

Wireless Drop Counter

PS-3214

Introduction

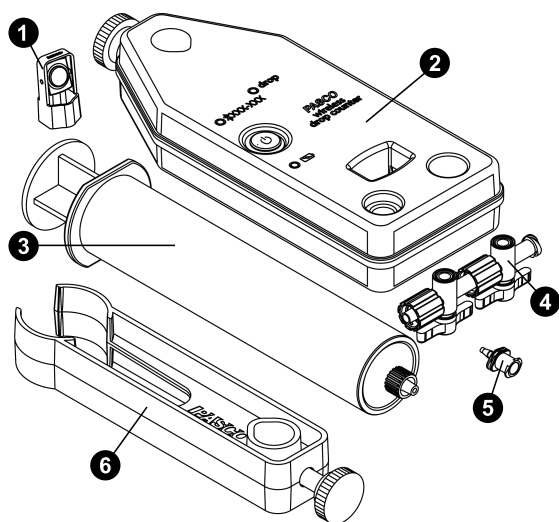
The Wireless Drop Counter is a versatile sensor that measures the number of drops of fluid that fall through the rectangular opening (drop window) of the sensor and converts the drop count into a volume. It is typically used in conjunction with a pH sensor and other equipment to perform a titration. Using Bluetooth or the included micro USB cable, you can connect the sensor to PASCO Capstone, Sparkvue, or Chemvue software to display and analyze collected data.

The Wireless Drop Counter can be mounted on a support rod. The device is equipped with two integrated probe holders. The included micro stir bar fits over the end of a PASCO pH probe and other probes of the same diameter. The included syringe, syringe holder, stopcock valves, and drop tip can be assembled into a drop dispenser that can be mounted on a support rod.

⚠ IMPORTANT: Do NOT use the drop dispenser to hold highly concentrated solutions, strong oxidizers such as bleach, or reactive organic solvents. These chemicals will corrode the syringe, creating a potential hazard and significantly reducing its usable lifetime.

Equipment

Included equipment:



- 1 Micro stir bar
- 2 Wireless Drop Counter
- 3 Syringe (60 mL)
- 4 2× stopcock valves
- 5 Drop tip
- 6 Syringe holder
- 7 Micro USB cable (1 m; not pictured)

Required software:

- PASCO Capstone, Sparkvue, or Chemvue data collection software

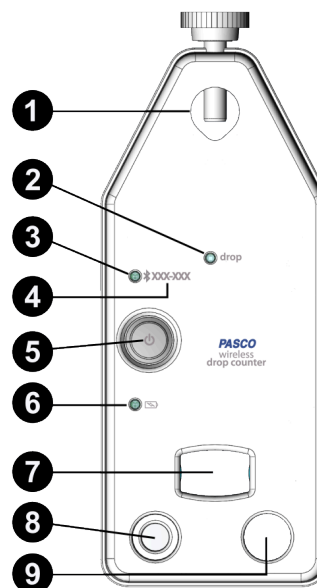
Recommended items:

- Wireless Temperature Sensor (PS-3201)
- Wireless pH Sensor (PS-3204)
- Magnetic Stirrer (SE-7700)
- Support rod and table clamp
- 150 mL beaker
- 10 mL graduated cylinder
- Samples of 0.1 M NaOH
- Samples of 0.005 M HCl

Replacement part:

- Drop Dispenser (PS-6935)

Features



1 Hole for support rod

2 Drop Indicator LED

Flashes to indicate when a drop is detected passing through the drop window.

3 Bluetooth LED

Indicates the status of the sensor's Bluetooth connection.

Bluetooth LED	Status
Red blink	Ready to pair
Green blink	Connected

4 Device ID

Use to identify the sensor when connecting via Bluetooth.

5 ON/OFF button

Press and briefly hold to turn the sensor on or off.

6 Battery LED

Indicates the charging status of the sensor's rechargeable battery.

Battery LED	Status
Red blink	Low power
Yellow ON	Charging
Green ON	Fully charged

7 Drop window**8 Hole for temperature sensor****9 Hole for pH sensor**

Get started

Follow these steps when using the sensor for the first time.

