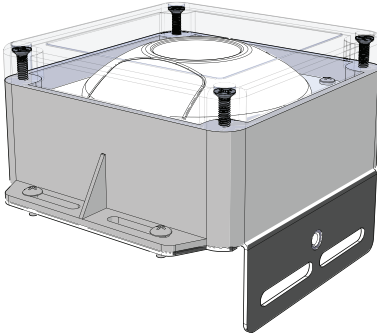


RAYN Installation Guide

RAYN Photo Sensor

Overview

The RAYN Growing Systems Photo Sensor (RPS) monitors the levels of photosynthetic photon flux density (PPFD) that reach plants both within and outside photosynthetically active radiation (PAR) in controlled growth environments.



Features

- Measures illuminance (0–1,000 lux)
- Measures PPFD levels (0–4,000 $\mu\text{mol/s/m}^2$)
- Optional long life battery

Ambient Environment

The Photo Sensor is encased in a weatherproof enclosure (NEMA IP67) and is intended for use in a controlled environment. The sensor operates within a temperature range of -10°C – 50°C (14°F – 122°F).

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Ambient Light

The Photo Sensor absorbs solar energy, storing it for use during low light periods. The sensor will operate after only a brief exposure to light; however for best results the sensor should be mounted in a location with a minimum of three hours of exposure to natural or artificial light (minimum $10 \mu\text{mol/s/m}^2$ or 480 lux) on a daily basis. With a full charge the sensor will continue operation without solar charging for 48 hours. See [Illuminance Test on page 5](#).



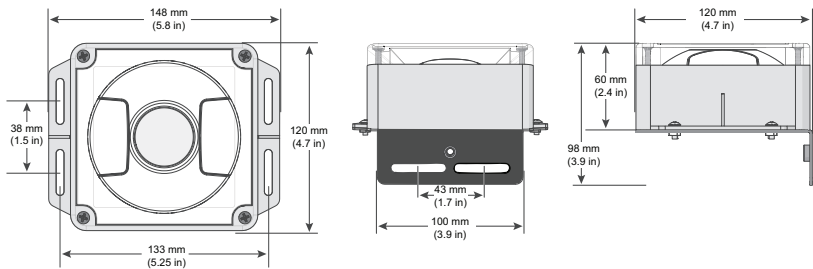
Note: *If these conditions cannot be met, it is also possible to install an optional battery (type CR1632 Lithium 3 V) providing continuous data transmission during extensive low light conditions.*

Location

The sensor installation location is important for both its sensing operation and for successful wireless transmission of data to the receiver that controls the connected lighting loads.

- Install the sensor within the same space as the light the sensor is measuring, preferably on the same plane as the plant canopy.
- Install the sensor within line of sight, and within 24 m (80 ft) of the wireless receiver that is controlling the fixtures.

Dimensions



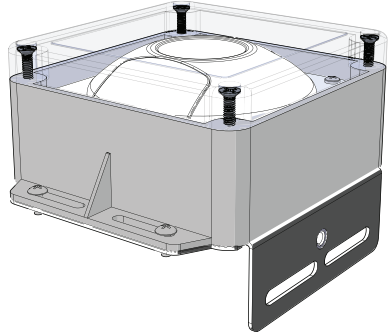
| | Length | | Width | | Height | |
|--------------------------|--------|-----|-------|-----|--------|-----|
| | mm | in | mm | in | mm | in |
| With mounting bracket | 148 | 5.8 | 120 | 4.7 | 98 | 3.9 |
| Without mounting bracket | 148 | 5.8 | 120 | 4.7 | 60 | 2.4 |

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Installation

1. Expose the sensor to a natural or artificial light source for a minimum of 15 minutes to generate sufficient power for commissioning.
2. Install the sensor within the same space as the light it is measuring, preferably on the same plane as the plant canopy, and within line of sight of the wireless lighting controller (receiver) that is operating the fixtures. See the guidelines described in [Location on the previous page](#). Secure the mounting bracket to the growing structure or camera type tripod using standard 1/4"-20 mounting hardware (not provided).



Note: Sufficient power is required for the linking and commissioning process. If necessary, install a battery (type CR1632 Lithium 3 V) to further assist with commissioning. See [Install a Battery on page 5](#).

Operation

The Photo Sensor samples and records new data values based on the current illuminance. The sensor repeatedly transmits the data on a heartbeat timer and will send on-change; meaning when the data value exceeds $\pm 5\%$ from the last transmitted reading. The heartbeat period is 120 seconds, and the sample data rate is 5 seconds.



Tip: The average lux and PPFd values are calculated using exponential filtering algorithms. When the current read value deviates by more than 5% of the average value, a message is transmitted. Once the level is below $1 \text{ } \mu\text{mol/s/m}^2$ (50 lux), the fast on-change behavior is disabled and only regular heartbeat updates are sent.

