Go Direct® SpectroVis® Plus
(Order Code GDX-SVISPL)

Go Direct SpectroVis Plus is a portable, visible to near-IR spectrophotometer and fluorometer. This spectrophotometer can be used in a wide range of introductory spectroscopy experiments for chemistry, biology, and physics. Such experiments include: determining the peak wavelength to collect data on solution concentration for Beer's law studies, collecting a full wavelength spectrum to measure absorbance, percent transmittance, fluorescence, or emissions, and monitoring rates of reaction.

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 SpectroVis Plus
- 15 plastic cuvettes and lids
- Rechargeable battery (included inside unit; remove if data collection is strictly via USB)
- Mini USB Cable
- Power supply (for battery recharge only; do not plug in if taking data)

Compatible Software
See **www.vernier.com/manuals/gdx-svispl** for a list of software compatible with Go Direct SpectroVis Plus.

Quick Start: Vernier Spectral Analysis® and Bluetooth®
1. Charge your spectrometer for at least eight hours before first use using the included power supply. Disconnect the power supply before attempting to collect data. It is recommended that you not have the power supply attached while collecting data wirelessly.
2. Turn on your sensor. The LED will blink.
3. Launch Spectral Analysis.
4. Click or tap Connect a Spectrometer. Select your Go Direct SpectroVis Plus from the list of Discovered Wireless Devices. Your spectrometer's ID is located near the barcode on the label. The Bluetooth LED on the sensor will now glow blue (no longer flashing).
5. Click or tap **DONE** to enter data-collection mode. You are now ready to continue your experiment.

Using other Vernier data-collection apps or connecting via USB?
Visit **www.vernier.com/start-spectrometer**

Note: This sensor also works with LabQuest 2 and LabQuest 3; it does not work with the original LabQuest.

Charging the Sensor
Connect Go Direct SpectroVis Plus to the included AC power cable for at least eight hours. **Note:** This is only required for data collection via Bluetooth wireless technology.

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

Powering the Sensor

Turning on the sensor	Press Power button once or connect to USB. Green LED indicator next to Power icon is solid when unit is on.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Green LED indicator turns off when sleeping.

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

www.vernier.com/start/gdx-svispl

Connecting via Bluetooth

Ready to connect	Press Power button once. Blue LED next to Bluetooth icon flashes when sensor is ready to connect.
Connected	Blue LED next to Bluetooth icon is solid when sensor is connected via Bluetooth wireless technology.

Connecting via USB

Connected and charging	Orange LED next to battery icon is solid when sensor is connected to Spectral Analysis via USB. LED next to Bluetooth icon is off. LED next to power is solid green. LED next to USB icon is solid green.
Connected, fully charged	LED next to battery icon is off when sensor is connected to Spectral Analysis via USB and fully charged. LED next to Bluetooth icon is off.
Charging via USB, connected via Bluetooth	This combination is not permitted.
Charging via AC power, connected via Bluetooth	This combination is not recommended.

Using the Product with Spectral Analysis

Connect the sensor following the steps in the Quick Start section of this user manual.

Select the Type of Data to Measure

The three options for Experiment Types are:

1. Measurement *vs.* Wavelength—collect a full spectrum.
2. Measurement *vs.* Concentration—conduct a Beer's law experiment.
3. Measurement *vs.* Time—collect time-based data for a kinetics experiment.

By default, Absorbance is expanded. You can also choose from % Transmittance, Fluorescence, Emissions, or Advanced Full Spectrum. Use the Advanced Full Spectrum mode to switch between all the measurement types in the same session. For complete instructions, refer to the Spectral Analysis user manual at **www.vernier.com/spectral-analysis**

Measurement *vs.* Wavelength (Full Spectrum)

1. Select Measurement *vs.* Wavelength.
2. If applicable, follow instructions for calibration. Align the cuvette so the clear side of the cuvette is facing the light source. **Note:** Calibration is not required for fluorescence or intensity.
3. You are now ready to collect data. Fill a cuvette about 3/4 full of a sample of the solution to be tested. Place the sample in the Spectrophotometer and click Collect. Click Stop to end data collection. The spectrum is automatically stored.
4. Save or export your data from the File menu.

