



GETTING STARTED GUIDE



Cisco Aironet 1550 Series Outdoor Mesh Access Points INCLUDING LICENSE AND WARRANTY

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1 About this Guide

This guide is designed to familiarize yourself with your Cisco Aironet 1550 Series Outdoor Mesh Access Point and prepare it for use in your wireless network. Due to the complexity and number of product options available, this guide does not provide detailed mounting and configuration instructions. Those instructions can be found in the following documents:

- *Cisco Mesh Networking Solution Deployment Guide*
- *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide*
- *Cisco Aironet 1520 Series Access Point Power Injector Installation Instructions*

Detailed configuration information can also be found in the Cisco wireless LAN controller documentation for the controller and software release you are using. These and other documents are available on Cisco.com. Follow these steps to access these documents:

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- Step 1** Browse to <http://www.cisco.com>.
 - Step 2** Click **Support**. A pop-up window appears.
 - Step 3** Click **Wireless under** Select a Product Name. The Select Your Product or Technology page appears.
 - Step 4** Click **Wireless > Outdoor Wireless**.
 - Step 5** Click **Cisco Aironet 1550 Series** in the Search for a Specific Product field. The Cisco Aironet 1550 Series Introduction page appears.
 - Step 6** Choose the appropriate link for the documentation you want to view or download.
-

FCC Safety Compliance Statement

The FCC with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (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 installation of this radio according to the instructions found in this manual will result in user exposure that is substantially below the FCC recommended limits.

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.

Use is permitted with antenna gain not exceeding 4 dBi in the 2.4 GHz band and 7 dBi in the 5 GHz band, as described in filing, with a minimum separation distance of 20 cm between the antenna and all persons during normal operation.

Declaration of Conformity with Regard to the EU Directive 1999/5/EC (R&TTE Directive)

This declaration is only valid for configurations (combinations of software, firmware and hardware) provided and/or supported by Cisco Systems. The use software or firmware not supported/provided by Cisco Systems may result that the equipment is no longer compliant with the regulatory requirements.

General Safety Guidelines

Warnings

Safety warnings appear throughout this guide in procedures that may harm you if performed incorrectly. A warning symbol precedes each warning statement. The warnings below are general warnings that are applicable to the entire guide. Specific warnings are included in the sections to which they apply.

Translated versions of the safety warnings in this guide are provided in the *Safety Warnings for Cisco Aironet 1550 Series Outdoor Mesh Access Points* document that accompanies this guide. The translated warnings are also in Appendix A of the *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide*, which is available at cisco.com.



Warning

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

SAVE THESE INSTRUCTIONS



Warning

There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Statement 1015



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



Warning

This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.

Statement 366



Warning

Read the installation instructions before connecting the system to the power source.

Statement 1004



Warning

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



Warning

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

2 Introduction to the Access Point

The Cisco Aironet 1550 Series Outdoor Mesh Access Point (hereafter called the *access point*) is a ruggedized outdoor access designed for service in mesh networks. The 1550 series leverages 802.11n technology with integrated radio and external antennas. The 1550 outdoor platform consists of (Multiple Input Multiple Output) MIMO WLAN radios and optional integrated spectrum intelligence (Clean Air).

CleanAir provides full 11n data rates while detecting, locating, classifying and mitigating radio frequency (RF) interference to provide the best client experience possible. CleanAir technology on the outdoor 11n platform mitigates WiFi and non-WiFi interference for both the access and backhaul radios.

The 1550 AP series offers multi-band 2.4 GHz, and 5 GHz configurations with an option to configure access and backhaul radios. The 1550 outdoor radios are called 2.4GHz MIMO radios and 5GHz MIMO radios. The radios can be configured for one or two radio operation. The 2.4GHz radios are used primarily for local access and the 5 GHz radios for wireless backhaul in the Mesh.

The 1550 series supports the modularity of the 1520 series and allows flexibility in radio configuration. In addition to full interoperability with 802.11n clients, the 1550 series interoperates with legacy clients and offers enhanced backhaul performance. The 1550 series can also be configured with an integrated DOCSIS 3.0 cable modem.



Note The 4.9-GHz Public Safety band requires a license and may be used only by qualified Public Safety operators as defined in section 90.20 of the FCC rules.

The access point is a standalone unit that can be cable strand or tower mounted. The access point can also operate as a relay node for other access points not directly connected to a wired network. Intelligent wireless routing is provided by the patent-pending Adaptive Wireless Path Protocol (AWPP). This enables each access point to identify its 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 is configured, monitored, and operated through a Cisco wireless LAN controller (hereafter called a *controller*) as described in the appropriate *Cisco Wireless LAN Controller Configuration Guide*. The *Cisco Mesh Networking Solution Deployment Guide* describes how to plan and initially configure the Cisco mesh network, which supports wireless point-to-point, point-to-multipoint, and mesh deployments. The controllers use a browser-based management system, a command-line interface (CLI), or the Cisco Wireless Control System (WCS) network management system to manage the controller and the associated access points. The access point is compliant with Wi-Fi Protected Access 2 (WPA2) and employs hardware-based Advanced Encryption Standard (AES) encryption between wireless nodes to provide end-to-end security.

3 Unpacking the Access Point



Note When you are unpacking the access point, do not remove the foam blocks attached to the antenna connectors. The foam protects the antenna connectors during installation.

Follow these steps to unpack the access point:

-
- 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 the “Package Contents” section are included in the shipment. Check each item for damage. If any item is damaged or missing, notify your authorized Cisco sales representative.
-

Package Contents

Each access point package contains the following items:

- One 1550 series access point
- Installed mounting plate (attached to the back of the access point)
- Ground lug with screw and washer
- *Cisco Aironet 1550 Series Outdoor Mesh Access Point Mounting Instructions*
- *Translated Safety Warnings for Cisco Aironet 1520 Series Outdoor Mesh Access Points*
- This guide

Optional Equipment

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

- Hazardous Location Battery Backup Unit (HZBBU)
- Standard Battery Backup Unit (BBU)
- Fiber Optic Link
- Cable modem (AIR-1520-CM-D2=)
- Battery, 6 amp hour (AIR-1520-BATT-6AH=)
- 100BASE-BX10-U rugged SFP (GLC-FE-100BX-URGD=)
- Take-up reel for fiber cable (AIR-1520-FIB-REEL=)
- Pole mount kit (AIR-ACCMK1520=)
- Strand mount kit (AIR-ACCSMK1520=)
- Cable power module and supply (AIR-1520-CAB-PWR=)
- Band installation tool for pole mount kit (AIR-BAND-INS-TL=)
- Street light power tap (AIR-PWR-ST-LT-R3P=)
- AC power cord, 40 ft. (12.2 m) with North American plug (AIR-CORD-R3P-50NA=)
- Power injector (AIR-PWRINJ1500-2=)
- FIPS kit (AIRLAP-FIPSKIT=)

- Third-party lightning arrestors as required by local authorities

4 Configurations

The 2GHz MIMO radio operates in 2.4 GHz ISM band. It supports channels 1-11 in US, 1-13 in Europe, and 1-13 in Japan. The 5GHz MIMO radio operates in the UNII-2 band (5.25 – 5.35 GHz), the UNII-2 Extended/ETSI band (5.47 – 5.725 GHz), and the upper ISM band (5.725 – 5.850 GHz). For information on the regulatory domains see “Regulatory Domains” section on page 7.

