GraphPlan

Guide to the financial modelling software in the
BBC Microcomputer Z80 pack

Contents

Conventions used in this guide

In this guide, we use a set of standard notations to refer to keys on the keyboard, to rows and columns on a spreadsheet, and to items you type in. The following examples will show how the conventions work.

ESCAPE refers to a key on the keyboard — in this case, the key marked 'ESCAPE'

<field number> means type in a field number: do not type in the angled brackets

n means type in a number

CTRL BREAK means: while holding down **CTRL**, press **BREAK**

In the chapters on the maths and statistics commands:

x-row
y-row
x-column
y-column refer to the input rows or columns (the rows or columns which contain the figures that you want to put into a calculation)

z-row
z-column refer to the output row or column (the row or column where you want the results of the calculation to be put)

1 GraphPlan

GraphPlan is a financial modelling program, designed to help you visualise the way your financial position is developing.

You'll be working with a spreadsheet — an array of rows and columns — on your screen. Into it, you feed details about your finances. You then ask the computer to perform calculations on those figures. GraphPlan can be used to work out personal expenses, to forecast cashflow, to predict profits — most kinds of analysis are possible, including complex statistical work.

You can have your finished spreadsheet printed out or stored on disc; and you can use GraphPlan to turn those rows of figures into graphs and charts, to give an instant picture of what the figures really mean.

In the next two chapters, we explain the idea of a spreadsheet and the basics of graphs and charts. Chapter 4 tells you how to load the program and start it running. Chapter 5 guides you through your first GraphPlan session. Read this chapter before you start doing real work with the program — you can try out the activities it describes as you go through it. It's only an introductory survey, but it will tell you all you need to know to get started.

The main part of the manual — chapters 6 to 16 — is a complete guide to all the GraphPlan activities.

At the back of the guide, you'll find:

- a chapter which makes suggestions on using GraphPlan for statistical analysis
- a guide through the program's graphics design options
- an index to the GraphPlan commands
- a list of the error messages that might appear on your screen
- a glossary
- an index.

Before you start, please read carefully your *Z80 user guide*. It contains essential information on setting up your equipment, loading its operating system and preparing discs.

2 Using spreadsheets

A spreadsheet is an array of rows and columns on which you can create a model of any financial operation. Each space in the spreadsheet is a cell.

spreadsheet
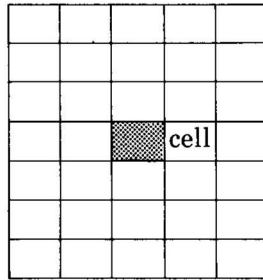
This spreadsheet has five columns and seven rows, and could store a number in each of its 35 cells. You can then perform calculations on these numbers. You could, for example, fill columns 1 and 2 with numbers and ask the program to add them together and put the results in column 3.
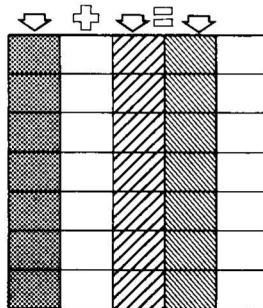
GraphPlan can handle much larger spreadsheets than this: it's possible to have up to 1000 cells.

3 Using graphics

With GraphPlan you can see data from your spreadsheets in pictorial form — in charts.

To construct a chart, you handle one row (or column) of your spreadsheet at a time. In GraphPlan, the pictorial version of a single row (or column) is called a graph. You might, for example, want to see your company's sales figures over the last five years as a graph, so that you can get a visual idea of the rate at which they're going up.

There are three kinds of graph — three ways of presenting a row or column of data:

- **bar**
- **line**
- **pie**.
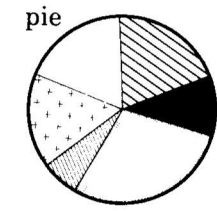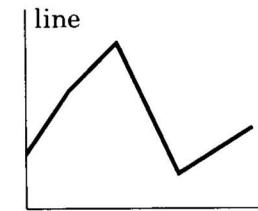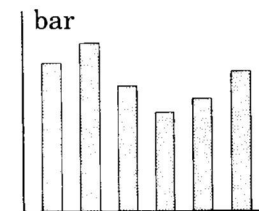
Bar graphs are best for showing comparisons — for example, your forecast profits in each of the next five years. Line graphs show changes over time: you might use one to show how your expenses have fluctuated over the last twelve months. Pie graphs are used to depict how something is shared out — how, for example, last year's income was distributed among wages, overheads, tax, profits and so on.

Each cell in the row (or column) on your spreadsheet becomes:

- a bar on a bar graph
- a point in a line graph, or
- a segment in a pie graph.

4 Working with GraphPlan

This chapter explains:

- how to start GraphPlan
- how your screen will be arranged
- how to give the program instructions
- how to leave the program.

Starting

1 Make sure that everything is switched on.

2 Flip over your function key cards until they're open at the GraphPlan page.

3 Put your GraphPlan program disc in drive A and your data disc, if you're using one, in drive B.

4 If you need to load CP/M

press   `CTRL` `BREAK`

Otherwise,

type   `CTRL` C

5 After the A> prompt

type   `GRAPH` `RETURN`

GraphPlan will start, and a blank spreadsheet will appear on your screen.

The screen

When GraphPlan starts, the screen looks like this:
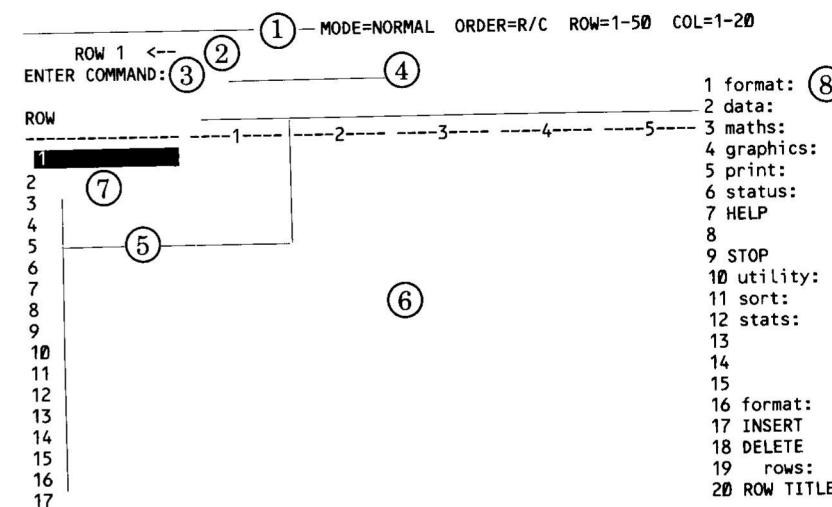
1	message areas	5	space for spreadsheet row and column headers
2	data pointer line	6	spreadsheet area
3	prompt	7	data pointer
4	entry line	8	menu area

message areas
Spaces where the program will display its messages to you.

data pointer line
Tells you where on your spreadsheet you're currently working. At any one moment, GraphPlan will be working on:

- one particular row
- one particular column, or
- one particular cell.

This is the position where data will be entered, or commands carried out. The position is marked in two ways:

- by a highlighted block on the screen, marking the row, column or cell: this is the data pointer itself
- by the data pointer line, which gives the position of the data pointer.

prompt
A screen message that asks you to enter a command or some data.

entry line
The space where your commands and data will appear, as you type them in. You don't type straight into the cell: GraphPlan copies the data you enter into the correct spreadsheet position.

spreadsheet area
The space where the cells of your spreadsheet will be shown. Unless you set up a small spreadsheet, it will not all be shown on the screen at once — there isn't enough space. Instead, only the part you're currently using will be visible. When you start, an empty spreadsheet will appear on your screen, 17 rows deep and five columns wide.

data pointer
Shows you where on your spreadsheet you're currently working.

menu area
The space where reminders of the GraphPlan commands can be displayed.

Messages and prompts

Messages and prompts are shown in this guide like this:

Message `MODE=NORMAL ORDER=R/C ROW=1-50 COL=1-20`

Message `OK to erase current data?`

Prompt `ENTER COMMAND:`

Prompt `SET PAPER; HIT RETURN`

Giving commands

The top of your screen will currently look something like this:

```
                                  MODE=NORMAL   ORDER=R/C  ROW=1-50  COL=1-20
     ROW 1  <--
ENTER COMMAND:
```

The prompt line here consists of:

`ENTER COMMAND:`

This is the command prompt: GraphPlan is ready to receive a command from you. You can give commands only when the prompt line says `ENTER COMMAND:` and nothing else.

You give a command by typing in a command number.

Some commands keep prompting for information. If you're in the middle of an operation like this, you need to finish the command, by pressing `ESCAPE`, before you can give a new command.

When we say something like:

select   63

we mean:

press   `ESCAPE`

if necessary to leave the operation you're in, then

type   63 `RETURN`

If you make a mistake while entering a command, press `ESCAPE` and start again.

Using the menus

The menu area has room for twenty options, but many more than that are available. In fact, what you see when you start GraphPlan is just the top of its menu. The complete menu has nearly 150 lines. To get to later sections, you select one of the numbers whose label is in lower-case letters, for example:

3 maths:

Selecting 3 will make the menu area jump to the part of the menu that lists maths commands.

You can jump around the menu at any time using these lower-case commands. To get back to the top of the menu:

press   RETURN

Leaving GraphPlan

To stop working with GraphPlan:

select   9

When you leave the program, data on your screen is lost (unless you've filed it), so when it receives the 9 command, the program reminds you of this:

Message   OK to erase current data?

Prompt   VERIFY (Y OR N):

Type   Y RETURN

You could then remove the GraphPlan program disc and, if you want to, load another program.

Always leave the program in this way before switching your computer off or taking the GraphPlan disc out, otherwise the contents of the disc might be corrupted.

You can re-enter GraphPlan by:

typing   GRAPH RETURN

5 Trying out GraphPlan

This chapter guides you through GraphPlan, step by step. It's a good idea to try out each step as you read about it. When you've worked through the chapter, you'll be familiar with all the basic rules for using the program.

First, start the program, following the instructions in chapter 4. A blank spreadsheet will appear on your screen.

Planning a spreadsheet

Before using GraphPlan to prepare a spreadsheet, it's a good idea to work out on paper:

- what you want the spreadsheet to show
- where you will get your data from
- what calculations you are going to want GraphPlan to carry out.

Start by designing a simple spreadsheet on a piece of paper.

Example

This is a very simple profit and loss forecast for a fictitious company, Blueprint Products. The rows might look like this:

sales
cost of sales
gross profit
research and development
wages
other overheads
total overheads
net profit

The forecast might be for each of the six years 1990-1995, so the spreadsheet will have six columns:

	1990	1991	1992	1993	1994	1995
sales						
cost of sales						
gross profit						
wages						
r & d						
other overheads						
total overheads						
net profit						

Next, work out where the data will come from. You will type in figures for:

- *sales*
- *wages*
- *research and development*
- *other overheads.*

You will then ask GraphPlan to calculate the figures for:

- *cost of sales*
- *gross profit*
- *total overheads*
- *net profit.*

Throughout this chapter, we shall be returning to the Blueprint Products example. You might like to follow it, keying in the data and commands we suggest; or better still, invent your own spreadsheet along similar lines.

Setting up

To set up a spreadsheet:

select   **109**

Message   OK to erase current data?

Prompt   VERIFY (Y OR N):

The SET UP command has the effect of erasing any data on the screen, to make way for a new spreadsheet. The program will always check with you before carrying out any command that erases data. This time, there isn't any current data, so it's quite safe to answer 'yes'.

Type   Y RETURN

The next stage is to specify how many rows and columns you'll need. Allow two or three extra of each, in case you want to extend your spreadsheet later.

Prompt   NUMBER OF COLUMNS (1-99):

Type   <the number of columns you want> RETURN

You can choose any number up to 99. If you're not sure how many columns you'll need

press   RETURN

and the program will choose a number for you (in this case, 20).

Example

To set up the spreadsheet for the Blueprint Products profit forecast, specify at least 6 columns: 8 would be a good size.

Prompt   ROWS (1-133):

Now type in the number of rows you want, up to 133, then press RETURN. If you just press RETURN, you will get 133 rows.

Example

For the Blueprint spreadsheet, specify at least 8 rows: 10 would be a good choice.

The more columns you ask for, the fewer rows will be offered — the size of your computer's memory determines the size of the offer. For example:

- if you specify 99 columns, you can have up to 10 rows
- if you specify 1 column, you can have up to 239 rows
- if you specify 51 columns, you can have up to 22 rows.

Message   n ROWSxn COLS

Prompt   VERIFY (Y OR N):

n stands for the numbers you've chosen. If you want to change them

type   N `RETURN`

and the NUMBER OF COLUMNS (1-99): prompt will re-appear. Otherwise,

type   Y `RETURN`

The spreadsheet you've set up — or the first part of it — now appears on your screen.

Adding titles

Next, give your rows and columns titles. For row titles:

select   20

Prompt   :

Type   <title of row 1> `RETURN`

A row title can be up to 40 characters long — letters, numbers or symbols — though there's only enough space on the screen to show the first 13 characters. If you make a mistake while typing

press   `DELETE`

to rub out the last character you typed. To rub out a string of characters, hold the `DELETE` key down. If you find your letters are appearing as capitals:

press   `CAPS LOCK`

When you've entered your first row title and pressed `RETURN`, the title will appear in the right place on your spreadsheet.

Prompt   :

You can now enter the title of the second row, and so on. If you want to go back and alter any of your row titles, use the cursor keys. The title of the row your cursor is currently in is shown highlighted on your screen. To move the cursor to the previous row:

press   ⬆

You can now re-enter the title. To move to the next row:

press   ⬇

Example

The titles you enter for the Blueprint spreadsheet will be as follows. You'll see that there isn't space on the screen to show the last two letters of 'overheads'. (If you want to make more space for titles, there are instructions in chapter 7.)

sales
cost of sales
gross profit
r & d
wages
other overheads
total overheads
net profit

When you've given all your rows the right titles:

press   `ESCAPE`

Now you can do the same for column titles.

Select   25

Each column title can have two lines.

Prompt   1:

Type   <first line of first column title> `RETURN`

Prompt   2:

Type   <second line> `RETURN`

If your title has only one line, press **RETURN** when you get the prompt `2:`. Each line can be up to 19 characters long, though only the first 9 will show on the screen.

Prompt `1:`

Now you type in the first line of your second column title. Carry on until you've named all your columns.

