



Communication Gateway Installation Guide



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1. Introduction

This guide presents the instructions for the physical installation of the communication gateway necessary for the physical installation and commissioning of FLO® charging stations, comprised of one or two EV chargers. The communication gateway is used to connect an EV charger to the Charge Point Operator (CPO) backend. This backend network provides tools to monitor and control the connected EV chargers.

A gateway installation is required for all FLO networked EV chargers except for those with integrated gateways. Refer to the corresponding product installation guide for more details.

2. Safety

Carefully read these instructions before beginning the installation. Take the time to become familiar with all the parts and equipment involved before installing the EV chargers, operating the EV chargers, or performing maintenance on the communication gateway.

IMPORTANT SECURITY INSTRUCTIONS – KEEP THESE INSTRUCTIONS FOR FUTURE REFERENCE

All installation, commissioning, testing, and maintenance of charging stations and communication gateways must be done in accordance with the manufacturer’s instructions, as well as all applicable local and national standards.

Safety Measures to Avoid the Risk of Electric Shock, Explosion or Electric Arc	
	• Use the appropriate individual protection equipment and follow the practical safety standards for electrical work. • Before starting, ensure the power is off on every power source connected to the charging station and its associated parts. • Follow the product’s classification guidelines as defined in these instructions.

NOTE: Follow the installation instructions to reduce the risk of severe injury and/or death.

3. Connectivity

This section details information regarding the EV chargers' connectivity and communication.

3.1. Communication Gateway

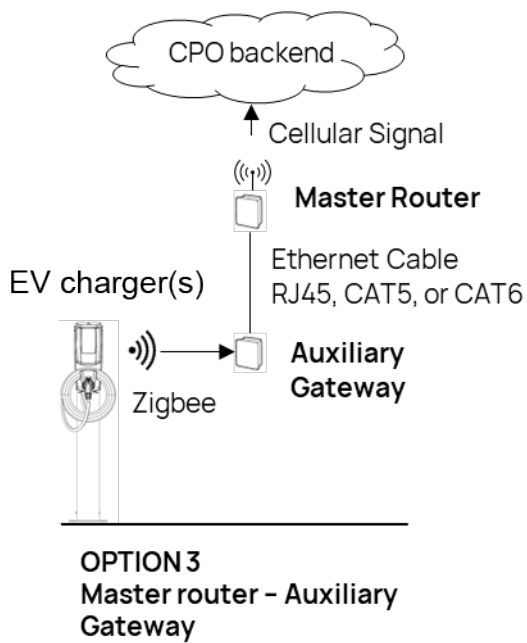
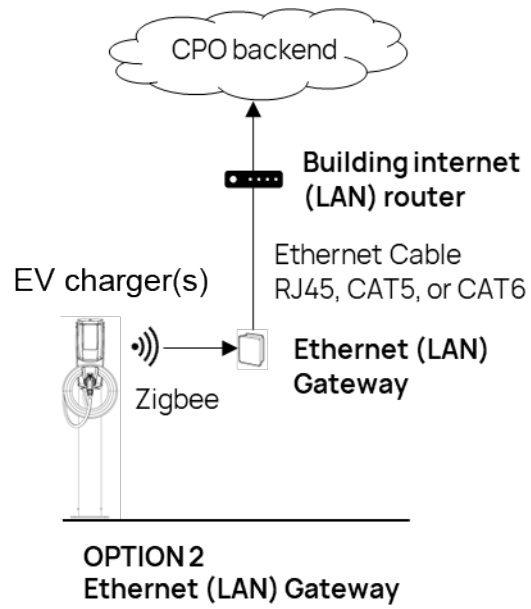
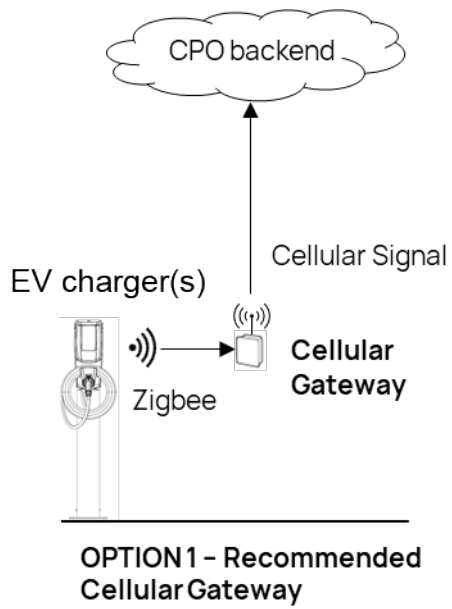
A communication gateway is required to enable the connectivity between the EV chargers and the CPO backend. The communication gateway is a device which operates independently from the EV chargers. It must always be connected to the network, in accordance with the usage conditions and annexes of the Global Management Service (GMS) contract. Detailed information about the gateway specifications can be found on the [Digi XBee data sheet](#).

3.2. Communication Protocols

The gateway enables communication between the EV chargers and the CPO backend using the following communication protocols:

- Gateway and EV chargers ↔ Zigbee (IEEE 802.15.4)
- Gateway and CPO backend ↔ Cellular (LTE) or Ethernet (LAN)

Communications between the gateway and EV chargers are bidirectional. The Gateway can receive data and other signals from the EV chargers, as well as send commands to control the EV chargers. Communications between the Gateway and CPO backend usually uses a direct cellular communication. This is the most typical installation and is recommended over Ethernet (LAN) or Master/Auxiliary options for simplicity:



More details about options for connecting the Gateway to the CPO can be found in the *4.1.1. Site Communication Signal* section.

