

proFit demo – a quick guide

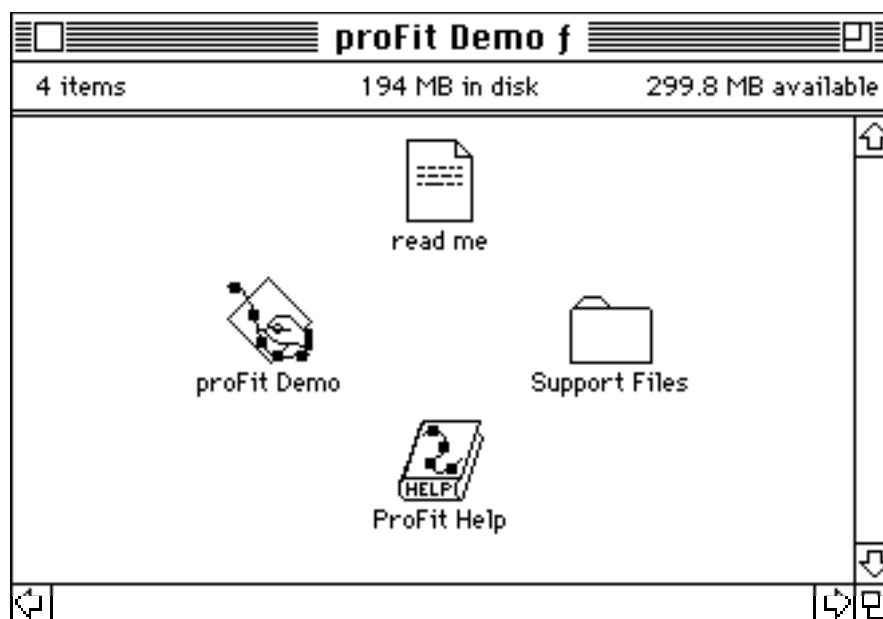
This is a quick introduction to the proFit demo disk. It gives a step by step description of a simple session with proFit and shows you some of the application's features.

Installation

To install the proFit demo software, simply double-click the file “profit Demo Installer”. This installer will create the demo package in a folder called “proFit Demo f” (Fig. 1).

Fig. 1

The proFit demo folder



Read the “read me” file for latest news and compatibility alerts. Then double click the file “proFit Demo” to start the application.

A first session

In the following we describe a typical session with proFit. We plot and analyse the growth of the world’s population over the last 50 years. The table to the right shows the number of inhabitants on this planet in the years after 1940.

year	population in millions
1940	2200
1950	2500
1960	3000
1969	3600
1975	4000
1981	4400
1987	5000
1990	5300

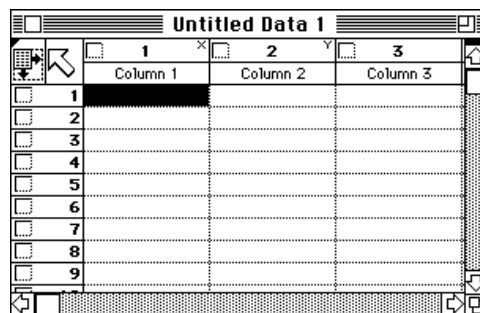
We must enter the data of Table I into a data window. To do this, you have to open a new data window:

- **Choose “New Data” from the File menu.**

An empty data window appears (see Fig. 2).

Fig. 2

An empty data window



	1	2	3
	Column 1	Column 2	Column 3
1			
2			
3			
4			
5			
6			
7			
8			
9			

The data is arranged in horizontal rows and vertical columns. The topmost cell of each column shows the name of the column (by default “Column 1”, “Column 2”, etc.). The cells below contain the data of each column.

Now you must enter the data from Table I into this window.

- **Click on the first empty cell of column 1 and enter the first year, 1940.**

We fill the first column with the years and the second column with the population in millions. The first year is 1940.

- **Click on the first cell of column 2 and enter the population, 2200.**

Note that we enter the population in millions.

- **Repeat steps 2 and 3 to enter the remaining data in the following rows.**

Fill in the year and population data as given in Table I. Note that you can use the arrow keys, the tabulator key, and the return and enter keys to move from one cell to another.

- **Enter the column titles, 'year' and 'population in millions'.**

Click the column titles 'Column 1' or 'Column 2' and enter the new names. Your window should now look as shown in Fig. 3.

