ONRAMP WIRELESS

TOTAL REACH NETWORK

# AC-Powered Outdoor Base Station Installation Guide

## for a Single Access Point

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AC-Powered Outdoor Base Station Installation Guide - Single AP

010-0036-02 Rev. A

April 3, 2015

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# Revision History

| Revision | Release Date | Change Description |
|---|---|---|
| A | April 3, 2015 | Initial release. |

# 1 Introduction

This manual instructs installers on how to assemble and install the AC-Powered Outdoor Base Station in the field. The AC-Powered Outdoor Base Station is comprised of an internal On-Ramp Wireless AP, battery backup, a 3G/4G wireless modem, an environmental monitor, and integrated GPS and 3G/4G modem antennas. It is ***strongly recommended*** that installers read through all instructions BEFORE starting assembly and installation.

The AC-Powered Outdoor Base Station kit includes the following components:

- Equipment cabinet with power system and integrated GPS and cellular modem antennas ready to accept the On-Ramp Wireless Access Point
- Backup battery

In preparation for assembly and installation, it is **imperative** that you determine the type of installation you will be doing (e.g., pole mount, wall mount, or pipe mount) so that you have the proper tools, equipment, hardware, and brackets. For network planning and configuration considerations as well as installation prerequisites and considerations, refer to the *AP Deployment Guide (010-0006-00).*

Before starting installation you **MUST** have the following components available for installation:

- A wireless modem configured and tested as specified in the *Backhaul Selection and Configuration Manual (010-0032-00)*.
- An On-Ramp Wireless AP
- A 2.4 GHz antenna (Some sites may require different antennas, check with your sales representative to verify the antenna needed for your site.)
- An appropriate 50 ohm coaxial antenna cable to connect the Base Station to the 2.4 GHz antenna. Depending upon length of cable required for installation, acceptable options include, but are not limited to: LMR400, ½ inch Heliax, or ⅞ inch Heliax.
- Depending upon how the 2.4 GHz antenna will be installed, proper installation will require appropriate antenna mounting brackets and hardware specific to the installation site. On-Ramp Wireless has approved accessories available. Contact your sales representative if you would like more information.

The following figure shows an example of an installed AC-Powered Outdoor Base Station.

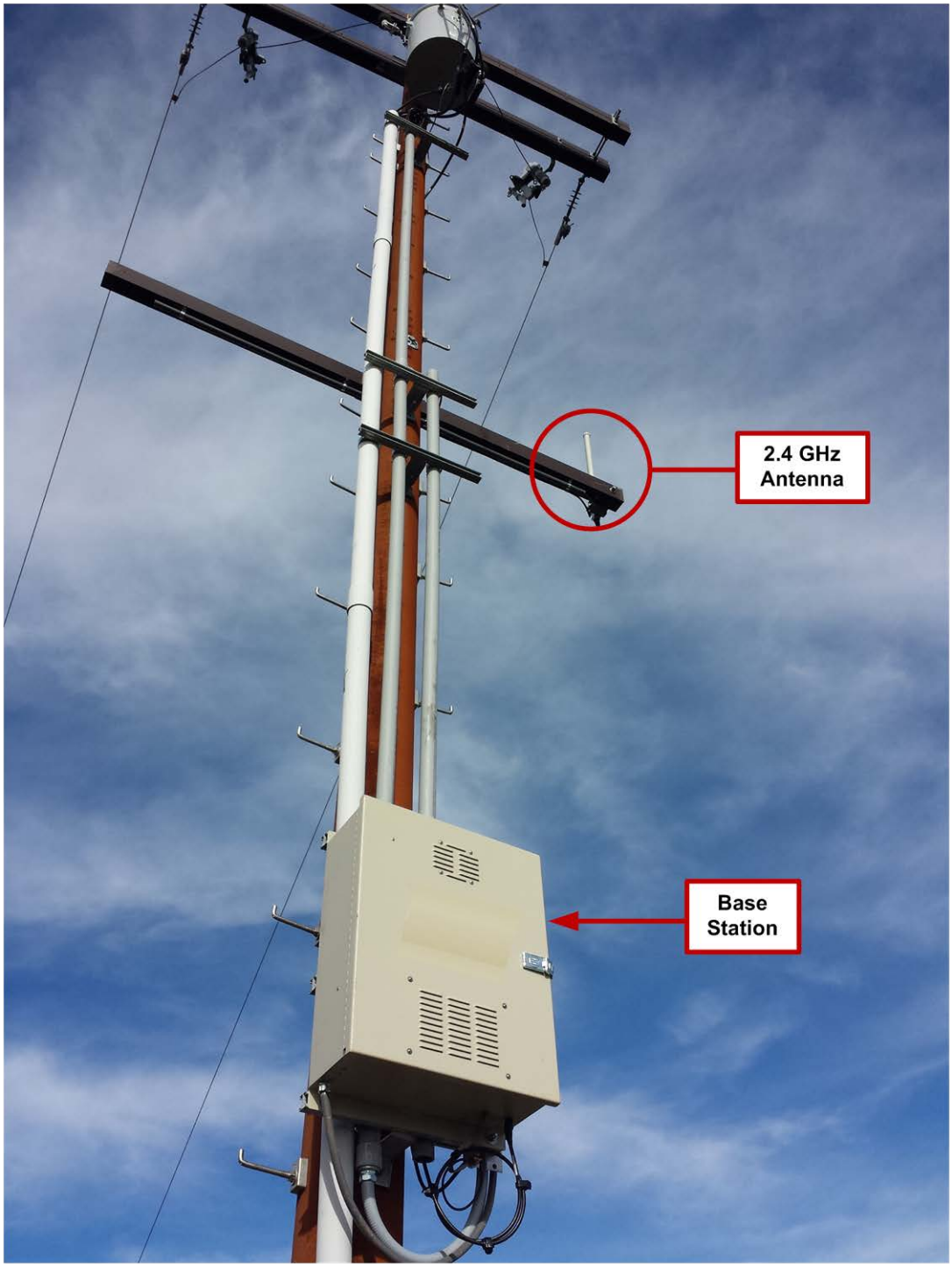



**Figure 1. Example of an Installed AC-Powered Outdoor Base Station**

The following figure provides an example of the interior of a fully assembled and operational AC-Powered Outdoor Base Station.

