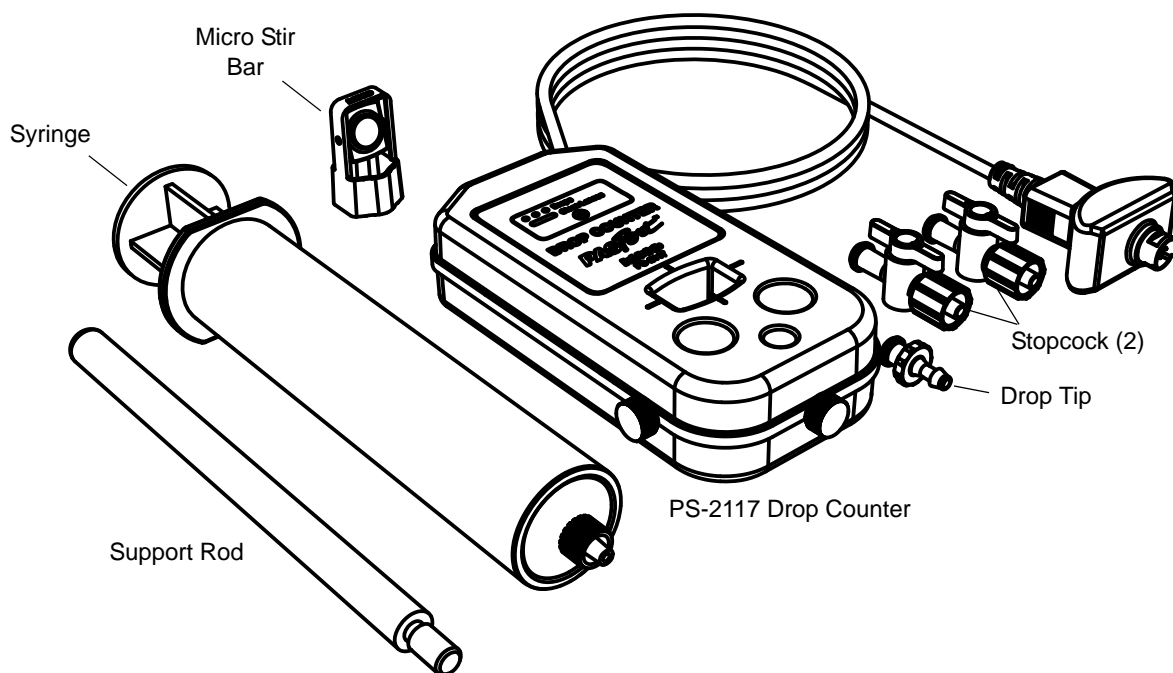


# Drop Counter

PS-2117



## Included Parts

- Drop Counter
- Micro Stir Bar
- Syringe (60 mL)
- Stopcock (2)
- Drop Tip
- Support Rod

## Additional Parts Required

- PASPORT compatible PASCO interface or datalogger
- Three-finger Clamp (SE-9445)
- Support Rod and Stand (SE-9451)
- Multi Clamp (ME-9507)
- Magnetic Stir Plate (SE-7700)
- Beaker, 150 mL

## Additional Parts Recommended

- Buret, 50 mL (SE-7703)
- Chemistry Sensor (PS-2170)
- pH Sensor (PS-2102)

- Temperature Sensor (PS-2125)
- Other sensors for measuring conductivity or oxygen-reduction potential (ORP)
- Micro Stir Bars, set of 5 (PS-2565)

## Quick Start

1. Connect the Drop Counter to your PASPORT compatible PASCO interface.
2. If you are using a computer, connect the interface to it and start the data acquisition software.
3. Press or click the start button to begin recording data.
4. Allow drops of liquid to fall through the rectangular opening.

## Introduction

The Drop Counter measures the number of drops of fluid that fall through the rectangular opening of the sensor. It is typically used in conjunction with a pH sensor and other equipment to perform

a titration. Data from the Drop Counter and other sensors are recorded and displayed in software such as PASCO Capstone, or on a datalogging interface such as an Xplorer GLX.

The Drop Counter can be mounted on a support rod and the support rod can be clamped to a rod stand. The counter is equipped with three integrated probe holders. The included Micro Stir Bar fits onto the end of a pH probe or probe of the same diameter.

