

# Vernier EasyData™ App

## Getting Started

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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 devices (EasyTemp and EasyLink) and other data collection devices, such as Texas Instruments CBR 2™ motion detector, CBL 2™ System, or Vernier Go!Motion™, and LabPro®.

## What You Need

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

Hardware and Software	Notes
<b>Calculators</b>	
<ul style="list-style-type: none"><li>TI-84 Plus with operating system version 2.3 or later</li></ul> <p>-or-</p> <ul style="list-style-type: none"><li>TI-83 Plus with operating system version 1.16 or later</li></ul>	<p>You can download a free copy of the latest operating system software for your calculator from <a href="http://education.ti.com/latest">education.ti.com/latest</a>.</p> <p>The TI-83 Plus requires a separate data collection device such as a LabPro or CBL 2.</p>
<b>Data Collection Devices:</b>	
USB sensors and devices <ul style="list-style-type: none"><li>EasyTemp</li><li>EasyLink</li><li>Go! Motion (motion detector)</li><li>CBR 2 (motion detector)</li></ul>	These devices are designed to connect to the USB port found on the TI-84 Plus. When using these sensors, there is no need for any additional data-collection interfaces.
Standard devices <ul style="list-style-type: none"><li>CBR and CBR 2 (motion detectors)</li><li>LabPro</li><li>CBL 2</li></ul>	Using the calculators I/O port, these devices can be used with any of the TI graphing calculators.
<b>Sensors (from Vernier Software &amp; Technology)</b>	
Over 40 sensors available including; Temperature, pH, Pressure, Motion, Force, Heart Rate, Conductivity, Dissolved Oxygen and more.	For a complete list of sensors, visit <a href="http://www.vernier.com/probes/index.html">www.vernier.com/probes/index.html</a> .

## Connecting devices

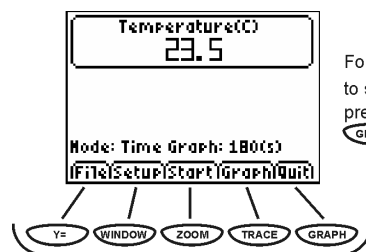
There are several data-collection devices that can be used with EasyData. These devices include the CBL 2, LabPro<sup>®</sup>, CBR<sup>™</sup>, CBR 2, Go!<sup>™</sup> Motion, and the Vernier EasyTemp and EasyLink. For more information on connecting data-collection devices, please refer to the device's user guide.

When the calculator detects a data collection device connected to the USB port, 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.



For example, to select **Quit**, press the **GRAPH** key.

### 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.



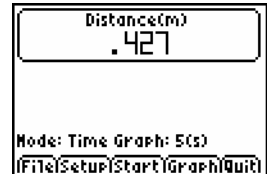
# Starting and Quitting the EasyData App

**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.

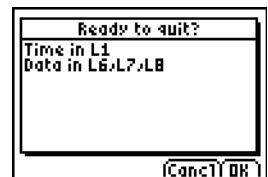


## Quitting EasyData

1. Select **Quit** from the main screen.

A message notes the lists in which the data can be found.

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

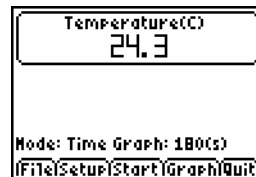


# Changing a Sensor's Measuring Unit

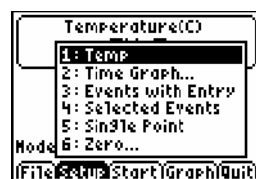
You can change the measuring unit for a connected sensor. With a temperature probe, for example, you can change the unit from Celsius (°C) to Fahrenheit (°F).

## To change the measuring unit

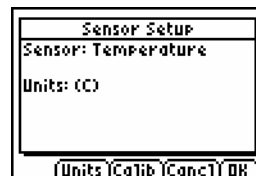
1. From the EasyData main screen, select **Setup**.



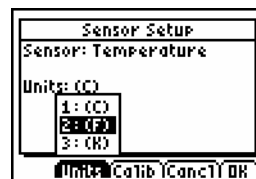
Choose the sensor displayed at the top of the menu, such as **Temp** for the temperature probe.



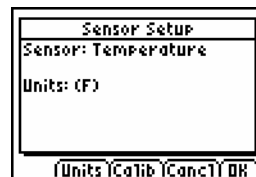
2. The Sensor Setup screen is displayed. Select **Units**.



3. A menu is displayed showing the possible units for the connected sensor. Select the unit that you want EasyData to use.



4. The Sensor Setup screen shows the selected unit. Select **OK** to return to the main screen.



# Setting a Zero Reference (zeroing the sensor)

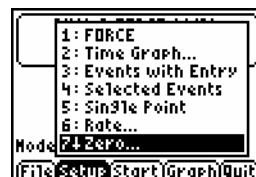
When using some sensors, it is useful to set the sensor to read zero under certain conditions. With a force sensor, for example, you can set the sensor to read a value of zero when no force is applied. This is often as helpful, and simpler, than calibrating the sensor.

## To zero sensor readings

1. From the EasyData main screen, select (Setup).

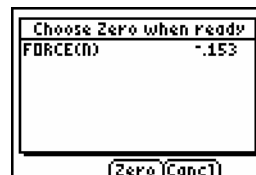


Choose **Zero...** displayed at the bottom of the menu.



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

Set up the sensor in the manner that you want it to read zero. For example, remove any mass from a force sensor.



3. When the displayed reading stabilizes, select (Zero).

You are returned to the main screen and the sensor's reference is set to zero.

# 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 an Auto-ID sensor is connected.
2. Select **(File)**, from the main screen and choose **New**.

EasyData restarts in the default data-collection mode, and the default settings are restored. **Note:** All unsaved data is also erased.

# 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.

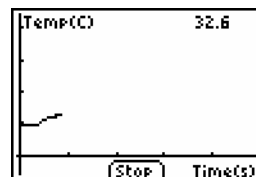
After a few seconds, the EasyData main screen is displayed. The screen shows the current EasyData mode and the current sensor reading.



3. Select **(Start)** to start collecting data, and then wait five seconds.

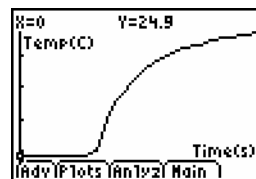
4. Hold the end of the EasyTemp sensor for about 30 seconds.

The graph shows the temperature as it changes.



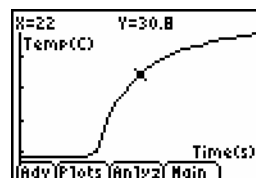
5. Select **(Stop)** to stop collecting data

EasyData displays a scaled graph of the collected temperatures.



6. Press **(D)** 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.

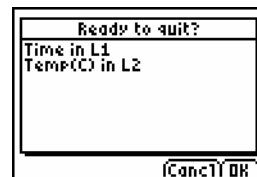




8. Select **Quit** to quit EasyData.

9. Select **OK**.

A message notes the lists in which the data can be found.



You have completed the Quick Start exercise for collecting temperature. To learn how to collect data with a motion sensor, complete the Quick Start exercise for collecting motion data. The remainder of this guide contains detailed instructions and reference information for using EasyData features.

## Quick Start: Graphing a Ball Bounce with a CBR 2

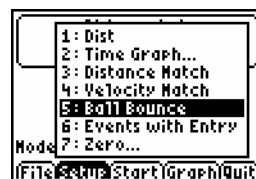
You can connect the CBR 2 motion sensor to a TI-84 Plus calculator and use EasyData to graph the motion of a bouncing ball. This exercise uses the **Ball Bounce** mode to collect samples automatically at regular time intervals.

1. Turn the TI-84 Plus calculator on, and display the home screen.
2. Connect the CBR 2 to the calculator's USB port.

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



3. Select (Setup) and choose **Ball Bounce**.

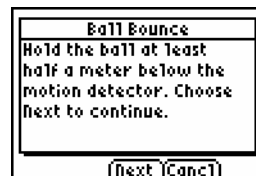


4. Pick up a ball and hold the CBR 2 above the ball.

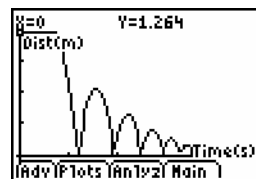


5. Select (Start) to begin data collection.

Follow the on-screen instructions to collect motion data for the bouncing ball.



- Once the motion data has been transferred, a graph of the ball's motion is displayed.



- Identify a bounce on the graph with a uniform shape to it.

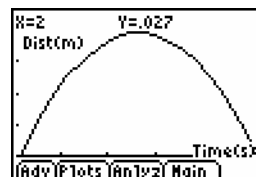
Select **(Anlyz)** and choose Select Region from the analyze menu.



A Region Select warning message will be displayed. Select **(OK)**.

- Press **(D)** repeatedly to scroll the cursor to the beginning of a uniform bounce. Select **(OK)** to set your left boundary marker.

Press **(L)** repeatedly to scroll the cursor to the end of the uniform bounce. Select **(OK)** to set your right boundary marker. A graph of the selected region will be displayed.

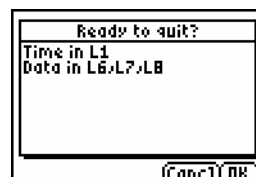


- Select **(Plots)** to view the corresponding velocity and acceleration graphs.

- When you finish exploring the graphs, select **(Main)** to return to the EasyData main screen.

- Select **(Quit)**. A message notes the lists in which the data can be found.

Select **(OK)** to quit EasyData.



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

## Collecting Multiple Data Runs

In order to compare consecutive runs of data, it is necessary to store your current data before performing the next data-collection trial. When collecting data with a single sensor, EasyData will allow you to store two runs of previous data for comparison and analysis with your current data.

