PROJECTOR 1

Business Graphics, Forecasting and Presentation System

48K ZX Spectrum

PROJECTOR 1 was developed by Computer Aided Training Services Ltd for McGraw-Hill. Key points font by Image Systems.

PROJECTOR 1

Introduction

PROJECTOR 1 is an advanced business graphics, forecasting and presentation system. It provides a wide range of facilities, and although it is designed to be as simple to use as possible, it is worth spending a little time getting to know it.

Load the tape by typing

LOAD "projector"

then start the tape and press ENTER.

After the tape has been running for a short time, you will obtain the title page, plus a message "STOP THE TAPE". Stop the tape at this point, and press ENTER to see the printer menu. This asks you for information about the kind of printer interface and printer you are using. Select the system you require by pressing the relevant number key. The printer is needed only if you want to copy the graphic images generated by PROJECTOR 1 onto paper.

Restart the tape when asked.

The program will search for the relevant print routine on the tape before loading the main part of PROJECTOR 1.

PROJECTOR 1 is a long and complex program, and takes about 5 minutes to load from the tape. The title screen will appear, followed by a "data now loading" message as the demonstration program is loaded into the computer. After the "stop the tape" message, the title page will be replaced by the main menu - 14 options are available.

Select the menu option you require by using the up or down cursor keys (CAPS SHIFT with 6 or 7) to move the red cursor until it is opposite the option you want. It is possible to get straight to two of the most commonly needed options more quickly. You can move the cursor directly to "New Data" and "Directory" by using CAPS SHIFT with 8 (right arrow) and CAPS SHIFT with 5 (left arrow) respectively.

It is best to begin with the demonstration, which shows you some of the capabilities of PROJECTOR 1. Select "Play Presentation" and press ENTER. Type in the name "demo1" (without the quote marks) and press ENTER. In answer to the question "Breakable?" type 'y' and ENTER. PROJECTOR 1 will now play through its demonstration. Sit back and enjoy it. If you want to stop the presentation at any time, press CAPS SHIFT with SPACE (BREAK), which will take you straight back to the main menu.

Follow the next part of these instructions carefully, as they take you step-by-step through the process of loading and displaying your own data.

Delete data

Select the "Directory" option as above. You will be given three options: begin by selecting the "Delete all data" option by moving the cursor over it and pressing ENTER. In answer to the "Sure?" prompt, answer 'y' and press ENTER again. This deletes all data (at this stage, the demonstration) from the memory. Now, with a clean sheet, you can enter some data of your own.

New data

Select this option from the main menu. In using PROJECTOR 1, data is typed in

using one of a range of formats:

by DAYS, WEEKS, MONTHS, QUARTERS or YEARS;

as ORDINARY numbers:

as PAIRS of values - this format is used for an xy graph, or for pairs of histograms such as you might use when comparing two sets of values.

You do not decide at this stage how you want to display the data. The various display options draw on the data when you use them. Start by entering some simple values. Try entering four quarterly values: follow the screen prompts to select the QUARTERLY option, starting with the first quarter and any year you like. The data entry chart will appear on the screen, with quarters listed automatically. Enter the data for the first four quarters - try values of 15, 8, 25 and 30 as a start. Simply type in each number, followed by ENTER. After entering the numbers, use STOP (SYMBOL SHIFT with A) to finish. You are asked to give a name for the data - use any name you like, up to nine characters, but for this example type "test" then ENTER. There is a short pause while the data is checked and written into memory, at the end of which you are returned to the main menu.

You are now ready to try out some of the display functions.

Graph

When you select this option, you are asked which data you want to use; as the only data in the computer at the moment is "test", use that! A sub-menu shows a range of options available for the graph. First type in a title for the graph, ("Quarters"), and for the moment skip through the vertical and horizontal axis options by pressing ENTER for each. Then you can select the functions you want, using 'y' or 'n' for yes and no, and pressing ENTER after each selection. You can use the cursor keys to go up and down the list. Start by setting up a simple graph, without using the "Fit line" or "Fit curve' options. Use STOP when you have finished. The graph will then be displayed as you have requested. Pressing ENTER again will return you to the main menu, after flashing on the screen a reference number for the graph. As this is the first graph, the reference will be "g1".

