

Fitting data with Logger Pro

1. If you are going to view and analyze data from a data file you need to
 - (a) Generate a delimited text file (from LabVIEW, a text editor, Excel, or some other spreadsheet application) with the x values in the first column and the y values in the second column. You can also include the uncertainties in the y values in the third column.

Note: the ordering of the columns is not critical but the instructions below will have to be modified according to the way you order the columns in your file.

The default tab delimiter in LabVIEW is a reasonable choice, but a comma delimiter will also work. If you save the data from Excel be sure to write it as either a **Text (tab delimited)** or a **CSV (comma delimited)** file.
 - (b) Start Logger Pro.
 - (c) Select **File** along the top bar, then **Open**, then find your data file and open it. You will likely need to change the **Files of type** entry to **All Files**. Importing a delimited file as a text file is usually successful even though Logger Pro will say that it is an incompatible file format.
2. If you are using “generate” values you need to
 - (a) Select **Data** along the top bar, then **New Manual Column** for a column that will contain entered values. You should give the column a meaningful name, units, and short name (**short nm**) since these are used in generating labels on the graphs.

The most useful part of this particular option is that you can automatically generate a column of values.
 - (b) If you need a column that is calculated from another column, select **Data** and **New Calculated Column** where you can specify a column name, the units, and a short name as well. But, most importantly, you specify the formula to calculate the values in the column. Note that you can select the desired column name from the drop-down box at the bottom to simplify writing the formula.
3. If your values for the x -axis are not in ascending order you need to select **Data** and **Sort data set**, pick the correct column to sort, and click on **OK**.
4. Name the data columns to get nice labels on your axes by right clicking on the data region, select **Column Options** and pick the desired data column. If you put the correct description for the values represented on that axis under **Name** (such as “Output”) and the units for those numbers under **Units** (such as “V”) you will get a label that is properly formatted (“Output (V)”). You can also

give a more descriptive short name (such as “Out”) that will be used in the fitting equation.

Note: If you find that you need the Greek symbols in your labels or units, you can get them from the drop-down box.

5. If your file included a column of uncertainties in the y values, you can have error bars included on your graphs by right clicking on the data region, selecting **Column Options**, and picking the column that includes your y values. Then click on the **Options** tab at the top of the box, click on **Error Bar Calculations** and **Use Column**. Then select the column containing the uncertainties in the drop-down box.

At this point, you can either just create a graph of the values or you can fit a model equation to those values.

- To create a graph of the values:
 1. Right click on the graph area and select **Graph Properties**. Here you can select which columns to use for the different axes, whether they are linear or logarithmic, the axis limits, and the axis labels if you don't like the defaults.
- To fit a model to the values:
 1. Click on **Analyze, Curve Fit...** and select the desired equation such as **Linear**, **Natural Exponent**, or several other options. If the predefined functions don't work for your model equation, you can choose **Define Function** where you can define your own equation. Click on **Try Fit** to see how well the fit worked.

Sometimes it is necessary to specify starting values by hand to get a good fit (this is evidenced by the line indicating the fit not properly passing through the data points). Fitting a nonlinear equation like an exponential to data can sometimes get lost unless you give it an adequately accurate starting point. You can manually enter values in the boxes for the parameters to adjust the fit as necessary. When you do so, it will switch to **Manual** fitting instead of **Automatic**. Adjust the parameters until the fit line is “reasonably close” to the data points. Then click on **Automatic** and **Try Fit**. Hopefully, it will now provide a fit that passes through (or at least near) the data points.

Once the fit looks good click on **OK**.

2. Right-click on the fit information box on the graph and select **... Fit Options**, select the **Show Standard Error** and **Show On Graph** options. Also set the **Displayed Precision** to at least 4 *significant figures* (not 4 decimal places).

3. You will probably want to move the fit information box to a convenient place on the graph. If you are going to put the graph in a document, you probably want to remove the fit information box and put that information in the figure caption, the body of the text, or both instead.
- ***In both cases you need to complete most of the following instructions to make a usable graph.***
 1. You may want to right-click on the graph, select **Graph Options**, and select **Point Symbols** if you only have a few data points and wish to highlight them.
 2. If you wish you can right click on the data area and select **Data Set Options** to change the name of the dataset. This is the name on the top line of the fit information box.
 3. Do not put a title on the graph if you are going to put it into a document – that information will be in the figure caption. However, you may want to have a title on the graph that you put in your notebook to identify it.
 4. Once you have the graph you can print it for your notebook, copy it to paste it into a document, or print it to a file. To print it to a file select **File, Page Setup**, then select either “Adobe PDF” or “Metafile to EPS Converter” (they should both be available in C460 ESC), select **OK**, select **File, Print Graph** and you will eventually be asked for an output file name. The file will not necessarily be put in the same folder as your original data file. The eps or pdf file can be included in your document with most document editing packages.
 5. If you want to scale the text on your graphs (*this is **necessary** if you want text large enough to see when the graph is included in a document*) you can do this by changing the size of the graph. Logger Pro keeps the text the same size (the default is 12-point) as you change the size of the graph. When you print the graph or copy it to another document, it will keep the same ratio of text size to overall graph size. Reducing the size of the graph on the screen will result in larger text in the final printed figure. For example, to have 8-point text (this is the minimum text size to be considered legible in a publication) on a graph with a final width of $3\frac{3}{8}$ inches (a single column in a printed journal) you would want to reduce the graph *on the screen* to a width of $3\frac{3}{8} * 12/8$ inches.

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