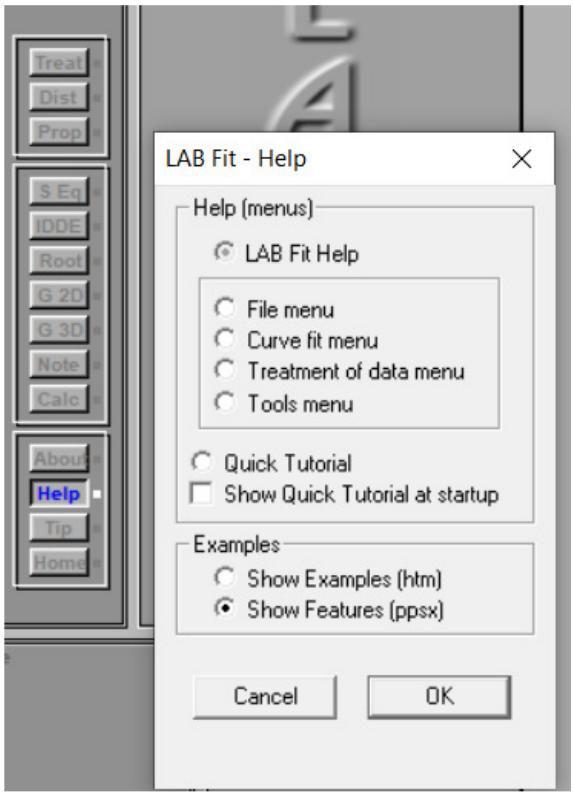
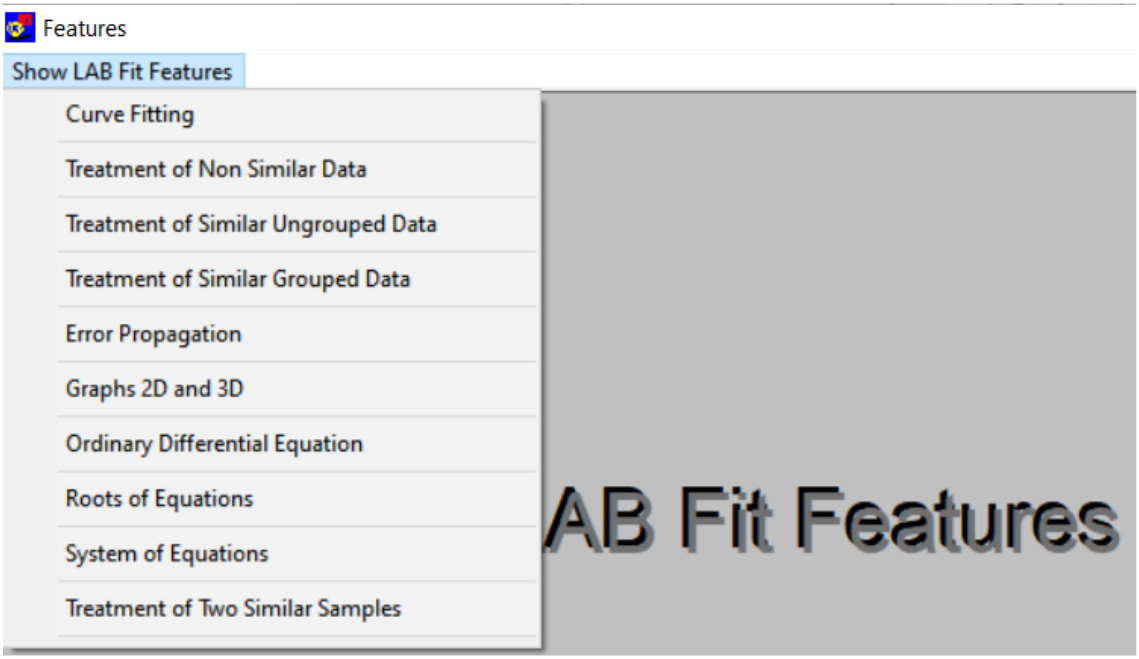
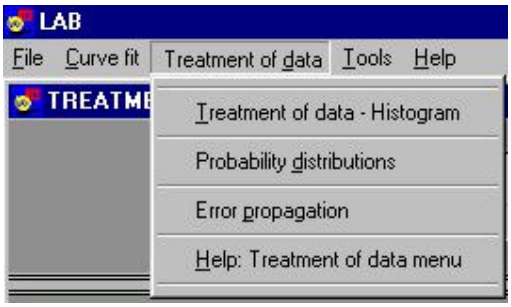
Clicking "Help" and choosing "Show Features (ppsx)"…



…you will watch several movies with help about...