Now select "Graph" from the main menu again, and try some of the other options, perhaps joining the points or adding a background grid.

Fit line and fit curve

These options are selected from within the "Graph" option. They represent one of PROJECTOR 1's most valuable facilities, that of fitting a calculated line or curve to a set of values. If you also select "Display statistics" option, then after you have pressed ENTER to end the display, a page of statistics will appear, indicating the equation and the degree of fit of the line or curve. Note that the calculation of the curve can be quite complicated, and it may take the computer a little while to work it out.

Try a few variations on your graph, using the same data for now.

Histograms

Next, try the "Histograms" option. Once again, you get a sub-menu of options. Full details of the options are given in the "Summary of Functions" which follows. To begin with, move the cursor down to "title" and type in "Quarters", which leaves

all the other options at their default values. Use STOP, and your histogram will appear. Pressing ENTER will store it in memory. Note that histograms are referenced automatically in the same way as graphs, but using "h1", "h2", etc.

Pie-charts

Try this option, too. The chart is constructed automatically from your data, and percentages of the total are added automatically. With pie-charts you also have the option to add text to the drawing, in the form of captions or explanatory notes. If you make a mistake, note that PROJECTOR 1 does not let you use DELETE; you have to move back with the cursor and overtype. Pie-charts are referenced automatically in a series of "p1", "p2", etc. Pie-chart colours can be selected, but adjacent sectors are always shown in contrasting types of shading, so that the pie-chart will be understandable when copied to a printer.

Presentations

If you now go to the "Directory" option, and choose "View data", you will see your data and all the different graphs, histograms and pie-charts that you have made from it are referenced. You can put together a presentation using any of these. Go back to the main menu (with ENTER or STOP) and select "Build/modify presentation". Choose the option to "build", and (assuming that you have at least one graph, histogram, and pie-chart) put together a presentation consisting of g1, h1, p1. The format for entering this information is the same as for data entry. Use STOP to end data entry. You will be asked whether you want a manual or automatic presentation - begin with a manual one. Give the demonstration any name up to nine characters.

To replay the presentation, select "Play presentation" from the main menu, and proceed just as you did to play "demo1".

Break

Pressing BREAK (CAPS SHIFT with SPACE) will produce a low rasping noise, and will take you directly to the main menu. The only exception to this is when playing an "unbreakable" presentation . . . from this there is no escape until it has played its course, so use unbreakable presentations with care, especially if you have unsaved data in the computer!

PROJECTOR 1 provides a vast range of facilities. You will by now have an idea of the basics of using the program. The following alphabetic summary of the program's functions expands on what you have done, and explains the rest of the features. There is no substitute for using the program! Practice until you are completely familiar with the way PROJECTOR 1 works, and you will discover that it is a quick, easy and time-efficient way of producing business graphics, presentations and projections for the future.

SUMMARY OF FUNCTIONS

In alphabetical order

Build/modify presentation

A presentation is a sequence of slides that you can replay. The unique slide

references generated by PROJECTOR 1 were displayed at the time of creating the slides and are held on the Directory (left arrow, that is CAPS SHIFT and 5 to get quickly to Directory from the main menu).

Presentations can be:
   automatic with a pre-set delay between slides
   or *manual* where you have to press a key at the end of each slide.

The entry screen is similar to entering ordinary data. You enter the slide references in sequence, for example:
   k2
   h1
   k3
   p4
   k6
   dweek1
   k2
   h1
   g9
will build a sequence of 9 slides starting with key points 2 and ending with graph 9. Both upper and lower case are acceptable for referencing the slides.

You can delete from and insert slides to the presentation by using < and >; < deletes the entry on which the cursor is placed, and > makes a space. However, deleting from a presentation does not delete from the Directory - the slide could be used in another presentation.

PROJECTOR 1 does not check that all the references are in the Directory, so you can include undeveloped slides (guess their references!). When you try to replay a non-existent slide you will get the message DATA NOT IN MEMORY.

For automatic presentations you can specify a number of runs, that is the number of times the presentation is played. After the first play it simply restarts from the beginning.
Slides can be used several times in a presentation.
A presentation itself can be referred to by using "xpres3" where "pres3" is the presentation name.
A presentation can be included in other presentations. You can chain presentations together:
   "xpres1" contains:
   k2
   h1
   k3
   p4
   k6
   xpres2
and plays 5 slides immediately followed by 4 more. In effect this plays as one presentation but two are stored on the Directory.

