

**BOLDFIELD LIMITED  
COMPUTING**

*Jupiter*   
ACE 

**SPREADSHEET**

**Users Manual**

## INTRODUCTION

A Spreadsheet is an extremely useful program whenever you have a lot of numbers to deal with, and repetitive calculations to perform on them. It is best known in accounting and bookkeeping, but it is far more versatile than that. In effect it is a method of arranging computations not in time one after the other (as in a normal computer program) but in space, in a table of numbers.

When you have become familiar with this program, you will most probably want to make more than one Spreadsheet model to represent several different real life situations. The method used is to set up each individual model using the 'Master' cassette supplied, and to SAVE your own unique versions of the pro, ram on to other, blank, cassettes. You would then use these on a day to day basis, retaining the Master tape for when you wanted to create fur her Spreadsheets.

Alternatively, the Master tape can be used every time - but you would lose all the information you had entered when the computer is turned off.

## LOADING INSTRUCTIONS

To load and run the Master program enter: load s L

To load and run a previously SAVEd Spreadsheet enter: load filename s  
(where filename is the word you used to SAVE the model with)

## THE SPREADSHEET LAYOUT

After the introductory titles, the program asks you to select the size of Spreadsheet you wish to create.

The Spreadsheet format is a simple two dimensional array of boxes, where the horizontal lines are called ROWS and are referred to by numbers, and the vertical lines are called COLUMNS referred to by letters.

The maximum constraints on sheet size are determined by two factors. First, the row numbering system is from 00 to 99 (note that the fifth row would be called 05 and not just 5 ) and the lettering system is from A to Z (surprisingly !!) - in fact whether you say 'a' or 'A' is relevant, but not yet.

The second limitation is caused by the amount of memory. The program is actually very clever and measures the size of RAM pack fitted to the computer. With 16K of additional memory, the Spreadsheet can support about 1,350 boxes, but this figure is reduced if you use text or long formulae. However, if you use a GOLDFIELD 48K RAM pack, the full 2,600 boxes are available with plenty of space for data.

The minimum sized sheet is 4 columns by 9 rows, as this is one screen full of boxes. In choosing your preferred layout, the only other restriction is that the column size must be even.

So, you could have a tall, narrow sheet (say, A to L by 00 to 99), or you could have a shorter, wider one (say, A to Z by 00 to 50), or something in between. Naturally, the decision depends on the purpose of the Spreadsheet.

By the way, after you have selected a column size, the program tells you the maximum number of rows you could have based on the memory limit.

## THE COMMANDS

Having selected the Spreadsheet size, the program takes a short time to configure itself, and then the opening screen appears.

What you see is the top left corner of the sheet (or the whole sheet if you happened to select the smallest possible size !), covering columns A to D and rows 00 to 08. The message 'SPACE 75%' or some other figure, informs you of the percentage of working memory remaining for you to use. The long white bar at the top left is the cursor, and this shows which box is currently being considered. Although this appears to occupy two columns, it does in fact only relate to the left most one, as the columns are really arranged in an overlapping pattern (a bit like brickwork). At the bottom of the screen you will see a list of letters which are the controlling commands; these will become more familiar with practice, and here is what they stand for:

G means Go to box, and is followed by the address.                   Eq.: G a05

C means go to Column, and is followed by the letter.               Eq.: C a

R means go to Row, and is followed by the number.                 Eq.: R 05

These three commands cause the cursor (and consequently the box under current attention) to move. You could also use the cursor keys (5,6,7 & 8) to do the same thing, but then you cannot make huge jumps !

If you stray outside the range of columns and rows originally displayed, the screen moves with you across the Spreadsheet, ie. the TV screen acts as a movable window over the otherwise invisible sheet.

E means Enter, and is followed by a second command line to allow you to select what type of thing it is that you wish to enter. These are N for a Number, F for a Formula, S for a String (of text - up to 12 characters) and B for a Blank. The program then specifically asks for your entry, unless you selected a Blank in which case the box is simply cleared.

T means Title, and is followed by C or R depending on whether you are intending to title the current Column or the current Row. Titles can only be up to five characters long.

F means Formula, and is a toggle switch. If you position the cursor on a box which contains a Formula, pressing F will reveal the formula, or the current numeric answer to the formula, whichever is not displayed. pressing F again will revert to the original state.

K means Kalculate (sorry about the spelling!), and is followed by either A for Across, or D for Down. It is important that you realise that the computer evaluates ALL the boxes in the Spreadsheet during Kalculate, using the latest information from all the entries. The options A or D dictate the direction of this operation. A (for Across) means that the horizontal Rows are processed first (starting at 00) and when these are finished, the vertical columns are calculated (starting at A). D (For Down) makes the computations in the other order. Quite often the distinction does not make any difference (to be exact, if all your formulae are based on entries only above and to the left of it, then it makes no difference).

S means Store the contents of the current box in the Pen (which is explained later !)

U means Pen Up

X means eXit from the Spreadsheet, and puts you in FORTH.  
( You can get back to the Spreadsheet from FORTH by entering S )

#### HOW TO USE NUMBERS

All arithmetic has to be performed using floating point, and consequently, all numeric entries must contain a decimal point (so 12 for example, would be entered as 12. or 12.0 ).

#### HOW TO USE FORMULAE

When a box contains a formula, it will also contain a number as well. The number has the value of the formula based on current entries, after the calculations are done.

To build a formula you can use a variety of ingredients, based on the style of FORTH, but not identical to it. You can gather the numeric input to the formula in two ways, and having gathered them you can perform various operations on them; so the formula itself is a mixture of shorthand notations for gathering numbers and operating on them.

