Wireless Vacancy/Occupancy PIR or Dual-Tech Sensor

Installation Guide

This guide covers all models of RVS vacancy and RCS occupancy ceiling sensors.

These models include:

RVS-A-*X*W	Vacancy sensor with small motion short range lens (1000 sq. ft.)
RVS-B-*X*W	Vacancy sensor with large motion large range lens (1900 sq. ft.)
RVS-DA-*X*W	Dual-tech vacancy sensor with small motion short range lens (1000 sq. ft.)
RVS-DB-*X*W	Dual-tech vacancy sensor with large motion large range lens (1900 sq. ft.)

The RCS models are identical to the RVS with the addition of a battery to provide power for support of auto-on occupancy sensor applications.

The character *X* in the model number is replaced with U for 902MHz, Y for 868MHz radios, and J for 928MHz radios.

The product box includes the sensor, installation guide, lens mask, and two wire straps for ceiling tile mounting.

Note: *The sensor cover is removable however it must be properly seated for normal operation*

Note: *The RVS is a solar powered device that absorbs solar energy from artificial or natural light sources. Before assigning the RVS sensor to a receiver or controller, the sensor should be exposed to a good light source for a minimum of 2 minutes.*

RVS - Vacancy, RCS - Occupancy Sensor Description

The RVS/RCS (also referred to as the sensor in this guide) is a wireless, energy harvesting sensor. The models include a single method PIR (passive infrared) sensor or a dual technology method of occupancy detection using a PIR sensor and audio interface (any reference to audio in this guide applies to DT models only). The combination of PIR sensor and audio sensing adds additional assurance of positive occupant detection. Passive microphone technology provides coverage of audible human activity across most of the PIR detection range. Innovative noise filtering is used to prevent false triggers that could keep lights on in empty rooms. Used for indoor applications, the detector is optimized for ceiling heights of 8 - 10 feet (2.4 - 3 meters).

Sensor Operation

The RVS sensor is powered by solar energy from natural or artificial light sources. The solar energy is transformed into electrical energy which is then used as a power source for the sensor. Powered by two solar cells, the sensor will begin operation without a battery within 2 minutes of having sufficient light (6 foot candles or 65 lux).

The RCS models are battery powered (CR1632) and have continuous operation.

The sensor supports the Occupancy Sensor EnOcean Equipment Profile A5-07-01.

The sensor must be within range of any linked receivers or controllers, installed within 80' (24m) of each other. For applications exceeding this range, signal repeaters may be needed to extend the range.

Operating Sequence (Dual-Tech models only)

If the monitored space is vacant for a period of time, only the PIR interface will actively monitor for occupancy. The audio interface will be disabled.

Once the PIR has detected motion, an occupancy telegram is sent immediately and the audio interface is enabled.

Once the audio is enabled, two timers become active that control the audio interface.

1. The **Audio Enabled Timer** is reset with each PIR event and defines the maximum duration which the audio remains active.

   If the timer expires, the audio will be disabled, no other action will be performed at that time. Once the timer has expired, only PIR triggers can reset the timer to keep the light on. The default setting for the Audio Enabled Timer is 60 minutes and is not configurable.

   For example: Body motion must be detected at least once an hour to keep the light on.

2. The **Sensor Occupancy Timer** is reset every time a PIR or audio trigger is detected. It defines the time in which an occupancy trigger (PIR or audio) must be detected to keep the audio input active. The default value for this timer is 20 minutes and it is configurable to values of 5, 10, 15, 20 , 25 minutes or disabled. If the sensor occupancy timer expires, the sensor will send out a vacancy signal and 40 seconds later the audio will be disabled. The 40 seconds grace time allows an occupant to use sound to reset the sensor occupancy timer and turn the light back on.

The audio interface has a sound threshold that when exceeded, will maintain the sensors occupied state while the timers are active. The threshold is slightly higher than the background noise level. The background noise level is averaged over a 30 second window and filtered out. Any other sound louder than this background level will trigger the audio.

For example: If a fan is running in the background while the space is occupied, only a sound slightly louder than the fan noise will trigger the audio.