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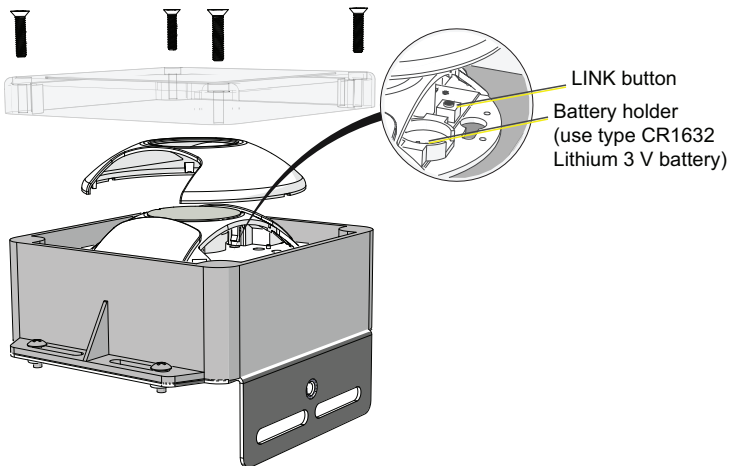


Note: For an on-change data message to be sent, the sensor requires sufficient power. The sensor obtains sufficient power by using stored solar energy, absorbing new energy when the light level is above 500 lux, or when a battery (CR1632) is installed to assist.

The on-change feature ensures that if a large change occurs, the sensor may transmit several data values at its sample rate before returning to sending normal operation heartbeat messages.

Linking

This process requires the controller (receiver) to be installed, powered, and within range of the sensor. See [Location on page 2](#). You will also need direct access to the sensor electronics.



1. Remove the weatherproof enclosure cover and the sensor cover for direct access to the LINK button.
2. Activate LEARN mode at the receiver. Review the receiver product user documentation for guidance to activate modes.
3. Press the sensor LINK button.
4. Deactivate LEARN mode at the receiver.
5. Replace the sensor cover on the sensor, and replace the weatherproof cover ensuring a secure fit, taking care not to over-tighten the hardware.

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Install a Battery

A battery is not required for normal operation of the Photo Sensor. However, the battery is required when insufficient natural or artificial light causes a low power mode at the sensor, and it may be required to supplement the solar charged power.

In normal operation, the expected battery life is one year in complete darkness and five years in normal operational use.

1. Remove the weatherproof enclosure cover and the sensor cover for direct access to the battery holder.
2. Replace the battery with type CR1632 Lithium 3 V. Install the battery with the positive (+) side oriented up.
3. Replace the sensor cover on the sensor, and replace the weatherproof cover ensuring a secure fit, taking care not to over-tighten the hardware.

Test Modes

The Photo Sensor includes onboard tests to assist with installation and commissioning, including a illuminance test and a commissioning test.



Note: *To run any test, the sensor requires sufficient power from a full charge and/or the use of a battery.*

Illuminance Test

The illuminance test is provided to assist when selecting the installation location of the sensor. The sensor must be installed in a location that provides optimum light energy for operation.

You will need access to the LINK button on the sensor electronics (see [Linking on the previous page](#)).

1. Press and hold the LINK button for six seconds until the green LED (located near the solar panel) blinks at a slow rate.
2. Press and hold the LINK button again for six seconds until the green LED stops blinking (pauses). The green LED will blink again at a rate according to the detected light level. Refer to the table on the following page to determine if your sensor is installed in a suitable location with sufficient charging for the required operation.

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| Rate (blinks) | Description | Illuminance (lux) | Time to Full Charge (hours) | Charge Maintenance (hours per day) |
|---------------|---------------------------------|-------------------|-----------------------------|------------------------------------|
| 1 | Below operating level | <50 | n/a | n/a |
| 2 | Operational level, not charging | >50 | n/a | n/a |
| 3 | Operational level, charging | >100 | 30-60 | 8 |
| 4 | Operational level, charging | >200 | 15-30 | 4 |
| 5 | Operational, charging | >500 | 7-15 | 2 |

3. The test repeats every two seconds and expires after 100 seconds. Press and release the LINK button to manually exit test mode.

Commissioning Test Mode

The commissioning test temporarily increases the heartbeat of the sensor, sending a message every 10 seconds, to allow for quick feedback on light levels.

1. Press and hold the LINK button for six seconds until a green LED (located near the solar panel) blinks at a slow rate.
2. Press and release the LINK button until the red LED blinks.
3. Press and hold the LINK button for six seconds until the red LED turns off. The commissioning test will expire after five minutes. Press and hold the LINK button for six seconds to manually exit test mode.

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Compliance

End of life: Must be taken apart to recycle: Plastic case - 7 / Remove battery / Remove PCB assembly

- 902 MHz models only: FCC ID: STM300U, IC RSS-210, contains IC: 5713A-STM300U
- 868 MHz models only: CE/UKCA Compliant, complies to: ETSI EN 300 220-2 V1.1.1 (2017-2)
- 928 MHz models only: ARIB STDT108 Complies with the Japanese radio law and is certified according to ARIB STDT108. This device should not be modified (otherwise the granted designation number will become invalid)

FCC

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 A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Any modifications or changes to this product not expressly approved by RAYN Growing Systems, LLC. could void the user's authority to operate the product. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

ISED Compliance

This device contains a license-exempt transmitter/receiver that complies with Innovation, Science, and Economic Development Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

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Conformité ISDE

Cet appareil contient un émetteur/récepteur conforme aux CNR d'Innovation, Sciences et Développement économique Canada (ISDE) applicables aux appareils radio exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes:

1. L'appareil ne doit pas produire d'interférences.
2. L'utilisateur de l'appareil doit accepter toute interférence, même si l'interférence est susceptible d'en compromettre le fonctionnement.