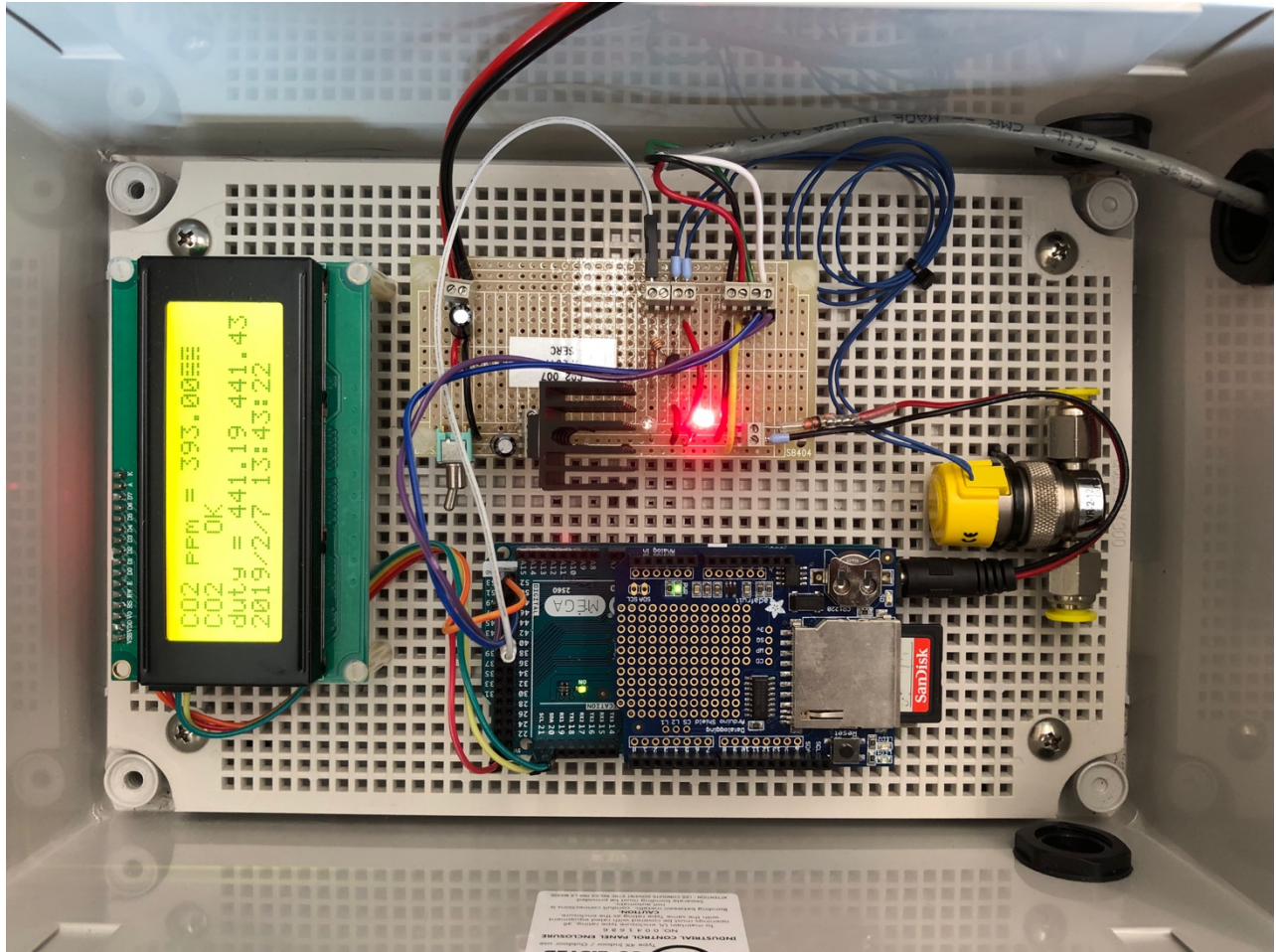


CO₂ Sensor Calibration Protocol

SERC Technology in Ecology Lab

Last updated April 26, 2019 by Carmen Ritter



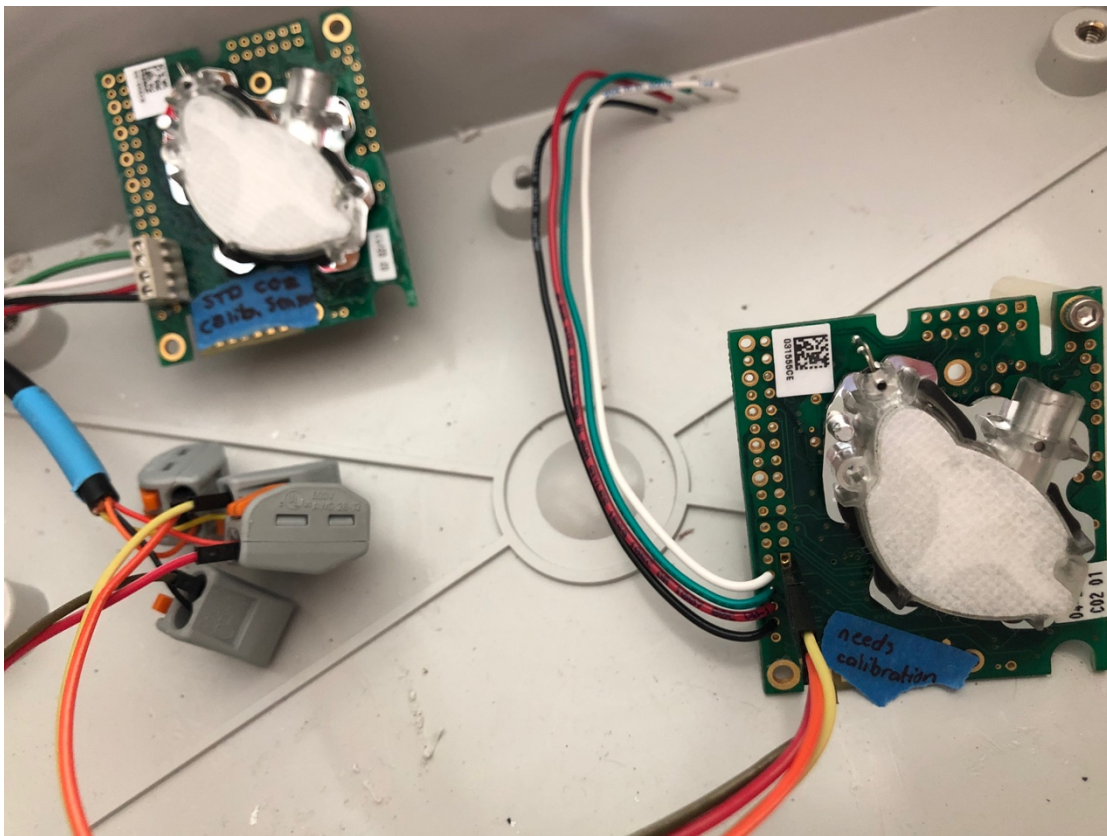
When to Calibrate

- Sensor reads obviously incorrect values
- Sensor was sprayed with a coating, or altered in any other way
- Other components in the sensor system have changed
- Sensor was dropped or potentially damaged

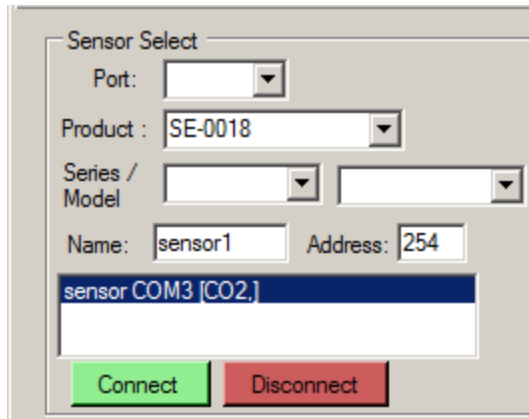
Methods

1. Remove SD card from box. Download onto specified file on server.
 - a. Rename automatic file to reflect name/number of sensor.
 - b. Delete card if informed to do so.
 - c. Replace in box.
2. Remove wires from CO₂ sensor terminal block with flathead screwdriver.
3. Mark sensor box number on sensor with tape to avoid confusion.

