MATRIX

SPREADSHEET PLUS

INSTRUCTION MANUAL

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CONTENTS

1. OVERVIEW

MATRIX is an electronic spreadsheet which can help with most applications where large amounts of numeric data need to be processed. Windows and pull-down menus make the program very simple and easy to use.

The main features of MATRIX are the *spreadsheet*, the *calculator*, the *notebook* and the *paperweight*. The calculator is useful for one-off calculations, the notebook is a simple word processor which can extract data from the spreadsheet, and the paperweight is a temporary store used mainly to move data around or between the spreadsheet and notebook.

2. INTRODUCTION

2.1 GETTING STARTED
To start the program, insert the MATRIX tape or disk and type:

RUN "MATRIX"   <ENTER>

When MATRIX has finished loading, remove the program tape or disk and insert a work tape or disk. If you are using disk, then you should format the work disk before you load MATRIX. This can easily be done using the utility program provided on the CP/M disk (see the computer manual for details).

When the program starts up, the screen divides into 3 parts:

Menu Bar	- the top line of the screen
Spreadsheet	- this occupies the major part of the screen
Edit Zone	- the bottom two lines of the screen

2.2 MENUS
It will help you to learn how to use MATRIX if you familiarise yourself with the operation of menus. First of all, look at the top line of the screen where the names of the main menus are displayed - this is called the *menu bar*. Note that the first menu name *micro-Application* is reversed in relation to the other menu

names. This shows where the *menu cursor* is located. Press SPACE to move this cursor along the menu bar. To select an option, press the ENTER key when the cursor highlights it.

There is a quick way to pull down a particular menu - hold down the CTRL key and type the first letter of the menu, for example, **CTRL-F** will pull down the FILING menu (the exception to this is the *micro-Application* menu - press **CTRL-A**).

Each of the main menu options offers further selections. The first option, shown as a small rectangular block, is always an EXIT from the menu *without* executing a command. Press SPACE to choose the required option in the menu and press ENTER, or simply type the letter next to the required command, eg. to select CALCULATOR from the *micro-Application* menu, just type **C**.

Some menus offer options that act like switches or alternatives rather than specific commands. MATRIX indicates which ones are ON with a + sign. Sometimes several alternatives are shown, only one of which can be selected at a time, eg. the NUMBERS menu has DEGREES and RADIANS as the last two choices. Only one of these can be marked with a + sign, so that if you choose the opposite one then the next time you pull down the menu you will see that the + sign has moved.

3. THE SPREADSHEET

The spreadsheet is a set of boxes or *cells* layed out in rows and columns. The rows and columns are numbered so that any cell can be identified by its row and column. For example, the cell in row 4 and column 2 is referred to as R4C2. You don't have to tell MATRIX exactly how many rows and columns you want to use before you start. Instead you simply lay out the spreadsheet across the number of rows and columns you require. MATRIX will allocate memory for each row and column you decide to use.

If you try to enter something in a new row or column and there is not enough memory, you will be notified that there is a shortage.

Each cell can hold one of three types of information:

- a numerical value
- a formula, which evaluates to a numerical result
- text

The following paragraphs describe how to enter information into the spreadsheet.

3.1 THE CELL EDITOR

This section shows you how to move around the spreadsheet, how to enter information into cells, and how to change the contents of cells.

3.1.1 The Grid Cursor

The spreadsheet consists of a large number of cells. The *current cell* is identified by the *grid cursor* which highlights the cell by reversing its colours. When you first load MATRIX, the grid cursor can be found in the top left-hand corner of the spreadsheet. This cursor always shows you where you are in the worksheet and to edit any cell, you must move this cursor to it.

To move the cursor around the spreadsheet use the cursor keys (these look like arrow keys). For example, to work on the cell two columns to the right of the current cell, just press the RIGHT key twice.

Pressing UP or DOWN with the CTRL key held down will move the cursor up or down by a 'page'.

You can only move the grid cursor so long as you are not editing a cell (see 3.1.3) and there are no menus pulled down.

3.1.2 Entering Data

To enter data into the current cell, simply type it in directly from the keyboard. Whatever you type is displayed in the edit zone (at

the bottom of the screen) and then, when the ENTER key is pressed, it is stored in the current cell.