Either the PIR or audio can maintain the sensors occupied state with telegrams being sent at minimum every 100 seconds. A LED under the PIR lens will blink when an occupied state telegram is sent. A linked Echoflex controller has an occupancy timer that is reset only when receiving an occupied state telegram so the lights will remain on so long as the sensor continues to sense occupancy.

See the controller install guide for details on setting up this timer and occupancy or vacancy modes of control.

Operating Sequence (PIR models only)

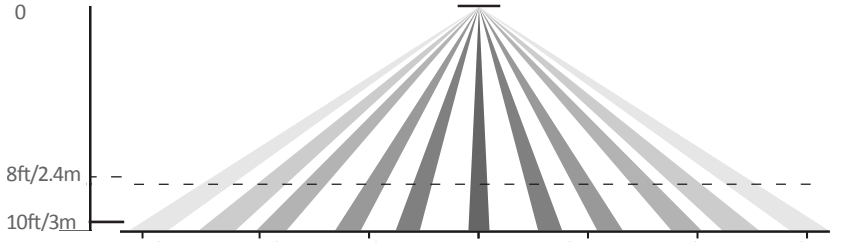
The RVS-A/RCS-B behave similarly as the dual tech models; when vacant the PIR monitors for occupancy. Once motion is detected and the occupancy state is transmitted to the receivers, the minimum period to the next telegram is > 100 seconds. If no motion is detected in 200 seconds, a vacant telegram is sent. The sensor will transmit telegrams indicating vacancy every 1000 seconds. So long as linked

controllers receive an occupied state telegram before their occupancy timer expires, the lights will remain on.

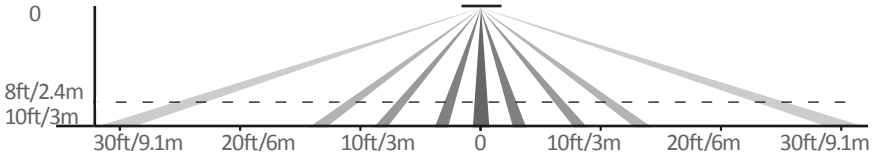
PIR Motion Detection

The sensors use a PIR sensor element that detects motion by measuring the infrared energy emitted by objects. The sensors are calibrated to detect the temperature range of the human body. The sensor has a lens that breaks the viewing angle of the sensor into zones (movement zones), infrared energy moving in and out of a zone is how the occupied state is defined. The amount of movement that triggers the sensor is dependent upon the density of the zones and where the motion takes place. A higher density of zones means smaller motion will trigger the sensor.

For detection of small motion (typing, drinking from a coffee cup), use the A lens which has more movement zones. Place the sensor close to the location where the motion may occur.



Lens A: use for small motion detection or small rooms.



Lens B: use for large motion detection or larger rooms.

The sensor comes with a sticker that can be applied to the lens to mask off areas where motion detection is not desired. Refer to the Lens Mask section of this guide.

An LED under the lens will blink once every 100 seconds when the sensor is detecting motion. Additionally, the LED color indicates the status of the battery when applicable, see the following table.

LED Color	Battery Status
Red	No battery or weak
Amber	50% discharged
Green	Full charge

Mounting the Sensor

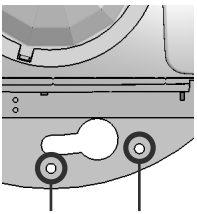
The mounting location of the sensor is important as this will directly affect the receivers' reception of the telegrams. Before installing, refer to the sections in the guide detailing the installation of wireless devices, layout tips and test operation modes.

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. The PIR sensors cannot detect occupancy through solid objects including items placed by a tenant, such as file cabinets or shelves. Use the dual-tech models in these applications.*

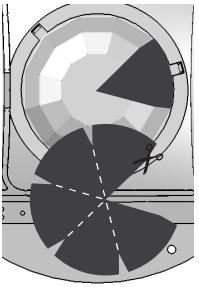
Select a location to mount the sensor on the ceiling by identifying the movement patterns that will be the most common in the space.

- For smaller office spaces where hand motion on a desktop is common, locate the sensor off to one end of the desk, in line with the desk edge or slightly behind so the PIR lens has direct line-of-sight to the keyboard desktop area. Insure that the PIR lens does not have direct line-of-sight out a doorway where walk-by traffic could trigger the sensor. Use the included lens mask stickers to mask off these areas.
- Larger offices where larger body motion is more common, placement of the sensor is less critical.

