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# Meru AP300

## Installation Guide

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# Contents

<b>About This Guide . . . . .</b>	<b>3</b>
Audience . . . . .	3
Other Sources of Information . . . . .	3
Meru Publications . . . . .	3
External References . . . . .	4
Guide to Typographic Conventions . . . . .	4
Syntax Notation . . . . .	5
Contacting Meru . . . . .	6
Customer Services and Support . . . . .	6
 <b>AP300 Series Introduction . . . . .</b>	 <b>1</b>
Hardware Specification . . . . .	2
AP300 Product Overview . . . . .	2
 <b>Installing the AP300 . . . . .</b>	 <b>3</b>
Safety Precautions . . . . .	3
Unpack the AP300 . . . . .	4
Determine Power Requirements . . . . .	5
Installation Requirements . . . . .	5
Additional Equipment . . . . .	7
Install the Access Points . . . . .	7
Select a Location . . . . .	7
Attach the AP300 Antennas . . . . .	8
Attach Standard Antennas . . . . .	8
Attach Remote Antennas . . . . .	9
Mount the Access Point . . . . .	9
Mount AP300 Horizontally . . . . .	9
Mount AP300 on a Wall . . . . .	10
Check AP300 LED Activity . . . . .	11
Configure AP300 Software . . . . .	12
Configure AP300 Using the CLI . . . . .	12
Configure AP300 Using the GUI . . . . .	14
Troubleshooting . . . . .	17
 <b>AP300 Brackets . . . . .</b>	 <b>19</b>
 <b>Specifications . . . . .</b>	 <b>21</b>
Wireless Interface for All APs . . . . .	21
Ethernet Interface for All Meru APs . . . . .	22

Physical Description for All Meru APs . . . . .	22
<b>Regulatory Information . . . . .</b>	<b>23</b>
USA . . . . .	23
Underwriters Laboratories . . . . .	23
Notices . . . . .	23
FCC Radiation Exposure Statement . . . . .	24
Radio Frequency Interference Requirements . . . . .	24
Interference Statement . . . . .	24
<b>Channels . . . . .</b>	<b>27</b>
IEEE 802.11a . . . . .	27
IEEE 802.11b/g . . . . .	28
IEEE 802.11n . . . . .	30

# About This Guide

- This guide describes the various options for configuring the Meru AP300 and the wireless LAN. The architecture and fundamental operations of system are described.

## Audience

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This guide is intended for network administrators configuring and maintaining the Meru AP300. Familiarity with the following concepts is helpful when configuring the Meru Wireless LAN System:

- Network administration, including:
  - Internet Protocol (IP) addressing and routing
  - Dynamic Host Configuration Protocol (DHCP)
  - Configuring Layer 2 and Layer 3 switches (if required by your switch)
- IEEE 802.11n (Wi-Fi) concepts, including:
  - ESSIDs
  - WEP
- Network Security (optional)
  - WPA
  - 802.1X
  - RADIUS
  - X.509 certificates

## Other Sources of Information

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Additional information is available in the following Meru publications, Web site, and external references.

### Meru Publications

- *Meru AP300 Install Guide*
- *Meru System Director Release Notes*

- *Meru Access Point and Radio Switch Installation Guide*
- *Meru Controller Installation Guide*
- *Meru System Director Command Reference*
- *Meru System Director Getting Started Guide*

## External References

- Stevens, W. R. 1994. *TCP/IP Illustrated, Volume 1, The Protocols*. Addison-Wesley, Reading, Mass.
- Gast, M.S. 2002. *802.11 Wireless Networks, The Definitive Guide*. O'Reilly and Associates, Sebastopol, Calif.

# Guide to Typographic Conventions

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This guide uses the following typographic conventions in paragraph text to help you identify information:

<b>Bold text</b>	Identifies commands and keywords in syntax descriptions that are entered literally.
<i>Italic text</i>	Used for new terms, emphasis, and book titles; also identifies arguments for which you supply values in syntax descriptions.
Courier font	Identifies file names, folder names, computer screen output, and text in syntax descriptions that you are required to type.
Ctrl-	Denotes that the Ctrl key should be used in conjunction with another key, for example, Ctrl-D means hold down the Ctrl and press the D key. Keys are shown in capitals, but are not case sensitive.



**Note:** Provides extra information, tips, and hints regarding the topic



**Caution!** Identifies important information about actions that could result in damage to or loss of data, or could cause the application to behave in unexpected ways



**Warning!** Identifies critical information about actions that could result in equipment failure or bodily harm

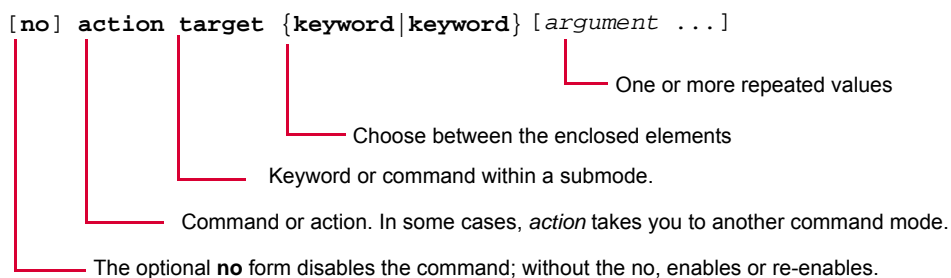
# Syntax Notation

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In example command syntax descriptions and examples, the following text elements and punctuation are used to denote user input and computer output for the command. In general, *Courier* font is used for command input and output at the command line; **bold** indicates required text and *italics* indicates values that are to be replaced.

<b>bold</b>	Required command, keywords, and punctuation.
<i>italic</i>	Arguments or file names where you substitute a value.
<b>no</b>	The optional no form of the command disables the feature or function.
[ ]	Optional elements are enclosed by square brackets.
{ }	Braces indicates that one of the enclosed elements must be used.
	Choices among elements are separated by vertical bars.
[ {} ]	A required choice within an optional element.
...	The preceding argument can be repeated.

The following figure shows a sample of syntax notation.



**Note:**

Many commands have a default setting or value, listed in the Default section of the command page.

# Contacting Meru

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You can visit Meru Networks on the Internet at this URL:

<http://www.merunetworks.com>

Click **Support** to view Meru Customer Services and Support information.

## Customer Services and Support

For assistance, contact Meru Customer Services and Support 24 hours a day at +1-888-637-8952 (+1-888-Meru-WLA(N)) or +1-408-215-5305. Email can be sent to [support@merunetworks.com](mailto:support@merunetworks.com).

Meru Customer Services and Support provide end users and channel partners with the following:

- Telephone technical support
- Software update support
- Spare parts and repair service



# Chapter 1

## AP300 Series Introduction

The Meru AP300 Access Point delivers high performance, full-speed, draft 2.0 compatible 802.11n connectivity while simultaneously supporting legacy 802.11a/b/g devices. The Meru Networks family of AP300 Access Points is supported by System Director Release 3.4.SR3 and later.

