

**BOLDFIELD LIMITED  
COMPUTING**



**UTILITIES**

**Users Manual**

## AN INTRODUCTION TO THE BUMPER UTILITIES CASSETTE

This single cassette contains an enormous range of very useful facilities and advanced programming routines for the Jupiter ACE. The User Manual is divided into four parts to cover the four types. Software included:

PART 1 ..... High Resolution Turtle Graphics

PART 2 ..... Sinclair ZX-printer routines

PART 3 ..... Standard Centronics and RS232 printer routines

PART 4 ..... Software for the Jupiter ACE Soundbox

Throughout this manual the commands are shown in upper case (capital letters), but this is only for clarity in presentation - you may enter them in either upper or lower case.

All the software is saved on the cassette using lower case words, and you MUST enter these in the same style (eg: load turtle not: LOAD TURTLE ).

### COPYING

You will find that none of these utilities are protected against the normal SAVE and VERIFY commands, which allows the user to take parts of the software to incorporate into his own programs. However, this licence is extended only insofar as the copyright holders permit. IT IS ILLEGAL FOR YOU TO COPY THIS CASSETTE FOR RESALE IN WHOLE OR IN PART. Also, if you use any part of this software in your own programs, you may not distribute the finished work without express permission from the copyright holders.

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Because this cassette is particularly long, and you may not even want to use all the utilities, it is recommended that you make your own copies of those parts that you do want, configured to suit your own hardware.

For example, say you have a certain matrix dot printer that requires an RS232 signal set to 7 data bits, even parity, 1 stop bit, and 1200 baud. The procedure to follow is to first load RS232 (From PART 3), configure the serial status using the menu in SET232, and SAVE the reset program under a new name on a blank cassette. Now every time you want to use this printer simply load the new routine, and enter the run command: RS232

## PART 1 - HIGH RESOLUTION TURTLE GRAPHICS PACKAGE

### INTRODUCTION

This package contains a whole new set of FORTH words to enable you to perform high resolution plotting on the Jupiter ACE, including useful predefined shapes, plotting facilities, image saving and the like.

If you have a Sinclair ZX printer, or a compatible product such as the Alphacom 32, this software also allows for high resolution printing, by using routines from PART 2 of this cassette.

You can use the new commands either immediately from the keyboard, or by incorporating them into your own FORTH colon definitions to produce even more advanced or customised operations.

To load this package enter: load turtle

To see a demonstration of its capabilities on the screen enter: demo1  
Alternatively, to produce a printed version, ensure the printer is switched on and enter: demo2

The screen sequence lasts about 3 minutes, and finishes with a double tone.

### WHAT IS HIGH RESOLUTION ?

The Jupiter ACE displays its normal keyboard characters by building up the image from lots of little dots using a grid of 8 by 8 possible positions. You can see the dots by looking closely at the screen. The number of characters in a line is 32 and the number of usable lines on the screen is 23, which means that there are 736 different places where a character can be placed. Now, the standard graphics on the ACE are simply a few extra characters where the grid is split into quarters (ie. a section comprising an area made up of 4 by 4 dots), and we call this CHUNKY graphics. The maximum number of places for each chunky segment is simply 4 times 736 which makes 2944.

Obviously, this relatively small number of plotting locations makes any drawing very ragged in appearance, and it would be far better to use the individual dots that the characters are built up from. This would then yield 64 times 736 locations (47,10'4) and allow drawings to have an enormously superior definition. We call this facility HIGH RESOLUTION graphics.

### HOW THE PROGRAM WORKS

Chapter 12 in the ACE users manual describes how you can redefine the ACE character set, and indeed, by redefining lots of characters and placing them in suitable positions on the screen, you could produce a high resolution picture all on your own! However, the task would be so time consuming and awkward to do, it is most unlikely that anyone would ever attempt to do it!

This package makes the computer do all the hard work! You simply use meaningful commands (such as CIRCLE) and the program redefines sufficient characters to produce the image that you want, where you want it.

Unfortunately, there is a limit to the number of characters that can be redefined, and in certain cases this will mean that you cannot continue plotting. In theory, there are 256 different characters that can be understood by a computer using an 8-bit processor (256 is the decimal equivalent of 11111111 in binary), but on the Jupiter ACE only half of these are actually available, because the other half is automatically the inverse video version of the first half!