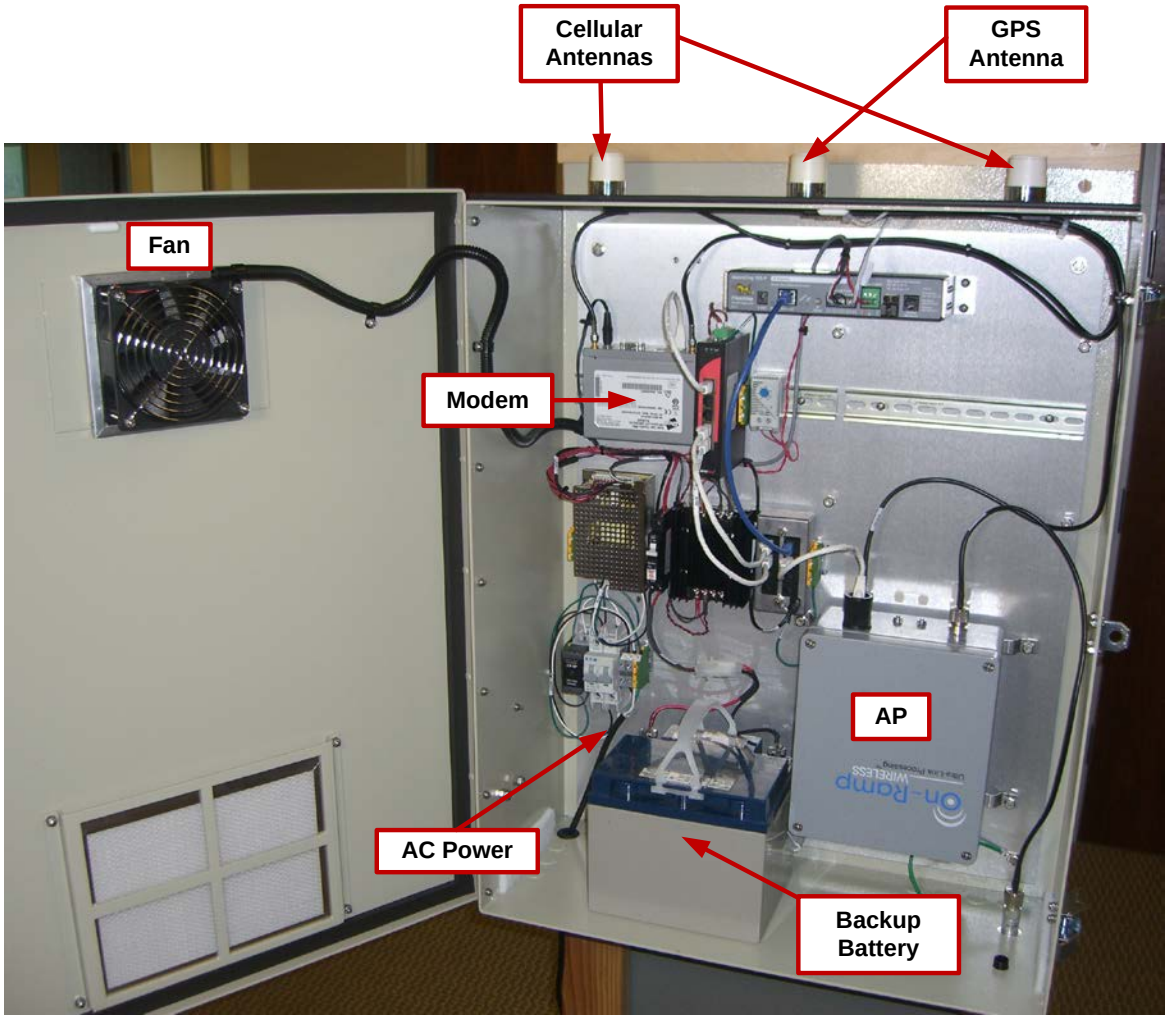



**Figure 2. Interior of the AC-Powered Outdoor Base Station**

# 2 Installation Procedures

The Base Station equipment cabinet houses all of the components with the exception of the 2.4 GHz antenna. The components inside the equipment cabinet are pre-installed at the factory with the following exceptions:  Access Point (AP), cellular modem, and backup battery.

The following picture shows the inside of the equipment cabinet prior to installing and connecting the 3G/4G wireless modem, AP, backup battery, and AC power.

