CLI and GUI. After configuring the BGN, the access point reboots.

After the access points are deployed and associated to the controller, the BGN should be changed from the default value to prevent the MAPs from attempting to associate to other mesh networks.

The BGN should be configured very carefully on a live network. You should always start with the most distant access point (last node) from the RAP and move towards the RAP. If you start configuring the BGN in a different location, then the access points beyond this point (farther away) are dropped, as they have a different BGN.

To configure the BGN for the access points using the controller GUI, follow these steps:

Step 1   Log into your controller using a web browser.

Step 2   Click **Wireless**. When access points associates to the controller, the access point name appears in the AP Name list.

Step 3   Click on an access point name.

Step 4   Find the Mesh Information section, and enter the new BGN in the Bridge Group Name field.

Step 5   Click **Apply**.

Step 6   Repeat Steps 2 through 5 for each access point.

Step 7   Log out from your controller, and close your web browser.

Safety Guidelines and Warnings

Translated versions of all safety warnings are available on Cisco.com. Additional safety information, along with regulatory information, is provided in Appendix B, "Declarations of Conformity and Regulatory Information".

Note
- This equipment is not suitable for use in locations where children are likely to be present.
- The marking information is located at the bottom of the apparatus.

Warning
Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning
Read the installation instructions before connecting the system to the power source. Statement 1004

Warning
This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017

Warning
Do not operate the unit near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use. Statement 364

Caution
The cables specified in this installation guide that are used with the specified cable glands provide protection against ingress of moisture for a Type 4/IP67 classified enclosure. If substitute cable are used, the installer must ensure that the size (OD) of the cable meets the acceptable range allowed by the cable gland.

Warning
This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning   **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Warning   **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning   **When installing or replacing the unit, the ground connection must always be made first and disconnected last.** Statement 1046.

Warning   **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Caution   All installation methods for mounting an access point on any wall surface is subject to the acceptance of local jurisdiction.

FCC Safety Compliance Statement

The FCC, with its action in ET Docket 96-8, has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-certified equipment. When used with approved Cisco Aironet antennas, Cisco Aironet products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio device according to the instructions in this publication results in user exposure substantially below the FCC recommended limits.

Safety Precautions

For safety and to achieve a good installation, please read and follow these safety precautions:

- Select your installation site with safety, as well as performance in mind. Remember: electric power lines and phone lines look alike. For safety, assume that any overhead line can kill.

- Call your electric power company. Tell them your plans, and ask them to come look at your proposed installation.

- Plan your installation carefully and completely before you begin. Successful raising of a mast or tower is largely a matter of coordination. Each person should be assigned to a specific task and should know what to do and when to do it. One person should be in charge of the operation to issue instructions and watch for signs of trouble.

- When installing the access points, remember:

    - Do not use a metal ladder.

    - Do not work on a wet or windy day.

    - Do dress properly—shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.

- Use a rope to lift the access point. If the assembly starts to drop, get away from it and let it fall.

If an accident should occur, call for qualified emergency help immediately.

Performing Site Surveys

Every network application is a unique installation. Before installing multiple access points, you should perform a site survey to determine the optimum use of networking components and to maximize range, coverage, and network performance.

Site surveys reveals problems that can be resolved before the network is operational. Because 802.11a/b/g/n operates in an unlicensed spectrum, there may be sources of interference from other 802.11a wireless devices (especially in multi-tenant buildings) that could degrade your 802.11 signals. A site survey can determine if such interference exists at the time of deployment.

A proper site survey involves temporarily setting up mesh links and taking measurements to determine whether your antenna calculations are accurate. Determine the correct locations and antenna types before you drill holes and route cables and mounting equipment.

