TEXAS INSTRUMENTS

TI-*nspire*™

Data Collection and Analysis Guidebook

This guidebook applies to TI-Nspire™ software version 3.2. To obtain the latest version of the documentation, go to *education.ti.com/guides*.

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Note: 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.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

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Contents

Getting Started with Data Collection

The Vernier DataQuest™ application is built into the TI-Nspire™ software and the operating system (OS) for handhelds. Use the Vernier DataQuest™ application to collect, view, and analyze data.

To use the Vernier DataQuest™ application, the TI-Nspire™ handheld OS must be 3.0 or higher. To update the OS, go to education.ti.com.

About Vernier DataQuest™

- Run the application on either a TI-Nspire™ handheld or a Windows® or Mac® computer.
- Choose from multiple sensor interfaces and sensors, such as the TI-Nspire™ Lab Cradle, to collect data.
- Collect data with up to five connected sensors (three analog and two digital) using the TI-Nspire™ Lab Cradle. For a complete list of compatible sensors, see *Compatible Sensors*.

  Important: The TI-Nspire™ CM-C Handheld is not compatible with the Lab Cradle and only supports the use of a single sensor at a time.

- Collect data either in the classroom or at remote locations using collection modes such as time-based or event-based.
- Select and focus on a subset of collected data.
- Collect several data runs for comparison.
- Create a graphical hypothesis using the Draw Prediction feature.
- Play back the data set to compare the outcome to the hypothesis.
- Analyze data using functions such as interpolation, tangential rate, or modeling.
- Display results in a graph or a table.
- Customize the way results are displayed.
- Link the data to other TI-Nspire™ applications.

Using Vernier DataQuest™ Data in Other TI-Nspire™ Applications

Data obtained during a data collection run is written to the graph and table views in the Vernier DataQuest™ application and can be used in these TI-Nspire™ applications:

- Calculator
- Graph

- Geometry
- Lists & Spreadsheet
- Data & Statistics

This graphic shows how data can be shared among the applications.
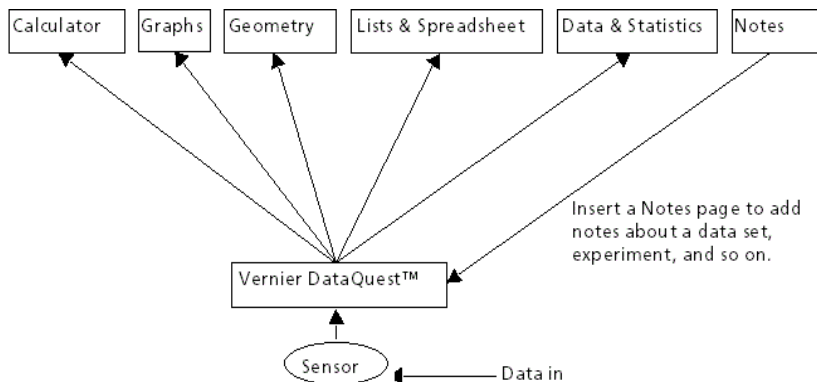
Exploring the Screens

The Vernier DataQuest™ application screen is identical in the handheld and the TI-Nspire™ software. The following graphic shows the application screen.

❶ Vernier DataQuest™ application view tabs. The application provides three views.

- • **Meter**. Displays the list of sensors connected or set up to use offline.
- • **Graph**. Displays collected data in a graphical representation, or displays the prediction before a data collection run.
- • **Table**. Displays collected data in columns and rows.

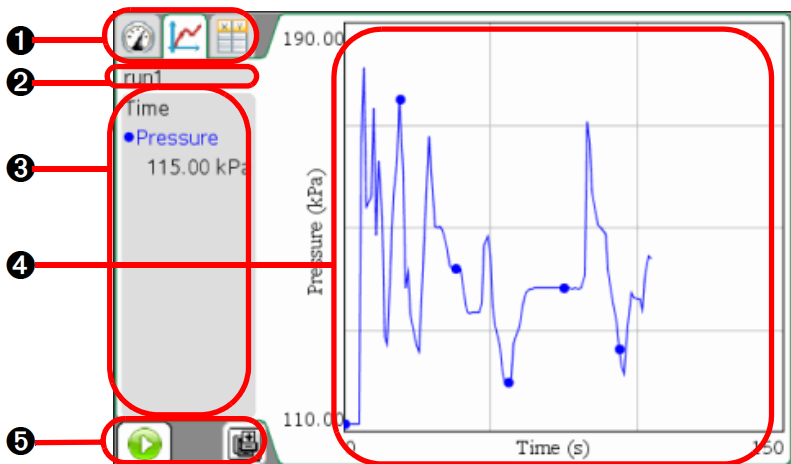**❷ Data Set selection tool.** This tool is displayed in the Graph view only and lets you choose which data set to graph.

❸ View Details area. This area contains information about the data appropriate for the current view.

❹ Data work area. The primary display of the data. The type of data displayed depends on the view.

❺ Data collection controls. Use these buttons to start and stop collections, store data sets, and capture data points.

Learning About Menus

Like other TI-Nspire™ applications, the Vernier DataQuest™ application has its own application and context menus.

When you first open a document or problem, insert the Vernier DataQuest™ application to open the application menu.

▶ Click **Insert > Vernier DataQuest**.

The Vernier DataQuest™ application opens with the Meter view active and the application menu open.

Important! If you connect a sensor before starting the Vernier DataQuest™ application, the connected sensor automatically launches the Vernier DataQuest™ application screen.
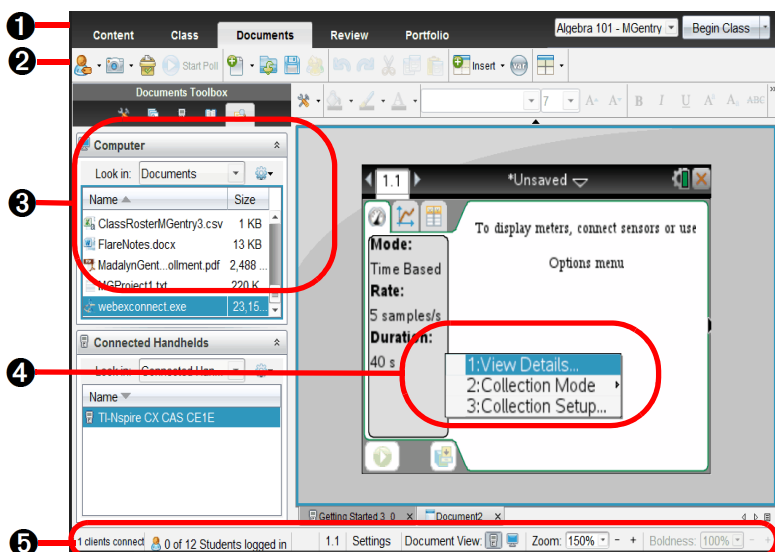
❶ **Workspace Selector.** In the TI-Nspire™ Teacher Software, click these tabs to switch from the Content Workspace to the Documents Workspace. These tabs are not shown in the student software. The Documents Workspace is the default workspace in the student software.

❷ **Toolbar.** Contains shortcuts to tools used to create folders, save files, create lesson bundles, send files to handhelds, and copy/paste. Options available from the toolbar change depending on which workspace is open.

❸ **Application menu.** Contains commands specific to the Vernier DataQuest™ application. Use these commands to collect and analyze data, set up sensors, view data in a graph or table, and so on.

❹ **Context menu.** Provides access to the tools most commonly used with the selected objects. Different options can appear on the context menu depending on the active object or the task you are performing.

Open the context menu by right-clicking an object or a work area.

Handheld: Move the cursor to the desired object, and then press ⌈ctrl⌋ ⌈menu⌋.

⑤ **Status bar.** Provides information about the active document and allows you to switch between the handheld view and the computer view.

Exploring the Status Bar
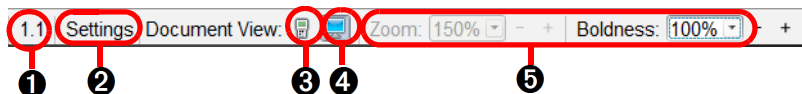
① **Problem and page number.** Displays the current page number and problem number in an active document.

② **Settings.** Double-click to display Document Settings.

③ **Handheld**: Lets you view documents as they appear on a handheld screen. The screen size is limited as it would be on the handheld.

Click 🔲 to activate the handheld view.

④ **Computer**: Lets you view documents as they appear in the software. Computer is the default view in the software.

Click 🖥 to activate the computer view.

⑤ **Scale.** A slider that lets you manage contrast (computer) or the size of the document (handheld).

- Used in the handheld view to change the size of the document and work area. Select the Zoom percentage menu to make the document larger.
- Used in the computer view to make the lines lighter or darker. Select the Boldness percentage menu or click – and + icons to change the document boldness.

Learning about Collection Devices

You can select from a variety of sensors and interfaces to collect data while running the Vernier DataQuest™ application with TI-Nspire™ software.

Multi-Channel Sensor Interfaces

Multi-channel sensor interfaces let you connect more than one sensor at a time.

Sensor Interface	Description
\n\n**Texas Instruments\nTI-Nspire™ Lab Cradle**	This sensor can be used with a handheld, a computer, or as a stand-alone sensor.\n\nThe sensor interface allows you to connect and use one to five sensors at the same time. It can be used in the lab or at a remote collection location.\n\nThe Lab Cradle supports two digital sensors and three analog sensors.\n\nThe Lab Cradle also supports high-sample data collection sensors, such as a hand-grip heart rate or a blood pressure monitor.\n\nWhen used as a remote sensor, you can download data to either a handheld or computer.\n\nFor more information, see the *TI-Nspire™ Lab Cradle Guidebook*.

Single-Channel Sensor Interfaces

Single-channel sensor interfaces can only connect to one sensor at a time. These sensors have either a mini-USB connector for a handheld or a standard USB connector for a computer. For a complete list of compatible sensors, see *Compatible Sensors*.

Sensor Interface	Description
\n\n**Vernier EasyLink®**	This sensor interface is used with handhelds. It has a mini-USB connector so it can be plugged directly into the handheld.\n\nConnect sensors to Vernier EasyLink® to:\n\n• Measure barometric pressure.\n\n• Measure the salinity of a solution.\n\n• Investigate the relationship between pressure and volume (Boyles' Law).

Sensor Interface	Description
Vernier Go!Link®	This sensor interface is used with computers. It has a standard connector so it can be plugged into a Windows® or Mac® computer. Connect sensors to Vernier GoLink® to: • Measure the acidity or alkalinity of a solution. • Monitor greenhouse gases. • Measure sound level in decibels.

Sensor Types

You can select from three types of sensors.

• **Analog sensors.** Temperature, light, pH, and voltage sensors are analog sensors and require a sensor interface.

• **Digital sensors.** Photogates, radiation monitors, and drop counters are digital sensors. These sensors can only be used with the TI-Nspire™ Lab Cradle.

• **Direct-connect USB sensors.** These sensors connect directly to a handheld or computer and do not require a sensor interface.

For a complete list of compatible sensors, see *Compatible Sensors*.

Sensors for Handhelds

The following lists some sensors you can use with a handheld.

Sensor	Description
Texas Instruments CBR 2™	This analog sensor connects directly to TI-Nspire™ handhelds through the mini-USB port. It is used to explore and graph motion. This sensor automatically launches the Vernier DataQuest™ application when you connect it to a handheld. Data collection begins when you select the Motion Match function. This sensor collects up to 200 samples per second. Use this sensor to: • Measure position and speed of a person or object. • Measure the acceleration of an object.

Sensor	Description
Vernier EasyTemp® temperature sensor	This analog sensor connects directly to TI-Nspire™ handhelds through the mini-USB port and is used to collect temperature ranges. You can design experiments to: • Collect weather data. • Record temperature changes due to chemical reactions. • Perform heat fusion studies.

Sensors for Computers

The following table lists some sensors you can use with a computer.

Sensor	Description
Vernier Go!Temp® temperature sensor	This analog sensor connects to the computer's USB port and is used to collect temperature ranges. You can use this sensor to: • Collect weather data. • Record temperature changes due to chemical reactions. • Perform heat fusion studies.
Vernier Go!Motion® motion detector	This analog sensor connects to the computer's USB port and is used to measure acceleration, speed, and velocity. Use this sensor to: Measure position and speed of a person or object. Measure the acceleration of an object.

Performing an Experiment

When performing an experiment, these basic steps are the same no matter which type of experiment you perform.

1. Start a new document or problem.

   Important! If you connect a sensor before starting the Vernier DataQuest™ application, the software automatically opens the Vernier DataQuest™ application.

2. Connect a sensor.
3. Modify sensor settings. (Optional, if using default settings)
4. Set the collection mode. (Optional, if using default settings)
5. Collect data.
6. Stop collecting data.
7. To save the data for future use, store the data set.
8. Save the experiment.
9. Analyze data.
10. Print data. (Optional, if you do not need a paper copy.)

Starting a Document

TI recommends starting a new document for each new experiment. Starting a new document ensures that the Vernier DataQuest™ application is set to its default values.

Important: The handheld can only have one document open. You are prompted to save it before creating a new document. TI also recommends that you have only one document open so the system assigns the sensor to the correct document.

Starting a New Document

To start a new document:

1. Click **File > New TI-Nspire™ Document**.

   Handheld: Press ⌂on, and then select **New Document**.

   A new document opens.

2. Click **Add Vernier DataQuest.**

   The Vernier DataQuest™ opens.

Adding a Problem to a Document

You can add a new problem to an existing document. TI recommends adding a new problem to the document, which ensures that the Vernier DataQuest™ application is set to its default values.

1. Click **Insert > Problem**.

   Handheld: Press doc▾, and then select **Insert > Problem**.

2. Click **Add Vernier DataQuest**.

   A new problem is added to the document.

Connecting Sensors

Some sensors require a sensor interface. For sensors that require an interface, you must connect the sensor to the interface first.

To connect a sensor and sensor interface:

1. Attach the sensor to the sensor interface using either the mini-USB, USB, or BT connector and the appropriate cable.

2. Attach the interface to a computer or handheld using the appropriate connector and cable.

   Note: To attach a handheld to a TI-Nspire™ Lab Cradle, slide the handheld into the connector at the bottom of the Lab Cradle.

Direct-connect USB sensors, such as the Vernier Go!Temp® temperature sensor (for computers) or the Vernier EasyLink® temperature sensor (for handhelds), connect directly to the computer or handheld and do not need a sensor interface.

Modifying Sensor Settings

You can modify how the sensor values are displayed and stored. For example, when using a temperature sensor, you can change the unit of measure from Centigrade to Fahrenheit.

Changing Sensor Measurement Units

The unit options that can be changed vary depending on the selected sensor. For example, options for the Vernier Go!Temp® Temperature sensor are Fahrenheit, Celsius, and Kelvin. Options for the Vernier Hand Dynamometer (a specialized force sensor) are Newton, Pound, and Kilogram.
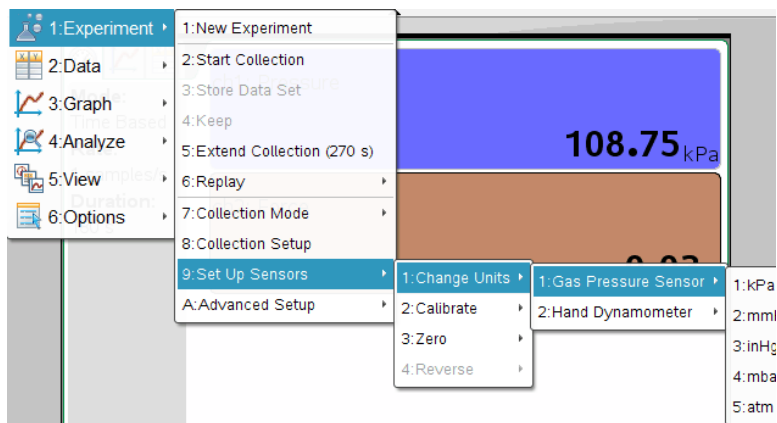
To change a unit of measure:

1. Click **Experiment** > **Set Up Sensors**.

2. Click **Change Units**, and then select the sensor you want to change.

   Note: The sensors displayed are those you attached or selected to use offline.

