

# RCT Installation Guide

WIRELESS CO<sub>2</sub>, HUMIDITY AND TEMPERATURE SENSOR



## Overview

The RCT sensor is a battery-free wireless transmitter monitoring indoor CO<sub>2</sub>, temperature and relative humidity levels. The sensor is available in 902, 868 and 928MHz frequencies.

The package includes the CO<sub>2</sub> sensor and this installation guide.

A detailed installation and commissioning guide for the RCT is available for download on [www.echoflexsolutions.com](http://www.echoflexsolutions.com)



Scan QR code for link to detailed guide

The RCT is a wireless, energy harvesting sensor that monitors CO<sub>2</sub> levels from 0-2000 ppm, room temperature in the range of 0-51°C (32°F to 124°F) and relative humidity in the range of 0-100%. The CO<sub>2</sub> measurement is automatically corrected for altitude by monitoring absolute pressure via an on-board sensor.

The RCT transmits wireless telegrams that contain the information defined within an equipment profile, EEP: A5-09-04.



### Note:

*Even with a brief exposure to light the sensor will operate however for best results the sensor should be mounted in a location with exposure to 4 hours of natural or artificial light on a daily basis.*



### Note:

*There is a battery clip for an optional CR2032 coin cell battery. Installing the battery during commissioning is highly recommended.*

## Preparing To Install

The RCT can be mounted to most surfaces; glass, stone, concrete, wallboard, cubicle partitions, etc. The sensor can be mounted using screws (not supplied) through the removable back plate (2 keyholes or using double-sided tape or Velcro™ (not supplied)).

The mounting location of the sensor is important as this will directly affect the receiver's reception of the sensor's wireless telegrams. High density construction materials in the space and furniture can disrupt wireless transmissions. The sensor should be installed in the space near where the receiver is mounted, however the signal will travel through other material - refer to the detailed guide for more information.

## Performing an Ambient CO<sub>2</sub> Calibration

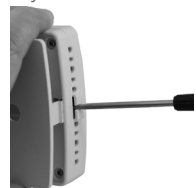
It is recommended that the installer perform an ambient air calibration of the RCT as part of the installation process. The sensor will record the lowest CO<sub>2</sub> level over a 2 minute period and will assign this reading the value of 420 ppm (outdoor air).

Refer to the CO<sub>2</sub> Calibration Mode section described later in this guide.

## Installation

The RCT has a removable back plate. The back plate has a security feature which requires a tool for the removal of the device from the back plate.

1. To remove the back plate, insert a flat head screw driver, into the slot and exert torque on the key tab to separate the back plate from the housing body as shown in the image. Once the tab is free, pull the body away from the back plate.



2. Mount the back plate to a bracket or the wall surface in a vertical orientation with the plastic key on the bottom. There are keyholes in the back plate that mate with standard electrical box screw patterns. Alternatively, you can mount the sensor using double sided tape or Velcro® (not supplied).
3. Once the back plate has been secured to the wall or mounting bracket, align the two top alignment tabs on the back plate with the enclosure body and press the lower edge over the plastic key until it clicks in place.

## Installing the Battery

The battery is not required for normal operation when the RCT 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 an 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.



## Linking the Sensor to a Receiver

This process requires the controller or receiver to be mounted, powered and within range of the RCT sensor to be linked. Before assigning the sensor to a receiver, the device must be exposed to a good light source for a minimum of 2 hours or install the optional start assist battery (not supplied).

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. Activate LEARN or LINK mode at the receiver, if necessary refer to the manufacturers documentation.
3. Press the CO2 sensors Link button.
4. Deactivate LEARN mode at the receiver.

## Using the Function Button



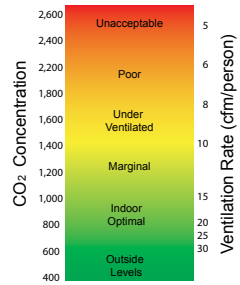
The RCT has a function button that allows installers and users to view current CO2 values, make adjustments to the CO2 calibration or utilize built-in test functions. Pressing the function button found at the lower right side of the sensor allows navigation to these different functions. Operational and navigational feedback is provided via the color LEDs.

### Reading the Explicit CO2 Value

To acquire the exact CO2 value press the function button on the side of the sensor. The LEDs will flash in sequence, green, amber then red to indicate the value. Add the number of color blinks together to total the CO2 concentration where a single LED blink; green = 500 ppm/blink, amber = 100 ppm/blink, red = 25 ppm/blink.

