Go Direct® Drop Counter

(Order Code GDX-DC)

Go Direct Drop Counter is used to perform accurate, automatic titrations. This digital sensor can be used in conjunction with a pH Sensor, ORP Sensor, Conductivity Probe, or other sensor to accurately record the volume of titrant added during a titration.

Go Direct Drop Counter has many features that makes it easy to use:

- Adjustable clamp, fits most laboratory ring stands and lattices
- Wide drop-detecting area
- Large sensor slot, fits most conventional stick-style sensors
- Smaller, adjustable slot for temperature sensors
- Red LED, near the detecting area, flashes to indicate a drop has been recorded

Note: Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

What's Included
- Go Direct Drop Counter
- Plastic reagent reservoir
- Plastic valve with a double stopcock fitting
- Vernier Microstirrer (a magnetic stirrer that fits on the tip of your sensor)
- Micro USB Cable

Compatible Software
See **www.vernier.com/manuals/gdx-dc** for a list of software compatible with the Go Direct Drop Counter.

Getting Started
Please see the following link for platform-specific connection information:

www.vernier.com/start/gdx-dc

Bluetooth Connection

1. Install Vernier Graphical Analysis™ on your computer, Chromebook™, or mobile device. If using LabQuest®, make sure LabQuest App is up to date. See www.vernier.com/ga4 for Graphical Analysis availability or www.vernier.com/downloads to update LabQuest App.
2. Charge your sensor for at least 2 hours before first use.
3. Turn on your sensor by pressing the power button once. The Bluetooth® LED will blink red.
4. Launch Graphical Analysis or turn on LabQuest.
5. If using Graphical Analysis, click or tap Sensor Data Collection. If using LabQuest, choose Wireless Device Setup > Go Direct from the Sensors menu.
6. Select your Go Direct sensor from the list of Discovered Wireless Devices. Your sensor's ID is located near the barcode on the sensor. The Bluetooth LED will blink green when it is successfully connected.
7. Click or tap Done to enter data-collection mode.

USB Connection

1. Install Graphical Analysis on your computer or Chromebook. If using LabQuest, make sure LabQuest App is up to date. See www.vernier.com/ga4 for software availability or www.vernier.com/downloads to update LabQuest App.
2. Connect the sensor to the USB port.
3. Launch Graphical Analysis or turn on LabQuest. You are now ready to collect data.

Note: This sensor does not work with the original LabQuest. It works with LabQuest 2 or LabQuest 3.

Charging the Sensor
Connect Go Direct Drop Counter to the included USB Charging Cable and any USB device for two hours. Connecting Go Direct Drop Counter to the electrode amplifier during charging is optional.

Charging	Orange LED next to the battery icon is solid while the sensor is charging.
Fully charged	Green LED next to the battery icon is solid when the sensor is fully charged.

Powering the Sensor

Turning on the sensor	Press button once. Red LED indicator flashes when unit is on.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Red LED indicator stops flashing when sleeping.

Connecting the Sensor
See the following link for up-to-date connection information:

**www.vernier.com/start/gdx-dc**

Connecting via Bluetooth

| Ready to connect | Red LED next to the Bluetooth icon flashes when sensor is awake and ready to connect. |
| Connected | Green LED next to the Bluetooth icon flashes when sensor is connected via Bluetooth. |

Connecting via USB

Connected and charging	Orange LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and the unit is charging. LED next to Bluetooth icon is off.
Connected, fully charged	Green LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and fully charged. LED next to Bluetooth icon is off.
Charging via USB, connected via Bluetooth	Orange LED next to the battery icon is solid when the sensor is charging. Green LED next to the Bluetooth icon flashes.

Using the Product

1. Assemble the equipment. (Note: The Vernier Stir Station, pH Sensor, 100 mL beaker, and utility clamp are not included with the Vernier Drop Counter.)
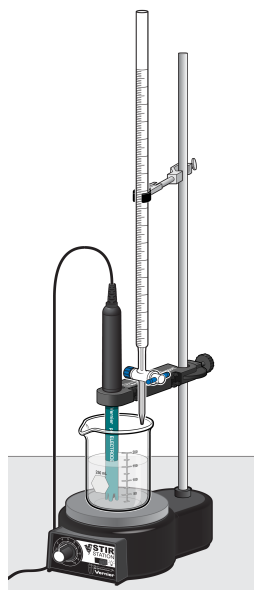
a. Place a 100 mL beaker on the center of the Stir Station.
b. Remove the storage bottle from the sensor (if applicable). Insert the sensor body through the larger round hole on the Drop Counter.
c. Slip the Microstirrer onto the bottom of the sensor. Slide the Drop Counter down the ring stand to a level such that the Microstirrer is very close to the bottom of the beaker. Tighten the turn screw of the Drop Counter to hold it firmly in place.
d. Connect the spout and two 2-way valves to the plastic reagent reservoir. **Note:** There are two 2-way valves below the reagent reservoir. In this setup, use the bottom valve as an on-off valve (either completely open or completely shut). Use the top valve as an adjustment valve to adjust to a slow, consistent rate.
e. Using the utility clamp, secure the reagent reservoir to the stir station rod. The spout should be aligned just above the three-sided rectangular opening.