Measurement *vs.* Concentration (Beer's law)

1. Select Measurement *vs.* Concentration.
2. If applicable, follow instructions for calibration. Align the cuvette so the clear side of the cuvette is facing the light source. **Note:** Calibration is not required for fluorescence or intensity.
3. Follow the instructions in the Choose a Wavelength dialog box. Select Done.
4. Click Collect. Your first sample should still be in the Spectrophotometer. After the reading stabilizes, click Keep. Enter the concentration of the sample and click or tap Keep Point.
5. Place your second sample in the cuvette slot. After the reading stabilizes, click Keep. Enter the concentration of the sample and click or tap Keep Point.
6. Repeat the previous step for the remaining samples. When finished, click Stop to end data collection. The data is automatically stored.
7. To see the best fit line equation for the standard solutions, click Graph Tools, select Apply Curve Fit, and choose Linear. Click or tap Apply.
8. If doing Beer's law to determine the concentration of an unknown, place the unknown sample in the cuvette holder. Click or tap Graph Tools and enable Interpolate. Click or tap along the line until you find the concentration value that matches your unknown's measurement.
9. Save or export your data from the File menu.

Measurement *vs.* Time (Kinetics)

1. Select Measurement *vs.* Time.
2. If applicable, follow instructions for calibration. Align the cuvette so the clear side of the cuvette is facing the light source. **Note:** Calibration is not required for fluorescence or intensity.
3. Follow the instructions in the Choose a Wavelength dialog box. Select Done.
4. The default data-collection settings collect measurements every two seconds until the user manually stops data collection.
5. Mix the reactants. Transfer ~2 mL of the reaction mixture to a cuvette and place the cuvette in the spectrometer. Click or tap Collect.
6. When finished, click or tap Stop.
7. To fit a function to the data, click Graph Tools, select Apply Curve Fit, and choose the appropriate curve fit. Click or tap Apply.
8. To add a calculated column to the data set, click OK in the measurement header on the data table. Select Add Calculated Column. Modify the name, units, and displayed precision accordingly. Select Insert Expression and select the appropriate equation. Modify the parameters and column options, if necessary. Click or tap Apply. The calculated column is automatically displayed on the graph.
9. Save or export your data from the File menu.

Change the Settings in Spectral Analysis

1. Click or tap the gear to show the Spectrometer Settings dialog.
2. There are three parameters listed in the dialog box:
   - **Integration Time:** This is similar to the shutter speed of a camera. Spectral Analysis automatically selects the proper sample time during

calibration in Absorbance and % Transmittance modes. If using Fluorescence, Intensity, or Advanced Experiment modes, you can modify this value to increase the amount of light hitting the detector and the signal spectral output.

- **Wavelength Smoothing:** This is the number of adjacent readings on either side of a given value that is used to calculate an average value.
- **Temporal Averaging:** This is the number of readings taken at a given wavelength to calculate an average reading.

3. Select the Calibrate button to recalibrate your spectrometer at any time.

Measure an Emission Spectrum with Spectral Analysis

You may use your Spectrophotometer to measure the emission spectrum of a light source such as an LED or a gas discharge tube. To do so, you will need to purchase the Vernier Optical Fiber (order code: VSP-FIBER).

Measure Intensity of Light Emissions

Insert the Vernier Optical Fiber into the SpectroVis Plus.

1. Connect the sensor following the steps in the Quick Start section of this user manual.
2. Open Spectral Analysis.
3. Select the appropriate Emissions experiment from the listed options and follow the prompts in the app. Intensity is a relative measure with a range of 0–1. **Note:** The Spectrophotometer is not calibrated for measuring intensity.
4. Aim the tip of the optical fiber at a light source. Start data collection. Tap the Stop button to end data collection.

If the spectrum maxes out (flat and wide peaks at a value of 1), increase the distance between the light source and the tip of the optical fiber cable or reduce the integration time (see the Change the Settings in Spectral Analysis section).

To adjust the integration time, click or tap the gear. Set the integration time to a suitable value.

Measure Fluorescence with Spectral Analysis

You may use your Spectrophotometer to measure the fluorescence spectrum of an aqueous sample, such as chlorophyll, riboflavin, and fluorescein. Fluorescence is the emission of light by a compound after it has absorbed a particular wavelength of light. Under most circumstances, the emission of light will occur at a longer wavelength than the light used to excite it. The SpectroVis Plus has two excitation wavelengths: one at 405 nm and one at 500 nm.

There are three general types of data collection that measure fluorescence—fluorescence *vs.* wavelength, which produces a spectrum, fluorescence *vs.* concentration, and fluorescence *vs.* time for kinetics experiments. To collect these types of data after the experiment type has been selected as Fluorescence, follow the instructions in the Spectral Analysis user manual at **www.vernier.com/spectral-analysis**. **Note:** You may need to change the integration time to get accurate peak intensities in fluorescence mode. To adjust the integration time click or tap on the gear. Set the integration time to a suitable value.

