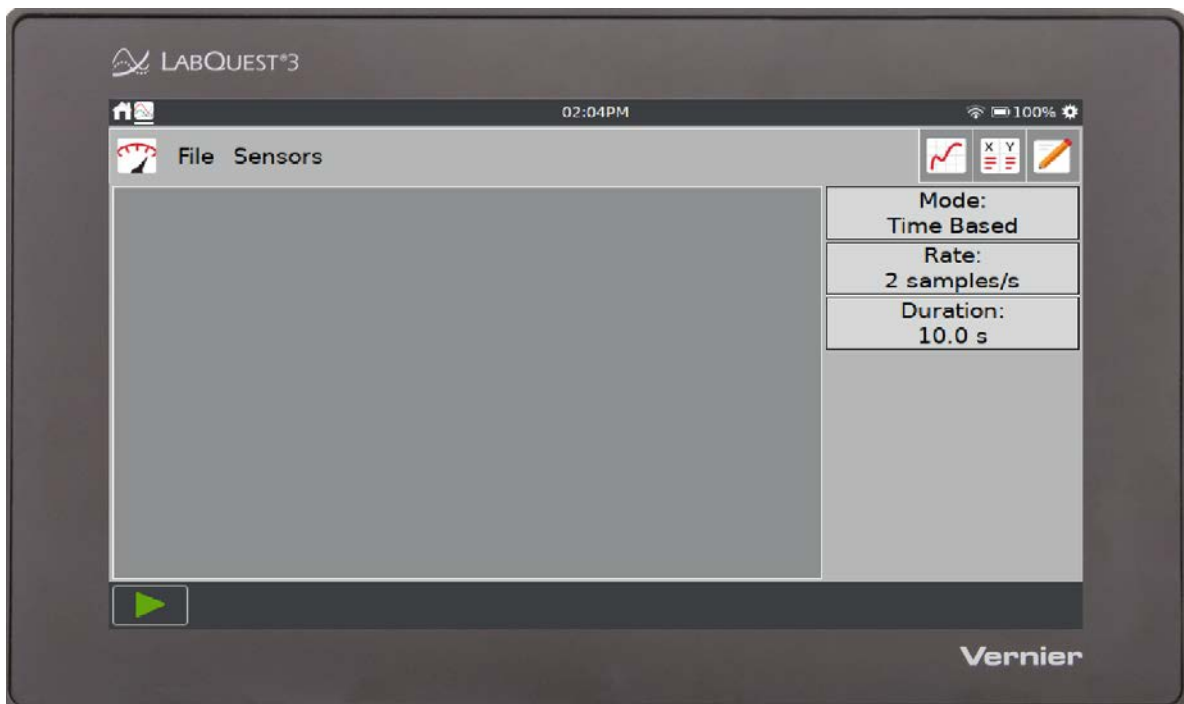


# LabQuest<sup>®</sup> 3 User Manual



Version 3.0.7  
July 2023

## **ABOUT THIS GUIDE**

LabQuest 3, first shipped in September 2020, comes with a [Quick-Start Guide](#) to get you started with basic data collection and analysis. The LabQuest 3 User Manual is an extended guide detailing the hardware and software features of LabQuest 3.

This document represents features available in the 3.0.7 version of LabQuest 3 software released in July 2023.

**Note:** Vernier LabQuest 3 is designed for educational use. This product, related sensors, and accessories are not designed or to be used for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

The included software is provided “as is.” Vernier makes no warranties as to performance, merchantability, fitness for a particular purpose, or any other warranties whether expressed or implied.

## **SAFETY INFORMATION**

### **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 contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
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.

*L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;*
2. *L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est 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 dysfonctionnement du dispositif. Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis 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.*

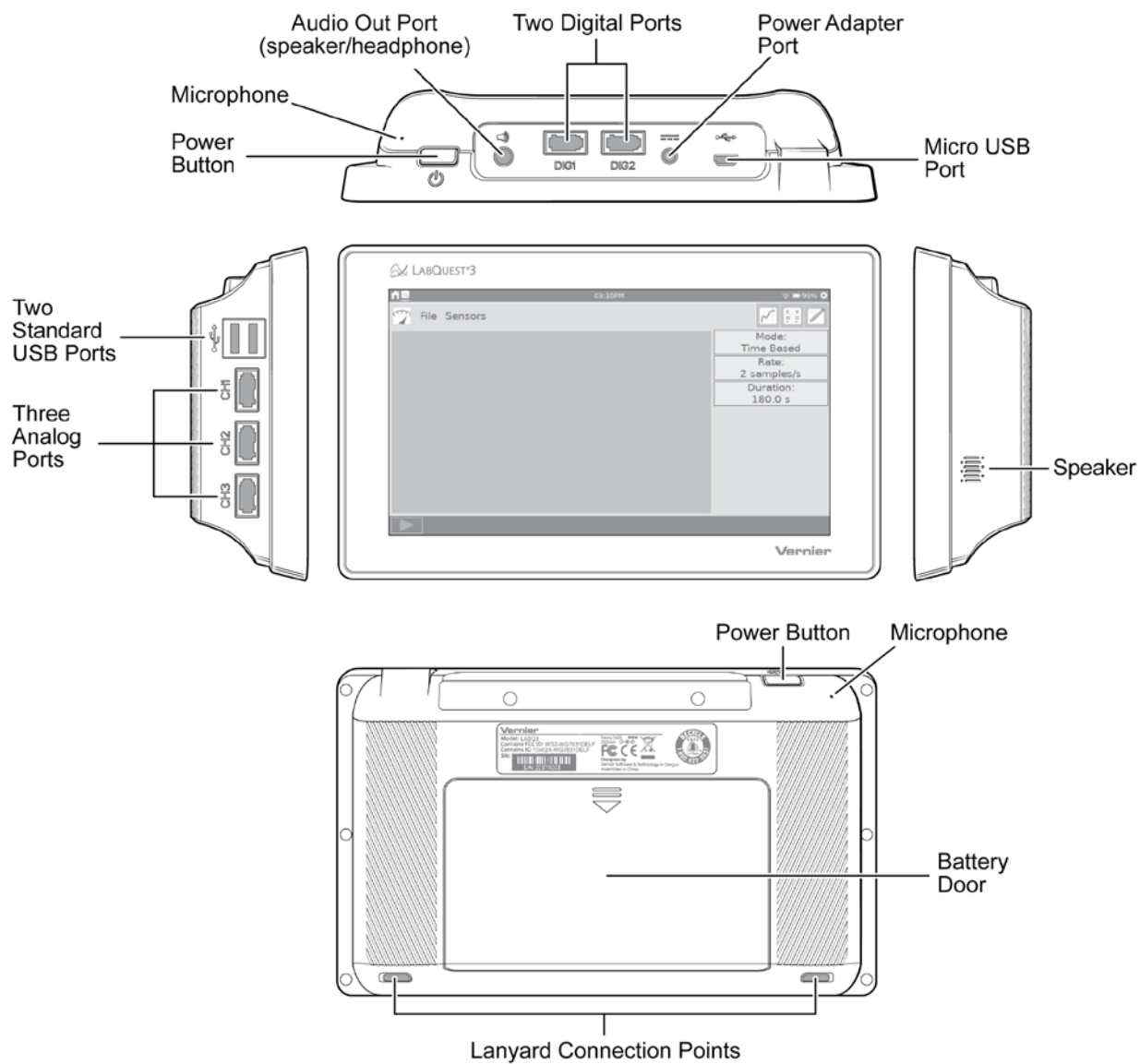
**Avertissement d'exposition RF:** *L'équipement est conforme aux limites d'exposition aux RF établies pour un environnement non supervisé. L'antenne (s) utilisée pour ce transmetteur ne doit pas être jumelés ou fonctionner en conjonction avec toute autre antenne ou transmetteur.*

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## I. GETTING STARTED



### What's Included

- LabQuest 3 unit
- Rechargeable battery (in unit)
- AC power adapter
- Micro-USB computer connection cable
- Quick-Start Guide

## Preparing for First-Time Use

### Remove the Protective Battery Tab

LabQuest ships with the battery in place; however, there is a protective tab covering the battery contacts that must be removed. Remove the battery and discard the tab before using LabQuest. For assistance on removing the battery, see [Replacing the Battery](#) in the appendix.

### Remove the Protective Screen Covering

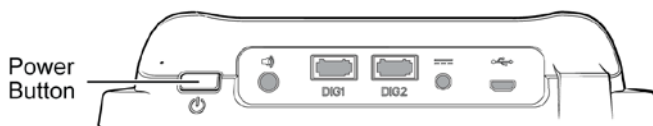
Remove and discard the protective screen cover that comes on the unit. This cover is intended to prevent damage to the screen during shipping. It is not intended as a protective cover for everyday use.

### Charge Overnight

We recommend charging the battery for at least 12 hours prior to using LabQuest for the first time on battery power. To do this, connect the included power adapter to LabQuest and an AC power source.

LabQuest uses a high-quality lithium-ion battery. There is never a need to condition the battery by regular full discharge/charge cycles and it is safe to leave the battery charging indefinitely. For more details about the battery, see [Battery Maintenance](#) in the appendix

## Powering on LabQuest



Press the power button located on the top edge of the unit. LabQuest completes its booting procedure and automatically launches the LabQuest App. This can take 45 seconds to complete.

If the screen momentarily shows a charge battery icon or does not light after a moment, check to be sure you have removed the protective battery tab and properly replaced the battery. Connect the power adapter to LabQuest and to an AC power source, and then try the power button again.

### Power Button Behavior

**Power on/resume**—If the screen is off for any reason (LabQuest is shutdown, suspended, or the screen is off to conserve battery power), press and release the power button to turn LabQuest on.

- If only the screen is powered off, pressing the power button turns the screen on.
- If LabQuest is suspended, it takes a few seconds for the LabQuest App to start up.
- If LabQuest is shut down, it needs to fully boot, taking about 45 seconds.

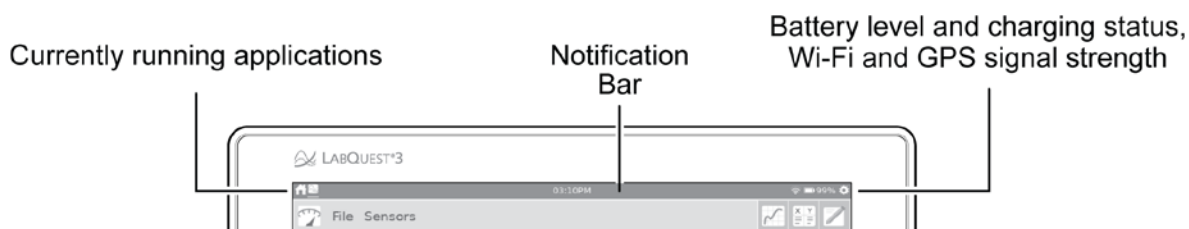


**Suspend**—When LabQuest is on, press and release the power button once to put LabQuest into a suspend mode. In this mode, all running apps are closed. While suspended, LabQuest uses less power but the battery can still drain.

**Shut down**—To shut down LabQuest, press and hold the power button for about five seconds and release it when the shutdown message appears. Wait for LabQuest to shut down. To cancel the shutdown procedure, tap Cancel before the countdown is complete. This is the lowest energy state of the device; however, even when shutdown, the battery still drains very slowly.

**Forced shutdown**—Holding the power button down for more than eight seconds powers off LabQuest uncleanly. This should be avoided as you are likely to lose your data and potentially cause file system corruption. Only do this if you have no other way to power off the unit.






## Reading the Notification Bar



The left side of the Notification bar shows the apps that are currently running in the order they were launched. The white underline indicates the application you are currently viewing.

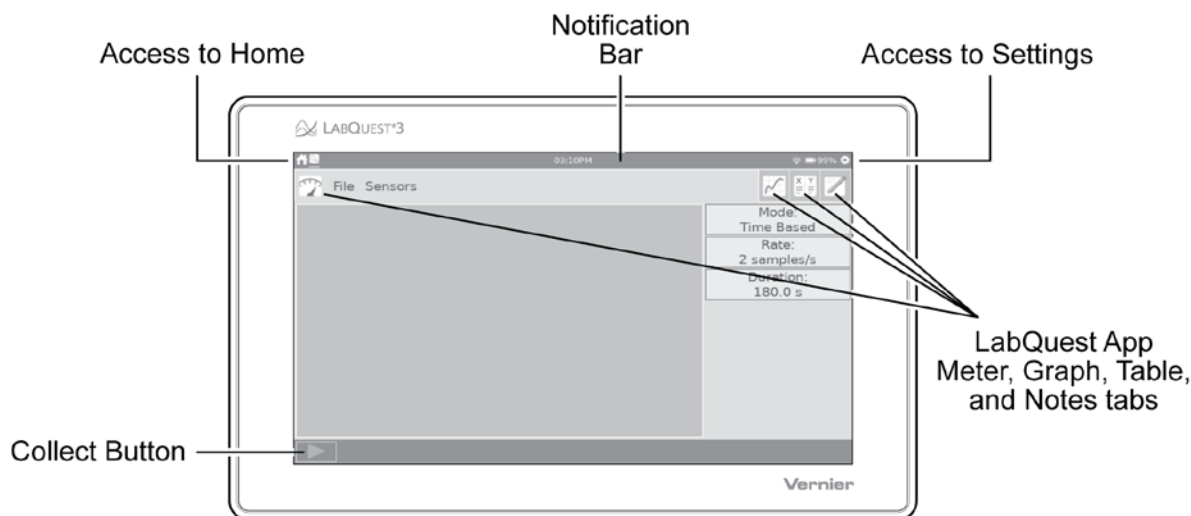
The current time is shown in the middle of the notification bar. The time is set using the [Time & Date app](#) accessed from the Settings screen.

The right side of the Notification bar shows battery level and charging status as well as Wi-Fi and GPS signal strength. GPS signal strength is only shown when the GPS sensor is being used. See [Internal Sensors](#) for more details.

-  50%—Running on battery power (50% battery life remaining)
-  50%—Battery is charging (50% charged)
- —Battery Fault or No Battery (If you see this icon when you power your LabQuest for the first time, the protective battery tab may not have been removed.)
- —Wi-Fi signal strength (If all bars are grayed out, Wi-Fi may be off.)
-  3—GPS is on (signals acquired from 3 satellites)

## II. USING THE TOUCH SCREEN

LabQuest 3 has a capacitive touch screen like those found on tablets and smart phones. LabQuest is controlled by touching the screen. Instead of using your finger, you can use a stylus designed for capacitive touch screens (not included) if desired.

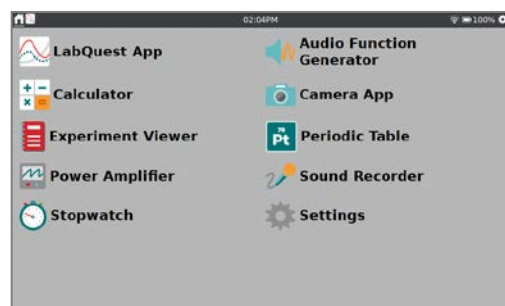


### Common Gestures

- **Single tap**—Use a single tap to interact with most objects on the device.
- **Touch and drag**—Use touch and drag to select regions on a graph or to scroll through menus.
- **Long press**—Use the long press to activate special functionality on some objects such as holding down the keyboard shift key to enable shift lock or beginning a table selection.
- **Two-finger pinch/zoom/pan**—Use this gesture to manually scale graphs or pan the data table.
- **Double-tap**—Double-tap to scale the graph to fit the data or to edit elements of the data table such as cell data (when allowed), column name, or dataset name.
- **Single-finger swipe (from edges)**—Use this gesture to change which app is displayed.

### Accessing Home

- Tap or swipe down from the left side of the Notification bar to view the Home screen.
- Tap to select an application you want to use. See [Additional Apps on LabQuest 3](#) for more details.



## Accessing Settings

- Tap or swipe down from the left side of the Notification bar to view the Settings screen.
- Tap to select the setting you want to modify. See [Customizing the Settings](#) for more details.




## Switching Between Running Apps

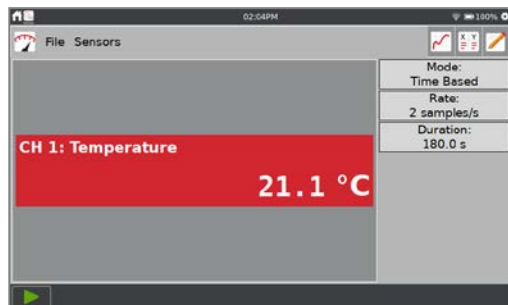
Swipe left or right from the edge of the screen to switch between running apps. The app order is represented by the icons on the left side of the notification bar. The order that the icons appear relates to the order in which the apps are launched.


## Navigating the LabQuest App Screens

The LabQuest App Meter, Graph, Table, and Notes screens are accessed by tapping the associated tab icons.

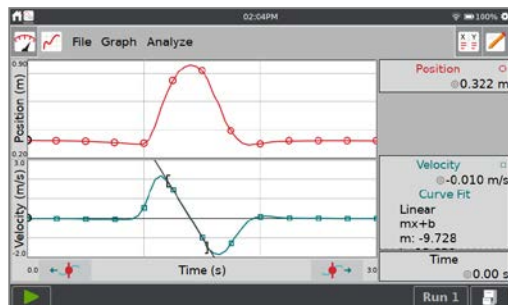
 **Meter screen**—Use the Meter screen to view live sensor readouts, configure sensors, and set data-collection parameters.

For a detailed description of how the Meter screen is used, see [Configuring Sensors](#) and [Modifying the Data Collection Settings](#).




 **Graph screen**—From the Graph screen you can view a graph of your data and perform analyses, including curve fits.


For a detailed description of how the Graph screen is used, see [Setting Up Graphs](#) and [Analyzing Your Data](#).



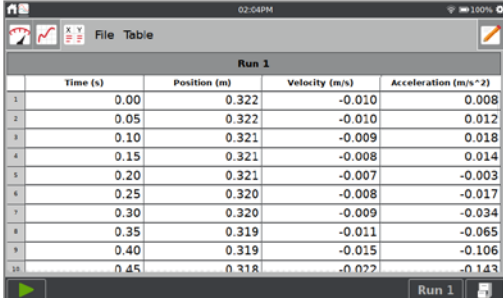
## Using the Touch Screen

 **Table screen**—Use the Table screen to view a tabular representation of your data, create calculated columns, and manually enter data.

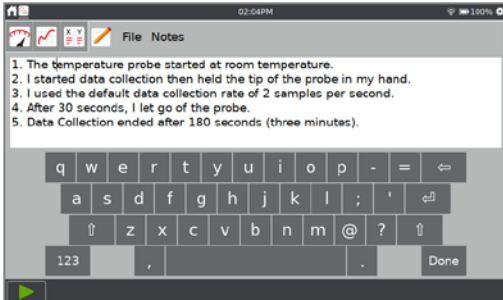
For a detailed description of how the Table screen is used, see [Manually Entering Data](#) and [Analyzing Your Data](#).

 **Notes screen**—From the Notes screen you can record observations about your experiment.

For more information, see [Adding Notes to Your Experiment](#).



	Time (s)	Position (m)	Velocity (m/s)	Acceleration (m/s <sup>2</sup> )
1	0.00	0.322	-0.010	0.008
2	0.05	0.322	-0.010	0.012
3	0.10	0.321	-0.009	0.018
4	0.15	0.321	-0.008	0.014
5	0.20	0.321	-0.007	-0.003
6	0.25	0.320	-0.008	-0.017
7	0.30	0.320	-0.009	-0.034
8	0.35	0.319	-0.011	-0.065
9	0.40	0.319	-0.015	-0.106
10	0.45	0.318	-0.027	-0.143



File Notes

1. The temperature probe started at room temperature.
2. I started data collection then held the tip of the probe in my hand.
3. I used the default data collection rate of 2 samples per second.
4. After 30 seconds, I let go of the probe.
5. Data Collection ended after 180 seconds (three minutes).



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123 , . Done


## Data-Collection Controls


To start data collection from any LabQuest App screen, tap Collect, . As data are collected, the graph and table are updated live. You can tap Stop, , to end data collection early or wait until the collection completes.


In event-based data-collection modes (e.g., Events with Entry), a Keep button, , appears to the right of the Stop button. In this mode, you must tap  to record the data point. For more information, see [Events with Entry](#).