You can correct mistakes in exactly the same ways as you did when giving row titles. The ⟵ key moves the cursor to the previous column.

Example

The Blueprint column titles will each be only one line long:

1990
1991
1992
1993
1994
1995

Your columns will be moved over to the left as the sixth title is entered on the spreadsheet.

When you've finished:

press **ESCAPE**

If you want to change any row or column title later, use options `20` or `25` again.

Your spreadsheet is now ready. If you follow this set-up procedure for Blueprint Products' profit forecast, your screen will now look like this:

```
                            MODE=NORMAL   ORDER=R/C   ROW=1-10   COL=1-8
      ROW 1 (sales) <--
ENTER COMMAND:
                                                              1 format:
ROW                 1992     1993     1994     1995           2 data:
---------------- ----3---- ----4---- ----5---- ----6---- ----7---- 3 maths:
 1 sales                                                      4 graphics:
 2 cost of sales                                             5 print:
 3 gross profit                                              6 status:
 4 r & d                                                     7 HELP
 5 wages                                                     8
 6 other overhea                                            9 STOP
 7 total overhea                                            10 utility:
 8 net profit                                               11 sort:
 9                                                          12 stats:
10                                                          13
                                                            14
                                                            15
                                                            16 format:
                                                            17 INSERT
                                                            18 DELETE
                                                            19   rows:
                                                            20 ROW TITLE
```

Moving over your spreadsheet

You'll use the cursor keys to move over your spreadsheet, so that the row or column number shown at the data pointer changes to the number you want. If your spreadsheet is too large for the screen to show it all, only the part you're currently using will be shown. To move to an area currently off-screen, use the cursor keys, and the area shown will change.

There are more details on moving over your spreadsheet in chapter 7.

Using the data pointer

Many GraphPlan commands operate on a particular row or column. For example, when you use maths commands, the results of your calculations are put into the row or column you specify. With these commands (we'll explain them in detail in the next few pages), the rule is:

- first set the data pointer
- then select the command.

That is, use the cursor keys to move the data pointer to the row or column you're interested in before entering the number of the command you want.

With other commands, you don't have to specify a particular row or column, but you do need to choose between row mode or column mode. That is, your data pointer must show a row number (for row mode) or a column number (for column mode).

If the data pointer shows something like:

        ROW 2 <--

or   ROW 3 , COL 4 <--

you're in row mode. If it shows something like:

        COL 7

or   COL 1 , ROW 3 <--

you're in column mode.

To change the row or column that is being addressed:

- use the horizontal cursor keys to move between columns
- use either ⬆ or ⬇ to switch from a column to the first row
- use the vertical cursor keys to move between rows
- use either ⬅ or ➡ to switch from a row to the first column.

Limiting the rows and columns you deal with

You may want to enter data or carry out calculations on only a part of your spreadsheet. To limit the area of spreadsheet you operate on, use commands 92 (for rows) or 93 (for columns) or both.

Example

You've set up spare rows and columns in your Blueprint spreadsheet, and you might want to limit the program's operations, so that you work only on the columns to which you've given titles — that is, columns 1 to 6.

Select   93

Prompt   COL BEGIN (1-8):

Enter the number of the column at the start of the range you want to work with:

type   1 RETURN

Prompt   COL END (1-8):

Now enter the number of the last column in the range:

type   6 RETURN

When you've changed the row or column range, the message shown at the top right hand corner of your screen will remind you:

message   ROW=1-10 COL=1-6

Data entry

The next stage is entering data into your spreadsheet. Press ⬅ to display the left-hand part of your spreadsheet.

Set the data pointer to the row or column into which you want to put data.

Example

Move the data pointer in your Blueprint spreadsheet to ROW 1.

Select   31

Prompt

CHOOSE (VALUE=0, CONSTANT=1, GROW=2, INCR=3):

You are being asked to choose an entry option, by typing **0**, **1**, **2** or **3**:

---

0   to enter data cell by cell
1   to enter data in the first cell and make the program repeat it in all the other cells in the row or column
2   to enter a base value in the first cell, and make the program make it grow by a percentage rate from each cell to the next
3   to enter a base value in the first cell, and make the program increase it by a constant amount from cell to cell.

There are some general rules about entering data:

- to enter a zero, type **0** `RETURN`
- to repeat an amount you've just entered, press `RETURN`
- do not try to enter pound signs or commas.

GraphPlan can accept and store longer numbers that it can normally fit into a cell. It will take numbers up to 15 digits long, including up to 3 decimal places. The program abbreviates long numbers by:

- not showing decimal places
- showing any number longer than nine characters as **✳✳✳**.

You can change these ways of treating long numbers, by enlarging the display space for each cell and by asking GraphPlan to show decimal places. Full instructions are in chapter 7.

If you find you've entered the wrong number:

- use the cursor keys to go back to the cell
- now enter the correct number.

Example

You can now enter four rows of data on the Blueprint spreadsheet:

- *- sales*
- *r & d*
- *wages*
- *other overheads.*

The other rows will be filled by carrying out calculations with the data you enter.

sales
Check that the data pointer is in row 1.

Select   **31**

The sales figures are expected to grow at a steady 20% a year, so, choose the grow option, **2**:

type   **2** `RETURN`

Option 2 gives you:

prompt   **BASE VALUE:**

Type the number for the first cell — that is, the sales figure for 1990, which in this example is 200,000.

Type   **200000** `RETURN`

The base figure will appear in the first cell.

Prompt   **RATE:**

Enter the percentage by which sales grow each year:

type   **20** `RETURN`

You could enter a negative figure here if you needed to show decline instead of growth.

GraphPlan will now fill all the cells in the row (or column), move on to the first cell in the next row (or column), and wait for another command.

research and development
Move the data pointer to **ROW 4**.

Select   **31**

Research and development costs vary from year to year — in this example, they start high, and then go down rapidly once the company's product has been proved on the market — so you enter the figures cell by cell: choose option **0**.

Option 0 gives you:

prompt   **VALUE:**

Type the number to go in the first cell of the row.

Type   **200000** RETURN

GraphPlan will now move on to the next cell, and prompt you for a **VALUE:** *again.*

Type in the other values in the row:

150000
80000
5000
2000
2000

(You don't need to type in the last 2000: press RETURN *and the program will repeat what it entered in the previous cell.)*

When you have filled all the cells you want to fill:

press   ESCAPE

to return to the command prompt.

wages figures
The data pointer will be in the right position already – **ROW 5**.

Select   **31**

In this example, the wage bill increases by a constant increment each year, so choose the increment option, **3**.

Option 3 gives you:

prompt   **BASE VALUE:**

Enter the number for the first cell:

type   **32000** RETURN

The base figure will appear in the first cell.

Prompt   **RATE:**

Enter the increment figure:

type   **1800** RETURN

Once again, you could enter a negative figure if you needed to show a decrease.

GraphPlan will now fill all the cells in the row (or column), move on to the first cell in the next row (or column), and wait for another command.

other overheads
The data pointer will already be in position, in **ROW 6**.

Select   **31**

In this example the other overheads are a constant 35000 a year, so choose the 'constant' option, **1**.

Option 1 gives you:

prompt   **BASE VALUE:**

Enter the constant figure:

type   **35000** RETURN

GraphPlan will fill all the cells in the row (or column), move to the first cell of the next row (or column), and wait for another command.

You have now finished entering data — the rest of the spreadsheet will be filled in with the results of calculations carried out on what's already there. To give GraphPlan the necessary instructions you use a new group of commands, the maths commands.

Using maths commands

Select   3

The maths commands will be listed on the right of your screen. There is a set of statistical commands available too: you can look at the statistics sub-menu by selecting 12.

These commands are explained one by one in chapters 9 and 10 of this guide. Here, we will show the basic principles behind the way they work.

The procedure for carrying out calculations on your spreadsheet is:

■ use the cursor keys to move the data pointer to the empty row or column where you want the answers to appear
■ select the maths or statistics command you want
■ specify, when prompted, the rows or columns which contain the numbers you want to put into the calculation.

The row (or column) where the results go is the output row (or output column).

The rows (or columns) that contain the figures you want to put into the calculations are the input rows (or input columns).

Example

You can now fill in the other rows in the Blueprint spreadsheet.

cost of sales
In this example, it's a constant fraction: one quarter of the sales figures. Move the data pointer to the output row, ROW 2. The maths command you need is 54, which divides the numbers in a row or column you specify by a constant figure.

Select   54

Prompt   VALUE:

Enter in the value of the constant — in this case, 4.

Type   4 RETURN

Prompt   ROW (1-10):

Enter in the number of the row with the sales figures:

type   1 RETURN

The calculations will now be carried out.

gross profit
The gross profit is 'sales' less 'cost of sales'. Check that the data pointer is at the output row — in this example, ROW 3.

Select   42

the subtraction command.

Prompt   ROW (1-10):

Now you specify the first input row. This is the row with the figures you want GraphPlan to subtract from — the 'sales' figures.

Type   1 RETURN

Finally, specify the other input row — the one with the figures to subtract by, the 'cost of sales' figures.

Prompt   ROW (1-10):

Type   2 RETURN

The calculations will now be carried out, and the results put in row 3.

total overheads
You'll be adding the figures for:

■ *research and development*
■ *wages*
■ *other overheads.*

The ordinary addition command (41 ADD) can add only two sets of figures together, so here you should use the SUM command instead. This command adds together the figures in a series of rows (or columns) — as many sets of numbers as you like, as long as the numbers that go into the sum occupy adjacent rows (or columns). Here, the series you're interested in is rows 4 to 6.

Move the data pointer to row 7 and select 55.

Prompt   ROW BEGIN (1-10):

After the first prompt, type the number of the first row of the series you want to sum and press RETURN. *In this case:*

type   4 RETURN

Prompt   END (4-10):

Type   6 RETURN

The calculation will now be carried out.

net profit

Make sure the data pointer is at row 8; select 42 *and specify the two rows in the subtraction sum: 3 and 7. GraphPlan will do the rest.*

The final spreadsheet should look like this:

```
                         MODE=NORMAL  ORDER=R/C  ROW=1-10  COL=1-8

       ROW 9  <--
     ENTER COMMAND:
                                                            40 maths:
     ROW           1990     1991     1992     1993     1994 41 ADD
     --------------  ----1----  ----2----  ----3----  ----4----  ----5---- 42 SUB
     1 sales       200,000  240,000  280,000  345,600  414,720 43 MULT
     2 cost of sales 50,000   60,000   72,000   86,400  103,680 44 DIV
     3 gross profit 150,000  180,000  216,000  259,200  311,040 45 NEGATE
     4 r & d        200,000  150,000   80,000    5,000    2,000 46 INVERSE
     5 wages         32,000   33,800   35,600   37,400   39,200 47 INTEGER
     6 other overhea 35,000   35,000   35,000   35,000   35,000 48 ROUND
     7 total overhea 267,000  218,800  150,600   77,400   76,200 49 CUMULATE
     8 net profit  -117,000  -38,800   65,400  181,800  234,840 50 ABSOLUTE
     9                                                          51 ADD K
     10                                                         52 SUB K
                                                                53 MULTK
                                                                54 DIVK
                                                                55 SUM
                                                                56 GET
                                                                57 FLOOR
                                                                58 CEILING
                                                                59
```

Stored maths commands

While you're working on a spreadsheet, GraphPlan keeps in the computer's memory not only all the data in your spreadsheet, but also the maths commands you've used. If you later store the spreadsheet on disc, the maths commands will be stored too.

Example

The stored maths commands in the Blueprint example are all row commands, so select 22 *for rows. You will see a display like the following:*

```
     Press any cursor key to recover your display.
           ROW 1 (Sales) <--
     ENTER COMMAND:
                       UNDER BLANK DEC FOR                      40 maths:
     ROW           TYPE LINE LINES SIZ MAT COMMAND  PARAMETERS  41 ADD
     --------------  ----  ----- ----- --- --- -------- ----------- 42 SUB
     1 sales       data        -   -   -                          43 MULT
     2 cost of sales data      -   -   - DIV K    K=4 ROW=1       44 DIV
     3 gross profit data       -   -   - SUB      ROW=1 ROW=2     45 NEGATE
     4 r & d       data        -   -   -                          46 INVERSE
     5 wages       data        -   -   -                          47 INTEGER
     6 other overhea data      -   -   -                          48 ROUND
     7 total overhea data      -   -   - SUM      ROWS 4 - 6      49 CUMULATE
     8 net profit  data        -   -   - SUB      ROW=3 ROW=7     50 ABSOLUTE
     9             data        -   -   -                          51 ADD K
                                                                  52 SUB K
     10            data        -   -   -                          53 MULTK
                                                                  54 DIV K
                                                                  55 SUM
                                                                  56 GET
                                                                  57 FLOOR
                                                                  58 CEILING
                                                                  59
```

The parameters are the details you put into your calculation: row or column numbers, constants, or formulas.

The other columns in this display show format options, which affect the way your rows will be printed. These options can be changed: the instructions are in chapter 16.

What you see on the screen is the structure of the financial model you've created. This display is particularly useful if someone else uses your spreadsheet and wants to see how it was set up.

To go back to your spreadsheet, press one of the cursor keys.

Editing

GraphPlan makes it easy to edit your spreadsheet if you need to. You can:
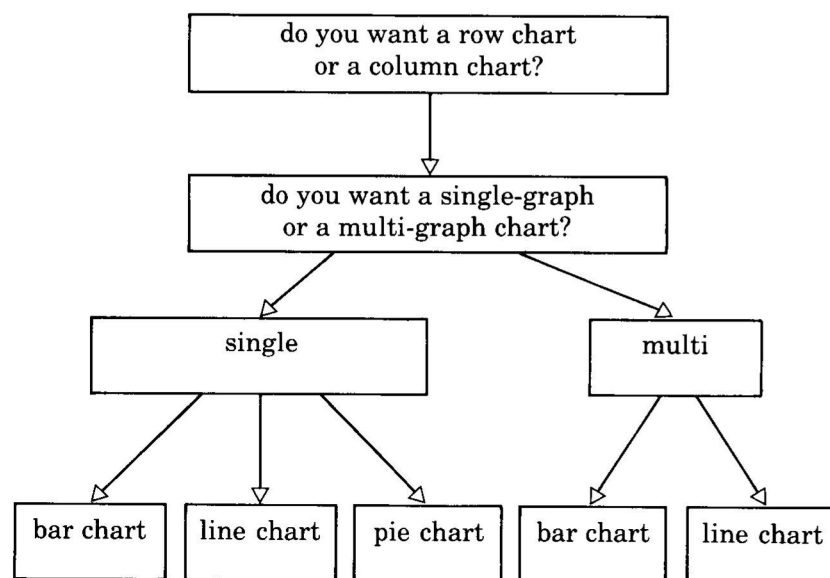
- move rows and columns around
- delete a row or column
- copy rows or columns
- change the data in one cell
- delete stored maths commands.