Let's suppose we want to store the value 55 in cell R4C2. First move the cursor to this cell using the cursor keys and then type **55<ENTER>**. As soon as you press ENTER, the value **55.00** will appear in the cell (values are displayed to two decimal places by default – to change this, see chapter 8), and the cursor will move to the cell below. The automatic movements of the cursor makes it easy to enter data in columns. If you want to enter data in rows, terminate each entry with TAB instead of ENTER.

3.1.3 Changing a Cell

To modify some existing information in the spreadsheet, move the grid cursor to the relevant cell and then press the COPY key (or any key other than SPACE, the cursor keys and the ENTER key). The contents of this cell will be reproduced at the bottom of the screen in the edit zone.

You can move around the edit zone using LEFT and RIGHT or use DEL to delete a character.

When you have made the necessary changes, press ENTER (or TAB) to show that the entry is finished; alternatively, use the ESCAPE key to cancel any changes that you have just made.

These editing keys can also be used with the calculator, the notebook, and in general whenever MATRIX prompts you to enter information from the keyboard, for example, a filename.

Note: as you move the grid cursor around the spreadsheet, the edit zone does *not* display the contents of each cell unless you press COPY.

3.2 CELL CONTENTS

Up to now you have seen how to put values in cells and how to modify them. Each cell can contain a *value*, a *label*, or a *formula*.

3.2.1 Values

When we entered **55** in cell **R4C2**, MATRIX considered it to be a *value*. Values can be used by formulae in other cells as part of their calculations.

3.2.2 Labels

Without *labels* to identify the figures on your spreadsheet, you would soon forget which is which.

Labels are entered in exactly the same way as values - the only difference is that you use characters, instead of just numbers.

For example, you could go to cell R3C2 and type in **January** <ENTER> to name that column January. A label serves only to identify a row or column visually, and *cannot* be used in a formula. However, in Chapter 7 we will find out how to *name* a cell - cell names *can* be used in formulae.

3.2.3 Calculation Formulae

Enter the following simple example which will demonstrate the use of formulae:

	1	2	3	4
3		January	February	
4	Food	55.00		
5	Rent	100.00		
6	Total			

Suppose you want to total the expenses for January in cell R6C2: if you were to write the formula in plain English, it would be something like this:

Total (January) = Food (January) + Rent (January)

For MATRIX to understand a formula you must tell the program where to get the information it needs. All formulae must begin with an equals sign (=), which indicates to MATRIX that a formula follows.

So, if we were to rewrite our formula in terms that MATRIX can understand, it would be:

$$=R4C2+R5C2$$

Note: we have used capital letters in this manual for clarity, though you could use =r4c2+r5c2 just as effectively.

Move the cursor to cell R6C2 and enter the above formula. When you press ENTER, MATRIX evaluates the formula and displays the answer in the current cell.

Instead of working out the co-ordinates of the cells referred to in your formulae, you can get MATRIX to do it for you. When you are in the middle of writing a formula, you can hold down the SHIFT key and move the cursor onto the cell you wish to refer to using the cursor keys. Now press COPY and MATRIX will automatically write the co-ordinates into the edit zone.

3.2.3.1 Absolute Referencing
When you write a formula which refers to cells by their row and column number, it is called *absolute referencing*.

3.2.3.2 Relative Referencing
Another way to refer to cells is to give their position relative to the cell which contains the formula. We could rewrite our formula in English as:

Total = Cell two rows above + Cell one row above

which, in terms MATRIX can understand, looks like this:

$$=R-2C+0 + R-1C+0$$

where **R-2** refers to the row two above (ie. the number of the row is two lower), and **C+0** refers to the same column. This is called *relative referencing* because the position of the cell addressed is expressed relative to the position of the cell in which the formula is written.

This offers a great advantage over absolute referencing, as it allows you to move or copy groups of cells to other positions in the spreadsheet without having to rewrite all the formulae. For this reason, it is best to use relative referencing wherever possible.

MATRIX offers an easy way of entering relative co-ordinates: move the cursor to the cell to be referenced as before, but this time press the CLR key instead of the COPY key, and MATRIX will place the relative references in the formula for you.

There is a shorthand way of referring to a cell in the same row or column. Instead of **R+0** or **C+0**, simply place an apostrophe (') after the letter **R** or **C**. eg. **R'C-2** or **R-3C'**.

