Echoflex Installation Guide
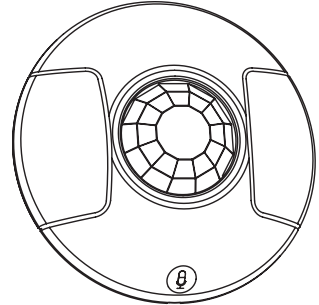## Ceiling Vacancy-Occupancy Sensor RVS RCS

Overview

The wireless Ceiling Vacancy-Occupancy Sensor is available as a vacancy (RVS) or occupancy (RCS) model, both of which offer two detection ranges, two radio frequencies, and can operate using standard passive infrared (PIR) or Dual Technology.

The Dual Technology sensor uses PIR and passive microphone technology to provide full coverage of audible human activity. Innovative noise filtering prevents false triggers that could keep lights on in empty spaces.

Dual-tech model shown

The vacancy ceiling sensor (RVS) has two solar cells to harvest energy when the lights are ON, while the occupancy ceiling sensor (RCS) is battery powered to support auto-ON occupancy sensor applications.

Model	Detection	Coverage
RVS-A-xW* RCS-A-xW*	Lens A: small motion, short range	42 m^2 at 2.4 m (450 ft^2 at 8 ft) 74 m^2 at 3.6 m (800 ft^2 at 12 ft)
RVS-B-xW* RCS-B-xW*	Lens B: large motion, broad range	167 m^2 at 2.4 m (1800 ft^2 at 8 ft) 279 m^2 at 3.6 m (3000 ft^2 at 12 ft)
RVS-DA-xW* RCS-DA-xW*	Lens A: small motion, short range, and audio	42 m^2 at 2.4 m (450 ft^2 at 8 ft) 74 m^2 at 3.6 m (800 ft^2 at 12 ft)
RVS-DB-xW* RCS-DB-xW*	Lens B: large motion, broad range, and audio	167 m^2 at 2.4 m (1800 ft^2 at 8 ft) 279 m^2 at 3.6 m(3000 ft^2 at 12 ft)

*Where x is the radio frequency: U=902 MHz and Y=868 MHz.

When used with an Echoflex lighting controller, the sensor is well suited to meet all energy code requirements for occupancy or vacancy-based general lighting applications.

This document covers installation, testing, and settings that apply to all RVS RCS models. The product package includes the sensor, lens mask stickers, two wire staples, and battery (RCS models only).

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Prepare for Installation

To ensure optimal function, consider the installation environment and the following guidelines:

- For indoor use only. Operating temperature -10°C to 45°C (14°F to 113°F), 5%–92% relative humidity (non-condensing).
- High density construction materials and large metal appliances or fixtures in the space may disrupt wireless transmissions.
- Install the sensor within range of linked receivers or controllers, 24 m (80 ft). Consider adding a repeater to extend reception range.
- Ensure the lens model is suitable for the detection application. For small office spaces (lens A models), locate the sensor so the PIR lens has a line-of-sight to the desktop. See *Sensor Coverage on page 9*.
- Avoid locating the sensor where it can easily sense movement outside of the intended space, such as hallways or adjacent rooms. If these conditions are unavoidable, use lens mask stickers to block off specific areas. See *Lens Masking on page 5*.
- Do not install within 2.5 m (8 ft) of an HVAC airflow duct or vent.
- For the solar-powered RVS model, before linking the sensor expose it to a good light source for at least two minutes at 65 lux (6 footcandles). Install the RVS with one solar cell facing a light fixture.

Supplies required to install (not provided):

- Two #6 screws, double-sided tape, or Velcro®

Installation

The sensor is optimized for 2.4–3 m (8–10 ft) ceiling heights. It can be attached to a suspended ceiling or finished wallboard ceiling, to a magnetic surface, or to other surfaces using flexible adhesive. Determine the installation method and follow the instructions.

> **Note:** *Consider linking the sensor while you have access and before replacing the cover. See Link to a Controller on page 5.*
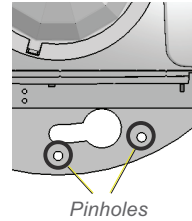
Wire Staples to Ceiling Tile

1. Use your fingers to remove the cover, flexing it gently to release the tabs that hold it in place. If you have difficulty, consider inserting a small flatblade screwdriver under a release tab.
2. Mark the sensor mounting location on the ceiling tile.