This means we only have 128 characters (ASCII codes 0 to 127) to play with, or to put it another way, only 128 segments of a high resolution picture.

There are two ways of making these go further.

The most obvious thing is to limit yourself to an area of the screen that is less than the whole screen! For instance, suppose you allowed an imaginary border around your picture of, say, one sixth of the screen size, this would save 4 lines at the top and bottom of the picture, and 5 columns on the left and right, which although not significantly restrictive, actually reduces the plotting area by over half, and hence less characters need to be redefined for a given picture!

The second method is more cunning. When this program is drawing on the screen it does quite a lot of tasks, and by selecting an option to do one more task, it will economise on the number of characters that are redefined - but with the penalty of reducing the plotting speed by about 70%.

Let me explain. Imagine the computer is drawing a circle for you. The first job it does is to calculate which dots are required to be filled in the starting character position, and second to find an as yet unused character to be redefined to this pattern. Next the process of redefinition (as Chapter 12) is undertaken, and then the character can be displayed. This process is repeated for the next character space encountered by the growing circle and continues until the shape is complete. Also, if the circle crossed an existing piece of the drawing, the program would obviously take the existing pattern of dots into account when redefining the new character. Now, the option to economise is for the computer to always check the new intended character layout against all the other existing character layouts, and if it finds one the same, to use that rather than consume another original one.

#### THE LAYOUT OF THE SCREEN

The high resolution screen has 0 to 255 positions across the screen, known as the X-axis, and 0 to 183 positions up the screen, known as the Y-axis. The origin (position 0,0) is the bottom left corner. There is a position known as HOME, which is initially the centre of the screen (127,91), but this can be changed to other places if you wish (see `SETHOME` below).

There is also an angle direction, which has 0 degrees pointing to the right of the screen, and increases in the anticlockwise direction. Hence pointing to the top of the screen would be 90 degrees.

To start a new high resolution page, enter: P

#### THE CONCEPT OF A TURTLE

In addition to creating high resolution graphics, this program also understands turtle instructions.

Imagine you have a very obedient turtle with a pen tied to its tail, and that you want to do some drawing. It might be reasonable to say to the turtle: 'Lower the pen, and walk 50 paces forward, turn 90 degrees to the left and walk 50 paces forward, raise the pen, turn 90 degrees to the left, walk 50 more paces forward, lower the pen and walk back home'

These instructions are more or less exactly what you enter! Only in an abbreviated style:  
DOWN 50 FORWARD 90 LEFT 50 FORWARD UP 90 LEFT 50 FORWARD DOWN HOME

These may be entered individually, or all at once, and in either case you end up with three sides of a square drawn, and with the turtle facing to the left (angle of 180 degrees) with its pen lowered. Note that although the last movement of the turtle was down the screen (when obeying HOME) it is still facing left because that was the angle after the last turning instruction. Note also that the turtle starts (after P) at HOME, pointing right (ie. angle of 0 degrees) with the pen raised. It also has white ink in the pen.

In fact you can change the ink by the commands WHITE, BLACK or CONTRAST. To test these commands, turn the turtle round to Face right (180 LEFT or 180 RIGHT if you prefer), and then enter: BLACK 25 FORWARD This has the effect of erasing half of the bottom line, because you have put black ink over the existing white line. Now enter: CONTRAST 25 BACK. This has the effect of reinstating the bottom with white ink, being a contrast to the now black line!

#### ABOUT SLOW AND FAST

When you started high resolution plotting the computer was operating in its slower economic mode, where it checks to see if the character to be redefined already exists. You can Check how many characters have so far been used by entering: C and holding the ENTER key down. The number is displayed in the top left corner of the screen and will be 8 if you have followed the examples above. When you release the ENTER key, the screen reverts to the drawing.

You could start again (enter P), enter: FST which selects the FaST plotting mode where the economising routine is omitted, do the same drawing again, and this time when you check the number of characters consumed it will be 20.

Enter:, SLW to change back to SLOW plotting mode.

