Lumewave and LumInsight IoT Gateway and Base Station Installation Guide
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Installation Planning

**IMPORTANT**: This document provides guidelines for the proper placement and installation of Gateways, Base Stations, and the antennas. Failure to follow the information in this guide can result in incorrect installation, poor system performance, and damage to the system.

Gateway Types

The Gateway and Base Station use the same IP66 rated enclosure. Both Gateways and Base Stations are available with either ethernet or cellular connections. The Cellular versions include a cellular antenna attached to the top of the enclosure.

The following table describes the three gateway configurations:

<table>
<thead>
<tr>
<th>Gateway Type</th>
<th>Site Description</th>
<th>Mounting location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway (models 100140, 100141, 100150-201 and 100150-211)</td>
<td>This configuration is intended for deployments in a limited area, such as a parking lot or a small campus.</td>
<td>Gateways are usually mounted on a rooftop of a nearby building with clear line of sight over the deployment area.</td>
</tr>
<tr>
<td>Gateway with Antenna Relocation Kit (model 900914)</td>
<td>This configuration is intended for deployments in a limited area, but where the Gateway and the antenna are installed in different locations.</td>
<td>The Gateway can be mounted in an IT cabinet or room, and the relocation antenna placed on the roof of the building.</td>
</tr>
<tr>
<td>Base Station (model 100142, 100143, 100150-281 and 100150-291)</td>
<td>This configuration is intended for deployments that extend over a large area (such as a city or a large campus).</td>
<td>The Gateway can be mounted in an IT cabinet or room, and the relocation antenna placed on the roof of the building.</td>
</tr>
</tbody>
</table>

The following illustrations show the three configurations (with ethernet enclosures):
Gateways

Gateways are intended for use within a limited area (such as a parking lot or a small campus), and come with a 900 MHz antenna that is mounted directly to the enclosure. Gateways are typically mounted on a roof top of a nearby building with a clear line of sight over the deployment area.

Certain deployment situations require that the Gateway enclosure and the antenna are installed in different locations. In such cases, you must use the Antenna Relocation Kit (model 900914), sold separately, which includes a 900 MHz relocation antenna and cabling to connect to the Gateway.

Base Stations

Base Stations are intended for deployments that extend over a large area (such as a city or a large campus). The Base Station includes a Gateway, a secondary amplifier to be pole-mounted below the antenna, and an Antenna Relocation Kit (model 900914) containing a 900 MHz relocation antenna and cabling.

Antenna Specification

1. The antenna provided with the Gateway is intended to be mounted directly on the Gateway enclosure. It must not be connected to the Gateway using any cabling. If you need to place the antenna in a different location, you must order the Antenna Relocation Kit and connect the relocation antenna to the Gateway using the provided cabling.

2. Do not use any third party antenna. Use only antennas provided by Echelon.

Antenna Cable Specification

1. Only use factory terminated cables to connect a Gateway or Base Station to a remote antenna.

2. Gateways are not supplied with antenna cabling. If a Gateway needs to be remote from the antenna, an Antenna Relocation Kit (model 900914) must be purchased from Echelon. Base Stations are supplied with an Antenna Relocation Kit, as well as an external amplifier to improve range.

3. Do not cut any excess cable length. This would require replacing the factory termination, which is not recommended. Coil any excess cable in large loops and tie it down safely.

4. **Understanding Signal Loss vs Antenna Gain**: As a rule of thumb, the RF range is reduced by half for every 6 dB signal loss. Signal is lost across cables and connectors. The longer the antenna cable and the more connections, the more loss.

5. Once you determine the distance between the antenna and the Gateway or Base Station, you should order cabling as indicated in the Cable Matrix table below.
### Cable Matrix

<table>
<thead>
<tr>
<th>Length</th>
<th>Coax “LMR” Series</th>
<th>Loss/100’ in db</th>
<th>Total Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50’</td>
<td>400</td>
<td>-3.9</td>
<td>2.0</td>
</tr>
<tr>
<td>50’ to 100’</td>
<td>600</td>
<td>-2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>100’ to 150’</td>
<td>600</td>
<td>-2.5</td>
<td>3.75</td>
</tr>
<tr>
<td>150’ to 200’</td>
<td>900</td>
<td>-1.7</td>
<td>3.4</td>
</tr>
</tbody>
</table>

### Gateway and Base Station Placement

1. Gateway and Base Station enclosures are designed to be mounted on a wall or pole.

2. Gateways and Base Stations require access to a power supply providing 120–240VAC at 50/60 Hz.

3. Gateways and Base Stations require access to either an ethernet connection or a cellular signal for data backhaul.

4. Gateway and Base Station enclosures need to be placed in a location that is accessible to service personnel.

5. If deploying a Gateway in a location where the entire enclosure cannot be suitably mounted for a clear line of sight over the deployment area, an Antenna Relocation Kit will be needed to mount the relocation antenna separately from the enclosure.

