RAYN Installation Guide
RAYN Multi-Sensor

Overview

The RAYN Growing Systems Multi-Sensor (RMS) is an all-in-one sensor for use in a controlled-growth environment to provide the crucial crop data you need for optimal growth. The RMS is a wireless sensor that utilizes solar power generated from the light in the environment, allowing you to place the sensor nearest the crop and canopy without the need for additional control or power wiring. The sensor monitors the health of your crop and the growing environment, and provides user-readable sensing data at the device.

Product Overview

1 – Integrated Solar Cell	7 – Mounting Bracket
2 – Light Sensor (PPFD)	8 – 1/4 in-20 UNC Screw Mount
3 – Display	9 – Watertight Protective Cover
4 – Link Button	10 – Reserved for Future Development
5 – Display Button	11 – CO_2, Temperature, Humidity, and Air Pressure Sensors
6 – **Note:** Always install the sensor with the display directed up and towards the light source.	

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Ambient Environment

The RMS is encased in a weatherproof enclosure (NEMA IP54) and is intended for use in a controlled environment. The sensor operates within a temperature range of -10°C to 50°C (14°F to 122°F).

Note: *Do not expose the sensing elements on the underside of the RMS to water or spray.*

Ambient Light

The RMS absorbs solar energy, storing it for use during low-light periods and 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 four hours of exposure to natural or artificial light (minimum 10 µmol/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.

Note: *If these conditions cannot be met, you may install a battery (type CR2032 Lithium 3 V, not provided) to ensure continuous data transmission during extensive low-light conditions. See Install a Battery on page 6.*

Installation and Operation

1. A battery is not required for normal operation if the sensor receives adequate natural or artificial light for charging. If the installation experiences long low-light periods, installing a battery may prove beneficial for continued data transmission.

Note: *An installed battery will not power the user interface. The battery assists the RMS to continue measuring sensed elements and sending on-change data transmissions during periods of low power. See Install a Battery on page 6 for details.*

2. Install the sensor with the display directed up and towards the light source. You may attach the sensor using the provided mounting bracket (attachment hardware not provided).
3. Link the sensor to a compatible controller such as the RAYN Touch controller or RAYN Syrcadia software on PC. Press the Link button on the sensor to send a connection message or manually enter the Sensor ID into the controller configuration. See *Buttons and LEDs on page 3* for details. Also refer to the embedded help system for your controller (RAYN Touch controller or RAYN Syrcadia software) for more details on linking a sensor in the software configuration.

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The RMS measures the sensed elements when adequate energy is available and transmits the measured data to the controller when changes occur. Reference *Sensor Specifications on page 5* for details of transmission on-change thresholds and sensed element specifications.

View the measured data on the sensor's screen or view the reported data in the controller software (RAYN Touch controller or RAYN Syrcadia software).
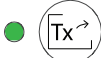
User Interface

ⓘ **Note:** *Use of the display and button interface is limited to the available energy on the device. The RMS requires a minimum energy level (solar charge) for maintained operation. When the energy level is below operational thresholds, a "Low Power Screen Hibernating" message is shown. Exposure to natural or artificial light (minimum 10 μmol/s/m^2 or 480 lux at least four hours) on a daily basis provides the required minimum charge. Exposure to higher lux over time generates a faster charge rate allowing longer term operation in low-light environments.*

Buttons and LEDs

Two buttons and related LEDs are provided on the RMS for user interface.

- The Link button, labeled [Tx] is a multi-function button. The related LED blinks green each time a message is transmitted to the connected controller.
    - A short press transmits a link request/provisioning message to the compatible radio controller (RAYN Touch controller or RAYN Syrcadia software on PC).
    - Press and hold the Link button for two seconds to display the EnOcean radio ID (in hexadecimal format) and the EnOcean Equipment Profile (EEP) for manual linking to the compatible controller.

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- The Display button is a multi-function button. The related LED blinks blue each time the Display menu is accessed.
    - A short press displays the current measured sensor data. See *IDLE SCREEN ON-PRESS below*.
    - Press and hold the Display button for four seconds to display the RMS Information screen. This screen shows related firmware information and available power levels for the device.
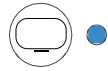
> **Note:** *Sensor data transmission and the user interface/display are disabled when the energy is below minimal operation levels.*

Screens

Screen/Function	Description
LOW POWER SCREEN HIBERNATING	Shown when the RMS does not have enough energy to operate the screen reliably. Sensor data transmission will continue, but the screen will not update in this mode until power levels are adequate. Expose the RMS to a light source for solar charging to fully power the device.
LOW TEMP SCREEN HIBERNATING	Shown when the ambient environment is too cold for the RMS screen to function. Sensor data transmission will continue. Increase the ambient temperature to resume screen function.
IDLE SCREEN ON-PRESS	Shown when the power levels are adequate for operation but the sensor is in power conservation mode. Press the Display button to show the current measured sensor values.