The configurations for two (2) radios are:

- AIR-CAP1552E-x-K9 2.4GHz b/g/n, 5GHz a/n MIMO, Outdoor Mesh AP
- AIR-CAP1552H-x-K9 2.4GHz b/g/n, 5GHz a/n MIMO, Outdoor Mesh AP w/ Haz Loc
- AIR-CAP1552C-x-K9 2.4GHz b/g/n, 5GHz a/n MIMO, Outdoor Mesh AP w/ DOCSIS 3.0 Cable Modem
- AIR-CAP1552I-x-K9

Regulatory Domains

The 1550 series supports the following regulatory domains:

- -A FCC/North America
- -E ETSI/EU
- -N Non-FCC
- -C China
- -M Middle East
- -K Korea
- -T Taiwan
- -Q Japan (5.47-5.725GHz channels)
- -S Singapore
- -R Russia

5 Becoming Familiar With the Access Point

The following illustrations show identify the access point connections. Before you begin the installation process, use these illustrations to familiarize yourself with the access point.

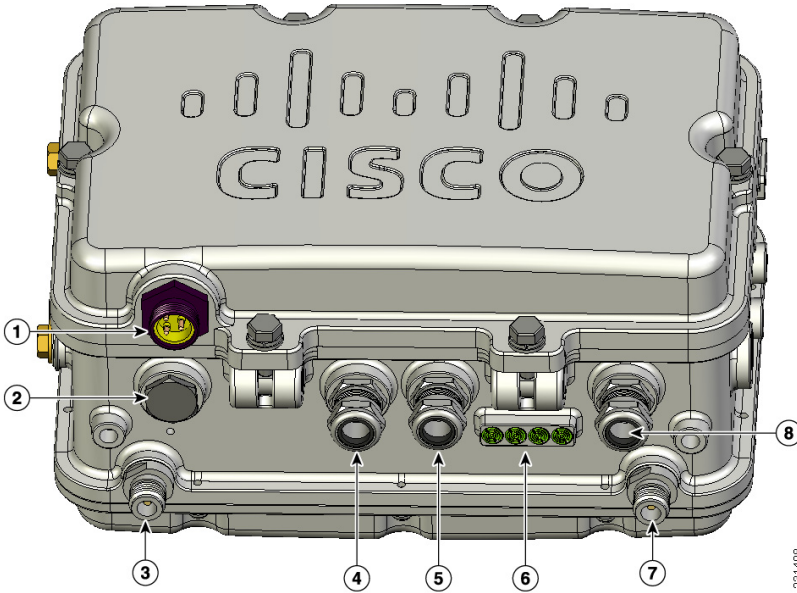


Note

The illustrations show all available connections for the configuration ordered. Unused connections are capped to ensure the access point's watertight integrity. Liquid tight connectors are provided for all ports, which can be installed prior to or after deploying the access point.

Figure 1 shows the access point bottom connectors.

Figure 1 Access Point Bottom Connectors



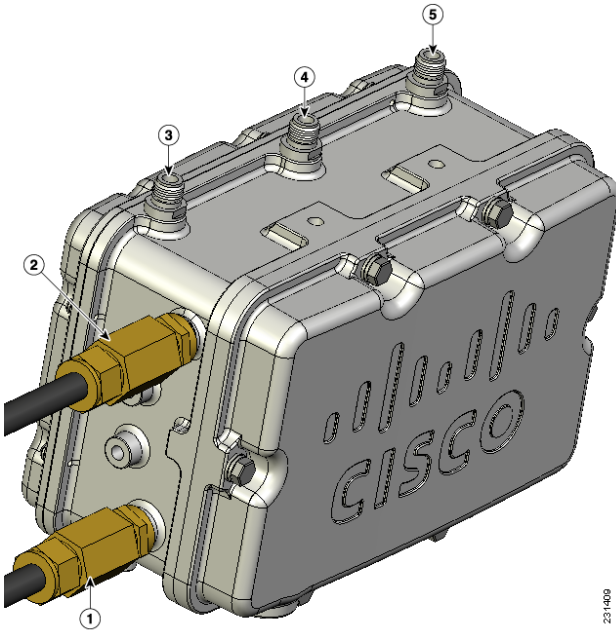
1	AC power connector	5	Power-over-Ethernet (PoE) Out Ethernet connector
2	Reserved for future use	6	LEDs
3	Antenna port 6	7	Antenna port 4
4	Fiber optic connector	8	PoE-In Ethernet connector


Note

Antenna port 5 is not shown in this illustration. The port is reserved for future use and will be located midway between antenna ports 4 and 6.

Figure 2 shows the access point left side and top connectors.

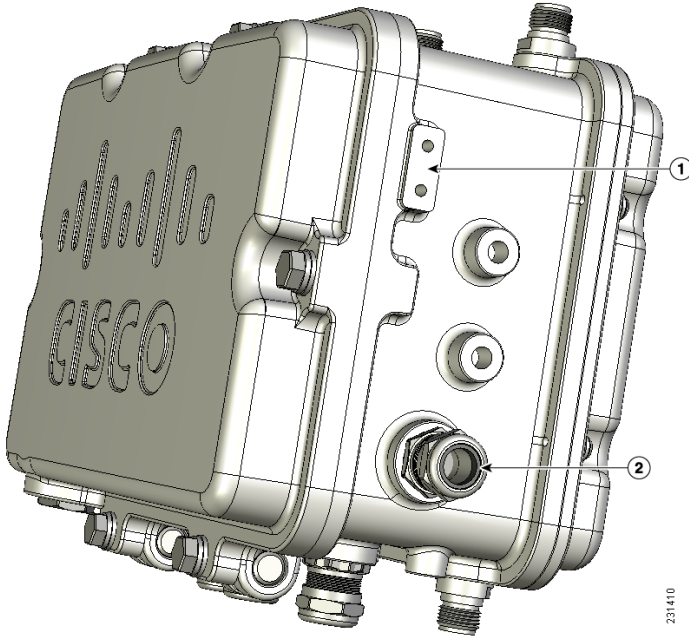
Figure 2 Access Point Left Side and Top Connectors



1	Fiber connector	4	Antenna port 2
2	Cable Power over Cable (PoC) connector	5	Antenna port 3
3	Antenna port 1		

Figure 3 shows the access point right side connections.

Figure 3 Access Point Right Side Connections



231410

1	Ground screw holes	2	DC power connector
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Radio Operation

The 1550 access point 802.11b/g/n radio is used primarily for local access and its 802.11a/n radio for wireless backhaul in the Mesh.

The 2GHz b/g/n radio operates in 2.4 GHz ISM band. It supports channels 1-11 in US, 1-13 in Europe, and 1-13 in Japan. It has two transmitters with a maximum total output power of 25dBm for 802.11b/g/n operation. Output power is configurable to 5 levels. It has three receivers that enable maximum-ratio combining (MRC).

The 5GHz a/n radio operates in the 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 26 dBm for UNII-2 and Extended/ETSI bands. The total maximum output power for the upper ISM band is 28 dBm. Output power is configurable for 5 power levels in 3dB steps. Its three receivers enables maximum-ratio combining (MRC).

The 1550 access point antenna options include a new integrated dual-band omni-directional antenna, with 2dBi gain at 2.4-2.5 GHz and 4 dBi gain at 5.25-5.85GHz. The antenna works in cable strand mount and low cost, low profile applications.

External Antennas



Warning

In order to comply with radio frequency (RF) exposure limits, the antennas for this product should be positioned no less than 20cm from your body or nearby persons.

Statement 339



Warning

Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, because they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada: Canadian Electrical Code, Section 54). Statement 1052



Warning

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

Statement 1030

The access point is equipped with three N-type radio frequency (RF) connectors (antenna ports 1, 2, and 3) on the top of the unit for external antennas to support multiple input single output (MISO) operation as shown in Figure 1. The access point also has three N-type RF connectors (antenna ports 4, 5, and 6) on the bottom of the unit for external antennas as shown in Figure 2. When using the optional Cisco compact omnidirectional antennas, the 2.4- and 5-GHz antennas connect directly to the access point. The Cisco omnidirectional antennas use vertical polarization.

The access point can also be equipped with specific third-party external antennas (see Table 1), subject to local regulatory requirements. If you install third-party antennas, be sure to install them with all waterproofing steps recommended by the third-party manufacturer. For additional information, see the documentation shipped with the antenna.