#### SOME MORE TURTLE COMMANDS

So far we have only used DOWN UP FORWARD BACK LEFT RIGHT and HOME. But there are some Further commands that do more advanced actions. Clear the screen and start again by entering: P DOWN which plots a dot at 127,91

50 50 MOVE tells the turtle to move to screen position 50,50 - and because the pen is down a diagonal line is drawn. 50 100 MOVEBY tells the turtle to move by increasing its X-axis value by 50 and its Y-axis by 100, and again because the pen is down a line is drawn. The line drawn is the straight route between the current position and the point which has the coordinates determined from the MOVEBY instruction. There is a special version of MOVEBY known as MOVEBY' where instead of using the proper screen X and Y axes, the turtle pretends that the way it is currently facing is the increasing X axis, with the increasing Y axis to its left hand side. Now because we haven't yet told the turtle to turn, it is still facing to

the right of the screen (angle of 0 degrees), so 60 -80 MOVEBY will make it move by increasing its personal X axis (towards the right of the screen in this case) by 60 paces, and by decreasing its personal Y axis (down the screen in this case) by 80 paces. Although this command may seem complicated, you will find it very useful for drawing regular shapes that are not in alignment with the screen.

40 SQUARE draws a square with sides of length 40. The first side is drawn in the direction that the turtle is currently facing, and the square is constructed by going left at the corners. Note that the turtle does not itself turn at the corners, he just walks sideways and backwards to suit! Now try -4V SQUARE and the shape is drawn again, but this time with the turtle setting off backwards. If you prefer to have the square centred on the current position, rather than start from it, you use what may seem a strange trick, and that is to have the pen UP. In fact this technique is used in all the predefined shape commands. If the pen is DOWN, the shape is drawn, as you would expect, with the turtle obediently setting off and leaving a trail behind him - whereas with the pen UP, the turtle stays still and the computer draws the shape centred on the current turtle position and in line with the current turtle direction.  
Try: 45 LEFT UP 40 SQUARE

50 70 RECTANGLE draws a rectangle with first side length 5V and second side length 70. As the pen is still UP, this shape is drawn by the computer.

Because the screen is getting a bit congested in this area, let's go somewhere else, enter: 175 125 MOVE DOWN which plots a dot at 175,125.

25 CIRCLE as you expect draws a circle with a radius of 25, and because the pen is now DOWN this is drawn by the turtle. You will notice that the turtle started off in its current facing direction (45 degrees) and went around in an anticlockwise path. A negative value before the command would cause the turtle to start off backwards, and as you have seen before, this causes a mirror image to be drawn.

Assuming that you have been entering all the examples then when we attempt to issue this command something strange happens. We want to type -25 CIRCLE but it comes out as /25 CIRCLE This is because we have used up quite a lot of the ACE characters in the drawing we have so far produced, and the computer has now started to redefine the normal keyboard characters! This doesn't really matter, but it does make entering commands awkward. To help us out of this problem there are two commands, O for Original, and N for New. If we enter O, the whole character set reverts to the original layouts, which makes entry of instructions easy, but also makes the drawing change to a jumble of ordinary characters. So, once the instruction is carried out, simply enter N to see the finished drawing - actually, it is just as easy to remember to put an N command in the instruction line, such as N -25 CIRCLE, so that the drawing command is executed with the New character set on display.

If you don't want a whole circle, you can specify how much by using the CURVE command. This requires two numbers, the radius and the degrees of curve. Unlike the other shape commands this one causes the turtle to change its current facing direction as it goes, but only when the pen is DOWN. Also, you can specify negative values of degrees of curve to make the arc go clockwise. Enter: O Enter: N 45 -200 CURVE  
A quick check on the number of characters that have been redefined (press C and hold ENTER) reveals 118, which is getting close to the maximum. However, in these examples we have been deliberately drawing over a wide area of the screen, and created many individual looking segments by overlapping the shapes etc.

So let us try another command that will cause the number of redefinable characters to be exceeded. Enter: 0 Enter: N 20 10 POLYGON this should draw a ten sided polygon with each side 20 units long. However, during the 4th side the computer emits a tone, informing us that it has run out of characters. Press C and ENTER to Check, and you will see 127, which is the last redefinable character.

To see some more commands, it would be easiest to start again! Enter: P

Continue by drawing the polygon properly, enter: DOWN 20 10 POLYGON Similar to the other shape commands, UP 20 10 POLYGON will create the same figure centred on the current turtle position.

The last predefined shape is an ellipse. 10 20 ELLIPSE will produce an ellipse with screen X-axis radius of 10 units, and screen Y-axis radius of 20 units.