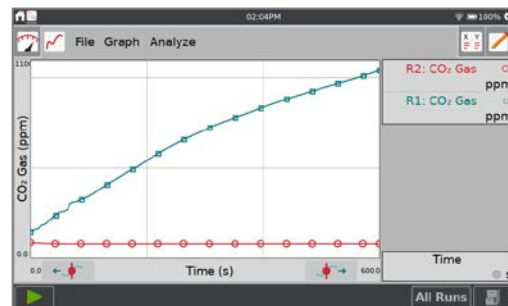
The Data Mark button, , appears to the right of the stop button when the data mark option is enabled for time-based collections. As data are collected, tap  to mark a particular point of interest. See [Enable Data Marking](#) for more information.

## Collecting Multiple Runs

To collect more data, overwriting your existing data, tap Collect, , again.

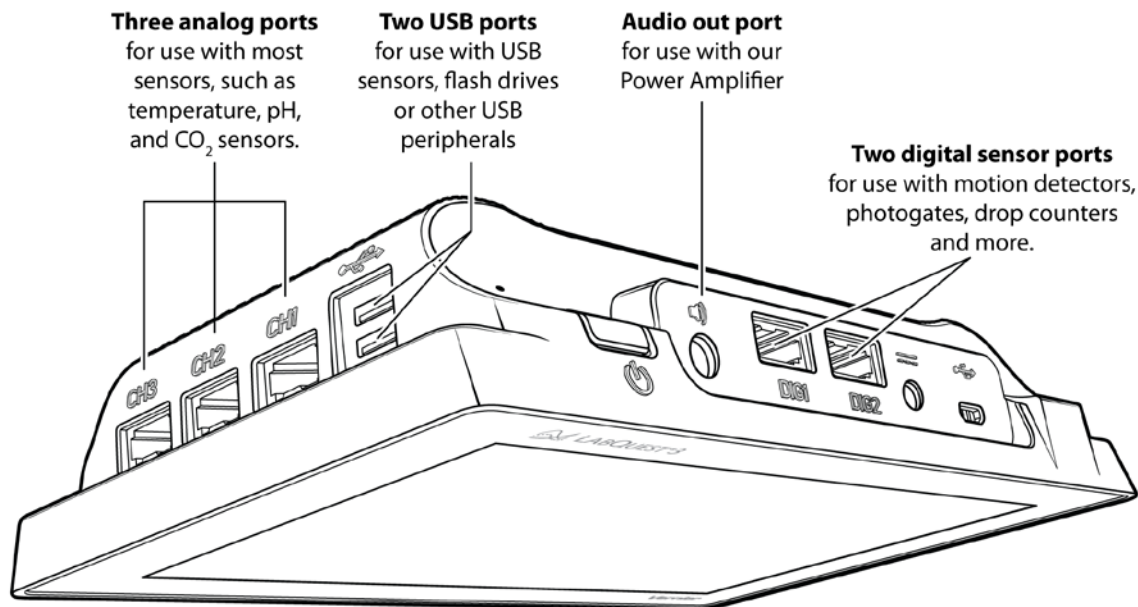
To collect additional data without overwriting your previous collection, tap Store Run, , before starting a new data collection.

To display multiple runs of data on the same graph, tap the run indicator button, , and select All Runs.



### III. CONNECTING SENSORS

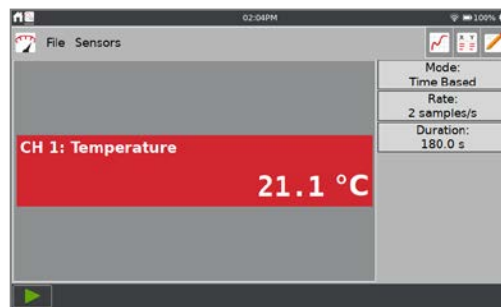
See [www.vernier.com/lq3-sensors](http://www.vernier.com/lq3-sensors) for a list of sensors compatible with LabQuest 3.



#### Wired Sensors

Connect your wired sensor to the appropriate sensor port. LabQuest App displays a meter and sets the default collection rate for the sensor.

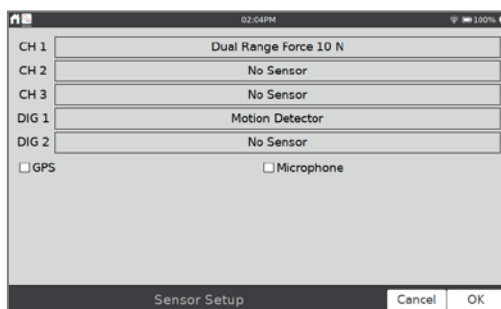
**TIP!** If connecting a Go Direct<sup>®</sup> sensor that includes multiple sensor channels, you may need to modify the Sensor Channel configuration to use some of the built-in sensors. See [Go Direct Sensor Channel Configuration](#).



#### Manual Sensor Setup

If your wired analog (BTA) or digital (BTD) sensor is not automatically identified by the LabQuest App, you can set up the sensor manually.

Choose Sensor Setup from the Sensors menu. Tap the field displaying No Sensor for the channel to which your sensor is connected. Choose the appropriate sensor from the list and tap OK.



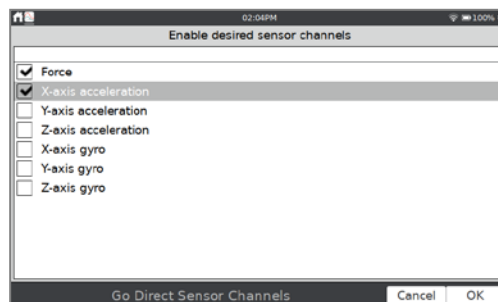
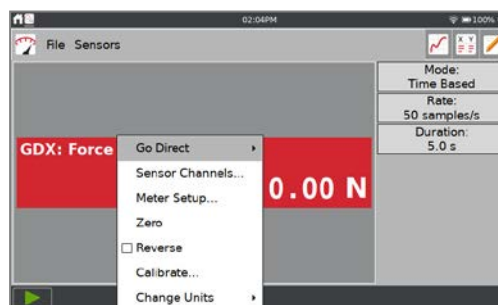
### Wireless Sensors

Follow these steps to connect to a wireless sensor.

1. Choose New from the File menu. Power on the sensor, tap Sensors ► Wireless Device Setup, and choose the matching sensor type, Go Direct, Go Wireless, or WDSS.
2. Select your sensor from the list of available sensors and tap OK.
3. Some Go Direct sensors have multiple sensor channels. These sensors have default configurations that do not typically use all available sensor channels.

Tap the sensor meter and select Sensor Channels to access the configuration screen. Select the applicable sensor channels and tap OK.

When connecting a Wireless Dynamic Sensor System (WDSS), you may need to rescan for devices if your device does not show up on the initial scan. Once you are connected to your device, select the sensors you want to use.



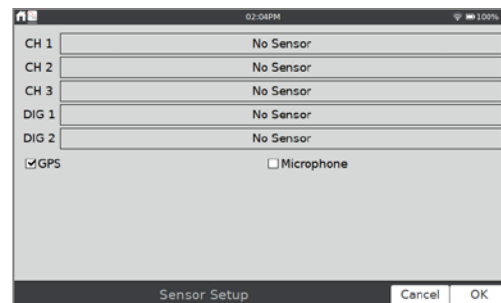
- LabQuest App automatically sets the default collection rate for the sensor.

**TIP!** At most, three Go Direct sensors and three Go Wireless<sup>®</sup> sensors can be connected at the same time.



## Internal Sensors

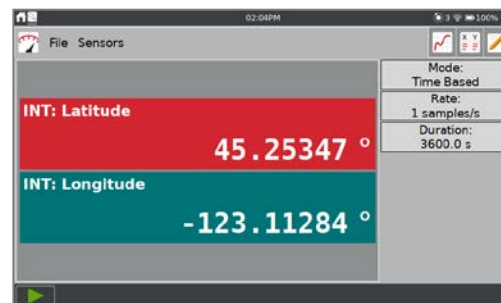
LabQuest 3 also has two built-in sensors: GPS and microphone. To enable an internal sensor, choose Sensor Setup from the Sensors menu. Within the Sensor Setup dialog box, select the check box to enable the associated sensor. Tap OK to return to the Meter screen.



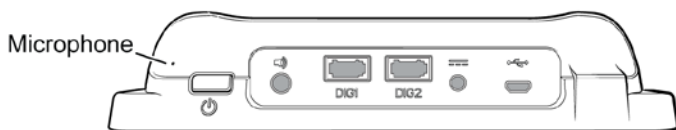
LabQuest automatically sets the default data-collection rate for the sensor.

- GPS**—The internal Global Positioning Sensor (GPS) collects latitude, longitude, and altitude readings, and can be used with other sensors. You can choose units of decimal degrees, degree minutes, or UTM.

**TIP!** It may take 15 minutes or more to acquire signals from enough GPS satellites to report your position. This is especially true the first time you use the sensor or after not using the sensor for a while. **We do not recommend using GPS indoors.**



- Microphone**—The internal Microphone is located on the back of LabQuest, near the power button as shown below. The sensor is used to show waveforms of the sound inputs. It does not measure sound level (i.e., decibels).





## IV. QUICK START TO DATA COLLECTION AND ANALYSIS



Follow these steps to quickly get started with basic data collection. For more detailed instructions, see [Using the LabQuest App](#).

1. Press and release the power button located on the top edge of LabQuest to turn on the unit. LabQuest App launches automatically.
2. Choose New from the File menu, and then connect your sensor as described in the [Connecting Sensors](#) section.

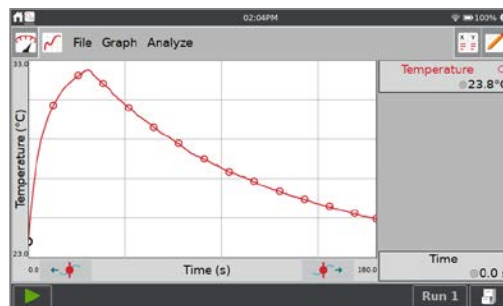
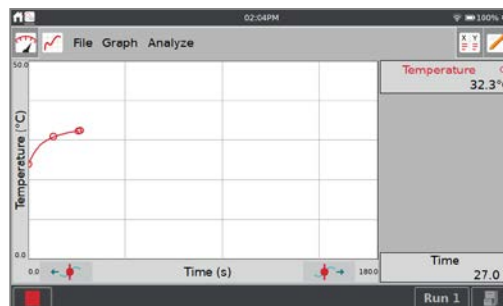
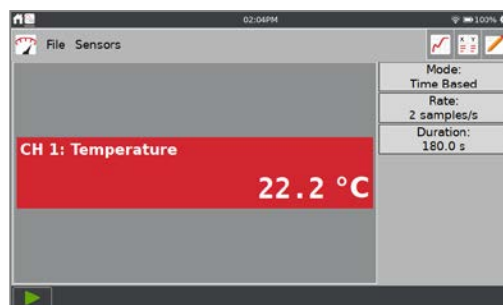
LabQuest App will auto-ID the sensor, display a meter, and automatically set the default collection rate for that sensor.

3. Tap Collect, . LabQuest App switches to the Graph screen and data collection begins. Collected data are displayed in real time for most sensors.

You can stop collection early by tapping Stop, . Once data collection is complete, the graph automatically scales to fit the data.

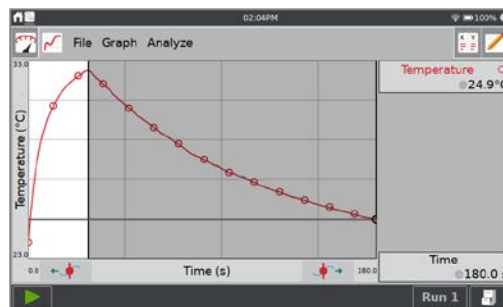
4. Tap the graph to examine a point of interest. The coordinates of the point are shown in the panel to the right of the graph. Tap another point or tap the Examine buttons to move the cursor left, , or right, .

**TIP!** You can pan and zoom the graph as desired using a two-finger pinch gesture. Double-tap the graph to rescale the graph to fit the data.



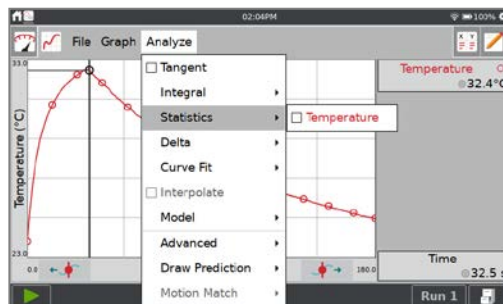


- For data analysis, you can select to analyze all data or just a portion of your data. To select a region of data for analysis, touch-and-drag across the graph to highlight the desired region.



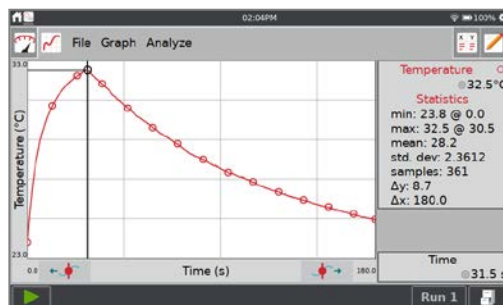
### Statistics

To view statistics for the selected data, choose Statistics from the Analyze menu. Tap the check box to select a data column.



The statistics information is then displayed in the panel to the right of the graph.

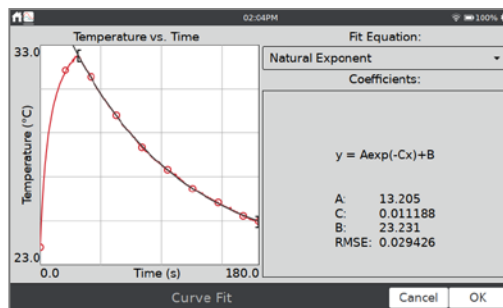
To remove the displayed statistics, tap Analyze on the Graph screen, choose Statistics, and then tap the checked box to clear the selection.



### Curve Fit

To fit a curve to the selected data, choose Curve Fit from the Analyze menu. Tap the check box to select a data column (the Linear fit is shown by default). Tap the Fit Equation dropdown and choose the desired equation.

LabQuest automatically determines and displays the fit coefficients and displays a preview of the curve fit on the graph. Tap OK to apply the fit and return to the Graph screen.





To remove the fit, choose Curve Fit from the Analyze Menu, and then select the checked box to clear the selection.

**TIP!** The Curve Fit coefficients cannot be manually adjusted. To enter your own parameters, see [Model](#) in the Analyzing Your Data section.

## *Quick Start to Data Collection and Analysis*

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### 6. Collect additional data.

- To collect more data, overwriting your existing data, tap Collect, , again.
- To collect additional data without overwriting your previous collection, tap Store Run, , before starting data collection.
- When you have multiple runs, tap **Run 1** to select the run you want to show on the graph. You can also choose to display all runs. For more information, see [Changing What is Plotted on a Graph](#).
- To clear your data and start over, choose New from the File menu. If you have unsaved data, you are prompted to Save or Discard your data. You can save the data on the LabQuest unit or to a connected USB flash drive. For more information, see [Managing LabQuest App Files](#).

## V. USING THE LABQUEST APP

The data-collection and analysis software, LabQuest App, is the heart of LabQuest 3. When you turn on LabQuest, the LabQuest App starts automatically. If the LabQuest App is not displayed on your screen, launch LabQuest App from the Home screen. See [Accessing Home](#).

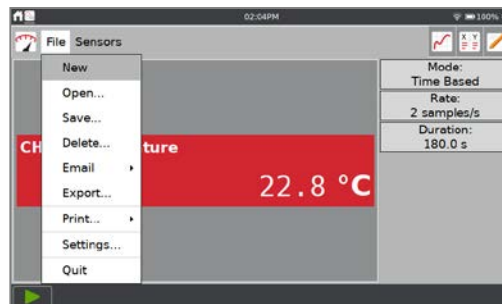
### Preparing for Data Collection

Data collection with LabQuest starts from the Meter screen, which is the default screen for LabQuest App. From this screen, you can view real-time sensor readings as well as a summary of the data-collection settings. Additionally, you can access tools to modify and customize these settings for your particular experiment.

### Starting a New File

Choose New from the File menu to reset all data-collection parameters and sensor calibrations back to default values. If you have unsaved data, you are prompted to either save or discard the data before continuing.

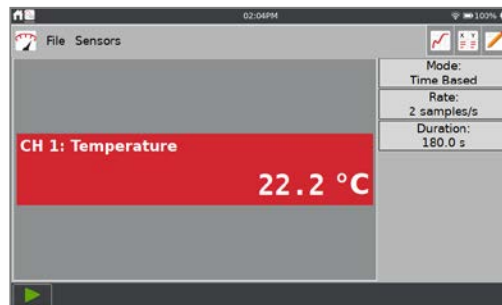
**TIP!** Start a new file before you connect wireless sensors or manually set up internal sensors. These sensors are disconnected when you start a new file.



### Data-Collection Summary

A summary of the data-collection settings (e.g., Mode, Rate, and Duration) is shown in the panel to the right of the sensor meters.

If the settings are not appropriate for your experiment, tap the summary box to access the Data Collection Setting dialog.



## Modifying the Data-Collection Settings

For most sensors, the default data-collection mode is Time Based. The default collection rate for the connected sensor is automatically set up when LabQuest identifies the sensor. To modify the data-collection settings, tap the summary box, or choose Data Collection from the Sensors menu.

The parameters listed in the Data Collection dialog depend on the mode selected.

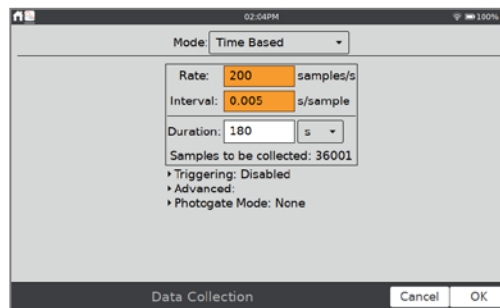
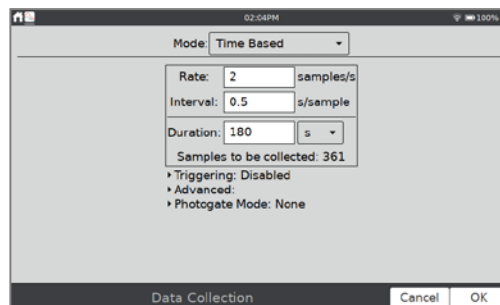
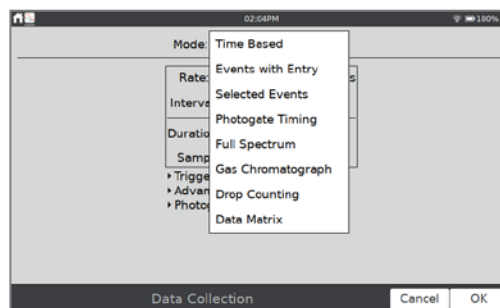
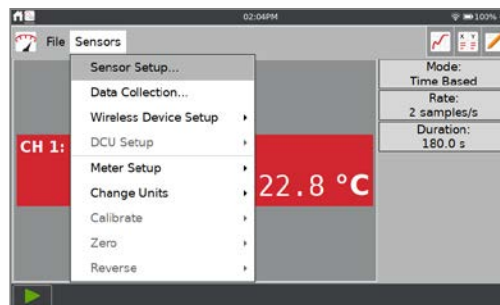
Data-collection modes include Time Based, Events with Entry, Selected Events, Photogate Timing, Full Spectrum, Gas Chromatograph, Drop Counting, and Data Matrix.

### Mode: Time Based

Time-based data collection is the default data-collection mode for most sensors. In this mode, sensor readings are recorded at regular time intervals.

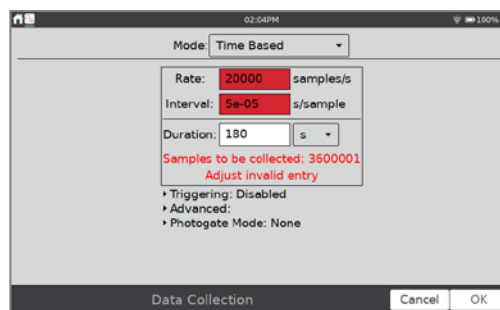
Adjustable parameters for this mode include the rate (or interval) and duration of data collection. The total number of samples to be collected based on these parameters is displayed.

**Warning Messages**—Under some circumstances, the Rate, Interval, and Duration fields may be orange or red. The orange highlight indicates that the rate has been set to a value slower or faster than what is recommended for the connected sensor or that the number of samples could lead to performance issues. You can still collect data using these settings; however, you may have undesirable results.