2. Make sure that both 2-way valves are in the closed position (horizontal). Add about 20 mL of titrant to the plastic reagent reservoir. For this example, we will use 0.1 M NaOH solution.

3. Before collecting data or calibrating the drops, adjust the flow rate of the two valves of the reagent reservoir. Temporarily, place another beaker below the spout of the reagent reservoir. First, completely open the bottom 2-way valve; then slowly open the top valve until a very slow drop rate is achieved—a rate of one drop every two seconds, or slower. Close the bottom valve.

A   B   C
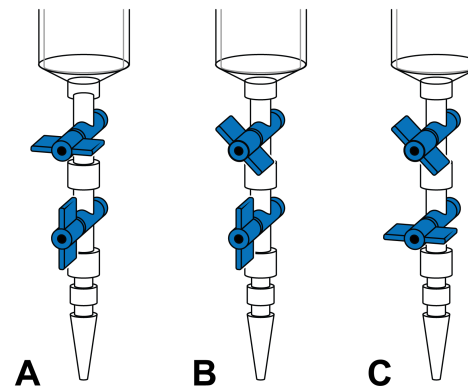
4. Add the solution to be titrated to the 100 mL beaker. For this example, use about 5 mL of 0.1 M HCl solution. Add enough distilled water so the solution level covers the bulb of the pH Sensor (about 35 to 40 mL). If you are going to use a small magnetic stirring bar, less distilled water will be required (about 1 to 20 mL). Turn on the magnetic stirrer. **Important:** Minimizing volumes of solution titrated and maximizing stirring efficiency will significantly improve your titration results.

5. Connect the sensor following the steps in the Getting Started section of this user manual. **Note:** The Drop Counter will only collect data if another sensor is connected.
6. No data will be collected until the first drop falls through the rectangular opening of the Drop Counter. Carefully center the spout of the reagent reservoir to allow the drops to pass through the Drop Counter. Completely open the lower 2-way valve (the upper valve should still be set to a slow drop rate). You will now see pH vs. volume data being plotted on a graph. When you are satisfied that the titration has proceeded past the equivalence point, shut off the lower 2-way valve of the reagent reservoir and stop the data collection.

Videos
View videos related to this product at **www.vernier.com/gdx-dc**

Calibrating the Sensor
There are three different ways to handle the reporting of volume:

- Use the stored calibration.
- Manually enter a drops/mL ratio value. If you have done a previous calibration with a particular apparatus, you can enter the drops/mL ratio.
- Perform an Automatic drops/mL calibration. You can calibrate the reagent reservoir or a buret. To perform your own drops-per-mL calibration, follow these steps:

1. Place a 10 mL graduated cylinder below the slot of the Drop Counter.
2. Fill the reagent reservoir about 3/4 full with the titrant solution.
3. Choose to calibrate the Drop Counter in your data-collection program.
4. Open the bottom 2-way (on-off) valve to begin releasing drops through the Drop Counter.
5. Release drops until there is 9–10 mL of liquid in the graduated cylinder.
6. Close the bottom valve to stop the drops.
7. Type the exact volume, to the nearest 0.1 mL, of liquid in the graduated cylinder in the Volume (mL) box of the Calibrate drops dialog box.
8. Choose to stop the calibration routine of your program.
9. The number of drops/mL will be displayed.
10. You can now continue with the titration.

Care and Maintenance

Battery Information
Go Direct Drop Counter contains a small lithium-ion battery. The system is designed to consume very little power and not put heavy demands on the battery. Although the battery is warranted for one year, the expected batter life should be several years. Replacement batteries are available from Vernier (order code: GDX-BAT-300).

Storage and Maintenance
To store Go Direct Drop Counter for extended periods of time, put the device in sleep mode by holding the button down for at least three seconds. The red LED will stop flashing to show that the unit is in sleep mode. Over several months, the battery will discharge but will not be damaged. After such storage, charge the device for a few hours, and the unit will be ready to go.

Exposing the battery to temperatures over 35°C (95°F) will reduce its lifespan. If possible, store the device in an area that is not exposed to temperature extremes.