For example: 2 green blinks = 1000 ppm  
 3 amber blinks = 300 ppm  
 2 red blinks = 50 ppm  
 Total CO2 = 1350 ppm

The colored chart is a guideline for mapping the CO2 concentration and how this value reflects on the spaces ventilation rate.



### Light Level Test Mode

This test will indicate the real-time energy produced by the solar panel allowing the installer to verify a good installation location when no battery is used.

1. Press the function button on the sensor until the green LED is blinking, about 6 seconds.
2. Tap the function button once to enter Light Level Test mode, the green LED will start blinking a pattern according to the light level, see table below.

Blinks	Lux	Foot Candles	Time to Fully Charge	Discharge time
0	< 50	< 4.6	Non operational	n/a
1	50-100	4.6 - 9.3	Min. operating level	n/a
2	100-200	9.3 - 18.6	32 hours to full charge	72 hours
3	200-500	18.6 - 246.5	16 hours to full charge	72 hours
4	500-1000	46.6 - 92.9	8 hours to full charge	72 hours
5	1000+	92.9+	4 hours to full charge	72 hours

### CO2 Calibration Mode - initiating an immediate calibration

1. Place the sensor in outdoor air above 32°F (0°C) and out of direct sunlight for 10 to 15 minutes. Avoid areas where people are lingering so the background CO2 readings are not affected.
2. Press the function button on the sensor until the green LED is blinking, about 6 seconds.
3. Tap the function button twice to enter CO2 calibration mode, the red LED will begin blinking.
4. Press the function button for about 6 seconds to view the current CO2 calibration mode.
  - Green LED blinking - Automatic Background Calibration (ABC) is enabled.
  - Red LED blinking - ABC is disabled
  - Amber LED blinking - ABC is enabled plus performs an immediate calibration.
  - Red & Amber LEDs blinking - calibrate to absolute CO2 value. (see detailed guide for more info)
5. Pressing the function button again for 6 seconds will cycle through the calibration modes. Step through the menu until the amber LED is blinking.
6. Press and hold the function button for about 6 seconds until the Amber LED is rapidly blinking which indicates the calibration process has begun. Place the sensor in the shaded outdoor location and wait until the amber LED stops blinking, about 2 minutes. The green LED will blink 10 times when complete then the sensor will enter normal operation.

## Sensor Operation

In order to best manage power, the transmitting interval of the RCT is automatically managed dependent on ambient light levels, rate of measurement change and amount of power stored in the sensor. Telegrams are sent at the following intervals:

- If the temperature change between last transmitted value and the current sample is  $> 0.6^{\circ}\text{C}$  ( $1.1^{\circ}\text{F}$ ) the sensor will transmit immediately.
- If the RH value change between last transmitted value and the current sample is  $> 3\%$  the sensor will transmit immediately.
- If the CO<sub>2</sub> value change between samples is  $> 200$  ppm, the sample and heartbeat rate shall adjust to 300 sec (5 min.) for 1 sample period.
- The CO<sub>2</sub> sample rate value is derived from three consecutive readings from the CO<sub>2</sub>IR sensor averaged with the previous transmitted value, level 1 and 2 only. For level 3, only the 3 readings taken during the current sample are averaged.

Level	Ambient Light	Temp/RH Rate	CO <sub>2</sub> sampling Rate	Heartbeat Rate
1	$> 200$ lux (18.5 fc)	16 sec	300 sec (5 min)	300 sec (5 min)
2	$< 200$ lux (18.5 fc)	32 sec	600 sec (10 min)	600 sec (10 min)
3	$< 50$ lux for 16 hours	64 sec	1200 sec (20 min)	1200 sec (20 min)

## Reading the CO<sub>2</sub> Value

The RCT does not have a digital display but it is possible to quickly determine the general range of CO<sub>2</sub> concentration in the space. You can also determine actual CO<sub>2</sub> concentrations in the space by pressing the function button.

The 3 colored LEDs located on the right side of the solar panel will blink every 15 seconds providing visual indication of the current CO<sub>2</sub> measurement range.

### CO<sub>2</sub> ranges indicated by the color LED blink:

- Green  $\Rightarrow < 1100$  ppm (Good ventilation/air quality)
- Yellow  $= 1100 \dots 1,500$  ppm (marginal ventilation/air quality)
- Red  $\Rightarrow > 1500$  ppm (low ventilation & potentially poor air quality)

## Regulatory Statements

FCC Part 15.231 (902 MHz models only)

Contains FCC ID: STM300U

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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