Consider the following operating and environmental conditions when performing a site survey:

- Data rates—Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver sensitivity occurs as the radio data increases.
- Physical environment—Clear or open areas provide better radio range than closed or filled areas.
- Obstructions—Physical obstructions such as buildings, trees, or hills can hinder performance of wireless devices.
- How far is your wireless link?
- Has a previous site survey been conducted?
- Do you have a clear Fresnel zone between the access points or radio line of sight?
- What is the minimum acceptable data rate within the link?
- Do you have access to both of the mesh site locations?
- Do you have the proper permits, if required?
- Are you following the proper safety procedures and practices?
- Have you configured the access points before you go onsite? It is always easier to resolve configurations or device problems first.
- Do you have the proper tools and equipment to complete your survey.

Translated Safety Warnings

The *Translated Safety Warnings for Cisco Aironet Outdoor Access Points* document is available at the following URL:

http://www.cisco.com/c/en/us/td/docs/wireless/access_point/warnings/reference/guide/1520_30_50_trans_warn78_18259_03.html

Declarations of Conformity and Regulatory Information

This appendix provides declarations of conformity and regulatory information for the Cisco Aironet 1542 Outdoor Access Point.

This appendix contains the following sections:

Manufacturers Federal Communication Commission Declaration of Conformity Statement

FC Tested To Comply
With FCC Standards

FOR HOME OR OFFICE USE

Models:	**FCC Certification number:**
AIR-AP1542I-B-K9	LDK102109P
AIR-AP1542D-B-K9	

Manufacturer:

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

This device complies with Part 15 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the receiving antenna.

- Increase separation between the equipment and receiver.

- Connect the equipment to an outlet on a circuit different from which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician.

⚠
Caution   The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using Cisco-supplied antennas. Any changes or modification to the product not expressly approved by Cisco could void the user's authority to operate this device.

⚠
Caution   To meet regulatory restrictions, the access point must be professionally installed.

Requirements of operator to register the RLAN device operating Outdoors in the 5150 -5250 MHz band and addressing possible interference issues in this band

Section 15.407(j) of the rules established filing requirements for U-NII operators that deploy a collection of more than 1000 outdoor access points with the 5.15-5.25 GHz band, parties must submit a letter to the FCC lab acknowledging that, should harmful interference to licensed services in this band occur, they will be required to take corrective action. Corrective actions may include reducing power, turning off devices, changing frequency bands, and/or further reducing power radiated in the vertical direction.

This material shall be submitted to:

Federal Communications Commission

Laboratory Division, Office of Engineering and Technology

7435 Oakland Mills Road, Columbia, MD, 21046

Attn: U-NII Coordination

or via website at https://www.fcc.gov/labhelp

use subject line U-NII Filing

Industry Canada

Models:	IC Certification Number:
AIR-AP1542I-A-K9	2461B-102109P
AIR-AP1542D-A-K9	

Canadian Compliance Statement

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna Type	Antenna Gain	Antenna Impedance
Dual-band Omni (1542I)	5/5 dBi	50 ohms
Dual-Band Directional (1542D)	8/9 dBi	50 ohms

Operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

La bande 5 150-5 250 MHz est réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

Users are advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

Les utilisateurs êtes avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5 250-5 350 MHz et 5 650-5 850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

Declaration of Conformity for RF Exposure

This access point product has been found to be compliant to the requirements set forth in CFR 47 Section 1.1307 addressing RF Exposure from radio frequency devices as defined in Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields. AP 1542I, has internal antennas, and should be located at a minimum of 9.8 inches (25 cm) or more from the body of all persons. AP 1542D, has internal antennas, and should be located at a minimum of 11.8 inches (30 cm) or more from the body of all persons.

This access point is also compliant to EN 50835 for RF exposure.

European Community, Switzerland, Norway, Iceland, and Liechtenstein

Access Point Models:

AIR-AP1542I-E-K9

AIR-AP1542D-E-K9

For detailed compliance information, see the *EU Directive 2014/53/EU - Compliance Information* document, at:

(URL to be added at FCS)

Declaration of Conformity for RF Exposure

The following is the declaration of conformity for RF exposure for the United States, Canada, European Union and Australia.