## Acid-base Titration

These steps explain a typical use of the Drop Counter.

### Procedure

1. Set up the equipment and consumables as illustrated in Figure 1. Attach both stopcocks to the syringe, and attach the drop tip to the bottom stopcock. Line up the drop tip with the rectangular opening in the Drop Counter.
2. Start with the valves of the stopcocks turned parallel to the table top. Add the solutions to the syringe and beaker.

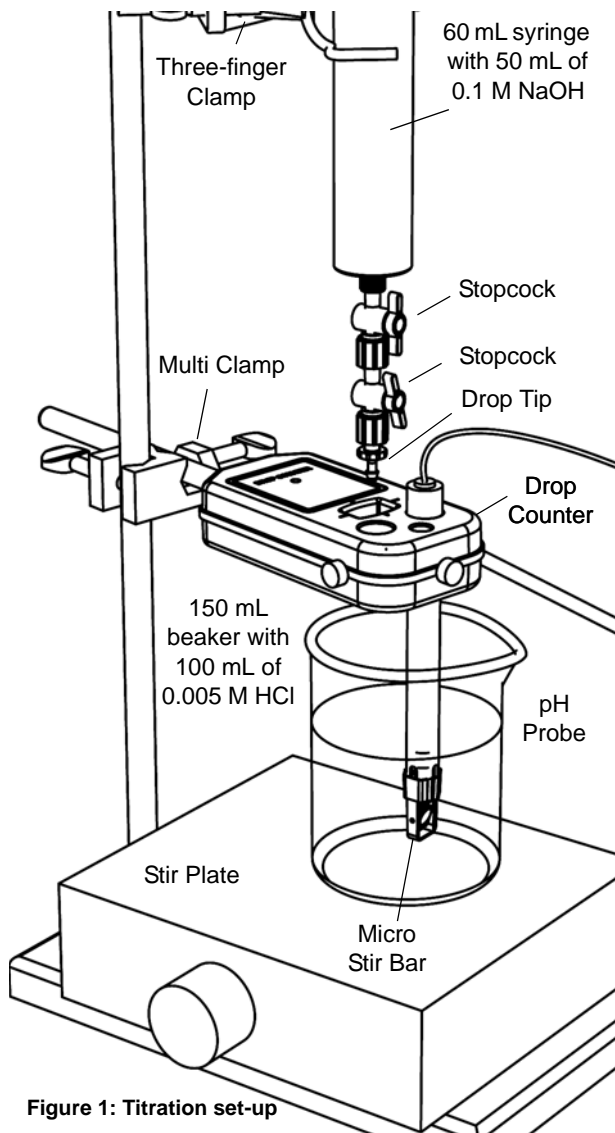


Figure 1: Titration set-up

3. Write down the initial volumes of both solutions (in the syringe and in the beaker), and the molarity of the titrant (in the syringe).
4. Connect the Drop Counter and pH sensor to your PASPORT compatible PASCO interface (or interfaces).
5. If you are using a computer, connect the interface to it and start the data acquisition software.
6. Start the stir plate.
7. Click or press the start button to begin recording data.
8. Open the top stopcock. Slowly adjust the bottom stopcock to start delivering titrant at about 2 drops per second.
9. Observe the data appearing on the pH versus drop count graph (Figure 2). After the equivalence point is reached, wait until the pH curve flattens.

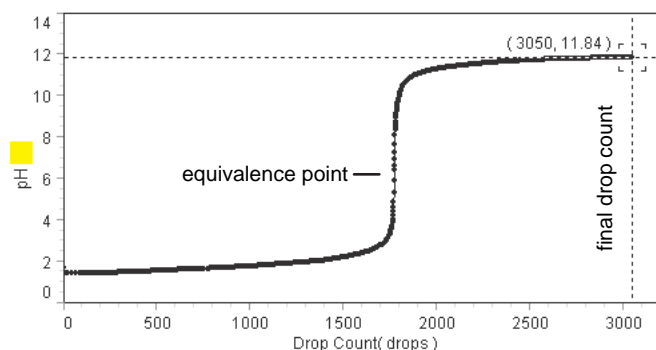


Figure 2: Graph of pH versus drop count

10. Close the stopcocks.
11. Stop data recording.
12. Read the final volume of fluid in the syringe and calculate the net volume of titrant that was dispensed.
13. Read the final drop count on the graph.
14. In the calculator window of the software or datalogger, enter a calculation as shown below, but using your own values of total volume dispensed and final drop count. The calculation gives the volume of titrant dispensed over time based on the number of drops and the average volume per drop.
 
