

Vernier EasyData™ App

(by Vernier Software & Technology)

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In this guidebook, references to TI-83 Plus also apply to the TI-83 Plus Silver Edition. References to TI-84 Plus also apply to the TI-84 Plus Silver Edition.

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What is the EasyData App?

The EasyData App is a graphing calculator application. It lets you collect, view, and analyze real-world data on certain TI graphing calculators using Vernier USB sensors and other data collection devices, such as Texas Instruments CBR 2™ motion detector, CBL 2™ System, or Vernier Go!Motion™ or LabPro®.

What you need

Note: In this guidebook, references to TI-83 Plus also apply to the TI-83 Plus Silver Edition. References to TI-84 Plus also apply to the TI-84 Plus Silver Edition.

Hardware and software	Notes
<ul style="list-style-type: none"><li data-bbox="57 619 591 717">• TI-84 Plus with operating system version 2.3 or later -or-<li data-bbox="57 723 591 820">• TI-83 Plus with operating system version 1.16 or later	<p data-bbox="591 619 1079 751">You can download a free copy of the latest operating system software for your calculator from education.ti.com/latest.</p> <p data-bbox="591 757 1079 855">The TI-83 Plus requires a separate data collection device, such as a Texas Instruments CBL 2™ System.</p>

Hardware and software	Notes
<p>Data Collection Devices from Vernier Software & Technology:</p> <ul style="list-style-type: none">• EasyTemp™• Go!™Motion• LabPro® <p>Data Collection Devices from Texas Instruments:</p> <ul style="list-style-type: none">• CBL 2™ System• CBR™ and CBR 2™ motion detectors	<p>Cables may be included with the sensors. Additional cables are available for purchase from retail stores, online retailers, and instructional dealers. See a list at education.ti.com/buy or shop the TI online store at education.ti.com/shop.</p>
<p>EasyData supports USB sensors from Vernier Software and Technology and from Texas Instruments, such as Go!™Motion, Vernier EasyTemp™ sensor, Texas Instruments CBR 2™ motion detector, and other sensors for measuring pH, force, and light.</p>	<p>You can purchase data collection devices and sensors at www.vernier.com.</p>
<p>To copy collected data to a computer or to install the EasyData App on a calculator from a computer, you need TI Connect™ installed on a computer running Microsoft® Windows® 98/2000; Windows NT®; or Windows XP® installed, or an Apple® Macintosh® with OS 7.1 or higher.</p>	<p>You can download TI Connect™ from education.ti.com/downloadticconnect.</p>

Where to find installation instructions

Detailed instructions on installing this and other applications are available at education.ti.com/guides. Follow the link to Flash Installation Instructions.

Note: The EasyData App may have been preinstalled on your graphing calculator. To find out if it's installed, press **[APPS]**, and then press **☑** to scroll through all available applications.

Getting help

The instructions in this guidebook are only for this application. If you need help using your calculator, refer to its comprehensive guidebook at education.ti.com/guides.

Connecting devices

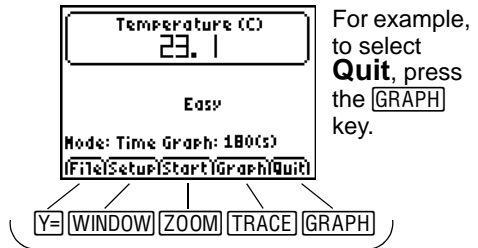
The examples in this guidebook use the EasyTemp™ USB temperature sensor. To connect other devices, please refer to the device's user guide.

When the calculator detects the data collection device, EasyData opens automatically and starts a default experiment appropriate for that device.

Navigating EasyData menus




Selecting on-screen options

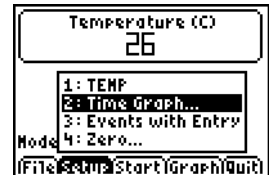
Each screen displays one or more options along the bottom of the screen. To select an option, press the calculator key directly below the option.



Selecting menu Items

EasyData menus differ slightly among the types of sensors. You can select menu items in the following ways:

- ▶ Press  or  to highlight the menu item, and then press  to select it.
- or -
- ▶ Press the number key that corresponds to the menu item.

