CHAPTER 1

Overview

The Cisco Aironet 1520 Series Outdoor Mesh Access Point (hereafter called the *access point*) is a wireless device designed for wireless client access, point-to-point bridging, point-to-multipoint bridging, and point-to-multipoint mesh wireless connectivity. The access point is a standalone unit that can be mounted on a streetlight pole or on a building wall or overhang. It is a self-contained outdoor unit that can be configured with a wired backhaul connection to an Ethernet segment for a rooftop deployment or can be configured with a wireless backhaul for a pole-top deployment. The access point can be installed where power is available without the need for a wired network connection.

The access point is available in two models: LAP1522 (supports 2.4-GHz and 5-GHz radios) and LAP1521 (supports a 2.4-GHz radio).The access point provides client access and wireless mesh backhaul that supports 6 to 54 Mbps data rates without the need for a license. The LAP1522 model dedicates the 5-GHz radio for backhaul operations to reach a wired network and uses the 2.4-GHz radio for wireless clients. The LAP1521 model uses the 2.4- or 5-GHz radio for both backhaul and wireless clients.

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 *Cisco Wireless LAN Controller Configuration Guide.* The *Deployment Guide: Cisco Mesh Networking Solution* 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 (WPA2) and employs hardware-based Advanced Encryption Standard (AES) encryption between wireless nodes to provide end-to-end security.

This chapter provides information on the following topics:

Main Hardware Features

Some of the access point's main hardware features are listed below:

- One or two radios (2.4- and 5-GHz)—see the "Single or Dual Radio Operation" section on page 3
- External radio antennas—see the "External Antennas" section on page 3
- Multiple power sources—see the "Multiple Power Sources" section on page 4
- Rugged metal enclosure—see the "Metal Enclosure" section on page 5
- Optional Ethernet ports—see the "Ethernet Ports" section on page 5
- Optional cable modem—see the
- Optional hardware—see the "Optional Hardware" section on page 6
  - Cable strand mount kit
  - Pole mount kit
  - 150 ft (45.72 m) Ethernet outdoor cable
- Optional battery backup—future availability

Figure 1 shows the access point connectors.

Figure 1 Access Point Connectors

1		4	
2		5	
3		6	

Connectors

The optional featues of the access point support these connectors (see Figure 1):

- Ethernet (PoE) uplink connector—(type RJ45 with TBD for waterproofing)
- Ethernet downlink connector—(type RJ45 with TBD for waterproofing)
- Three Type N antenna connectors (2.4-GHz radio)
- One Type N antenna connector (5-GHz radio)
- Fiber-optic connector—Small form factor pluggable (SFP)
- Power-over-cable (POC) connector—(TBD)
- AC power connector

Single or Dual Radio Operation

The access point is available in two models: LAP1522 (supports 2.4-GHz and 5-GHz radios) and LAP1521 (supports a 2.4- or 5-GHz radio). The radios use external antennas (see “External Antennas”).

The LAP1522 model supports simultaneous dual-radio operation using a 2.4-GHz 802.11b/g radio and a 5-GHz 802.11a radio. The LAP1521 model supports both mesh backhaul operation and wireless clients using a single 2.4- or 5-GHz radio.

The 5-GHz radio incorporates an Unlicensed National Information Infrastructure (UNII) radio transceiver operating in the UNII 5-GHz frequency bands. The 5-GHz radio on the access point is used for backhaul operations to the controller. The 5-GHz radio can also operate in the 4.9-GHz Public Safety band in the United States.

Note The 4.9-GHz 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 2.4-GHz radio supports three antennas for multi-input, single output (MISO) operation. The radio uses three receivers to support maximum ratio combining (MRC) to enhance receiver performance. MRC is a technique that combines the signals from multiple receivers in a manner to optimize the signals. MRC can provide up to 3 dB of increased receive signal strength.

The access point does not support both radios configured for backhaul support

External Antennas

The access point is equipped with three N-type radio frequency (RF) connector on the top of the unit for external 2.4-GHz antennas to support multiple input single output (MISO) operation. The LAP1522 model also has one to three N-type RF connectors on the bottom of the unit for external 5-GHz antennas (see Figure 1). 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 and Table 2), subject to local regulatory requirements. When you are installing third-party antennas, they must be installed with all waterproofing steps recommended by the third-party manufacturer.