3.2.3.3 Range Referencing
The functions SUM, AVER, MAX and MIN relate not to a single cell, but to a block of cells. For example, to total all the cells in column 4 between rows 2 and 8 you can use the formula:

$$=SUM(R2C4:R8C4)$$

The **:** character is used to separate two co-ordinates. In our previous example, the formula could have been written as:

$$=SUM(R4C2:R5C2)$$
or
$$=SUM(R-2C':R-1C')$$

Whenever you wish to specify a block of cells, give the co-ordinates of the cells in the top left-hand and bottom right-hand corners of the block.

3.2.3.4 Operators and Functions
The LIST FUNCTIONS option in the CELLS menu (see paragraph 7.1) displays the full list of operators and functions that MATRIX offers for use in formulae. These are listed below for easy reference.

Functions

ABS(x)	gives the absolute value of x
ATN(x)	arc tangent of x
AVER(RxCy:RaCb)	gives the arithmetic average of the defined range
CINT(x)	converts x into a whole number in the range -32768 to +32767
COS(x)	calculates the cosine of x
EXP(x)	e to the power of x (e=2.7182818)
FIX(x)	gives the integer part of x without any rounding
INT(x)	gives the next lower integer, eg. INT(4.1)=4, INT(-4.1)=-5
LOG10(x)	the logarithm of x to base 10
LOG(x)	the natural logarithm of x
MAX(RxCy:RaCb)	the largest value within the range
MIN(RxCy:RaCb)	the smallest value in the range
xMODy	the remainder when x is divided by y
PI	returns the value of PI=3.14159265
RND	gives a random value between 0 and 1
ROUND(x,y)	rounds the value x to y decimal places
SGN(x)	gives 0 if x=0, 1 if x>0, -1 if x<0
SQR(x)	gives the square root of x
SUM(RxCy:RaCb)	totals the values within the range
TAN(x)	calculates the tangent of x
x=y	gives -1 if x is equal to y
x<>y	gives -1 if x is different from y
x>=y	gives -1 if x is greater than or equal to y
x<=y	gives -1 if x is less than or equal to y
x>y	gives -1 if x is greater than y
x<y	gives -1 if x is less than y

Arithmetic Operators

+ - * /	add, subtract, multiply, divide
↑	to the power of
\	integer division (similar to INT(x/y))

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Logical Operators

x AND y	logically ANDs x with y
x OR y	logically ORs x with y
x XOR y	exclusive ORs x with y
NOT x	logically inverts x

3.4.2 More About Formulae

The maximum length of a formula is 159 characters, big enough for most applications. When you edit a cell which is referred to in one or more formulae, the formulae are automatically re-evaluated. If a formula cannot give a numerical result, a number of exclamation marks will be displayed instead.

In MATRIX, formulae and values are preceded by the = character, however, when you are entering an explicit number such as 55 or 100, the = sign is optional.

MATRIX allows you to reference cells by name as well as by co-ordinates (see paragraph 7.2 for more details). This can be very useful, particularly if you name cells which contain constants: eg. if the current VAT rate is stored in a cell called **VAT**, then the name **VAT** can be used in formulae instead of a numeric value or the cell co-ordinates. Naming cells helps to make your formulae clearer.

4. THE OFFICE TOOLS

The calculator and notebook are accessed through the *micro-Application* menu.

4.1 THE CALCULATOR

The MATRIX calculator does not look like a pocket calculator - it looks more like a notepad on which you write down calculations for MATRIX to evaluate. The advantage is that there is an ongoing record of what has been worked out in the window on the screen.

Type in your calculation on the keyboard. When you press ENTER. MATRIX evaluates what you have written and then displays the result, for example:

12+4*5 <ENTER>
=32

(12+4)*5 <ENTER>
=90

Note the use of brackets to change the order of calculation. The calculator not only accepts numbers that you enter but also values from the spreadsheet; you can refer to a spreadsheet cell by its co-ordinates or by its name, if it has one, for example:

12+4*R1C1 or,
12+4*VAT

Press ENTER on its own to exit from the calculator.

4.2 THE NOTEBOOK

The notebook is used to memorise and print out text. Any text in the notebook is automatically saved with the rest of the spreadsheet. There are three basic activities:

- writing in the notebook or modifying existing text
- deleting the contents of the notebook
- leaving the notebook to return to the spreadsheet

4.2.1 Entering Text into the Notebook

The notebook allows you to memorise notes or write short documents. Although it is not as powerful as a stand-alone word processor, you will find that it is very convenient to have a word processing facility within a spreadsheet program.