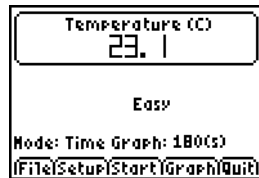


Quick Start: Graphing temperature with Vernier EasyTemp™

You can connect the EasyTemp™ USB temperature sensor to a TI-84 Plus calculator and use EasyData to watch the effect of holding the sensor in your hand. This exercise uses the **Time Graph** mode to collect samples automatically at regular time intervals.

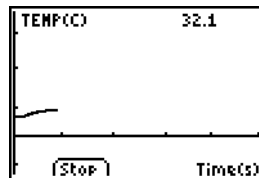
1. Turn the TI-84 Plus calculator on, and display the home screen.
2. Connect the EasyTemp™ sensor to the calculator.

After a few seconds, the EasyData main screen is displayed. The screen shows the current EasyData mode and the current sensor reading.



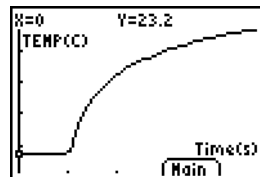
3. Select **Start** to start collecting data, and then wait five seconds.
4. Hold the EasyTemp sensor for about 30 seconds.


The graph shows the temperature as it changes.

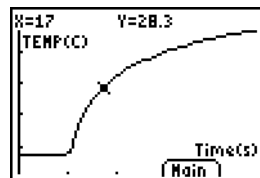


5. Select **Stop** to stop collecting data.

EasyData displays a scaled graph of the sampled temperatures.



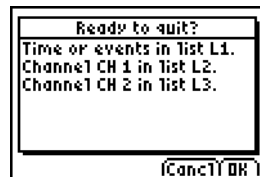
6. Press  repeatedly to scroll the cursor to the right, and note the temperature at each data point.



7. When you finish exploring the graph, select **Main** to return to the EasyData main screen.

8. Select **Quit**.

A message indicates that the collected data has been stored in calculator lists.



9. Select **OK** to quit EasyData.

You have completed the Quick Start exercise. The remainder of this guide contains detailed instructions and reference information for using EasyData features.

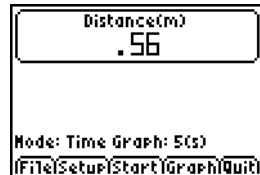
Starting and quitting the EasyData App

Note: EasyData starts automatically when you connect a sensor to the USB port of a TI-84 Plus calculator that is on the home screen.

Starting EasyData

- ▶ If EasyData is not already running on your calculator, press **[APPS]** to display the list of available applications, and then select **EasyData**.

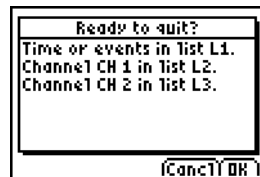
The application's information screen is displayed for about three seconds, followed by the main screen.



Quitting EasyData

1. Select **Quit** (press the **[GRAPH]** key) from the EasyData main screen.

A message indicates that the collected data has been transferred to the calculator's lists.



2. Select **OK** to quit EasyData, or select **Cancel** to return to the EasyData main screen.

Data collection modes

EasyData has modes that let you collect data automatically or manually.

- In **Time Graph** mode, EasyData automatically collects a specific number of samples at regular time intervals. You set the interval (in seconds) and the total number of samples to collect. You can stop the sampling manually, if you wish.
- In **Events with Entry** mode, you capture samples manually for a set of events that you define. For example, you might want to collect Boyle's law data using a gas pressure sensor to sample pressure readings for corresponding volumes of a container.

When you change an EasyData mode or setting, the change remains in effect until you restore the default settings, run another App, connect another sensor, or manipulate or delete list L5 outside the EasyData App.

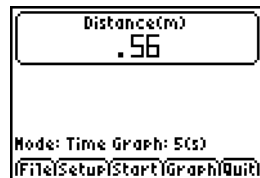
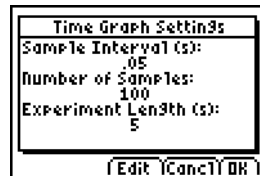
Collecting data automatically (Time Graph)

To collect data in the Time Graph mode

This example uses a motion detector. Your screen will vary depending on which sensor is attached.

1. If EasyData is not already in **Time Graph** mode:

- a) Select **Setup** to display the **Setup** menu.
- b) Select **Time Graph** to open the **Time Graph Settings** wizard.
The current settings are displayed.
- c) Select **OK** to return to the main screen.