Fig. 3

The data window with our data

	1	2	3
	year	ppulation in million	Column 3
1	1940.00000	2200.00000	
2	1950.00000	2500.00000	
3	1960.00000	3000.00000	
4	1969.00000	3600.00000	
5	1975.00000	4000.00000	
6	1981.00000	4400.00000	
7	1987.00000	5000.00000	
8	1990.00000	5300.00000	
9			

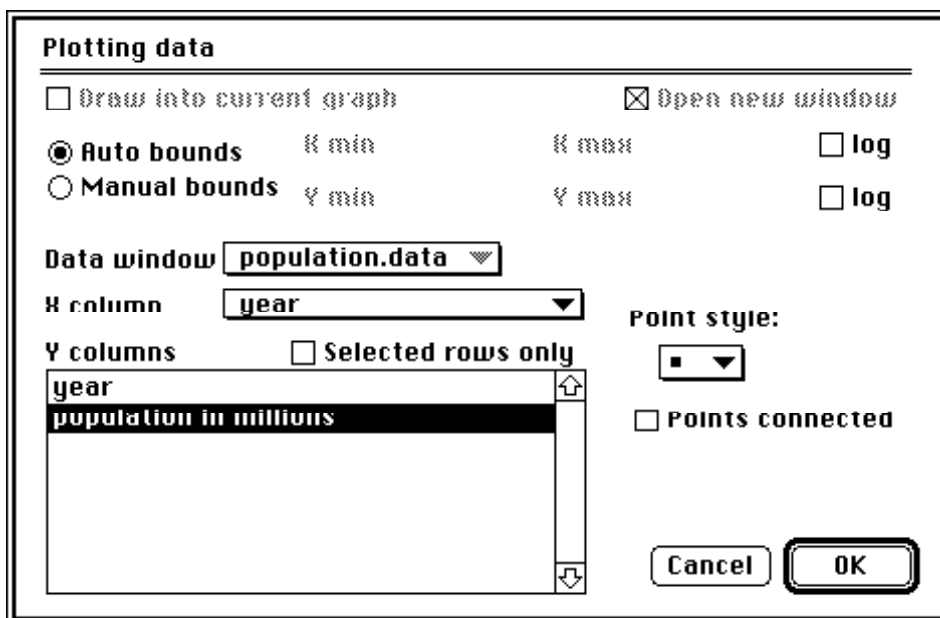
Now that you have entered the data, you can display it graphically:

- Choose “Plot Data...” from the Draw menu.

The dialog box shown in Fig. 4 appears.

Fig. 4

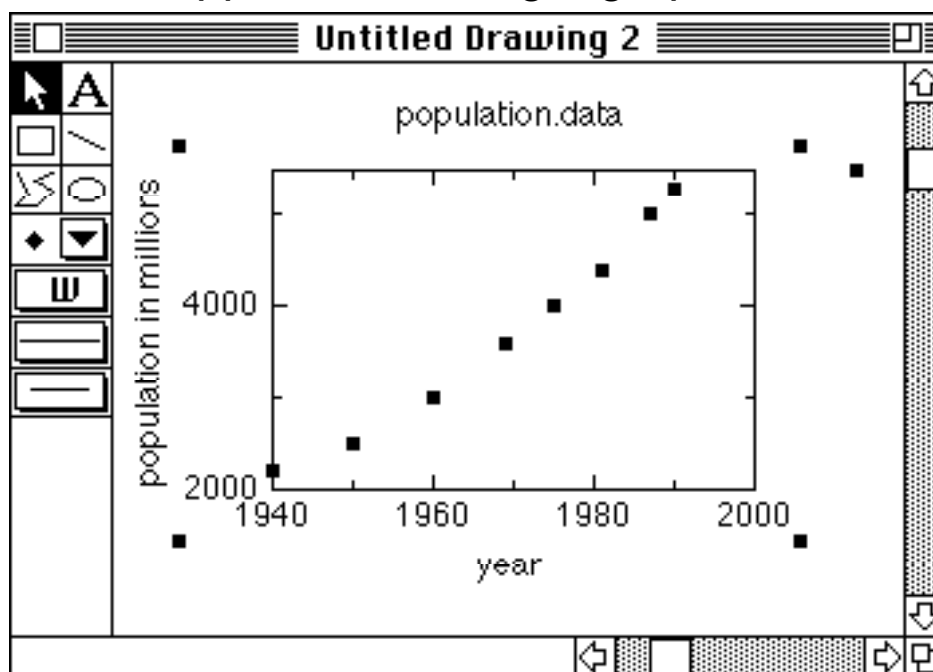
Options for plotting data



In this dialog box you can enter the range of the plot, the columns to be plotted and some other options. In this introductory session we can use the settings as they are. A drawing window appears, showing a graph of the data.

