

## General FAQs

### 1. What is WaveLinx PRO?

WaveLinx PRO Connected Lighting (WCL) system eliminates the cost and complexity of traditional control systems, and simplifies installation and commissioning while providing a flexible and reconfigurable wireless topology for “on the fly” space changes.

### 2. What components are available to create a complete WaveLinx PRO Connected Lighting System?

- WaveLinx CORE (Pro, Enterprise, Virtual)
- WaveLinx CORE software
- BACnet Integration
- API Integration
- WaveLinx Area Controller (Gateway)
- WaveLinx Mobile App (Commissioning and user personal control)
- WaveLinx PRO Wallstations - Battery and Line Voltage (Manual lighting and scene control)
- WaveLinx PRO Touchscreen
- WaveLinx PRO Integrated Sensor Fixtures (indoor ambient, industrial and outdoor site / area)
- WaveLinx PRO Fixtures
- WaveLinx PRO Relay Switchpack with 0-10V
- WaveLinx PRO Universal Dimming Switchpack with Dry Contact Input
- WaveLinx PRO Receptacle 15A and 20A (Wall mounted power outlet)
- WaveLinx PRO Room Based Sensor (Ceiling mounted multi sensor)
- WaveLinx PRO Outdoor Load Control Module (area, site, flood lighting control)

### 3. Can WaveLinx PRO communicate through interior walls?

Yes, WaveLinx PRO will communicate through two to three interior walls of standard sheetrock construction with wood or aluminum framing.

### 4. Can sensors be disabled?

Yes, Integrated or external sensors can be disabled (motion and/or daylight sensing) or have the sensitivity adjusted.

### 5. How does WaveLinx PRO communicate through or around concrete spaces, like stairwells and electrical closets?

The WaveLinx Area Controller emits a wireless signal using the 802.15.4 wireless protocol on the 2.4Mhz frequency range. This signal pulses out from the WAC in a wireless bubble. Concrete or metal structures will break this bubble. Ensure to place the WAC at least 15 feet away from these structures to allow the wireless signal to have the best angle around these structures. In addition most WaveLinx PRO devices act as a signal repeater which will allow the wireless signal to communicate around difficult spaces.

### 6. Can WaveLinx PRO be installed in the same area as the building Wi-Fi?

Yes, although 802.15.4 communications using a similar frequency as standard Wi-Fi it uses different channels, modulation and communications structure. This reduces the risk of conflicts of wireless systems.

### 7. Can multiple 802.15.4 wireless networks exist in the same area of a building?

Yes, 802.15.4 is self-healing, auto channel selecting mesh network. This means that these networks can coexist if set up correctly. In addition WaveLinx PRO devices will only communicate with the assigned WaveLinx Area Controller. Other 802.15.4 wireless networks may not include all the security and performance qualities of WaveLinx PRO and may not perform as well.

### 8. Are all WaveLinx PRO connections wireless?

No, the WaveLinx PRO Touchscreen, WaveLinx PRO Low-Voltage Power Module, and the WaveLinx Area Controller are both Power over Ethernet (PoE) powered and share information over a wired Ethernet connection.

## 9. What wireless technologies are used?

The WaveLinx Area Controller or gateway includes an IEEE 802.15.4 standard radio for communications to the WaveLinx PRO devices. Additional wireless radios are included in the WaveLinx Area Controller for supporting Bluetooth communications, Wi-Fi communications, as well as the capability to support the emerging standard Thread-based communications via its IEEE 802.15.4 radio.

## 10. Does Wireless Connected Lighting support the new DLC NLC requirements?

Yes, WaveLinx PRO was one of the first systems to qualify for DLC NLC requirements.

## 11. Does WaveLinx PRO support the space requirements of Title 24?

Yes, WaveLinx PRO was designed to meet the latest energy codes including Title 24. In addition WaveLinx PRO includes out-of-the-box functionality that includes control sequences that automatically meet many requirements of Title 24.

