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1986 ISSUE

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Selected products

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REDS SUPERGRAPHX. The best electronic interface for 64128. Features 8K buffer and allows 64 simultaneous fonts. Excellent value..... £69.00

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GEOS Products

Full range of GEOS products for the 64 & 128 at the best prices.

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| | 64 | 128 | 68000 | + |
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| Adventure Kit V | ● | ● | | |
| C128 FKeys Saver | | ● | | |
| ScreenDraw 64 | ● | ● | | |
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| Abarax | | | | |

DATA STATEMENTS

£30,000 Yeti Bet

Yeti is the first release from Destiny Software and to celebrate the fact Destiny boss Francis Lee has announced a competition in which the winner may or may not win £30,000!

The reason for the uncertainty is that the whole proceeds of the competition depends on the outcome of a £200 wager which Lee has placed with bookmakers, William Hill. Success is linked with the destiny of Chris Bonnington's expedition to collect positive proof of the Yeti's existence.

Bonnington is famous for his mountaineering exploits and this latest venture follows in the wake of reported close encounters by a recent Russian expedition. Bonnington is totally convinced that the outcome of his search will result in the first film of this elusive creature. "I am convinced the Yeti does exist and is not some kind of large primate but a completely new species."



Founder Francis Lee mounts postmaster £30,000 competition for his new company.

Like the Loch Ness monster, the Yeti or Abominable Snowman, has been the subject of stories and myths for centuries. Sightings have been reported and footprints photographed but still any incontrovertible proof has eluded the creature's pursuers. At the moment of placing the bet, William

Hill was still offering odds of 150:1 against success.

The £30,000 can be yours by submitting a postcard describing the Yeti in 50 words or less to the address below. The winner will be the person who is judged to have encapsulated the true nature of the Yeti. Employees of Destiny Software or Solution Public Relations are not allowed to enter. The judge's decision will be final and no correspondence will be entered into. Remember to include your name and address on the postcard.

Lee has his own feelings about the Yeti. "The idea of the Yeti represents beauty, mystery and romance together with that hint of danger... if it is loved then I hope that, once filmed for the rest of the world to see, it is allowed to remain free as nature intended."

Unfortunately, Destiny's Yeti is not free as nature intended; the C64 version costs £9.95.

Franklin

Franklin Software, Lamston House, 23 High Street, Ealing, London W3 5DF. Tel: 01-867 6077.



Dataphone's Designer Modem

Designer Modem(s)

A smart new modem based on the Demos II but with many additional features is on offer from Dataphone for less than £100.

Like the Demos II, the Designer has full BART approval, full computer control, auto-dial and auto-answer. Signal handling encompasses 1200/75 and 300/750 baud rates as well as 1390/1390 half duplex for bulk uploading with automatic hand rate sensing.

The additional features of the Designer include one-side buttons for use with manual software, a call

progress monitor which allows users to hear what's happening on the line, and a parallel connector for the telephone. The modem is linked to a computer by a standard 25 pin RS232 D socket and employs a three wire telephone circuit which prevents the tinkling of extensions when the modem is in use.

Pricing details are available from Dataphone.

Touchline

Dataphone Ltd 21 Alvic Square, Fincham, Peterborough PE2 6AF. Tel: 0753 236549

MIDI Modules

At the recent Frankfurt 88 computer exhibition, Chetach Marketing revealed their new velocity sensitive Mid Master keyboard MLE77A. The keyboard features a full size, seven octave console with velocity sensitive polyphonic keys with aftertouch and weighting.

Inch there is a powerful computer suitable for a wide range of uses when connected to other MIDI equipment. Despite its professional specification the cost is only £399.95.

Also at the show, visitors could see the new MIDI which Chetach are claiming to be 'the lowest cost MIDI Digital Drum Machine on the market' at £149.95. The MIDI Machine stores up to eight true digital voices sampled at 32KHz. Further voices can be bought from Chetach to create your own customised kit. To accompany the MIDI, there is also the DPS Electronic Drum Kit and Pad Interface.

Touchline

Chetach Marketing Ltd, Parkway House, Parkway Road, Watlington, Oxford O77 1AE. Tel: 0223 333323.

DATA STATEMENTS

Logotron At Last

Logotron is ready to release its low cost business packages for the Cdt through its new division, Logotron Business Products. The first three programs form their new 1925 Series whose name is derived from the £12.95 price tag, though a three-in-one version is available for £29.95.

Writer 1295 is a wordprocessor with full editing facilities for creating personalised correspondence, reports and documentation. It supports special printer functions such as bold and underline facilities, performs cut and paste either within a document or from one document to another, employs auto page numbering and page formatting. The amazing spellchecker boasts 108,000 commonly used words with rapid correction.

File 1295 forms a database which can handle up to 10,000 records with up to 25 characters in each field. Its search and select functions can pinpoint and guide the user to any particular field within an individual entry.

Planner 1295 comprises a spreadsheet with extensive arithmetic functions which calculates to a precision of 12 digits. Rows and columns can be copied, inserted and deleted at will.

All three programs will communicate with one another for mail merge purposes and further details are available from Logotron.

Touchline:

Logotron Ltd, Dairy Brewery, Gosdale Street, Cambridge CB2 3LA, Tel 0223 328636.

Flame Protected

Computer owners worried about a computer system infirmo will be interested to learn that Fire and Safety Training Ltd are to hold a seminar dealing with fire protection of computer installations.

The one day course on July 17th 1989 will be held at the Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL, from where further details and booking forms are available. The seminar costs £120 including lunch and refreshments, so book now to avoid disappointment.

Poached Egghead

Micro-musician Rob Hubbard has set his sights on the Sunshine State of California. After working with Electronic Arts at its San Mateo headquarters last summer, negotiations to tempt him onto its permanent staff were successfully concluded recently. The stunning music for *Shamus on Ice* was the first fruit of this liaison and Hubbard is now hard at work completing several other projects for EA.

During an incredibly successful four years as a freelance programmer, Hubbard has produced music tracks for over 60 games including *Saxonix*, *Monty on the Run*, *Crazy Comets* and *Kamikazeblasters*. Despite offers from several British software houses, he has proudly guarded his freelance status and Electronic Arts' offer must be considerable though no figure has been revealed.

In a fit of PR fervour, Hubbard is reported to have said, "My time at Electronic Arts convinced me that this was the right company for me to join. It could provide me with necessary support, both technically and



Rob Hubbard makes a cool personal as he drifts to the West Coast

technologically, to develop my skills as a music artist to their full potential." Funny, he didn't say anything about money!

Touchline:

Electronic Arts, Langley Business Centre, 11-19 Station Road, Langley, Slough, Berkshire SL3 8YN, Tel 0235 49442.



RAM Stick

RAM Electronics have released a new joystick which they claim exhibits high precision at a low price. The triangular base which allows hand held or table use gives rise to its name - the Delta. They further back their confidence in the Delta by offering a two year guarantee.

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anchorage for the stick and its large handle gives the user something to really come to grips with.

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Touchline:

RAM Electronics (Prest) Ltd, Unit 16, Redfield Industrial Park, Redfield Lane, Church Crookham, Aldershot, Hampshire GU11 0AK, Tel 0232 808881.

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BUY FOUR AND GET ONE FREE!

Designer

A powerful drawing package for C64 owners

By Paul Gilfoyle

Designer is a graphics package that offers features normally found on expensive commercial packages. As with these packages, this program has facilities for: cutting and pasting; saving and loading; geometry; rotating; enlarging plus much more.

Before we go into depth about the program itself it is important that we understand how graphics on the C64 work, specifically in hires mode. Hopefully you will have read about hires plotting in your manual and you will know all about it. It is important that you should also know about multi and mono colour modes as Designer allows you to use both of these.

Basically you must treat the screen as 1000 individual characters. Each character can have its own background and foreground colour, or if you are using multi-colours, each character can have three colours. A movable window is used within the program to carry out many of the functions. The window is extremely important and will be discussed later.

Getting Started

Once the program is started it will be in mono-colour mode. A joystick input I will allow you to move the cursor around the screen. The fire button on the joystick must be pressed and the joystick moved up in order to start drawing. To stop drawing you must press the fire button and move the joystick down.

Modes

There are five plotting modes available in Designer. These modes not only affect the way in which the joystick plots, but every function that involves any type of drawing. Keys 1 to 5 are used to select the mode. The mode will



also be affected by the type of screen you are using.

| Mode | Multi | Mono |
|------|----------|------------|
| 1 | Colour 0 | Background |
| 2 | Colour 1 | Background |
| 3 | Colour 2 | Foreground |
| 4 | Colour 3 | Foreground |
| 5 | Test | Test |

If you are drawing in multi-colour mode, mode 1 will give you the colour of the screen. If you have plotted any lines in other modes, mode 1 will erase them when you go over them again. The same is true in mono-colour for mode 2, as well as mode 1. You will see what I mean if you press '2' and draw a line. Now change to mode 1 by pressing '1' and go over the line again. You will not be surprised to know that modes are the most important aspect of Designer and you will use them frequently.

Designer is a menu driven program. To access the menu you must press the space bar. Cursor down allows you to select the option that you require from the menu, use the RETURN key to activate your choice.

Press RETURN again to exit from a sub-menu or function.

Four main menus exist in Designer and these give access to 15 sub-menus. On each menu the word 'MORE' appears at the bottom. Choosing this moves you onto the next menu. When you wish to return to the normal screen you should move the menu highlighter, with cursor down, until no options are highlighted and press RETURN.

Another important feature of Designer is the window. If you select 'window' on menu 2 you will see the current window whenever you press a key. Use the cursor keys to alter the size of the window and the function keys to move the window around. The window can be any size from one character to the size of the screen.

The idea behind the window is that any colours you want can be simply read in screen, within the dimensions of the window. Some packages take the burden out of this by a process of ANDing and ORing and ROLLING. This program uses other methods to perform this as you will see later.

The window can be used for scrolling, transforming, colouring and clearing. I will cover all of these later. For now we will work our way through the menus. Figure 1 gives details of the menus and the options on them.

I will take each menu in turn and look at the functions available:

MENU 1

TRANSFORM (A)

MIRROR: Will mirror any pixel data or drawing in the window.

SPIN: Will spin any pixel data in the window by 90 degrees. The spin image will be transferred to the top left hand part of the screen, under the menu. This is only really effective in mono colour but in some cases can be used in multi-colour as well.

FLIP: Flips over any pixel data in the window. If you are using more than 3 colours in the window, their positions may become confused and you will have to re-define them.

EXPAND X: Expands any pixel data in the window, horizontally. The window must start at the top left part of the screen. Window size determines function.

EXPAND Y: As above but vertically.

GEOMETRY (B)

SHAPES: You will be required to input six numbers for the program to draw the shape. The cursor will be central to whatever shape you describe - so if the cursor is in the centre of the screen, so will your shape. The first two inputs 'x1 and y1' are for the size of the shape. When you are asked for the shape you must enter how many sides you want it to have 0-2 will give a circle, whereas 3 gives a triangle. The fourth input is the angle of the shape.

The fifth input is for use with the REPEAT function. The number to enter for this should generally be between 5 and 30 for the best effect. When you are asked for a number for FILL, you would normally enter 2 or 3, or in some cases when using MULTI, enter the number corresponding to the colour the shape was drawn in. This number will be used later with the FILL function.

REPEAT: The number specified previously for increment is used here to re-draw the shape at a new angle. The new angle is found by adding the increment to the angle of the drawing.

SQUARE: By selecting this you will either turn it on or off. When it is on you will be putting down markers to produce a square exactly the size you require. You can also create more complex shapes by arranging the markers in different ways. Before you can really get to grips with this function you will have to learn about markers.

There is a function within the program that will allow you to place markers at the cursor position. This is useful for remembering where lines end or start. However, there are two further uses for markers. One is the SQUARE and the other FUNCTION.

To obtain a square, you must place the markers from left to right/down. The four markers will be placed automatically and the square will be drawn. The first figure shows this.

Should you wish to set up more complex shapes you should retrieve two markers and place a marker at a different position. Look at picture 2.

This process can be repeated in different ways to set up more complex figures. You can place three markers at

the top as well as the bottom. You should experiment with markers to see the effects for yourself. When you are ready you should turn the square function off and clear the markers.

COLOURS (C)

SET COLOURS (H)

You are asked to input three numbers for colours, they are as follows:

| | | | |
|--------|---|----------|----|
| BLACK | 0 | ORANGE | 8 |
| WHITE | 1 | BROWN | 9 |
| RED | 2 | Lt RED | 10 |
| CYAN | 3 | GREY-1 | 11 |
| PURPLE | 4 | GREY-2 | 12 |
| GREEN | 5 | Lt GREEN | 13 |
| BLUE | 6 | Lt BLUE | 14 |
| YELLOW | 2 | GREY-3 | 15 |

When you have done this the program will remember the colours, it is up to you to implant them in the screen.

It is worth mentioning at this point that when you clear the screen, the three colours that have been selected will be implanted in it.

GET COLOURS: From the point where the window originates the screen colours will be fetched and remembered. Unlike if you leave a drawing and forget what colours were used.

SET WINDOW: This will implant the selected colours within the window colour.

RANDOM: Will set the whole screen to random colours.

CUT AND PASTE (D)

AND: You will be required to input a number for the sprite that you wish to and with the present screen data. The operation will occur at the window origin.

OR: As above except that the operation will be OR.

XOR: As above but the operation will be an exclusive OR.

PUT: As above but the sprite will be placed on the screen in the normal way.

CREATE: The program incorporates for saving and loading pictures from tape or disk. In order to be able to do this you must assign your picture a number - then it will be known as a sprite. To create a sprite you must have your drawing inside the window and must start at the top left part of the screen for your picture to be 'photographed' by DESIGNER properly. The actual window size must be the same or larger than your drawing. You can assign a number to a sprite the size of a character or the entire screen. Should you assign a sprite, its previous image will be lost.



You will normally want to set individual sprites for animation which is also covered for in this program. Because this program uses up large amounts of memory do not expect to be able to have much more than a whole screen worth of drawing stored at any one time.

MENU 3

CURSOR: Changes the current colour.
MARKER: Changes the marker colour.

PAPER B: Changes the paper colour only when using MULTI. In MONO-colour the colour of the screen is determined by the background colour chosen.

BORDER: Changes the colour.

CLEARING (P):

CLR SCREEN

CLR WINDOW: As its name implies, this function clears only pixel data selected by the window.

CLR MARKER: When selected, any markers on the screen will be cleared. The run of course be used again.

EXTEND (H)

STARTS: Place random starts on the screen in different modes.

GRID: One problem in using a joystick is draw is that it is not always very accurate. This feature allows you to control your drawings to the single pixel.

When you select this function a grid will be drawn in place of the menu. The grid corresponds to a single character block. While you are using this function you will have access to move the window, change modes and draw with the joystick.

To see how this function works you should use the function keys to move the window well clear of the grid. When you are clear of the grid, move the cursor onto the grid and carefully position onto any square you wish.

If you want to fill any square you should press F, but it is important that you should keep within the confines of the grid. Also, you shouldn't change modes as this could end in disaster. If you attempt to fill any shape at any time and there is a gap in between the lines or line the filling will look, probably all over the screen. I will explain more about this later.

When you have defined the grid the way that you require press (P) to place it on the screen at the window position. The window should be the size of one character to avoid any mistakes.

Should you wish to edit the data in the grid you should press (E) and guide

the cursor over the squares that you don't want, then press (F) to fill them. They will then disappear. When you are satisfied (E) to re-draw the grid, then press (P) to put it on the screen again. Clear the grid by pressing (C).

Should you wish to examine any pixel data, simply position the window over the character block, and press (G) for Get. This function should usually be used in MONO colour, it can be used in MULTI colour but you should only use mode 2. When you select the grid function the appropriate mode will be selected to avoid any errors.

It is worth pointing out that if modes are used incorrectly the function for filling will usually spill.

You will not be able to edit in MULTI colour, but this can be achieved by returning to MONO. After exiting in MONO you can return to MULTI. One other point worth mentioning about MULTI colour is that you should treat two pixels as one pixel. Thus, when filling in a square you should also colour the adjoining square.

CHANGE CURS: If you are not happy with the cursor you can define it for yourself. To do this you must have the new cursor drawing at the top left side of the screen. It must be three character blocks wide and three deep—the normal dimensions for a hardware sprite.

It is generally best to define to new cursor in multi-colour mode. The markers will also take on the new appearance. An important feature about the menu box, is that any pixel data you place under it will remain there when the box goes.

SCROLLING (H)

PIXEL: When this is selected, you should enter the direction of the scroll. The actual scrolling will be taking place in the window only.

COLORS: The same as above except only the colours are scrolled.

ANIMATION: You should store a sequence of sprites—try from 1 to 16, to be used by this option. How many you use is up to you. Enter the number of the first sprite and then the number of the last sprite. When you have entered the time delay, the sequence will be animated.

MENU 4

PLOT/SPLIT (H)

SPLIT: This is a function that when turned on, will produce a second

plotting line parallel to the first. The space between these lines is known as the SPLIT, and it can be set between 0 and 9.

Try drawing some boxes and use a marker to close the lines properly, and you will see that the effect is a professional looking window.

INC SPLIT: This will alter the space between the lines.

INC PLOT: To achieve dotted lines, you would ideally have the split turned off. If you use INC PLOT now, you will be able to set a space of between 1 and 9 for plotting, and so get a dashed line.

PATTERN (H)

PATTERN: When this function is turned on you will be able to draw more fringes in any part of the screen. In order to do this you will also have to alter INC PLOT, but remember it will not be necessary to do any plotting in the normal way. You will see later that this function should be used in conjunction with other options.