1.1.1. Zigbee Protocol

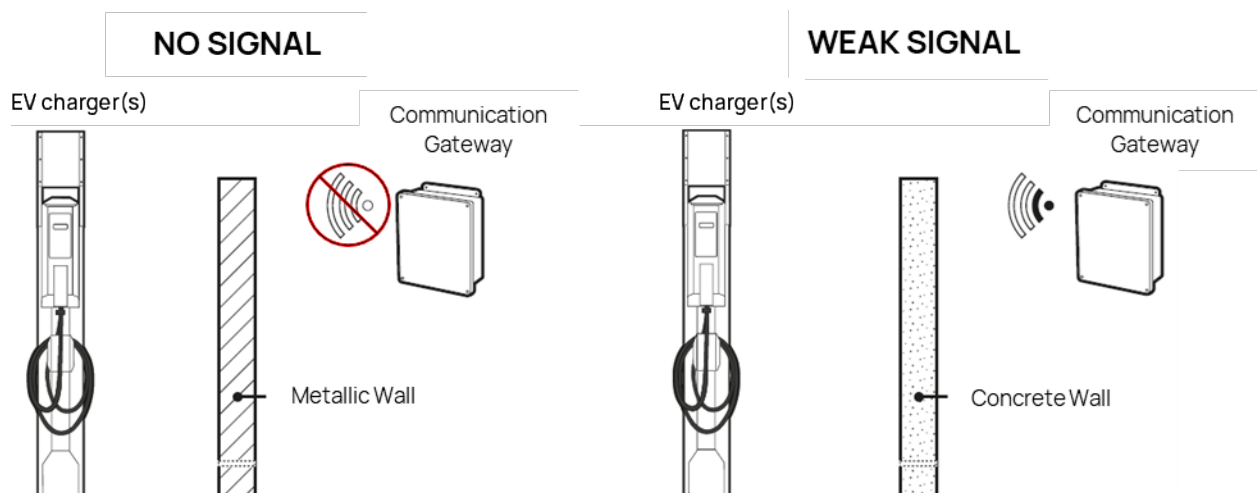
Each EV charger contains a wireless card which uses the ZigBee Pro/IEEE 802.15.4 physical communication layer for communications between the gateway and the charging stations. The properties of the physical layer are hidden to maintain and secure the configuration and the commissioning of the network database.

The ZigBee signal has the following characteristics:

- A 2.4 GHz wireless physical layer with a data rate of 250 kb/s
- An inexpensive installation
- Easy implementation
- Reliable data transfer
- 48.7 m (160 ft) operation range
- Very low energy consumption (Typically: 3.5 W, Maximum: 15 W, varies depending on the gateway model)

3.2.1.1. Zigbee Signal

To optimize the Zigbee signal, it is important to consider obstructions and structures in the layout design. The objects in the communication gateway's line of sight may reduce the range of the Zigbee signal, thus affecting the communication between the gateway and the charging stations. Materials such as wood and concrete will limit the range to a few meters, whereas metal will completely block the signal.

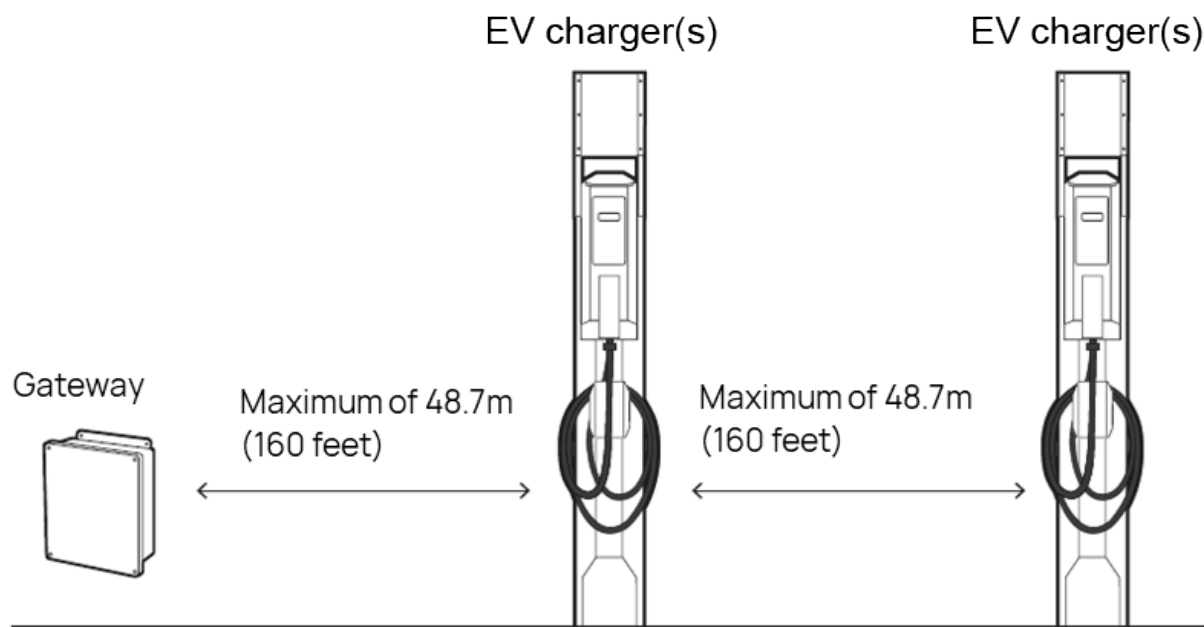


As such, to ensure a proper installation and communication, the communication gateway must be installed in the following way:

- On a single level floor rather than a multi-level floor plan.
- Using at least one communication gateway per floor.
- The communication gateway should be installed in a NEMA 4 watertight PVC electrical junction box (Not included - Refer to the *6.4. Junction Box* section for more information).