**Note**

The FCC limits the amount of power this device can transmit. Power transmitted is a combination of the amplification of the signal and the antenna gain. The access point has been designed to operate with the antennas listed below having a maximum gain of 4 dBi for 2.5-GHz and 7 dBi for 5-GHz antennas. Antennas not included in this list or having a higher gain are strictly prohibited for use with the access point. The required antenna impedance is 50 ohms.”

**Note**

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

Antenna Configurations

Two antenna configurations are available, based on how the access point is mounted. The cable strand mounting configuration uses three antennas and the tower mount configuration uses four antennas. Table 1 identifies the antenna ports used and explains the configurations.

Table 1 *Antenna Ports and Configurations*

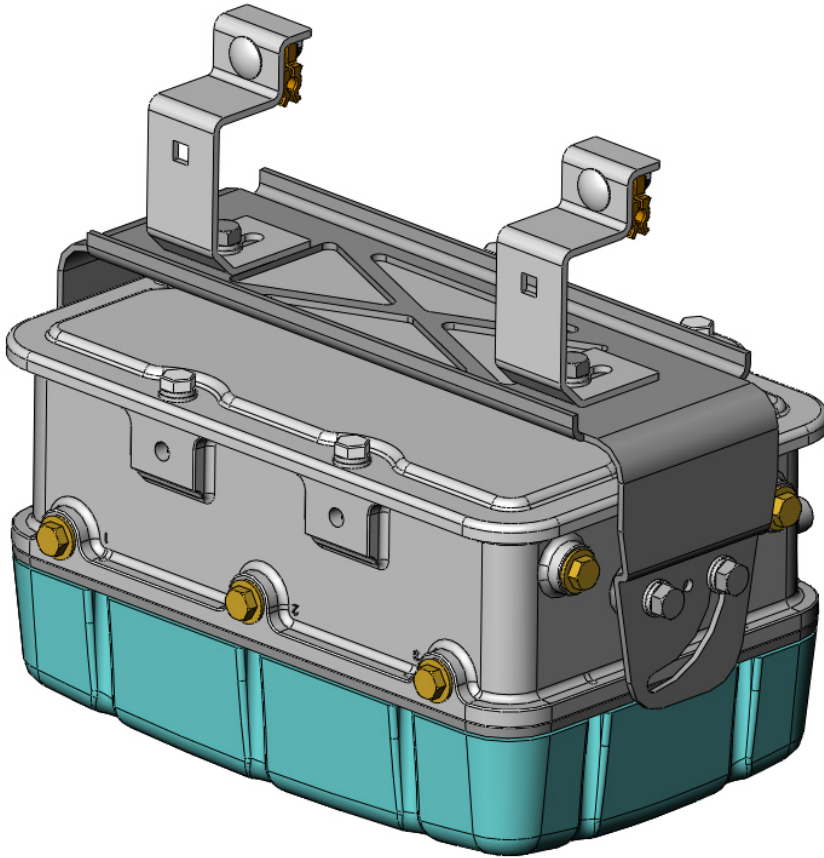
Antenna Port	Product Configuration	
	Cable Strand Mount (Two Antenna Receive MRC Access and One Backhaul)	Pole Mount (Three Antenna Receive MRC Access and One Backhaul)
1	2.4-GHz receive only	5-GHz receive and transmit
2	5-GHz transmit and receive	No connection
3	2.4-GHz transmit and receive	2.4-GHz receive only
4	No connection	2.4-GHz receive only
5	No connection	No connection
6	No connection	2.4-GHz transmit and receive

MIMO Antenna Options

The MIMO antenna replaces the aluminum cover on the radio-side of the housing. The MIMO antenna is constructed of a polycarbonate radome, aluminum ground plane, antenna support brackets and 3dual-band dipole antennas, each with an integral coax cable. Dual-band antennas cover the

frequency ranges 2.400-2.483 GHz and 5.250-5.850 GHz. The dual-band antennas span the WiMAX band 2.496- 2.690 GHz and extend the upper band to 5.250-5.875 GHz. Each 3-inch dual band antenna element is a vertically polarized omni-directional antenna with nominal peak antenna gain of 2 dBi for the 2.4 GHz antenna and 4 dBi for the 5 GHz. See Figure 4 for installed 1550 series MIMO antennas. Peak gain of the 2.4 GHz antenna is at 20 degrees down from the horizon, the 5 GHz is at 10 degrees down. The pigtail coax cable from each dual-band antenna will connect to the 5 GHz MIMO radio by a MCX right-angle male connector. The LP MIMO antenna requires the 5 GHz MIMO radio to be mounted 90 degrees to that of the non-PoC 1550 MIMO radio, as illustrated in Figure 4.

Figure 4 1550 Series MIMO Radio with Dual-Band Antennas Installed



MIMO External Antenna Configurations

The 1550 series support several MIMO external antenna configurations. The external antenna option for dual band 2.4/5 GHz operation is listed in Table 2.

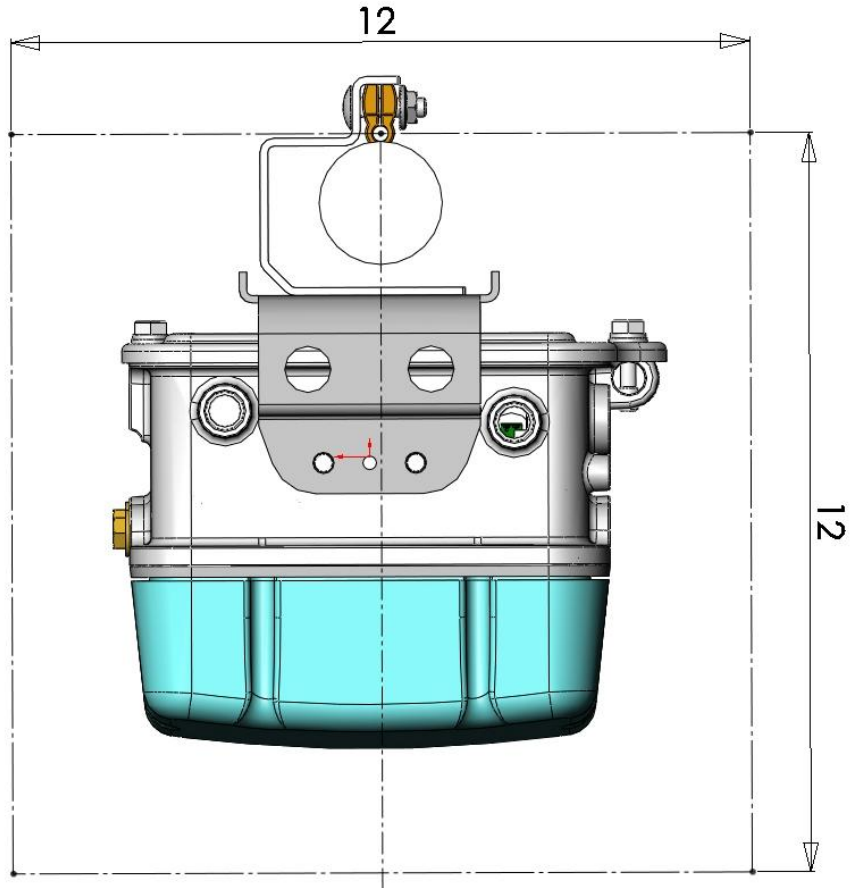
All the external antennas have DC shorts to ground for lightning protection. The 1550 series will provide up to six N-connectors for external connection to antennas.

Table 2 *Dual-Band (2.4 GHz and 5 GHz) External Omni Antenna Option*

Description
2.4-2.5/5.25-5.85 GHz, 4 dBi/7dBi 11" Omni Direct Mounting Ant with N male Connector.

The selection of the antenna is determined in the configuration of the product. The antennas cable strand mounting sustains up to 165 MPH gust wind loading. Dual-Bank antennas fit within a 12 x 12 inch boundary box as shown in Figure 5.