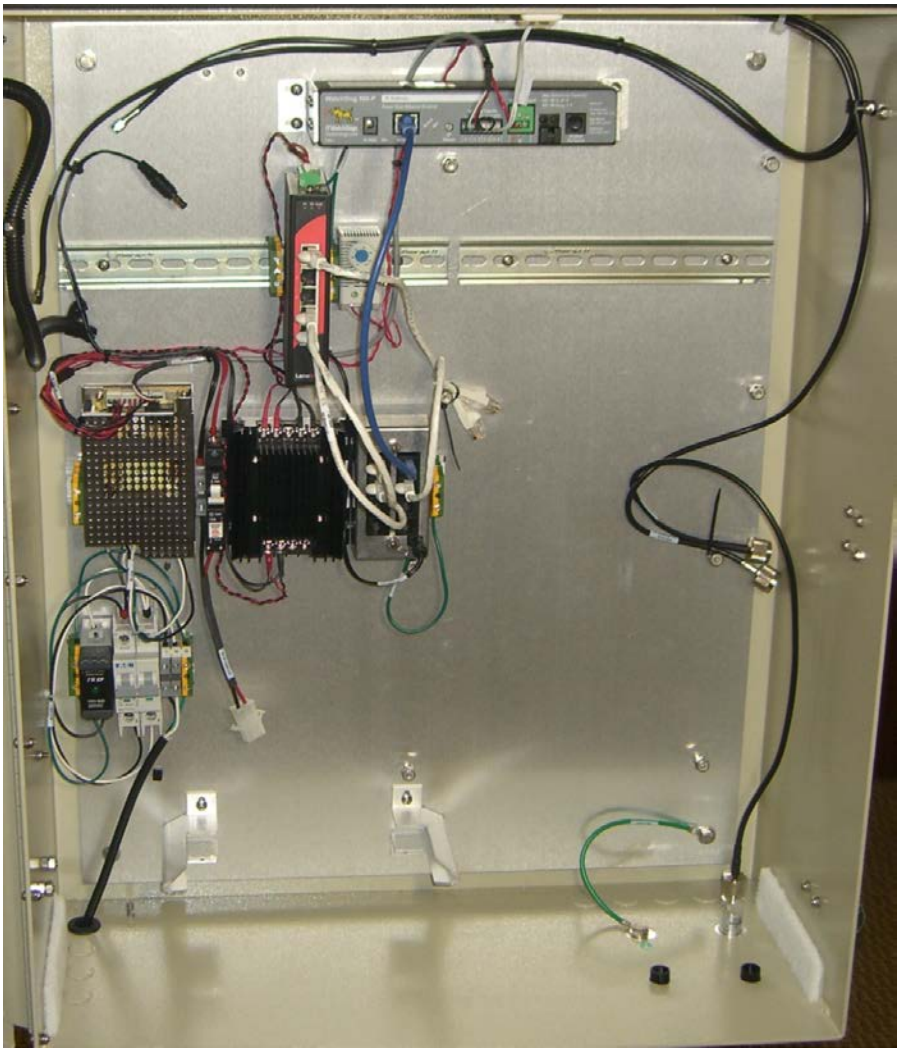


**Figure 3. Inside the Equipment Cabinet Prior to Installing Modem, AP, Battery, and AC Power**

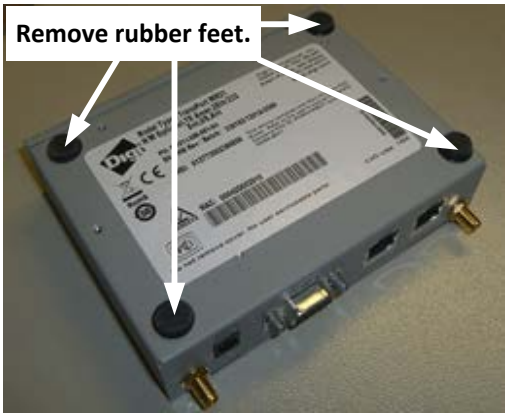
## 2.1 3G/4G Wireless Modem Installation

The 3G/4G wireless modem is installed inside the Base Station's equipment cabinet. The modem and wireless data service, with a fixed IP address, must be purchased by the customer. For modem

manufacture, model and configuration details, refer to the *Backhaul Selection and Configuration Manual (010-0032-00).*

**NOTE:** The information provided in this section is based on the On-Ramp Wireless' recommended Digi WR-21 modem. Other 3/4G modems and backhaul solutions may be installed but On-Ramp Wireless will not be able to provide configuration, installation, and troubleshooting support for these devices.

1. On the bottom of the modem, remove the rubber feet and carefully peel off the label and stick it onto the top side of the modem.

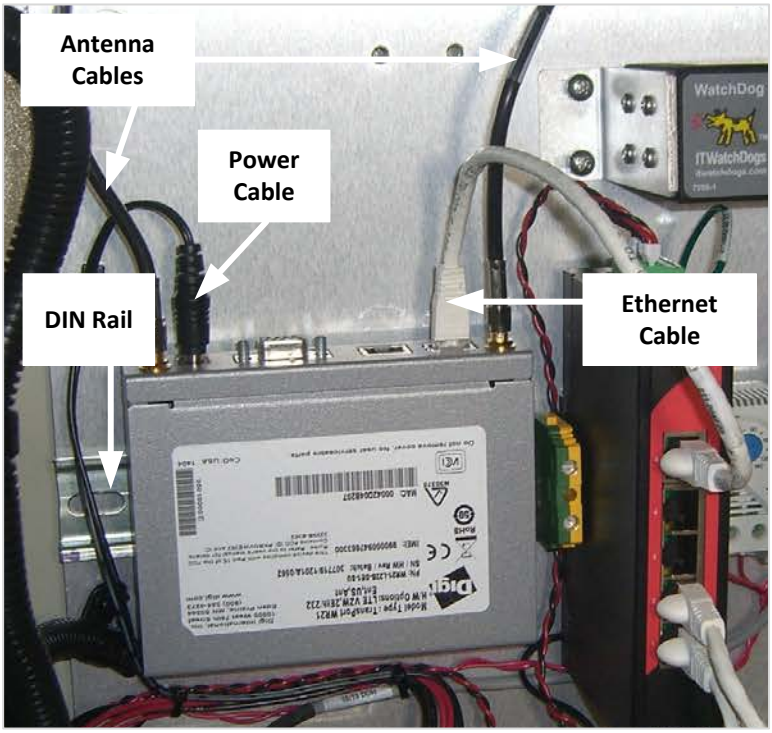




2. Inside the equipment cabinet, locate a bracket kit for the modem and assemble as shown below.

3. Next, attach the assembled bracket to the bottom side of the modem as shown below.

4. Install the modem on the DIN rail in the location shown below and connect all cables (2 antenna cables, 1 Ethernet cable, and 1 power cable).

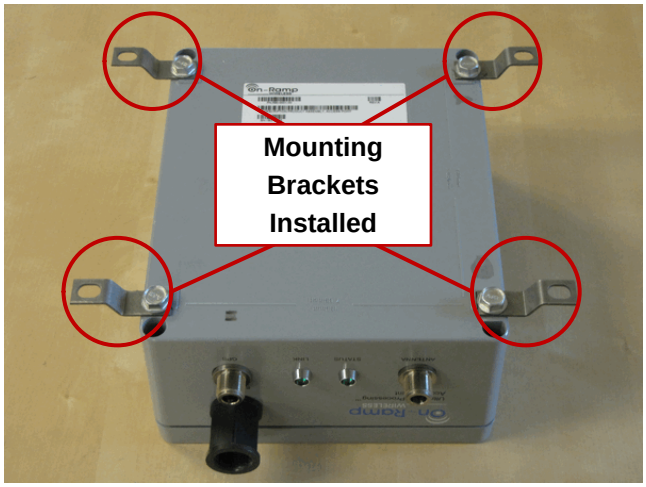



**NOTE:** When connecting the power cable, make sure that the locking tabs on the power connector are fully inserted into the modem. Twist the power cable ¼ turn clockwise so that the tabs lock into place as shown below.

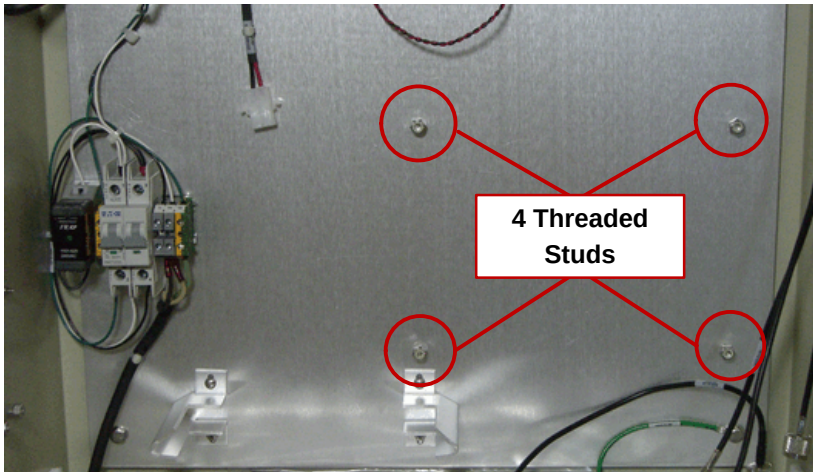
# 2.2 Access Point Installation

The Access Point (AP) is installed inside the Base Station's equipment cabinet.