3. Select the unit type from the unit menu.

The measurement unit is changed.

Note: You can change the units before or after you collect data. The collected data reflects the new measurement unit.

Calibrating a Sensor

When the software or handheld detects a sensor, the calibration for that sensor automatically loads. You can calibrate some sensors manually. Other sensors, such as the Colorimeter and the Dissolved Oxygen Sensor, must be calibrated to provide useful data.

There are three options for calibrating a sensor:

- Manual Entry
- Two Point
- Single Point

For more information, see the sensor's documentation for calibration values and procedures.

Setting a Sensor to Zero

Not all sensors can be set to zero. You cannot set sensors in which relative measurements such as force, motion, and pressure are common to zero. Sensors designed to measure specific environmental conditions, such as Temperature, pH, and CO_2 also cannot be set to zero.

To set the standing value to zero:

1. Click **Experiment > Set Up Sensor**.

2. Click the sensor, and then click **Zero**.

   Note: The sensors displayed in the sensor list are those attached or selected to use offline.

   The sensor value is now at zero.

Reversing a Sensor Reading Display

Use this feature to change the display of the reading.

By default, pulling with a force sensor produces a positive force and pushing produces a negative force. Reversing the sensor allows you to display pushing as a positive force.

If more than one sensor can be reversed, choose the one to reverse from the list.

To reverse the display of the sensor reading:

1. Click **Experiment > Set Up Sensor**.

2. Click the sensor, and then click **Reverse**.

   The sensor display is now reversed. If you are in Meter View, the

   reverse indicator appears $^{(\updownarrow)}$ after the sensor name.
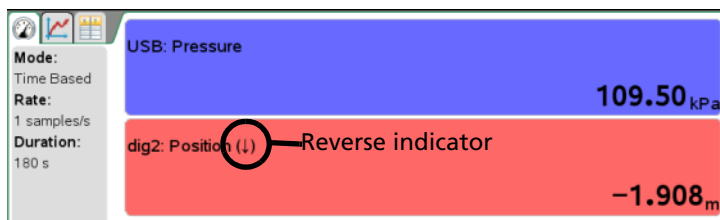
Setting the Collection Mode

Use Collection Mode to select the appropriate mode for the experiment. The default Collection Mode is Time Based for new experiments.

If you have unsaved data when you change the mode, a warning message states that changing modes clears unsaved data.

You can only use

• Photogate timing mode with the Vernier Photogate sensor.

• Drop Counting mode with the Vernier Drop Count sensor.

Setting a Time Based Collection Mode

The Time Based collection mode captures data using timing as a guide. Set this mode to collect either samples per second (Rate) or seconds per sample (Interval) to determine how often data points are collected. Rate and Interval are simply reciprocals of each other. To set the Collection Mode to Time Based:

1. Click **Experiment > Collection Mode > Time Based.**

    The Configure Time Based Data Collection window opens with either Interval or Rate selected. (It uses previous settings as the opening value.)

2. Select **Rate** or **Interval** from the list.

    *   **Rate** (samples/second): Type the number of samples per second. The interval is calculated.

    *   **Interval** (seconds/sample): Type the number of seconds per sample. The rate is calculated.

3. Type the number of seconds the data collection should last in the Duration field.

4. Review the value in the Number of points field to ensure the rate and duration are reasonable.

    Note: The Number of points field is a calculated field. This value is determined by the formula: Rate * Duration + 1.

    Important: Collecting too many data points impacts system performance.

5. Select one of the following, if needed.

    *   **Strip Chart** (Optional): Strip Chart continuously collects samples but only retains the last *x* data points collected. ("*x*" represents the number of points defined in the Number of points field.)

    *   **Data Marker** (Optional): Selecting this option places the Add Data Marker in the Data collection controls area.

        Click **Add Data Marker** to emphasize specific points, such as when you observe a change or when you change a condition. Some examples of change are:

        – Ice begins to form.

        – You stir the solution.

        – You add a chemical to the solution.
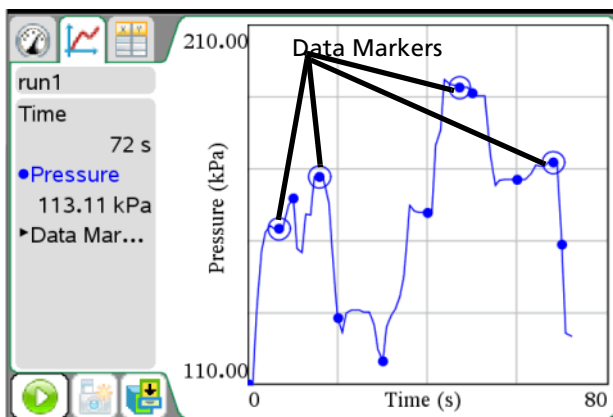
6. Click **OK**.

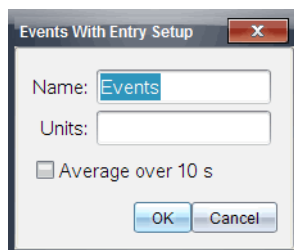   The settings are saved for the next run.

Setting the Events with Entry Collection Mode

Use the Events with Entry collection mode to capture samples manually by defining the independent value for each point you collect.

To set the collection mode as Events with Entry:

1. Click **Experiment > Collection Mode > Events with Entry**.

   The Events with Entry Setup dialog box opens.

2. (Optional) Type a name for the label.

3. (Optional) Type the units for the independent variable.

4. (Optional) Select the Average over 10 s (seconds) option.

   Use this option when sensor values fluctuate. The system collects ten seconds of data and retains the average reading.

5. Click **OK**.

   The settings are saved for the next run.

The Keep current reading icon now appears (inactive) in Data collection controls.

Setting the Selected Events Collection Mode

Use the Selected Event collection mode to capture samples manually by defining the independent value for each point you collect.

To set the collection mode as Selected Events:

1. Click **Experiment > Collection Mode > Selected Events.**

   The Selected Events Setup dialog box opens.

2. (Optional) Type a name for the label.

   Use any meaningful value.

3. (Optional) Type the units for the independent variable.

4. (Optional) Select the Average over 10 s (seconds) option.

   Use this option when sensor values fluctuate. The system collects ten seconds of data and retains the average reading.

5. Click **OK**.

   The settings are saved for the next run.

   The Keep current reading icon now appears (inactive) in Data collection controls.

Setting the Photogate Timing Collection Mode

Select the Photogate Timing collection mode only when using the Vernier Photogate sensor. The Photogate is for motion timing. It can time objects that pass through the gates or as a laser gate outside of the gates. It can also be used to time motion in any of these states:

• Pulse

• Pendulum

• Gate and pulse

• Gate state only

Setting the Drop Counting Collection Mode

Select the Drop Counting collection mode only when using the Vernier Drop Counter optical sensor.

Collecting Data

After the sensor and collection mode are set up, you can start collecting the data for the experiment. The collection mode determines the steps required for collecting data.

If you are in Meter View when you start data collection, the Vernier DataQuest™ application changes to Graph View and begins recording sensor data. The graph updates to show the data as it is collected.

> **Important:** When you use either Events with Entry mode or the Selected Events mode, data points are not recorded until you click
>
> **Experiment > Keep** or click .

Stopping the Data Collection

In most data collection modes, the collection ends automatically. If using the Events with Entry collection mode, you must stop data collection manually. You can also end data collection for any other mode manually at any time.

To stop a collection:

▶ Click **Experiment > Stop Collection.**

The current run stops.

Collecting Data in the Time Based Mode

To collect data using the Time Based mode:

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

   This step removes any existing data and ensures the connected sensor is set to its default values.

2. Connect a sensor.

   Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Time Based** for the collection mode.

4. Click **Experiment > Start Collection**.

5. Click **Experiment > Stop Collection**.

   The data set run is complete.

Collecting Data in the Events with Entry Mode

Use this procedure only after you assign Events with Entry as the collection mode.

To collect data using the Events with Entry mode only:

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

   This step removes any existing data and ensures the connected sensor is set to its default values.

2. Connect a sensor.

   Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Events with Entry** for the collection mode.

4. Click **Experiment > Start Collection.**

   The Keep current reading icon becomes active. The sensor shows the data point in the center of the screen.

5. Click **Experiment > Keep** for each data point you want to keep.

   The Events with Entry dialog box opens.
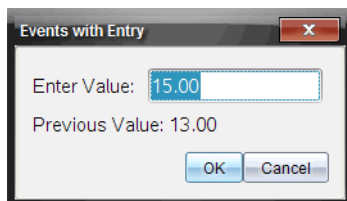
6. Type the value of the data point.

7. Click **OK**.

   The data point is saved in the appropriate location on the graph. The next point appears in the center of the graph.

8. Repeat steps 5 through 7 until you collect all of the desired data points.

9. Click **Experiment > Stop Collection**.

   The data set run is complete.

Collecting Data in the Events with Entry Mode Average over 10 Option

Use this procedure only after you assign Events with Entry as the collection mode and select the Average over 10 option.

To collect data using the Events with Entry mode Average over 10 s option:

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

   This step removes any existing data and ensures the connected sensor is set to its default values.
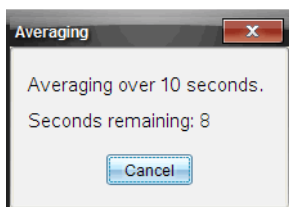
2. Connect a sensor.

   Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Events with Entry** as the collection mode.

4. Check the **Average over 10 s** option.

5. Click **Experiment > Start Collection.**

   The Keep current reading icon [icon] becomes active. The sensor shows the data point in the center of the screen.

6. When you are ready, click [icon].

   The Averaging dialog box opens, counting down to zero seconds. When the counter reaches zero, the system records the data point in the appropriate location on the graph.

7. Repeat step 6 until you collect all of the data points.

8. Click **Experiment > Stop Collection**.

   The data set run is complete.

Collecting Data in the Selected Events Mode

To use the Selected Events collection mode:

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

   This step removes any existing data and ensures the connected sensor is set to its default values.

2. Connect a sensor.

Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Selected Events** as the collection mode.

4. Check the **Average over 10 s** option.

5. Click **Experiment > Start Collection.**

   Keep current reading becomes active. The sensor shows the data point in the center of the screen when in Graph View.

6. Click **Experiment > Keep** for each data point to keep.

   The data point is saved in the appropriate location on the graph. The next point appears in the center of the graph.

7. Repeat step 6 until you collect all of the data points.

8. Click **Experiment > Stop Collection**.

   The data set run is complete.

Collecting Data in the Photogate Timing Mode

Use this procedure only after you assign Photogate Timing as the collection mode.

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

   This step removes any existing data and ensures the connected sensor is set to its default values.

2. Connect a sensor.

   Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Photogate Timing** as the collection mode.

4. Click **Experiment > Start Collection.**

5. Collect your data set.

6. Click **Experiment > Stop Collection**.

   The data set run is complete.

Collecting Data in the Drop Counting Mode

Use this procedure only after you assign Drop Counting as the collection mode.

1. Click **Experiment > New Experiment** to reset the sensor to its default values.

This step removes any existing data and ensures the connected sensor is set to its default values.

2. Connect a sensor.

   Note: When you connect a sensor, the sensor name is added to the sensor list.

3. Select **Drop Counting** as the collection mode.

4. Click **Experiment > Start Collection.**

5. Collect your data set.

6. Click **Experiment > Stop Collection**.

   The data set run is complete.

Storing a Data Set

For most experiments, data is collected for multiple trials (runs). You can store the data set from the latest run before performing a new run. Storing the data prevents it from being overwritten and retains the data by creating a new data set for the next run. The data set is not saved outside the application until you save the data set as a TI-Nspire™ or PublishView™ document.

Important: You must save the document if you want to keep the data after the application has been closed.

Note: The PublishView™ application is only available in the computer software.

If you do not need to retain the data from the previous run, overwrite the data set by starting another collection without storing the current data run.

To store a data set:

▶ Click **Experiment > Store Data Set.**

   The first data set is stored as "Run 1" by default and "Run 2" opens for collecting additional data. You can change the data set names.

Saving an Experiment

After you complete the experiment, save it as a TI-Nspire™ document (.tns file) or as a TI-Nspire™ PublishView™ document (.tnsp).

Important: The PublishView™ application is only available in the computer software.

1. Select the document you want to save.

2. Select **File > Save Document**.

   Handheld: Press $\boxed{\text{doc}\,\text{▾}}$, and then click **File > Save**.

   The document is saved.
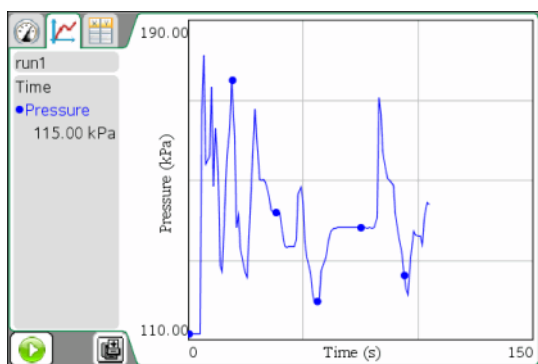
Working in the Graph View

When you collect data, it is written in both the Graph and Table views. Use the Graph view to analyze data.

Important: The Graph menu and Analyze menu items are only active when working in Graph View.

To display the Graph view:

▶ Click **View > Graph**.

The Graph View screen opens.

Displaying Graphs

Use the Show Graph menu to show separate graphs when using:

• A sensor that plots more than one column of data.

• Multiple sensors with different defined units at the same time.

You can display the top graph (Graph1), bottom graph (Graph 2), or both.

In this example, two sensors (the Gas Pressure sensor and the Hand Dynamometer) were used in the same run. The following image shows the columns Time, Force, and Pressure in the Table view to illustrate why two graphs are shown.

▶ Select **View > Graph**.
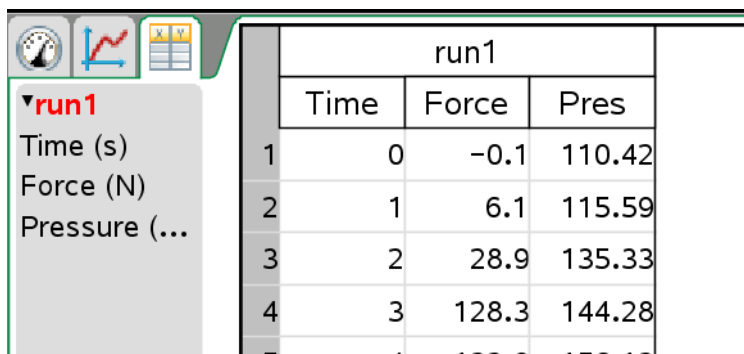
Displaying One Graph

When two graphs are displayed, the top graph is Graph 1 and the bottom graph is Graph 2.

To display only Graph 1:

▶ Select **Graph > Show Graph > Graph 1**.

Only Graph1 is displayed.

To display only Graph 2:

▶ Select **Graph > Show Graph > Graph 2**.

Only Graph 2 is displayed.

Displaying Multiple Graphs

To display both Graph 1 and Graph 2 together:

▶ Select **Graph > Show Graph > Both**.

Graph1 and Graph 2 are displayed.
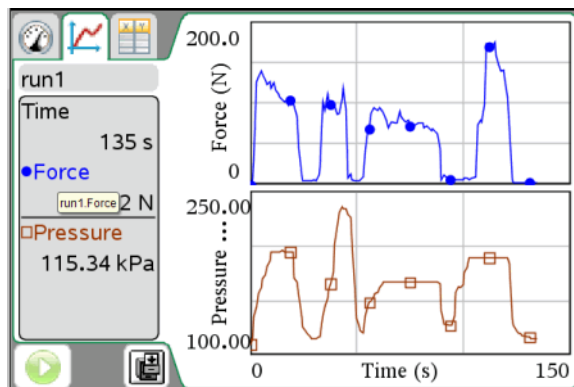
Displaying Graphs in the Page Layout View

Use the Page layout view when Show Graph is not the appropriate solution for showing more than one graph.

The Show Graph option is not applicable for:

- Multiple runs using a single sensor.
- Two or more of the same sensors.
- Multiple sensors that use the same column(s) of data.