Step 1: Charge the battery

To charge the battery, pry open the rubber seal on the back of the sensor and connect the micro USB port underneath to any standard USB charger via the included cable. The Battery Status LED is solid yellow while charging. When fully charged, the LED changes to solid green.

Step 2: Get the software

PASCO software is needed to collect data with the sensor. The sensor can be used with Sparkvue, PASCO Capstone, or Chemvue.

 **Sparkvue:** Open the software in a web browser at sparkvue.pasco.com. You can also install Sparkvue by visiting your device's app store.



 **PASCO Capstone** or  **Chemvue:** Additional purchase required. Go to pasco.com/downloads for details.

Step 3: Check for a firmware update

The sensor may have a firmware update available, providing feature improvements and bug fixes. To minimize disruptions, update the firmware before using the sensor with students.

1. Turn on the sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open Sparkvue, then select  **Sensor Data**.
3. Select  **Wireless Devices**. If you are using the web app version of Sparkvue, also select  **Connect a Wireless Device**.
4. From the list of available wireless devices, select the device which matches the device ID printed on your sensor.
5. A notification will appear if a critical firmware update is available. Select **Update** to download the firmware update.

For instructions on updating the software with PASCO Capstone or Chemvue instead of Sparkvue, see the software help.

Set up the software

Follow the steps below to connect the sensor to Sparkvue using Bluetooth and begin collecting data. For instructions on using the sensor with PASCO Capstone or Chemvue, or connecting the sensor using micro USB, see the software help.



NOTE: The Wireless Drop Counter automatically adjusts its internal brightness each time it is turned on. Therefore, always make sure the drop window is unblocked when turning on the sensor.

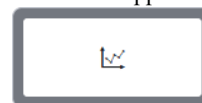
1. Turn on the sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open Sparkvue, then select **Sensor Data**.



3. Select **Bluetooth Devices**. If you are using the web app version of Sparkvue, also select  **Connect a Wireless Device**.



4. From the list of available wireless devices, select the device which matches the device ID printed on your sensor.
5. Select **Done**.
6. In the **Measurements for Templates** column, select the ☒ check box next to the name of the measurement you want to display.
7. Select the graph display in the **Templates** column. A graph of the selected measurement versus time appears.



8. Select  **Start** to begin collecting data.



Calibration

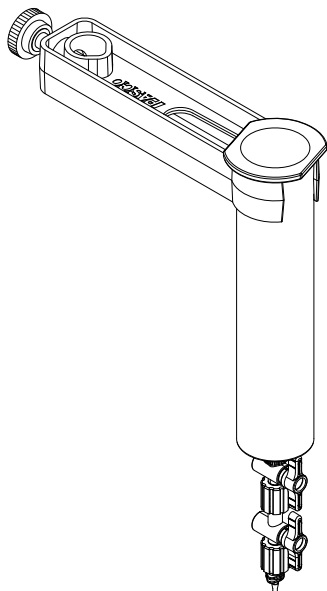
If you are using PASCO standard equipment, manual calibration of the Wireless Drop Counter is rarely required. However, if you are using third party equipment for the titration, or if the titrant is not water-based, you can improve the accuracy by calibrating the sensor manually before collecting data. Detailed instructions on calibrating the sensor are available on the PASCO Capstone, Sparkvue, or Chemvue Help sites.



NOTE: Calibration data is stored in the Wireless Drop Counter after being saved and can be used by any of the three programs.

Assemble the Drop Dispenser

The drop dispenser consists of the syringe, two stopcocks, drop tip, and syringe holder. The design of the fully assembled drop dispenser is shown below.