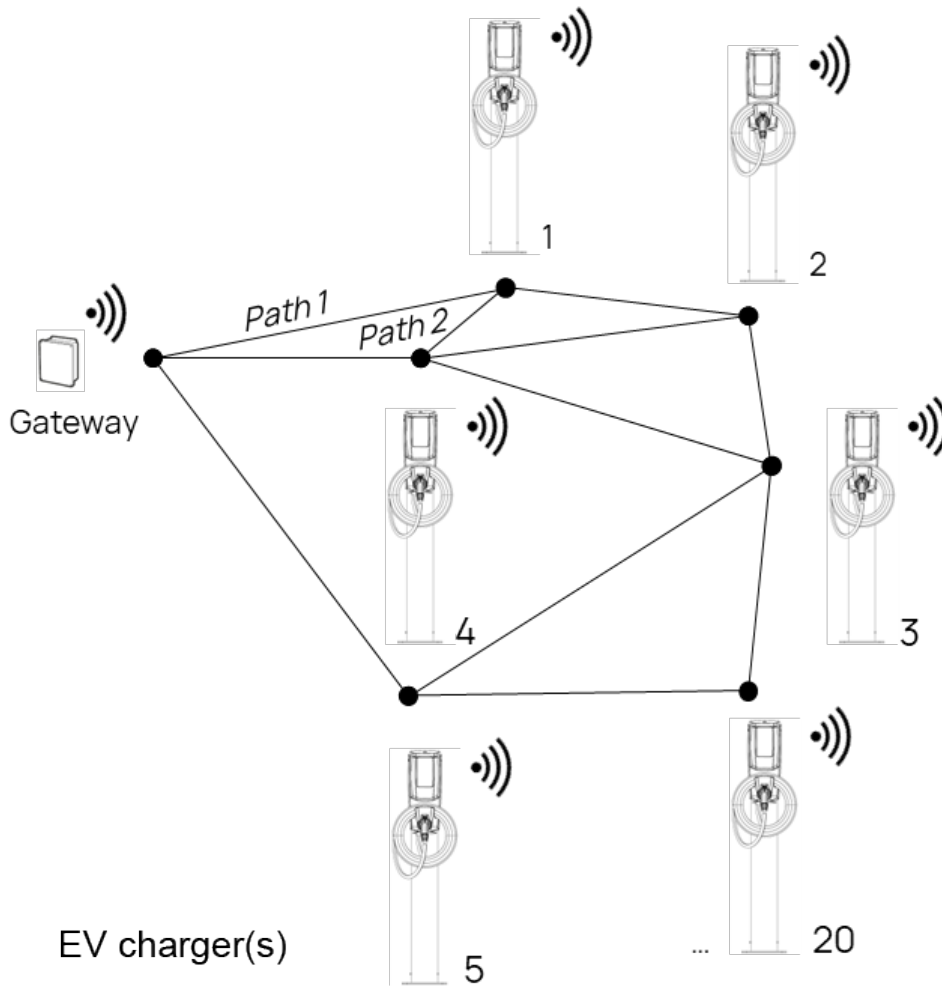
3.2.1.2. Gateway Signal Range

The Zigbee antennas used in the EV chargers, and gateways have a maximum range of 48.7 m (160 ft). To maintain proper communication of all networked EV chargers on site, all EV chargers should be kept within range of another networked EV charger. Obstructions such as walls, support columns, windows will decrease the signal strength, and must be considered in the gateway layout design. See the *3.2.1.1 Zigbee Signal* section for more information.



3.2.1.3. Meshed Network

The Zigbee protocol creates a local mesh communication network between all EV chargers connected to the same communication gateway. The EV chargers within the same mesh network may enable more than one path to communicate with the communication gateway.

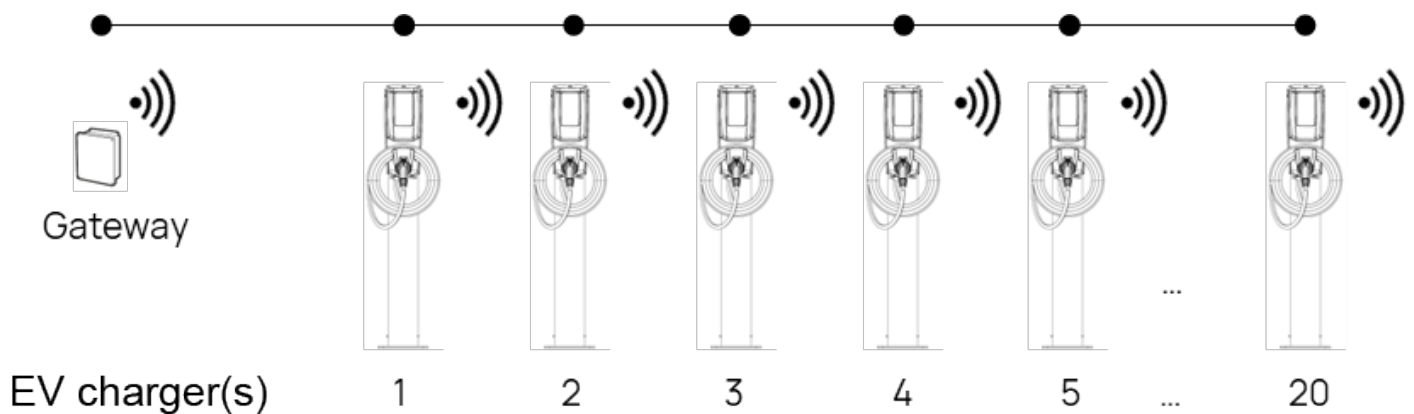


1. Data can be relayed directly to the communication gateway if there is a direct signal path between the EV chargers and the gateway (example path 1 above).
2. If a direct signal path does not exist, the signals can be relayed between EV chargers until they reach the communication gateway (example path 2 above). Once the signals reach the communication gateway, they will be sent to the CPO backend.