To use Page Layout:

1. Open the original data set you want to see in two graph windows.
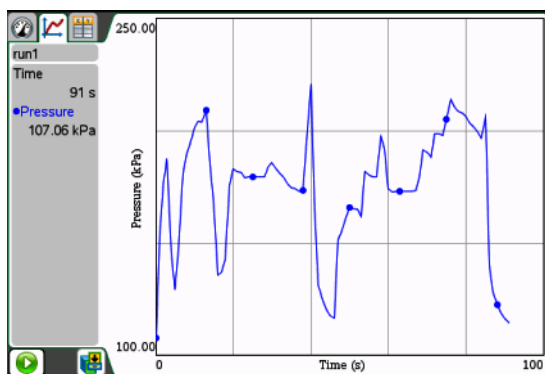
2. Click **Edit > Page Layout > Select Layout.**

   Handheld: Press [doc⌄], and then select **Page Layout > Select Layout**.

3. Select the type of page layout you want to use.

   In this example, the top and bottom ▭ page symbol was selected.
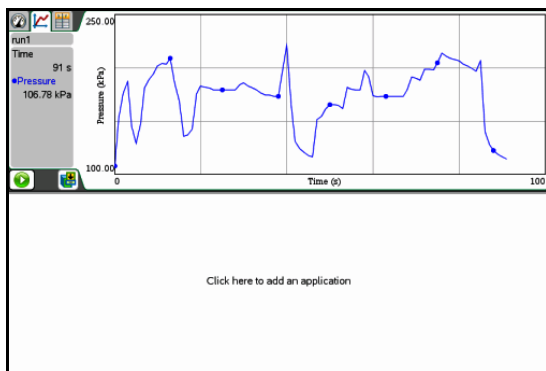
4. Click **Click here to add an application**.

   Handheld: Press `menu`.

5. Select **Add Vernier DataQuest**.

   The Vernier DataQuest™ application is added to the second view.

6. To see separate views, click the view you want to change, and then select **View > Table**.

   The new view is displayed.
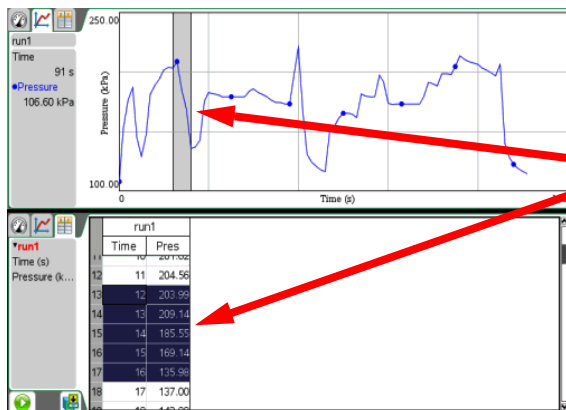
Note:

Selection in one view is reflected in the other.

7. To show the same view, click the view to change.

8. Click **View > Graph**.

   The new view is displayed.
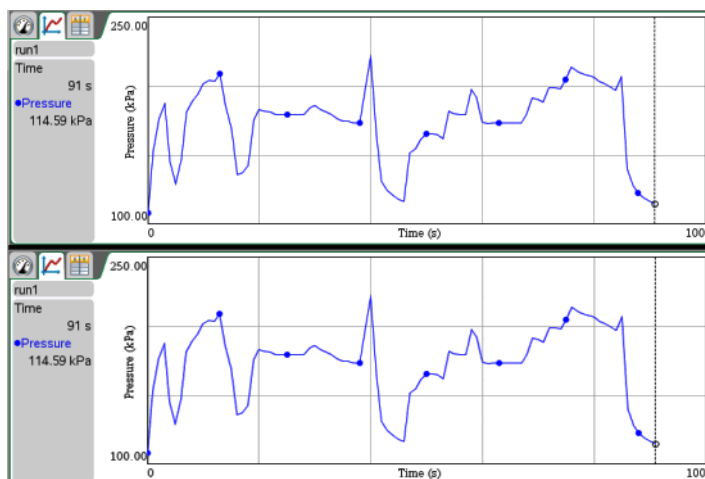
Customizing the Graph

You may customize the graph by adding a title, changing colors, and setting ranges for the axis.

Adding a Title

When you add a title to a graph, the title is displayed in the View Details area. When you print the graph, the title prints on the graph.

1. Click **Graph > Graph Title**.

   The Graph Title dialog box opens.
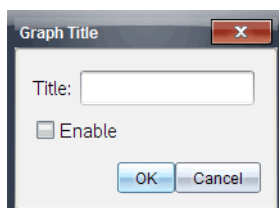
   If there are two graphs in the work area, the dialog box has two title options.
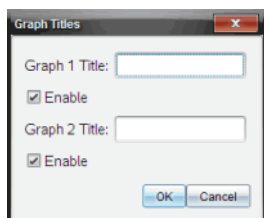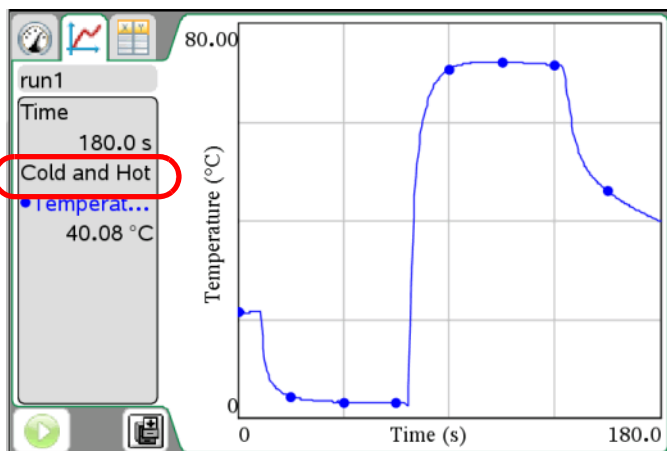
2. Type the name of the graph in the Title field.

   —or—

   a) Type the name of the first graph in the Graph 1 field.

   b) Type the name of the second graph in the Graph 2 field.

3. Select **Enable** to show the title.

   Note: Use the Enable option to hide or show the graph title as needed.
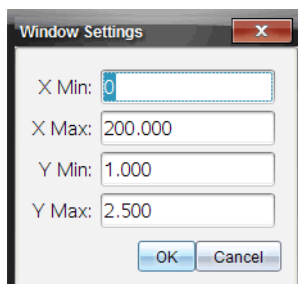
4. Click **OK**.

   The title is shown.

Setting Axis Ranges for One Graph

To modify the minimum and maximum range for the x and y axis:

1. Click **Graph > Window Settings**.

   The Window Settings dialog box opens.

2. Type the new values in one or more of these fields:

    – X Min

    – X Max

    – Y Min

    – Y Max

3. Click **OK**.

    The application uses the new values for the graph visual range until you modify the range or change data sets.

Setting Axis Ranges for Two Graphs

When working with two graphs, enter two y axis minimum and maximum values, but only one set of minimum and maximum values for the x axis.

1. Click **Graph > Window Setting**.

    The Window Setting dialog box opens.
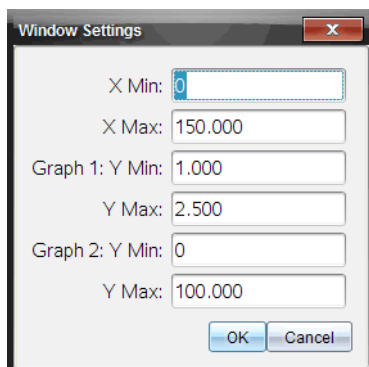
2. Type the new values in one or more of these fields:

    – X Min

- X Max
- Graph 1: Y Min
- Y Max
- Graph 2: Y Min
- Y Max

3. Click **OK**.

   The application uses the new values for the graph visual range until you modify the range or change data sets.

Setting the Axis Range on the Graph

You can modify the minimum and maximum range for the x and y axis on the graph.

1. Select the text you want to change.
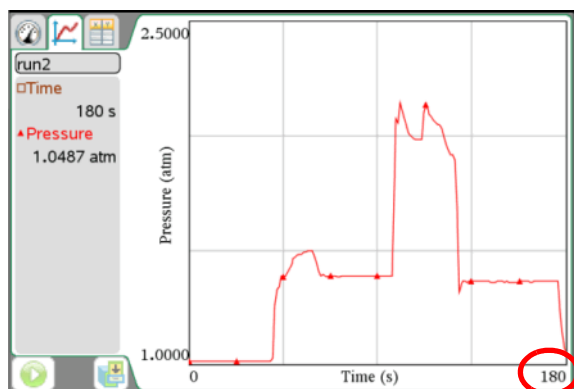
2. Type a new value for the text.

   Handheld:

   - Place the cursor over the value until the cursor changes to an I-beam I.

   - Highlight the text you want to change.

   - Type a new value for the text.
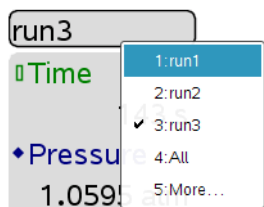
   - Press ⌈enter⌋.

   The text is changed, and the graph redrawn to reflect the change in value.

Selecting a Data Set to Plot

To save data sets or run multiple trials, select the data set to plot.

1. Click **Graph > Select Data Set**.

   The list of available data sets opens.

2. Select one of the following:

   - **Data Set name.** Plot one specific data set.

   - **All.** Plot all data sets.

   - **More.** Choose a combination of data sets to plot.

     When you use the **More** option and select more than one data set but not all data sets, the Data Set selection tool states Custom.

3. Click **OK**.

   The data set you selected is displayed.

Autoscaling a Graph

Use the autoscale option to show all the points plotted. Autoscale Now is useful after you change the x and y axis range or zoom in or out of a graph. You can also define the automatic autoscale setting to use during and after a collection.

Autoscale Now Using the Application Menu

▶ Click **Graph > Autoscale Now**.

The graph now displays all the points plotted.

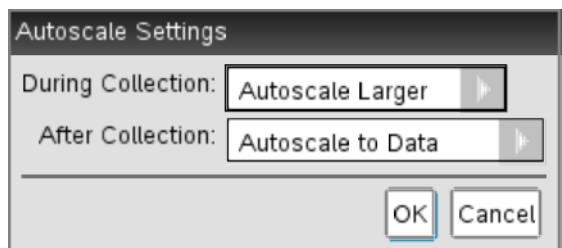### *Autoscale Now Using the Context Menu*

1. Open the context menu in the graph area.

2. Click **Window/Zoom > Autoscale Now**.

   The graph now displays all the points plotted.

Defining Autoscale During a Collection

There are two options for using the automatic autoscaling that occurs during a collection. To choose an option:

1. Click **Options > Autoscale Settings**.

The Autoscale Settings dialog box opens.

2. Click ▶ to open the **During Collection** drop-down list.

3. Select one of these options:

    •   **Autoscale Larger** - Expands the graph as needed to show all points as you collect them.

    •   **Do Not Autoscale** - The graph is not changed during a collection.

4. Click **OK** to save the setting.

Defining Autoscale After a Collection

You have three options for setting the automatic autoscaling that occurs after a collection. To set your choice:

1. Click **Options > Autoscale Settings**.

    The Autoscale Settings dialog box opens.

2. Click ▶ to open the **After Collection** drop-down list.

3. Select one of these options:

    •   **Autoscale to Data.** Expands the graph to show all data points. This option is the default mode.

    •   **Autoscale From Zero.** Modifies the graph so all data points including the origin point are displayed.

    •   **Do Not Autoscale.** The graph settings are not changed.

4. Click **OK** to save the setting.

Selecting a Range of Data

Selecting a range of data on the graph is useful in several situations, such as when zooming in or out, striking and unstriking data, and examining settings.

To select a range:

1. Place the cursor at the start of the area.

2. Drag the cursor across the graph to the end of the selected region.

   The selected area is indicated by gray shading.

   Handheld:

   • Place the cursor at the starting point, and then press ⌈ctrl⌉ ⌈🔲⌉.

     The cursor changes to ↔ (double-headed arrow).

   • Move the cursor to the end of the selection.

   • Press ⌈esc⌉.

     The cursor changes to ↖ (single-headed arrow).

3. Perform one of these actions.

   • Zoom in or out

   • Strike or unstrike data

   • Examine settings

Zooming In on a Graph

You can zoom in on a subset of the collected points. You can also zoom out from a previous zoom or expand the graph window beyond the data points collected.
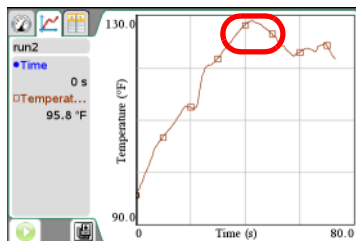
To zoom in on a graph:

1. Select the area you want to zoom into or use the current view.

2. Click **Graph > Zoom In**.

   The graph adjusts to display only the area you selected.

   The x range selected is used as the new x range. The y range autoscales to show all graphed data points in the selected range.

   These images show an original view and zoom in performed multiple times (or as a selected region).
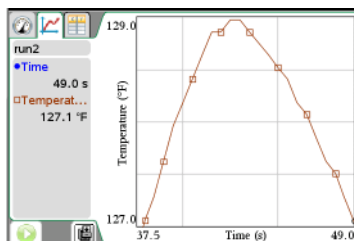
Zooming Out of a Graph

To zoom out of a graph:

▶ Select **Graph > Zoom Out**.

The graph is now expanded.

If a Zoom In precedes a Zoom Out, the graph displays the original settings prior to the Zoom In.

For example, if you Zoomed In twice, the first Zoom Out would display the window of the first Zoom In. To display the full graph with all data points from multiple zoom ins, use Autoscale Now.
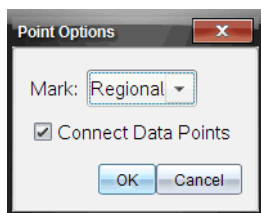
Changing the Point Display

You can adjust the way points are displayed on graphs, change the point colors, and change the symbols for point markers.

Setting Point Options

To indicate how often marks show on the graph and whether to use a connecting line:

1. Click **Options > Point Options**.

   The Point Options dialog box opens.

2. Select a **Mark** option from the drop-down list.

   • **None.** No point protectors.

   • **Regional.** Periodic point protectors.

   • **All.** Every data point as a point protector.

3. Select **Connect Data Points** to display a line between points.

   —or—

   Clear **Connect Data Points** to remove the line between points.

The following graphics show examples of some of the Point Mark options.
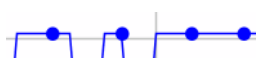
Regional

Connect Data Points - Selected

All

Connect Data Points - not selected

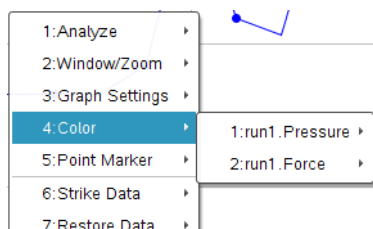
None

Connect Data Points - Selected

Changing Point Colors

To change the color of the marks from the default settings.

Note: On a TI-Nspire™ handheld, color is represented by different shades of gray.

1. Right-click the graph to open the menu.

2. Click **Color**.

   **Note:** The data option is often preceded by the data set name and column name.

3. Click the column variable to change.

4. Click the color.

   The line representing the data changes to the color selected.

Selecting Point Markers

1. Right-click in the graph to open the menu.

2. Click **Point Marker**.

   Note: If there is only one dependent variable column, the Point Marker option is preceded by the data set name and column name. Otherwise, the Point Marker option has a menu.
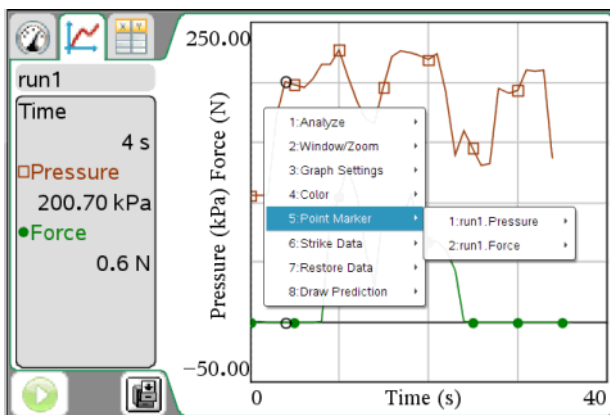
3. Select the column variable to change.

