Meru AP400

Installation Guide

June 2013

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 COMMERCIALLY 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 rmaadmin@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 WARRANTIES RESPECTING THE PRODUCT AND DOCUMENTATION AND SERVICES PROVIDED UNDER THIS AGREEMENT, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF DESIGN, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (EVEN IF MERU HAS BEEN INFORMED OF SUCH PURPOSE), TITLE OR AGAINST INFRINGEMENT OF THIRD PARTY RIGHTS. IF ANY IMPLIED WARRANTY CANNOT BE DISCLAIMED UNDER APPLICABLE LAW, THEN SUCH IMPLIED WARRANTY SHALL BE LIMITED IN DURATION TO THE HARDWARE AND SOFT-WARE WARRANTY PERIODS DESCRIBED ABOVE.

NO AGENT OF MERU IS AUTHORIZED TO ALTER OR EXCEED THE WARRANTY OBLIGA-TIONS OF MERU.

MERU SPECIFICALLY DOES NOT WARRANT THAT THE MERU SOFTWARE WILL BE ERROR FREE OR OPERATE WITHOUT INTERRUPTION.

THE REMEDIES IN THIS LIMITED PRODUCT WARRANTY ARE YOUR SOLE AND EXCLUSIVE REMEDIES, AND MERU'S SOLE AND EXCLUSIVE LIABILITY, FOR BREACH OF THE HARD-WARE OR SOFTWARE WARRANTY SET FORTH ABOVE.

Limitations of Liability

You acknowledge and agree that the consideration which you paid to Meru does not include any consideration by Meru of the risk of consequential, indirect or inci-dental damages which may arise in connection with your use of, or inability to use, the Product. THUS, MERU AND ITS RESELLER WILL NOT BE LIABLE FOR ANY INDI-RECT, INCIDENTAL, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS, LOST BUSINESS, LOST DATA, LOSS OF USE, OR

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THE LIMITATIONS SET FORTH HEREIN ARE INTENDED TO LIMIT THE LIABILITY OF MERU AND ITS RESELLERS AND SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSEN-TIAL PURPOSE OF ANY LIMITED REMEDY.

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 prin-ciples. 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

Contents

About This Guide

This guide provides installation instructions for the Meru AP400s. The term "access point" is used interchangeably throughout this document to apply to any model when there are no differences among the models.

Audience

This guide is intended for anyone installing Meru Wireless LAN System Access Points (APs).

Other Sources of Information

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

Meru Publications

- *Meru System Director Release Notes*
- *Meru System Director Getting Started Guide*
- *Meru Controller Installation Guide*
- *Meru System Director Command Reference*
- *Meru System Director Configuration Guide*

Website Resources

For the first 90 days after you buy a Meru controller, you have access to online support. If you have a support contract, you have access for the length of the contract. See this web site for information such as:

- *Meru System Director Release Notes*
- Knowledge Base (Q&A)

- Downloads
- Open a ticket or check an existing one
- Customer Discussion Forum

The URL is: **http://support.merunetworks.com**

- *Meru System Director Getting Started Guide*
- *Meru Controller Installation Guide*
- *Meru System Director Release Notes*
- *Meru System Director Configuration Guide*
- *Meru System Director Command Reference*

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.

Typographic Conventions

This document uses the following typographic conventions to help you locate and identify information:

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.

Contacting Meru

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

http://www.merunetworks.com

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.

Meru Networks, Inc. Customer Services and Support provide end users and channel partners with the following:

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

RMA Procedures

Contact Meru Customer Services and Support for a Return Material Authorization (RMA) for any Meru equipment.

Please have the following available when making a call:

- Company and contact information
- Equipment model and serial numbers
- Meru software release and revision numbers (for example, 3.0.0-35)
- A description of the symptoms the problem is manifesting
- Network configuration

Chapter 1
Access Points

Access Points contain radio devices that communicate with the Meru Controller and form the wireless LAN (WLAN). The Meru Controller and Access Points connect to the site's wired LAN through wired switches. Wireless clients associate with the Access Points as they roam throughout the WLAN. As such, they are an extension of the wired LAN, providing the wireless benefits of client mobility, enhanced access, and dynamic network configuration.

Figure 1: Wireless LAN Connected to Network
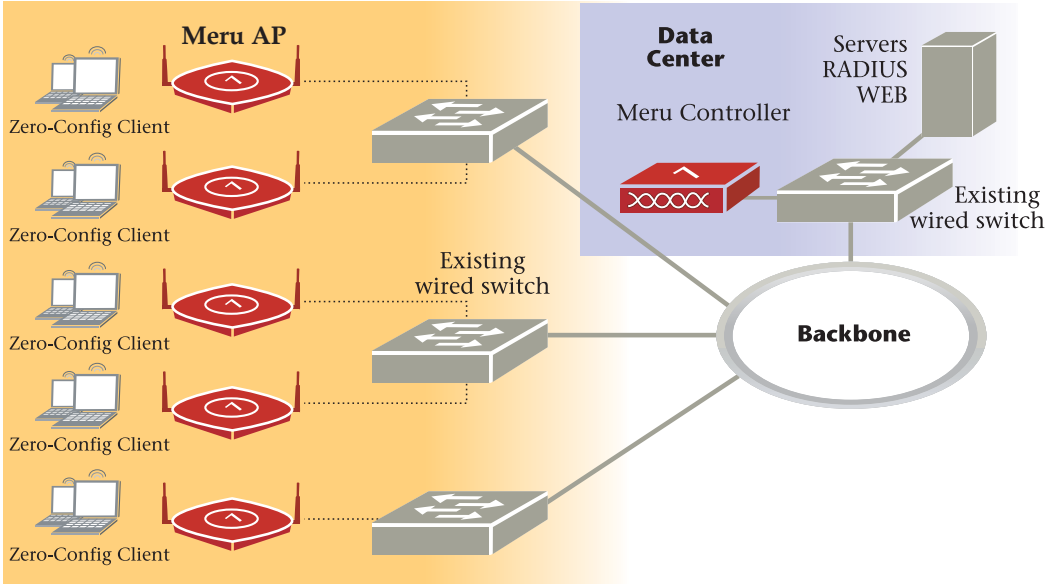
AP400

The AP400 Access Point series delivers high performance, full-speed, Wi-Fi certified 802.11n connectivity while simultaneously supporting legacy 802.11a/b/g devices. It is particularly suited to deployments that make use of voice or video wireless applications. The AP400 is available in the configurations shown below.

AP400 Configurations

| Model	Configuration
AP433e	Three dual-band 802.11n radios with 3x3 MIMO and external antennas.
AP433i	Three dual-band 802.11n radios with 3x3 MIMO and internal antennas.
AP433is	Two dual-band 802.11n radios and a spectrum radio with internal antennas.
OAP433e	Three dual-band 802.11n radios (two with 3x3 MIMO, one with 3x2) and external antennas.

Features for the AP400 include:

- Up to three 802.11n-capable wireless radios with no licensing requirement.
- 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 throughput.
- Dual-band external antenna options optimized for MIMO mode.
- Plug and Play deployment using centralized controller platforms.
- Multi-layered security including standard WPA2, 802.11i security (such as automatic traffic inspection).
- Each of these Access points may be powered by a standard 802.3af or 802.3at PoE device. However, in order to utilize all three radios in 3x3 operation, 802.3at PoE is required.
- Air Traffic Control technology for 802.11n devices and legacy a/b/g devices
- 3x3 MIMO with 3 transfer chains and 3 receive chains, delivering three spatial streams
- Channel span architecture which requires no channel planning or configuration
- Nine standard multiband, omni-directional antennas for AP433e.

Figure 2: AP433e
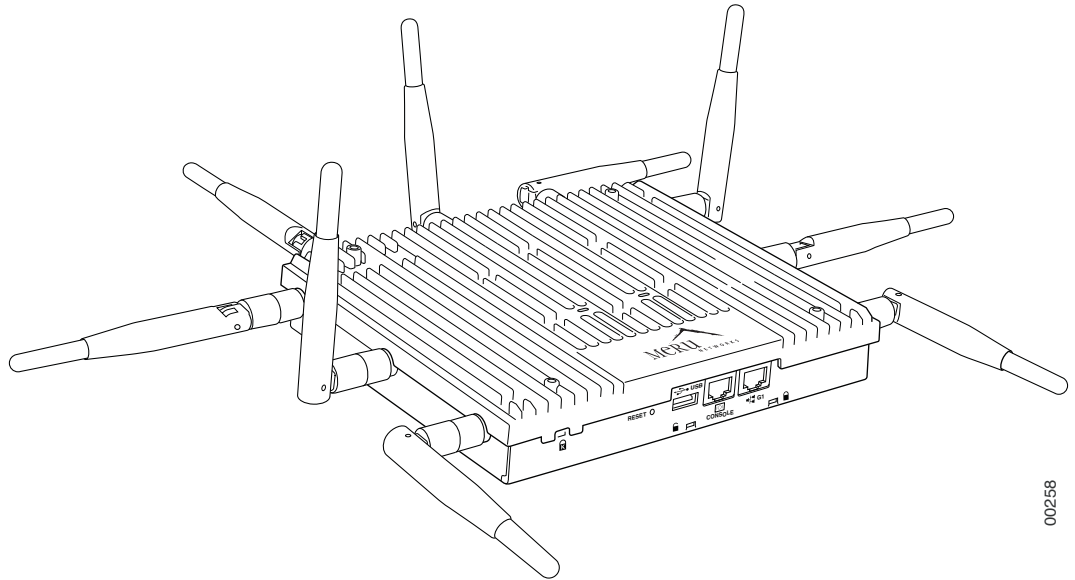
00258

Figure 3: AP433i/is
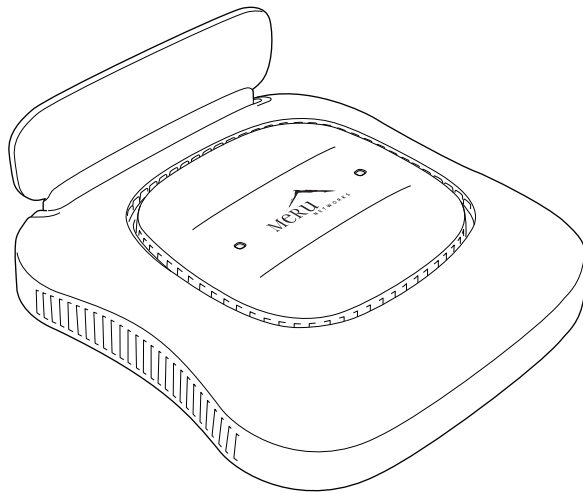
00275

Figure 34: OAP433e Outdoor Access Point (top and bottom)
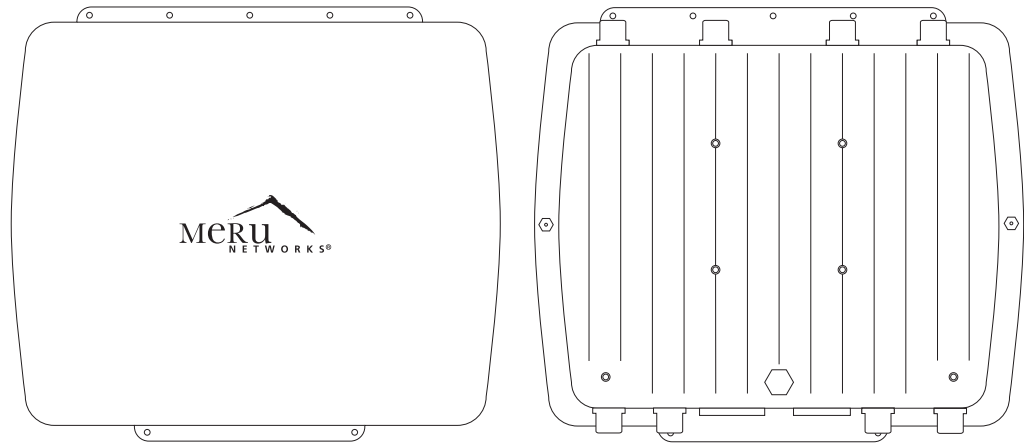
Chapter 2
Installing AP433e

This chapter describes how to install and configure an AP433e, which is supported on System Director versions 5.0 and later. It contains the following sections:

- Safety Precautions
- Unpack the AP433e
- Determine Power Requirements
- Installation Requirements
- Install the AP433e
- Check AP433e LED Activity
- Where to Go From Here

Safety Precautions

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

If an optional power supply is used, it must be one supplied by Meru Networks.

The AP433e is intended only for installation in Environment A as defined in IEEE 802.3af. All intercon-nected equipment must be contained within the same building, including the interconnected equip-ment's associated LAN connection.

Unpack the AP433e

Confirm that the AP433e shipping package contains these items:

- AP433e
- Nine antennas
- Wall mounting bracket

- Rubber feet
- Locking pin
- Two mounting screws

Determine Power Requirements

Power requirements vary, depending on which AP433e radios are deployed and what MIMO mode is used. See the chart below for supported power sources for different radio configurations.

Power Source	Radios Supported
802.3af	Radios 0 and 1
802.3at	Radios 0, 1, and 2

802.3af PoE Usage

When using System Director 5.0 (or later) and 802.3af PoE, Meru only supports two radios (radio 0 and 1). This is because three radios using an 802.3af switch may not have enough power to operate properly. When using an 802.af PoE, Meru supports single or dual radios utilizing up to 3 antennas each.

802.3at PoE Usage

When using System Director 5.0 (or later) and 802.3at, all possible configurations are supported (all three radios utilizing up to 3 antennas each). For a list of supported PoEs, see the appendix Supported Power Over Ethernet Devices for Meru APs.

Installation Requirements

An array of holes on the mounting bracket allows the AP433e 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.

The AP433e has a security cable slot so you can lock the AP433e with a standard security cable, such as those used to secure laptop computers.

Purchase optional mounting kits to mount the AP433e either from the ceiling or inside an enclosure:

- Above Suspended Ceiling Mounting Kit (T-Bar Hanger): MNT-SCRMKIT-01
- Above hanging ceiling tiles. Suitable for use in environmental air space in accordance with the Section 300-22(c) of the National Electric Code and Sections 2- 128.12 - 010 (3) and 12 - 100 of the Canadian Electrical Code. Part 1. C22. 1.

To complete AP433e installation, you need the items listed below.