"xpres2" contains:
g8
k2
h1
g9

You can also embed presentations wholly within other presentations:
"xpres1" contains:
i1
xpres3
xpres4
xpres2
i1
xpres1 could have a graphic logo, a beginning xpres3, a middle xpres4, and an end xpres2, followed by the logo again.

   This technique makes it easier to combine and update presentations. You can have up to 5 levels of presentation at any one time but they cannot loop either directly or indirectly, that is:
"xpres1" contains:
xpres3
xpres4
          where xpres4 contains:
                    xpres2
          and xpres2 contains:
                    xpres4
This is not allowed because xpres4 calls itself!
If you nest presentations they are replayed with the attributes of the deepest level presentation running at the time. For example, if the outer one is automatic and the inner one is manual then the combined presentation will start automatic, switch to manual (without warning), then back to automatic.

Directory
Directory displays a catalogue of data, slides and presentations; each is given a unique reference by PROJECTOR 1.
To get to a second screen of the Directory press any key.
You are told the amount of free space in memory. If you run out you will have to split your slides and presentations between more than one block of data on tape or microdrive.
You can delete entries. The method is the same as for data entry and for building a presentation. You refer to presentations as "xpres3" where "pres3" is the presentation name and data by "ddata4". No warnings are given, apart from when you wish to delete all entries when you am prompted "Sure?".
If you delete a presentation, its constituent slides are not deleted - they may be used elsewhere.

Note that the data is only in memory and is NOT stored on tape until you do Save from the main menu. If you exit PROJECTOR 1 without saving you will be reminded to Save; it is a good precaution to save on tape frequently and to

keep two copies on different tapes.

A fast way to get to the "Directory" from the main menu is to use right arrow, that is CAPS SHIFT and 5; (similarly to get to "New data" use left arrow, CAPS SHIFT 8).

There is room for about 7500 characters of data in memory, which should be ample for most presentations. Experience has shown that this represents approximately 50 slides depending upon the mix of slides and the size of data. For histograms and pie charts, to save space you can delete the original data on which they were based once they are saved as slides. However, in the case of graphs the original data must still exist when replaying. It is advisable to keep a copy of any deleted data.

Because a screen image takes up 6351 characters you will only have space for one full graphic image. You can of course load different sets of data and presentations using the LOAD facility.

Errors

You will not see many errors because PROJECTOR 1 automatically returns to the main menu and makes a rasping noise in the rare event of finding an error. If this happens check your data and try again. In even rarer circumstances an error can return you to Sinclair Basic command mode. If this happens type "GOTO menu" (key G and type "menu").

Graph

For line, scatter and line fitting.

Graphs are scaled automatically with four values marked on each axis - the maximum, minimum and two intermediate values; the axis values are rounded up to whole numbers.

Background grid gives lines at these x and y values to help you read off the intermediate points on the graph.

Join up points gives a line graph; if not you get a scatter plot of the data values. If there are too many points the data values are superimposed and your graph will look untidy, but PROJECTOR 1 tries its best; "all options on" tends to look overcrowded!

Fit line produces and draws the "best fit" line using the technique of least square linear regression. In its simplest terms linear regression is a statistical technique for doing what you would do with a ruler, a pencil and common sense.

Fit curve produces and draws a "best fit" curve if you think this is more appropriate. If you say yes to both then the lines overrides.

Display statistics only applies if you have fitted a line or curve. It tells you the degree of fit - if you can understand the statistics, that is! For a layman's guide refer to "A Word About Statistics' in this booklet. It is not important that you understand the statistics.

ENTER or STOP terminates the graph and displays statistics if requested or tells you the graph reference.

< (SYMBOL SHIFT and R) as usual gets you back to *options*, so you can fit a curve instead or you can try a different set of data on the latest options.
When you have finished, the graph is saved in memory exactly as it last appeared and given a reference, for example "g5".
You can copy the completed graph to the printer. You can also copy statistics to the printer at the end of the statistics display.
If you build the graph into a presentation you are not given the option of replaying statistics.

Graphic image
Graphic image loads a predefined screen image from tape.