4. Select the point marker to set.

   The Point Marker changes to the option selected.

Selecting an Independent Variable Column

Use the option Select X-axis Column to select the column used as the independent variable when graphing the data. This column is used for all graphs.

1. Click **Graph > Select X-axis Column**.

2. Select the variable you want to change.

   The x-axis label on the graph changes and the graph is reordered using the new independent variable for graphing the data.

Selecting a Dependent Variable Column

Use the option Select Y-axis Column to select which dependent variable columns to plot on the displayed graph(s).

1. Click **Graph > Select Y-axis Column**.

2. Select one of the following:

   • A variable from the list. The list is a combination of dependent variables and the number of data sets.

   • **More.** Selecting More opens the Select dialog box. Use this when you want to select a combination of data set variables to graph.
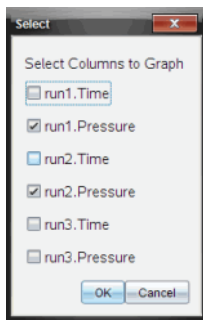
Showing and Hiding Details

You can hide parts of the screen to provide a larger view of the screen.

The following example shows screens with the details shown.
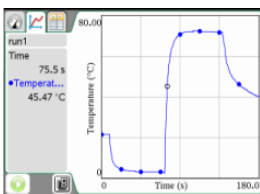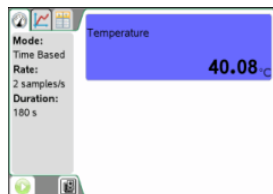
To hide details:

► Click **Options > Hide Details**.

The menu changes from Hide Details to Show Details.

The following parts of the screen are hidden:

- • Vernier DataQuest™ application view tabs
- • View Details area
- • Data collection controls

To show details:

► Click **Options > Show Details**.

Analyzing the Data in Table View

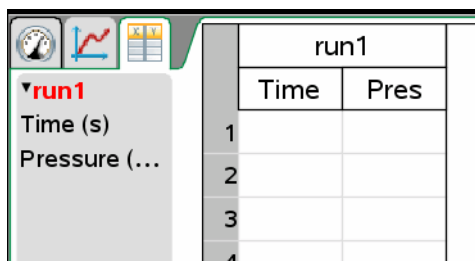Table view provides another way to sort and view collected data.

Defining Column Options

You can name columns and define the decimal points and the precision you want to use. To define the columns:

1. Click **View > Table**.

   The Table view is displayed.

   In this example, no data sets have been run and the Vernier Gas Pressure Sensor is attached.
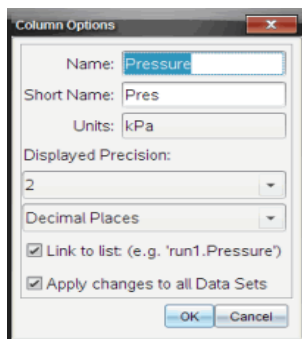

2. Click **Data > Column Options**.

   Note: You can be in the Meter, Graph, or Table view and still click these menu options. The results will still be visible.

3. Click the name of the column you want to define.

   Note: Some of the fields may be populated but can be edited.

   The Column Options dialog box opens.

4. Type the long name for the column in the **Name** field.

5. Type the abbreviated name in the **Short Name** field.

   Note: This name is displayed if the column cannot expand to display the full name.

6. Type the number of units in the **Units** field.

7. From the **Displayed Precision** drop-down list, select the precision value.

   Note: The default precision is related to the precision of the sensor.

8. Select **Link to list** to link to the symbol table and make this information available to other TI-Nspire™ applications.

   Note: Linking is the default for most sensors.

   Important: Heart rate and blood pressure sensors require a tremendous amount of data to be useful, and the default for these sensors is to be unlinked to improve system performance.

9. Select **Apply changes to all Data Sets** to apply these settings to all data sets.

10. Click **OK**.

    The column settings are now defined with the new values.

Creating a New Data Set

You can create a new data set that has the same columns as the existing data set(s). Column definitions from the latest data set are applied to the new data set.

▶ Select **Data > New Data Set**.

   An empty data set is created with the same column definitions as the existing data set.

Changing a Data Set Name

You can change the Data Set name above the column headings. This change is also displayed in the Data Set selection tool and the Details View area.
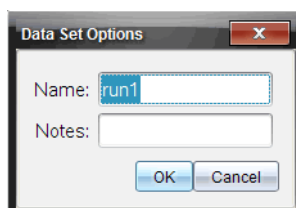
1. Click **View > Table**.

2. Right-click the Table pane.

   The context menu is displayed for the table data set name, for example, Run1.
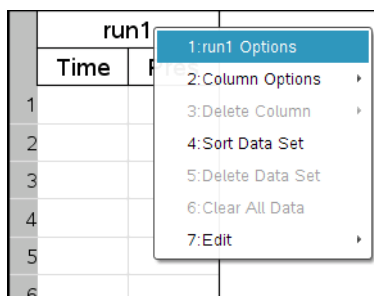
3. Click **Options** (preceded by the data set name).

   The Data Set Options dialog box opens.

4. Type the new name in the **Name** field.

   Note: The maximum character limit is 30 and the name cannot contain commas.

5. (Optional) Type information about the data set in the Notes field.

6. Click **OK**.

   The data set name is now changed.

Adding a New Column

To enter data manually, add a new column. Sensor columns cannot be modified, but data entered manually can be edited.

1. Click **Data > New Manual Column**.

   The Column Options dialog box opens.

   Note: Some of the fields may be populated but can be edited.

2. Type the long name for the column in the **Name** field.

3. Type the abbreviated name in the **Short Name** field.

   Note: This name is displayed if the column cannot expand to display the full name.

4. Type the units to be used.

5. From the **Displayed Precision** drop-down list, select the precision value.

   Note: The default precision is related to the precision of the sensor.

6. (Optional) Select **Apply changes to all Data Sets** to apply these settings to all data sets.

7. (Optional) Select **Generate Values** to automatically populate the rows.

   If you select this option, complete these steps:

   a) Type a starting value in the **Start** field.

   b) Type an ending value in the **End** field.

   c) Type the increase in value in the **Increment** field.

      The number of points is calculated and shown in the Number of Points field.

8. Select **Link from list** to link to data in another TI-Nspire™ application.

   Note: This list only populates when data exists in the other application and includes a column label.
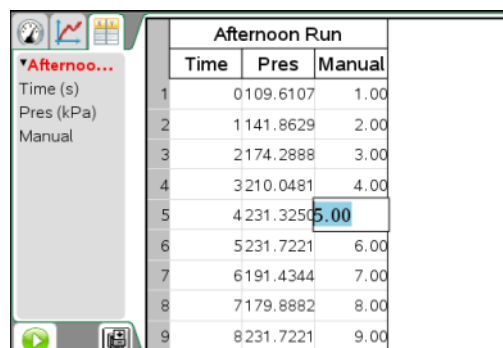
9. Select **Link to list** to link to the symbol table and make this information available to other TI-Nspire™ applications.

   Note: Linking is the default for most sensors.

   Important: Heart rate and blood pressure sensors require a tremendous amount of data to be useful, and the default for these sensors is to be unlinked to improve system performance.

10. Click **OK**.

    A new column is added to the table. This column can be edited.

Adding a New Calculated Column

You can add an additional column to the data set in which the values are calculated from an expression using at least one of the existing columns.

Use a calculated column when finding the derivative for pH data. For more information, see *Adjusting Derivative Settings*.

1. Click **Data > New Calculated Column**.

   The Column Options dialog box opens.

2. Type the long name for the column in the **Name** field.

3. Type the abbreviated name in the **Short Name** field.

   Note: This name is displayed if the column cannot expand to display the full name.

4. Type the units to be used.

5. From the **Displayed Precision** drop-down list, select the precision value.

   Note: The default precision is related to the precision of the sensor.

6. Type a calculation including one of the column names in the **Expression** field.

   Note: The system-provided column names are dependent on the sensor(s) selected and any changes made to the name field in Column Options.

   Important: The Expression field is case-sensitive. (Example: "Pressure" is not the same as "pressure.")

7. Select **Link to list** to link to the symbol table and make this information available to other TI-Nspire™ applications.

   Note: Linking is the default for most sensors.

   Important: Heart rate and blood pressure sensors require a tremendous amount of data to be useful, and the default for these sensors is to be unlinked to improve system performance.
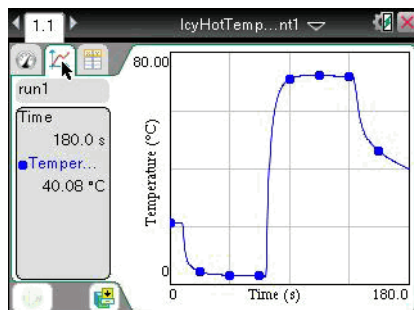
8. Click **OK**.

   The new calculated column is created.

Striking and Restoring Data

To strike data:

1. Open the data run that contains the data to be struck.

2. Select **View > Table**.
3. Select the starting row and scroll to the ending point.

   To select the region:

   Drag the cursor to the bottom or top of the screen to select the area out of the immediate view. It also scrolls the screen so you can see the selection.

   Handheld: Select the first cell by pressing the Touchpad and holding until the cell is filled. Release and move the cursor across cells until the row is selected. Move the cursor to the bottom or top of the screen to select the rest of the region. Click the Touchpad to complete the selection.

   In this example, row 21 is selected as the beginning area and row 147 as the end.

Beginning of selection

End of selection

4. Click **Data > Strike Data.**

Handheld: Press menu, and then click **Data > Strike Data.**

5. Select one of the following:

   • **In Selected Region:** Strike the data from the area you selected.

   • **Outside Selected Region:** Strike all data except the area you selected.

   The selected data is removed from the table.

Restoring Struck Data

You can restore previously struck data in any view.

1. Select the range of data to restore or if restoring all struck data, start at step two.

2. Click **Data > Restore Data**.

3. Select one of the following:

   • **In Selected Region** - Restore data in the selected area.

   • **Outside Selected Region** - Restore data outside the selected area.

   • **All Data** - Restore all data. No data selection necessary.

   The data is restored.

Analyzing Data in Graph View

In the Vernier DataQuest™ application, use Graph View to analyze data. Start by setting up graphs, and then use analysis tools such as integral, statistics, and curve fit to investigate the mathematical nature of the data.

Important: The Graph menu and Analyze menu items are only available when working in Graph View.

Viewing Data for Analysis

When analyzing data, you can view information in the View Details area, the View All Details dialog box, or on the graph.

Examining the View Details Area Data

When you perform analysis options, open the All Details for Graph dialog box to examine the details for the data. You can open and close this dialog box as often as you need.

Important: Some information is only shown in the View Details dialog box.

The detail information is shown in the View Details area even when the dialog box is closed.

You can expand the View Details area to have more space to display information.
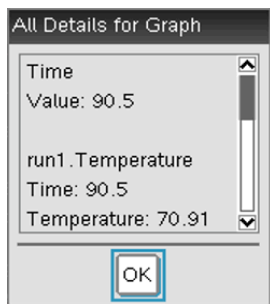
To view details for collected data:

1. Right-click in the View Details area to open the context menu.

    Handheld: Press `ctrl` `menu` .

2. Click **Details > All Details**.

   The All Details for Graph dialog box opens.

3. Use the scroll bar to view the rest of the data.

4. Click **OK**.

Note: Other options under the Details context menu may be available. These options are subsets you can select if you only want to view some of the details.
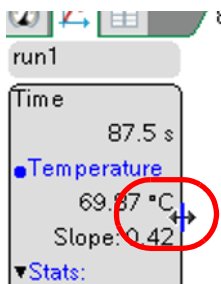
Expanding the View Details Area

Use this procedure to expand the View Details area. Increasing its size reduces the size of the graph. Use this same procedure to reduce the View Details area.

In this example, tangent line and statistics are displayed.
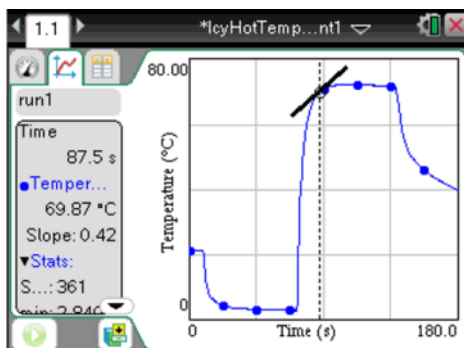
1. Place the cursor at the edge of the View Details area and hover until the cursor changes to ⟷.

2. Click and hold until the cursor changes to 📄.

3. Drag the area to the right to increase the size, and then click to set the size.

   Drag the area to the left to decrease the size, and then click to set the size.

Interpolating the Value Between Two Data Points

Use Interpolate to estimate the value between two data points and to determine the value of a Curve Fit between and beyond these data points. You can find the area under all of the data or a selected region of the data.

The examine line moves from data point to data point. When Interpolate is on, the examine line moves between and beyond data points.

To use Interpolate:

1. Click **Analyze > Interpolate**.

    A check mark appears in the menu next to the option.

2. Click the graph.

    The examine indicator is drawn to the nearest data point.

    The values of the plotted data are shown in the View Details area and the All Details for Graph dialog box.

    You can shift the examine line by moving the cursor with the arrow keys or by clicking on another data point.

    For information on clearing the Integral analysis, see *Removing Analysis Options*.

Finding the Slope

Tangent displays a measure of the rate at which the data is changing at the point you are examining. The value is labeled "Slope."

To find the slope:

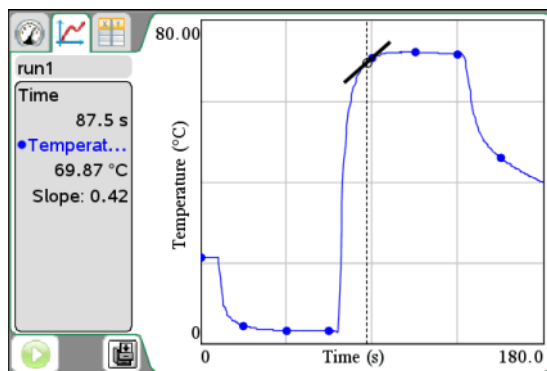1. Click **Analyze > Tangent**.

    A check mark appears in the menu next to the option.

2. Click the graph.

    The examine indicator is drawn to the nearest data point.

    The values of the plotted data are shown in the View details area and the All Details for Graph dialog box.

    You can move the examine line by moving the cursor with the arrow keys or clicking on another data point.

For information on clearing the Integral analysis, see *Removing Analysis Options*.

Finding the Area Under a Data Plot

Use Integral to determine the area under a data plot. You can find the area under all of the data or a selected region of the data.

To find the area under a data plot:

1. Leave the graph unselected to examine all the data, or select a range to examine a specific area.

2. Click **Analyze > Integral**.

3. Select the plotted column name if you have more than a single column.

    The data plot area is displayed in the View Details area.
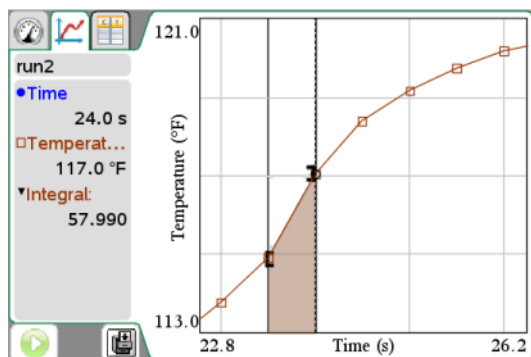
For information on clearing the Integral analysis, see *Removing Analysis Options*.
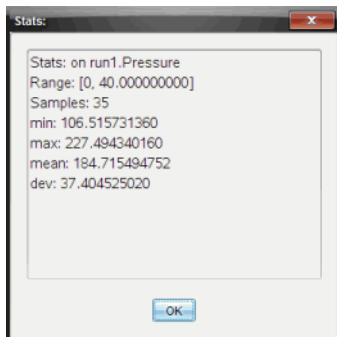
Generating Statistics

Use this option to determine the statistics associated with the plotted data. Minimum, maximum, mean, standard deviation, and number of samples are calculated. You can find the statistics for all the data or a selected region of data. The values are displayed in the View Details area and in the All Details for Graph dialog box.

