

Wireless Colorimeter and Turbidity Sensor

PS-3215A

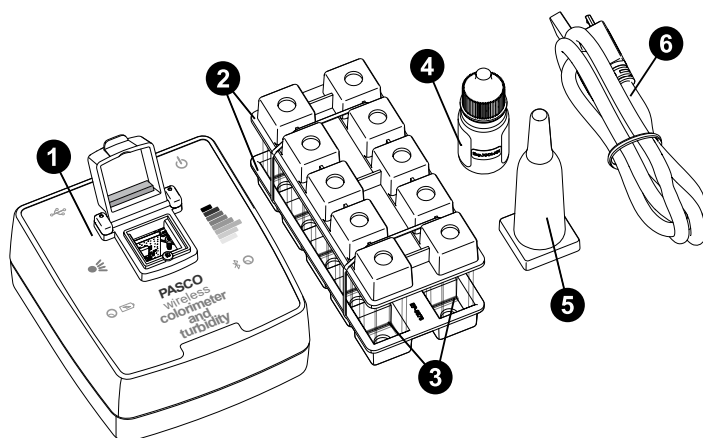
Introduction

The Wireless Colorimeter and Turbidity Sensor simultaneously measures the absorbance and transmittance of eight different wavelengths of light. 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 can also be used for the chemical analysis of water samples using PASCO's 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).

Components

Included components:



- 1 Wireless Colorimeter and Turbidity Sensor (PS-3215A)
- 2 2× cuvette racks
- 3 10× cuvettes (4× smooth, 6× lined) with caps
- 4 100 NTU calibration solution
- 5 Ampoule cap
- 6 Micro USB cable
- 7 2× 100 NTU cuvette labels (not shown)
- 8 2× 100 NTU expiration labels (not shown)

Required items:

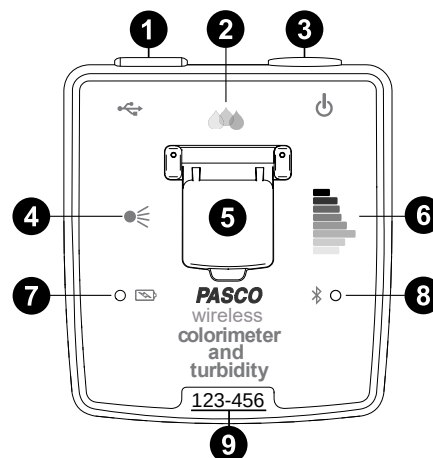
- PASCO Capstone or SPARKvue data collection software

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" on pasco.com to purchase the kits.

Features



1 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. Note that iOS devices do not support this connection method.

2 Turbidity sensor

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

3 Power button

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

4 Light source

Consists of a white LED for colorimeter measurements and an infrared LED for turbidity measurements.

5 Test chamber

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

6 Colorimeter sensor

Consists of eight spectral sensors, each filtered for a different range of wavelengths 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 two clear sides between the light and the sensor.

7 Battery Status LED

Blinks red to indicate that the sensor's battery is low and needs to be recharged. Turns yellow to indicate that the battery is charging. Turns green to indicate that the battery is fully charged.

8 Bluetooth Status LED

Indicates the status of the Bluetooth connection.

LED	Status
Red blink	Ready to pair
Green blink	Paired
Yellow blink	Remotely logging data

9 Device ID

Use to identify the sensor when connecting via Bluetooth.

Getting started

Initial step: Charge the battery

Charge the battery by connecting the micro USB port to any standard USB charger. The Battery Status LED is solid yellow while charging. When fully charged, the LED changes to solid green.

Get the software

You can use the sensor with SPARKvue or PASCO Capstone software. If you're not sure which to use, visit [pasco.com/products/guides/software-comparison](https://www.pasco.com/products/guides/software-comparison).

SPARKvue is available as a free app for Chromebook, iOS, and Android devices. We offer a free trial of SPARKvue and Capstone for Windows and Mac. To get the software, go to [pasco.com/downloads](https://www.pasco.com/downloads) or search for **SPARKvue** in your device's app store.

If you have installed the software previously, check that you have the latest update:

 **SPARKvue:** Main Menu  > Check for Updates

 **PASCO Capstone:** Help > Check for Updates

Check for a firmware update

SPARKvue

1. Press the power button until the LEDs turn on.
 2. Open SPARKvue, then select **Sensor Data** on the Welcome Screen.
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3. From the list of available devices, select the sensor that matches your sensor's device ID.
 4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
 5. Close SPARKvue once the update is complete.

PASCO Capstone

1. Press the power button until the LEDs turn on.
2. Open PASCO Capstone and click **Hardware Setup**  in the Tools palette.
3. From the list of available wireless devices, select the sensor that matches your sensor's device ID.

4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
5. Close Capstone once the update is complete.