Figure 5 1550 Series Boundary Box for Installed Dual-Band Antennas



Power



Warning

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



Warning

This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 366



Warning

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



Caution

Do not place the power injector in an unprotected outdoor environment because water could get into the power injector and cause a short circuit and possible fire.

The 1550 series access point supports the following power sources:

- AC power—100 to 480 VAC
- Quazi-AC power-over-cable (POC)—40 to 90 V
- External 12 VDC power
- Power-over-Ethernet—1550 power injector
- Internal 6 ampere-hour battery backup
- Alternative power source prioritization for custom applications is selectable with software upgrade



Warning

Connect the unit only to DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements in IEC 60950 based safety standards Statement 1033

The 1550 series access point can be connected to more than one power source. The access point detects available input sources and switches to the preferred power source using the following prioritization:

- AC or POC power
- External DC power
- 1520 power injector PoE power
- Internal battery power



Warning

This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028



Warning

To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.

Statement 1023



Caution

To provide inline PoE, you must use the 1520 series power injector. Other power injectors, PoE switches, and 802.3af power sources cannot provide adequate power, which may cause the access point to malfunction and cause over-current conditions at the power source. You must ensure that the switch port connected to the access point has PoE turned off.



Caution

Do not install the power injector and the power outdoors. They must be installed indoors.



Caution

When the access point is installed outdoors or in a wet or damp location, the AC branch circuit that is powering the access point should be provided with ground fault protection (GFCI), as required by Article 210 of the National Electrical Code (NEC).

Three AC power cord options are available:

- 40-ft (12.2-m) power cord for light pole installations in the US and Canada. One end of the power cord is terminated with an access point AC power connector and the other end is terminated with an AC plug (AIR-CORD-R3P-50NA=).
- 40-ft (12.2-m) power cord for use outside the US and Canada. One end of the power cord is terminated with an access point AC power connector and the other end is unterminated. (AIR-CORD-R3P-50UE=).
- 4-ft (1.2-m) streetlight power tap adapter for light pole installations in the US and Canada (AIR-PWR-ST-LT-R3P=).

Ethernet (PoE) Ports

The access point supports an Ethernet uplink port (POE-In) and a downlink port (POE-Out). The access point's Ethernet uplink port uses an RJ-45 connector (with weatherproofing) to link the access point to the 10BASE-T, 100BASE-T, or 1000BASE-T network. The Ethernet cable is used to send and receive Ethernet data and to optionally supply inline 56-VDC power from the power injector. The minimum length of this cable must be not less than 10 feet (3 meters).

The access point's downlink Ethernet port uses an RJ-45 connector (with weatherproofing) to provide LAN connectivity and IEEE 802.3af power to a peripheral customer device, such as a camera or sensor gateway. The BVI MAC addresses are printed on the label on the side of the access point



Tip The access point senses the Ethernet and power signals and automatically switches internal circuitry to match the cable connections.



Caution To provide inline PoE, you must use the 1520 series power injector. Other power injectors, PoE switches, and 802.3af power sources can not provide adequate power, which may cause the access point to malfunction and cause possible over-current conditions at the power source.

Cable Option

The factory-orderable cable option provides a cable modem and Power-over-Cable capabilities for the access point for high-speed data transfer and Internet access. When the cable option is installed, the access point uses its F-type cable connection to receive both data and power. Data is passed between wireless clients on the mesh network to the cable company's network via the access point's internal cable modem. In this configuration, the access point receives operating power from the cable. For detailed installation information, see the *Cisco Aironet 1550 Series Outdoor Access Point Hardware Installation Guide*. Configuration information can be found in the controller configuration guide of the controller you are using.

Fiber Option



Warning **Class 1 laser product.** Statement 1008

The factory-orderable fiber option provides a fiber input and output capability. Fiber is data is transmitted and received over a single-strand fiber cable which is connected to the access point using:

- 100BASE-BX10-U fiber Rugged small factor pluggable (SFP) module
- 1000BASELX single-mode Rugged SFP module
- 1000BaseSX multimode Rugged SFP module



Note SFP modules are not hot-swappable.

For convenience, two fiber connections are available on the access point. One connection is on the bottom of the unit (shown on Figure 1) and the other on the left side (shown on Figure 2). Client data is passed to the network controller through the fiber connection via a fiber capable switch. For detailed installation information about the fiber option, see the *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide*. Configuration information can be found in the controller configuration guide of the controller you are using.

6 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.

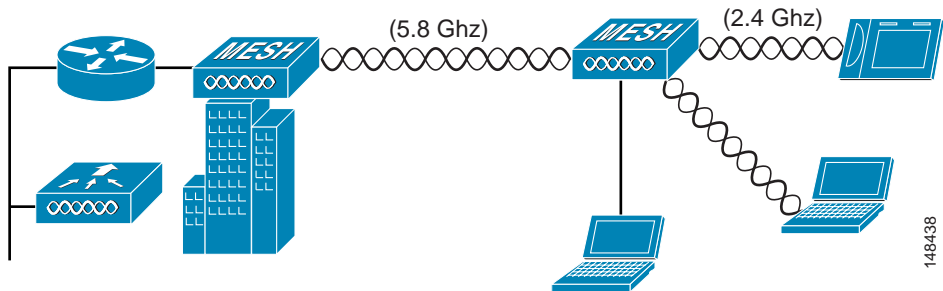
The access point plays two primary radio roles: a root access point (hereafter called a *RAP*) or a non-root access point (hereafter called a *MAP*), which is the default role of all access points. When the access point has a wired Ethernet or cable connector connection to the controller (through a switch), 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 band.

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 as shown in Figure 6. 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. Lightweight access point protocol (LWAPP) control traffic is also transferred over this bridged link.

Figure 6 Access Point Backhaul Example

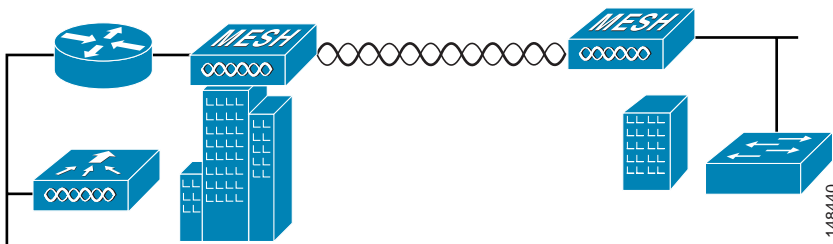


Point-to-Point Bridging

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 7. To support Ethernet bridging, you must enable bridging on the controller for each access point.

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 7 Point-to-Point Bridging Example

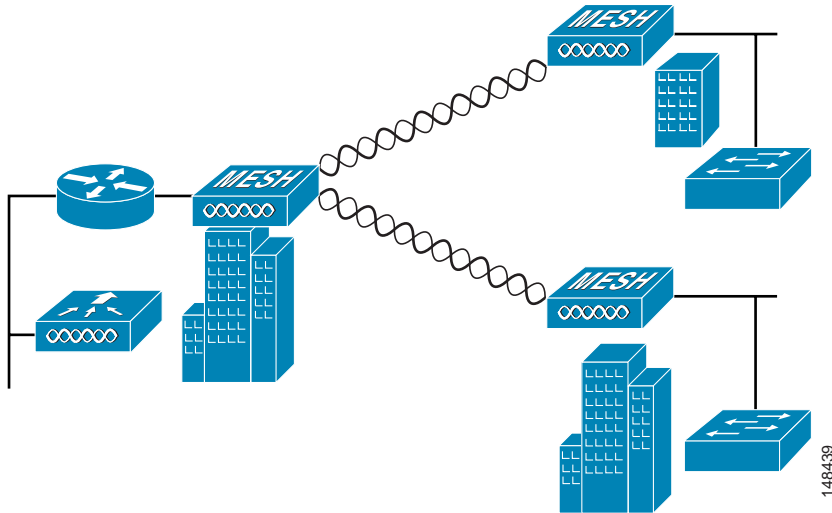


Point-to-Multipoint Bridging

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 8 illustrates an example of access point-to-multipoint bridging.