Note When you mount the access point in an indoor environment, you must also mount the antennas in an indoor environment.

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

Table 1 and Table 2 lists the supported external antennas for the access point.

Table 1 External 5-GHz Antennas

Part Number	Model	Gain (dBi)
AIR-ANT5180V-N	5-GHz compact omnidirectional[1]	8
	4.9-GHz compact omnidirectional[2]	7
AIR-ANT58G10SSA-N	5-GHz sector	9.5
AIR-ANT5114P-N	4.9- to 5-GHz patch[2]	14.0
AIR-ANT5117S-N	4.9- to 5-GHz 90-degree sector[2]	17.0

1. The compact omnidirectional antennas mount directly on the access point.
2. The use of the 4.9-GHz band requires a license and may be used only by qualified Public Safety operators as defined in section 90.20 of the FCC rules.

Table 2 External 2.4-GHz Antennas

Part Number	Model	Gain (dBi)
AIR-ANT2450V-N	2.4-GHz compact omnidirectional[1]	5.5
AIR-ANT2480V-N	2.4 GHz omnidirectional	8.0

1. The compact omnidirectional antennas mount directly on the access point.

Multiple Power Sources

The access point supports these power sources:

- Power-over-Ethernet (POE)—1520 power injector
- AC power—90 to 480 VAC
- Quazi-AC power-over-cable (POC)—40 to 90 V
- External 12 VDC
- Internal battery

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

- AC power or POC power
- External 12VDC power
- 1250 Power Injetor PoE power
- Internal Battery power

Note The power source default prioritization can be user reconfigured.

Caution To provide inline PoE, you must use the 1250 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 The power injector and the power module must be used in an indoor environment only.

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).

The AC power cord options are listed below:

- 40-ft (12.2-m) power cord for light pole installations in the US and Canada.
- 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.
- 4-ft (1.2-m) streetlight power tap adapter for light pole installations in the US and Canada.

Ethernet Ports

The access point supports an Ethernet uplink port and a downlink port. The access point's Ethernet uplink port uses an RJ-45 connector (with weatherproofing) to link the access point to your10BASE-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 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 Ethernet MAC addresses are printed on the label on the side of the access point (refer to the "Finding the Product Serial Number - TBD" section on page 13).

Tips 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 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.

Metal Enclosure

The access point uses a metal enclosure that can accommodate both indoor or outdoor operating environments and an industrial temperature operating range of (–40°F (–40°C) to 131°F (55°C). The access point complies with NEMA Type 4X and IP66 requirements from IEC60529.

Note When the access point is mounted indoors, the antennas must also be mounted indoors.

Cable Modem

Optional Hardware

Some of the access point hardware options are listed below:

- Cable modem—DOCSIS 2.0 compatible for direct connection to cable lines.
- Fiber optic module—uses Small Form Factor Pluggable (SFP) connections for connection to fiber optic lines.
  - Supports 100BaseBX modules
  - Supports 15.5 mi (25 km) of fiber-optic cable.
- Pole mount kit (SKU - TBD)—provides hardware for mounting the access point to the top of a metal or wood pole, such as a streetlight pole.
- Streetlight power tap adapter (SKU - TBD)—connects to the light control connector on a streetlight pole and provides AC power to the access point.
- Outdoor rated Ethernet cable (???)—used to supply Ethernet and optional DC power to the access point.
- 1520 power injector (SKU - TBD)—provides power-over-Ethernet (PoE) to the access point.
- AC power cord (for additional information, refer to the “Multiple Power Sources” section on page 4).
- Future availability—battery backup module (80 Watt hour (WHr). The integrated battery can be used to power the unit when external power sources are not available.
  - Four hour access point operation using two radios at 77°F (25°C)—with PoE output port off
  - Two hour access point operation using two radios at 77°F (25°C)— with PoE output port on
  - User installable and replaceable
-

Network Configuration 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*). When the access point has a wired Ethernet connection to the controller (through a switch), the radio role is called 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 also support wireless clients on the band not being used for the backhaul interface.