Installation Type	Items Required
Horizontal mounting	None
Vertical mounting over a wall stud	• Four #6 x 2" wood screws for a wood stud; or • Four #6 x 1½" metal screws for a metal stud • Mounting bracket
Vertical mounting on sheetrock	• Four #6 x 1" screws • Four #4-6 x 7/8" ribbed plastic wall anchors • Mounting bracket
Horizontal mounting below a hanging ceiling	None
Mounting above a ceiling tile	• Mounting bracket MNT-SCRMKIT

Additional Equipment

A power source is needed to power the AP433e. See Determine Power Requirements.

Install the AP433e

Select a Location
Attach the Provided Antennas
Install the Access Point

Select a Location

All AP433e interconnected equipment, including the associated LAN connection, must be contained within the same building. In addition, the AP433e location should meet 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 is supported) or the wall near the ceiling provides the least obstructed communications path. On a wall, orient the AP433e horizontally so that you can read the Meru logo without tilting your head at 90 degrees - this orientation provides optimum MIMO performance.

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

- We recommend planning for about 50 clients per radio (or per interference region) if you plan to use Virtual Port and plan to have phones as clients. For a data-only installation, plan up to 128 clients per radio, meaning 384 for AP433e. Refer to the Meru Deployment Guides on the support site for more information.

AP433e is designed to provide 360 degree omni-directional coverage as illustrated below. Plan placement with this pattern in mind.

Figure 35: Coverage Pattern for AP433e When Ceiling Mounted
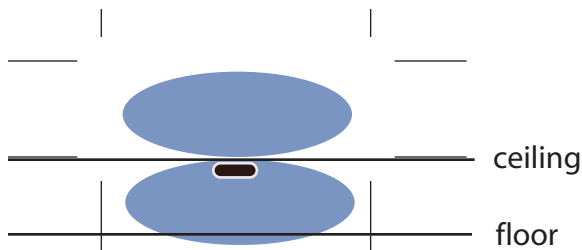
Most installations receive the best coverage using the following guidelines:

- Install APs toward the center of the building.

- Place APs about 80 feet apart.

- Do not install APs near metal objects, such as heating ducts, metal doors, or electric service panels.

- For best coverage, orient antennas as shown in Figure 6.

Attach the Provided Antennas

All AP433es have nine external antenna ports, labeled A0 - A8. These units operate with nine antennas attached, even though some configurations don't use all nine. Instead of attaching an antenna, you can cap unused antenna connectors with 50 ohm Reverse Polarity SMA terminators. (For a list of approved terminators, see http://support.merunetworks.com/.) Meru-supplied antennas are suitable only for indoor use. To achieve the best performance from your AP433e, position antennas at a 90 degree angles relative to each other as shown in Figure 6. (The antennas do not have to be oriented exactly as shown in the figure, but it is important to maintain the relative angles.) If for some reason you are unable to maintain those angles, the network will still operate, but you may experience up to a 20% drop in throughput depending on the antenna orientation.

Figure 6: AP433e Antennas in Ceiling and Wall Mount Configuration
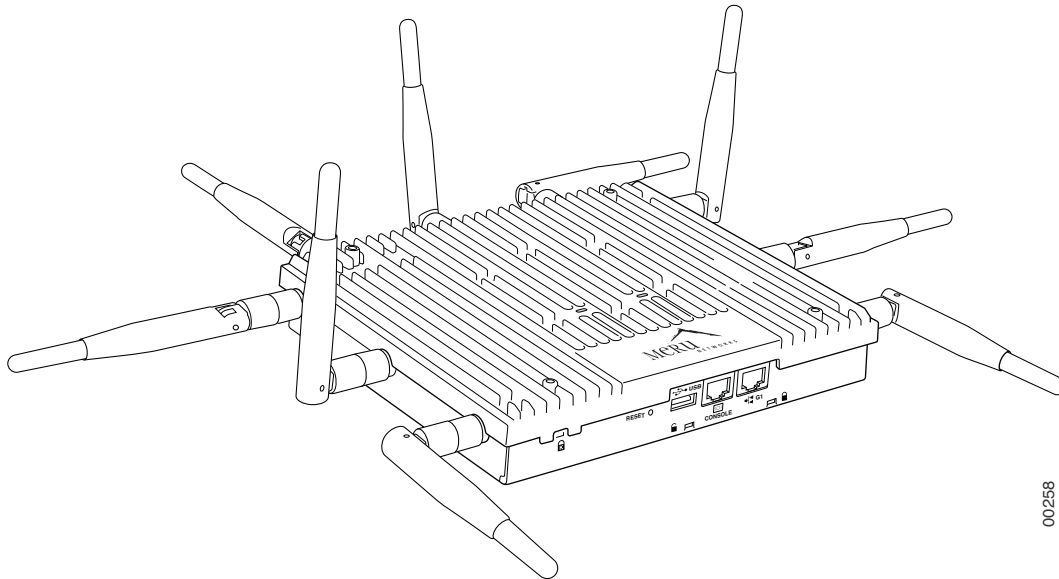
Do not leave any antenna connectors unterminated. All connectors on the AP must be terminated with antennas or with 50 ohm Reverse Polarity SMA terminators.

The attached antennas must be the same model; if you replace one antenna with a different type, replace them all.

Antenna Mappings

See Table 1 to determine which radio is associated with each antenna.

Table 1: Antenna Mappings

Antenna	Radio/Channel
1	Radio 1, Channel 0
2	Radio 1, Channel 1
3	Radio 1, Channel 2
4	Radio 2, Channel 0
5	Radio 2, Channel 1
6	Radio 2, Channel 2
7	Radio 3, Channel 0
8	Radio 3, Channel 1
9	Radio 3, Channel 2

Install the Access Point

AP433e ships with a mounting bracket included in the box. This bracket is intended for installation as a wall-mount; for mounting on a ceiling, no mount is typically required. See the following sections for more specific details.

- Mount AP433e Horizontally on a Shelf
- Mount AP433e Vertically on a Wall
- Mount AP433e Below a Suspended Ceiling
- Mount AP433e Above a Suspended Ceiling (Plenum)

Mount AP433e Horizontally on a Shelf

When mounting an AP433e horizontally, no mounting bracket is required. Be sure to position the antennas vertically when an AP433e sits on a surface. In order to ensure that the AP433e does not shift much, attach the rubber feet provided in the box to the bottom of the AP.

Mount AP433e Vertically on a Wall

To mount an AP433e on a wall, use the provided mounting bracket, as shown in Figure 7.

Figure 7: AP433e Wall Mounting Bracket

1. Place the mounting bracket against the wall with the sliding lock mechanism facing upwards. The Quick Reference Installation instructions on the bracket should be visible.

2. Using the holes on the mounting bracket itself as a guide, mark the location on the wall for the AP bracket mounting screws. If possible, center the mounting screws on a wall stud. (If mounting on a wall stud is impossible, use plastic wall anchors on the remaining screws.)

3. 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

4. If you are using plastic anchors, install them in the holes.

5. Line the bracket up with the holes and screw in the screws.

6. Attach the mounting screws to the underside of the AP433e in the holes provided (indicated in Figure 8).

Figure 8: AP Mounting Screw Holes
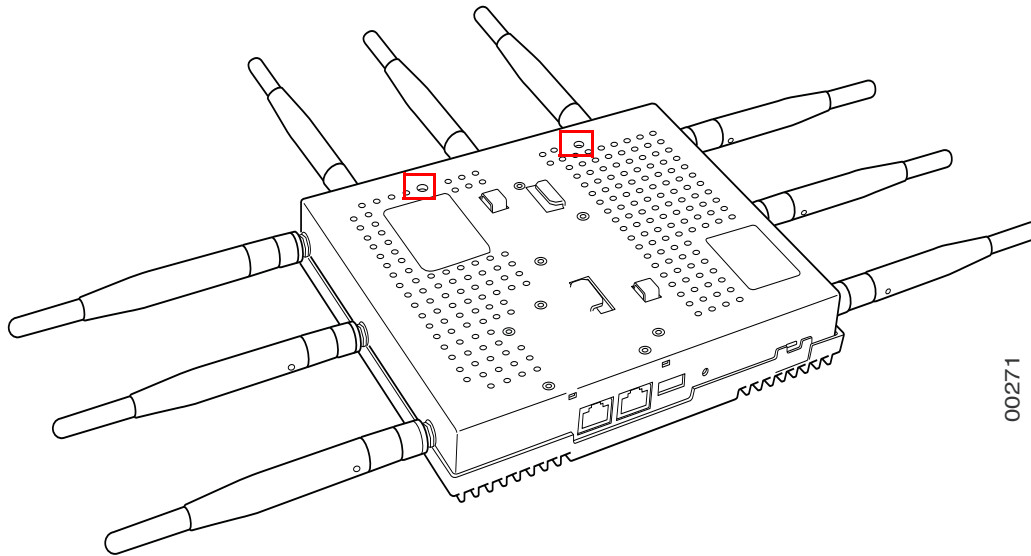
7. Orient the AP433e horizontally so that you can read the Meru logo and the Console and network ports are pointed downwards - this orientation provides optimum MIMO performance.

8. Align the mounting screws on the back of the AP433e with the corresponding holes on the mounting bracket.

9. Slide the AP433e downwards until the screws click into the holes. They should seat fairly firmly.

10. Slide the mounting bracket's locking bar to the right, locking the AP in place.

11. If desired, use the provided clip to lock the bracket shut by sliding it through the aligned holes on the right-hand side of the bracket.

12. Attach the antennas to the AP.

13. Connect one end of the Ethernet cable to the switch and the other end to the AP433e Ethernet port.

> **!** **Caution!** Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this, the AP won't power up.

Figure 9: Ports for the AP433e
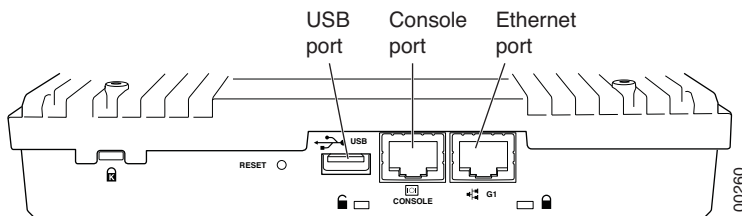
Mount AP433e Below a Suspended Ceiling

The brackets on the bottom of the AP433e allow it to be mounted directly to a ceiling T-bar (see Figure 10). Note that the AP lock must be **disabled** by sliding the locking key (provided in the box) into the **unlock** hole on the side of the AP shown in Figure 9 in order to clip the AP in place.

Figure 10: Mounting AP433e to a Suspended Ceiling Rail
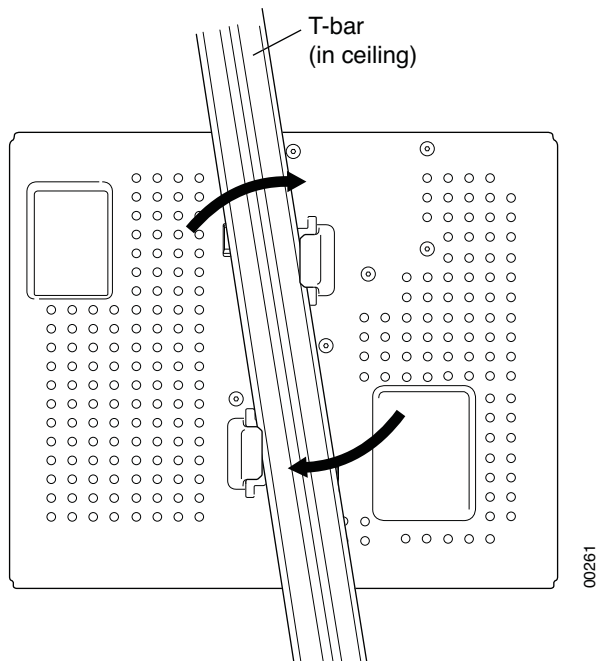
To mount an AP433e below a suspended ceiling:

1. Determine the location on the ceiling rail where the AP will be mounted and remove the ceiling tiles.

2. Verify that the AP is **unlocked** using the locking key on the unlock mechanism (on the same side as the Ethernet ports).

3. Press the AP433e against the T-bar at a slight angle and then rotate into place, as indicated in Figure 10. You should hear it snap in place.

4. For each antenna, loosen the knurled ring at the base of the antenna, orient the antenna and then retighten the ring.

5. Connect one end of the PoE Ethernet cable to the AP's Ethernet port (see Figure 11).

> **!** **Caution!** Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this. the AP won't power up.

Figure 11: Ports and Unlock Mechanism for the AP433e
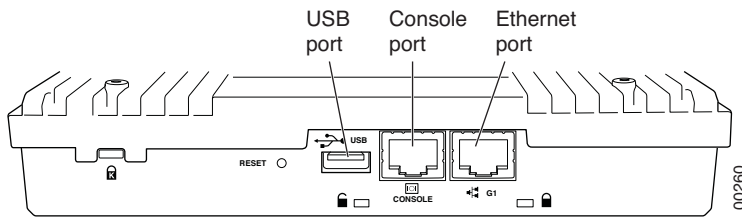
Mount AP433e Above a Suspended Ceiling (Plenum)

Use the optional T-bar box hanger mounting kit to mount the AP433e above suspended ceiling T-rails (see Figure 13). The installation attaches the T-bar box hanger to the ceiling rails and then the AP433e attaches to the T-bar box hanger. Note that an AP433e mounted above the ceiling has about 2-3 dBm less RF coverage than an AP433e mounted under the ceiling.

The AP433e with the metal enclosure exposed meets the requirements for fire resistance and low smoke-generating characteristics required by Section 300-22(C) of the National Electrical Code (NEC) for installation in a building's environmental air space.

You may need to modify thicker tiles to support this installation.

Warning! When installed in air-handling spaces, such as above a suspended ceiling, power the AP433e only with a PoE, not a power supply.

Warning! Any Fast Ethernet (FE) cables installed in air-handling spaces should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP (Multi Purpose Plenum), or CMP (Communications Plenum). Use Ethernet cable that meets the requirements for operating in plenums and environmental air space in accordance with Section 300-22(C) of the NEC.

