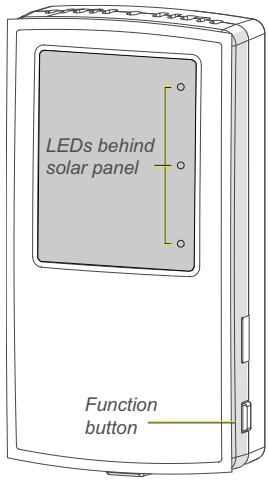
Echoflex Installation Guide
Wireless CO_2 Sensor RCT

Overview



The Wireless CO_2 Sensor (RCT) uses wireless technology to communicate accurate indoor CO_2, temperature, and relative humidity readings to compatible controllers.

The solar panel harvests and stores sufficient energy for normal operation. A CR2032 battery is used for calibrations and backup assistance if required.

This document covers installation, testing, and basic setup of the RCT. The product package includes the sensor and a battery.

Prepare for Installation

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

- For indoor, commercial controls use only. Operating temperature -25°C to 50°C (-13°F to 122°F) and relative humidity 5%–95%.
- High density construction materials and large metal appliances or fixtures in the space may disrupt wireless transmissions.
- Install the sensor within range of the gateway or interface to the monitoring system, 24 m (80 ft) unobstructed view. Consider adding a repeater to extend the wireless signal, if required.
- CR2032 coin cell battery is provided with the sensor. Install the battery or activate it if factory-installed by removing the protective plastic tab in the battery housing. See ***Battery Power on page 3***.
- Find a suitable location that has good light exposure. Use the ***Light Level Test on page 3*** to confirm adequate light exposure.
- Plan for at least 20 minutes outdoors for the sensor to calibrate an ambient air baseline. See ***Outdoor CO_2 Calibration on page 4***.

Supplies required to install (not provided):

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

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Installation

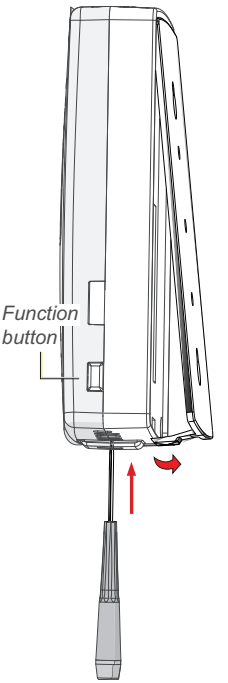
Use hand tools when installing. Over-torquing with a power tool can damage the sensor. The sensor's removable back plate can be mounted on most surfaces.

Note: *Consider linking the sensor while you have access and before replacing the cover, see* ***Send a Teach Message below****.*

Three different mounting options are available:

- Flush-mounted to a firm surface with screws and wall anchors (not provided).
- Using double-sided tape or Velcro (not provided).
- Over a standard, Class 2 low-voltage electrical box. Keyholes in the back plate mate with standard screw patterns.

1. Insert a precision flatblade screwdriver into the slot on the key tab to separate the back plate from the sensor.
2. Mount the back plate with the plastic key on the bottom.
3. Align the sensor over the back plate and press the lower edge until it clicks in place.
4. Test for adequate light levels. See ***Light Level Test on the facing page***.



Note: *The sensor can operate with low light exposure, but for best results, it should be mounted in a location with four hours of natural or artificial light daily, minimum 400 lux (40 footcandles).*

Send a Teach Message

The target receiving devices must be installed, powered, and within range of the sensor.

1. Remove the sensor from the back plate.
2. Activate the target device to receive a wireless message to connect. If necessary, refer to the related product documentation.
3. Press the **[Teach]** button on the sensor. (See image on facing page.)

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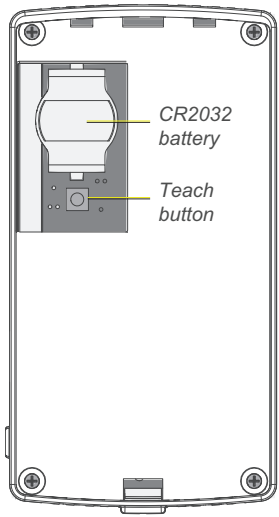
Battery Power

A battery is not required for normal operation if the sensor receives adequate natural or artificial light. See the table in the ***Light Level Test below***. A CR2032 battery is required to run the ***Outdoor CO_2 Calibration*** process on ***page 4***.

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 RCT.

To replace the battery:

1. Remove the sensor from the back plate by pressing the key on the lower edge of the sensor body.
2. Use a precision flatblade screwdriver to remove the old battery from the holder.
3. Insert a new battery with the positive side (+) facing up and press in place.
4. Replace the back plate and snap it in place.



Sensor Back View

Tests and Settings

Use the **[Function]** button and color LEDs to navigate the Tests and Settings menu. The **[Function]** button is on the side of the sensor and the LEDs display through the right side of solar panel.

- ***Light Level Test*** (green LED)
- ***Outdoor CO_2 Calibration*** (red LED)
- ***CO_2 Calibration Setting*** (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 **[Function]** 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 hold the **[Function]** 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	Ambient Light Lux (Footcandles)	Time to Fully Charge	Discharge Time
0	< 50 (< 5)	Non-operational	N/A
1	50–100 (5–9)	Operational	N/A
2	100–200 (9–19)	32 hours	72 hours
3	200–400 (19–37)	16 hours	72 hours
4	400–800 (37–74)	8 hours	72 hours
5	> 1000 (> 93)	4 hours	72 hours

About Calibration

The sensor must be calibrated to establish an ambient air baseline measurement in order to provide optimal performance and accurate readings. It can be calibrated using an outdoor environment or by enabling Automatic Background Calibration (ABC). The default calibration setting is enabled ABC.