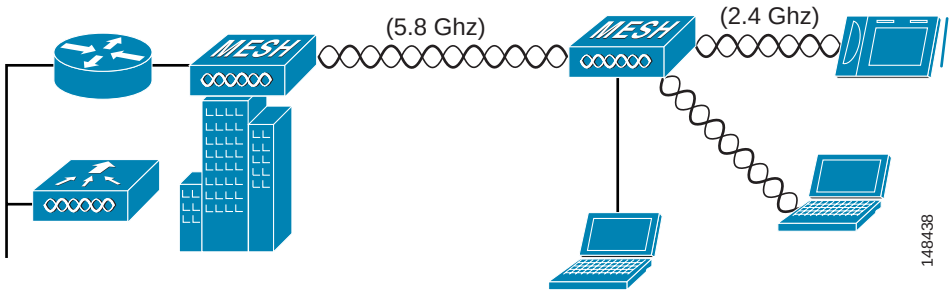
When the access point does not have a wired Ethernet connection to the controller (through a switch), the radio role is called a MAP. The MAPs have a wireless connection (through the backhaul interface) to other MAPs and finally to a RAP with an Ethernet connection through a switch to the controller. 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). MAPs also support wireless clients on the band not used for the backhaul interface.

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 2). 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.

Note The LAP 1505 model uses the 2.4-GHz radio for backhaul and wireless client operations.

Figure 2 Access Point Backhaul Example



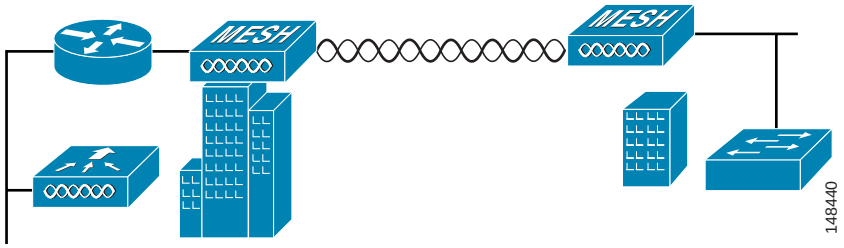
Point-to-Point Bridging

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

Note The LAP 1505 model uses the 2.4-GHz radio for bridging operations.

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 3 Access Point Point-to-Point Bridging Example

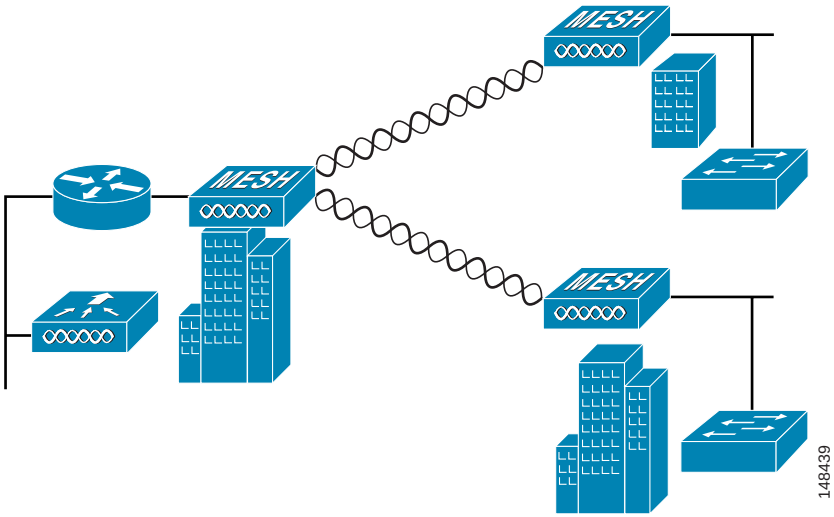


Point-to-Multipoint Bridging

The access points can be used as a RAP to connect multiple remote MAPs with their associated wired networks (see Figure 4). 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 4 Access Point Point to Multipoint Bridging Example



