

RESONATE WIRELESS OCCUPANCY SENSOR

Installation Guide



This guide covers all Resonate Occupancy Sensor models.

The ROS product family includes:

- ROS-WA-nW Wide angle motion sensor
- ROS-HW-nW Hallway motion sensor
- ROS-KM-nW Corner mount motion sensor

The character n is replaced with U for 902MHz, Y for 868MHz, and J for 928 MHz radios.

The package includes the motion sensor and installation guide.

NOTE: The ROS is a solar powered device that absorbs solar energy storing it for use during low light periods. Before assigning the ROS device to a receiver/controller, the device should be exposed to a good light source for a minimum of 2 hours.

NOTE: Mounting brackets are not included with the sensor. Please see the ROS Occupancy Sensor page on our website for bracket accessory information.

Resonate Occupancy Sensor Description

The ROS (also referred to as the sensor in this guide) is a wireless, energy harvesting sensor that monitors room occupancy state using a passive infrared motion detector. The ROS sensors are intended for indoor use only, ideally mounting on a wall at 6-7 feet (1.8 -2.2 m) from the floor.

Sensor Operation

The sensor is powered by solar energy from natural or artificial light sources. The solar energy is transformed into electrical energy which is then stored providing a continuous power source for the sensor. Powered by six solar cells, the sensor can operate without battery backup for up to 225 hours. The sensor will operate even with a brief exposure to light, however for best results the sensor should be mounted in a location with exposure of 2 hours of natural or artificial light (160 - 500 lux or 16-50 fc) on a daily basis.

The motion sensor supports the Occupancy sensor profile A5-07-01. Supply Voltage 0...5.1V, linear n=0...255

TIP: To get feedback on the light level where the sensor is mounted, refer to sections “Test Operating Modes” and “Light Level Test”.

The sensor will broadcast occupancy immediately upon a state change from vacant to occupied. The sensor broadcasts a telegram when movement is detected and repeats occupied telegrams with a minimum 100 second period between subsequent transmissions.

TIP: For range verification between the sensor and controller, refer to sections “Test Operating Modes” and “Installing Wireless Devices”.

After detecting motion, the PIR sensor is shut-down to conserve energy for 100 seconds. When the sensor reactivates and no motion is detected, the sensor transmits a vacancy telegram after 100 seconds, 200 seconds total since the previous transmission. The PIR sensor will remain active until the next occupancy state.

The sensor transmits to a receiver or relay controller. The sensor and controller must be within range and installed within 80' (24 m) of each other. For applications exceeding 80' (24 m) range, telegram repeaters may be needed to extend the reception range.

The ROS family use a PIR sensor that detects motion by measuring the infrared energy given off by objects. The sensor is calibrated to detect the heat range of human body temperature. The sensor has a lens that breaks the viewing angle of the sensor into zones. It is the movement of the infrared energy moving in and out of a zone that defines motion, so detection is stronger when people are closer to the sensor.

The sensor will transmit occupancy or vacancy depending on the occupancy state of the room.

The sensor will transmit:

- Every 100 seconds or
- Immediately upon detecting motion if the previous state was vacant or unoccupied.

Sensor Applications

Hallways - Mount the ROS-HW sensor on a wall at 6-7' (1.8 -2.2 m) height, centered and facing the hallway. For mounting at higher levels, use the BR-1 or EWM-BR wall mount bracket. These brackets have 30° of vertical range adjustment to accommodate adjustment of the sensor to monitor motion, i.e. over doorways or at hallway intersections. The BR-3 bracket may also be used when mounting on ceilings.

Hi-Bay End Of Aisle - The ROS-HW sensor can be used for hi-bay end-of-aisle applications. Mount the sensor to an electrical box using conduit attached to the boxes side to adjust the box and sensors angle.

Corner Mount - Mount the ROS-KM sensor on a wall at 6-7' (1.8 -2.2 m) height using the BR-2 corner mount bracket or EWM-BR swivel bracket. The brackets provides vertical and horizontal adjustment for the sensor. For full motion detection coverage, position the sensor on the bracket so it is facing directly out of the corner.

Wide Angle - Mount the ROS-WA sensor on a wall at 6-7' (1.8 -2.2 m) height. For mounting at higher levels, use the BR-1 or EWM-BR wall mount bracket. The brackets have 30° of vertical range adjustment to accommodate adjustment of the sensor to monitor motion. The BR-3 bracket may also be used when mounting on ceilings.

NOTE: The sensor can not detect occupancy through solid objects including items placed by a tenant, such as file cabinets or shelves.