Note: *If ABC is enabled, you do not need to run the **Outdoor CO_2 Calibration**. If you calibrate the sensor outdoors, the ABC option should be disabled, see **CO_2 Calibration Setting**.*

Outdoor CO_2 Calibration

The sensor can be calibrated outdoors to establish a baseline measurement.

To use the outdoor calibration method:

1. Place the sensor outdoors, out of direct sunlight in air above 0°C (32°F) for at least 20 minutes. Avoid areas where people linger so readings are not affected.
2. Press and hold the **[Function]** button until the green LED starts blinking.
3. Press the **[Function]** button to cycle through the menu of color LEDs and stop when the red LED blinks.
4. Press and hold the **[Function]** button until the LED stops blinking to select Outdoor CO_2 Calibration.
   The sensor assigns the value of 420 ppm (outdoor air) to the lowest CO_2 value recorded since its last calibration cycle. The green LED blinks for five seconds and stops when calibration is complete.

CO_2 Calibration Setting

The sensor provides an Automatic Background Calibration (ABC) option that can be set indoors. ABC is enabled by default.

ABC is a feature that measures the lowest level of CO_2 that occurs over a three-week period to establish an ambient air baseline and assign the value 420 ppm to this lowest value.

The ABC feature works best where the monitored space is periodically unoccupied for eight hours or more at least once in a typical three-week period. If the monitored space is occupied 24/7 or is an industrial or greenhouse operation where CO_2 levels may be elevated over long periods of time, then the ABC feature should be disabled.

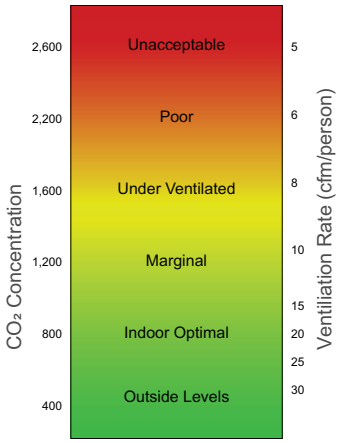
To set the calibration option:

1. Press and hold the **[Function]** button until the green LED starts blinking.
2. Press the **[Function]** button to cycle through the menu of color LEDs and stop when the green and red LEDs blink.
3. Press and hold the **[Function]** button until the LEDs stop blinking to select CO_2 Calibration Setting.
4. Press and release the **[Function]** button to cycle through menu until your target setting displays.
   - Green LED blinks: enable ABC
   - Red LED blinks: disable ABC
5. Press and hold the **[Function]** button to save the setting.

Current CO_2 Value

The current CO_2 value is shown as a sequence of blinking LEDs. To get a reading of the current value:

1. Press the **[Function]** button. The LEDs blink in sequence to indicate the current value.
2. Add the number of color blinks together for a total, where a single blink represents:
   - Green = 500 ppm/blink
   - Blue = 100 ppm/blink
   - Red = 25 ppm/blink
3. For example:
   - 2 green blinks = 1,000 ppm
   - 3 blue blinks = 300 ppm
   - 2 red blinks = 50 ppm, for a total CO_2 = 1,350 ppm.



The chart illustrates CO_2 concentration and how values correspond to ventilation rates (2,600=Red; 1,500=Yellow; 400=Green).

Note: *The sensor automatically corrects for altitude. Pressure compensation is factored into CO_2 readings using 3% for every 300 m (1000 ft).*

Current General Range

The sensor blinks a color LED every 15 seconds to indicate the current general range of CO_2.

- Green = less than 800 ppm (good ventilation and air quality)
- Blue = 800 to 1,400 ppm (marginal ventilation and air quality)
- Red = greater than 1,400 ppm (low ventilation and potentially poor air quality)

Transmission Intervals

Sufficient ambient light levels ensure a sustained power source for transmissions. Transmission intervals are determined by ambient light levels, rate of measurement change, and the amount of power stored in the sensor as follows:

- If the measured temperature change between the current sample and the last transmitted value is greater than 0.6°C (1.1°F), the sensor transmits immediately.
- If the relative humidity (RH) change between the current sample and the last transmitted value is greater than 3%, the sensor transmits immediately.
- For levels 1 and 2, the CO_2 sample rate value is derived from three consecutive readings averaged with the previous transmitted value.
- For level 3, only the three readings taken during the current sample are averaged.

Level	Ambient Light Lux (Footcandle)	Temp/RH Rate	CO_2 Sample Rate
1	> 200 lux (18.5 fc)	16 sec	300 sec (5 min)
2	< 200 lux (18.5 fc)	32 sec	600 sec (10 min)
3	< 50 lux (4.6 fc) for 24 hrs.	64 sec	1,200 sec (20 min)

Compliance

For complete regulatory compliance information, see the Wireless CO_2 Sensor datasheet at **echoflexsolutions.com**.

FCC Compliance

Echoflex Wireless CO_2 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-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

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