2. When you are ready to start collecting data, select **Start**.
3. To stop the sampling process before it automatically stops, select and hold **Stop** (press and hold the **ZOOM** key).

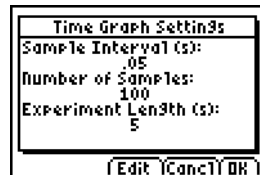
When sampling stops, EasyData displays a graph of the sampled data.

To change Time Graph settings

This example uses a motion detector. Your screen will vary depending on which sensor is attached.

1. Select **Setup** to display the **Setup** menu.
2. Select **Time Graph** to open the **Time Graph Settings** wizard.

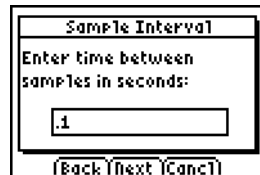
The current settings are displayed.



Time Graph Settings
Sample Interval (s): 0.5
Number of Samples: 100
Experiment Length (s): 5
(Edit) (Cancel) (OK)

3. Select **Edit** to open the **Sample Interval** step.

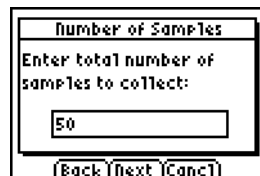
4. Type the new interval. For example, type .1 to sample every 1/10 second. You can also press **CLEAR** to clear the current value.



Sample Interval
Enter time between samples in seconds:
.1
(Back) (Next) (Cancel)

5. Select **Next** to advance to the Number of Samples step.

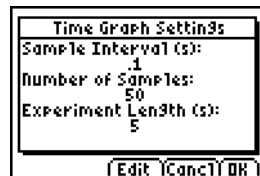
6. Type the new number of samples to collect.



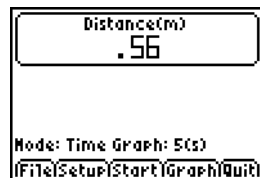
Number of Samples
Enter total number of samples to collect:
50
(Back) (Next) (Cancel)

7. Select **Next** to display a summary of the new settings.

The experiment length is calculated from the settings that you typed.



8. Select **OK** to return to the main screen.



Collecting data manually (Events with Entry)

In Events with Entry mode, each sampled value becomes a y value; you enter the x value.

To collect data in Events with Entry mode

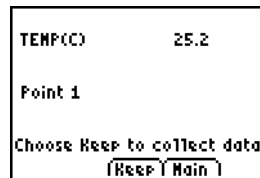
1. Select **Setup** from the EasyData main screen, and then select **Events with Entry**.

The main screen is displayed with current settings.



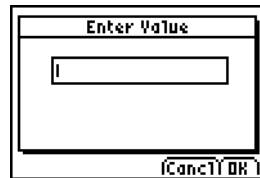
2. To begin, select **Start**.

EasyData waits for you to collect the first sample.



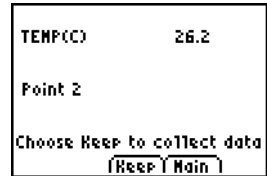
3. Set up (or wait for) the condition that you want to capture.
4. When ready to capture the current sampled (y) value, select **Keep**.

You are prompted to assign an x value to define the data point.



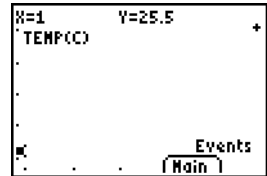
5. Type the x value, and then select **OK**.

EasyData waits for you to collect the next point.



6. When you have finished collecting data, select **Stop**.

The data points are displayed as a graph (a calculator scatter plot).



7. Press **←** and **→** to review the data, or select **Main** to return to the EasyData main screen.

Exploring collected data graphically

After collecting data, EasyData displays a graph of the data, automatically scaled for easy viewing. The calculator is placed in Trace mode automatically so you can scroll through the collected data points on the graph screen.

- The x-axis (horizontal axis) is the independent variable. In Time Graph mode, this represents time. In Events with Entry mode, it is a set of user-defined events.

- The y-axis (vertical axis) is the dependent variable. In all data collection modes, it is the physical data collected by the attached sensor

Exploring the data outside EasyData

When you quit the EasyData App, a message reminds you of which calculator lists contain the collected data. You can then examine the data using your calculator or a computer.