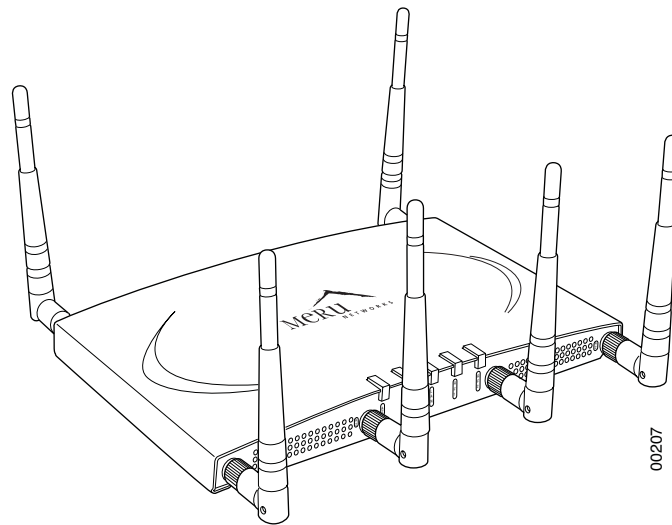


Figure 1: AP300

Key product features include:

- 802.11n support with channel bonding in both 2.4GHz and 5GHz frequency bands. Channel bonding combines two 20Mhz channels into a single-wide 40Mhz channel for increased theoretical throughput.
- Dual-band external antenna options optimized for MIMO mode
- Plug and Play deployment using centralized Meru Controller platforms
- Multi-layered security including standard WPA2, 802.11i security such as automatic traffic inspection

This access point is available in three different configurations:

- AP320: Two 802.11n radios with 3x3 MIMO mode streams
- AP310: Single 802.11n radio with 3x3 MIMO mode stream
- AP311: Single 802.11n radio with 3x3 MIMO mode stream and single 802.11a/b/g radio (upgradeable)

Each of these Access points may be powered by a standard 802.3af for 2x2 MIMO Mode. For 3x3 full channel mode, use either a power supply or a a 802.3at PoE device.

## Hardware Specification

The AP300 hardware platform features:

- 10/100/1000 Ethernet port, copper
- 1 serial/console port (reserved)
- DC power input (5 Volts)
- 6 RPSMA external antenna connectors

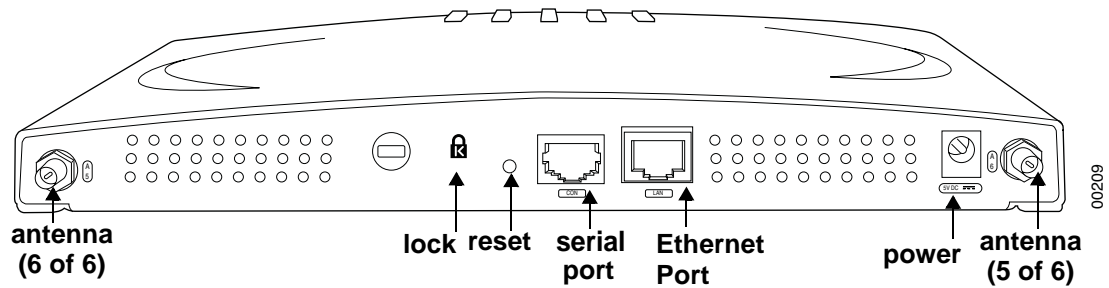


Figure 2: AP300

## AP300 Product Overview

The Meru AP300 Series, supported by System Director release 3.4.SR3 and later, includes the following features:

- Air Traffic Control technology for 802.11n devices and legacy a/b/g devices
- 3x3 MIMO (Multiple Input, Multiple Output) technology with three dedicated, configurable input/output streams that deliver data rates up to 300 Mbps
- Software upgradeable radios for maximum investment protection
- Meru channel span architecture which requires no channel planning or configuration
- Six standard multiband, omni-directional antennas for AP320 and AP311. Three standard multiband, omni-directional antennas for AP310.
- Powered by 5 volt DC input, 802.11af compliant PoE device, or 802.11at compliant PoE device.

# Chapter 2

## Installing the AP300

This chapter describes how to physically install the Meru AP300. It contains the following sections:

- [Safety Precautions](#)
- [Unpack the AP300](#)
- [Determine Power Requirements](#)
- [Installation Requirements](#)
- [Install the Access Points](#)
- [Configure AP300 Software](#)
- [Check AP300 LED Activity](#)
- [Configure AP300 Software](#)
- [Troubleshooting](#)

## Safety Precautions

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**IMPORTANT**—Read and follow the regulatory instructions in Appendix C before installing and operating this product.

This product is intended to be supplied by a UL Listed power supply, marked Class 2 or LPS, and rated minimum 5 Vdc, 3A.



**Caution!** The AP300 is not certified for plenum installations, and should not be installed in the plenum space.

Document Number: 3.5.1 Rev 1

# Unpack the AP300

The Meru AP300 series consists of the 3 models shown in [Table 1](#). Depending which model you are installing, you will have either six or three antennas. Drawings in this chapter show six antennas.

**Table 1: Meru AP300 Radios and Antennas**

Model	1st Radio	2nd Radio
AP320	a/b/g/n with 3 dual band omni-directional antennas	a/b/g/n with 3 dual band omni-directional antennas
AP311	a/b/g/n with 3 dual band omni-directional antennas	a/b/g with 3 dual band omni-directional antennas (upgrade-able)
AP310	a/b/g/n with 3 dual band omni-directional antennas	NA

Confirm that the AP300 shipping package contains these items:

- AP300 with attached mounting bracket
- Six (AP320, AP311) or three (AP310) antennas
- Power supply

## Antenna List and Power Table

Antenna Model name	Brand	Antenna Type	Antenna Gain	Antenna Pattern	Max. conducted Power
S245112PT	Laird Technologies	Panel	<u>10.9dBi@2450MHz</u>	directional	<b>&lt;2400 MHz ~ 2483.5 MHz&gt;</b> 802.11b : 16.76 dBm (0.047 W) 802.11g : 21.82 dBm (0.152 W) 802.11n (BW 20MHz) : 25.24 dBm (0.334 W) 802.11n (BW 40MHz) : 20.02 dBm (0.100 W)
			<u>13.5dBi@5500MHz</u>		
S24517PT	Laird Technologies	Panel	<u>8dBi@2450MHz</u>	directional	<b>&lt;5725 MHz ~ 5850 MHz&gt;</b> 802.11a : 21.92 dBm (0.156 W) 802.11n (BW 20MHz) : 22.35 dBm (0.172 W) 802.11n (BW 40MHz) : 21.99 dBm (0.158 W) 802.11a : 6.32 dBm / 0.004 W 802.11n (BW 20MHz) : 6.18 dBm / 0.004 W 802.11n (BW 40MHz) : 8.43 dBm / 0.007 W
			<u>10.7dBi@5500MHz</u>		
T24130P10006GT	TerraWave Solutions	Panel	<u>13dBi@2.4GHz</u>	directional	
M6060060MO136200	TerraWave Solutions	Dipole	<u>6dBi@2.4GHz</u>	omnidirectional	<b>&lt;2400 MHz ~ 2483.5 MHz&gt;</b> 802.11b : 16.78 dBm (0.048 W) 802.11g : 21.82 dBm (0.152 W) 802.11n (BW 20MHz) : 25.28 dBm (0.337 W) 802.11n (BW 40MHz) : 23.48 dBm (0.223 W) <b>&lt;5725 MHz ~ 5850 MHz&gt;</b> 802.11a : 21.87 dBm (0.154 W) 802.11n (BW 20MHz) : 26.15 dBm (0.412 W) 802.11n (BW 40MHz) : 23.25 dBm (0.211 W)
			<u>6dBi@5GHz</u>		
M6060070MP13620	TerraWave Solutions	Patch	<u>6dBi@2.4GHz</u>	directional	802.11a : 11.85 dBm / 0.015 W 802.11n (BW 20MHz) : 11.04 dBm / 0.013 W 802.11n (BW 40MHz) : 8.23 dBm / 0.007 W
			<u>7dBi@5GHz</u>		

# Determine Power Requirements

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Your power requirements will vary, depending on which AP300 radios are deployed and what mode is used. See [Table 2](#).