3. Remove the ceiling tile from the T-bar frame.
4. Insert the wire staples through the pinholes on the sensor, one set located on each side near the keyholes.
5. Poke the tines through the ceiling tile, then bend each tine over in opposite directions for a secure fit.
6. Replace the ceiling tile and reattach the sensor cover.

Pinholes

Wallboard Ceiling

1. Insert a flatblade screwdriver under one of the two release tabs and gently pry to remove the cover and access the mounting keyholes.
2. Mark the location of the keyholes on the ceiling.
3. Bore two holes and insert the anchors (not provided).
4. Attach the sensor to the ceiling with the screws (not provided).
5. Replace the sensor cover.

Integrated Magnets

Attach sensor directly to the suspended ceiling steel T-bar frame or other metallic surface using the two integrated magnets.

Double-sided Tape or Velcro

1. Cut two lengths of tape (not provided) to the appropriate size and adhere one side to the mounting plate and the other to the ceiling.
2. Press the sensor firmly in place.

Sensing Technology

PIR sensing is calibrated to detect motion in the human body heat range. The lens divides the viewing angle into zones to detect when infrared energy moves in and out of a zone.

The amount of movement that the sensor detects depends on the density of the zones and where the motion takes place. A high density of zones means smaller motions are detected. The movement zones in lens A are designed to detect small motion (typing, desktop activity). See ***Sensor Coverage on page 9***.

Audio sensing filters out background noise level averaged over a 30 second window and sets its threshold slightly higher. If sound exceeds the threshold while the timers are active, the sensor's occupied state is maintained. For example, if a fan is running in the background of an occupied space, only a sound slightly louder than the fan registers.

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Key Timers

The **Audio Enabled Timer** defines the maximum duration that audio sensing is active. Each PIR detection resets the Audio Enabled Timer. The timer setting is 60 minutes and is not configurable.

The **Sensor Occupancy Timer** defines the time that detection, PIR or audio sensing, is required to keep the audio active. Each audio or PIR event resets the timer. The default setting is 20 minutes and is configurable.

The sensor transmits an occupied message to the controller:

- Every 100 seconds, or
- Immediately when a change to the occupied state is detected

Echoflex controllers also have a configurable occupancy timer that controls when the lights shut off after a period of vacancy. See the controller's Configuration Guide for details on setting up timers and occupancy or vacancy modes of control.

Dual Technology Models

When both PIR and audio sensing are enabled, the following logic is used:

- When the space is occupied, PIR and audio detection can reset both the sensor's Occupancy Timer and the controller's Occupancy Timer.
- When the space is vacant and all timers have expired, only PIR detection or manual control can change the state to occupied, if the sensor is configured for occupancy.
- When audio is detected in an occupied space, the sensor's Occupancy Timer is reset, but not the Audio Enabled Timer; it expires after 60 minutes or is reset by PIR detection.
- A vacancy message is sent after 20 minutes (default) of no detection, then 40 seconds later the audio is disabled. The 40-second grace timer allows an occupant sufficient time to use sound to reset the sensor's Occupancy Timer.

PIR Sensing Only
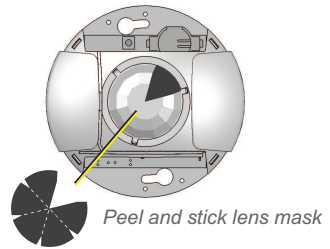
For PIR sensing only, the following logic is used:

- When the space is occupied, PIR detection and manual control can keep the lights ON and reset the controller's Occupancy Timer.
- When the space is vacant and the controller is configured for *occupancy*, a PIR detection or manual control can change the state to occupied.
- When the space is vacant and the controller is configured for *vacancy*, only manual control can change the state to occupied.
- A vacancy message is sent after 200 seconds of inactivity, and then subsequent messages are sent every 1000 seconds.

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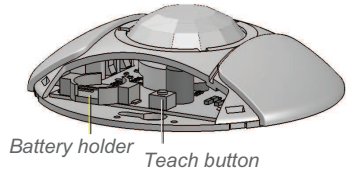
Lens Masking

Lens mask stickers are provided to block a section of the lens from detecting occupancy. To attach, remove the backing and stick the mask on the sensor lens to cover the target section. Cut to size, if required.

Peel and stick lens mask

Link to a Controller

The target controller must be installed, powered, and within range of the RVS RCS. Repeating the linking process can also be used to unlink the device.