The "Treatment of data" menu



This menu has several basic statistics tools for the treatment of experimental data. It is divided in three options, detailed at next.

1) "**Treatment of data - Histogram**", that contains two options:

   a) "**Treatment of similar data**", destined to the treatment of measurements of a same quantity, measured N times at a similar fashion (with **histograms**);

   b) "**Treatment of non-similar data**", destined to the treatment of measurements of a same quantity, but with distinct uncertainties;

2) **"Probability distributions"**, destined to the calculation of probabilities for many distributions (Gaussian, t-Student, Fisher-Snedecor, Chi-Square and Correlation Coefficient);

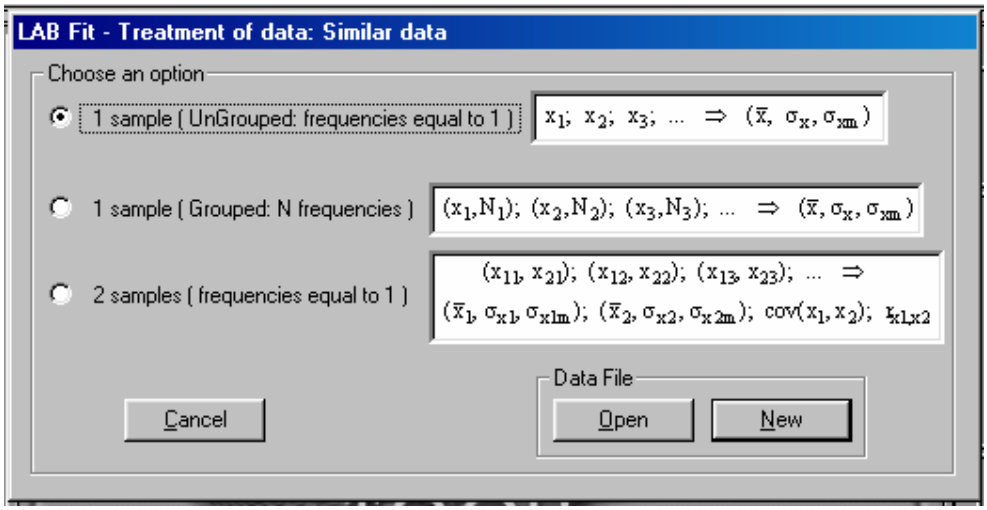
3) "**Propagation of errors**", destined to the error calculation in functions caused by the error in their independent variables.

Treatment of data – Histogram (Treat)

This item is divided in two parts as it follows.

Treatment of similar data

When the user performs **one** or **two** series of readings and wants to communicate the final result of the measurement process through the **mean value**, the **readings standard deviation**, the **mean value standard deviation**, the **mean value** and, if it is the case, the **correlation coefficient** between the two series, the "Treatment of similar data" option must be chosen at the "Treatment of data" menu or the "Treat" button must be clicked. The following dialog box will then appear:

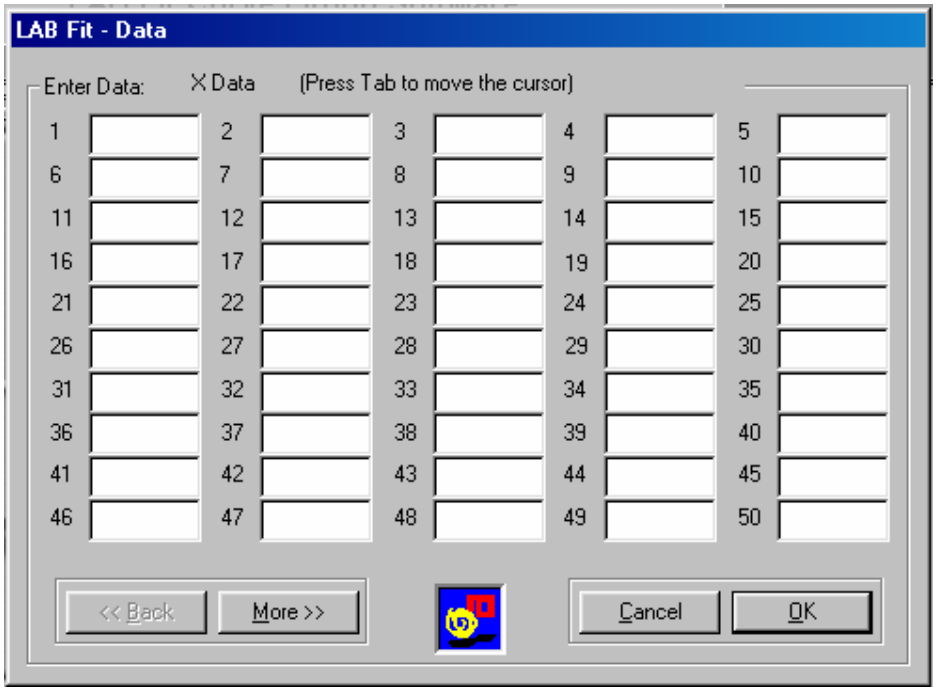


The **first option** must be chosen if the user, when measuring a quantity, has **listed all the accomplished readings**, one by one.

The **second option** must be chosen if the user, when measuring a quantity, has **gathered the accomplished readings**, writing only the **distinct values**, and also the respective **frequencies** of these values.

The **third option** must be used if **two** non-gathered **series** of readings are being analyzed, with the **same quantity** of elements.

Once the most appropriate option was chosen, when "New" is clicked at the previous dialog box, **the dialog box for data acquisition** will appear, as shown at the picture at next:



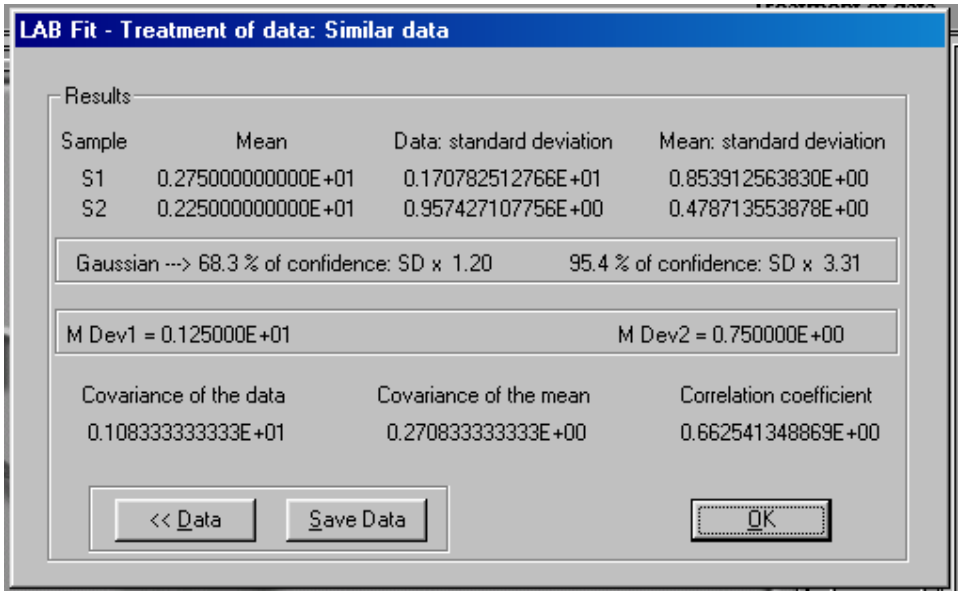
The values to be treated, called indistinctly of "X" must, then, be informed. If there are more than 50 values, just click on the "More" button and continue informing the data normally. At the end of the information, just click on the "OK" button to proceed.

If the data are **not gathered**, **the results** will be presented at next, at a dialog box.

If the data are **gathered**, after clicking on "OK", **the frequencies** that the data occur must be informed, at the **same order** of the information of the data itself.

If there are **two data sets**, after clicking on "OK", the **second set** must be informed, at the **same order** of information of the first set, with which it is desired to establish a correlation.