NEW ORIGIN: When drawing more fringes with the PATTERN function you can control its origin on the screen by selecting this command.

PUT MARKER: I have already spoken about markers and this is the function that allows you to place them. There are only four markers available for use. Should you have four markers placed and you try to place another marker, the first marker down will be lost.

GET MARKER: When selected, the last marker you put down will be retrieved. You can retrieve all 4 should you require.

SPRAY (H)

SPRAY: This will produce a spray effect by setting random pixels in a small radius. The thickness of the spray can be altered, but as the thickness increases the speed of the cursor will become slower. There are other functions that can be used in conjunction with spray to make it more powerful, but more about that later.

THICKNESS: This allow you to set the thickness of the spray.

SYSTEM RESET: Will RUN the whole program from the beginning but leave any sprites that you have created in memory.

WINDOW (L)

When this is selected you will have immediate access to shape and move the window. Use the CURS keys to alter the size of the window and the function keys to move the window around.

MENU 4

MIXED MODE (M)

DRAW: This function operates directly with the first marker. The idea being that when the first marker is placed on the screen, a line will be drawn from the cursor to the marker.

MIX MODE: When you turn this on the effect will only be appreciated in MULTI-colour. By using this function, colours 1, 2 and 3 will be used at random. This is achieved by switching between modes. If this is used in conjunction with 'PATTERN', you will see the effect will be quite amazing. This is particularly useful for the 'SPRAY' command.

If you have set some interesting colours, by using MIX MODE you can create colour bars, and it may well appear that you have more than 16 colours. It is important that you should NEVER 'FILL' any object when MIX MODE is ON. Always remember to turn it off when you have finished using it, and remember that the actual mode will probably be different from the one selected on

entry to this command.

CURSOR(S)

CENTER: This simply places the cursor in the centre of the screen.

HOME: The cursor will be moved to the top left section of the screen.

ORIG CURS: If you have redefined the cursor to your own design (ie routine will return you to the original cursor).

SLOW: So far, if you have done any plotting with the joystick, you have only used one speed. This function slows the cursor down until you either look at the window or across it. The only drawback with this function is that it will slow the entire DESIGNER program down. Press the left arrow key to view the window and normal cursor and program speed will be restored.

PRIORITY: When this is OFF, the cursor will appear in front of any screen data. If the priority is ON the cursor lines in your drawing will appear in front of the cursor.

SAVE/SCREEN (S)

MULTI-SCREEN: This turns on MULTI-COLOUR MODE.

MONO-SCREEN: This selects

MONO mode.

SAVE: You will be asked for a file name - the maximum number of characters is ten. When you have entered the filename you will be asked if you want tags on disk. When you press the relevant key your options will be saved. Should you decide that you do not want to continue with the operation then you must enter 'RETURN' as the file name, and you will return to the sub-menu.

LOAD: Same as above except that the operation is for loading sprites.

TEXT/FILL (F)

TEXT: There are four character sets available. Sets 1 and 2 will give you normal size characters, Sets 3 and 4 give you double size characters. While you are using this function you will be able to control the window with the function keys.

The text characters will be put on the screen at the origin of the window, so it is best if you keep the window size to 1 character block. When you are ready to start putting your characters on the screen use keys (+8 and/or) to go through the character set. ☐

See listings on page 82

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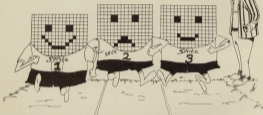
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A Moving Experience



If sprites move you to tears, here's all the info to move them instead!

By Eric Doyle

One of the problems with the CGA is that it has no commands for controlling the sprites which are such essential elements for all kinds of programming applications.

Sprites are also known as MOBs which stands for movable object blocks. They are like any screens which can be moved across, independently of the main screen and each other. Sprites are square but they seem to assume all manner of shapes on the screen by rendering peripheral areas as transparent. Anything behind a sprite is visible in these areas allowing the sprite to blend in with the background.

Each sprite definition occupies a 64 byte block of memory within the 64Kb area which the video chip, VIC, can access. This gives a potential of 255 definitions but only eight sprites can be displayed on the screen at a time. Exceed this value and some sprites will

disappear or start to flicker.

Located just after the screen memory are eight locations called sprite pointers which indicate the 64 byte block which holds a sprite and allocates a program number to the sprite.

The sprite definitions are known as Sprite Data 0 to Sprite Data 255 but the program calls the eight selected sprites Sprite 0 to Sprite 7. This may sound confusing but all will become clear.

A problem for the beginner is that sprites make heavy use of two of the least understood commands in the Basic language - PEEK and POKE.

I remember approaching these commands with great trepidation during my VIC-20 days but let me assure you that they aren't as frightening as you may at first think. Imagine a computer as a row of glass boxes numbered from 0 to 65535. Each box contains a volatile number which has a

value of 255 or less. PEEK allows you to look through one of these boxes to see what number lies there. It then reports back what it has found but doesn't have the contents of the box unscathed.

POKE actually opens the box, the number vanishes into the ether and is replaced with a value that POKE has been given to store away. This value may be derived from the original value inside the box so PEEK and POKE are dispatched together to complete the mission. For example, PEEK 55248, PEEK (55248+1) would result in PEEK reading the value through the side of the glass box numbered 55248. This value would then have one added to it and be passed to POKE. The box would be opened and the command number would disappear before the new number was inserted.

Those commands form the basis of sprite control but with eight sprites to worry about we'll just consider one for

new and get complicated later.

The first task is to organize the memory of the 684 to accommodate the sprites.

Setting Up

The most awkward tasks in sprite manipulation are the setting up procedures. First you have to decide where the sprites are going to be stored, then you have to design them in multicolour or standard format. Allow this the sprite pointers and parameters have to be set and only then can you really do anything with them.

Sprites have to be in the same bank of memory as the screen and any user-defined character sets which may be required. This has to be arranged into a mere 184k chunk. The most constrained bank of memory is the one which is called the default setting and therefore is used when the computer is first set up. In this area virtually all of the first kilobyte (1024 bytes) is memory dedicated to keeping the Basic operating system operating. Then the next kilobyte is used by the screen. After that comes a free 148k of memory which must be shared by the program, character set and sprite definitions.

Not much room so let's change the memory around a little. The start of Basic is stored in locations 45 and 44 which are set at 01 and 00 respectively. If this can be moved to the start of Bank 1 of memory (16384) a whole 48 Kb will be available for sprites, screens and characters. The Basic Mover listing will achieve this for you. When creating your program substitute a suitable filename as string A\$. Once you have a program to load substitute its name in A\$ and make another copy of this amended program as your loader routine.

Available sprites are now 13, 14 and 15 in the cassette buffer with sprites 32 to 35 available in normal Basic area which is now effectively protected from the new Basic start.

Sprite Preparation

The program called Sprites will set up a sprite for you to play with as Sprite Data 13.

The computer needs to know where this sprite is so we turn to the sprite pointers which occupy eight bytes from location 2040. We'll allocate our sprite definitions to the

pointer for Sprite 1 by poking the value 15 in the second pointer (POKE 2041, 15).

Next a colour has to be applied to the sprite. Each sprite has a register in the VIC chip for its own colour. These lie from 53267 to 53269. Our sprite is dark blue so the next command is POKE 53268, 6. Still the sprite remains invisible. The on/off switch is located in the byte at 53269. To turn the sprite on we have to flick the second bit on by giving it a value. The easiest way to do this is to poke the location with 2 but the best way is to modify the value which is in there already. This is best because you'll reach a situation one day where you can't be sure which sprites are on or off. All you know for sure is that Sprite 1 should be turned on. We need a command which will set bit 1 but leave the other bits unaffected. Boolean algebra supplies us with a way to do this.

The OR command dictates that when two bytes are ORed together each corresponding bit in the two bytes are compared with one another, if either or both are set to one the resultant bit value is a 1. What happens if 164 is ORed with 2?

```
164 10100100
    2 00000010
---
166 10100110
```

Bit 1 is set by this method and the other bits maintain their status. What's more if the two bit was already set it would also remain set. This means that a suitable equation for switching on a sprite would be:

```
POKE 53269, PEEL (53269) OR (2) 'set
```

Where *n* is a sprite number from 0 to 7. For our sprite, 1 will be substituted for *n*. This type of equation is used a lot in sprite manipulations so we'll call it the switch command. The switch command which can turn any one sprite off looks like this:

```
POKE 53269, PEEL (53269) AND (255-2) 'set
```

After turning the sprite on it may still be invisible. This is because in part of nowhere all the visible screen. POKE location 53280 and 53281 with 100 and 1 should appear.

Adding Colour

What we have done is to move the sprite to a position which has X and Y co-ordinates of 100 (x-axis) 100 (y-

X-Y format). Location 53280 controls the X value, Y being the previous of 53281. All of the sprites have X/Y registers in similar consecutive pairs between 53240 and 53263.

The sprite looks a little strange because it was defined as a multicolour character to switch from standard mode, there is another location which acts like a midway switch. Use the switch command substituting 53276 for both mentions of 53268.

The sprite looks better but it was intended that the colours would be light blue, dark blue and black. We have already seen how dark blue can be assigned but what about the other colours?

In multicolour sprite mode all of the sprites on the screen have the same secondary colours because they are obtained from a common pair of memory locations, Multicolour Bitrow 53285 (allocated to 01 bit pairs in the sprite) and Multicolour 1 from 53286 (allocated to 11 bit pairs). 53285 is to be assigned as black so it should be poked with a zero. 53286 is light blue and needs to contain a value of 14. Note that the main colour, the light blue stored in the sprite colour register, is given to all bit pairs configured as binary 10 which differs from the equivalent situation in Multicolour UDG where the main colour is designated to a 11 bit pair. A sprite 00 pairing is transparent and shows anything lying beneath it.

Sprites can be magnified vertically and horizontally. Type in the following commands and see what happens:

```
POKE 53272,2
POKE 53271,2
POKE 53270,0
POKE 53273,0
```

Within a program, the correct way to do this would be to use the switch and unswitch command types but for this simple demo we'll waive this convention.

Over and Under

In normal use sprites can pass over, or behind, the background and may even move across one another. For sprites passing one another there is a fixed priority. Sprite 0 will always pass in front of all other sprites, Sprite 1 will pass behind Sprite 0 but in front of all the others, and so on down to pass old

Sprite 3 which always passes behind another sprite. It follows that sprite priority should be considered when deciding which sprite's data and sprite pointer indicators.

Background characters such as the standard ROM characters or UDGs can be given priority over any sprite by a register at \$D276. If the bit controlling any particular sprite is set, the sprite will pass behind any screen characters. To set this in operation, move the cursor to the sprites current position and type a few characters. These will be hidden by the solid part of the sprite. Next, move the cursor to an empty bit beginning and type POKE \$D276,2 and the sprite will 'sink' into the background behind the typed characters. Many 3D effects can be created using sprite to sprite and sprite to background priorities.

When two sprites collide the event is registered at location \$D278. Each sprite has its own bit and both colliding sprites are registered. This means that a collision between Sprite 0 and Sprite 1 will return a PEEKed value of three bits 0 and 1.

Similarly, sprite to character collisions are registered in \$D279. PEEKing normally has no effect on a memory location but in both these registers the act of PEEKing causes the register to be cleared. If a collision has occurred some time ago and the Sprites 0 and 1 are no longer in contact, the last reading of register \$D278 will return a value of three but a second PEEK will result in a zero unless two other sprites are in collision.

A collision is only registered when an area of the sprite which has a bit pairing of 11 or 10 is touched. Transparent 80 pairs and Multicolour 0 areas both have no-effect. This makes it possible to have an area of the sprite which is coloured but does not register a collision.

Getting About

Sprites can be moved a pixel at a time much more easily than UDGs because of their dedicated X/Y registers. For Sprite 1 these registers are \$D280 and \$D281. Sprite movement is achieved by increasing or decreasing the values contained in these registers. Changing only one of the registers causes movement in the plane that it controls, up or down. If both registers are changed the planned movement is diagonal.

When the value of the Y register

reaches a value less than 50 or greater than 250, the sprite starts to disappear behind the border, now by row. The same thing happens if the X register falls below 24. This means that sprites can gently glide off the screen and hide behind the border. At power up, all of the sprites are normal out of sight at 0,0. In this position they are all touching and if they were turned on, the collision detector would register a maximum 255. It must always be remembered that sprite collisions can occur of the screen as well as on.

When discussing the visible limits of the X register no mention was made of the maximum value. This is because, although there are 255 pixel positions, the horizontal resolution allows 512 pixel positions. One byte can only store a maximum value of 255 so a special register is allocated to store a extra ninth bit. Only one bit is needed to extend the maximum nine bit byte value of 511. The ninth bit for all of the sprites are stored in \$D264. Each high bit is allocated to a bit in this location so setting the high bit uses the switch command format.

The procedure starts when the current X value is known to be, or PEEKed and found to be 255. This register must immediately be poked back to zero and the high bit in \$D264 must be set. The X register can then be increased again and it reaches 89 or more when it starts to glide behind the screen and under the border. Once the sprite has completely disappeared the high byte could be cleared using the switch command format.

The best way to master sprite control is to jump in and try it. To help you in your plunge Table 1 includes all of the major sprite locations.

TABLE 1

| Sprite # | | |
|----------|----------------------|--------|
| Sprite 0 | X co-ordinate | \$D248 |
| | Y co-ordinate | \$D249 |
| | Colour Register | \$D287 |
| | Pointer Screen start | +0000 |
| Sprite 1 | X co-ordinate | \$D250 |
| | Y co-ordinate | \$D251 |
| | Colour Register | \$D288 |
| | Pointer Screen start | +0017 |
| Sprite 2 | X co-ordinate | \$D252 |
| | Y co-ordinate | \$D253 |
| | Colour Register | \$D289 |
| | Pointer Screen start | +0018 |

| Sprite 3 | | |
|----------|----------------------|--------|
| Sprite 3 | X co-ordinate | \$D254 |
| | Y co-ordinate | \$D255 |
| | Colour Register | \$D290 |
| | Pointer Screen start | +0019 |

| Sprite 4 | | |
|----------|----------------------|--------|
| Sprite 4 | X co-ordinate | \$D256 |
| | Y co-ordinate | \$D257 |
| | Colour Register | \$D291 |
| | Pointer Screen start | +0020 |

| Sprite 5 | | |
|----------|----------------------|--------|
| Sprite 5 | X co-ordinate | \$D258 |
| | Y co-ordinate | \$D259 |
| | Colour Register | \$D292 |
| | Pointer Screen start | +0021 |

| Sprite 6 | | |
|----------|----------------------|--------|
| Sprite 6 | X co-ordinate | \$D260 |
| | Y co-ordinate | \$D261 |
| | Colour Register | \$D293 |
| | Pointer Screen start | +0022 |

| Sprite 7 | | |
|----------|----------------------|--------|
| Sprite 7 | X co-ordinate | \$D262 |
| | Y co-ordinate | \$D263 |
| | Colour Register | \$D294 |
| | Pointer Screen start | +0023 |

Bit Registers

| bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|--------|----|----|----|---|---|---|---|
| value | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| sprite | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| on/off switch | \$D264 | | | | | | | |
| Multicolour switch | \$D276 | | | | | | | |
| X co-ordinate bit 9 | \$D264 | | | | | | | |
| Increase height | \$D270 | | | | | | | |
| Increase width | \$D277 | | | | | | | |
| Character priority | \$D275 | | | | | | | |
| Sprite collisions | \$D278 | | | | | | | |
| Character collisions | \$D279 | | | | | | | |

| Colour controls | Bit Pattern | Location |
|-----------------|-------------|----------|
| Colour register | 00 | \$D287 - |
| | | \$D294 |
| Multicolour 0 | 00 | \$D285 |
| Multicolour 1 | 11 | \$D286 |
| Trans parent | | |
| Border colour | | \$D280 |
| Screen | | \$D281 |

Sprite co-ordinate ranges

| Screen dimension | Total | Visible |
|-------------------|--------------------|---------|
| 80 characters (X) | 0 - X+87*24 - X+87 | |
| 28 characters (X) | 0 - X+87*23 - X+79 | |
| 28 characters (Y) | 0 - 255 - 80 - 240 | |
| 24 characters (Y) | 0 - 255 - 84 - 240 | |

* Set the ninth bit register after 255

See listing on page 180

"£229 for all that?"

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"Oh really - like what?"

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have to take the tractor paper out to unroll it - it's built into the L.C. 10's paper parking. There's a large 4k buffer - it's even got six NLQ fonts as standard. It prints at a resolution of 120 cps and has a really fine NLQ at 30 cps."

"Why, that sounds good, but what about quality? You'd have to go a long way to beat the price quality on that NLQ, do you not?"

"True, but they've even improved on that and you can change all the resident fonts at the touch of a button."

"Hmm, that's really nice - £229 for all that? I wonder if my dealer will have any left..."

31234
31235
31240
+1819

31236
31237
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+1820

31238
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31242
+1821

31246
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31253
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total line

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31286

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Y1486

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22/82

GAMES UPDATE

This month's releases are dominated by budget games with Mastertronic, Code Masters and Firebird battling for the top spot. Newcastle based Zeppelin games is the latest into the fray and launched its first two games. Read on for details of these and news of the Alternative World Games and the next in the long running Leader Board saga

By Tony Hetherington

Full Priced Games

ALTERNATIVE WORLD GAMES (Greenin Graphics) is a collection of novel and wonderful sports events that will have you in stitches as well as the canal, river and a sack. Eight events will inevitably take their toll on your pocket and your sanity as you compete against human or computer opponents in a sack race, by crossing while carrying as many plates as possible, throwing a boat as far as possible, keeping a mart in a single hand, climb a pole, run up a wall, burst balloons with a pogo stick and extract all corners in a pillow fight.