When characters are typed in at the keyboard they are inserted at the cursor position; any text after the cursor is automatically moved across. Use the cursor keys in the normal way to move around the text, or UP and DOWN with the CTRL key held down to step through the text a page at a time.

Use the DEL key to delete unwanted characters (this deletes the character to the left of the cursor), or ENTER to finish a paragraph or create blank lines.

Press CTRL and C at the same time to insert text contained in the paperweight at the cursor position. Use the ESCAPE key to return to the notebook's menu bar.

There is no need to format text on the screen (don't worry if words are split between lines), because text is formatted as it is printed.

4.2.2 Printing Text From the Notebook

If you are using the notebook just to keep notes, you won't be too worried about how they are going to print out. However, you can also use the notebook to print reports, and MATRIX allows you to insert *command lists* into your text containing special commands to be sent to the printer (to change the type style, perhaps) or for MATRIX itself (to select data from the spreadsheet).

A command list must be enclosed within special characters called *delimiters*. Normally these are < and >, although they can be changed if these particular characters are likely to be found in your text. There is a limit of 160 characters between delimiters.

There are four types of command, the simplest of which is the S command to change the delimiter characters. For example, to change the delimiters < and > to (and), use this command sequence:

<S()

After this command, the delimiters are (and). Notice how the second delimiter immediately becomes active and is used to terminate the command list. The same character could be used for both the opening and closing delimiter; it is not necessary to have two different ones.

The **K** command allows you to print special characters which are not found on the Amstrad keyboard. Type the letter **K** followed by the ASCII code for the character you want, for example **<K33>** will print the character whose ASCII code is 33.

The **C** command is used to send *control codes* to the printer, ie. characters that activate certain functions but do not print. In this case use the letter **C**, followed by the ASCII code. For example, **<C14>** (which will select a different type size on many printers).

The difference between these two commands is that the **K** command is used for printable characters (which affect the character count for a line) but the **C** command just sends instructions to the printer.

The following example will work on the DMP 2000 printer. In order to print the title of a document in bold characters, you must set up two command lists, one each side of the text. The first sends 2 control codes to the printer that turn on bold type and the second sends 2 more codes that turn it off again:

<center>**<C27,C71> TITLE <C27,C72>**</center>

The **R** command is the most powerful of all - it allows you to extract data from the spreadsheet and insert it into the text. The syntax is:

<center>**<RxCy*d*>**</center>

where x and y are the row and column of the cell, and *d* is a parameter that indicates the *direction* of the data and should be either **R** for rows or **C** for columns.

Suppose that the cells R1C1 to R3C1 of the spreadsheet contain three names; *Smith*, *Jones* and *Brown*, and that you want to send each person a copy of the notebook. In order to address the copies individually, you could write something like this at the top of the letter:

<center>**Dear Mr <R1C1C>,**</center>

<center>- 13 -</center>

Having done this, if you tell MATRIX to print three copies of the notebook, the first will use the name *Smith*, the second *Jones*, and the third *Brown*. Note that the final C tells MATRIX that the data is to be found in a column.

A command list can contain several commands, which should be separated by commas, eg.

<p style="text-align:center"><C15,R1C1C,C18></p>

If MATRIX encounters a syntax error in a command list, it will ignore the command concerned and continue with the following one, if any.

Printing the notebook is an option in the FILING menu.

4.3 MATRIX INFORMATION
This option in the *micro-Application* menu gives you various statistics. The most important is the number of BYTES FREE, which is the available memory for data storage. The notebook, the paperweight and the spreadsheet all share the same area of memory.

5. THE FILING MENU

All commands or instructions directly relating to the disk, tape or printer are grouped under the FILING menu (except loading and saving the paperweight which is included in the EDITING menu).

5.1 LOADING AND SAVING
When MATRIX saves the spreadsheet to disk or tape, it also saves additional information. This includes the notebook text, the cell names, and the various spreadsheet parameters/settings (those for printing, screen colours, menu numbers and choices, graphic zones etc). The only thing not saved is the paperweight.

Certain commands in the FILING menu (OPEN, NEW and END) will erase the current spreadsheet. Therefore, if any modifications have been made since the spreadsheet was last saved you will be reminded to save it when you try to execute one of these commands.

Notes about naming files:
The name of a file must not exceed eight characters (plus an optional 3 character extension if you are using disk).