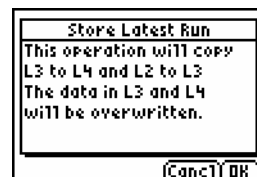
Each time a run is stored, list L3 is copied into L4 and list L2 is copied into L3. Your independent variable will always remain in list L1 and should be kept consistent between data-collection trials. To view all data runs on a single graph, refer to the **Graph Features and Analysis** section. Keep in mind that storing data is not the same as saving data in an experiment. For information on saving data, refer to the **Managing Data** section.

### Storing Data

1. When data collection has been completed, select **(File)**, and then select **Store Run**.



2. The Store Latest Run screen will appear identifying where the data will be stored. Select **(OK)** to store your data.



3. You are now ready to collect a new run of data. **Note:** It is not necessary to store the data following your third data-collection trial.

## Data Collection Modes

EasyData has several modes that let you collect data automatically or manually. The five most common modes are listed below.

- 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.
- In **Selected Events** mode, you capture samples manually every time **Keep** is selected. For example, you might want to collect individual temperature and pH readings along a stream bank at different locations.
- In **Single Point** mode, an averaged reading is collected for each data collection. A consecutive reading is collected each time a new data collection is started. This mode is ideal for environmental monitoring such as stream temperature or pH.
- In **Rate** mode, the rate of periodic data, such as heart rate or sound waveforms, is calculated. This mode can be set to collect rate readings in beats per minute (bpm) or Hertz (Hz). Only select sensors support rate mode.

When you change an EasyData mode or setting, the change remains in effect until you restore the default settings, or connect a different sensor. If a new sensor is added, you have the option of adding the new sensor and retaining the previously set mode or restoring the mode to the default settings.



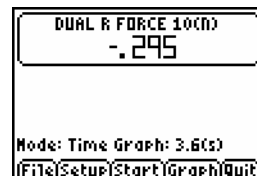
# Collecting Data Automatically (Time Graph)

## To collect data in the Time Graph mode

This example uses a force sensor connected to an EasyLink and a TI-84 Plus calculator. Your screens will vary depending on which sensor and data-collection device is attached.

1. Turn the calculator on, and start the EasyData app.

After a few seconds, the EasyData main screen is displayed. The screen shows the current EasyData mode and the current sensor reading. The default mode for most sensors is **Time Graph**.



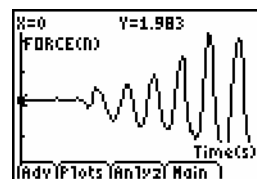
2. Select **(File)** and choose **New** to restore data collection and sensor defaults.



3. Select **(Start)** to begin collecting data.

4. Data collection will automatically end when all samples have been collected. To stop data collection early, select **(Stop)**.

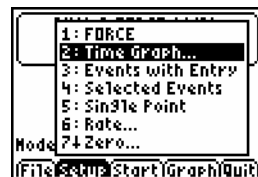
When data collection has ended, EasyData displays a graph of the collected data.



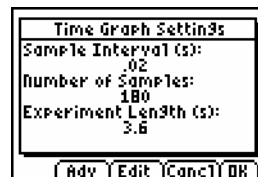
## To change Time Graph settings

This example uses a force sensor connected to an EasyLink and a TI-84 Plus calculator. Your screens will vary depending on which sensor and data-collection device is attached.

1. From the EasyData main screen, select **Setup**, and then select **Time Graph..** to open the **Time Graph Settings** wizard.

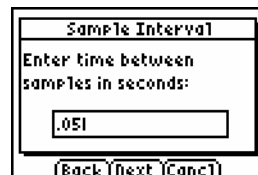


The current **Time Graph** settings are displayed.

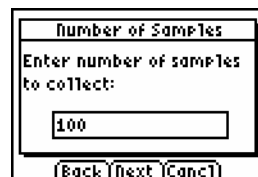


2. Select **Edit** to enter new **Time Graph** settings beginning with the sample interval.

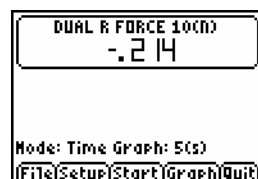
Press **CLEAR** to clear the old sample interval and type in the new interval. Select **Next** to advance to the number of samples screen.



Press **CLEAR** to clear the old number of samples and type in the new number of samples. Select **Next** when finished to display a summary of the new settings.



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



# Collecting Data Manually (Events with Entry)

In **Events with Entry** mode, each reading collected from a sensor becomes a y value. After each reading, EasyData prompts you to enter the corresponding x value.

## To collect data in Events with Entry mode

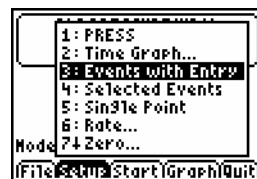
This example uses a gas pressure sensor connected to an EasyLink and a TI-84 Plus calculator. Your screens will vary depending on which sensor and data-collection device is attached.

1. Turn the calculator on, and start the EasyData app.

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



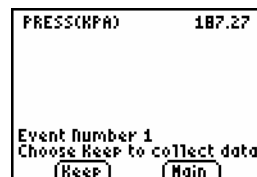
2. From the EasyData main screen, select **(Setup)**, and then select **Events with Entry**.



3. Select **(Start)** to begin collecting data. EasyData waits for you to collect the first sample.

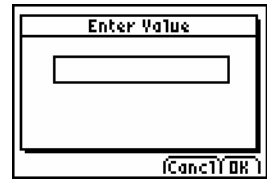


4. When you are ready to collect the first sample (y value) and the displayed reading appears stable, select **(Keep)**.

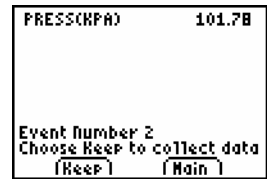




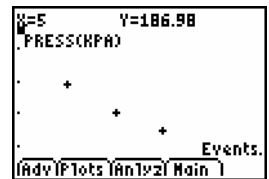
You are prompted to type in an x value that corresponds to the sample you just collected. Enter it and select (OK) to prepare for the next sample.



- Repeat the above step for each additional sample to be collected.



- When you have finished collecting data, select (Stop).  
The data you have collected are displayed as a graph.



- Press (Right Arrow) or (Left Arrow) to review your data, or select (Main) to return to the EasyData main screen.

## Collecting Data Manually (Selected Events)

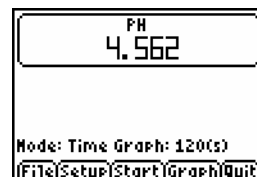
In **Selected Events** mode, each reading collected from a sensor becomes a y value. EasyData automatically assigns the sample number as the x value.

### To collect data in Selected Events mode

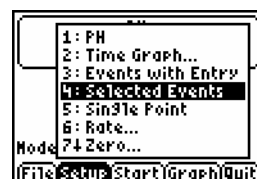
This example uses a pH sensor connected to an EasyLink and a TI-84 Plus calculator. Your screens will vary depending on which sensor and data-collection device is attached.

1. Turn the calculator on, and start the EasyData app.

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



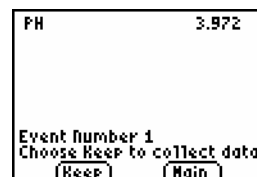
2. From the EasyData main screen, select **Setup**, and then choose **Selected Events**.



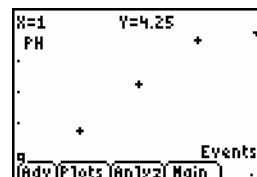
3. Select **Start** to begin collecting data. EasyData waits for you to collect the first sample.



4. When you are ready to collect the first sample (y value) and the displayed reading appears stable, select **Keep**.



5. Repeat the above step for each additional sample to be collected.
6. When you have finished collecting data, select **[Stop]**.
7. The data you have collected are displayed as a graph. Press **[▶]** or **[◀]** to review your data, or select **[Main]** to return to the EasyData main screen.



## Collecting Data Manually (Single Point)

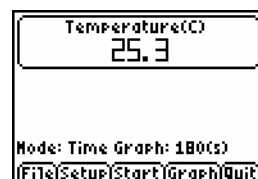
In **Single Point** mode, EasyData samples readings from the sensor for a 10 second period. When sampling is finished, the mean reading is calculated and displayed. Each time a reading is collected, it is stored in memory for future use. If you wish to clear previously collected data, select **New** from the **File** menu.

### To collect data in Single Point mode

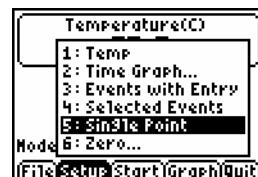
This example uses an EasyTemp and a TI-84 Plus calculator. Your screens will vary depending on which sensor and data-collection device is attached.

1. Turn the calculator on, and start the EasyData app.

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

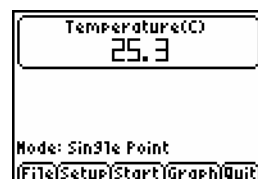


2. From the EasyData main screen, select **Setup**, and then select **Single Point**.



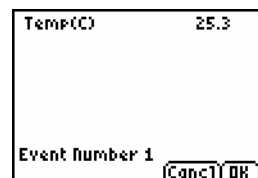
3. Select **Start** to begin collecting data. EasyData collects data for 10 seconds.

When data collection has finished, the averaged reading is displayed.



4. If you wish to keep the reading and prepare EasyData to take another, select **OK**.

If you are finished and no other readings are to be taken, select **Cancel**.



5. To collect another reading, repeat Steps 3 and 4.

# Specialized Data Collection Modes

## Using Motion Detectors

In **Distance Match** mode, EasyData helps to build understanding of graphs by letting you try to create data that matches a predefined graph. The sample interval and number of samples are preset and cannot be changed. Each of the preset plots is randomly generated so that students have the option of matching a new plot every time.

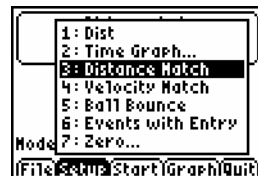
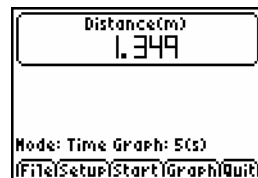
In **Velocity Match** mode, students work to match preset plots of velocity rather than distance. Interpretation of velocity plots helps to further the understanding of graphs established during Distance Match. The sample interval and number of samples are preset and cannot be changed. Each of the preset plots is randomly generated so that students have the option of matching a new plot every time.