To mount an AP433e above the ceiling with the optional T-bar kit, follow these steps:

1. Determine the location on the ceiling rails where the AP will be mounted and remove the ceiling tile.

2. Unpack the T-bar hanger kit.

3. Unlock the AP by sliding the locking key into the small hole with an unlocked image above it.

Figure 12: Ports and Unlock Mechanism for the AP433e
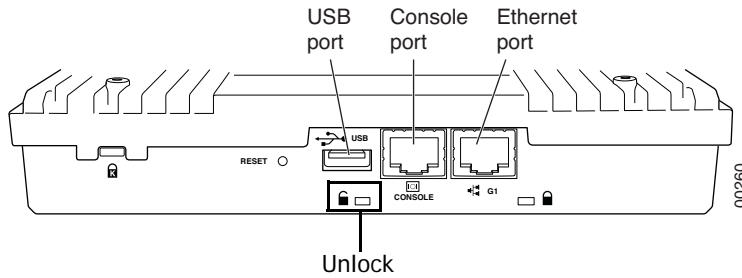
4. Attach the square bracket to the underside of the main support bar using the screws provided, as shown in Figure 13.

Figure 13: AP433e Mounted Above a Suspended Ceiling Face Down
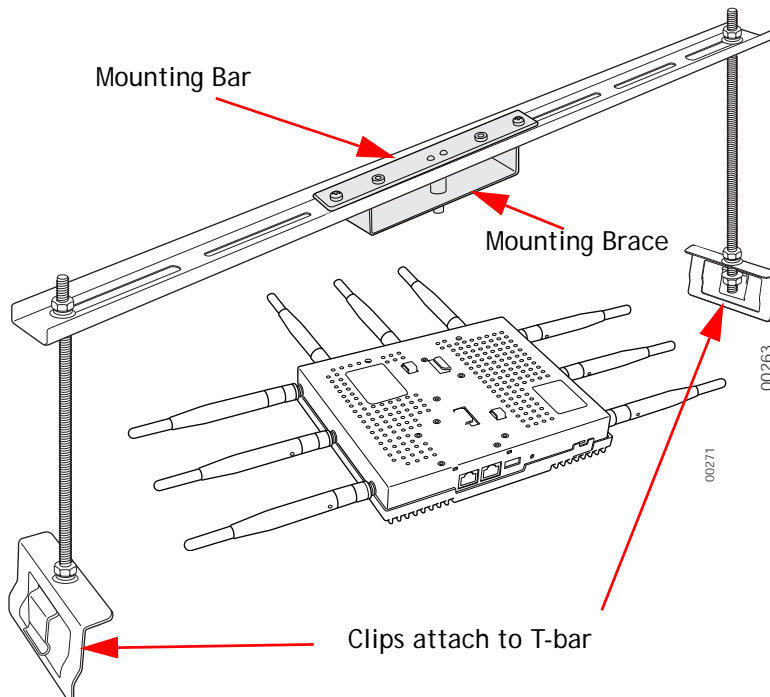
5. Brace your hand against the back of the main support bar and press the AP433e against the square bracket in a similar manner to that indicated in Figure 10.

6. Twist until the AP433e clicks into place. If desired, you can now lock the AP using the locking key.

7. Attach the two legs of the mounting bracket to the T-bars on which the AP is to be mounted by sliding the clips onto the bars.

8. For each antenna, loosen the knurled ring at the base of the antenna, point the antenna down, then retighten the ring (or attach the antennas, if not already done).

9. Remove a nut from each leg and slide the crossbar (with the AP attached) in place on top of the legs.

10. Replace the two nuts, locking the bar in place.

11. Connect one end of the PoE Ethernet cable to the Ethernet connector.

! **Caution!** Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this. the AP won't power up.

✔ **Note:** Use a shielded Cat 5e (or greater) Ethernet cable in order to comply with international electromagnetic emissions limits.

12. Check that the AP433e is operating correctly before replacing the ceiling tile. Verify correct operating using the LEDs, as shown in Check AP433e LED Activity.

Mount AP433e on a Dropped Ceiling Bevel Tile

The mounting procedure for a ceiling that has recessed supports and lowered tiles is similar to that of mounting on a suspended ceiling. However, this procedure requires a specialized mounting bracket (MNT-SCRMKIT-03), as shown in Figure 14.

Figure 14: Dropped Bevel Tile Mounting Bracket
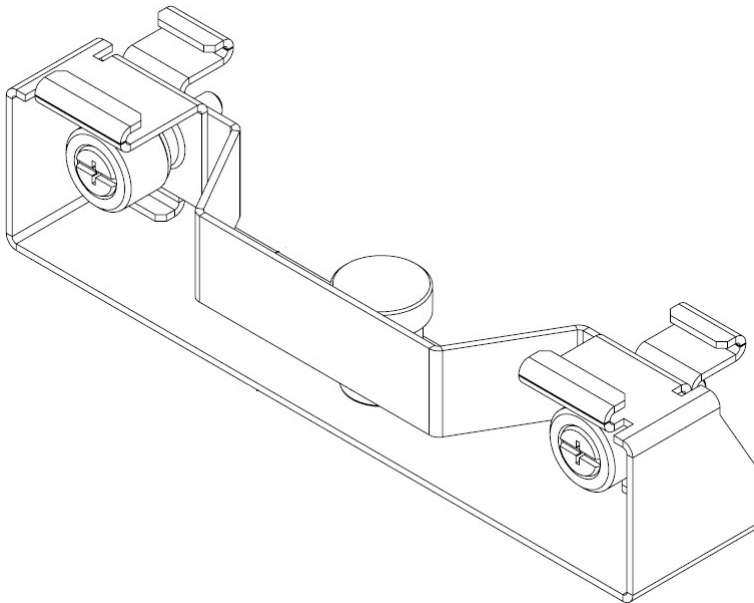
1. Remove the ceiling tile alongside which the AP will be mounted.

2. Be sure that AP433e is not locked by inserting the locking key into the Unlock mechanism as shown in Figure 15 below.

Figure 15: Ports and Unlock Mechanism for the AP433e
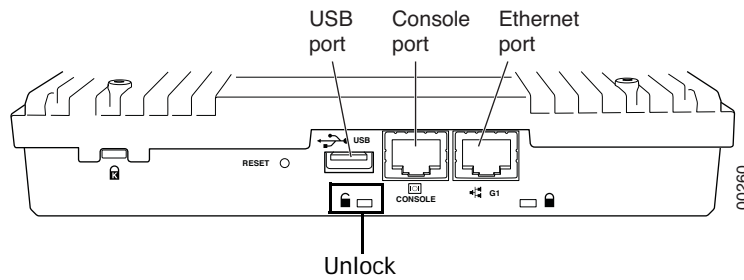
3. Align the mounting bracket with the AP433e slots used for the ceiling t-bar in **Mount AP433e Below a Suspended Ceiling**.

4. Press down on the tab indicated on the underside of the AP and twist the AP into place.

5. Push down on the thumbscrews provided on the mounting bracket and clip it to the ceiling bar that will support the AP.

6. Tighten the screws to ensure that the mechanism stays locked in place.

7. Connect one end of the CAT5 (or greater) Ethernet cable with PoE to the Ethernet connector shown in **Figure 15** above.

!   **Caution!**   Be sure to connect the Ethernet cable to the Ethernet port. The cable can mistakenly be plugged into the Console port; if you do this, the AP won't power up.

Mount AP433e on an Interlude T-Bar

The mounting procedure for a ceiling that has interlude T-Bar supports is similar to that of mounting on a suspended ceiling. However, this procedure requires a specialized mounting bracket (MNT-SCRMKIT-04), as depicted in Figure 16.

Figure 16: T-Bar Mounting Bracket
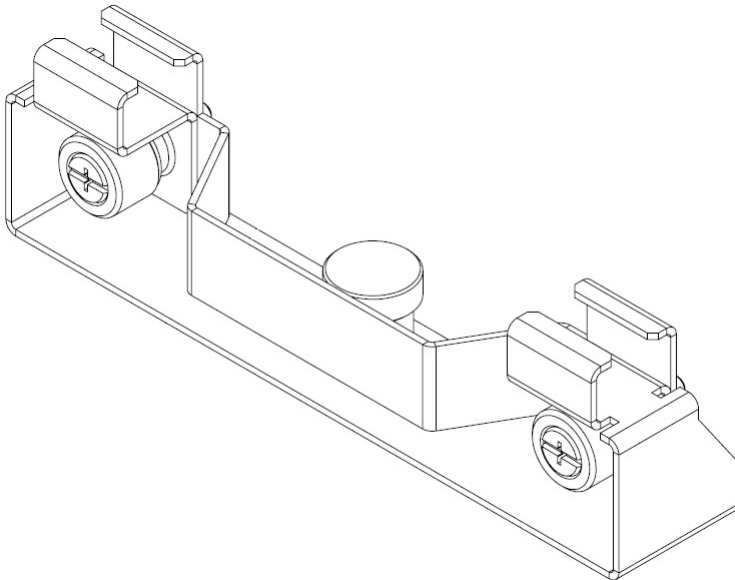
1. Remove the ceiling tile alongside which the AP will be mounted.

2. Be sure that AP433e is not locked by inserting the locking key into the Unlock mechanism as shown in Figure 17 below.

Figure 17: Ports and Unlock Mechanism for the AP433e
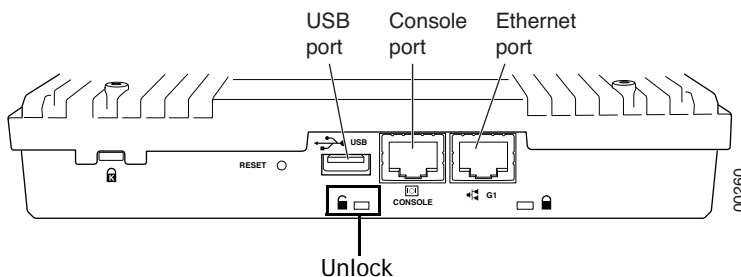
3. Align the mounting bracket with the AP433e slots used for the ceiling t-bar in Mount AP433e Below a Suspended Ceiling.

4. Press down on the tab indicated on the underside of the AP and twist the AP into place.

5. Push down on the thumbscrews provided on the mounting bracket and clip it to the ceiling bar that will support the AP.

6. Tighten the screws to ensure that the mechanism stays locked in place.

7. Connect one end of the CAT5 (or greater) Ethernet cable with PoE to the Ethernet connector shown in Figure 17 above.

> **!** **Caution!** Be sure to connect the Ethernet cable to the Ethernet port. The cable can mistakenly be plugged into the Console port; if you do this, the AP won't power up.

Check AP433e LED Activity

When AP433e first connects to the controller (and any time the access point is rebooted), the AP initializes and is then programmed by the controller. When the AP first powers up, all LEDs are green.

Figure 18: AP433e Status LEDs
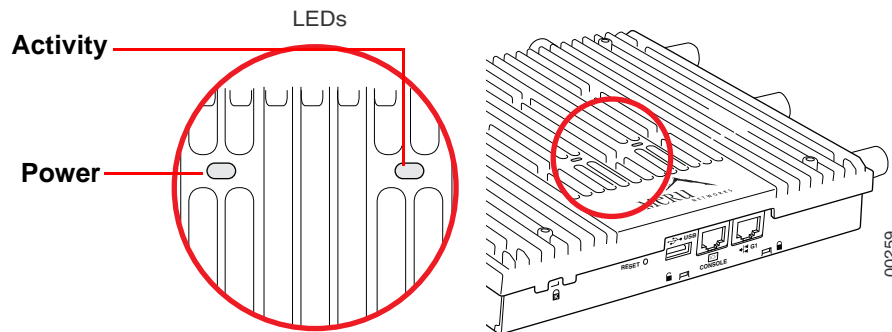
After the AP433e is connected, check the status of the LEDs. The functions of the LEDs are described below.

AP433e LED Descriptions

LED	Function	Troubleshooting
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	If the status LED is blinking red and yellow, there is an alarm on the AP. Determine what the alarm is by clicking **Monitor > Dashboard > Alarms** and looking at the AP alarms. You can also use the CLI commands **show alarm** and **show log**.

Change LED Appearance

If you want to change the appearance of the LEDS, follow these steps:

1. From the controller, click **Configuration > Devices > AP**, and then select the AP.

2. Select one of these settings for the LED Mode setting:
   — **Normal:** LEDs are as described above
   — **Blink:** Sets all LEDs flashing; this is useful to locate an AP
   — **Dark:** Turns off all LEDs

3. Click **OK**.

Where to Go From Here

Now that the AP433e is installed, refer to the *Meru System Director Getting Started Guide* for instructions on initializing the hardware. Return to this chapter to check the status of the LEDs once the WLAN is operational.

Chapter 3
Installing AP433i

AP433i is supported by System Director versions 5.1 and greater. This chapter describes how to install and configure an AP433i or AP433is. It contains the following sections:

- Safety Precautions
- Unpack the AP433i
- Determine Power Requirements
- Installation Requirements
- Installing AP433i
- Check AP433i LED Activity
- Where to Go From Here

> **Note:** This document depicts installation procedures for the AP433i and 433is models. Since both devices are externally identical, the same procedures can be used for either device.

Safety Precautions

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

If an optional power supply is used, it must be one supplied by Meru Networks.

The AP433i 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.

Unpack the AP433i

Confirm that the shipping box contains the following:

- AP433i
- Plastic attachment (used when paddle antenna is disconnected)
- Wall mounting bracket
- Rubber feet
- Locking pin
- Two mounting screws

Determine Power Requirements

Power requirements vary, depending on which AP433i radios are deployed and what MIMO mode is used. See the chart below for supported power sources for different radio configurations.

Power Source	Radios Supported
802.3af	Radios 0 and 1
802.3at	Radios 0, 1, and 2

802.3af PoE Usage

When using System Director 5.0 (or later) and 802.3af PoE, Meru only supports two radios (radio 0 and 1). This is because three radios using an 802.3af switch may not have enough power to operate properly. When using an 802.af PoE, Meru supports single or dual radios utilizing up to 3 antennas each.

802.3at PoE Usage

When using System Director 5.0 (or later) and 802.3at, all possible configurations are supported (all three radios utilizing up to 3 antennas each). For a list of supported PoEs, see the appendix Supported Power Over Ethernet Devices for Meru APs.

Installation Requirements

An array of holes on the mounting bracket allows the AP433i 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.

The AP433i has a security cable slot so you can lock the AP433i with a standard security cable, such as those used to secure laptop computers.

Purchase optional mounting kits to mount the AP433i either from the ceiling or inside an enclosure:

- Above Suspended Ceiling Mounting Kit (T-Bar Hanger): MNT-SCRMKIT-01

To complete AP433i installation, you need the items listed below.