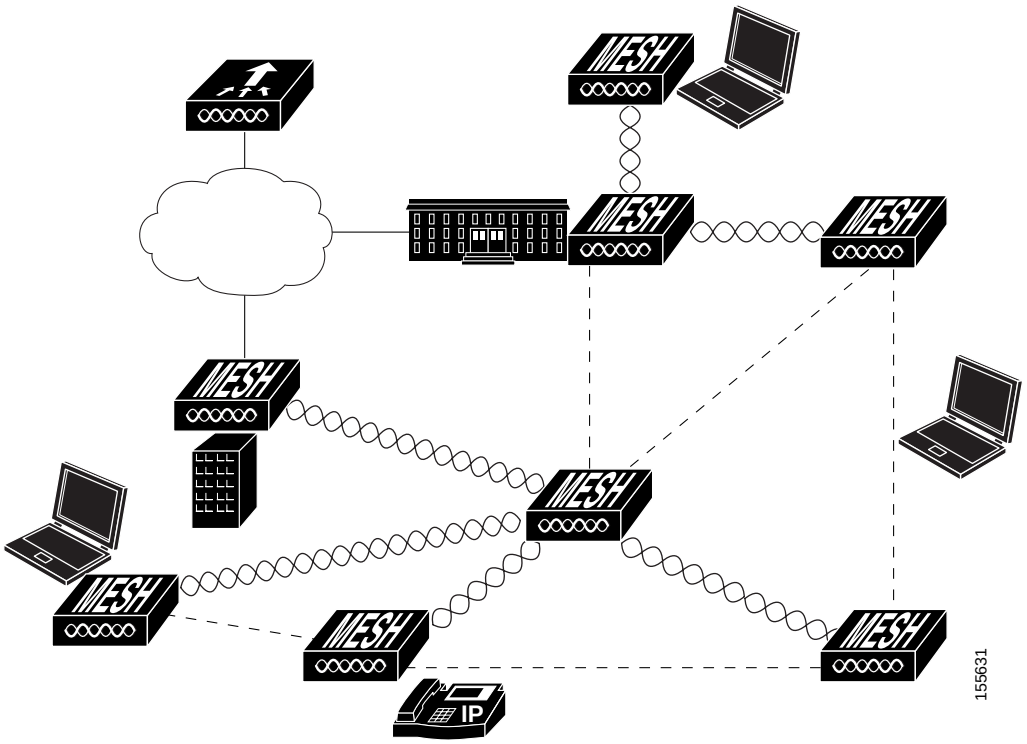
Mesh Network

The access points are 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.

Figure 5 illustrates a typical mesh configuration using MAPs and RAPs.

Figure 5 Typical Mesh Configuration Using Access Points



Layer 2 and Layer 3 Network Operation

The access points support Layer 2 or Layer 3 network operation. In Layer 2 configurations, the access point and the controller are on the same subnet and communicate with encapsulated Ethernet frames using MAC addresses rather than IP addresses. Layer 2 configurations are typically not scalable into larger networks. Additionally, Layer 2 operation is supported only by the Cisco 4400 series controllers.