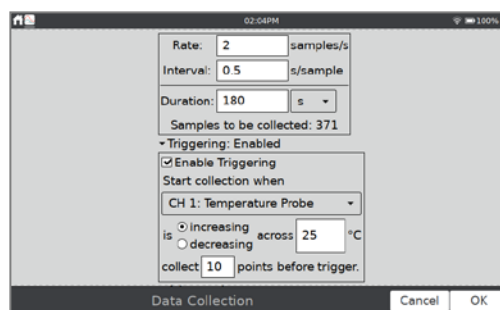


The red highlight indicates one of the following and you cannot apply the changes until the warning condition has been resolved:

- The rate has been set to a value slower or faster than what a connected device and/or sensor configuration can support.
- The number of samples exceeds the storage available.
- The number of samples exceeds 2000 (for rates faster than 80,000 samples/s).



**Triggering**—Triggering is only available in the Time-Based mode. When enabled, LabQuest waits for a trigger condition to be met before recording data. To set the trigger, choose the sensor and set the threshold conditions. You can also set the number of points to be saved before the trigger condition is met.

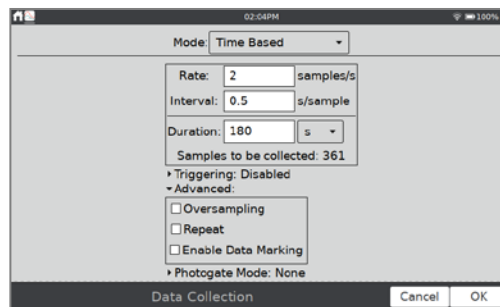


**Advanced**—The Advanced field has three options that can be independently enabled by selecting the associated check box.



- **Oversampling** can be used with data-collection rates less than ten samples per second. When enabled, the sensor samples at a rate higher than your selected rate. The app averages those readings and reports an average value for each collection interval.

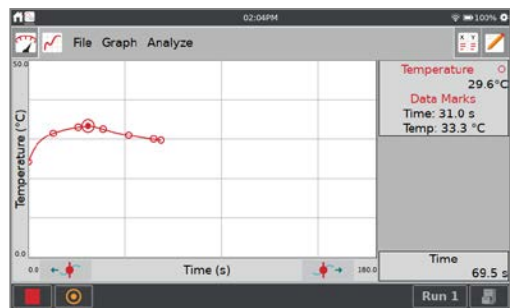
Oversampling can be used to reduce measurement noise by combining a burst of readings into one value. As an example, oversampling can sometimes reduce the influence of unseen but real variations, such as those from a flickering light source.

- **Repeat** can be used when the data-collection rate is at most 500 samples per second. When enabled, a new data-collection run is started as soon as the current run has ended. This setting is helpful for exploratory investigations.



***TIP!** Data for each run is overwritten when a new run is started.*

- **Enable Data Marking** can be used to mark points of interest during a time-based data collection. When enabled, the Mark Data button, , appears next to the stop button during data collection. Tap  to mark a particular point of interest. After completing data collection, data marks can be named using the panel to the right of the graph. See [Tag Data](#) for more information.



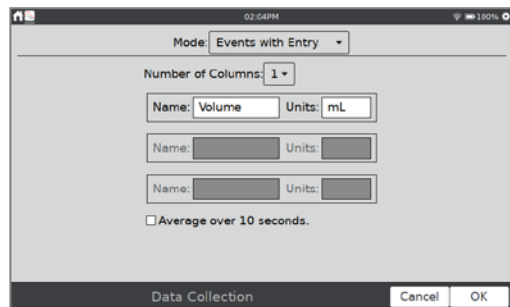
- **Photogate Mode**—This mode is used for photogate experiments that also use a time-based sensor. Examples include impulse and momentum and centripetal force experiments that use a photogate and force sensor to collect the necessary data. See [Photogate Timing](#).



### Mode: Events with Entry

Sometimes experiments depend on a quantity other than time. For example, a Boyle's law experiment investigates pressure as a function of the volume of gas in a closed container.

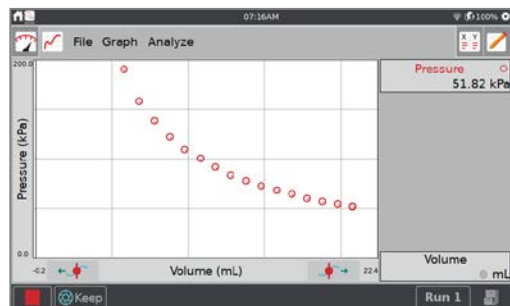
**TIP!** In Events with Entry mode, no time information is recorded.

- **Name and Units**—Enter a name and units for each independent variable.
- **Average over 10 seconds**—You can choose to average data over ten seconds and report the averaged reading. When selected, each time you keep a point, data are collected for 10 seconds and the average reading over that time period is recorded.



In Events with Entry mode, a Keep button, , appears next to the stop button during data collection. Tap  to record the sensor value (e.g., gas pressure in the Boyle's law experiment).

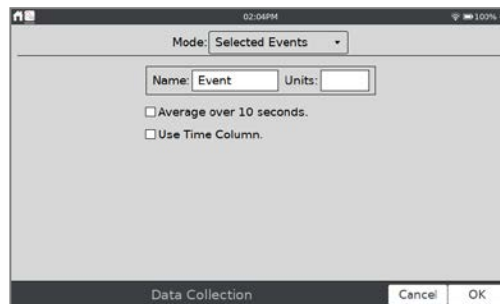
In response, you are prompted to enter a value for the independent variable (e.g., gas volume in the Boyle's law experiment). Sensor data are plotted against the independent variable.



### Mode: Selected Events

Selected Events mode is similar to Events with Entry, except that entries of 1, 2, and 3... are automatically recorded as the independent variable.

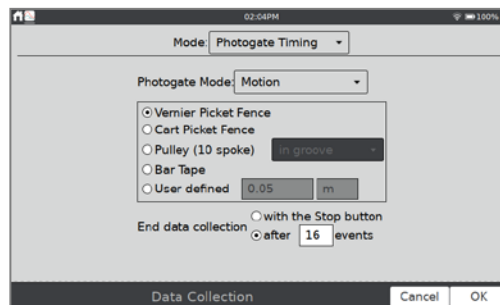
- **Name and Units**—Enter a name and units for each independent variable.
- **Average over 10 seconds**—You can choose to average data over ten seconds and report the averaged reading.
- **Use Time Column**—Choose this option to record time instead of the reference number as the independent variable.



### Mode: Photogate Timing

Photogates require a different set of timing options. When a wired (BTD) photogate is detected or when a Go Direct Photogate is set up to use Gate State channels only, LabQuest App defaults to Photogate Timing mode.

You have two options for ending data collection in this mode: with the Stop button or after a defined number of events. A block/unblock pair counts as two events, so a picket fence with 8 bars needs to stop after 16 events.



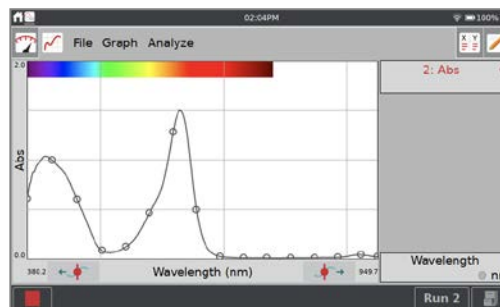
Choose the proper Photogate Mode for your experiment. For more information, see

- **Wired (BTD) Photogates** [www.vernier.com/til/3329](http://www.vernier.com/til/3329)
- **Go Direct Photogates** [www.vernier.com/til/4314](http://www.vernier.com/til/4314)

### Mode: Full Spectrum

When a spectrometer is detected, LabQuest App defaults to Full Spectrum mode. In this mode, Intensity, Absorbance, Fluorescence, or % Transmittance can be measured as a function of wavelength.

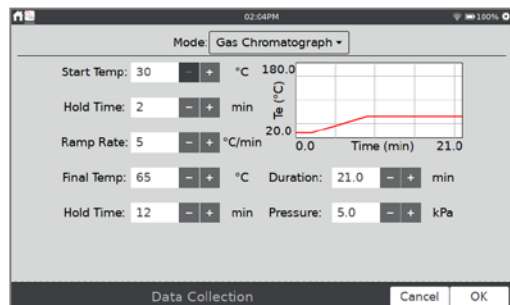
- For Beer's law experiments with spectrometers use Events with Entry mode.
- For Kinetics experiments use Time Based mode.



## Mode: Gas Chromatograph

When a Vernier mini gas chromatograph (e.g., Vernier Mini GC™ Plus) is detected, LabQuest App defaults to the Gas Chromatograph mode. In this mode, various parameters are available for the user to establish a temperature and pressure profile adequate for the current experiment.

When starting data collection, a set of default parameters is displayed. Tap the parameter field to enter a new value, or adjust the default value using the buttons. These values are reflected in the preview of the time-dependent temperature graph displayed to the right. After setting the parameters, tap OK to initiate the warm up.



## Mode: Drop Counting

LabQuest App defaults to this mode when a Vernier Drop Counter or Go Direct Drop Counter are connected. When using this mode, data points are recorded every time a drop is detected by the drop counter. For information on calibrating a drop counter, see

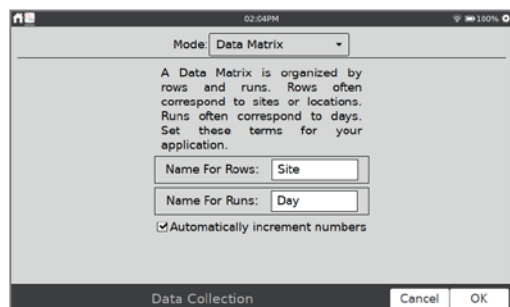
- Vernier Drop Counter  
[www.vernier.com/manuals/vdc-btd](http://www.vernier.com/manuals/vdc-btd)
- Go Direct Drop Counter  
[www.vernier.com/manuals/gdx-dc](http://www.vernier.com/manuals/gdx-dc)



## Mode: Data Matrix

This mode is helpful for field work. It provides a way to collect data referenced to two parameters, such as the locations of your sampling sites and the dates they are sampled. You can collect data from up to eight sensors by adding and removing sensors during data collection.

For more detailed information, see [www.vernier.com/ti/2366/](http://www.vernier.com/ti/2366/)



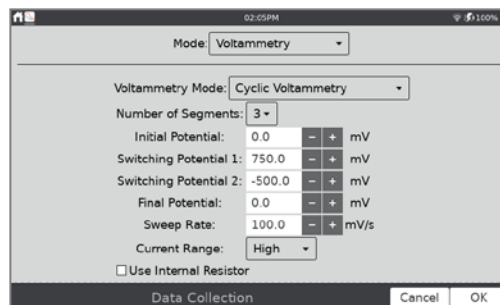


## Mode: Voltammetry

When a Go Direct Cyclic Voltammetry System is detected, LabQuest App defaults to the Voltammetry mode. In this mode, various parameters are available in order to investigate the half-cell reactivity of an analyte. The Voltammetry Modes supported in LabQuest App are Cyclic Voltammetry, Open-Circuit Potentiometry, and Bulk Electrolysis.

Once selecting the Voltammetry Mode, a set of default parameters is displayed. Tap the parameter field to enter a new value. You can select Use Internal Resistor to use the internal resistor instead of an external screen-printed electrode.

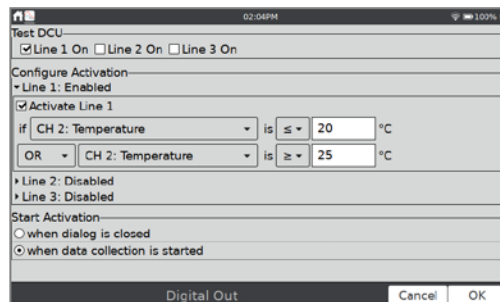
For more information on using the Go Direct Cyclic Voltammetry System, see [www.vernier.com/manuals/gdx-cvs](http://www.vernier.com/manuals/gdx-cvs)



## DCU Setup

Connect a Digital Control Unit (DCU) to one of the LabQuest digital ports. Choose DCU Setup from the Sensors menu and select the DCU for setup.

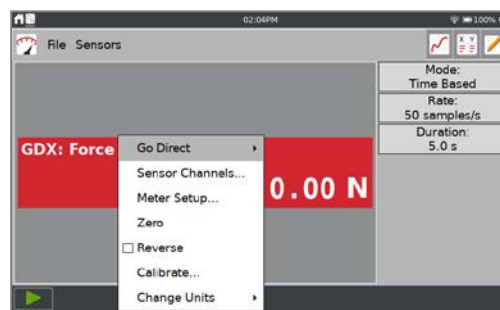
- **Test DCU**—Manually turn on and off the digital lines.
- **Configure Activation**—Use logic statements to activate digital lines based on sensor readings.
- **Start Activation**—Apply digital output logic immediately or only while collecting data.



Once digital output has been activated, automatic identification of sensors is disabled for the port used by the DCU. The LabQuest App cannot detect the removal of the DCU or the addition of any other digital sensor in that port. To turn off the digital output and enable auto-ID of sensors, choose New from the File menu.

## Configuring Sensors

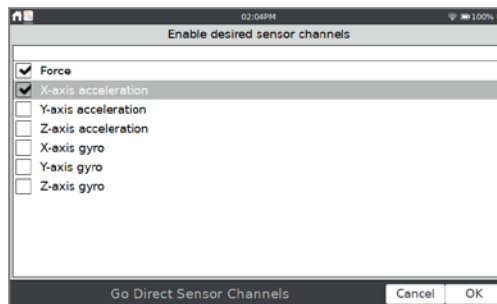
A digital meter for each connected sensor is shown on the meter screen. Tap on a sensor meter to display options for changing sensor settings. The available options depend on the sensor and can include options to set up channels, change units, calibrate, zero, and reverse the sensor. Many of these options can also be accessed from the Sensors menu.



## Go Direct Sensor Channel Configuration

Many Go Direct sensors have multiple sensor channels. These sensors have a default configuration that does not typically use all available sensor channels.

Tap the sensor meter and select Sensor Channels to access the configuration screen. Select the applicable sensor channels and tap OK.

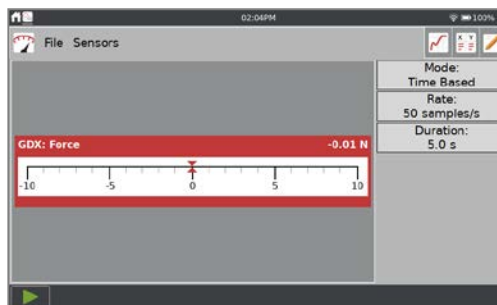
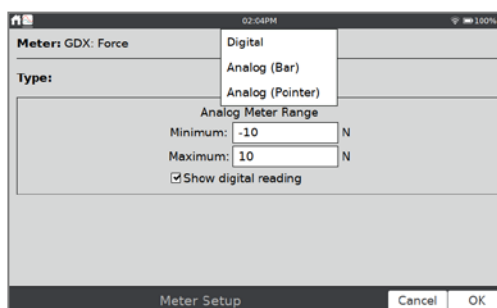


## Meter Type

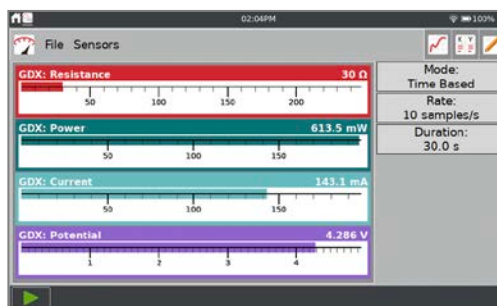
The default meter style is a digital meter. You can also display the meter as an analog meter.

To display an analog meter, tap the meter and choose Meter Setup.

- **Meter Type**—Choose Digital, Analog (Bar) or Analog (Pointer).
- **Analog Meter Range**—Enter the minimum and maximum values for the numeric range displayed on the analog meter. The default values are the same as those used with the default graph setup.
- **Show digital reading**—When selected, this option displays the digital sensor reading on the analog meter.



**TIP!** Vernier energy sensors use analog meters by default. All other sensors use digital meters.

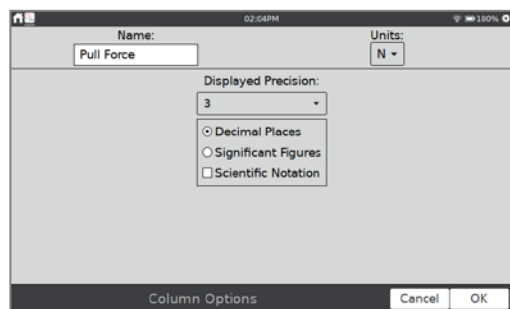
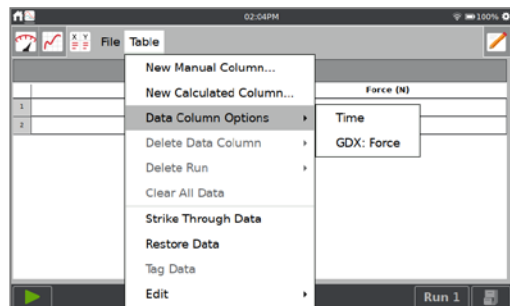


## Meter Name and Displayed Precision

The column name and default display precision are intentionally determined based on the specific sensor. You can change these values as needed.

From the Table screen, select Data Column Options from the Table menu. Select the column that corresponds to the meter you want to change.

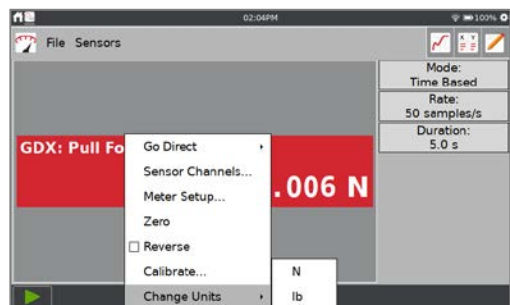
- **Name**—Change the column name.
- **Units**—If a sensor can be displayed with different units of measure, you can change units here.
- **Displayed Precision**—Choose the number of decimal places or significant figures to show in the meter and in the data table. You can also choose to display the values using scientific notation.



## Changing Units

Some sensors can have the data displayed in other units. Generally the default units are the SI unit for that particular sensor reading. Tap the meter, choose Change Units, and select the applicable unit.

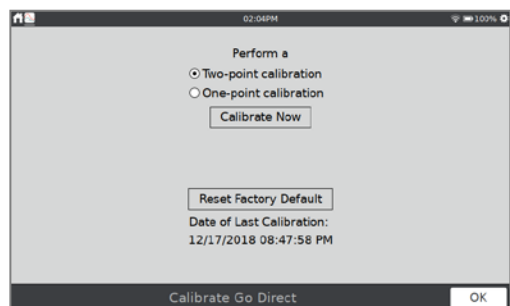
Choosing a new unit updates all existing and subsequent data for that sensor. Not all sensors can change units.



## Calibrating the Sensor

Most sensors use a custom calibration stored on the sensor. However, some sensors do require calibration. Choose Calibrate from the Sensors menu to calibrate a sensor. Updating the calibration does not change data already collected.

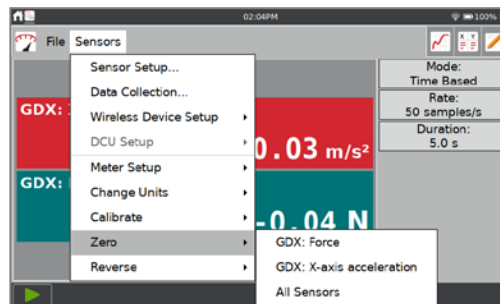
For more information on calibrating a sensor, see [www.vernier.com/ti/3394](http://www.vernier.com/ti/3394) or your sensor's user manual. Not all sensors can be calibrated.



## Zeroing the Sensor Reading

Tap the meter and choose Zero to set the current sensor reading to zero. This adds an offset to all subsequent sensor readings; data already collected are not affected. Not all sensors can be zeroed.

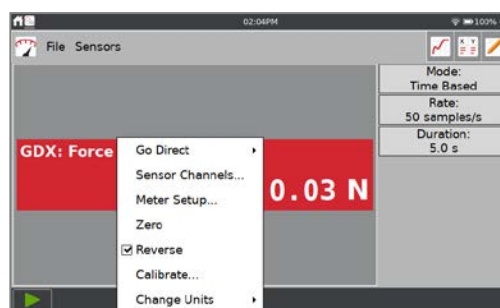
***TIP!** Multiple sensors can be zeroed at the same time by choosing Zero from the Sensors menu and selecting All Sensors.*



## Reversing the Sensor Reading

Some sensors read both positive and negative values. For example, force sensors by default read positive values when pulled, and negative values when compressed.