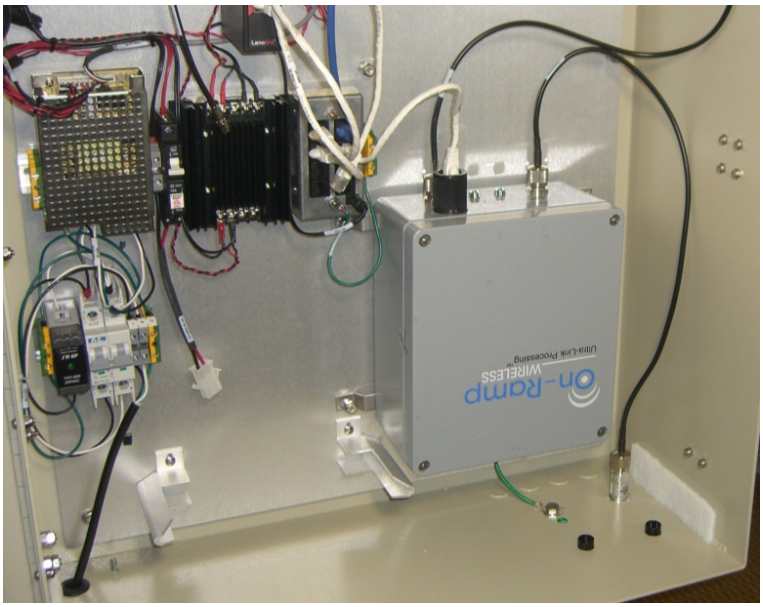
1. Attach the four mounting brackets with the fasteners that came with the AP.




2. Locate the four threaded studs on the back panel of the equipment cabinet. Remove the self-clinching nuts from the studs in preparation for installing the AP.

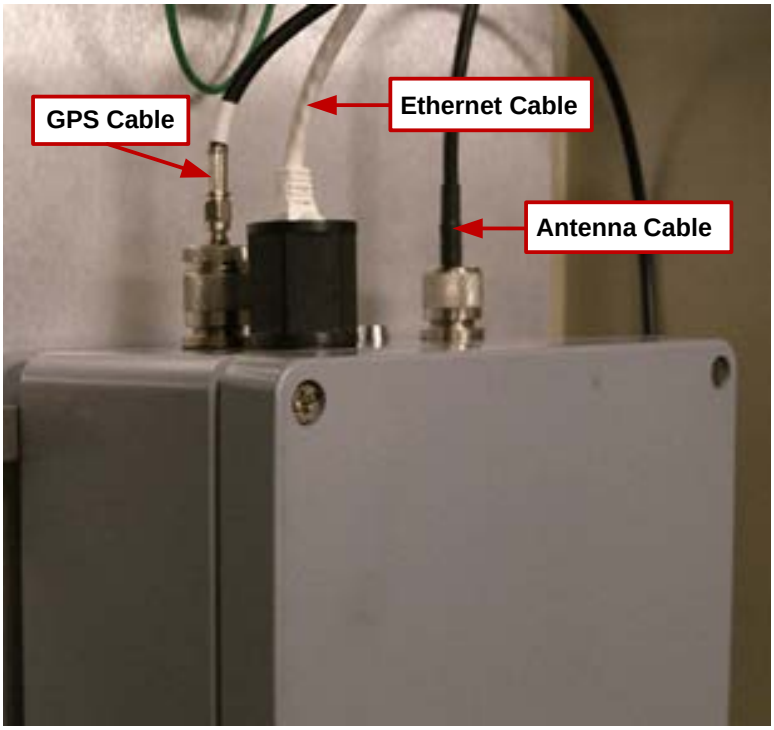


3. Place the AP on the four threaded studs and fasten securely with the self-clinching nuts.



**NOTE:** Make sure that the connectors on the AP are facing up as shown below.

4. Attach the GPS, Ethernet, and antenna cables as shown below.

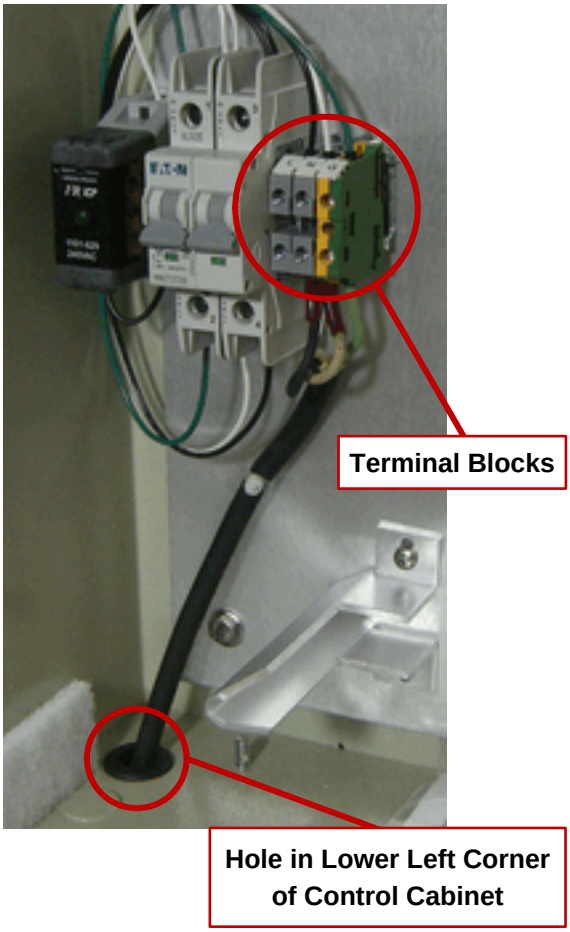



**NOTE:** The AP's antenna cable is connected to a coaxial surge suppressor in the lower right corner of the equipment cabinet beneath the AP as shown in the picture above).

# 2.3 AC Power Assembly

The AC-Powered Outdoor Base Station operates on a single phase, 100 - 240 VAC power. A dedicated 15 or 20 Amp power circuit should be installed by a licensed electrician according to the local codes.

1. An appropriate NEMA-rated, flexible conduit header should be used to receive the power lines entering from the hole in the lower left corner of the cabinet.
2. Connect the power cables to the terminal blocks (marked L, N, and G) located to the right of the power switch. Connect the ground wire to terminal “G”, the neutral wire to terminal “N,” and the 120 or 240 VAC line to terminal “L.”



# 2.4 Battery Installation Preparation

## 2.4.1 Battery Safety Precautions

**CAUTION:** Care must be taken when handling and connecting the batteries. Refer to the battery manufacturer's website, www.power-sonic.com, for full safety information.

Lead acid batteries can produce explosive mixtures of hydrogen and oxygen. Take the following precautions:

- Never install batteries in an airtight or sealed enclosure and make sure installation is adequately ventilated.
- Charge batteries in accordance with the instructions given in the manufacturer's manual.
- Keep all sparks, flames and cigarettes away from batteries.
- Connect cables tightly to the terminals to avoid sparks.
- Wear proper eye and face protection when installing and servicing batteries.
- Avoid contact of the electrolyte with skin, eyes or clothing.
- Never remove or damage the vent valves.
- In the event of an accident, flush with water and call a physician immediately.
- Do not place metal objects across battery terminals.
- Remove all metallic items such as watches, bracelets and rings when installing or servicing batteries.
- Wear insulating gloves when installing or servicing batteries.
- Use insulating tools when installing or servicing batteries.