## 12. What are the benefits of Wireless Controlled Lighting?

- **Reduce installation time and cost** with simple out-of-the-box functional wireless lighting system setup, integral diagnostics and a simple mobile application for configuration and control.
- **Save on operating costs** with a system that is designed to provide immediate and consistent energy savings and drive energy efficiency throughout the building.
- **Manage flexibility** with quickly re-assignable fixtures to create new control zones and areas via WaveLinx Mobile App.
- **Reduce training time and simplify control** using the intuitive WaveLinx Mobile user app to configure area favorites, daylighting, occupancy and scene controls.

## 13. Does WaveLinx PRO provide energy data?

Yes, energy usage information from the WaveLinx PRO Connected Lighting System is available through the CORE Energy Dashboard.

## 14. Where can WaveLinx PRO be used?

WaveLinx PRO can enable luminaires to meet controls application requirements in commercial office, industrial, healthcare and education spaces. WaveLinx PRO also provides out-of-the-box functionality and basic commissioning capabilities while maintaining energy code and DLC CALC compliance.

WaveLinx PRO supports any size building where you are looking for a wirelessly controlled lighting solution.

## 15. How long does it take to setup WaveLinx PRO?

WaveLinx PRO includes out-of-the-box functionality to allow the installing contractor to immediately see the lighting is functional and verify the system working. Occupancy and, in some applications daylight functions, will work out-of-the-box immediately upon installation and power-up for any luminaire installed with the integrated sensor.

## 16. How much time does it take to setup WaveLinx PRO compared to other systems?

Once the WaveLinx PRO devices are physically installed joining them to the WaveLinx Area Controller (WAC) is done with the press of the PAIR button on the WAC. This process is called Construction Grouping and also verifies wireless communications and addressing of each device as well as add the devices to the WaveLinx mobile application.

Actual system setup is done with the WaveLinx Mobile Application by dragging devices into areas. This process uses a Patent Pending Automatic Code Commissioning process to program all devices to a code compliant Title 24 compliant sequence of operations.

## 17. How can the end user control dimming of the areas?

The local user can adjust the dimming of luminaires in each area from local wallstations or touchscreens in the space or via the WaveLinx mobile app.

## 18. Can you easily replace a WaveLinx PRO device and avoid reprogramming?

Yes, if a device needs to be replaced. The original device can be removed and a new replacement device is added to the WaveLinx Area Controller (WAC). Within the WaveLinx Mobile App simply select the icon for the original device and click the "replace" option to select the new replacement device. It will automatically inherit all previous programming and grouping.

**19. Will WaveLinx PRO interfere with the building Wi-Fi system?**

No, WaveLinx PRO uses a 802.15.4 communication protocol which uses different communications channels than building Wi-Fi.

**20. What are the wireless specifications for WaveLinx PRO?**

- WaveLinx PRO uses the IEEE 802.15.4 standard radio to communicate to devices
- Connect up to 200 (150 best practice) devices are supported per WaveLinx Area Controller
- Communicates 150 ft through two interior walls for device to device communication

**21. Are the sensors Occupancy or Vacancy?**

WaveLinx PRO sensors can be programmed as either Occupancy or Vacancy. The default setting for the occupancy groups is to default to Automatic Partial ON to 50% (occupancy mode).

**22. Can sensors be disabled?**

Yes, Integrated or external sensors can be disabled or have the sensitivity adjusted.

**23. How does daylighting work?**

WaveLinx PRO supports both open loop and closed loop daylighting. Closed loop daylighting is supported using integrated or tile mounted sensors providing accurate individual daylight zones for each luminaire (or wired group of luminaires for tile mount sensors). Open loop is typically supported using the WaveLinx PRO ceiling sensor controlling multiple wireless relays or integrated sensor luminaires.

WaveLinx PRO also now supports open loop performance from devices that were typically closed loop only so that groups of luminaires may daylight uniformly.