Tap the meter and choose Reverse to swap the sign of the reading with respect to the default sensor reading. Not all sensors can be reversed.



## Setting up Graphs

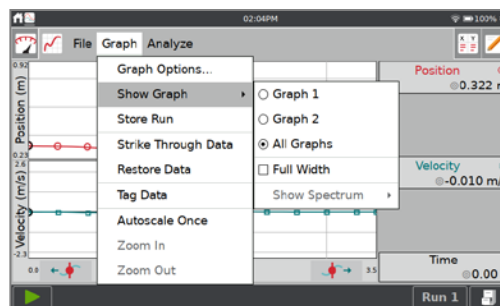
The default graph configuration is based on the connected sensor(s) and the selected data-collection mode. You can change the default behavior as desired. Changes to the graph can be made either before or after data collection.

## One or Two Graphs

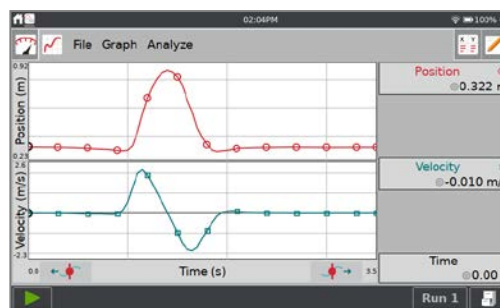
The number of graphs displayed is determined by the connected sensors. While most sensors typically only show one graph, some sensors, such as the motion detector, show two graphs by default. When using multiple sensors, sensors with different units are plotted on separate axes whenever possible. Sensors (and [Go Direct Sensor Channels](#)) added prior to data collection are plotted automatically.

You can change the number of graphs displayed from the Graph screen. Choose Show Graph from the Graph menu and select the desired Graph configuration.

- **Full Width**—This option displays the graph(s) using the full width of the screen by hiding the graph details displayed to the right of the graph.
- **Show Spectrum**—When using a spectrometer, you can control the color background shown on the graph to be full screen, a narrow strip, or not shown.

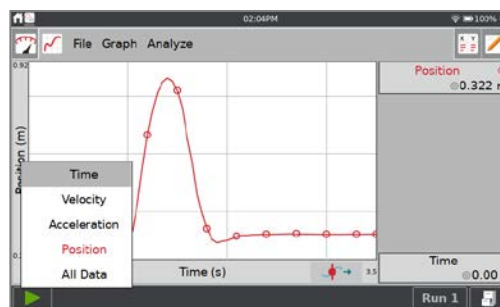


When two graphs are displayed, the graphs have a common x-axis. While you can change the associated data column and scaling of the independent axis, the change applies to both graphs.

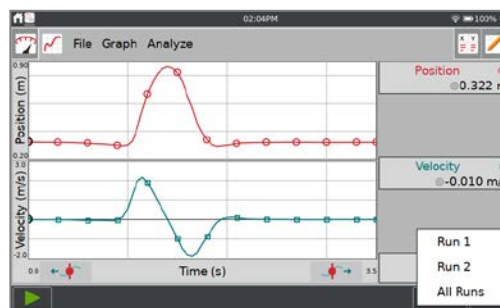


### Changing What is Plotted on a Graph

To change what is plotted on a graph, tap the axis label, and add or remove a column that is plotted.



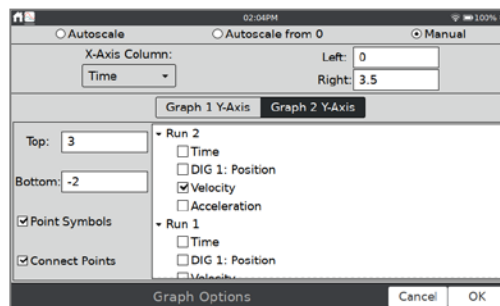
When data from more than one trial are available, you can change which run to display or display all runs. Tap on the Run selector button, **Run 1**, and select which run to display.



For even more control over the graph setup, choose Graph Options from the Graph menu.

Use the Graph Options dialog to change the style of the graph traces.

- **Point Symbols**—Surround some, but not all, of the points with a mark (e.g., a circle or triangle).
- **Connect Points**—Connect contiguous data points (data-table order) with straight-line segments. The order the points are connected is determined by their order in the data table. These lines help the eye follow the data trend but are not equivalent to a curve fit. By default, connected points are on for time-based collections and off for events-based collections such as Events with Entry.



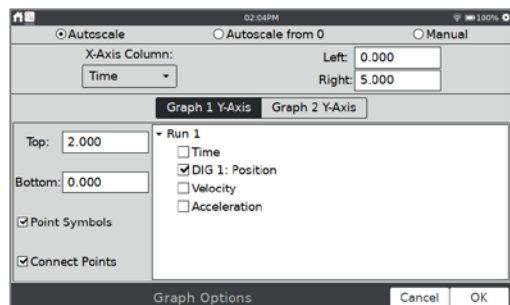
## Scaling the Graph

The scaling on your graph is set up automatically based on the connected sensors and data-collection mode. During data collection, the graph autoscales as needed to ensure all collected data points are shown on the graph. When data collection is complete, the graph updates to fit the data. If needed, you can adjust the scaling manually.

## Autoscale Options

Choose Graph Options from the Graph menu to modify the autoscale settings. There are three options.

- **Autoscale**—This is the default option and functions as described above.
- **Autoscale from 0**—This is the same as the default option except that the origin is always shown on the graph.
- **Manual**—This scaling option respects the graph scaling you have chosen.



## Manual Scaling the Graph using Gestures

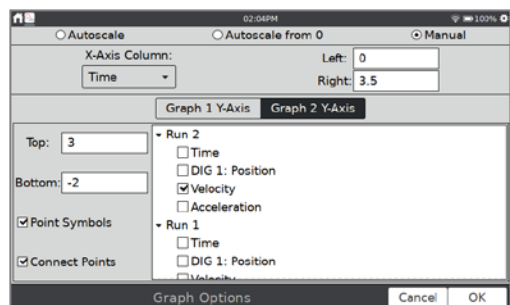
Use a two-finger pinch/zoom/pan gesture to rescale the graph as desired. Rescaling the graph during data collection is not recommended unless your Autoscale option is set to Manual. This is because a new data point could force the graph to rescale to show that point.

Double-tap the graph to rescale the graph to fit the data.

## Manually Scaling the Graph Using Menus

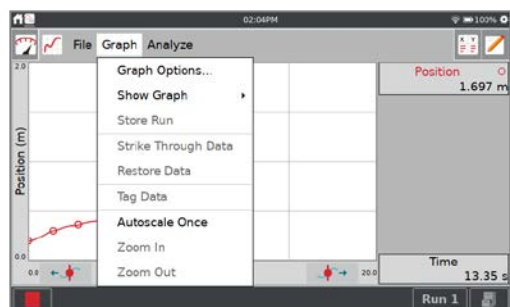
Choose Graph Options from the Graph menu to manually adjust the graph scaling.

- **Left and Right**—These change the x-axis range and apply to both Graph 1 and Graph 2.
- **Top and Bottom**—These change the y-axis range. There are separate entry boxes for Graph 1 and Graph 2.



Choose Autoscale Once from the Graph menu to scale the graph to the data. This is the same as double-tapping the graph.

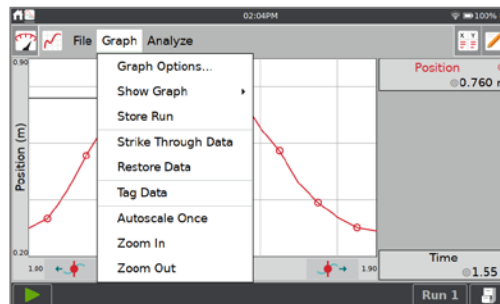
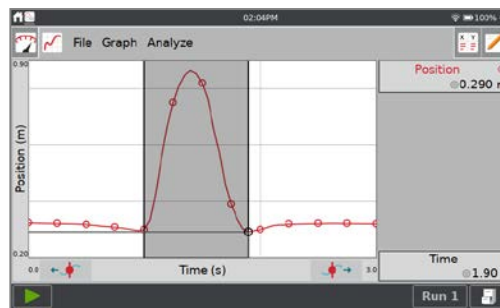
**TIP!** Be sure your autoscale option is set to Manual if you want to retain your manual scaling during data collection.



To zoom in on a selected region of data, touch and drag across the screen to highlight a region. If needed, you can adjust the trailing edge of the selected region using the Examine Buttons (←→, →←).

Choose Zoom In from the Graph menu to scale the x-axis to match the selected region. The y-axis automatically scales to fit the data.

Choose Zoom Out from the Graph menu to undo a Zoom In and return the graph axes to the previous settings. If Zoom In is used several times, Zoom Out will undo each Zoom In one at a time.



## Drawing Predictions

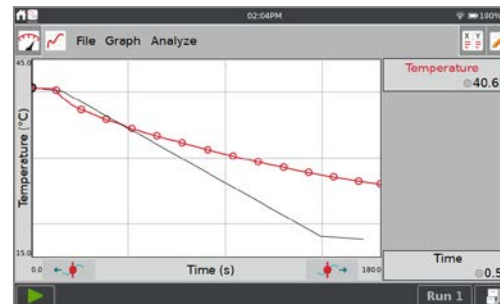
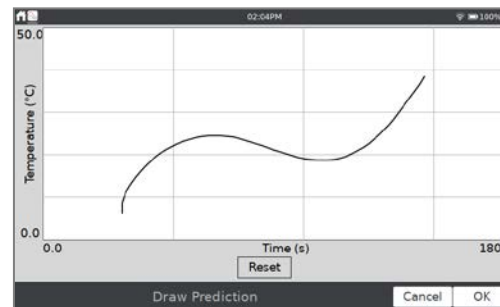
The LabQuest App has a free-hand sketch tool for drawing on the Graph screen. This can be used for a variety of purposes. It is most often used to sketch a prediction of how a graph will appear once data are subsequently collected.

Choose Draw Prediction from the Analyze menu. Select the desired graph (Graph 1 or Graph 2) to activate the tool.

Touch-and-drag across the screen for smooth curves or tap the screen in several places to connect sequential taps with straight-line segments. The Reset button removes your sketch if you need to start over.

Tap OK to place your sketch on the main graph. To remove a prediction, choose Draw Prediction again from the Analyze menu.

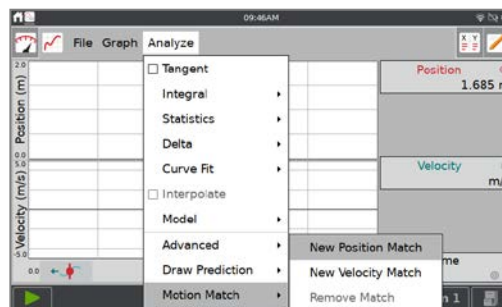
**TIP!** When collecting data, the data plot over the prediction line.



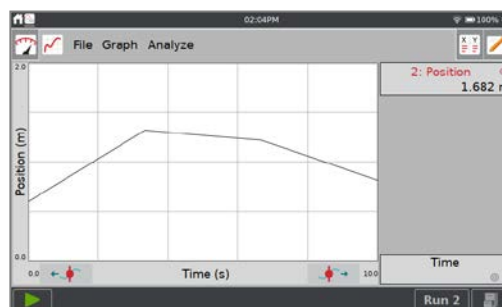
## Motion Matching

The Motion Match feature adds a target position or velocity plot on your graph that you can match as you collect data. The Motion Match menu is only available if a Motion Detector (any version), Motion Encoder, or Go Direct Sensor Cart is connected.

Choose Motion Match from the Analyze menu and select either a New Position Match or New Velocity Match to activate the tool.

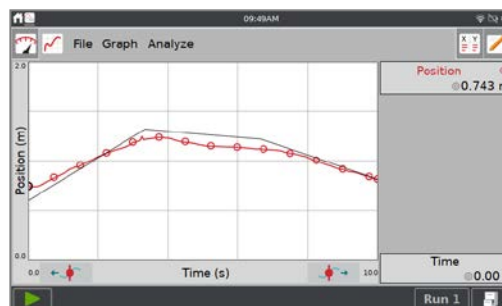


When Motion Match is activated, a random target graph is generated for the matching exercise. Only the selected graph (Position or Velocity) is shown.





You can change or remove the target graph by again choosing Motion Match from the Analyze menu and selecting the applicable option.



When you start data collection, the collected data plot over the target data. You can collect data over the target graph an unlimited amount of times.





**TIP!** When using Motion Match, automatic graph scaling is disabled. The graph does not automatically scale to fit the data during or after data collection.

## Collecting Data



To start data collection, tap Collect, , from any LabQuest App screen. As data are collected, the graph and table are updated. You can tap Stop, , to end data collection early or wait until the collection completes.

In event-based data-collection modes (e.g., Events with Entry), a Keep button, , appears to the right of the Stop button. In this mode, you must tap  to record the data point. For more information, see [Events with Entry](#).

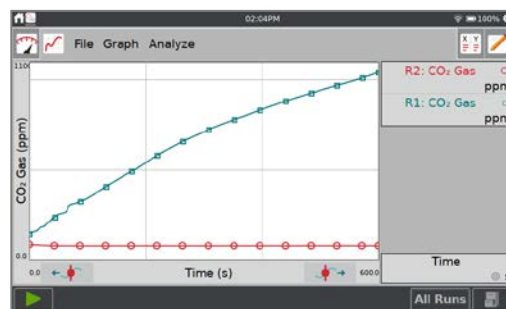
The Data Mark button, , appears to the right of the Stop button when that option is enabled for time-based collections. As data are collected, tap  to mark a particular point of interest. See [Enable Data Marking](#) for more information.



## Collecting Multiple Runs

To collect more data, overwriting your existing data, tap Collect, , again. To collect additional data without overwriting your previous collection, tap Store Run, , before starting a new data collection.

To display multiple runs of data on the same graph, tap the run indicator button, , and select All Runs.



## Deleting Unwanted Runs

If you have collected multiple runs, you can delete runs that are no longer needed.

From the Table screen, choose Delete Run from the Table menu and select a run to delete.

**NOTE:** You cannot delete the last dataset created as it is the active dataset for continued data collection.


Time (s)	CO <sub>2</sub> Gas (ppm)
1	860
2	856
3	852

## Manually Entering Data

You can use LabQuest App to graph and analyze manually entered data. When no sensors are connected, the table and graph default to display two manual data columns: X and Y. You can manually enter data from the Table screen.

## Navigating the Table Screen

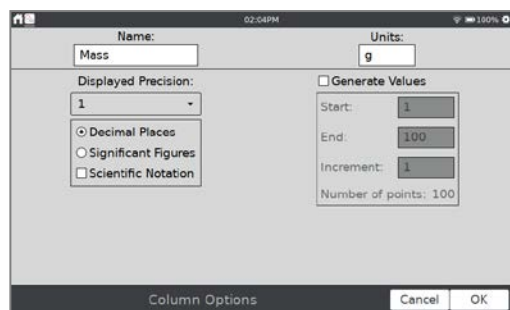
Below are the common gestures used to navigate the Table screen:

- **Edit a cell**—Double-tap a cell, column name, or run name to edit the contents.
- **Scroll the data table**—Swipe up and down to scroll the data table.
- **Pan the data table**—When there are more than five columns in your data table, you can touch and drag the table to view the additional columns.
- **Select multiple cells**—Touch-and-hold, then drag across the screen to select multiple cells. Use the selected cells in conjunction with [Strike Through Data](#) and [Cut/Copy/Paste edit tools](#) found in the Table menu.
- **Change the displayed run**—Tap the Run indicator button, , to change which dataset is displayed on the data table.

## Naming a Column

From the Table screen, double-tap the column name to access Column Options. Update the fields as needed.

- **Name**—Change the column name.
- **Units**—Enter units for your data.
- **Displayed Precision**—Choose the number of decimal places or significant figures to show in the table.



## Entering and Editing Manual Data

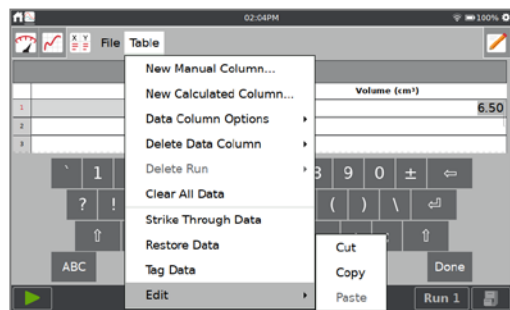
From the column options dialog box, you can automatically generate values, or you can enter data manually.

Double tap a cell to enter or edit the cell data. Only manual columns can be edited directly in this manner. Sensor and time data cannot be edited in this way.



From the Table menu, you have access to edit tools Cut, Copy, and Paste. Use these tools to copy data from one column to another.

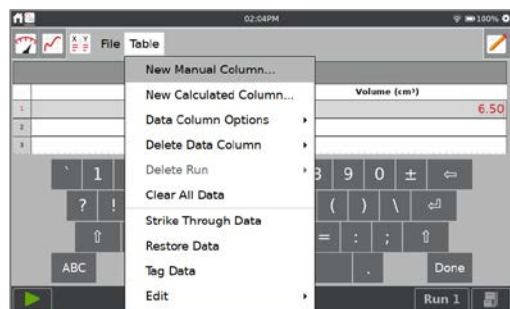
**TIP!** You can copy values to and from the table and other applications such as the [Calculator](#) or the [Stopwatch](#).



## Adding Manual Columns

Choose New Manual Column from the Table menu to create additional manual columns as needed. Modify the Name, Units, and Displayed Precision as desired.

**TIP!** You can also add a manual column to an experiment file that includes sensor data.



## Creating Calculated Columns

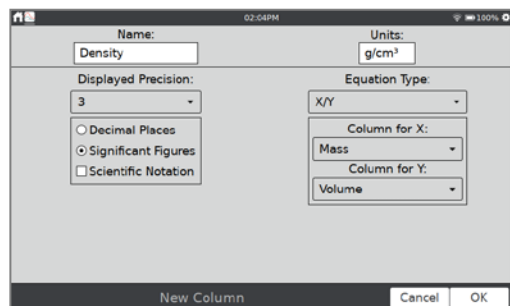
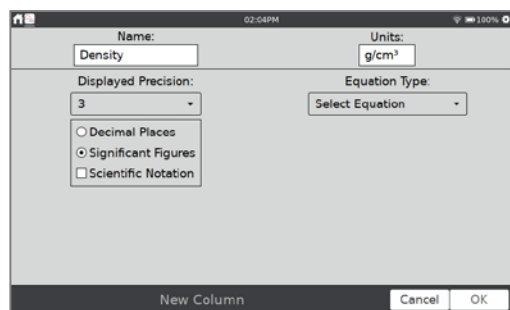
Calculated columns are columns with values that are based on other columns through a mathematical formula. For example, you might define a calculated column as the inverse square of another column, or you might calculate the ratio of mass and volume columns to create a density column.

Choose New Calculated Column from the Table menu. Modify the Name, Units, and Displayed Precision as desired.

Tap the Equation Type field and select an equation type for your calculation. Note that A, B, C, etc., represent constants and X, Y, and Z represent other data columns.

Define the data columns and coefficients for your equation and tap OK.

**TIP!** Calculated columns can also be used with sensor data and can be a useful data-analysis tool.



## Managing the Data

Data that you have collected but no longer want can be deleted from the LabQuest App file.

- **Delete Data Columns**—Choose Delete Data Column from the Table menu and choose the column you want to delete. Note that you cannot delete data collected from a sensor; however, you can hide data using the [Strike Through Data](#) tool.
- **Delete Run**—If you have collected multiple runs, you can delete runs that are no longer needed. Choose Delete Run from the Table menu and select a run to delete. Note that you cannot delete the last dataset created.
- **Clear All Data** —Choose Clear All Data from the Table menu to delete all data from the table. Upon choosing this option, you are prompted to confirm. This option is used when you wish to clear previously manually entered data or collected sensor data without changing any custom settings.