Fig. 5

A drawing window



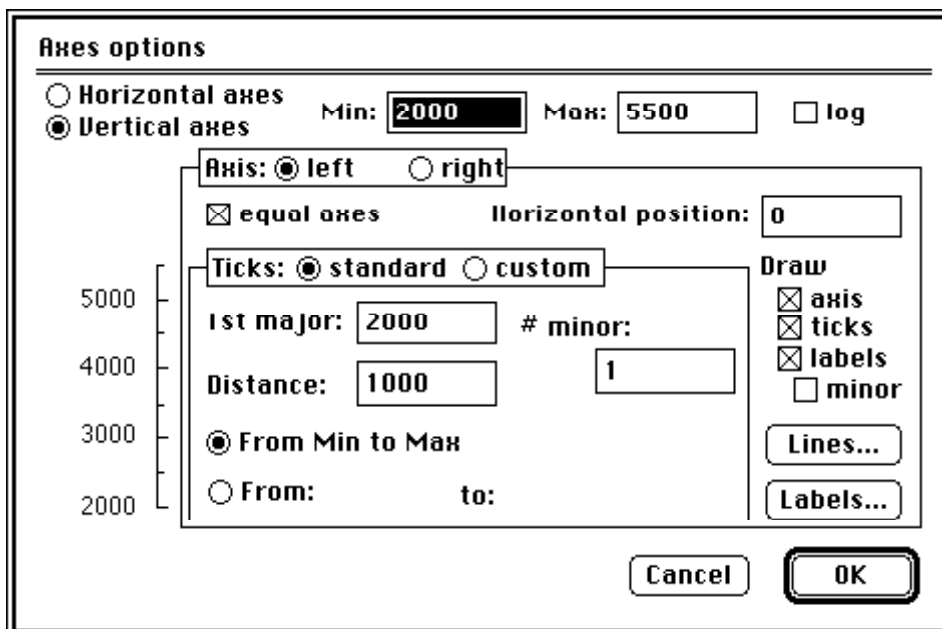
Now you can edit this graph by using some of proFit's drawing features.

- **Double-click the vertical axis to change its range.**

(Double-click the vertical axis itself, not the numbers to the left of it!) A dialog box appears, presenting some options for the axis.

Fig. 6

Options for the vertical axis



You can change a variety of parameters here. Most often you will use the edit fields “Min” and “Max” near the top of the box. They define the range of the axis. Another important field is the “Distance” field that defines the distance between major ticks.

- **Enter 0 for “Min” and 6000 for “Max”, then click OK.**

The vertical axis of the graph starts now with 0 and ends with 6000.

Double-click other parts of the graph or its legend to see other dialog boxes, where you can change more attributes. Try double-clicking the horizontal axis, the centre of the plot, or the square dot in the legend. You can also double-click any text in the drawing to change it. Or you can choose any of the drawing tools at the left border of the window to add lines, polygons, text, etc.

Fitting a function to our data

The growth of a population can often be described by an exponential function of the type

$$p(t) = p(\xi_0) \cdot e^{\xi \pi \left(\frac{(t - \xi_0)}{\tau_0} \right)} \quad (1)$$

where $p(t)$ is the population at time t , $p(x_0)$ the population at an arbitrary start time x_0 , and t_0 its growth constant.

Let us try to investigate the validity of this formula for the world's population. We want to find the set of parameters for equation (1) that describes our data best.

- Choose “exp” from the Func menu.