1. Remove the cover to access the **[Teach]** button, using your fingers to flex it gently and release the tabs that hold it in place. If you have difficulty, consider inserting a small flatblade screwdriver under a release tab.

Battery holder *Teach button*

2. Press the **[Learn]** button on the controller to activate Link mode. If necessary, refer to the controller product documentation.
3. Press the **[Teach]** button on the RVS RCS once to send a message. An LED blinks to confirm a successful transmission.
4. Deactivate Link mode on the controller before attempting to link to any other controllers.

Battery Power

A CR1632 battery is not required for normal operation of RVS models if the sensor receives adequate natural or artificial light. See the table in the ***Light Level Test on the next page***. A battery may be required to run installation tests or when the artificial light is insufficient to power the sensor.

A CR1632 is included with RCS models. The battery may be factory installed or packed separately according to shipping regulations. Insert the battery if required or remove the protective plastic tab before installing the RVS RCS.

> **Note:** *When the sensor transmits a message, the LED blinks. The LED color indicates the battery's strength: green if good, blue if low, and red if dead or missing.*

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To replace the battery:

1. Use your fingers to remove the cover, flexing it gently to release the tabs that hold it in place. If you have difficulty, consider inserting a small flatblade screwdriver under a release tab.
2. Use your finger to remove the old battery from the holder. Insert a new battery with the + positive side facing up and press in place.
3. Replace the cover and press in place.

Tests and Settings

Use the **[Teach]** button and color LEDs to navigate the Tests and Settings Menu. Remove the cover to access the **[Teach]** button located beside the battery clip. The LEDs display through the front lens.

ⓘ **Note:** *A battery is required to run tests or change settings. If you cannot access the LED blink menu, replace the battery. See **Battery Power on page 5** for installation instructions.*

- *Light Level Test* (green LED)
- *Range Confirmation* (blue LED)
- *Walk Test* (red LED)
- *Sensor Setting* (red and blue LEDs)
- *LED Display* (green and red LEDs)

The menu times out after two minutes of inactivity.

Light Level Test

The Light Level Test quantifies the amount of energy produced by the solar cells and confirms a good installation location.

1. Press and hold the **[Teach]** button until the green LED appears. Release the button to enter the menu and display the first item, blinking green LED.
2. Press and hold the **[Teach]** button again until the green LED stops blinking. The green LED then repeats a number of blinks according to the detected light level. If you move the sensor, it reevalutes the light level every two seconds.

Blinks	Lux (Footcandles)	Charge Level
1	< 40 (< 3.7)	Not sustainable
2	40–65 (3.8–6)	PIR operational only
3	> 65 (> 6)	Dual-tech operational

The test repeats every two seconds and runs for 100 seconds. To exit before the time-out, press and hold the **[Teach]** button for 10 seconds.

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Range Confirmation

The Range Confirmation test quantifies the wireless signal strength with a linked controller that has range confirmation capability.

> **Note:** *Only one controller can be linked to the RVS RCS to run the test properly. Disable repeaters in range.*

1. Press and hold the **[Teach]** button until the green LED appears. Release the button to enter the menu and display the first item, blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the blue LED is blinking.
3. Press and hold the **[Teach]** button until the LED stops blinking to initiate the Range Confirmation test.

   After the RVS RCS transmits and receives a Range Confirmation message, the signal strength status is displayed as an LED blink color.

LED Blink	Signal Strength
Green	-41 to -70 dBm (best)
Blue	-70 to -80 dBm (good)
Red	-80 to -95 dBm (poor, move closer)
No LED	No linked controllers detected

The test repeats every five seconds and runs for 50 seconds. To exit before the time-out, press and hold the **[Teach]** button.

Walk Test

The Walk Test verifies the boundaries or limits of the sensor's range.

1. Press and hold the **[Teach]** button until the green LED appears. Release the button to enter the menu and display the first item, blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the red LED is blinking.
3. Press and hold the **[Teach]** button until the LED stops blinking to initiate the Walk Test.
4. Move throughout the space including corners and areas that may be obscured from line of sight to the sensor. Each time the sensor detects movement, the red LED blinks. If audio sensing is enabled (DT model), the green LED blinks when sound is detected.
5. Adjust the lens masking, if required, to block certain areas of the space from sensor detection. See ***Lens Masking on page 5***.

The Walk Test times out after 100 seconds of inactivity. To exit before the time-out, press and hold the **[Teach]** button for 10 seconds.

