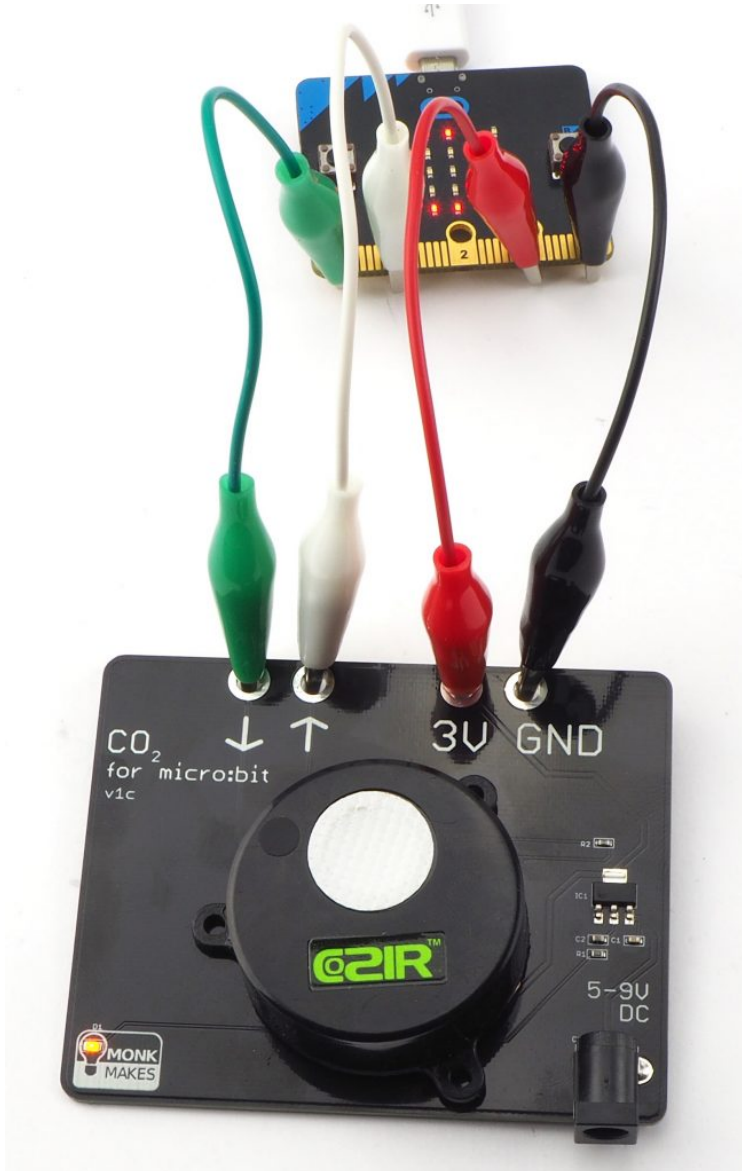


CO₂ SENSOR FOR MICRO:BIT

This board, designed for use with the Lets Talk Science Living Space Project, provides a CO₂, temperature and Relative Humidity measurements to a BBC micro:bit.



This board was designed by MonkMakes Ltd for use with the Lets Talk Science project — Living Space: <https://letstalkscience.ca/livingspace>

Here you will find all sorts of useful resources and lesson plans.