**24. What is the difference between open loop and closed loop daylighting?**

Open loop daylighting typically uses a single daylight sensor to control multiple groups of fixtures. This is used on many wired and wireless systems today. It uses less daylight sensors but may not be as accurate at setting daylight especially if partition walls or other obstacles are in the space.

Closed loop daylighting uses a single daylight sensor per daylight zone and typically controls a single fixture, especially in today's environment of integrated sensors. This provides a daylight zone per fixture which means the light level at the work surface will be uniform, although the light output at the ceiling may vary from fixture to fixture based on how much light each fixture has to put out to maintain the desired light level.

**25. How do I know if an integrated sensor has been commissioned?**

The WaveLinx PRO Integrated sensors provide LED feedback showing occupancy detection as well as communications and commissioning. The LED on the WaveLinx PRO integrated sensor will blink Green when detecting occupancy when it is in out-of-the-box mode and not paired to a WaveLinx Area Controller. Once the WaveLinx PRO integrated sensor has been paired to a WaveLinx Area Controller the internal LED will blink white when detecting occupancy and to show wireless communications traffic.

**26. What if I lose my login credentials for a WaveLinx Area Controller?**

A simple push button sequence using the "PAIR" button on the WaveLinx Area Controller can be used to reset the WAC login credentials as well as the building intranet and Wi-Fi authentication credentials. This sequence does not affect any other programming in the WAC that may have been already completed. Refer to the WaveLinx Area Controller installation instructions for more information.

**27. How easy is it to replace a device after it has been setup using the WaveLinx Mobile App?**

It is very easy to replace devices that have already been programmed. Step 1: replace the physical hardware. Step 2: Press and release the "PAIR" button on the WaveLinx Area Controller to pair the new device with the WAC, this also places the new device in the default area in the WaveLinx Mobile App. Step 3: Within the WaveLinx Mobile App find the original device you want to replace, at the bottom of the screen you will see a "Replace" button. Press this button and you will see a list of similar devices that are in the default area. Select the device you just installed, this will place the new device in the area and inherit the programming of the original device.

## 28. Can I restore the WaveLinx Area Controller to factory defaults?

Yes, a simple push button sequence using the "PAIR" button on the WaveLinx Area Controller can be used to restore the WAC to factory defaults. This clears all programming and removes all wireless devices from the WAC as well as resets all login credentials. Refer to the WaveLinx Area Controller installation instructions for more information.

## 29. Can you disable daylight dimming?

Yes, daylighting can be disabled using the WaveLinx mobile app.

## 30. Does WaveLinx PRO support BACnet integration?

Yes, with WaveLinx CORE and the CORE Exchange application, WaveLinx PRO can provide BACnet integration across the entire WaveLinx PRO network.

## 31. Does WaveLinx PRO support API integration?

Yes, with WaveLinx CORE and the CORE Exchange application, WaveLinx PRO automatically exposes Area, zone and scene points for API integration.

## 32. Does WaveLinx PRO provide a path to my building intranet (LAN)?

The WaveLinx Area Controller (WAC) is the only device that connects physically to the building intranet. In addition to other security measures the WAC isolates the wired Ethernet network from the wireless network which limits the possibility of someone using the WaveLinx PRO Connected Lighting System to gain business confidential information.

## Design FAQs

### 1. What are the indoor wireless design best practices?

Design Consideration	Best Practice	Maximum
WAC's on a CORE network	20 (Pro)	300 (Enterprise)
Gateway/WAC Range	150 feet	300 feet LOS
Number of wireless devices	150	200
Number of Interior Walls	2 walls	3 walls
Distance from WAC to 1st WCL Device	150 ft	200 ft
Distance between WCL Devices	75 ft	150 ft
Number of Hops from WAC	4 hops	5 hops
Number of Areas per WAC	50 (49 user defined)	50 (49 user defined)
Total zones per WAC	200	200
Total occupancy sets per WAC	100	100
Number of Scenes per Area	16	16
# of Mobile App Admins per WAC	1	1
# of Mobile App Users per WAC	10	30

### 2. Does the WaveLinx Area Controller (WAC) need to be installed in the space or can it be installed in the Plenum?

The WAC can be installed in the plenum above the drop ceiling and will communicate to the devices in the space. For outdoor site and area applications, it should be installed indoors in a position to "see" through a window to at least one outdoor controlled device. It should not be installed on or near a metal or concrete wall.

