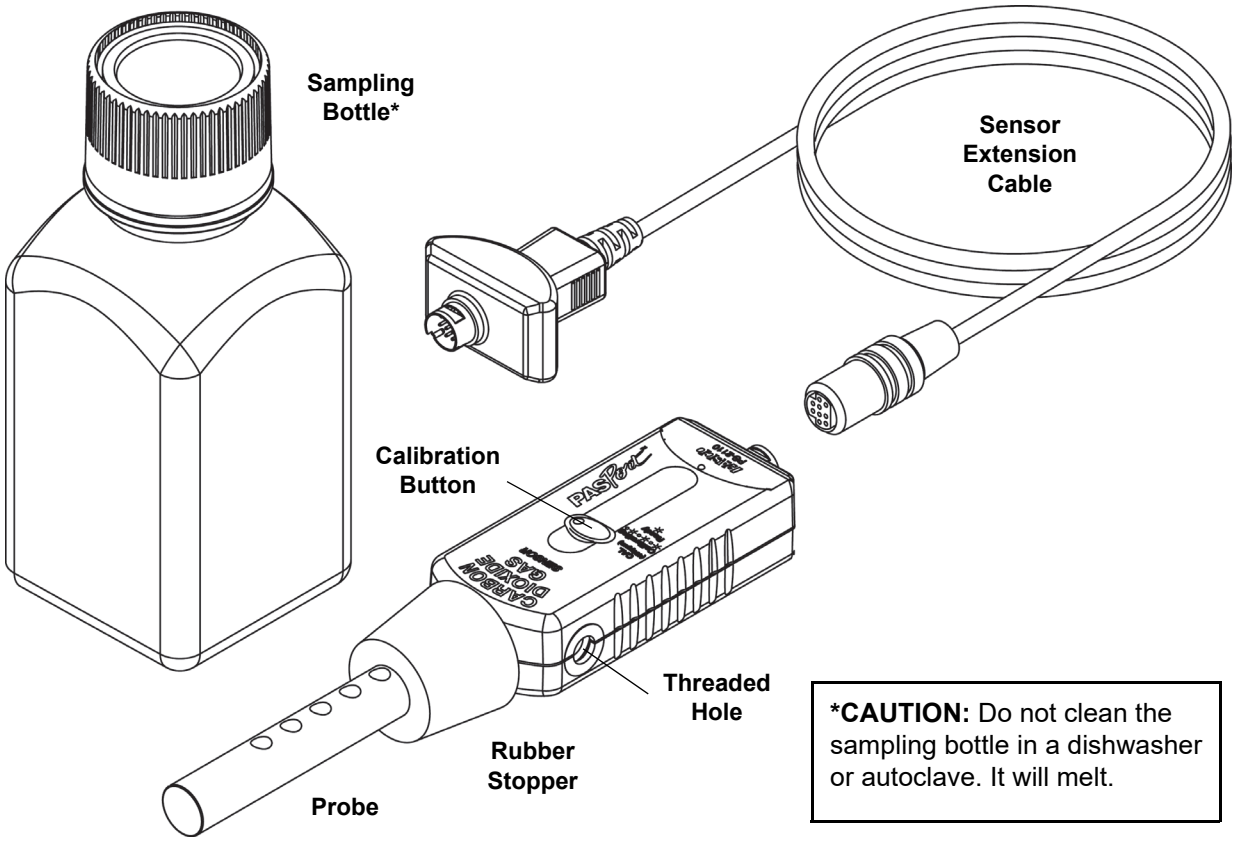
Carbon Dioxide Gas Sensor

PS-2110



***CAUTION:** Do not clean the sampling bottle in a dishwasher or autoclave. It will melt.

Included Items
Carbon Dioxide Gas Sensor
Sampling Bottle, Clear, 250 mL
Sensor Extension Cable (PS-2500)
Rubber Stopper