The picture at next shows the results for the treatment of two sets of readings: the first one involves the following values: 1; 2; 3 and 5. Whereas the second one involves: 2; 1; 3 and 3.



The **first line** of results shows the **mean value**, the **standard deviation of the readings**, and the **standard deviation of the mean value** of the **first series** of data.

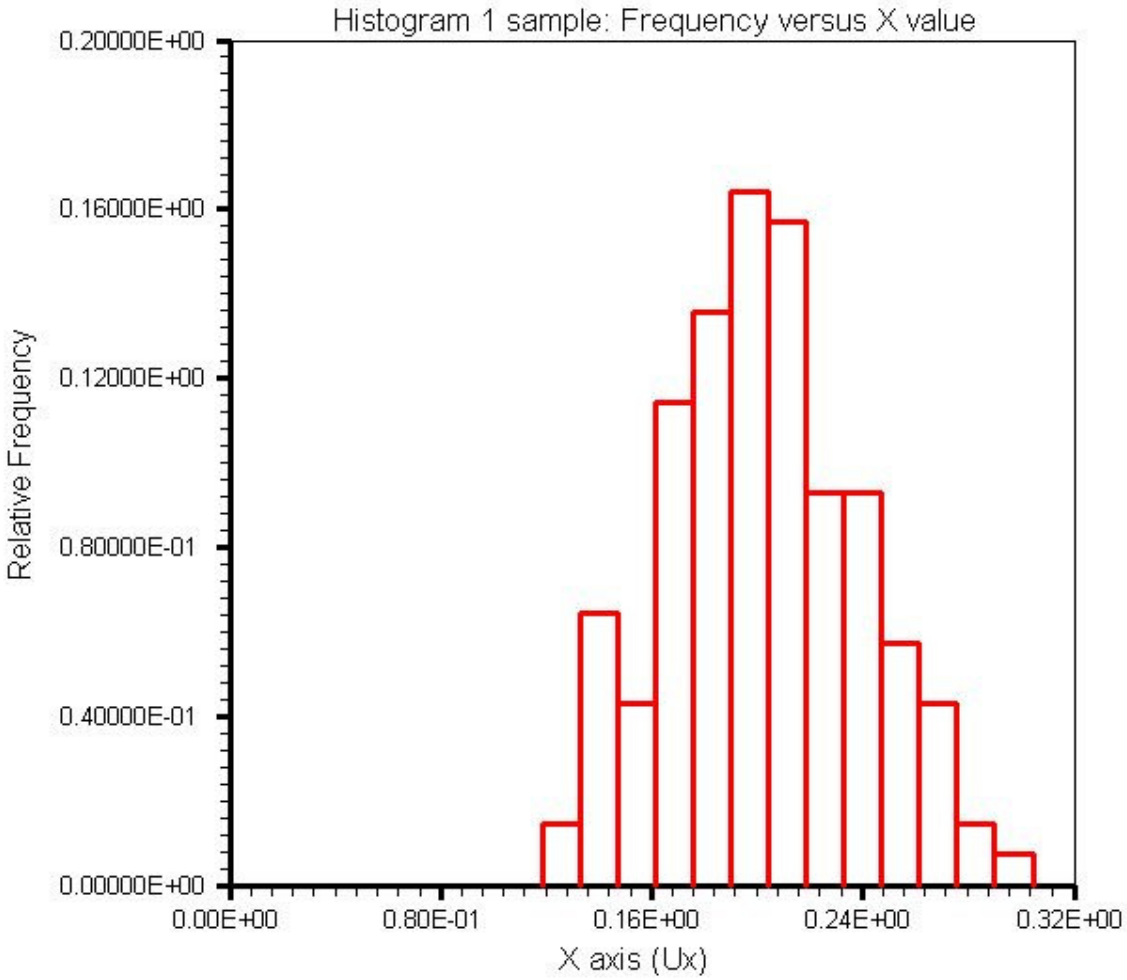
The **second line** of results shows the **mean value**, the **standard deviation of the readings**, and **the standard deviation of the mean value** of the **second series** of data.

The **third line** of results indicates for **how much** the standard deviation must be multiplied so that an interval has 68.3% and 95.4% of confidence, considering a Gaussian distribution for the data. Such factors are a function of the quantity of readings at the samples.