## 2.4.2 Pre-Installation Battery Testing

Use a DC volt meter to verify that the battery voltage is above 12.1 Volts. If the voltage is below 12.1 Volts, the battery must be charged before installation.

**NOTE:** It is recommended that the battery be fully charged within 48 hours of installation.

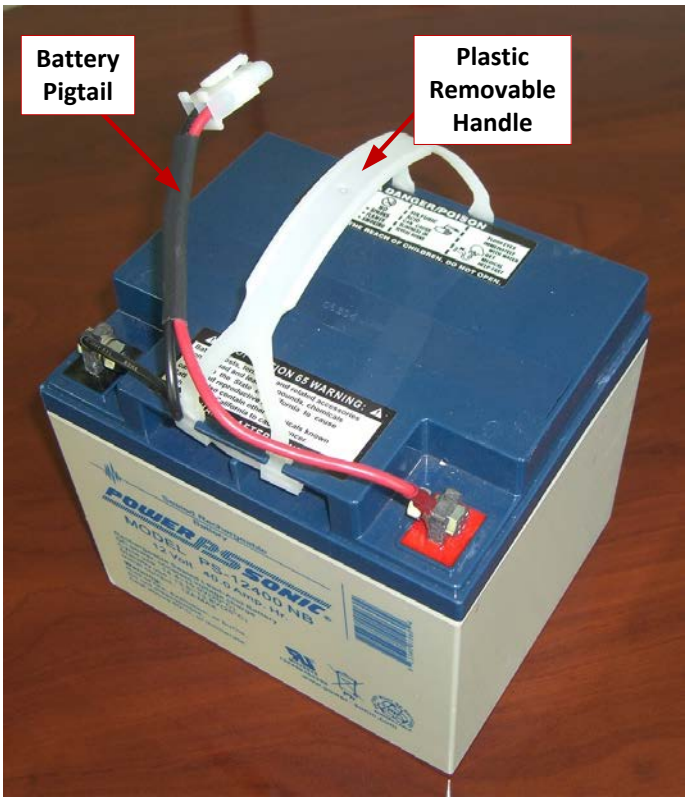
Installation of the lead-acid gel cell battery is described in section 2.5.

# 2.5 Battery Installation

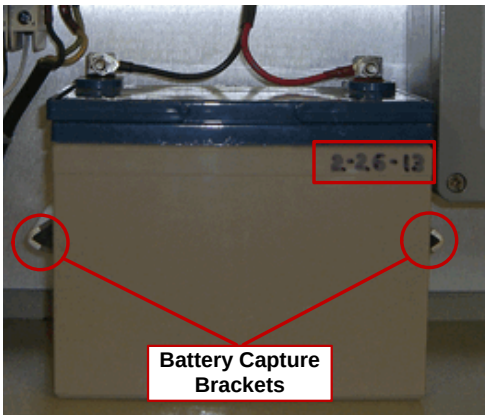
**CAUTION: DO NOT move or transport the equipment cabinet with the battery installed as serious damage will occur! If the equipment cabinet must be moved or transported, remove the battery first.**

1. Locate the battery pigtail cable (shown below). It is shipped attached to the battery connector inside the cabinet.

2. Using the fasteners provided with the battery, attach the pigtail cable as shown below. The red wire connects to the red terminal and the black wire connects to the black terminal.

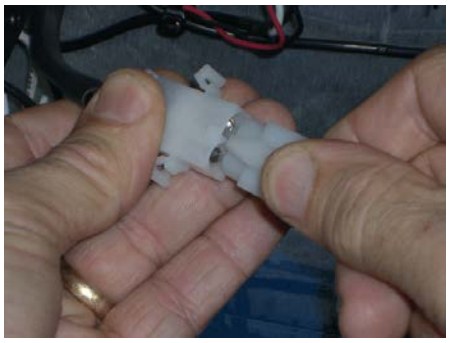


3. Prior to installing the battery in the equipment cabinet, write the installation date on the light-colored area on the battery's case with a black, permanent ink pen. This will be useful to determine the life of the battery.

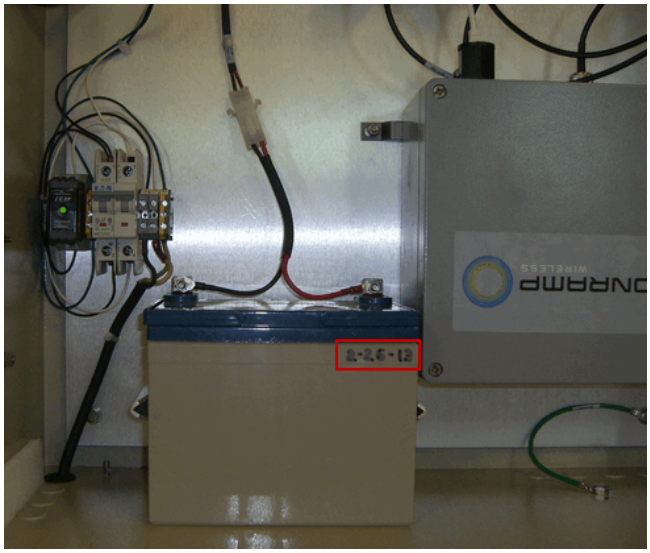



Place the battery into the equipment cabinet between the battery capture brackets as shown in the picture, with the battery terminals oriented to the back of the cabinet.

4. Attach the pigtail connector on the battery to the receiving pigtail connector on the inside of the equipment cabinet as shown below.



5. The following picture shows the battery installed inside the equipment cabinet with the pigtail cable attached to the battery and connected to the battery circuit.



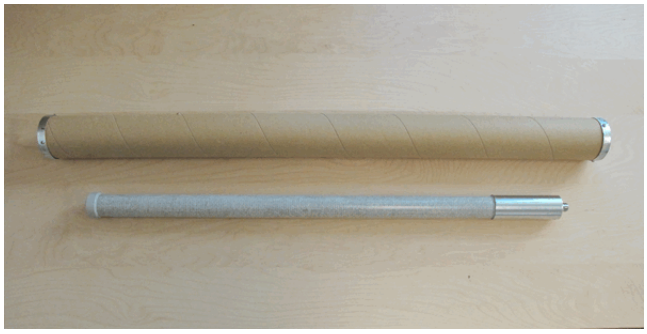

**NOTE:** At this point, the AC power and battery circuit breakers inside the equipment cabinet should be in the OFF position.