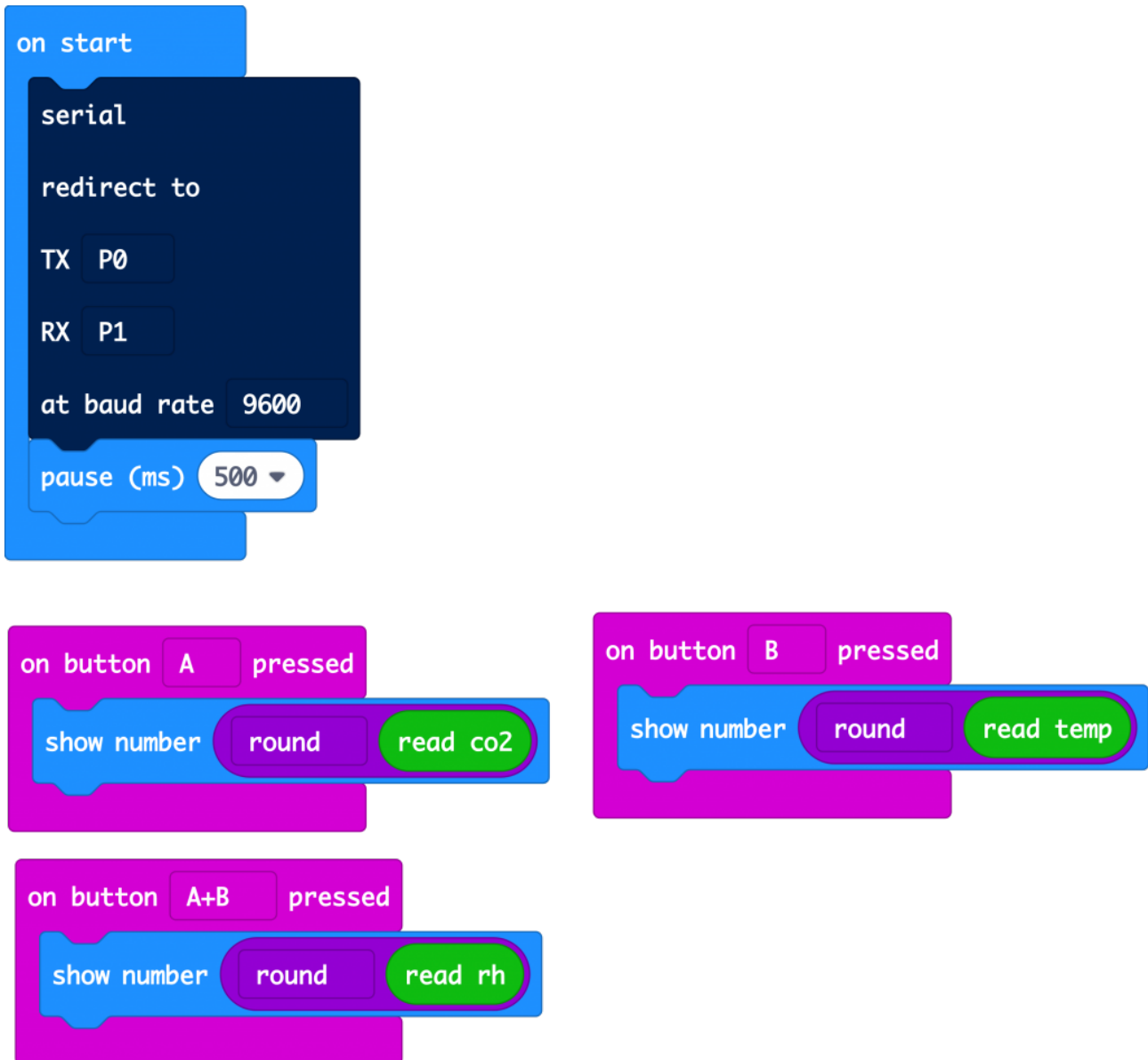
WARNING

When powered by batteries, the CO₂ sensor will provide power back to the micro:bit. But make sure you have the power leads connected right between the CO₂ sensor board and the micro:bit or your micro:bit could be damaged.

Getting Started

Wire-up the board to your micro:bit as shown above. Then flash the following program onto your micro:bit by following the link below to open the blocks editor and then click on Download (bottom of the web page) and copy the hex file onto your micro:bit.

https://makecode.microbit.org/_faiFbdM115sE



Once the program is uploaded, pressing Button A will display the CO2 level in parts per million of CO2. Pressing button B will display the temperature in degrees C and both buttons together will show the relative humidity.