- On your calculator, you can explore the data by viewing the data in the list editor. (On the TI-84 Plus, press **STAT** and then select **Edit**.)
- You can also perform statistical analysis (such as calculating mean, median, and standard deviation) on the data.
- By using TI Connect™ computer software and an appropriate TI Connectivity cable, you can copy the data to a computer and import the data into other software tools such as:
 - Spreadsheet software to analyze the data.
 - TI InterActive!™ for formal presentations.

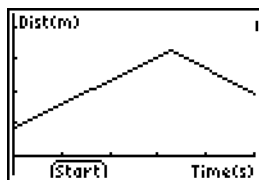
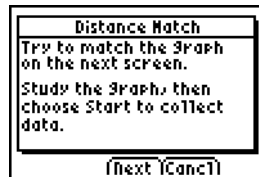
Graph Match (motion detector only)

When connected to a motion detector, EasyData has a **Distance Match** mode. This mode helps build understanding of graphs by letting you try to create data that matches a predefined graph.

Note: The sample interval and number of samples for the **Distance Match** mode are preset and cannot be changed.

To match a graph

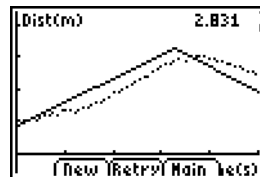
1. While holding the motion detector in one hand and the calculator in the other, aim the motion detector at a wall.
2. Start the EasyData App.
3. From the **Setup** menu, select **Distance Match**.
4. Select **Start** and follow the instructions on the screen.
5. Select **Next** to display the graph to match. Take a moment to study the graph and what it may represent.



6. Position yourself where you think the graph begins. Select **Start** to begin data collection.

You can hear a clicking sound as the data is collected.

7. Walk backward and then forward, trying to match the graph. Your position is plotted on the screen.



8. When the sample is finished, examine how well your “walk” matched the graph.
9. Do one of the following:
 - Select **Retry** to redisplay the same graph to match. Try to improve your match.
 - Select **New** to display a new graph to match.
 - Select **Main** to return to the main screen.

Changing a sensor's measuring unit

You can change the measuring unit for a connected sensor. With a motion detector, for example, you can change the unit from meters (m) to feet (ft).

To change the measuring unit

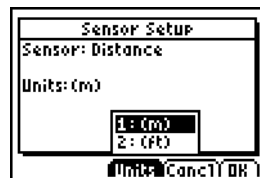
1. From the EasyData main screen, select **Setup**, and then select the menu item for the sensor, such as **Dist** for the motion detector.

The Sensor Setup screen is displayed.



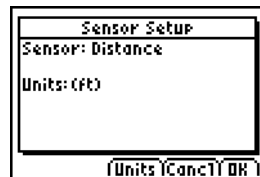
2. Select **Units**.

A menu is displayed showing the possible units for the connected sensor.



3. Select the unit that you want EasyData to use.

The Sensor Setup screen shows the selected unit.



4. Select **OK**.

Setting a zero reference (zeroing the sensor)

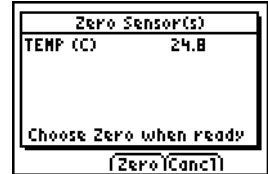
By default, EasyData uses the data sampled by the connected sensor. If the motion detector senses a distance of 2.3 meters, for example, EasyData displays 2.3 meters.

You may prefer to use the current data reading as a zero reference, so that data values less than the reference are displayed as negative, and greater values are displayed as positive. Setting a zero reference affects all data-collection modes.

To set the zero reference

1. Select **Setup** to display the **Setup** menu.
2. Select **Zero**.

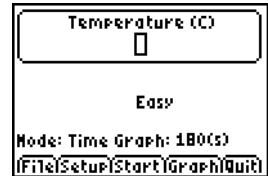
The Zero Sensor(s) screen is displayed, with a continually updated sample reading.



3. Adjust the sensor data by, for example, moving the motion detector closer or farther from a wall.

4. When the data reading is at the value you want to use as a zero reference, select **Zero**.

You are returned to the main screen. Sample data is now adjusted for the new zero reference.



To remove the zero reference

1. Make sure a sensor is connected.
2. Select **File**, and then select **New**.

EasyData restarts in the **Time Graph** mode, and the default settings are restored.

Restoring EasyData default settings

The default EasyData settings are appropriate for a wide variety of sampling situations. If you are unsure of the best settings, begin with the default settings, and then adjust the settings for your specific activity.