4. With the stacking header and attached wires in the top right corner of the CO₂ sensor, connect the calibration wires in the descending order: Black, Red, Orange, Yellow. If the wires do not fit in the stacking header, use Wago blocks to connect the calibration wires to male-male wires with thinner tips that will fit (shown below).

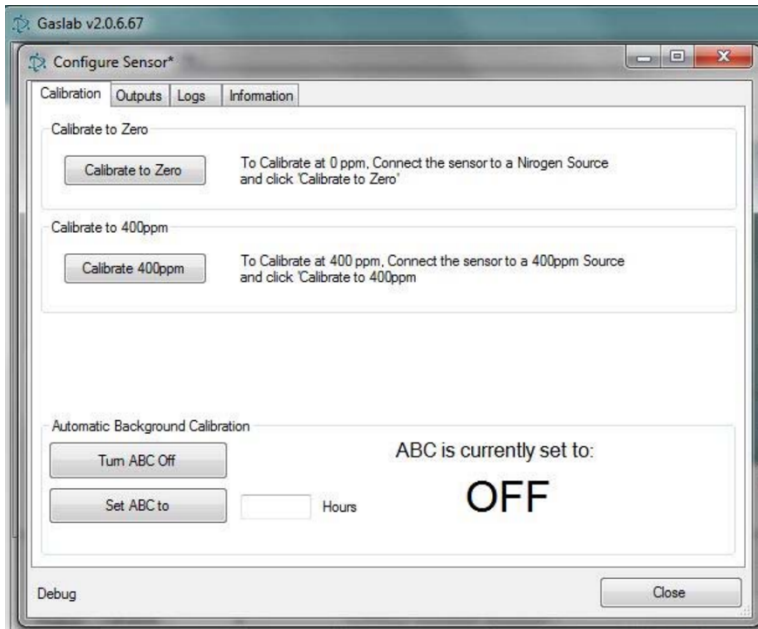


5. If the calibration sensor has not already been set up, (with terminal block in the top right corner) in descending order: Black, Red, White, Green.



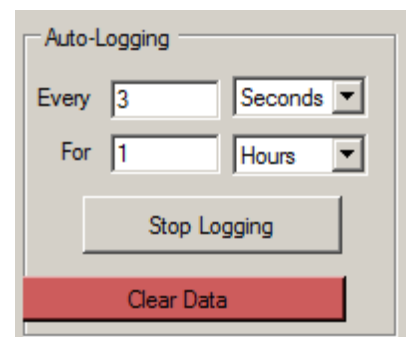
6. Connect air input line to feed into calibration box. The air line should be a known CO₂-free air source. If you don't have this, use Nitrogen instead.
7. Plug in the calibration box's breadboard to a 12V power source.
8. Open GasLab on computer.
 - a. Connect USB from non-calibrated sensor to computer.
 - b. Select product (bottom left) SE-0018.
 - c. Select the port in which the non-calibrated sensor resides.
 - d. Click "Connect."

9. Click “Configure Sensor” and ensure that ABC is turned OFF.

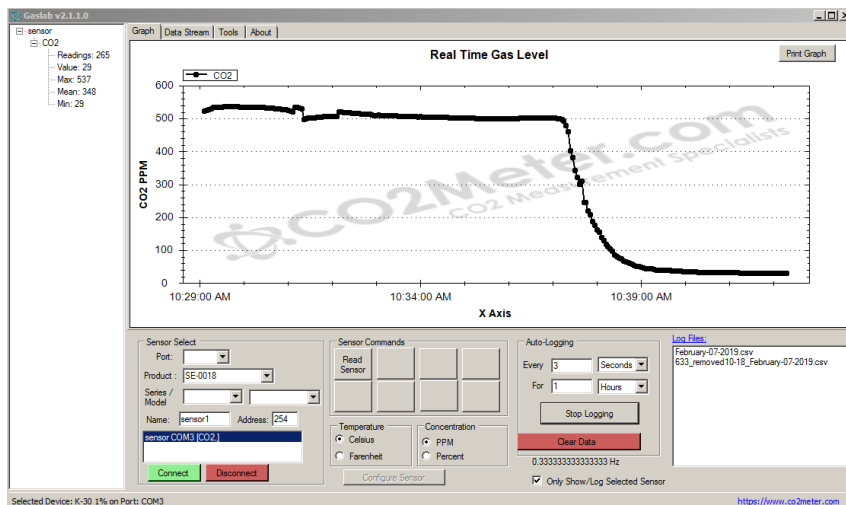


10. Go to the Information tab within the configuration window. The K30’s default address is 0x68, which will show up as 104 for the bus address. If the sensor is being used in tandem with a BME 680, or any other hardware that will conflict with the K30’s address, change it here to 52, which will correspond to a 0x34 address. Click “set” and then close the window.