To generate statistics:

1. Leave the graph unselected to examine all the data, or select a range to examine a specific area.

2. Click **Analyze > Statistics**.

3. Select the plotted column name if you have more than a single column. For example, run1.Pressure.

   The Stats dialog box opens.

4. Review the data.

5. Click **OK**.

   For information on clearing the Statistics analysis, see *Removing Analysis Options*.
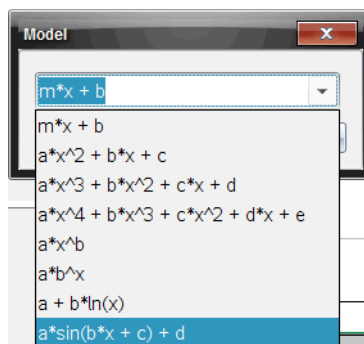
Generating a Curve Fit

Use Curve Fit to find the best curve fit to match the data. Select all of the data or a selected region of data. The curve is drawn on the graph.

To generate curve fit:

1. Leave the graph unselected to examine all the data, or select a range to examine a specific area.

2. Click **Analyze > Curve Fit**.

   The Model dialogue box opens.

3. Refer to the table below to select a curve fit option.

Curve Fit option	Calculated in the form:
Linear	y = m*x + b
Quadratic	y = a*x^2 + b*x + c
Cubic	y = a*x^3 + b*x^2 + c*x + d
Quartic	y = a*x^4 + b*x^3 + c*x^2 + d*x + e
Power (ax^b)	y = a*x^b
Exponential (ab^x)	y = a*b^x
Logarithmic	y = a + b*ln(x)
Sinusoidal	y = a*sin(b*x + c) + d
Logistic (d $\neq$ 0)	y = c/(1 + a*e^(-bx)) + d
Natural Exponential	y = a*e^(-c*x)
Proportional	y = a*x

The Fit Linear dialog box opens.
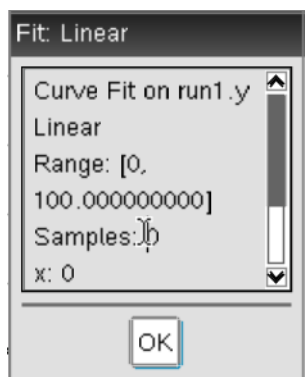
4. Click **OK**.

   The following image is an example of a Quadratic curve fit.
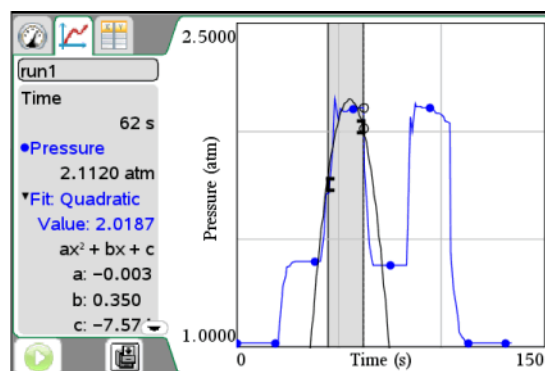
5. Review the data.

   For information on clearing the Curve Fit analysis, see *Removing Analysis Options*.

Plotting a Model

This option provides a manual method for plotting a function to fit data. Use one of the predefined models or enter your own.

You can also set the spin increment to use in the View Details dialog box. Spin increment is the value by which the coefficient changes when you click the spin buttons in the View Details dialog box.

For example, if you set m1=1 as the spin increment, when you click the up spin button the value changes to 1.1, 1.2, 1.3 and so on. If you click the down spin button, the value changes to 0.9, 0.8, 0.7, and so on.

To plot the model:

1. Click **Analyze > Model**.

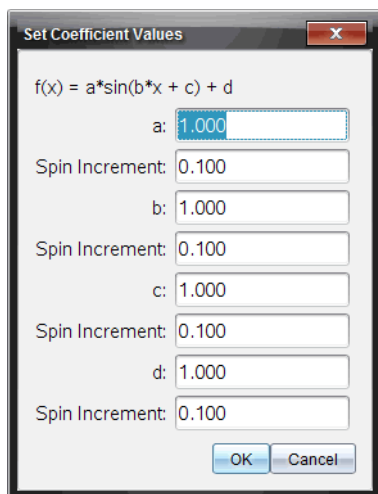   The Model dialog box opens.
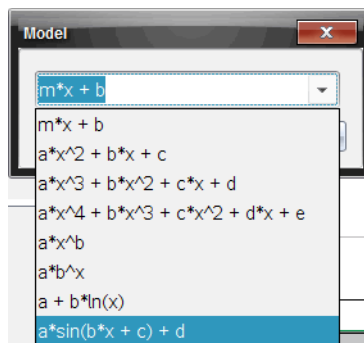
2. Type your own function.

   —or—

   Click to select a value from the drop-down list.

3. Click **OK**.

   The Set Coefficient Values dialog box opens.

4. Type the value for the variables.

5. Type the change in value in the Spin Increment fields.

6. Click **OK**.

   Note: These values are the initial values. You can also adjust these values in the View Details area.

   The model is shown on the graph with adjustment options in the View Details area and in the All Details for Graph dialog box.

   Notice that the minimum and maximum axis are too large for this particular example.
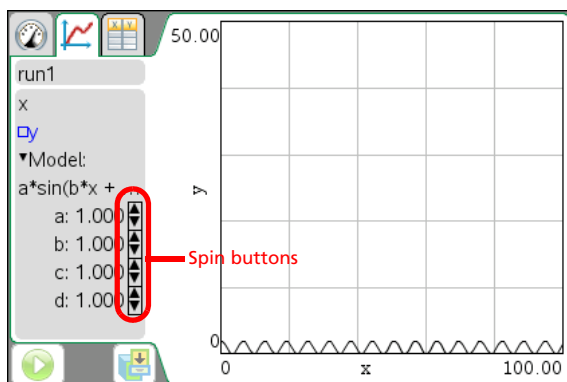
7. (Optional) Adjust the window setting for minimum and maximum axis values. For more information, see *Setting the Axis for One Graph*.

For information on clearing the Model analysis, see *Removing Analysis Options*.
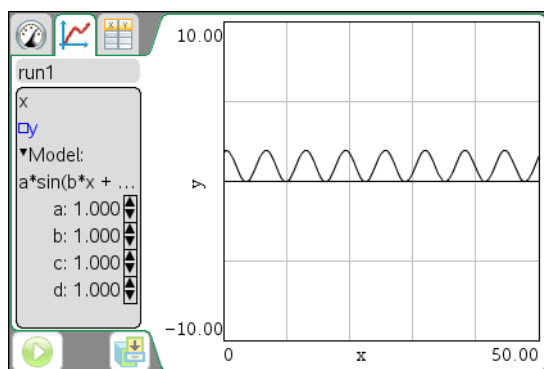
8. Click ▲▼ to make any desired adjustments to the coefficients.

—or—

Click the value in the View Details area.

This graphic is an example of a model with adjusted values.
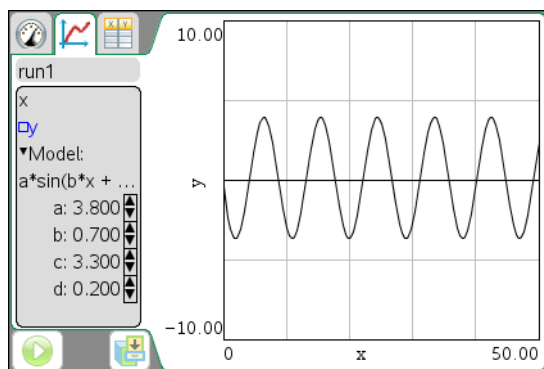
Removing Analysis Options

When clearing previously analyzed data from the graph and the View Details area, you can choose to clear all data, a specific data display, or remove any generated models.

Use the View Detail menu to remove the following items:

- Integral

- Statistics
- Curve Fit
- Model

1. Click **Analyze > Remove**.
2. Select the data display you want to remove.

    The display you selected is removed from the graph and the View Details area.

Using Advanced Data Collection Options

To collect information at a remote location, you can set up and use a remote sensor.

Use one of the two following methods to collect data using a remote sensor:

• The manual trigger on the TI-Nspire™ Lab Cradle or a sensor with a trigger to start the collection.

• A time delay to start the collection.

Setting Up Offline Sensors

Use the Add Offline Sensor option to set collection parameters and change units for a sensor that is not currently attached to a computer or handheld.

You cannot use a sensor offline, but you can prepare it for use before it is attached. This option makes it faster to share the sensor during a lesson or lab when there are not enough sensors for everyone.

1. Click **Experiment > Advanced Set Up > Configure Sensor > Add Offline Sensor**.

   The Select Sensor dialog box opens.
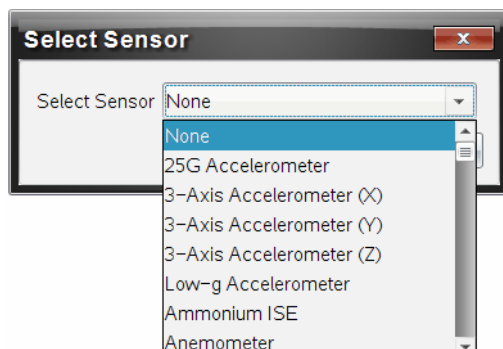
2. Select a sensor from the drop-down list.

   The sensor is displayed in the view you have open.

3. Click **View > Meter**.

   The Meter view shows the list of available sensors.

Setting Up a Remote Collection Unit

Only the TI-Nspire™ Lab Cradle, TI CBR 2™, and Vernier Go!Motion® support remote data collection.

Sensors use values currently defined in the Vernier DataQuest™ application. You must edit these collection mode values before you set up the remote unit. For more information, see *Modifying Sensor Settings.*
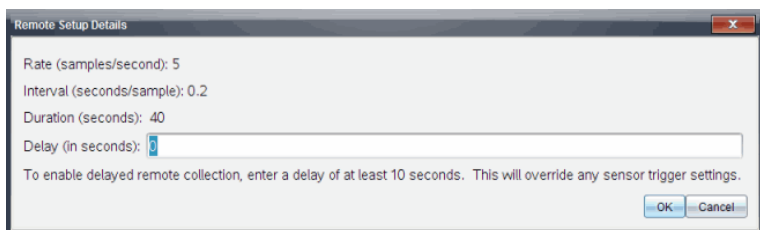
To select the collection unit:

1. Connect a sensor.

2. Set up the experiment by opening a new document and setting the collection mode.

   For more information, see *Setting the Collection Mode*.

3. Click **Experiment > Advanced Set Up > Remote Collection**.

4. Select a data collection device from the content list.

   The Remote Setup Details dialog box opens.

5. (Optional) Type the delay value.

   Setting the delay at zero allows you to use the manual trigger button on the Lab Cradle to start the collection. See *Using the Manual Trigger to Start the Collection*.

6. Click **OK**.

   The Remote Setup dialog box opens.

   A message is displayed telling you how to start the collection and that it is safe to disconnect the data collection device.

7. Disconnect the sensor.

8. View the LED lights to determine if the sensor is ready to collect data.

   • **Red**. Indicates that the system is not ready.

   • **Amber**. Indicates the system is ready, but is not collecting data.

   • **Green**. Indicates the system is collecting data.

9. Press the trigger to collect data.

## *Setting Up the Sensor for Triggering*

To start data collection based on a specific sensor reading, the TI-Nspire™ Lab Cradle and sensor must be connected.

You must set the sensor and the threshold type for the system to use when collecting data. When the trigger is reached, the sensor starts collecting data.

To set up the trigger:

1. Connect the sensor.

2. Click **Experiment > Advanced Set up > Triggering > Set Up**.

    The Configure Trigger dialog box opens.
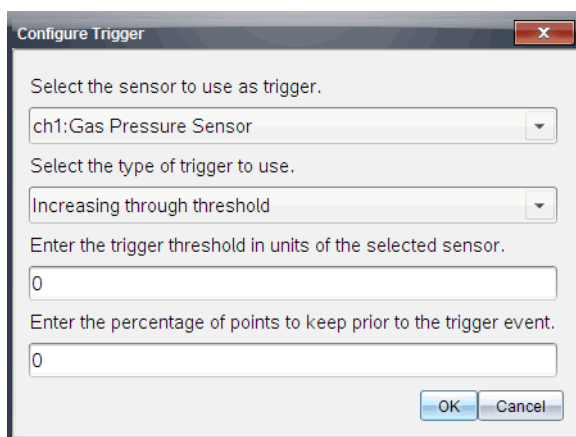
3. Select the sensor from the **Select the sensor to use as trigger** drop-down list.

    Note: The menu displays the sensors connected to the TI-Nspire™ Lab Cradle.

4. Select one of the following from the **Select the type of trigger to use** drop-down list.

    • **Increasing through threshold.** Use to trigger on increasing values.

    • **Decreasing through threshold.** Use to trigger on decreasing values.

5. Type the appropriate value in the **Enter the trigger threshold in units of the selected sensor** field.

When entering the trigger value, enter a value within the range of the sensor.

If you change the unit type after setting the threshold, the value automatically updates.

For example, if you use the Vernier Gas Pressure sensor with the units set as atm and you later change the units to kPa, the settings are updated.

6. Type the number of data points to keep before the trigger value occurs.

7. Click **OK**.

The trigger is now set and enabled if values were entered.

8. (Optional) Select **Experiment > Advanced Set up > Triggering** to verify the active indicator is set to Enabled.
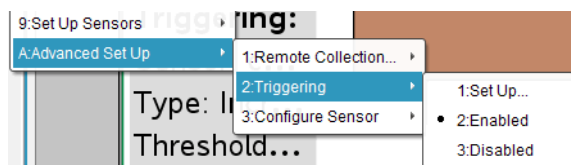
Important: When the trigger is enabled, it stays active until it is disabled or you start a new experiment.

Enabling a Disabled Trigger

If you set the trigger values in the current experiment, and then disable them, you can enable the triggers again.

To enable a trigger:

▶ Click **Experiment > Advanced Set Up > Triggering > Enable**.

The trigger is now active.

Disabling an Enabled Trigger

To disable the active trigger.

▶ Click **Experiment > Advanced Set Up > Triggering > Disable**.

The trigger is no longer active.

Using the Manual Trigger to Start the Collection

1. Save and close any open documents.

    When performing experiments, TI recommends that you have only one document open. The system cannot determine which of the documents to use with the sensor if multiple documents are open.

2. Create a new document.

    Creating a new document ensures that the Vernier DataQuest™ application is set to its default values.

3. Attach a sensor to the TI-Nspire™ Lab Cradle.

4. Attach the TI-Nspire™ Lab Cradle to the computer or handheld.

5. Set up an experiment.

6. Click **Experiment > Advanced Set Up > Remote Collection > TI-Nspire Lab Cradle**.

    The Remote Setup Details dialog box opens.
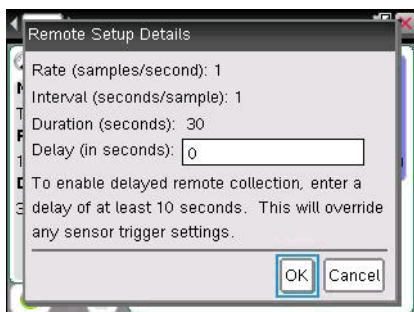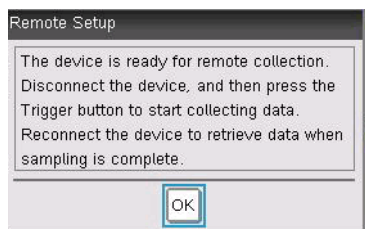

7. Review the settings. Verify the delay is at zero (no delay).

    Setting the delay at zero allows you to use the manual trigger button on the Lab Cradle to start data collection.

8. Click **OK**.

    The Remote Setup dialog box opens indicating the sensor is ready for remote collection.

```
Remote Setup

The device is ready for remote collection.
Disconnect the device, and then press the
Trigger button to start collecting data.
Reconnect the device to retrieve data when
sampling is complete.

                    OK
```

9. Disconnect the Lab Cradle.

10. Click **OK**.

When you disconnect the TI-Nspire™ Lab Cradle from the handheld
or computer, verify the status. When the LED transfer is blinking
amber, the Lab Cradle is ready to collect data.