English Software's sequel to its popular Knight Games, KNIGHT GAMES II, takes the contestants into space for a series of shoot 'em-ups before qualifying for a head to head contest in jet jousting, light sabres and photon chains. I thought the final three events did capture the feeling of a clash between knights in the year 300 unfortunately, you have to blast your way through countless aliens to get there!

Do you remember Leader Board, the hit and hope golf game from Access that featured golf holes constructed from islands set in a vast water trap that shot straight to the top of the charts? It was followed in quick succession by Leader Board Tournament (that added new courses), Leader Board Executive (introduced trees) and World Class Leader Board (trees, bunkers, a driving range on disk versions and a top down view of each course). The blood-and-thunder department has produced WORLD CLASS LEADER BOARD - FAMOUS COURSES OF THE WORLD VOLUME 1 (Access/USG) (id) which means there's more to come! This latest Leader Board model is basically World Class Leader Board which includes computer versions of three of the best known golf courses and another Access inspired challenge course. Now your joystick controlled golfer can stroll the fairways and greens of Pebble Beach, Colonial and Muirfield and they go badly over you on the challenging course at the Glenmoor Country Club.

RATAN is the latest Taha coin-up conversion from Imagine in which you play the King of a handy breed of barbarians and must defend your people from the evil



ENGLISH SOFTWARE



ACCESS



IMAGINE

Wizard Kary and his evil minions that he has unleashed on the land of Marana. Armed with your sword and an iron will you must travel through the caverns of your quest until you finally face the wizard in his dead best guise as the soul-snaking dragon. Through perilous corridors you will cut and hack your way through wretched men, chimera, giga (kardians), bats, fish snakes, waves armed bugs and skeletons as you fight your way through the game's six levels. Along the way you can aid your quest by collecting weapons and magical items such as a shield and armor to reduce damage done to you, a ring to speed up your actions and jewel for bonus points.

Raiden is a fast, snazzy anything-but-movers game which is let down by poor animation but still worth a look by fans of the arcade machine.

PEGASUS BRIDGE is the latest in P55's strategy series and is based on the crucial airborne assault by the British 6th Airborne Division on key gun positions and bridges that cleared the way for the D-Day landings.

This is not a tank for the faint hearted as although deposits are considered, the British main parachute behind enemy lines and destroy major targets before taking and holding three important bridges against massive German counter attacks. If you prefer, Pegasus Bridge allows you to play the Germans in the equally difficult job of defending a wide area against an attack that could freely come from any direction or take on an opponent in a head to head battle.

CEL once again grabbed the headlines by persuading the owners to slap an 18 certificate on it's new "Shock, Horror" adventure based on the life and works of **JACK THE RIPPER**.

In the game that is built on ghoulish graphics and blood curdling text you play a policeman man who stumbles on one of the Ripper's victims, gets mistaken for the murderer by the police and in your panic to escape you shot several policemen and old ladies yourself which absurdly takes you all total to Ripper standards in three scenes of text. You then spend the rest of the game tracking down the real (fictitious) murderer while keeping one step ahead of the police and out of jail.

Jack the Ripper falls sadly by short of the standards set by CEL's other horror adventures Dracula and Frankenstein and is ruined by gory descriptions that go beyond the story line and become just silly. For example, even if you're in a blind panic, pushing an old lady doesn't cause her brains to spill out onto the pavement! Let's have less hype and more gameplay.

Finally, on a lighter note Cascade has released a beautiful casual action kit called **TRAX**. This assembly stands for Transformable Arcade Zone and includes a 64 screen level-based game and a construction kit to build your own screen and park it full of bricks, traps, reflectors, bouncers and machine generators.

Budget Games

This month's big budget news is that Mastertronic has introduced two of the best selling games of all times as part of it's \$1.99 Wizardry range. **CHICKEN RITTERS** and **WOLF OF THE EXPLODING PIST** both topped the charts when they were first released by Activision and Melbourne House and are set for a successful return in their one-price format.

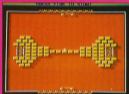
Melbourne House's Judge Dredd, Knuckle Busters and Baccara B!l also make a Biosoft comeback as does Bubble



PELAGUS BRIDGE

and Snake Rock which plays like a cross between Snake and Paperboy!

Mastertronic has tried to up the budget stakes by launching the new **MAD X** range of games that include two



RIPPER



WOLF OF THE EXPLODING PISTOL

GAMES UPDATE

games for \$2.99. One of the first MAD X releases is **ROCKFORD** which is the budget home-computer version of the Amiga-based arcade game Rockman that was based on the First Star Child game *Be Like Dink!* The gameplay is the same addictive Boulder Dash style but has some interesting added features such as growing walls, snakes that turn rocks into treasure and treasure into rocks and fire that can be put out if you can find a tap, lava flows and then push the drops of water to the fire.

ROLLAROUND is the peak of the standard Mastertronic games this month, and is an incredibly addictive mix of collecting the correct number of an different colored crosses from Spindley's style screens while avoiding the aliens. These aliens come in several types which will suddenly disrupt your game just when you think you've completed a screen. There are some that will match your own square or square, others that gain certain areas, bombs that home in on you and particularly vicious ones that turn squares into holes.

Being! The blockbusting ball business back as Firebird launch **L BALL 2** (The Quest for the Past). The highly developed and intelligent ball race want to drive into their past to discover their ancestry. However, to do this you will have to brave the malodorous dangers of the ancient ruins and the perils that lurk in them and collect as many ancient artifacts as possible. Armed with a laser and the ability to bounce out (and in) of danger you must complete each maze by collecting a key, then reaching the exit before the time limit runs out.

Each maze is constructed from a series of blocks and barriers which have different properties. Some you can bounce safely on, others dissolve in time and some destroy you on contact. You will also find magic bombs that wipe out the critters that populate the maze, life particles (that make up an extra life) and generators that produce a random effect that can help or hinder you in your incredibly addictive quest.

Finally, **SABOTAGE** and **ZYBEX** are the first two games from Zappala's Games, a new North Eastern budget soft ware house. **SABOTAGE** is an incredibly difficult shoot 'em-up in which you must burst across the scrolling landscape of an alien planet to find the eight pieces of a blue gem to destroy it and rid the occupier of Earth. This isn't going to be easy, and it will take some of your six lives to get past the first one.

ZYBEX can be played by either one or two players simultaneously that are powerfully attacked and avoid battle with a bizarre selection of aliens using whatever weapons they can find. Full price action at a budget price.

SUNBURST is the latest release from Hresvorn's Rack-it budget label and is written by Nybelus author John Phillips. The universe is in great danger once again, only this time it's because there are too many suns! You have been volunteered to recover the balance, by attacking these suns and destroying them by attaching energy carrying aliens that populate giant rock formations to build up enough energy to dive into the sun and turn it into a black hole, which takes you neatly, but impossibly, into the next level. TE



ROCKFORD



L BALL 2



SABOTAGE

Byting into the 6510

In this instalment of our series on programming in machine code we add a wordwrap to our typewriter program

By Burghard-Henry Lehmann

At the beginning of this series I named speed as one of the main advantages of programming in machine code. However good you are at programming in Basic, there are error routines which execute in pace so painfully slowly in Basic that you have to program it in machine code - or not do it at all!

In this article I'd like to continue with our simple wordprocessing program by adding a routine which gives this point once more. I'd like to add a wordwrap routine to our wordprocessor.

"Wordwrap" is one of those computer terms which hasn't been known before the advent of the wordprocessor, because you can't do it on a mechanical typewriter, not on an electric one. The phrase means that you can enter text as if you had a never ending line to write on. When you come to the end of the actual line on the screen, you just keep on writing, never mind the end of the line, and the computer does the rest.

If you have started a new word at the end of the old line it moves - "wraps" - the beginning of that

word onto the beginning of the next line and moves the cursor print position automatically forward, accordingly. And it does all this while you are writing, without interrupting the flow of your typing!

The advantage of this is obvious. You don't have to consider at the end of every line if the next word you want to type will still fit onto the old line or if you should start a new line. (As you know, mechanical typewriters try to assist you in making this decision by inserting a bell five or ten characters before the end of the line ...)

With computers you don't have to worry about this kind of thing at all. As I've said, the computer takes care automatically of the changeover from one line to the next which allows you to concentrate completely on what you are writing. It is indeed as if you had an endlessly long line to write on.

So much about the beauty of this facility. But, as you should know by now, the computer does nothing which it hasn't been programmed to do. And in order to program such a facility, first of all we have to become very precise about what exactly we want the

computer to do and when we want it to be done!

The Mechanics of Wordwrap

First the "when". From what I have explained so far, wordwrap has obviously to be done at the beginning of each new screen line. When the user types in the first character of a new line the computer has to decide if there is any wordwrap to be done and then do it.

If the user enters a space at this point, this obviously means that he has just finished a word which, as it happens, fits exactly at the end of the old line. And this means, that no wordwrap has to be done. The letters at the end of the former line are left as they are.

Furthermore, the space just entered can be ignored! Because all it signifies is, that a new word is to be started, and this new word can go flush to the left hand side, because it will be separated from the former word by the new line.

If, on the other hand, the user enters a letter, there are still two

possibilities the computer has to decide on. This letter can be part of a word which has been started on the old line or it can again be the first letter of a new word, namely, if the last character on the old line had been a space.

In the first case, wordwrap is to be done, while in the latter again no action has to be taken.

Determining the Start of a New Line

The first routine you'll find in this month's listings page is to be inserted into the main routine, as given in the January issue of *Four Commodore*. It's best to place it directly after line 729, which branches to CRSR right, if that key has been pressed.

All the routine does, is look at the current print position as contained in SCREENMEM and see if it is pointing at the beginning of a screen line.

At this point I have to admit that this way of doing it is not the most efficient one in that it is rather time consuming. Normally we don't like to send the computer through a loop in the middle of a major flow, except if absolutely necessary. But since we are programming in machine code which is so quick that you won't notice the difference and since I am giving you all this only as an example to study, it works all right for our purposes.

If you are interested in wordprocessing and would like to make more out of our humble program, you might like to look for ways to do it more elegantly. One way would be by introducing extra variables which count the rows and lines and would make the determination of the beginning of a new line much more straightforward, that it doesn't require the program flow to go through the whole loop every time a key has been pressed. (This could be, at the same time, the basis for a routine which displays the line and column the cursor is on, either at the top or at the bottom of the screen...)

But in the context of this series of articles the routine numbered lines 730 - 1120 does as just as well.

It starts by saving the last keypress, which is contained in the accumulator, in a variable, called "TEMPSTORE".

Pushing this byte onto the machine stack would not be a very good idea, since we will need to recover it in the wordwrap routine itself and, if you have read the last article

thoroughly, you will know by now that you can't pull something from the stack in the midst of a subroutine which you have pushed onto the stack before you called that subroutine! (Remember my advice from the last article; if you aren't certain, better save important data in a variable than pushing it onto the stack and be sorry!)

The routine itself is very straightforward. The beginning of the second screen line (we are, of course, not interested in the beginning of the first line!) is loaded into a variable, called "LINESTART". Then it goes into a loop which compares the start of every line on screen, with the contents of SCREENMEM.

If a match is found, it means that the current position is at the beginning of a new line. In this case our wordwrap routine is called in line 1050. After returning from this subroutine it continues as normal (line 1055).

If no match is found, the loop ends after 24 goes. TEMPSTORE is recovered into the accumulator and everything continues as normal.

Dealing with a Space

The wordwrap subroutine itself, which I have assembled at 090 9090, starts off by loading the result of the last keypress back into the accumulator (line 100) and testing it for a space (lines 110 - 120).

As I have explained earlier, if the user has pressed the spacebar at this point, it means that he has just finished a word and now wants to start a new word. Therefore, no wordwrap has to be done and this space can be ignored.

In lines 140 - 150 the routine waits for the next keypress. When this keypress has been done, the result is stored in TEMPSTORE (line 170) to match it with the flow of the main routine, and then it exits prematurely from the wordwrap subroutine, continuing as normal.

If, on the other hand, a letter key has been pressed, we enter the wordwrap routine proper.

First we save the current position in the title, the current screen position and the current position on the colour screen in three new variables, called TEXTSAVE, SCRNSAVE and COLSAVE (lines 260 - 280). (Remember, for those of you who still have the old ROM, we always have to deal with the position on the colour screen too!)

Doing the Wordwrap

The wordwrap routine itself consists of two parts. First we have to find the beginning of the word which the user has just started and then we have to move that part onto the new line. Furthermore, we want to substitute - "pad" - the beginning of the word on the old line with spaces so it doesn't cut.

The first part consists of a loop (lines 440 - 600) which works backwards, looking at each former character until it finds a space. This space signifies that the beginning of the word, the user has just started to type, has been found.

The X-register is used as a counter. Afterwards it will tell us, how many letters have to be moved onto the new line.

Notice also, that we are going back with the variables we have initiated at the beginning of the routine so as not to change the contents of our main variables, TEXTFILE, SCREENMEM and SCREENCOL! The reason for this will become clear in a minute.

Lines 610 - 630 test for the space. Once the space has been found we have to go one step forward again, because we are not interested in that space itself, but rather in the first letter of the word, which follows it. This is done in lines 700 - 800 where each position is incremented by one.

Moving the Wordstart

After this we are left with two positions in the title, on the screen and on the colour screen. TEXTSAVE, SCRNSAVE and COLSAVE respectively point at the first letter of the word which has just been started, while our standard variables TEXTFILE, SCREENMEM and SCREENCOL, point at the current position at the beginning of the new line.

All we have to do now is use indirect-Y to move the data from our position to the other, while, at the same time, crossing the old position with a space.

This is done in the second loop, which I called "MOVELOOP" (lines 830 - 1020).

The Y-register is used to move the data itself from the old position to the new one and is therefore incremented with every pass through MOVELOOP.

The X-register, which holds the amount of letters to be moved, serves again as our counter and is now

documented with every pass through MOVELOOP. When X contains 0, the job is done.

Wrapping it up

Finally we have to update our standard variables (TEXTFILE, SCREENMEM and SCREENCOL) to the proper position which is now of course several rows into the new line.

I do this by transferring the contents of the Y-register, which after MOVELOOP holds the number of lines we have moved, into the accumulator and then adding that value to the respective position, that is, TEXTFILE, SCREENMEM and SCREENCOL.

"TYA" is a very simple one byte instruction which stands for "Transfer the contents of the Y-register into the Accumulator". Since this instruction doesn't change the contents of the Y-register I use it three times for all our main variables.

You might like to know that 6518 assembly language has lots of very straightforward and easy to use transfer instructions.

"TAX" transfers the contents of the accumulator into the X-register and thus does the opposite of what we are doing in our routine.

"TAY" transfers the contents of the accumulator into the Y-register. "TXA" does this same thing the other way round.

Finally, the lesser used "TSX" transfers the contents of the X-register into the stack-pointer, while "TXS" does the same thing vice versa.

Incidentally, the last two instructions constitute the only way in which you can program the stack pointer directly. In other words, if you want to program the stack pointer, you transfer its contents with TXS into the X-register, do with the value whatever

you want to do and then transfer the result with TXS back into the stack pointer. In short, as I've said in the last article, you should do this kind of thing only if you know exactly what you're doing!

And Finally...

Figure 1 gives you a list of the six assembler mnemonics we have learned about in this article.

In the next article I want to finish our wordprocessing theme by demonstrating how you can send the traffic, created by our program, to the printer and also save it onto disk or tape and load it back into the computer again.

Figure 1

| | |
|-------|--|
| TAX = | Transfer contents of Accumulator into X-register |
| TXA = | Transfer contents of X-register into Accumulator |
| TAY = | Transfer contents of Accumulator into Y-register |
| TYA = | Transfer contents of Y-register into Accumulator |
| TXS = | Transfer contents of Stack pointer into X-register |
| TSX = | Transfer contents of X-register into Stack pointer |

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Dan Dare II

In 1988, Virgin hit the top with *Dan Dare* and now the eagerly awaited follow-up looks set to repeat that success with vengeance - Mekon's Revenge.

The Mekon has been plotting the downfall of Earth after Dan foiled his last scam which employed a deadly android. Scientists have been working night and day to produce a genetically engineered race of Super Trees whose awesome powers are sure to give the Mekon total victory. Even now they are on their way...

Dan, at the head of a Space Fleet hit squad, has managed to penetrate the spaceship's defences. His mission is to sink out and destroy the Super Trees depriving of war as they liberate in their protective Plexiglass Life Support Bubbles (by crates at Virgin believe in safe sockets).

The ship is separated into four brilliantly coloured sections full of ordinary but deadly Trees and Space Fleet troops. The lasers blast in all directions so Dan has to duck and shoot his way through the throng, trying not to shoot his own men in the process.

Scattered around the complex are control panels which operate force-field barriers. Any unrepaid adversary would be well advised to shoot these out first because the minute a Super Tree Bubble is blasted a self-destruct mechanism starts into action. If Dan can't destroy all of the Super Trees and get to an airlock before the countdown reaches zero, the whole section of the ship will be destroyed and take him on a one way trip to oblivion.

The time limit for completing the spring training is extremely tight and only a few small errors are allowed. My best advice is to spend some time memorising and mapping the corridors, but be careful not to run out of energy. When you then blast your first Super Tree you should at least know where you ought to be going.

If Dan makes it to the connecting passage to the next level, a door closes behind him and he is protected from the explosives.

The first level is relatively easy to complete but from level two onwards the going gets tough. Contraband corridors, artificial gravity generators which push you away from your goal, reflex crushers that turn you into space cabbages, all conspire to keep you from your goal. One way takes suck you in and blow you out miles from your intended location. Life Support Bubbles appear in the strangest of places and their control panels resemble the force-field generators so closely that you can start the countdown before you realise what you've done.