A screen image is an exact copy of any screen previously saved by the Spectrum command **SAVE "name" SCREEN$**. Because there are many other graphics/painting programs available (and due to lack of space) it was decided not to build up this SCREEN$ image using PROJECTOR 1 itself. However, once the graphic has been loaded into the data area PROJECTOR 1 can replay it instantly.
You are asked to position the tape to load SCREEN$ and play.
When it is loaded, a copy of the screen image is stored away in memory; you can then copy to the printer.
As it takes 6351 characters to store one screen in memory you will only have room for one full screen image. Typically you will use this for a company logo at the start and finish of a presentation.
Screen images are given a reference of i; for example "i1".

Histogram
Histograms are scaled automatically.

But you can override the scaling by changing the maximum and minimum values. If you have negative values the horizontal axis will come in the middle of the screen.

First horizontal and *Frequency horizontal* refer to the labelling of the horizontal axis. Values of 1 and 1 put labels every bar.
The horizontal labels are generated according to the type of data. For example Sun Mon Tue etc., for daily and Jun Jul Aug etc., for monthly.
Up to 63 bars are allowed - enough for two months' daily figures. If you use over 10 bars then labelling 1 and 1 will look untidy. The default is 5 and 5 giving horizontal labels every 5 bars.

Surprisingly you will find that red bars on a black background with a black border looks effective.

If the data type was *pairs* then you get a side by side histogram. For example, you can compare budget against actual figures.
The labelling of the horizontal axis for this type of histogram is slightly irregular. The frequency of horizontal labels should be an even number equal

to twice the number of pairs you want the frequency to be, and the first
horizontal label should be an odd number equal to the bar number (1,3,5 etc.)
of the first solid coloured bar you want labelled.
Once again < (SYMBOL SHIFT and R) returns you to the options screen.
ENTER or STOP stops the histogram display and moves on; you can then save
to the printer if you wish.
Each completed histogram is given a unique reference, for example h6,
entered automatically in the Directory and stored in memory.

Key points
These are used to preview, explain and summarise other slides.

Headings are optional; if you use them you get up to 5 lines of key points; if not
you get 6.
You can have *bullets*, or *numbers* (1,2,3 etc.) or just a space before each point.
You can have blank lines simply by pressing ENTER to a point when building
the slide.
You can have a delay between uncovering each point on replay.

Up to 21 characters per line are allowed. After that the line just scrolls up and
is lost!
When typing in a key point you will know when you have gone over 21
characters because the input line scrolls up (but take account of the number of
Ms and Ws - see below).
Careful with colour combinations - red letters on cyan or yellow background
works well as does blue on cyan.
Upper and lower case letters, numbers and the characters ()!%';-+=:#?/*,.
only are allowed. Other characters will give strange output. No check is made.

All valid characters are 3 Sinclair characters high by 1 character wide, except
upper and lower case W and M which are 2 characters wide. So the 21
characters per line must be reduced by 1 for each W and M!
You can modify the heading or any point. Do not worry that the final point
sometimes appears to be overwritten. It will be OK.
Typing ENTER on its own to a point will leave a blank line.

If you type < on its own to a point you are returned to the options screen. You
can then change the letter colour or bullets options and carry on. After
returning to the options screen, you can modify any line, but PROJECTOR 1
does not step through each line automatically. Answer 'y' to "Modify?" and
then put in the line number you want to change or add. Use this feature to
emphasise one point or for continuation lines for bullet points. You can flip
between the options and the key points screen as many times as you like using <.

STOP will terminate and save the slide: you can then copy to the printer.

It is possible, but not very interesting, to have presentations consisting solely of
key points.

Key points are given a unique reference, for example "k4", stored in memory and added to the Directory.

Load
Loads all of the data area from tape or microdrive into memory.

Included in data are finished slides and presentations.
It overwrites any existing data.
If a microdrive is plugged in PROJECTOR 1 asks whether you want to load from microdrive, and if so the name of the saved data file.
On first loading PROJECTOR 1, the demonstration data area is automatically loaded. You will probably want to overwrite this with your own data area.

Modify/View data
The main menu option to Modify/View the data works in a similar way to the "New data" option. If you do not move the cursor away from the top left-hand corner of the data screen PROJECTOR 1 knows that you are viewing rather than modifying and will not ask you for a new data name.