The communication of signals from the CPO backend through the communication gateway to the EV chargers follow the same data path.

3.2.1.4. Maximum Gateway Capacity

A maximum of 20 EV chargers can be connected to the same communication gateway:

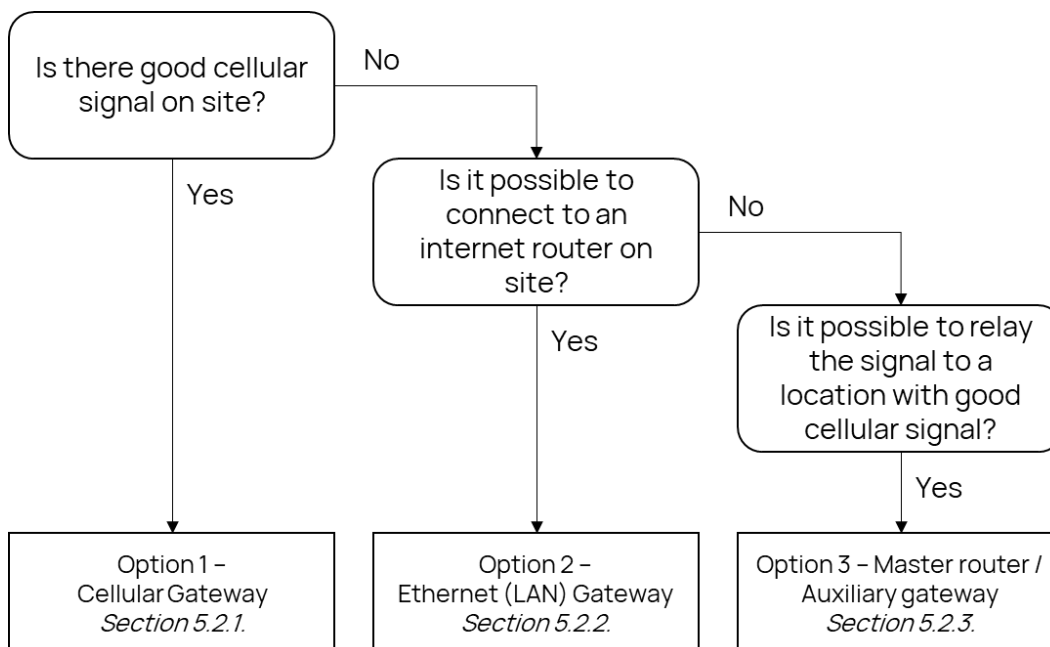


4. Communication Gateway Selection

This section details information regarding which type of communication gateway configuration to select as well as the right number of gateways to deploy for a given project.

4.1.1. Site Communication Signal

The communication gateway must be selected based on the site location and configuration. The following questions help to identify the right communication gateway and communication protocols required:



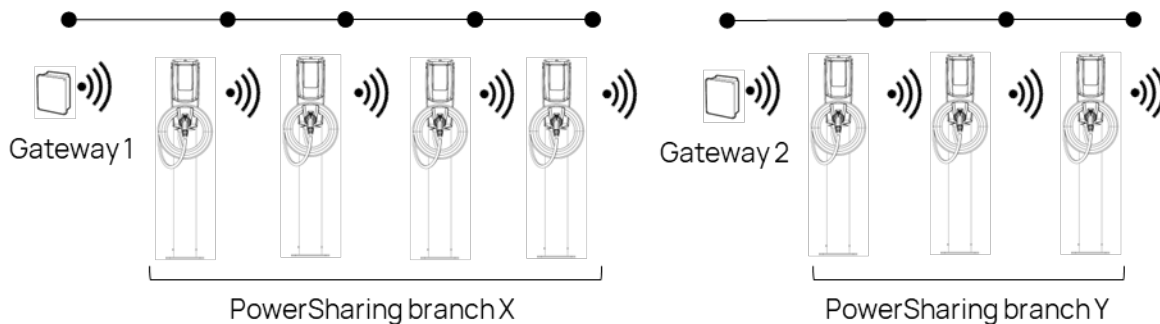
4.1.2. PowerSharing™

Gateways are configured in PowerSharing™ mode for the EV chargers to share the power.

Multiple gateways may be required depending on the answers to these questions:

- Are the EV chargers going to be in PowerSharing mode?
- Can all EV chargers using PowerSharing mode together, communicate with the same communication gateway?