Installation Type	Items Required
Horizontal mounting	None
Vertical mounting over a wall stud	- Four #6 x 2" wood screws for a wood stud; or - Four #6 x 1½" metal screws for a metal stud - Mounting bracket
Vertical mounting on sheetrock	- Four #6 x 1" screws - Four #4-6 x 7/8" ribbed plastic wall anchors - Mounting bracket
Horizontal mounting below a hanging ceiling	None
Mounting above a ceiling tile	- Mounting bracket MNT-SCRMKIT-01

Additional Equipment

A power source is needed to power the AP433i. See Determine Power Requirements.

Installing AP433i

Select a Location

All AP433i interconnected equipment must be contained within the same building, including the inter-connected equipment's associated LAN connection. Ceiling mounting is recommended but wall mounting is also supported. In addition, the AP433i 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 is supported) or the wall near the ceiling provides the least

obstructed communications path. On a wall, orient the AP433i horizontally so that you can read the Meru logo without tilting your head at 90 degrees - this orientation provides optimum MIMO performance.

- We recommend planning for about 50 clients per radio (or per interference region) if you plan to use Virtual Port and plan to have phones as clients. For a data-only installation, plan up to 128 clients per radio, meaning 384 for AP433i. Refer to the Meru Deployment Guides on the support site for more information.

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

AP433i is designed to provide 180 degree omni-directional coverage as illustrated below. Plan placement with this pattern in mind.

Figure 19: Coverage Pattern for AP433i When Ceiling Mounted
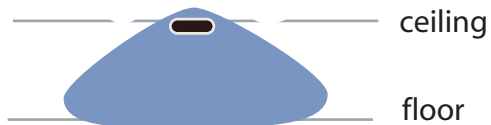
Most installations receive the best coverage using the following guidelines:

- Install APs toward the center of the building.

- Place APs about 80 feet apart.

- Do not install APs near metal objects, such as heating ducts, metal doors, or electric service panels.

AP433is Operating Band Configuration

Due to the spectrum scanning capability implemented in the AP433is models, users must ensure that the three radios provided by the AP are configured to specific bands and channels for optimal operation.

Install the Access Point

AP433i ships with a mounting bracket included in the box. This bracket is intended for installation as a wall-mount; for mounting on a ceiling, no bracket is typically required. See the following sections for more specific details.

Mount AP433i in any of the following ways:

- Mount AP433i Horizontally on a Shelf

- Mount AP433i Vertically on a Wall

- Mount AP433i Below a Suspended Ceiling

- Mount AP433i Above a Suspended Ceiling

Mount AP433i Horizontally on a Shelf

When mounting an AP433i horizontally, no mounting bracket is required. Be sure to position the paddle antenna vertically when an AP433i sits on a surface. In order to ensure that the AP433i does not shift much, attach the rubber feet provided in the box to the bottom of the AP.

Mount AP433i Vertically on a Wall

Prior to installing the mounting bracket, it is recommended that users remove the protective plastic shell from the AP. This makes it easier to properly lock the device in place once it is mounted. To remove the shell, flip the AP upside-down and release the four locking clips from the AP itself, as indicated in Figure 20.

Figure 20: AP433i Shell Clip Locations

Press tabs on each corner to release.

Press tabs on each corner to release.

00276
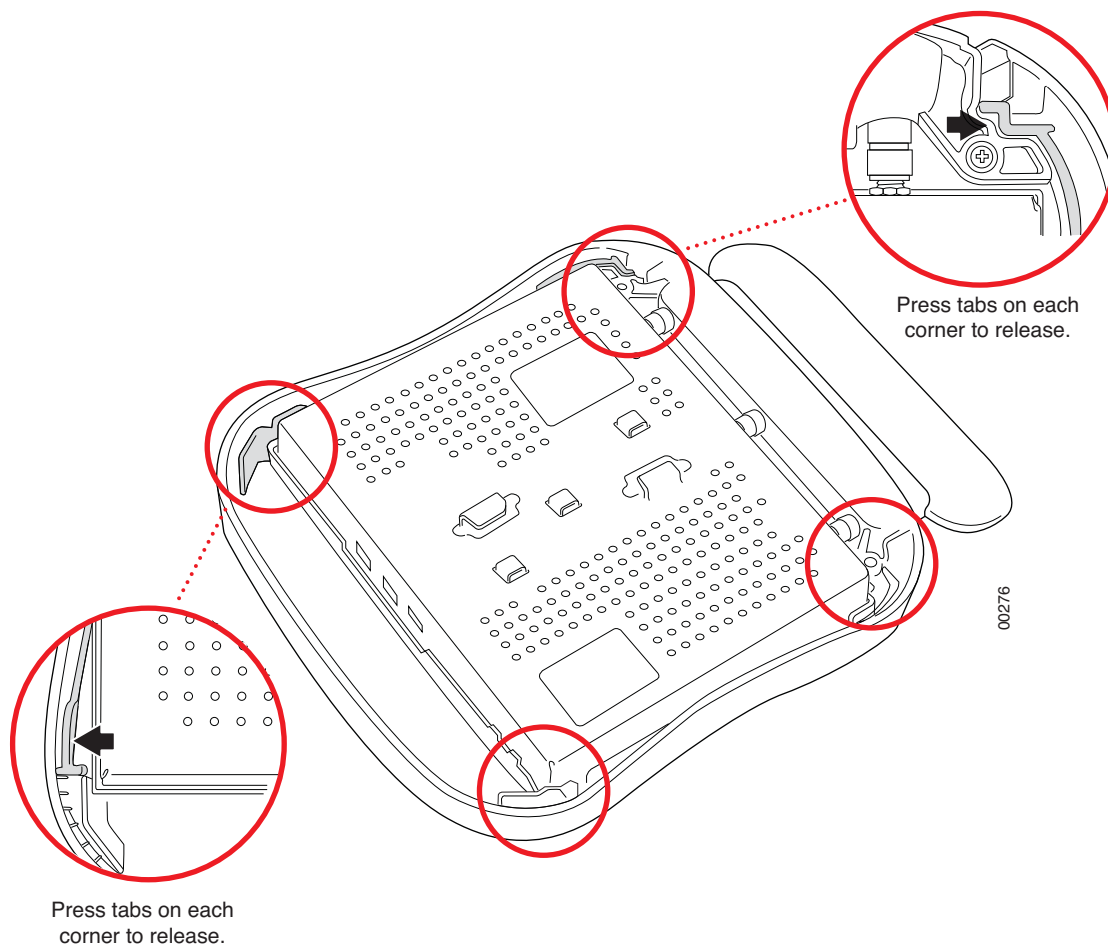
After unclipping the shell, it is a simple matter to lift it off of the main AP. See Figure 21.

Figure 21: Removing the AP433i Shell
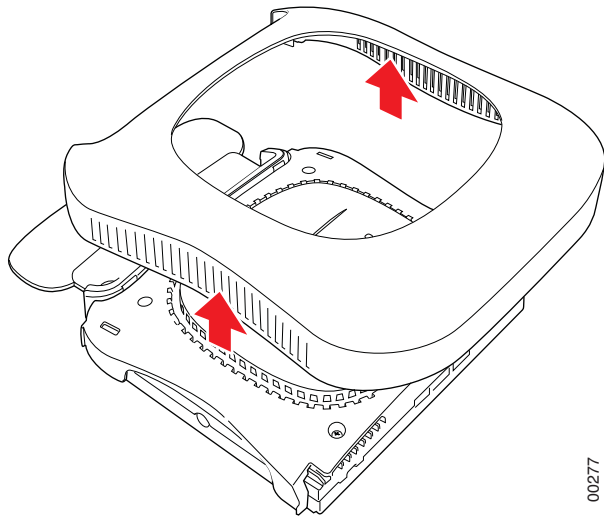
You are now ready to proceed with the wall mounting procedure.

To mount an AP433i on a wall, use the provided mounting bracket, as shown in Figure 22.

Figure 22: AP433i Wall Mounting Bracket

1. Place the mounting bracket against the wall with the sliding lock mechanism facing upwards. The Quick Reference Installation instructions on the bracket should be visible.

2. Using the holes on the mounting bracket itself as a guide, mark the location on the wall for the AP bracket mounting screws. If possible, center the mounting screws on a wall stud. (If mounting on a wall stud is impossible, use plastic wall anchors on the remaining screws.)

3. 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

4. If you are using plastic anchors, install them in the holes.

5. Line the bracket up with the holes and screw in the screws.

6. Attach the mounting screws to the underside of the AP433i in the holes provided (indicated in Figure 23).

Figure 23: AP Mounting Screw Holes
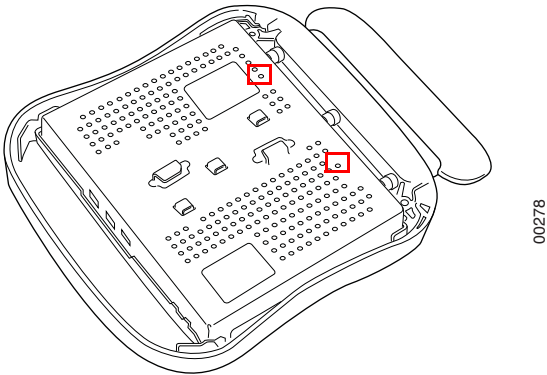
7. Orient the AP433i horizontally so that you can read the Meru logo and the Console and network ports are pointed downwards - this orientation provides optimum MIMO performance.

8. Align the mounting screws on the back of the AP433i with the corresponding holes on the mounting bracket.

9. Slide the AP433i downwards until the screws click into the holes. They should seat fairly firmly.

10. Slide the mounting bracket's locking bar to the right, locking the AP in place.

11. If desired, use the provided clip to lock the bracket shut by sliding it through the aligned holes on the right-hand side of the bracket.

Figure 24: Locking the AP in Place

Insert locking pin
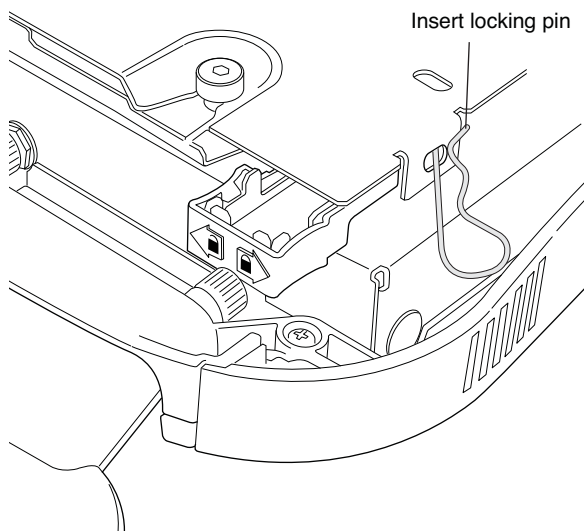
12. Connect one end of the Ethernet cable to the switch and the other end to the AP433i Ethernet port.

! **Caution!** Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this, the AP won't power up.

Figure 25: Ports for the AP433i
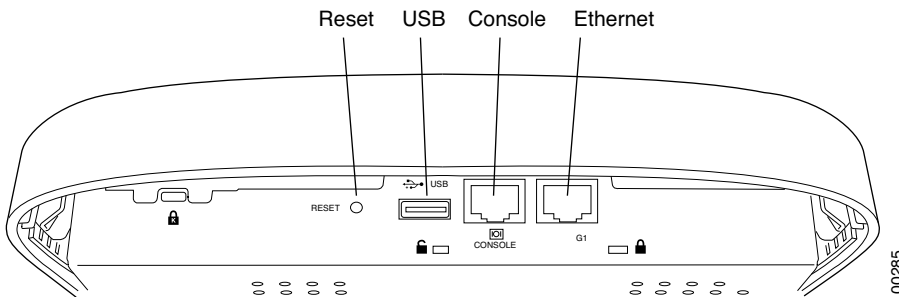
Mount AP433i Below a Suspended Ceiling

The brackets on the bottom of the AP433i allow it to be mounted directly to a ceiling T-bar (see Figure 26). Note that the AP lock must be **disabled** by sliding the locking key (provided in the box) into the **unlock** hole on the side of the AP shown in Figure 25 in order to clip the AP in place.

Figure 26: Mounting AP433i to a Suspended Ceiling Rail
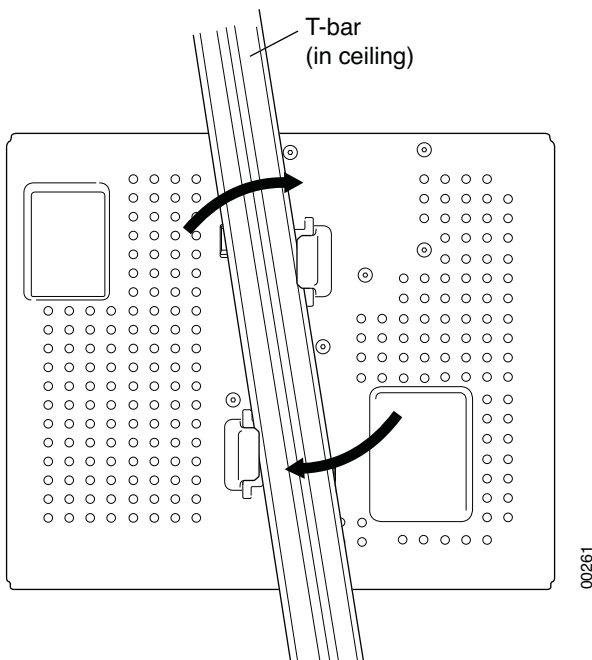
To mount an AP433i below a suspended ceiling:

1. Determine the location on the ceiling rail where the AP will be mounted and remove the ceiling tiles.

2. Verify that the AP is **unlocked** using the locking key on the unlock mechanism (on the same side as the Ethernet ports).

3. Press the AP433i against the T-bar at a slight angle and then rotate into place, as indicated in Figure 26. You should hear it snap in place.

4. Connect one end of the PoE Ethernet cable to the AP's Ethernet port (see Figure 27).

> **!** **Caution!** Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this. the AP won't power up.