# 2.6 Installing the 2.4 GHz Antenna and Cable

This section provides high level, basic instructions for installing the A2.4 GHz antenna and cable. For general guidelines, refer to the *AP Deployment Guide (010-0006-00)*.

**NOTE:** Mounting and installation methods for the 2.4 GHz antenna vary from site to site depending on numerous factors. Improper installation can severely reduce system performance. It is recommended that antenna installation be reviewed by a qualified RF engineer or verified by On-Ramp Wireless deployment services.

1. Acquire a 2.4 GHz antenna. Pictured below is a common antenna for most installations.



2. Mount the 2.4 GHz antenna as per the site design plan.
3. Ensure that the 2.4 GHz antenna is plumb after it is installed.

As an example, the following figure shows an antenna installed on a pipe using a common antenna mounting bracket.

**NOTE**: The standard 32” long, 2.4 GHz antenna recommended by On Ramp will mount to a pipe with a maximum outer diameter (OD) of 2” with the supplied clamps. The supplied clamps will work with a 1-3/4” pipe but ***will not*** work with a 2” pipe.

# 2.7 Cable Routing and Sealing

## 2.7.1 Guidelines for Routing Cables

Verify that all cables are properly connected as shown in the schematic in Appendix A. Dress and secure the cables to the surrounding structure with tie wraps or other cable attachment clamps designed for the cable being used.

## 2.7.2 Guidelines for Weatherproofing Antenna Cable Connectors

Weatherproof all antenna cable connectors using an industry-approved method. These methods include, adhesive lined shrink tubing, self-amalgamating tape, self-bonding silicone tape, or butyl mastic tape and electrical tape (shown below).

# 3 Grounding

The equipment cabinet must be properly grounded per local codes and the site design plan.

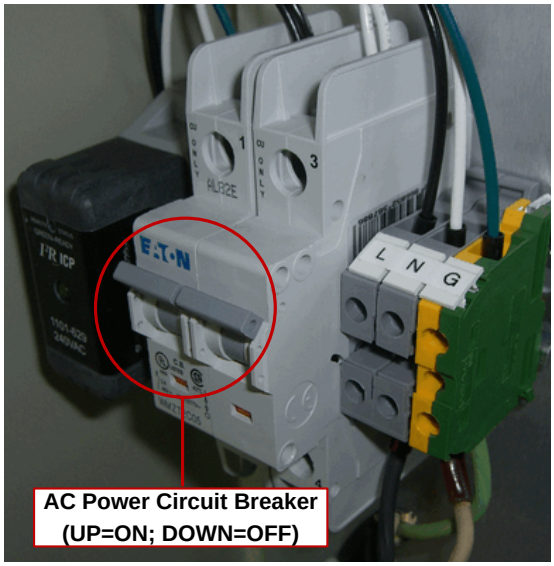
The ¼" ground stud on the bottom right side of the equipment cabinet and the 2.4 GHz antenna mount should be grounded to an existing ground system, ground ring, or ground rod using a #6 or larger ground wire.

For grounding guidelines, refer to the *AP Deployment Guide (010-0006-00)*.

# 4 Operation

After the installation has been completed, ensure that the AC-Powered Outdoor Base Station powers up properly by following the procedure below.

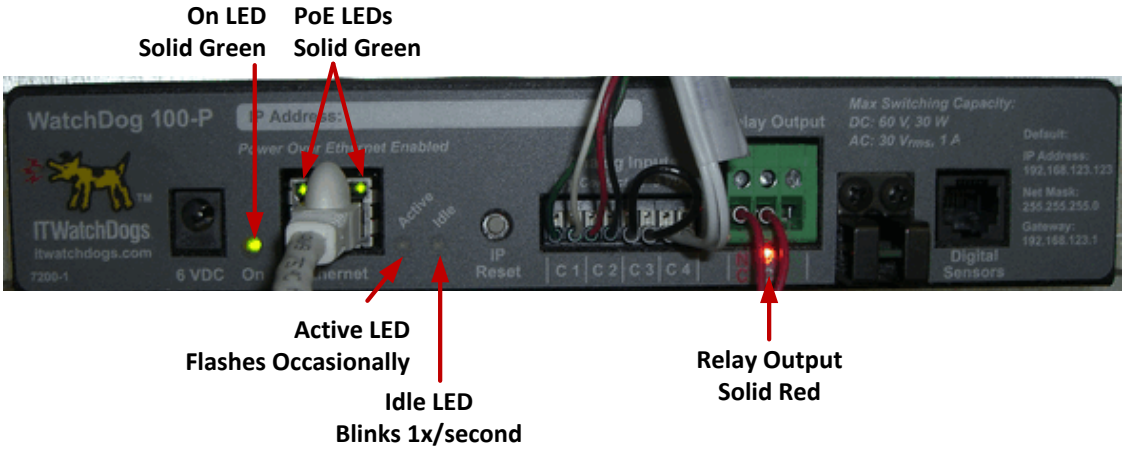
1. Flip UP the tab to turn ON the AC power circuit breaker located in the lower left corner of the equipment cabinet just to the right of the $I^2R$ surge suppressor. This provides power to the main power supply.



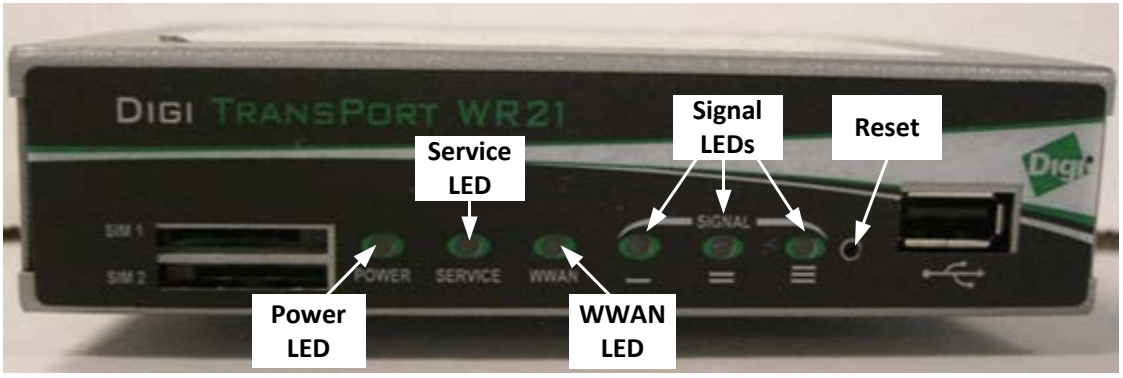

2. Verify that the $I^2R$ surge suppressor LED is green as shown in the following figure.


3. Verify that the status of the LEDs on the Watchdog unit, at the top of the cabinet, are as follows:

   - ❒ The “On” LED is green.
   - ❒ The two “Power over Ethernet (PoE)” LEDs should be green.
   - ❒ The “Active” LED occasionally flashes red which means that that processor is active.
   - ❒ The “Idle” LED blinks red about once per second.
   - ❒ The relay output LED is a solid red (no blinking).