NOTE: Do not locate the sensor near forced air vents as hot moving air may cause the sensor to false trigger. Leave at least 4' (1.2 m) minimum between air vents and the sensor.

NOTE: Incandescent lights may cause false trips when turning on.

Mounting the Sensor on a Wall

The sensor can be mounted on any surface; glass, stone, concrete, wall board, cubicle partitions, etc. The sensor can be mounted using screws (not supplied) through the removable back plate or using double sided tape or Velcro™ (not supplied); there are keyholes on the back plate for mounting to a standard electrical box.

The mounting location of the sensor is important as this will directly affect the receivers reception of the telegrams. Before installing, refer to the sections in the guide detailing the installation of wireless devices, layout tips and test operation modes.

1. The sensor has a removable back plate. Using your thumb, press on the raised plastic key found on the lower edge of the sensor body and pull the body away from the back plate.
2. Mount the back plate to the wall surface in a vertical orientation with the plastic key on the bottom. There are holes in the back plate that mate with

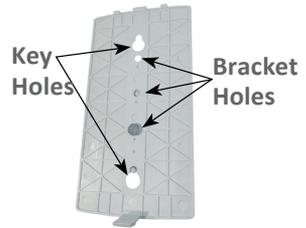


standard electrical box screw patterns, such as a handy box or mud ring. (Alternatively, see “Mounting the Sensor on a Bracket, below)

3. Once the back plate has been secured, align the two top alignment tabs on the back plate with the sensor body and press the lower edge over the plastic key until it clicks in place.

Mounting the Sensor on a Bracket

The Sensor backplate has been pre-drilled with 3 bracket mounting holes and 2 key-holes with spacing for mounting on a standard electrical box. The bracket can be installed either in the center 3 holes or, for maximum angle adjustment, in the bottom 2 bracket holes and the bottom keyhole as shown in the photo.



Linking the Sensor to a Receiver

This process requires the controller or receiver to be mounted and powered and within range of the sensor to be linked.



The sensor is a solar powered device that absorbs energy through a solar panel; storing it for use during low light periods. Before assigning the sensor to a receiver/controller, the device must be exposed to a good light source for a minimum of 2 hours or install the optional start assist battery.

1. Remove the sensor from the back plate by pressing in on the tab on the lower edge and pulling away from the back plate.
2. Activate LEARN or LINK mode at the receiver, if necessary refer to the manufacturers documentation.
3. Press the sensors LINK (TEACH) button.
4. Deactivate LEARN mode at the receiver.

Installing or Replacing the Battery

The battery is not required for normal operation when the ROS receives adequate natural or artificial light. The battery can be used during installation (start assist).

1. Remove the sensor from the back plate by pressing the key on the lower edge of the sensor body and pull the body away from the back plate.
2. To remove old battery: Using a small flat head screwdriver or pen as a lever, insert pointed end under the clear plastic battery retaining clip's edge and pop the clip off.
3. Install or replace the battery in the clip with a new CR2032 coin cell battery insuring the positive side (+) will



be facing up.

4. Align the two straight edges of the retaining clip with the battery holder and press the clip in with your finger.

Test Operating Modes

Ensure the ROS is fully charged before entering test modes. Inserting a battery during test modes is also recommended. The following tests can be selected when in test mode.

Light Level Test: provides visual feedback of the immediate energy produced by the solar panel.

To enter Light Level Test mode, press and hold the test button for 6 seconds. The green led will begin to blink (LEDs are located on right hand side of the solar panel).

Press the test button again for 6 seconds to select Light Level Test. The green LED will blink in accordance to the light level it is detecting. This will change (2 second lag time) as you move the sensor to areas with different light levels. See following blink indicator table.



LIGHT LEVEL TEST TABLE

The green LED will blink according to the energy produced by the solar cell

Blinks	Lux Foot Candles	Time To Fully Charge	Discharge Time
0	0.0	below operating level	n/a
1	25-50 2.3-4.6	min operating level	n/a
2	50-100 4.6-9.3	48 hours to full charge	100 hours
3	100-200 9.3-18.6	24 hours to full charge	150 hours
4	200-500 18.6-46.5	12 hours to full charge	200 hours
5	500+ 46.5+	6 hours to full charge	225 hours

The time to fully charge is based on the storage capacitor charging from a non-operational condition. Discharge time indicates how long a fully charged sensor will operate in the dark. The test will repeat every 2 seconds and run for a duration of 100 seconds. You may quit the test at any time by pressing the Test button for 6 seconds.