The **fourth line** of results gives the **mean deviation** of each one of the two series.

The **fifth line** of results gives the **covariance among the data**, "**the covariance of the mean**", and the **correlation coefficient** between the two series.

See a histogram example drawn by **LAB Fit**:



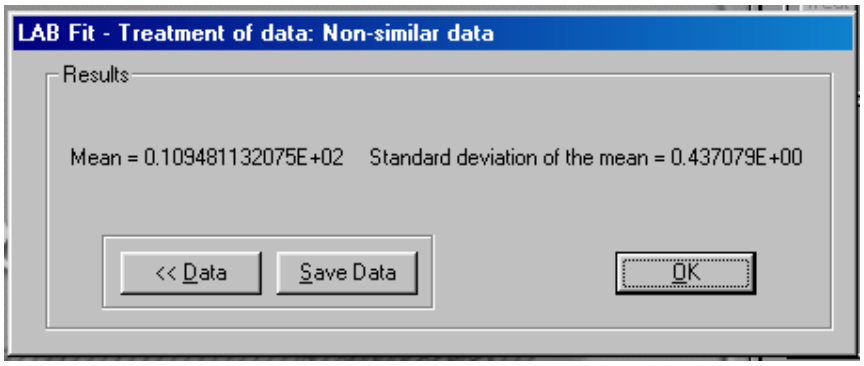
Treatment of non-similar data

In case the user has two or more distinct results of one measurement, each one of them given by a mean value and by its respective uncertainty, a final result can be extracted (**a new mean value** and a **new uncertainty**), using the "Treatment of non-similar data" option, that is available from the "Treatment of data" menu, or by clicking on the "Non" button. After a fast overview about the selected option, the **dialog box of data acquisition** appears (shown at the previous section) and the user must, then, inform:

1) The **values of X** (in reality, the mean values of the results of the measurements), will be shown by clicking "OK" at the end of the display of these mean values.

2) The **uncertainties of x** (corresponding to the informed mean values).

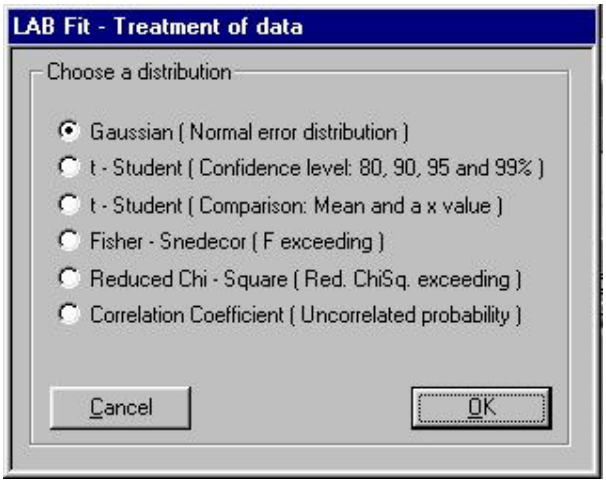
When "Ok" is clicked at the dialog box for data acquisition, the results will be presented as it is shown at next:



The **presented result** is referred to the information of the followings mean values of a measurement: 10.5 and 12.4. The informed uncertainties were, respectively: 0.5 and 0.9. It's worth saying that the calculation of a new mean value is done through a **weighted mean** having the **statistical weight** being used at the calculation of the weighted mean.