As you reach the higher levels, Trees and Space Fleet troops disappear into hidden passages. Keep your eyes open for this because these short cuts can mean the difference between life and death.

Assuming that you reach and complete the fourth level,

there's a nasty surprise waiting when you meet the Mekon in an eyeball to eyeball confrontation which really gets Dan Dare's slander up. Armageddon out of hand!

When your proficiency level has reached maximum proportions and you can whizz through the spaceship like a disc of assault, it's not time to think the game is in the bag because another challenge awaits - you can become the Mekon and try to beat Dan at his own game.

The Mekon's task is to release all of the Super Trees but desperate Dan has rigged all the destruct sequences. If you find the time limit tight as Dan, you'll never make it as the Mekon. To succeed you'll have to zip around the corridors at breakneck speed - no wonder the Mekon's green.

The programmers are credited as Virgin's Gang of Five. Judging by their results, *Dan Dare II* has been a labour of love and the graphics are some of the best planned that I've seen for a long time and the logic challenges even surpass its predecessor.



The version that I received was a pre-release without music, but the sound effects are sufficient to keep me happy. Anything over and above this would simply be a bonus but I would like to have seen a Hall of Fame scoreboard.

Mekon's Revenge scores very highly on all counts and I hope that the Gang of Five get to work on a sequel very soon. *Dan Dare* - software of the future!

E.D.

Further:

Name: *Dan Dare II - Mekon's Revenge*, Suppliers: Virgin, 3rd Floor, York, Portobello Road, London W11 2JN, Tel: 01-727 8070. Price: £18.95 (C&A £17.95) (Disk).

Mekon's Revenge

LORDS OF...

Nice guys end up with Madagascars! That's the warning issued to would-be Lords of Conquest that take up the challenge to dominate the world in this Electronic Arts strategy game. This isn't an attack on Madagascars, but a reflection on its poor strategic location and how deplorable Lords of Conquest players need to be to stand any chance of winning.

Lords of Conquest can be played by up to four players on or your own against a tough computer opponent and fought at three different skill levels, three different levels of luck and over 30 different predefined maps or one created by the computer or by you using the map creator?

The game is developed from a board game called Borderlands and so features map to play board game gameplay combined with the flexibility and instant crumpling of a computer. Each game begins by dividing up the areas of the game map between the players with the game level, deciding who has first pick and in a one-player game if either you or the computer has two or four bonus areas.

The game is then played in turns with each player allowed to launch two attacks into adjacent areas. The success of an attack depends on the opposing forces and support available from neighbouring areas. These forces consist of weapons (infantry) and horses (heavy) in the basic game which can be transported about by boats in the intermediate and advanced, allowing attacks almost anywhere in the world.

The object of the game is total domination by annihilating your opponents before they get you. In a one-player game this is a simple head to head battle, but in a multi-player game you just can't sit on your own so you have to make and break alliances to suit your needs.

A basic game can be won or lost by the player who has control of the gold mines and horses rearing grounds. These produce the wealth and horses necessary to raise armies and create castles and with them launch attacks. You can also use your gold reserves to build cities that not only add to the defence of the area it's in and the adjacent areas but also doubles gold production in those areas.

In more advanced games the gold and rearing grounds are joined by coal mines, iron ore mines and lumber yards that all produce much needed resources at the end of each turn. In these more complex games the player must juggle these resources to build weapons and boats to carry his weapons and horses to foreign lands. For example, a weapon can still be bought for gold but also made with iron and coal. Similarly a city can be built if you have a combination of timber, iron, coal and a little gold.

Changing the luck level alters the certainty of combat. At its lowest level, combat is a simple matter of the highest total winning with the aggressor winning any ties. If you increase the luck you increase the doubt, since ties are decided randomly and at the highest level the chances of success are

determined by the percentage of attackers and defenders.

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T.H.

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Constructing a Compiler

We kick off our new series with an introduction to developing your own compiled programming language

By Steve Carrie

This series is primarily aimed at the disk-based Commodore 64 owner, although given a reasonable knowledge of the target machine, PLUS 4 and C128 owners (128 model) could convert the programs as required. Over the next few months, I hope to show you how you can develop a new language for your computer and a compiler to go with it. As supplied, Commodore 64 BASIC lacks facilities to make effective use of the numerous features of this powerful machine. Many companies now supply programs and cartridges which will enhance poor old BASIC. This is something resembling a modern programming language. Unfortunately, they do nothing for BASIC's sometimes ponderous slow execution speed and while many compiled language systems do exist for the 64, they tend to be very expensive and thus out of the reach of many owners.

I'll describe my first attempt at compile writing in the hope that it will inspire you to greater things. Writing a compiled language system is not as difficult as you may think. Perhaps the most difficult part is defining the language itself, the commands and their syntax. The language used here is called First Compiled Language or FCL; not a very original name I admit but it will do for now. FCL is a very simple language which provides facilities for handling unsigned integer values and also character strings. Some basic program control structures are provided and facilities exist for calling machine language subroutines. Certain features have been borrowed from other languages. Those of you familiar with Pascal may recognise certain FCL features such as BEGIN/END block marking and FORWARD subroutines declaration. The terms "Procedure Division" and "Data Division" have been borrowed from COBOL, although they are used

for reference only and do not require explicit definition within a program.

What is a Compiler?

In simple terms, a compiler is a program which takes a program written in a source language and produces a fast machine code equivalent. The term "compiler" is often applied to another type of program, the assembler. The major difference is that "compiler" is more often applied to a high-level language translator while "assembler" refers to a program which translates a particular microprocessor assembly language. In some cases (such as the FCL system) an assembler may form part of the compilation process, translating the output from the code generation stage. It is normal for the complex process to be split into stages. This allows certain parts to be updated as required and often eases the task of compiler construction since each part may be tested separately.

Many of the popular high-level languages are compiled, examples BASIC, C. On the other hand, BASIC is usually an interpreted language (although BASIC compilers do exist). The differences are discussed later, but to confuse the issue, there is a sort of halfway house. The FORTH language system uses what is often referred to as an interactive compiler as it incorporates the best features of both systems.

Compiler Vs Interpreter

In an interpreted language system such as Commodore 64 BASIC, the program text is prepared using an editor which is normally part of the interpreter itself. This usually takes the form of a line editor in which a line of text is entered, prefixed by a line number which determines its position in the program. When the code is

executed, the interpreter begins processing the text at the first line. Each line is scanned for language elements which will determine the operations to be carried out. The syntax of the line has to be checked as it is assessed. The actual operations are carried out by subroutines which are part of the interpreter code. Once a line has been processed, the interpreter forgets all about it and goes on to the next line. Because the program has to be scanned in this way, the actual run speed tends to be slow. Compare this with the action of a compiler.

Once again, the program text is edited using some form of screen or line editor. Here the similarity ends. The compiler scans and translates the whole program before execution. In some cases, a form of pseudo-code is produced which is then executed by a fast mini-processor. In others, an actual machine code program is produced. The execution speed is considerably faster than an interpreted system because there is no need to continually check the syntax of each program line. Runtime support is provided by a library of routines which are either appended to the end of the final program or loaded into another part of memory at runtime.

When you turn on your C64, you can begin programming immediately in BASIC thanks to the interpreter which is held in permanent ROM memory. You can edit programs with the built-in editor, load and save your programs and RUN them. All of these features and more are provided courtesy of the BASIC interpreter. In addition to these, the interpreter will allow you to perform most commands outside of the program, i.e. in direct mode. The interpreter is interacting with you. Interpreters are generally interactive systems. This is useful when you have to debug a program. You can halt the execution of the program, check variable values, alter them as

required and then cause the program to continue. Although execution speed may be slow, program development and debugging is relatively quick and easy.

When using a compiled language system, similar editor facilities are provided by an editor program which must be loaded into memory. Unlike an interpreted system, no interactive testing of the program may be carried out. Debugging the program is a much more complex affair due to the lack of these interactive facilities. Certain systems do provide debugging features but these usually take the form of a separate program, used alongside the executable program at runtime.

On the basis of this comparison, it appears that the interpreted system seems better on program development, that the compiler whereas the reverse is true for final execution speed. From this, it would seem that some kind of interactive compiler would be ideal. FORTH goes some way to providing the seemingly ideal programming environment. FORTH is a language developed some years ago for the control of radio telescopes. The compiler provides many of the interactive features of an interpreter and once you get used to the peculiarities of the language itself, it becomes an excellent software development system.

The FCL Compiler System

The FCL compiler has been written in BASIC. Before you cringe, consider what I've said about program development and debugging. The only other option I had was machine language and it is considerably easier to develop the techniques in a high-level language. The BASIC on the 64 is, as we have seen, an interpreted language and the penalty is a painfully slow execution speed. You could use FCL to develop a new compiler so long as you don't mind having your hands while a compiler...

The Bug File

This system isn't perfect I'm afraid. There are one or two problems with this version, which occur mainly within the library routines which provide the runtime support. Most are merely an inconvenience but the fourth point may cause a real problem. Here is the current list although I

expect that there are some that I have not come across.

- The autorenewal and autoincrement operators do not work. It was intended that the ++ and -- operators would provide automatic, and autoadd, within expressions as in the C language. What actually transpired was that they would only work when applied to a single numeric variable.
- The DERR() function does not behave altogether stably in some situations. I've found that a couple of dummy DERR()'s is a good idea. I've not been able to find why this happens.
- On some occasions, reading an INPUT file which does not actually exist may cause the machine to hang up. A RUN/STOP/RESTORE keypress will reset the machine.
- After an extended execution of a program using string manipulation and/or type conversion operators and functions, the memory fills up with redundant strings. Due to a design flaw (by your truly) no garbage collection facilities exist nor can they be written for this version. The effect of this is for the program to stop with a memory full error after some considerable time. This may be OK for most applications since the memory given over to the storage of strings is considerable; the memory left free after the program is loaded which is normally in excess of about twenty-odd K.

functions. These are defined as follows:

Statements are actual programming commands which cause some immediate effect such as screen clearing (CLS) or device control (P/BUSE/ENDP).

Operators Arithmetic, logical and relational operations causing effect on one or more variable quantities. For example, add (+), multiply (*) or logical exclusive-or (XOR).

Functions Language elements which return a result when given one or more parameters. The LEN, ASCII and STLEN functions are examples. These appear in an expression.

The next task was to decide what kind of data this language should be able to handle. Since this was my first attempt at such a project, I decided to keep things simple and allow only unsigned integer and character string types. Facilities for type conversion were considered necessary and so functions such as ASCII and CHAR were included.

The next section is basically a programmer's reference manual for the language. It details items such as variable declaration and explains each statement, operator and function. If you go on to develop your own language, it may be a good idea to write everything down in a similar form to this before you start to design and program your compiler.

The FCL Language

Before writing out to write your compiler, you should define the language. If you are writing a compiler for an established language then you need only follow the standard for it. Designing your own language is a challenge for both your programming skills and your imagination. When I originally started out on this project, my intention was to write some kind of super-assembler which would make machine code programming easier for beginners. As the project developed, I decided to be more ambitious and write a high-level language compiler. This brought its own special problems, first of language design.

The first thing I had to do was to define a programming language. At one point I thought about writing a compiler for BASIC 2, but decided to walk before running! And so the FCL project was born. The first thing was to define three groups of language elements: statements, operators and

FCL Programmers Reference

In the following document, *Acute* characters are used to highlight FCL language elements. The source editor, EDIT selects lowercase mode when executed. Please note that the FCL compiler will not accept uppercase characters except where they occur within string literals.

A FCL program consists of a variable declaration section, a program instruction section and optionally one or more subprogram instruction sections. The variable declaration part is called the Data Division and the instruction section is called the Procedure Division. These names are for reference only and are not required in the program unlike the COBOL language from which these names are borrowed. Subprogram sections are subprocedures which have the same basic construction as the main procedure but are identified as subroutines by the restorative statement.

All variables and subroutines must be declared before they are referenced. This means that subroutines should be placed in the program before the main Procedure Division or be pre-declared using the *forward* statement. If a subroutine has been pre-declared with *forward* then it must be defined elsewhere, typically after the Procedure Division.

A procedure section always starts with a *begin* statement and ends with the *end* statement. This is true for both the Procedure Division and any subroutines. The compiler will give a warning if it finds a variable declaration within a procedure but the variable will still be defined. An error condition occurs if the compiler finds a program instruction outside a procedure, i.e. in the Data Division. In this case, the instruction is ignored. Should any error occur during compilation, the creation of the symbol and literal data files will be suppressed thus effectively preventing code generation. Should only warnings be flagged then the creation of these files will proceed as normal.

The Data Division - declaring variables

All variables to be used in the program must be declared here. You may also pre-declare any subroutines which are not explicitly defined until after the Procedure Division. Variables are declared using the *var* statement along with descriptors *int*, *string* and *array*. A variable of the type "int" is an unsigned integer whose value may range from 0 to 65535 inclusive. A variable of type *string* is a sequence of characters of length up to 255. The *array* descriptor creates an array of either *int* or *string* types.

Variable and subroutine names must begin with an alphabetic character and may contain any alphanumeric characters thereafter. The maximum length of a variable or subroutine name is 30 characters. PCL reserved words may not be used as variable names. The name "n" is also illegal. Some examples of valid variable declarations are given below:

```
var int counter, maximum
var string inputline
var int table array (10)
var string edit array (200)
```

While declarations of differing types must be made on separate lines, array and non-array variables of the

same type may appear on the same line. Note also that you cannot dynamically define arrays (i.e. *var int xyz array (abc)* where "abc" is an integer). You may use integer variables as subscripts in a procedure section only. Some examples of illegal declarations are shown below:

```
var int count, string line - dont mix types
var string table array (count) - no dynamic decl.
var int last - last is reserved
```

Pre-declaring Subroutines

Normally, a subroutine should be defined before the Procedure Division. The *forward* statement allows you to pre-declare a subroutine to the compiler thus allowing you to place it anywhere in the program. When you declare a subroutine in this way you must explicitly define it somewhere in the program otherwise the compiler will report an error.

The *extern* statement may also be applied to subroutine names. This sets up a dummy reference during compilation. It is possible to use this feature to make special calls to machine code programs in memory at runtime. This is not a recommended method of making such calls. Refer to the *system* statement and *sysf* function descriptions for details. Using *extern* in this way involves editing the intermediate ASM file produced by the COBOLGEN stage. An example Data Division is shown below:

```
! Example of a comment line
! Example of a Data Division
var int min,max,count,keys array(200)
var string something
! typical forward declaration
!
! forward getinput,getoutput
!
! explicit defined subroutines go here
!
! start of Procedure Division
```

The Procedure Division - begin and end statements

All program instruction lines must appear within a block bounded by a *begin/end* pair. This applies to instructions within a subprogram definition as well as those in the Procedure Division. The *end* statement generates different code depending on the context in which it is

used. In the Procedure Division it generates a program termination sequence whilst in a subroutine, it generates a return/division-subprogram sequence. Should any instruction line appear outside of a *begin/end* block then the compiler will report an error.

Numeric Expression and Literals

The compiler is capable of handling decimal, binary, octal and hexadecimal numeric literals. In an expression, the way in which the compiler will interpret a literal numeric quantity is determined by a special character prefix. The dollar (\$) denotes hexadecimal, the percent (%) denotes binary) the *u* denotes octal. Should there be no prefix, the compiler assumes the literal to be decimal. The following examples will hopefully make this clearer:

```
$5000 Assumed to be a hexadecimal number.
%1011 Assumed to be a binary number.
+ 741 Assumed to be an octal number.
5212 Assumed to be a decimal quantity.
```

Note that depending on the number base used, certain characters may be considered illegal (i.e. octal only uses numeric characters 0 to 7 inclusive, 8 and 9 being considered illegal).

In a numeric expression you may include operators, numeric variables, numeric literals and numeric functions (i.e. those returning a numeric result). The compiler performs type checking on an expression and will report a type mismatch error should it detect any type irregularities such as an attempt to assign a string to numeric variable.

String Expressions and Literals

Only certain operations are allowed on strings such as concatenation (joining strings using +) and relational comparisons. There are a number of string functions available. An attempt to assign a numeric quantity directly to a string variable will cause a type mismatch error.

A string literal should be delimited by quotes (""). Any character may appear within a string including apostrophe letters and ascii control characters. The total length of any string quantity must not exceed 255 characters otherwise a string length error will occur.

Subroutines

A subroutine is a subprocedure whose structure is similar to that of the main Procedure Division but is declared outside of it. A subroutine consists of a subheader statement followed by a block of program instructions inside a *begin/end* pair. The subprocedure may contain any of the program instructions, which are valid in the Procedure Division including calls to other subroutines. Also provided is the *return* statement which allows the programmer to force a return from subprocedure from a point other than the end of the subroutine. Any attempt to place a subroutine definition inside any procedure will cause the compiler to abort with a fatal error.

To call a subroutine, you can either simply place the name of the subroutine as a line by itself or use the more specific *call* statement. Both will produce a call to the subroutine. An example is shown below:

Example of the use of subroutines

```

Data Division
.....
or not movement.com)
forward.com)map.com)down

Procedure Division
.....
loop
Example of call by name only
countup
Example of call by call statement
call countdown
end

Subroutines
.....
subroutine countup
begin
<instructions>
end

subroutine countdown
begin
instructions
end
    
```

Operator Precedence

The order in which operations in an expression are carried out is known as the order of precedence. The compiler will effectively rearrange the order of elements in an expression according to the following table which is in order

1. Functions
2. Decrement/increment (- and ++)
3. Division/Multiplication (/ and *)
4. Subtraction/Addition (- and +)
5. Relational comparisons (<, >, >=, <=, > and =)
6. Logical operators (NOT, AND, XOR and OR)

Within the groups shown, precedence is from highest to lowest, i.e. in an expression AND would be evaluated before OR.