Press — 125.1 uMol, 24.5 °C, 45 %, 688 ppm
Press — 1.0 kPa, 101.3 kPa
Press — 125.1uMol graph (400 – 700 nm)
Press

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Sensor Specifications

Each sensor element on the RMS is represented with an icon on the Display when the menu is accessed. Review the sensor's specifications below for overall range and transmit on change specifications.

☀	Photosynthetic photon flux density (PPFD) sensing - shown in micromoles (μMol/m^2/s) [PPFD range: 0–2500.00 uMol/m^2/s, spectral range: 400–700 nm]
	Transmits on change +/- 6.25% from the last reading
🌡	Ambient air temperature sensing - shown in degrees Celsius (°C) [range: -10°C to 50°C (14°F to 122°F)]
	Transmits on change +/- 0.5°C from the last reading
💧	Ambient humidity sensing - shown in percent (%) [range: 1%–90%]
	Transmits on change +/- 3% from the last reading
CO_2	Carbon dioxide (CO_2) sensing - shown in parts per million (ppm) [range: 400–2000 ppm]
	Transmits on change +/- 50 ppm from the last reading
☁	Air vapor pressure deficit (VPD) sensing - shown in kilopascal (kPa) [range: 0.0–9.9 kPa]
	Transmits on change +/- 0.3 kPa from last reading
🌬	Air pressure sensing - shown in kilopascal (kPa) [range: 50.0–115.0 kPa]
	Transmits on change +/- 0.5 kPa from last reading

Spectrum Graph

Spectrum graph is shown on the RMS as you cycle through the Display menu (only available when the RMS has adequate energy for operation).

This spectrum graph shows the current PPFD measurement at the top right and the vertical scale at-a-glance view of the current spectrum measurement (between 400–700 nm).


31.8 uMol

400   (nm)   700
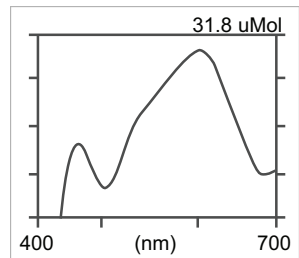
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Install a Battery

A battery is not required for normal operation of the RMS. However, an assist battery may be required when insufficient natural or artificial light forces the sensor into a low power mode. The battery supplements the solar charged power, allowing for continued data transmission. The assist battery does not power or operate the screen or button functions. In normal operation, the expected battery life is one year in complete darkness and five years in normal operational use.
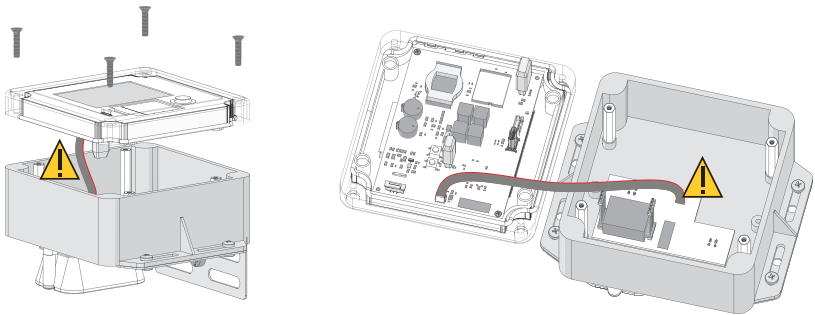

1. Remove the four screws securing the cover, and then carefully remove the waterproof enclosure cover. A ribbon cable connects between the sensor base and the user interface on the cover. Use **CAUTION** when removing the cover to prevent accidental disconnection or damage.

2. Remove the battery holder from the sensor board.
3. Insert a type CR2032 Lithium 3 V coin cell battery into the holder with the positive (+) side oriented up.

4. Replace the battery holder with battery installed to the sensor board and ensure the ribbon cable is fully seated at both ends.
5. Reinstall the sensor's waterproof cover to the base in the original orientation, secured with the four screws. Take care not to over-tighten the hardware.
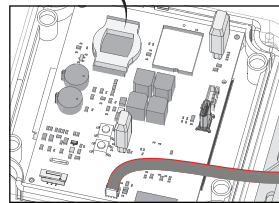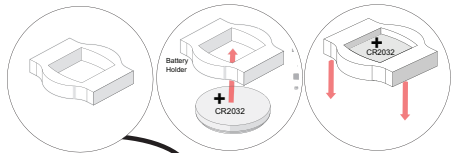
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Compliance

End of life: Must be taken apart to recycle per local resources and code. Plastic case - 7, Remove battery, Remove PCB assembly.

For current and complete compliance information, view the product datasheets at rayngrowingsystems.com.

FCC Compliance

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For any FCC matters:

Electronic Theatre Controls, Inc. dba RAYN Growing Systems
3031 Pleasant View Road
Middleton, WI 53562
+1 (608) 831-4116
rayngrowingsystems.com

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 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.

Contains FCC ID: SZV-STM300U

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.

Contains IC ID: 5713A-STM300U

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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.

Contient ID IC: 5713A-STM300U