**Ball Bounce** mode, is a specialized routine to help students understand the motion of a bouncing ball. When data is collected EasyData adjusts the data, with respect to the floor, so that each bounce on the distance graph has the same minimum distance. This helps students to visually connect the data on the graph to the perceived motion of the ball. The sample interval and number of samples are preset and cannot be changed.

## To collect data in Distance Match

This example uses a CBR 2 connected to a TI-84 Plus calculator.

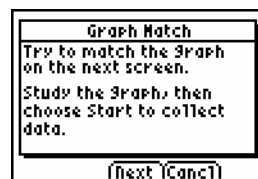
1. From the EasyData main screen, select **(Setup)**, and then select **Distance Match**.



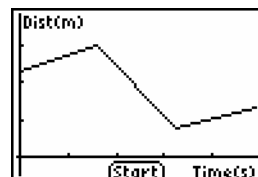
2. Select **(Start)** to begin the activity.



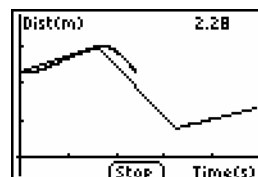
3. Follow the instructions displayed in the Graph Match dialog box. Select **(Next)** to display the next screen.



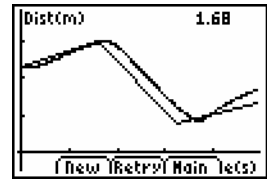
4. A graph of distance vs. time is displayed. The graph should be examined before attempting to match the graph. When ready to perform the match, select **(Start)** to begin collecting data.



Walk back and forth in front of the motion sensor to match the displayed graph.



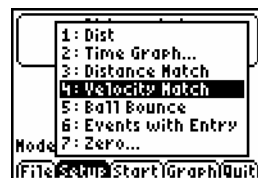
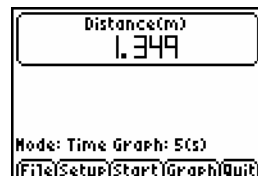
5. Select **(New)** to display a new graph to match, or select **(Retry)** to match the same graph already displayed. When finished, select **(Main)** to return to the main screen.



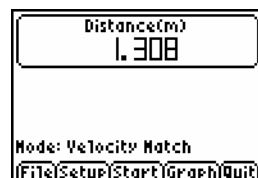
## To collect data in Velocity Match

This example uses a CBR 2 connected to a TI-84 Plus calculator.

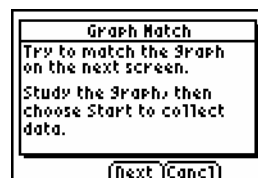
1. From the EasyData main screen, select **(Setup)**, and then select **Velocity Match**.



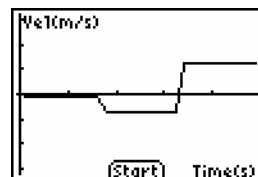
2. Select **(Start)** to begin the activity.



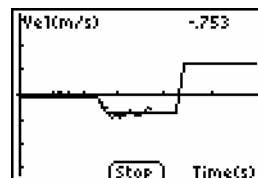
3. Follow the instructions displayed in the Graph Match dialog box. Select **(Next)** to display the next screen.



4. A graph of velocity vs. time is displayed. The graph should be examined before attempting to match the graph. When ready to perform the match, select **(Start)** to begin collecting data.

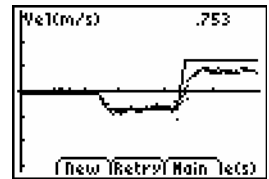


Walk back and forth in front of the motion sensor to match the displayed graph.





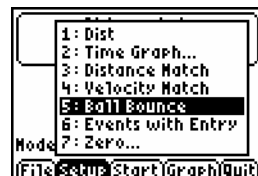
5. Select **(New)** to display a new graph to match, or select **(Retry)** to match the same graph already displayed. When finished, select **(Main)** to return to the main screen.



## To collect data in Ball Bounce

This example uses a CBR 2 connected to a TI-84 Plus calculator.

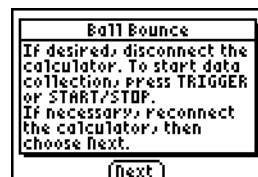
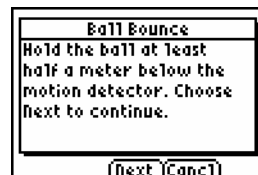
1. From the EasyData main screen, select **(Setup)**, and then select **Ball Bounce**.



2. Pick up a ball and hold the CBR 2 above the ball. Select **(Start)** to begin data collection.

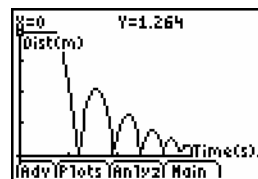


3. Follow the instructions displayed in the Ball Bounce dialog box. Select **(Next)** to display the next screen.



4. Once the motion data has been transferred, a graph of the ball's motion is displayed. Scroll through the collected data points on the graph screen using the  $\blacktriangleright$  and  $\blacktriangleleft$  keys.

Select **Plots** to display a plot of velocity or acceleration, or select **Anlyz** to analyze the displayed graph. When finished, select **Main** to return to the main screen.



## Using Photogates

When a photogate is attached, there are four photogate data collection modes that can be used. These data-collection modes are only available when a photogate is set up. Photogates cannot be used in conjunction with any other sensors and must be connected to the digital (DIG) channels of the LabPro or CBL 2. When using an older photogate, it may not auto-ID and it will be necessary to set up your photogate manually.

Once the photogate is set up, the gate status will be displayed in the meter on the main screen. To test the photogate, block it with your hand; the status should report as Blocked. Once you remove your hand, it should change to Unblocked.

The default mode is **Motion Timing**. This mode is appropriate for a picket fence experiment, a smart pulley, or a user-defined device. Only auto-ID photogates may be daisy-chained. During operation, times are recorded as leading opaque edges of a device pass through the photogate beam. These times are used to calculate distance, velocity and acceleration.

In **Gate Timing** mode, the time during which one or two photogates are blocked is measured. Corresponding velocities will be calculated from the measured times and the width of the object used to block the gate.

In **Pulse Timing** mode, the time between two blocking events is measured and stored. If you are using one photogate, the timing starts when the photogate is first blocked, and it stops when the photogate is blocked again. When two photogates are used, the timing starts when the first photogate is blocked, and stops when the second gate is blocked.

In **Pendulum Timing** mode, the period of an object as it oscillates through the photogate will be measured.

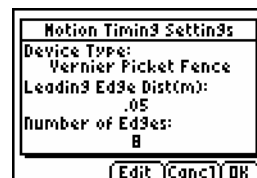
## To collect data in Motion Timing mode

This example uses a photogate connected to a CBL 2. During the experiment, a Vernier Picket Fence is dropped through the photogate.

- From the EasyData main screen, select **Setup**, and then select **Motion Timing...**



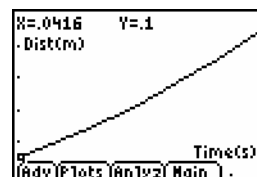
The default **Motion Timing** settings are displayed. The default device should be set as a Vernier Picket Fence. Select **OK** to return to the main screen.



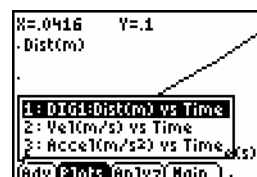
- Select **Start** to begin collecting data. Wait for the data-collection device to beep, then drop the Picket Fence through the photogate.



- When all eight opaque bars of the Picket Fence have passed through the photogate beam, data collection will end. A graph of distance vs. time will be displayed.



- Select **Plots** to view the corresponding velocity and acceleration graphs.



- Select **Main** to return to the main screen.

**Options:** To use a device other than a Vernier Picket Fence, select **Edit** from the Motion Timing Settings dialog box and select one of the following.

**Pulley (Outside Edge)** if you are using a 10-spoke Super Pulley and want to measure rotational or linear motion based on the outside diameter of the pulley wheel. For example, rolling the pulley along a table top.

**Pulley (Inside Edge)** if you are using a 10-spoke Super Pulley and want to measure rotational or linear motion created by a string running through the pulley's groove. For example, setting up an Atwood's machine experiment.

**User Defined** when using a different type of device like a bar tape or a 3-spoke pulley.

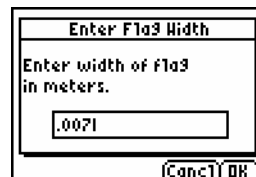
## To collect data in Gate Timing mode

This example uses a single photogate connected to a CBL 2. During the experiment, a regular #2 pencil will be passed through the photogate. Gate Timing can be used with one or two photogates.

- From the EasyData main screen, select (Setup), and then select **Gate Timing...**



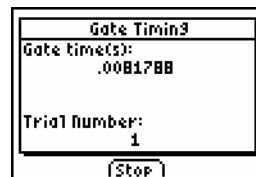
The Flag Width screen is displayed. Press (CLEAR) and type in the width of the object that will be passing through the photogate. Select (OK) to return to the main screen.



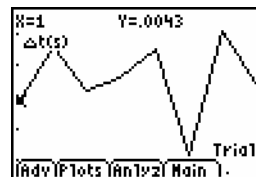
- Select (Start) to begin collecting data. Wait for the data-collection device to beep, then pass the pencil through the photogate once.



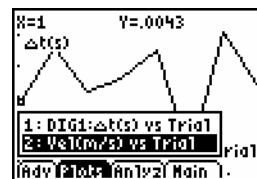
The time the gate is blocked is displayed along with the trial number. Pass the pencil through the gate several more times.



- Select (Stop) to stop collecting data. A graph of time blocked vs. trial number is displayed.