## Analyzing Your Data

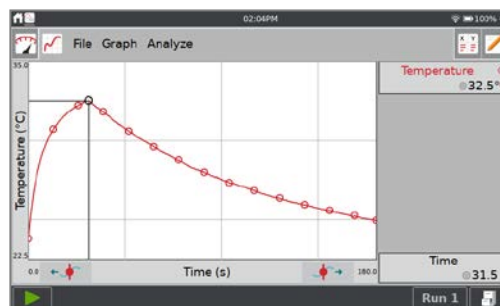
Most data analysis can be done from the Graph screen. Analysis can include examining data on the graph, calculating statistics, modeling with automatic or manual curve fits, and doing a FFT analysis of your data. The results of your analysis are shown in the plot details box to the right of the graph. Tap the box to view the results in a full screen.

To remove an analysis from your graph, select it again.

## Examining the Data

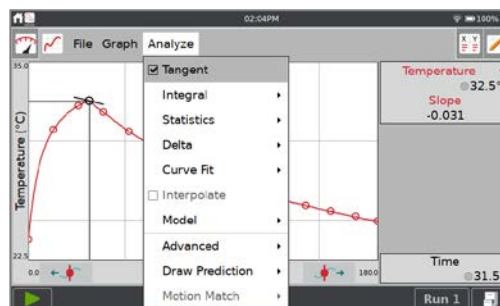
To examine data on the Graph screen, tap on a data point of interest. The Examine cursor jumps to the data point with the nearest x-value. Cursor lines highlight the x- and y-axis values and the coordinates are displayed to the right of the graph.

You can make fine adjustments to the cursor location by using the Left, , and Right, , examine buttons.



## Tangent

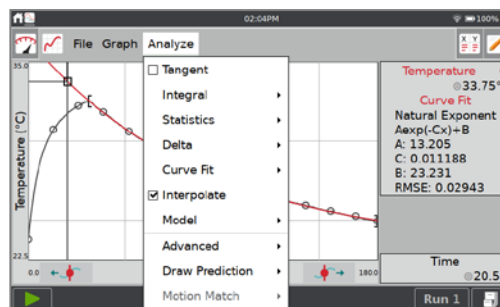
The Tangent mode enhances the Examine cursor by adding a tangent line and numeric display of the slope as you tap different locations on the graph. Choose Tangent from the Analyze menu to activate this tool.



## Interpolate

When you have performed a curve fit, you can use the Interpolate tool to examine points on the fitted function. Choose Interpolate from the Analyze menu to activate this tool.

The Examine cursor locates a position on the fitted function instead of a data point. Coordinates are shown to the right of the graph.



**TIP!** When using Interpolate, the examine cursor is a square instead of a circle, the data points and connecting lines are gray, and the curve fit is drawn in color.

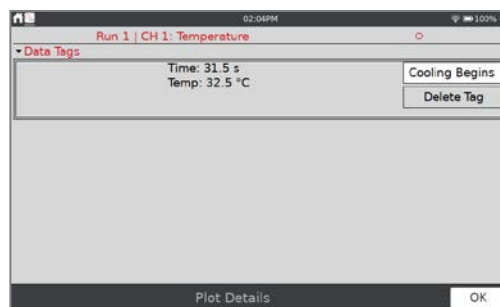
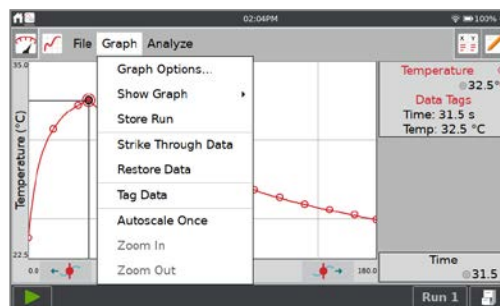
## Tag Data

Use the tag data tool to tag a data point with a comment for later reference.

Tap a point you wish to tag, then choose Tag Data from the Graph menu to tag that point. The tagged point is indicated with a large circle or square. Repeat as needed.

To add comments, tap in the panel to the right of the graph and enter a comment into the blank field.

**TIP!** Tag Data does not work for manually entered data. If more than one run is plotted on the graph, only the point from the most recent run is tagged.



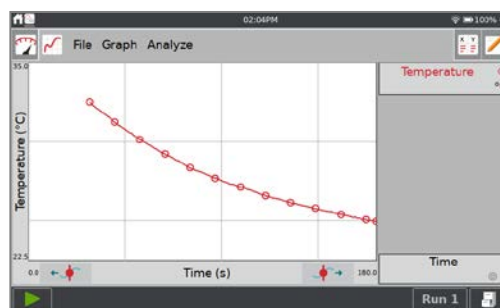
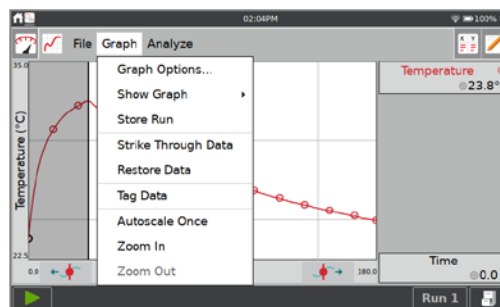
## Excluding Data from Analysis (Strike Through Data)

While you cannot delete data collected from sensors, you can exclude some data points from the analysis. This option is called Strike Through Data. You can access Strike Through Data from the Graph or Table menu.

Tap on a data point or touch-and-drag to select a region of data that you wish to strike. The data can be selected from either the graph or the table.

Choose Strike Through Data from either the Graph or Table menu.

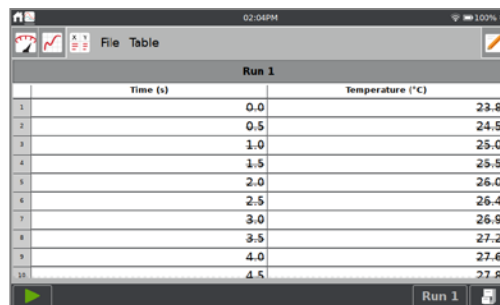
The struck data no longer appear on the graph.



## Using the LabQuest® App

The data are shown in the table as struck. This is what gives the tool its name.

To restore all struck data, choose Restore Data from either the Graph or Table menu.



Run 1		
Time (s)	Temperature (°C)	
1	0.0	23.8
2	0.5	24.5
3	1.0	25.0
4	1.5	25.5
5	2.0	26.0
6	2.5	26.4
7	3.0	26.9
8	3.5	27.2
9	4.0	27.6
10	4.5	27.8

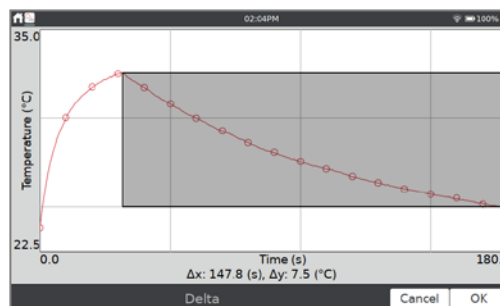
### Delta

The Delta tool opens a preview graph where you can examine x- and y-deltas over regions of your data.

From the Graph screen, choose Delta from the Analyze menu. Touch-and-drag across the graph to create a box overlaid on the graph. The vertical side of the box yields  $\Delta y$ , and the horizontal side of the box yields  $\Delta x$ .

To redo the selection, touch-and-drag again.

Tap OK to keep these values and display the box on the graph. To exit the Delta tool without displaying the box on the Graph screen, tap Cancel.

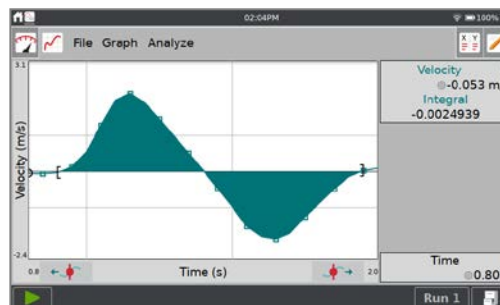


### Integral

The Integral tool numerically integrates graphed data. If a region of the graph is selected, only that region is used for the integral. If there is no selection, the entire graph is used. See also [Peak Integration](#).

From the Graph screen, choose Integral from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name.

The area representing the integral is shaded and the numeric result is displayed in the panel to the right of the graph.

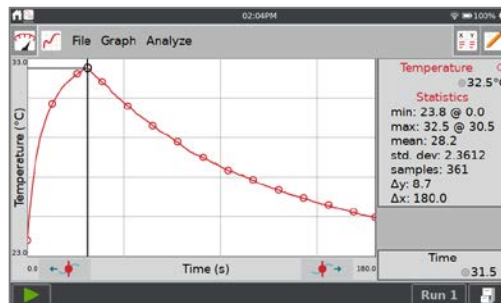


## Statistics

The Statistics tool displays descriptive statistics for selected data. If a region of the graph is selected, only that region is used for fitting. If there is no selection, the entire graph is used.

From the Graph screen, choose Statistics from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name.

The results are displayed in a panel to the right of the graph. If a region is selected, brackets are drawn to indicate the region used for calculations.

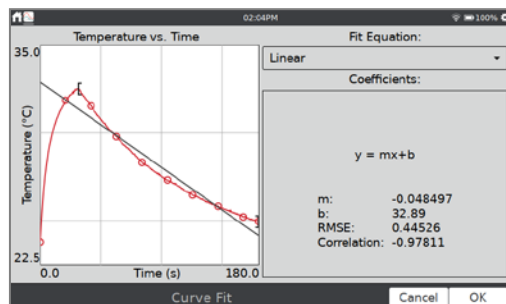


## Curve Fit

The Curve Fit tool fits a chosen function to your data. If a region of the graph is selected, only that region is used for fitting. If there is no selection, the entire graph is used.

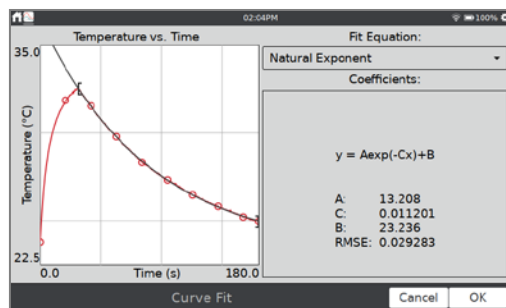
From the Graph screen, choose Curve Fit from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name.

A linear fit is displayed by default. To select a different curve fit, tap the fit equation and choose the desired equation.



LabQuest displays the fit in the preview graph at the left. The fit coefficients and root mean square error (RMSE) are displayed. For linear fits, the correlation coefficient is also displayed.

Tap OK to keep this fit and display the curve on the Graph screen. To exit the Curve Fit tool without applying the curve fit, tap Cancel.



**TIP!** The RMSE is a measure of how well the fit matches the data. The smaller the RMSE, the closer the data points are to the fitted line. The RMSE has the same units as the y-axis data.

## Model

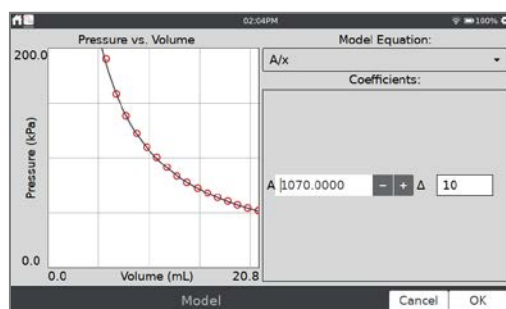
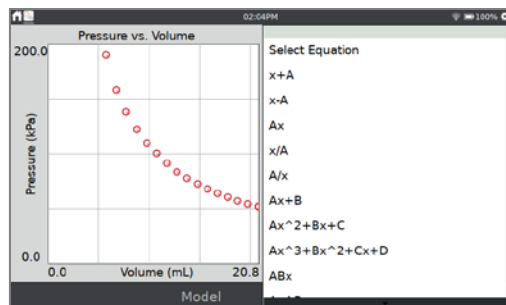
The Model tool manually fits a chosen function to your data.

From the Graph screen, choose Model from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name.

Choose the desired model equation from the Model Equation list. LabQuest displays the modeled function in the preview graph.

The model parameters (e.g., A, B, and C) are adjustable. Change them by direct entry or by using the + and – buttons. Use the  $\Delta$  tool to modify the difference associated with the buttons.

Tap OK to display the modeled function on the Graph screen. To exit the Model tool without applying the function, tap Cancel.



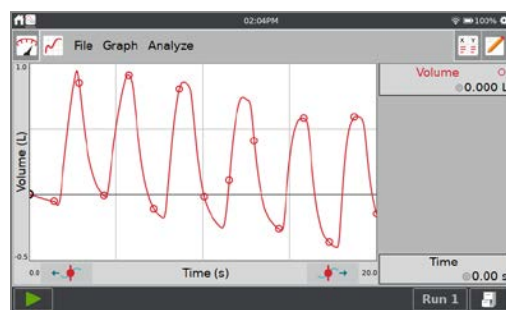
**TIP!** If no function appears on the graph when modeling, your parameters are likely defining a curve that is outside of the plot window.

## Baseline Adjustment

This tool is used when analyzing spirometer data. For a series of breathes, the volume data from each breath should increase and then decrease, returning close to zero for each breath cycle.

In some cases, the baseline drifts making it so that volume appears to increase or decrease by a given amount for each breath. The baseline adjustment applies a factor to compensate for this error.

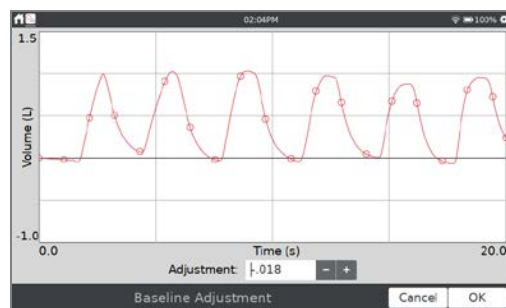
Because LabQuest App uses the x-axis as its baseline when calculating an integral, adjusting the baseline can result in better lung volume measurements.





From the Graph screen, choose Advanced from the Analyze menu, then select Baseline Adjustment. Enable the tool by tapping on the displayed sensor or column name.

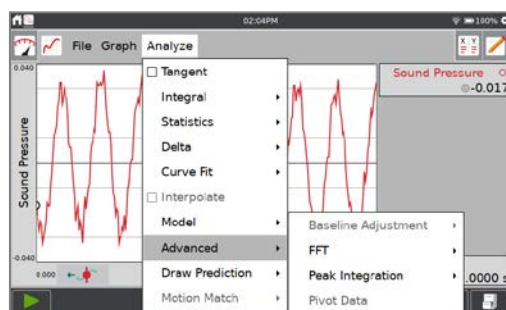
Use the + and – buttons or tap the value to adjust the graph so that the volume data returns to a value close to zero after each cycle. Tap OK.



## FFT Analysis

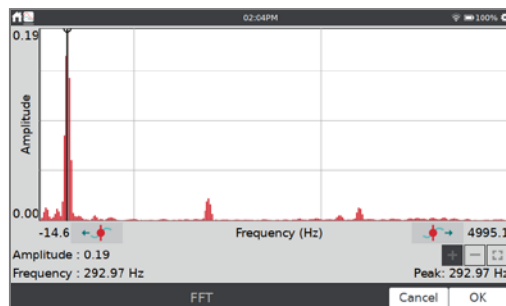
Fast Fourier Transforms (FFTs) are typically used when analyzing microphone data. The tool calculates the FFT of the selected data. The results are displayed in a separate graph that can be analyzed.

From the Graph screen, choose Advanced from the Analyze menu and select FFT. Enable the tool by tapping on the displayed sensor or column name.



Adjust the graph display by touching and dragging across the graph to select a region, and then tap Zoom; alternatively, you can use the two-finger pinch/zoom/pan gesture to highlight a region of interest. The frequency with the highest amplitude for the region on the graph is displayed below the graph.

Tap OK to exit the tool. The results of the FFT analysis are shown in the plot details.



## Peak Integration

The Peak Integration tool is most commonly used when analyzing gas chromatograph data; however, it can be applied to any data plot. Peak Integration differs from the [Integral](#) tool in that it does not use the x-axis as the baseline. Instead, the integral for Peak Integration is evaluated using the minimum y-values to the left and right of a selected peak or region.

From the Graph screen, choose Advanced from the Analyze menu and select Peak Integration. Enable the tool by tapping on the displayed sensor or column name.

Adjust the graph display by touching and dragging across the graph to select a peak, and then tap Zoom; alternatively, you can use the two-finger pinch/zoom/pan gesture to highlight a peak. Tap Add to report the value in the table.

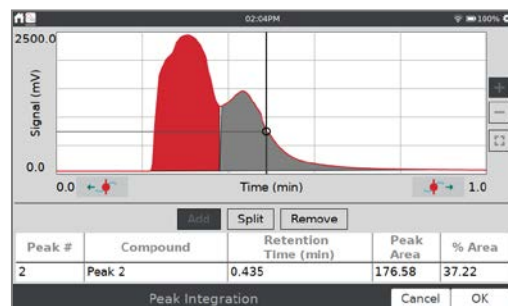
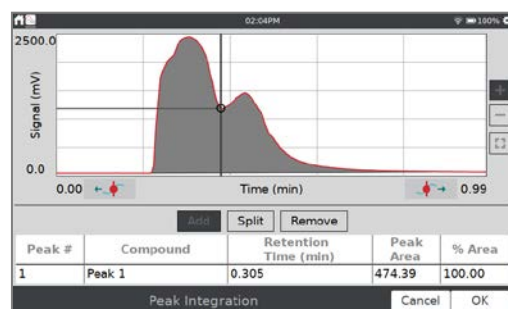
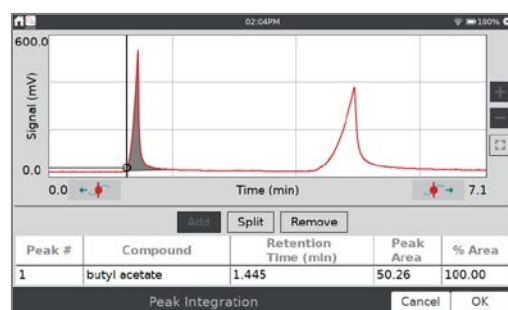
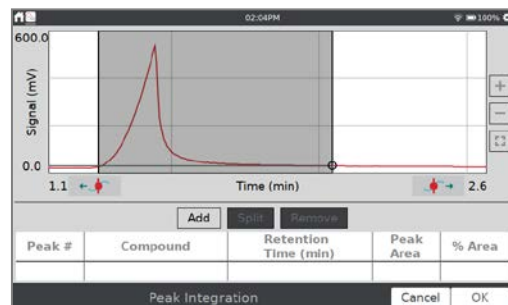
As you add peaks, you can rename them by double-tapping the compound cell in the table below the graph.

Repeat as needed to capture the data for all of your peaks. If you need to look at data for a peak you have already added, tap that region to select it.

If you have two peaks that overlap, you can find the area of the two regions by first selecting the entire region and adding it to the table. Tap the region to select it, and then tap on the graph to show the point where you want to split the region.

Tap the Split button to divide the original region into two separate regions. The left portion of the region is selected and shown in the table.

Tap the right portion of the split region to see the data for that region.



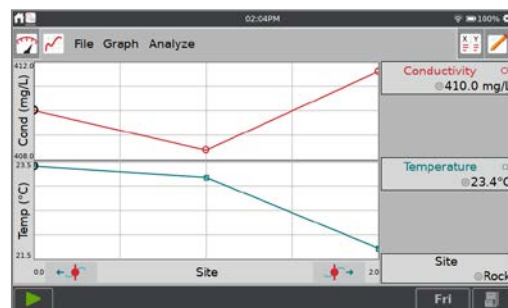
When you are done, tap OK to view the peak data in the Plot Details, where you can see the full table of data.

Peak #	Compound	Retention Time (min)	Peak Area	% Area
1	Peak 1	0.305	297.81	62.78
2	Peak 2	0.435	176.58	37.22

## Pivot Data

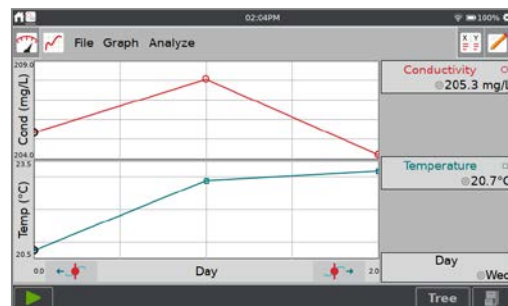
Pivot Data is only available when the data-collection mode is set to Data Matrix mode. A typical setup of the data matrix is to have the testing sites be the independent variable, and the days you test be in different datasets.

Pivot Data transposes the independent variable with the data sets, so you can view the daily data as the location changes or pivot the data and view the location data as the day changes.