If you are saving to disk, MATRIX will automatically add the default extension .TAB to the file name. Extensions help to identify different types of file: to specify your own extension, add a full stop and up to three characters after the filename.

5.1.1 Open
The OPEN command allows you to access any spreadsheet previously saved by MATRIX. To load it into the computer, enter the filename when you are prompted. If you do not specify the file extension, MATRIX assumes that it is .TAB. If you are loading from cassette, you can just press ENTER and MATRIX will load the first file it finds on the tape.

If you are loading from disk, MATRIX will give you an error message if it cannot find the file you have specified.

If the file that you load in needs the memory being used by the paperweight, then MATRIX will erase it and load the complete file. The message *pw erased* will then be displayed.

5.1.2 Close
Use the CLOSE command to save the spreadsheet to disk or tape. This will include the notebook and the current parameters in force. You must specify a filename for the document being saved (see above).

5.1.3 New
The NEW command erases all the information currently held in memory, except the paperweight. This includes the spreadsheet, the notebook, the cell names, and the graphic zones.

5.1.4 End
The END command completely erases the memory and resets the computer to its original startup state. You will be asked to confirm your selection in case you have made a mistake.

5.1.5 Special Disk Drive Commands
When your computer is connected to a disk drive, you should select DISKETTE from the FILING menu. If you are using disk there are two extra commands, CATALOGUE and ERASE DOCument which are not available when tape is used.

5.1.5.1 Catalogue
The CATALOGUE command is similar to CAT in BASIC. It displays a list of all the files on the disk, with their sizes. If the window is too small to display the full list, press any key to display the next page.

5.1.5.2 Erasing a Document
Use the ERASE DOC command to delete a disk file. When you have entered the name of the file to be deleted, MATRIX will erase it without further confirmation. If the file is not found on the disk, no files are deleted.

5.2 PRINTING
You can print the spreadsheet or the notebook. The print options are:

SPREADSHEET   - to select which part of the spreadsheet to print
NOTEBOOK   - to print the notebook
TO DISK   - to direct the output to disk or tape
LINE FEED   - to activate or de-activate the line feed
PAGE WIDTH   - to change the page width
LINES/PAGE   - to set the page length
LINES/PRINT   - to set the number of printed lines per page

The SPREADSHEET command asks you what group or range of cells you wish to print.

The NOTEBOOK command asks you how many copies you want to print.

Before anything is printed, the prompt *Printer Ready?* will be displayed - Press ENTER to continue.

The TO DISK command allows you to send the output to a disk file instead of the printer.

The LINE FEED command allows you to specify whether or not a *line feed* character should be sent at the end of each line. If the printout is double-spaced, or all on one line, you should change the setting.

The PAGE WIDTH command allows you to specify the size of the paper being used. To start with this defaults to 80 columns, but you can set it to anything between 10 and 160, providing your printer is capable of dealing with it.

LINES/PAGE and LINES/PRINT allow you to set the number of lines that will fit on the paper you are using and the number of lines that will actually be used for printing (so you can allow for a margin at the top and bottom of each sheet). Obviously, you can't print on more lines than there are on a page.

After you select SPREADSHEET or NOTEBOOK, MATRIX asks whether the printer is ready. When you are ready to print press ENTER, making sure that the printer is switched on. To interrupt the printing at any time, just press the ESCAPE key.

6. THE EDITING MENU

The EDITING menu contains all the commands relating to the paperweight and also those that operate on a group of cells (deleting, formatting, sorting).

As the editing functions operate on one or more cells, you will be asked to specify one or two sets of co-ordinates. If you press ENTER for any of these, MATRIX will use the co-ordinates of the current cell.

6.1 THE IDEA BEHIND THE PAPERWEIGHT

The paperweight is a means of temporarily storing information, so that it can be moved around within the notebook or spreadsheet, or transferred between them, or saved and retrieved from disk or tape.

6.1.1 Cutting

The CUT command moves a block of cells from the spreadsheet to the paperweight, leaving a blank space behind. Any previous contents of the paperweight are lost.

6.1.2 Copying

The COPY command transfers the contents of a block of cells from the spreadsheet to the paperweight, but leaving the spreadsheet as it was. Any previous contents of the paperweight are lost.

Formulae in the block of cells that you are copying will not be transferred to the paperweight unless you have SHOW FORMULAE active at the time (see Chapter 9). When SHOW VALUES is active, the values only are transferred across.