Required Items*
PASCO Interface
PASCO Data Collection Software

**See the PASCO catalog or the PASCO web site at www.pasco.com for more information.*

Introduction

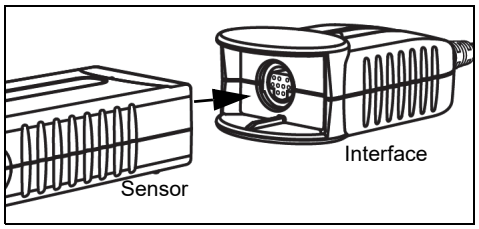
The PS-2110 Carbon Dioxide Gas Sensor measures carbon dioxide gas concentration in parts per million in gases such as air. The sensor is designed only for educational purposes and is not intended for environmental compliance studies.

The sensor is designed to work with a PASPORT-compatible interface and PASCO data collection software (such as PASCO Capstone or SPARKvue) to measure carbon dioxide gas concentration.

The sensor includes a sensor extension cable, a 250 mL clear plastic sampling bottle, and a stopper that fits over the sensor's probe.

Setup the Carbon Dioxide Gas Sensor

- Plug the Carbon Dioxide Gas Sensor into a PASPORT input port of a PASCO interface.



NOTE: If more distance is needed between the sensor and the interface, plug the sensor into the included Extension Cable, and then plug the cable into the interface.

- Insert the sensor probe into the gas sample. Allow 90 seconds for the sensor to warm up with the probe temperature between 20° and 30° C.
- Start the PASCO data collection software.

Using the PASCO Data Collection Software

- Set up a data display (such as a Digits or Graph display) in the software.
- In PASCO Capstone, click one of the display templates in the workbook page, or double-click an icon in the "Displays" palette to open a data display.
- In the SPARKvue sensor parameter screen, touch 'CO2 Concentration' to highlight it, and then touch 'Show' to open a Graph display.
- Click "Record" (in Capstone) or touch 'Start' in SPARKvue to begin recording data.

CAUTION:

The sensor was not designed for use in liquids, dusty or windy environments, or in direct sunlight. Do not place the sensor in liquid samples such as water or beverages as this will permanently damage the sensor. Using the sensor in dusty or windy environments or in direct sunlight may cause anomalous readings. The operating temperature range is between 20° and 30°C.

NOTE: Do not try to remove the probe from the sensor. It is not removable.

STORAGE:

Always store the sensor in the plastic zip-lock bag to minimize distorted sensor readings due to dust and dirt.

Collecting CO_2 Samples

Use the sampling bottle to collect air samples, such as an atmospheric sample or the carbon dioxide gas produced from germinating seeds.

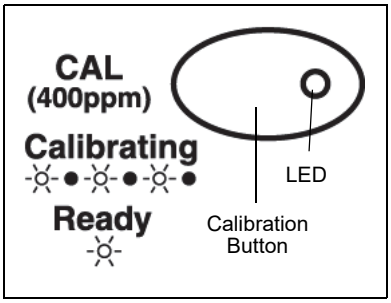
To collect an atmospheric sample

Keep the bottle upright and the neck open (without the stopper). Wait long enough to allow atmospheric air to fill the bottle. Insert the probe with the stopper into the neck of the bottle. Be sure that the stopper fits snugly into the neck of the bottle.

To collect expired air or other gas samples

Collect the sample in a plastic bag and clamp the bag closed. To take a reading, open the bag and immediately place it over the probe and stopper, holding the bag tightly around the stopper.

Sensor Calibration



Because the sensor is factory calibrated, calibration is not required for most activities. However, the sensor's characteristics may change over time. To restore the sensor to its factory-calibrated state, perform the calibration using a fresh air sample.

