Calibration of carbon dioxide sensors

Important: Before you calibrate your carbon dioxide sensor, be sure that you have correctly set the altitude/pressure variable in your sensor. See the user manual for more information.

For best accuracy, we recommend a calibration once every four to six weeks.

General calibration steps (either calibration method)

Always wait to calibrate the sensor until it has been continuously powered for a minimum of 20 minutes. This allows the sensor to warm up.

To calibrate, press the *Menu* button until the “Set recalibration CO2 level” screen is displayed. Use the + and - buttons to set the value to the CO_2 level. (This is dependent upon the method you choose below.) Now, press the *Menu* button once to view the “Hold + and - to recal CO2” screen. Hold both buttons. The sensor will adjust its parameters. If the calibration is successful, you will see a “Calibration Successful” screen. Your sensor is now calibrated and ready for use. If the calibration is not successful, try it again. If you continue to have problems, contact airCarbon.

Method 1. Using outside air to calibrate

For most applications, outside air is an accurate and effective calibration source. Outdoor carbon dioxide is generally a well-mixed atmospheric gas. That is, it typically remains at a relatively constant slowly-changing level. Currently, this level is near 390 ppm [1].

Although carbon dioxide is generally well-mixed in the atmosphere, in locations near carbon dioxide sources (such as running vehicles, factories, humans, etc.) carbon dioxide can vary. For rural areas and small towns, this variability it rarely more than 20 ppm above the well-mixed level of 390 ppm. For metropolitan areas, the daily maximum can be 80 ppm or more above this level. Also, because of weather and climate effects, carbon dioxide is generally better mixed in mid-afternoon than in the morning. For these reasons, as a general rule, calibrate your sensor in the mid-afternoon. For more information, review the research in [2].

To calibrate using outside air, take your sensor to an outside area away from running vehicles, people, animals, and other carbon dioxide sources. Let the sensor carbon dioxide value settle for about 20 minutes. (Since human breathing creates a significant amount of carbon dioxide, for best results leave the sensor during this time.) Then follow the steps above for calibrating the sensor using the outside air carbon dioxide value of 390 ppm.

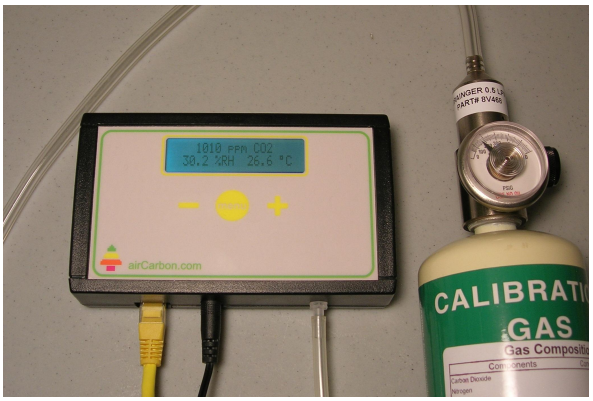
Method 2. Using calibration gas

If you purchases a sensor with an external port, you have the capability using calibration gas.

Calibration gas can be obtained from several sources (eg. JJS Technical Services). For best results, purchase a calibration gas with a concentration that is similar to the concentrations that you plan to measure. For example, if you are monitoring a greenhouse and your levels are typically around 1200 ppm, select a 1000 or 1500 ppm calibration gas. You will also need a gas flow regulator valve for the calibration gas. Poor calibration will occur with excess pressure, so choose a gas flow regulator that flows 0.5 liters per minute (lpm) or less.

To calibrate with calibration gas, first set the "recalibration CO2 level" according to your calibration gas using the directions above. Then, press *Menu* until you return to the data display screen. Install the valve on the calibration gas cylinder. Connect the valve to the sensor using vinyl tubing--available at most hardware stores. Turn on the calibration gas valve. You should seen the data display begin changing within 30 seconds. Wait for the CO_2 data value to stabilize. Now, press the *Menu* button until you see the "Hold + and – buttons to recal CO2" screen. Hold the buttons until you see the recalibration start. Once you see the screen "Calibration Success", shut off the gas. Your sensor is now calibrated. If it still does not calibrate successfully, contact airCarbon support. Be sure to shut off your calibration gas when finished!

Calibration with a 1000 ppm calibration gas



References

[1] Mauna Loa CO_2 observatory: http://www.esrl.noaa.gov/gmd/ccgg/trends/

[2] Grimmond, C.S.B, et al. Local-scale fluxes of carbon dioxide in urban environments: methodological challenges and results from Chicago. *Environmental Pollution* **116**. 2002. Available: http://www.kcl.ac.uk/ip/suegrimmond/publishedpapers/Chicago_CO2_%202002_EPVOL116PS243S254.pdf. Last accessed March 2011.

