Wireless Colorimeter and Turbidity Sensor (PS-3215)

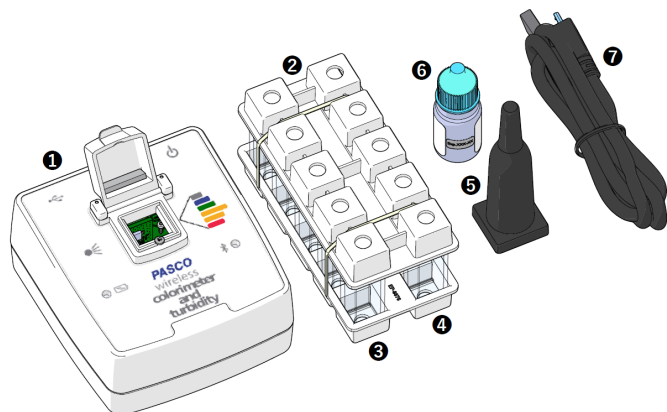## Wireless Colorimeter and Turbidity Components

About the Product

The colorimeter simultaneously measures the absorbance and transmittance of six different wavelengths. The sensor can be used to study Beer's law (absorbance versus concentration), enzyme activity, photosynthesis, and the rates of chemical reactions (absorbance versus time). The colorimeter is now calibrated to read concentrations directly from our ezSample Snap Vial test kits.

The sensor also functions as a turbidimeter for water quality analysis. Rather than measuring transmitted light, the turbidity sensor measures light scattered at a 90 degree angle from the sample. Turbidity level (cloudiness) of water samples is measured in nephelometric turbidity units (NTU).

What's Included

- ❶ Wireless Colorimeter and Turbidity Sensor
- ❷ 2x Cuvette Rack
- ❸ 4x Cuvette with Cap, smooth
- ❹ 6x Cuvette with Cap, lined
- ❺ Ampoule Cap
- ❻ 100 NTU Calibration Solution
- ❼ Micro USB Cable
- ❽ 2x Label, 100 NTU Cuvette (not shown)
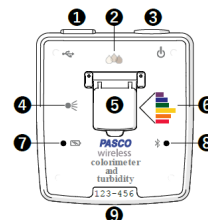- ❾ 2x Label, 100 NTU Expiration (not shown)

Required Items

- **SPARKvue or PASCO Capstone Software**
  PASCO software is required for data collection and analysis

Required Items for Water Quality Measurements

- **ezSample Snap Vial Test Kit**
  Chemical analysis of water samples requires an ezSample kit for the chemical being tested. Kits are available for testing Ammonia, Chlorine, Iron, Phosphate, and Nitrate. Search for "ezSample" at **pasco.com** to purchase the kits. (Note that other ion test kits do not require a colorimeter to determine concentration.)

❶ USB Port

Use with the USB cable to connect to a USB wall charger to charge the battery. Connect to a USB port of a computer or mobile device to send measurement data to software (iOS devices not supported).

❷ Turbidity Sensor

Consists of a photodiode that measures the amount of light scattered by a test sample at 90 degrees. When using or calibrating this sensor, ensure that you are using a smooth cuvette.

❸ Power Button

Press and hold for 1 second to turn the sensor on or off.

❹ Light Source

Consists of a white LED for Colorimeter measurements and an Infrared LED for Turbidity measurements.

❺ Test Chamber

Insert a cuvette containing a test solution or an ezSample Snap Vial ampoule. Keep out ambient light by closing the cover when using cuvettes or covering ampoules using the Ampoule Cap. (If the Ampoule Cap is lost, cover the ampoule with a crupled paper towel or small cloth instead.)

❻ Colorimeter Sensor

Consists of a spectral sensor capable of detecting six wavelenths of light. The sensor measures the intensity of light transmitted through a solution in the test chamber. When using this sensor, ensure that you use a lined cuvette with the smooth sides **between the light source and sensor (left to right)**.

❼ Battery Status Light

Indicates the battery charge and charging status.

Light	Status
Red (blink)	Low charge (20%)
Green (solid)	Full charge
Yellow (solid)	Charging

❽ Bluetooth Status Light

Indicates the status of the Bluetooth connection.

Light	Status
Red (blink)	Ready to pair
Green (blink)	Paired
Yellow (blink)	Remotely logging data

❾ Device ID

Use to identify the sensor when connecting using Bluetooth.

Getting Started

This section contains tasks that should be performed before using the device in the classroom.