The EV chargers sharing the power of the same electrical circuit in the PowerSharing configuration must be connected to the same communication gateway. This requirement may impact how the EV chargers' connectivity is distributed between the multiple communication gateways:

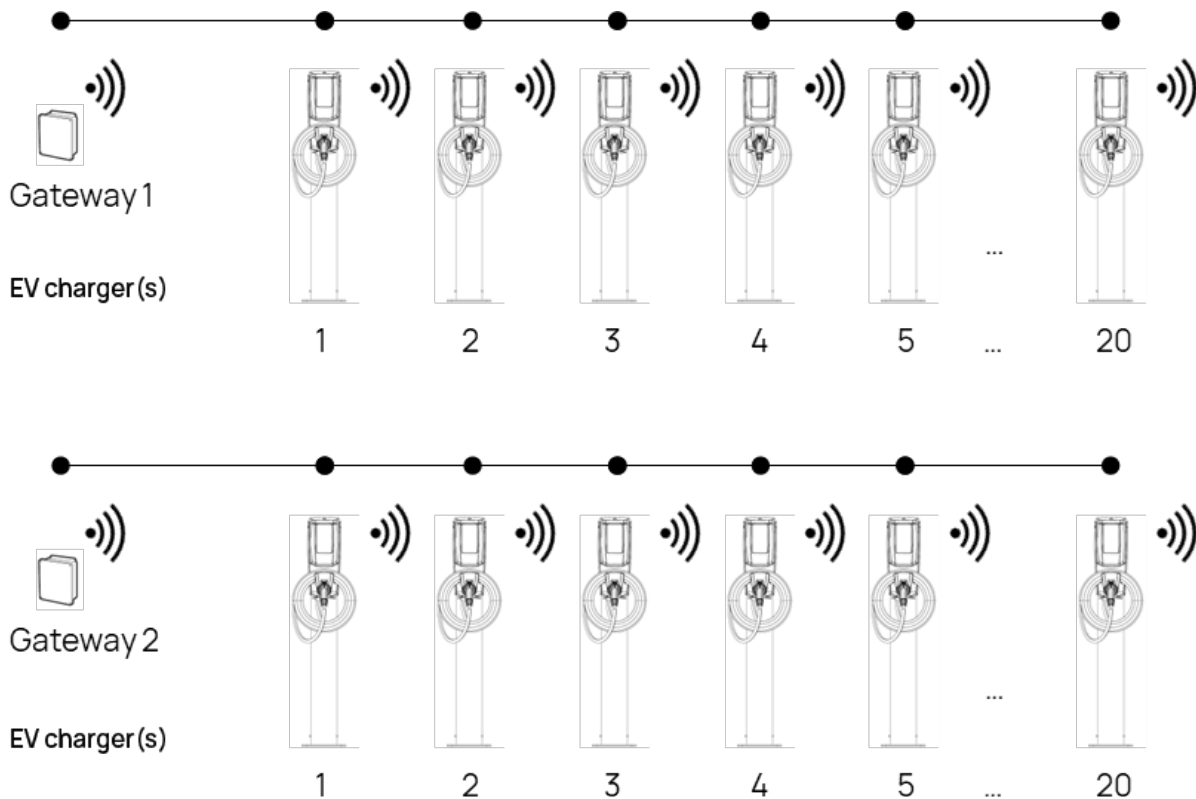


NOTE: One single gateway can manage PowerSharing for multiple groups of power sharing chargers simultaneously. Example above: if the total chargers of branch X and Y is equal or lower than 20 and they're all in the operating range of one single gateway, then only one gateway is needed.

4.1.3. Single or Multiple Communication Gateways

Multiple communication gateways should be installed if the answer to at least one of these questions is **Yes**:

- Are there more than 20 EV chargers?
- Are the EV chargers installed on more than one floor?
- Are the EV chargers' signals to the communication gateway and/or to each other blocked by any structure or obstruction (i.e., no line of sight between EV chargers and/or between EV chargers and the communication gateway)?
- Are the EV chargers more than 48.7 m (160 feet) apart and/or more than 48.7 m (160 ft) away from the communication gateway?



NOTE: Each gateway only has **one** LAN port; therefore, multiple gateways cannot be daisy chained. In the case of Ethernet/LAN hardwire connection, an Ethernet switch (customer supplied) rated for the operating environment and with adequate number of LAN ports is required.

5. Site Layout Information

Communication gateway positioning is highly dependant on the site layout of EV chargers. To ensure adequate connectivity for all EV chargers on site and power supply for all communication gateways, the communication gateway positioning must be considered when designing the site layout.

5.1. Site Signal Strength

5.1.1. Cellular Signal

Before starting the installation, the site must be surveyed to determine if the cellular signal strength is adequate according to the cellular network used. Large concrete structures such as underground parking garages or remote locations may have poor cellular signal strength.

An adequate cellular signal strength is required for the gateway to work properly. A signal that is inadequate will negatively impact communication between the gateway and the CPO backend. The signal strength can be easily estimated using cell phones, using the following methods:

- **Android (preferred):** The *Play Store* has several applications, for example, *G-NetTrack*, for measuring cellular signal strength. It is also possible to look at the cellular signal strength in the *About Phone* parameters through the *Sim card Status* parameters.
- **iOS:** Dial *3001#12345#* from the phone to enter Field Test Mode. Detailed signal strength information will be available in this mode.

The *rsrp0* parameter indicates the site's dBm reading.

5.1.1.1. Cellular Signal Strength References

The following table quantifies the quality of the signal based on the cellular signal strength in dBm.

NOTE that all current FLO gateway models use 4G/LTE.

	Excellent	Good	Fair	Poor	Deadzone
4G / LTE	> -90 dBm	-91 dBm to -105 dBm	-106 dBm to -110 dBm	-111 dBm to -119 dBm	< -120 dBm

ADEQUATE

INADEQUATE

5.1.1.2. Inadequate Cellular Signal on Site

If a site has an inadequate cellular signal, the communication gateway can be configured to work with an existing Internet service through a LAN connection made via Ethernet or both a master router and auxiliary communication gateways can be deployed onsite.