Copying formulae is normally only useful if you are going to PASTE the paperweight into the spreadsheet somewhere else. If absolute referencing was used, then the formulae may need adjusting to reflect the new position (this is one reason why relative referencing is preferable).

6.1.3 Pasting

The PASTE command takes the contents of the paperweight and transfers it to the position that you specify. Note that you need to indicate only the top left-hand corner of the new position. The contents of the paperweight are left unchanged after pasting.

6.1.4 Saving the Paperweight

The SAVE PW command takes the contents of the paperweight and saves it to tape or disk in a file with the name that you specify.

6.1.5 Reading the Paperweight
The READ PW command loads a paperweight previously saved onto tape or disk.

6.1.6 Viewing the Paperweight
The VIEW PW command opens a window in which the contents of the paperweight are displayed. If the window is too small to show all the contents of the paperweight, touch any key (except ESCAPE which ends the display) in order to see the rest.

6.2 EDITING THE SPREADSHEET
The following commands operate directly on the spreadsheet, on a block of cells that you specify. To apply a command to the current cell only, press ENTER four times when asked for the co-ordinates.

6.2.1 Erasing
The ERASE command totally erases a range of cells.

6.2.2 Editing
The EDIT command is used to format a range of cells according to the numerical type and number of decimal places specified in the NUMBERS menu (see chapter 8).

6.2.3 Sorting
You can sort a single row or column, or a range. If you specify a range, you are also asked for the row or column that will be used as the key to sort on (this row or column need not be within the range).

There are 4 types of sorting:

> A-Z sorting - ascending alphabetic
> 0-9 sorting - ascending numeric
> Z-A sorting - descending alphabetic
> 9-0 sorting - descending numeric ·

Here is a simple example illustrating an ascending numeric sort (the other sorts work in a similar way, with capital letters coming before small letters in an alphabetic sort):

	2	3	4	5	6
3					
4		January	February	March	April
5					
6	Rent	90.00	90.00	90.00	95.00
7	Phone	52.50	57.20	46.90	69.35
8	Electricity	91.40	87.60	58.30	68.53

This example shows the total expenses for rent, telephone and electricity for the first four months of the year. If you wanted to rearrange the figures according to the telephone costs then you could sort row 7 by using the range R7C3 to R7C6, and choosing to sort 0-9. If you do this, then only the telephone costs would be rearranged and the figures would no longer represent the correct month.

What you really need to do is rearrange all the data, including the month labels at the top of the columns, using the telephone row as the sort key. To do this, specify the range to be sorted as R4C3 to R8C6, choose to sort by ROW, and enter 7 for the row number.

If you do this sort, the result will be as follows:

	2	3	4	5	6
3					
4		March	January	February	April
5					
6	Rent	90.00	90.00	90.00	95.00
7	Phone	46.90	52.50	57.20	69.35
8	Electricity	58.30	91.40	87.60	68.53

The row *Phone* has been sorted and all the corresponding data in the same column has been moved accordingly.

You should only use the numeric sort to sort cells containing values and formulae. Similarly, you should only use the alphabetic sort to sort cells containing labels. If you break this convention, you may find you get unexpected results.

7. THE CELL MENU

This menu offers options that relate to the spreadsheet's cells.

7.1 LIST FUNCTIONS
By using this command you can list the functions and operators offered by MATRIX. Press ENTER to exit the display.

7.2 NAMING A CELL
To name a cell place the grid cursor over the cell to be named, choose NAME CELL from the CELL menu and then enter its name (up to 10 characters). Note that capitals and lower case are treated differently by MATRIX, eg. *tariff* and *TARIFF* are two different names. Cell names can be used in formulae, eg:

=2*TARIFF+R1C2

Note: if TARIFF has not been defined as the name of a cell, MATRIX considers it to be a label and takes the value as 0.

When you use the paperweight to copy or move part of the spreadsheet, cell names are *not* moved or copied.

7.3 LIST NAMES
This command lists all the current cell names giving their corresponding co-ordinates. If there are too many names to fit in the display window, hit any key to view the remainder. Press ESCAPE to exit.

7.4 ERASING A NAME
Before asking you which name to delete, MATRIX lists all the names. Press ESCAPE to remove this display and then enter the name to be deleted.

7.5 GO TO A CELL
To move instantly to any cell on the spreadsheet use the GO TO CELL command, which will ask you for the co-ordinates of the cell you wish to go to. This cell will be placed at the top left-hand corner of the spreadsheet display.