Figure 8 Point-to-Multipoint Bridging Example

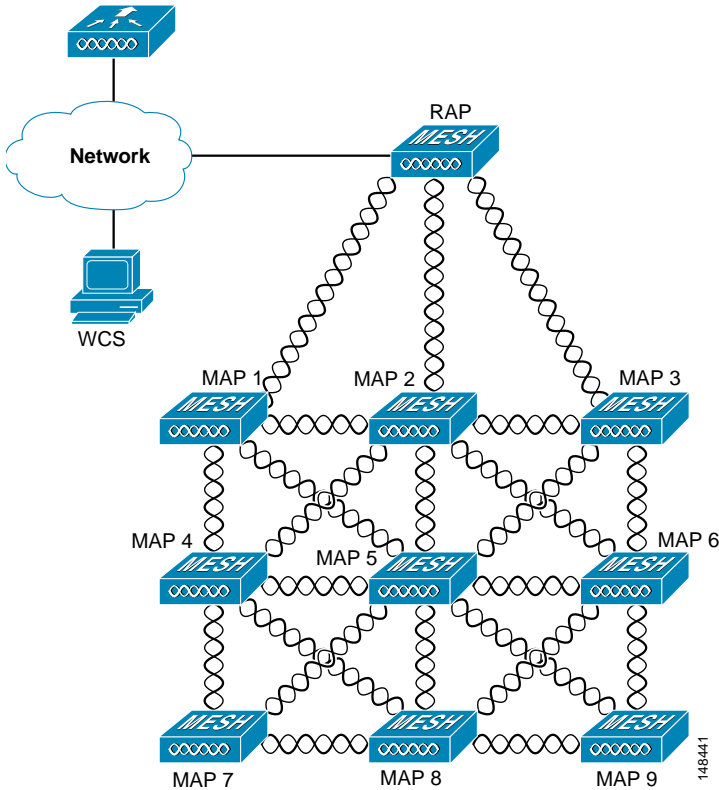


Mesh Network

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 patent-pending 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 bandwidth available for backhaul.

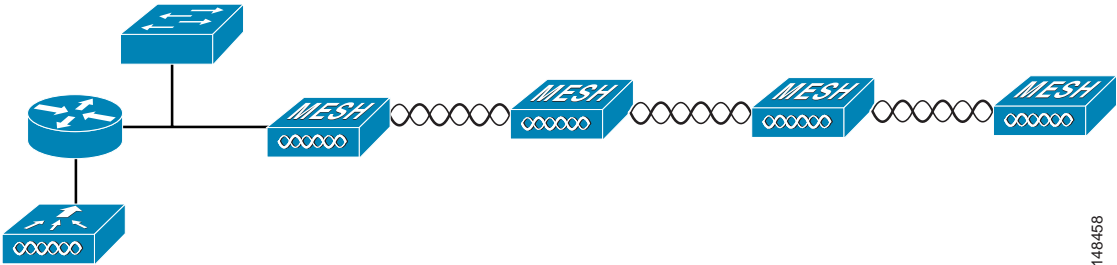
Figure 9 illustrates a typical mesh configuration using MAPs and RAPs.

Figure 9 Typical Mesh Configuration Using MAPs and RAPs

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 10 illustrates a typical Layer-3 wireless network configuration containing access points and a controller.

Figure 10 Typical Layer 3 Access Point Network Configuration Example



7 Preparing the Access Point

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

- For information on planning and initially configuring your Cisco mesh network, refer to the *Cisco Mesh Networking Solution Deployment Guide* or the *Cisco Aironet 1500 Series Wireless Mesh AP Design Guide*. These documents are available on cisco.com.
- Do not install the access point in an area where structures, trees, or hills obstruct radio signals to and from the access point.
- You can install the access point at any height, but best throughput is achieved when the access points are mounted at the same height.



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

Site Surveys

Cisco recommends that you perform a site survey before installing the equipment. A site survey reveals problems that can be resolved before the network is operational. Because 802.11a is unlicensed, 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.

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.



Tip When power is not readily available during a site survey, use an unrestricted power supply (UPS) to temporarily power the mesh link.

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

- 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 the correct antenna?
- Do you have access to both of the mesh site locations?
- Do you have the proper permits, if required?
- Do you have a partner? Never attempt to survey or work alone on a roof or tower.
- 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?

Avoiding Damage to Radios in a Testing Environment

The radios on outdoor units (bridges) have higher transmit power levels than radios on indoor units (access points). When you test high power radios in a link, you must avoid exceeding the receiver's maximum receive input level. At levels higher than the normal the receiver's operating range, packet error rate (PER) performance is degraded. At even higher levels, the receiver can be permanently damaged.

To avoid receiver damage and PER degradation, you can use one of the following techniques:

- Separate the omnidirectional antennas by at least 2 ft (0.6 m) to avoid receiver damage or by at least 25 ft (7.6 m) to avoid PER degradation.



Note These distances assume free space path loss and are conservative estimates. Required separation distances for damage and performance degradation levels in actual deployments will be less due to non line-of-sight propagation conditions.

- Reduce the configured transmit power to the minimum level.
- Use directional antennas and keep them pointed away from each other.

- Cable the radios together using a combination of attenuators, combiners, or splitters to achieve a total attenuation of at least 60 dB.

For a radiated test bed, the following equation describes the relationships among transmit power, antenna gain, attenuation, and receiver sensitivity:

$$\text{txpwr} + \text{tx gain} + \text{rx gain} - [\text{attenuation due to antenna spacing}] < \text{max rx input level}$$

Where:

txpwr = Radio transmit power level

tx gain = transmitter antenna gain

rx gain = receiver antenna gain

For a conducted test bed, the following equation describes the relationships among transmit power, antenna gain, and receiver sensitivity:

$$\text{txpwr} - [\text{attenuation due to coaxial components}] < \text{max rx input level}$$



Caution

Under no circumstances should you connect the antenna port from one access point to the antenna port of another access point without using an RF attenuator. If you connect antenna ports you must not exceed the maximum survivable receive level of 0 dBm. Never exceed 0 dBm or damage to the access point can occur. Using attenuators, combiners, and splitters having a total of at least 60 dB of attenuation ensures that the receiver is not damaged and PER performance is not degraded.

Before You Begin



Warning

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

Before you begin the installation process:

- Become familiar with the procedures for mounting the access point.
- Become familiar with the access point connections (Figure 1 on page 9, Figure 2 on page 10, and Figure 3 on page 11).
- Verify that the switch you are using to connect the controller is configured properly.

**Note**

For additional installation, mounting and safety information for the outdoor mesh access point, see the *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide*, which is available on Cisco.com, and *Safety Warnings for Cisco Aironet 1520 Series Outdoor Mesh Access Points*, which accompanies this guide.

8 Deploying the Access Point

**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

The access point is deployed on Layer 3 networks. Layer 3 is the default mode for a newly configured wireless LAN controller. This guide assumes that you will be deploying your access point on a Layer 3 network and a DHCP server is available.

Before deploying the access point, make sure the controller to which the access point will associate is properly configured by performing the following operations:

- Make sure that the wireless LAN controller is set to Layer 3 mode
- Verify the wireless LAN controller software version
- Record the access point BVI MAC address
- Enter the access point BVI MAC address to the wireless LAN controller filter list

Verifying the Wireless LAN Controller Mode

Follow these steps to verify that the wireless LAN controller mode is set to Layer 3:

-
- Step 1** Open your web-browser and enter the IP address of your wireless LAN controller. Be sure to precede the IP address with `https://`. A login screen appears.
 - Step 2** Enter your username and password. The default case-sensitive username and password are *admin* and *admin*. The Summary page appears.
 - Step 3** From the top menu bar, click **CONTROLLER**. The Controller General page appears.
 - Step 4** Verify that the LWAPP Transport Mode is set to Layer 3. If it is not, change it to Layer 3 and click **Apply**.
 - Step 5** Save any changes you made.