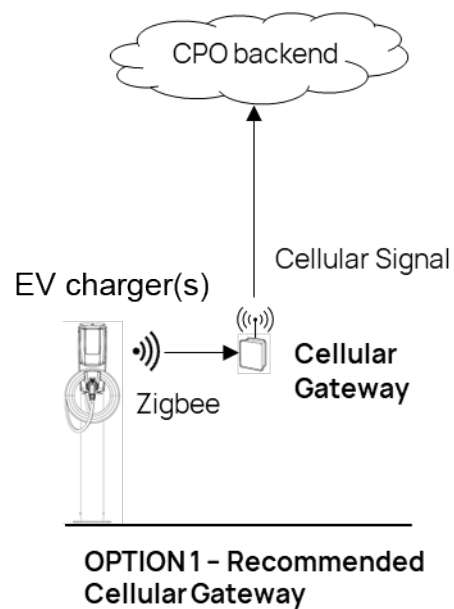
If the site requires any of these configurations, the appropriately configured communication gateways must be selected at ordering and programmed for those purposes before leaving our installations.

5.2. Gateway Layout Options

The EV chargers' layout and configurations may impact the communication gateway layout.

5.2.1. Cellular Gateway

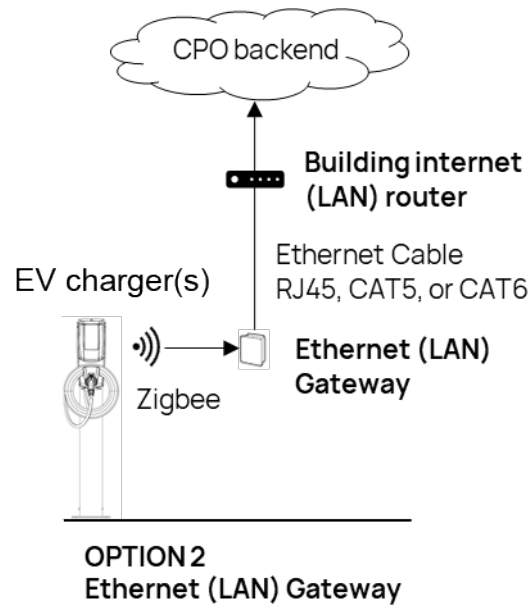
Most outdoor and some indoor installations are likely to have a good cellular signal and little to no structures to block the communication signals. For these scenarios, a cellular communication gateway can be deployed.



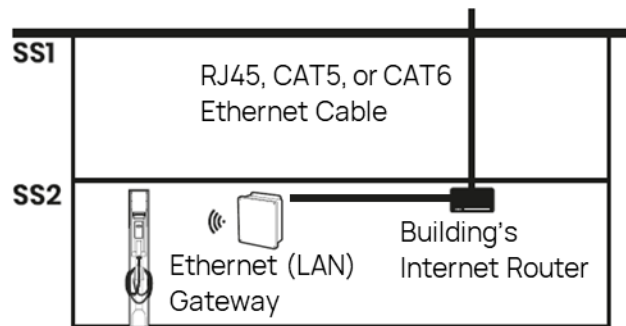
5.2.2. Ethernet (LAN) Gateway

Some indoor installations might be more challenging, such as multi-level parking garages and underground parking lots. These structures often block the communication and cellular signals. Similarly, remote locations might have a weak cellular signal.

For these scenarios, when an Internet router is accessible on site, an Ethernet (LAN) gateway can be deployed and connected to the building's Internet router via an Ethernet cable.



Below is an example of communication gateway installation when a cellular signal is blocked from the underground parking structure:



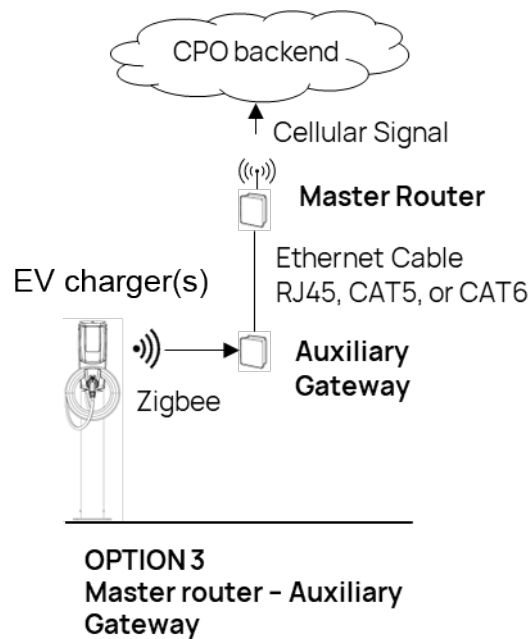
Underground parking: Absence of cellular signal and available building Internet router. An Ethernet (LAN) gateway must be installed to relay the communication.

NOTE: The building's Internet router must have enough ports available, and the network providing the Internet connectivity must allow the Ethernet gateway to be connected to it, including an appropriately set up firewall and IP address. In some cases, an Ethernet switch (customer supplied) rated for the operating environment and with adequate number of LAN ports is required.