Full details are in chapter 11.

Graphics commands

The next step is to turn the figures on your spreadsheet into pictorial form — a chart.

A chart in GraphPlan is a collection of one or more superimposed graphs; a graph is a pictorial display of the data in just one row (or column) of your spreadsheet.

```
┌─────────────────────────┐
│ do you want a row chart │
│   or a column chart?    │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ do you want a single-graph │
│   or a multi-graph chart? │
└─────────────────────────┘
      │                │
      ▼                ▼
┌──────────┐      ┌──────────┐
│  single  │      │  multi   │
└──────────┘      └──────────┘
  │   │   │          │     │
  ▼   ▼   ▼          ▼     ▼
┌──────┐┌──────┐┌──────┐┌──────┐┌──────┐
│ bar  ││ line ││ pie  ││ bar  ││ line │
│chart ││chart ││chart ││chart ││chart │
└──────┘└──────┘└──────┘└──────┘└──────┘
```

When you're setting up a chart, there are several detailed design decisions to make. GraphPlan gives you the choice of making them yourself, or letting it decide for you — that is, using its default design.

To do your own designing, you select the advanced graphics command, 63; to follow the default design, use the simple graphics commands, 62 and 61.

For now, you should keep with the simple graphics commands.

From the Blueprint spreadsheet, you will probably want to see the net profit figures displayed in chart form. However, it would give you more information to see the profit figures and the sales figures superimposed on the same chart. This will show you:

- *the rate of growth of each*
- *the relationship between the two rates.*

So you'll want a multi-graph row chart.

To set up the chart, move the data pointer to the first row you want to see as a graph.

Select   62

A message like this will come up:

message   Current=ROW 1,Bar

This is a default graph specification. If you don't change the specification, GraphPlan will display a bar graph of the data in row 1.

To change the specification, follow the prompts:

prompt   Enter Row(1-10) for Graph 1:

If the data pointer is showing the row you want, press RETURN. If it is not, type in the number of the first row you want to see as a graph:

type   1 RETURN

Prompt   Choose (Bar=1,Line=2,Pie=3) for Graph 1:

A bar graph is a good choice for sales figures.

Type   **1 RETURN**

Prompt   `Enter Row(1-10) for Graph 2:`

Type   **8 RETURN**

Prompt   `Choose (Bar=1,Line=2,Pie=3) for Graph 2:`

The profit figures might best be shown as a line graph.

Type   **2 RETURN**
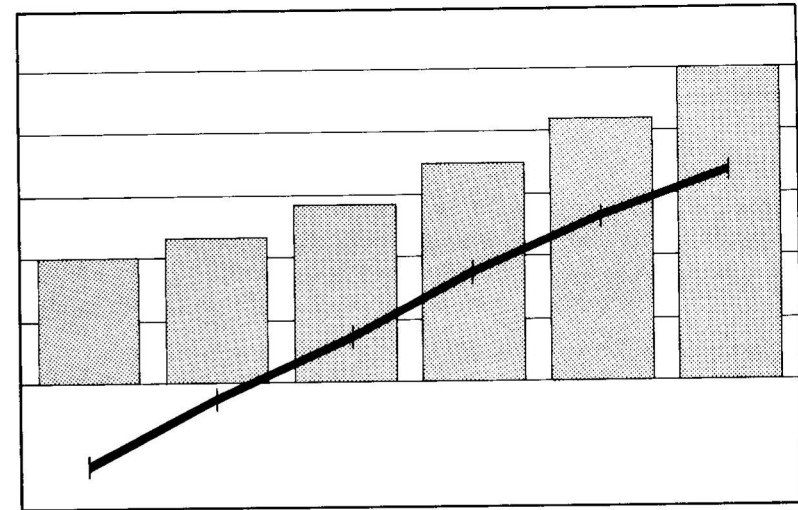
Prompt   `Enter Row(1-10) for Graph 3:`

GraphPlan now allows you to set up more rows, all of which can be superimposed on the same chart. In this case two rows is enough. So, to finish:

press   **ESCAPE**

To display your chart on the screen:

- make sure the data pointer is in the right mode: in this case, row mode, since it's a row chart
- select **61**.

The chart will now be displayed, like this:

To return to your spreadsheet, press any cursor key. As long as you continue working with the same spreadsheet, you can redisplay the graph by selecting **61**.

'What if': projecting

The graphics option is one of GraphPlan's most useful and powerful features. Another is its ability to let you change some of the data in your spreadsheet, and test the implications.

You can change:

- the data in a particular cell
- the maths commands you used to fill some of your rows or columns
- whole rows or columns.

You can also add extra rows and columns. Full details are in chapter 13.

Example

You might want to test the implications of a faster growth rate in Blueprint's sales. Move the data pointer to row 1.

Select   **31**

for the ENTER command. Choose option 2 and give the same base figure, 200,000. Then, when the **RATE:** *prompt appears*
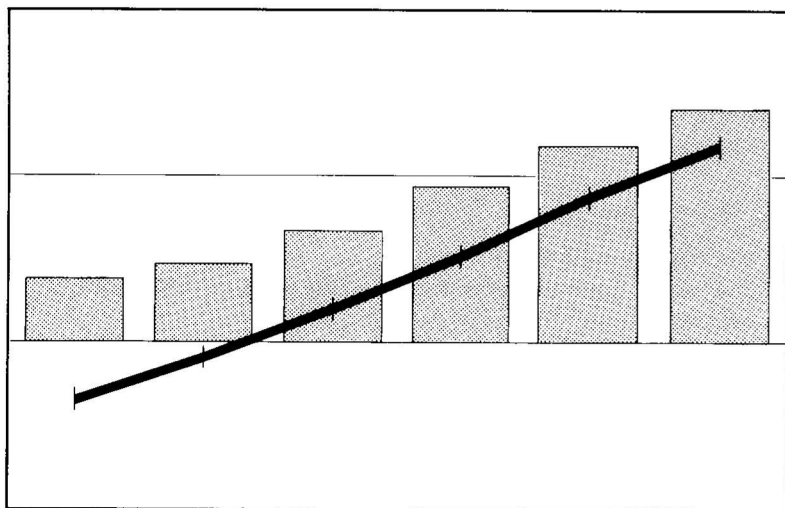
type   **35** **RETURN**

Higher sales figures will now show up on your spreadsheet.

To calculate the implications, select the COMPUTE command, **98.** You can now watch the results as they appear on the screen. When the computing is finished:

·   message   **DONE.**

You can now display a chart of the changed spreadsheet, to get a visual idea of the change. Select **61.** The chart will look like this:

Sorting and ranking data

GraphPlan allows you to rearrange your spreadsheet:

■   in alphabetical order of row (or column) title
■   in order of the size of the figures in one particular row or column.

Alternatively, you can rank your figures (1 for the best, 2 for second best, and so on — like competition results) without physically re-arranging the spreadsheet. Instructions are in chapter 14.

Filing a spreadsheet

You will want to store your spreadsheets and charts on disc. You can file them on your GraphPlan disc if you like, but it's better to use a separate data disc — you may already have put one in drive B.

To file your spreadsheet, first decide which disc you want to use. The program assumes you want drive A; to specify drive B, you need the SET DRIVE command:

select   **108**

Prompt   **DRIVE (A-P):**

Type   **B** **RETURN**

To file the spreadsheet:

select   **112**

Message   **DRIVE B:**

Prompt   **TABLE NAME:**

Type in a name for your table, then press **RETURN**. Table names can be up to eight characters long: for the rules on filenames, look at chapter 15 and at your *Z80 user guide*.

If you enter a name longer than eight characters, the program will cut it down.

Example

If you choose the name BLUEPRINT, GraphPlan will refer to the file as BLUEPRIN

Wait a moment while the program saves your spreadsheet on disc.

Message `saved.`

If you continue to work with the spreadsheet on your screen, its filename will be shown at the top left-hand corner of your screen.

Filing a chart

Select **108** to specify which drive you want to file your chart on. Then, to file the chart:

select   **121**

Message   `DRIVE A:` or `DRIVE B:`

Prompt   `CHART NAME:`

Type in the name, then press **RETURN**. The same rules for names apply. You can use the same name for a chart as for the spreadsheet from which it is taken. GraphPlan will give the table a `.TBL` extension at the end of its name, and the chart a `.CHT` extension.

It will take a moment or two to save the chart on disc.

Message   `saved.`

Printing a spreadsheet

You can print copies of your spreadsheets and for this you need to make decisions on format.

Select   **82**

Prompt   `PAGE NUMBER (0-999)`

Type the page number (between 0 and 999) you want to appear on the spreadsheet, then press **RETURN**.

A series of prompts for the date will follow. Enter the year as its last two digits (for example, 85 for 1985) and the month and day as numbers.

For example, if the date is 5 November 1985:

Prompts:	Type:
`DATE (YEAR AS YY):`	85 **RETURN**
`MONTH (1-12)`	11 **RETURN**
`DAY (1-31)`	5 **RETURN**

Now select which rows and columns you want printed: the row-range and the column-range.

Example

To print the first seven rows and the first six columns of the Blueprint spreadsheet (which is 9 rows deep and 8 columns wide):

Prompts:	Type:
`ROW-RANGE BEGIN (1-9):`	1 **RETURN**
`END (1-9):`	7 **RETURN**
`COL-RANGE BEGIN (1-8):`	1 **RETURN**
`END (1-8):`	6 **RETURN**

Alternatively, if you want to print the whole of your spreadsheet, press **RETURN** after each of the `BEGIN` prompts.

Next, give the spreadsheet a title, up to three lines long. Each line can be up to 40 characters long.

Prompt   `TITLE 1:`

Type in the first line, then press **RETURN**.

Prompt   `TITLE 2:`

Type in the second line, then press **RETURN**. If there's no second line, just press **RETURN**.

Prompt   `TITLE 3:`

Type in the third line, then press **RETURN**. If there's no third line, just press **RETURN**.

Message `SET PAPER; HIT RETURN`

Make sure the printer is switched on, the paper is lined up, and that the 'on line' light on the printer is on. Then press **RETURN**, and your spreadsheet will be printed out.

You can print out your charts too: there are full instructions in chapter 12.

Putting GraphPlan to work

In this chapter, you've been introduced to — and perhaps tried out — all the basic GraphPlan activities. You should now have some idea what the program is capable of.

The rest of this guide covers the same activities in detail. For example, you can:

- vary the layout of your spreadsheets
- carry out more complicated calculations
- specify different printing formats
- choose various styles of chart presentation.

We suggest you start putting GraphPlan to serious use, and consult the rest of the guide when you need to: the best way to find out what the program can do is to put it to work.

6 Setting up a spreadsheet

This chapter describes how to:

- clear away a spreadsheet you've finished with
- set up a new spreadsheet
- give its rows and columns titles.

Clearing and setting up

If there's already a spreadsheet on your screen, the first stage is to clear it away.

Select   113 to re-use the same spreadsheet, but with new values
           114 to re-use the same spreadsheet, but with new row and
                column titles
           109 to start from scratch

Each of these commands erases any data on your screen, and will remind you of this:

Message `OK to erase current data?`

Prompt   `VERIFY (Y OR N):`

Type   `Y` **RETURN**

If you select 109, the following appear:

prompt   `NUMBER OF COLUMNS (1-99):`

prompt   `ROWS (1-n):`

After each prompt, type in the number you want, within the range indicated in the prompt, then press **RETURN**. If you just press **RETURN** the program will select numbers for you (56 rows, 20 columns).

The more columns you ask for, the fewer rows will be offered — the size of your computer's memory determines the size of what is offered.

Then:

Message   n ROWSxn COLS

Prompt   VERIFY (Y OR N):

Type   Y RETURN

If you want to give your rows and columns titles, use commands 20 and 25.

Giving the rows and columns titles

Select   20 to give the rows titles.

Prompt   :

Type in the title of the first row (up to 40 characters long), then press RETURN. The prompt will return, so that you can enter a title for the second row. Use DELETE and the cursor keys to correct mistakes. When you've finished, press ESCAPE.

Select   25 to give the columns titles.

Prompts   1:
          2:

Each column title can have two lines. After each prompt, type in the appropriate line (up to 19 characters), then press RETURN.

Prompt   1:

Now enter the first line of the second column title, and carry on until you've finished. Use DELETE and the cursor keys to correct mistakes. When you've finished, press ESCAPE.

7 Handling a spreadsheet

This chapter describes how to:

- change the screen layout
- move over the spreadsheet
- get displays other than your current spreadsheet
- work with only part of the spreadsheet.

Specifying the screen layout

To change the way your data will be presented on the screen, select 86. A series of prompts will appear, one by one. At each prompt, a message will remind you of the current option.

Prompt   DECIMAL PLACES (0-3):

Normally, GraphPlan shows whole numbers only — that is, 0 decimal places. To show 1, 2 or 3 decimal places, type in the number you want, then press RETURN.

Prompt   ROW TITLE WIDTH (5-30):

GraphPlan normally allocates 15 spaces for row titles. The last two are always blanks. So if you want a title 25 characters long to be shown, specify 27 here. Type the number you want, then press RETURN.

Prompt   COLUMN WIDTH (4-20):

Select the number you want, type it in, and press RETURN. The standard GraphPlan column width is 10, of which the last two spaces are blanks. To decide on a column width:

- count the digits in the longest number you'll want to show
- don't count the commas in the number
- add one for the decimal point
- add two for the spaces at the end of the column.

So, if you want a number as long as the following to be shown:

12,345,678.90

specify 13.

Prompt   DISPLAY ZERO VALUES (NO=0, YES=1):

Normally, zero values are shown as blank spaces. If you want to display them as zeros, type 1 RETURN .

Your screen display will now change to follow the new specification.

Moving over the spreadsheet

Use the cursor keys to move over the spreadsheet, so that the row or column number shown at the data pointer changes to the number you want. If your spreadsheet is too large for the screen to show it all, only the part you're currently using will be shown. To move to an area currently off-screen, use the cursor keys, and the area shown will change.

Fast moves

Select 36 to move the data pointer instantly, without having to use cursor keys.