Table 2: AP300 Power Options

AP300 Configuration	Power Options
1 radio - b/g mode	Either a power supply (included) or PoE 802.3af
1 radio - n-mode	Either a power supply (included) or PoE 802.3af
2 radios - 1 b/g-mode, 1 n mode	For 2x2 MIMO mode, use either a power supply (included) or PoE 802.3af. For 3x3 MIMO mode, use either a power supply (included) or a PoE 802.3at.
2 radios - both in n mode	For 2x2 MIMO mode, use either a power supply (included) or PoE 802.3af. For 3x3 MIMO mode, use either a power supply (included) or a PoE 802.3at.

## Installation Requirements

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The AP300 standard mounting bracket can be removed. The AP300 is also designed to be used with brackets supplied by other vendors; if you use a bracket other than an AP150 bracket (which is identical), you need to obtain three shoulder screws (see Appendix A). Meru APs can be mounted on Cisco 1230 series brackets, but the Cisco 1240 and 1250 series brackets are new and not compatible with the Meru bracket.

The AP300 has a security cable slot so you can lock the AP300 with a standard security cable, such as those used to secure laptop computers. See [Figure 3](#).

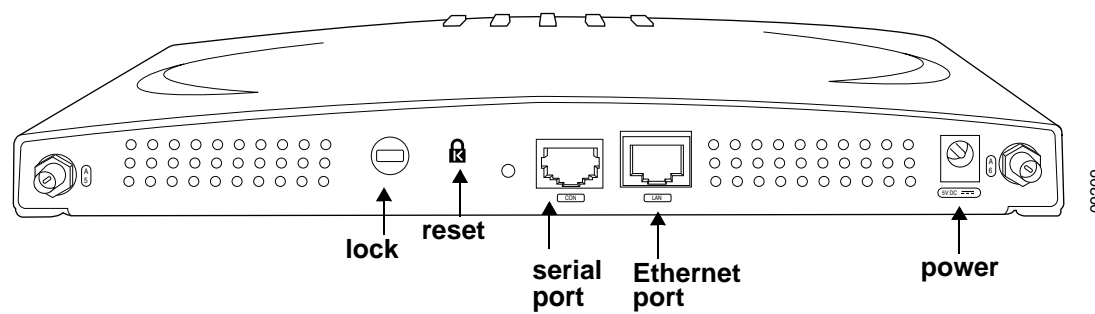


Figure 3: AP300 Bottom View

An array of holes on the mounting bracket allows the AP300 to be mounted on the wall and over junction boxes or molly bolts. There are holes for passing the PoE Ethernet or external power supply cable through the bracket if the bracket is mounted on a junction box.

To complete this installation, you need the items listed in [Table 3](#).

Table 3: AP300 Installation Items

Installation Type	Consumable Items Required
Horizontal mounting	None
Vertical mounting over a wall stud	<ul style="list-style-type: none"><li>• Two #6 x 2" wood screws for a wood stud; or</li><li>• Two #6 x 1½" metal screws for a metal stud</li></ul>
Vertical mounting on sheetrock	<ul style="list-style-type: none"><li>• Mounting bracket</li><li>• Two #6 x 1" screws</li></ul>
Horizontal mounting below a hanging ceiling	<ul style="list-style-type: none"><li>• Two #4-6 x 7/8" ribbed plastic wall anchors</li><li>• Mounting bracket</li><li>• Two caddy fasteners</li></ul>
Using existing Cisco 1230 series brackets	<ul style="list-style-type: none"><li>• Two plastic spacers</li><li>• Two keps nuts (with attached lock washer)</li><li>• Mounting bracket</li><li>• special screws - see Appendix A</li></ul>

Table 4: AP300 Installation Tools

Installation Type	Tools Required
Horizontal mounting	None
Vertical mounting over a wall stud	<ul style="list-style-type: none"> <li>• Drill</li> <li>• 1/8"drill bit</li> <li>• Screwdriver</li> <li>• 1/8"Allen wrench</li> </ul>
Vertical mounting on sheetrock	<ul style="list-style-type: none"> <li>• Drill</li> <li>• 3/16" drill bit</li> <li>• Screwdriver</li> <li>• 1/8"Allen wrench</li> </ul>
Horizontal mounting below a hanging ceiling	<ul style="list-style-type: none"> <li>• Screwdriver</li> <li>• Wrench or pliers</li> <li>• 1/8"Allen wrench</li> </ul>
Using existing Cisco 1230 series brackets	<ul style="list-style-type: none"> <li>• Screwdriver</li> </ul>

## Additional Equipment

A power source is provided with the AP300. If you want to use a PoE, you need to provide one of the following:

- 802.3af compliant PoE device (for 2x2 mode)
- 802.3at compliant PoE device (needed for 3x3 mode)

# Install the Access Points

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## Select a Location

The AP300 is only intended for installation in Environment A as defined in IEEE 802.3af. All interconnected equipment must be contained within the same building, including the interconnected equipment's associated LAN connection. In addition, the AP300 should be mounted in a location that meets the following conditions:

- Relatively unobstructed access to the stations the AP serves. Select a location with minimal physical obstructions between the AP and the wireless stations. In an office with cubicles, mounting the APs below a hanging ceiling (plenum testing is not complete at this time) or the wall near the ceiling provides the least obstructed communications path. For an external power supply connection, ensure the power source is near to where the AP300 will be mounted.

- Access to wall outlet or a to a Power over Ethernet (PoE) connection to the network switch servicing the controller.

Most installations receive the best coverage using the following guidelines:

- Install APs toward the center of the building.
- Do not install APs near metal objects, such as heating ducts, metal doors, or electric service panels.
- Relative to the ground, orient the antenna up or down, not sideways.



**Note:** The previous guidelines are general guidelines. Each site has its own unique environment. Place access points accordingly.

## Attach the AP300 Antennas

The AP300 has six external antenna ports, labeled 1 - 6. AP320 and AP311 use all six antennas. AP310 uses three antennas (1 - 3). Make sure that all external antennas and their associated wiring are located entirely indoors. The external antennas are not suitable for outside use.