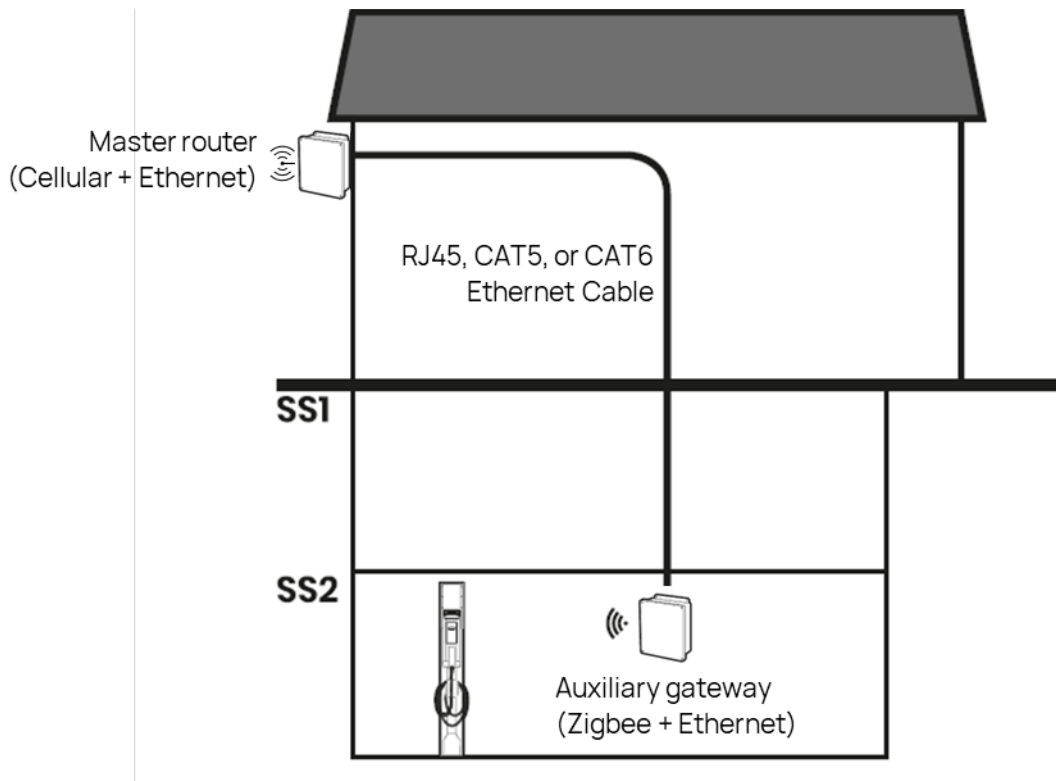
5.2.3. Master Router / Auxiliary Gateways

If the cellular signal is low or inexistant and there is no Internet router connectivity in underground structures, a master router combined with one or more auxiliary gateways may have to be installed.

The master router should be placed in an area where a cellular signal is available and will transfer the data to the CPO backend. Its communication with the auxiliary gateways is done through an Ethernet cable. The communication between the EV chargers and the auxiliary gateways is still done through Zigbee.



Below is another example of a communication gateway installation when a cellular signal is blocked from the underground parking structure and no Internet router is available in the building:



Underground parking: Absence of cellular signal and building Internet router. A master router and an auxiliary gateway must be installed to relay the communication.

NOTE: Only one auxiliary gateway can be connected to a master router. If more than one auxiliary gateway is needed, then an Ethernet switch (customer supplied) rated for the operating environment and with adequate number of LAN ports is required. Both the master router and auxiliary gateways only have one LAN port.

NOTE: The master router can not communicate directly with EV chargers.

6. Gateway Installation

The communication gateway installation must be done by an engineer, a technician, or a qualified service agent.

6.1. Gateway Types

FLO uses Digi gateways, which are robust programmable wireless solutions.

6.2. Gateway Electrical Installation

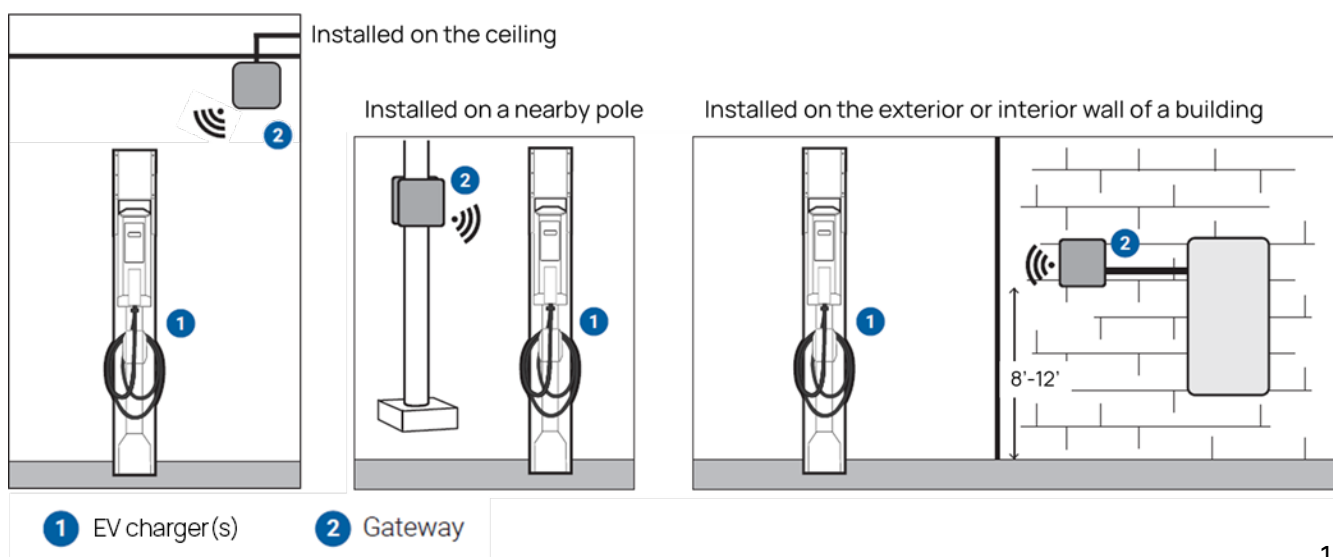
We recommended installing the gateway on a separate power source from the EV chargers. This ensures that the gateway will still communicate with other EV chargers when an EV charger is under maintenance. Each communication gateway requires a 120 VAC electrical outlet for its power supply to be plugged into.

