Carbon Dioxide Sensor *xs*

for the LogIT Microsense® system

Instructions & Resources

Overview

The Carbon Dioxide sensor is designed to measure the amount of Carbon Dioxide gas present in air. It provides measurements in ppm (Parts Per Million).
It uses NDIR (Non Dispersive Infrared Absorbance) to measure the CO_2 molecules present in the air.

Ideas for use

- Environmental monitoring of CO_2 levels.
- Greenhouse CO_2 monitoring.
- Plant growth and measurements of optimum growing conditions.
- Photosynthesis studies.
- Human breath composition.
- Office/Classroom/Home environmental studying.

Specifications

Range:	0 - 20000 ppm (resolution 1 ppm)
Accuracy:	+/- 0.02% volume CO_2 +/- 3% of reading
Update rate:	Every 2 seconds
Operating Conditions:	0°C to 50°C (32°F to 122°F) 0 to 85% RH, non condensing
Storage conditions:	-40°C to 70°C (-40°F to 158°F)
Power:	USB 4.5 - 5.25V 30mA average 300mA peak
Life expectancy:	15 years nominal commercial environments

Care

This sensor is not waterproof. Do not use the sensor in excessive damp conditions or extremes of temperature as permanent damage will result.
Do not disassemble this sensor, no user serviceable parts inside.

Trouble shooting

- If no sensor is found in the software, check the power supply is within operating power range (see above)

- Your software and/or LogIT (with a display) may need updating to support it, which is available over the internet free of charge.

If the sensor is not recognised by your software or LogIT (for example if the data logger displays ???) you probably need a firmware/software update.
SensorLab or LogIT Lab will update the LogIT data logger - if you are using different data logging software you can download an evaluation version of SensorLab to update your LogIT(s) by performing steps 1 & 2:

1: Visit the LogIT website www.logitworld.com If you have software, go to step 3.
2: To upgrade your data logging software click on the 'Support' tab followed by 'Software Downloads & Updates'. Download and install SensorLab.
3: To upgrade the data logger, start the logging software (SensorLab or LogIT Lab) and Select 'Administration' under the 'File' option.
4: Select 'Reload loggers System' and the upgrade should proceed.

Note the Carbon Dioxide sensor is not compatible with the CheckIT display for LogIT SL/ LIVE.

- Basic recalibration can be done by the user - see 'Recalibration' on the following page.

The resources shown overleaf are available in PDF form at www.logitworld.com

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Preparing for use - (See the Quick Start Guide on the next page)

When first plugged into a LogIT Data logger the sensor should ideally be left for 10 minutes for the internal sensor to stabilise and give the most accurate readings, although usable readings can be obtained after 2 minutes.

- Connect the sensor to the power adapter using the supplied USB cable
- Plug the adapter into a suitable mains power socket
- Plug the 5 pin din connector into a suitable LogIT data logger
- Switch on the data logger or start the logging software if using a computer
- The sensor should start recording ppm readings of CO_2

Powering the CO_2 sensor from a computer

If you are using the sensor away from an available mains power supply, you can plug the USB power cable into a spare USB socket on your computer. The sensor will then take its power from the USB socket.

Note: The sensor only takes power from the USB socket with no data being sent from the computer. If using a Laptop, note that the sensor will use some additional power of the laptops battery, although this is a very small amount and should not affect battery life.

Powering the CO_2 sensor from USB battery pack (not supplied)

If you wish to use the sensor without the use of a computer with a remote data logger such as a LogIT Voyager, you may use a small USB battery pack. These are readily available as mobile phone chargers and can take 2 AA batteries or more.

In all cases the sensor reading is updated every 2 seconds and LogIT will always display & record the last reading it receives from the sensor.

Recalibration

Your CO2 sensor is supplied pre-calibrated but accuracy can change over time.
To recalibrate the sensor, perform the following steps outside allowing a good flow of air around the sensor:

- Connect the sensor to a LogIT data logger. *Note: you can use a remote logger with display or a computer running LogIT software.*
- Connect your CO2 sensor to either the power supply or optional battery pack. Allow the sensor to stabalise for 10 minutes.
- With a straightened paper clip or similar, GENTLY insert the end into the small hole on the bottom of the CO_2 sensor until the display shows a 60 second countdown. Remove the paper clip.
- Leave the sensor to calibrate to 400ppm. Usually a couple of minutes.
- Your sensor is now calibrated.

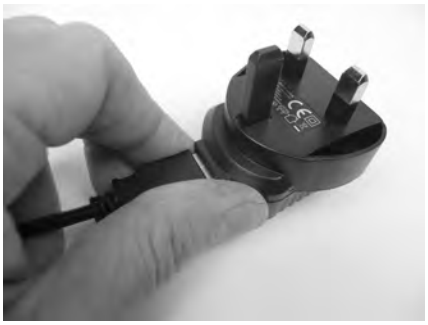
If the recalibration fails for any reason, remove the power supply, then reconnect the power and attempt the above again.