#### SOME OTHER COMMANDS

V is a modified version of VLIST. It returns the ACE to normal text mode and lists the dictionary.

DOT simple leaves a dot at the current turtle position in the current pen colour.

CENTRE raises the pen if it was down), resets the turtle to the centre of the screen (127,91), and resets the angle to 0 (pointing right).

PLOT is the foundation command of all this plotting, but is rarely needed on its own! The command requires three parameters, X-coordinate, Y-coordinate, and plotting mode. The command works in the same way as the word PLOT described on page 77 of the ACE manual, but now in high resolution.

XYCOORD puts the current turtle coordinates on the FORTH stack as two decimal numbers.

ATHOME tests whether the current turtle coordinates match those of the current HOME coordinates. A flag of 1 is put on the FORTH stack if the match is true, otherwise a flag of 0 is put on the stack.

ANGLE is a variable that holds the current turtle direction. This can be read by entering: ANGLE S . or set to some other value by: n ANGLE !

POINT is a command to test the colour of any particular dot on the screen. A flag of 1 is left on the stack if the dot is WHITE, and a flag of 0 if it is BLACK. For example: 127 91 POINT . produces 1, because the dot in the centre of the screen is currently white.

%SCALE is a variable normally set to 100, but can be changed to alter the scale of subsequent drawings. Example: 50 %SCALE ! would cause all following plotting to be at half size.

DEG a variable that operates in conjunction with ELLIPSE. Normally set to 350, to produce full ellipses, this can be changed to other values in order to draw partial figures. A negative value will cause clockwise plotting. Example: -180 DEG ! 20 30 ELLIPSE

COPYTURTLE the printing command for Sinclair ZX printers. The current screen image is printed using the NEW character set. This command has been developed from routines [.provided in Part 2 of this cassette.

## MOVING HOME

The HOME command copies the XY coordinates from a HOMESTACK, to the FORTH stack, and executes MOVE. Hence, by storing different values on the HOMESTACK you can have several HOMES. The command SETHOME reads the current turtle position and places the XY coordinates on the HOMESTACK. Up to 2V HOMES can be stored at once, but only the top one is active. Another command, H) drops the top coordinate pair from the HOMESTACK, to enable the previous HOME to be active.

You can try these words out by placing the turtle in several places with the pen UP, storing the coordinates in the HOMESTACK using SETHOME, and then join the home positions together by entering: DOWN HOME H) HOME H> HOME etc. In fact, you would be more likely to use this Facility within a FORTH loop.

## THE MULTIPLE SCREEN OPTION

For special effects you can select a different style of screen layout, where you have lots of little screens, each with its own turtle, and all moving at the same time!

The command to initiate this is: W H MULT (instead of P), where W and H are numbers describing the size of small screen required. W is the number of columns wide, and H is the number of lines high, for each small screen.

Obviously you must be careful when setting up this option, as the full screen is only 32 columns by 23 lines. Hence, w should be a number that divides into 32 a whole number of times (with a remainder if required), and H should similarly divide into 23. Also, since there are only 127 characters that can be redefined, and this option works by full mapping of each small screen, the values of W and H must be such that W H is less than 127. If you attempt to exceed this limit, a message TOO LARGE is displayed.

The computer automatically calculates and sets up the maximum number of little screens that will fit in the full screen, and spaces them out with borders to occupy any unused columns or lines.

The turtle that you control is in the centre of each little screen, with the pen up, and facing with an angle of V degrees.

As an example, enter: 8 5 MULT which produces 16 screens. DOWN will reveal the 16 screen centres, and UP 20 SQUARE produces 16 boxes, 20 CIRCLE draws pretty circles etc.!

## SAVING AND LOADING DRAWINGS TO CASSETTE

After all your artistic efforts, it is only fair that you should be able to save your drawing for posterity!

The first thing to do is enter: 0 so that you can see your commands being entered. Then enter: SV picturename (where picturename is the word you have chosen to call your picture), at the same time as starting the cassette recorder. The recording can be verified as a bytes file: 0 0 BVERIFY picturename

The command to load a previously saved picture is: LD picturename  
It is best to enter INVIS before typing this instruction, so that the picture is not spoiled by the loading words.



## DEFINING YOUR OWN FORTH WORDS

All the commands provided by this package may be used inside FORTH colon definitions, and obviously, you can also create new words that make use of the variables and flags that are available.