6.3. Gateway Location

The communication gateway must be installed with the recommended specifications:

- Must be protected against the elements:
 - Requires the installation of an electrical junction box to protect the communication gateway. All installations require a junction box. See the *6.4. Junction Box* section for more information.
- Installed at a height of 8 to 12 feet (2.44 m to 3.66 m) above the ground, to be accessible for maintenance but inaccessible to the public.
- Not installed on a charging station pedestal.
- Installed with the recommended distances to keep a good communication signal, as mentioned in previous sections.

Below are some typical installations:



6.4. Junction Box

All installations require the installation of the communication gateway inside an electrical junction box.

6.4.1. Specifications

The junction box must have the following specifications:

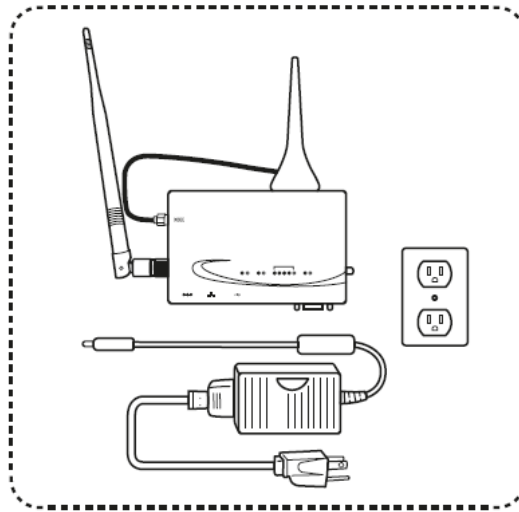
- NEMA 4 type compliant watertight PVC electrical box.
- Large enough so that the gateway as well as the antenna is in the PVC electrical box. The recommended dimensions are: 12" x 12" x 4" (30.5 cm x 30.5 cm x 10.2 cm) or larger.
- Must be non-metallic. Metallic surfaces block the communication signals.
- A 120 VAC electrical outlet must be installed in the junction box to power the gateway.

NOTE: Use of a ground fault circuit interrupter outlet (GFCI) should be avoided unless required by local code (e.g., NEC 210.8(B)).

6.4.2. Installation Requirements

The installation of the junction box and the gateway must follow these recommendations:

- The installation should not impact the integrity and waterproof rating of the junction box.
- The conduit to the junction box enters from the bottom. It should not enter from the top of the junction box.
- The junction box must be mounted with the dedicated mounting holes.
- Only non-metallic mounting plates should be used inside of the junction box.
- The communication gateway must not rest at the bottom of the junction box and should be placed at least 25 mm (1") from the bottom of the junction box.
- The communication gateway should be fixed securely in the junction box. It should not be resting on the bottom of the junction box.
- The communication gateway should be mounted to leave adequate space to position the antennas.
- The communication gateway antennas should be oriented so they are orthogonal to each other to ensure optimal coverage.



6.4.3. Installation Procedure

Follow the steps below to install the junction box and the communication gateway:

1. De-energize the main power supply.
2. Install the junction box at the best location on the site. See the *6.3. Gateway Location* section to follow the best practices regarding gateway locations).
3. Pull the cables in the junction box.
4. Install a 120 V power outlet.
5. Insert the communication gateway inside the junction box and secure it in place. See the *6.3. Gateway Location* section to follow the best practices regarding installation requirements.
6. Connect the power supply to the communication gateway and to the 120 V power outlet.
7. Connect the Ethernet cables in case of a master router / auxiliary gateway setup or if the gateway is connected to the building's Ethernet router.

NOTE: It is essential to confirm the availability of the cellular signal before starting the installation. See the *5.1. Site Signal strength* section for more information.

6.5. Initial Startup

The gateway is already configured to communicate with the backend server by cellular link or LAN as per information provided at ordering. No configuration is necessary onsite. It is essential though to validate that the communication gateway works properly. To do so, use the following procedure:

1. Make sure the gateway is properly connected. Validate that:
 - a. The power supply is firmly plugged in, and the power supply connector is locked via a clockwise quarter turn.
 - b. The Ethernet cable (Optional) is properly connected.
 - c. The flexible antenna is firmly screwed in the ZigBee port (indicated as *XBEE* on the gateway. Not applicable for the Master router).
 - d. The cellular pivoting antennas are firmly screwed into the corresponding ports (indicated as *WWAN*, not applicable for LAN gateways).
2. Turn power on and validate that:
 - a. The communication gateway is powered up. The green Power indicator light will turn on.

NOTE: The gateway start-up will automatically begin a few seconds later.

3. Validate that the green light indicators appear in the three to four following zones:
 - a. Signal strength:
 - OFF: No (or a small amount of) cellular signal.
 - Continuously yellow – amber: Adequate strength of the signal for most of the applications – Fair.
 - Continuously green: Good cellular signal and optimal position of the communication gateway or master router.
 - b. Network/Service.
 - c. Xbee (Not applicable for the Master router).
 - d. Power.

NOTE: If the signal strength LED indicator light is off, we recommend moving the device to a better location. A weak signal can lead to unstable connections or a disconnection. Contact FLO technical support for more recommendations.

7. Validation and Commissioning

Once the communication gateway is installed and working properly, activate the commissioning. **Contact the FLO support team at 1 855 543 8356.**

8. Copyright and Liability

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