The two ways of gathering numbers are by writing them explicitly in the formula, or by taking them from another box in the Spreadsheet. To be written explicitly the number is enclosed in single quotes, and must contain a decimal point as previously mentioned. Eg.: '134.'  
To take a number from another box, you simply give it's address. Eg.: A15 or d25 . If the column letter is in upper case than the address is known as ABSOLUTE, and if it is in lower case it is RELATIVE. The significance of this difference is described later under Copying.

When the formula is evaluated, it could be, either intentionally or by mistake, that the box address you have given does not contain a proper number (it might be blank, be full of text, or contain a so far uncalculated formula) - in which case the value of zero is assumed.

The arithmetic operations of plus, minus, multiply and divide (+, -, \*, and /) can be used in formulae. FORTH words can also be included, but these must be enclosed in double quotes. Eg.: "over" . If you do use these, remember that all the arithmetic is floating point, and that this means that numbers take up two stack entries each.

(Academic note: +, -, \*, and / are really abbreviations for "+", "-", "\*", and "/" )

The operations are always written after the numbers they operate on, in what is called Reverse Polish Notation (this method allows you the enormous flexibility of interacting with the FORTH system on the ACE).

For example: d33 '1.' + '2.5' /  
means: take the number from the box at address d33, here is a 1, add them together, (remember the answer so far), here is a 2.5, now divide the answer by it.

(Academic note: Using algebraic logic, the same formula would have been written as: [d33 +'1.'] / '2.5' )

If a formula is too long to be displayed in the space reserved for a box, you can see it by moving the cursor to that box, which will cause the formula to appear at the top of the screen. All you see in the box itself is the first part of the formula followed by a '>' symbol.

#### THE PEN AND HOW TO COPY

There is an imaginary pen associated with the cursor, and it is either UP and not writing, or it is DOWN and is writing.

You use the pen to copy information from one place on the Spreadsheet to another. In fact the pen is so clever it can actually adjust things to suit the move !

There are two ways to store information in the pen. The first is that when you are entering something into a box, a copy is automatically stored in the pen; also a listing of it appears at the top of the screen beside a statement of the current pen status (up or down). The data stays in the pen until it is overwritten by something newer.

The second method is by using the S (for Store) command, while the cursor is over some information to be collected.

Having, stored data in the pen, you should raise it by pressing U (for Up) - in fact this action is often done for you - now go to where you want the data to be copied, press U (to regain pen control) followed by D (to lower the pen Down) and there it is ! You can repeat this sequence to make another copy somewhere else if you want.

Copying numbers, strings and blanks is straightforward, but formulae are much more interesting ! If a formula contains ABSOLUTE addresses (ie. those written with upper case column letters, such as A24) it is copied exactly the same. However, if it contains RELATIVE addresses (such as a24) these are changed to suit the new location.

For example, say a formula originally written in box F27, was: d24 '2.' / (this means take the number from box d24 and divide it by two) Now, relative to F27, d24 is two columns to the left and three rows above. So if you copied the Formula to another location, say J34, the RELATIVE address of d24 would become H31 - and this adjustment is automatic.

You can mix ABSOLUTE and RELATIVE addressing in the same formula if you want.

BE WARNED - If you leave the pen in the Down position and move around the Spreadsheet, the contents of the pen are written to every box encountered on the way.

#### USING FORTH

The X command takes you out of the Spreadsheet, and into FORTH. You may now define your own words to use in formulae (enter S to get back to the main program).

To save you the bother, the following words have already been defined to operate on the stack using double length versions of the standard words to cope with the floating point arithmetic:

2! 2@ 2DUP 2SWAP 2DROP 2ROT 2OVER

The ability to use FORTH words in formulae lets you do many exciting things. An easy example would be to may define some new words such as SIN, COS and TAN For use in trigonometrical expressions.

A more adventurous use might be to design an interface which connects to some external monitoring equipment, and to say, incorporate a reading in a FORTH word such as GAUGE, which in turn is used in a Spreadsheet formula or two ! With each subsequent use of K (for Calculate), the Spreadsheet values would take the latest GAUGE value into account.

BE WARNED: If you operate in FORTH with a current Spreadsheet still in the background, you must be very careful using REDEFINE. This word should only be used if it does not alter the address in the dictionary of any of the words created by the Spreadsheet program - if in doubt, DON'T !

#### SAVING YOUR MODEL

The entire Spreadsheet, including all the latest entries, can be SAVED and VERIFIED just like a program you may have written yourself. In fact, as is normal practice in computing, we recommend you make several SAVES of any models that contain important information - it is surprisingly easy for a single cassette to be mislaid, damaged or otherwise corrupted.

It is also a good idea to SAVE the model with a meaningful filename, such as SHOP-ACCOUNTS so that you know what it is in the future. To be able to SAVE, you must first be in FORTH (command X from the Spreadsheet).

Not only is all the information saved in this way, but also the sheet layout and the screen position at the time of doing it. To LOAD the model again, simply enter: load filename s (which actually puts you back in exactly the same place as you were when the SAVE was made).

#### OPERATIONAL ERRORS

If any error occurs during a calculation, you will be put in FORTH, and given an error message. The most common being ERROR 8 (dividing by zero) and ERROR 15 (too many, or no floating point numbers on the stack). Enter S to get back to the Spreadsheet, and the cursor will be in the box which caused the problem.

If you attempt to make an invalid entry it is usually ignored, and the computer waits for a valid one ! If you make a wrong command, such as pressing T (for Title) when you meant E (For Enter), you can normally escape by pressing ENTER - which returns you to the command mode.