1. Make sure a sensor is connected.
2. Select **File**, and then select **New**.

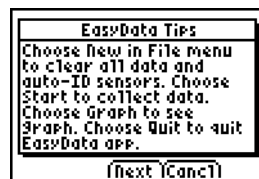
EasyData restarts in the default data-collection mode, and the default settings are restored.

Viewing EasyData tips

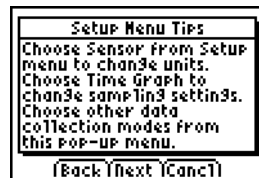
EasyData contains built-in tips to help you. Tips include general EasyData tips, setup menu tips, graph tips, and a list of supported products.

1. From the EasyData main screen, select **File**, and then select **Help**.

The first tip screen is displayed.



2. Select **Next** to view the next tip.



3. Select one of the options.
 - Select **Back** to display the previous tip
 - Select **Next** to display the next tip.
 - Select **Cancel** to cancel and return to the EasyData main screen.

Ensuring reliable data collection

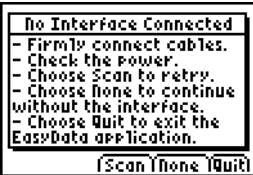
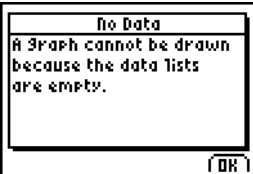
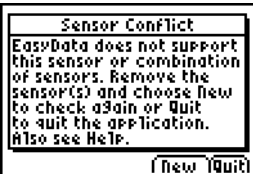
Do not disconnect the data collection device during data collection or while the “Checking Sensors” screen is displayed.

Keep in mind that the lists containing previously collected data are cleared when you select **Start**. This applies to all data-collection modes.

In case of difficulty

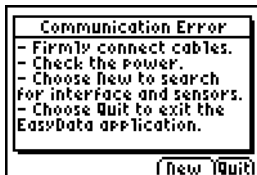
Problem	Cause and/or solution
Insufficient memory	<p>You must have sufficient memory for the EasyData App and the data lists. EasyData needs 5000 bytes to run effectively. You need to delete items from the calculator memory.</p> <p>To delete items on the TI-83 Plus, press 2nd [MEM], select Mem Mgmt/Del, select All, scroll to the item you wish to delete, and press DEL.</p>
Data doesn't look right	<p>Check that the experiment conditions are correct, and then repeat the sample.</p>

Error messages

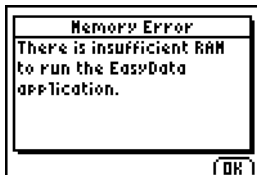
Message	Description
 <p>The screenshot shows a dialog box titled "No Interface Connected". The text inside lists several troubleshooting steps: "- Firmly connect cables.", "- Check the power.", "- Choose Scan to retry.", "- Choose None to continue without the interface.", "- Choose Quit to exit the EasyData application." At the bottom, there are three buttons: "Scan", "None", and "Quit".</p>	<p>The calculator could not recognize a valid connection to the data collection device.</p> <p>Make sure a sensor is connected.</p> <p>Check all physical connections, power supply, and device batteries.</p> <p>Restore the default settings: On the EasyData main screen, select File, and then select New.</p>
 <p>The screenshot shows a dialog box titled "No Data". The text says: "A graph cannot be drawn because the data lists are empty." At the bottom right, there is an "OK" button.</p>	<p>A graph plot was requested without collecting any data. You can display a graph only after you have run an experiment to store data in the calculator memory.</p>
 <p>The screenshot shows a dialog box titled "Sensor Conflict". The text says: "EasyData does not support this sensor or combination of sensors. Remove the sensor(s) and choose New to check again or Quit to quit the application. Also see Help." At the bottom, there are two buttons: "New" and "Quit".</p>	<p>Visit www.vernier.com for a list of supported sensors.</p> <p>If you are using two sensors, they must be plugged into CH1 first and CH2 second of CBL 2™ System or LabPro.</p> <p>Note that you cannot use a motion detector simultaneously with a sensor attached to CH1.</p>

Message

Description



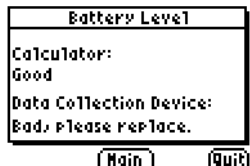
Check all physical connections, power supply, and device batteries.



You need to delete items from the calculator memory. (See ["In case of difficulty"](#) on page 23.)



Install fresh batteries in the calculator or data collection device.



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