11. Press the trigger button on the Lab Cradle.

The data collection starts immediately.

After you have collected data, see *Retrieving Remote Data.*

Using a Delay to Start the Collection

1. Save and close any open documents.

When performing experiments, TI recommends that you have only
one document open. The system cannot determine which of the
documents to use with the sensor if multiple documents are open.

2. Create a new document.

Creating a new document ensures that the Vernier DataQuest™
application is set to its default values.

3. Attach a sensor to the TI-Nspire™ Lab Cradle.

4. Attach the TI-Nspire™ Lab Cradle to the computer or handheld.

5. Click **Experiment > Advanced Setup > Remote Collection >
TI-Nspire Lab Cradle**.

The Remote Setup Details dialog box opens.

6. Review the settings.

7. Type the amount of time in seconds to delay the start of the
collection.

Important: When you use a delay, the manual trigger button on the
TI-Nspire™ Lab Cradle has no impact on the start of the collection.

8. Click **OK**.

The Delayed Remote Setup dialog box opens indicating when sampling will begin.

9. Click **OK**.

    The Remote Setup dialog box opens indicating the countdown has started.

10. Click **OK**.

11. Disconnect the Lab Cradle.

12. View the LED lights to determine if the sensor is ready to collect data.

    *   **Red**. Indicates that the system is not ready.
    *   **Amber**. Indicates the system is ready, but is not collecting data.
    *   **Green**. Indicates the system is collecting data.

13. Collect the data.

    After you have collected the data, see *Retrieving Remote Data*.

Retrieving Remote Data

After data is collected, you must transfer the data to the computer or handheld. After the data transfers, you can analyze the data. For more information, see *Analyzing Data in Graph View*.

To retrieve data:

1. Open the Vernier DataQuest™ application.

2. Attach the TI-Nspire™ Lab Cradle to the handheld or computer.

    The Remote Data Detected dialog box opens*.*
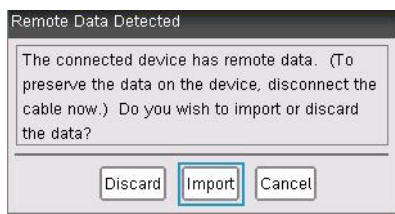
3. Click **Import**.

    The data transfers to the Vernier DataQuest™ application.

Working with Advanced Analysis Features

Use the Vernier DataQuest™ application advanced data analysis features to:

- Replay the data collection.
- Adjust derivative settings.
- Draw a predictive plot.
- Use Motion Match.
- Examine graphs using the Page Layout view.

Replaying the Data Collection

Use the Replay option to playback the data collection. This option lets you:

- Select the data set you want to replay.
- Pause the playback.
- Advance the playback by one point at a time.
- Adjust the playback rate.
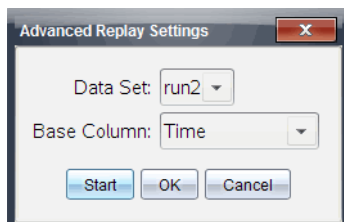- Repeat the playback.

Selecting the Data Set to Replay

You can replay one data set at a time. By default, the latest data set plays using the first column as the base column (example: time reference).

If you have multiple data sets, and want a different data set or base column than the default, you can select the data set to replay and the base column.

To select the data set to replay:

1. Click **Experiment > Replay > Advanced Settings**.

   The Advanced Replay Settings dialog box opens.

2. Select the data set to replay from the Data Set drop-down list.

   Note: Changing the run in the Data Set selection tool does not affect the playback choice. You must specify which data set in **Experiment > Replay > Advanced Settings**.

3. (Optional) Select a new value from the Base Column drop-down list.

   The selected column acts as the "Time" column for the replay.

   Note: The base column should be a strictly increasing list of numbers.

4. Click **Start** to start the playback and save the settings.

   Note: Data Set and Base Column options are based on the number of stored runs and the sensor type used.

Starting the Playback

To start the playback:

▶ Select **Experiment > Replay > Start Playback**.

Playback of the data set run starts, and the Data Collection Control buttons change to Stop Playback, Pause, and Advance by One Point. The Advanced by One Point button (and menu item) is inactive until you pause the replay.

Pausing the Playback

To pause the playback:

▶ Select **Experiment > Replay > Pause** or click.

The following events occur:

- The playback pauses.
- The menu option changes to "Resume."

- The button changes to.
- The menu option Advance One becomes active.

Restarting the Playback

To restart the playback after pausing:

▶ Select **Experiment > Replay > Resume.**

The playback resumes.

Advancing the Playback by One Point

Use this option to advance the playback point by point. The playback must be selected and paused for this option to be available.

To advance the paused playback:
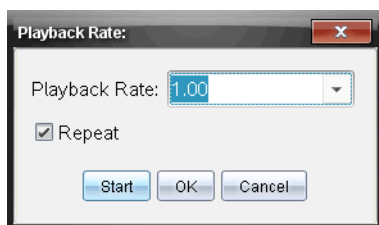
▶ Select **Experiment > Replay > Advance One.**

The playback advances by one point until the last point is reached.

Adjusting the Playback Rate

To adjust the playback rate:

1. Select **Experiment > Replay > Playback Rate**.

The Playback Rate dialog box opens.

2. In the Playback Rate field, click ▼ to open the drop-down list.

3. Select the rate at which the playback will play.

Normal speed is 1.00. A higher value is faster, and a lower value is slower.

4. Select one of the following options:

   • Click **Start** to start the playback and save the settings.

   • Click **OK** to save the settings for use on the next playback.

Repeating the Playback

1. Select **Experiment > Replay > Start Playback**.

2. Click **Start** to start the playback and save the settings.

Adjusting Derivative Settings

Use this option to select the number of points to use in derivative calculations. This value affects the tangent tool, velocity, and acceleration values.

Find pH derivative settings using a calculated column.

The Vernier DataQuest™ application can determine a numeric derivative from a list of data with respect to another list of data. The data can be collected using sensors, input manually, or linked with other applications. The numerical derivative is found using a calculated column.

To determine the numerical 1st derivative of List B with respect to List A, enter the following expression in the Column Options dialog:

```
derivative(B,A,1,0) or derivative(B,A,1,1)
```

To determine the numerical 2nd derivative of List B with respect to List A, enter the following express:

```
derivative(B,A,2,0) or derivative (B,A,2,1)
```

The last parameter is either 0 or 1 depending on the method you are using. When it is 0, a weighted average is used. When it is 1, a time shifted derivative method is used.

Note: The first derivative calculation (weighted average) is what the Tangent tool uses to display the slope at a data point when examining data. (Analyze > Tangent).

Note: The derivative calculation is completely row based. It is recommended that your List A data be sorted in ascending order.

1. Click **Options > Derivative Settings**.

    The Settings dialog box opens.
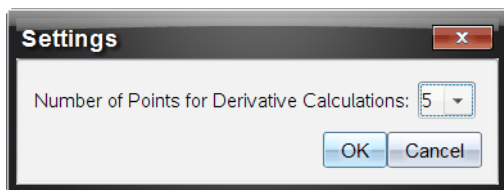
2. Select the number of points from the drop-down list.

3. Click **OK**.

Drawing and Clearing a Predictive Plot

You can add points to the graph to draw a prediction and you can remove the prediction.

Drawing a Predictive Outcome

Use this option to add points to the graph to predict the outcome of an experiment.

To draw the prediction:

1. Click **Analyze > Draw Prediction > Draw**.
2. Move the cursor over the graph, and then click each area in which you want to place a point.
3. Press **Esc** to release the drawing tool.

   Handheld: Press `esc`.

   The following image is an example of a drawn prediction.
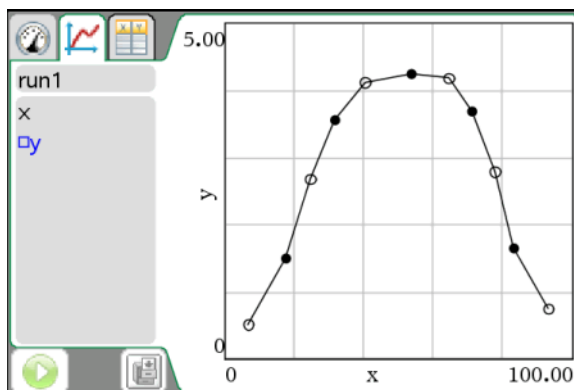
Clearing the Prediction

To clear the drawn prediction:

▶ Click **Analyze > Draw Prediction > Clear**.

Using Motion Match

Use this option to create a randomly generated plot when creating position versus time or velocity versus time graphs.

This feature is only available when using a motion detector like the CBR 2™ sensor or the Go!Motion® sensor.

Generating a Motion Match Plot

To generate a plot:

1. Attach the motion detector.
2. Click **View > Graph.**
3. Click **Analyze > Motion Match**.
4. Select one of the following options:

   • **New Position Match.** Generates a random position plot.

- • **New Velocity Match.** Generates a random velocity plot.

  The following image is an example of the Motion Match (New Velocity Match) generated plot:
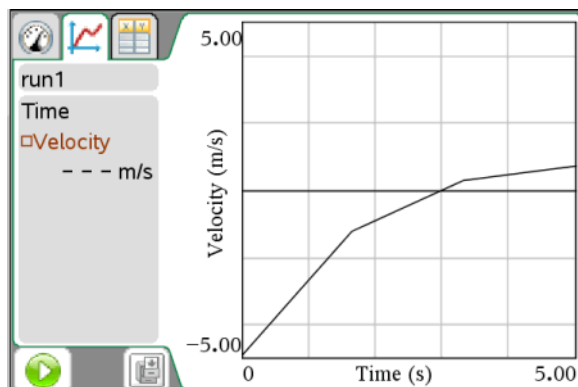
Note: Continue selecting a new position or a new velocity match to generate a new random plot without removing the existing plot.

Removing a Motion Match Plot

To remove the generated plot:

▶ Click **Analyze > Motion Match > Remove Match**.

Printing Data

You can only print from the computer. You can print any single displayed active view, or with the Print All option:

- One data view.
- All of the data views.
- A combination of the data views.

The Print All option has no affect on applications outside of the Vernier DataQuest™ application.

Selecting Print All Options

To select the Print All option:

1. Click **Options > Print All Settings**.

   The Print All Settings dialog box opens.
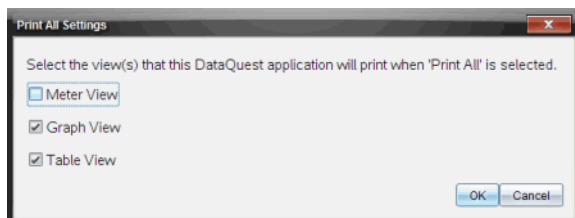
2. Select the views you want to print.

   - **Print Current View.** The current view is sent to the printer.
   - **Print All Views.** All three views (Meter, Graph, and Table) are sent to the printer.
   - **More.** Only the views you select are sent to the printer.

3. Click **OK**.

   The Print All Settings are now complete and can be used when printing.

Printing Data Views

To print a data view:

1. Click **File > Print**.

   The Print dialog box opens.
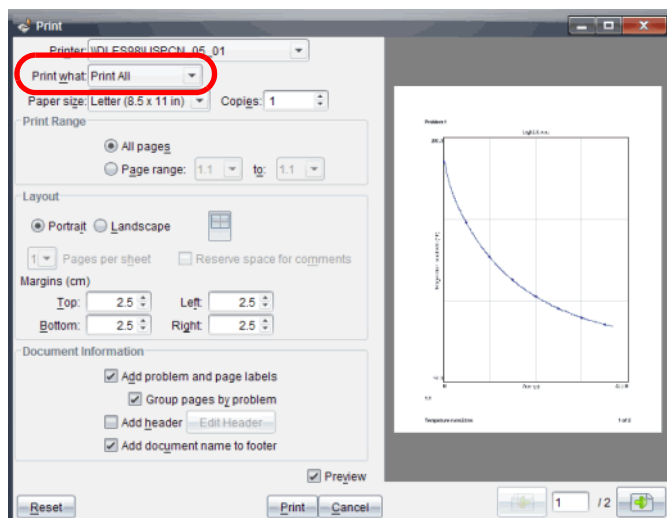
2. Select **Print All** from the Print what drop-down list.

3. Select additional options, if needed.

4. Click **Print** to send the document to the printer.

Using the Sensors and Data with Other Applications

The Sensor Console is a specialized view of the Vernier DataQuest™ application designed for using sensors with other TI-Nspire™ applications such as:

• Graphs

• Geometry

• Data & Statistics

• Lists & Spreadsheet

When you perform experiments, TI recommends that you have only one document open. The system cannot determine which of the documents to use with the sensor if multiple documents are open.

Collecting Data in Other Applications

To use Sensor Console with a sensor:

1. Open the application you want to use to capture the data.

2. Click **Insert > Sensor Console**.

   Handheld: Press [doc▾], and then **Insert > Sensor Console**.

3. Attach the sensor if it is not already attached.

4. Wait a moment for the Sensor Console bar to become active.
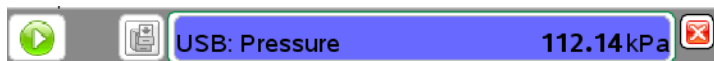
5. Click **Collect Data > Start Collections**.

6. Wait for the data set run to end or stop the collection.

Stopping Data Collection

To stop collecting data:

1. Click **Collect Data > Stop Collection.**

   Handheld: Press [menu] and select **Collect Data > Stop Collection**

2. Click **Collect Data > Close Console**.

   The data set is available for use in the current application.

Opening the Sensor Console Application Menus

The Sensor Console menus are a subset of the Vernier DataQuest™ menus.

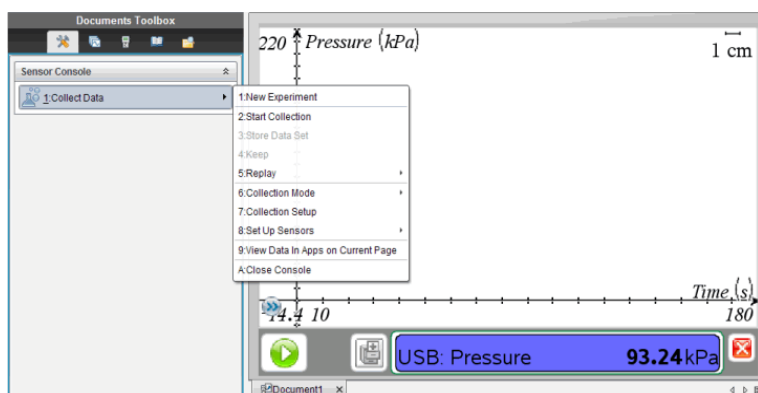### Accessing the Application Menu on the Computer

To access the Sensor Console menu:
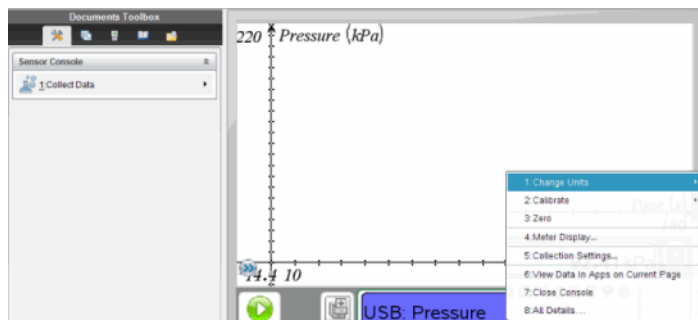
1. Click anywhere on the Sensor Console.

   Handheld: Press `menu`.

2. Click **Collect Data**.

   The Sensor Console menu opens.

Note: To access options specific to the Sensor Console, right-click the Sensor Console bar. On a handheld, press `ctrl` `menu`.
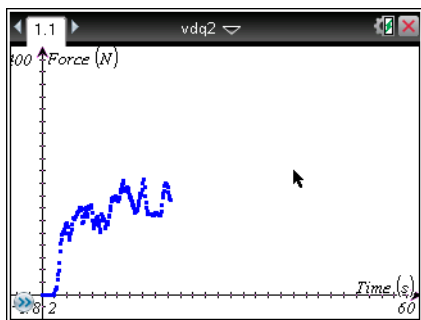
Viewing Existing Data

You can view data collected and stored from a different TI-Nspire™ application in the current application.