Multiple Condition Testing

As in BASIC you may test for multiple conditions in one line using a combination of the relational and logical operators. A TRUE condition evaluates as *True* (-) in BASIC and a FALSE condition evaluates as 0. This is also true for string comparisons; i.e. the result of a string comparison is a numeric quantity, 0 or 1. The following are examples of valid comparisons:

```

if count > 10 for max=10*min+1
read=input string=year string
write P(put string=year string)
    
```

Refer later for description of the *if* and *write* statements. Note that the system tests for a FALSE condition rather than a TRUE one. This means that in an expression such as *if flag*, the variable "flag" is tested to see if it contains the value of FALSE (0). Any non-zero value in "flag" will evaluate as TRUE.

FCL Program Statements

In this section, the following notation is used:

- <address> 16-bit numeric value representing a memory address
- <expression> A sequence of operators and functions which will evaluate to a quantity
- <variable> Variable of any type
- <mem exp> Memory expression
- <str exp> String expression
- <condition> Expression testing some condition
- <instructions> A sequence of program lines
- <channel> Numeric expression representing a channel number

- <filename> String expression representing a valid filename
- <writeln> Any valid expression for output
- <readfile> Any variables for input

Square brackets [] and [] are used to denote optional parameters whilst a vertical bar (|) separates legal parameter options.

Setting memory locations *loc* and *word*

1. *loc* <address> , <count> >
2. *word* <address> , <count> >

1. A single byte in memory at < address > is set to the value of < mem exp > which must be in the range 0-255.
2. Two consecutive bytes in memory at < address > and < address + 1 > are set to the value of < mem exp > in normal lo/hi-byte order.

Program control 1: *loop/while/end-loop/when*

```

loop [when < condition > ]
< instructions >
endloop [when < condition > ]
    
```

The *loop/endloop* pair allows a set of < instructions > to be repeated depending on one or more conditional expressions. The *while/when* options allow testing of conditions at the start and/or end of the loop.

With *loop while < condition >*, the loop will be entered only if the < condition > evaluates TRUE otherwise control is passed to the first instruction following the corresponding *endloop* statement.

With *endloop when < condition >*, an exit from the loop will occur only if the < condition > evaluates TRUE otherwise control is passed to the corresponding loop statement. Note that if no condition is tested for at either end then the loop will continue indefinitely i.e. an *endless loop*.

Program Control 2: *if/else/endif*

```

if < condition >
< instructions 1 >
else < instructions 2 >
endif
    
```

If < condition > evaluates TRUE then < instructions 1 > is executed. If the optional *else* clause is included and < condition > evaluates FALSE the < instructions 2 > is executed. The *endif* statement must be included in either case.

Input/Output 1: channel

channel [# <channel >] < num exp >

This is the basic character output call which outputs a single character whose user code value is < num exp >.

Normally the screen is used unless a < channel > is specified. In this case the < channel > must have been previously opened by the *open* statement.

Input/Output 2: open and close

1. *open* < channel > , < filename >
for input/output
2. *close* < channel >

1. Open a disk file < filename > via < channel > for either input and output. The < channel > number must lie in the range 2-255 inclusive; channel numbers 0/1 and 15 are illegal.
2. Close a disk file opened via < channel >.

Input/Output 3: write

write [# < channel >] < write list >

Output data to the screen (or < channel >). The < write list > may contain numeric and/or string expressions. The write control characters (;) cause different effects. Normally, a carriage return will be output after a < write list >. The semicolon and comma allow presentation of this thus allowing basic formatting to be carried out. Both force input to commence at a specific position after the last print position; the semicolon at the next consecutive position and the comma at the next tab; the screen is assumed to be eight into 9 tab positions at intervals of 8 characters. The apostrophe (') forces a carriage return.

Examples of write statement lines.

```
write "The answer is "total
write "Hello CBM!";
write "; tablepointer"
```

Input/Output 4: read

read [# < channel >] < read list >

This statement allows input of data at runtime into specific variables. You may only specify variable names in the < read list >. Either string or numeric variables may be input. Variable names are separated by commas in the read list. The cursor is switched on and input takes place at the current screen write position (screen only). Examples of the read statement.

```
read table(count)
read startaddress,endaddress
read # ;startnumber,zone
```

Miscellaneous Statements: call, wait, tab, space

call

Clear the screen and home the cursor to the top-right corner of the screen.

wait < num exp >

Causes the computer to wait for a specified time, the actual time period being given by < num exp >. Since the basic time unit is 1/60th of a second, a delay of 1 second is achieved with wait 60.

tab

Forces the program to terminate.

read < address >

Execute a machine code subroutine beginning at < address >. The subroutine must end with an RTS instruction. See also the explanation.

byte < address >

Returns the value contained in the memory location at < address >.

word < address >

Returns the value of the word at < address > and < address > + 1. Similar to byte except that a 16-bit value is returned.

len < str exp >

Returns the length of < str exp >. If the < str exp > is valid, length is always in range 0-255.

write < str exp >

Returns the ASCII code of the first character in < str exp >.

write < num exp >

Evaluates TRUE if the RUN/STOP key has been pressed. The < num exp > is a dummy parameter.

byte < num exp >

Evaluates TRUE if any key other than shift, run/stop control or commander has been pressed. The < num exp > is a dummy parameter.

channel < channel >

Returns a numeric character code from < channel >. If < channel > is zero, the keyboard is the input device.

status < num exp >

Returns the value of the I/O status bytes. In BASIC this is the internal variable ST. The < num exp > is a dummy parameter.

close < num exp >

Returns the disk status value (i.e. the error code). Again < num exp > is a dummy parameter.

String Functions

char < num exp >

Returns the character whose ASCII code is given by < num exp > which must be in range 0-255.

str < num exp >

Returns the literal of < num exp > as a string.

left < str exp > , < num exp >

Returns the left most < num exp > characters of < str exp >.

right < str exp > , < num exp >

Returns the rightmost < num exp > characters of < str exp >.

mid < str exp > , < num exp 1 > , < num exp 2 >

Returns a substring of < str exp > of < num exp 2 > characters from < str exp > starting at position < num exp 1 >.

write < address > , < str exp >

Passes control to a machine code subroutine at < address >. Parameters are passed in < str exp > in the following format: accumulator= register= register flag.

This four character string format is used to return the values of the registers in the same order.

disk < num exp >

Returns the disk status string. The num exp is a dummy parameter.

To be continued



Electronic Arts
41/27/84

THE TRAIN



Electronic Arts
41/27/84

By the end of the summer 1944, it was fairly obvious which way the war was going. Different Germans responded in different ways. Some tried to ingratiate themselves with the Allies and prove that they really were decent chaps after all and had only been obeying orders. Others tried to prepare for a life of luxury since all hostility had ceased, presumably in South America.

One such German was Hermann Goering, Commander of the German Air Force, a big action and art collector. The term collector is used in its broadest sense. He used the German occupation of France to appropriate as much of the French national art treasures for his own personal pleasure.

As the German armies withdrew from France, so a train

filled with Goering and Goering's haul for Germany and it is at the station of Metz that you, Pierre LeFou, a member of the French Resistance, first catch up with it. Your objective is to steal the train back and return it and its contents to the people of France.

It is midnight when you and your companion Le Duc attack the station. You must proceed ever so far as he tries to board the train. This involves shooting soldiers who appear behind the windows of the station building before they shoot you. Get hit once and it's game over time. No lives lives here.

Le Duc signals to you when he is ready and all you have to do now is get the train back to western lines before dawn. Fortunately you do have some aspirations to give you a hand.

Operating the train involves coming to terms with the various controls in the cab. Throttle and brake are fairly

simple, but you must also make sure that the furnace is well looked after if you are to maintain a good head-of-steam. There is a means blow-off facility - included in case the boiler is about to blow up and you must learn the system of whistles which will alert the resistance to switch points for you.

As you progress you can monitor your position by summoning up a map screen. You will have to negotiate attacks from enemy night fighters as they attempt to strafe the train as well as gunboats when you cross a river. These boats cannot be swarmed so you need to stop on a bridge and blow them out of the water before they can blow you up.

Stations are a different proposition. You can run them if you choose but stopping might be necessary in order to refuel. Once you have taken a station - played in exactly the same way as you attacked Metz, you also have the opportunity to send a signal to the resistance. You can ask them to take a bridge or station for you but they will only be able to hold it for two hours so it's up to you to make good time, especially if you want repairs in a station.

The game is excellent graphically and sound addictions is high. Control is similar to that in the game *Dambusters* in so much as you press different keys to give you different views - inside the engine, forward and rear facing guns and the map screen.

The gameplay is limited though being a lot simpler than *Dambusters* with the arcade sections being particularly easy after a while. Although you can try different routes and the three difficulty ratings in order to improve your final assessment, since I had completed the game, I didn't find any great urge to return to it. **G.B.H.**

Technicalities:

Name: *The Train* Supplier: Electronic Arts/Treble, Langley Business Centre, 11-29 Newton Road, Langley, W. Midge, Berks SL3 7JX. Tel: 0933 49462. Price: £9.99/Caj £4.95 (Disk).

Character Building

Get your sprites and UDGs ready for action on the starting grids

By Norman Doyle

User Defined Graphics and sprites can lift a dull program into a new dimension. The ability to design a series of characters is an essential skill which, once mastered, leads the way to professional results in video animation as much as in game production. UDGs are based on a simple 8x8 pixel grid but sprites are slightly more complicated to create on their more intricate 16x16 pixel grid.

Faced with the problems of standard and multi-color modes, the prospect for the beginner is overwhelming but the hardest part is typing in the rows of data which make up the characters. With eight bytes per UDG and a possible 255 characters, the best way to enter the data is to use a graphic design program which allows you to construct a graphic on a grid and save a whole section of memory. This block can then be loaded from within the master program. A combined or companion sprite designer is also desirable but make sure that both programs have a multi-color option.

ROM Raiding

UDGs are similar to the characters that the ROM uses and if some of the ROM characters are needed on the same screen as the UDGs they have to be downloaded first. This is not a simple case of poking and poking because the ROM is banked away out of sight behind the I/O registers at 53248 through 53743.

When accessing the character ROM all I/O functions are disabled, including the keyboard so you must be taken to get this part of the program



correct. If a mistake is made the computer will be as dead as a doorknocker until it is switched off and then on again. This is yet another reason for saving before running.

Characters and screen must fit in the same 16KB section of memory and this will vary according to your needs. For this reason the ROM Raider routine in the Listings section has certain values which must be allocated before running. The block of characters which are used by this routine includes the alphanumeric characters and all the punctuation marks, 64 characters in all. Each character consists of eight bytes and

each bit of every byte represents a pixel when the character is printed onto the screen.

Creating UDGs

UDGs use exactly the same size grid as the normal ROM characters - 8x8 pixels. Even if you don't own a character designer, you can still define your own characters by following a few simple rules.

A character grid is shown in figure one.

Every row is stored as a byte of memory and the squares which make up a byte correspond to the eight bits of the byte. A pixel is marked on if a bit is set to one and turned off if the bit is zero. Each square has a value according to its position which is divided so that each value between zero and 255 gives a unique shape which covers all of the possible combinations of on and off pixels.

A character can therefore be defined as a series of eight decimal values as we have seen with the ROM Raider routine. On the screen the letter A looks like this:



Fig. 1



Fig. 2

The number beside each row is derived by adding all of the values at the top of a column which correspond to a framed-up pixel in that row of the diagram. This can also be applied to a designed character:



Fig. 3

Access to the new character set is achieved through the low nibble of location 53272 after all of the necessary bank switching and screen positioning has been completed.

Selecting where the characters lie in the character set requires a little bit of common sense. If characters are to be used it is best to allocate them in the same values as the ROM ones. For example, the letter A should be the second group of eight bytes. This means that it can be placed on the screen by poking the value of 1 to the screen location where it is to be displayed, just as you would if you were using the ROM characters.

The colour of the character is stored in the normal memory map (5556 to 5625). To assign a colour to a character, a value must be poked to a corresponding memory location within the map. Any of the 16 colours can be chosen but a character moving across the physical screen map must have its movement shadowed by moving its colour around the colour map, it doesn't happen automatically.

Coloured Characters

Standard UDICs only use two colours, a foreground colour (switched on pixels) and a background colour (switched off pixels). This limits the visual impact of the character and the use of multicolour characters can help here, but at a price.

The multicolour character grid only has half of the resolution of a standard character - 480 pixels. This is because the colour information is stored on board the character by a clever use of paired bits.

The best way to design the character is to use colours as shading to represent each of the four permitted colours of the character. Always remember that one of the colours is limited to the first eight colours in the numerical sequence from zero to 15:



Fig. 4

The eight byte values for the character are calculated by allocating a value to the paired bits of each pixel using fixed regulations. Background colour is always designated as 00. Multicolour 1 is 04 (binary value 1), Multicolour 2 becomes 10 (binary 2) and Multicolour 3 is designated by 11 (binary 3). This correlation between the paired pixel value in decimal and the name of the multicolour type acts as a useful reminder when creating the characters. Subtracting these values into the grid we derive the following values:



Fig. 5

The values look similar to those which were calculated for standard UDICs and it is difficult to tell them apart just by looking at the figures. Try to display a multicolour character and the differences soon become apparent. Just as ROM characters cannot be used as multicolour characters, so multicolour UDICs are often unusable for display in standard mode.

To switch the display from one mode to the other requires a simple poke to 53278.

POKE 53278,PEEK(53278) OR 15

Multicolour mode can be abandoned by using a similar construct, substituting AND 255 for OR 15.

Colour Slots

The colour is selected for the three multicolour options in one of two ways. Multicolour 1 is taken from a value poked to 56262 and its neighbouring location, 53283, determines Multicolour 2. The values contained in these locations can be any of the colour values from zero to 15 but, without resorting to split screen machine code routines, they are the same colours for every multicolour character on the screen.

Well at least you don't have to worry about moving the colours around the screen!

Multicolour 3 is stored in the colour map and determines if the character is displayed in multicolour or standard mode. The C64 is a very unforgiving machine and I've always supposed that its designer was a Yorkshireman - you don't get one for next and the price you pay here is a reduced colour range. The same sixteen values may be poked to the map but values up to seven display the character in standard mode with the assigned colour at its base following the normal rules. If the value lies between eight and fifteen, the character is displayed in multicolour but the colour of Multicolour 3 is added to the poked value minus eight. This means that the C64 slips back to the old VIC days with only eight foreground colours available.

The multicolour mode is limited that can produce rapidly results if handled properly. Use its resources wisely and the result can be deceptively more colourful. Across the whole screen, the only colour which can differ for each character is Multicolour 3, so use this as the main colour whenever possible, leaving the other two colours as shading or minor detail lines. If the two fixed colours are selected from the extended colour range (8 to 15), the colour range will seem wider and problems of colour clashes will be less frequent.

In both modes the background colour which shows through will be set by a poke to location 53281 but this is not always the case.

Extended Backgrounds

No pixel is actually switched off because everything on the screen is displayed as a colour. What we really mean by an off pixel is one which is turned on to display the background colour which is normally fixed for the full screen. In extended colour mode this rule is broken, but the cost is a very serious loss in the range of characters which can be displayed.

Instead of the usual 256 character set, extended mode only has 64. These are repeated four times and a different background colour can be assigned to each of the otherwise identical sets. The colours are assigned by locations 53281 to 53284 and depends on bits six and seven of the character's screen code. Reflecting on this, you soon realise why only 64 characters are available. When the value of the screen character exceeds 63, the 64 bit is altered. Since this bit determines the colour, the system reverts to screen code character zero (the 'a' symbol) but with a different background colour.

The location that the colour is taken from is determined by the following table:

| Bit Pattern | Colour Location | Code Range |
|-------------|-----------------|------------|
| 00XXXXXX | 53281 | 0 to 63 |
| 01XXXXXX | 53282 | 64 to 127 |
| 10XXXXXX | 53283 | 128 to 191 |
| 11XXXXXX | 53284 | 192 to 255 |

The character colour is determined in the normal way using the colour map but only standard characters mode can be used because the multicolour locations are used to select the background colours.

Extended mode is controlled by bit 6 of location 53285:

```
POKE 53285, PEEK(53285) OR 64
```

To turn the mode off again the 000 64 is subtracted with AND 191.

Though this mode is limited in character range, it does include all of the alphanumeric and punctuation characters which makes it ideal for creating striking title or text screens.

Sprites

The same rules apply to sprites as apply to character defining. A sprite is just a movable block of characters with a definition that looks like figure six.

The heavy lines in the grid show

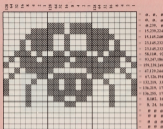


Fig 4

how the sprite can be broken down into character sized groups. The horizontal divisions are of little importance but the vertical lines are important when defining a sprite in memory.

Sprites consist of six character blocks with three half height characters. This is derived so that each sprite definition fits in a 64 byte block to make memory management easier.

A sprite definition for a single sprite row of 24 pixels is broken down into three groups of eight bytes shown in the diagram and these are written into consecutive bytes in memory going across all three values for each row in turn before starting on the next row.

The example shown in figure six would have a configuration for the first row of 0, 16, 0 and these would occupy the first three bytes of sprite memory. The second row would be placed into the next three bytes as 8, 16, 8. The other 51 bytes would follow the same pattern until the sprite was fully defined. This only fills 63 bytes. The extra byte is there for purposes but in cases where more than eight sprites are used this byte could be pressed into service as a store for the sprite colour for a multicolour mode this would correspond to Sprite Multicolour 21.