1. For the best sensor performance, mount the RVS sensor so at least one of the solar cells is facing a light fixture. The sensor will operate in low light levels however, for best performance; a minimum of 6 foot candles must be maintained. If the controlled lights in the space are dimmable either manually or via daylight harvesting, insure the light level at the lowest dimmed level meets this 6 FC requirement. If the light value does not meet this requirement, install a battery.
2. Remove the cover by inserting a small screwdriver under the white enclosures lip. Gently twist the screw driver and pull the cover away from the base.
3. Choose a mounting method. The sensor can be mounted:
   - With the integrated magnets to a steel T-bar ceiling frame or other metallic surface by placing the sensor on to the metal rail.
   - With screws and anchors (not provided) to a wall-board ceiling.
     i. Use a pencil to mark the mounting base keyhole locations and remove the sensor.
     ii. Using a drill, bore the two holes and insert the anchors.
     iii. Install the screws, leaving them loose while you place the sensor.
     iv. Tighten the screws.
   - With the provided wire straps to a soft ceiling tile.
     i. Mark the sensor mounting location on the ceiling tile with a pencil. Remove the ceiling tile from the T-bar frame.
     ii. Insert the soft ceiling tile adapters through the pair of small holes beside both keyholes on the sensors mounting plate.
     iii. Poke the tines through the ceiling tile, then bend each tine over in opposite directions for a secure fit.
     iv. Replace the ceiling tile.


Wire Mounts

   - With double sided tape or Velcro™, not provided. Cut two lengths of tape and remove the backing. Place on the mounting surface of the sensors back plate, pressing down. Remove the backing from the tape's other side and place the sensor on the ceiling surface, pressing firmly.
4. Refer to the section titled **Linking the Sensor to a Receiver**.
5. Once linking is complete, replace the sensor cover. **Ensure the cover is fully seated.** If the cover is not firmly attached, it could obstruct the lens and adversely affect operation.



Lens Masking

Lens mask stickers are provided in the packaging for your convenience.

1. As needed, peel off the lens masks to fit the desired area to be blocked.
2. Apply the mask gently to the section of the lens exterior to block the required area from occupancy sensing.

Linking the Sensor to a Receiver

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

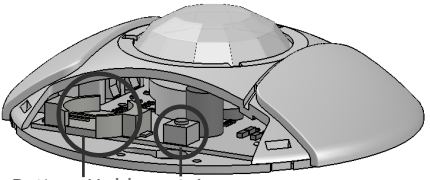
The sensor is a solar powered device that absorbs energy through a solar panel; storing it for use during low light periods. Before assigning the sensor to a receiver/controller, the RVS must be exposed to a good light source for at least 2 minutes.

1. Remove the cover by inserting a small screwdriver under the white enclosures lip. Gently twist the screw driver and pull the cover away from the base.
2. Activate LEARN or LINK mode at the receiver, if necessary refer to the manufacturers documentation.
3. Press the sensors LINK button.
4. Deactivate LEARN mode at the receiver.

Installing or Replacing the Battery

The battery is not required for normal operation when the RVS receives adequate natural or artificial light, minimum 6 foot candles or 65 lux. The RCS model comes with a battery (requires installation).

1. Remove the cover by inserting a small screwdriver under the white enclosures lip. Gently twist the screw driver and pull the cover away from the base.
2. To remove an old battery, use a small screwdriver as a lever and insert under the battery. Gently twist the screwdriver so the battery pops out.
3. Install or replace the battery with a new CR1632 coin cell battery insuring the positive side (+) will be facing up.
4. Place the battery in the holder and press in place with your thumb.



Test Operating Modes

Test modes require a battery to be installed. For RVS units, insert a CR1632 battery to run tests.

Remove the cover for access to the test button.

The following 5 tests can be selected when in test mode operation.

1. Light Level Test
2. Range Confirmation Test
3. Walk Test Mode
4. Sensor setting Mode including PIR or Audio Sensitivity and Sensor Occupancy Timer Adjust Mode
5. LED indication disable

Light Level Test:

1. 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 under the lens).
2. 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) if you move the sensor to areas with different light levels. See blink indicator table below.