Note: When calibrating, make sure the sensor is not simply dangled out of a window. The reason is that CO_2 from the room can move over the sensor giving a false reading and will make the calibration incorrect.
It is also advisable to set the calibration running and then return a few minutes later. This is also to prevent false readings of CO_2 during the calibration.

Quick Start Guide

1. Connect the end of the supplied USB cable into the CO_2 sensor.

2. Connect the sensor to a suitable power supply. This can be the supplied mains power adapter, spare USB port on a computer or a readily available third party USB battery pack (Not supplied).



3. Plug the 5 pin din connector into a suitable LogIT data logger (in the photo, we are using a LogIT Voyager)

4. Switch on the data logger or start the logging software if the data logger is connected to a computer

5. The sensor should start recording ppm readings of CO_2

6. When first plugged into a LogIT Data logger the sensor should ideally be left for 10 minutes for the internal sensor to stabilise and give the most accurate readings, although usable readings can be obtained after 2 minutes.

Photosynthesis and the Plant

Subject: Biology

Sensor: Carbon Dioxide sensor, Temperature sensor, Light sensor

Overview:
By mounting the Carbon Dioxide sensor within a small 'Biosphere' a plants ability to absorb CO_2 can be monitored over a short space of time along with the temperature and light indicating the effects these parameters have on the CO_2 levels.

Equipment required:

LogIT Carbon Dioxide sensor
LogIT temperature sensor (ProTemp or HiTemp)
LogIT light sensor (LUX, Smarteye or SPX LUX)
LogIT Datalogger
Sensor extension leads
Plastic bag or propagator and some elastic bands
Plant

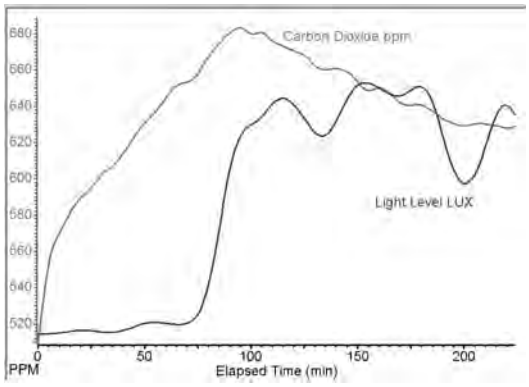
Hazards:
Place the apparatus in such a way that it will not come into contact with water or be exposed to excessive moisture.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous material.

Suggested Method
1. Attach the CO_2 sensor to the side of the plant pot using an elastic band or similar. (If using a small propagator as shown in the photo, place the sensor in the bottom)
2. Place the temperature sensor and light sensor in a similar way to the CO_2 sensor.
3. Connect the sensors to the datalogger & the CO_2 sensor to a suitable power supply.
4. Switch on the logger and allow the sensor to stabilise for 10 minutes.
5. Place the whole plant and sensors into a plastic bag sealing the end with another elastic band.
6. Start logging the CO_2 using the logger remotely or connected to a computer.

Note: Do not place in direct sunlight as this can kill the plant in such a small propagator.

Results:

Do the results show that Photosynthesis has taken place?
What happens to the concentration of CO_2 when the light increases/decreases?
Is this a surprise? Why does this happen?
What happens to the temperature? Why does this happen?



Going further:
Try and get some data from a greenhouse or similar plant propagation.
How might you set up an experiment to see how CO_2 levels effect plant growth?

Biology

The classroom

Subject: Biology

Sensor: Carbon Dioxide sensor.

Overview:
By placing the CO_2 sensor in a classroom, the levels of CO_2 can be recorded along with the effects of opening and closing windows and doors.

Equipment required:

LogIT Carbon Dioxide sensor
LogIT data logger

Hazards:

Place the apparatus in such a way that it will not come into contact with water or be exposed to excessive moisture.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous material.

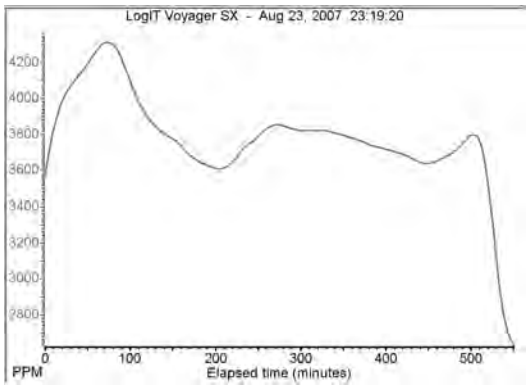
Suggested Method

1. Position the CO_2 sensor on a suitable table.
2. Connect the sensor to the LogIT Data logger and to a suitable power source.
3. Switch on the logger and allow the sensor to stabilise for 10 minutes.
4. Start logging the CO_2.
5. After a predetermined time eg. near the end of the lesson, stop logging.