4. Select **(Plots)** to view the corresponding velocity graph.



5. Select **(Main)** to return to the main screen.

**Options:** When collecting data in Gate Timing mode, it is possible to use one or two photogates. The example above describes the use of a single photogate.



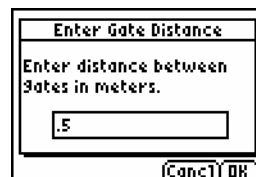
## To collect data in Pulse Timing mode

This example uses two photogates connected to a LabPro. The gates are spaced 0.5 meters apart along a ramp. During the experiment, a cart will be passed through the two photogates.

1. From the EasyData main screen, select (Setup), and then select **Pulse Timing...**



The Gate Distance is displayed. Press (CLEAR) and type in the distance between the photogates. Select (OK) to return to the main screen.



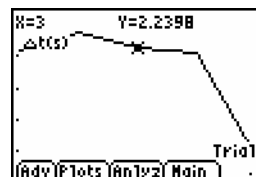
2. Select (Start) to begin collecting data. Wait for the data-collection device to beep, then allow the cart to pass through each of the photogates.



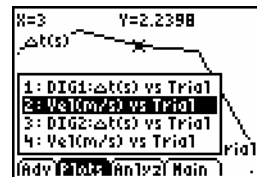
The time required for the cart to pass from the first to the second photogate is displayed along with the trial number. Pick up the cart and place it at the top of the ramp. Pass it through the photogates several more times.



3. Select (Stop) to stop collecting data. A graph of time vs. trial number is displayed.



4. Select **(Plots)** to view the corresponding velocity graph.



5. Select **(Main)** to return to the main screen.

**Options:** When collecting data in Pulse Timing mode, it is possible to use one or two photogates. The example above describes the use of a two photogates. When performed with a single photogate, time is measured between two consecutive blocks of the gate.

## To collect data in Pendulum Timing mode

This example uses a single photogate connected to a LabPro. During the experiment, a pendulum bob repeatedly passes through the photogate.

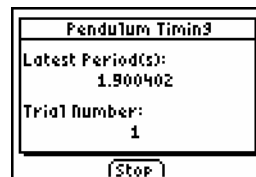
1. From the EasyData main screen, select **(Setup)**, and then select **Pendulum Timing....**



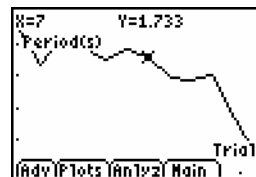
2. Select **(Start)** to begin collecting data. Wait for the data-collection device to beep, then release the pendulum so that the bob passes through the photogate.



The time required for the pendulum to pass through the photogate three times (a full period) is displayed along with the trial number. Allow the pendulum to continue oscillating to collect multiple periods.



3. Select **(Stop)** to stop collecting data. A graph of period vs. trial number is displayed.



4. Select **(Main)** to return to the main screen.

## Miscellaneous Data Collection

**Titration** mode cannot be selected and will only appear if a Drop Counter along with an analog sensor is being used. When this mode is set all data-collection settings are preset and cannot be changed.

When the titration mode is started, the LabPro or CBL 2 is instructed to collect 2500 samples from the attached sensor at a sample interval of 1 sample/second. It is best to set the drop rate of the titrant no faster than 1 drop/second.

To stop data collection, it is best to select  $\overline{\text{Stop}}$  rather than allow all 2500 samples to be collected. When data collection is stopped, first and second derivatives are calculated. The derivative calculations will only apply to data collected from a sensor in CH1 of the data-collection device.

To perform a titration without using a Drop Counter, refer to the data collection mode **Events with Entry** found earlier in this section.

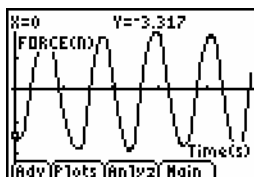
**Long-Term** mode, is automatically set if the sample interval of a **Time Graph** is set above 270 seconds or the experiment length exceeds 1800 seconds (30 minutes). When Long Term is set, the data-collection device can be disconnected from the calculator during data-collection. Once all data has been collected, reconnect the data-collection device and follow the on-screen instruction to retrieve the data. This mode cannot be used with EasyLink or EasyTemp.

# Graph Features and Data-Analysis Tools

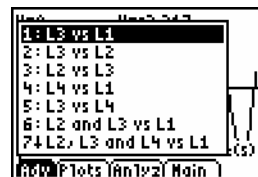
After collecting data, EasyData displays a graph of the data, automatically scaled for easy viewing. The calculator is placed in Trace mode automatically so you can scroll through the collected data points on the graph screen using the  $\rightarrow$  and  $\leftarrow$  keys. Several common, data analysis tools are accessible from the graph screen.

## Graph Screen Overview

- The x-axis (horizontal axis) is the independent variable. For example, in Time Graph mode this represents time, or 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.



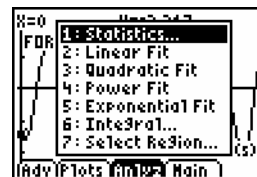
**Adv** The Advanced menu enables the plotting of graphs using data collected from previous data-collection trials, calculated data, data entered by hand, or derivatives calculated during titrations.



**Plots** When multiple sensors, motion detectors, or photogates are used to collect data, the Plots menu lists all possible data plots that can be graphed.

**Anlyz** The EasyData application has many analysis tools with which to analyze data. Refer to the Analyzing Data section for more information.

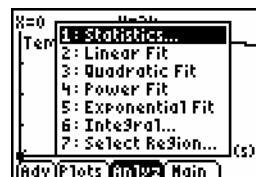
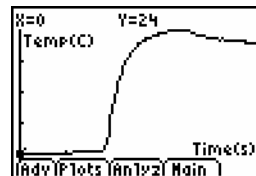
**Main** The Main button is used to exit the graph screen and return to the main screen.



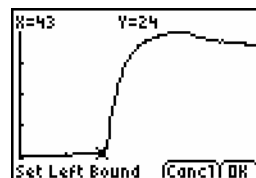
## Performing Statistics or Integral calculations

Statistics and Integral calculations can be performed over any region of the data shown on a graph. Statistics and Integral calculations are only allowed on a graph that is displaying a single dependent variable on the Y-axis. Use the choices from the (Plots) and (Adv) menus to display a graph with only a single dependent variable on the Y-axis.

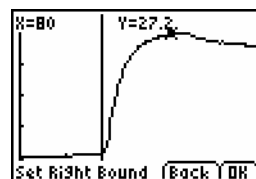
1. From the EasyData graph screen, select (Anlyz), and then choose **Statistics**.



2. Scroll through the collected data points on the graph screen using the (D) and (L) keys. Move the cursor to the left boundary of the data to be analyzed and select (OK). A vertical line representing the left boundary marker is displayed.

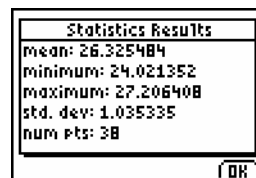


3. Move the cursor to the right boundary of the data to be selected and select (OK).



4. A screen is displayed with the results of the statistics calculations. Select (OK) to return to the graph screen.

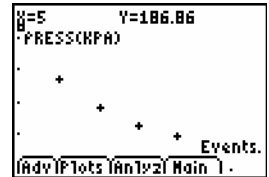
To calculate an integral instead of statistics, select (Anlyz) and choose **Integral**, then repeat Steps 2 – 4.



## Curve Fits

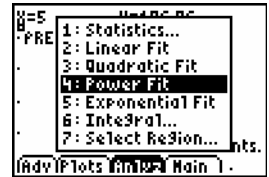
There are four types of curve fits available in the **Anlyz** menu found on the EasyData graph screen. Each curve fit is unique and designed for a specific use. When a curve fit is selected, it will be performed on all of the displayed data. To fit a curve to a specific region of data, use the Select Region option to isolate only the data you wish to work with. Curve fits can only be applied to a single data set at a time. For multiple data sets, repeat the curve fit procedure for each data set being analyzed.

- From the EasyData graph screen, select **Anlyz**, and then choose one of the four displayed curve fits.



**Linear Fit** – This fit is calculated in the form  $y = a*x + b$ . Values for **a**, **b**, and a curve fit correlation **R** are calculated and displayed.

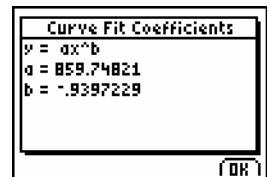
**Quadratic Fit** – This fit is calculated in the form  $y = a*x^2 + b*x + c$ . Values for **a**, **b**, and **c** are calculated and displayed. A minimum of 3 data points is required.



**Power Fit** – This fit is calculated in the form  $y = a*x^b$ . Values for **a** and **b** are calculated and displayed. A minimum of 2 data points is required and all data points must be positive, non-zero values.

**Exponential Fit** – This fit is calculated in the form  $y = a*e^{(-b*x)}$ . Values for **a** and **b** are calculated and displayed. A minimum of 2 data points is required and all Y-axis data must be positive, non-zero values.

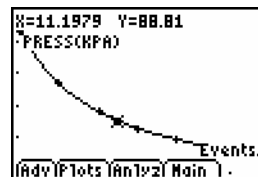
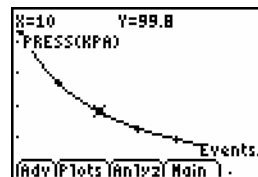
- The curve fit calculation is performed and the curve-fit coefficients are displayed. Select **OK** to return to the graph screen.





- EasyData displays the curve fit drawn over the original data points. Scroll through the collected data points on the graph screen using the  $\blacktriangleright$  and  $\blacktriangleleft$  keys.

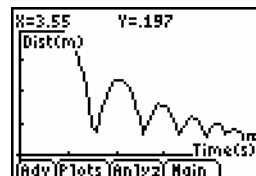
To move the trace cursor to the curve fit, press  $\blacktriangleup$  or  $\blacktriangledown$ .  
The cursor can now be moved along the curve fit.