Figure 27: Ports for the AP433i
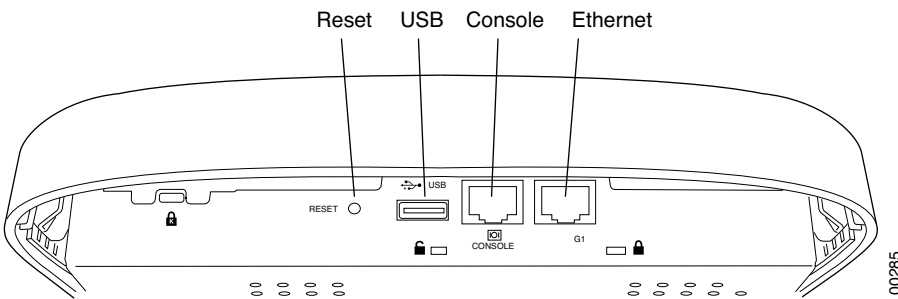
Mount AP433i Above a Suspended Ceiling

Use the optional T-bar box hanger mounting kit to mount the AP433i above suspended ceiling T-rails (see Figure 29). The installation attaches the T-bar box hanger to the ceiling rails and then the AP433i attaches to the T-bar box hanger. Note that an AP433i mounted above the ceiling has about 2-3 dBm less RF coverage than an AP433i mounted under the ceiling.

You may need to modify thicker tiles to support this installation.

> **⚡** **Warning!** The AP433i is not plenum rated and as such should only be installed in non-plenum airspace.

> **⚡** **Warning!** Any Fast Ethernet (FE) cables installed in air-handling spaces should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP (Multi Purpose Plenum), or CMP (Communications Plenum). Use Ethernet cable that meets the requirements for operating in plenums and environmental air space in accordance with Section 300-22(C) of the NEC.

To mount an AP433i above the ceiling with the optional T-bar kit, follow these steps:

1. Determine the location on the ceiling rails where the AP will be mounted and remove the ceiling tile.

2. Unpack the T-bar hanger kit.

3. Unlock the AP by sliding the locking key into the small hole with an unlocked image above it.

Figure 28: Ports for the AP433i
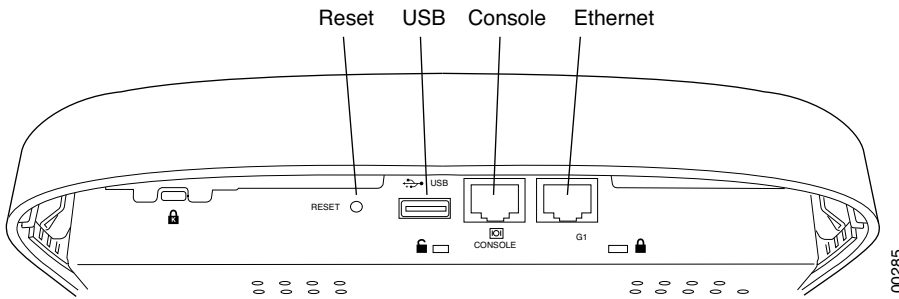
4. Attach the square bracket to the underside of the main support bar using the screws provided, as shown in Figure 29.

Figure 29: AP433i Mounted Above a Suspended Ceiling Face Down
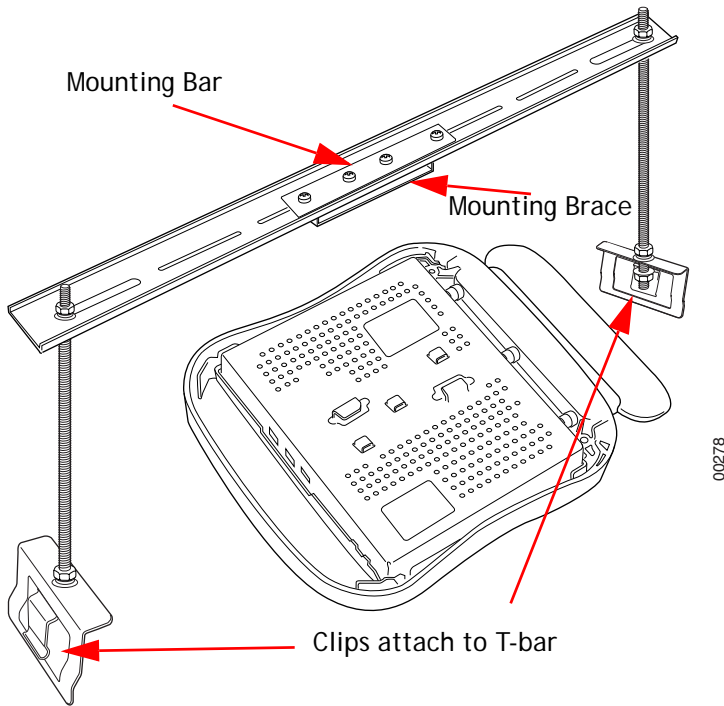
5. Brace your hand against the back of the main support bar and press the AP433i against the square bracket in a similar manner to that indicated in Figure 26.

6. Twist until the AP433i clicks into place. If desired, you can now lock the AP using the locking key.

7. Attach the two legs of the mounting bracket to the T-bars on which the AP is to be mounted by sliding the clips onto the bars.

8. Align the antenna in a vertical position, so that it is perpendicular to the AP itself.

9. Remove a nut from each leg and slide the crossbar (with the AP attached) in place on top of the legs.

10. Replace the two nuts, locking the bar in place.

11. Connect one end of the PoE Ethernet cable to the Ethernet connector.

Caution!   Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port. If you do this. the AP won't power up.

Note: Use a shielded Cat 5e (or greater) Ethernet cable in order to comply with international electromagnetic emissions limits.

12. Check that the AP433i is operating correctly before replacing the ceiling tile. Verify correct operating using the LEDs, as shown in Check AP433i LED Activity.

Check AP433i LED Activity

When AP433i first connects to the controller (and any time the access point is rebooted), the AP initializes and then is programmed by the controller. When the AP first powers up, all LEDs are green. Thereafter, the Status LED color reflects the various operating states.

Figure 30: AP433i Status LEDs
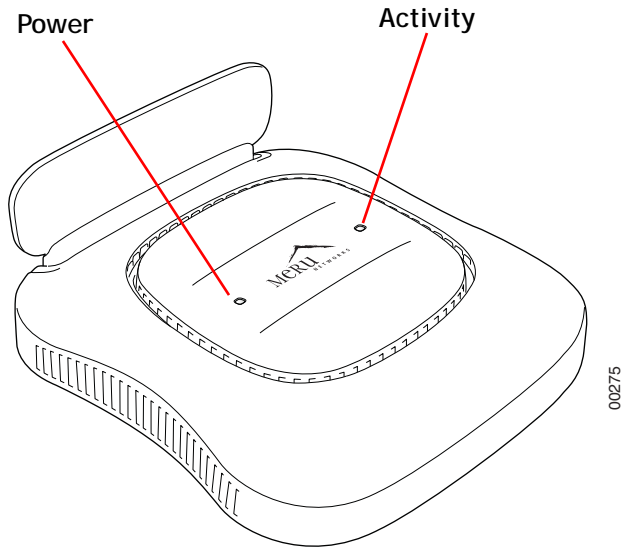
After the AP433i is connected, check the status of the LEDs. The functions of the LEDs are described below.

AP433i LED Descriptions

LED	Function	Troubleshooting
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	If the status LED is blinking red and yellow, there is an alarm on the AP. Determine what the alarm is by clicking **Monitor** > **Dashboard** > **Alarms** and looking at the AP alarms. You can also use the CLI commands **show alarm** and **show log**.

Change LED Appearance

If you want to change the appearance of the LEDS, follow these steps:

1. From the controller, click **Configuration** > **Devices** > **AP**, and then select the AP.

2. Select one of these settings for the LED Mode setting:
   — **Normal**: LEDs are as described above
   — **Blink**: Sets all LEDs flashing; this is useful to locate an AP
   — **Dark**: Turns off all LEDs

3. Click **OK**.

Where to Go From Here

Now that the AP433i is installed, go to the *Meru System Director Getting Started Guide* for instructions on initializing the hardware. Return to this chapter to check the status of the LEDs once the WLAN is operational.

Chapter 4
Installing OAP433e

This chapter describes how to physically install an OAP433e, which is supported on System Director versions 5.1 and later. It contains the following sections:

- Unpacking the OAP433e
- Installation Requirements
- Assembling the Waterproof Ethernet Connector
- Installing the Access Point
- Where to Go From Here

✔ **Note:** Please use the OAP433 series only with Listed ITE or equivalently-rated equipment.

Unpacking the OAP433e

Figure 34: OAP433e Outdoor Access Point (top and bottom)
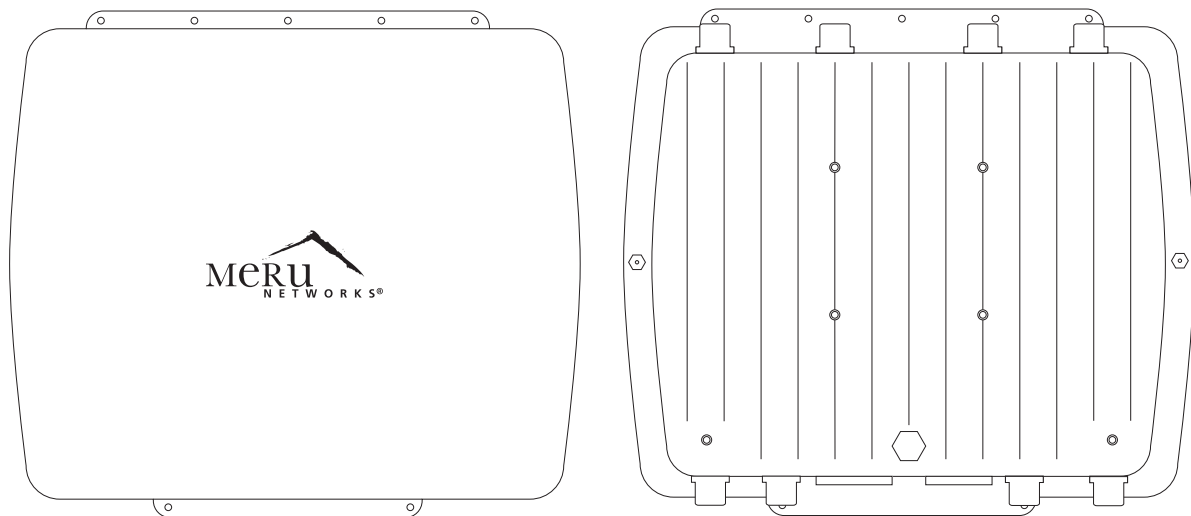
Confirm that the OAP433e shipping boxes contain the following items:

- OAP433e Outdoor Access Point
- Water barrier for the Ethernet connection (when shipped, this is not connected to the AP)
- Wall/Pole Mount Hardware Kit for mounting OAP433e to a 2″ to 3″ diameter steel pole or tube or as part of a radio or tower structure (3 pieces)
- Screws and bolts for assembling the mounting bracket
- Drywall screws (for wall-mounted installation)
- Ground wire

Installation Requirements

In addition to the hardware supplied by Meru Networks, you need the following:

Required

- Antennas (sold separately)
- RF coaxial cable to connect the antennas to the OAP433e
- Drill (if wall-mounting)
- Crescent wrench
- Outdoor CAT5 Ethernet cable—Cable type CMX
  — Size 22 (American Wire Gauge) with a 3.8mm gap
  — Size 24 (AWG) with a 3mm gap

✔ **Note:** The Ethernet cable must be run through the OAP433e's water-tight input port, which is provided in the package. This will ensure a waterproof seal around the connection. Follow the instructions listed later in this chapter to properly install the cable.

Power Requirements

The OAP433e does not ship with a power adapter, and as such, must be powered by a PoE device. In order to ensure that all three radios on the AP are active, it must be plugged into an 802.3at power source. If an 802.3af source is used, the third radio will be disabled due to insufficient power.

Assembling the Waterproof Ethernet Connector

The OAP433 ships with a separate Ethernet connector that must be disassembled in order to run a cable through it. Once tightened and connected to the AP itself, this connector will ensure a waterproof seal for the AP.

To run an Ethernet cable through the waterproof connector:

1. Unscrew the two main components of the connector.

2. Remove the insert from the larger portion of the connector. This should be a rubber casing surrounded by a plastic shell. Both the plastic shell and the rubber casing should have a slit along one side, allowing them to be opened up in order to insert the cable.

3. Prior to attaching the rubber casing to the cable, run the cable through the smaller portion of the original two-part enclosure. Be sure to run the cable through the smaller opening (at the top of the plastic component) so that the head of the cable goes towards the AP. (Note that this step can be done after the rest of the connector has been assembled, but it can be difficult to do so when deploying long cables, so it's best to do it here instead.)

4. Run the Ethernet cable through the slit in the rubber casing and ensure that the casing wraps firmly around the cable. The Ethernet connector at the end of the cable should be on the larger side of the rubber casing.

5. Replace the larger plastic component (the one that has threading on both ends) such that it fits around the rubber casing with the plastic shell. The portion of the component with a large rubber washer should be facing the end of the Ethernet cable (which will be connected to the AP).

6. Connect the Ethernet cable to the port on the AP and screw the plastic threading in place. This should be tightened firmly, but should not require excessive force.

7. Finally, screw the last plastic portion to the top of the threading. Again, tighten this firmly, but not excessively. The gap between the top cap and the base of the threading component should be 3mm when using a 24AWG cable or 3.8mm when using a 22AWG cable.

Now that the Ethernet cable connection has been fully assembled, the AP is ready to be deployed.

Installing the Access Point

Selecting a Location

When you plan the OAP433e physical configuration, include the elements shown in this drawing:

Figure 35: Sample Physical Layout
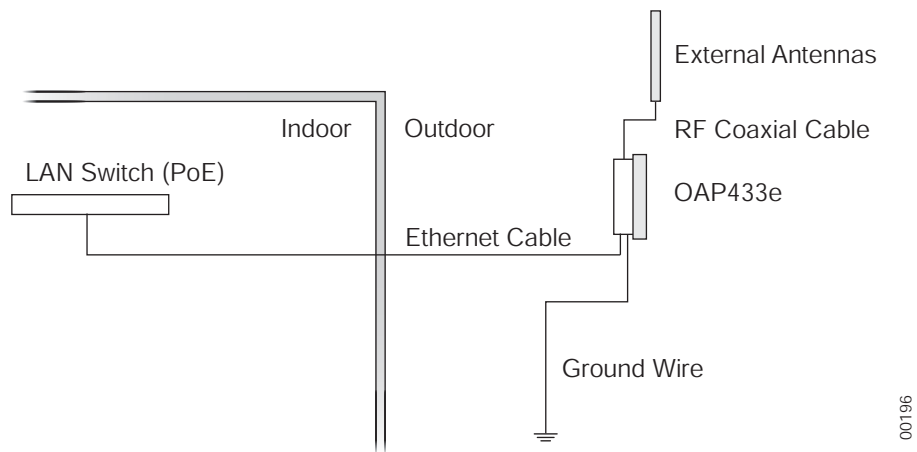
Radio Position Planning

Never construct a radio mast, pole, or tower near overhead power lines. In addition, local regulations may limit or prevent construction of a high radio mast or tower. If your OAP433e link requires a high radio mast or tower, consult a professional contractor for advice. Once the required antenna height has been determined, other factors affecting the precise position of the OAP433e must be considered.