Prompts   ROW (1-n):

   COLUMN (1-n):

After the prompts, type in the numbers of the row and column you want to appear at the top left hand corner of your screen; press RETURN each time. The program will always display a full screen, so if you specify, say, the last row in your spreadsheet, the whole of the bottom part of the spreadsheet will be shown.

Other displays

To see displays other than your spreadsheet:

select   63 to set up a graphics display
          22 or 27 to see the commands stored in your rows or
                columns.

To return to your spreadsheet from any other display, press any cursor key.

Getting a display of stored maths commands

Select   22 to display the print options and stored commands for
                all the rows on your screen

          27 to display the print options and stored commands for
                all the columns on your screen.

To get a display of the same information for off-screen parts of the spreadsheet:

■ press any cursor key to get back to your worksheet
■ use the cursor keys to bring the section you want on-screen
■ select 22 or 27 again.

Clearing the screen

If you ever need to clear the screen and redisplay your spreadsheet — if you've been working with graphics, for example — select 115.

Working with only part of a spreadsheet

If you want to enter data or carry out calculations on only a part of your spreadsheet, use commands 92 or 93 or both.

Select   92 to restrict the range of rows operated on.

Prompt   `ROW BEGIN (1-n):`

Prompt   `ROW END (1-n):`

After each prompt, type in the number you want, then press **RETURN**.

Select   93 to restrict the range of columns operated on.

Prompt   `COL BEGIN (1-n):`

Prompt   `COL END (1-n):`

When you've changed the row or column range, the message shown at the top right hand corner of your screen will remind you:

message   `ROW=n-n COL=n-n`

8 Entering data

This chapter describes how to:

- select a row or column
- enter data into it.

Selecting a row or column

First, select the row or column you want to enter data into. Use the cursor keys to move the data pointer. If your spreadsheet is very large, use the select commands, 33 and 34. When you give one of these commands, you'll be prompted to specify the row or column you want.

Prompt   `ROW (n-n):`
or   `COL (n-n):`

Type the number, then press **RETURN**.

Entering cell by cell

Select   30 to enter data cell by cell.

Prompt   `VALUE:`

Type in the value you want to put in the first cell in the row or column shown in the data pointer, then press **RETURN**. The prompt will re-appear, so that you can enter data into the next cell.

When you've finished:

press   **ESCAPE**

Entering by row or column

Select 31 when the values you're entering:

- are the same in the whole row or column
- grow or fall by a regular percentage from cell to cell
- increase or decrease by a regular amount from cell to cell.

Prompt

`CHOOSE (VALUE=0, CONSTANT=1, GROW=2, INCR=3):`

Type 0, 1, 2, or 3.

option	prompts	effect
0	VALUE:	cell-by-cell entry
1	BASE VALUE:	number you type will be entered in every cell
2	BASE VALUE: RATE:	base value will be put in first cell; values in other cells will grow at the rate you specify
3	BASE VALUE: RATE:	base value will be put in first cell; values in other cells will grow by the increment you specify

9 Maths

This chapter describes how to carry out mathematical calculations on your spreadsheet.

The procedure is:

- use the cursor keys (or 33 and 34) to move the data pointer to the empty row or column where you want the answers to appear
- select the maths command you want
- specify, when prompted, the rows or columns which contain the numbers you want to put into the calculation.

The row (or column) where the results go is the output row (or output column).

The rows (or columns) that contain the figures you want to put into the calculations are the input rows (or input columns).

Instead of carrying out calculations on two rows and putting the result in a third, you can modify the figures in one row by a constant (shown here as k), and put the answer in a second row. To work with a constant, move the data pointer to the z-row.

Simple arithmetic

To do simple arithmetic, move the data pointer to the z-row.

Select   41 for adding $x+y$ goes to z
              42 for subtracting $x-y$ goes to z
              43 for multiplying $x \times y$ goes to z
              44 for dividing $x \div y$ goes to z

Prompt   `ROW (n-n):`

Type in the number of the x-row (within the range shown in the prompt) and press **RETURN**.

Prompt   `ROW (n-n):`

Type in the number of the y-row (within the range shown in the prompt) and press **RETURN**. The calculations will now be carried out.

Working with a constant

Instead of carrying out calculations on two rows and putting the result in a third, you can modify the figures in one row by a constant (shown here as k), and put the answer in a second row.

To work with a constant, move the data pointer to the z-row.

Select   51   for adding   x+k goes to z
         52   for subtracting x−k goes to z
         53   for multiplying x×k goes to z
         54   for dividing   x÷k goes to z

Prompt   `VALUE:`

Type in the value of the constant k and press **RETURN**.

Prompt   `ROW (n-n):`

Type in the number of the x-row (within the range shown in the prompt). Press **RETURN**. The calculations will now be carried out.

Raising to a power

This command takes each number in the x-row and raises it to the power of the corresponding number in the y-row. Move the data pointer to the z-row and select **140**.

Prompt   `ROW (n-n):`

Type in the number of the x-row (within the range shown in the prompt).

Prompt   `ROW (n-n):`

Type in the number of the y-row and press **RETURN**. The calculations will now be carried out.

Single row operations

These operations allow you to modify each number in a row and put the result into a second row.

To carry out one of these operations, move the data pointer to the z-row.

Select   45   for negate   −x goes to z
         46   for inverse   1/x goes to z
         47   for integer   INTx goes to z
         48   for round   (INTx)+0.5 goes to z
         50   for absolute   ABSx goes to z
         138   for logarithm   LOGx goes to z
         139   for exponent   EXPx goes to z

Prompt   `ROW (n-n):`

Type in the number of the x-row (within the range shown in the prompt). Press **RETURN**. The calculations will now be carried out.

command	effect		example	
NEGATE	takes each number in the x-row, changes it from positive to negative (or from negative to positive), and puts the result in the z-row	x: z:	5.00 −5.00	−75.00 75.00
INVERSE	takes each number in the x-row, divides it into 1, and puts the result in the z-row	x: z:	2.00 0.50	−5.00 −0.20
INTEGER	takes each number in the x-row, rounds it down to the next whole number, and puts the result in the z-row	x: z:	123.50 123.00	90.60 90.00
ROUND	takes each number in the x-row, rounds it up or down to the nearest whole number, and puts the result in the z-row	x: z:	45.80 46.00	123.50 124.00

ABSOLUTE	changes each negative number in the x-row to a positive number, leaving positive numbers as they are, and puts the result in the z-row	x:	-5.00	50.00
		z:	5.00	50.00
LOGARITHM	takes each number in the x-row and puts its natural logarithm in the z-row	x:	2.00	50.00
		z:	0.70	3.90
EXPONENT	takes each number in the x-row and puts its exponent in the z-row	x:	2.00	8.00
		z:	7.40	2981.00

Cumulate

This command puts a set of cumulating totals in the z-row. In detail, it:

- prompts you for an opening balance
- goes to the first cell in the x-row
- adds the figure there to the opening balance
- puts the result — the new balance — in the first cell in the z-row
- goes to the second cell in the x-row
- adds the figure there to the new balance
- puts the result in the second cell in the z-row

and so on.

For example, with an opening balance of 20:

| x-row | 2 | 8 | 5 | 25 | -40 |
| z-row | 22 | 30 | 35 | 60 | 20 |

Move the data pointer to the z-row and select **49**.

Prompt   **VALUE**

Type the opening balance (type **0** if there's none), and press **RETURN**.

Prompt   **ROW:**

Specify which row is the x-row and press **RETURN**. The calculation will now be carried out.

Sum

If you're working by row, the SUM command calculates totals vertically — that is, it produces a row of column totals.

Move the data pointer to the z-row and select **55**.

Prompts   **ROW BEGIN (n-n):**

END (n-n):

Type the numbers of the first and last rows of the range you want to sum. Press **RETURN** each time.

The calculation will now be carried out.

Floor and ceiling operations

In these operations you set a lower (floor) or upper (ceiling) limit. GraphPlan looks at the figure in each cell in the x-row. If it's within the limit, it's copied into the z-row; if it's outside the limit, the limit value is put in the z-row.

Examples

If you set a floor limit of 75, all the figures in the x-row over 75 are copied into the z-row, but all the figures under 75 are replaced by 75.

Setting a ceiling of 100 means that every figure in the x-row under 100 is copied; otherwise, 100 is entered in the z-row. So there will be no figures in the z-row above 100.

Move the data pointer to the z-row, and

select   57 to set a floor limit
          58 to set a ceiling limit.

Prompts VALUE:

         ROW (n-n):

Using your own formulas

You can create your own formula to show GraphPlan what to put in a z-row. Move the data pointer to the z-row and select 35.

Prompt   :

Type in the formula, then press RETURN. The calculation will be carried out.

Follow these rules for writing formulas:

- you can use any combination of +, −, ∗ (for multiply) and / (for divide)
- refer to your x-rows by using L (for example, L7 would refer to row 7)
- you can refer to individual cells by using V (for example, V1,5 means row 1, column 5 — the row number always comes first)
- you can include positive numbers
- show negative numbers (for example, −5) like this: (0−5)
- a formula can be up to 40 characters long.

If you're working by column rather than by row, the L number will refer to a column rather than a row.

Examples

L4∗L6   *multiplies the figures in row 4 by those in row 6 and puts the answer in the z-row*

L3/5   *divides row 3 figures by the number 5, and puts the results in the z-row*

V3,4+L1   *adds the figure in the cell at row 3, row 4 to the figures in row 1, and puts the results in the z-row*

Sending output to a cell

To send the output from a formula calculation to a particular cell, rather than to a whole row, select 37.

Prompts ROW (n-n):

         COL (n-n):

Specify the output cell: enter the row number after the first prompt and the column number after the second prompt. End with RETURN each time.

Prompt   :

Now enter the formula, following the same rules — except that you can't use L references.

10 Statistics

This chapter describes how to carry out statistical calculations on your spreadsheet.

The statistics commands work like the ordinary maths commands:

- use the cursor keys (or 33 and 34) to move the data pointer to the empty row or column where you want the answers to appear
- select the statistics command you want
- specify, when prompted, the rows or columns which contain the numbers you want to put into the calculation.

The row (or column) where the results go is the output row (or output column).

The rows (or columns) that contain the figures you want to put into the calculations are the input rows (or input columns).

In the following explanations, we use 'row' to cover both 'row' and 'column'. We use x and y to refer to input rows and z to refer to the output row.

GraphPlan's statistics commands enable you to:

- look at trends in a set of figures
- investigate the characteristics of a set of figures.

There's some advice on using these commands in chapter 17.

Looking at trends

There are four commands which look at a row of figures (the x-row), and produce a new row, the z-row, which sets out an underlying trend in the x-row.

131 DELTA

You specify a period (for example, 3). GraphPlan:

- looks at the figure in the first cell in the x-row
- jumps the number of cells you specified (here, 3)
- looks at the figure in the next cell (here, the fourth)
- calculates the difference between the two figures — that is, the values at the beginning and end of the period
- puts the difference in the z-row, in the cell at the end of the period (here, cell 4)
- goes to the second cell in the x-row, and repeats the process.
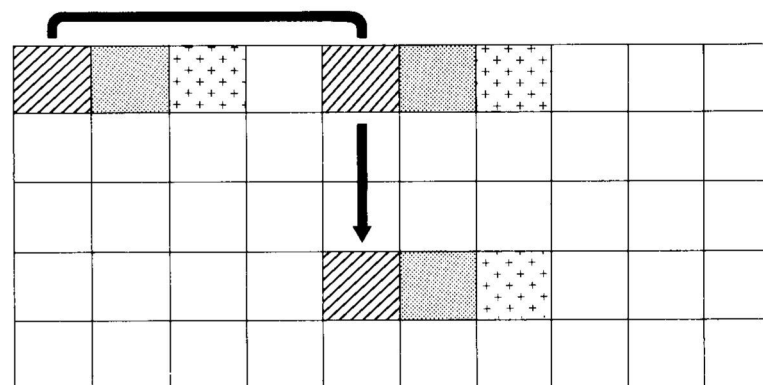
132 % GROWTH

Does the same as DELTA, except that it shows the difference not as a value but as a percentage.

133 MOV AVG

You specify a period (say 3). The program then calculates the average of the figures in the first period (cells 1, 2 and 3) and then the second period (cells 2, 3 and 4), and so on.

Each of these three commands gives you two prompts:

prompts   PERIODS (1-12):

           ROW (1-n):

After the first, type the period number; after the second, the number of the x-row. Then press RETURN each time.

134 SMOOTH

This command carries out exponential smoothing — adjusting a set of figures to give extra weight to the more reliable (usually, the more recent) figures.

Prompts   **% RATE:**

         ROW (1-n):

The higher the percentage rate you type in, the greater the weighting. Normally, you'd choose a rate between 5% and 25%.

Investigating characteristics

The second group of statistics commands can help you make sense of a group of figures by telling you, for example:

- the highest and lowest figures
- the average
- how close to the average the figures are.

Each command operates on all or part of a row, and puts the result in an output cell in that row. In other words, it reduces a whole group of figures into one figure that shows one important characteristic of the group.

It operates on all the rows on your spreadsheet, producing a column of answers, the z-column.

Move the data pointer to the z-column, and

select   **135** to work out the average figure in each row
            141 to copy the largest figure in each row into the z-column
            142 to copy the smallest figure in each row into the z-column
            136 to put the standard deviation in each row into the z-column
            137 to put the variance in each row into the z-column
            143 to put the number of values in each row into the z-column
            144 to put the total in each row into the z-column.

With each command, you can operate on just part of each row, rather than the whole row. To define how much of the row to work on, these prompts will appear:

Prompts   **COL BEGIN (1-n):**

         END (1-n):

After the prompts, type in column numbers to define the range of cells in each row you want analysed.

11 Editing a spreadsheet

This chapter describes how to:

- move parts of your spreadsheet around
- copy and delete rows or columns
- change the data in one cell
- delete a stored maths command.

Moving a row or column

Select   23 to move a row
            28 to move a column.

Prompt   `OLD NUMBER (n-n):`

Type the number of the row or column you want to move, and press `RETURN`.

Prompt   `NEW NUMBER (n-n):`

Type the number of the position you want to move it to, and press `RETURN`. The row or column will then be moved, and the rest of the spreadsheet adjusted.

A special command inserts the last row or column of your spreadsheet at the position shown by your data pointer. If you leave the last few rows and columns of your spreadsheet empty, you can use this command as a way of inserting blank lines into a spreadsheet.