Charge the Battery

The Wireless Colorimeter and Turbidity Sensor contains a rechargeable battery that lasts an entire school day when fully charged. Charge the battery before using the Wireless Colorimeter and Turbidity Sensor for the first time, since it is not shipped with a full charge.

To charge the battery, connect the sensor to a USB wall charger or powered USB port using the USB cable. The battery status light will be solid yellow while the battery is charging. The light will change to solid green when the battery is fully charged.

Install or Update Software

The latest update of PASCO Capstone or SPARKvue is required to use the Wireless Colorimeter and Turbidity Sensor. Download the software at the locations provided. If the software is already installed, check for an update using the provided instructions.

SPARKvue®

Windows and Mac Computers
Download: Go to **pasco.com/sparkvue**, then click **Downloads**. Update: Click 🗏, then select **Check for Updates**.

Mobile Devices and Chromebooks
Search for SPARKvue in your device's app store. SPARKvue will automatically install future updates.

PASCO capstone™

Windows and Mac Computers
Download: Go to **pasco.com/capstone**, then click **Downloads**. Update: Click **Help**, then select **Check for updates**.

Check for a Firmware Update

It is important to update the sensor firmware to the latest version to access the latest features and bug fixes. Sensor firmware is installed using SPARKvue or PASCO Capstone. Connect the sensor to SPARKvue or PASCO Capstone to check for a firmware update.

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open SPARKvue or PASCO Capstone, then click **Sensor Data** (SPARKvue) or **Hardware Setup** (PASCO Capstone).
3. Select the Wireless Colorimeter and Turbidity Sensor that matches the device ID.

If a notification appears that indicates a firmware update is available, click **Yes** to install the update. If a notification does not appear, the firmware is up to date.

Using the Colorimeter

Use the colorimeter to measure the absorbance and transmittance of six different wavelengths.

Step 1: Prepare Solutions for Analysis

When preparing solutions for analysis:

- Use the lined cuvettes.
- Handle the cuvettes by the lined sides to avoid getting fingerprints on the smooth sides.
- Fill cuvettes ¾ full with the test solution and cap the cuvette.
- Clean the smooth sides of the cuvette using a lint-free wipe before inserting it into the test chamber.

Step 2: Prepare a Blank Calibration Cuvette

Fill one lined cuvette ¾ full with the solvent used to prepare the test solutions. The solvent is used to calibrate the colorimeter.

Step 3: Set Up Data Collection

SPARKvue®

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open SPARKvue, then click **Sensor Data** 📊.
3. Select the Colorimeter that matches the device ID.
4. Select a Quick Start Experiment.
   a. **Absorbance and Transmittance**
      Measure absorbance and transmittance of a solution at six different wavelengths on a bar meter display.
   b. **Beer's Law**
      Plot absorbance versus concentration of known solutions to determine the unknown concentration of a solution.

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1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open PASCO Capstone, then click **Hardware Setup** 🖥️.
3. Select the Colorimeter that matches the device ID.

> ✏️ **NOTE:** You may be prompted to calibrate the sensor here. If you want to calibrate now, click **Calibrate** and proceed to the **Calibrate the Sensor** section. Otherwise, click **Cancel**.

4. Click **Hardware Setup** 🖥️ again to close the panel.
5. Select a Quick Start Experiment.
   a. **Absorbance and Transmittance**
      Measure absorbance and transmittance of a solution at six different wavelengths on a bar meter display.
   b. **Beer's Law**
      Plot absorbance versus concentration of known solutions to determine the unknown concentration of a solution.

Step 4: Calibrate the Sensor

SPARKvue®

1. Click **Hardware Setup** 📊, then click ⚙ for the **Wireless Colorimeter**.
2. Insert the blank calibration cuvette into the Colorimeter *with the smooth sides facing left to right so the light can pass through to the sensor* and close the cover.
3. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
4. Click **Done**, then close Hardware Setup.

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1. Click **Calibration** 🟢. Select **Wireless Colorimeter** from the list, then click **Next**.
2. Insert the blank calibration cuvette into the Colorimeter *with the smooth sides between the light source and the sensor* and close the cover.
3. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
4. Click **Finish**, then click **Calibration** 🟢 again to close the panel.

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Step 5: Collect Data (Absorbance and Transmittance)

⊡ SPARKvue®

1. Insert a cuvette containing your test sample with the smooth sides between the light source and the sensor and close the cover.
2. Click **Start** ● to begin data collection.
3. Click **Stop** ■ to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

◭ PASCO capstone™

1. Insert a cuvette containing your test sample with the smooth sides between the light source and the sensor and close the cover.
2. Click **Record** ● to begin data collection.
3. Click **Stop** ◼ to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

Step 5: Collect Data (Beer's Law)

⊡ SPARKvue®

1. Click **Start** ● to begin data collection.
2. Insert a cuvette containing a solution of known concentration with the smooth sides between the light source and the sensor and close the cover.
3. Enter the known concentration in the table.
4. Click **Keep** ✅ to record the Absorbance measurement.
5. Repeat Steps 2 to 4 for each known solution.
6. Click **Stop** ■ to end data collection.