Range Confirmation Test: provides visual feedback of the sensors signal strength by a linked receiver with range confirmation capability (only “F series” controllers have range confirmation ability). One and only one receiver can be linked to the sensor for proper operation of the test (disable repeaters in range for proper test operation).

1. To enter Range Confirmation Test mode, press and hold the test button for 6 seconds. The green LED will begin to blink.
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the amber LED is blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select Range Confirmation Test.

4. All three LED's will blink (for 1 second) in this test mode when the sensor transmits or receives a Range Confirmation Telegram followed by the sensor displaying the linked signal strength status for 2.5 seconds, see table below.

RANGE CONFIRMATION TEST TABLE

LED	Signal Strength
Green - Blinking 2.5 sec	-41 to -70 dBm
Amber - Blinking 2.5 sec	-70 to -80 dBm
Red - Blinking 2.5 sec	-80 to -95 dBm
No LED	No linked receivers detected

The test will repeat every 10 seconds and run for a duration of 3 minutes. You may quit the test at any time by pressing the test button for 6 seconds.

Walk Test Mode: In walk test mode, the red LED will blink on every motion event. This allows an installer to verify the sensor can monitor and detect motion in an area as required.

1. To enter Walk Test mode, press and hold the Test button for 6 seconds. The green LED will begin to blink.
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red LED is blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select Walk Test mode.

The test will run for a duration of 100 seconds. You may quit the test at any time by pressing the Test button for 6 seconds.

Sensitivity Adjust Mode: The sensitivity feature allows the installer to adjust the sensitivity level. False occupancy states caused by other elements can be reduced by selecting the min. sensitivity level. The default setting is max. sensitivity.

To enter Sensitivity adjust mode, press and hold the Test button for 6 seconds. The green led will begin to blink.

1. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red and amber LEDs are blinking simultaneously, go to step 3.
2. Press and hold the test button again for 6 seconds to select PIR sensitivity adjust mode.
3. A press and release of the button will allow you to scroll through the settings as shown in the table below.

SENSITIVITY ADJUST TABLE

Setting	Indication
High	Green LED blinking
Medium	Amber LED blinking
Low	Red LED blinking

NOTE: The low sensitivity setting is used as the base line for the lens detection ray diagrams found on the ROS data sheets.

To select a setting press and hold the test button for 6 seconds when the desired LED is blinking. To exit without saving, allow the test to time-out in 60 seconds or press the Link button to exit immediately without saving.

Installing Wireless Devices

Careful planning is needed when locating the receivers and transmitters based on the construction materials in the space and possibility of tenant's furniture disrupting the transmissions.

The occupancy sensor should be installed in the space where the receiver is mounted and connected to the occupancy control equipment. The signal will travel through some material barriers.

Refer to the tables below for range considerations with building materials that reduce the radio signal power.

Material	Attenuation
Wood	0 - 10%
Plaster	0 - 10%
Glass	0 - 10%
Brick	5 - 35%
MDF	5 - 35%
Ferroconcrete	10 - 90%
Metal	90 - 100%
Aluminum	90 - 100%

Material	Radio Range-typical
Line of sight:	80' (24m) corridors
Line of sight:	150' (46m) open halls
Plasterboard:	80' (24m) through 3 walls
Brick:	33' (10m) through 1 wall
FerroConcrete:	33' (10m) through 1 wall
Ceiling:	not recommended

Wireless System Layout Hints

Avoid locating transmitters and receivers on the same wall.

Avoid locating transmitters and receivers where the telegrams must penetrate walls at acute angles. This increases the material the telegram must pass through reducing the signal power.

Avoid large metal obstructions as they create radio shadows. Place receivers in alternate locations to avoid the shadow or use repeaters to go around the obstacle.

Do not locate receivers close to other high frequency transmitters.

Leave at least 3' between the receiver and any other source of interference including, ballasts, LED drivers, computers, video equipment, Wi-Fi/LAN routers, GSM modems and monitors. Transmitters are not affected by these sources of interference.

Agency Listings and Compliance

CEC Title 24 Compliant

Built in an ISO9001 certified facility

FCC Part 15.231 (902 MHz models only)

Contains FCC ID: TCM300U

The enclosed device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (i.) this device may not cause harmful interference and
- (ii.) this device must accept any interference received, including interference that may cause undesired operation.

IC RSS-210 (902 MHz models only)

Contains IC: 5713A-STM300U

CE (868 MHz models only)

CE Marking



ARIB STDT108 (928MHz models only)

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)



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