To use this command, move the data pointer to the place where you want to make the insertion. If the pointer indicates a row, the final row will be inserted; if it indicates a column, the final column will be inserted and select 17 and the insertion will be made.

Copying rows or columns

To copy an entire row into another row (or an entire column into another column), move the data pointer to the row (or column) you want to copy into, and select 56.

Prompt   `ROW (n-n):`

or   `COLUMN (n-n):`

Type in the number of the row (or column) you want to copy, press `RETURN`, and the copying will be carried out.

Deleting a row or column

To delete a row or column, move the data pointer to the row or column you want to delete, and select 18.

Message `OK to erase current data?`

Prompt   `VERIFY (Y OR N):`

Type   Y `RETURN`

and the deletion will be made. The rest of the spreadsheet will move across to fill the gap.

Changing one cell

To change the contents of a single cell, select 32.

Prompts `ROW (n-n):`

or   `COLUMN (n-n):`

After the prompts, enter the row and column numbers of the cell; then press `RETURN` each time.

Prompt   `VALUE:`

Type the new value. Type 0 to empty the cell. Then press `RETURN`.

Nullifying a command

To nullify a command associated with a row or column, move the data pointer to the row or column and select 39.

Prompt   VERIFY (Y OR N):

Type   Y RETURN

The command will be deleted, but the data will be left unchanged.

To look at the commands associated with your rows and columns, use 22 for rows or 27 for columns.
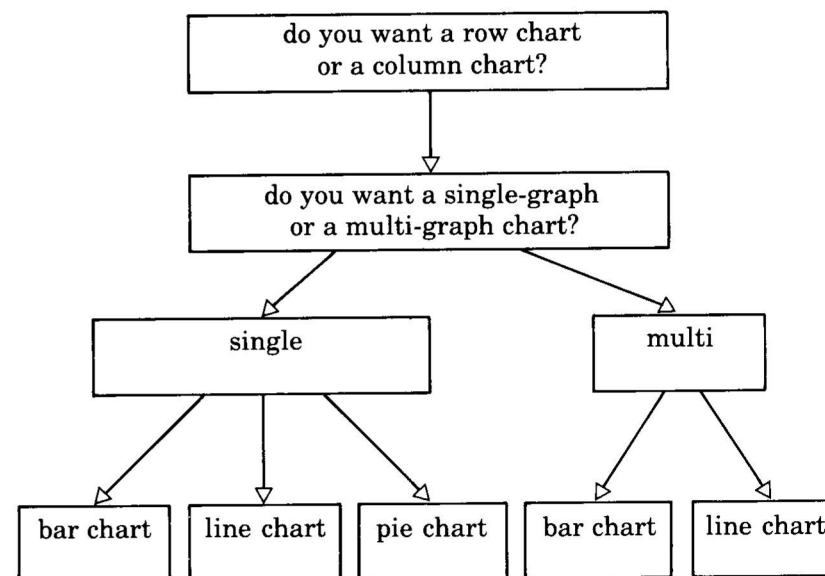
12 Graphics

This chapter describes how to set up a chart using:

- the simple graphics commands
- the advanced graphics command.

First decisions

To construct a chart in GraphPlan, you first complete the spreadsheet on which your chart will be based — or load it back from disc.

Now you have to make some general decisions:

A GraphPlan pie chart can have up to eight segments (slices of the pie). If you ask for a pie chart of a row or column with more than eight values in it, only the first eight non-zero values will be shown. Negative values will be treated as positive. So make sure first that your data is suitable for pie presentation.

When you're setting up a chart, there are many detailed design decisions to be made. GraphPlan gives you the choice of making them yourself, or letting it decide for you. GraphPlan's own design is called the default design.

To do your own designing, select **63** for the advanced graphics command. To follow the default design, select **62** and **61** for the simple graphics commands. (You'll need **63** too if you want to set up a numeric line chart.)

You can change the default design by making your own design decisions. This new design becomes the default design for that session. When you start a new session, the default design will have reverted to GraphPlan's own again.

You may well, therefore, decide to select **63** to set up your chart the first time, and then use the simpler commands later to produce different graphs with the same general presentation.

This diagram summarises what happens when a row or column from your spreadsheet is turned into a graph:

1 cell becomes | 1 bar | 1 point | 1 segment

1 row or column becomes

1 set of bars | 1 line | 1 pie
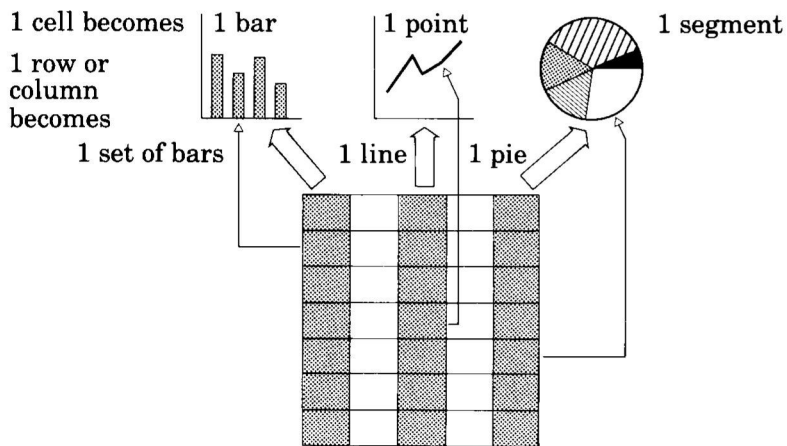
In a column graph, the column title becomes the graph's title or legend; the row titles become the x-axis legends

In the following, 'row' stands for both row and column.

Simple graphics

To set up a chart from your current spreadsheet, using the default design, move the data pointer to the first (or only) row you want to see as a graph. Select **62**.

Message `Current=Row 1,Bar`

This message tells you the current graph specification — a bar chart of the data in row 1.

Prompt `Enter Row(n-n) for Graph 1:`

If the data pointer is showing the row you want, press **RETURN**. If it is not, type in the number of the row you want to see as a graph and then press **RETURN**.

Prompt `Choose (Bar=1,Line=2,Pie=3):`

Type 1 **RETURN** for a bar graph
2 **RETURN** for a line graph
3 **RETURN** for a pie chart.

If you want a single-graph chart, there are no more options to decide on so press **ESCAPE**.

For a multi-graph chart, you need to specify which other rows you want to see on your chart.

Prompt `Enter Row(n-n) for Graph 2:`

You can now specify a row for a second graph and so on, up to a maximum of six graphs. When you've finished, press **ESCAPE**.

To display your chart on the screen:

■ make sure the data pointer is in the right mode: either row or column, depending on whether you want to display a row chart or a column chart
■ select **61**.

The chart will appear. To return to your spreadsheet, press any cursor key.

Advanced graphics

The advanced graphics command works differently from the other GraphPlan commands. You select 63 and a new screen display appears: the graphics main menu.

```
Enter Selection:
---------------------------------------------------------------

                    1 - Display Chart
                    2 - Define Chart Options
                    3 - Define Axes Options
                    4 - Define Pie Options
                    5 - Print Chart
                    6 - Plot Chart


---------------------------------------------------------------
```

You now choose between the six options on the menu: type the number corresponding to your choice and press **RETURN**.

Type   1 to display your chart on the screen
          2 to design your chart
          3 to design the presentation of the axes of your chart
          4 to make special design decisions for pie charts
          5 to print out your chart
   6 to plot your chart on a plotter device.

To return to your spreadsheet from the graphics main menu, press **ESCAPE**.

Once you get used to the sub-menus, you'll be able to work through them without any help from this manual. Until then, use the *Guide through the graphics sub-menus* at the back of the manual.

Option 1 works exactly like command 61. Your chart will appear on the screen.

Options 2, 3, and 4 display sub-menus, in which you make design decisions.

Option 2 is the most important option — it's there that you make your main design decisions.
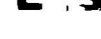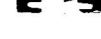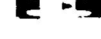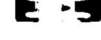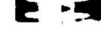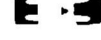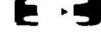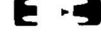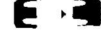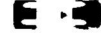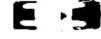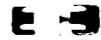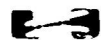
Option 3 is there in case you want to make special decisions about such matters as the scaling and labelling of your axes. You don't have to go through this sub-menu, since GraphPlan will make default decisions for you. The only exception is if you want to produce a numeric line chart, in which case there are some essential decisions you have to take in option 3.

Option 4 is where you design pie charts.

Option 5 enables you to print out your chart.

Option 6 presents a sub-menu for users with plotter devices who want to plot rather than print their chart.

The sub-menus consist of:

- a message and prompt line at the top
- a series of decision points; the one you're currently dealing with is shown highlighted on the screen.

You use each sub-menu as follows:

- go through its decision points one by one
- read the messages at the top of your screen carefully
- at each decision point, type in your decision (what you type will appear after the prompt at the top of your screen)
- then press **RETURN** to move on to the next decision
- if the particular decision doesn't apply to you, just press **RETURN**.

Don't worry if there's already some text at the entry prompt: this is merely the default decision at this decision point. You can type over it — or, if you're happy with the default, just press **RETURN**.

When you've finished the design decisions, the sub-menu will take you back to the first decision point. You can now go back through the decision points, changing your mind if you want to. You can use the cursor keys to move between them.

When you're happy with your decisions, press **ESCAPE**, and the graphics main menu will re-appear.

Resetting a chart

Select 123 to delete all your graphics decisions, resetting each sub-menu to the default values.

Message   OK to erase current data?

Prompt   VERIFY (Y OR N):

Type   Y RETURN

13 'What if' analysis

This chapter describes how to carry out projections — 'what if' analyses.

Projecting is done in three stages:

- set up your spreadsheet
- make the changes you're interested in
- compute the consequences.

You'll use the commands in chapters 8 and 9 to set up your spreadsheet. To make changes, first decide whether you want to change just data, or maths commands, the arrangement of rows and columns, and so on.

If you want to change data only, you can protect everything else from accidental alteration by selecting 101. A P for PROTECT will now appear at the top right hand corner of your screen. To turn the protection back off, select 101 again.

Now you can make the changes you want. You could:

- re-enter particular parts of the spreadsheet, using the ordinary data entry and maths commands
- move parts of your spreadsheet around, using the editing commands.

Next, you could:

- limit the range of rows and columns which you want to re-calculate: use the commands 92 and 93, which are explained in chapter 7
- establish an order in which the computation will be carried out: select 102.

Normally, GraphPlan will compute all the rows first, then the columns. 102 lets you change this order. When you select 102, you will see:

prompt

`(ROW/ONLY=1,COL/ONLY=2,ROW/COL=3,COL/ROW=4):`

Type   1 **RETURN** to compute the rows only
       2 **RETURN** to compute the columns only
       3 **RETURN** to compute rows first, then columns
       4 **RETURN** to compute columns first, then rows.

The computation order is shown at the top of your screen. For example:

`ORDER=R/C`

The normal order is R/C: if that order is what you want, you don't need to use 102.

There are two commands that carry out the 'what if' computation. To re-compute the whole spreadsheet, select 98. The calculations will be carried out and a message will appear:

message   `DONE.`

To re-compute a single row or column, move the data pointer to that row or column and select 38. The calculations will then be carried out.

14 Ranking and sorting

This chapter describes how to:

- rank the data in your spreadsheet
- sort it.

Ranking

Ranking a set of values means assigning to each value a number that indicates its position in the range of values. For example, the highest value might be given the number 1, the next highest 2, and so on. Two kinds of ranking are possible:

- giving a rank order to the data in a particular row (or column), putting the rank numbers in a different row (or column).
- giving an alphabetical rank order to the row (or column) titles.

The command is the same for both. First use the data pointer to select the row (or column) in which you want the rank numbers to appear.

In the following, 'row' means row or column.

Select   72

Prompt   `ROW # (OR USE COL TITLE=CR):`

To rank data, type the row number you want, then press **RETURN**. To rank your titles, press **RETURN**.

Prompt   `DESCENDING=0, ASCENDING=1 (0-1):`

For descending order (in which the highest value gets the lowest rank number), type 0 **RETURN**. For ascending order, type 1 **RETURN**. In an alphabetical ranking of your row titles, 'descending order' means that titles beginning with A would be given the low numbers (1, 2, 3); 'ascending order' means that titles beginning with Z would be given the low numbers.

Message `sorting...`

The program will now fill in the rank numbers.

Sorting

You can sort — that is, rearrange — two kinds of item into their rank order:

- data in a particular row (or column)
- your row (or column) titles.

In the following, 'row' means row or column.

To do either kind of sorting, move the data pointer to row mode, and select 71. (You can, if you like, rank your data or titles with command 72 before you sort them — but you don't have to.)

The prompts and messages are the same as in 72:

prompts `ROW # (OR USE COL TITLE=CR):`

`DESCENDING=0, ASCENDING=1 (0-1):`

Message `sorting...`

The program will now rearrange your data or titles in the order you specified. The whole of each row will be moved — so the whole of your spreadsheet will be rearranged. Empty rows will be arranged ahead of the others, so if you have a lot of empty rows, your new spreadsheet will look as though it's blank. Press ⬇ or ➡ until you reach your data.

15 Filing

This chapter describes how to:

- file spreadsheets and charts on disc
- retrieve them from disc
- erase a filed spreadsheet or chart.

When you save your spreadsheets and charts on disc, you choose a filename, but GraphPlan automatically adds a filename extension:

- .TBL for spreadsheets
- .CHT for charts.

Filing spreadsheets and charts

When you've completed a spreadsheet or a chart (or both), you may want to file it permanently on disc. First, decide which disc you want to use. In GraphPlan, A is the default drive on which the program will save your work: if you want to file your data on the disc in drive A, you can do it straight away.

If you want to use the other disc, select 108.

Prompt `DRIVE (A-P):`

Type B RETURN

Drive B will now be your data drive until the end of the session, unless you select 108 again and change back to drive A.

To file the current spreadsheet, select 112.

```
Hit RETURN to see the available tables or charts
    CURRENT=xxxxxxxx                    DRIVE y:
```

Prompt   **TABLE NAME:**

(The **Hit RETURN** message will appear only if you've already saved some spreadsheets on this disc.) **xxxxxxxx** is the filename of your current spreadsheet, if you've already given it one. **y** stands for the drive you've just selected.

You can now either:

- see a list of the files with .TBL extensions on the disc in the data drive
- specify a name for the new file.