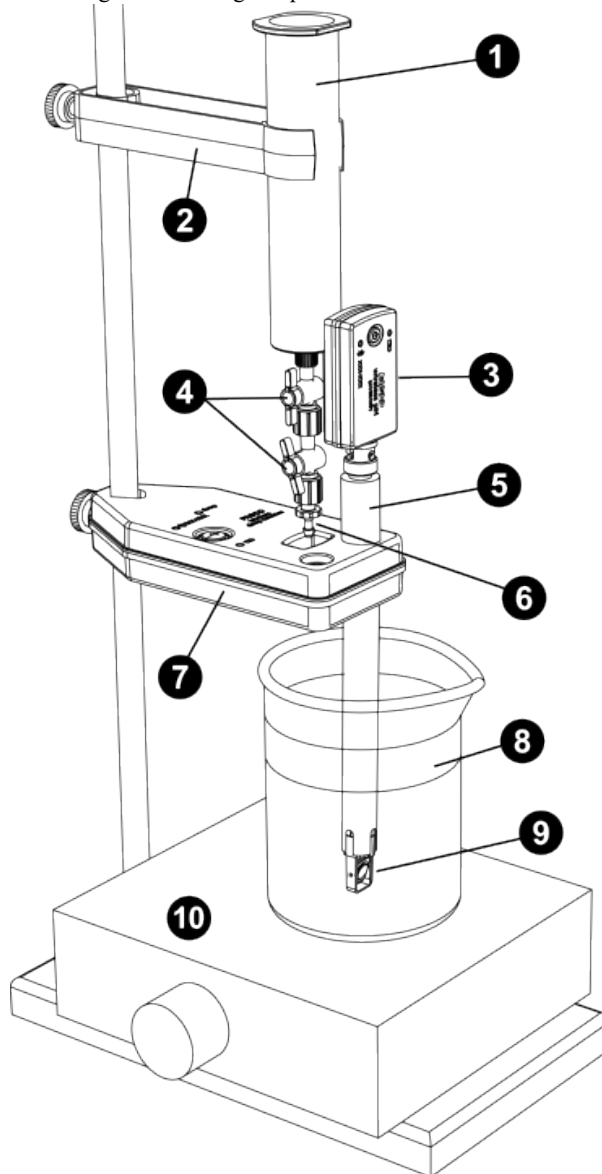


1. Remove the plunger from the syringe. Remove the protective white plastic caps from the stopcock valves.
2. Connect the two stopcocks together, then connect the stopcocks to the end of the syringe.
3. Connect the drop tip to the bottom of the stopcocks.
4. Connect the syringe holder to the drop dispenser, then use the thumbscrew on the syringe holder to mount the drop dispenser on a support rod.

The bottom stopcock of the drop dispenser is used to regulate flow rate. The top stopcock is used to turn the flow on and off. The top stopcock should always be in either the completely open position (handle vertical) or the completely closed position (handle horizontal).

Titration setup

You can perform a titration with the Wireless Drop Counter and drop dispenser using the following setup:



- ❶ Syringe with 50 mL of 0.1 M NaOH
- ❷ Syringe holder
- ❸ Wireless pH Sensor (PS-3204)
- ❹ Stopcocks
- ❺ pH probe
- ❻ Drop tip
- ❼ Wireless Drop Counter
- ❽ 150 mL beaker with 100 mL of 0.005 M HCl
- ❾ Micro stir bar
- ❿ Magnetic Stirrer (SE-7700)

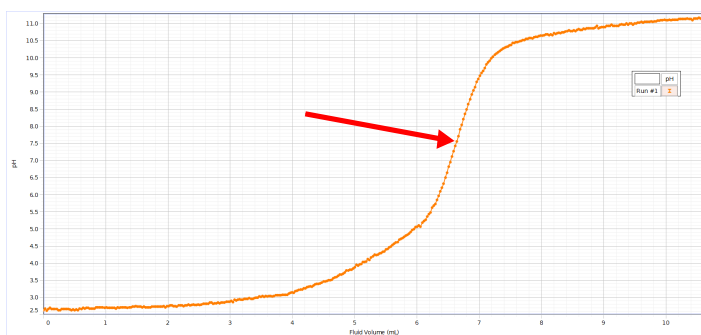
Assemble the titration setup

1. Mount the Wireless Drop Counter on a support rod.
2. Attach a pH probe to a Wireless pH Sensor (PS-3204). Place the pH probe into the larger of the two sensor ports on the Wireless Drop Counter, as shown above.
3. Mount the micro stir bar on the end of the pH probe.
4. Fill a 150 mL beaker with 100 mL of 0.005 M HCl.
5. Arrange the Magnetic Stirrer and the beaker so that the end of the pH probe and the micro stir bar are submerged in the liquid in the beaker.
6. Mount the drop dispenser above the Wireless Drop Counter and position it so that the drop tip is placed over the drop window.
7. Fill the syringe of the drop dispenser with 50 mL of 0.1 M NaOH.