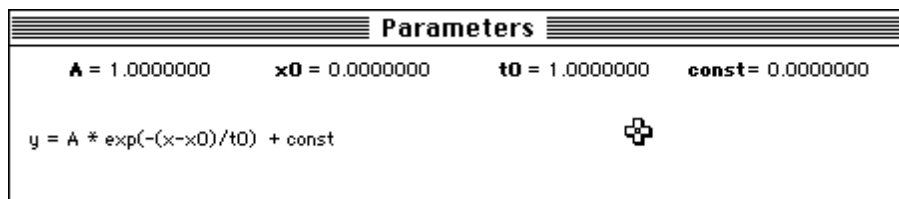
This brings the parameters-window to the front. This window gives a description of the built-in exponential function and its parameters. The function looks like this:

$$y = A \cdot e^{\xi \pi \frac{-(\xi - \xi_0)}{\tau_0}} + \text{const} \quad (2)$$

This formula is essentially identical to Eq. (1).

The Parameters-window also displays the default values for A , x_0 , t_0 , and $const$. Starting from these values, proFit will look for a better set of parameters for describing the data. But first you must define which parameters you want to fit and choose good starting values.

Fig. 7
The Parameters for the exponential function



As mentioned above, the starting time x_0 is arbitrary. Let us set it to 1940:

- Click the number beside “x0” in the Parameters-window and enter the starting value 1940.

This defines the parameter's value.

Since x_0 is arbitrary, we do not want to fit it:

- Click on “**x0**” in the Parameters-window.

When you click on x0, it changes from bold (**x0**) to normal (x0). This indicates that this parameter is fixed and will not be fitted. We also hold the constant *const* fixed at 0, since we don't need it:

- Click on “**const**”.

Again, the text changes from bold to normal to indicate that the corresponding parameter will not be fitted. Before fitting, you should assign starting values to the parameters that are going to be fitted, in our case *A* and *t0*. This increases the speed of the fit and the chances to find the best set of parameters. Reasonable starting values for our problem can be estimated easily:

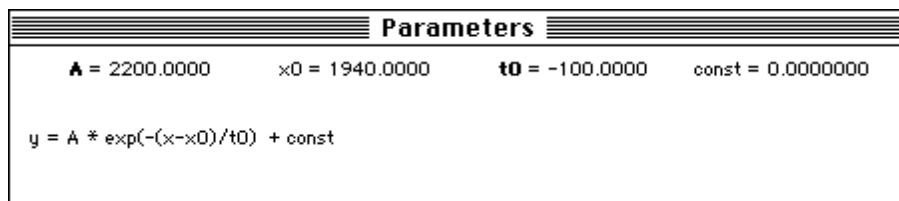
A is the population in the year 1940, so we can set it to 2200 millions. $-t_0$ (note the minus, it comes from the different definitions of Equations (1) and (2)) is the time in which the population increases by a factor $e = 2.71$. Looking at the plot of the data in the drawing window, we can easily guess it to be between 50 and 200 years. Let us set *t0* to -100:

- Enter the starting values 2200 for *A* and -100 for *t0*.

The resulting parameters-window should now be like the one shown in Fig. 8:

Fig. 8

The new Parameters



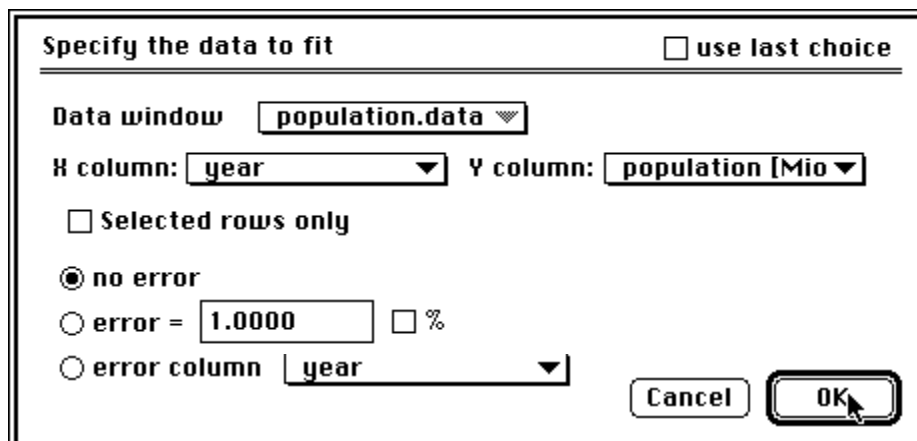
Now we are ready to fit our parameters:

- Choose “Nonlinear Fit” from the Calc menu.