If you are wondering about the big gray serial redirect block in the on start block, well this block starts serial transfer of data between the micro:bit and the CO2 sensor.

MicroPython

You can also use the board with MicroPython as the following code example shows.

Unless you are interested in the serial protocol used, you may want to copy the code below into your program and make use of the functions `get_co2()`, `get_tempC()` and `get_rh()`.

```
from microbit import *

uart.init(tx=pin0, rx=pin1)

co2 = 0
tempC = 0
rh = 0

def check_incoming_messages():
    global co2, tempC, rh
    if uart.any():
        response = str(uart.read(), 'UTF-8')
        if len(response) < 8:
            return
        cmd_letter = response[1]
        cmd_value_str = response[2:8]
        value = int(cmd_value_str)
        if cmd_letter == 'Z':
            co2 = value
        elif cmd_letter == 'T':
            tempC = (value - 1000) / 10.0
        elif cmd_letter == 'H':
            rh = value / 10

def get_co2():
    uart.write('Z\r\n')
    sleep(100)
    check_incoming_messages()
    return co2

def get_tempC():
    uart.write('T\r\n')
    sleep(100)
    check_incoming_messages()
    return tempC

def get_rh():
    uart.write('H\r\n')
    sleep(100)
    check_incoming_messages()
    return rh

# Copy the code above into your program and then use the functions
# get_co2, get_tempC and get_rh in your own code

while True:
    display.scroll(get_co2())
    if button_a.was_pressed():
        display.scroll('T=' + str(get_tempC()))
```

```
if button_b.was_pressed():
    display.scroll('RH=' + str(get_rh()))
    sleep(500)
```

CO2 Concentrations

So, what do these readings mean?

Fresh outdoor air should give a reading of around 400. In a smallish room with a few people in it, this will rapidly rise above 1000, as people breathe out CO2. If it gets above 2000 then your air is getting dangerously unhealthy.

Calibration

Your sensor is a sensitive scientific instrument and the readings it gives will gradually get less accurate. If you leave the sensor powered-up in a well ventilated room for 24 hours, then it will calibrate itself automatically.

You can also force calibration using the Calibrate CO2 block in the COZIR blocks category. This will set the sensor's readings back to 400. So you should run this block only after the sensor has been in fresh air for 30 mins or so.

Altitude Compensation

If you live somewhere high up, then you need to tell the sensor about this by putting a Set Altitude block into your On Startup block and then changing its number to your altitude above sea-level in meters.

Battery Power

Once you have the code all working, you can disconnect the USB power and instead power the CO2 Sensor Board through the DC barrel jack using either a battery pack or a DC adapter. In both cases the power supply should be of between 5 and 9V.

Troubleshooting

If you are having trouble with your CO2 sensor, here are a few pointers that might help.

- * Power - The CO2 part of the sensor module will not work reliably if the micro:bit is powered from a 3V battery pack. It should be powered either by USB, or from a 9V battery (or 6V battery pack) connected to the CO2 board that will then power the micro:bit (but not both).
- * Connections - alligator/crocodile leads are notorious for failing while looking perfectly ok. Try swapping the leads out.
- * Calibration - although we calibrate the modules during manufacture, we have noticed that sometimes they need recalibrating after shipping. If you Edit the Makecode project here: https://makecode.microbit.org/_faiFbdM115sE
.. you will see that the COZIR category of blocks has a block called Calibrate. Calling this block will tell the sensor that the current CO2 concentration is 400ppm. So, if you call this after the sensor has been in an unoccupied room for 10 minutes, the readings should jump to 400. Also leaving the sensor powered for 24 hours should result in it autocalibrating, assuming that the lowest reading it finds in that 24 hour period is 400ppm. Try calling the Calibrate block, even if you know the concentration is higher, just to check that the CO2 sensor is working.