Step 6 From the menu bar, click **MONITOR** to return to the Monitor Summary page.

Verifying the Wireless LAN Controller Software Version

On the Summary page, you can verify the software version that the wireless LAN controller is running. If a version update is necessary, refer to the appropriate controller configuration documentation.

Recording the Access Point MAC Address

Use a text file to record the MAC address of all the access points you intend to deploy in your network. Having a file of access point MAC addresses will be of considerable value for future testing. While you are compiling the list, you might want to change the name of the access point to something you can easily remember. The name can contain up to 32 characters. The following example, *fisher_street:ea:co* contains the last four HEX characters of the access point MAC address.

Adding the Access Point MAC Address to the Wireless LAN Controller Filter List

The wireless LAN controller maintains an access point authorization MAC address list and responds to discovery requests from access points on that list. Follow these steps to add the access point MAC address (or MAC addresses) to the Wireless LAN controller filter list:

-
- Step 1** If you are not logged onto the wireless LAN controller, log on now. The Summary page appears.
 - Step 2** On the menu bar, click **SECURITY**. The Security RADIUS Authentication Server page appears.
 - Step 3** Under AAA in the left frame, click **MAC Filtering**. The Security MAC Filtering page appears.
 - Step 4** Click **New**. The MAC Filters New page appears.
 - Step 5** Enter the MAC address of the access point in the MAC Address field. You can also use the **config macfilter add** command to add a MAC filter entry to the controller.
 - Step 6** Select a WLAN ID or **Any WLAN** from the WLAN ID pop-up menu.
 - Step 7** Enter a description (32 characters maximum) of the access point in the Description field.
 - Step 8** Choose an interface from the Interface Name pop-up menu.
 - Step 9** Click **Apply**.
 - Step 10** Repeat this process to add other access points to the list.



Note

You can also use the controller CLI command **config macfilter add** to add a MAC filter entry on the controller.

Step 11 On the menu bar, click **Monitor** to return to the Monitor Summary page.

Verifying Controller Association

To verify that your access point is associated to the wireless LAN controller, perform these steps:

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

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.

Deployment Notes

Using a DHCP Server in a Layer 3 Mesh Network

To use a DHCP server in a Layer 3 mesh network, make sure the wireless LAN controller is in Layer 3 mode. You must also configure DHCP option 43 on the DHCP server. After the controller is restarted, the access point receives IP addresses from the DHCP server.

Configuring DHCP Option 43

You can use DHCP Option 43 to provide a list of controller IP addresses to the access points, enabling each access point to find and join a controller. This section contains a DHCP Option 43 configuration example on a Microsoft Windows 2003 Enterprise DHCP server for use with Cisco Aironet lightweight access points.

Additional information about Microsoft DHCP Option 43 is available on Cisco.com at the following URL:

http://www.cisco.com/en/US/tech/tk722/tk809/technologies_configuration_example09186a00808714fe.shtml

DHCP Option 43 server implementation information for Cisco IOS is available at cisco.com at the following URL:

<http://www.cisco.com/en/US/docs/wireless/technology/controller/deployment/guide/dep.html#wp1068287>



Note In DHCP Option 43, you should use the IP address of the controller management interface.



Note DHCP Option 43 is limited to one access point type per DHCP pool. You must configure a separate DHCP pool for each access point type.

Cisco Aironet 1000 and 1500 (1505 and 1510) series access points use a comma-separated string format for DHCP Option 43. Other Cisco Aironet access points use the type-length-value (TLV) format for DHCP Option 43. DHCP servers must be programmed to return the option based on the access point's DHCP Vendor Class Identifier (VCI) string (DHCP Option 60). The VCI strings for Cisco access points capable of operating in lightweight mode are listed in Table 3:

Table 3 Lightweight Access Point VCI Strings

Access Point	Vendor Class Identifier (VCI)
Cisco Aironet 1000 Series	Airespace.AP1200
Cisco Aironet 1040 Series	Cisco AP c1040
Cisco Aironet 1100 Series	Cisco AP c1100
Cisco Aironet 1130 Series	Cisco AP c1130
Cisco Aironet 1200 Series	Cisco AP c1200
Cisco Aironet 1240 Series	Cisco AP c1240
Cisco Aironet 1250 Series	Cisco AP c1250
Cisco Aironet 1260 Series	Cisco AP c1260
Cisco Aironet 1300 Series	Cisco AP c1300
Cisco Aironet 1500 Series	Cisco AP c1500 ¹
	Cisco AP.OAP1500 ² , Cisco AP.LAP1510 ² , or Cisco AP.LAP1505 ²
	Airespace.AP1200 ³
Cisco Aironet 1520 Series	Cisco AP c1520
Cisco Aironet 1550 Series	Cisco AP c1552 Cisco AP c1553

1. For controller release 4.1 or later.

2. For controller release 4.0, the VCI depends on the model.

3. For controller release 3.2.

The format of the TLV block for 1040, 1100, 1130, 1200, 1240, 1250, 1260, 1300, and 1520 series access points is listed below:

- Type: 0xf1 (decimal 241)
- Length: Number of controller IP addresses * 4
- Value: List of WLC management interfaces

To configure DHCP Option 43 for Cisco 1000 and 1500 (1505 and 1510) series lightweight access points in the embedded Cisco IOS DHCP server, follow these steps:

Step 1 Enter configuration mode at the Cisco IOS command line interface.

Step 2 Create the DHCP pool, including the necessary parameters such as default router and name server as shown in the following example:

```
ip dhcp pool pool name
network IP Network Netmask
default-router Default router
dns-server DNS Server
```

Where:

pool name is the name of the DHCP pool, such as AP1000.

IP Network is the network IP address where the controller resides, such as 10.0.15.1

Netmask is the subnet mask, such as 255.255.255.0

Default router is the IP address of the default router, such as 10.0.0.1

DNS Server is the IP address of the DNS server, such as 10.0.10.2

Step 3 Add the Option 60 line using the following syntax:

```
option 60 ascii "VCI string"
```

For the VCI string, use the value from Table 3. The quotation marks must be included.

Step 4 Add the Option 43 line using the following syntax:

```
option 43 ascii "Comma Separated IP Address List"
```

For example, if you are configuring Option 43 for Cisco 1000 or 1500 series access points using the controller IP addresses 10.126.126.2 and 10.127.127.2, add the following line to the DHCP pool in the Cisco IOS CLI. Be sure to include the quotation marks:

```
option 43 ascii "10.126.126.2,10.127.127.2"
```

The quotation marks must be included.

To configure DHCP Option 43 for Cisco Aironet 1040, 1100, 1130, 1200, 1240, 1250, 1260, 1300, and 1520 series lightweight access points in the embedded Cisco IOS DHCP server, follow these steps:

Step 1 Enter configuration mode at the Cisco IOS CLI.

Step 2 Create the DHCP pool, including the necessary parameters such as default router and name server. The commands used to create a DHCP pool are as follows:

```
ip dhcp pool pool name
network IP Network Netmask
default-router Default router
dns-server DNS Server
```

Where:

pool name is the name of the DHCP pool, such as AP1520.

IP Network is the network IP address where the controller resides, such as 10.0.15.1

Netmask is the subnet mask, such as 255.255.255.0

Default router is the IP address of the default router, such as 10.0.0.1

DNS Server is the IP address of the DNS server, such as 10.0.10.2

Step 3 Add the Option 60 line using the following syntax:

```
option 60 ascii "VCI string"
```

For the VCI string, use the value from Table 3. The quotation marks must be included.