6. **Coax Cable Drip Loop:** Ensure that the coax cable running between the Gateway and the relocation antenna has a drip loop immediately before the enclosure to help prevent water leaking into the enclosure.
Base Station Amplifier Placement

1. The amplifier provided with the Base Station must be attached to the pole below the antenna as close as is practical.

2. Use the supplied bracket to attach the amplifier.

3. The amplifier has two cable connectors labelled “To Antenna” and “To Injector”. The “To Injector” side is connected to the cable going to the Base Station. The “To Antenna” side is connected to a much shorter cable connected to the antenna.

4. Notice that there is a loop between the amplifier and the antenna. This is a 2-foot loop to provide slack in the cable when installing or replacing the amplifier.

5. Be sure to waterproof the cable connections to the amplifier using waterproof tape (using supplied waterproof tape).

Antenna Placement

1. **IMPORTANT**: Before any antenna installation, an RF survey should be performed:
   - To assure that there is appropriate coverage for communication with the controllers.
   - To assure there is no RF interference.

   If you do not perform an RF survey, you risk finding out after your installation that due to interference, you have a reduced ability to communicate with the installed controllers.

2. Place the antenna in an unobstructed area. Standing at your antenna, you must be able to turn 360 degrees and have a clear view of your deployment area.

3. When installing the relocation antenna on a building, the height of the antenna should be at least 10 feet above the highest point of the building.

4. Building rooftops are popular places for antennas. Ensure that there is enough horizontal and vertical separation from any other antenna on the roof. Essentially, place the antenna as far away as possible from any other antennas.

5. The antenna must be mounted high enough to clear all structures between the antenna and the controllers in the deployment area.

6. The antenna must be mounted vertically, as shown in the installation diagrams. Do not mount at an angle or upside down.

7. Be sure to waterproof the cable connections to the antenna using the supplied waterproof tape.
8. **Wall mounted antenna:** The antenna must be mounted high enough to clear all walls and structures.

9. **Roof mounted antenna:** The antenna must clear all walls and structures.

10. **Pole mounted antenna:** The antenna must extend past the top of the pole and be clear of all walls and structures. Attach the antenna using the supplied bracket. Tighten the bracket so that the antenna and pole are a rigid structure.

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**Installation Instructions**

This section provides installation instructions for the Gateway and Base Station, and the Relocation Antenna.

**Installing a Gateway or Base Station**

Installing a Gateway or Base Station requires the same steps. The only difference is for a gateway using the antenna mounted to the enclosure, in which case there is no antenna cabling.

There are two types of installations:

- Ethernet Gateway or Base Station
- Cellular Gateway or Base Station
Ethernet Gateway or Base Station Installation Steps

1. Mount the Gateway or Base Station to a wall or pole.

2. Punch out the two knockouts at the bottom of the enclosure so that you can run the power and ethernet cables. Optionally, you can connect conduits to the knockouts (as shown below), and run the cables through the conduits.

3. Pull the three power wires through the left knockout.

4. Pull the Ethernet cable through the right knockout.

5. Connect the wires as shown in the Ethernet Wiring diagram below. The three wires (white, black, and green) attach to the power unit and ground (must be connected to earth ground). The Ethernet cable connects to the CloudGate unit.

6. Seal the knockout openings to prevent water or moisture from entering the enclosure.
7. If you are installing a Gateway using the direct-mount antenna, screw the antenna directly into the slot at the top right of the enclosure, and skip the section on antenna installation. Otherwise follow the instructions under Antenna Installation.