Using the Product with LabQuest App

Connect the sensor following the steps in the Quick Start section of this user manual.

Select the Type of Data (or Units) You Want to Measure

The default data type is absorbance. If you want to measure the absorbance of a solution, proceed directly to the Calibrate the Spectrophotometer section.

If you want to measure %T, fluorescence (excited at 405 nm or 500 nm), or intensity, do the following:

1. From the Sensors menu, choose Change Units ► USB: Spectrophotometer.
2. Select the unit or data type you wish to measure.

Calibrate the Spectrophotometer (Not Required if Measuring Intensity or Fluorescence)

1. Choose Calibrate ► USB: Spectrophotometer from the Sensors menu. **Note:** For best results, allow the Spectrophotometer to warm up for a minimum of five minutes.
2. Fill a cuvette about 3/4 full with distilled water (or the solvent being used in the experiment) to serve as the blank. After the Spectrophotometer has warmed up, place the blank cuvette in the Spectrophotometer. Align the cuvette so a clear side of the cuvette is facing the light source.
3. Follow the instructions in the dialog box to complete the calibration, and then tap OK.

Collect Data with LabQuest

Measurement *vs.* Wavelength (Full Spectrum)

1. Fill a cuvette about 3/4 full of the solution to be tested and place it in the Spectrophotometer.
2. Start data collection by tapping on the Start button in the lower left corner of the screen. Tap the Stop button to end data collection.
3. Tap on the graph to select a wavelength. Note the wavelength you may want to use for a future Beer's law or kinetics experiment.
4. To store the spectrum data, tap on the file cabinet icon in the upper right of your screen.

Measurement *vs.* Concentration (Beer's Law)

1. Generate a spectrum as described above. On the Meter screen, tap Mode. Change the mode to Events with Entry.
2. Enter the Name (e.g., Concentration) and Units (e.g., mol/L). Select OK.
3. A message will appear warning you to either save or discard the full spectrum run. Make your choice and proceed with data collection.
4. Set the wavelength for data collection. On the Meter screen, tap on the meter, and select Change Wavelength. Enter the wavelength of your choice and select OK. If the wavelength you type in is not measured by the unit, LabQuest will automatically choose the wavelength closest to your choice.
5. Place your first Beer's law standard solution in the Spectrophotometer. Start data collection. After the absorbance reading stabilizes, tap Keep. Enter the concentration of the solution and select OK.

6. Place your second standard sample in the Spectrophotometer. After the absorbance readings stabilize, tap Keep. Enter the concentration of the second sample and select OK.
7. Repeat Step 5 for the remaining standard samples. After you have tested the final standard, tap the Stop button to end data collection.
8. To calculate a best fit line equation for your standards, choose Curve Fit from the Analyze menu. Select Linear for the Fit Equation, and then select OK. The graph screen will appear again with the linear regression equation displayed.
9. Place a cuvette containing an unknown sample of solution in the Spectrophotometer. Tap the Meter tab and write down the displayed absorbance value. Tap the Graph tab and choose Interpolate from the Analyze menu. Trace the linear regression equation to determine the concentration of the unknown.

Measurement *vs.* Time (Kinetics)

1. Generate a spectrum as described above. On the Meter screen, tap Mode. Change the data-collection mode to Time Based.
2. You can change the rate, interval, and/or duration of time of data collection, if desired. Select OK when you are ready to proceed.
3. A message will appear warning you to either save or discard the full spectrum run. Make your choice and proceed with data collection.
4. Set the wavelength for data collection. On the Meter screen, tap on the meter, and select Change Wavelength. Enter the wavelength of your choice and select OK. If the wavelength you type in is not measured by the unit, LabQuest will automatically choose the wavelength closest to your choice.
5. Mix the reactants, transfer ~2 mL of the reaction mixture to a cuvette, and place the cuvette in the Spectrophotometer. Start data collection. You may tap the Stop button to end data collection early.
6. To calculate a function for your data, choose Curve Fit from the Analyze menu. Select the Fit Equation, and then select OK. The graph screen will appear again.

Measure an Emission Spectrum with LabQuest

You may use your Spectrophotometer to measure the emission spectrum of a light source such as an LED or a gas discharge tube. To do so, you will need to purchase the Vernier Optical Fiber (order code: VSP-FIBER).

Measure Intensity of Light Emissions

1. Insert the Vernier Optical Fiber into the SpectroVis Plus.
2. Use a USB cable to connect the Spectrophotometer to your LabQuest.
3. Choose New from the File menu.
4. On the Meter screen, tap Change Units ► USB: Spectrophotometer ► Intensity from the Sensors menu. Intensity is a relative measure with a range of 0–1. **Note:** The Spectrophotometer is not calibrated for measuring intensity.
5. Aim the tip of the optical fiber at a light source. Start data collection. Tap the Stop button to end data collection.