Step 4 Add the option 43 line using the following syntax:

```
option 43 hex hex string
```

The hex string is assembled by concatenating the TLV values shown below:

Type + Length + Value

Type is always *f1(hex)*. *Length* is the number of controller management IP addresses times 4 in hex. *Value* is the IP address of the controller listed sequentially in hex.

For example, suppose that there are two controllers with management interface IP addresses, 10.126.126.2 and 10.127.127.2. The type is *f1(hex)*. The length is $2 * 4 = 8 = 08$ (*hex*). The IP addresses translate to *0a7e7e02* and *0a7f7f02*. Assembling the string then yields *f1080a7e7e020a7f7f02*. The resulting Cisco IOS command added to the DHCP scope is listed below:

```
option 43 hex f1080a7e7e020a7f7f02
```

9 Declarations of Conformity and Regulatory Information

This section provides declarations of conformity and regulatory information for the Cisco Aironet 1500 Series Access Point.

Manufacturers Federal Communication Commission Declaration of Conformity Statement



Models

AIR-CAP1552E-A-K9
AIR-CAP1552H-A-K9
AIR-CAP1552C-A-K9
AIR-CAP1552I-A-K9

Certification Numbers

FCC ID: LDK102074P

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 the integrated antennas. Any changes or modification to the product not expressly approved by Cisco could void the user's authority to operate this device.

VCCI Statement for Japan

Warning

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

警告

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCI-B

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.

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

208697

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

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 adaptors. Using any other cables/adaptors 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.

Industry Canada

Canadian Compliance Statement

AIR-CAP1552E-A-K9

IC: 2461B-102074P

AIR-CAP1552H-A-K9

AIR-CAP1552C-A-K9

AIR-CAP1552I-A-K9

This Class B Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte les exigences du Règlement sur le matériel brouilleur du Canada.

This device complies with Class B Limits of Industry Canada. 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.

Cisco Aironet Access Points are certified to the requirements of RSS-210. The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

This device has been designed to operate with antennas having a maximum gain of 4 dB for 2.4 GHz and 6 dB for 5 GHz. Antennas having a gain greater than 6 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

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

European Community, Switzerland, Norway, Iceland, and Liechtenstein

Models:

AIR-CAP1552E-E-K9

AIR-CAP1552H-E-K9

AIR-CAP1552C-E-K9

AIR-CAP1552I-E-K9

Declaration of Conformity with regard to the R&TTE Directive 1999/5/EC & Medical Directive 93/42/EEC

Български [Bulgarian]	Това оборудване отговаря на съществените изисквания и приложими клаузи на Директива 1999/5/EC.
Česky [Czech]:	Toto zařízení je v souladu se základními požadavky a ostatními odpovídajícími ustanoveními Směrnice 1999/5/EC.
Dansk [Danish]:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 1999/5/EF.
Deutsch [German]:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprechenden Vorgaben der Richtlinie 1999/5/EU.
Eesti [Estonian]:	See seade vastab direktiivi 1999/5/EÜ olulistele nõuetele ja teistele asjakohastele sätetele.
English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 1999/5/CE.
Ελληνική [Greek]:	Αυτός ο εξοπλισμός είναι σε συμμόρφωση με τις ουσιώδεις απαιτήσεις και άλλες σχετικές διατάξεις της Οδηγίας 1999/5/EC.
Français [French]:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes de la Directive 1999/5/EC.
Íslenska [Icelandic]:	Þetta tæki er samkvæmt grunnkröfum og öðrum viðeigandi ákvæðum Tilskipunar 1999/5/EC.
Italiano [Italian]:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/CE.
Latviešu [Latvian]:	Šī iekārta atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.

Nederlands [Dutch]:	Dit apparaat voldoet aan de essentiële eisen en andere van toepassing zijnde bepalingen van de Richtlijn 1999/5/EC.
Malti [Maltese]:	Dan l-apparat huwa konformi mal-htigiet essenzjali u l-provedimenti l-oħra rilevanti tad-Direttiva 1999/5/EC.
Magyar [Hungarian]:	Ez a készülék teljesíti az alapvető követelményeket és más 1999/5/EK irányelvben meghatározott vonatkozó rendelkezéseket.
Norsk [Norwegian]:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-direktiv 1999/5/EF.
Polski [Polish]:	Urządzenie jest zgodne z ogólnymi wymaganiami oraz szczególnymi warunkami określonymi Dyrektywą UE: 1999/5/EC.
Português [Portuguese]:	Este equipamento está em conformidade com os requisitos essenciais e outras provisões relevantes da Directiva 1999/5/EC.
Română [Romanian]:	Acest echipament este în conformitate cu cerințele esențiale și cu alte prevederi relevante ale Directivei 1999/5/EC.
Slovensko [Slovenian]:	Ta naprava je skladna z bistvenimi zahtevami in ostalimi relevantnimi pogoji Direktive 1999/5/EC.
Slovensky [Slovak]:	Toto zariadenie je v zhode so základnými požiadavkami a inými príslušnými nariadeniami direktív: 1999/5/EC.
Suomi [Finnish]:	Tämä laite täyttää direktiivin 1999/5/EY olennaiset vaatimukset ja on siinä asetettujen muiden laitetta koskevien määräysten mukainen.
Svenska [Swedish]:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

142730

The following standards were applied:

EMC—EN 301.489-1 v1.4.1; EN 301.489-17 v2.1.1

Health & Safety—EN60950-1: 2005; EN 50385: 2002

Radio—EN 300 328 v 1.7.1; EN 301.893 v 1.5.1

The conformity assessment procedure referred to in Article 10.4 and Annex III of Directive 1999/5/EC has been followed.

This device also conforms to the EMC requirements of the Medical Devices Directive 93/42/EEC.



Note This equipment is intended to be used in all EU and EFTA countries. Outdoor use may be restricted to certain frequencies and/or may require a license for operation. For more details, contact Cisco Corporate Compliance.

The product carries the CE Mark:



Declaration of Conformity for RF Exposure

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. The minimum separation distance from the antenna to general bystander is 7.9 inches (20cm) to maintain compliance.

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 2. The minimum separation distance from the antenna to general bystander is 7.9 inches (20cm) to maintain compliance.

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. The minimum separation distance from the antenna to general bystander is 20cm (7.9 inches).

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. The minimum separation distance from the antenna to general bystander is 20cm (7.9 inches).

Administrative Rules for Cisco Aironet Access Points in Taiwan

This section provides administrative rules for operating Cisco Aironet access points in Taiwan. The rules for all access points 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。

127DAB

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

4.7.5 在 5.25-5.35 兆赫頻帶內操作之無線資訊傳輸設備，限於室內使用。

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。

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.

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-CAP1552E-x-K9

AIR-CAP1552H-x-K9

AIR-CAP1552C-x-K9

AIR-CAP1552I-x-K9

Regulatory Information

Figure 11 contains Brazil regulatory information for the access point models identified in the previous section.

Figure 11 Brazil Regulatory Information



Portuguese Translation

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

English Translation

This equipment operates on a secondary basis and consequently must accept harmful interference, including interference from stations of the same kind. This equipment may not cause harmful interference to systems operating on a primary basis.

Declaration of Conformity Statements

All the Declaration of Conformity statements related to this product can be found at the following location: <http://www.ciscofax.com>

10 In Case of Difficulty

Help is available from Cisco should you experience difficulties; however, before contacting Cisco, look for a solution to your problem in the following places:

- The Troubleshooting section of this guide

- The troubleshooting section of the *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide*
- The *Troubleshooting a Mesh Network* troubleshooting guide found on cisco.com at http://www.cisco.com/en/US/products/ps8368/prod_troubleshooting_guides_list.html
- The Tools and Resources section on the Technical Support and Documentation page at cisco.com

Follow these steps to contact the Technical Assistance Center on cisco.com:

-
- Step 1** Open your browser and go to <http://www.cisco.com/>.
- Step 2** Click **Support**. The Support page appears.
- Step 3** Choose the link that best serves your support requirements.