## Select Region

The **Select Region** feature is used to isolate a specific and continuous region of a data set. Data outside of the selected region is permanently deleted. The selected region is copied from the calculator's data lists, all lists are cleared of data, and then the selected data is copied back into the lists. Once this feature is used, the data outside your selection is permanently deleted. It may be wise to use the **Save As** option from the (File) menu before performing a **Select Region**.

1. From the EasyData graph screen, select (Anlyz), and then choose **Select Region**.



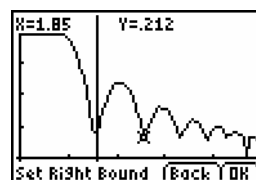
**Note:** Selecting a region of data causes the deletion of all data outside of the region selected.



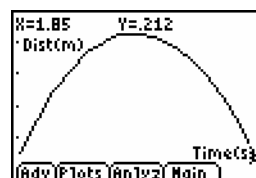
2. Scroll through the collected data points on the graph screen using the (D) and (L) keys. Move the cursor to the left boundary of the data to be selected and select (OK). A vertical line representing the left boundary marker is displayed.



3. Move the cursor to the right boundary of the data to be selected and select (OK).



4. The graph screen is displayed with the selected region of data. When data analysis is finished, select (Main) to return to the main screen.



# Managing Data: Saving, Opening and Deleting Experiments

Using EasyData it is possible to save your experimental setup along with any collected data, for later use. When an experiment is saved it includes the current sensor calibrations, data-collection parameters, and any data that had been collected.

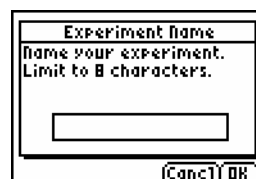
Saved experiments are easy to open and help to save time when repeating experiments. Calculator memory does have limitations and it is advisable to routinely delete unnecessary experiment files. The EasyData application has been designed to allow a maximum of 50 saved experiment files.

## Saving an Experiment

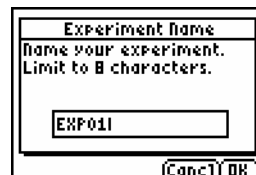
1. Select **(File)**, and then select **Save As....**



2. Using the calculator keypad, enter a name for the saved experiment. The experiment name can include both letters and numbers, but must be no longer than 8 characters and cannot begin with a numeral.



3. Select **(OK)** to save the experiment

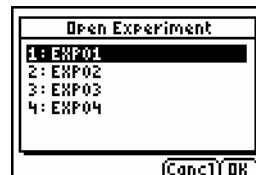


## Opening an Experiment

1. Select **File**, and then select **Open....**



2. The Open Experiment screen is displayed. Select the experiment to be opened and then select **OK**.



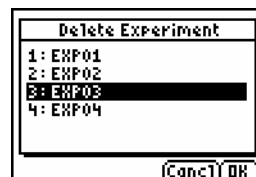
3. The experiment is opened and you are returned to the main screen.

## Deleting an Experiment

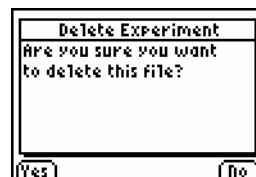
1. Select **File**, and then select **Delete....**



2. The Delete Experiment screen is displayed. Select the experiment to be deleted and then select **OK**.



3. A message appears asking if you are sure you want to delete the experiment. Select **Yes** to delete the experiment and return to the main screen.



# Editing a Sensor's Calibration

When EasyData detects a sensor, it automatically loads a calibration for that sensor. If you wish to edit a sensor's calibration, you can do so by manually entering new calibration values or by using either a single-point or two-point calibration procedure.

## Manually Inputting a New Calibration

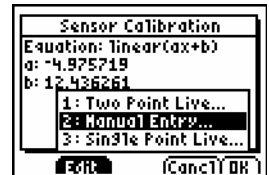
1. From the EasyData main screen, select **Setup**, and then select **CH1:** (or the appropriate channel).



2. Select **Calib**.

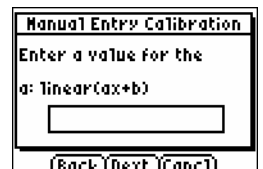


3. Select **Edit**. A menu is displayed showing the different calibration methods.

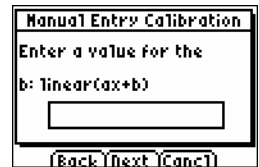


4. Select **Manual Entry....**

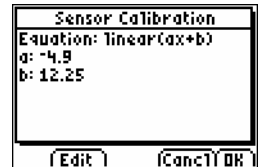
5. The slope for the current calibration is displayed. Press **CLEAR** to erase the displayed value. Type in your new slope value and select **Next**.



6. The intercept for the current calibration is displayed. Press **CLEAR** to erase the displayed value. Type in your new intercept value and select **Next**.

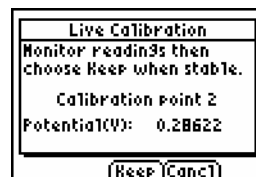
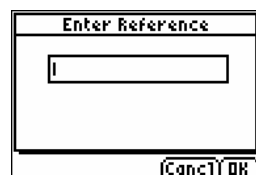
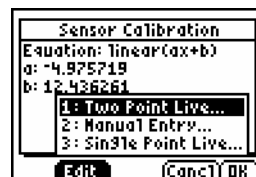
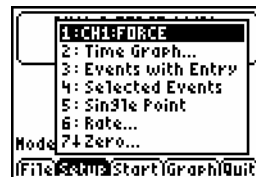


7. Select **OK** from the Sensor Calibration screen. Select **OK** again to return to the main screen.

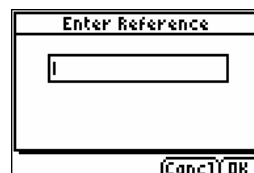


## Creating a New Calibration using Two Points

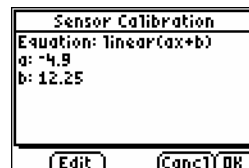
- From the EasyData main screen, select **Setup**, and then select **CH1:** (or the appropriate channel).
- Select **Calib** from the Sensor Setup screen.
- Select **Edit**. A menu is displayed showing the different calibration methods.
- Select **Two Point Live...**
- Place your sensor into the necessary condition for the first calibration point (e.g. a force sensor with no mass hanging from it or a pH sensor in a pH buffer). Monitor the displayed Potential (V). When the value is stable, select **Keep**.
- Enter the known value for the first calibration condition (e.g. "0" for a force of zero N), and select **OK**.
- Place your sensor into the necessary condition for the second calibration point (e.g. a force sensor with a 200 g mass hanging from it). Monitor the displayed Potential (V). When the value is stable, select **Keep**.



8. Enter the known value for the second calibration condition (e.g. 1.96 N for a 200 g mass), and select **OK**.



9. The Sensor Calibration screen will be displayed with your new calibration slope and intercept values. Select **OK** to return to the Sensor Setup screen, and then select **OK** again to return the main screen.

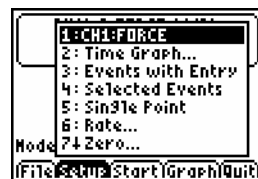




## Creating a New Calibration using a Single Point

This calibration method defines a new y-intercept, leaving the existing slope unchanged. Adjusting a barometer to match the local barometric pressure is a good example of using the **Single Point** calibration. The example below is using a force sensor connected to a LabPro.

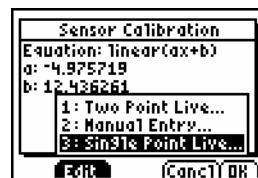
1. From the EasyData main screen, select **Setup**, and then select **CH1:** (or the appropriate channel).



2. Select **Calib** from the Sensor Setup screen.

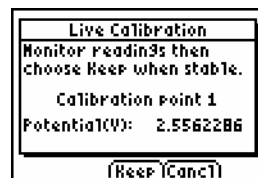


3. Select **Edit**. A menu is displayed showing the different calibration methods.

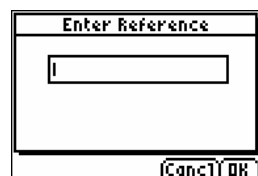


4. Select **Single Point Live....**

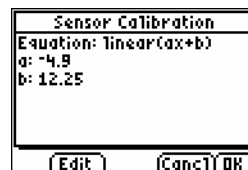
5. Place your sensor into the necessary condition for the calibration point (e.g. a force sensor with a known mass hanging from it). Monitor the displayed Potential (V). When the value is stable, select **Keep**.



6. Enter the known value for the calibration condition (e.g. 1.96 N for a 200 g mass), and select **OK**.



7. The Sensor Calibration screen will be displayed with your new calibration slope and intercept values. Select **(OK)** to return to the Sensor Setup screen, and then select **(OK)** again to return to the main screen.



# Manually Setting up a Sensor

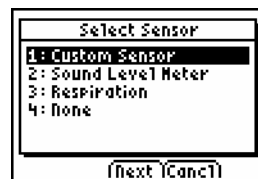
When using a non Auto-ID sensor, it is necessary to set up the sensor manually before data can be collected. The procedure for setting up a sensor is slightly different depending on the type of connector found on the sensor. Analog sensors (most sensors) connect to one of the analog ports found on the left side of the LabPro or CBL 2, or to the EasyLink. Digital sensors (photogates and drop counters) connect to the digital ports found on the right side of the LabPro or CBL 2. Follow the appropriate directions below to manually set up a sensor.

## Analog Sensors

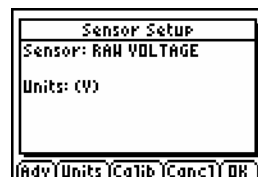
1. From the EasyData main screen, select (Setup), and then select **Other Sensors....**



2. The Select Sensor screen is displayed. Choose **Custom Sensor**, and then select (Next).



3. Raw Voltage is displayed as the default sensor setup. Select (Adv) to edit the sensor setup.



4. Press **CLEAR** to clear the long sensor name. Type in the name of the custom sensor, then select **Next**.

Long Sensor Name  
Enter a long name.  
14 characters or less.  
TEMPERATURE  
(Back) (Next) (Cancel)

Press **CLEAR** to clear the short sensor name. Type in the short name of the custom sensor, then select **Next**.