● Be sure there are no other radio antennas within 2 m (6 ft.) of the OAP433e.

● Place the OAP433e away from power and telephone lines.

● Avoid placing the OAP433e too close to any metallic, reflective surfaces, such as roof-installed air-conditioning equipment, tinted windows, wire fences, or water pipes.

Radio Interference

Avoiding radio interference is an important part of wireless planning. Interference is caused by other radio transmissions using the same or an adjacent channel frequency. You should first scan your proposed site using a spectrum analyzer to determine if there are any strong radio signals using the 2.4 or 5 GHz spectrums. Always use a channel frequency that is furthest away from another signal on the spectrum.

Weather Conditions

Take into account any extreme weather conditions that are known to affect your location. Consider these factors:

- **Temperature —** The OAP433e is tested for normal operation in temperatures from - 40°F to 140°F. Operating in temperatures outside of this range may cause the unit to fail.

- **Wind Velocity —** The OAP433e can operate in winds up to 44 m/s and survive higher wind speeds up to 66 m/s. You must consider the known maximum wind velocity and direction at the site and be sure that any supporting structure, such as a pole, mast, or tower, is built to withstand this force.

- **Lightning —** You should make sure that the unit, any supporting structure, and cables are all properly grounded. Additional protection using lightning rods, lightning arrestors, or surge suppressors may also be employed in order to protect against lightning strikes on the antennas. Contact Meru Sales for more information regarding this equipment.

- **Rain —** The OAP433e is weatherproofed against rain. Also, prolonged heavy rain has no significant effect on the radio signal. However, it is recommended to apply weatherproof sealing tape around the Ethernet port and antenna connectors for extra protection. If moisture enters a connector, it may cause a degradation in performance or even a complete failure of the link.

- **Snow and Ice —** Falling snow, like rain, has no significant effect on the radio signal. However, a build up of snow or ice on antennas may cause the link to fail. In this case, the snow or ice has to be cleared from the antennas to restore operation of the link.

Ethernet Cabling

When a suitable antenna location has been determined, plan a cable route from the OAP433e outdoors to the PoE-enabled controller indoors. Consider these points:

- The Ethernet cable length should never be longer than 100 ft.

- Determine a building entry point for the cable.

- Determine if conduits, bracing, or other structures are required for safety or protection of the cable.

- For lightning protection at the controller end of the cable, consider using a lightning arrestor immediately before the cable enters the building.

- The shield of the ethernet cable needs to be grounded at the lightning arrestor. If, by design, the lightning arrestor cannot provide this ground, the shield of the ethernet cable will need to be grounded by the installer.

Grounding

It is important that the OAP433e, cables, and any supporting structures are properly grounded. The OAP433e unit includes a grounding screw to attach a ground wire. (See Figure 36 for grounding screw locations.) Be sure that grounding is available and that it meets local and national electrical codes.

Figure 36: Grounding Holes
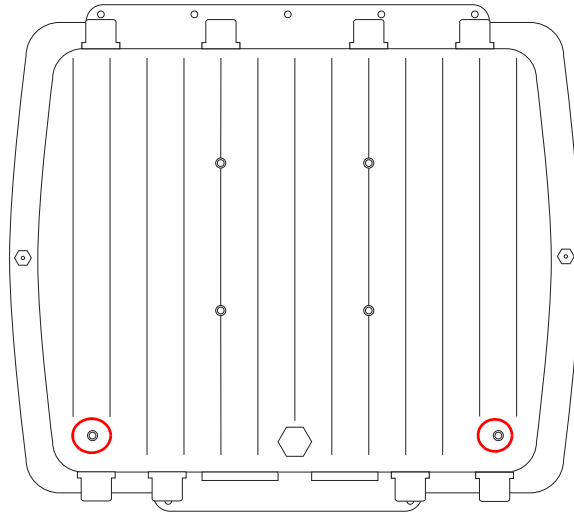
Test Basic Link Operation

Prior to deploying the AP, it is recommended that users connect it to an existing Meru deployment in order to ensure basic functionality. This can be done indoors in a controlled setting, prior to going through the trouble of mounting it externally. To do so, simply connect the AP to an existing controller and verify that the controller recognizes it. If so, proceed with the following section in order to deploy the AP.

Mounting the Access Point

The OAP433e can be mounted on the following (brackets are included):

- 2 to 3 inch diameter pole
- Wall

Mounting OAP433e with the Pole-Mounting Bracket

Be sure to attach antennas (see Connecting Antennas and Ground Wire to OAP433e) before mounting an OAP433e on a pole. Follow these steps to mount the unit to a 2 to 3 inch diameter steel pole or tube using the mounting bracket:

1. Attach the OAP433e to the square portion of the mounting bracket by placing the bracket flat against the bottom of the AP and inserting screws into the corners of the bracket portion. The holes on the bracket should correspond to the holes on the bottom of the AP.

Figure 37: Square Mounting Bracket Attaches to Bottom of OAP433e
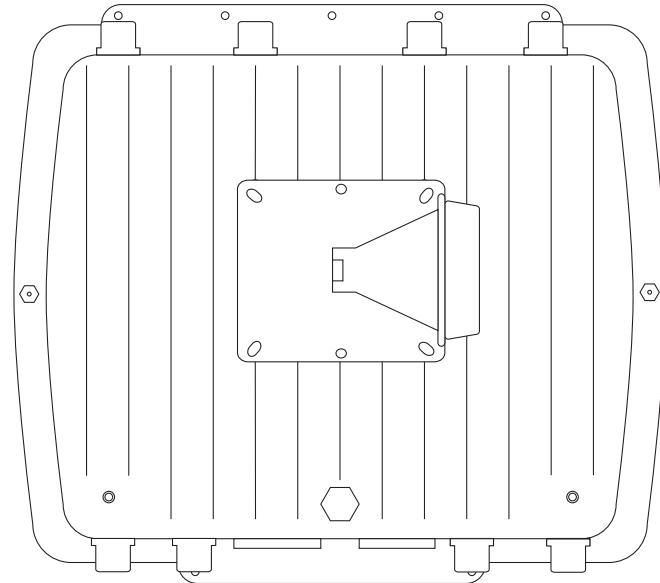
✔ **Note:**   Note that the circular portion of the bracket should be facing to the side of the AP (the AP's sides are the faces that do not have antennas or other attachments). This is to ensure that the AP is properly oriented when the bracket is fully assembled.

2. Next, identify the portion of the bracket assembly that inserts into the circular opening on the portion currently attached to the AP. The correct component has a corresponding circular section with a hollow cone protruding from one face of it. See Figure 38.

Figure 38: Second Bracket Attachment
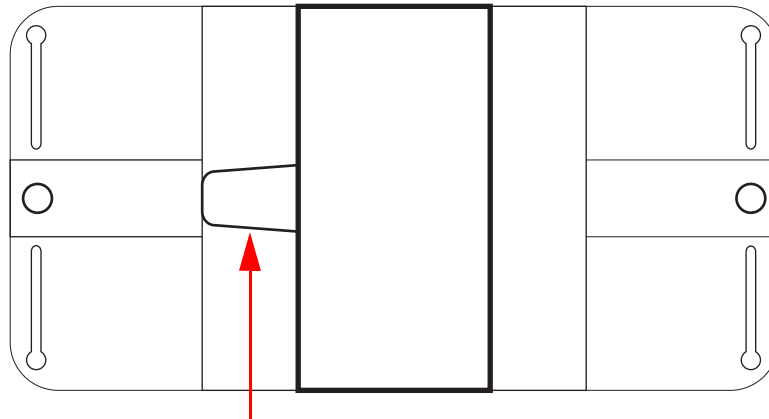
Cone portion (connects to other bracket)

3. Insert the cone into the circular portion of the bracket attached to the AP. The two should fit somewhat snugly, although a screw assembly will be required to hold them in place.

4. Run one of the long screws provided in the package down through the hole that runs through both portions of the bracket. The head of the screw should fit into the hexagonal slot on the top of the bracket assembly.

5. On the other end of the screw (i.e., the one that doesn't have the hexagonal head), slide a flat washer and then a lock washer into place. The flat washer should be against the base of the mounting assembly.

6. Screw one of the hexagonal nuts into place on top of the two washers. Once tightened, the nut should force the lock washer into place and the two bracket components should be locked together.

7. At this point, locate the third portion of the bracket. It should be shaped like a small, wide 'v'. This part will be used to brace against the backside of the pole.

8. Place the opening of the 'v' bracket against the pole and hold the OAP433e (with attached bracket assembly) up opposite it. The holes on either end of the 'v' bracket should align with the two middle holes on the 'v' portion of the bracket attached to the AP.

Note: When fully deployed, the Meru logo on the top of the AP should be right-side up. This will ensure that the Ethernet cable is oriented downwards when the entire bracket is assembled. Make sure that the AP is properly oriented before tightening everything in place on the pole.

9. Slide the two remaining long screws from the package contents into the corresponding holes. The hexagonal head of each screw should be on the bracket end that faces the AP (i.e., on the end that is already attached to the AP itself).

10. Again, slide a flat washer followed by a lock washer and a hexagonal nut onto the bottom of each screw.

11. Tighten the securing nuts just enough to hold the bracket to the pole. (The bracket may need to be rotated around the pole during the alignment process.)

12. Rotate/orient the AP as desired, then tighten the nuts securely in place.

13. Connect the Ethernet cable to the controller inside the building and verify that all antennas are securely connected.

Mounting OAP433e with the Wall-Mounting Bracket

Attach the bracket to a wall with the flat side flush against the wall. Follow these steps to mount the unit to a wall using the wall-mounting bracket:

1. Prior to attaching the bracket to the AP, it is important to drill the required holes in the wall and insert the sheetrock anchors provided in the AP package. One of the three included bracket components consists of a circular portion (with a hollow cone in the center) connected to a wide 'v'-shaped portion. Use the 'v'-shaped portion as a guide.

2. Place the 'v' component against the wall at the desired location and mark the four holes (one at each corner of the bracket) on the wall.

✔ **Note:**   Note that the bracket must be oriented such that the wider portions of the bracket are its top and bottom when placed against the wall. This will ensure that the fully deployed AP will be oriented properly (with the Ethernet cable leading downwards).

3. Remove the bracket and drill the corresponding holes. When finished, insert the plastic sheetrock anchor inserts into each hole drilled.

4. Place the bracket against the wall again and use the screws provided with the plastic anchors to attach it to the wall.

5. Using the portion of the bracket assembly that has a flat component attached to another circular portion (see **Figure 39**), attach the OAP433e to the square portion of the mounting bracket by placing the bracket flat against the bottom of the AP and inserting screws into the corners of the bracket portion. The holes on the bracket should correspond to the holes on the bottom of the AP. See **Figure 40**.

Figure 39: Square Mounting Bracket
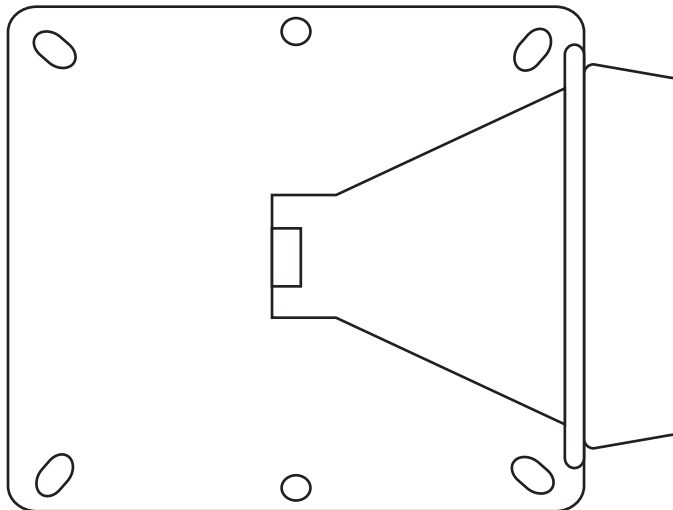
Figure 40: Square Mounting Bracket Attaches to Bottom of OAP433e
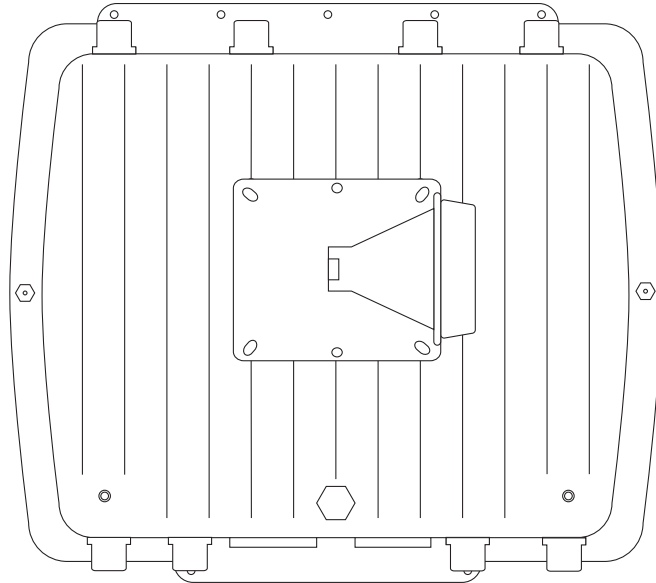
✔ **Note:** Note that the circular portion of the bracket should be facing to the side of the AP (the AP's sides are the faces that do not have antennas or other attachments). This is to ensure that the AP is properly oriented when the bracket is fully assembled.

6. Insert the circular portion of the bracket attached to the AP into the hollow cone portion of the bracket on the wall. The two should fit somewhat snugly, although a screw assembly will be required to hold them in place.

7. Run one of the long screws provided in the package down through the hole that runs through both portions of the bracket. The head of the screw should fit into the hexagonal slot on the top of the bracket assembly.

8. On the other end of the screw (i.e., the one that doesn't have the hexagonal head), slide a flat washer and then a lock washer into place. The flat washer should be against the base of the mounting assembly.