7.6 FILLING CELLS
You can use the FILL CELLS command to copy the contents of a single cell (value, text or formula) to all the other cells in the range you specify. For example, if you want cells R1C2 to R2C7 to contain the same formula, this is how to you would do it:

- enter the formula into cell R1C2
- choose the FILL CELLS command from the CELLS menu
- enter R1C2 as the co-ordinates of the FIRST CELL
- enter R2C7 as the co-ordinates of the LAST CELL

8. THE NUMBERS MENU

This menu allows you to choose the type and format of numbers displayed on the screen. Except for UNITS, which immediately comes into effect, any change that you make affects only numbers entered afterwards. To change the format of existing numbers, use the EDIT command from the EDITING menu (see paragraph 6.2.2).

8.1 DECIMAL PLACES
The DECIMALS option allows you to specify the number of decimal places used when numeric results or values are displayed. This is only in effect when either the DECIMAL or UNITS type is selected.

8.2 NUMERICAL TYPES
There are four numerical types used by MATRIX, only one of which is in effect at any one time. The current type is indicated by a + sign.

8.2.1 Integer Type
This type displays whole numbers only (without any unit type). Decimal numbers will be truncated at the decimal point.

If you want the unit type to be displayed with integers, set the number of decimal places to 0 and select UNITS.

8.2.3 Decimal Type
Under this format, the numbers are displayed as decimals using the number of decimal places set by the DECIMALS option. Trailing zeros will be added where necessary.

8.2.4 Units Type
This option allows you to specify up to three characters which are appended to numbers. Normally, you would use this for monetary amounts or measures, eg. 1.75p, 293kg, or 8.2cm. By switching on the UNITS option, you also invoke the DECIMALS option, so if you want whole numbers only, set the number of decimal places to 0.

8.2.5 Bar Type
This format displays the contents of a cell as a horizontal bar, the length of which depends on the value itself. This type should only be used with values falling within the range of the column width (in characters) multiplied by 4. If they exceed this, the largest bar for that column will be displayed, which is not then truly representative.

8.3 DEGREES/RADIANS
This option determines whether calculations using the functions ATN, COS, SIN, TAN are performed in DEGREES or RADIANS.

9. OTHER OPTIONS

This menu groups together various commands that allow you to change spreadsheet parameters.

9.1 COLUMN WIDTH
This command allows you to adjust the size of individual columns in the spreadsheet. First you must specify the new width and then which columns this should be applied to.

9.2 SHOW FORMULAE OR SHOW VALUES
You can choose whether calculated results or formulae are shown on the screen. Explicit values will be displayed preceeded by an = sign.

These two commands are alternatives and whichever is in effect will be marked with a + sign. Some other MATRIX commands are influenced by this choice:

- cutting and copying the paperweight
- printing the spreadsheet
- printing the notebook

If a formula to be displayed is too large for its cell, it will be truncated. If you want to see the formula in full, move the cursor to the cell and press ESCAPE to display it in the edit zone. If you want to print the spreadsheet showing formulae, it is advisable to enlarge all the relevant columns first.

9.3 AUTOMATIC OR MANUAL RECALCULATION

When AUTOMATIC recalculation is in effect, all formulae are evaluated every time the spreadsheet is changed. This can be rather time consuming, so you can switch to MANUAL recalculation to speed up data entry. When you want the calculations to be done, either choose AUTOMATIC RECALC or re-select MANUAL RECALC, which re-calculates everything in the spreadsheet once.

9.4 CHANGING COLOUR

The screen display is divided into 3 areas or zones as far as colours are concerned. These are:

PAPER   - the background colour
INK   - the colour of the characters
BORDER   - the colour of the border

There are 27 different colours to choose from. If you have a monochrome monitor, these will show as different intensity levels.

To change the colours, just press either **P**, **I** or **B** to select the next colour for that zone. Press ENTER when you have made your choice.

9.5 SEPARATING COLUMNS

Adjacent spreadsheet columns are normally separated by a vertical line or column. If you prefer not to have this, choose COLUMN SEPARATOR from the menu and the lines will disappear. To re-introduce them, just choose COLUMN SEPARATOR again.

If the spreadsheet is printed, the vertical lines are replaced by exclamation marks (!).