Short Sensor Name  
Enter a short name.  
7 characters or less.  
TEMP  
(Back) (Next) (Cancel)

Press **CLEAR** to clear the sensor unit. Type in the unit of measurement for the custom sensor, then select **Next**.

Sensor Units  
Enter a name for units.  
6 characters or less.  
(C)  
(Back) (Next) (Cancel)

5. If the sensor requires a special warm-up period, press **CLEAR** to clear the old warm-up time and type in the new value, then select **Next**. **Note:** if you are unsure about a warm-up time, enter a value of 1.

Sensor Warmup Time  
Enter a warmup time in  
seconds. 0 to 999.  
1  
(Back) (Next) (Cancel)

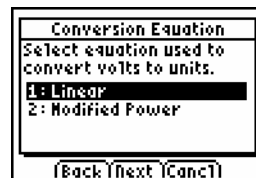
6. The Displayed Decimal Places screen is displayed. Choose the number of decimal places to display sensor readings, then select **Next**.

Displayed Decimal Places  
1: 1  
2: 2  
3: 3  
4: 4  
5: 5  
(Back) (Next) (Cancel)

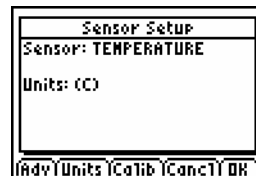
7. From the Sensor Signal Type screen, choose the type of sensor being set up and then select **Next**. **Note:** most sensors are 0-5 Volt.

Sensor Signal Type  
Select the type of signal  
used by this sensor.  
1: 0-5 Volt  
2: +/-10 Volts  
(Back) (Next) (Cancel)

- From the Conversion Equation screen, choose the type of calibration equation to be used and then select **(Next)**. **Note:** most sensors use a linear calibration equation.



- The Sensor Setup screen is displayed with updated information pertaining to the custom sensor. Select **(OK)** to return to the main screen.

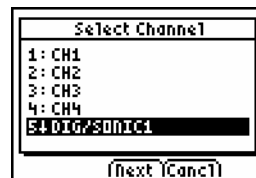


## Digital Sensors

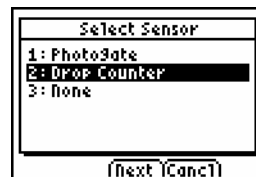
- From the EasyData main screen, select **(Setup)**, and then select **Other Sensors...**



- The Select Channel screen is displayed. Choose **DIG/SONIC**, and then select **(Next)**.



- The Select Sensor screen is displayed. Choose either **Photogate** or **Drop Counter**, and then select **(Next)**.



The main screen is displayed with updated information pertaining to the custom sensor.



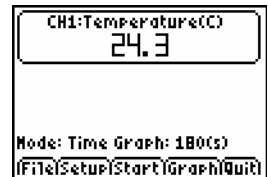
# Data Collection Triggering

In most cases, data collection is initiated by selecting **Start**. Another option is to set up triggering. There are two methods of triggering available, (1) software trigger and (2) manual trigger. Triggering can only be set when collecting data with a LabPro, CBL 2, CBR, or CBR 2. The EasyLink and EasyTemp do not support triggering.

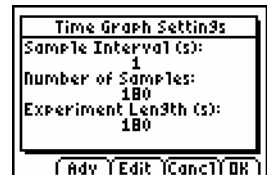
## Software Triggering

In software triggering, you choose a measurement reading that will trigger data collection, e.g. when the temperature is increasing and reaches a value of 28°C. Follow these steps to set up a software trigger.

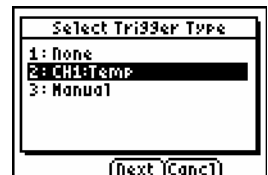
1. From the EasyData main screen, select **Setup**, and then select **Time Graph...**



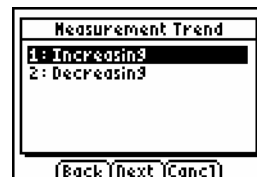
2. The current **Time Graph** settings are displayed. Select **Adv**.



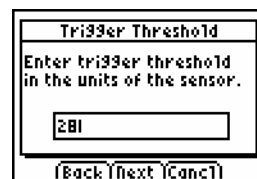
3. The Select Trigger Type screen is displayed. Choose the appropriate channel, e.g. **CH1**, and select **Next**.



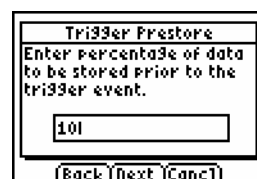
- The Measurement screen is displayed. Choose whether triggering should occur when the readings increase or decrease (**Increasing** or **Decreasing**), and select **(Next)**.



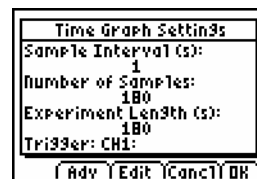
- The Trigger Threshold screen is displayed. Press **(CLEAR)** to clear the old threshold and type in the new value, then select **(Next)**. **Note:** trigger threshold is the sensor reading, e.g. 28 for 28°C, that will trigger data collection.



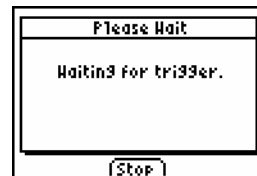
- The Trigger Prestore screen is displayed. Press **(CLEAR)** to clear the old prestore and type in the new value, then select **(Next)**. **Note:** trigger prestore is the percentage of all data collected before the trigger level is reached, e.g. 10 for 10%.



- The updated Time Graph Settings are displayed. Select **(OK)** to return to the main screen.



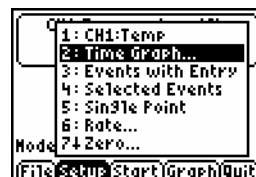
- EasyData is now set for triggering. When **(Start)** is selected, data collection will not begin until the set trigger value is met



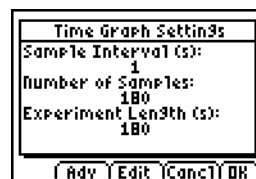
## Manual Triggering

In manual triggering, data collection starts when the Start/Stop or Trigger button on the data-collection device (LabPro, CBL 2, CBR, or CBR 2) is pressed. Follow these steps to set up for manual trigger.

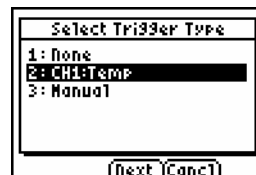
1. From the EasyData main screen, select **Setup**, and then select **Time Graph...**



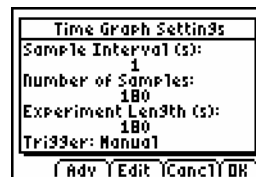
2. The current **Time Graph** settings are displayed. Select **Adv**.



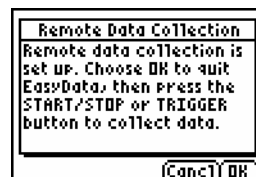
3. The Select Trigger Type screen is displayed. Choose **Manual** and select **Next**.



4. The updated Time Graph Settings are displayed. Select **OK** to return to the main screen.



5. EasyData is now set for triggering. Select **Start** and follow the on-screen instructions when you are ready to start data collection.





## **Appendix A:**

### **Frequently Asked Questions (EasyData FAQs)**

**Q:** May I disconnect a data collection device during data collection safely?

**A:** No, disconnecting a data collection device such as CBR 2™ sonic motion detector, CBL 2™ system, or Vernier EasyTemp™ will result in loss of collected data using EasyData App.

---

**Q:** What is the recommended amount of calculator RAM memory for use with the EasyData App.

**A:** TI and Vernier recommend that you have at least 5000 bytes of free RAM in your calculator

---

**Q:** Can EasyData App be transferred between calculators?

**A:** EasyData can be transferred between TI-84 family calculators and TI-83 Plus calculators. EasyData can not be transferred to TI-89s, TI-73s, TI-86, TI-83, TI-82, Voyage 200, TI-92, TI-92 Plus.

---

**Q:** What Vernier sensors am I unable to use with EasyData and CBL 2 and LabPro?

**A:** Blood pressure, Rotary Motion, Radiation

---

**Q:** What Vernier sensors am I unable to use with EasyData and the EasyLink interface?

**A:** Blood pressure, Rotary Motion, Radiation, Microphone, CO<sub>2</sub>, Photogate

---

**Q:** Can I capture screen shots of EasyData App using TI Connect software or TI-Navigator?

**A:** Yes, but only when the App is not actively collecting data (while monitoring on the EasyData main screen, or during a real-time graph or active data collection).

---

**Q:** Why when I select one point for statistics calculations, does it calculate with two points?

**A:** The select region and statistics features will select 2 points even if you chose the same point for the left and right boundaries. If you choose a point previous to the last point, the feature will add the point immediately to the right. If you choose the last point, the feature will add the point immediately to the left.

---

---

**Q:** Why will Photogate Auto-ID with LabPro and not with CBL 2?

**A:** The firmware of LabPro will allow this to occur and the firmware for CBL 2 will not. With CBL 2, you may set up the photogate sensor in the Other Sensors menu.


---

**Q:** I am trying to use TI Connect for Mac® to view my calculator directory while I am connected to a sensor and in EasyData App, why am I not able to view the calculator directory?

**A:** The calculator can only communicate with one device at a time. So, while connected to a sensor and actively reading data, and while you are in the App, you can not view the calculator directory. Also, you may have to restart TI Connect for Mac to view the calculator directory after leaving the App. With that being said, when the App is not actively collecting data while monitoring on the EasyData main screen, or during a real-time graph or active data collection, you can capture a screenshot.