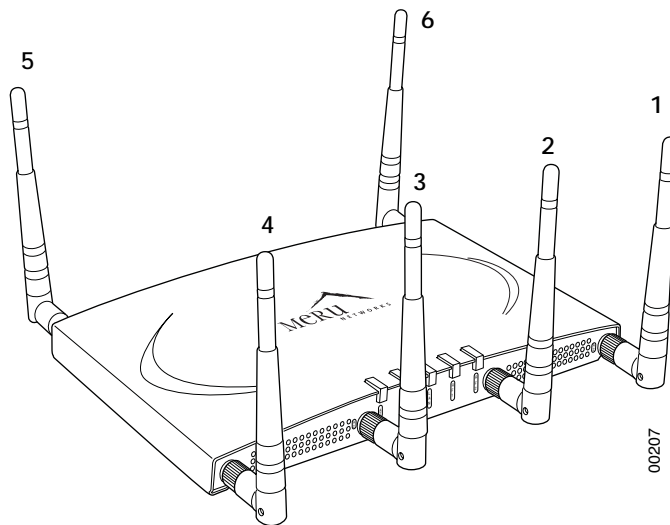


Figure 4: AP320 Antennas 1-6

## Attach Standard Antennas

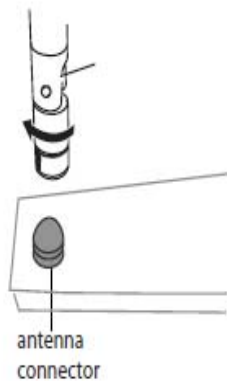
All standard attached antennas must be the same model. If you replace one antenna, replace them all. These antennas are supported:

- Antenna Standard multiband, omni-directional white antenna (included)
- Standard Antenna Gain ~ 2.2 dBi for 2.4 GHz, and 3 dBi for 5 GHz
- RP SMA connectors for external antenna options

Make sure that all external antennas and their associated wiring are located entirely indoors. The external antennas shipped are not suitable for outside use.



Attach the antennas to the connectors on the AP300 (see [Figure 5](#)). Rotate the knurled ring at the base of the antenna clockwise to attach the antenna. The ring should be finger-tight.



**Figure 5: AP300 Antenna Connection**



**Caution!** When changing the orientation of the antennas, be sure to slightly loosen the knurled ring before moving the antenna. Retighten the ring afterward. Otherwise, you might damage the internal cabling in the AP.

## Mount the Access Point

You can mount an AP300 in the following ways:

- Horizontally on a surface, for example set the AP300 on a shelf
- Vertically on a wall
- In the ceiling (plenum testing is not complete at this time)

### Mount AP300 Horizontally

When mounting an AP300 horizontally, remove the mounting bracket. Be sure to position the antennas vertically when an AP300 sits on a surface. See [Figure 6](#).

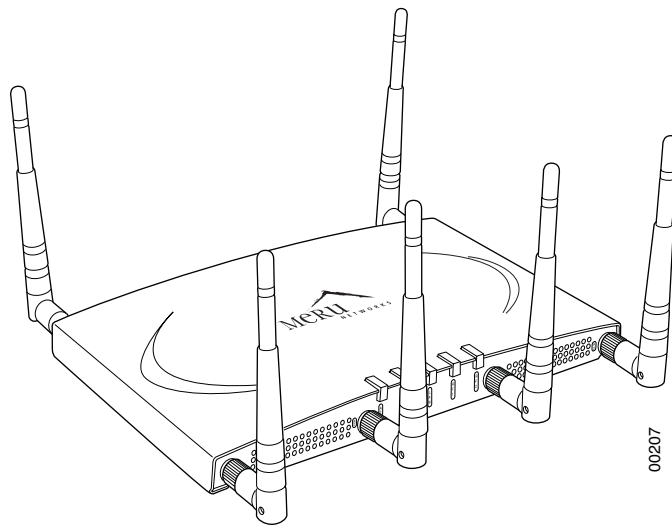


Figure 6: Horizontal AP300

## Mount AP300 on a Wall



**Note:** If you are replacing AP150s, you can use the existing brackets: the AP150 and AP300 use the same bracket. If you are replacing AP200s, the AP300 bracket can be attached to the old bracket with shoulder screws (see Appendix A); you don't have to remove the old brackets.

The AP300 ships with the mounting bracket attached. To mount an AP300 on a wall:

1. Using the bracket holes as a guide, mark the location on the wall for the two AP bracket mounting screws. If possible, center the mounting screws on a wall stud. If you do not center the mounting screws on a wall stud, use plastic wall anchors.
2. Drill holes at the locations you marked:
  - 3/16-inch holes if you are using plastic anchors
  - 1/8-inch holes if you are using only the screws
3. If you are using plastic anchors, install them in the holes.
4. Screw in the screws most of the way.
5. Mount the bracket on the screws, placing the circular portion of the keyhole mounts over the screw heads and sliding the bracket down.
6. Connect one end of the Ethernet cable to the AP300 Ethernet port shown in [Figure 7](#).

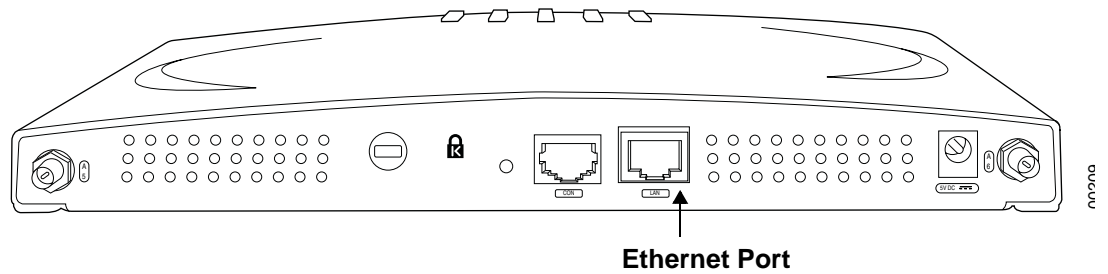


Figure 7: Connect AP300 to LAN

7. Either connect an external power supply to the power connector and plug it into the wall, or connect an appropriate PoE power device to the Ethernet port (see [Figure 7](#)).

## Check AP300 LED Activity

After the AP300 is connected, the LEDs should light (see [Figure 8](#)).

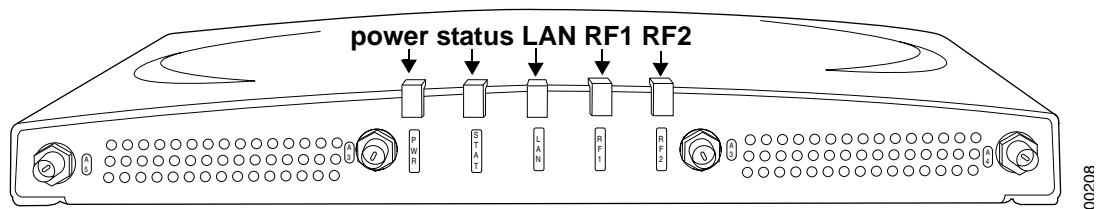


Figure 8: AP300 Status LEDs

The functions of the five LEDs are described in [Table 5](#).

When the AP300 is first connected to the controller and any time the access point is rebooted thereafter, the AP initializes with and then is programmed by the controller. When the AP is first powered up, all LEDs are green. Thereafter, the Status LED (see [Figure 8](#)) color reflects the various operating states ([Table 5](#)).