Alternatively, a WAC may be ordered preinstalled in an outdoor rated enclosure for exterior applications.

**3. Should I install the WAC next to a concrete or metal wall?**

No, Concrete or metal walls severely impact the strength of the wireless signal and will reduce the overall coverage and performance of the WaveLinx PRO Connected Lighting System. The WAC should be installed in the center of the overall space that it will be controlling.

**4. Should I install the WAC in an Electrical Closet or IT room?**

No, these types of rooms are typically surrounded by concrete walls. Concrete walls severely impact the strength of the wireless signal and will reduce the overall coverage and performance of the WaveLinx PRO Connected Lighting System. The WAC should be installed in the center of the overall space that it will be controlling.

**5. What is the maximum distance the WaveLinx PRO Connected Lighting System can communicate?**

The WaveLinx Area Controller can control a maximum 150 WaveLinx PRO devices within 150 feet line of sight (LOS). If you have not reached the 200 device limit within 150 ft, wireless hopping will allow you to reach additional devices up to the 200 device maximum. Each line voltage powered wireless device can act as a signal repeater or (hopper) and provides an additional 75 feet of wireless coverage as long as the device is within 75 ft of a device within the WAC 50 ft range. WaveLinx PRO supports a maximum of 5 hops each adding 75 ft of coverage beyond the WAC 150 ft range.

**6. Can I install a single integrated sensor fixture in a space with non-integrated sensor fixtures?**

Yes, an indoor ambient integrated sensor fixture offers up to 500 square feet of motion coverage at heights up to 15 feet. If the coverage pattern of the single sensor is adequate for the room, this scenario may be possible. Even daylighting is possible for the room with a single integrated sensor, but generally installations use all or no integrated sensors for a simplified bill of materials.

**7. Are the only options for fixture control WaveLinx PRO Relay Switchpacks and fixtures with integrated sensors?**

No. Some brands offer wireless communications for direct control of a fixture without an integrated sensor. Additionally, a Tilemount Sensor Kit is available for control of agnostic 0-10V loads.

**8. How many devices can exist on a WaveLinx Area Controller?**

The WaveLinx PRO Connected Lighting System supports up to 200 (150 devices best practice) wireless devices per WaveLinx Area Controller (WAC). These devices should be within 300 ft (MAX) / 150 ft (best practice) line of sight. It is best practice to have a WaveLinx Area Controller communicate to devices on the same floor.

**9. Can the WaveLinx Area Controller communicate to devices beyond the 300 ft line of sight (150 foot best practice)?**

Yes, WaveLinx PRO supports wireless device beyond the 300 ft limit by allowing devices to be repeaters and supports up to 5 hops indoors (10 hops outdoors) maximum hops maximum to extend the wireless communications footprint.

**10. What luminaires are capable of supporting WaveLinx PRO Connected Lighting System?**

WaveLinx PRO indoor models are available in ambient, downlight, and architectural models. WaveLinx PRO also offers outdoor and industrial fixture options with additional fixture options coming to market many times during the year.

WaveLinx PRO Dimming Switchpacks allow virtually any 0-10V luminaire to be controlled by the WaveLinx PRO Connected Lighting Solution.

**11. How is emergency lighting accomplished using WaveLinx PRO?**

WaveLinx PRO integrated luminaires offer emergency options via included emergency battery packs and integrated transfer switches (options vary by model). At the building level the CEPC-1-D product can be used with the WaveLinx PRO Relay Switchpack with 0-10V to support individual luminaires or a zone of luminaires.