---

**Q:** Why won't my calculator respond to any key presses?

**A:** Under certain conditions the application may appear to be locked up and stop responding to any key presses. The calculator is stuck in a failed attempt to communicate with a data-collection device. Press  a few times to get the device out of this situation.

---

**Q:** Why does EasyData miss my key presses?

**A:** The calculator operating system will miss quick key presses if it is busy communicating with a data-collection device. With more active communication comes the increased likelihood of missed key presses, particularly if the key is quickly pressed and released. Press and briefly hold the key down until the expected action occurs.

---

**Q:** Can EasyData communicate with multiple data-collection devices simultaneously?

**A:** No. Whenever EasyData first starts, it scans for devices connected to the USB port (if a USB port is present). If nothing is found it then scans for devices connected to the I/O port. EasyData will always find the device connected through the USB port first.

---

**Q:** Why aren't all data-collection modes available for all sensors?

**A:** Not all modes are compatible with every sensor. Only the modes that are compatible with the detected sensor will appear.

---

---

**Q:** Why can't I calibrate my sensor?

**A:** Not all sensors can be calibrated using the same calibration routine. The available calibration modes are determined by the detected sensor.

---

**Q:** Why does my calculator use up batteries so quickly?

**A:** The calculator is using battery power any time it is turned on. An application such as EasyData puts an added load on the batteries when it communicates with a connected data-collection device. USB devices like the EasyTemp and EasyLink draw all of their power from the calculator's batteries. In addition, there are some sensors that put an even greater strain on the batteries.

---

**Q:** Why doesn't EasyData work with my CBR 2?

**A:** When used with a TI-83 Plus or TI-84 Plus calculator, the CBR and CBR 2 must be powered by a strong set of batteries. If you are experiencing problems, replace the batteries in the CBR or CBR 2.

---

**Q:** Why doesn't EasyData automatically launch when I connect my EasyTemp or EasyLink?

**A:** Connecting a USB data-collection device will only start EasyData if the calculator is on the home screen.

---

**Q:** Why isn't my salinity sensor working with EasyData and an EasyLink?

**A:** Some older Vernier Salinity Sensors may not be properly identified by EasyData. To avoid this problem, start EasyData and wait until the main screen appears before connecting the sensor.

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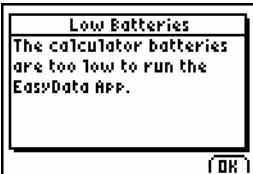
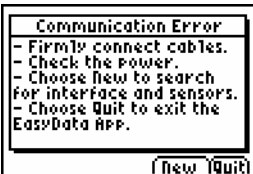
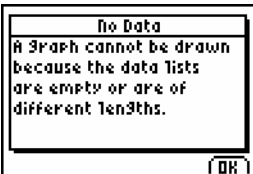
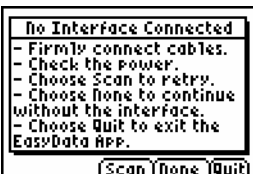
**Q:** Why does my calculator turn off while I am running EasyData?

**A:** In order to prolong the life of the calculator batteries, EasyData will automatically power down (APD) the calculator in times of inactivity. If no keys are pressed and data collection is not currently active, the calculator will power down after approximately 5 minutes. The calculator will never be allowed to power down during Two Point Calibrations, Events with Entry and Selected Events data collection, Zeroing or when waiting for a Trigger or digital event.

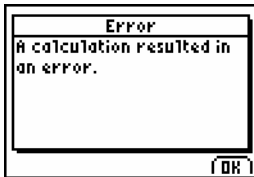
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## Appendix B: Error Messages

The table below has been included to provide a helpful explanation of the error messages that may be encountered while using EasyData.

Message	Description
 <p>The calculator batteries are too low to safely run EasyData.</p> <p>Select <b>(OK)</b> to return to the home screen. Replace the batteries before starting the EasyData app again.</p>	<p>The calculator batteries are too low to safely run EasyData.</p> <p>Select <b>(OK)</b> to return to the home screen. Replace the batteries before starting the EasyData app again.</p>
 <p>The application failed in attempting to communicate with the connected data-collection device.</p> <p>Make sure all cables are properly connected and the data-collection device has power.</p> <p>Selecting <b>(Quit)</b> will exit EasyData. Selecting <b>(New)</b> will erase all settings, data, and search for an interface.</p>	<p>The application failed in attempting to communicate with the connected data-collection device.</p> <p>Make sure all cables are properly connected and the data-collection device has power.</p> <p>Selecting <b>(Quit)</b> will exit EasyData. Selecting <b>(New)</b> will erase all settings, data, and search for an interface.</p>
 <p>The default or requested plot cannot be shown because one or more of the lists involved is empty or the lists involved are of different lengths. All involved lists must contain at least a single data point and be of the same length.</p> <p>Collect some data, fill the lists with data outside of EasyData, or load data from a saved experiment.</p>	<p>The default or requested plot cannot be shown because one or more of the lists involved is empty or the lists involved are of different lengths. All involved lists must contain at least a single data point and be of the same length.</p> <p>Collect some data, fill the lists with data outside of EasyData, or load data from a saved experiment.</p>
 <p>The calculator could not establish a valid connection to a data-collection device.</p> <p>Make sure all cables are properly connected and the data-collection device has power, then select <b>(Scan)</b>.</p> <p>Selecting <b>(Quit)</b> will exit EasyData. Selecting <b>(None)</b> will start the application with no interface connected.</p>	<p>The calculator could not establish a valid connection to a data-collection device.</p> <p>Make sure all cables are properly connected and the data-collection device has power, then select <b>(Scan)</b>.</p> <p>Selecting <b>(Quit)</b> will exit EasyData. Selecting <b>(None)</b> will start the application with no interface connected.</p>

Message	Description
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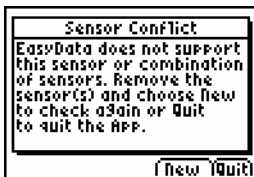
The application encountered an error while performing the requested calculation. Some common reasons for this error:

A Power curve fit was performed, but not all x and y values are greater than zero.

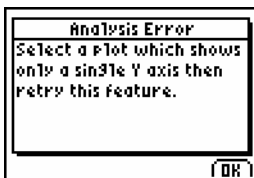
An Exponential curve fit was performed, but not all y values are greater than zero.

A two-point calibration was performed, but the reference entered or measured voltage was invalid. Perform the calibration again, making sure the reference and voltage values are distinct.

A statistics or integral calculation resulted in a divide by zero error. Collect another data set and repeat the calculation.

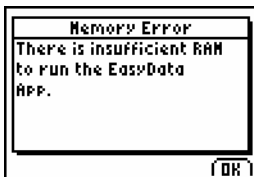


Either the connected data collection device or sensor is not supported by EasyData, or the sensor combination is invalid.



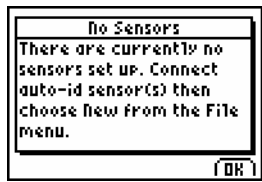
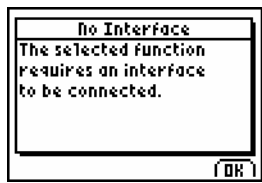
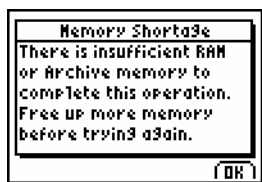
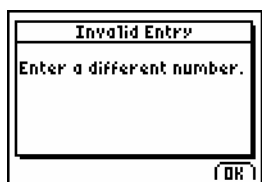
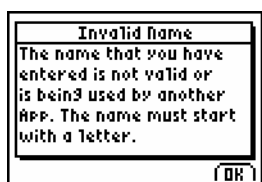
EasyData cannot perform the selected analysis feature based on the displayed graph.

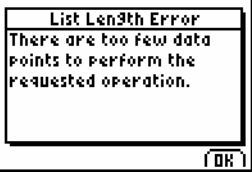
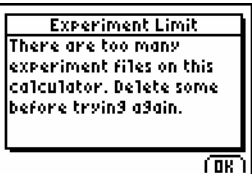
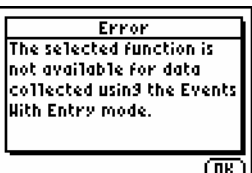

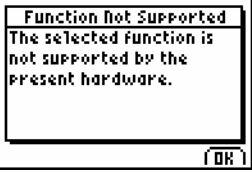
Select **[Plots]** or **[Adv]** to display a graph which shows only a single dependent variable on the Y-axis, then attempt the analysis again.

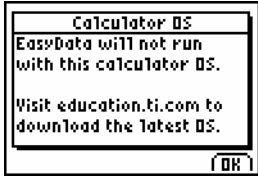
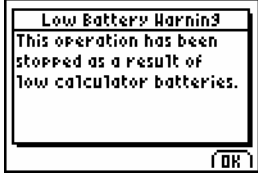
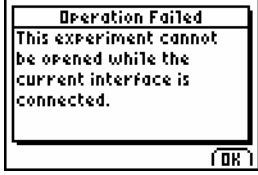
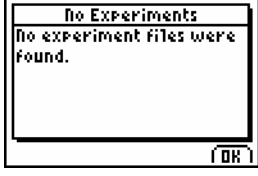
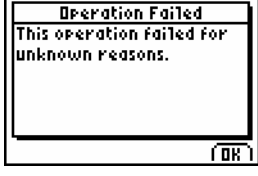


A minimum of 1600 bytes of free RAM is required to start the EasyData application.

Select **[OK]** to exit EasyData. Free up RAM by deleting or archiving programs, lists, matrices, and other calculator variables before restarting the application.