Table 5: AP300 LED Descriptions

LED	Function
Power	off—no power green—presence of power
Status	off—no power green—booting stage 1 blinking green and off—booting stage 2 blinking green and white—discovering the controller blinking green and blue—downloading a configuration from the controller blinking blue and off—AP is online and enabled, working state blinking red and yellow—failure; consult controller for alarm state
LAN	off—no power, or no link green—link status OK (at any speed) green/blinking—activity (at any speed) red—auto negotiation failure
Radio 1 Radio 2	off—no radio present green—radio enabled green blinking—data activity yellow—disabled or in scanning mode red—failure

## Configure AP300 Software

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You can configure both the power source the AP300 will use and the channel width the AP300 will use. The default power source is 802.3af, and the default channel width is 20 MHz; these are the lowest (and slowest) settings. Increase range and throughput by changing MIMO mode to 3x3. The power supply option that you select determines whether or not you can use 3x3 MIMO. Be sure to change the power supply setting to either a DC power supply (provided) or a 802.11at PoE before changing MIMO mode to 3x3.

### Configure AP300 Using the CLI

Use the CLI command **configure ap** to set the Power Supply Type and **configure interface Dot11Radio** to set the Channel Width, and MIMO Mode. For example:

1. Access the controller from a browser by entering the IP address of the controller.
2. Switch to configuration mode by entering **terminal configuration** at the CLI prompt. The prompt changes to *controller name (config)*.
3. Select an AP by entering the command *ap #*. For example:

```

default(config)# ap 1 *****changes to ap config****
default(config-ap)# ? *****help lists options****
boot-script Configure boot script for this AP.
building Building location for this AP.
connectivity Manage AP connectivity.
contact Contact person for this AP.
dataplane-mode Determine whether the data packets go through the
controller or not.
default Reset to default values
description Description of AP.
do Executes an IOSCLI command.
end Save changes, and return to privileged EXEC mode.
exit Save changes, and return to global configuration mode.
floor Floor location for this AP.
high-density-enable Enable high density.
led Configure LED settings.
link-probing-duration Duration AP waits before rebooting when
controller link is down.
location Location of this AP.
mac-address Assign a new MAC address or pre-provision AP.
model Assign AP HW type.
no Disables various parameters.
power-supply Power Supply mode for this AP.
show Displays various parameters related to this AP.

```

4. Set the power supply with the CLI command **power supply**. For example:

```

default(config-ap)# power-supply ? *****help lists options****
5V-DC 5V-DC for AP Power.
802.3-af 802.3af Power Over Ethernet.
802.3-at 802.3-at Power Over Ethernet.
dual-802.3-af dual-802.3af Power Over Ethernet.
default(config-ap)# power-supply 5V-DC ***changes power to 5V***

```

5. Exit configuration mode with the CLI command **exit**.
6. Switch to radio channel configuration with the CLI command **interface Dot11Radio #**. For example:

```

default(config-ap)# exit
default(config)# interface Dot11Radio 1 1 ***switches to radio channel
config***
default(config-if-802)# ? *****help lists options*****
admin-mode Administrative Mode.
antenna-property Manage external wireless interface antennas.
antenna-selection Antenna configuration.
channel Configure the channel ID.
channel-width Configure the Channel Width for 802.11n
default Set various parameters to the default value.
do Executes an IOSCLI command.
end Save changes, and return to privileged EXEC
mode.
exit Save changes, and return to global configuration
mode.
fixed-channel Fix channel so it cannot be changed by auto-
channel configuration.
mimo-mode Configure the MIMO mode

```

```

mode                AP mode configuration.
no                  Disables various parameters.
power               Transmit power in the format low,medium,high.
For example, 20,20,20.
preamble-short      Enables short preamble.
protection-cts-mode B/G protection mechanism.
protection-mode      bg protection mode.
rf-mode             Configure the Radio Frequency mode (802.11a, b,
g, bg, an
, or bgn).
show                Displays various parameters related to this
wireless interface.

```

7. Change channel width from 20 MHz (default) to 40 MHz with the CLI command **channel-width**. For example:

```

default(config-if-802)# channel-width ? ***help shows options***
20-mhz                20 MHz.
40-mhz-extension-channel-above 40 MHz Extension channel above.
40-mhz-extension-channel-below 40 MHz Extension channel below.
default(config-if-802)# channel-width above 40 MHz Extension channel
****changes channel width****

```

8. Change MIMO Mode from 2x2 (default) to 3x3 with the **mimo-mode 3x3** command. For example:

```

default(config-if-802)# mimo-mode 3x3 *****changes MIMO *****
default(config-if-802)# end
default#
default

```

## Configure AP300 Using the GUI

Follow these steps to change Power Supply Type, Channel Width, and MIMO Mode using the GUI:

1. Enter the IP address of the controller in your browser. You see the controller GUI interface.
2. From the controller GUI, click **Configuration > Devices > APs**. The AP Table shown in [Figure 9](#) is displayed.

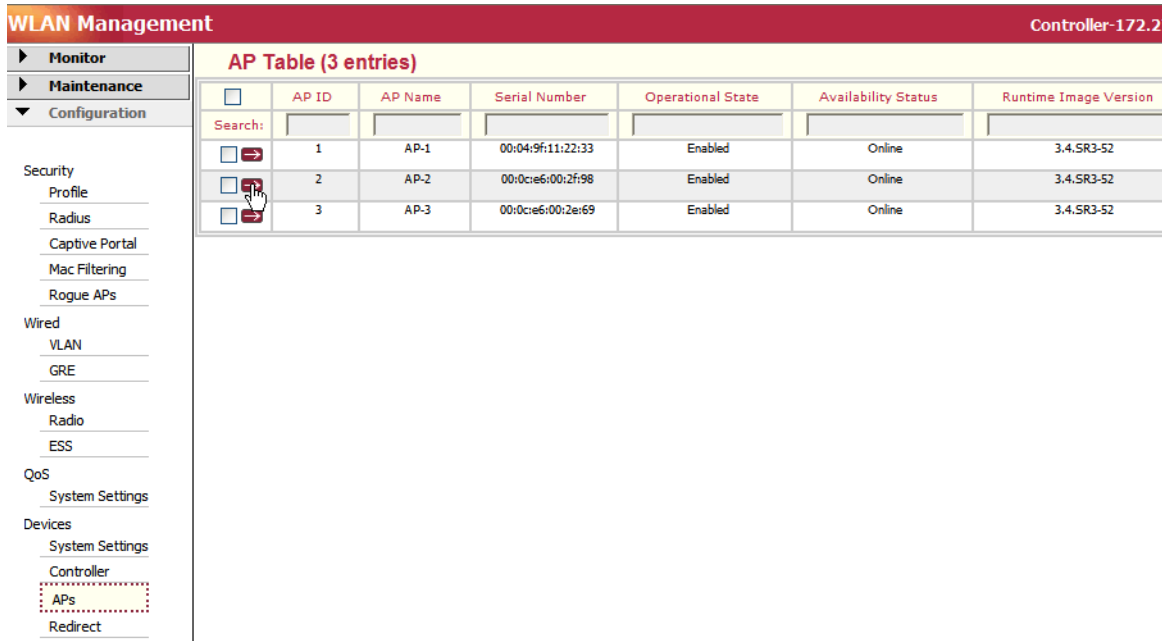


Figure 9: AP Table Configuration Window

- Click the arrow that corresponds to the AP300 to change. The AP configuration for that AP is displayed. See Figure 10.