Names and references
For any set of figures you enter and any presentation you create you are asked to name the data or presentation (such as "demo1"). These names can be up to 9 characters and punctuation marks of your own choice. PROJECTOR 1 is "case-blind", that is upper and lower case letters are all stored as lower case, so "Data1-6%" is equivalent to "DATA1-6%" and "data1-6%". A check is made to ensure that you do not use the same name twice.
   Histograms, pie charts, graphs, key points and images are all given their own unique references by PROJECTOR 1, automatically stored in the data area as slides and automatically added to the Directory. You will see the references displayed after each has been created.

New data
New data is typed in separately from histograms, pie charts and graphs. Before you construct histograms, pie charts or graphs, you need to input data! But you only need to input once - you can produce a histogram, pie chart or graph from the same data.

Data can be input:
   by DAYS, WEEKS, MONTHS, QUARTERS or YEARS
   simply as ORDINARY numbers
   as pairs of values for an xy graph or for a side by side histogram.

Up to 63 numbers can be entered as ORDINARY data, or 42 numbers for the other types.
Data can be positive or negative numbers with or without a decimal point, but numbers written in scientific notation or as fractions will not be recognised.

For example:
   31, +4 and -7.67 are all valid
   but, 7.5E7 or 3/4 are not.

When inputting data:

ENTER takes you to the beginning of the next field. If the cursor is at the beginning of a field when ENTER is pressed then the number in the previous field is repeated,
< deletes a number (see below).
> creates a space to insert (see below).
You can move around the screen with the cursor controls should you wish to revise an entry:
An individual character can be revised by positioning the cursor over it and typing a new character, or can be blanked out by typing a space.
< deletes the whole entry in the field that the cursor is in, and moves all subsequent entries up one field.
> similarly moves the current field and all subsequent ones down, and creates a space for inserting a new entry.
STOP finishes entering data. At this stage noughts are inserted in any blank field before the last one in which you have made an entry, and you are asked to change any entries that are not understandable numbers. When you have made any necessary corrections exit again with STOP.
You are asked for a data name - up to 9 characters and punctuation marks of your choice.
If data under the name you have given already exists you are given the option to overwrite the existing data or rename your new data.
Data can be included in a presentation by referring to it as "dweek1", where "week1" is the data name.

Options
At various points, PROJECTOR 1 contains pre-set options which will give your slides an attractive presentation. You can vary these by overtyping the pre-set values followed by ENTER. When entering colour options use the numbers 0-7 on the ZX Spectrum keyboard. At the end of each histogram, pie chart, graph or key point slide you can return to the options screen by typing < (SYMBOL SHIFT and R), change the options and retry until you are happy with the end result.
   If any of the options are incorrect the message "Invalid" is flashed and PROJECTOR 1 substitutes a default value. If this is unsuitable use < to change options.

Pie-charts
Pie-charts give automatic percentages.

You add other text by simply moving the cursor and typing.
Up to 10 slices is a realistic maximum but PROJECTOR 1 leaves this up to you.

Narrow slices can look untidy.

When building a pie you can pull out one or more slices (or all if you wish!) for emphasis using the Separate Slice? screen.

If you do not like the format < (SYMBOL SHIFT and R) will return you to the options screen.

Each completed pie is given a unique reference, for example "p3", entered automatically in the Directory and stored in memory.

You are not allowed to build a pie chart based on data that includes negative numbers. If you try you will get the message "invalid".

When you are satisfied with the picture, press STOP; you can then copy to the printer if you wish.

Play presentation

Presentations can be:
  Automatic with a preset delay between slides.
  Manual where you have to press a key at the end of each slide.

You are also given the option of making the presentation breakable or not. If it is, then pressing BREAK at any point will return you immediately to the main menu. If not then the only way to stop is to pull out the plug! Use the unbreakable mode only for exhibitions and point-of-sale advertising.

For manual presentations, at the end of each slide you can press:
  t to replay This slide
  l to replay the Last slide
  c to Copy the slide to a printer
  STOP to stop the presentation
  any other key to continue to the next slide.

Project

Used to forecast data for several periods.