Message	Description
 <p>The screenshot shows a dialog box titled "No Sensors". The text inside reads: "There are currently no sensors set up. Connect auto-id sensors) then choose New from the File menu." At the bottom right, there is an "OK" button.</p>	<p>EasyData cannot perform the selected operation unless a sensor is set up.</p> <p>Select <b>(OK)</b> and either connect an Auto-ID sensor or select <b>(Setup)</b> and choose <b>Other Sensors</b> to set up a sensor manually.</p>
 <p>The screenshot shows a dialog box titled "No Interface". The text inside reads: "The selected function requires an interface to be connected." At the bottom right, there is an "OK" button.</p>	<p>EasyData cannot perform the selected operation unless a data-collection device is connected.</p> <p>Select <b>(OK)</b> and perform one of the following:</p> <p>Connect a data-collection device. Select <b>(File)</b> and choose <b>New</b>.</p>
 <p>The screenshot shows a dialog box titled "Memory Shortage". The text inside reads: "There is insufficient RAM or Archive memory to complete this operation. Free up more memory before trying again." At the bottom right, there is an "OK" button.</p>	<p>There is insufficient calculator memory available to complete the requested operation. Managing experiment files uses free archive memory and/or RAM.</p> <p>Select <b>(OK)</b> to exit EasyData. Free up RAM by deleting lists, matrices, and other calculator variables. Free up Archive by deleting other applications. Restart EasyData when memory has been freed up.</p>
 <p>The screenshot shows a dialog box titled "Invalid Entry". The text inside reads: "Enter a different number." At the bottom right, there is an "OK" button.</p>	<p>The number entered is invalid.</p> <p>Select <b>(OK)</b> and enter a valid number.</p>
 <p>The screenshot shows a dialog box titled "Invalid Name". The text inside reads: "The name that you have entered is not valid or is being used by another App. The name must start with a letter." At the bottom right, there is an "OK" button.</p>	<p>Experiment names must start with a letter and cannot share a name with an existing file (appVar) that was created by another application.</p> <p>Select <b>(OK)</b> and enter a different, valid experiment name.</p>

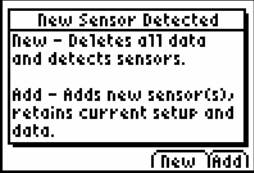
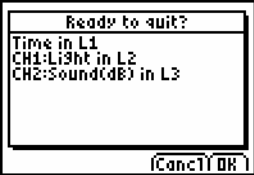
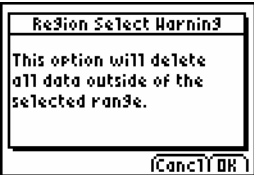

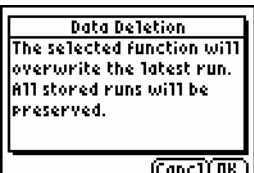
Message	Description
	<p>The requested analysis feature requires more data points than are available in the plotted lists. Quadratic curve fits require a minimum of 3 data points. All other analysis features require a minimum of 2 data points.</p> <p>Select <b>OK</b> and collect more data points before repeating analysis.</p>
	<p>There are 50 experiments already saved on the calculator.</p> <p>Select <b>OK</b>. From the main screen, select <b>File</b> and choose <b>Delete...</b> Select old experiments to delete before attempting to save an experiment again.</p>
	<p>The Select Region, Statistics, and Integral function cannot be performed on data collected using the Events with Entry data-collection mode. These functions require well-ordered, independent data to succeed.</p>
	<p>The Store Run feature is not available when there is more than one sensor or the connected sensor is in a channel other than CH1.</p>
	<p>Advanced triggering features are only available when using a LabPro, CBL 2, CBR or CBR 2.</p>

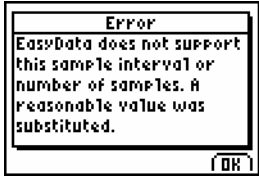
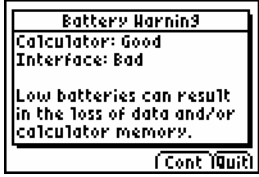
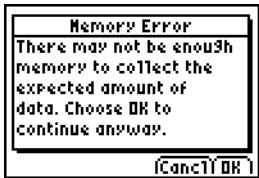
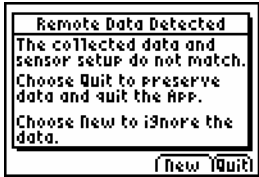
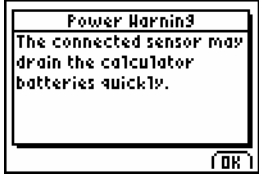
Message	Description
	<p>The minimum calculator OS that will support EasyData is TI-84 Plus OS 2.30 or TI-83 Plus OS 1.16.</p> <p>For the latest calculator OS updates, visit <a href="http://education.ti.com">education.ti.com</a>.</p>
	<p>The calculator or CBR 2 batteries are too low to continue. All data collected has been preserved.</p> <p>Select <b>OK</b>, then select <b>Quit</b> from the main screen. Replace the batteries in your data-collection device and then restart EasyData.</p>
	<p>The selected experiment was saved using a data-collection device different than the connected device and the file cannot be safely opened.</p> <p>Connect the appropriate device or no device at all, and then try to open the experiment again.</p>
	<p>No experiment files were found in calculator memory.</p> <p>Save files to the calculator, or transfer files from another calculator before trying to open experiments.</p>
	<p>The selected experiment failed to open due to data corruption.</p> <p>Delete the corrupted experiment from calculator memory to prevent future problems.</p>

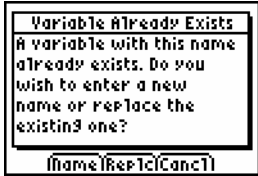

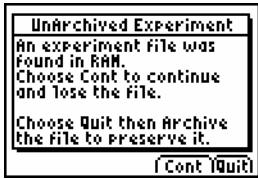
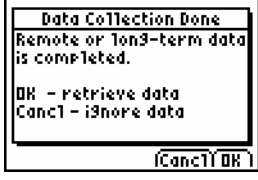
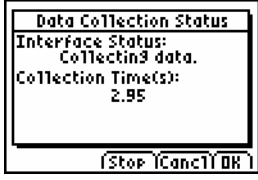


# Appendix C: Warning Messages

The table below explains the purpose and meaning of messages that may be encountered while using EasyData.

Message	Description
	<p>A new Auto-ID sensor has been detected.</p> <p>Select <b>(New)</b> to delete all setup information, data, and scan for new sensors.</p> <p>Select <b>(Add)</b> to add the detected sensor while preserving all existing data and setup information.</p>
	<p>The application has stored all collected data in the calculator lists shown.</p> <p>Select <b>(OK)</b> to exit EasyData.</p> <p>Selecting <b>(Cancel)</b> to return to the EasyData main screen.</p>
	<p>The Select Region function deletes all data outside of the area selected. All data lists will be affected.</p> <p>Select <b>(Cancel)</b> to abort this function and preserve data.</p> <p>Select <b>(OK)</b> to perform the Select Region function and delete all data outside the selection.</p>
	<p>EasyData has detected existing data which will be overwritten by the requested data collection.</p> <p>Select <b>(Cancel)</b> to return to the main screen and preserve the data.</p> <p>Select <b>(OK)</b> to continue and overwrite existing data.</p>
	<p>Existing data has been detected and will be overwritten by the requested data collection. Stored data runs will be preserved.</p> <p>Select <b>(Cancel)</b> to return to the main screen and preserve the data.</p> <p>Select <b>(OK)</b> to begin and overwrite data not stored.</p>

Message	Description
	<p>The sample interval or # of samples entered is not supported by the current hardware/software combination. The closest, acceptable value has been substituted.</p>
	<p>Either the connected data collection device or calculator is running low on batteries. It is recommended that the batteries be replaced.</p> <p>Select <b>(Cont)</b> to ignore this warning and continue. A loss of data may result.</p> <p>Select <b>(Quit)</b> to exit EasyData. Replace the batteries before restarting EasyData.</p>
	<p>There is less than 5000 bytes of free RAM available to store data.</p> <p>Select <b>(OK)</b> to proceed with data collection and run the risk of not collecting all requested data points.</p> <p>Select <b>(Cancel)</b> to return to the main screen. Select <b>(Quit)</b> to exit EasyData and free up more RAM.</p>
	<p>The calculator and connected data-collection device do not share a remote data collection configuration. When remote or long-term data collection is started, EasyData assigns a unique ID to both devices. Only the calculator and data-collection device that share the same ID can be used to retrieve the data.</p> <p>Select <b>(New)</b> to ignore the collected data and continue. Collected data will be erased.</p> <p>Select <b>(Quit)</b> to quit EasyData. Connect the calculator to the correct data-collection device and restart EasyData.</p>
	<p>The sensor currently connected consumes battery power at a higher rate than most sensors.</p>

Message	Description
	<p>The experiment name entered already is in use.</p> <p>Select <b>(Name)</b> and enter a different experiment name.</p> <p>Select <b>(Replc)</b> to overwrite the existing experiment with the new file.</p> <p>Select <b>(Cancel)</b> to return to the main screen.</p>
	<p>Select <b>(Yes)</b> to permanently delete the experiment file.</p> <p>Select <b>(No)</b> to preserve the selected experiment and return to the main screen.</p>
	<p>An experiment file was found in the calculator RAM. This may be the result of limited archive memory. EasyData experiments must be in the calculator's archived memory to be properly opened.</p> <p>Select <b>(Cont)</b> to delete the experiment and continue.</p> <p>Select <b>(Quit)</b> to exit EasyData. Move the experiment file to archive memory before restarting EasyData. Make room in memory as necessary.</p>
	<p>The connected data-collection device has completed the requested remote or long-term data collection.</p> <p>Select <b>(Cancel)</b> to ignore the data and continue running EasyData. Collected data will be erased.</p> <p>Select <b>(OK)</b> to retrieve the data to the calculator.</p>
	<p>The current data-collection device is currently collecting or configured to collect remote or long-term data. Interface status and elapsed time are displayed.</p> <p>Select <b>(Stop)</b> to halt data collection and retrieve already collected data.</p> <p>Select <b>(Cancel)</b> to stop data collection and reset the data-collection device. Collected data is deleted.</p> <p>Select <b>(OK)</b> to quit Easydata and continue data collection. Restart once data collection has finished.</p>