United States

This system has been evaluated for RF exposure for Humans in reference to ANSI C 95.1 (American National Standards Institute) limits. The evaluation was based on ANSI C 95.1 and FCC OET Bulletin 65C rev 01.01. To maintain compliance, the minimum separation distance for AP 1542I, having internal antennas, is 9.8 inches (25 cm) from general bystanders. The minimum separation distance from AP 1542D, having internal antennas, is 11.8 inches (30 cm) from general bystanders.

Canada

This system has been evaluated for RF exposure for Humans in reference to ANSI C 95.1 (American National Standards Institute) limits. The evaluation was based on RSS-102 Rev 5.

To maintain compliance, the minimum separation distance for AP 1542I, having internal antennas, is 9.8 inches (25 cm) from general bystanders. The minimum separation distance from AP 1542D, having internal antennas, is 11.8 inches (30 cm) from general bystanders.

Ce système a été évalué pour l'exposition aux RF pour les humains en référence à la norme ANSI C 95.1 (American National Standards Institute) limites. L'évaluation a été basée sur RSS-102 Rev 2.

La distance minimale de séparation de l'antenne de toute personne est de 9.8 "(25 cm) pour AP 1542I, pour assurer le respect.

La distance minimale de séparation de l'antenne de toute personne est de 11.8 "(30 cm) pour AP 1542D, pour assurer le respect.

European Union

This system has been evaluated for RF exposure for Humans in reference to the ICNIRP (International Commission on Non-Ionizing Radiation Protection) limits. The evaluation was based on the EN 50385 Product Standard to Demonstrate Compliance of Radio Base stations and Fixed Terminals for Wireless Telecommunications Systems with basic restrictions or reference levels related to Human Exposure to Radio Frequency Electromagnetic Fields from 300 MHz to 40 GHz. To maintain compliance, the minimum separation distance for AP 1542I, having internal antennas, is 9.8 inches (25 cm) from general bystanders. The minimum separation distance from AP 1542D, having internal antennas, is 11.8 inches (30 cm) from general bystanders.

Australia

This system has been evaluated for RF exposure for Humans as referenced in the Australian Radiation Protection standard and has been evaluated to the ICNIRP (International Commission on Non-Ionizing Radiation Protection) limits. To maintain compliance, the minimum separation distance for AP 1542I, having internal antennas, is 9.8 inches (25 cm) from general bystanders. The minimum separation distance from AP 1542D, having internal antennas, is 11.8 inches (30 cm) from general bystanders.

Guidelines for Operating Cisco Aironet Access Points in Japan

This section provides guidelines for avoiding interference when operating Cisco Aironet access points in Japan. These guidelines are provided in both Japanese and English.

Access Point Model:

AIR-AP1542I-Q-K9

AIR-AP1542D-Q-K9

Japanese Translation

　この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）が運用されています。

1　この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局が運用されていないことを確認して下さい。

2　万一、この機器から移動体識別用の構内無線局に対して電波干渉の事例が発生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡頂き、混信回避のための処置等(例えば、パーティションの設置など)についてご相談して下さい。

3　その他、この機器から移動体識別用の特定小電力無線局に対して電波干渉の事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問い合わせ下さい。

連絡先：03-6434-6500

43768

English Translation

This equipment operates in the same frequency bandwidth as industrial, scientific, and medical devices such as microwave ovens and mobile object identification (RF-ID) systems (licensed premises radio stations and unlicensed specified low-power radio stations) used in factory production lines.

1. Before using this equipment, make sure that no premises radio stations or specified low-power radio stations of RF-ID are used in the vicinity.

2. If this equipment causes RF interference to a premises radio station of RF-ID, promptly change the frequency or stop using the device; contact the number below and ask for recommendations on avoiding radio interference, such as setting partitions.

3. If this equipment causes RF interference to a specified low-power radio station of RF-ID, contact the number below.

Contact Number: 03-6434-6500

VCCI Statement for Japan

⚠

Warning   **This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.**

警告   この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI-A

Administrative Rules for Cisco Aironet Access Points in Taiwan

This section provides administrative rules for operating Cisco Aironet Access Points in Taiwan. The rules are provided in both Chinese and English.