From the Graph screen, choose Advanced from the Analyze menu and select Pivot Data to activate this tool.

Alternatively, from the Table screen, choose Pivot Data from the Advanced menu.



## Settings for LabQuest App Files

Trigonometric and derivative calculations used in calculated columns, curve fits, and models include settings you can control.

Select Settings from the File menu to access the LabQuest Settings.

- Angle Units for Trigonometric Calculations
- Number of Points for Derivative Calculations

For more information on these settings, see [LabQuest App Settings](#).

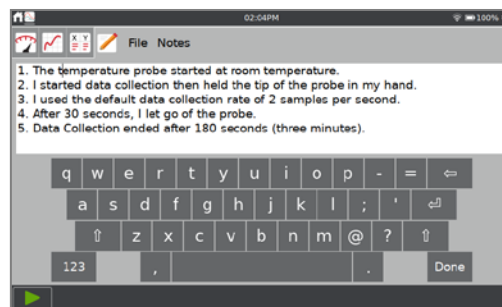
## Viewing Vernier Experiments

In previous versions of LabQuest, you could access Vernier experiments from within the LabQuest App. In LabQuest 3, Vernier experiments are accessed using the Experiment Viewer App. See [Experiment Viewer App](#) for more details.

## Adding Notes to Your Experiment

From the Notes screen, you can enter notes as you perform an experiment. The Notes menu provides access to standard edit commands cut, copy, paste, and clear all.

The keyboard comes up automatically when you tap the notes field. Tap Done to dismiss the keyboard.



## Managing LabQuest App Files

When the LabQuest App launches, a LabQuest file is created. The LabQuest App file can contain data-collection settings, graphs, data tables, analyses, and notes. These files have a .qmb1 extension and can be saved to the internal storage space on LabQuest or to a USB flash drive. LabQuest App files can also be opened and manipulated on a computer using Logger Pro<sup>®</sup> 3 software.

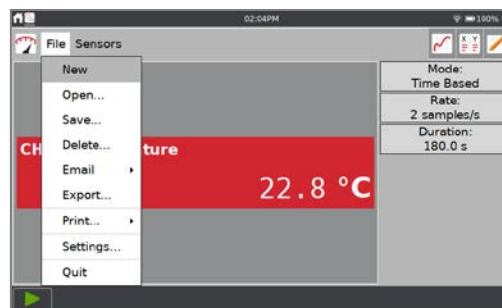
Tools to manage your files are found in the File menu, which can be accessed from any LabQuest App screen. From the File menu, you can save, export, or email the current file. You can also open previously saved files that are stored on LabQuest or on a USB flash drive.

If you are using a USB flash drive, the drive can be formatted in FAT16 or FAT32 (the most common Windows<sup>®</sup> and macOS<sup>®</sup> formats). LabQuest cannot read NTFS or HFS+ formatted drives.

## Starting a New File

Choose New from the File menu to start a new LabQuest App file. This action resets all data-collection parameters and sensor calibrations back to their default values. Wireless, internal, and manually connected sensors are disconnected.

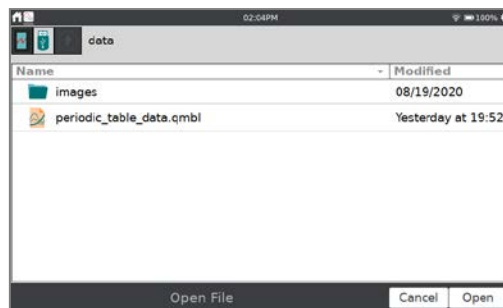
If you have unsaved data, you are prompted to either save or discard the data before continuing.



## Opening an Existing File

Choose Open from the File menu to display a list of files that you have saved on LabQuest. To open a file, tap the file name and tap Open.

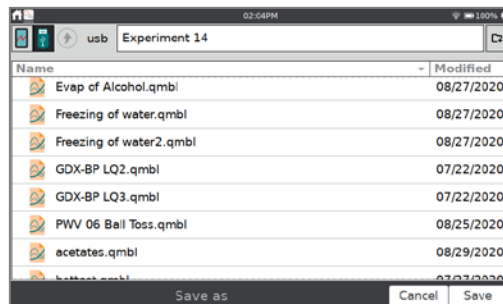
When a USB flash drive is connected, the dialog defaults to showing you files from your flash drive.



## Saving the Current File

Choose Save from the File menu to display the Save As dialog box where you can tap on a source icon (USB, LabQuest) to select a destination. Tap in the File name field to assign a name to the file.

When a USB flash drive is connected, the dialog defaults to showing you files from your flash drive.



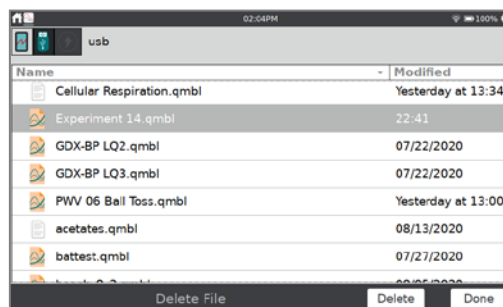
You can click the New Folder icon, , to add additional folders for organizing your saved files.



## Deleting a Saved File

Choose Delete from the File menu to display a file list similar to the open file dialog. Tap on a source icon (USB, LabQuest) to select the source where the file is located. Tap the desired file name, and then tap Delete.

When a USB flash drive is connected, the dialog defaults to showing you files from your flash drive.



## VI. USING LABQUEST 3 AS A DATA SHARING SOURCE



LabQuest 3 can serve as a Data Sharing source that can wirelessly stream sensor data to Vernier Graphical Analysis™ or Vernier Graphical Analysis™ Pro apps running on computers, Chromebook™ notebooks, or mobile devices such as iOS, iPadOS<sup>®</sup>, and Android™ tablets and smartphones.

### How Data Sharing Works

- Set up an experiment with Vernier sensors and LabQuest 3.
- Use Graphical Analysis app to wirelessly connect to the LabQuest 3 unit using Wi-Fi. Both devices must be on the same Wi-Fi network; however, the Wi-Fi network does not require internet connectivity.
- Data collected on LabQuest 3 are shared with the connected devices. The data can be streamed live during data collection or transferred in full after data collection is complete.
- Each recipient of the data can perform an individual analysis of the shared data on their device. Data analysis done on LabQuest 3 or any connected device is not shared with the other devices.

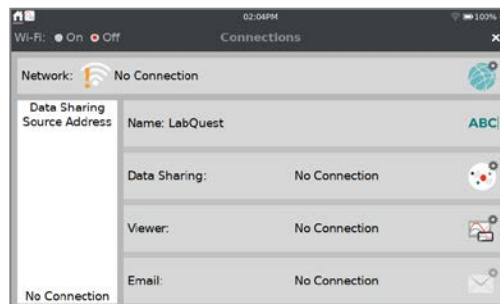
### Connecting to a Wi-Fi Network

To set up LabQuest as a Data Sharing source, you need to connect LabQuest to a Wi-Fi Network and enable Data Sharing.

1. Launch the Connections app, , from the [Settings screen](#). Verify Wi-Fi is on.
2. Tap the Network Settings icon, , to open the Network Configuration dialog box. This dialog lists any 2.4 GHz networks within range, as well as options to manually join or create a network.

**TIP!** LabQuest 3 cannot detect or connect to 5 GHz networks.

3. Select a network. Choose from the following options:
  - [Existing Network \(Infrastructure Network\)](#)
  - [LabQuest Hosted Network](#)



## Existing Network (Infrastructure Network)

To connect to an existing Wi-Fi network, follow these instructions.

1. Locate the network within the list and tap on the network name to select it.



2. If prompted, enter your network's passphrase and tap Connect.

If your network requires additional network authentication information or if you have an enterprise network that requires a network certificate, see our website for more instructions: [www.vernier.com/til/2836](http://www.vernier.com/til/2836).



3. Verify LabQuest has successfully connected to the network. The network status should change to a numeric IP address.

When LabQuest has successfully connected to the network, tap OK to return to the Connections app.



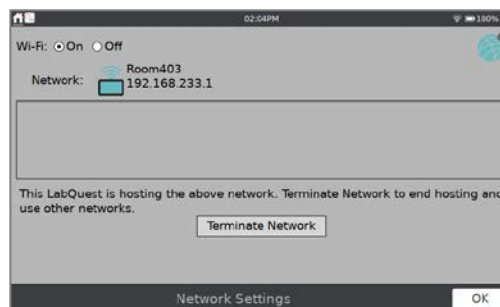
## Creating a LabQuest-Hosted Network

If you do not have access to an existing Wi-Fi network, or are not permitted to access your school's network, set up a network using LabQuest 3.

Students can connect to a LabQuest network with their mobile devices. This network does not support access to the internet, but that is not needed when using Data Sharing. LabQuest email functionality and over-the-air updates are not supported with this type of network as they require internet access.

1. Scroll to the bottom of the available network list and select Create Network.
2. Tap the Network Name field and assign a name to this new network (e.g., LabGroup4 or Room403). Tap Create.
3. Verify LabQuest has successfully created a network. The network status should change to a numeric IP address and a message noting that LabQuest is hosting a network is shown on the screen. Tap OK to return to the Connections app.


**TIP!** Some Android implementations have trouble viewing and connecting to this type of ad-hoc network. These devices require the use of an infrastructure network.





## Enabling Data Sharing on LabQuest 3


In addition to connecting to a Wi-Fi network, you need to set up LabQuest as a Data Sharing Source using the following instructions.

1. Launch the Connections app, , from the [Settings screen](#).



2. To easily identify your LabQuest unit, give it a unique name. Tap **ABC** and edit the name as needed. Note that only alpha and numeric characters are allowed. You cannot use spaces or punctuation marks in the LabQuest name. Tap Done to save the name.



3. Tap the Data Sharing icon, , to open Data Sharing Settings.



4. Verify Data Sharing is On.

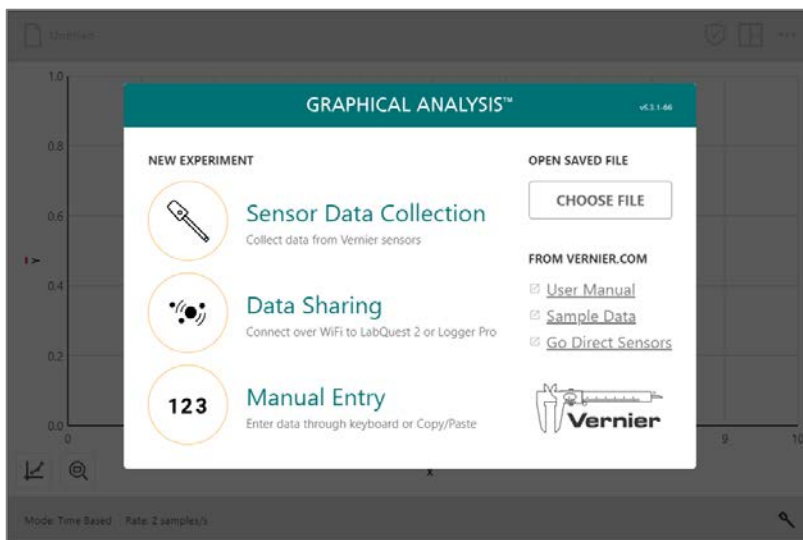
If you want to start and stop data collection from your computing device, select the check box to enable this feature. Tap OK to save the setup.



## Connecting to LabQuest 3 from Your Device

After setting up LabQuest as a Data Sharing source, you can connect to this LabQuest unit from your computer, Chromebook, tablet, or smartphone.

## Accessing LabQuest Data Using Graphical Analysis or Graphical Analysis Pro




1. Connect your computer, Chromebook, or mobile device to the same Wi-Fi network to which you connected LabQuest 3.
2. Launch Graphical Analysis on your computer, Chromebook, tablet, or smartphone.
3. From New Experiment, select Data Sharing. Discovered Data Sharing sources are listed automatically. *Note: If your Graphical Analysis app has the Graphical Analysis Pro features unlocked, click or tap Local from the Data Sharing connection dialog to see LabQuest data sharing sources.*
4. Tap the name of the LabQuest 3 source to connect. If your LabQuest 3 is not listed in Data Sharing sources, you can connect by choosing Specify Source and manually entering the LabQuest Data Sharing source address or by scanning the QR code.

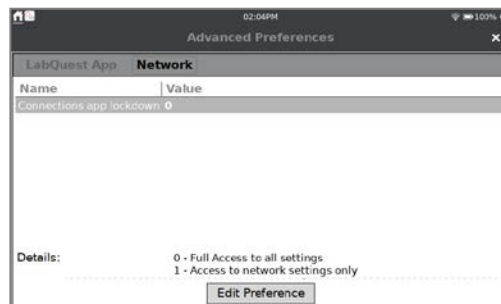
## Accessing LabQuest Data Using the Data Share Web App

1. Launch the Connections app from the Home screen.
2. Connect your computer, Chromebook, tablet, or smartphone to the same Wi-Fi network to which you connected LabQuest 3.
3. On your computer, Chromebook, tablet, or smartphone, open a supported browser and enter the Data Sharing Source Address. Alternatively, if you have a QR code reader on your device, you can access the app using the provided QR code.


## Restricting Access to the Connections Setup

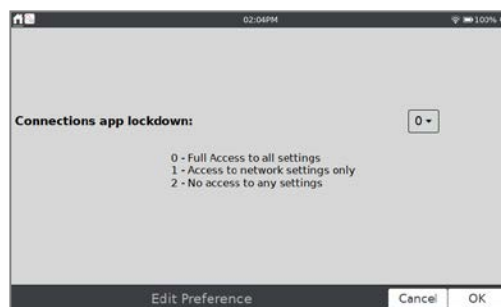
After configuring your LabQuest, you can set Advanced Preferences to restrict access to the Connections setup information. This prevents students from inadvertently changing the network and Data Sharing settings.

1. Launch Advanced Preferences, , from the Settings screen and tap the Network tab.

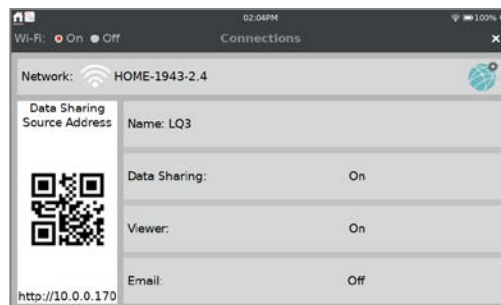


2. Tap Edit Preference and select the desired setting.

Changes to the Connections main screen do not show if the lockdown mode is changed while the Connections app is running. Tap the close button, , then launch the Connections app again.

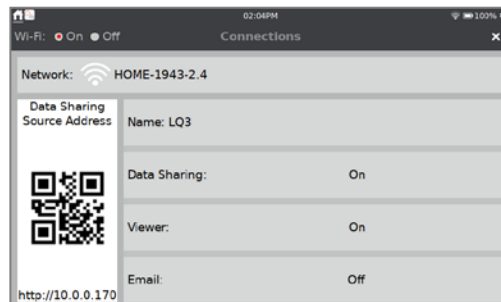


When option 1 is selected, you have access to network connections only. LabQuest name, Data Sharing, LabQuest Viewer®, and email settings are not accessible.



When option 2 is selected, network settings are also not accessible.

For access to all settings, choose option 0.



## VII. USING LABQUEST 3 WITH A COMPUTER OR CHROMEBOOK

LabQuest 3 can be used via USB connection with the following software:

- Logger Pro<sup>®</sup> 3 (version 3.16.1 or newer) [www.vernier.com/lp](http://www.vernier.com/lp)
- Vernier Graphical Analysis™ or Graphical Analysis Pro (version 4.11 or newer) [www.vernier.com/ga](http://www.vernier.com/ga)

### Collecting Data Using Computer or Chromebook Software

LabQuest 3 can be used as a USB sensor interface with a computer or Chromebook. To collect data, follow these steps:

1. Connect a wired (BTA or BTD) sensor to LabQuest. **Note:** USB and wireless sensors must connect directly to the computer or Chromebook and not to the LabQuest unit.
2. Connect LabQuest to your computer or Chromebook using the included USB cable. The micro end of the cable connects to LabQuest and the full-sized end connects to an available USB port on your computer or Chromebook.
3. Open the data-collection software on your computer or Chromebook. The software detects LabQuest and the attached sensor(s), displaying a graph ready for data collection. LabQuest displays a screen with two arrows indicating it is controlled by another device.
4. Click the Collect button on the computer or Chromebook to start data collection.



When using LabQuest 3 as a computer interface, either the battery must be charged or LabQuest must be connected to AC power. LabQuest 3 cannot operate on USB power alone.

## Transferring Data from LabQuest App to Logger Pro 3

### Automatically Transferring Data

If you collect data in LabQuest App and subsequently connect LabQuest to a computer, Logger Pro 3 automatically detects the presence of the remote data and displays a message indicating the data can be retrieved from LabQuest. Follow the onscreen instructions to download data to the computer.

### Manually Transferring Data

To manually transfer saved data from LabQuest, open Logger Pro 3 on your computer. Choose LabQuest Browser from the computer File menu, and then choose Open. Select the desired LabQuest file from the list and click Open. Once opened on the computer, you can choose to save the file as a Logger Pro (.cml) file by choosing Save As from the computer File menu.

**TIP!** If sensors are still connected when a LabQuest file is opened using Logger Pro 3, the sensors are ignored. To enable the sensors, choose New from the Logger Pro 3 File menu.

Another method for manually transferring data from LabQuest to Logger *Pro 3* is to choose LabQuest Browser from the File menu in the computer software, then choose Import. Import differs from Open in that only the data in the LabQuest file are added to the current computer session. You can compile data from multiple LabQuest sessions into a single computer session for graphing and comparison.

***TIP!** Compile class results from multiple LabQuest files or multiple LabQuest devices by repeatedly importing data into a single Logger Pro 3 file.*

### **Manually Moving Data from Logger Pro 3 to LabQuest**

Data and/or sensor configurations can be saved to LabQuest from your computer. Open an existing Logger *Pro 3* file or set up a new file with the applicable data-collection settings. Choose LabQuest Browser from the Logger *Pro 3* File menu, then choose Save As and enter a descriptive filename. Any data, as well as the sensor configuration, will be stored on LabQuest as a LabQuest file. Any features in the computer file not existing on LabQuest (such as embedded images, video analysis, graph annotations, or most calculated columns) will be ignored on LabQuest.

### **Deleting Data on LabQuest from Logger Pro 3**

To delete data on LabQuest from Logger *Pro 3*, choose LabQuest Browser from the File menu and select Delete. Select the files you want to delete from the displayed list and click Delete.

***TIP!** You can use this feature to delete multiple files from your LabQuest.*

### **Transferring Data from LabQuest App to Graphical Analysis and Graphical Analysis Pro**

Collected data can be transferred from LabQuest to Graphical Analysis or Graphical Analysis Pro through wireless Data Sharing via Wi-Fi. For more information on Data Sharing, see [Using LabQuest 3 as a Data Sharing Source](#).

You can also transfer data from LabQuest to Graphical Analysis or Graphical Analysis Pro by saving the LabQuest App (.qmb1) file to a USB flash drive, and then opening the saved file from the flash drive on a computer or Chromebook.


***TIP!** You cannot access data saved on LabQuest 3 through a USB connection.*

## VIII. EMAILING DATA FILES AND SCREENSHOTS

If LabQuest is connected to a network with internet access, you can email your data file, graph, text file, or screenshot to an email client. To set this up, follow these instructions:


### Configuring the Email Settings

1. Connect LabQuest to a network with internet access. For detailed instructions, see [Connect to a Wi-Fi Network](#).

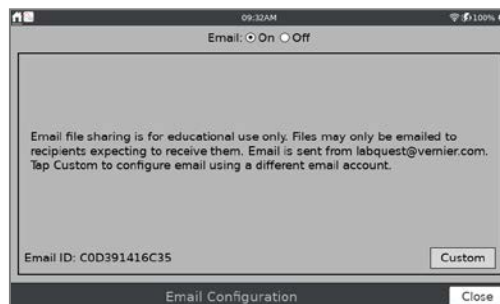
2. Launch the Connections app, , from the [Settings screen](#).

**TIP!** If you don't see the icons for accessing the Email Configuration, you may need to update the Connections app lockdown settings. See [Restricting Access to the Connections Setup](#) for more information.



3. Tap the Email settings icon, , to open the Email Configuration dialog box. Verify email is On. This configuration accesses the Vernier outbound email service. Emails are sent using the email address labquest@vernier.com.