To see the list, press **RETURN**, and details of the earliest spreadsheet you saved will appear. For example:

BLUEPRIN   Blueprint Products/Sales/1990-95 10x8

This message shows:

- the file name (here, BLUEPRIN)
- up to three titles, separated by **/** signs: these are titles that the spreadsheet has been given using command **82** (see chapter 16)
- the size of the spreadsheet (here, 10 rows x 8 columns).

Press   **RETURN**, and details of the next file will appear. You can carry on until you see:

message   **No more tables/charts on this drive.**

You can file your current spreadsheet at any point, by

typing   **<filename>RETURN**

The file will normally be saved on the disc in the data drive. If you want to use temporarily the disc in the other drive

type   **<drive identifier><filename>RETURN**

It will take the program a few moments to record the file on to your disc. When it has done so, you will see:

message   **saved.**

The name you give can be up to eight characters long: read carefully the rules for filenames printed in the *Z80 user guide*.

Your spreadsheet is now filed on your disc, but a copy of it is still there on the screen.

If you accidentally specify a filename that's already in use on this disc, you'll see:

message   **Your table file already exists.**
          Continue with save?

prompt   **VERIFY (Y OR N):**

If you type Y, your old table will be wiped over by the new one.

To file the current chart select **121**.

Prompt   **CHART NAME:**

As with **121**, you can get a list of the files on the disc with .CHT extensions, or you can file your chart straight away.

Chart details appear like this:

message   **TUESDAY**

Again, the filename can be up to eight characters long. If it's the only chart you've produced from the parent spreadsheet, you can safely give it the same name as the parent.

To save both spreadsheet and chart at once select **107**.

Prompt   **TABLE NAME:**

The name you type in will be given to both the spreadsheet and the chart. Hitting **RETURN** will produce a list of .TBL files.

Loading spreadsheets and charts

First, select **108** if necessary, to specify the drive with the data disc that holds the file you want to load. Then:

select   **111** to load a spreadsheet
             120 to load a chart
             106 to load a spreadsheet and its chart together.

The procedure is the same as for filing. Type in the names of the spreadsheet or chart you want to load and press **RETURN**.

If you specify a file that isn't on the disc, you'll see:

message   `There is no file on this diskette`
                  `with this name.`

If you specify a file with a spreadsheet whose dimensions are smaller than those of the spreadsheet on your screen, you'll see:

message   `New table is smaller than current`
                  `table dimensions. Enlarge?`

Prompt   `CHOOSE (NEW=0, CURRENT=1):`

Type   `0` to choose the new table size
           `1` to stay with the dimensions on the screen.

Erasing a spreadsheet or chart

To erase a file, first select **108** if necessary, to specify the disc that contains the file. Then:

select   **117** to erase a spreadsheet
             122 to erase a chart.

Prompt   `TABLE NAME:`

or   `CHART NAME:`

Type the name of the file you want to erase, then press **RETURN**. You can press **RETURN** to see a list of the spreadsheets or charts filed on the disc.

16 Printing

This chapter describes how to:

- print out your spreadsheets
- set up and save on disc your own design for laying out printed spreadsheets.

First decisions

As with graphics, there are a number of design decisions to make before printing a spreadsheet, but, as before, there are default decisions which you can use if you want to.

To use all the default decisions and have your current spreadsheet printed, select **83**.

If you want to give your report a title, but otherwise to follow the default design, select **82**.

If you want to make some design decisions, these are the commands you'll use:

select   **81** to arrange spacing, page length, and so on
            21 to arrange the layout of the numbers in your rows
            26 to arrange the layout of the numbers in your columns.

Some decisions appear in more than one of these routines. The rules for conflicting decisions are that:

- decisions made in **26** override all conflicting decisions
- decisions made in **21** override conflicting decisions made in **81**.

If you want to check what design decisions you've made:

select   **84** for general design decisions
            22 for row design decisions
            27 for column design decisions.

If you want to save your report on disc, select **85**.

To print out other things:

select   **63**   for your current chart
         116   for a list of your tables
         124   for a list of your charts **118** for a description of your
             report.

If, once your printer is running, you want to interrupt printing, press
ESCAPE.

All the printing commands will prompt you to make the necessary
decisions. The next few pages guide you through these prompts.

Simple printing

To print your spreadsheet, following the default design, select **83**.

Message   `SET PAPER; HIT RETURN`

Make sure your printer is on and the paper is lined up, then press
RETURN. Your spreadsheet will be printed out, just as it appears on
the screen. A printed spreadsheet is called a report.

Giving your spreadsheet titles and printing it

This is the next simplest print command after **83**. It enables you to
give your spreadsheet a title, but not to make any design decisions.

Prompt   `PAGE NUMBER (0-999):`

Choose a page number that you want to show at the top right hand
corner of your report. Type **0** if you don't want a page number. Then
press **RETURN**.

Prompt   `DATE (YEAR AS YY):`

A date can be shown at the top left-hand corner of your report. If you
want to show a date, type in the last two digits of the year (for
example, **88** for 1988), then press **RETURN**. If you don't want one to be
shown, just press **RETURN**, and the next two prompts will be skipped.

Prompts   `MONTH (1-12):`

          `DAY (1-31)`

After the prompt, type in the number of the month or day, and press
RETURN.

Prompts   `ROW-RANGE BEGIN (1-n)`

          `END (1-n)`

Type in the number of the first and last rows you want to be printed,
and press **RETURN**.

Prompts   `COL-RANGE BEGIN (1-n)`

          `END (1-n)`

Type in the number of the first and last columns you want to be
printed and press **RETURN**.

These decisions will affect your spreadsheet if you go back to it after
printing it. Instructions for resetting row and column ranges are
given in chapter 7.

Prompts   `TITLE 1:`

          `TITLE 2:`

          `TITLE 3:`

Type in a title line after each prompt and press **RETURN**. Each line
can be up to 40 characters long. If you want only one or two lines of
title, press **RETURN** after the other prompts.

Message   `SET PAPER; HIT RETURN`

Make sure the printer is on and the paper lined up, then press
RETURN.

Designing your report

To make general design decisions about your report, select 81.

A series of 15 prompts will appear.

MARGIN (0-50):
> Type in the right margin size you want and press **RETURN**

LEFT MARGIN (0-50):
> Type in the left margin size you want and press **RETURN**.

ENHANCEMENT (0-3):
> If your printer can print in bold, this option will select how dark the printing will be: 0 is light, 3 dark.

ROW TITLE WIDTH (4-40)
> This option sets the space allocated to your row titles. The default is 20 characters. Type the number you want, then press **RETURN**.

COLUMN WIDTH (4-20):
> Type the width you want, then press **RETURN**. The default width for each column is 10 characters.

COLUMNS PER PAGE (1-n):
> In the default design, the first ten columns of your table are printed on page 1 of your report, the next 10 on page 2, and so on. To answer this prompt:
>
> 1   count the number of characters your printer can print in each line
> 2   subtract the left-hand margin width you've specified
> 3   subtract the row title width you've specified
> 4   divide the result by the column width you've specified.
>
> The answer you get is the maximum number of columns your printer will be able to show on each page. Type the answer, then press **RETURN**.

DECIMAL PLACES (0-3):
> Type the number of decimal places you want to show, then press **RETURN**. The default is 1.

OMIT ZERO ROWS (NO=0,YES=1):
> If you want to leave out from your report all the rows that contain only zeros, type 1. Otherwise, type 0. Finish with **RETURN**.

SUPPRESS ZERO VALUES (NO=0,[-]=1,[ ]=2):
> If you chose to show zero rows, you can choose now how to show the zeros:
>
> type   0 **RETURN** to show zeros as 0
>   1 **RETURN** to show zeros as dashes
>   2 **RETURN** to show zeros as blanks.

PRINT ROW TITLE AFTER WHICH COLUMN (0-9):
> Normally, row titles are printed at the left of your spreadsheet, before column 1. If you want to show them somewhere in the middle of the spreadsheet, type the column number you want the titles in, then press **RETURN**. Press 0 **RETURN** or **RETURN** for the usual position.

NEGATIVE NUMBERS (-N=0,N-=1,(N)=2):
> This option lets you choose how you want negative numbers to be shown in your spreadsheet:
>
> type   0 **RETURN** to show negatives like this: -55
>   1 **RETURN** to show them as 55-
>   2 **RETURN** to show them as (55).

PAGE CONTROL (OFF=0,FEED=1,PAUSE=2):
> This option determines how your printer will handle a report more than a page long:
>
> type   0 **RETURN** for the printer to print continuously
>   1 **RETURN** for the printer to start a new page where necessary
>   2 **RETURN** for the printer to pause at the end of a page to allow you to insert another sheet of paper.

If your printer takes continuous paper, you'll select **0** or **1**.
If you choose **1** or **2**, you'll need to define where your page breaks will come, using the 'trailing blank lines' option in command **21**.

OMIT COMMAS (NO=0,YES=1):
Type   **0 RETURN** to keep the commas that mark thousands in numbers
1 RETURN to omit the commas.

DOUBLE SPACE (NO=0,YES=1):
Type   **0 RETURN** for single-line spacing
1 RETURN for double-line spacing.

OMIT LINE NUMBERS (NO=0,YES=1):
Type   **0 RETURN** to have row and column numbers printed on the report
1 RETURN to omit them.

You've now made all the decisions on this command. Now choose one or more of the following.

Select   **21** to make special design decisions for your rows
26 to make special design decisions for your columns
83 to print your report
82 to give your report titles, then print it.

Making special design decisions for rows

Select **21**. This command enables you to make special design decisions for your rows, one by one.

ROW (1-n):
Type the number of the first row you want to change, then press **RETURN**.

TYPE(DATA=0,SUBT=1,HEAD=2,NOTE=3,OMIT=4):
Type   **0 RETURN** to identify the row as containing numeric data
1 RETURN to treat the row title as a subtitle
2 RETURN to treat the row title as a heading
3 RETURN to put the row title at the foot of the page, as a footnote
4 RETURN to omit the row on your printed report.

UNDERLINE(NO=0,[-]=1,[=]=2,[_]=3):
Decide whether you would like the row underlined, and if so, what sort of underlining you'd like. Type the appropriate number between 0 and 3, and press **RETURN**.

TRAILING BLANK LINES (NEW PAGE=9):
This option allows you to leave a number of blank lines straight after the row. Type a number between 0 and 9, then press **RETURN**. If you type **9**, the printer won't leave any blank lines, but will start a new page.

DECIMAL PLACES (0-3 OFF=4):
You can set the number of decimal places you want to show for each number in the row. Type a number between 0 and 4, then press **RETURN**.

FORMAT (NO=0, [%]=1, [£]=2, NO,=3):
This option sets the format of each number.
Type   **0 RETURN** to have no % or £ signs, but use commas to mark thousands
1 RETURN to use commas and %
2 RETURN to use commas and £
3 RETURN to have no % or £ or commas.

You can now go on to set the format for another row. When you've finished setting row formats, press **ESCAPE**.

Making special design decisions for columns

Select 26. This command enables you to make special design decisions for your columns, one by one. It works like 21: after each prompt, type your choice then press **RETURN**.

Prompts   COLUMN (1-n):

       COLUMN WIDTH (4-20):

       DECIMAL PLACES (0-3 OFF=4):

       FORMAT (NO=0, [%]=1, [£!]=2, NO,=3):

       COLUMN (1-n):

You can now specify the layout of another column. Press **ESCAPE** when you've finished.

Checking your print options

Select   84 to see on the screen the decisions you've made
           118 to get a printout of them.

Each command will remind you of the decisions you've made in 82, 21, 26 and 81.

After selecting 118 you'll see:

prompt   SET PAPER; HIT RETURN.

Press   **RETURN** to start printing.

Printing a list of spreadsheets or charts

These commands print out a list of the tables or charts on the disc in your data drive.

Select   116 for tables
            124 for charts.

Prompt   SET PAPER; HIT RETURN.

Press **RETURN** to start printing. The printout will give you the same information that you get when pressing **RETURN** to list your files in 112 or 121: see chapter 15.

Saving your report

To save your report, that is, your spreadsheet plus your design decisions, select 85.

Prompt   CHARTNAME:

Choose a filename for your report. Check the rules for filenames in your *Z80 user guide*. Type in the filename, then press **RETURN**. GraphPlan will now save the report.

Message   DONE.

This command saves your report in a form which you can then edit using a word processor like MemoPlan. To do this:

- leave GraphPlan by selecting 9
- put your MemoPlan disc in drive A
- put the disc that contains your report in drive B
- start up MemoPlan
- use the MemoPlan 'read' command to load your report into MemoPlan
- edit it, file it again or print it using the MemoPlan commands.

This makes it easy to include GraphPlan spreadsheets in documents you prepare with MemoPlan. A letter to your bank manager, for example, could include a cash flow spreadsheet. The MemoPlan guide has full instructions for using MemoPlan commands.

17 Making sense of figures

With a spreadsheet program, it's easy to produce a mass of figures, but harder to see their significance at a glance. GraphPlan helps by enabling you to:

- produce graphs, to give you a visual idea of the figures
- carry out statistical investigations on the figures.

The graphics commands are described in chapters 3 and 12, and the statistical commands in chapter 10. This section concentrates on statistics and suggests how you can put the statistical commands to use in making sense of figures.

They can do this in two ways:

- finding trends, so that you can forecast future figures
- finding the characteristics of a set of figures — locating their 'centre', finding what they have in common.

In this chapter, we use 'row' to refer to both rows and columns.

Forecasting

GraphPlan has a group of commands which analyse a set of past figures, to help you forecast future developments. Each command looks at a row of figures and interprets it, producing a new row which shows more clearly the way the figures are moving.

You can turn the new row into a graph, to get an even clearer picture.

131 DELTA
Looks at two of the cells in a row you specify, and calculates the difference between the values in those two cells. You specify a period. Under period 3, for example, the program calculates the difference between every third cell.

132 % GROWTH
Does the same as DELTA, except that it shows the difference not as a value but as a percentage.

Both these commands enable you to look at trends: the longer the period you specify, the longer-term the trends will be. From % GROWTH, you'll be able to get an idea of the growth rate of your figures, so that you could use the grow option in the entry command (see chapter 8) to produce a forecast for future years.

133 MOV AVG
You specify a period. The program then calculates the average of the figures in the first period and then the second period and so on.

134 SMOOTH
This command carries out exponential smoothing — adjusting a set of figures to give extra weight to the more reliable (usually, the more recent) figures. It prompts you for a percentage rate: the higher the rate, the greater the weighting. Normally, you'd choose a rate between 5% and 25%.