You see a dialog box that lets you choose the data columns you want to fit (Fig. 9):

Fig. 9

Settings for fitting



- Click OK to start fitting

The fit only takes some seconds. When it is completed, the fitted parameters are printed in the Results-window.

The fit yields -54 years for t_0 and 2113 millions for parameter A .

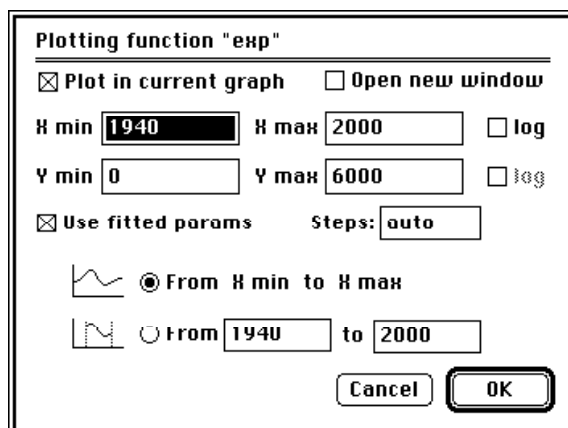
Now we can plot function (1) using these parameters:

- Choose “Plot Function...” from the Draw menu

A dialog box appears, displaying some plotting options (Fig. 10):

Fig. 10

Settings for plotting



- Click OK to draw the curve.

The curve is drawn in the graph.

Of course, this sample session could only show some few aspects of proFit’s drawing and fitting capabilities. As you start working with proFit, you will find many features that have not been mentioned here. They are easy to understand and you will be able to use most of them without further explanations.

The following chapters will give you a short summary of some of the more unusual features of the application.

Defining your own functions

In the previous sample session you fitted the built-in exponential function to your data set. Fine. But what do you do if your model function is some lengthy, complicated mathematical construction that does not appear among proFit’s built-in functions in the “Func” menu?

Define your own function! With proFit you can use virtually all functions you can think of. Let’s look at an example: Imagine you want to analyse a function of the form

$$y = a \sin(x) \cdot \ln(x) + b \quad (3)$$

with the parameters a and b . To define it in proFit:

- **Choose “New Function” from the File menu.**

This opens a new, empty function window.

- **Enter the definition of your function in the new window.**

The definition of this function looks like this:

```
function logSine;
begin
  y := a[1]*sin(x)*ln(x) + a[2];
end;
```

The first line of this definition just gives the name (logSine) of the function. Then, enclosed between `begin` and `end`, follows the definition of the function. In the third line the function is calculated (from the variable x and the parameters $a[1]$ and $a[2]$), and it is assigned (“:=”) to the variable y .

- **Choose “Add To Menu” from the Misc menu.**

Doing so tells proFit to translate your function into computer code. The new function is added to the Func menu, and the parameters-window shows its default parameters.

After adding the function to proFit, you can change its parameters in the parameters-window. You can plot the function, use it for fitting, calculate a table of its values, etc.

To plot it, you first should set its parameters $a[1]$ and $a[2]$ to reasonable values, e.g. 1 and 0.5: Edit the fields of the parameter-window. Then you select “Plot Function...” from the Draw menu. In the dialog box (Fig. 10) that comes up, you select the plotting range (e.g. the x -axis from 0 to 5 and the y -axis from -2 to 2). If you still have an open drawing-window from previous work, you should check the option “Open New Window” in the dialog box (Fig. 10), otherwise you draw your curve over the old graph.

Our sample function is not defined for $x \leq 0$. If you would calculate it for a negative x -value, proFit would report an error. However, the function converges to $y=a[2]$ for $x=0$. You may want to expand its definition range by defining $y(x) = a[2]$ for all $x \leq 0$. This can be done easily by the following modified definition. (After having modified a definition in the Function-window, again select “Add to Menu” from the Misc menu to add it to proFit.)

```
function logSine;
begin
  if x <= 0
  then y := a[2]
  else y := a[1]*sin(x)*ln(x) + a[2];
end;
```

This new version of the function shows how you can use the `if` statement for conditional execution.

Your function could even become much more complicated than that. proFit allows function definitions that contain more than one statement. You also can define your own variables and procedures, you can access the data in the data windows, and much more. You can use most elements of the “Pascal” programming language.

In your demo package you can find more examples of function definitions.

Writing programs

Besides defining functions for fitting and plotting, you can also define any algorithms for data-generation and -transformation using the same syntax.