**12. Are there any battery powered devices in the system?**

Yes, the Wireless Ceiling Sensor and Battery Power Wallstations both utilize standard alkaline batteries. Both devices utilize low-power approaches to maximize battery life of up to 10 years.

**13. Is Occupancy forwarding supported?**

Yes, WaveLinx PRO supports occupancy set forwarding, which allows a sensor or group of sensors to trigger occupancy in another area based on the first area being occupied. This is often used to keep corridor lights ON when offices are occupied after hours.

#### **14. Does WaveLinx PRO support PIR or Dual Technology sensing?**

WaveLinx PRO supports both integrated and external sensor options. Integrated / tile mounted options provide a dense network of passive infrared (PIR) based occupancy sensors. Standalone sensor options vary from battery powered PIR to mains powered versions that utilize PIR or dual technologies (PIR + ultrasonic) wired through a Universal Dimming Switchpack.

#### **15. Are WaveLinx PRO wallstations programmable?**

Yes, each button on the WaveLinx PRO Wireless Wallstations (mains powered and battery versions) can be programmed with the following actions.

- Scene Selection (default)
- Set Scene Toggle
- Set Zone Toggle
- Set Zone Level
- Set Raise Level
- Set Lower Level
- No Action

Each button is also programmed with the Area it is controlling as well as the Fade Rate.

#### **16. Can a wallstation control devices in more than one area / zone?**

Yes, each button can be programmed with an Area and Scene or Zone selection.

#### **17. Can a wallstation control devices that are connected to a different WaveLinx Area Controller?**

Current wallstations can control devices that are connected to the same WaveLinx Area Controller. Systems like WaveLinx PRO that do not require a central server to coordinate communications between area controllers cannot support communications to other wireless networks.

#### **18. Does WaveLinx PRO support partial off?**

Yes, WaveLinx PRO mobile schedules allow you to create times when the Unoccupied light level may have different values.

#### **19. How does WaveLinx PRO support Demand Response?**

The system sending the demand response signal must be connected to the same network as the WaveLinx PRO Connected Lighting System. A demand response signal can be sent to CORE via BACnet for enterprise demand response. Each WaveLinx Area Controller can be programmed with unique demand reduction values (20% default). The lights are gradually reduced over time until they reach the new target level.

#### **20. Does WaveLinx PRO control outdoor lighting?**

Yes, WaveLinx PRO supports indoor and outdoor lighting control from a single system. The WaveLinx PRO Outdoor Load Control Module is a 7 pin connector that enables any area, site, or flood fixture with a NEMA 7-pin receptacle. Also available are factory or field installed (via Zhaga Book 18 4-pin socket) integrated sensor options providing occupancy and daylight sensing.

#### **21. Is the WaveLinx PRO Connected Lighting System enterprise networkable?**

Yes, WaveLinx CORE Enterprise and Virtual can network up to 300 Wireless Area Controllers each supporting up to 200 wireless devices all under a single web based interface.

#### **22. Can WaveLinx PRO schedules be overridden by a manual wallstation (switch)?**

Yes, manual wallstations and commands from the mobile application can override a programmed schedule

#### **23. What is the requirement for low and high end trim?**

High end trim cannot be lower than low end trim, which can be set to 0%. High end trim can be as low as 1%.

#### **24. What is Disconnected Mode in WaveLinx PRO?**

Disconnected operation occurs after a predetermined time if Wavelinx devices lose communications with the WaveLinx Area Controller. For example, indoor fixtures with integrated sensors autonomously provide occupancy detection and daylighting (if daylighting were enabled when commissioned) until communications with the WaveLinx Area Controller resumes.



## Security FAQs

### 1. Is WaveLinx PRO secure?

Yes, utilizing an industry best seven tier security model and following NIST recommended security practices with AES 128-bit encryption, WaveLinx PRO was the first building lighting control system to earn the UL2900-1 cybersecurity certification (no longer active) for network connected products. WaveLinx PRO now carries the international and independently verified IEC 62443 cybersecurity certification.