Example

The first row of the table shows a set of quarterly sales figures. GraphPlan's statistical commands can help you find the trends behind those figures. The other rows in the table show some of the results you would get.

Each command prompts you for a period or a percentage rate, and a row to look at. It's best to try out several options on each command. The idea is to get as many different angles on the figures as possible: one way of looking at them will reveal their underlying trend. Without GraphPlan, it would take hours of tedious calculation to produce these analyses.

	----1----	----2----	----3----	----4----	----5----	----6----	----7----	----8----
1 sales	20,012	25,009	17,662	19,877	24,511	30,923	21,866	26,544
2 per 1	20,012	4,997	-7,347	2,215	4,634	6,412	-9,057	4,678
3 per 2	20,012	25,009	-2,350	-5,132	6,849	11,046	-2,645	-4,379
4 per 3	20,012	25,009	17,662	-135	-498	13,261	1,989	2,033
5 per 4	20,012	25,009	17,662	19,877	4,499	5,914	4,204	6,667

This table shows the original sales figures (row 1), and the results of four **DELTA** *calculations, using four different periods (rows 2 to 5). Row 2 sets out the fluctuations in the figures: there are increases most quarters, but sharp falls in columns 3 and 7. (These drops are a year apart: there seems to be a seasonal influence on sales.) Row 5 shows the effect of looking at the sales figures a year at a time rather than a quarter at a time. Each column now shows a positive figure — though the size of the increase is less at column 7 than at column 6: there is no steady acceleration.*

	----1----	----2----	----3----	----4----	----5----	----6----	----7----	----8----
1 sales	20,012	25,009	17,662	19,877	24,511	30,923	21,866	26,544
2 per 1		25	-29	13	23	26	-29	21
3 per 2			-12	-21	39	56	-11	-14
4 per 3				-1	-2	75	10	8
5 per 4					22	24	24	34

These are the same figures shown as percentages, using **% GROWTH**. *Row 2 shows that the seasonal fall is remarkably consistent: a 29% drop in columns 3 and 7. The pick-up after the drop was much stronger in the second year (21%, column 8) than in the first year (13%, column 4). Rows 3 and 4 show wildly fluctuating figures, but row 5 emphasises that the longer-term trend is one of steady growth (columns 5, 6 and 7), with a sharp take-off in column 8. In relative terms, growth has been steady — even though the increases in absolute terms have been less even, as row 5 of the* **DELTA** *calculations showed.*

	----1----	----2----	----3----	----4----	----5----	----6----	----7----	----8----
1 sales	20,012	25,009	17,662	19,877	24,511	30,923	21,866	26,544
2 per 2		22,511	21,336	18,770	22,194	27,717	26,395	24,205
3 per 3			20,894	20,849	20,683	25,104	25,767	26,444
4 per 4				20,640	21,765	23,243	24,294	25,961
5 average					5	7	5	7

Finally, the results of some **MOV AVG** *calculations. As you'd expect from averages, the fluctuations have been smoothed out — row 4 shows a continuous growth in yearly average sales. Row 5 is the result of a* **% GROWTH** *operation on row 4, showing that the rate of average growth fluctuates with remarkable consistency between 5% and 7%. Row 3 also shows an interesting pattern: almost identical figures in columns 3, 4 and 5, then a take-off in columns 6, 7 and 8.*

GraphPlan's statistics commands quickly produce patterns for you to investigate, but they can't interpret the patterns for you. At this point, you need to bring in your knowledge of your business, to decide on causes and strategies. Here, GraphPlan can't offer solutions — but it can give you the vital clues.

Investigating characteristics

These commands can help you make sense of a group of figures by telling you, for example:

- the highest and lowest figures
- the average
- how close to the average the figures are.

Each command operates on all or part of a row (or column), and puts the result in an output cell in that row (or column). In other words, it reduces a whole group of figures into one figure that shows one important characteristic of the group.

135 MEAN
Works out the average figure.

141 MAX
Copies the largest figure into the output cell.

142 MIN
Copies the smallest figure into the output cell.

136 SIGMA
Calculates the standard deviation and puts the result into the output cell. The standard deviation tells you how close the figures are to the average figure.

137 VARIANCE

An alternative way of working out how scattered the figures are around the average.

In calculating the variance, the program:

- finds the difference between each figure and the mean
- squares each difference figure
- adds all the difference figures together
- divides the total by the number of figures in the group.

The standard deviation is the square root of the variance — so the standard deviation usually gives you the more immediately useful number.

Example

figures	average	standard deviation	variance
21, 19, 20	20	1	2
5, 45 and 10	20	22	950

In both cases, the average is 20. In the first group, the figures are all close to the average, so the standard deviation is low. In the second group, the figures are much more widely scattered, so the standard deviation is high.

143 COUNT

Puts the number of figures in the group into the output cell.

Guide through the graphics sub-menus

Many of the decisions you take in these menus depend on what kind of graph you want to produce.

means — for a bar chart only

means — for a line chart only

means — for a mixed bar-and-line chart only

means — for a pie chart only

Displaying a chart: graphics option 1

This works in exactly the same way as command **61**.

Designing a chart: graphics option 2

A sub-menu will appear, from which you make your design choices. When you've finished — or whenever you want to return to the graphics main menu — press `ESCAPE`.

The sub-menu looks like this:

```
Define Chart Options

ENTER DATA:
------------------------------------------------------------------
          Main Title ████████████████████████████████████
          X Axis Title
          Y Axis Title

                       Type      Shade   Symbol   Colour
  Graph  Row/Col  (Bar/Line/Pie) (0-6)    (0-6)    (1-8)
  -----  -------  -------------- -----   ------   ------
    1       1          Bar         1        1        2
    2                  Bar         2        2        3
    3                  Bar         3        3        4
    4                  Bar         4        4        5
    5                  Bar         5        5        6
    6                  Bar         6        6        7

          Stack (Y/N).....................N
          Horizontal Bar (Y/N).............N
          Colour (Y/N)....................Y
```

ENTER DATA:
This is the prompt line; the blank line above it is a space for GraphPlan messages. The numbers in the table determine the design of your graphs.

You now go through the design decisions one by one. The sub-menu allows you to set up six graphs from your spreadsheet on your chart.

As you type in each decision, your typing will appear to the right of the ENTER DATA prompt. Press `RETURN` and the data will appear in its correct position in the main part of the screen. You can then make the next decision on the menu.

Main title
Enter up to 40 characters (use fewer for a colour display).

X Axis Title
Y Axis Title
Enter up to 40 characters (use fewer for a colour display).

The titles will appear like this:

Bar chart	Line chart	Pie chart

MAIN TITLE
y-axis title
x-axis title
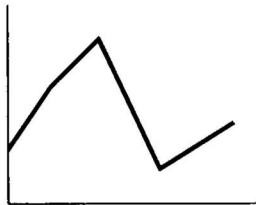
MAIN TITLE
y-axis title
x-axis title

MAIN TITLE
x-axis title
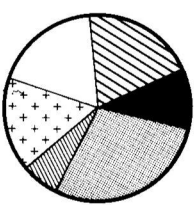
Row/Col
Enter the number of the row or column you want to see as your first graph, or 0 if you want your first graph to be empty. If you're setting up a numeric line chart, enter the number of the column that contains the y-axis data (you'll be able to define the x-axis in graphics option 3).

Type

 type B

 type L

 type P

Shade

Decide here what type of shading to use. A message gives you the options:

message **0-hollow, 1-solid, 2-cross h, 3-h(45), 4-hollow, 5-h(135), 6-h(0)**

0 hollow	4 hollow
1 solid	5 horizontal (135 degrees)
2 cross-hatch	6 horizontal (0 degrees)
3 horizontal (45 degrees)	

Type the appropriate number. If you want to produce a solid colour graph, choose **1**.

Press **RETURN**.

Symbol

Type a number between 1 and 6 to select the symbol you want to use to plot the points on your graph.

Message **0-(no symbol), 1-(*), 2-(+), 3-(0), 4-(X), 5-(#), 6-($)**

If you type **1**, for example, your graph will appear as a line joining up * symbols. If you want to produce a solid line graph in colour, type **0**.

Press **RETURN**.

Colour

If you don't have a colour monitor, press **RETURN**. If you do have colour, type a number between 1 and 8. The background of your graph will be black. The colour you select is the colour of the bars or line on the graph.

Type   1 for green
         2 for red
         any number from 3 to 8 for blue.

The next stage is to make all the same decisions again for your second graph and so on until you've set up all your graphs.

When you've finished designing your graphs, press **RETURN** repeatedly until the **N** after **Stack (Y/N)** is highlighted.

There are three final decisions to make. Type **Y** **RETURN** or **N** **RETURN** for each of them.

Stack (Y/N)

Decide whether or not to stack your graphs. A stacked chart is useful when you want to see how the data in a set of graphs contributes to a total. Instead of laying out the bars in each graph side-by-side, the program stacks them on top of each other.
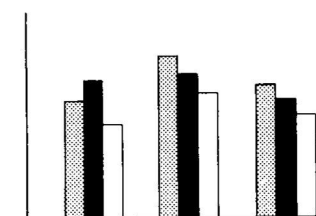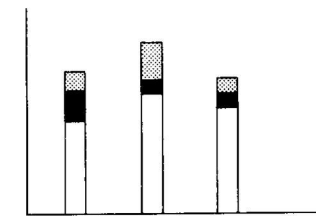
unstacked graph   stacked graph

Type N RETURN.

Horizontal (Y/N)

Decide whether you want to show your chart sideways, that is, with the x-axis vertical and the y-axis horizontal. This works well whenever the x-axis doesn't show numeric or time data. In a horizontal bar chart, the maximum number of bars is 16.

You can't have line graphs in a horizontal chart. If you select the horizontal option for a mixed bar-and-line chart, the line graphs in it will be automatically converted to bar graphs.

. To get a horizontal chart, check that the 'X Data Type' option is set to 'Text': you do this by selecting option 3 from the graphics main menu, and following the sub-menu that appears.

Type N RETURN.

Colour (Y/N)

Asks you whether you want a colour display or not.

You can now go back through the sub-menu again if you like, to change any decisions. Press RETURN to move from one option to the next without changing your earlier decision. Press ↑ to move back to earlier decisions. When you're satisfied with your design specification, press ESCAPE.

Special design decisions

A scattergram is a line graph in which the points aren't joined up. You'll need to specify something like this:

Graph	Row/Col	Type (Bar/Line/Pie)	Shade (0-6)	Symbol (0-6)	Colour (1-8)
1	1	Line	0	n	n

Choose whichever symbol and colour seems appropriate.

Design limitations

There are two important limitations to bear in mind:

■ In a bar chart, up to 100 bars can be displayed side-by-side. If you have, say, six bar graphs in your chart, each can have only 16 bars. You can get much more data on to your chart by stacking the graphs.

■ A pie chart can contain only eight segments. GraphPlan will automatically show the first eight non-zero values in the row or column you specify. It will convert negative to positive values. You should check the contents of the row or column carefully before setting up a pie chart, to make sure that the chart will make sense. If necessary, re-order the spreadsheet by selecting 23 or 28: see chapter 11.

Designing the axes of your chart: graphics option 3

This option displays another sub-menu on your screen, in which you specify:

- what kind of data you have on each axis
- what kind of scaling (linear or logarithmic) you want on each axis
- the scale of each axis
- the location of titles.

You don't have to go through this sub-menu at all: if you don't, GraphPlan will automatically make decisions on all its options.

Nothing in this sub-menu has any effect on pie charts.

The axis design sub-menu looks like this:

```
Define Axes Options

ENTER DATA:T
----------------------------------------------------------


          X Data Type (T-Text,D-Date,N-Numeric).......T
          Date Type (W,M,Q,Y,MY,QY)...................
          Date Start..................................
          Draw Frame (N-Suppress,L-Left,B-Box)........B
          Legend (N-Suppress,L-Left,R-Right,B-Bottom).B

          Axes Specification        Y Axis        X Axis
                                    --------      --------
          Type (L-Linear,O-Log).......L
          Auto Scaling (Y/N)..........Y
          Minimum.....................
          Maximum.....................
          Number of Major Div (1-10)..
          Number of Minor Ticks (0-5).0

          Draw Grid Lines (Y/N).......Y          N
```

You now go through these choices one by one. The option you type in appears as you type it after the **ENTER DATA:** prompt. When you press **RETURN** the data will move to the correct position on the sub-menu display.

X Data Type (T-Text,D-Date,N-Numeric)

Specify the kind of data you want to show in your x-axis. If you're creating an ordinary row chart, look at the column headings on your spreadsheet (if it's a column chart, look at the row headings).

Type   **T RETURN** if the headings are words or phrases (for example, 'wages' or 'heat and light')

D RETURN if the headings are dates

N RETURN to create a numeric line chart, plotting two columns (or rows) against each other.

If you enter **N**, you'll get the message:

message   **Enter Row(1-50)/Col(1-20) number for the numeric X axis**

Type in the row (or column) number that contains the data against which you want to plot the data in your main row (or column), then press **RETURN**. Only line charts can have numeric axes: if you specified a bar chart, GraphPlan will automatically convert it.

Date Type (W,M,Q,Y,MY,QY)

If you've just entered **T** or **N**, you'll see:

message   **X axis is not date**
           .. Press RETURN to continue

Press **RETURN** twice.

If you entered **D**, choose from the following:

type			examples	
	W RETURN	for weekdays	*examples*	*MON*
	M RETURN	for months		*JAN*
	Q RETURN	for quarters		*Q1*
	Y RETURN	for years		*1990*
	MY RETURN	for months and years		*JAN/1990*
	QY RETURN	for quarters and years		*Q1/1990*

Depending on what you chose, you'll see one or more of the following:

prompt   `Starting Weekday(1-7) ?`

          `Starting Month(1-12) ?`

          `Starting Quarter(1-4) ?`

          `Starting Year(1-9999) ?`

Type in the appropriate number followed by **RETURN**. For weekdays, 1 means Sunday, 2 Monday, and so on. You can abbreviate years by typing in, say, 91 instead of 1991.