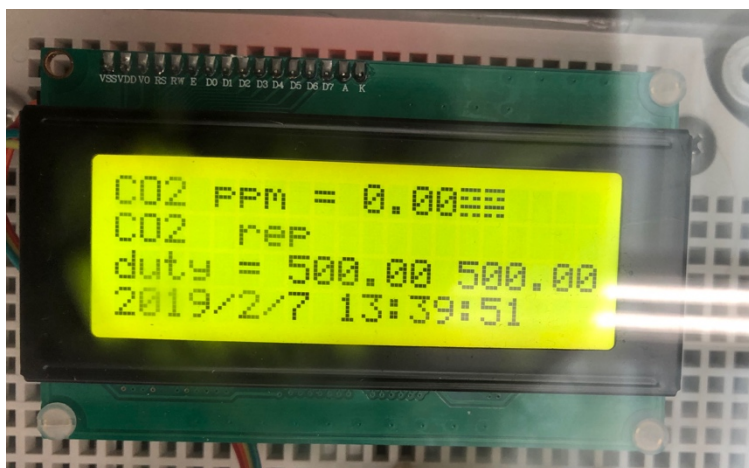
11. In “Auto-Logging” section, log for every 3 seconds.



- a. Click “Start Logging.”
- b. Rename automatic file to reflect name/number of sensor’s plot, or number of sensor itself if not associated with a plot (at beginning of file name).
 - i. EXAMPLE: “620_February-07-2019.csv”



12. Once non-calibrated and standard sensors have both stabilized, record their pre-calibration ambient values on the data sheet.
13. Seal box and flush with air line. When both sensors have stabilized, and the standard sensor is stable at zero for 30-60 seconds, record each of their pre-calibration “zero” values on the data sheet.
14. Click “Stop Logging,” then “Configure Sensor.”
 - a. Calibrate sensor to zero.
15. Click “Start Logging,” and make sure both sensors are stabilized at zero.
 - a. Record the post-calibration “zero” values on the data sheet.



16. Turn off air line and open box so sensors may readjust to ambient measurements.
 - a. Once sensors have stabilized, record post-calibration ambient values on the data sheet.
17. Stop logging and disconnect the newly calibrated sensor, remove wires, and store in an antistatic bag for future use.

After Calibration

1. Locate the .csv file Gaslab generated
 - a. It automatically stores these files in your Documents > Gaslab Logs
2. Make sure the file is named correctly, and put it in the corresponding folder on Dropbox
 - a. If it was associated with a plot (and has that number at the beginning of the file name), save in:
 - i. DOE Warming Experiment > CO2 Data > Gaslab_CSV_Calibration_Logs
 - b. Do the same if the beginning of the file is the sensor’s number

3. OPTIONAL STEP: if you've been asked to save the DATALOG file off of the SD card in the calibration compartment, remove the card after each sensor, name with the same standards as above, and save under:
 - a. DOE Warming Experiment > CO2 Data > *whatever the sensor's plot # was*

Troubleshooting Gaslab

- To be honest, this program has a ton of issues. You will likely need to close it after you finish calibrating each sensor, and reopen it when you have connected the new one, being careful to reselect the proper port.
- If you try to do two in a row, or connect the wrong port first then immediately change the connected port and try to connect it again, Gaslab will probably freeze. Thus, close and reopen the program in either of those cases
- ALWAYS make sure ABC is turned off
- If your air source is not getting the STD sensor down to zero when you flush the chamber with the controlled air, there is likely contamination in your air source. Connect to a known 0% CO2 air source. Nitrogen is recommended.