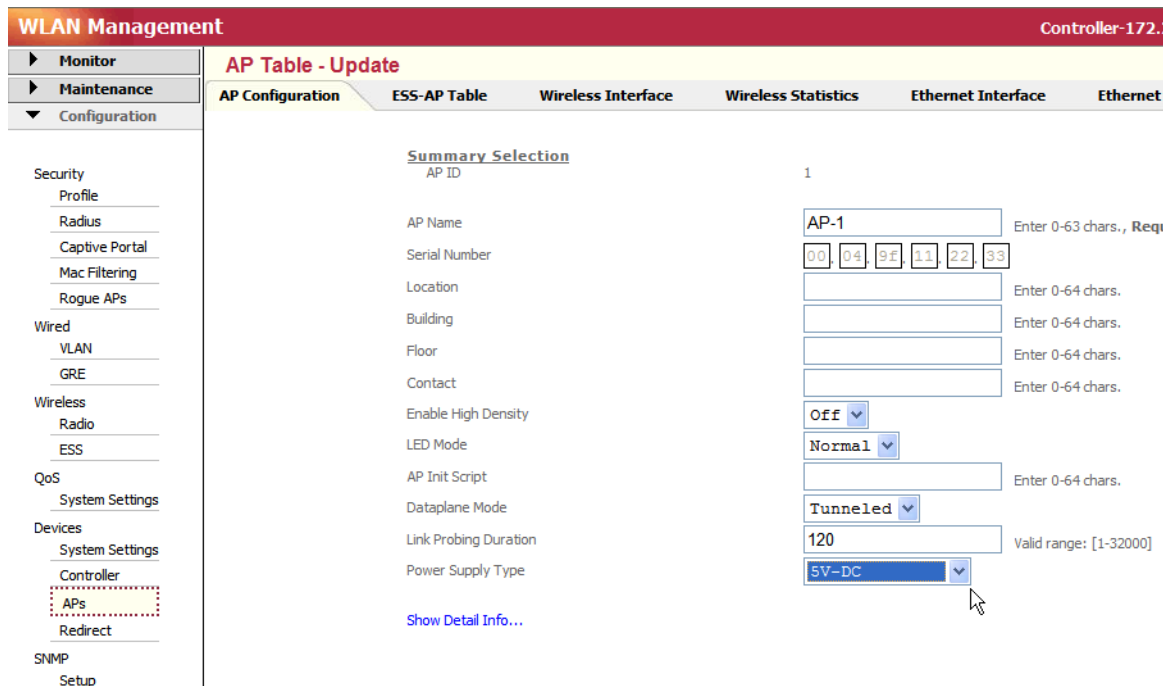


Figure 10: Changing Power Supply Type

- Click the **Power Supply Type** drop-down list and select one of the following options. The included DC power block corresponds to the option 5V DC.

- 802.3-af: Default power supply. Select this when using a traditional PoE. This power supply type only supports 2x2 MIMO mode.
  - 802.3-at: Select when using a higher-powered, next generation PoE. This power supply type supports 3x3 MIMO mode.
  - 5V-DC: Select when AP300 is plugged into a wall outlet. This power supply type supports 3x3 MIMO mode.
  - dual-802.3: Select when using a dongle that combines power from two traditional PoEs. This power supply type supports 3x3 MIMO mode.
5. Click OK.
  6. Next, configure MIMO mode and Channel Width. Click the **Wireless Interface** tab. You see the Wireless Interface Configuration window shown in [Figure 11](#).

Summary Selection	
AP ID	13
Ifindex	1
Description	ieee80211-13-1 <small>Enter 0-256 chars.</small>
Administrative Status	Up
Channel	1
Short Preamble	On
RF Band Selection	802.11bgn
Antenna Selection	Left
Transmit Power (dBm) (low,medium,high)	20,20,20 <small>Enter 0-8 chars.</small>
AP Mode	Normal Mode
Fixed Channel	Off
Protection Mechanism	WMM-style TXOP Protection
Protection Mode	Auto
Channel Width	40 MHz Extension channel above
MIMO Mode	3x3

Hide Detail Info...	
AP Name	AP-320-HR-1F
AP Model	AP320
Operational Status	Enabled
Last Change Time	2007/07/28 14:54:10
Radio Type	RF6
MTU (bytes)	2346
RF Band Support	802.11abgn
Scanning Channels	1
Number of Antennas	3
Dual abg Support	Off

Figure 11: Wireless Interface Tab - Set MIMO Mode and Channel Width



**Note:** The Short Preamble Setting affects 11b clients only. The Protection Mechanism setting has no effect at this time.

7. Configure RF Band Selection by selecting a value from the drop-down list. To configure the band as N only, select a setting that includes N and change the data rates setting to make only N viable.
8. Configure MIMO mode by clicking the drop-down list and selecting either 2x2 or 3x3. Be sure you have already configured an appropriate power source for 3x3 MIMO Mode. 3x3 MIMO Mode produces higher reliability, range, and speed but both settings (2x2 and 3x3) should approach 320 mbps.



9. Configure Channel Width by clicking the drop-down list and selecting either **40 MHz Extension channel above** or **40 MHz Extension channel below**. The 'channel above' and 'channel below' are relative to the value set in the Channel control setting (see [Figure 11](#), the third setting from the top). This configures the channel bonding.
10. Click OK.

## Troubleshooting

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- If an AP320 continually reboots or demonstrates other unusual behavior, and MIMO Mode is set to 3x3, there may be a mismatch of power and MIMO Mode. Make sure that you have an appropriate power source configured, as well as attached to an AP320 with MIMO Mode set to 3x3.
- When RF band selection is set to 802.11n, the security mode can only be set at **clear**, **wpa2** or **wpa2psk**. This is an 802.11n restriction.
- The ChannelWidth field value **40 Mhz-extension-channel-above** is only applicable if the extension channel above is available in the country code. For example, A\_EXT\_CHANNELS=36:40 case, 40 Mhz-extension-channel-above configuration is valid for channel number 36. Currently we support extension channels in only the US country code. In addition, the default channel numbers for RF mode BG or A mode are changed in the US country code (DEFAULT\_B\_CHANNEL=6, DEFAULT\_A\_CHANNEL=36).