Note Click **My Tech Support** if you are a registered user.

- Step 4** Follow the instructions on the page.
-

Troubleshooting



Caution No serviceable parts inside. Do not open.

This section provides troubleshooting procedures for basic problems with the access point. For the most up-to-date, detailed troubleshooting information, refer to the Cisco Support website at cisco.com.

Guidelines for Using the Access Point

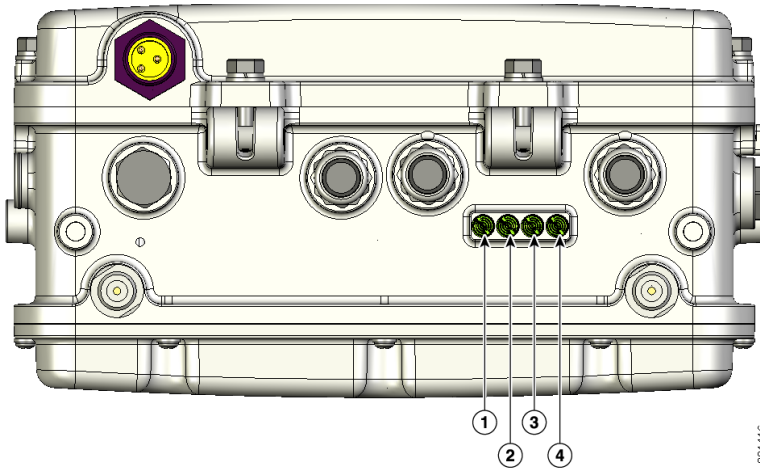
You should keep these guidelines in mind when you use the access point:

- The access points can only communicate with controllers and cannot operate independently.
- The access point communicates only with controllers and does not support Wireless Domain Services (WDS). The access points cannot communicate with WDS devices. However, the controller provides functionality equivalent to WDS when an access point associates to it.
- The access point supports Layer 3 LWAPP 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. Layer 3 operation is scalable and is recommended by Cisco. Unless it has a static IP address, 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 LWAPP communications. The routes to the primary, secondary, and tertiary controllers must allow IP packet fragments.
- Before deploying your mesh access points ensure that the following has been done:
 - Your controllers are connected to switch ports that are configured as trunk ports.
 - Your mesh access points are connected to switch ports that are configured as untagged access ports.
 - A DHCP server is reachable by your mesh access points and has been configured with Option 43. Option 43 is used to provide the IP addresses of the Management Interfaces of your controllers. Typically, a DHCP server can be configured on a Cisco Layer 3 switch or router.
 - Optionally a DNS server can be configured to enable a local domain Cisco LWAPP controller (CISCO-LWAPP-CONTROLLER.<local domain>) to resolve to the IP address of the Management Interface of your controller.
 - Your controllers are configured and reachable by the mesh access points.
 - Your controllers are configured with the MAC addresses of the mesh access points.

Checking the LEDs

Four LEDs, located between the PoE-In and PoE-Out connectors, monitor the status of the access point's power, uplinks, and radios. Figure 12 identifies and describes the LED functions. Table 7 provides additional LED information.

Figure 12 LEDs



1	Status LED— Displays the current status of the access point and power.	3	Radio 1 Status LED—Displays the status of the 802.11n radio.
2	Uplink Status LED—Displays the status of all uplink connections (Ethernet, fiber, cable, and mesh).	4	Radio 2 Status LED—Displays the status of the 802.11n radio.

Table 4 Access Point LED Descriptions

Color ¹	Status LED	Uplink LED	RF-1 and RF-2 LEDs
Dark	No power applied	No physical connector present or all uplink ports are down.	Radio turned off
Green	Access point operating normally	Uplink ports operating normally	Radios operating normally
Blinking green	Loading or upgrading IOS image	–	–
Blinking red	Mesh Authentication mode	–	–

Table 4 Access Point LED Descriptions (continued)

Color ¹	Status LED	Uplink LED	RF-1 and RF-2 LEDs
Red	Firmware failure	–	Firmware failure
Cycling red/green	LWAPP discovery	–	–

1. All LEDs dark indicates no power is applied.
All LEDs amber indicates the access point power supply is on.



Note Regarding LED status colors, it is expected that there will be small variations in color intensity and hue from unit to unit. This is within the normal range of the LED manufacturer's specifications and is not a defect.

See the *Cisco Aironet 1550 Series Outdoor Mesh Access Point Hardware Installation Guide* for a detailed description of the LEDs and additional troubleshooting tips.

Misconfigured Access Point IP address

IP address misconfiguration can occur when you are re-addressing a segment of your mesh network and you start at the mesh access point connected to the wired network (RAP). To avoid this problem, always start the IP addressing changes from the farthest access point and work your way back to the root access point. This problem might also happen if you move equipment such as uninstalling an mesh access point and then redeploying with a different IP subnet in another physical location on the mesh network.

Another option to fix this misconfigured IP address is to physically take a controller in Layer 3 mode with a root access point to the location of the misconfigured mesh access point. Set the bridge group name for the root access point to match the misconfigured access point. Add the access point's MAC address to the controller's filter list. When the misconfigured access point appears in the controller's Summary page, configure the access point with an IP address.

If you are using a static IP address on the access point and plan on redeploying the access point on another subnet, perform a **clear config** command from the controller for that access point while it is joined before you remove it from the network.

Verifying the Controller MAC Filter List

Prior to 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. To view the MAC addresses added to the controller MAC filter list and ensure the MAC filter list is enabled, 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 (HTTPS) using a web browser and click **SECURITY > AAA > MAC Filtering** to view the MAC addresses added to the controller filter list. Then click **Wireless > Mesh** to ensure the MAC filter list is enabled.

11 Cisco 90-Day Limited Hardware Warranty Terms

There are special terms applicable to your hardware warranty and various services that you can use during the warranty period. Your formal Warranty Statement, including the warranties and license agreements applicable to Cisco software, is available on Cisco.com. Follow these steps to access and download the *Cisco Information Packet* and your warranty and license agreements from Cisco.com.

1. Launch your browser, and go to this URL:

http://www.cisco.com/en/US/products/prod_warranties_listing.html

The Warranties and License Agreements page appears.

2. To read the *Cisco Information Packet*, follow these steps:
 - a. Click the **Information Packet Number** field, and make sure that the part number **78-5235-03D0** is highlighted.
 - b. Select the language in which you would like to read the document.
 - c. Click **Go**.

The Cisco Limited Warranty and Software License page from the Information Packet appears.

- d. Read the document online, or click the **PDF** icon to download and print the document in Adobe Portable Document Format (PDF).



Note

You must have Adobe Acrobat Reader to view and print PDF files. You can download the reader from Adobe's website: <http://www.adobe.com>

3. To read translated and localized warranty information about your product, follow these steps:
 - a. Enter this part number in the Warranty Document Number field:
78-5236-01C0
 - b. Select the language in which you would like to view the document.
 - c. Click **Go**.
The Cisco warranty page appears.
 - d. Read the document online, or click the **PDF** icon to download and print the document in Adobe Portable Document Format (PDF).

You can also contact the Cisco service and support website for assistance:

<http://www.cisco.com/en/US/support/>

The following are special terms applicable to your hardware warranty.

Duration of Hardware Warranty

Ninety (90) Days

Replacement, Repair, or Refund Policy for Hardware

Cisco or its service center will use commercially reasonable efforts to ship a replacement part within ten (10) working days after receipt of a Return Materials Authorization (RMA) request. Actual delivery times can vary, depending on the customer location.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

To Receive a Return Materials Authorization (RMA) Number

Contact the company from whom you purchased the product. If you purchased the product directly from Cisco, contact your Cisco Sales and Service Representative.

Complete the information below, and keep it for your reference.

Company product purchased from	
Company telephone number	
Product model number	
Product serial number	
Maintenance contract number	

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