Chinese Translation

低功率電波輻射性電機管理辦法

第十二條   經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條   低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

127048

English Translation

Administrative Rules for Low-power Radio-Frequency Devices

Article 12

For those low-power radio-frequency devices that have already received a type-approval, companies, business units or users should not change its frequencies, increase its power or change its original features and functions.

Article 14

The operation of the low-power radio-frequency devices is subject to the conditions that no harmful interference is caused to aviation safety and authorized radio station; and if interference is caused, the user must stop operating the device immediately and can't re-operate it until the harmful interference is clear.

The authorized radio station means a radio-communication service operating in accordance with the Communication Act.

The operation of the low-power radio-frequency devices is subject to the interference caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

Chinese Translation

低功率射頻電機技術規範

4.7　無線資訊傳輸設備

4.7.6　無線資訊傳輸設備須忍受合法通信之干擾且不得干擾合法通信；如造成干擾，應立即停用，俟無干擾之虞，始得繼續使用。

4.7.7　無線資訊傳輸設備的製造廠商應確保頻率穩定性，如依製造廠商使用手冊上所述正常操作，發射的信號應維持於操作頻帶中。

209139

English Translation

Low-power Radio-frequency Devices Technical Specifications

4.7

Unlicensed National Information Infrastructure

4.7.6

The U-NII devices shall accept any interference from legal communications and shall not interfere the legal communications. If interference is caused, the user must stop operating the device immediately and can't re-operate it until the harmful interference is clear.

4.7.7

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

NCC Requirement (Revision 2018, Articles 18 and 19)

Chinese Translation

電磁波暴露量MPE 標準值1mW/cm² ，評估結果為 30mW/cm2

English Translation

MPE standard value is $1mW/cm^2$, the assessment result is $30mW/cm^2$.

Statement 371—Power Cable and AC Adapter

接続ケーブル、電源コード、AC アダプタ、バッテリーなどの部品は、
必ず添付品または指定品をご使用ください。添付品・指定品以外の部品を
ご使用になると故障や動作不良、火災の原因となります。また、電気用
品安全法により、当該法の認定（PSE とコードに表記）でなく UL 認定
（UL または CSA マークがコードに表記）の電源ケーブルは弊社が指定す
る製品以外の電気機器には使用できないためご注意ください。

English Translation

When installing the product, please use the provided or designated connection cables/power cables/AC adapters. Using any other cables/adapters could cause a malfunction or a fire. Electrical Appliance and Material Safety Law prohibits the use of UL-certified cables (that have the "UL" shown on the code) for any other electrical devices than products designated by CISCO. The use of cables that are certified by Electrical Appliance and Material Safety Law (that have "PSE" shown on the code) is not limited to CISCO-designated products.

EU Declaration of Conformity

All the Declaration of Conformity statements related to this product can be found at the following location:

http://www.ciscofax.com

Operation of Cisco Aironet Access Points in Brazil

This section contains special information for operation of Cisco Aironet access points in Brazil.

Access Point Models

AIR-AP1542I-Z-K9

AIR-AP1542D-Z-K9

Regulatory Information

Figure B-1 contains Brazil regulatory information for the access point models identified in the previous section.

Figure B-1   Brazil Regulatory Information

Portuguese Translation

Este equipamento não tem direito a proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

English Translation

This equipment is not entitled to the protection from harmful interference and may not cause interference with duly authorized systems.

Access Point Pinouts

This appendix describes the pin signals of the access point Ethernet connectors, and the power injector input and output connectors.

Table C-1 describes the pin signals for the power injector input connector (To Switch).

Table C-1   Power Injector Input Connector (To Switch) Pinouts

Pin Number	Signal Name
1	Ethernet signal pair (10/100/1000BASE-T)
2	
3	Ethernet signal pair 10/100/1000BASE-T)
6	
4	Ethernet signal pair (1000BASE-T)
5	
7	Ethernet signal pair (1000BASE-T)
8	
Shield	Chassis ground