LIGHT LEVEL TEST TABLE

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

Blinks	Lux	Foot Candles	Charge Level
1	< 40	< 3.7	Non-operational
2	40-65	3.8 to 6	PIR only operational mode
3	> 65	> 6	Audio mode operational

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 10 seconds.

Range Confirmation Test: provides visual feedback of the sensors signal strength by a linked receiver with range confirmation capability. Have only one receiver linked to the sensor for proper operation of the test and disable repeaters in range for proper test operation).

The Range Confirmation test requires a battery to be installed.

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.

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 4 seconds and run for a duration of 50 seconds. You may quit the test at any time by pressing the test button for 10 seconds.

Walk Test Mode: In walk test mode, the red LED will blink on every motion event. DT models will also blink green on audio events. 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 red LED will begin blinking when motion is detected. The test will run for a duration of 100 seconds. You may quit the test at any time by pressing the test button for 10 seconds.

Sensor Sensitivity Adjustment Mode: This mode allows adjustment of the PIR Sensitivity, Audio Sensitivity and Sensor Occupancy Timer duration. False occupancy states caused by external elements can be reduced by adjusting the sensitivity levels.

Note: *New settings do not take affect until you save and exit*

1. To enter sensor setting mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).
2. A quick press of the button at this level will allow you to scroll between the test/ setting modes. When the red and amber LEDs are blinking, go to step 3.
3. Press and hold the button again until the LEDs stop blinking to select this mode, about 6 seconds.
4. A quick press of the button at this level scrolls between:
   Double Green - PIR Sensitivity
   Double Amber - Audio Gain (DT model only)
   Double Red - Occupancy Sensor Timer (DT model only)
5. Press and hold the teach button again for 5 seconds to select the desired sensor setting. The corresponding LED will blink according to the current setting. Press the button to scroll through the available settings.

PIR Sensitivity - green LED blinks indicate setting
1 blink = high (default);
2 blinks = medium;
3 blinks = low

Audio Sensitivity - amber LED blinks indicate setting (DT model only)
1 blink = automatic (default)
2 blinks = low sensitivity
3 blinks = disabled

Sensor Occupancy Timer - red LED blinks indicate setting (DT model only)
1 blink = disabled
2 blinks = 5 minutes
3 blinks = 10 minutes
4 blinks = 15 minutes
5 blinks = 20 minutes (default)
6 blinks = 25 minutes

Note: *If the Disabled setting is selected for the Sensor Occupancy Timer, the audio will remain active the entire 60 minute duration of the Audio Enabled Timer. Disabling both the Sensor Occupancy Timer and Audio Sensitivity setting will have the sensor behave exactly like the IR model.*
To save the Sensor setting, press and hold the teach button until all the LEDs double blink. The unit will now be in normal operating mode with the new setting in effect..

To select a setting press and hold the test button for 10 seconds when the desired LED is blinking. To exit without saving, allow the test to time-out in 60 seconds.

LED Indication Enable/Disable

1. Enter Test mode as usual, press and hold the teach button until the green LED begins to blink (about 6 seconds).

Note: *New settings do not take affect until you save and exit*

2. A quick press and release of the button at this point will allow you to select between test modes. When the green and red LEDs are both blinking simultaneously, go to step 3.
3. Press and hold the teach button again for about 6 seconds until they stop blinking.
4. The red LED blinking indicates the motion detection LED is active. The green LED blinking indicates the LEDs are inactive. Tapping the teach button will toggle between these two states.
5. Save and exit by press and holding the teach button for 5 seconds.

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 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%
Ferro concrete	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
Ferro Concrete:	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

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)

R 206-000372

Energy Code Compliance

California Energy Commission Title 24
Washington State Energy Code
ASHRAE 90.1-2013
IECC 2015

For the latest info on Echoflex Solutions sensors scan the QR code

Document 8DC-5543 | Revision 2.0| 8188M21-5543-1 | Rev F

Echoflex Solutions, Inc.
#1, 38924 Queens Way | Squamish | BC | Canada | V8B 0K8
Toll Free: 888-324-6359 | Phone: (778) 733-0111 | Fax: (604) 815-0078
Email: info@echoflexsolutions.com | www.echoflexsolutions.com