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

Figure 6 Typical Layer 3 Access Point Network Configuration Example

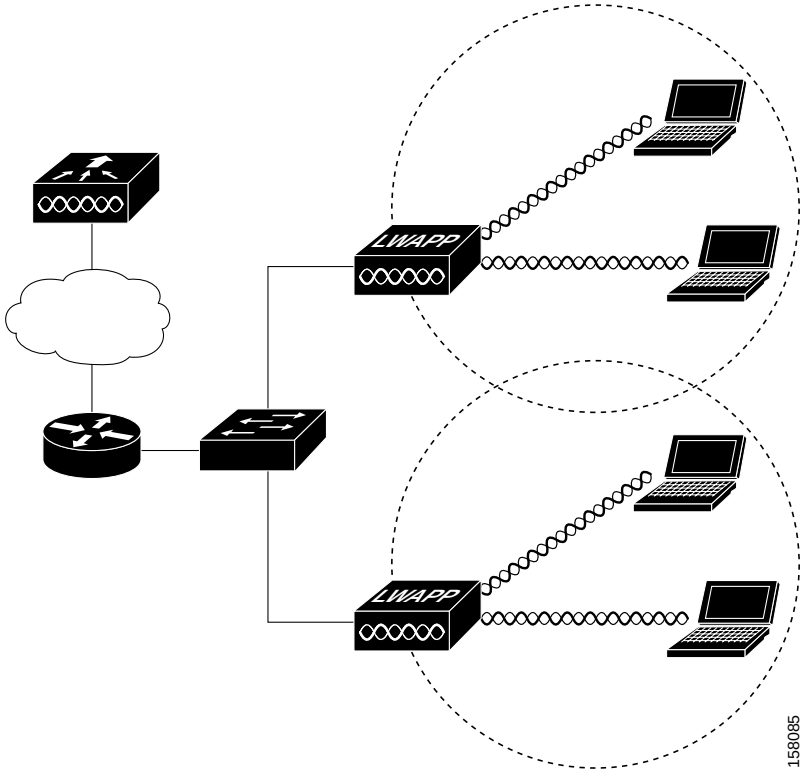
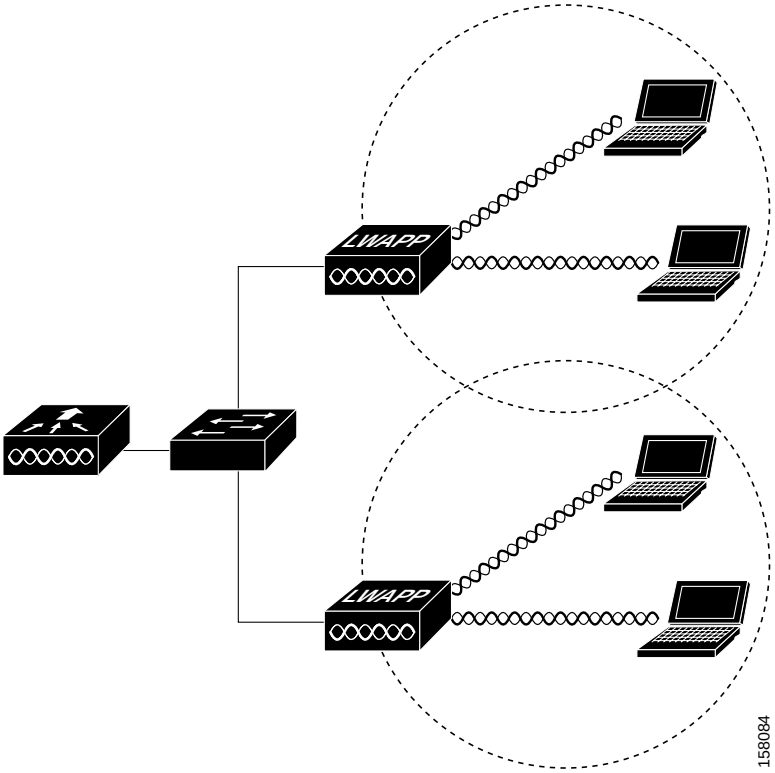


Figure 7 illustrates a typical Layer 2 network configuration. In a Layer 2 configuration, the controller and the access points are on the same subnet.

Figure 7 Typical Layer 2 Access Point Network Configuration Example



APPENDIX B

Declarations of Conformity and Regulatory Information

This appendix provides declarations of conformity and regulatory information for the Cisco Aironet 1520 series lightweight outdoor mesh access point.

This appendix contains the following sections:

Manufacturers Federal Communication Commission Declaration of Conformity Statement

Model:

AIR-LAP1522AG-A-K9
AIR-LAP1521G-A-K9

FCC Certification number:

AIR-RM1520G-A-K9: LDK102064
AIR-RM1520A-A-K9: LDK102063

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.

Note The use of the 4.9-GHz band requires a license and may be used only by qualified Public Safety operators as defined in section 90.20 of the FCC rules (LAP1510 model only).

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 VCCI 準拠クラスB機器（日本）
この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをしてください。

Department of Communications—Canada

IC Certification Number:

AIR-RM1520G-A-K9:	2461B-102064
AIR-RM1520A-A-K9:	2461B-102063

Canadian Compliance Statement

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

Cet appareil numerique de la classe B respecte les exigences du Reglement sur le material broilleur 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’s access points are certified to the requirements of RSS-210 issue 5, RSP 100, and RSS 102 for spread spectrum devices.