◭ PASCO capstone™

1. Click **Preview** ◯ to begin data collection.
2. Insert a cuvette containing a solution of known concentration with the smooth sides between the light source and the sensor and close the cover.
3. Enter the known concentration in the table.
4. Click **Keep Sample** ✔ to record the Absorbance measurement.
5. Repeat Steps 2 to 4 for each known solution.
6. Click **Stop** ◼ to end data collection.

Using the Water Quality Colorimeter

Use the colorimeter to perform a chemical analysis of water samples using ezSample Snap Vial test kits.

Step 1: Prepare Samples for Analysis

ezSample Snap Vial test kits can be used to test for concentrations of Ammonia, Chlorine, Iron, Phosphate, and Nitrate. Refer to the documentation for the ezSample Snap Vial Kit for instructions on how to prepare the samples. When preparing the samples:

- Clean the ampoule using a lint-free wipe before inserting it into the test chamber.
- Handle the ampoules by the tip to avoid getting fingerprints on the ampoule body.
- Cover the ampoule in the test chamber with the Ampoule Cap to keep out ambient light.

Figure 1. Ampoule cap covering an ezSample Snap Vial ampoule inserted into the test chamber.

Step 2: Set Up Data Collection

⊡ SPARKvue®

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open SPARKvue, then click **Sensor Data** 📊.
3. Select the Colorimeter that matches the device ID.
4. Deselect ☐ the default measurement, then select ☑ a chemical to measure. (You may need to scroll down to see the additional measurements.)
5. Under **Templates**, select **Digits**.

◭ PASCO capstone™

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open PASCO Capstone, then click **Hardware Setup** 🖥.
3. Select the Colorimeter that matches the device ID.

> ✏ **NOTE:** You may be prompted to calibrate the sensor. If you want to calibrate now, click **Calibrate** and proceed to the **Calibrate the Sensor** instructions. Otherwise, click **Cancel**.

4. Click **Data Summary** ◭.
5. Double-click **Digits** 🔢 in the Displays palette.
6. Click and drag **Turbidity (NTU)** into the Digits display.
7. Click **Data Summary** ◭ again to close the panel.

Step 3: Calibrate the Sensor

⊡ SPARKvue®

1. Click **Hardware Setup** 🔧, then click ⚙ for the **Wireless Colorimeter**.
2. Insert the calibration ampoule included with the ezSample Kit into the Colorimeter; cover with the Ampoule Cap.
3. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
4. Click **Done**, then close **Hardware Setup**.

◭ PASCO capstone™

1. Click **Calibration** 🟢. Select **Wireless Colorimeter** from the list, then click **Next**.
2. Insert the calibration ampoule included with the ezSample Kit into the Colorimeter; cover with the Ampoule Cap.
3. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
4. Click **Finish** , then click **Calibration** 🟢 again to close the panel.

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Step 4: Collect Data

⊡ SPARKvue®

1. Insert an ampoule containing your sample and cover with the Ampoule Cap.
2. Click **Start** 🟢 to begin data collection.
3. Click **Stop** 🟥 to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

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1. Insert an ampoule containing your sample and cover with the Ampoule Cap.
2. Click **Record** 🔴 to begin data collection.
3. Click **Stop** 🟧 to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

Using the Turbidity Sensor

Use the Turbidity sensor to measure the turbidity level (cloudiness) of a water sample.

Step 1: Prepare Solutions for Analysis

When preparing solutions for analysis:

- Use the smooth cuvettes that do not have lines.
- Fill cuvettes ¾ full with the test solution and cap the cuvette.
- Clean the smooth sides of the cuvette using a lint-free wipe before inserting it into the test chamber.

Step 2: Prepare a Blank Calibration Cuvette

Deionized water is used for the first calibration point. Fill one smooth cuvette ¾ full with deionized water and cap the cuvette.

Step 3: Prepare a 100 NTU Calibration Cuvette

The 100 NTU solution is used for the second calibration point.
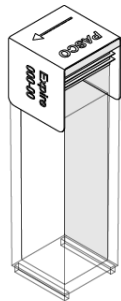

Figure 2. A cuvette with the 100 NTU label placed over the cap with the expiration date label attached.