The problem is when so many of us use this information. The VIC chip 16Kb rule applies to sprites in the same way as it does to screens and characters etc. A quick bit of arithmetic shows that 356 sprites could be defined in a 16Kb

block but in practice this is false because the screen and character set also need space within the block and under normal programming conditions, only eight sprites can be displayed on the screen at a time. If screen does not permit the full range of sprites to be held within the VIC's memory bank, a bit of slick shunting can move the necessary data into the area from elsewhere in the computer's memory.

Eight bytes at the end of screen memory control which block of memory the sprite definition is found in. These locations can be found by adding 8095 to the location of the first byte of the screen and the eight bytes from this location form the sprite pointers. For example, the normal screen starts at location 1024 so the sprite pointers start at location 1024 plus 8016 = location 2040.

The values stored in these locations determine the 64 byte block which is used. When a sprite is placed on any of these pointers the sprite definition starts at the first byte of the current VIC memory bank. In the example used this would actually be the start of memory, location 0, which is not a good idea. A value of two would take the definition from location 64 to 127, which is no better. For the normal bank the sprites can only safely start with a pointer value of 32 but even this would place the sprite definition right at the start of Basic memory. A few sprites can, however, be squeezed in the cassette buffer (ignore values 19 to 19 = memory locations 892 to 1023).

80 Column Video

We take an in-depth look at the 8563 chip which controls the video display of the C128

By D. Anderson

Perhaps one of the most interesting aspects of the Commodore 128 is the 80-column screen. Indeed, the 8563 chip which controls the video display, has some very interesting aspects within itself. An examination of the memory map, reveals that the 8563 has only two locations reserved for it. This would tend to indicate a very simple chip, without any of the 'trills' of earlier Commodore graphic chips - after all, two registers can hardly control any earth-shattering effects.

However, Commodore have employed an unusual trick in implementing this chip. The usual method of allowing access to a chips registers, is to map them into memory - this means that they can be accessed directly with a simple POKE to the desired register. However, with the 8563, we have a seldom used method, in which just two locations are reserved in main memory. In order to write to a register, the register number is placed in the first location, and the value to be inserted into it is placed in the second register.

For Commodore users, this may seem a rather long winded way of doing things, but it does have its advantages; namely, that very little I/O space is required. Anyone familiar with the old Color Genie will recognize this technique.

The surprises do not stop there! If you search through the memory using the monitor, looking for the 80-column screen, you will not find it. Where has it gone? Well, the answer is

that it is not in the memory. Strange, you may think, but true! The 80-column screen is in its own self-contained 16K of RAM, which does not appear in the memory map. To access this, data must be sent through the two 8563 I/O locations. Again, long winded, but it does mean that your text screen does not gobble up any of the main memory.

So, when Commodore tell you that you have just bought a 128K computer, you can tell them that they are wrong - you've got a 148K computer (128K main memory, 16K 80-column screen, and 4K of I/O memory). How many 148K computers do you know? Not many!

Now for the bad news! Due to the complicated method of accessing the 8563, it means that your BASIC programs will be more complicated, and a little slower (although if you switch to 2MHz mode, this should compensate for this).

The two locations in memory for the 8563, are \$E000, and \$E001 - register is \$E000, value is \$E001. Some quite startling effects are possible, by playing around with these two registers, including moving the screen position, smooth scrolling, partial screen blanking, and many others.

Now, I expect you want to know how to manipulate the text screen - first, you need to know how to use the two locations to store this data on the screen. By investigating the manual print routines, I have been able to find the locations which are necessary for

this. By the way, if you wish to explore the C128 kernel, the same addresses as used on the C64 can be used - as a jump table has been inserted, so that calls to the kernel will still be to the same place.

Register Meaning

| | |
|------|--|
| \$12 | - high byte of the memory location to be manipulated |
| \$13 | - low byte of the memory location to be manipulated |
| \$1F | - contains the value to be stored |

Next, we need to know how the video memory is set out. By sending data to the video memory, I have been able to put together this breakdown of the memory:

| | |
|----------|----------------------------|
| \$B000 - | text screen |
| \$B001 - | attributes for text screen |
| \$2000 - | character definition data |

Unfortunately, there are some bad side-effects to the indirect addressing of the \$200. Firstly, since it is acting on its own, independent of the main computer, you have to make sure that it has finished doing its last job before you ask it to do another. This is done by reading \$D000, if the \$200 is not busy, then bit-7 of this is cleared. If not, we just have to wait until it is not. Secondly, when you write the address to be manipulated in registers \$12 & \$13, this is taken by the video controller, and it appears to change it. As a result, if you do not get your value to be stored in the memory in time, it ends up in the wrong place - very useful! BASIC ends up being much harder for this, and so unfortunately, to access the 64k of RAM, we have to use machine code. Figure 1 shows an assembly listing for POKEing a character onto the 80-column screen.

Figure 3

| | |
|----------|---|
| \$A000 - | read value from video memory |
| \$A001 - | store the video memory into the main memory |
| \$A002 - | store a value in the video memory |
| \$A003 - | store the contents of \$B000-\$B003 into the video memory |

Program 2 contains the routines necessary to retrieve a disk file of character definitions, and replace them into the video memory.

Figures 1 and 2

| | |
|---------------|---|
| LDR \$1F | index register to one screen register value |
| STX \$D000 | store register value |
| LOOP BPL LOOP | wait until video is ready |
| STA \$D001 | store value to be stored |
| RTS | |

If we want to read the contents of a cell on the text screen, then instead of writing the new value of \$D001, we read the contents of \$D001. Figure 2 shows an assembly listing for this.

| | |
|---------------|---|
| LDR \$1F | index register to one screen register value |
| STX \$D000 | store register value |
| LOOP BPL LOOP | wait until video is ready |
| LDA \$D001 | retrieve value to be stored |
| RTS | |

The attribute data on the 80-column screen, is considerably more complex than that of the VIC chip. Besides the usual colour definitions, it is also capable of flashing, underlining and reversing characters. Incidentally, since the \$200 allows the characters to be reversed through hardware, there is little point in defining a character set, where half of it is taken up by reversed versions of the rest - if you write your own software to use the screen attribute.

However, the most important bit in the attribute byte, is the one which selects from which character set the displayed character will come from. This enables both sets of Commodore characters to be displayed simultaneously. (When shift/CRM is pressed, the whole screen does not change, as it does on the VIC chip's 40-column screen.) Since both sets are in the character definition memory at one time, this bit allows two-character sets to be displayed simultaneously - thus allowing a character set of \$12. If you wish to manipulate this attribute data, it is done in exactly the same way as placing characters on the screen, except that the position of the video

memory is different. (See the memory map given earlier.)

Re-defining Definitions

Now, as I said earlier, the definitions of the characters are all stored in the RAM, so to alter these, we just read new definitions into this, and overwrite! No need to bother about watching ROMs in or out, and no need to bother about interrupts, as in the VIC chip. Program 1, presents a program that allows you to re-define the definitions, and to subsequently save them onto disk. The machine code data which contains check digits, so any errors are reported, contains the routines already discussed - storing characters on the screen, altering the attributes, and altering the character definitions.

Since the video RAM does not appear in the normal memory map, it is not possible to save it on a peripheral. Thus, it was necessary to transfer it across into main memory, before this process was complete. Users may like to examine this code with the aid of the monitor. Figure 3 shows a simple breakdown. □

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4TH

AND INCHES

If the title of this game means nothing to you, the chances are you wouldn't want to buy it when you see what it was about. American Football is one of those games like cricket that people either love or hate. There is no middle-ground.

It would be a pity if you did turn your nose up at it though, as it is the best simulation that I have ever seen so far.

Produced by Accolade, who also gave us the excellent baseball simulation Hardball, 4th and Inches is both easy to play and easy to get hooked to.

The game is entirely joystick controlled from selecting your play from a menu to maintaining key players as you try to complete the move.

You have two players available for each position. The coach's screen gives you an assessment of each player and allows to substitute as well. Each player is rated according to his speed and strength. The ratings are speed, fast, quick, steady, solid, strong, tough and big. In general, the faster you are, the smaller you are and vice versa.

There are eleven main types of offensive formation from which the computer selects five for you to choose from. These include shotgun, double tight end, short yardage and the various kicking plays. Once you have selected your basic formation, you must then choose the precise play you are going to attempt, be it running, passing or kicking. Most are passes out of a short gun tend to work very well here. Occasionally you are faced as the play you want to attempt does not feature in the list offered by the computer, but this is a minor quibble and most of the time you will have ample choice.

While you are doing all this, the defence always selects its strategies as it tries to disrupt the offence. Should you line up for a pass or a running play or do you hedge your bet? What about blocking the quarterback and if so, should you use your defensive backs or linebackers? A useful tip here is that the computer very seldom runs with the ball. Another nice touch is that if you are playing against the computer, you choose plays are highlighted, but if you are playing against a friend, the plays aren't lit up so that both players can choose in secret.

Once all the plays have been chosen, it is time to put strategies into action. Into the offence, you control the quarterback once the ball is snapped and it is then up to you when you release the ball. Too early and your receiver will not have completed their patterns. Too late and you risk being sacked.

Once the ball has been passed or handed off, you take charge of the receiver and can then attempt to move down field as far as possible before getting jumped on by the opposition. Here again, it is necessary to know who you have just given the ball to. It is pointless trying to break tackles with your lightest fastest wide receiver - a side step should prove to be more effective.

The defensive player can select the man that he wishes to control although this may change as the ball moves down the field. Only a small area of the field is shown at any given moment so if the ball moves any great distance, the play 'zooms' into the next section of the field.

Kicking, be it punting, or attempting a field goal or point-after-try, requires you to time the kick properly. Misjudge and you will top the ball horribly.

Don't forget to watch the clock either. You have three timeouts each half, and it is essential to know when the clock will stop automatically, or you have to do it yourself.

The animation of the characters is excellent and unusual in American Football games. All twenty-two players are shown. The choices presented to you together with the tactics chosen by the computer ensures a wide open free flowing game. The result is both extremely playable and highly addictive. Even if you don't understand all the formation names and what the players are attempting to do (a few more diagrams in the instructions would have helped here) you will soon get a feel for the action and it won't be long before you are calling the plays like an old pro. Very highly recommended.

G. B. H.

Footballer

Name: 4th and Inches. Supplier: US Gold/Accolade, Units 2/1 Hatfield Way, Hatfield, Birmingham 10 7AL. Tel: 0757 736 108. Price: £9.99 (12) / £4.99 (6pk).

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WINDOWS



THE FINAL CARTRIDGE III

The high-resolution bit mapped windows are selected from a menu bar. An unlimited number of windows can be open on the screen at the time. The windows can be freely moved on the screen.

The following windows are already implemented in ROM:

PERFORMANCE WINDOW

Select mouse port, joystick port, mouse speed, screen colour, pointer colour, keyboard stick, keyboard repeat.

CALCULATOR

Complete calculator of a LCD-calculator (input either with mouse, joystick or keyboard). The numeric keypad of the C188 can be used in O44 mode.

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Easy to use wordprocessor with proportional characters enables you to store and print text notes, letters, etc.

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Enables you to open directories from different disks and drives, sort and print directories.

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List, Run, Rename, Write, Search, Install and format disks.

TAPE WINDOW

Activates fast and normal modes.

PRINTED WINDOWS

Select different printers, such as Commodore serial, Commodore, RS 102, Colour printers.

REQUESTED WINDOWS

DISK BASED OTHER WINDOWS

CLICK

Real Time Clock, with Alarm.



Final
series

Final
User
And
down
What
Game
"The
is de
want
out I

CM

Point to Point

Bit-mapped screens are difficult to handle but the resolution starts here

The high resolution screen on the C64 is enough to drive anyone dizzy. After working out where the switched thing can be used you then meet the problem of how to draw a straight line. After several hours of grappling with graphic dots most people throw up their hands in horror, head for the nearest hospital and get thoroughly pixelated.

One myth that we'll explore straight away is the high resolution machine. Even Commodore prefer to call the high resolution mode by its alternative name of bit-mapped graphics because the resolution is no higher than you get by employing our default graphics. The bit-map screen is really 1000 1000 characters which completely fill the screen. If actual UDUs were used there would only be 250 characters, about a quarter of a screenshot, but the number of pixels per square inch would be exactly the same. Despite this, the lines label has made and a mode by any other name will surely as well.

Bit-mapping is rarely used by programmers because it has the reputation for using up large tracts of memory and its peculiar arrangement makes programming difficult.

A single bit-map occupies 8Kb of memory for the pixel requirements and a further 1000 bytes for the colour information. Fortunately, it is possible to access the RAM which lies under the ROMs at 40960 to 40120 and 57344 to 55315. Using the latter area is best because Basic memory can be left intact.

To reconfigure the memory so that the VIC takes all of its information from this part of memory Bank 4 must be selected and then location 53272 can be modified to organise the locations of the colour map and the visible pixel screen.

Bank Transactions

Pixel screen placement is very limited - it can either fill the top or the bottom 8Kb of the 16Kb bank. The position is selected by bit 3 of location 53272. If this bit is set, the pixel screen is at the top and a zero value is at the bottom end.

The colour map has to be placed where the pixel map isn't! When bit 3 is set the colour map can be positioned at one of eight locations in the lower part of the bank or in the eight positions at the top of the bank when bit 3 is zero. See Tables 1 and 2 for the possible locations and byte values.

In our case, the bank covers the locations from 49532 to the top of memory but an area to be avoided is 53248 to 53243, unless you're curious to see what a system crash looks like. This leaves two areas, one of 8Kb and another of 8Kb. It stands to reason that the pixel screen is going to be stored in the 8Kb block from 57344 to 55315, where the colour memory goes is purely arbitrary within the bounds of 49532 and 53247, any 1000 bytes will do so we'll use those starting at 53224. This means that sprite definitions 0 to 47 can be stored in from 48132 onwards. The sprite pointers start at 53240.

The colour map controls two aspects of the screen colours. The high nybble is used to define the foreground and the lower four bits define the background. For example, if the screen is filled with byte values of 110, the binary equivalent is 01 0011 010. Splitting this into two nybbles gives

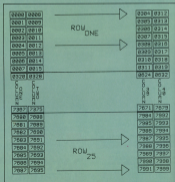
```
0110 = 6
1110 = 14
```

The result is the standard C64 screen library of a light blue foreground on a dark blue background.

In the listing section there is a machine code program, Hi-res Setup, which sets the memory configuration and clears the colour map and pixel screen.

Screen Layout

Hi-res mode is entered by: POKE 53265, PEEK(53265) OR 32 To return to standard mode the command is: POKE 53266, PEEK(53266) AND 223



In hi-res mode each byte in the graphics row corresponds to eight pixels on the screen but the top line of the screen does not run along its consecutive bytes (0, 1, 2, 3, etc) but in increments of 8 (0, 8, 16, 24, etc). The second line follows a similar sequence (1, 9, 17, 25, etc). This may seem strange but remember what I said at the beginning: the hi-res screen is really 1600 UDG characters. A character is an 8x8 pixel block so the hi-res screen byte sequence goes down eight bytes, back to the screen top, across one byte and then down eight bytes again. This is shown in Diagram 1.

This shows that programming is no simple matter. A straight line along the top of the screen would poke a value of 255 into byte 0, then into byte 8 and move on by jumps of eight until byte 342 is reached. If this is difficult to consider the problems that diagonal lines pose?

What is needed is a system which allows a pixel position to be described by X and Y co-ordinates. This means that the pixel is found by counting across X pixels and down Y pixels. The steps in the horizontal, or X, direction is 500 (0 to 500) and in the Y direction is 200 pixels (0 to 599). The co-ordinates are written (X,Y) so the top left pixel is (0,0), its neighbour is (1,0) and the bottom, left pixel is (519,599).

The way in which this is translated into actual screen bit positions is calculated in the following way. We firstly need to find out which character holds the pixel. There are eight bytes per character column so the column in which the pixel lies is given by:
 $COLUMN = INT(X/8)$
 Similarly the row is calculated by:
 $ROW = INT(Y/8)$

To check this we'll use co-ordinates (119,5). The column is $INT(119/8)$ or 14 and the row calculation gives 0. This means the pixel lies somewhere in the extreme right hand character on the second screen row - remember that the columns are numbered 0 to 59 and that the rows run from 0 to 24.

To find which of the character's bytes holds the bit we must not only have to concentrate on the low right bit of the co-ordinate value. There are eight bytes numbered 0 to 7 so the byte value is given by:

$BYTE = Y AND 7$

To finally pinpoint the bit is not so easy. There are eight bits so applying X

AND 7 would render a value but the numbering of the bits would have to run from left to right for this value to be correct. Unfortunately, the numbers run from right to left so the bit equation becomes:

$BIT = 7 - (X AND 7)$

The actual byte on the pixel screen, which starts at a numerical location which we'll call BASE, is calculated by:

$LOC = BASE + ROW * 8 + COLUMN * 8 + BYTE$

To mark on the pixel we use:

$POKE LOC, PEEK (LOC) OR 2 ^ BIT$

This all means quite a lot of calculations and it takes its toll on processor time. Hi-res basic routines are slow and cumbersome. Hi-res routines are even worse, which is one of the reasons why we won't be looking at them here.

Sketching Form

One of the problems of using this area of memory is that although data can be poked to the screen it cannot be read back again without switching out the ROM. A short machine code and basic routine will do this.

The Hi-res Demo listing shows how the screen can be used. After setting up and clearing the memory, the program proper is entered at line 1000. The actual equation used for drawing the line is $Y = mX$, where m is calculated by $(Y2-Y1)/(X2-X1)$ but if $Y2-Y1$ is zero the line is a horizontal bar and if $X2-X1$ is zero the line is vertical.