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.T he antennas should be positioned more than 6.56 feet (2 meters) from your body or nearby persons.

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

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.

CHAPTER 7

Cisco Aironet 1520 Series Mesh Access Points

This chapter lists the 1520 series mesh access point IEEE 802.11b/g (2.4-GHz) and IEEE 802.11a (5-GHz) channels and the maximum power levels supported by the world's regulatory domains. For additional product hardware information refer to the *Cisco Aironet 1520 Series Outdoor Mesh Access Point Hardware Installation Guide.*

The AIR-LAP1522 access point model supports both 802.11b/g and 802.11a radios, The AIR-LAP1521 access point model only supports a 802.11b/g radio.

The following topics are covered in this chapter:

Channels and Maximum Power Levels

IEEE 802.11b/g (2.4-GHz Band)

When shipped from the factory, theAIR-LAP1522G access points support the channels and maximum power levels listed in Table 7-1 for their regulatory domain.

Note In Table 7-1, the operating data rates (in Mbps) are shown in the CCK and OFDM table cells. For example: *CCK 1-11* indicates CCK data rates of 1 to 11 Mbps and *All* indicates all CCK and OFDM data rates.

Table 7-1 Channels and Maximum Conducted Power for the 802.11b/g Radio with Up to 5.5-dBi Antennas

Channel ID	Center Freq (MHz)	Maximum Conducted Power Levels (dBm) in the Regulatory Domains		
		–A		
		CCK 1-11	OFDM 6-48	OFDM 54
1	2412	28	25	25
2	2417	28	26	26
3	2422	28	27	26
4	2427	28	27	26
5	2432	28	27	26
6	2437	28	27	26
7	2442	28	27	26
8	2447	28	27	26
9	2452	28	27	26
10	2457	28	26	26
11	2462	28	25	25
12	2467	–	–	–
13	2472	–	–	–
14	2484	–	–	–

Table 7-2 Channels and Maximum Conducted Power for the 802.11b/g Radio with Up to 8.0-dBi Antennas

Channel ID	Center Freq (MHz)	Maximum Conducted Power Levels (dBm) in the Regulatory Domains		
		–A		
		CCK 1-11	OFDM 6-48	OFDM 54
1	2412	28	24	24
2	2417	28	25	25
3	2422	28	26	26
4	2427	28	27	26
5	2432	28	27	26
6	2437	28	27	26
7	2442	28	27	26
8	2447	28	27	26
9	2452	28	26	26
10	2457	28	25	25
11	2462	28	24	24
12	2467	–	–	–
13	2472	–	–	–
14	2484	–	–	–

IEEE 802.11a (5-GHz Band)

When shipped from the factory, the AIR-LAP1522AG access points support the channels and maximum power levels listed in Table 7-4 for their regulatory domain.

Note In Table 7-4, the operating data rates (in Mbps) are shown in the OFDM table cells. For example: *OFDM 6-36* indicates 6 to 36 Mbps data rates.

Table 7-3 Channels and Maximum Conducted Power for IEEE 802.11a Radio with Up to 17 dBi Antennas

Channel ID	Center Frequency (MHz)	Bandwidth (MHz)	Maximum Conducted Power Levels (dBm) in the Regulatory Domains								
			–A			–N			–T		
			OFDM 6-36	OFDM 48	OFDM 54	OFDM 6-36	OFDM 48	OFDM 54	OFDM 6-36	OFDM 48	OFDM 54
(4900 to 5100 MHz)											
20	4950	20	20	20	20	–	–	–	–	–	–
21	4955	20	20	20	20	–	–	–	–	–	–
22	4960	20	20	20	20	–	–	–	–	–	–
23	4965	20	20	20	20	–	–	–	–	–	–
24	4970	20	20	20	20	–	–	–	–	–	–
25	5975	20	20	20	20	–	–	–	–	–	–
26	4980	20	20	20	20	–	–	–	–	–	–
5725 to 5850 MHz											
149	5745	20	28	27	26	28	27	26	28	27	26
153	5765	20	28	27	26	28	27	26	28	27	26
157	5785	20	28	27	26	28	27	26	28	27	26
161	5805	20	28	27	26	28	27	26	28	27	26
165	5825	20	28	27	26	28	27	26	28	27	26

Special Country Restrictions

Table 7-4 lists special restrictions for wireless operation in some countries.