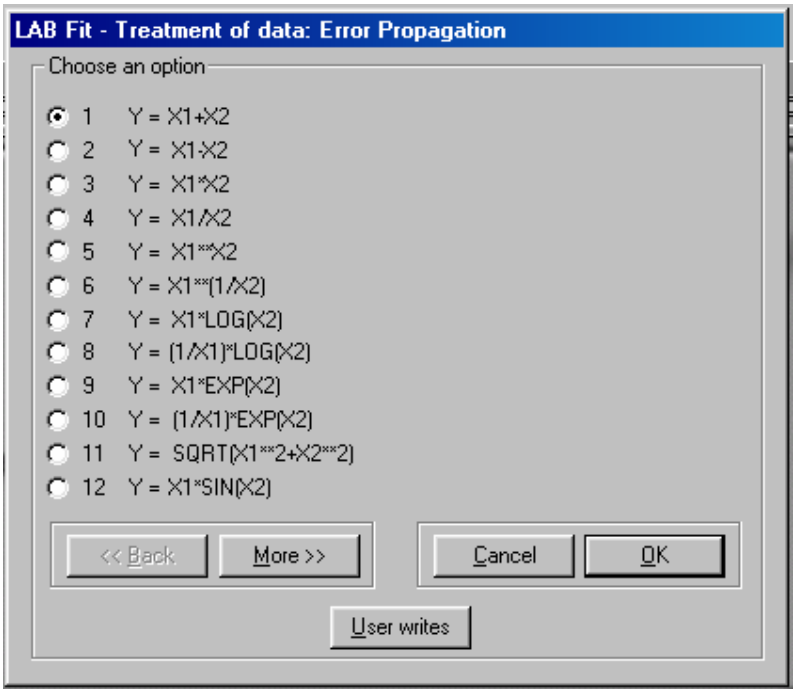
Probability distributions (Distr)

Here the following options are available:

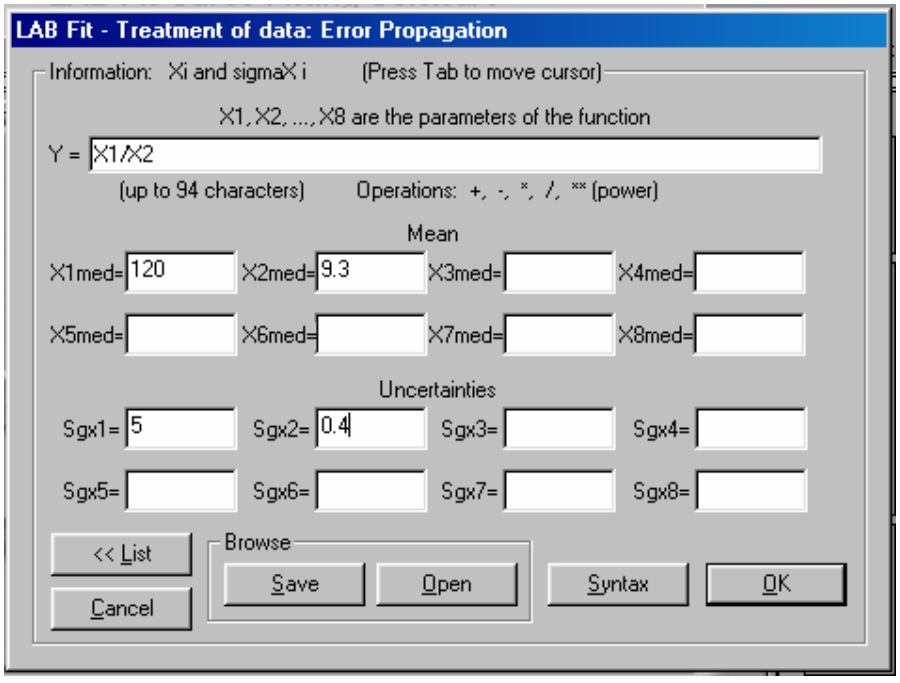


Error Propagation (Prop)

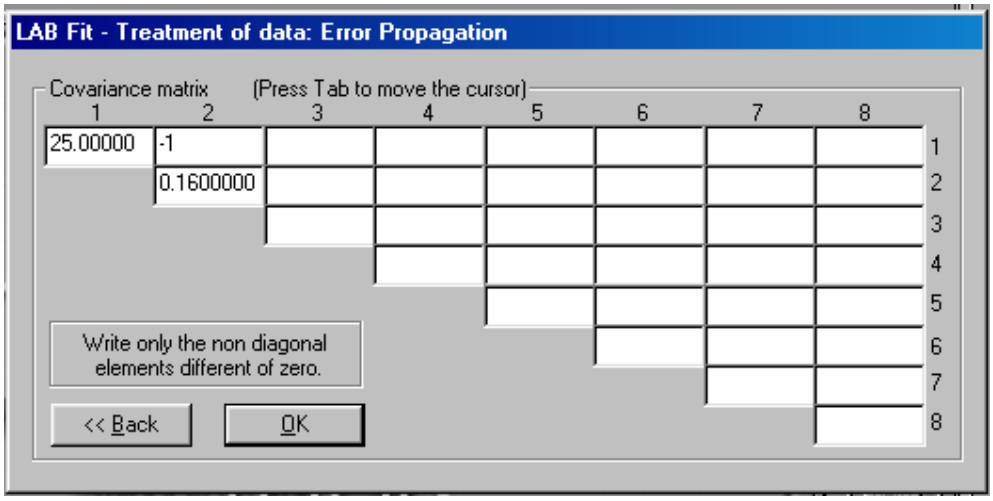
When the independent variables of a function have errors, the value of the function cannot be known exactly, because the errors of those variables are propagated to the final calculated result for this function. To do such a calculation at the **LAB Fit**, just use the "Propagation of errors" option at the "Treatment of data" menu, or at the "Prop" button. At next, a dialog box for the functions' definition is shown, which can have up to 8 independent variables:



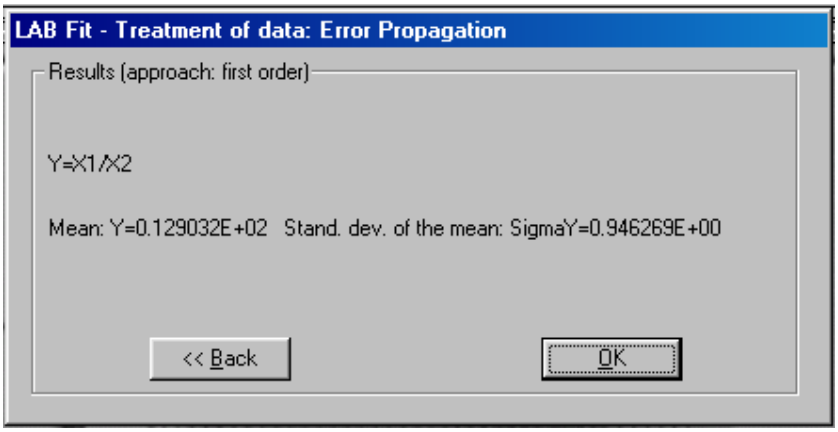
At the previous dialog box **12 functions** are shown, of a **total of 48**. If the user wants to access other functions, the "More" button must be clicked. In case the desired function is found, it must be selected and, right after, the "OK" button must be clicked. In case the function is not part of the **LAB Fit** library, the user must click on the "User writes" button. So, at the dialog box that will appear, the function must be written, with up to 8 independent variables (X1, X2,..., X8), at the first edit box. See the example at next.



In this dialog box it is possible to see the function Y = X1 / X2, with X1 = (120 ± 5) and X2 = (9,3 ± 0,4). When "OK" is clicked, the question if the user wants to **inform the covariances** between the independent variables is asked. If you chose **no**, they will be considered **zero**. If you choose **yes**, they **must be informed** at the dialog box shown at next:



The diagonal elements, given by the square of the uncertainties of the independent variables, are automatically written by the **LAB Fit**.It will be required to write the **non-diagonal** and **non-zero** elements. As an example, it must be observed that, at the previous dialog box, it was informed cov(X1,X2) = -1.0. When “Ok” is clicked at the previous dialog box, the result is immediately shown:



If the **covariances were not informed**, they would be considered zero, and it would have also the information about the **maximum deviation**, in addition to the **standard deviation** of the mean value of the function.

Fortran Syntax

Operations:

Addition: +

Subtraction: -

Multiplying: *

Division: /

Power: ** or ^

Functions applied to a value x

Sine of x: **sin(x)**

Cosine of x: **cos(x)**

Tangent of x: **tan(x)**

Arc which the sine is x: **asin(x)**

Arc which the cosine is x: **acos(x)**

Arc which the tangent is x: **atan(x)**

Hyperbolical Sine of x: **sinh(x)**

Hyperbolical Cosine of x: **cosh(x)**

Hyperbolical Tangent of x: **tanh(x)**

Sine of x (x in degrees): **sind(x)**

Cosine of x (x in degrees): **cosd(x)**

Tangent of x (x in degrees): **tand(x)**

Natural Logarithm of x: **log(x)**

Logarithm of x at the base 10: **log10(x)**

Exponential of x (e powers x): **exp(x)**

Root square of x: **sqrt(x)**

Absolute value of x: **abs(x)**