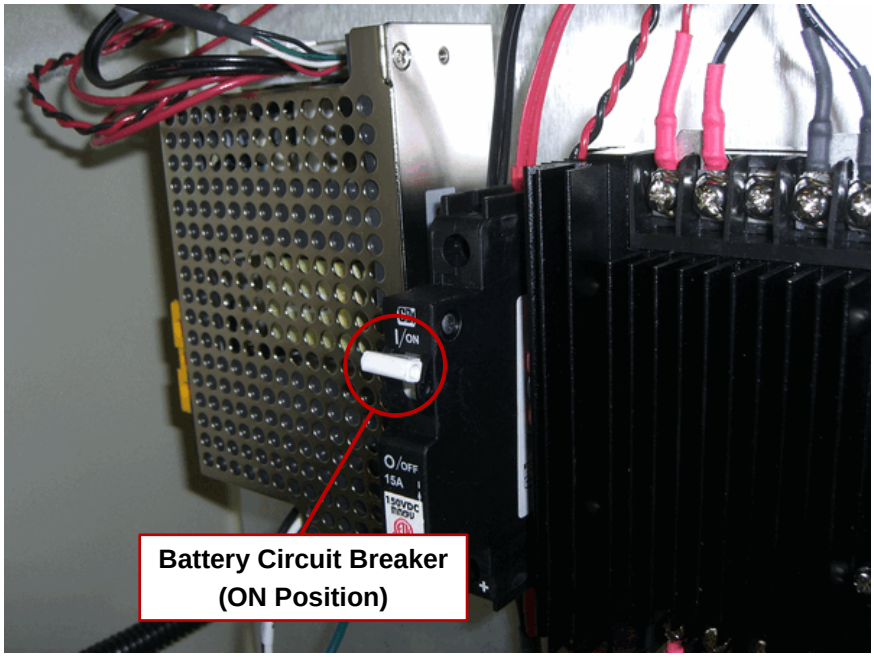



4. Verify that the modem powers on by checking the LEDs on the modem. Depending on signal strength, it may take between 1 to 5 minutes for the “Service LED” to turn green. If the modem fails to establish a link, refer to section 5.2 to troubleshoot the issue.




5. Verify that the AP's Status LED is on. If it is not, refer to section 5.1 to troubleshoot the issue.

6. Flip UP the tab to turn ON the battery circuit breaker which is located just to the right of the power supply. This brings the battery into the circuit.




**NOTE:** Turning on the battery circuit breaker only enables the battery for backup; no visual indication exists.

7. Test the functionality of the battery by turning off the AC power circuit breaker (shown in step 1). This test ensures that the backup battery is working properly when the AC power fails. If all component lights are still green, then the battery is functioning properly.
8. When battery functionality has been verified, turn the AC power circuit breaker back on.
9. When all tests are complete, both the AC power and the battery circuit breakers should be in the ON position and all components should display green lights.
10. The system is now ready for configuration and commissioning. For details, refer to the *AP Deployment Guide (010-0006-00)*.

# 5 Troubleshooting Guidelines

## 5.1 System Troubleshooting

The following table provides system troubleshooting guidelines.

**Table 1. System Troubleshooting Guidelines**

| Problem | Action |
|---|---|
| 3G/4G modem does not acquire signal | If the modem fails to establish a link after power up, verify that both antennas cables are connected to the antennas.<br>If modem still does not acquire, use a cell phone to verify the carrier's signal is actually available at the installation site. |
| AP does not power up | When the AP is powered on, the Status LED illuminates. If this fails to happen:<br>1. Verify that the AC power circuit breaker is turned on.<br>2. Verify that the PoE cable is properly connected to the AP Ethernet port.<br>3. Verify that the PoE injector's power connector is fully inserted. |
| No power to power supply | 1. Check and verify that the AC power circuit breaker is on and the $I^2R$ surge suppressor is green.<br>2. If there is still no power, check the circuit breaker feeding the base station. |
| AP does not acquire GPS | Verify that the GPS and 2.4 GHz antenna cables are connected and have not been swapped. |

**CAUTION:** BEFORE performing any work in the Base Station's equipment cabinet, turn off the AC circuit breaker supplying power to the Base Station and the AC power and battery circuit breakers in the equipment cabinet.

## 5.2 Modem Troubleshooting

**NOTE:** The information provided in this section is based on the On-Ramp Wireless' recommended Digi WR-21 modem. Other 3/4G modems and backhaul solutions may be installed but On-Ramp Wireless will not be able to provide configuration, installation, and troubleshooting support for these devices.

Use the following table to help troubleshoot any modem issues for the Digi WR-21.

**Table 2. Modem Troubleshooting Guidelines**

| LED/Button | Color and Light Pattern | Activity Indicated |
|---|---|---|
| Power LED | Green | Power is applied. |
| | Not illuminated | No power. |

| LED/Button | Color and Light Pattern | Activity Indicated |
|---|---|---|
| Ethernet Link LED (on the Ethernet connector at the rear of the unit) | Flashing green | The link is up and there is Ethernet traffic on the link. |
| Service LED | Solid green | Cellular link is up. |
| | Flashing green | Data is being sent or received. |
| WWAN LED | Blinking green | Flashes to show which network mode the unit is operating in:<br>■ Off = no service<br>■ 1 blink = GPRS mode<br>■ 2 blinks = EDGE mode<br>■ 3 blinks = UMTS mode<br>■ 4 blinks = HSDPA mode<br>■ 5 blinks = HSUPA mode<br>■ 6 blinks = LTE mode<br>■ On steady = CDMA mode |
| Signal Strength LEDs | 0-3 Green LEDs | ■ 0 LEDs illuminated: ≤ -113 dBm (effectively no signal)<br>■ 1 LED illuminated: ≥ -112 dBm and ≤ -87 dBm (weak signal)<br>■ 2 LEDs illuminated: ≥ -86 dBm and ≤ -71 dBm (medium strength signal)<br>■ 3 LEDs illuminated: ≥ -70 dBm and ≤ -51 dBm (strong signal) |
| Reset button | | Single press: Performs equivalent of a power-cycle.<br>Press and hold: Resets device configuration settings to factory defaults (factory reset).<br>**WARNING!!**<br>**DO NOT reset modem to factory defaults prior to contacting On-Ramp Wireless support.** |

The following picture points out the LEDs/buttons on the modem.