 **NOTE:** Do not touch the drop dispenser during the titration except when opening and closing the stopcocks. Doing so may affect the drop size.

Acid-base titration

1. Start your chosen software and connect the sensor to it.
2. Create a graph display of pH versus fluid volume.
3. Start the Magnetic Stirrer. Check to make sure the micro stir bar is able to rotate freely.
4. In the software, begin recording data.
5. Adjust the stopcock valves on the drop dispenser so that the titrant drops fall at about 1 drop per second.
6. Observe the data on the pH versus fluid volume graph. After the equivalence point is reached, continue collecting data until the pH curve flattens, as shown below. (The red arrow indicates the equivalence point.)



7. Close the stopcock valve and stop data recording.

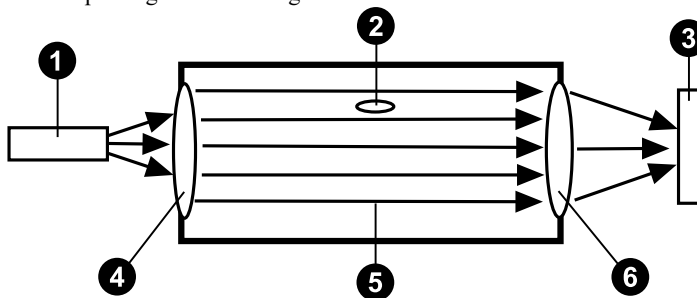
Other titrations

Titration with different solutions can be performed using the same equipment and procedure. Other probes, such as conductivity or ORP, can be used in place of the pH probe for these titrations.

Theory of operation

The Wireless Drop Counter uses an infrared light source and a photodetector. Lenses spread the light into a "sheet" and refocus it onto the photodetector. When a drop of fluid passes through the Wireless Drop Counter, it partially blocks this sheet of light, and the photodetector registers a momentary decrease in light intensity.

The Wireless Drop Counter uses infrared light and ignores visible light. When the sensor turns on, it automatically adjusts the light level for the best sensitivity. For best results, use the Wireless Drop Counter away from direct sunlight or other sources of infrared that may interfere with its operation. The diagram below shows a side view of the drop window and the path light takes through it.



- ① Infrared light source
- ② Drop
- ③ Detector
- ④ Collimating lens
- ⑤ Sheet of light
- ⑥ Focusing lens

Troubleshooting

- If the indicator light flashes twice for a single drop and the Wireless Drop Counter registers more drops than actually dispensed, fluid is most likely splashing back into the drop window. Adjust the relative positions of the beaker, Wireless Drop Counter, and drop dispenser to eliminate this effect.
- If the indicator LED remains on constantly and the Wireless Drop Counter does not register drops, the lenses in the drop window are likely dirty or wet. Clean the lenses in the drop window with water or a glass cleaner, then dry the window with a cotton swab or tissue.
- If the sensor loses Bluetooth connection and will not reconnect, try cycling the ON button. Press and briefly *hold* the button until the LEDs blink in sequence, then release the button.
- If the sensor stops communicating with the computer software or tablet application, try restarting the software or application. If the problem persists, press and *hold* the ON button for 10 seconds, then release the button and start the sensor in the usual way.
- If the previous steps do not fix a connection problem, turn Bluetooth off and back on for your computer or tablet and retry.
- If the Wireless Drop Counter will not turn on, use the micro USB cable to connect it to a USB port or charger.

Probe care and maintenance

The Wireless Drop Counter is splash-resistant but not waterproof. Do not immerse the sensor in liquid. If the inside surfaces of the drop window need to be cleaned, use a piece of lens paper or a lint-free cloth and water or a glass cleaner.

Software help

The Sparkvue, PASCO Capstone, and Chemvue 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

Chemvue

Software: Main Menu  > Help

Online: help.pasco.com/chemvue

Specifications and accessories

Visit the product page at pasco.com/product/PS-3214 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 student handouts and teacher notes. Visit pasco.com/freelabs/PS-3214.

Technical support

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

 Web pasco.com/support

 Chat pasco.com

 Email support@pasco.com

 Phone 1-800-772-8700 x1004 (USA)
+1 916 462 8384 (outside USA)

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.