Let us have a quick look at a small program that fills the first column of a data window with the powers of two: 2, 4, 8, 16, etc. To define this program, again open a new function-window (“New Function” from the file menu) and enter the following definition. (Note that this program starts with the keyword `program`, and not `function`. The rest of it follows the same syntax scheme as a function definition.)

```
program powersOf2;  
var i: integer;  
begin  
  for i := 1 to nrRows do  
    data[i,1] := 2 ** i;  
  SetColumnName(1, 'Powers');  
end;
```

To add this program to proFit, again select “Add to Menu” from the Misc menu. The program “powersOf2” will appear in the submenu “User” of the Calc menu. To run it, choose it from this menu. It will fill the first column of the frontmost data window with the desired values.

For a complete list of syntax elements for writing functions and programs, you can consult proFit’s built-in help command (which you find under the help-balloon menu if you are running operating System 7 or later, and under the Apple menu for older operating systems).

Some hints

Printing

proFit was designed for optimum quality results on every printer. For high-end laser writers PostScript commands are generated. For all other printers (such as high-resolution ink-jet printers), printing occurs at maximum available resolution.

Therefore, to get best results, you should tell proFit if you are using a PostScript

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printer or not. To do this, select “Printing/General...” from the submenu “Preferences” in the File menu. In the dialog box that appears, you should check or uncheck the check-box “Print drawings using PostScript”.

Exporting pictures

When you are working with a drawing application such as proFit, you may want to copy drawings from this application into your word-processor, to make the drawings part of some written text.

There are three possibilities to do that:

1. Copy the desired part of a drawing from proFit and paste it into your text application.
2. If you are working under System 7, you can create a publisher and subscribe to it from your text application (if your text application supports this feature).
3. If you are going to print on a PostScript printer, you can save your drawing as a PostScript- (EPS) file (if your text application supports this feature).

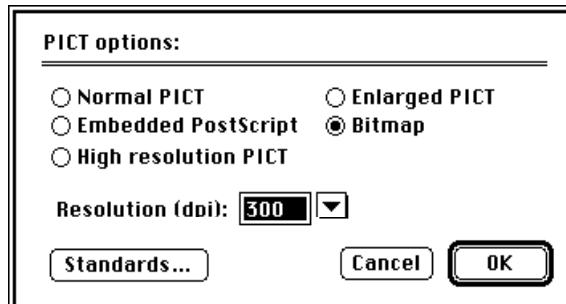
With many conventional applications, drawings copied by method 1 or 2 may print in poor quality on some printers. With proFit you can export pictures that print fine in most situations!

In order to take advantage of this feature, you should tell proFit what kind of printer you are going to use. If you are using a PostScript printer, proFit will include PostScript information in its pictures, if you are using a non-PostScript printer, proFit can generate so called “high-resolution bitmaps” that print fine on most printers.

Use “PICT Options...” from the submenu “Preferences” in the File menu. In the dialog box that comes up (Fig. 11) you can specify if you want PostScript included in the pictures that you copy from proFit (check “Embedded PostScript”), or if you want a bitmap (check “Bitmap” and enter your printer’s resolution).

Fig. 11

Picture options



For guiding you can use the help balloons under system 7. More information on the other options is given in the proFit user manual.

More highlights

Graphic text editor:

Have you already edited a text in the Drawing-window? If not, then open a drawing window, select the text tool (the “A” in the toolbox at the right border

of the window), and click into the drawing window. In the dialog box that comes up, you can interactively create any text, with any font, size, and style, with arbitrary sub- and superscripts.

Background operation:

Did you realise that proFit can run “in the background” when doing lengthy operations? If you are e.g. calculating a very large table of a complicated function or fitting a large set of data, proFit may need some minutes to do this. While proFit is working, just click on the window of any other application. This application will come to the front while proFit continues its work in the background.

External modules:

If you should ever think that you have reached the limits of proFit:

You may have noticed the command “External Modules...” in the Misc menu. With this command, you can add the code of a function or program that you have written in any compiler of yours, and use it in the same way as any built-in function or user command.

The proFit demo package includes some code and source examples of external functions and programs in the folder “External Modules”.

And, and, and...:

As you work with proFit, you will discover many other unique features. Have a look at the files in the folder “Support Files”. Explore!

For more information on proFit contact:

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