Note: This procedure can be run for the length of a lesson or during an entire day. It is also good logging practise to add markers when an event occurs such as a window being opened or a door left ajar. You may also like to perform the experiment connected to a computer and the results discussed during the lesson as changes take place.

Results:

What do the results show?
Can you see a pattern?
How does opening a window affect the readings?



Going further:

What other rooms might you consider monitoring?
Monitor a sports hall during a sports event. How might the level of CO_2 effect the performance of the players?

Environment

Human breath

Subject: Biology

Sensor: Carbon Dioxide sensor

Overview:
By breathing into a bag, the amount of CO_2 can be recorded before and after exercise to see if more or less CO_2 is expelled.

Equipment required:

LogIT Carbon Dioxide Sensor
LogIT data logger
Computer
Large plastic bag or similar.

Hazards:

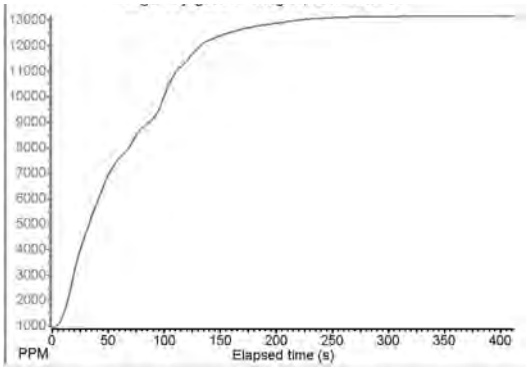
Ensure any exercise is suitable for the student and the surrounding environment.
Always check your local regulations or the school advisory
service such as CLEAPSS or SSERC for guidance on the use of any hazardous material.

Suggested Method

1. Place the CO_2 sensor into a large plastic bag.
2. Plug the sensor into a LogIT data logger and connect to the computer
3. Switch on the logger and allow the sensor to stabilise for 10 minutes.
4. Breathe into the bag and allow the value to 'peak'. Record the value.
5. Perform some exercise.
6. Again, breathe into the bag and note the 'peak' value.

Note: It is important that when breathing into the bag the breath is not forced out as over range and false readings can be taken. It might be better to simply breathe normally and then placed the bag over the mouth at a suitable out breath. A large bin liner was found to produce good results. You can 'overlay' the two sets of results.

Results:



What do the results show?
Does this confirm your prediction as to what might happen?
Why is there a change in the amount of CO_2?
What does this suggest is happening in the body during exercise?

Going further:

Try monitoring different forms of exercise. Does this make a difference to the CO_2 levels?
What other sensors might be used in conjunction with the CO_2 to show how the body works during exercise? An example might be a temperature sensor or Heart receiver.

Biology

Pollution - Road side monitoring

Subject: Environmental

Sensor: Carbon Dioxide sensor

Overview:
By mounting the Carbon Dioxide sensor by the side of a road, the CO_2 levels emitted by passing traffic can be directly compared with other roads in different locations.

Equipment required:

LogIT Carbon Dioxide sensor
LogIT data logger
Laptop computer & clamp stand

Hazards:

Students should be supervised at all times when used near roads or by traffic.
Do not cause a distraction to any road users.
Place the apparatus in such a way that it will not come into contact with water or be exposed to excessive moisture.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous material.

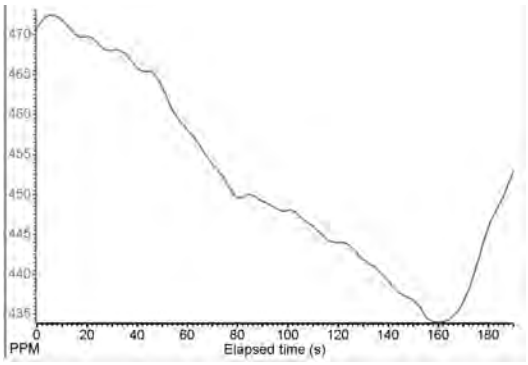
Suggested Method

1. Attach the CO_2 sensor to the logger and connect the logger to the computer. (The photo shows a LogIT Black Box data logger being used).
2. Connect the sensors power cable to the laptop using the USB cable.
3. Switch on the logger/computer and allow the sensor to stabilise for 10 minutes.
4. Start logging the CO_2.
5. After a predetermined time stop logging.

Note: For this example, the sensor was mounted in a clamp stand at a height of 250cm near a road.

Results:

What happens to the CO_2 levels?
Where is this CO_2 coming from?
How might buildings affect the readings?



Going further:

How might different times of day change the results?
How might the height of the sensor effect the results ie. what would the levels of Carbon Dioxide be at the height of an office window?
What might the readings be in a rural location?

Environment

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Waste electrical and electronic products must not be disposed of with household waste.
Please recycle where facilities exist.
Check with your Local Authority or Retailer for recycling advice.

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