`Draw Frame (N-Suppress,L-Left,B-Box)`

Type
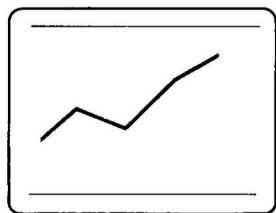
N **RETURN** for   L **RETURN** for   B **RETURN** for
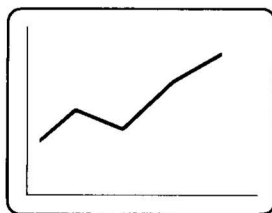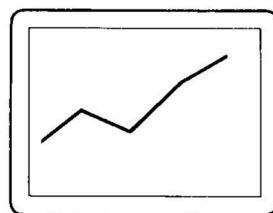
`Legend (N-Suppress,L-Left,R-Right,B-Bottom)`
A legend is a key to your chart. For example, if you're creating a row chart, the legend will describe what kind of data is in the row ('net profits', 'car expenses' and so on). If you're setting up a multi-graph chart, there will be several legends.

Type   N **RETURN** for no legends to be shown
          L **RETURN** for legends to be on the left of your chart
          R **RETURN** for legends to be on the right of your chart
          B **RETURN** for legends to be at the bottom of your chart.

The final five decisions on this sub-menu apply to both axes — unless you specified a TEXT or DATE x-axis, in which case you'll get this message at each of the x-axis decision points:

message `X axis is not numeric .. press RETURN`
               `to continue`

Press **RETURN** when you get this message.

`Type (L-Linear,0-Log)`
Decide which type of scaling you want on each axis.

Type   L **RETURN** for linear, and the values will be spaced evenly
                 along the axis
        O **RETURN** for logarithmic, if you have a very large range of
                 values. In a logarithmic scale, each value on the
                 scale is ten times the previous value.
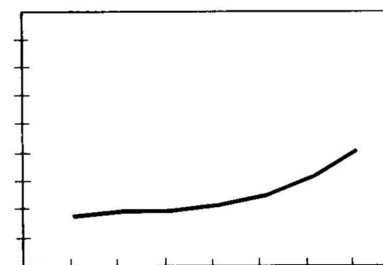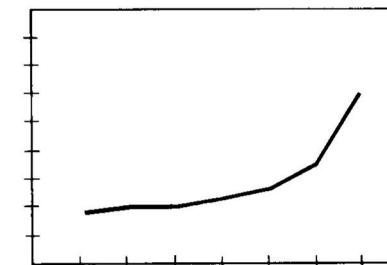
logarithmic scale   linear scale

`Auto Scaling (Y/N)`
Under auto-scaling, GraphPlan decides the highest and lowest values shown on each axis, and the number of divisions the axis will be divided into.

Type   Y **RETURN** if you want automatic scaling
        N **RETURN** if you want to look at only part of the range of
                 values, or if you want to enlarge the scale to get
                 more detail.

If you choose Y, the next three lines of decisions don't apply, and you'll get messages like this:

message   `Y axis is in auto-scaling mode .. press`
          `RETURN to continue`

If you choose N, you now make your scaling decisions by typing the appropriate number followed by **RETURN**.

Minimum
Determines the minimum value on the axis — the value at which the axis starts.

Maximum
Sets the value at which the axis ends.

Number of Major Div (1-10)
Defines the number of divisions you want to see between the lowest and highest value on the axis.

maximum value

six major divisions
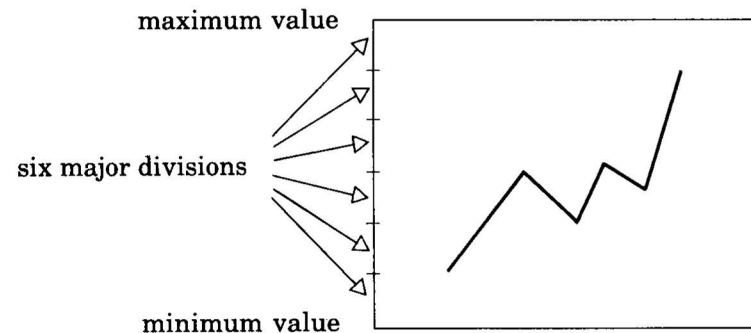
minimum value

You cannot specify more than 10 divisions and the divisions decision doesn't apply at all to logarithmic axes. If you fail to enter both the minimum and the maximum values, or if you give a maximum that's not greater than the minimum, GraphPlan will return to auto-scaling.

Number of Minor Ticks (0-5)
These are the small markers between the major divisions. The number you type determines how many minor ticks will be shown between each major division — the maximum is 5. This decision doesn't apply to logarithmic axes.

Draw Grid Lines (Y/N)

Type   **Y RETURN** if you want a grid line to be drawn on your chart at each major division

           N RETURN if you don't want a grid line at each major division.

minor tick

grid line
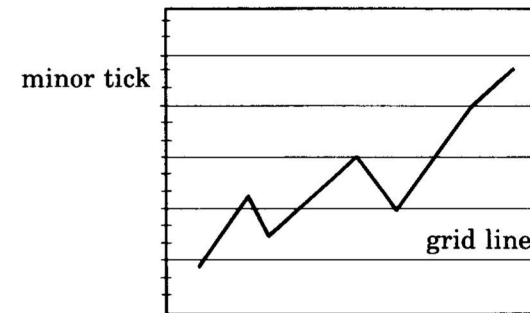
You've now completed this sub-menu so, press **ESCAPE**.

Designing a pie chart: graphics option 4

This option allows you to specify how you want a pie chart to look. You'll need to have gone through the relevant parts of option 2 first.

The sub-menu looks like this:

```
Define Pie Options
1-hollow,2-h(45),3-h(0),4-h(90),5-h(135),6-c h(light),7-c h(dense),8-solid
ENTER DATA:
------------------------------------------------------------------------

                    Shade   Colour  Explode
        Segment     (1-8)   (1-8)   (Y/N)
        -------     -----   -----   -------
           1          1       1        N
           2          2       2        N
           3          3       3        N
           4          4       4        N
           5          5       5        N
           6          6       6        N
           7          7       7        N
           8          8       8        N


        Print Percentages (Y/N)...........Y

        Sort Pie Segments By Size (Y/N)...N
```

A GraphPlan pie chart can have up to eight segments. The first cell in the row or column being handled will become the first segment, and so on. The first segment starts at the 3 o'clock position; the chart is then constructed clockwise.

This sub-menu allows you to decide (in this order):

- a shading for each segment
- a colour for each segment
- an 'explode' display for each segment
- to show round the chart the percentage of the whole pie that each segment represents
- to arrange the segments in order of size, rather than in the order on your spreadsheet of the cells they represent.

You work through these decisions one by one, pressing **RETURN** to move from one to the next. When you've finished, press **ESCAPE**.

The shading options are as follows:

 1 hollow

 2 (45 degrees)

 3 horizontal (0 degrees)

 4 vertical

 5 (135 degrees)

 6 cross-hatch

 7 cross-hatch

 8 solid

The colour options are as follows:

1	green
2	red
3-8	blue

If you select an 'explode' option for a segment, that segment will be shown slightly larger than normal on the chart, to emphasise it.

 exploded segment
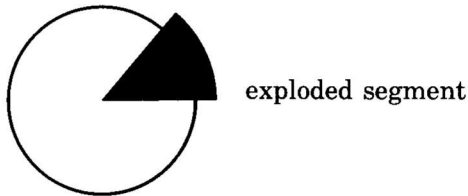
Printing a chart:
graphics option 5

Before you select this option, make sure that:

- you have a current spreadsheet and chart
- your printer is ready to print.

When you make this selection, you will see:

prompt   `Do you want to enlarge your chart (Y/N)?`

Type   Y **RETURN** to print your chart so that it fills an A4 page
       N **RETURN** to print it so that it fills only the top half of an A4
                page.

Message   `SET PAPER; HIT RETURN`

Press   **RETURN**

Your chart will be displayed on the screen and printed by the printer (it will take a few minutes for the printer to finish).

To stop printing at any time, press **ESCAPE**, and you'll be returned to the graphics main menu.

Plotting a chart:
graphics option 6

You'll need this graphics option only if you have a plotter connected to your Z80 computer. Make sure before you select it that you've made all the chart design decisions you want to.

A sub-menu will be displayed like this:

```
Plot Chart                                          Press Ctrl-P to Plot

ENTER DATA: 2
------------------------------------------------------------------------



                    Number of Pens (1-8)..........2

                    Pause For Pen Change (Y/N)....Y

                    Transparency (Y/N)............N

                    Page Format...................1
```

Go through the four decision points on the menu. Three page formats are available:

type   1 for 11 x 8 inches (roughly A4)
       2 for 5.5 x 8 inches (horizontal A5)
       3 for 8 x 5.5 inches (vertical A5).

Press   **ESCAPE** to return to the graphics main menu
       CTRL P   to start the plotter.

Prompt   `SET PLOTTER and PAPER; HIT RETURN`

Press   **RETURN**

Message   `Plotting in Progress...`

To stop the plotter at any time, press **ESCAPE**, and you'll be returned to the graphics main menu.

Index to GraphPlan commands

Entries in the menu that end in colons display the relevant sub-menu.

Error Messages

If you make a mistake, the program will display a message on the screen, to tell you where you went wrong. There are three kinds of error that might happen:

- CP/M errors
- execution errors
- GraphPlan errors.

CP/M errors

Error messages that start **Bdos Err** come from the CP/M operating system. There's a guide to them in your *Z80 user guide*.

Execution errors

CM ERROR
One of the programs on your GraphPlan disc is missing.

Action: make a new copy of the GraphPlan master disc. If the error persists, contact your dealer.

DW ERROR
Your GraphPlan disc is full.

Action: use the CP/M command PIP to copy some of your tables and charts from the GraphPlan disc on to a data disc, then delete them using ERA from the GraphPlan disc. PIP and ERA are explained in your *Z80 user guide*.

DZ ERROR
The program tried to divide by zero.

Action: check the calculation you were trying to carry out.

ME ERROR
The directory of your GraphPlan disc is full.

Action: use the CP/M command PIP to copy some of your tables and charts from the GraphPlan disc on to a data disc, then delete them using ERA from the GraphPlan disc. PIP and ERA are explained in your *Z80 user guide*.

OE ERROR
An internal error that has no effect on the program.

Action: enter your next command and carry on.

OF ERROR
A number used in the calculation you're carrying out is too large.

Action: find the number that's too large, and change the sum.

OM ERROR
The computer has run out of memory.

Action: split your spreadsheet, or the calculation you're attempting, into smaller pieces.

GraphPlan errors

The contents of this file are incorrect
The computer cannot carry out the save operation you've asked for: either your disc or your drive is faulty.

Action: try again. If you get the message again, try with a different disc. If the error still persists, ask your dealer to check your disc drive.

New table is smaller than current table dimensions
The table you're trying to load is smaller than the table on your screen.

Action: Type **0** to use the smaller table size, **1** to use the larger.

`Cannot display/print/plot chart.`
`Zero data in all selected rows/cols`
You've asked the program to construct a chart when there's no data to
go into it.

Action: Check the spreadsheet. Set up the chart again, by select-
            ing 62 or 63.

`Cannot display/print/plot chart. Zero row/col`
`data for numeric X-axis`
You're trying to set up a numeric line chart, but the row or column
you've specified for the x-axis has no data in it.

Action: Go through the setting-up routine again, specifying the
            correct row or column (see *Guide through the graphics sub-
            menus*, graphics option 3).

Glossary

This glossary covers terms used in GraphPlan. There isn't space here
to cover the special terminologies used in maths and statistics opera-
tions: they are explained in chapters 9 and 10.

There's a more general glossary in your *Z80 user guide*.

axis
The baseline at the bottom or left-hand edge of a chart. The horizon-
tal baseline is the x-axis, the vertical baseline the y-axis.

bar
One of the three types of graph. The value in each cell is shown as a
solid bar. See chapter 3.

cell
A space in a spreadsheet, at the intersection of a row and a column.

chart
A pictorial version of some or all of the data in a spreadsheet. A chart
can be made up of one or more graphs. See chapter 3.

command prompt
When the entry line contains the words `ENTER COMMAND:` and
nothing else, it's displaying the command prompt, which means that
the program is ready to receive a command.

constant
One of the four data entry options, in which you enter a value in the
first cell of a row (or column) and the program repeats it in every
other cell. See chapter 8.

data drive
The drive at which GraphPlan will look when saving or loading
spreadsheets and charts. When you start the program, A is the data
drive, but you can switch to B instead. See chapter 15.

data pointer
A highlighted block on the screen, to show where in the spreadsheet you're currently working.

default
A standard setting, built into the program, but often adjustable by you.

entry line
The space on the screen where your commands and data appear, as you type them in.

explode
A way of displaying a segment of a pie chart, to draw attention to it.

graph
A pictorial version of a single row (or column) from a spreadsheet. There are three kinds of graph: bar, line and pie. See chapter 3.

grow
One of the four data entry options, in which you enter a base value in the first cell of a row (or column), and the program makes it grow by a percentage rate from each cell to the next.

increment or **incr**
One of the four data entry options, in which you enter a base value in the first cell of a row (or column), and the program makes it change by a constant increment from each cell to the next.

input row (or **input column**)
The row (or column) containing the figures that you want to put into a calculation. See chapter 9.

legend
A label on a chart to show what a graph in that chart represents.

line
One of the three types of graph. The value in each cell is plotted as a point, and the points are joined up to form a line. See chapter 3.

model
Working with spreadsheets is often called financial modelling: you are setting up a model of your financial position, with which you can experiment, seeing the effects of different decisions. The model itself is the spreadsheet without its data: you can display it on your screen by selecting 22 and 27.

numeric line chart
A chart in which you plot two columns (or rows) against each other (you might, for example, plot various incomes against the income tax they'd be liable to).

output row (or **output column**)
The row (or column) into which the program will put the results of a calculation. See chapter 9.

period
In statistics, a range of cells within a row or column, which you want the program to examine.

pie
One of the three types of graph. The total of the first eight values in the row or column is shown as a circle, and the values themselves as segments of that circle. See chapter 3.

rank
To assign a number to each value in a row (or column) that indicates that value's position in the range of values in the row. For example, the highest value might be assigned the number 1, the second highest 2, and so on.

report
A printed spreadsheet.

scattergram
A line graph which shows the data points but omits the line that joins them up.

select
To choose a command from the menu and give that command. For example, to select 63, press ESCAPE if necessary to get the command prompt, and then type 63 RETURN.

spreadsheet
A grid of rows and columns, in which you can enter and manipulate numbers.

stack
In a stacked bar or bar-and-line chart, the bars are shown stacked vertically instead of laid out next to each other.

value
1 A figure in, or to be entered into, a cell
2 One of the four data entry options, in which you enter data cell by cell. See chapter 8.

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