1. Fill one smooth cuvette ¾ full with the 100 NTU solution and cap the cuvette.
2. Place a 100 NTU cuvette label over the cuvette cap, as shown in the figure.
3. Place an expiration date label on the 100 NTU Cuvette label.

> ✏️ **NOTE:** The 100 NTU standard sample should provide accurate results (±7%) up to the expiration date.

Step 4: Set Up Data Collection

⊡ SPARKvue®

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open SPARKvue, then click **Sensor Data** 📊.
3. Select the Colorimeter that matches the device ID.
4. Toggle the **Wireless Turbidity Sensor** switch from disable ⚪ to enable 🔵. (You may need to scroll down the list of measurements to see the sensor.)
5. Under **Templates**, select **Digits**.

◢ **PASCO** capstone™

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open PASCO Capstone, then click **Hardware Setup** 🖥️.
3. Select the Colorimeter that matches the device ID.

> ✏️ **NOTE:** You may be prompted to calibrate the sensor here. If you want to calibrate now, click **Calibrate** and proceed to the **Calibrate the Sensor** section. Otherwise, click **Cancel**.

4. Toggle the **Wireless Turbidity Sensor** switch from disable ⚪ to enable 🔵.
5. Click **Data Summary** 🔺.
6. Double-click **Digits** 🔢 in the Displays palette.
7. Click and drag **Turbidity (NTU)** into the Digits display.
8. Click **Data Summary** 🔺 again to close the panel.

Step 5: Calibrate the Sensor

⊡ SPARKvue®

1. Click **Hardware Setup** 🔧, then click ⚙ for the **Wireless Turbidity Sensor**.
2. Insert the blank calibration cuvette into the test chamber and close the cover.
3. Click **Calibrate** in item 3. A green check mark will indicate that calibration is complete.
4. Remove the blank calibration cuvette, then insert the 100 NTU Standard cuvette into the test chamber and close the cover.
5. Click **Calibrate** in item 4. A green check mark will indicate that calibration is complete.
6. Click **Done**, then close **Hardware Setup**.

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1. Click **Calibration** 🟢. Select **Wireless Turbidity Sensor** from the list, then click **Next**.
2. Insert the blank calibration cuvette into the test chamber and close the cover.
3. Click **Calibrate** for the blank calibration cuvette. A green check mark will indicate that calibration is complete.
4. Remove the blank calibration cuvette, then insert the 100 NTU Standard cuvette into the test chamber and close the cover.
5. Click **Calibrate** for the 100 NTU Standard cuvette. A green check mark will indicate that calibration is complete.
6. Click **Finish**, then click **Calibration** 🟢 again to close the panel.

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Step 6: Collect Data

⊡ SPARKvue®

1. Insert a cuvette containing a test sample into the test chamber and close the cover.
2. Click **Start** 🟢 to begin data collection.
3. Click **Stop** 🟥 to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

☁ PASCO capstone™

1. Insert a cuvette containing a test sample into the test chamber and close the cover.
2. Click **Record** 🔴 to begin data collection.
3. Click **Stop** 🟥 to end data collection.
4. Repeat Steps 1 to 3 for additional test samples.

Experiment files

Download one of several student-ready activities from the PASCO Experiment Library. Experiments include editable student handouts and teacher notes. Visit pasco.com/freelabs/PS-3215.

Software Help

Additional information on how to use the Wireless Colorimeter and Turbidity Sensor with SPARKvue and Capstone can be found in the SPARKvue and PASCO Capstone Help. The help can be accessed within the software or online.

⊡ SPARKvue®
Software: Click ☰, then select **Help**.

Online: **pasco.com/help/sparkvue**

☁ PASCO capstone™
Software: In the menu bar, click **Help**, then select **PASCO Capstone Help**.

Online: **pasco.com/help/capstone**

Additional Information

Visit the product web page at **pasco.com/product/ps-3215** for additional information, including:

- Specifications
- Buying Guide (Accessories, Replacement Parts)
- Experiments
- Documents (Knowledge Base, Safety Sheeets)

Technical Support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

☐ Chat	pasco.com
📞 Phone	1-800-772-8700 x1004 (USA)
	+1 916 462 8384 (outside USA)
✉ Email	support@pasco.com

Regulatory Information

Limited Warranty
For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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Product end-of-life disposal
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 or disposal service, or the place where you purchased the product.
The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

FCC statement
This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE statement
This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

Battery disposal
Batteries contain chemicals that, if released, may affect the environment and human health.
Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations.
To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative.
The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.