# Appendix A

## AP300 Brackets

The AP300 is designed to be used with brackets supplied by other vendors. Meru APs are compatible with the Cisco 1230 series brackets, but the 1240 and 1250 series brackets are new and not compatible. If you reuse a Cisco 1230 series bracket, follow these steps:

1. Obtain three of the screws shown in [Figure 12](#).

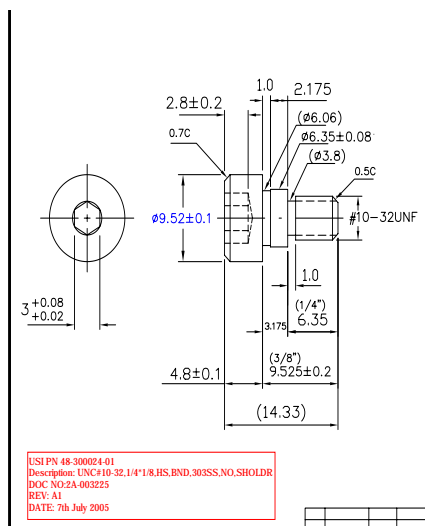
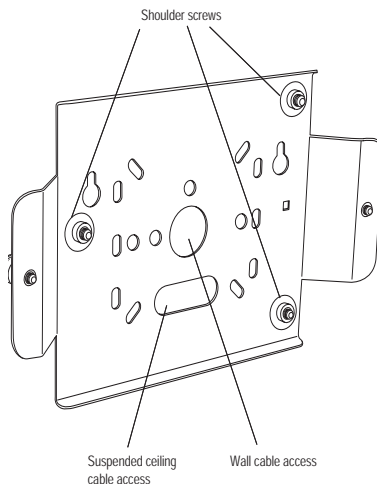


Figure 12: Shoulder Screw (specification front and side)

2. Insert the three screws into the locations indicated in [Figure 13](#).



**Figure 13: Location of Shoulder Screws**

- 3.** Slide the Meru bracket with shoulder screws onto the Cisco bracket.

# Appendix B

## Specifications

This chapter provides specifications for Meru Access Points and contains the following sections:

- [Wireless Interface for All APs](#)
- [Ethernet Interface for All Meru APs](#)
- [Physical Description for All Meru APs](#)

## Wireless Interface for All Meru APs

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Table 6: Wireless Interface Specifications

Feature	Details
Wireless Standards	<ul style="list-style-type: none"><li>• 802.11a, 802.11b, 802.11g, 802.11n</li></ul>
Antennas	<ul style="list-style-type: none"><li>• Two to six external antennas. Omni-directional and directional antennas for specific coverage requirements</li></ul>
Wireless Medium Access	<ul style="list-style-type: none"><li>• Wi-Fi Compliant 802.11 MAC standard</li></ul>
Power Management	<ul style="list-style-type: none"><li>• Power-save mode for clients in both QoS mode and non-QoS mode</li></ul>
Frame Size	<ul style="list-style-type: none"><li>• Peak frame size of &gt; 2346 bytes</li><li>• Fragmentation and reassembly of 802.11/Ethernet frames</li></ul>
Client Activities Supported	<ul style="list-style-type: none"><li>• Active scanning and passive scanning</li><li>• Pre-authentication</li><li>• Power-save mode supported</li></ul>

## Ethernet Interface for All Meru APs

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Feature	Detail
Wireline Standard	<ul style="list-style-type: none"><li>• One Ethernet (IEEE 802.3) interface, supporting half-duplex and full-duplex modes</li><li>• Supports the Power over Ethernet (PoE) IEEE 802.3af standard</li></ul>

## Physical Description for All Meru APs

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Physical specifications for Meru Access Points are provided in the access point Data Sheet. Contact your Meru sales engineer for a copy of the document.

# Appendix C

## Regulatory Information

The Meru Networks, Inc. Meru Access Points (APs) must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. For country-specific approvals, see below. Meru Networks, Inc. is not responsible for any radio or television interference caused by unauthorized modification of APs, or the substitution or attachment of connecting cables and equipment other than that specified by Meru Networks, Inc. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. Meru Networks, Inc. and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

## USA — Federal Communications Commission (FCC)

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### FCC Radiation Exposure Statement

**Caution!**

The radiated output power of the Meru Networks, Inc. devices is well below the FCC radio frequency exposure limits. However, the Meru Networks, Inc. Meru Access Points should be used in such a manner that the potential for human contact during normal operation is minimized. To avoid the possibility of exceeding the FCC radio frequency exposure limits, you should keep a distance of at least 20 cm between you (or any other person in the vicinity) and the Access Point antennas.

## Radio Frequency Interference Requirements

### Interference Statement



**Note:**

**Meru Networks Meru Access Point**

These devices are restricted to indoor use because they operate in the 5.15 to 5.25 GHz frequency range. The FCC requires such products to be used indoors for the frequency range 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

These devices comply with Part 15 of the FCC Rules. Operation of the devices is subject to the following two conditions: (1) The devices may not cause harmful interference, and (2) The devices must accept any interference that may cause undesired operation.

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

- Relocate this device.
- Increase the separation between the device and the receiver.
- Connect the device into an outlet on a circuit different from that of other electronics.
- Consult the dealer or an experienced radio technician for help.



**Note:**

The Meru Networks Meru Access Point must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Any other installation or use may violate FCC Part 15 regulations. Modifications not expressly approved by Meru Networks, Inc. could void your authority to operate the equipment.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.



## Canada. Industry Canada (IC)

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This device complies with RSS210 of Industry Canada.

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

L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met.

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

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Pour empêcher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit être utilisé à l'intérieur et devrait être placé loin des fenêtres afin de fournir un écran de blindage maximal. Si le matériel (ou son antenne d'émission) est installé à l'extérieur, il doit faire l'objet d'une licence.



**Caution! Exposure to Radio Frequency Radiation.**

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website <http://www.hc-sc.gc.ca/rpb>.



**Note: Meru Networks Meru Access Points**

These devices are restricted to indoor use because they operate in the 5.15 to 5.25 GHz frequency range. Industry Canada requires such products to be used indoors for the frequency range 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

# Appendix D

## Channels

This device has been designed to operate with the antennas listed below, and having a maximum gain of 13.5 dB. Antennas not included in this list or having a gain greater than 13.5 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

This appendix provides the access point radio channels supported by the world's regulatory domains.

### IEEE 802.11a

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11a 20-MHz-wide channel are listed in [Table 7](#).

**Table 7: IEEE 802.11a Channels**

Channel Number	Frequency in MHz	Regulatory Domains	
		Americas	Japan
34	5170	-	X
36	5180	X	-
38	5190	-	X
40	5200	X	-
42	5210	-	X

Table 7: IEEE 802.11a Channels (Continued)

Channel Number	Frequency in MHz	Regulatory Domains	
		Americas	Japan
44	5220	X	-
46	5230		
48	5240		
52	5260		
56	5280		
60	5300		
64	5320		
149	5745	X	-
153	5765	X	-
157	5785	X	-
161	5805	X	-
165	5825	X	-

## IEEE 802.11b/g

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11b/g channel are listed in [Table 8](#).



**Note:**

Mexico is included in the Americas regulatory domain; however, channels 1 through 8 are for indoor use only while channels 9 through 11 can be used indoors and outdoors. Users are responsible for ensuring that the channel set configuration complies with the regulatory standards of Mexico.

**Table 8: IEEE 802.11b/g Channels**

Channel Number	Frequency in MHz	Regulatory Domains				
		Americas	EMEA	Israel	China	Japan
1	2412	X				X
2	2417	X				X
3	2422	X				X
4	2427	X				X
5	2432	X				X
6	2437	X				X
7	2442	X				X
8	2447	X				X
9	2452	X				X
10	2457	X				X
11	2462	X				X
12	2467	-				X
13	2472	-				X
14	2484	-				X (for 802.11b only)

## IEEE 802.11n

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11b/g channel are listed in [Table 9](#).

