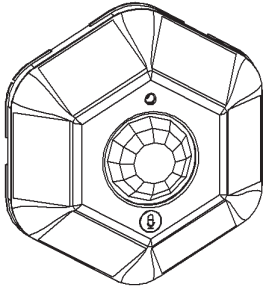


Echoflex Installation Guide

Ceiling & High Bay Occupancy Sensor MOS

Overview

The Ceiling & High Bay Occupancy Sensor (MOS) is a wireless, energy harvesting sensor that is available as either a passive infrared (PIR) or a Dual Technology model. The Dual Tech sensor uses PIR and passive microphone technology to provide full coverage of audible human activity across the entire PIR detection range. Innovative noise filtering prevents false triggers that could keep lights on in empty spaces.

Model	Detection	Coverage	
MOS-IR-xA*	Lens A: small motion, short range	93 m ² at 2.4 m (1000 ft ² at 8 ft)	 <p><i>Dual Tech Model</i></p>
MOS-IR-xB*	Lens B: large motion, broad range	176 m ² at 2.7 m (1900 ft ² at 9 ft)	
MOS-IR-xC*	Lens C: high bay coverage	585 m ² at 12 m (6300 ft ² at 40 ft)	
MOS-DT-xA*	Lens A: small motion, short range, & audio	93 m ² at 2.4 m (1000 ft ² at 8 ft)	
MOS-DT-xB*	Lens B: large motion, broad range, & audio	176 m ² at 2.7 m (1900 ft ² at 9 ft)	

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

This document covers installation, testing, and settings that apply to all MOS models. The product package includes the sensor, lens mask stickers, mounting plate with integrated magnets, and two wire staples.

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.
- Install on a finished ceiling surface or suspended ceiling tile.
- Ensure the sensor model's lens is suitable for your ceiling height.



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- PIR sensing must have an unobstructed view of the space. Do not mount behind or near tall cabinets, shelves, or hanging light fixtures.
- Avoid locating the sensor where it can easily sense movement outside of the intended space, such as hallways, glass partitions, or adjacent rooms. If these conditions are unavoidable, use lens mask stickers to block off specific areas. See [Lens Masking on page 4](#).
- Do not install within 2.5 m (8 ft) of an HVAC airflow duct or vent.

Supplies required to install (not provided):

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

Installation

The sensor can be attached to a suspended ceiling or finished wallboard ceiling. An auxiliary mounting plate with integrated magnets is also provided. Determine the installation method and follow the instructions.



Note: Consider linking the MOS while you have access and before replacing the cover. See [Link to a Controller on page 4](#).

Wire Staples to Ceiling Tile

1. Remove the sensor cover to access the mounting pinholes.
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 (provided) 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.

Wallboard Ceiling

1. Remove the sensor cover to access the mounting keyholes.
2. Mark the location of the keyholes on the ceiling.
3. Bore two holes and insert screw anchors (not provided).
4. Attach the sensor to the ceiling with screws (not provided).
5. Replace the sensor cover.

Integrated Magnets

Attach sensor directly to the suspended ceiling T-bar frame using the auxiliary mounting plate's integrated magnets.

Adhesive

Use double-sided tape or Velcro (not provided). Cut a piece of double-sided adhesive tape or adhesive-backed Velcro to the appropriate length and press firmly in place.

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Sensor Operation

The sensor's six solar cells harvest and store energy from natural or artificial light sources and provide sufficient power to operate without a battery up to seven days for the DT models, and nine days for the PIR. It can operate with a brief exposure to light, however for best results the sensor should be exposed to two hours of natural or artificial light (160 lux or 15 footcandles) on a daily basis. A CR2032 coin battery must be installed in the MOS-IR-xC sensor for use in high bay applications.

Sensing Technology

PIR sensing is calibrated to detect motion in the heat range of human bodies. The sensor is more sensitive to movements that cross the detection zones than those moving toward or away from the detection zones. The closer the movement is to the sensor, the more sensitive the sensor's response. The detection 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.

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:

- Minimum 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.

PIR Sensing Only (IR Models)

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.

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- 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 every 1000 seconds.

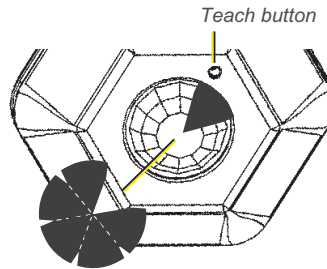
Dual Technology (DT Models)

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.

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 compatible target controller must be installed, powered, and within range of the MOS.



Note: *The linking process can be used both to link a device to a controller and to unlink a linked device from a controller.*

1. Press the **[Learn]** button on the controller to activate Link mode. If necessary, refer to the controller product documentation.
2. Press the **[Teach]** button on the front of the sensor once to send a message.
3. Deactivate Link mode on the controller before attempting to link to any other controllers.