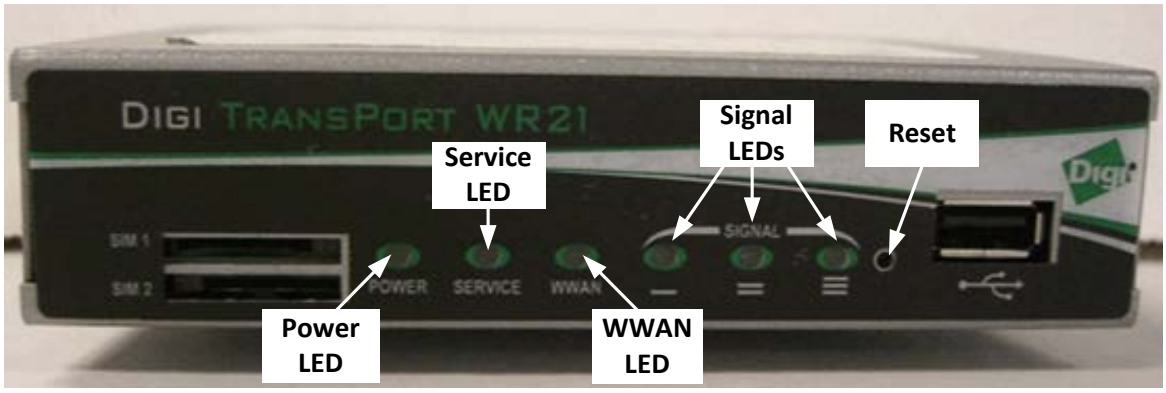



**Figure 4. Modem Indicator LEDs/Buttons**

# 6 Preventive Maintenance

The following table shows the recommended preventive maintenance schedule for the AC-Powered Outdoor Base Station.

**CAUTION:** When performing annual maintenance, take appropriate precautions to avoid electrical shock.

For additional assistance, contact On-Ramp Wireless Customer Support at (858) 592-6008 or email support@onrampwireless.com.

**Table 3. Preventive Maintenance Schedule**

| Task | Frequency |
|---|---|
| 1. Remove, clean, and re-install air filters. | Annually |
| 2. Check that all connections are secure and that there are no loose or broken wires. | Annually |
| 3. Check the base station cabinet for any water intrusion and remove it. | Annually |
| 4. Check the seals around the base station door and ensure that none are worn or damaged. | Annually |
| 5. Check for and clean away any corrosion from the battery terminals.<br>**CAUTION:** Wear protective gear while performing this step. | Annually |
| 6. Perform battery check for proper voltage. First, turn OFF the battery circuit breaker. Check battery voltage with a voltage meter. If the battery registers below 12.6 V, the battery should be replaced.<br>**NOTE:** After checking/replacing the battery, be sure to turn ON the battery circuit breaker. | Annually |
| 7. Check the date that the battery was installed. If it has been longer than 3 years since the battery was installed, replace the battery.<br>**NOTE:** Battery replacement is recommended every 3 years. | Annually |

# Appendix A Mechanical Drawing

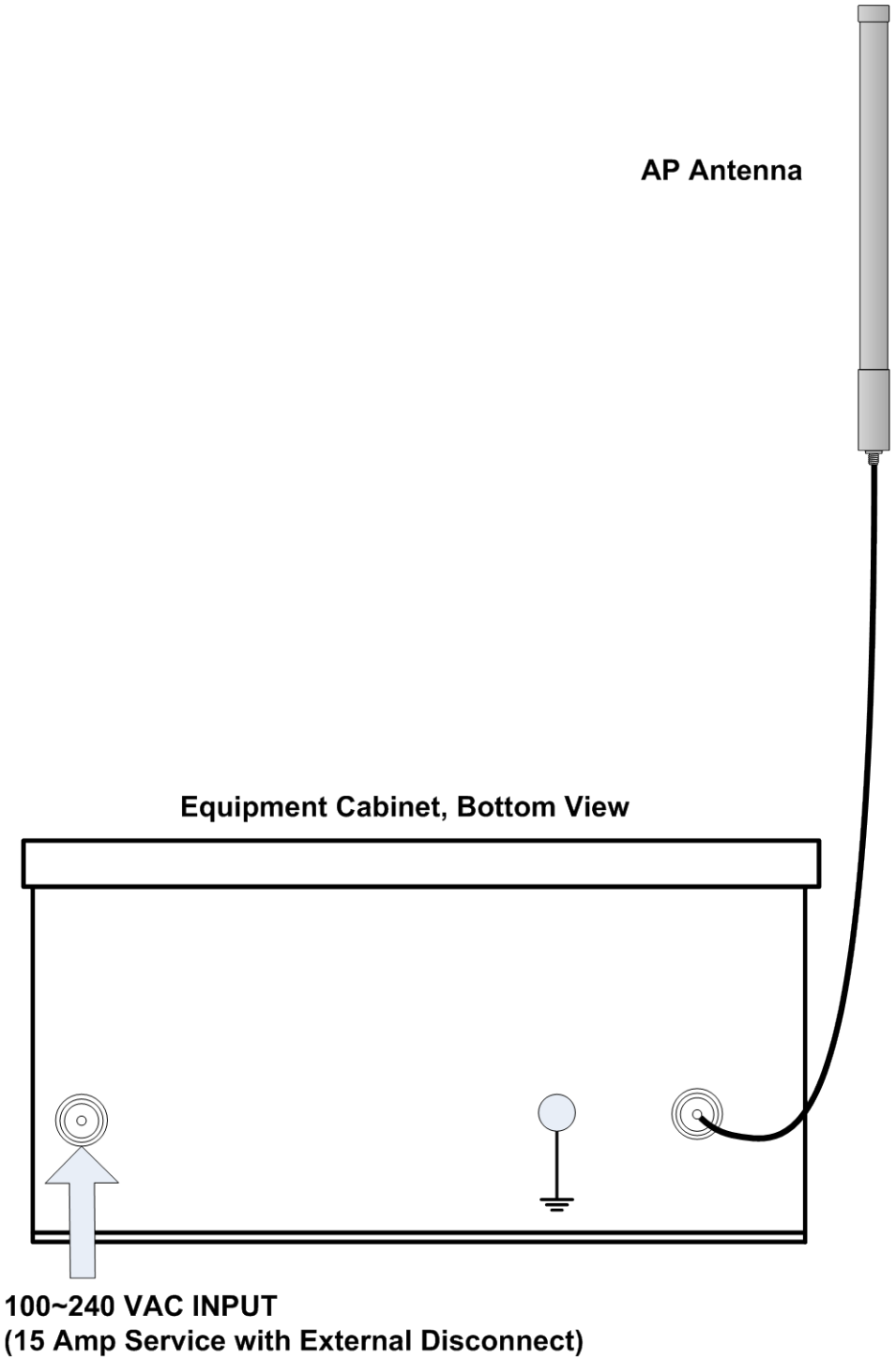



**Figure 5. Component Cabling**