Table 7-4 Special Country Restrictions for Wireless Operation

Country	Frequency Band (GHz)	Regulatory Domain	Special Limitation and Restrictions
Australia	5	–N	5 GHz maximum antenna gain limited to 7 dBi.
Mexico	2.4	–N	End user must limit 2.4 GHz operation to 2450 to 2483.5 MHz and 36 dBm EIRP[1].
New Zealand	5	–N	5 GHz maximum antenna gain limited to 7 dBi.
United States	4.9	–A	The use of the 4.9-GHz band requires a license and may be used only by qualified Public Safety operators as defined in section 90.20 of the FCC rules.

1. EIRP (dBm) = maximum output power (dBm) + antenna gain (dBi)

Changing the Lightweight Access Point Output Power

This section provides instructions for changing the 1500 series access point output power to comply with the maximum power limits imposed by special regulatory and country restrictions (see the "Special Country Restrictions" section on page 7-5). Follow these instructions to change the output power settings using a controller and your browser:

Note Administrator privileges may be required in order to change access point settings.

Caution To meet regulatory restrictions, the access point and the external antenna must be professionally installed. The network administration or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password-protected by the network administrator to maintain regulatory compliance.

The output power on the 1500 series access points can be changed only by using a Cisco wireless LAN controller (2600 series or 4400 series), the controllers on a Cisco Wireless Services Module (WiSM), or using Cisco Wireless Control System (WCS).

Note See the *Cisco Wireless LAN Controller Configuration Guide* for more details on how to to configure your access point using the web-browser interface.

Follow these steps to change the 1500 series access point's output power to meet local regulations using a controller:

Step 1 Open your Internet browser. You must use Microsoft Internet Explorer 6.0.2800 or a later release.

Step 2 Enter **https://IP address** (where *IP address* is the controller's IP address) in the browser address line and press **Enter**. A user login screen appears.

Step 3 Enter the username and password and press **Enter**. The controller's summary page appears.

Note The username and password are case-sensitive.

Step 4 Click **Wireless** > **802.11a Radios** or **802.11b/g Radios** and a list of associated access points appears.

Step 5 Choose the desired access point from the displayed list and click **Configure**. The the radio settings page appears.

Step 6 Scroll down to the Tx Power Level Assignment field, and click **Custom**.

Custom indicates that the radio output power is manually controlled by the Tx Power Configuration setting field.

Step 7 In the Tx Power Level field, select the appropriate power level setting (1 to 5).

Based on the operating channel, the regulatory domain, and the controller power level setting (1 to 5), the actual transmit power at the access point can be reduced to comply with special regulatory or country restrictions.

Note The access point supports only two output power levels for the 2.4-GHz radio and three output power levels for the 5-GHz radio.

Note Table 7-1 and Table 7-3 list the access point maximum output power levels supported for each regulatory domain when the access point is shipped from the factory.

Table 7-5 lists the controller power settings and the corresponding output power levels for these two examples:

- 2.4-GHz (802.11b/g) operation:
  - American regulatory domain
  - Channel 3 using 11-Mbps data rates
- 5-GHz (802.11a) operation:
  - American regulatory domain
  - Channel 149 using 36-Mbps data rates

Table 7-5 Example of Output Power Levels

Controller Tx Power Settings[1]	Radio Output Power	
	802.11b/g (dBm)	802.11a (dBm)
1 (maximum)	24[2]	24[3]
2	21	21

1. The Tx Power Level setting of 1 represents the maximum conducted power setting for the access point. Each subsequent controller power level (such as 2, 3, 4, etc.) represents an approximate 3-dBm reduction in transmit power from the previous power level.
2. The maximum output power level obtained from Table 7-1.
3. The maximum output power level obtained from Table 7-3.

Step 8 Click **Apply**.

Step 9 Close your Internet browser.

For additional configuration information, refer to the *Cisco Wireless LAN Controller Configuration Guide*.