**TIP!** The email ID is unique to each LabQuest and is included in any email sent from each unit. You cannot receive incoming emails on LabQuest.



4. If you want to use a different email service for sending emails from LabQuest, tap Custom and follow the on-screen prompts for setting up your email.

Detailed instructions can be found on our website:

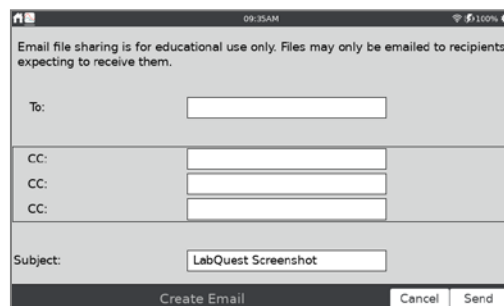
- For Gmail™, see [www.vernier.com/til/8735](http://www.vernier.com/til/8735).
- For Yahoo® mail, see [www.vernier.com/til/10183](http://www.vernier.com/til/10183).



**TIP!** This is used to access the outbound email server associated with this email account required for sending emails. The email used here is the sending email account for the files you send. You cannot receive incoming emails on LabQuest.

## Emailing a file from the LabQuest App

1. Choose Email from the LabQuest App File menu and select the type of file you want to email. You can email the LabQuest App file (.qmb1), the graph file (.pdf), text file (.txt), or screenshot (.png).
2. Enter the email address(es) and tap Send to email the file.



The screenshot shows the email sharing interface in the LabQuest App. At the top, it displays the time 09:35AM and battery status at 100%. A warning message reads: "Email file sharing is for educational use only. Files may only be emailed to recipients expecting to receive them." Below this, there are input fields for "To:", "CC:", and "Subject:". The "Subject:" field is pre-filled with "LabQuest Screenshot". At the bottom, there are three buttons: "Create Email", "Cancel", and "Send".

## IX. PRINTING FROM LABQUEST 3

LabQuest 3 can print to networked printers that support the Internet Printing Protocol (IPP). You can print a graph, data table, your own notes, or the screen as it is currently displayed in LabQuest App. In addition, if a printer is not available or you cannot get your LabQuest on the same network as your printer, you can use the Print to PDF option to save a PDF file to a USB flash drive for printing from a computer later.

### Printing to a Networked Printer

1. Connect LabQuest to the same network to which your printer is connected. For detailed instructions, see [Connect to a Wi-Fi Network](#).

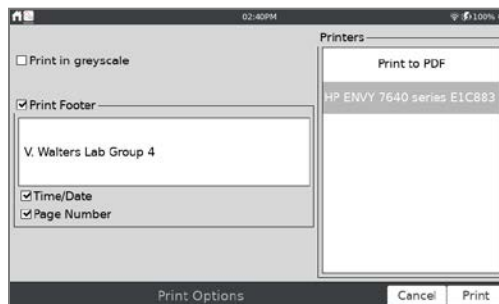
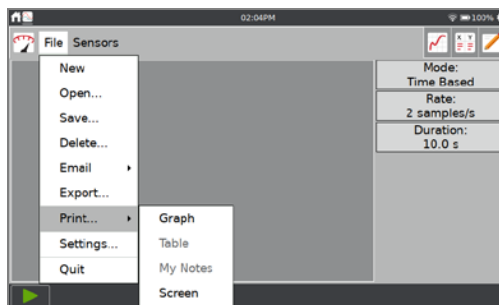
**TIP!** Your LabQuest and printer must be on the same Wi-Fi network. The network does not have to be connected to the internet for IPP printing to work. Some printers can create their own networks that support connecting directly to the printer itself.

2. From the LabQuest App, choose Print from the File menu, and then choose the item that you want to print (Graph, Table, My Notes, or Screen).

**TIP!** Options for printing Table and My Notes are not available when those items have no data to print.

3. The Print Options dialog box displays the available printers. Tap on the printer name to select the printer. If desired, you can choose to print in grayscale, add a graph title, or add a customized footer to your document.
4. Tap Print to print your document.

**TIP!** Your printer selection will be remembered until you quit the LabQuest App or turn the LabQuest off.





## Using Print to PDF

With the Print to File feature, you can create PDF files of a graph, data table, notes, or LabQuest screen (as currently displayed). You can use the files to include with lab reports or print the files from a computer at a later time.

1. To use Print to File, connect a USB flash drive to your LabQuest.
2. Choose Print from the File menu, and then choose the item that you want to print (Graph, Table, My Notes, or Screen).

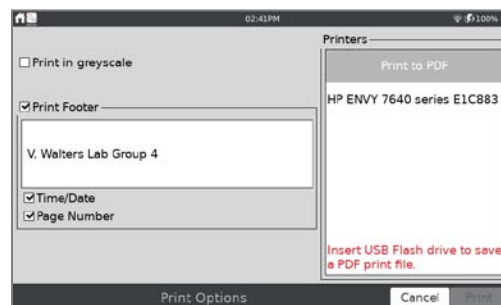
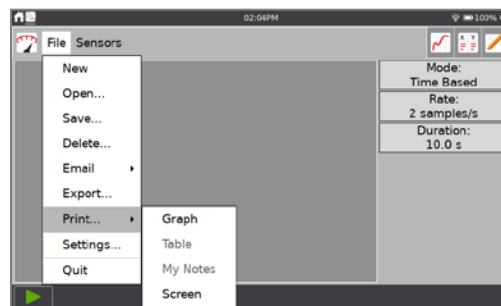
**TIP!** Options for printing Table and My Notes are not available when those items have no data to print.

3. Tap Print to PDF to select that option. If desired, you can choose to print in grayscale, add a graph title, or add a customized footer to your document.

**TIP!** You must have a USB flash drive connect to your LabQuest to use the Print to PDF option.

4. Tap print to save the PDF to your USB flash drive.

**TIP!** LabQuest 3 does not support printing directly to a printer via a USB cable.



## X. PROJECTING AND MONITORING LABQUEST 3 DEVICES

Use our [LabQuest Viewer software \(order code, LQ-VIEW\)](#) for Windows and macOS computers or [LabQuest Viewer for iPad](#) to view and control LabQuest wirelessly from your computer or iPad. LabQuest Viewer can be used in conjunction with a projector to share the LabQuest 3 screen with the entire class.

Instructors can use LabQuest Viewer to demonstrate LabQuest 3 to the class and have students present their work to fellow classmates.

With LabQuest Viewer, you can

- View and control one or more LabQuest units from a computer or iPad.
- Connect to a projector or interactive white board for class demos or student sharing.
- Monitor student progress on any LabQuest connected to your network.
- Create screenshots of the LabQuest screen to copy and paste into lab instructions.
- Set customizable permissions that permit viewing without control, or password-protect a connection.

### LabQuest Viewer System Requirements


- **Windows**—Windows 7 (SP1), Windows 8, Windows 8.1, Windows 10, or Windows 11
- **macOS**—macOS 10.8 or newer
- **iPad**—iOS 8 or newer or iPadOS (any version)

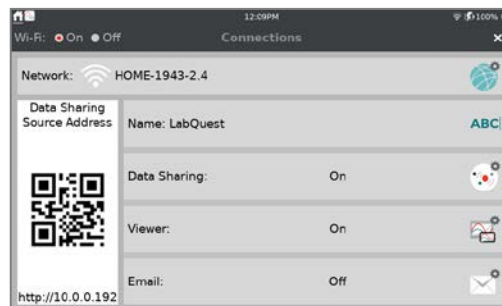
### LabQuest Setup

To set up your LabQuest to communicate with LabQuest Viewer, follow these instructions:

1. Connect LabQuest to a network. For detailed instructions, see [Connecting to a Wi-Fi Network](#).

*TIP! The Network used for the LabQuest Viewer does not require internet connectivity.*

2. Launch the Connections app, , from the [Settings screen](#).




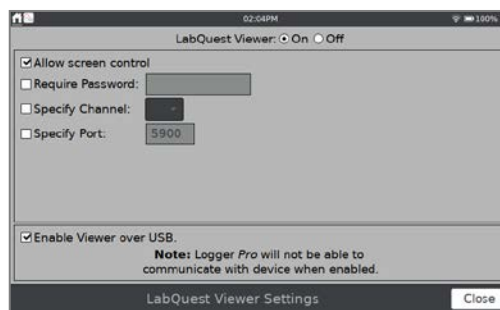
- LabQuest Viewer requires each LabQuest unit to have a unique name.

Tap **ABC** and edit the name as needed. Note that only alpha and numeric characters are allowed. You cannot use spaces or punctuation marks in the LabQuest name.

Tap Done to save the name.

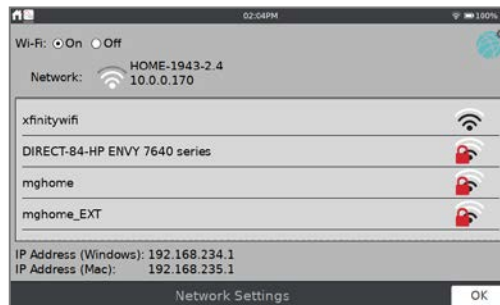


- Tap the Viewer settings, , to open the Viewer Settings dialog box. Ensure the Viewer is On.
- Select the checkbox to Allow Screen Control so you can control the LabQuest unit from your computer or iPad.
- Tap OK to exit the LabQuest Viewer settings.



If Wi-Fi is not available, you can Enable Viewer over USB to connect with the LabQuest Viewer computer software via a USB connection.

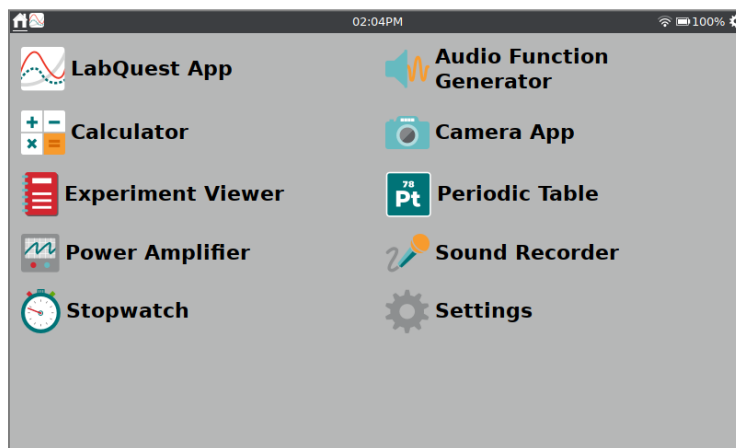
The IP address for the USB connection to the computer is displayed on the Network Setup dialog. There are different addresses; which one applies depends on the type of computer you are using.



**TIP!** While this option is selected, LabQuest cannot be used as a USB interface with Logger Pro® 3, Graphical Analysis, or Graphical Analysis Pro.

## XI. USING OTHER APPS

Tap or swipe down from the left side of the Notification Bar to access additional apps on the LabQuest 3.

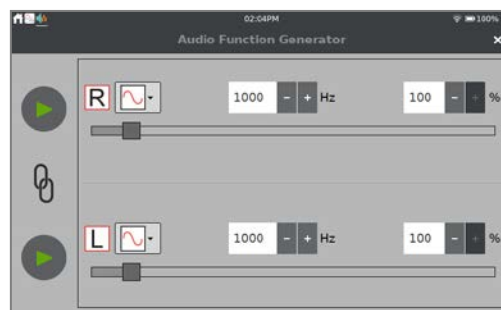


### Audio Function Generator

The Audio Function Generator is used to create waveforms in the audio frequency range. Select a waveform, frequency, and volume for each channel.

The link between left and right channels is on by default so that both channels start and stop together. Tap the link icon to control the channels independently.

Use the sliders to adjust the frequency.



A common use of the Audio Function Generator is to create tones and beats for waveform study using a microphone. For the best waveform quality, connect a powered computer speaker to the LabQuest audio output jack.

### Calculator

The Calculator App is a standard scientific calculator that uses algebraic notation. You can copy a calculator result and paste it into the Notes tab or into a manual column cell.



## Camera App

The Camera App works with digital (USB) cameras. Use the Camera App to view a live image feed from a camera and to capture and save images for later viewing. You can also view images saved to a USB flash drive.

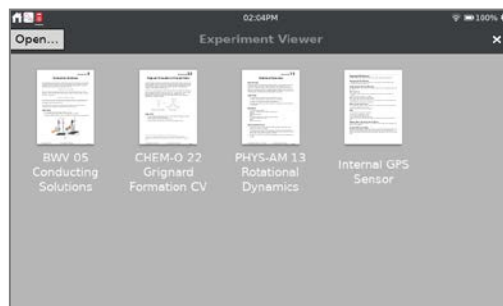
See [www.vernier.com/til/3659](http://www.vernier.com/til/3659) for more information regarding supported digital cameras.



## Experiment Viewer

The Experiment Viewer is a PDF reader that can access over 75 experiments that are pre-loaded on your LabQuest. You can also use this application to view other PDF files saved on a USB flash drive. These files can be saved directly to your LabQuest unit, as needed.

In addition to experiment files, documentation for the internal sensors, and a copy of this user manual are available within this application.

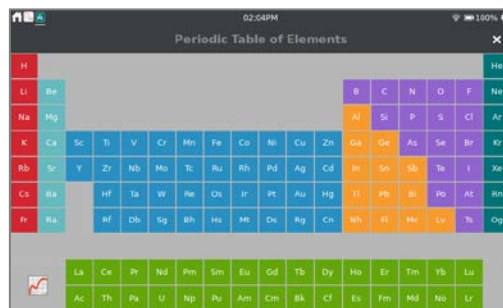


In addition to the experiment files included on the LabQuest 3, Vernier offers a complete set of lab books for elementary through college. For more information, see [www.vernier.com/books](http://www.vernier.com/books).

## Periodic Table

The Periodic Table app contains standard reference information on the elements. Tap an element to see details.

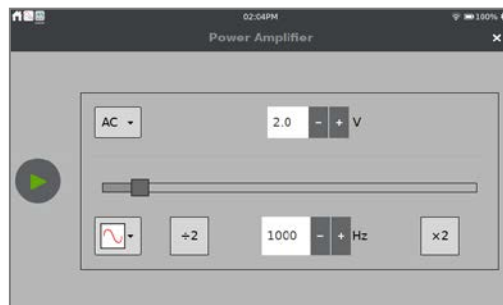
Data from the Periodic Table app is available as a saved LabQuest App file. Choose Open from the LabQuest App File menu and select the Periodic Table Data file. From the Graph screen, tap on the y-axis label to select different values to plot.



## Power Amplifier

The Power Amplifier app controls the [Vernier Power Amplifier \(order code PAMP\)](#) when connected to the LabQuest Audio Out port. The Power Amplifier is used to create waveforms with up to 10 V amplitude and currents of 1 A.

Select the desired output (AC or DC). DC output levels are limited to 0.2 V steps. AC waveforms include sine, square, sawtooth, and ramps. Select an amplitude and frequency using the controls. The frequency can be changed by factors of two using the  $\div 2$  and  $\times 2$  buttons.







## Sound Recorder

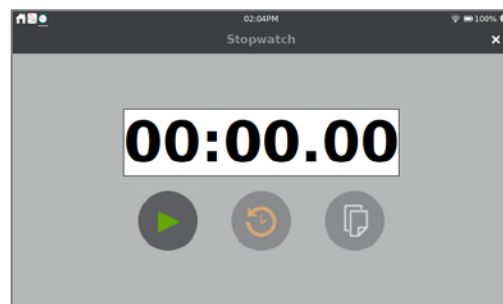
You can use the Sound Recorder app to record and replay short audio clips. The clips can be saved and replayed as needed.



## Stopwatch

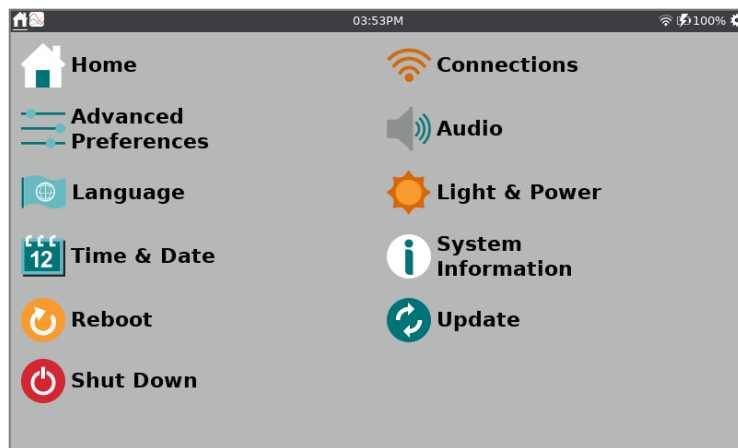
The Stopwatch is a simple digital timer. Tap the Start button, , to begin timing and tap the Stop button, , to stop timing. Subsequent taps continue to start and stop the timer. Tap the Reset button, , to return the timer to zero.

Use the Copy button, , to place the current time on the clipboard for pasting into the Notes screen, the calculator, or a manual column data cell.



## XII. CUSTOMIZING THE SETTINGS






Tap or swipe down from the right side of the Notification Bar to access the apps that control the device settings.



### Connections—Wi-Fi, Data Sharing, and Email

Use the Connections app to connect your device to a Wi-Fi network and set up other network-enabled features such as Data Sharing and emailing files. Tap the icon to modify the settings.

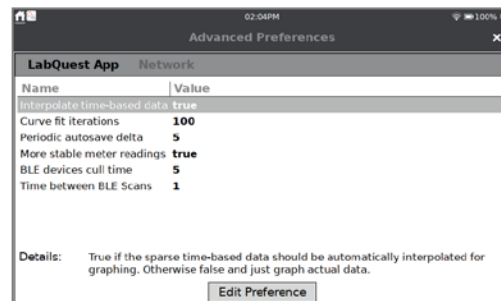


-  [Connect to a Wi-Fi Network](#)
-  [Give your LabQuest a Unique Name](#)
-  [Setup Data Sharing](#)
-  [Configure LabQuest Viewer Settings](#)
-  [Connect to an Email Client](#)

### Advanced Preferences

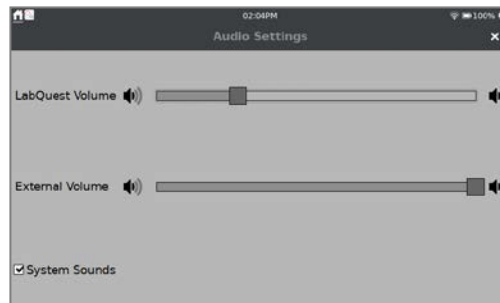
Advanced feature options can be found in Advanced Preferences. Tap on the name of the feature to view details and edit the settings.

**TIP!** See [Restricting Access to the Connections Setup](#) for an example of how to use this app.



### Audio

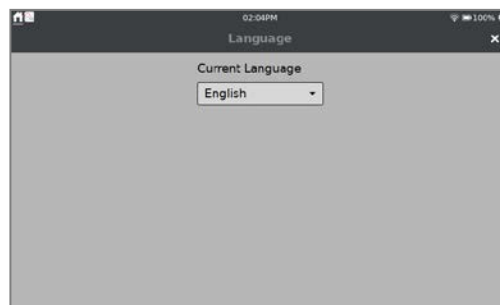
Use the slider to adjust the volume of the built-in speaker or the Audio Out port. You can also enable system sounds, such as a chirping sound, when the unit powers on or off.



### Language

Specify the language of the displayed text on your device.

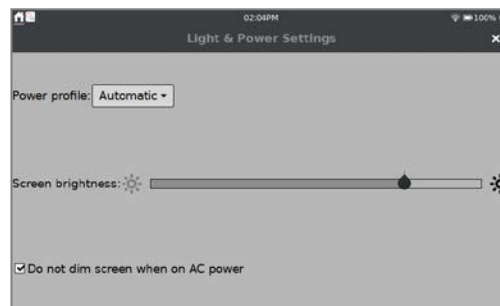
For more information on the supported languages, see [www.vernier.com/til/1808](http://www.vernier.com/til/1808).



### Light & Power

Adjust the screen brightness and select different power profiles that can help extend your battery life between charges. When using AC power, you can select to have the screen always on.

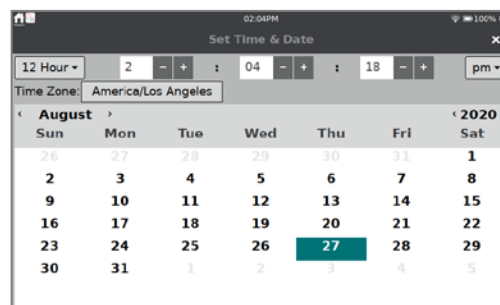
For more information, see [LabQuest Power Profiles](#).