1. Open the document with the captured data set.

    For example, open the Graphs application.

2. Click **Insert > [*other application*]**.

    For example, insert Lists and Spreadsheet.

    The selected application opens.

3. Click **Insert > Sensor Console**.

    The Sensor Console bar opens at the bottom of the application.

    In this example a sensor is attached, but it does not have any affect on this procedure.

4. Click **Collect Data > View Data in Apps on Current Page.**

   Handheld:

   a) Click in the Sensor Console area.

   b) Press menu, and then **Collect Data > View Data in Apps on Current Page**.

   Wait until the data is populated. After a few moments, the data is displayed.
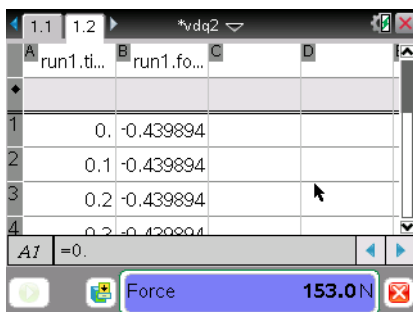
5. Click **Collect Data > Close Console**.

   You can now work with the data in the current application.

Analyzing Data in the Data & Statistics Application

When you open existing data in the Data & Statistics application, the data first displays as a Dot Point graph. You must take additional steps to organize the points.

The following image is an example of existing data opened as a Dot Point graph in the Data and Statistics application.
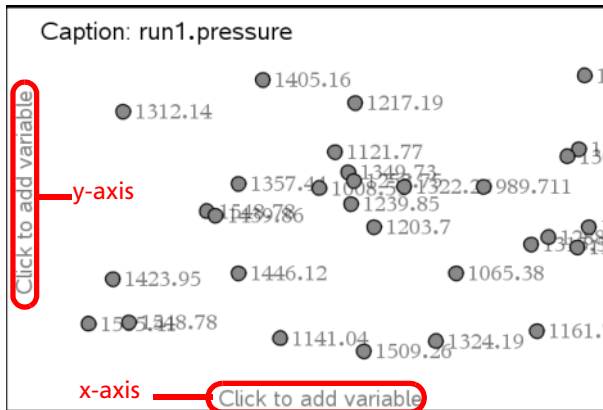
1. Open a document containing a data set from the Data & Statistics application.

2. Click the text "Click to add variable" on the y-axis.

3. Select the variable.

4. Click the text "Click to add variable" on the x-axis.

5. Select the variable.

   The data is replotted.
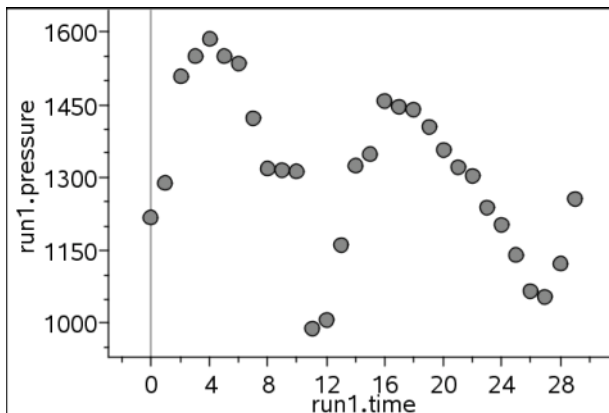
Compatible Sensors

The following sensors can be used with the Vernier DataQuest™ application.

- 25-g Accelerometer
- 30-Volt Voltage Probe
- 3-Axis Accelerometer
- Low-g Accelerometer
- CBR 2™ - Connects directly to handheld USB port
- Go!Motion® - Connects directly to computer USB port
- Extra Long Temperature Probe
- Stainless Steel Temperature Probe
- Surface Temperature Sensor
- Ammonium Ion-Selective Electrode
- Anemometer
- Barometer
- Blood Pressure Sensor
- C02 Gas Sensor
- Calcium Ion-Selective Electrode
- Charge Sensor
- Chloride Ion-Selective Electrode
- Colorimeter
- Conductivity Probe
- High Current Sensor
- Current Probe
- Differential Voltage Probe
- Digital Radiation Monitor
- Dissolved Oxygen Sensor
- Dual-Range Force Sensor
- EasyTemp® - Connects directly to handheld USB port
- EKG Sensor
- Electrode Amplifier

- Flow Rate Sensor
- Force Plate
- Gas Pressure Sensor
- Go!Temp® - Connects directly to computer USB port
- Hand Dynamometer
- Hand-Grip Heart Rate Monitor
- Instrumentation Amplifier
- Light Sensor
- Magnetic Field Sensor
- Melt Station
- Microphone
- Nitrate Ion-Selective Electrode
- O2 Gas Sensor
- ORP Sensor
- pH Sensor
- Relative Humidity Sensor
- Respiration Monitor Belt (Requires Gas Pressure Sensor)
- Rotary Motion Sensor
- Salinity Sensor
- Soil Moisture Sensor
- Sound Level Meter
- Spirometer
- Thermocouple
- TI-Light - Sold only with the CBL 2™
- TI-Temp - Sold only with the CBL 2™
- TI-Voltage - Sold only with the CBL 2™
- Tris-Compatible Flat pH Sensor
- Turbidity Sensor
- UVA Sensor
- UVB Sensor
- Vernier Constant Current System

- Vernier Drop Counter
- Vernier Infrared Thermometer
- Vernier Motion Detector
- Vernier Photogate
- Voltage Probe
- Wide-Range Temperature Probe

TI-Nspire™ Lab Cradle

The TI-Nspire™ Lab Cradle is a device used with TI-Nspire™ handhelds, TI-Nspire™ software for computers, or as a stand-alone tool to collect data.

The Lab Cradle supports all TI sensors. It also supports more than 50 analog and digital Vernier DataQuest™ sensors, including motion detectors and photogate sensors. To see the full list of supported sensors, go to education.ti.com/education/nspire/sensors.

Important: The TI-Nspire™ CM-C Handheld is not compatible with the Lab Cradle and only supports the use of a single sensor at a time.

The Lab Cradle comes pre-loaded with its own operating system (OS). The TI-Nspire™ 3.0 operating system for handheld and computer software has been preset to recognize the Lab Cradle so you can start using it immediately.

Note: Any TI-Nspire™ OS earlier than 3.0 will not recognize the Lab Cradle. For more information about upgrading a handheld OS, see Getting Started with the TI-Nspire™ CX Handheld or Getting Started with the TI-Nspire™ Handheld.

Exploring the Lab Cradle

The following graphic shows the front and back of the Lab Cradle.
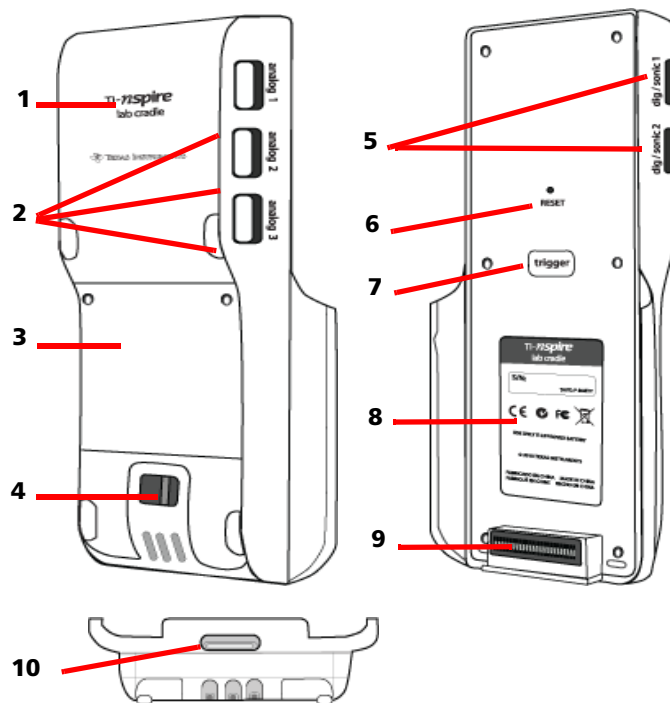
1   TI-Nspire™ logo. The TI-Nspire™ name.

2   Analog ports. The three BT analog ports used to connect analog sensors. The other side of the cradle has two digital ports for digital sensors.

3   Battery panel and compartment area. The compartment is where the rechargeable battery is located. Two cross-slotted screws are used to secure the panel to the Lab Cradle.

4   Lanyard attachment point. A metal bar for attaching a lanyard.

5   Digital ports. The two digital ports used to connect digital sensors.

6   **Reset button.** Press this button to reboot the operating system if the Lab Cradle does not respond to commands. Data may be lost when the Lab Cradle reboots.

7   **Trigger.** Pressing this button is one method for capturing data from attached sensors. Use this trigger when using the Lab Cradle as a stand-alone data collection tool.

8   **Label.** Displays the serial number and other hardware information.

9   **Handheld transfer connector.** Used to connect the handheld and Lab Cradle when collecting or transferring data.

10   **Locking latch.** Used to lock the Lab Cradle and handheld together.

Setting up the Lab Cradle for Data Collection

Before you can use the Lab Cradle to collect data, you must connect it to a handheld or computer to define the collection parameters.

Attaching the Lab Cradle

To attach a handheld to a Lab Cradle, slide the handheld into the connector at the bottom of the Lab Cradle. To lock the handheld to the Lab Cradle, push the lock up with the handheld facing up. Push the lock down to release the handheld.

You can also connect to a handheld by plugging the handheld's cable into the Lab Cradle's mini-USB port. This connection lets you transfer data from the Lab Cradle to the handheld when you have collected data in the stand-alone mode.

To connect the Lab Cradle to a computer, plug the cable's mini-USB connector into the Lab Cradle's mini-USB port. Then plug the cable's standard USB connector into the computer's standard USB port.

Defining Collection Parameters

You must have the TI-Nspire™ software loaded on the computer or handheld. Use the built-in Vernier DataQuest™ app to:

- Modify sensor settings.
- Set up data collection modes.
- Define triggering.

For more information, see the *TI-Nspire™ Data Collection and Analysis Guidebook*.

Using the Lab Cradle

The Lab Cradle can be used in the classroom or remotely. Collect the data with the Lab Cradle, and then retrieve the data later. Store the data on the Lab Cradle until you return to the classroom, and then transfer it to a handheld or computer for analysis.

Using the Lab Cradle with a Handheld

You can connect the Lab Cradle to your handheld to collect or retrieve data.

Using the Lab Cradle with a Computer

The Lab Cradle works with all Windows® and Mac® operating systems currently supported by the TI-Nspire™ Teacher and Student computer software.

Using the Lab Cradle as a Stand-Alone Data Collection Tool

You can use the Lab Cradle in stand-alone mode to collect data either manually or automatically. Press the trigger button to manually start and stop data collection when in stand-alone mode.

Note: For long-term data collections TI recommends you use an AC adapter for a handheld or a remote collection device such as the Lab Cradle.

Before collecting data, set up the data collection parameters using the Vernier DataQuest™ app or use the sensor's default settings. If you do not change the parameters and use a single sensor, the Lab Cradle collects data using the sensor's default settings. If you use multiple sensors, the Lab Cradle collects samples beginning with the sensor that has the shortest collection time requirement.

You do not have to reconnect the Lab Cradle to the same computer or handheld to download the data. You can use any computer or handheld running a compatible OS and TI-Nspire™ software to download the data.

Learning About the Lab Cradle

Portability

The Lab Cradle fits into the palm of most high school students' hands when connected to the TI-Nspire™ handheld.

The Lab Cradle features an attachment point for a lanyard. Students can attach a lanyard to wear the Lab Cradle around their neck. This feature lets students keep their hands free to steady themselves in rough terrain during remote data collection activities.

When collecting data for an experiment that subjects the Lab Cradle to intense movement, TI recommends that students wear a Vernier Data Vest or zip-up jacket with the sensor secured both around the student's neck as well as to the student's chest. For example, if a student is measuring speed or motion on a roller coaster, the Lab Cradle may bounce around due to the movement of the roller coaster. Wearing a zip-up jacket or Vernier Data Vest limits the movement of the Lab Cradle.

Durability

The Lab Cradle is durable enough to withstand extensive use in the classroom and in the field. It is designed to survive being dropped from a height of 36 inches, the height of a standard lab table.

Storing/Operating Temperature Ranges

The Lab Cradle storage temperature range is between -40°C (-40° F) to 70°C (158° F).

The Lab Cradle, when used as a stand-alone data collection tool, operates in temperatures from 10° C (50° F) to 45° C (113° F).

Triggering Methods

The Lab Cradle has two options for triggering data collection—automatic or manual.

To use automatic triggering, define the criteria in the Vernier DataQuest™ application to start data collection. The Lab Cradle can trigger on either an increasing or decreasing value.

Manual triggering is defined in the Vernier DataQuest™ app. By setting the trigger delay value to zero, you can start data collection by pressing the trigger button on the Lab Cradle when using it as a stand-alone data collection tool.

You can define a delay in triggering the data collection when using the Lab Cradle with a computer or handheld. The Vernier DataQuest™ app starts a countdown based on the time delay you define. When the countdown reaches zero, the Lab Cradle and its connected sensors begin collecting data.

Multi-Channel Data Collection

You can connect up to five sensors to the Lab Cradle. It provides three analog BT connectors and two digital BT connectors.

The Lab Cradle supports multi-channel data collection by allowing you to collect data through all five sensors at the same time. When using all five sensors at the same time, the time stamp is the same for all data collection streams.

Sampling Rate

The maximum sampling rate for a Lab Cradle using a single BT sensor is 100,000 samples per second. This sampling rate allows you to collect data for high-sample sensors, such as microphones, blood pressure monitors, and hand-grip heart rate monitors.

If using more than one sensor at the same time, the 100,000 samples per second rate is divided by the number of connected sensors. For example, when using:

•   One sensor, data is collected at 100,000.

•   Two sensors, data is collected at 50 kHz per sensor.

•   Three sensors, data is collected at 33.3 kHz per sensor.

Some sensor's maximum sample rates are less than the maximum sample rate of the Lab Cradle. For example, with five sensors connected to the Lab Cradle, data may be collected at 20 kHz per sensor; however, temperature sensors may only be capable of collecting data at 1 kHz so it will only collect data at that rate.

Viewing Data Collection Status

The Lab Cradle has an LED light located on the top to indicate data collection status. This light will be red, green, or amber and use a variety of blink patterns.
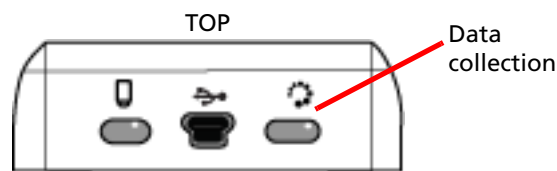
Red

•   Red indicates that you need to wait until the system is ready.

•   *Slow blink:* The Lab Cradle is updating experiment storage space. This is automatic behavior and does not impact active collections.

•   *Fast blink:* Indicates one or more attached sensors are not warmed up. (You may still collect data during the warm-up period but you risk the data being less precise.)

Amber

•   Amber indicates the system is ready but the collection has not yet started.

- *One blink per second:* The sensor is configured and set up for sampling.
- *Slow blink:* The Lab Cradle is connected to a computer or handheld running TI-Nspire™ software but not set up for sampling.
- *Fast blink:* The Lab Cradle is ready for data collection when you press the trigger.

Green

- Green indicates the system is actively collecting data.
- *Slow blink:* Actively collecting data.

    Note: There may be a slight variation in the duration of the blink depending on the mode/rate of collection.

- *Fast blink:* Pre-storing data prior to a trigger.

Alternating Amber and Green

- The blinking pattern indicates the system is in trigger mode but has not yet reached the trigger event.

Managing Power

When managing the power for the Lab Cradle, you must consider the power source being used. The Lab Cradle can be powered by its rechargeable battery or a connected power cord.