### 2. What are the tiers for security?

WaveLinx PRO uses a seven layer multi-tiered security approach that includes industry best practices, Cooper Lighting Solutions ingenuity and the customer as a partner.

- Physical security
- Customer security
- Device communication security
- Network communication security
- Network segmentation security
- OTA update security
- COE assurance

Review the WaveLinx PRO statement of security document for more information on each of these seven layers.

### 3. Why is physical security so important?

Physical security is a partnership between Cooper Lighting Solutions and the customer. The WaveLinx PRO product includes multiple security measures in the devices. Physical access at the customer location is the first step. Physical access to a device may provide the ability for a potential attack.

### 4. Why AES 128-bit encryption, why not AES 256-bit?

WaveLinx PRO uses AES 128-bit encryption for device-to-device communications as recommended by the National Institute of Standard and Technology (NIST) and The Cooper Lighting Solutions Product Cybersecurity Center of Excellence (PCCoE).

AES encryption comes in three standard key sizes (128, 192 and 256bits). Many people think because there are three sizes AES 256-bit must be better. In fact there were three keys sizes because it was developed for US Military/Government communications which requires three security levels.

AES 128-bit encryption uses a 128-bit key to encrypt the data. That is  $2^{128}$  power or 34 trillion trillion trillion possible combinations if someone wanted to brute force guess your encryption key. Assuming you were able to guess the correct key 50% of the way through the combinations it would still take over 1 billion years.

### 5. Can someone send a command or take over one of the WaveLinx PRO devices?

No, All WaveLinx PRO devices use AES 128-bit encryption and also require that the commands be sent only to and from the WaveLinx Area Controller (WAC).

### 6. Is the WaveLinx mobile application secure?

Yes, WaveLinx mobile use HTTPS (TLS1.2) protocols to authenticate communications between the WaveLinx Area Controller and the mobile device. This inhibits other mobile applications or software from sending commands to the WaveLinx PRO Connected Lighting System.

### 7. If someone were to hack into my WaveLinx Area Controller can they see the rest of my system or my building intranet (LAN)?

No, each WaveLinx Area Controller employs its own unique key, which limits potential breaches to only a small area. Also the WAC provides segmentation between the lighting Operational Technology (OT) network and the enterprise Information Technology (IT) network. Even if an attack within the lighting (OT) network and its devices is successful, the WAC isolates the enterprise IT network from potential attack.

**8. How do I keep mobile devices from accessing the WaveLinx PRO Connected Lighting System?**

Each mobile device must have three things to access the WaveLinx PRO Connected Lighting System.

1. First, they must be able to physically log onto the building Wi-Fi in order to access the WaveLinx Area Controller. This requires that they know the Wi-Fi SSID and have the WPA2 password, provided by your building IT team.
2. Second, they must have installed the WaveLinx mobile application which is available via the Apple and Google stores.
3. Third, they must have the unique WaveLinx Area Controller login username and passwords in order to access the WaveLinx PRO Connected Lighting System.

The key component to keeping unauthorized mobile devices from accessing the WaveLinx PRO Connected Lighting System is physical access and customer network authentication policies.

**9. Are firmware updates secure?**

Yes, Cooper Lighting Solutions firmware updates are digitally signed which means that only our over the air (OTA) firmware updates will be accepted by each device.

**10. If there is a security issue in the future how will we know?**

The Cooper Lighting Solutions Product Cybersecurity Center of Excellence (PCCoE) maintains a publicly available website for information and feedback concerning cybersecurity threats and responses. The PCCoE also independently evaluates Cooper Lighting Solutions IoT products for vulnerabilities as new cybersecurity threats are exposed.

**11. Does WaveLinx PRO comply with California SB-327?**

Yes, WaveLinx PRO and CORE both are in compliance with the bill.