You may find it helpful to put the ACE back into its normal text mode (Enter: V ) before you commence programming.

As an example you could write a new command called DRAWS which draws all the bits and pieces used in the various explanations above:

```
: DRAWS
50 S0 MOVE 50 100
MOVEBY G0 -80 MOVEBY 40
SQUARE -40 SQUARE 45 LEFT          (NOTE: this word is shown as it would
UP 4g SQUARE 50 70                 be LISTed.)
RECTANGLE 175 125 MOVE DOWN
25 CIRCLE -25 CIRCLE 45
-200 CURVE 20 10 POLYGON
```

;

Enter: P DOWN DRAWS to see it work. You might also be interested to run this word again in FAST mode to see the difference in both speed and limitation of this facility. Enter: FST P DOWN DRAWS

If you wish to increase the amount of available memory to allow for your own programming, you can delete the demonstration files by entering: FORGET DEMOS

## PART 2 - SINCLAIR PRINTER SUITE

### INTRODUCTION

The commands and facilities provided in this package are in three categories. The first consists of new words which you can load directly into the Jupiter ACE to enable Sinclair ZX printers or compatible products (such as the Alphascom 32) to be driven. These words are very easy for the novice to use and provide for straightforward printing activities. The second category is a simple word processor which generates sideways characters to enable 80 column text to be produced. And finally, there are some more commands for creating very powerful printing and plotting facilities, particularly intended for the interested hobbyist to develop his own character fonts or special printing functions.

### HARDWARE

To physically connect a ZX-printer or compatible unit to the ACE you will require a suitable adapter because, although the ACE has the same signals on its expansion port as a Zx81, they are in a different order! BOLDFIELD COMPUTING supply two such adapters; AC8 - a pre-built, multipurpose motherboard, allowing simultaneous use of ZX and Jupiter formatted accessories; and AC9 - a DIY kit which allows a single ZX accessory to be fitted. You will also need to replace the ACE power supply unit with the 1.5 amp unit supplied with the ZX-printer.

A better alternative is the Alphascom 32 printer which uses thermal paper, has its own power supply and a more stable performance than the ZX-Printer! Incidentally, BOLDFIELD COMPUTING do not sell or support either of these printers.

Although most ACE owners now have RAM expansion packs, some of the printing commands have been recorded separately to enable them to work with the standard 3K computer.

### CATEGORY 1 - SIMPLE PRINTING ROUTINES

The first routine in this section is a single command called COPY. This machine code word reproduces a copy of the current screen image on the printer. It uses the standard ACE character set regardless of whether you have redefined them or not. To make an exact copy of a screen with redefined characters you would use a more advanced technique - see later. Normally, you would load this word (load copy) along with your own program so that you can get a hard copy of the screen at any time by simply entering COPY. You may of course prefer to enter INVIS COPY to prevent the command itself from being printed.

The next routine is called LPRINT (load lprint) which provides the three commands LPRINT, BYE and TAB. LPRINT directs everything that would normally be seen on screen to the printer. In fact the "OK" which confirms execution of the command is the first thing to be printed. The diversion continues until you enter BYE which switches the computer back to normal screen display. A typical use might be to list your own programs; the sequence would be :-

```

LOAD lprint
LOAD program
LPRINT
LIST 1st-word
LIST 2nd-word
;
;
;
LIST last-word
BYE

```

TAB is a modified version of TAB as shown on page 75 of the ACE manual and works on both the screen and the printer, hence :-

```

: HELLO
: 16 TAB ." Hello"
;

```

would cause. Hello to be displayed near the centre of the screen or, if in LPRINT mode printed near the centre of the paper.

The next routine on the cassette is called INVERT (load invert) and contains three commands to do various inverse video functions. NEG turns the whole screen to inverse video, and if this was COPYed a reverse image would also appear on the paper (ie. silver characters on a black background with the ZX-printer). If you only want part of the screen to be inverse video the command to use is INVERT. INVERT expects two preceding numbers which are the start and finish character positions for inverting. Each position represents a possible character numbered from 1 in the top left hand corner of the screen to 736 in the bottom right hand corner. So enter 16 64 INVERT to see the section of screen between the 16th character (half way along the top line) to the 64th character (the end of the second line) change to inverse video. Another 16 64 INVERT would change it back again. The last command is SWEEP which inverts the whole screen but this time in a sweeping fashion rather than all at once.