A trap routine is included to prevent Y or X from exceeding the screen boundaries otherwise a computer crash could result. The formulae for calculating the bit positions are then applied but, before the final bit is poked into place, the Kernel ROM has to be switched out. To do this the machine code routine must know where to look for the byte under the ROM. To this end, the high and low byte of the location are derived from variable LOC and poked in reverse order to 290 and 291. During the SYS call the poked value is stored and, on returning to basic control, this location is poked, bit modified and then poked back under the ROM.

The lines numbered in the 1000

range can be modified to draw many different shapes. A few suggestions are listed underneath the main program - substitute those lines and as a final project you could start to write your own drawing program using sprites and joystick control.

The only thing which can go wrong will show up if you press RUN/STOP and RESTORE. The rest that follows poses a table of Kernel jump locations under the ROM causing the corruption of four of the lines character squares. It would be possible to write an interrupt driven program to store the 32 bytes from location 6400 elsewhere in memory so that they can be recovered if necessary.

Hi-res programming is a challenge which falls into a programmer's. A knowledge of maths is essential but even this is not enough to create efficient routines. Algorithms with strange-sounding names (Bresenham's line, Bresenham's approximation) tend to name that they have been derived to take advantage of the computer's pixel matrix. Many of these routines have later been applied to sprite movement through calculator rather than under direct control. What happens on the home screen can often be adapted for use elsewhere. This made it a great teacher but a hard master. ☐

TABLE 1 - High memory colour map locations.

| Byte Value | Pixel map position | Map offset to add to bank base |
|------------|--------------------|--------------------------------|
| 9 | HIGH | 0 |
| 25 | HIGH | 1024 |
| 41 | HIGH | 2048 |
| 57 | HIGH | 3072 |
| 73 | HIGH | 4096 |
| 89 | HIGH | 5120 |
| 105 | HIGH | 6144 |
| 121 | HIGH | 7168 |
| 137 | LOW | 8192 |
| 143 | LOW | 9216 |
| 161 | LOW | 10240 |
| 177 | LOW | 11264 |
| 193 | LOW | 12288 |
| 209 | LOW | 13312 |
| 225 | LOW | 14336 |
| 241 | LOW | 15360 |

TABLE 2 - Bank Addresses

| Bank Number | Base Address | End Address |
|-------------|--------------|-------------|
| 0 | 0 | 65535 |
| 1 | 16384 | 32767 |
| 2 | 32768 | 49151 |
| 3 | 49152 | 65535 |

May I Interrupt?

Exciting game effects can be created with the help of interrupts and smooth scrolling

By Norman Doyle

If you want to learn how the professionals create perspective scrolling effects you have to understand two basic concepts. These are smooth scrolling and interlink interrupts.

If you've ever watched a scrolling Spectrum game, you'll have noticed the jerky movements of the background. The same is often true of the Amstrad CPC's, so why is the C64 different? The answer lies in the fact that the whole C64 screen can be moved a whole character to the right of its normal position. This is done in eight small steps, each of which corresponds to the distance between adjacent pixels. You may have heard this referred to as a *hardware scroll*.

Try the following demonstration:

```
10 FOR A=1 TO 1POKE$1270,
  PEEK$(248+*A)
20 FOR B=0 TO 255:NEXT B
30 FOR A=6 TO 0 STEP-1:POKE
  $1270, PEEK$(3270 AND 248+*A)
40 FOR B=0 TO 255:NEXT B
50 GOTO 10
```

A scroll based purely on this would hardly be stunning but consider one character in the lower corner of the screen. Assume that the screen is

scrolling to the right. After narrowing the screen down to 38 columns, the character scrolls eight pixels to the right (similar to program line 30):

Step one

Then the screen jumps straight back to the original position (value 0). In the remaining of a microsecond the character is poked to the column to the right of its original position. This gives the impression that it has glided but by fit into its new position, just like a spirit moving across the screen.

Step two

Then the procedure repeats but this time the character finished in the third column position. Once the character reaches the end column it is poked back across into the first column again.

For a demonstration of this phenomenon try the Character Scroll listing in the back pages of this issue.

You'll notice that the whole screen moved to the left, making this suitable for moving the ' scenery' about only. The whole screen is moved bitwise for eight pixels... no problem. Thus on each row the characters have to be moved one position to the right and the last character has to be moved to

the first column. This would give a wraparound effect.

This requires over 250 actions per line (at the microprocessor at about 2000 actions per screen). Each action averages four or five cycles of the clock which surpasses the interrupt period.

There is a maximum of three interrupts which can be chained so that it seems that actions occur simultaneously. This makes it possible to scroll the whole screen but even then care has to be taken.

Most games require a scoreboard of some kind, so the example I have given allows for this and makes scrolling easier.

Splitting Images

In normal operation the scoreboard would keep jumping back and forth in sympathy with the changes in location \$1270 (\$1281). This can be prevented by splitting the screen.

Imagine that the screen is split at line 20. For a fraction of a second the screen is locked in position with a zero value in the lower three bits of location \$1270. This allows a stationary image to be scanned onto the screen. When the first 20 rows of characters have been 'printed' to the screen the second

interrupt runs a routine which scrolls the picture according to a value rising from zero to seven. This value is updated with each call to this interrupt and transferred from its storage location to \$1270. At the start of the top of the screen interrupt this is changed back to zero for the stationary screen.

Diagram 2

All this happens so quickly that the screen appears to scroll in the bottom portion only, the top holds steady. A trick of the eye as well as electronic magic.

There's no reason why you can't change colours too. Last time we saw how interrupts could change borders and character sets to ones from on the same screen, this time we can break the rule that states that all multi-coloured characters have to have three colours in common (including the background colour) and one which can be varied. Now all of the colours can change within the area of the screen split!

The Status Quo

All you have to remember is that anything you change in one interrupt

has to be reset in the next. The status quo must be maintained if order is to prevail.

This is also true when returning to the main, non-interrupt linked, routine. Remember this and your half way to mastery of the screen. Also remember that the screen is scanned from left to right and top to bottom so vertical splits are out of the question which way you scroll the screen.

Stretching these rules further, it is possible to add another interrupt to the screen, giving three distinct bands. One of these is stationary, one scrolls slowly and the third scrolls quickly. This gives a perspective effect if the characters used make the stationary screen the moon and stars, the middle split the far perspective and the third split the foreground. *Pipeman* may seem like a long listing but it contains the necessary routines to show one of these pseudo 3D landscapes.

Once you have typed in the program, look at the moon. This is created by adding sprites to a character representation of the moon. The sprites form the bottom half of the screen in the second split and give a

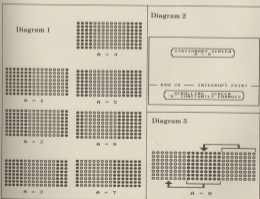
colours effect of the moon passing behind the mountain range. This makes the reality of the existence of split and such trickery in the key to good programming.

Pipeman is well annotated and direction of the interrupt routines will give a clue as to what is happening on the screen.

Changing Direction

Scrolls don't have to occur in one direction. Splits can be used to scroll sections of the screen in opposite directions, at right angles to one another or even combine the vertical and lateral movements to allow multidirectional scrolling. Vertical scrolls are controlled by the lower three bits of location \$1265 (\$DM1), so you might like to play around with this and see what happens.

When you add sprite control with four optional interrupts a realistic left and right scrolling effect can be created. *Footlocker* will be the subject of the next article, so until then enjoy playing with screen splits and scrolls without interruption.



First Steps

We move in on the computer addicts

By Norman Doyle



“Addicts are mad. I don't do computing regularly. I can control it.” The same jumpy forward a few months to show an unshaven, disheveled figure crouched over a keyboard. Piggy, bloodshot eyes peep out from under a shock of disheveled hair — the video junk is manifesting on his skeletal frame.

Over the top maybe, but there's more to computers than meets the eye.

I remember my first computer with great affection. In fact, I spent so much time with it that my girlfriend went off with somebody else and I hastily noticed! Computer addiction can damage more than your love life, however. Studies are currently being carried out in this country and the USA to draw up guidelines for people who use computers frequently. The critics may scoff and say that many people spend as long watching broadcast programmes on their television but such outbreaks only show the ignorance of the speaker. OK, I admit that a lot of time can be spent watching the box but consider the difference of television with computer watching.

When have you seen someone only a matter of a yard or less from the screen? Who does anyone watch so intently that they can't look away for a moment. The answer to both of these is when they are playing a computer game or programming. Some people may occasionally get so wrapped up in a TV show that they watch just as intently but this is for a relatively short period — some computer users do it for hours. All the time you're watching, the screen throws all manner of electromagnetic radiation and charged particles at you. What this accumulative effect may be is not yet known, but I'm sure it can't be healthy.

Of greater concern are the physical and mental effects that computers certainly do induce. Eye strain, headaches and in extreme cases, crippling pains in the hands have all been attributed to prolonged computer exposure.

What can be done to avoid these risks? Obviously, limit the time you spend glued to the monitor. When you turn it on, decide how long you intend to use it for and adhere to your time limit. A couple of hours is quite long enough. You can then go and have a coffee, read a book or the detrimental effects of caffeine, get some fresh air. In fact, do anything but computing. You can go back later if you must, but remember you run the risk of the digital equivalent of numbness if you sit there too long!

Not everyone is prone to the hazards of computing but ask yourself, “Is it worth the risk?”

Lively Motion

How can I be so gloomy on a day in Spring, the time of the year when a young man's fancy lightly turns to thoughts of programming.

Nonsensical is the noble art of computing may be wondering what computer art is all about. How does it all work? Well, the computer screen is made up of tiny dots of light, called pixels (picture cells). By giving a different colour to groups of pixels letters, words, a whole new world can be created. Even movement can be simulated. Nothing actually moves on the screen, it only appears to — the famous goldfish bowl strikes again!

Movement is achieved by switching pixels on and off in sequence, just like the light tubes freewheeling the big-boy jack's disco box. As one light goes out another comes on and it appears that the first light has jumped from A to B.

To get some idea of this try the following program:

```
10 A$="HOME, BRIGHT"
20 PRINT "CLR,SW":
30 FOR A=1 TO 99
40 PRINT LEFT$(A$,"SW"):
50 FOR B=1 TO 12
60 NEXT B
70 GOTO 30
```

Analysis of the routine shows that the screen is cleared and a ball is printed in the first column. Next a space is printed over the ball erasing it and another ball is printed in the next column. After a short pause, the program picks up the first row left most characters of AS which causes the space to be printed over the ball again and another ball appears in the third column. This continues until the ball is printed in the last column and then the cycle starts again from the left.




Each time the ball is printed it is a different ball which is identical to the last ball. In other words the ball doesn't move it only appears to. In games where a little character walks across the screen, inspection of the memory will show that there are several little men, each displaying a different phase of taking a step. Showing these separate characters in quick succession gives the illusion of movement, just like a Mickey Mouse cartoon. Even the terminology is taken from the cartoon world, each character is called a 'frame of animation'.

Frame of Last

The more frames that are included to describe the movement, the more realistic the movement becomes but the time taken to display the range of animations makes the action slip into very detailed slow motion. This would make a game very boring so most animation sequences are kept down to about four frames which repeat over and over again.

For an excellent example of animation buy, beg or borrow a copy of US Gold's Impossible Mission. It's been around a long time and is now available on a budget priced compilation. Despite its age, it's an excellent example of the art of games' programming.

Enjoy whatever it is that you do with your computer but, hey, let's be careful out there! ☺

Character Grabber

Grab character sets from other programs and save them to disk or tape for later editing with a character editor (such as CodeM4 from *Your Commodore May 1977*). Character sets can be saved from anywhere within the memory with the exception of the BK of RAM under the Kernel ROM.

Typing it in

Character Grabber is in the form of a BASIC loader, which should be typed in and saved before running it. When typing it in, cassette users should remember to make the appropriate changes. Now, type NEW and enter in direct mode:

POKE 8142:POKE 44,31:NEW

Now load and run the program that was previously saved. This will generate and save a new program name called "CHAR GRABBER" to disk (or tape). The loader is no longer required.

Using the Program

First of all, load the program with the characters you want to grab and run the machine with a reset switch or cartridge with a built-in reset switch. Now load Character Grabber with LOAD "CHAR GRABBER",A and activate it with SYS 4096.

Steal character sets from other programs with this handy C64 utility

By Andrew Leader



You will be presented with a screen split into two parts. The top half of the screen shows the current character set as 8 lines of 32 characters, therefore showing the full 256 characters of the set. The bottom half of the screen shows the video bank and character set numbers and instructions on use of the program.

The function keys (F1, F2, F3 and

F7) are used to change the video bank number (0, 1, 2 or 3) and the '+' and '-' keys change the set number (0 to 7) within that bank. These keys are used to scan through the memory for the required character set.

Note: Sets 0 and 1 are not available in Bank 0 because they are used by zero page, screen memory and the program itself. Also, Set 2 in Bank 0 is partially used by the program also. However, this is not a disadvantage as most sets are usually stored in Banks 1 and 2.

When the required set is selected and on the screen, press 'N' to save it. You will be prompted for the filename and the storage medium (tape or disk). All saved character sets will re-load at addresses 2048 through to 4096. Therefore the load address will need to be changed if it is to re-load at a different address. (There is a program on the 1541 demo disk which will do this so will many disk utilities.)

To exit the program, press SHEET and X or alternatively RUN/STOP and RESTORE. Type 315 4096 to start.

See listings on page 98



Project Stealth Fighter



If this had been released a year or so earlier, it might have been the first computer game to cause a stir in the US Congress. Project Stealth Fighter is a combat flight simulator based on the F-19 "Stealthfighter", the ultra-invisible warplane of which the Pentagon denies any knowledge, but which the whole world knows about - you can even buy a plastic scale-model kit of it.

In many ways this is an update of Microprose's earlier flightgames, F-15 Strike Eagle, but with the accent on stealth and electronic warfare. The F-19, apparently known to pilots as "The Pranker" is a strange-looking animal, more like a flying saucer than a conventional jet fighter. The idea is to avoid reflecting back enemy radar beams, which the spiky bits an regular jet fighters do. The penalty is an overall reduction in flight performance.

As a result, this package is more complementary to Strike Eagle, rather than supplanting it. The emphasis is on subtly getting into enemy territory, performing your mission, whether this is the interception of an enemy aircraft or a ground strike, and getting out again, while alerting the enemy defenses as little as possible.

Like the earlier flightgames, PSF features three-dimensional wireframe graphics, however it applies those to ground features, not just to hostile planes. This definitely ups the realism quotient and the excitement, as does the fact that you actually have to land your aircraft at a friendly base, in F-15 Strike Eagle, you were safely home if you simply overflew your base base.

PSF also offers a variety expanded range of weapons options (reviewing this game also starts to sound like an arms dealer - we are definitely talking about an enhanced- lethality combat scenario here). You get to try with two different types of A/A missiles, infra-red homing Sidewinders and radar-guided AMRAAMs, plus an extensive range of air-to-ground missiles, just about anything non-nuclear is here.

Targets are either in the air or on the ground in four basic scenarios. The first one involves making life hell for the poor old Libyans, the next involves sipping the "mudabe" beans one the Persian Gulf (and the last two, the hardest, are over

Soviet territory. Various levels of difficulty are available, and you can always turn down one of the randomly chosen missions, if it looks bad to you.

Medals and/or promotions are awarded depending on results. This is where I found the game a little dull, compared with its predecessor. It awards most of the points for destroying the target, being undetected (flying slow and avoiding enemy radars) and getting back safely. As a result, the incentive to indulge in lengthy dogfights, which were the bits I enjoyed most in F-15 Strike Eagle seems much reduced, particularly as there isn't a lot of fuel margin left after you've subtracted everything needed to get to the target and back, and the F-19's flight performance isn't particularly wonderful compared with a Mig-29 Fulcrum.

Still, there's scope for a lot of adrenalinic action here - the run in over a ground target can be particularly hairy - with Migs and SAMs blazing in from all directions, it's very easy to fly into the ground while trying to activate your infrared and radar jammer and fire off decoys, let alone hit the target.

A nice touch too is the keyboard overlay, which can be configured to fit either the C64 or C128. Admittedly without it the game would be impossible, so many controls have been added. The documentation is excellent too, with a 115-page manual and a full set of mission maps.

Microprose, possibly sensitive to criticism of the company's somewhat Byzantine name, has included a disclaimer in the package. It seems that the company really has nothing against anyone Islamic or Russian at all. If that's so, folks, let's see you do a Mig simulation, with scenarios varying from Angola to Cambodia. Or how about a blind guidance mission over Afghanistan?

Politeny apart, this is a compulsive game, and one I played into the small hours. I'm not sure I'd swap my copy of F-15 Strike Eagle for it, though.

E.F.

Touchline:

Name: Project Stealth Fighter, **Supplier:** Microprose Software Ltd, 2 Market Place, Tisbury, Gloucestershire GL8 8DA. Tel: 0668 34236. **Price:** £14.95 (C64) £19.95 (C128).

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Amiga News

Find out what's been happening in the Amiga world

By Anne Owen

FACC II - Floppy Disk Accelerator

Sometimes when the Workbench Navigator is asking the rhetorical question "Are You there fonts?" I am amused. Sometimes I wonder why the Amiga, a Porsche in every other respect, has a two-stroke under the bonnet in those grinding 3.5" drives. The new drives should be fast enough and I.J. Kulkstart has improved access times greatly. But you might like to look at FACC II if those tears still pop up to the drumming of frustrated fingers.