Water Resistance
Go Direct Drop Counter is not water resistant and should never be immersed in water.

If water gets into the device, immediately power the unit down (press and hold the power button for more than three seconds). Disconnect the sensor and charging cable, and remove the battery. Allow the device to dry thoroughly before attempting to use the device again. Do not attempt to dry using an external heat source.

How the Sensor Works
The sensor has an infrared LED emitter on one end of the area through which the drop falls (1.3 × 3.7 cm) and a detector on the other end. When the infrared beam (centered at 890 nm) between the source and detector is blocked by a drop of titrant, a digital signal is sent to the data-collection software. The drops are then converted to volume units (e.g., milliliters) in the data-collection program. A red LED indicator light flashes each time a drop of liquid passes through the Drop Counter.

Use Go Direct Drop Counter with other Vernier sensors such as our Ion-Selective Electrodes, Conductivity Probe, or other Vernier pH Sensors. The Vernier Drop Counter can accommodate many third-party electrodes when used in conjunction with the Electrode Amplifier.

Troubleshooting
- Set a slow drop rate. For the best, most accurate data, we recommend setting the rate at 2 seconds/drop or slower. A slow rate provides enough time for each drop of titrant to be thoroughly mixed in the solution and the pH sensor (or other sensor) to respond.
- Minimize the volume of solution to be titrated. We recommend 5–10 mL of test solution. Larger volumes will take longer to mix and may require a very slow drop rate for best results.
- Use the Vernier Microstirrer. It helps deliver solution directly to the pH bulb, minimizing the response time. Also, you can run a magnetic stirrer at a very high speed and the Microstirrer will not form a visible vortex, which prevents splashing.
- Add only as much distilled water to the titrated solution as is necessary to cover the bulb of the pH Sensor (or other sensor).

- Use the plastic reagent reservoir that is supplied with the Drop Counter. The reagent reservoir provides a wider diameter and less change in the hydrostatic pressure per unit volume of titrant above the 2-way valve.
- Use the pair of 2-way valves; one for drop rate adjustment and the other as an on-off valve. This eliminates the need to do a fine adjust during the initial readings and also allows for a consistent rate to be set.
- Manually release drops at a slower rate to allow for more thorough mixing when near the equivalence point.

For additional troubleshooting and FAQs, see **www.vernier.com/til/3855**

Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Go Direct Drop Counter, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories/Replacements

Item	Order Code
Reagent Reservoir, 2 Valves, and Tip	VDC-RR
Microstirrer	MSTIR
Stopper Stem	PS-STEM
Plastic 2-Way Valve	PS-2WAY
Micro USB Cable	CB-USB-MICRO
USB-C to Micro USB cable	CB-USB-C-MICRO
Go Direct 300 mAh Replacement Battery	GDX-BAT-300

Warranty

Warranty information for this product can be found on the Support tab at **www.vernier.com/gdx-dc**

General warranty information can be found at **www.vernier.com/warranty**

This warranty does not cover consumables, such as the reagent reservoir and valves.

Disposal

When disposing of this electronic product, do not treat it as household waste. Its disposal is subject to regulations that vary by country and region. This item should be given to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you help prevent potential negative consequences on human health or on the environment. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, contact your local city office or your disposal service.

Battery recycling information is available at **www.call2recycle.org**

Do not puncture or expose the battery to excessive heat or flame.

The symbol, shown here, indicates that this product must not be disposed of in a standard waste container.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

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

RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Industry Canada - Class B This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

RF exposure warning: The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'appareil doit accepter tout interférence radioélectrique, même si cela résulte à un brouillage susceptible d'en compromettre le fonctionnement.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel interférant-brouilleur: "Appareils Numériques," NMB-003 édictée par industrie Canada. L'utilisation est soumise aux deux conditions suivantes:
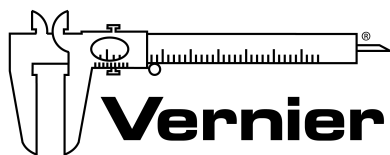
(1) cet appareil ne peut causer d'interférences, et

(2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un disfonctionnement du dispositif.

Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisie de telle façon que l'équivalent de puissance isotrope émis (e.i.r.p) n'est pas plus grand que celui permis pour une communication établie.

Avertissement d'exposition RF: L'équipement est conforme aux limites d'exposition aux RF établies pour un environnement non supervisé. L'antenne (s) utilisée pour ce transmetteur ne doit pas être jumelés ou fonctionner en conjonction avec toute autre antenne ou transmetteur.

Note: This product is a sensitive measurement device. For best results, use the cables that were provided. Keep the device away from electromagnetic noise sources, such as microwaves, monitors, electric motors, and appliances.

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