PROJECTOR 1 allows you to extend a line or curve beyond the current data to predict future values. You are asked how many periods forward and whether you want to fit a line or a curve (the defaults are 6 and a line) then PROJECTOR 1 calculates the equation of the line or curve, and generates and then displays the new data.

Notice that the projected values lie exactly on the line or curve and are highlighted in yellow.

Project is not allowed for data set up in "pairs" format.

The number of projected values plus existing values must be less than or equal to 63 or 42. If this is not the case PROJECTOR 1 reduces the number of projected values and tells you.

You can save the projected data under a new name or by using an existing name make it overwrite existing data.

You cannot save a projection for inclusion in a presentation; but you can graph

the projected data and save that instead, and you can copy the projected graph to the printer using "c".

Project is an extremely powerful and easy to use facility . . .

Save
Saves all the data area on tape or microdrive.

Make sure that you are recording, not playing (ear plug out)!

You are asked to rewind the tape and play to verify that the SAVE worked correctly. If verify fails, the computer will make a rasping sound, then return to the main menu. If nothing at all happens (no recording!), press BREAK (CAPS SHIFT and SPACE) to return to the main menu and save again.

If a microdrive is plugged in (PROJECTOR 1 automatically detects this) you are asked whether you want to save to microdrive or to tape. If you reply 'm' then you are asked additionally for a microdrive filename to uniquely identify the data.

Save frequently and take a second copy on a different tape or microdrive cartridge and do not keep them in the same place!

Summary of keys

STOP	SYMBOL SHIFT and A	exits from the current screen.
move cursor then ENTER	CAPS SHIFT 6 or 7	select a main menu option.
right arrow	CAPS SHIFT and 8	top of menu (New data).
left arrow	CAPS SHIFT and 5	Directory.
<	SYMBOL SHIFT and R	at the end of a slide returns you to the options screen.
GOTO menu	G and m-e-n-u	restarts the program if interrupted.
BREAK	CAPS SHIFT and SPACE	returns immediately to the main menu (unless an unbreakable presentation is running).
On data entry		
<	SYMBOL SHIFT and R	deletes a data item.
>	SYMBOL SHIFT and T	inserts a data item.
ENTER		moves the cursor to the next field.
ENTER on its own		repeats a data item.

A WORD ABOUT STATISTICS
by Ged Fitzgibbon

Introduction

It is by no means essential to understand statistics to use PROJECTOR 1. Statistics are not designed to be part of a presentation. However, it is useful to know how much confidence to place in the line or curve that the computer has drawn, and it is possible to display (and print out) statistical information. The following, while by no means a complete description, forms an introduction to the subject.

Linear regression is a well known statistical technique for calculating a best line or curve to a set of data points. This section will illustrate the method and give a brief explanation of the figures you get with the "Display Statistics" option in building a graph
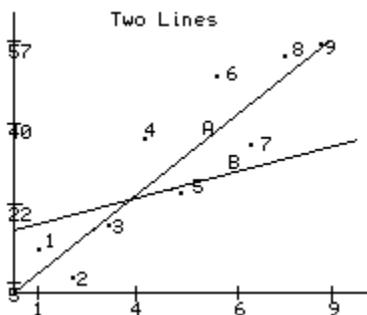
Figure 1

You can draw any number of lines through the points. Why is any line A better than any other line B? One reason is that the residuals, that is the errors from the points to the fitted line, add up to a smaller number for A than for B. The measure normally used is the sum of the squares of the residuals. The smaller the sum of the squares the better the fit. Hence the method is often called "least squares regression".

A line has the general equation $Y = mX^2 + c$ where m and c are the values (called coefficients) to be estimated. For a curve the method fits $Y = qX^2 + mX + c$.