9. Screw one of the hexagonal nuts into place on top of the two washers. Once tightened, the nut should force the lock washer into place and the two bracket components should be locked together.

10. Connect the Ethernet cable to the controller and verify that all antennas are securely connected.

Connecting Antennas and Ground Wire to OAP433e

OAP433e does not ship with any antenna by default. Since customers have different outdoor applications, we suggest that you choose from the various antenna options offered by Meru. See the list in Optional External Antennas.

The OAP433e works both with antennas that attach directly to the unit and remote antennas. When using antennas that attach to the unit, attach the antennas before installing the unit. When deploying an OAP433e with remote antennas, first mount remote antennas and then connect them to the AP. If you aren't planning on using some of the antennas, be sure to terminate the connections with antenna terminators in order to prevent excess transmissions from unused connectors.

Note: Although there are three radios in the OAP433e, space constraints allow for only eight antennas to be connected to the AP. Consequently, Radio 1 only supports two antennas. See Figure 41 for details on which antennas correspond to each radio.

Figure 41: Antenna/Radio Associations for OAP433e
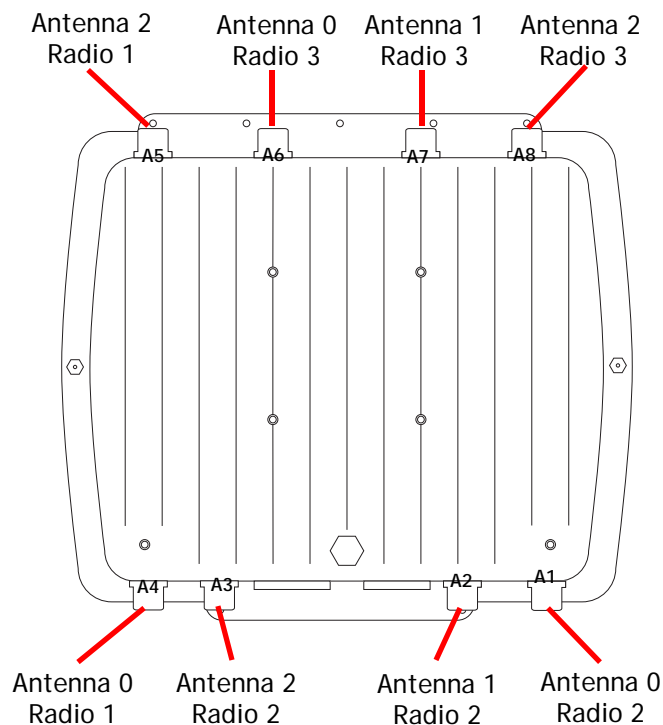
Follow these steps to connect antennas:

1. Remove the protective dust caps from the antenna connectors.

2. Mount the external antenna on the same supporting structure as you did the OAP433e, within 3 m (10 ft.) of it, using the bracket supplied in the antenna package.

3. Connect the antenna to the OAP433e's N-type connector (5G-1 and 2.4G-1) using the RF coaxial cable provided in the antenna box.

4. Apply weatherproofing tape to the antenna connectors to help prevent water entering the connectors.

Note: When not using antenna connectors on the OAP433e, keep the covers securely attached for weather protection. Once the AP is deployed, these unused connectors must be properly terminated.

Follow these steps to attach the ground wire:

1. A grounding screw and cable are both provided in the product packaging. The OAP433e has two grounding holes, in the corners on the underside of the AP.

Figure 42: Grounding Holes
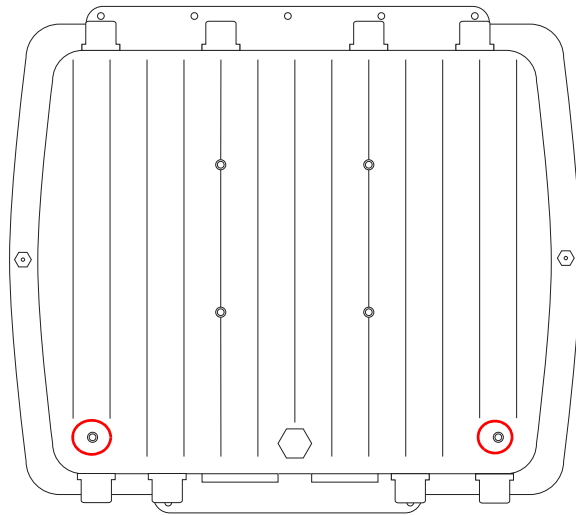
2. Connect the screw to either of the holes and attach the provided grounding wire.
3. Attach the other end of the grounding wire to an appropriate grounding source.

Caution! Equipment shall be installed in accordance with the National Electrical Code ANSI/NFPA 70 and the Canadian Electrical Code, Part 1, and when applicable, the National Electrical Safety Code, IEEE C2.

Equipment shall be properly grounded according to Chapter 8 of ANSI/NFPA 70, the National Electrical Code (NEC) and the Cable distribution system should be grounded (earthed) in accordance with ANSI/NFPA 70, the National Electrical Code (NEC), in particular Section 820.93, Grounding of the Outer Conductive Shield of a Coaxial Cable.

The separate protective earthing terminal provided on this product shall be permanently connected to earth.

Where to Go From Here

Now that the OAP433e is installed, go to the *Meru System Director Getting Started Guide* for instructions on initializing the hardware. Return to this chapter to check the status of the LEDs once the WLAN is operational.

As well, check the AP chapter in the *Meru System Director Configuration Guide* for instructions on configuring radio band, dual radio, and external antenna operation.

Appendix A
Cautions and Warnings

The cautions and warnings that appear in this manual are listed below in English, German, French, and Spanish.

Cautions

A Caution calls your attention to a possible hazard that can damage equipment.

"Vorsicht" weist auf die Gefahr einer möglichen Beschädigung des Gerätes in.

Une mise en garde attire votre attention sur un risque possible d'endommagement de l'équipement. Ci-dessous, vous trouverez les mises en garde utilisées dans ce manuel.

Un mensaje de precaución le advierte sobre un posible peligro que pueda dañar el equipo. Las siguientes son precauciones utilizadas en este manual.

! **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.

Vorsicht! Bei einer Neuausrichtung der Antennen muss vor Bewegung der Antenne der Rändelring leicht gelockert werden. Anschließend den Ring wieder festziehen. Anderenfalls können die internen Kabel im AP beschädigt werden.

Mise en garde En cas de modification d'orientation des antennes, veiller à desserrer légèrement la bague moletée avant de réorienter l'antenne. Resserrer ensuite la bague, faute de quoi le câblage interne du point d'accès pourrait être endommagé.

Precaución! Al cambiar la orientación de las antenas, asegúrese de aflojar ligeramente el anillo estriado antes de mover la antena. Luego vuelva a apretar el anillo. De otro modo, podría dañar el cableado interno del punto de acceso.

! **Caution!**   Be sure to connect the Ethernet cable to the Ethernet port; the cable can mistakenly be plugged into the Console port.

Vorsicht!   Darauf achten, dass das Ethernetkabel am Ethernetanschluss und nicht versehentlich am Konsolenanschluss angeschlossen wird.

Mise en garde   Veiller à bien connecter le câble Ethernet au port Ethernet et non pas au port Console.

Precaución!   Asegúrese de conectar el cable Ethernet al puerto Ethernet, porque por error se puede enchufar en el puerto de la consola.

! **Caution!**   The radiated output power of the access points is well below the FCC radio frequency exposure limits. However, the Meru Access Point 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.

Vorsicht!   Die abgestrahlte Ausgangsleistung von Geräten von Meru Networks, Inc. liegt weit unter den Hochfrequenz-Expositionsgrenzwerten der FCC. Die Meru Access Point Zugangspunkte von Meru Networks, Inc. sollten jedoch so verwendet werden, dass das Potenzial für Kontakt mit Menschen während des normalen Betriebs auf ein Mindestmaß beschränkt wird. Um die Möglichkeit einer Überschreitung der FCC-Hochfrequenz-Expositionsgrenzwerte zu vermeiden, ist ein Abstand von mindestens 20 cm zwischen Ihnen (bzw. einer anderen Person in der Nähe) und den Zugangspunkt-Antennen zu wahren.

Mise en garde   La puissance de rayonnement émise par les équipements Meru Networks, Inc. est très inférieure aux limites d'exposition aux fréquences radio définies par la FCC. Toutefois, les points d'accès de la série Meru Access Point de Meru Networks, Inc. doivent être utilisés de façon à éliminer tout risque de contact humain en fonctionnement normal. Pour éviter de dépasser les limites d'exposition aux fréquences radio définies par la FCC, il est impératif de préserver en permanence une distance supérieure ou égale à 20 cm entre l'utilisateur (ou toute personne se trouvant à proximité) et les antennes du point d'accès.

Precaución!   La potencia de radiación de los dispositivos de Meru Networks, Inc. está muy por debajo de los límites de exposición a radiofrecuencia estipulados por la FCC. No obstante, los puntos de acceso de la serie Meru Access Point de Meru Networks, Inc. deben usarse de tal manera que se minimice la posibilidad de contacto para el usuario durante la operación normal. Para evitar la posibilidad de exceder los límites de exposición a radiofrecuencia establecidos por la FCC, el usuario (o cualquier otra persona en torno) debe mantenerse a una distancia de al menos 20 cm respecto a las antenas del punto de acceso.

!

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.

Vorsicht! 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.

Mise en garde Exposition aux rayonnements à fréquence radioélectrique

L'installateur de cet équipement radio doit veiller à positionner et orienter l'antenne de telle sorte qu'elle n'émette pas un champ radioélectrique supérieur aux limites définies par Santé Canada pour la population générale. Consulter le Code de sécurité n° 6, disponible sur le site Web de Santé Canada à l'adresse http://www.hc-sc.gc.ca/rpb.

Precaución! Exposición a la radiación de radiofrecuencia.

El instalador de este equipo de radio debe cerciorarse de que la antena está local- izada u orientada de tal manera que no emita un campo de radiofrecuencia superior a los límites estipulados por Health Canada para la población; consulte el Código de Seguridad 6 que podrá encontrar en el página web de Health Canada, http://www.hc-sc.gc.ca/rpb.

Warnings

A warning calls your attention to a possible hazard that can cause injury or death. The following are the warnings used in this manual.

"Achtung" weist auf eine mögliche Gefährdung hin, die zu Verletzungen oder Tod führen können. Sie finden die folgenden Warnhinweise in diesem Handbuch:

Un avertissement attire votre attention sur un risque possible de blessure ou de décès. Ci-dessous, vous trouverez les avertissements utilisés dans ce manuel.

Una advertencia le llama la atención sobre cualquier posible peligro que pueda ocasionar daños personales o la muerte. A continuación se dan las advertencias utilizadas en este manual.

Warning! With plastic covers removed, this product is suitable for use in environmental air space in accordance with the Section 300-22(c) of the National Electric Code and Sections 2- 128.12 - 010 (3) and 12 - 100 of the Canadian Electrical Code. Part 1. C22. 1. For other countries, consult local authorities for regulations.

Achtung! Bei abgenommener Kunststoffabdeckung ist dieses Produkt zur Verwendung in einem Umgebungsluftraum gemäß Abschnitt 300-22(c) des National Electric Code und Abschnitt 2- 128.12 - 010 (3) und 12 - 100 des Canadian Electrical Code Teil 1. C22.1 geeignet. Die Vorschriften für andere Länder sind bei den örtlichen Behörden erhältlich.

Avertissement Sous réserve que ses couvercles de plastique soient déposés, cet appareil est adapté à une utilisation dans les vides de construction des bâtiments selon la section 300-22(c) du code NEC (National Electric Code) et les sections 2- 128.12 - 010 (3) et 12 - 100 du Code électrique du Canada, partie 1. C22. 1. Pour tous les autres pays, consulter les organismes de réglementation locaux.

Advertencia   Una vez desprendidas las cubiertas de plástico, este producto es adecuado para su uso en el espacio aéreo circundante en conformidad con la sección 300-22(c) del National Electric Code (Código Eléctrico Nacional de EE.UU.) y las secciones 2- 128.12 - 010 (3) y 12 - 100 del Código Eléctrico de Canadá. Parte 1. C22. 1. En otros países, consulte a las autoridades locales competentes para informarse acerca de las normativas vigentes.

Warning! Any Fast Ethernet (FE) cables installed in air-handling spaces should be suitable under NEC Article 800.50 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CL2-P, CL3-P, MPP (Multi Purpose Plenum), or CMP (Communications Plenum).

Achtung! Alle Fast-Ethernet (FE)-Kabel, die in Lüftungsräumen installiert werden, sollten gemäß NEC Artikel 800.50 geeignet sein und entsprechend zur Verwendung in Hohlräumen (Plenum) und Lüftungsräumen im Hinblick auf Rauchausbreitung gekennzeichnet sein, z.B. CL2-P, CL3-P, MPP (Multi Purpose Plenum) oder CMP (Communications Plenum).

Avertissement Les câbles Fast Ethernet (FE) installés dans un vide d'air doivent correspondre aux critères de l'article 800.50 du code NEC et identifiés en conséquence comme adaptés à une utilisation dans les vides de construction des bâtiments en matière de propagation de la fumée (marquages CL2-P, CL3-P, MPP (Multi Purpose Plenum) ou CMP (Communications Plenum)).

Advertencia   Todos los cables Fast Ethernet (FE) instalados en espacios aéreos deben cumplir con el artículo 800.50 del NEC y estar marcados adecuadamente para su uso en espacios aéreos y plenums en lo concerniente a la propagación de humo, tales como CL2-P, CL3-P, MPP (Plenum multifuncional), o CMP (Plenum de comunicaciones).

Warning! Inside antennas must be positioned to observe minimum separation of 20 cm. (~ 8 in.) from all users and bystanders. For the protection of personnel working in the vicinity of inside (downlink) antennas, the following guidelines for minimum distances between the human body and the antenna must be observed.

The installation of the indoor antenna must be such that, under normal conditions, all personnel cannot come within 20 cm. (~ 8.0 in.) from any inside antenna. Exceeding this minimum separation will ensure that the employee or bystander does not receive RF-exposure beyond the Maximum Permissible Exposure according to FCC CFR 47, section 1.1310 i.e. limits for General Population/Uncontrolled Exposure.

Achtung! Innenantennen müssen so positioniert werden, dass ein Mindestabstand von 20 cm (ca. 8 Zoll) zu allen Benutzern und anderen Personen gewahrt wird. Zum Schutz von Personal, das in der Nähe von Innenantennen (Downlink) arbeitet, sind die folgenden Richtlinien für Mindestabstand zwischen dem menschlichen Körper und der Antenne zu beachten.