**Table 9: IEEE 802.11n Channels**

Channel Number	Frequency in MHz	Regulatory Domains			
		North America	ETSI	Japan (-P)	China
1	2412	X		X	
2	2417	X		X	
3	2422	X		X	
4	2427	X		X	
5	2432	X		X	
6	2437	X		X	
7	2442	X		X	
8	2447	X		X	
9	2452	X		X	
10	2457	X		X	
11	2462	X		X	
12	2467	-		X	

Channel Number	Frequency in MHz	Regulatory Domains			
		North America	ETSI	Japan (-P)	China
13	2472	-		X	
14	2484	-			
36	5180	X		X	
40	5200	X		X	
44	5220	X		X	
149	5745	X	-	-	X
153	5765	X	-	-	X
157	5785	X	-	-	X
161	5805	X	-	--	X

## MERU NETWORKS, INC.

### Limited Product Warranty

This Limited Product Warranty applies to the original end-user customer of the Meru product which you purchased for your own use, and not for resale (“Product”), from Meru Networks, Inc. (“Meru”) or its authorized reseller (“Reseller”).

#### Limited Warranties

- One-year limited hardware warranty: Meru warrants to you that Meru hardware (other than Third Party Products as described below) will be free from defects in materials and workmanship for a one-year period after the date of delivery of the applicable product to you from Meru or its Reseller (the “Hardware Warranty Period”). If Meru receives written notice from you of such defects during the Hardware Warranty Period, Meru will, at its option, either repair or replace Meru hardware that Meru determines to be defective. Replacement products may be remanufactured units, and will be warranted for the remainder of the original Hardware Warranty Period, or if greater, for thirty days from delivery of such replacement. Should Meru be unable to repair or replace the Meru hardware, Meru (or its Reseller, as applicable) will refund to you the purchase price of the Product.
- 90-Day Limited Software Warranty: Meru warrants to you that, for a 90-day period after the date of delivery of the applicable product to you from Meru or its Reseller (the “Software Warranty Period”), when properly installed and used, (a) the media on which the Meru software is provided will be free from defects in materials or workmanship; and (b) the Meru software will substantially conform to the functional specifications in the applicable documentation. If Meru receives written notice from you of a breach of this warranty during the Software Warranty Period and is able to reproduce the defect, Meru will, at its option, either repair or replace the defective Meru software. Should Meru be unable to repair or replace the Meru software, Meru (or its Reseller, as applicable) will refund to you the purchase price of the Product.

#### Exclusions

The warranty on the Product shall not apply to defects resulting from the following:

- Alteration or modification of the Product in any way, including without limitation configuration with software or components other than those supplied by Meru or integration with parts other than those supplied by Meru.
- Abuse, damage or otherwise being subjected to problems caused by negligence or misapplication (including without limitation improper or inadequate maintenance or calibration), relocation of the products (including without limitation damage caused by use of other than Meru shipping containers), or use of the products other than as specified in the applicable Meru product documentation (including without limitation incompatible operating environments and systems), or improper site preparation or maintenance.
- Damage as a result of accidents, extreme power surge, extreme electromagnetic field, acts of nature or other causes beyond the control of Meru.
- Use of the Product with software, interfacing, parts or supplies not supplied by Meru.

The warranty on the Product does not apply if the Product is sold, or in the case of software, licensed, for free for evaluation or demonstration purposes.

Meru expressly disclaims any warranty or obligation to support the Product for all operating environments – for example, as illustration and not limitation, Meru does not warrant or ensure interoperability of the Product with future telecommunication systems or other future software or hardware.

You understand and acknowledge that the Products may generate, use or radiate radio frequency energy and may interfere with radio communications and/or radio and television receptions if is not used and/or installed in accordance with the documentation for such products. WHILE MERU USES COMMERCIALY REASONABLE EFFORTS TO ENSURE COMPLIANCE OF THE PRODUCTS WITH APPLICABLE UNITED STATES FEDERAL COMMUNICATIONS COMMISSION AND PROTECT AGAINST HARMFUL INTERFERENCES, YOU ACKNOWLEDGE AND AGREE THAT INTERFERENCES WITH RADIO COMMUNICATIONS AND/OR RADIO AND TELEVISION RECEPTIONS MAY OCCUR AND THAT MERU WILL NOT BE LIABLE FOR ANY DAMAGES OR INCONVENIENCE BASED ON SUCH INTERFERENCES.

**Third Party Products** - The above Limited Warranties are exclusive of products manufactured by third parties (“Third Party Products”). If such third party manufacturer provides a separate warranty with respect to the Third Party Product, Meru will include such warranty in the packaging of the Meru Product.

#### **Return procedures**

To obtain warranty service you must: (a) obtain a return materials authorization number (“RMA#”) from Meru by contacting [support@merunetworks.com](mailto:support@merunetworks.com), and (b) deliver the Product, in accordance with the instructions provided by Meru, along with proof of purchase in the form of a copy of the bill of sale including the Product’s serial number, contact information, RMA# and detailed description of the defect, in either its original package or packaging providing the Product with a degree of protection equivalent to that of the original packaging, to Meru at the address below. You agree to obtain adequate insurance to cover loss or damage to the Product during shipment.

If you obtain an RMA# and return the defective Product as described above, Meru will pay the cost of returning the Product to Meru. Otherwise, you agree to bear such cost, and prior to receipt by Meru, you assume risk of any loss or damage to the Product. Meru is responsible for the cost of return shipment to you if the Meru Product is defective.

Returned products which are found by Meru to be not defective, returned out-of-warranty or otherwise ineligible for warranty service will be repaired or replaced at Meru’s standard charges and shipped back to you at your expense.

At Meru’s sole option, Meru may perform repair service on the Product at your facility, and you agree to provide Meru with all reasonable access to such facility and the Product, as required by Meru. On-site repair service may be available and is governed by the specific terms of your purchase.

All replaced parts, whether under warranty or not, are the property of Meru.

#### **Warranty limitations**

THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED BY MERU, TO THE MAXIMUM EXTENT PERMITTED BY LAW. THERE ARE NO OTHER



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The jurisdiction applicable to you may not allow the limitations of liability or damages set forth above, in which case such limitation shall only apply to you to the extent permitted in such jurisdiction.

#### **Additional Information**

This Limited Product Warranty shall be governed by and construed in accordance with the laws of the State of California, U.S.A., exclusive of its conflict of laws principles. The U.N. Convention on Contracts for the International Sale of Goods shall not apply.

This Limited Product Warranty is the entire and exclusive agreement between you and Meru with respect to its subject matter, and any modification or waiver of any provision of this statement is not effective unless expressly set forth in writing by an authorized representative of Meru.

All inquiries or claims made under this Limited Product Warranty must be sent to Meru at the following address:

Meru Networks Inc.,  
894 Ross Drive, CA 94087, USA  
Tel: 408-215-5300  
Fax: 408-215-5301  
Email: [support@merunetworks.com](mailto:support@merunetworks.com)



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