Figure 2

Figure 3

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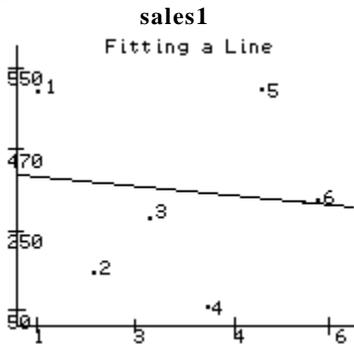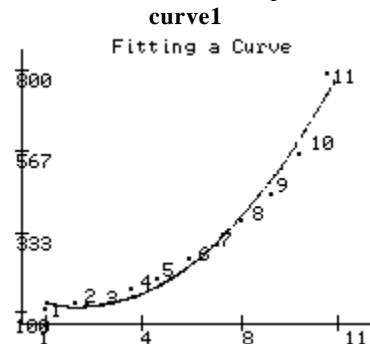
So the first output from the "Display Statistics" option is the equation:

$$Y = -13.429 X + 405.333 \qquad \text{for sales1}$$

and $\qquad Y = 8.217 X^2 - 37.129 X + 151.891 \qquad$ for curve1

Once calculated, the equation can be used to predict Y for new values of X. This is the heart of the "Project" option. When you project, it should come as no surprise that the projected values lie exactly on the line or curve.

The remaining output from the "Display Statistics" option is concerned with the degree of statistical confidence in the fit.

R squared

sales1 = .00967 $\qquad\qquad\qquad$ curve1 = .979

R^2 is one of the best measures. It is the fraction of variation of Y explained by a variation in X. So for the curve, R^2 is 0.979, that is 98% of the variation in Y is explained by a variation in X, with 2% unpredictability. This, as you can imagine, is an unusually good fit. On the other hand R^2 for sales1 is only 0.009, that is 1% of the variation is accounted for by the regression equation with the remaining 99% random!

Corrected R^2 is a slight variation on R^2, adjusted for the degrees of freedom - only of interest if you understand what this means.

t statistics

sales1		curve1	
constant	= 1.532	constant	= 3.886
X	= -0.198	X	= -2.48
		X^2	= 6.76

The t statistics are measures of the reliability of the individual parts of the equation; in general the larger they are the better. Specifically if the t statistic for a coefficient is between +2 and -2 then the coefficient is suspect. On the other hand if its t statistic is greater than 2 (or less than -2) then there is a 95% chance that the coefficient is non-zero. To be precise, a t statistic for a coefficient is an indicator of whether that coefficient is zero and thus not part of the equation. For example if you tried a curve fit and the t statistic of the X^2 coefficient was low then it is highly likely that a line (without the X^2) would give a better fit.

Standard errors

sales1		curve1	
constant	= 264.596	constant	= 39.083
X	= 67.942	X	= 14.969
		X^2	= 1.215

Standard errors show the degree of variation in each of the coefficients. Since these are known to obey the famous "normal" statistical distribution then the usual rules apply! There is a 66% probability that a coefficient is within one standard error and a 95% probability that it is within 2 standard errors. For example for the line:

$$Y = -13.429 X + 405.333$$

there is a 66% chance that the constant is 405.333 plus or minus 264.595

(its standard error), which means that it is between 141 and 670.
There is a 95% chance that the constant is 405.333 plus or minus 531.192
(twice its standard error), that is, between -126 and 937. In other words
the standard error is saying "your guess is as good as mine!".

Curve equation: $Y = 8.217 X^2 - 37.129 X + 151.891$
On the other hand if we look at the X^2 coefficient on the curve the confidence
levels are:
    66%: 8.217 + or - 1.215, that is between 7.0 and 9.4
    95%: 8.217 + or - 2.430 (2 standard errors), that is 5.8 to 10.6
The interplay of standard errors can be difficult to interpret. The next statistic
is of more practical use.

Standard error of the regression

sales1	curve1
284.222	35.588

This shows the expected variation in the line Y itself. 66% of the values and
hence of the data points will lie within one standard error of the line and 95%
within two standard errors. For example, if we look at curve1 (sales1 gives a
ridiculously wide variation) and take a particular value of X, say 8, then Y on
the calculated curve is:
    $Y = 8.217 X^2 - 37.129 X + 151.891$, that is 380.747
There is a 66% level of confidence:
    that Y lies between 380.747 + or - 35.588,
    that is 345 and 416;
and a 95% level of confidence
    that Y lies between 380.747 + or - 71.176 (2 standard errors),
    that is 309 and 451.

F statistic

sales1	curve1
0.039	186.975

This is another overall measure of the success of the regression. Needless to
say, the higher the value the better. The degrees of freedom are needed when
you look up the value in your handy pocket book of tables of the cumulative F
distribution! To save you the trouble, there is a 99% probability that curve1
fits the points, but the least said about sales1 the better!