If the spectrum maxes out (flat and wide peaks at a value of 1), increase the distance between the light source and the tip of the optical fiber cable or reduce the sample time (see the Change the Settings in LabQuest section).

To adjust the sample time, tap on Mode from the Meter screen. Set the Sample Time to a suitable value.

Measure Fluorescence with LabQuest

You may use your Spectrophotometer to measure the fluorescence spectrum of an aqueous sample, such as chlorophyll, riboflavin, and fluorescein. Fluorescence is the emission of light by a compound after it has absorbed a particular wavelength of light. Under most circumstances, the emission of light will occur at a longer wavelength than the light used to excite it. The SpectroVis Plus has two excitation wavelengths: one at 405 nm and one at 500 nm.

There are three general types of data collection that measure fluorescence—fluorescence *vs.* wavelength, which produces a spectrum, fluorescence *vs.* concentration, and fluorescence *vs.* time for kinetics experiments. Once the units have been changed to Fluorescence from the Sensors menu, follow the instructions in the Collect Data with LabQuest section of this user manual to collect these types of data. **Note:** You may need to change the sample time to get accurate peak intensities in fluorescence mode. To adjust the sample time, tap on Mode from the Meter screen. Set the Sample Time to a suitable value.

Change the Settings in LabQuest

Data Collection Screen

The Data Collection Screen in LabQuest lists all the settings for the device. To display this box, choose Sensors ► Data Collection from the Meter screen.

For most experiments, the default settings work well.

There are four parameters listed in the dialog box.

- **Sample Time:** This is similar to the shutter speed of a camera. LabQuest automatically selects the proper sample time during calibration. **Note:** For emission studies, you may need to change the sample time manually.
- **Wavelength Smoothing:** This is the number of adjacent readings on either side of a given value that is used to calculate an average value. **Note:** Be careful adjusting this parameter as it may shift your wavelength values slightly.
- **Samples to Average:** This is the number of readings taken at a given wavelength to calculate an average reading.
- **Wavelength Range:** The range is determined by the type of Spectrophotometer in use.

Videos

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

Specifications

Light source	Incandescent with LED support
Detector	Linear CCD
Wavelength range	380 nm–950 nm
Wavelength reporting interval	~1 nm
Optical resolution (FWHM)	5.0 nm
Wavelength accuracy	± 4.0 nm
Photometric accuracy	±0.10 A.U.
Typical scan time	~2 s
Operating temperature	15–35ºC
Battery	High-capacity, lithium-ion rechargeable battery
USB specification	2.0 full speed
Wireless specification	Bluetooth® v4.2
Dimensions	15 cm × 9 cm × 4 cm
Support for fluorescence	Excitation centered at 405 and 500 nm

Safety

- When this instrument is in data-collection mode labeled Intensity, the light source will be blocked or turned off. Continue to use proper safety precautions.
- Do not remove or modify any of the installed safety components of this device. Doing so will create an unsafe operating condition and will void the product warranty.
- No user-serviceable parts are in this device. Do not attempt to open or modify this device. Contact Vernier for all repairs and service including lamp replacement.
- Handle the device with care. This instrument can be damaged if it is dropped.
- Do not use this instrument if it is damaged in any way. Contact Vernier Technical Support for troubleshooting and technical assistance.
- Do not use this instrument for clinical or diagnostic procedures.

Troubleshooting

For troubleshooting tips, see **www.vernier.com/til/3847**

Repair Information

- The light source in Go Direct SpectroVis Plus is an incandescent lamp. The lifetime of this source is rated at approximately 8,000 hours.
- The lamp is covered by a three-year warranty.
- Contact Vernier for all repairs and service including lamp replacement.
- No user-serviceable parts are in this device. Do not attempt to open the case of the device. Do not attempt to change or repair the lamp. Doing so will create an unsafe operating condition and will void the product warranty.

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Go Direct SpectroVis Plus, 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
Cuvette Rack	CUV-RACK
Plastic Cuvettes (Visible Range)	CUV
Vernier Spectrophotometer Optical Fiber	VSP-FIBER
Replacement Battery for LabQuest® 2 and LabQuest Stream®	LQ2-BAT
LabQuest Power Supply	LQ-PS
Vernier Mini USB Cable	CB-USB-MINI
Vernier Mini USB-C Cable	CB-USB-C-MINI

Warranty

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

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

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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