8. Install the security latch. The enclosure comes with a security latch that accepts a self-tapping screw or F81 lock.

9. You can now Go to the Antenna Installation section.

Cellular Gateway or Base Station Installation Steps

1. Mount the Gateway or Base Station to a wall or pole.

2. Punch out the bottom left knockout of the enclosure so that you can run the power wires. Optionally, you can connect a conduit to the knockout (as shown below), and run the cables through the conduit.

3. Pull the three power wires through the left knockout.
4. Connect the wires as shown in the Cellular Wiring diagram below. The three wires (white, black, and green) are attached to the power unit and ground (must be connected to earth ground).

![Cellular Wiring Diagram]

5. Seal the knockout to prevent water or moisture from entering the enclosure.

6. Attach the cellular antenna directly to the connector at the top left of the enclosure.

![Connect Cellular Antenna]

7. If you are installing a Gateway using the direct-mount antenna, screw the antenna directly into the slot at the top right of the enclosure, and skip the next section on antenna installation. Otherwise follow the instructions under Antenna Installation.

![Connect Direct-mount RF Antenna]

8. Install the security latch. The enclosure comes with a custom security latch that accepts a self-tapping screw or F81 lock.

![Security Latch]
Antenna Installation

There are three antennas that can be attached to a Gateway:

- A cellular antenna
- A direct-mount RF antenna
- A relocation antenna

Installing the Cellular Antenna

For cellular communication, you must mount the cellular antenna to the connector located at the top left of the Gateway or Base Station (shown below).

Installing the Direct-Mount RF Antenna

Installing the provided direct-mount Gateway antenna simply requires screwing the antenna into the top right connector of the Gateway enclosure.

Installing the Relocation Antenna

The relocation antenna is provided in the Antenna Relocation Kit (model 900914). Installing the relocation antenna is significantly more involved than the other antennas, in that it can require long cable runs and drilling one or more holes through walls to connect the Gateway to the antenna.

Read carefully the information in the "Installation Planning" section, paying particular attention to “Antenna Placement”. The following diagram shows a typical pole-mounted relocation antenna.
1. Attach the relocation antenna to the top of a pole.

2. Allow for a 2-foot loop in the cable to provide sufficient slack in your coax cable.

3. For a Base Station, ensure that the amplifier is below the coax loop and properly mounted to the pole, as described in “Base Station Amplifier Placement”.

4. **Be sure to waterproof the cable connections to the amplifier using waterproof tape (using supplied waterproof tape).**

**Recommended Installation**

The following diagram shows a recommended Gateway or Base Station installation.

1. Waterproof all RF connectors using the provided rubber tape or other approved sealants.

2. Secure the coax cable from the Gateway all the way to the antenna.

3. The Gateway or Base Station enclosure should be placed in an IT cabinet or utility room with access to power and a network connection.

4. Make a hole through an exterior wall for the coax cable. Sleeve as necessary to protect the coax cable.

5. Using a 14/3 severe duty electrical cord provides an easy means of disconnecting for service and power cycling.
# Installation Review Checklist

This checklist is intended to help ensure that your installation has been completed correctly. You should be able to answer **yes** to all of the following questions:

## AT THE ANTENNA:

1. Did you perform an RF survey?  
2. Are you using an antenna and RF cables that have been supplied by Echelon (or meet the specifications in the Cable Matrix)?  
3. Does your antenna location have a 360-degree view with a clear line of sight with the installed controllers?  
4. If mounted to pole, is the antenna attached to the pole such that the antenna and pole are a rigid structure?  
5. If installing a Base Station, is the amplifier attached below the antenna with a cable loop between the antenna and the amplifier?  
6. Did you install your antenna far enough away from any other RF antennas?  
7. If roof mounted, is your antenna at least 10 feet above the highest point of the rooftop?  
8. Did you install the antenna vertically and not at an angle or upside down?  
9. Did you weatherproof all of the antenna/cable connectors?  

## AT THE ENCLOSURE:

10. Is the gateway or Base Station location readily accessible to a service technician (as defined by the NEC)?  
11. Did you wire the power cables in accordance with the NEC, and any applicable local codes?  
12. Does your Gateway or Base Station location have an ethernet drop or good cellular coverage for data backhaul?  
13. Did you seal the knockouts on the Gateway or Base Station enclosure?  
14. Did you create a drip loop in the antenna cabling next to the Gateway or Base Station enclosure?  
15. If using cellular, did you attach the cellular antenna to the Gateway or Base Station enclosure?