Using the colorimeter

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

Step 1: Prepare solutions for analysis

When preparing solutions for colorimeter analysis:

- Use the lined cuvettes.
- Handle the cuvettes by the lined sides to avoid getting fingerprints on the smooth sides.
- Fill cuvettes $\frac{3}{4}$ 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 $\frac{3}{4}$ full with the solvent used to prepare the test solutions. The solvent will be 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. From the list of available wireless devices, select the sensor with a device ID matching the ID printed on your sensor.
4. Select a Quick Start Experiment from the column on the right.
 - **Absorbance and Transmittance**
Measure absorbance and transmittance of a solution at eight different wavelengths on a bar meter display.
 - **Beer's Law**
Plot absorbance versus concentration of known solutions to determine the unknown concentration of a solution.

 **NOTE:** Upon opening the Quick Start Experiment, you may be prompted to calibrate the sensor. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the SPARKvue section of **Calibrate the sensor**. Otherwise, click **Cancel**.

PASCO Capstone:

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open Capstone. Click **Hardware Setup**  in the Tools palette.
3. From the list of available wireless devices, select the sensor with a device ID matching the ID printed on your sensor.

 **NOTE:** Upon connecting the sensor, you may be prompted to calibrate it. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the Capstone section of **Calibrate the sensor**. Otherwise, click **Cancel**.

4. Click **Hardware Setup**  again to close the tool.
5. A list of Quick Start Experiments will be visible in the main window. Select one of the following Quick Start Experiments.
 - **Absorbance and Transmittance**
Measure absorbance and transmittance of a solution at eight different wavelengths on a bar meter display.
 - **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. Select **Hardware Setup** , then click the **Calibration**  button for the **Wireless Colorimeter**.
2. Insert the blank calibration cuvette into the test chamber, with the smooth sides between the light and 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.

PASCO Capstone:

1. Click **Calibration**  in the **Tools** palette.
2. Select **Wireless Colorimeter** from the list of available sensors and click **Next**.
3. Insert the blank calibration cuvette into the test chamber, with the smooth sides between the light and sensor, and close the cover.
4. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
5. Click **Finish**, then click **Calibration**  again to close the tool.

Step 5: Collect data (Absorbance and Transmittance)

SPARKvue:

1. Insert a cuvette containing your test sample into the test chamber, with the smooth sides between the light and sensor, and close the cover.
2. Click **Start**  to begin data collection.
3. When you have obtained your necessary data, click **Stop**  to end data collection.
4. Remove the sample cuvette from the test chamber.
5. Repeat the above steps for any additional test samples.

PASCO Capstone:

1. Insert a cuvette containing your test sample into the test chamber, with the smooth sides between the light and sensor, and close the cover.
2. Click **Record**  to begin data collection.
3. When you have obtained your necessary data, click **Stop**  to end data collection.
4. Remove the sample cuvette from the test chamber.
5. Repeat the above steps for any 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 into the test chamber, with the smooth sides between the light and sensor, and close the cover.
3. Enter the known concentration into the table.
4. Click **Keep**  to record the Absorbance measurement.
5. Remove the sample cuvette from the test chamber.
6. Repeat Steps 2 through 5 for each known solution.
7. When you have all necessary data, 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 into the test chamber, with the smooth sides between the light and sensor, and close the cover.
3. Enter the known concentration into the table.
4. Click **Keep Sample**  to record the Absorbance measurement.
5. Remove the sample cuvette from the test chamber.
6. Repeat Steps 2 through 5 for each known solution.
7. When you have all necessary data, click **Stop**  to end data collection.

Using the water quality colorimeter

Use the colorimeter to perform 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, or nitrate. Refer to the documentation for your chosen 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.
- To keep out ambient light, cover the ampoule in the test chamber with the ampoule cap, as shown in Figure 1.

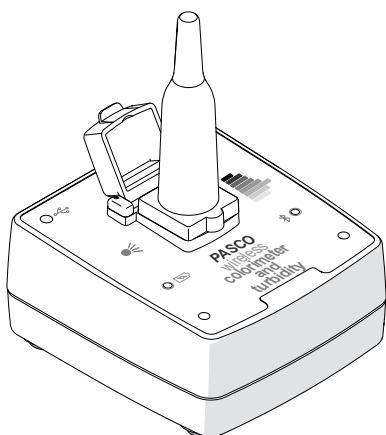


Figure 1. Ampoule cap covering an ezSample Snap Vial ampoule inserted into the test chamber.

Step 2: Set up data collection

SPARKvue:

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open SPARKvue, then click **Sensor Data**.
3. From the list of available wireless devices, select the sensor with a device ID matching the ID printed on your sensor.
4. Deselect ☐ the default measurement, then select ☒ the chemical corresponding to your ezSample Snap Vial test kit. (You may need to scroll down to see the additional measurements.)
5. Under **Templates**, select **Digits** to open the Experiment Screen. A digits display measuring your selected chemical in mg/L will automatically be created.

NOTE: Upon creating the display, you may be prompted to calibrate the sensor. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the SPARKvue section of **Calibrate the sensor**. Otherwise, click **Cancel**.

PASCO Capstone:

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open Capstone. Click **Hardware Setup** in the **Tools** palette.

3. From the list of available wireless devices, select the sensor with a device ID matching the ID printed on your sensor.

NOTE: Upon connecting the sensor, you may be prompted to calibrate it. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the Capstone section of **Calibrate the sensor**. Otherwise, click **Cancel**.