Die Innenantenne muss so installiert werden, dass sich unter normalen Bedingungen kein Personal bis auf weniger als 20 cm (ca. 8 Zoll) an eine Innenantenne annähern kann. Durch Überschreitung dieses Mindestabstands wird sichergestellt, dass Mitarbeiter oder andere Personen keiner RF-Exposition über die maximal zulässige Exposition (MPE; Maximum Permissible Exposure) gemäß FCC CFR 47, Abschnitt 1.1310 (Grenzwerte für die allgemeine Bevölkerung/unkontrollierte Exposition) ausgesetzt werden.

Avertissement Les antennes intérieures doivent être positionnées de façon à respecter une distance minimum de 20 cm par rapport aux utilisateurs et aux tiers. Pour la protection du personnel travaillant à proximité des antennes intérieures (liaison descendante), respecter les directives suivantes pour assurer des distances minimales entre les êtres humains et les antennes.

Toute antenne intérieure doit être installée de telle sorte que, dans des conditions normales, le personnel ne puisse s'en approcher à moins de 20 cm. Cette distance minimale est destinée à garantir qu'un employé ou un tiers ne sera pas exposé à un rayonnement radioélectrique supérieur à la valeur maximale autorisée, telle qu'elle est définie dans les limites d'exposition non contrôlées pour la population par la réglementation de la FCC CFR 47, section 1.1310.

Advertencia Las antenas interiores deben colocarse de manera que se observe una separación mínima de 20 cm. (~ 8 pulg.) respecto a todos los usuarios y circunstantes. Para la protección del personal que trabaje en las inmediaciones de las antenas interiores (receptoras), deben observarse las siguientes directrices relativas a la distancia mínima entre el cuerpo humano y la antena.

La instalación de la antena interior debe efectuarse de tal modo que, en condiciones normales, ningún miembro del personal pueda acercarse a menos de 20 cm. (~ 8,0 pulg.) de cualquier antena interior. El cumplimiento de este mínimo de separación asegura que el empleado o circunstante no recibirá exposición a radiofrecuencia por encima de la Exposición Máxima Permisible conforme a la normativa FCC CFR 47, sección 1.1310, es decir, los límites asignados a la Exposición Incontrolada/Población Civil.

Appendix B
Regulatory Information

The Meru Access Point (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.

For AP400

Radio

- FCC Part 15
- Canada RSS210
- EN 300 328 V1.6.1 (11/2004)
- EN 301 893 V1.3.1 (08/2005)
- Japan Technical Regulations

EMC

- FCC Part 15
- EN 301 489-17 V1.2.1 (08/2002)
- Japan VCCI

Safety

Prolonged exposure to RF radiation can be hazardous. Switch off unit power before service or installation procedures.

Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time |E|2, |H|2 or S (minutes)
1500-100,000			5	6

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time |E|2, |H|2 or S (minutes)
1500-100,000			1.0	30

Note: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Frequencies Blocked for Regulatory Compliance

802.11a frequencies 5.25-5.35 GHz and 5.47-5.725 GHz have been blocked for DFS compliance.

USA

Underwriters Laboratories

For the AP150, AP300, AP400, AP1000, and the OAP180 series, the following statement and notices are applicable:

Use only with Listed I.T.E. equipment.

Notices

The unit is intended for installation in Environment A as defined in IEEE 802.3.af. All interconnected equipment must be contained within the same building, including the interconnected equipment's associated LAN connection.

Suitable for use in environmental air space in accordance with Section 300-22(c) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, C22.1.

FCC Radiation Exposure Statement

!

Caution!

The radiated output power of the Meru Networks devices is well below the FCC radio frequency exposure limits. However, the Access Point should be used in such a manner that the potential for human contact during normal operation is minimized. When installing and operating these devices, keep a minimum distance of 20 cm (8 inches) between the antennas and any persons/users in the vicinity.

Radio Frequency Interference Requirements

The Interference Statement applies to the following APs:

- AP150
- OAP180
- AP1000
- AP300
- AP400

Note:

Meru Access Points

All devices except the OAP180 are indoor devices. The FCC requires indoor use for the frequency range 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

High-power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with or damage to these devices, or both.

Interference Statement

This device complies with Part 15 of the FCC 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 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:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note:

The 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.

For products available in the USA and Canadian markets, only channels 1 through 11 can be operated. Selection of other channels is not authorized.

Canada. Industry Canada (IC)

The Class B digital portion of this apparatus complies with Canadian standard ICES-003.

These devices comply with RSS210 of Industry Canada.

Per RSS 210 A9.5 point 7:

(i) the device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems;
(ii) the maximum antenna gain permitted (for devices in the bands 5250-5350 MHz and 5470-5725 MHz) to comply with the e.i.r.p. limit; and
(iii) the maximum antenna gain permitted (for devices in the band 5725-5825 MHz) to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated in section A9.2(3).
In addition, users should also be cautioned to take note that high-power radars are allocated as primary users (meaning they have priority) of the bands 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage to LE-LAN devices.
(iv) These devices are not permitted to operate in the 5600 - 5650 MHz band.

For products available in the USA and Canadian markets, only channels 1 through 11 can be operated. Selection of other channels is not authorized.

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.

This device and its listed antenna(s) must not be co-located or operated in conjunction with any other antenna or transmitter

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 étre 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 empecher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit etre utilze a l'interieur et devrait etre place lin des fenetres afin de Fournier un ecram de blindage maximal. Si le matriel (ou son antenne d'emission) est installe a l'exterieur, 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.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the antennas and any persons/users in the vicinity.

✔

Note:

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.

Access Points have been designed to operate with the antennas listed below. Antennas not included in this list are strictly prohibited for use with these devices. The required antenna impedance is 50 ohms.

AP Antennas with Gain

AP Model	Antenna Type	Gain (2.4 GHz)	Gain (5 GHz)
AP300/AP400	Dual-Band Omni-Directional MN-ANTabg-W	2 dBi	3 dBi
AP300/AP400	Dual-Band Omni-Directional ANT-ABGN-23	2 dBi	3 dBi
AP300/AP400	High-Gain Dipole Omni-Directional ANT-ABGN47O	4.7dBi	4.7dBi
AP150	Dual-Band Omni-Directional SAA04-220050	2 dBi	3 dBi

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

Europe—EU Declaration of Conformity and Restrictions

$C\mathcal{E}$
!
This equipment is marked with either the CE Mark, the alert symbol, and the notified body's number and can be used throughout the European Community. This mark indicates compliance with the R&TTE Directive 1999/5/EC and the relevant parts of the following technical specifications.
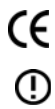
$C\mathcal{E}$
Ⓘ
This equipment is marked with either the CE Mark, the alert symbol, and the notified body's number and can be used throughout the European Community. This mark indicates compliance with the R&TTE Directive 1999/5/EC and the relevant parts of the following technical specifications.

EN 300 328. Electromagnetic Compatibility and Radio Spectrum Matters (ERM). Wideband transmission systems, data transmission equipment operating in the 2.4 GHz ISM (Industrial, Scientific, and Medical frequency bands in the range of 902–928 MHz, 2.4–2.485 GHz, and 5.15–5.25 GHz) band and using spread spectrum modulation techniques, harmonized EN standards covering essential requirements under article 3.2 of the R&TTE directive.

EN 301 893. Broadband Radio Access Networks (BRAN). 5 GHz high-performance RLAN, harmonized EN standards covering essential requirements of article 3.2 of the R&TTE directive.

EN 301 489-17. Electromagnetic Compatibility and Radio Spectrum Matters (ERM). Electromagnetic Compatibility (EMC) Standard for Radio Equipment and Services, Part 17 Specific Conditions for Wideband Data and HIPERLAN Equipment.

EN 55022 Statement (applicable to AP201 Rev 2, AP208 Rev 2 only). This is to certify that the above models are shielded against the generation of radio interference in accordance with the application of Council Directive 2004/108/EC, Annex I, 1a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22). Compliance is dependent upon the use of Cat 5e shielded data cables.

EN 60950-1. Safety of Information Technology Equipment.

EN 50385. Product standard to demonstrate the compliances of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields.

!
Marking by the alert symbol indicates that usage restrictions apply.

 Marking by the alert symbol indicates that usage restrictions apply.

Meru Networks, Inc. declares that their Access Points comply with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Meru Networks, Inc. vakuuttaa täten että Access Points tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.

Hierbij verklaart Meru Networks, Inc. dat het toestel Access Points in overeenstem- ming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.

Bij deze verklaart Meru Networks, Inc. dat deze Access Points voldoet aan de essen- tiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.

Par la présente, Meru Networks, Inc. déclare que l'appareil Access Points est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.

Par la présente, Meru Networks, Inc. déclare que ce Access Points est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables.

Härmed intygar Meru Networks, Inc. att denna Access Points står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

Undertegnede Meru Networks, Inc. erklærer herved, at følgende udstyr Access Points overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.

Hiermit erklärt Meru Networks, Inc. dass sich dieser/diese/dieses Access Points in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet.

Hiermit erklärt Meru Networks, Inc. die Übereinstimmung des Gerätes Access Points mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG.

Con la presente Meru Networks, Inc. dichiara che questo Access Points è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.

Por medio de la presente Meru Networks, Inc. declara que el Access Points cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.

Meru Networks, Inc. declara que este Access Points está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

Hawnhekk, Meru Networks, Inc. jiddikjara li dan Access Points jikkonforma mal-htigijiet essenzjali u ma provvedimenti ohrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.

Käesolevaga kinnitab Meru Networks, Inc. seadme Access Points vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.

Alulírott, Meru Networks, Inc. nyilatkozom, hogy a Access Points megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.

Meru Networks, Inc. týmto vyhlasuje, e Access Points splna základné poiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.

Meru Networks, Inc. tímto prohlašuje, e tento Access Points je ve shode se základními poadavky a dalšími príslušnými ustanoveními smernice 1999/5/ES.

Šiuo Meru Networks, Inc. deklaruoja, kad šis Access Points atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Ar šo Meru Networks, Inc. deklare, ka Access Points atbilst Direktivas 1999/5/EK butiskajam prasibam un citiem ar to saistitajiem noteikumiem.

Niniejszym, Meru Networks, Inc., deklaruje, ze Access Points spelnia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.

These products are intended to be used in all countries of the European Economic Area with the following restrictions:

IEEE 802.11a Restrictions

- These products are for indoor use only (5150–5250 MHz).
- To ensure compliance with local regulations, be sure to set your Access Point to the country in which you are using the Access Point.
- The Meru Access Point products can be used only indoors in the following countries: Austria, Belgium, Bulgaria, Czech Republic, Germany, Cyprus, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Norway, Portugal, Poland, Romania, Spain, Slovak Republic, Slovenia, Sweden, Switzerland, Turkey, and United Kingdom.

EEE 802.11b/g Restrictions

- France—In all Metropolitan départements, wireless LAN frequencies can be used under the following conditions, either for public or private use:
  Indoor use: maximum power (EIRP) of 100 mW for the entire 2400–2483.5 MHz frequency band.

Japan

EN 55022 Statement (applicable to AP201 Rev 2, AP208 Rev 2 only). This is to certify that the above models are shielded against the generation of radio interference in accordance with the application of Council Directive 2004/108/EC, Annex I, 1a. Conformity is declared by the application of EN 55022 Class B (CISPR 22). Compliance is dependent upon the use of shielded data cables.

Model AP300

Model AP300 module rev 1

003WWA080094   003GZA080095   003XWA080096

Model AP150

003NY06122 0000   003GZ06030 0000   003WY06046 0000

Singapore

For the AP201 Rev 2, AP208 Rev 2, and OAP180, the following approval information applies:

> **Complies with**
> **IDA Standards**
> **DA103798**

For the AP300 series, the following approval information applies:

> **Complies with**
> **IDA Standards**
> **DB102245**

Manufacturing Information

The AP150, AP1000, AP300, and AP400 are built in Taiwan. Factory information is provided under NDA and upon request.

Distributed Antenna Systems (DAS)

Meru Networks does not certify or endorse any specific Distributed Antenna System (DAS) vendors. Meru Networks will provide support to Meru Wi-Fi customers that use distributed antennas within the terms and conditions of the MeruAssure Terms of Service and in accordance with the customer's support agreement. Meru Customer Support will support Meru software and hardware, and will work jointly with DAS vendors to identify and troubleshoot issues, but any support related to RF issues, including RF coverage, shall be the responsibility of the DAS vendor.

Meru Networks recommends that customers use only a DAS that has been tested to work with Meru hardware and software. Meru does not provide any site surveys, design or implementation of Wi-Fi over DAS. Meru recommends that customers obtain such services from a trained and qualified systems integrator or from their DAS vendor.

Appendix C
Supported PoEs

Supported Power Over Ethernet Devices for Meru APs

PoE	Description
POE-AT-1AC	Mid-Span High Power pre-802.3at PoE injector (1 Port, 110V/220V AC input). Ideal for Meru AP300, AP300i, or AP1000; backward compatible with 802.3af, also works with Meru AP150.
POE-AT-12AC	Mid-Span 802.3af+ High Power PoE injector (12 Port, 110V/220V AC input), 19" rack mountable, remote management capable. Ideal for Meru AP300, AP300i, or AP1000.
POE1-24AC	Mid-Span 802.3af PoE injector (24 Port, 110V/220V AC input) - Ideal for Meru AP300, AP300i, or AP1000.
POE1-24ACDC	Mid-Span 802.3af PoE injector (24 Port, 110V/220V AC or 48V DC input) - Note only supports 20 access points?? Ideal for Meru AP300, AP300i, or AP1000.

Appendix D
Optional External Antennas

This appendix provides quick overviews regarding several external antennas that are supported in conjunction with AP400 models.

Antenna Model	Meru Part Number	Supported AP Models
ANT-ABGN230-W	830-00104	AP433e
ANT-I3ABGN-0304-O	831-00035	AP433e
ANT-O6ABGN-0607-PT	831-00030	AP433e
ANT-O6ABGN0606-O	831-00029	OAP433e
ANT-BG080-NM	831-00005	OAP433e
ANT-A080-NM-1	831-00006	OAP433e
ANT-A080-NM-2	831-00007	OAP433e
MERU-ANT-PI622	810-00037	AP433i, AP433is
MERU-ANT-PD312	810-00038	AP433i, AP433is

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