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Compatibility

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<th>Computer:</th>
<th>iPad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Loggers</td>
<td>EasySense VISION WiFi</td>
</tr>
<tr>
<td></td>
<td>EasySense V-Log 4 WiFi</td>
</tr>
<tr>
<td></td>
<td>EasySense V-Log 8 WiFi</td>
</tr>
</tbody>
</table>

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To begin – the Home screen

To connect to a data logger

1) Ensure the iPad is connected to the same network as the data logger (Settings, WiFi).
2) Start the EasySense App on the iPad.
3) Tap on the status button ‘Not Connected’ on the bottom right of the screen.
4) Select the data logger from the list. The status button will change to show that it is ‘Controlling xx or Viewing xx’.

The first iPad that connects to a data logger becomes the Controller and has access to set up a new recording and start and stop logging. Subsequent iPads that connect have Viewing rights only.

Note: If you select the status button while it shows Controlling or Viewing xx, it will automatically disconnect the logger.
Graph

To begin recording, simply tap on the Start icon. During logging the icon will show a square. Tap on this icon to stop data being recorded before the selected duration has passed.

If you want to repeat the last experiment (clear data but keep all the settings the same) simply tap on the Start icon again.

If you want to graph a new set of data, without the previous set of data being erased, select Overlay from the Options menu before you select Start.

New recording

Select the New icon to set up a new investigation e.g. to change logging mode, duration of a recording, or to identify a change of sensors or change a sensor’s range.
Sensors – use to deselect any sensors from which readings are not required or to change a sensor’s range.

Choose your mode of logging

- **Test Mode** - use to establish the sensor/s current value.

- **EasyLog** - pre-set to record sensor values **continuously** as a line graph until stopped.
  
  With EasyLog selected tap on Done.

  To begin recording select the Start icon >. Logging will start with a time span of 30 seconds and when it has elapsed the time span will double automatically. This will continue until the recording is stopped by selecting the Stop icon ■.

- **Snapshot** - pre-set to record sensor values on demand (**manual sampling**) with a bar graph display.
  
  With Snapshot selected tap on Done.

  To begin recording select the Start icon >. Tap within the graph area to collect a sample. Select the Stop icon ■ to finish

  If you select the Start icon again you will be given the option to add the new readings to the end of the existing data (if No is selected the existing data will be deleted).

- **Manual** - use to record sensor values against a chosen time span as a line graph display. Choose the time span, interval between samples, start condition and trigger for the recording to start.
Select the Start condition required for the recording to start.

Select ‘None’ for recording to begin as soon as you tap on the Start icon.

Select ‘On Level’ to delay the start until a set condition is reached. Select:
- The trigger sensor
- Whether the value should be above, below, rises above or falls below
- Enter the sensors trigger value

If a FAST recording time (interval less than 20 ms) and trigger on level is selected then pre-triggers will become available.

Pre-triggers allow a percentage of samples to be stored before the trigger condition is met and the remainder to be taken afterwards.

For example, if 1,000 readings are to be taken and a 25% pre-trigger is selected, 249 readings will be taken before the trigger condition is met and 750 on and after the trigger.

Note: Sufficient time must be allowed to elapse for pre-trigger samples to be taken.

Select Done.

Select the Start icon ►. Recording will start when the start condition you have selected is met. The recording will stop when the selected time span has passed.

Notes:
- If the interval is less than 20 ms then the recording will be in FAST mode and there will be no screen display of the data until the recording ends.
- If the interval is greater than 20 ms with a trigger level selected, a ‘Waiting for trigger...’ message will appear at the bottom of the graph. When the trigger condition is reached the recording will begin.

Select the Stop icon ■ to stop data being recorded before the selected duration has passed.
Timing - New Recording

Timing is used to handle data from switch-type sensors such as Light gates and Timing mats. Measurements can be taken from either a single sensor connected to Input A, or from two sensors connected to both Input A and B.

Select the New icon to set up a new investigation. To perform calculations for Speed/Velocity, Acceleration, Distance, Momentum and Kinetic Energy, select the type and size of apparatus used in an experiment. Choices are:

<table>
<thead>
<tr>
<th>Time</th>
<th>Apparatus</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>from A to B</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>from A to A e.g. Stopwatch</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>at A or B</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>at A then B</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>period at A e.g. Pendulum</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed /Velocity</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td></td>
<td>Double interrupt card</td>
</tr>
<tr>
<td></td>
<td>Picket fence</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulley</td>
</tr>
<tr>
<td>from A to B</td>
<td></td>
</tr>
<tr>
<td>at A or B</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td>at A then B</td>
<td>Single interrupt card</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td>Picket fence</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulley</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acceleration</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td>Double interrupt card</td>
</tr>
<tr>
<td></td>
<td>Picket fence</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Pulley</td>
</tr>
<tr>
<td>at A or B</td>
<td>Double interrupt card</td>
</tr>
<tr>
<td>from A to B</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td>at A then B</td>
<td>Double interrupt card</td>
</tr>
<tr>
<td>change from A to B</td>
<td>Double interrupt card</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Momentum and Kinetic Energy</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td></td>
<td>Double interrupt card</td>
</tr>
<tr>
<td></td>
<td>Picket fence</td>
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<tr>
<td></td>
<td>Pulley</td>
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<tr>
<td>at A or B</td>
<td>Single interrupt card</td>
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<tr>
<td>from A to B</td>
<td></td>
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<tr>
<td>at A then A</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td>change from A to A</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td>at A then B</td>
<td>Single interrupt card</td>
</tr>
<tr>
<td>change from A to B</td>
<td>Single interrupt card</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Raw Times (interrupt edge times)</th>
<th>Measurement to enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>at A</td>
<td></td>
</tr>
<tr>
<td>at A or B</td>
<td></td>
</tr>
</tbody>
</table>
Step 1: Select the New recording icon.

Step 2: Tap on the Timing type row.

Step 3: Tap on the Apparatus row (Not required for Time investigations).

Step 4: Select the type of apparatus being used.

Step 5: Select the Single Interrupt.

Step 6: Select Display options if you want to alter the number of decimal, units of measurement or columns of data displayed.

Step 7: Scroll to select the measurement required for calculation and its unit.

Step 8: Select Back if you want to alter the display options or Done to finish.

Step 9: Select the New recording icon.
Analysing captured data

The **Tools** menu has a number of Analysis tools to study the captured data. Some of these tools will not be available while in Snapshot or Timing mode.

**Values (All modes)**

The **Values** at this marker point is shown in the data boxes and highlighted in the table.

Drag the marker to select a data point.

(10) Tap on a row to open the choices available.

(11) Make your choice then either select **Back** to make further changes or **Done** to Finish.
**Interval/ Difference (EasyLog, Manual & Timing mode)**

The Difference between the data at these two points is shown here.

The Gradient for the data between the two markers is shown here.

The Gradient line indicates the slope for whichever sensor is selected on the Y-axis.

Drag the 2 markers to choose the points.

The Gradient for the data between the two markers is shown here.

To alter the sensor displayed on this axis, tap in the area left of the axis and select.

This should be done before you select the Gradient tool.

Drag the markers to choose two points.

The time elapsed between the two points is shown here.

The Difference between the data at these two points is shown here.

**Gradient (EasyLog, Manual & Timing mode)**

This feature calculates the rate of change of data. A positive gradient shows that values are increasing – the larger the gradient, the faster the change.
**Area (EasyLog & Manual mode)**

This feature is used to calculate and display the area under a chosen section of the graph. The calculation for area is performed on the data from all channels. The units correspond to the product of the Y and X-axis.

To alter the sensor displayed on this axis, tap in the area left of the axis and select *This should be done before you select the Area tool*.

*Drag the markers, shading lines will mark the section under the graph for whichever sensor is selected on the Y-axis.*

**Statistics (EasyLog, Manual & Timing mode)**

Calculates and displays statistical information about the data collected from the data channel currently selected on the Y-Axis.

- **Maximum:** the highest value
- **Arithmetic Mean and SD (standard deviation)** – the scatter of a series of measurements about their mean value
- **Minimum:** the lowest value
Best Fit Line *(EasyLog, Manual & Timing mode)*
Automatically calculates and draws a linear best fit through the data at the two points selected for the data channel currently selected on the Y-Axis.

\[ y = (mx + c), \quad r^2 \]

- \( y \) = the data channel selected
- \( x \) = how far along (i.e. time or reading number)
- \( m \) = the constant of the slope (gradient between two points)
- \( c \) = the \( y \) axis intercept

\( r^2 \) = the coefficient of determination and is a measure of goodness of fit e.g. when \( r^2 \) equals 1.0, all points lie exactly on a straight line with no scatter.

Displaying data

**Title, Zoom, Y-Axis sensor choice**

To alter the sensor displayed on this axis, tap in the area left of the axis and select *This option will not be available while an Analysis tool is in use*

**Zoom** - To magnify an area so that it can be seen in greater detail, pinch two fingers and move apart to zoom in or pinch together to zoom out on both the X and Y axis. To expand the magnified area further, repeat the above.
Double tap to switch zoom OFF and return to the original graph.
Show/Hide sensor, Autoscale, Sensor settings, Scale sensors *(EasyLog, Manual & Snapshot mode)*

- Tap in a data value box.
- Deselect to hide this sensor’s graph line from view.
- Applies Auto scale to the data collected using a minimum value of zero and maximum being the limit.
- If the scale of an axis is too large or small, tap here to alter the minimum and maximum limits manually.
- Apply the same scale to any other of the same type sensor connected.