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Battery Power

A battery is not required for normal operation of A and B lens models if the sensor receives adequate natural or artificial light. See the table in the [Light Level Test below](#). A CR2032 battery (not provided) may be required to run installation tests or when the artificial light is insufficient to power the sensor.

A CR2032 is included with the MOS IR*C lens model. 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 MOS.

1. Insert a precision flatblade screwdriver under the clear plastic cover at one of the release tabs in the base plate and pull up. Repeat with at least two tabs until the cover pops free.
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 over the sensor aligning the button hole with the **[Teach]** button and press in place.

Tests and Settings

Use the **[Teach]** button and color LEDs to navigate the Tests and Settings menu. The **[Teach]** button is on the front of the sensor and the LEDs show through the lens.

- [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. An LED sequence flashes to confirm when you enter the menu or if you exit before it times out.

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 is displayed. Release the button to enter the menu and display the first item, the blinking green LED.

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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. The sensor reevaluates the light level every two seconds.

Blinks	Lux (Footcandles)	Time to Fully Charge	Discharge Time
0	< 20 (< 2)	Not sustainable	N/A
1	20–40 (2–4)	Operational	N/A
2	40–80 (4–8)	48 hours	100 hours
3	80–160 (8–16)	24 hours	150 hours
4	160–320 (16–32)	12 hours	200 hours
5	320 > (32 >)	6 hours	225 hours

The time to fully charge the storage capacitor is from a non-operational condition. Discharge time indicates how long a fully charged sensor operates in the dark. The test repeats every two seconds and runs for 100 seconds. To exit before the time-out, press and hold the **[Teach]** button.

Range Confirmation

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



Note: *The MOS must be fully charged or use a battery to run the test. Only one controller can be linked to the MOS to run the test properly. Disable repeaters that are in range.*

1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the 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 MOS 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

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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 is displayed. Release the button to enter the menu and display the first item, the 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 4](#).

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.

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 is displayed. Release the button to enter the menu and display the first item, the 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 brand of controller 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.

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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.*

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.

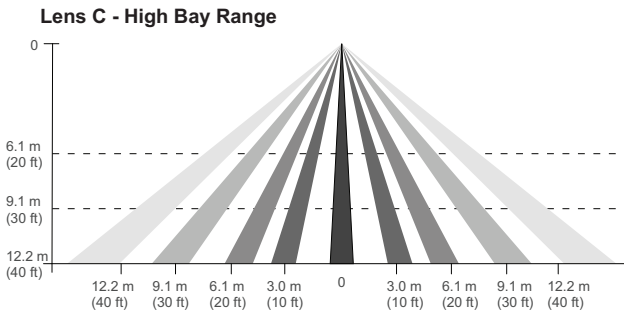
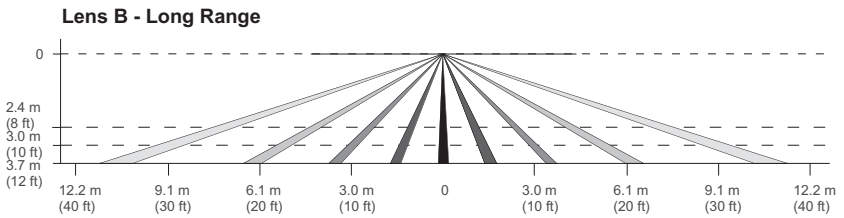
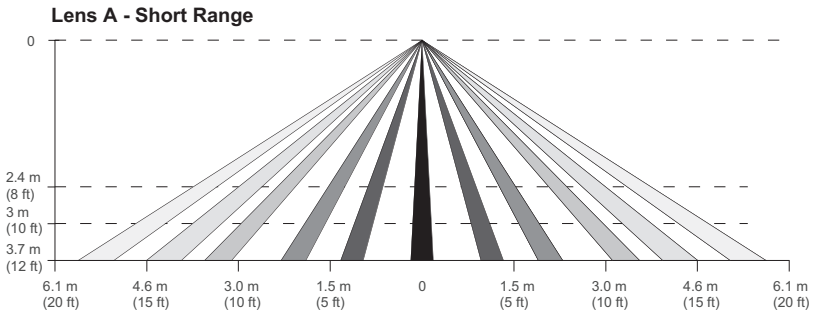
1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the blinking green LED.
2. Press and release the **[Teach]** button to cycle the menu of color LEDs and stop when the green and red LEDs are both blinking.
3. Press 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.

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Sensor Coverage

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



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Compliance

For complete regulatory compliance information, see the Ceiling & High Bay Occupancy Sensor datasheet at echoflexsolutions.com.

FCC Compliance

Echoflex Ceiling & High Bay 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: SZV-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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