COPY, LPRINT and INVERT will each fit in the unexpanded ACE. The last routine in this category is ZX-PRINTER (load zx-printer). This is a set of commands requiring extra memory, but it can be loaded on top of COPY, LPRINT and INVERT to produce a very useful suite of facilities within 19K of RAM. Once loaded, you can check the dictionary (VLIST) to see several new words, some of which will be dealt with in the third category. The more straightforward commands are BLOCKPRINT, WIDEPRINT, TALLPRINT, THINPRINT and ITALIC. As their names suggest these are all special styles of printing. In all cases you just enter the command (eg. enter: BLOCKPRINT) and the current screen display is printed in the appropriate style.

BLOCKPRINT produces a 16 column printout with each character constructed from chunky square blocks. WIDEPRINT is also a 16 column printout but the characters are simply stretched. TALLPRINT is a standard 32 column printout but with all the characters twice the normal height. THINPRINT is a special 42 column printout using new characters formed from a 6x8 dot matrix. ITALIC is a 32 column sloping text but it has one limitation. Because each character occupies part of its neighbour's column, the last (32nd) column cannot be properly printed. In fact the overspill appears wrapped around into the first column! This problem is obviously avoided if you keep the last column empty.

In any of these printing modes you can stop the printer by BREAK (SHIFTED SPACE) after completion of any line.

## CATEGORY 2 - WORDAGE

Sinclair ZX-printers are only capable of printing 32 columns of normal text. We can increase this figure by clever tricks such as using thinner characters (THINPRINT), but only to a limited extent. WORDAGE, however, uses an interesting technique to overcome this problem; it prints sideways! Instead of having 80 lines of 32 columns it produces 32 sideways lines of 80 columns. Although the page length (ie. paper width) is small the advantages are considerable.

Load WORDAGE (load wordage) to display the program instructions. With a little practice you will soon become proficient in its use, but there are a few points to remember:

The final printed page is 32 lines of 80 column text (2560 characters), and there are four of these to the whole document. To fit on the screen and leave room for instructions, the visual display area is only 9 lines of 32 columns (288 characters) which is called a section. The computer allows 9 such sections per page. The current Section and Page number are displayed at the top of the screen. To let you know where the cursor would be with respect to the final printed document, a line number and tab position are also displayed prior to the input of new script.

There are two functions that are only accessible outside the program. To use these you must BREAK the program (an ERROR 3 is displayed and can be ignored). The command QUANTITY counts the number of words after the current cursor position - so to count all the words in a document you must place the cursor at the beginning of the script before BREAKING. QUANTITY may take some time to count a full document. The other command is REVERSE which reverses the video status of a named string. Hence: REVERSE THE will cause the computer to change all occurrences of "THE" or "the" to inverse video. Note the warning displayed at the start of WORDAGE that this facility will change occurrences where the string is a substring of a bigger word - such as in "whether". Again, this command can take some time if the document is large. To revert to the main program after BREAKING simply enter WORDAGE.

When you type in your script it is initially in the input buffer which means you can insert or delete in the normal ACE way. The amount of typing you do at this stage is limited by the space available below the horizontal line. To place this script in the document simply press ENTER. The text is processed (including justification) and stored in the document. To insert new script within the stored text, place the cursor at the point where insertion is to begin and select E from the menu. As before, your typing is initially in the input buffer, and when you press ENTER, it will be processed and inserted into the document.

You may delete text in only one, rather limiting, way. Place the cursor at the position where deletion is to commence and press DELETE (SHIFTed 0). The program asks if you really mean it (press Y For YES) and everything after the cursor position is deleted.

The commands to print the document are clearly given in the program.

To save a document on a cassette, you simply SAVE the entire program containing the text. For example, BREAK when you are ready, and enter: SAVE LETTER when this file is loaded (load LETTER), and you run WORDAGE, you will find your document intact!

### CATEGORY 3 - ADVANCED PROGRAMMING

There are five more words saved on the cassette and further words included in the main programs ZX-PRINTER and WORDAGE, which are intended for the advanced user. These enable a wide range of printing options to be generated and customised for your own specific purposes. However, before these are used, some explanation is required of the principles involved.