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Sensor Setting

The Sensor Setting adjusts PIR Sensitivity, Audio Sensitivity, and Sensor Occupancy Timer duration. To reduce false occupancy states caused by external elements, consider adjusting the sensitivity setting.

1. Press and hold the **[Teach]** button until the green LED appears. Release the button to enter the menu and display the first item, blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the red and blue LEDs are both blinking.
3. Press and hold the **[Teach]** button until the LEDs stop blinking to select Sensor Setting.
4. Press the **[Teach]** button to cycle through the options:
   - Two green blinks - PIR Sensitivity
   - Two blue blinks - Audio Sensitivity (DT model only)
   - Two red blinks - Occupancy Timer (DT model only)

Note: *Echoflex dual-tech sensors have a configurable Occupancy Timer that sends a vacancy message when expired. If using another controller brand with a DT model, you may want to adjust the Occupancy Timer on the sensor to control vacancy messaging.*

5. Press and hold the **[Teach]** button again to select an option. The corresponding LED blinks according to the current setting.
6. Press the **[Teach]** button to cycle through the settings.

Blinks	PIR Sensitivity Green LED	Audio Sensitivity Blue LED	Occupancy Timer Red LED
1	High (default)	Automatic (default)	Disabled
2	Medium	Low	5 mins
3	Low	Disabled	10 mins
4			15 mins
5			20 mins (default)
6			25 mins

7. Press and hold the **[Teach]** button for 10 seconds to save and exit.

Note: *If the Occupancy Timer is disabled, the audio remains active the full duration of the Audio Enabled Timer. Disabling both the Occupancy Timer and Audio Sensitivity sets the sensor to detect PIR only.*

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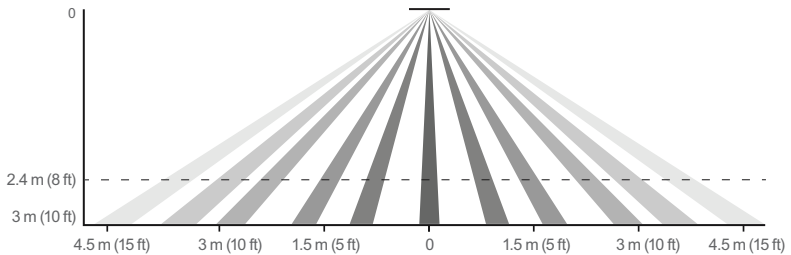## Ceiling Vacancy-Occupancy Sensor

LED Display

The LED Display setting enables or disables the LEDs. Blinking LEDs are informative but not suitable for every location. Disabling the LEDs eliminates distractions as well as conserves battery power. If disabled, the LEDs still operate to run tests and indicate low battery.

1. Press and hold the **[Teach]** button until the green LED appears. Release the button to enter the menu and display the first item, blinking green LED blinking.
2. Press and release the **[Teach]** button to cycle the menu of color LEDs and stop when the green and red LEDs are both blinking.
3. Press and hold the **[Teach]** button until the LEDs stop blinking to select LED Display.
4. Press the **[Teach]** button to toggle between the two states:
   - Red LED blinking - enable LEDs for motion detection
   - Green LED blinking - disable LEDs for motion detection
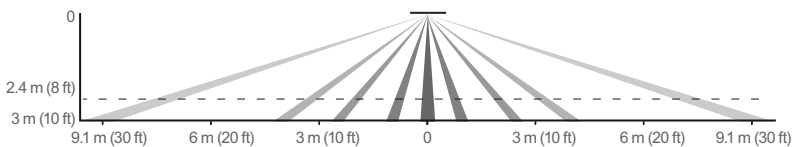5. Press and hold the **[Teach]** button for five seconds to save and exit.

Sensor Coverage

The following diagrams illustrate the sensor coverage for each of the lens.

Lens A - small motion detection or small rooms

Lens B - large motion detection or large rooms

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Compliance

For complete regulatory compliance information, see the Echoflex Ceiling Vacancy-Occupancy Sensor datasheet at **echoflexsolutions.com**.

FCC Compliance

Echoflex Ceiling Vacancy-Occupancy Sensor
(For any FCC matters):
Echoflex Solutions, Inc.
3031 Pleasant View Road
Middleton, WI 53562
+1 (608) 831-4116
echoflexsolutions.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 Electronic Theatre Controls, Inc. 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: TCM300U

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

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

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