10. THE GRAPHS MENU

MATRIX's graphics capabilities allow you to represent any area of the spreadsheet as a graph. You can define up to four *graphic zones* at any one time.

10.1 DEFINING GRAPHIC ZONES

In order for MATRIX to represent data graphically, you must tell it what values to work with, ie. which part of the spreadsheet to display. There are four graphic zones called F, I, L and O which can be displayed individually or all at once.

When the GRAPHS menu is displayed, choose one of the sub menus F, I, L or O, in order to select a graphic zone and then enter the absolute references for the range to be defined. These are then identified by the appropriate number (1-4). To see the co-ordinates of each zone, simply display the GRAPHS menu.

10.2 USING GRAPHICS MODE

When you choose GRAPHIC MODE, the zones are displayed graphically according to the current setup. To change this, or to create a new graph choose one of the options from the GRAPHICS menu bar:

ZONE	- to choose which zone(s) are displayed
DISPLAY	- choice of graphic type and presentation
TEXT	- to associate some text with the graphics
PRINTOUT	- to print out the graphics screen
QUIT	- return to the spreadsheet

10.2.1 Selecting Zones to Display

The zone(s) currently being displayed are shown on the menu bar after the word *zone*. The ZONE menu allows you to select any one zone or ALL zones at once. Information about the setup for that zone is indicated in brackets after the zone number:

- R or C if the display is by row or column
- G if grid is selected
- L if legend is selected

These options are chosen from the DISPLAY menu.

10.2.2 Selecting the Display Format

The DISPLAY menu offers a further eight options used to define the format and presentation of your graphs. The first four define the type of display:

BARS	- for vertical bars
CUMUL	- for vertical bars shown cumulatively
LINES	- for line graphs
SECTORS	- for pie charts

The LEGEND command tells MATRIX that you want to give a graph a key to help identify the different bars or lines. You cannot use LEGEND with pie charts, or zones that represent only a single column (the defined zone must be an area or a row).

The key is shown at the top of the graph (shaded boxes for bar charts, coloured lines for line graphs). If you wish, you can use the TEXT command to annotate the key with an appropriate description.

The GRID command simply puts a squared matrix (like graph paper) behind the graph display. As the grid shown is always relative to the values being represented, it sometimes appears as one or two large squares only.

The BY ROW and BY COLUMN commands simply tell MATRIX which direction the data is to be approached within the defined zone, either horizontally or vertically.

10.2.3 Adding Text to the Graph

If you select TEXT, there are two further options, EDIT and ERASE ALL.

The ERASE ALL command destroys all the text associated with the current display zone. To avoid mistakes, MATRIX asks you to confirm this option before it is actually executed.

The EDIT command displays a small cursor which you can move around the screen by using the cursor keys. It is possible to overlay text anywhere on the graph with this editor, so be careful. When you start typing something in you are in EDIT mode and can move LEFT and RIGHT and also delete characters with the DEL key. Press ENTER to finish the entry and return to full screen mode where you can enter some text on another line. When you have finished, press ESCAPE to return to the graphics menu bar.

10.2.4 Printing the Screen

If you have a printer that can print graphics, the PRINTOUT option allows you to dump the screen to the printer.

Before you start printing, make sure that the LINE FEED toggle is set correctly for the printer being used. (see paragraph 5.2)

11. PROBLEMS?

If MATRIX is unable to execute a command issued from a menu, then a special window appears with the message *There is a Problem* followed by a message relating to the cause of the problem. The most common of these is *Insufficient Memory*, which means that the computer has run out of space to operate properly. This can sometimes be overcome by emptying the paperweight (COPY one cell only), or clearing the notebook.

However, most errors occur through calculation problems, and the relevant message appears in the cell concerned.

11.1 COMMON ERROR MESSAGES

These will appear in the cell causing the error:

Circular Ref.
If a circular reference is detected, this message is displayed in the cell concerned. This will occur when the formula in a cell refers to the same cell, or when two cells refer to each other.

Syntax Error
When the syntax of a formula is not correct.

Division by zero
You are trying to divide by zero.

Arith Overflow
MATRIX is unable to evaluate a formula. The most likely cause is that the result is too large.

Invalid Arg.
The argument used with a function is invalid.

< >
When this symbol appears in a cell, it is because the result produced or the value which has been entered, cannot be displayed without some formatting changes to the cell or the spreadsheet. Often this can be resolved by enlarging the column width to accommodate the value.

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