Usually, the most condensed form of creating information (such as graphics characters) is by means of an algorithm which works like a mathematical formula. However, complicated and virtually random characters (such as the alphabet) are not readily described in this way, and they have to be stored explicitly in a data array or 'look-up-table'. The words provided here encompass both techniques. When the second method is used, you will see an associated dot addressable array, normally called DOTFILE present (eg. THINPRINT, WORDAGE etc.).

You will also see that some operations are performed by supporting words which can be used separately if required. For example, the ITALIC Font uses SLOPE, and the sideways printing in WORDAGE uses TURNDOTS.

Whilst most of the words are useful in their own right, the real intention is to illustrate the methods adopted and hence to allow the experienced user to write his own programs based on the same routines.

The first word in this category is PRINTLINE (load printline). This primitive expects the address of a 256 byte buffer on the stack. As an example it is supplied with a DOTFILE containing the line 'This is Jupiter ACE printing'. To see this actually printed enter: DOTFILE PRINTLINE (in this case the DOTFILE was previously created by: CREATE DOTFILE 256 ALLOT and filled with the sample pattern. The bytes in the DOTFILE are in scanning order). You can also check how PRINTLINE works within the ZX-PRINTER suite for outputting each line of special characters.

The second word provided is ACE-LOGO (load ace-logo) which is simply another DOTFILE containing the Jupiter ACE logo held as three 256 byte lines. You may find this handy for heading your printouts to distinguish them from ZX listings. To print the logo you could enter instructions as follows: ACE-LOGO PRINTLINE ACE-LOGO 256 + PRINTLINE ACE-LOGO 512 + PRINTLINE Alternatively, why not define another word to do it for you:

```
: LOGO
  3 0
  DO
  I 256 * ACE-LOGO +
  PRINTLINE
  LOOP
;
```

The next word is CHARSET (load charset) which has two functions. The first is to reset the original ACE characters after you have redefined them (enter: 0 CHARSET), and the second is in the setting up of a new 'look-up-table' for your own character set. CHARSET expects an address on the stack where it is to make a 1024 byte character set. For example: CREATE CHARS 1424 ALLOT CHARS CHARSET gives you space for a character set to play with. You can easily find the first byte address by entering: CHARS .

PRINTSCAN (load printscan) contains several new commands. The machine code primitive called PRINTSCAN prints a single scan of dots on the printer and needs a 32 byte buffer to hold the 256 potential dots that form a line. PRINTSCAN also requires the address of the first byte on the stack. This command is particularly useful in the creation of graphs, which in turn could be generated by data logging from some external equipment. To see a typical graph plotted, enter: ZIGZAG Because it is likely that data logging will be performed as a background activity, multitasking is included. Enter: MULTITASKING to initialise the example. You will note that the normal 'OK' prompt of the ACE is replaced with the message 'MULTITASKING' to remind you of the new status. In this case the previous graph generated by ZIGZAG is now plotted at the rate of one scan per minute, and you can be doing other computing at the same time!

Hobbyists will note that these commands can be tailored to suite their own purposes, and that the possibilities are only limited by your own imagination!

The final word saved on the cassette is LPRINT-42 (load lprint-42), and this is a version of LPRINT incorporating the techniques to generate 42 column printing. Another tab word (TTAB) is supplied to operate on the printer, and as before the word to resume the screen display is BYE.

words that have been included in the main programs that might be of interest are:

TURNDOTS turns an 8 x 8 bit dot array on the stack clockwise by 90 degrees.

SLOPE expects the address of the first byte of 256, and then shifts the first 32 bytes to the right by 7 bits, the second by 6 bits etc.

ASCIIDOTS a FORTH algorithm, makes an inversion code (Inc) which is 0 for normal and 255 for inverse, then 'normalises' the ASCII code and works out where to fetch the dots from. FETCHDOTS does this, with GRAPHICHARS making the graphics.

PRINTSCREEN a FORTH word that has the effect of COPYING the current screen image to the printer.

You might also find another word SHOW useful to examine any 8 bit character set whose finish and start address are on the stack:

```
: SHOW
DO
CR I . I C@
8 0
DO
DUP 128 AND EMIT 2
*
LOOP
DROP 1000 0
DO
LOOP
LOOP
;

Try: 8192 7600 SHOW
to see some ROM characters
```

Professional programming is available from the author:

Mr Charles Wehner, 105 High Street, Blaenau-Ffestiniog, Gwynedd, Wales.

