



# AIRKit<sub>v1</sub>

## User Guide



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# Welcome

Welcome to your own personal **AIRKit**!

This guide will help you assemble your **AIRKit** and give you a glimpse into the effects of CO<sub>2</sub>.



With **AIRKit**, you will assemble your own CO<sub>2</sub> sensor and be able to record the levels of carbon dioxide in the air around you – wherever you may be!

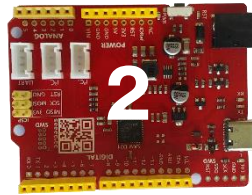


## Kit Contents

1. User manual (probably in your hands)
2. Microcontroller board (the brains)
3. CO<sub>2</sub> sensor (the nose)
4. LCD Screen (how the kit communicates)
5. I<sup>2</sup>C cables x2 (to connect things)
6. The **AIRKit** case! (just a box)
7. The case cover (to make it look good)
8. 9 Volt battery (for POOOOWER!)
9. Battery connector (to transfer the power)
10. Switch (to switch the **AIRKit** on and off)
11. USB C cable (alternative power or re-programming)
12. Plastic feet x3 (to keep the microcontroller in place)
13. 20 cm of sticky foam (to keep other bits in place)



1



2



3



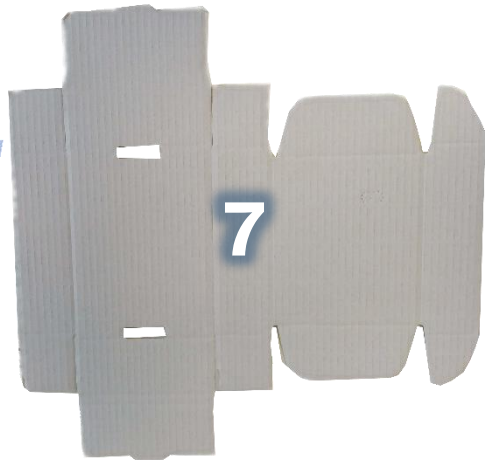
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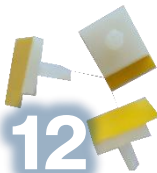
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11



12



13



## Overview

Carbon Dioxide (CO<sub>2</sub>) is everywhere around us. It is safe in low concentrations, however spending long periods of time in higher levels may cause long term health issues and affect our wellbeing.

In 2018, average atmospheric carbon dioxide levels were 407ppm. This is the highest level in 800,000 years!

Measuring and becoming aware of the CO<sub>2</sub> levels around us can help us avoid high CO<sub>2</sub> concentrations, so we can live healthier lives.

With **AIRKit**, you will assemble your personal CO<sub>2</sub> sensor and record the levels of CO<sub>2</sub> in the air around you – wherever you may be!



## Setup

Setup time required: 20 minutes

Additional materials:

- Scissors
- Pritt stick (or any other brand of glue)

### Step 1 Prepare the case!

Cut the case cover (7) along the solid black lines.

Glue the cover to the outside of the **AIRKit** case (6).



Taking care, follow the scissor markings on the template and cut out holes for the following: CO<sub>2</sub> sensor, LED screen.

Assemble the box by folding the printed 'fold' lines.

Make a hole on the back of the box, large enough to thread the USB cable (11) through.

## Step 2 Insert the brains, connect the nose

Cut the foam into five equal sized pieces. Save one of them for later, take the other four and stick them to LCD screen (4) and the CO<sub>2</sub> sensor (3).



Push the feet (12) through the holes on the microcontroller board (2) stick it to the inside of the box.

Using the I<sup>2</sup>C cables (5) connect the microcontroller board (2) to the CO<sub>2</sub> sensor (3) and the LCD Screen (4). The I<sup>2</sup>C connectors only fit one way. Make sure you are connecting them to the I<sup>2</sup>C ports on the board, not the UART - they are labelled. Once everything is connected, place all the components in the box.



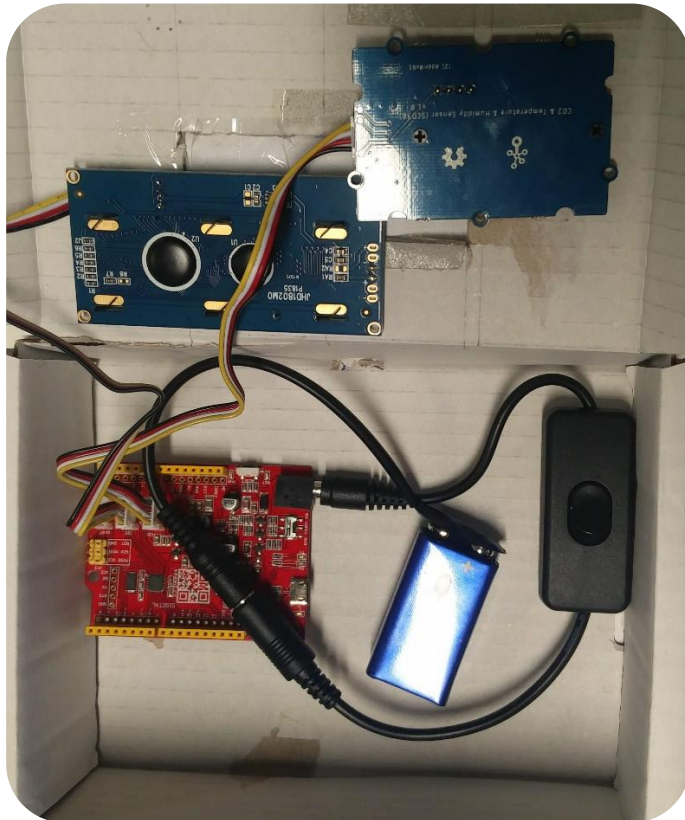


### Step 3 P0000OWER!

Clip the 9V battery (8) to the battery connection cord (9) and connect the battery connection cord to the power switch (10).