**Data Value boxes**

The value recorded by a sensor is displayed in a data box. The colour used in a data value box corresponds to the colour of the plotted line and the y-axis label on the graph.

**Grid, Overlay**

- Select Grid to mark the graph area with a faint grating.
- With Overlay selected a new set of data can be added to the graph without the previous set of data being erased - useful for repeating an experiment to compare data.
  - **Note:** Not available in Timing mode

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Line or Bar graph
If Line is selected individual readings are joined by a line, the thickness of which can be varied. If Points is selected then each reading will be marked by a cross. Line is selected by default when the mode of collection is EasyLog or Manual.
If Bar is selected then readings will be shown as bars of colour. Bar is selected by default when the mode of collection is Snapshot or Timing mode.
The option to change from a line to a bar graph or vice versa will not be available until after data has been collected.

X-Axis
Tap in the space below the graph area to cycle through the options available for display on the X-axis.
1. **Time** - select between:
   - Seconds - elapsed time (from zero until that point) in seconds [ Time (s) ],
   - Time - elapsed Time in days, hours, minutes, seconds and milliseconds [ Time (s), (m:s), (h:m:s), (d.h:m:s) ].
   - Absolute Time – clock time for the duration of the recording [ Absolute Time (h:m:s), (d.hh:m:s.ms) ].

2. **Reading Number**

The Table display
When the iPad is landscape the graph area will automatically fill the window. To expose the table rotate the iPad to portrait.
Drag in the table area to scroll the data.
When the Values tool is used, data selected on the graph will be highlighted in the table and vice versa.

Show Columns *(Timing mode only)*
To show data used to calculate the final result select Show Columns from the Options menu in Timing. Select any columns you would like displayed from the list. The columns available will vary depending on the Timing mode selected.

Show Data As *(Timing mode only)*
Data can be recalculated in another form without having to repeat an experiment using Show Data As from the Options menu in Timing. Select how you want to show the current data and enter any measurements required for the calculation. E.g. recalculate Distance data collected using a picket fence to show Speed.

Delete a Value *(Timing mode only)*
Tap and hold on the appropriate reading in the graph area, and select Delete.
Changing a sensor’s range *(Graph mode only)*

Some **Smart Q** sensors have multiple ranges e.g. a Light Level sensor. The way to change a sensor’s range to one more suitable for an experiment is:

1. **Select the New recording wizard icon**
2. **Tap on the Sensors row**
3. **Tap on the row that contains the sensor’s name**
4. **Select the required range from the list and then Back**

**Retrieve**

Select **Retrieve** from Graph or Timing mode to retrieve stored data from a logger.

A dialog box will open showing a list of the saved data files stored in the data logger’s memory, tap on a file to open.

Retrieved data can be used in the same way as real-time data i.e. it can be analysed, saved and printed.

**Share button**

**Email, Print, Open in**

If your iPad is connected to a network with Internet access you can email your data file or screenshot anywhere as an attachment. Open in EasySense on iPad, Mac or PC.

Use to print out a copy of the current graph to an available AirPrint-enabled printer.

Open in a third-party app on the iPad (files will be in a SSL format). Use this to save to Dropbox, etc.

Open in a third-party spreadsheet app (files will be in a CSV format). Use this for Numbers, etc.
File options

Open file
To load previously saved data files select the Open icon or select Open from the Home screen.
Open the appropriate folder and the tap on a file to open.

Delete file
Locate the file then either
1. Swipe the file to the left and select Delete.
2. Select Edit (top right), then select the file, then Delete (bottom right).

Saving files
Data is auto-saved within the program. The file name auto-defaults to the creation date & time.

File name
Locate the file (default name is the creation date & time) then swipe the file to the left and select Rename. Type in a new name and select Save.

Folder name
1. Locate the folder (default name is the creation date).
2. Select Edit (top right), then select the folder.
3. Type in a new name and select Save.

Delete folder
1. Locate the folder.
2. Select Edit (top right), then select the folder.
3. Select Delete Folder.
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Definitions
The following expressions have the meanings given here:

- ‘DHG’ means Data Harvest Group Limited, being owner of all intellectual property rights in the Software

- ‘Documentation’ means both printed and electronic user documentation.

- ‘Software’ means the program supplied.

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