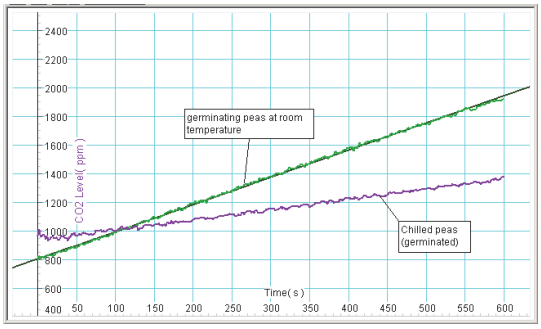
(**NOTE**: Refer to the User's Guide and On-Line Help for the data collection software.)

- Collect a sample of fresh air (400 to 450 ppm CO_2).
- Insert the probe with stopper into the upright sampling bottle. Be sure that the stopper fits snugly into the neck of the bottle.
- Connect the sensor to a PASPORT-compatible interface. Set up a digits display and start recording data. Wait at least 90 seconds for the reading to stabilize.
- Press the Calibrate button (CAL) for 3 seconds and then release it. The green light emitting diode (LED) will start blinking once per second to indicate that calibration has begun.
- Wait approximately two minutes. When the green LED stops blinking, the initial (first) calibration is finished.
- For the second calibration, wait five minutes. Press the Calibrate button (CAL). Wait two minutes. When the LED stops blinking, the second (final) calibration is finished.
- Check that the reading in the data acquisition software is 400 ppm ±50 ppm (parts per million).

Suggested Activities

Cellular Respiration of Peas

- Put 1/4 cup of dry pea seeds in the sampling bottle. Insert the probe and stopper into the neck of the bottle.
- Connect the sensor to a PASPORT-compatible interface and start the data collection software.
- Record data for about 10 minutes; this is the baseline reading before germination.
- Disconnect the sensor from the interface and remove the probe from the sampling bottle.
- Moisten the pea seeds with a few teaspoons of water. Place a dark cloth over the bottle and allow the peas to germinate overnight.
- Reconnect the sensor and put the probe and stopper back into the neck of the bottle. Do not let the probe or sensor get wet.
- Record data for about 10 minutes, and compare the carbon dioxide concentration *after* germination to the concentration *before* germination.



- Try the experiment with germinated pea seeds at different temperatures.

Other Activities

- Plant Respiration versus Photosynthesis
- Cellular Respiration
- Animal Respiration
- Air Quality Evaluations
- Sublimation of Solid CO_2 (dry ice)
- Rate of CO2 Generation in Chemical Reactions
- Decomposition Rate of Organic Materials in Soils
- Measurement of Carbon Dioxide Concentration from Various Sources

More Information

For the latest information about the Carbon Dioxide Gas Sensor, visit the PASCO web site at www.pasco.com and enter “PS-2110” in the Search window.

Specifications

Item	Value
Range:	**±0 to 300,000 ppm**
Accuracy:	**0 to 50,000 ppm: 100 ppm or 10% of value, whichever is greater 10,000 to 50,000 ppm: 20% of value Over 50,000 ppm: qualitative only**
Resolution	**1 ppm**
Operating Temperature	**+20° to +30°C**
Relative Humidity	**5 to 95% non-condensing**
Repeatability	**±50 ppm or 5% of value, whichever is greater**

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: +1 916-462-8384 (worldwide)
877-373-0300 (U.S.)

E-mail: support@pasco.com

Web www.pasco.com

Limited Warranty For a description of the product warranty, see the PASCO catalog. **Copyright** The PASCO scientific *Instruction Sheet* is copyrighted with all rights reserved. Permission is granted to non-profit educational institutions for reproduction of any part of this manual, providing the reproductions are used only in their laboratories and classrooms, and are not sold for profit. Reproduction under any other circumstances, without the written consent of PASCO scientific, is prohibited. **Trademarks** PASCO, PASCO Capstone, PASPORT, and SPARKvue are trademarks or registered trademarks of PASCO scientific, in the United States and/or in other countries. For more information visit www.pasco.com/legal.

Product End of Life Disposal Instructions:

This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol (to the right) and on the product or its packaging indicates that this product must not be disposed of in a standard waste container.