Connect the power switch cable to the round jack barrel power socket on the Microcontroller board (2).

Leave the 9V battery and power switch inside the box, you can use the saved piece of foam to stick them to the box.





#### Step 4 Start measuring

Flip on the power switch (10). The LED Screen (4) will turn on and the first reading will be displayed. There will also be a green light on the microcontroller board (2).

If you wish to power the **AIRKit** for a long period of time, connect the **AIRKit** to a USB power source by connecting the USB-C cable to the micro controller board.

Close the box so that the CO<sub>2</sub> Sensor is exposed to your surroundings.

Leave for 10 seconds to allow the sensor to settle and display the first true value of your CO<sub>2</sub> exposure.

Enjoy and start experimenting!






## Using your AIRKit

The **AIRKit** measures CO<sub>2</sub> levels in the air.

CO<sub>2</sub> levels are measured in parts per millions (ppm) which quite simply denotes that for a reading of 100 ppm, there would be 100 particles of CO<sub>2</sub> for every 1,000,000 particles of surrounding air.

People are affected in various ways when subject to high concentrations of CO<sub>2</sub>. These are displayed in the table below.



CO <sub>2</sub> (ppm)	Likely Effects
<b>250-350</b>	background (normal) outdoor air level.
<b>350-1,000</b>	typical level found in occupied spaces with good air exchange.
<b>1,000-2,000</b>	level associated with complaints of drowsiness and poor air.
<b>2,000-5,000</b>	level associated with headaches, sleepiness, and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
<b>5,000</b>	this indicates unusual air conditions where high levels of other gases could also be present. Toxicity or oxygen deprivation could occur. This is the permissible exposure limit for daily workplace exposures.
<b>&gt;40,000</b>	Exposure may lead to serious oxygen deprivation and is immediately harmful



Increasing the number of people in the room or being in a confined space are some of the reasons for an increased CO<sub>2</sub> concentration.

To reduce the levels, you can try opening a window or increase the air flow around the area you are in.

Try to work out what else makes the CO<sub>2</sub> reading change!

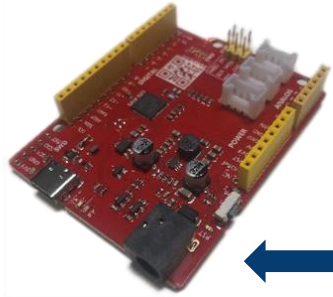
Note: The CO<sub>2</sub> sensor will record  $\pm 30$ ppm of the true concentration level.

Take you **AIRKit** with you, make a note of the levels of CO<sub>2</sub> displayed on the chart printed on the box.

<b>DATA</b>	<500	500	600	700	800	900	1000	1500	>2000
Classroom									
Bedroom									
Kitchen									
Car									

## Troubleshooting

If the LED Screen is on, but no figures are being displayed, press the reset button on the Micro Controller Board. This will reset the board and it should power up properly.



If the LED screen has no power all together, reset the board.

If the CO<sub>2</sub> levels have not varied in a while, check the CO<sub>2</sub> sensor connection. Disconnect and reconnect the I<sup>2</sup>C cable on both ends and reset the board.

If this still doesn't work, it is likely to be a power supply issue. Therefore, check the battery is not flat or that the USB cable is plugged in correctly.

If the LED screen starts flickering or buzzing check the battery level. Sometimes a low battery can have this effect.

The 9V battery is only intended to power the device for short periods of time. For continued data logging make use of the USB C cable connected to a phone charger, laptop or even a portable power bank.



## Warnings

Do not operate outside temperatures of 0°C - 50°C.

Do not leave running for longer than 12 hours.

Disconnect the power supply (battery or mains) before touching any of the components.

Running time can be limited when using the battery. For long running times, use the supplied USB-C cable.

Attempting to re-program the micro controller board will void any warranty.

**AIRKit** is made for 8-18yrs. Small components are a choking hazard.

Do not leave within reach of children below 6 years old.

Do not have any liquids around the device at any time.

The warranty provides 12 months full cover against a faulty or non-functional component. If you find a faulty component, simply return the whole kit to us together with proof of purchase. We will send a replacement **AIRKit** to you.

BonaCaeli is a trade name of BPP Technical Services Ltd.

The BonaCaeli project aims to educate and inform its sponsors on how to measure and mitigate the concentrations of carbon dioxide that they are exposed to.

For more information visit: [bonacaeli.com](http://bonacaeli.com)



# Notes



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