$$\text{volume} = [\text{Drop Count (drops)}] * 100/3050$$

In this example, “100” is the total volume dispensed (in mL) and “3050” is the final drop count.
15. In the graph, change the horizontal axis to the calculated “volume” (Figure 3).

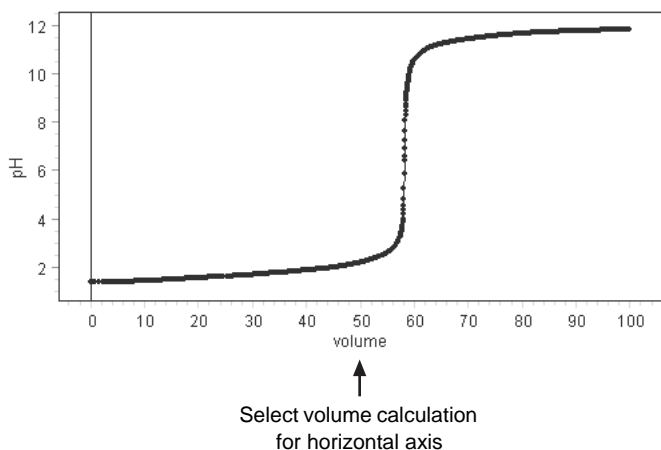


Figure 3: Graph of pH versus volume

### Tips

- Except for opening and closing the stopcocks, do not touch the syringe during the titration; otherwise, the drop size may change significantly.
- The drop rate must remain approximately constant (about 2 drops per second) in order for the drop size to remain constant.
- Drop size depends on the exact position of the bottom stopcock. Therefore, the average drop size will be different for every titration. For each titration, re-enter the volume used and drop count values in the calculation.

## Other Titrations

Titrations 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.

## Theory of Operation

The 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 Drop Counter, it partially blocks this sheet of light, and the photodetector registers a momentary decrease in light intensity.

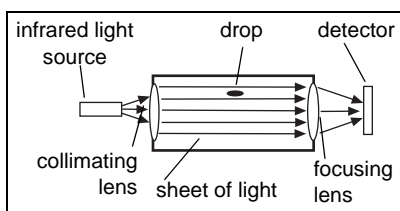


Figure 4: Diagram of Drop Counter

The Drop Counter uses infrared light and ignores visible light. On power up, it automatically adjusts the light level for the best sensitivity. Use the Drop Counter away from direct sunlight or other sources of infrared that may interfere with it.

When the Drop Counter detects a falling drop, the green indicator light emitting diode (LED) flashes. If something stationary is blocking the photodetector, the indicator LED remains on.

## Troubleshooting

Problem	Cause	Solution
Indicator light flashes twice for a single drop. Drop Counter registers more drops than actually dispensed.	Fluid is splashing back into the drop window.	Adjust the position of the beaker, Drop Counter, or syringe to eliminate splash back
Indicator LED remains on constantly. Drop Counter does not register drops.	Lenses in drop window are dirty or wet.	Clean lenses with water and dry with a cotton swab or tissue.

## Specifications

Maximum drop rate	40 drops per second
Default sample rate	5 samples per second
Maximum sample rate	10 samples per second
Minimum object detection size	0.64 mm diameter
Enclosure	Polypropylene, water resistant, chemically resistant to mild acids and bases
Detector type	Infrared photodetector with collimating lens

## Technical Support

For assistance with any PASCO product, contact PASCO at:

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

Phone: +1 916 786 3800 (worldwide)  
800-772-8700 (U.S.)

Web: [www.pasco.com](http://www.pasco.com)

Email: [support@pasco.com](mailto:support@pasco.com)

For more information about the Drop Counter and the latest revision of this Instruction Sheet, visit the PASCO web site and enter PS-2117 in the Search window.

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### 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.