### 12 Time & Date

You can set the LabQuest time and date. The time and date are used to timestamp when files are saved and when data collection begins (used with Logger Pro 3 software).

**TIP!** When connected to a Wi-Fi network, the time and date are automatically updated; however, the time zone must be updated manually.



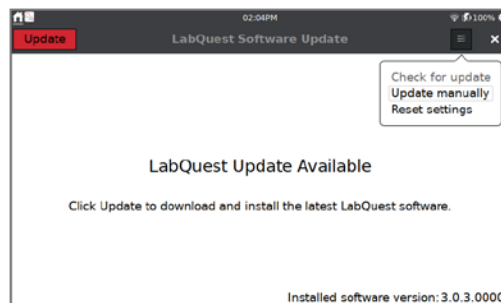


## Update

You can check for updates when your LabQuest is connected to a Wi-Fi network that has internet access.

You can also reset some or all of your user settings back to factory defaults including network and email configurations, user labs, and saved data files.

For more information, see [Software Updates](#) in the Appendix.



## LabQuest App Settings

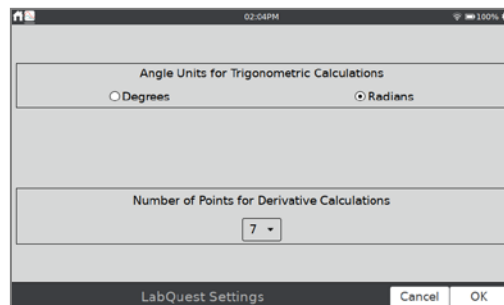
Settings in the LabQuest App are specific to and save with the LabQuest App file. To access these settings, choose Settings from the LabQuest App File menu. These settings can be applied to existing files and automatically update the existing data. The settings return to default upon choosing New from the File menu.

### Angle Units for Trigonometric Calculations

Calculated columns, curve fits, and modeled functions may use trigonometric calculations; choose Degrees or Radians. The default unit is Radians.

### Number of Points for Derivative Calculations

Calculated columns, curve fits, modeled functions, and some calculated sensors columns (e.g., Motion Detector velocity and acceleration columns) can use numerical derivatives.



The algorithm for such derivatives utilizes a user-defined number of points. The default value of seven points is sufficient for many experiments, but you may want to choose a larger number for human-scale Motion Detector experiments (e.g., our Motion Match experiment), or a smaller number for cart-based Motion Detector experiments (e.g., our Impulse and Momentum experiment).

For more information on how derivatives are calculated, see [www.vernier.com/til/1011](http://www.vernier.com/til/1011).

## XIII. APPENDIX

### Technical Specifications

#### Display

- 15.41 cm × 8.59 cm (17.64 cm diagonal) color screen
- LED backlight
- Landscape screen orientation

#### Processor

- 2 GHz application processor

#### Connectivity

- Wi-Fi 802.11 b/g/n
- Bluetooth® wireless technology

#### User interface

- Capacitive touch screen
- Touch navigation utilizing gestures

#### Power

- Rechargeable, high-capacity battery
- DC charging/powering through external adapter (included)

#### Data acquisition

- 12-bit resolution
- Built-in GPS and microphone

#### Ports

- 3 Analog (BTA) sensor ports
- 2 Digital (BTD) sensor ports
- 2 USB port for sensors, flash drives, and peripherals
- USB micro port for computer connectivity
- DC power port
- Audio Out port for use with Vernier Power Amplifier, headphones, and speakers

#### Maximum sampling rate

- Single sensor: 100,000 samples/s (0.02 seconds maximum duration)
- Multiple sensors: 10,000 samples/s (0.21 seconds maximum duration)

#### Minimum sampling rate

- 0.00125 samples/s (800 s/sample)

#### Maximum samples (standalone)

- Single sensor: 2000 samples 20K–100K samples/s
- Single sensor: 14,000–21,000 samples\* at less than or equal to 10,000 samples/s
- Multiple sensors: 12,000–14,000 samples\* at less than or equal to 10,000 samples/s

#### Environmental durability

- Operating temperature: 0 – 45°C
- Storage temperature: –30 – 60°C
- Splash resistant
- Rugged enclosure designed to withstand a fall from lab bench

#### Size and weight

- Size: 11.7 cm × 19.0 cm × 4.0 cm
- Weight: 549 g

#### Storage

- 500 MB
- Expandable with USB flash drive

#### Non-compatible sensors

LabQuest 3 does not support the following:

- Heat Pulser
- Vernier Flash Photolysis Spectrometer

\*The highest number of samples is for the very first collection after starting LabQuest. The smaller number of samples depends on the number of previous collections and stored runs during this LabQuest session.

## **Battery Maintenance**

LabQuest uses a high-quality lithium-ion battery. This is the same chemistry used in premium laptop and smartphone batteries and you can expect similar performance. There is never a need to condition the battery by regular full discharge/charge cycles.

Use only the supplied AC adapter to charge the LabQuest battery. A [replacement adapter](#) can be purchased from our website (order code LQ3-PS). AC adapters from the original LabQuest or LabQuest 2 should not be used with LabQuest 3 as they do not provide enough power to run the unit and charge the battery. See [www.vernier.com/til/8431/](http://www.vernier.com/til/8431/) for more information.

The battery takes about 12 hours to completely charge. It is safe to leave the battery charging indefinitely, and there is no need to fully discharge the battery before charging. Battery life depends on the sensors used, but in most cases, you can obtain six or more hours of use before recharging. We recommend charging LabQuest overnight to start the next day with a full charge.

Battery life depends on the sensors and features used. To access power-saving options, choose the Light & Power app from the Settings screen. Optimize day-to-day battery life by setting the screen brightness to the minimum acceptable level and power off (suspend) the unit whenever the unit is not in use.

When using LabQuest as a standalone device, the screen dims after a few minutes of no use, even during data collection. However, LabQuest does not turn itself off while collecting data until the battery is almost discharged. Data loss due to a loss of power is minimized through periodic saving of a backup file.

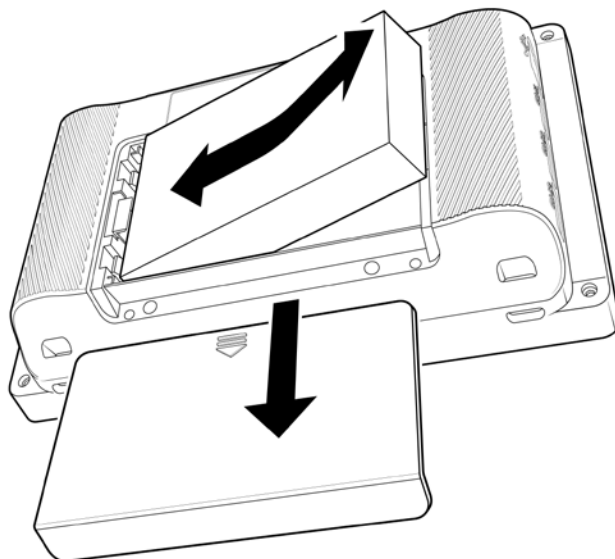
When using LabQuest 3 as a computer interface, either the battery must be charged or LabQuest must be connected to AC power. LabQuest 3 cannot operate on USB power alone.

The long-term life of the battery varies, but you can expect about 300 to 400 full charge/discharge cycles before the battery needs to be replaced. In this count, a charge from half-way to a full charge would count as half of a charge cycle. In typical school use, the battery can last three years or more. Exposure to temperatures over 35°C significantly reduces the battery life.

As a battery reaches the end of its useful life, the run time becomes shorter and the battery begins to swell. Eventually the run time will be too short for your application, and you will want to replace the battery. You should also replace the battery when the swelling is visually noticeable.

Rechargeable batteries are considered a consumable, and as such, are warranted for one year. A [replacement battery](#) can be ordered from our website (order code LQ3-BAT). Recycling information is available at [www.call2recycle.org](http://www.call2recycle.org).

## Replacing the Battery



Follow these steps to replace a LabQuest battery:

1. Turn the unit over being careful not to set the unit on something that could scratch the screen.
2. Slide the battery door cover down until it releases, then lift it off the unit.
3. Lift the battery from the right side and pull the battery to the right as you lift it out of the unit.
4. When replacing the battery only use a battery provided by Vernier (order code: LQ3-BAT).
5. Make sure the battery contact points on both the unit and battery are clean and free of debris.
6. Insert the new battery label side up, starting by putting the left edge in first.
7. Carefully set the battery in place so as not to damage the battery contacts or plastic tabs that hold the battery against the contacts.
8. Set the battery door in over the battery just below its closed position, then slide the door up until it latches.
9. Charge the new battery at least 12 hours to ensure it is fully charged.

## LabQuest Power Profiles

There are four power profiles available: Battery, AC, Automatic, and Always On. Select the power profile that best matches how you use your LabQuest unit. While the Battery and AC profile names suggest when they might be used, these profiles do not depend on how you are powering your LabQuest. The Battery profile is designed to conserve battery power during times the LabQuest unit is inactive. The AC profile also applies power saving options; however, there is more time between the different power saving steps.

The Automatic profile option is the default option. When using this profile, the power configuration is detected, and the corresponding power profile is applied. Note that LabQuest cannot distinguish between power coming from an AC adapter or an external backup battery such as the [LabQuest Battery Boost 3](#). When using an external battery, you may want to use the Battery profile to conserve power of the external battery.

Here is a summary of the power profile stages to conserve power:

	Battery		AC	
	Not in Use	Collecting Data	Not in Use	Collecting Data
<b>Dim screen</b>	after 2 minutes	after 5 minutes	after 5 minutes	after 15 minutes
<b>Screen off</b>	after 5 minutes	after 15 minutes	after 15 minutes	after 30 minutes
<b>Suspend</b>	after 45 minutes	never	after 90 minutes	never
<b>Shut down</b>	after 2 days	never	after 2 days	never


If you are setting up LabQuest for display, you may not want the unit to dim at all. To do that, choose the option Do not dim screen on AC power. This option will keep your LabQuest screen on as long as your LabQuest is connected to AC power. If you disconnect the AC adapter, your LabQuest will revert to using the selected power profile.

***TIP!** We do not recommend using this option when using an external battery backup as your batteries will drain rapidly.*

The Always On profile disables all automatic power saving functionality of your LabQuest. When using this profile, your screen will never dim, and your unit will not turn off on its own. Use this option only when AC power is not available, and you need to keep the screen on.

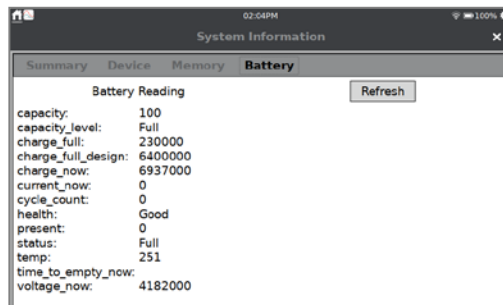
**Note:** Using this option can reduce your battery life by 30%–50% or more.

## Troubleshooting Battery Issues

Launch the System Information app, , from the [Settings screen](#). Tap the Battery tab to view details about the battery.

The battery readings do not update automatically. Tap Refresh to update the information on the screen.


For more information, see [www.vernier.com/til/8479](http://www.vernier.com/til/8479).



## Case and Screen Maintenance

LabQuest is water and shock resistant. Do not submerge LabQuest in liquids or allow liquids to sit on the screen for any extended time. Wipe it clean with a damp cloth only; do not use any solvents including ammonia or glass cleaners. For information on disinfecting your LabQuest unit, see [www.vernier.com/til/6551](http://www.vernier.com/til/6551).

## Software Updates


LabQuest arrives with software preloaded. To view the version of the app you are currently running, launch the System Information app, , from the [Settings screen](#). The summary tab shows the version you are currently running.

When available, free updates are accessible from our website at [www.vernier.com/lq3-update](http://www.vernier.com/lq3-update).



### Updating via USB Flash Drive

From the Vernier website, download the update file to a USB flash drive. The file should be in the root directory of the flash drive and not in a folder.

Connect the flash drive to your LabQuest. The Update app launches automatically when the update file is detected. Tap  to update your LabQuest.



Before applying the update, your battery level is checked to ensure you have enough power to update LabQuest safely.


- If your battery level is greater than 30%, the update continues automatically.
- If your battery level is less than 30%, you must connect the AC power adapter before updating the unit.
- If your battery level is too low to maintain power without the AC adapter, the update does not proceed automatically. In this case, you should only attempt an update if you have no other option since a loss of power during an update may leave your unit in an unusable state.


Once the update is complete, you receive a message that your LabQuest is up to date.

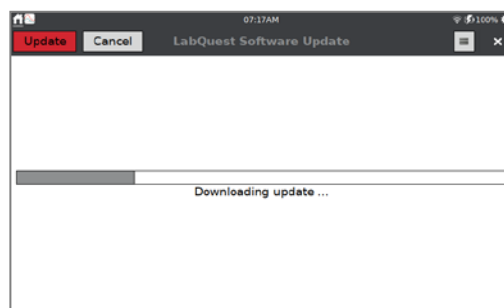
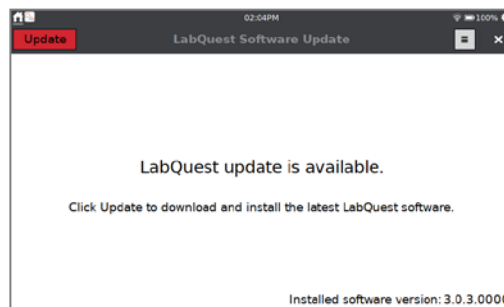
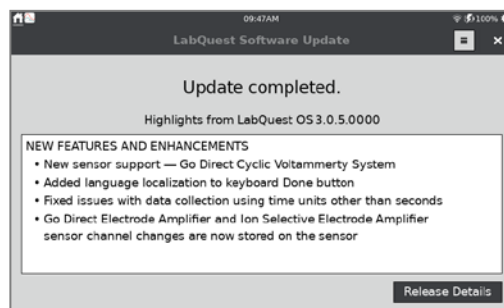
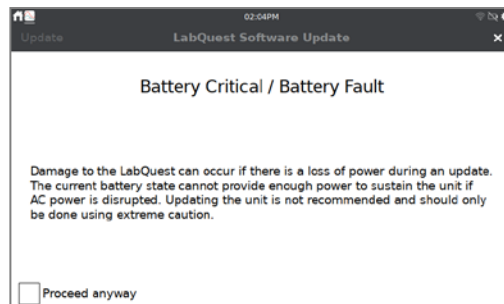
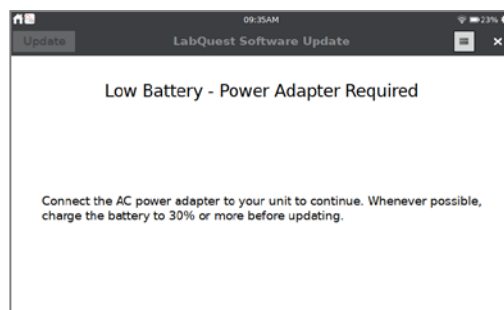
Tap the close button, ×, and continue to use your LabQuest.

### Over-the-Air Updates

If you are running LabQuest software version 3.0.2 or newer and your LabQuest is connected to a Wi-Fi network that has internet connectivity, you can check for and apply updates over the internet.



From the settings screen, tap  Update to initiate a check for updates.

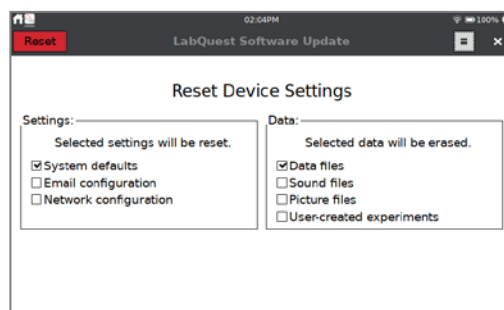
If a newer version of the software is available, tap  to download and install the update.



### Reset Device Settings

If you are running LabQuest software version 3.0.2 or newer, you can also use the Update app to reset the LabQuest back to factory settings. This includes removing any saved network or email configurations and user-saved files.

Tap  and select Reset Defaults. Make sure the items you want to reset are selected then tap .



### Backdating LabQuest 3

Applying an older update can only be done using a USB flash drive and is not recommended. If you are running LabQuest software version 3.0.4 or newer, you cannot apply an update that is older than version 3.0.4.

### Getting Additional Help

For access to user manuals, our Technology Information Library, and chat, visit our website: [www.vernier.com/labq3](http://www.vernier.com/labq3).

You may also contact Vernier directly by phone or email:

**Toll Free:** 888.837.6437

**Email:** [support@vernier.com](mailto:support@vernier.com)

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Complete source code for the open source software is available on request. Contact us at [info@vernier.com](mailto:info@vernier.com), or by writing to

Source Code Request  
Vernier Science Education  
13979 SW Millikan Way  
Beaverton, OR 97005  
USA



Source code will be made available for download, or you may request a CD-ROM of the code. A shipping and handling fee will be charged for a CD-ROM.

The exact terms of GPL, LGPL, and some other licenses are provided to you with the source code distribution. You may also read the license at [www.gnu.org/licenses](http://www.gnu.org/licenses).

## Warranty

Vernier warrants this product (with the exception of the battery) to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. This warranty covers educational institutions only.

The LabQuest battery is a consumable, and as such, Vernier warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. For more information about the LabQuest battery, see [Battery Maintenance](#).

## 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.

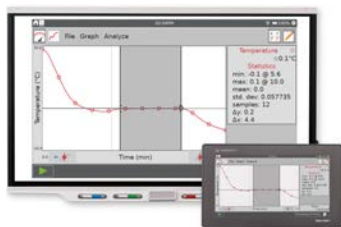
Battery recycling information is available at [www.call2recycle.org](http://www.call2recycle.org)

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.

## Accessories



### LabQuest Viewer

Display and control LabQuest on a computer to teach students how to use LabQuest, demonstrate experiments, or share class data.

[www.vernier.com/lq-view](http://www.vernier.com/lq-view)

Also available, LabQuest Viewer for iPad

[www.vernier.com/product/labquest-viewer-for-ipad/](http://www.vernier.com/product/labquest-viewer-for-ipad/)



### LabQuest Charge Station

Charge and store up to four LabQuest units with this compact and affordable charge station.

[www.vernier.com/lq3-crg](http://www.vernier.com/lq3-crg)



### LabQuest Battery Boost 3

With the added power of an external battery, data can be collected for extended periods in the field where AC power is not available.

[www.vernier.com/lq-boost3](http://www.vernier.com/lq-boost3)



### Vernier Lanyard

The LabQuest neck strap helps prevent accidental drops during field studies.

[www.vernier.com/lq3-lan](http://www.vernier.com/lq3-lan)



### LabQuest Micro to USB-C Computer Cable

LabQuest to computer USB-C cable

The cable has a USB micro plug and USB-C plug. This cable is recommended for computers and Chromebook™ notebooks that only have USB-C ports.

[www.vernier.com/cb-usb-c-micro](http://www.vernier.com/cb-usb-c-micro)



### LabQuest Stand

Use the LabQuest stand to prop your LabQuest off the lab bench to protect it from accidental spills and to provide a natural viewing angle for your screen.

[www.vernier.com/lq3-stn](http://www.vernier.com/lq3-stn)



### Curriculum Resources

In addition to the experiment files included on the LabQuest 3 (see [Experiment Viewer](#)), Vernier offers a complete set of lab books for elementary through college. For more information, see [www.vernier.com/books](http://www.vernier.com/books).

## Replacement Parts



### **LabQuest Micro USB Computer Cable**

Replacement LabQuest-to-computer USB cable

The cable has a USB micro plug and USB standard-A plug. One cable is included with each LabQuest 3.

[www.vernier.com/cb-usb-micro](http://www.vernier.com/cb-usb-micro)



### **Replacement LabQuest 3 Battery**

Replacement high-capacity, rechargeable, lithium-ion battery for the Vernier LabQuest 3

One battery is included with each LabQuest 3.

[www.vernier.com/lq3-bat](http://www.vernier.com/lq3-bat)



### **LabQuest Power Supply**

Replacement power supply for the LabQuest

One power supply is included with each LabQuest 3.

[www.vernier.com/lq3-ps](http://www.vernier.com/lq3-ps)



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