4. Double-click the **Digits** icon in the **Displays** palette.
5. In the digits display, click **<Select Measurement>** and select the chemical corresponding to your ezSample Snap Vial test kit.

Step 3: Calibrate the sensor

SPARKvue:

1. Select **Hardware Setup**, then click the **Calibration** button for the **Wireless Colorimeter**.
2. Insert the calibration ampoule included with the ezSample kit into the test chamber. Cover the chamber 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** in the **Tools** palette.
2. Select **Wireless Colorimeter** from the list of available sensors and click **Next**.
3. Insert the calibration ampoule included with the ezSample kit into the test chamber. Cover the chamber with the ampoule cap.
4. Click **Calibrate**. A green check mark will indicate that the colorimeter is calibrated.
5. Click **Finish**, then click **Calibration** again to close the tool.

Step 4: Collect data

SPARKvue:

1. Insert an ampoule containing your sample into the test chamber. Cover the chamber with the ampoule cap.
2. Click **Start** to begin data collection.
3. When you have all required data, click **Stop** to end data collection.
4. Remove the ampoule from the test chamber.
5. Repeat the above steps for any additional test samples.

PASCO Capstone:

1. Insert an ampoule containing your sample into the test chamber. Cover the chamber with the ampoule cap.
2. Click **Record** to begin data collection.
3. When you have all required data, click **Stop** to end data collection.
4. Remove the ampoule from the test chamber.
5. Repeat the above steps for any 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 $\frac{3}{4}$ full with the test solution, then 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 $\frac{3}{4}$ 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.

1. Fill one smooth cuvette $\frac{3}{4}$ full with 100 NTU solution and cap it.
2. Place a 100 NTU label over the cuvette cap. (See Figure 2.)
3. Place an expiration date label on the 100 NTU label.

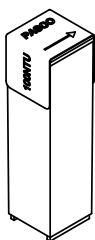


Figure 2. A cuvette with the 100 NTU label placed over the cap, with the expiration date label attached.

NOTE: The 100 NTU standard sample should provide accurate results ($\pm 7\%$) until 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. From the list of available wireless devices, select the Wireless Colorimeter and Turbidity Sensor with a device ID matching the ID printed on your sensor.
4. Toggle the **Wireless Turbidity Sensor** switch from disabled  to enabled . (You may need to scroll down the list of measurements to see the sensor.)
5. Under **Templates**, select **Digits** to open the Experiment Screen. A digits display measuring turbidity (in NTU) versus time will automatically be created.

NOTE: Upon creating the display, you may be prompted to calibrate the sensor. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the SPARKvue section of **Calibrate the sensor**. Otherwise, click **Cancel**.

PASCO Capstone:

1. Turn on the Wireless Colorimeter and Turbidity Sensor.
2. Open Capstone and click **Hardware Setup**  in the **Tools** palette on the left.
3. From the list of available wireless devices, select the Wireless Colorimeter and Turbidity Sensor with a device ID matching the ID printed on your sensor.

NOTE: Upon connecting the sensor, you may be prompted to calibrate it. If you wish to do so now, click **Calibrate** and proceed to Step 2 of the Capstone section of **Calibrate the sensor**. Otherwise, click **Cancel**.

4. Toggle the **Wireless Turbidity Sensor** switch from disabled  to enabled .
5. Double-click the **Digits**  icon in the **Displays** palette to create a digits display.
6. In the digits display, click the **<Select Measurement>** box and select **Turbidity (NTU)** from the list.

Step 5: Calibrate the sensor

SPARKvue:

1. Click **Hardware Setup** , then click the **Calibration**  button 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 appear to 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 appear to indicate that calibration is complete.
6. Click **Done**, then close Hardware Setup.

PASCO Capstone:

1. Click **Calibration**  in the **Tools** palette.
2. Select **Wireless Turbidity Sensor** from the list of available sensors to calibrate, then click **Next**.
3. Insert the blank calibration cuvette into the test chamber and close the cover.
4. Click **Calibrate** for the blank calibration cuvette. A green check mark will appear to indicate that calibration is complete.
5. Remove the blank calibration cuvette, then insert the 100 NTU standard cuvette into the test chamber and close the cover.
6. Click **Calibrate** for the 100 NTU standard cuvette. A green check mark will appear to indicate that calibration is complete.
7. Click **Finish**, then click **Calibration**  again to close the tool.

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. When you have collected all required data, click **Stop**  to end data collection.
4. Remove the cuvette from the test chamber.
5. Repeat the previous four steps for any 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. When you have collected all required data, click **Stop**  to end data collection.
4. Remove the cuvette from the test chamber.
5. Repeat the previous four steps for any additional test samples.

Software help

The SPARKvue and PASCO Capstone Help provide information on how to use this product with the software. You can access the help from within the software or online.

SPARKvue

Software: Main Menu > Help

Online: help.pasco.com/sparkvue

PASCO Capstone

Software: Help > PASCO Capstone Help

Online: help.pasco.com/capstone

Specifications and accessories

Visit the product page at pasco.com/product/PS-3215 to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

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.

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

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.

CE statement

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

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.

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.