Batteries

The Lab Cradle runs on a rechargeable battery that supports one full day of high-use, high-consumption sensor data collection before recharging. An example of high-use data collection is an experiment requiring 150 total minutes of continuous data collection with CO2 (47 mA) and O2 sensors at one sample every 15 seconds.

The battery recharges in less than 12 hours.

Viewing the Battery Status

There are two ways to view battery status: when attached to a handheld, or by looking at the LED light. When the Lab Cradle is attached to a TI-Nspire™ handheld, you can view the battery status for both. The first value is the handheld and the second value is the Lab Cradle.
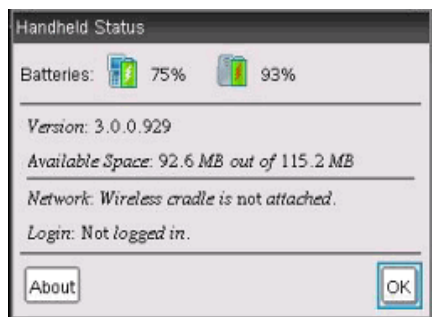
▶ Press ⌂on 5 (Settings) 4 (Status).

When you attach the Lab Cradle directly to a computer, you do not see a power indicator. Use the LED light on the top of the Lab Cradle to determine battery status.
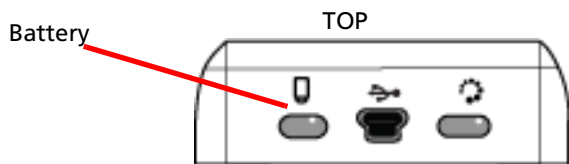
When the Lab Cradle is connected to a USB power source (either wall charger or computer):

- Red - Slow blinking LED indicates the charge is low but charging.
- Amber - Slow blinking LED indicates the Lab Cradle is charging
- Green - Slow blinking LED indicates the Lab Cradle is fully charged.

When in the TI-Nspire™ Cradle Charging Bay:

- Red - Solid LED indicates the charge is low but is still charging.
- Amber - Solid LED indicates the Lab Cradle is charging.
- Green - Solid LED indicates the Lab Cradle is fully charged.

When running and not charging:

- Red - Blinking LED indicates the battery is below six percent.
- Amber - Blinking LED indicates the battery is below 30 percent.
- Green - Blinking LED indicates the battery is between 30 percent and 96 percent. Two green blinks per second indicates the battery is over 96 percent.

Managing Battery Power

When the battery power reaches 30 percent, a yellow LED indicates the Lab Cradle needs to be charged. The LED turns red when the battery power reaches five percent.

When managing battery power for the Lab Cradle, remember that some sensors need to warm up before use. You can collect data while the sensor is warming up; however, the data may not be as precise.

When you start a long-term or remote data collection, the system checks current power sources to determine if the sources are adequate to support the sensors from the beginning to the end of the experiment.

If the power is unable to support the experiment configuration, a warning indicates that the power available is insufficient for the experiment. You either need to charge the battery or plug the Lab Cradle into an external power source.

When using the wall charger, TI-Nspire™ Cradle Charging Bay, or USB cable plugged into a powered computer, the Lab Cradle can be fully charged from a dead state in less than 12 hours when not being used.

The battery is capable of supporting one full day of high-use, high-consumption sensor data collection or two full days of moderate to low consumption sensor data collection.

Charging the Lab Cradle

You can charge the Lab Cradle in a number of ways.

- Wall charger
- USB Cable connected to a computer
- TI-Nspire™ Navigator™ Cradle Charging Bay

Charging with an AC Wall Charger

Connect the plug to a standard AC wall outlet and the mini-B USB connector to the TI-Nspire™ Lab Cradle.
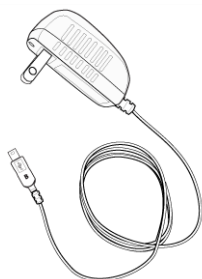
Charging with a USB Cable

The Lab Cradle can be charged using a standard USB cable. Attach the mini-B connector to the Lab Cradle and the USB type A connector into the computer.

The Lab Cradle will fully charge in less than 12 hours.
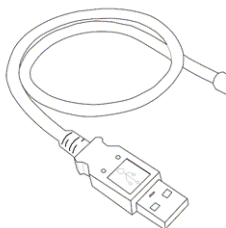
Charging with a Charging Bay

Use the TI-Nspire™ Navigator™ Cradle Charging Bay to charge five Lab Cradles at the same time. A full charging bay with dead Lab Cradle units fully charges those units in less than 12 hours.

You can leave the Lab Cradle in the charging bay even if fully charged. You can recharge at any time regardless of the current charge level.

The charging bay is only included in certain bundled packages. The charging bay works with Lab Cradles or with Lab Cradles connected to handhelds.

Upgrading the Operating System

Before You Begin

Before beginning an OS download, ensure that batteries are at least 25 percent charged. If attached to a handheld, remove the handheld before updating the Lab Cradle. You cannot update the OS with the handheld attached.

Finding Operating System Upgrades

For up-to-date information about available OS upgrades, check the Texas Instruments website at education.ti.com.

You can download an OS upgrade from the Texas Instruments website to a computer, and use a USB cable to install the OS on your TI-Nspire™ Lab Cradle. You will need an Internet connection and the appropriate USB cable to download the updates.

Checking for Lab Cradle OS Updates

When using TI-Nspire™ software, you can quickly determine if your Lab Cradle OS is up to date when the Lab Cradle is connected to a computer.

1. Open the TI-Nspire™ software and ensure the Lab Cradle is connected to your computer.

2. In the Documents Workspace, click 🖳 to open Content Explorer.

3. In the Connected Handhelds/Lab Cradle pane, select a connected Lab Cradle.
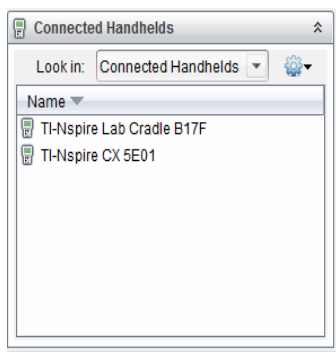
4. Select **Help > Check for Handheld/Lab Cradle OS Update**.

   • If the operating system is current, the Check for Handheld OS dialog box opens indicating that the operating system on the Lab Cradle is up to date.
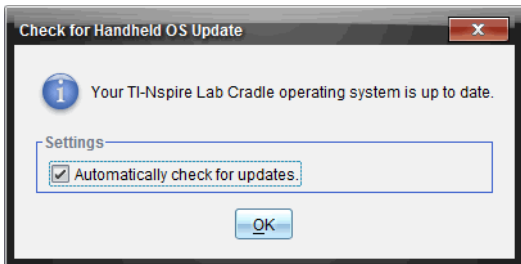
- If the operating system is not current, the dialog box contains a message indicating that a new version of the operating system is available.

5. To turn off automatic notifications, clear the "Automatically check for updates check box. By default, this option is turned on.

6. Click **OK** to close the dialog box.

Upgrading the Operating System

In the TI-Nspire™ software, you can select to upgrade the operating system on a connected Lab Cradle from the following workspaces and menus:

- In all versions of the software, you can select **Help > Check for Handheld/Lab Cradle OS Update**. Select a connected Lab Cradle in the Content Explorer to activate this option. If the OS on the Lab Cradle is not current, the dialog box indicates that there is an updated version of the operating system. Follow the prompts to update the operating system.

- In all versions of the TI-Nspire™ software, you can use options available in the Documents Workspace:

  – Open Content Explorer, select the Lab Cradle name, and then click

     and select **Install Handheld/Lab Cradle OS**.

    —or—

  – Select **Tools > Install Handheld/Lab Cradle OS**.

- Those using teacher versions of the TI-Nspire™ software can use options available in the Content Workspace:

  – In the Resources pane, right-click the name of a connected Lab Cradle, and then select **Install Handheld/Lab Cradle OS**.

    —or—

– Select the Lab Cradle name in the Preview pane, click in the Preview pane, and then select **Install Handheld/Lab Cradle OS**.

—or—

– Right-click the Lab Cradle name and select **Install Handheld/Lab Cradle OS**.

Completing the OS Upgrade

When you select to update the OS on a Lab Cradle, the Select Handheld/Lab Cradle OS File dialog box opens.
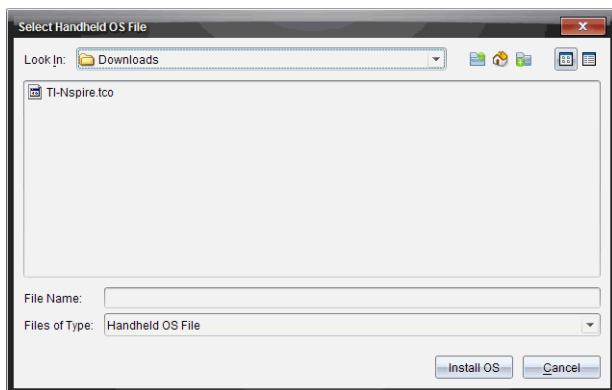
The file displayed for selection defaults to the file type required for the selected Lab Cradle.

1. Select the OS file TI-Nspire.tlo.

2. Click **Install OS** to download the OS and update the Lab Cradle. The confirmation message "*You are about to upgrade your handheld/Lab Cradle operating system. Any unsaved data will be lost. Do you want to continue*?" is displayed.

3. Click **Yes** to continue.

    The Installing OS dialog box opens indicating the progress of the download. Do not disconnect the Lab Cradle.

4. When the download is complete, the Information dialog box opens indicating that the OS file has been successfully transferred to the Lab Cradle. You can disconnect the Lab Cradle.

Information

The OS file has been successfully transferred to the handheld.
The handheld will take a few moments to install the OS and restart.
If you wish, you can disconnect the handheld from the computer now.

OK
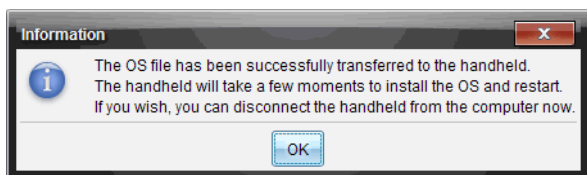
5. Click **OK**.

Updating the OS on Multiple Lab Cradles

1. To view connected lab cradles:

    •   In the Content Workspace, view connected lab cradles in the Resources pane under the Connected Handhelds heading.

    •   In the Documents Workspace, open the Content Explorer to view connected lab cradles.

2. Click **Tools > Install Handheld/Lab Cradle OS**.

    The Select Handheld OS File dialog box opens.

Select Handheld OS File

Please select a handheld/lab cradle.
Install OS for all connected handhelds/lab cradles.

Name	OS Version
TI-Nspire Lab Cradle F162	.tlo 3.1.0.318
TI-Nspire Lab Cradle EC8B	.tlo 3.1.0.318

Continue   Cancel
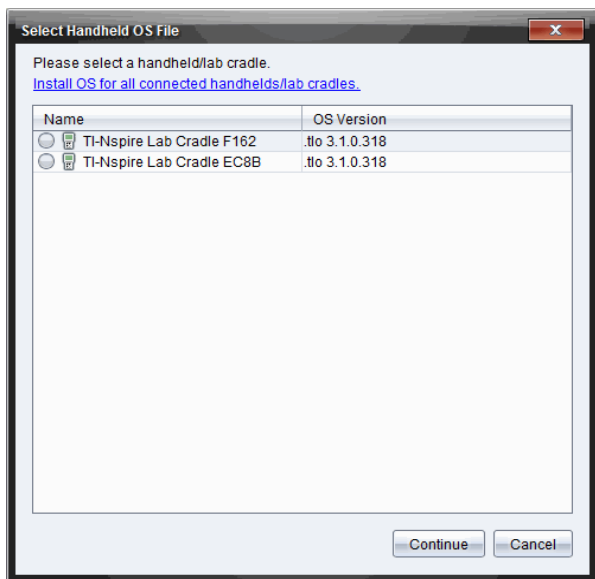
3. Click **Install OS for all connected handhelds/lab cradles**.

    Note: You can also update the OS on one lab cradle by clicking the radio button next to the handheld name, and then clicking **Continue**.

    The OS Installation dialog box opens.
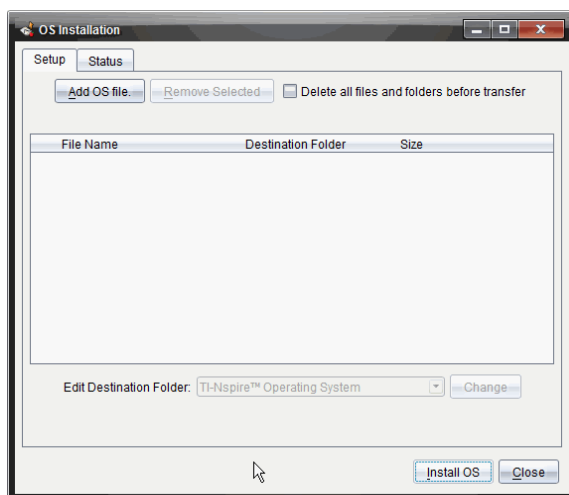
4. Click **Add OS File**.

   The Add to Transfer List dialog opens.
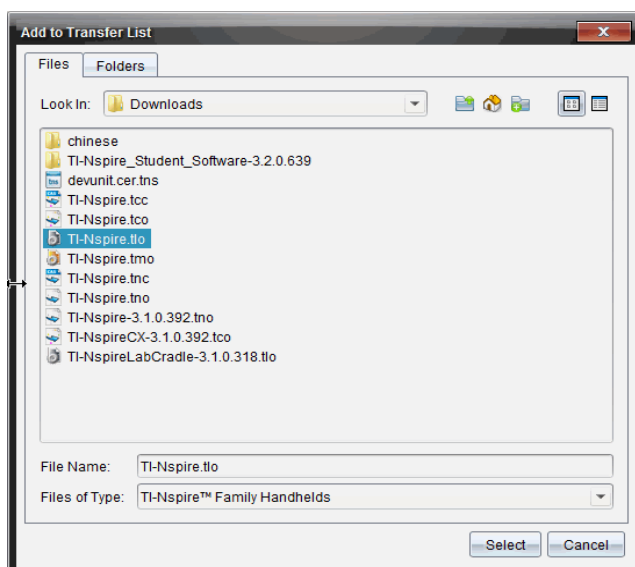
5. Navigate to the folder on your computer where the operating system file is located.

6. Select the TI-Nspire.tlo file.

7. Click **Select**.

   The OS Installation dialog box is redisplayed showing the selected file.

8. Click **Install OS**.

   The operating system is updated on the connected lab cradles. The status of the update is shown on the Status tab in the OS Installation dialog box.

9. When all lab cradles are updated, click **Stop Transfer**.

10. Click **Close** to close the OS Installation dialog box.

Appendix: Service and Support

Texas Instruments Support and Service

For U.S. and Canada:

For General Information

Home Page:	education.ti.com
KnowledgeBase and e-mail inquiries:	education.ti.com/support
Phone:	(800) TI-CARES / (800) 842-2737 For U.S., Canada, Mexico, Puerto Rico, and Virgin Islands only
International information:	education.ti.com/international

For Technical Support

For Product (Hardware) Service

Customers in the U.S., Canada, Mexico, Puerto Rico and Virgin Islands: Always contact Texas Instruments Customer Support before returning a product for service.

For All Other Countries:

For general information

For more information about TI products and services, contact TI by e-mail or visit the TI Internet address.

E-mail inquiries:	ti-cares@ti.com
Home Page:	education.ti.com

Service and Warranty Information

For information about the length and terms of the warranty or about product service, refer to the warranty statement enclosed with this product or contact your local Texas Instruments retailer/distributor.

Precautions for Rechargeable Batteries

Take these precautions when replacing rechargeable batteries:

- Use only the charger recommended for the cell or battery, or the one that was provided with the original equipment.

- Remove the cell or battery from the charger or alternating current adapter when not in use or being charged.

- Use of the battery in other devices may result in personal injury or damage to equipment or property.

- Do not mix brands (or types within brands) of batteries. There is a risk of explosion if a battery is replaced by the wrong type.

Disposing of Batteries

Do not mutilate, puncture, or dispose of batteries in fire. The batteries can burst or explode, releasing hazardous chemicals. Discard used batteries according to local regulations.

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