### PART 3 - STANDARD PRINTERS

There are two words saved on the cassette to permit standard printers to be driven by the Jupiter ACE via the PRINTER CARD (AC12) available from BDLDFIELD COMPUTING.

People who have previously purchased the PRINTER CARD will be familiar with the style of the software controls outlined in the item's User Manual. The software provided here is similar but more advanced in operation, and does not require the board initialisation procedure given in the manual.

For Centronics parallel printers, load the appropriate word (load centronics), and you will have two new commands in the dictionary. CENTRONICS is the command to divert what would normally appear on the screen to the printer, and BYE is the command to switch back to normal screen display. There is an in-built protection against the computer 'hanging' should the printer go 'off-line' (an extended BUSY signal) during a printing sequence. After a period of about 2 seconds the display is automatically reverted to the screen. If you wish to modify the duration of this feature, enter: n FIND CENTRONICS 34 + !where n is the time in seconds (approximately).

Serial interfacing is more awkward because the data structure and transmission speed between the computer and the printer must be exactly matched. When you load the appropriate word (load rs232) you will have three new commands in the dictionary. RS232 which diverts the screen display to the printer, BYE which returns to normal, and SET232 a program to modify the serial configuration.

To modify the current serial status, enter: SET232 The current configuration is displayed (3 bits, 2 stop, 1200 baud) and the user is prompted to modify each parameter in turn. You must enter a valid response to each prompt in full, even if it is the same as the current value - an error condition will occur if you enter inappropriate or null data. When all four parameters are set (number of data bits, parity, number of stop bits, baud rate) the program executes RS232 with the revised configuration. To save this for further use, enter: BYE (to regain screen display) and SAVE filename (it might be a good idea to use the device name as a filename, such as SAVE EPSON-80)

There are a few features of SET232 which are worth noting. The current mode of the computer (INVIS, HEX etc.) is temporarily stored while SET232 goes through its paces, and is restored on completion. Hence, parameter values are always displayed and entered in ordinary decimal format.

The baud rate is strictly not infinitely variable, but must coincide with integer divisions. Whilst common speeds (900, 1200 etc.) are not a problem, rates at either end of the range may appear incorrect. For example, if you requested the highest speed of 9600, the computer will display 9910 (which is more accurate, but nominally the same). If you want very low speeds, these may be entered including a decimal point (eg. 45.5), but then you will also need to alter the SET232 program by removing the UFLOAT operation.

In common with the CENTRONICS option, the RS232 software includes a facility for automatic return to screen display in the event of the printer sending a long BUSY signal luring transmission. The time delay is initially 2 seconds, but may be altered by: n FIND RS232 265 + ! where n is the time in seconds (approximately).

#### PART 4 - SOUNDBOX

There are two words saved on the cassette that work in conjunction with the Jupiter ACE SOUNDBOX (AC4) available from BOLDFIELD COMPUTING.

People who have previously purchased the SOUNDBOX will be familiar with the style of the software controls outlined in the item's User Manual.

The first word on the cassette is SOUNDBOX (load soundbox) and this contains all the controlling commands given in the manual, together with the examples TRIMPHONE, TRAIN and WOLF (listed as wolf-whistle in the manual). A further command, ALL , runs a demonstration of these examples.

Users can erase the examples to leave just the control words by:  
FORGET TRIMPHONE

The second new word on the cassette is BAGPIPES (load bagpipes), which as you might expect, produces simulated bagpipe music.

Enter: BLOW to start the drone, and then play music as follows:

A S D F G H J K represent a scale of notes, with sharps on W E and T Y U

Any other key stops the current note playing, but leaves the drone going.

To cease the drone, press the BREAK key and enter: STOP



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turtle .. the complete suite of software

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### PART 3 - Standard Printers

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### PART 4 - Soundbox

Soundbox .. Soundbox controls

Bagpipes .. Bagpipe simulation

NOTE: Certain machine code commands (lprint, lprint-42, centronics, rs232 etc.) use the system variable known as EXWRCH (see page 141 in ACE manual), and consequently, these may not be moved in the memory whilst they are in action. This means, for example, that you may not LOAD a word into the dictionary whilst the ACE is diverting its output to a printer.