FACC II comes, via the Amiga Centre Scotland, from ASDG (may be type that one), an American outfit with a background in Amiga utilities.

The Floppy Disk Accelerator relies on clever software to get as much information into memory as possible,

thus decreasing access to the disk surfaces. The memory assigned is known as a buffer and the technique is disk caching. AmigaDOS has its own add Buffers command but FACC treats buffers as a common pool, while Add Buffers assigns buffers to a specific drive. FACC, ASDG claims, will also search 2048 in the same time as Add Buffers will just 16.

Because FACC II supports Fast Memory, the more add-on memory you have, the better the improvement in performance. (Add-on memory is always Fast Memory.) It also clears buffers intelligently so that applications don't crash.

To install FACC II is suggested that FACC III and LIBASDG are copied to your usual work disk. If this

is an ASB Workbench then there isn't enough space. You will certainly have to get rid of the demos drawer and perhaps the utilities drawer to make room.

FACC II can be accessed from the CLI or Workbench (slightly restricted form). The former is via Satisfaction, the latter via Facetool. These tools allow the number of buffers to be changed.

Also on the disk and one for your System drawer is Sysmon, an unrelated program which displays behind the scenes data such as RAM used and processes in action.

ASDG have gone for disk based documentation and very good it is with user and programmer manuals in their appropriate drawers. Full details are given on installing FACC II with example command lines and startup sequence text. There is also a demonstration.

The speeding up to Amiga disk access can be nothing but good and I experienced no problems with the programs I used while FACC II was installed. A simple benchmark of the extra speed was the opening in sequence of all the drawers on my Gemini disk. Each window has a number of icons to display and the time taken was halved with FACC II installed.

Footnote:

Name: FACC II. Price: £24.99 inclusive. Machine: Amiga. Supplier: Amiga Centre Scotland, 4 West Street Lane, Edinburgh, EH3 3RN. Tel 011-557 4141.



K-Spread3

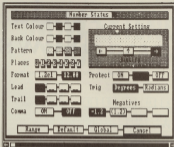
Yet another spreadsheet for the Amiga, this time from English software company Kama. K-Spread3 was one of the first programs available for the Atari ST and it's the first British spreadsheet for the Amiga. It is released in the wake of *Analyst* and *Maniplan* from the USA.

Cheaper of the three at £79.00, K-Spread3 lacks some of the advanced facilities of its rivals, notably the programming languages. However K-Spread3 does use the *Intuition* (WIMP) interface, provides block move and copy, table lookup facilities and macros.

Kama's claim that K-Spread3 is easy to use and will take only brief training before full use can be made of it as a valid one. K-Spread3 however is a little unusual in its presentation with one window for entering data and manipulating functions and one window for the sheet itself. The latter can be resized or scrolled. Each window has a separate set of pull-down menus which become active when the window is selected.

K-Spread3 also provides business graphics in line, horizontal/vertical clustered bar and horizontal/vertical stacked bar charts.

Printer support is ingeniously



James Dwyer

simple with codes entered in spreadsheet boxes. These can be EBCDIC codes or ANSI codes ready for translation for the printer currently selected in Preferences.

An interesting design but there's tough opposition in the more comprehensive *Maniplan* and

Analyst, now bundled with *Scribble!* and *Organise!* as *Works*, itself being sold as a small business package with the A500.

Footnote:

Kama Computers Ltd, Pangbourne, Berkshire. Tel 03337 4333.

Demonstrator

This original package from Meridian Software allows you to record, edit and replay sequences of commands or "happenings". Demonstrator can be used from the CLI or the Workbench, in which it uses the "info" firm tool types to set parameters. It can record key strokes and mouse moves and recordings can be made to loop continuously.

There are " terse" and "verbose" modes of recording. On playback, the former completes a sequence in rapid jumps while the latter shows the complete sequence of actions and is used for "demonstrating" applications.

A trade mark of Meridian is the heavy control of their programs. Amiga key plus function keys are utilized in Demonstrator to start, pause and end record or playback. A status window can be displayed. Default files, which start Demonstrator with certain parameters such as speed, lock-out keyboard

control, update frequency and status display on/off, can be edited.

DemoPlayer is an invisible "task" activated from the Workbench or run from CLI which activates events by reading from a recorded file. One thing that has to be noted is that DemoPlayer knows nothing about its current environment or must always start from an identical position as playback as when the file was recorded.

A recording engineer in any field needs editing facilities. Demonstrator records a series of events into an event file. Two utilities, DemoReport and DemoCompile convert this file between event data and ASCII and back again. While in ASCII form you may use any text editor (ED for instance) to make changes and any key codes are included in the manual.

There are macros for events and special event commands which allow you to structure a playback and to add

text in windows on the screen (ideal for a tutorial program) and also to run CLI commands e.g. RUN SAY "Welcome to Your Amiga".

Meridian's Demonstrator manual is clear enough with all the required information on one page and without too much cross-referencing. The obvious applications of Demonstrator are for initial training in database or spreadsheet work and for demonstrations by those selling Amiga software. Demonstrator can also be used for (restricted) educational materials. An original piece of software looking for somewhere to go.

Footnote:

Name: Demonstrator. Supplier: Meridian Software, P.O. Box 380408, Houston, TX 77289-0408. Tel (713) 488 7144 (US). Machine: Amiga. Price \$49.00.

Originality: 9/10. Usability: 7/10. Documentation: 7/10. Value: 7/10.

AmiExpo Show Report

DESKTOP VIDEO

As this AmiExpo the proliferation of programs for manipulating moving video images leaves no doubt that although the Mac got a jump on desktop publishing, the Amiga is setting the standards in hardware and software for the world to come in desktop video. The NewTek Video Toaster is actually here. "Real time, full colour digitizing, real time digital colour effects, and a broadcast quality preview all in one system". Even more add-ons are promised. Soon there will be a chroma-key video switcher and an NTSC (US) game program. There was no estimate of when the PAL version of this beauty will be released, but did you know DigPaint by NewTek is out in a PAL version?

Digital Creations showed its new

Superjet Contact and overlay device. A-Squared continued to astonish with its LIVE! real time video frame grabber. Brown and Wagh is now selling TYPIENT and other Xerox products such as the showtime TV Show for IFF pictures using both NTSC and PAL video standards.

MicroIllusions continues to release modems in its Photon series. Photon Video is to be a complete video animation system. The demo of a Norwegian galloping in a loop was smooth indeed. It was Photon Paint, however, which amazed me with its beyond DigPaint features in H.A.M. Seventeen year old Oren Pelt from Tel Aviv is the designer, who was eager to get out to Disney Land since it was his first visit to the States!

Our intrepid Stateside reporter takes us through the recent Amiga show in California

By Lewis Tiley

DESKTOP PUBLISHING AND WORDPROCESSORS

The new breakthroughs in Amiga software may well increase IBM and APPLE to send destruction aimed at the Amiga's competition in desktop publishing programs. We now have two distinct classes of publishing programs. Amiga's seminars identified the distinctions well. There was "Desktop publishing-Entry Level" which featured Screen Wagh with an updated Publisher 1800 renamed Publisher Plus. It no longer uses a dangle, and it has added to its document capabilities the most important new feature for smooth printing - PostScript laser support! Brown-Wagh Publishing distributes it. Look out for a new wordprocessor from them called EXCELLENCE. Steve Wagh says that it will rival WordPerfect in its smoothness.

Brown-Wagh has suddenly metamorphosed as a top distributor of excellent software. Their "publishing partners" now include Minto-Systems, Northern Software Group, SoftWood Co. and Xerox Group. They also will be handling PAR Software in the future. Jim Hill with PAR

demonstrated a new Paint program which is also a new text program, too. Called EXPRESS PAINT, it features unlimited font use, imports text from most wordprocessors and has a maximum "canvas width up to 8192 pixels" and a smooth vertical scroll limited only by memory. WOW! I hope to be reviewing this new paint/write disk soon.

Jim Bayless of New Horizons Software showed his ProWrite which holds its own as a multi-font colour graphics word processor and FLOW which is an idea processor that almost reads your mind. Gold Disk's PagePrinter and LaserScript, which has set the standard for Amiga publishing, can also be classified at this level. With each power, why were these fine desktop publishing disks called "entry level"?

The answer lies in Amiga publishing software's third generation. The seminar on "Professional Desktop Publishing" told us why. There shall soon be a battle of the giants as Gold Disk with its Professional Page comes head to head and foot to foot against Soft Logic's Publishing Partner Professional. Both are what Amiga has needed to be taken seriously in a competitor.

Both put out PostScript files as early as the IBM and the Mac can. This means that the Amiga has finally earned professional and may be used with standard laser printers, including Apple's LaserWriter. Screen Tool always can bring you exciting information about these near equals in the ALDUS Page Maker and Ventura Publisher.

Who knows, maybe Aldus and Ventura will port over to the Amiga like Wordperfect has done with its total wordprocessing program which is a professional printing program in itself. They announced a new collection of desktop programs for the Amiga called Library. It consists of a file called Notebook, a Calendar, Calculator, File Manager for creating directories and a Program Editor. WordPerfect, incidentally, runs the best telephone backup-service for their users which I have ever used. A small bug in an early version of WordPerfect elicited a call to them from me. Not only was my question answered by a special Amiga adviser (they have separate people for IBM and Apple), but I was sent a complete set of update disks the next day at no charge! If only other software houses would adopt such practices.

MUSIC

Music-X from MicroMusicians is represented as a "state of the art professional music software". The integration with mounted keyboards and MIDI interfaces certainly demonstrated the validity of the claim. D&B, T's line of Music Software is now committed to the Amiga as well as the Mac and AtariST. Their RCS T1.6 is now available with essentially the same features on all three. Only serious musicians should investigate this rapidly growing product of "serious software for the thinking musician" for they truly live up to their motto.

Ami Expo

STILL IMAGING

AmiExpo offered an opportunity to view two of the leading contenders in 3D programs - AEGIS' intensive Videospace 3D and Byte by Byte Scripts 3D/Animate-3D. It was disappointing that Impulse didn't have their new Silicon ray tracing animation demo there. It would have been most informative to be able to compare these impugned side by side.

New York was very creative about the release date on Digi-Paint. Although a broadcast (there) was in circulation, along with their Video Taster announcement, which described a paint program which would not need preliminary work with DPAINT.H, Mr. Longfellow remained tight lipped. Olfive at an exposition the big exhibitors are overwhelmed so that small companies, the two guys programming and publishing from their garage, escape the notice they deserve. Let this happen in this report, here are some small but very important software packages that you want to investigate. R.G.B. Video Creations provides intensive materials for DPAINT.H, DigiPaint, Cali-

Art 1, Scene 01; Hotel West Bonaventure (with apologies to W. Shakespeare's Julius Caesar)

Thunder and Lightning, Fate, from opposite sides, Antonio Jacobson with his vocal drama, and Lew Tilley.

TILLEY *Sings* more, *Publicize Jacobson*, *Brangle you the large man and the broadest one to this California U.S.A.? Why are you breakbites? And why waste me so?*

JACOBSON *Are you not now'd when all the way of road?*

Shall I like a thing anyone? O Tilley, I have seen tempests when the lightning flash

Have you'd the heavy oak, and I have seen

The ambitious great evil and rage and foam,

To be rank'd with the downy young clouds.

But never till tonight, never till now, Did I go through a tempest dropping fire.

Either there is a civil strife in heaven, Or else the world too must with the gods

grapher and PageSetter. If you require any of these programmes, you need DeLore-Help's notes?

S. Anthony Stadler (two guys, one a programmer the other an artist, have teamed up with A-Squared Disc, Inc. (info handle LIVE) to sell their inexpensive "PostScript text and page layout utilities for Amiga, Apple II and MS-DOS". They offer Laserport Print 1.2, Plot, Laserforms Vol. I and Utilities. These programs enable you to convert almost anything you want to PostScript files which will print on the available Laser printers to give a professional look to your publications. The PRINT program will even do a four colour separation. Write them directly at 889 De Haro St., San Francisco, CA 94103. Tell them Lewis Tilley sent you!

Games? Sure, there was always a crowd lined up along MicroMusicians' wall of four booths, but this was no "game show" type of expo. This was the "over thirty" crowd looking for solutions to their video, design and publication problems. The only post-er mention of games came from a substitute speaker Antonio Jackson from London, who replaced R.J. Mical at the last minute Sunday morning. He gave Definder of the Crown credit for reversing the fortunes

of the Amiga in the UK market. TILLEY *Who, saw you anything more wonderful?*

Jacobson never allowed for he had gathered up the book of old jokes by Joe Miller to read found in America and worried away to a corner of the area inspiring hotel Wayne Bonaventure, where he prepared an unexpected talk last Sunday on the European AMIGA situation.

Tilley, left on his own, descended to the machines of eight thousand eager Amiga fans attending the opening day's display. During that weekend Tilley ran through computer "manicures" during the second AmiExpo held in the U.S. to put it to the Gods sending one of the worst wind and wave storms to hit the Southern California coast in its recent history. Was it mere coincidence that last October's devastating earthquake in California devastating the participants in an all-Commodore show held in Anaheim at the DisneyLand Board?

of the Amiga in the UK market.

Lead-off keynote speaker Jay Mical, acknowledged father of the Amiga in Los Gatos, California, reiterated his history to its development much as he had done previously at the first AmiExpo in New York. It was over the dead bodies of the original financial backers of the small company that he and Mical swammed the great heat and rain of the Amiga into the cheap game machine environment by the developers. He was directed at one time to remove the H.A.M. feature (which now gives the AMIGA 4096 colours on the screen at the same time). H.A.M. was left on only because it would have been more expensive to remove it at that time to date. He expressed regret that "half-bright" has been revealed. He had hidden the feature within the design with secret ideas of future colour expansion for it.

Mical is not only very proud of the Amiga 1000 which bears the pain print of his dog inside its case, but informed us of his final gift to the future Amigas. He says at Los Gatos finished the design of the next generation of video chips which will make possible 1024 x 1024 resolution along with two megabytes of available memory. *Where?*

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Amiga Games

What's new in the Amiga World? Read on!

Ninja Mission

Oh no, I hear you groan, not another Kang Fu/Martial Arts Fighting game! But the nice thing about Ninja Mission is the price. Where some software vendors have been charging full price for their games, Ninja Mission is under £10 – a price more suited to Commodore 64 games.

It's the same old scenario though – you have to enter a building, and systematically kill all the inhabitants, collect a few items and get the hell out. However in this case your opponents are fully trained Ninja fighters – things in the ancient sense of the word) and a special bit at the end of the game (at least I think it is).

Add to this the fact that these fighters also start throwing items and stars (shurikens), and you have a recipe for total mayhem on an Amiga scale.

The nice part is that if you kill an opponent and he is of the throwing star type (sorry I can't think of a better way of putting it) then he will drop his stars, leaving it up to you and his companions to fight over the stars, ending up with a lot of dead bodies.

The game isn't without its faults – some simple programming errors in whereby the dead bodies are piled up in the opposite end of the room when you re-enter it at a later date. Another "fault" is that on some occasions the music and the fighting stops, leaving you to fight with no feedback whatsoever.

Apart from these "bitches" I can say that Ninja Mission is a good game, not brilliant, but good – and definitely something to keep in mind if you are looking for this sort of thing. Otherwise avoid it like the plague. M.B.



Touchline

Name: Ninja Mission. Supplier: Microdeal, 4-10 Post Square, London EC2, Tel: 01-377 5880. Machine: Amiga. Price: £9.95. Originality: 5/10. Graphics: 4/10. Playability: 5/10. Value: 4/10.

Insanity Fight



Microdeal are at it again with an interesting variation on Galaga. In this time, you have to avoid the buildings below your ship, and make sure you don't get hit by missiles fired from cannon bases and a massive destruction ship that comes down from the top of the screen – just what you don't want it to.

The aim of the game is naturally enough, to destroy everything in sight, destroy all of the swirling alien formation flying ships, cover as much terrain as possible, and look after the reserves of energy and firepower whenever possible.

There are a few nice touches, such as the sampled speech and the effective, albeit brief, animated "blink" – but then it less cost stars by 15 seconds of this grinding – oh well, it gives me enough time to snap open a cherry cola!

What makes this game a little different are the various symbols that are dotted over the terrain. Fly over these and you earn a number of different invisibility, more power, transport controls (a nasty one that), and a whole host of other items, some of which are useful, others just a pain in the rear.

After the first level, it becomes clear that this is a game for people with a good memory – or with a map. There is a premise of a screen construction set in the rear but one which doesn't excite me very much (does it you?).

To be honest, there are so many of these games of this genre around already, I don't know why Microdeal bothered releasing Insanity Fight. It is an exceptionally crass shock' em up with very little to offer above that of better versions such as their excellent Goldrunner released a couple of months back.

Sorry Microdeal, you can and have done better than this. M.B.

Touchline

Name: Insanity Fight. Supplier: Microdeal, P.O. Box 68, St. Austin, Cornwall PL23 4YB. Tel: 0736 68020. Machine: Amiga. Price: £9.95. Originality: 3/10. Graphics: 4/10. Playability: 5/10. Value: 3/10.

NR-35



Also software are at it again with a new set of budget releases for the Amiga - but with NR-35 they are clearly out to make value for money games.

There isn't a story with this game (thankfully) and the idea is to shoot anything and everything that flies towards you. The basic story line is similar to a hundred and one other games, but the sprites are wonderfully detailed (as they

should be), the backgrounds scroll past you very smoothly, with some very nicely looking "minisets" that don't do you any good should you come into contact with them.

The sprite animation is probably the finest I have seen in a long time, but what really lets this game down is the time-consuming disk loading between games. I mean is this really necessary? Amiga! A 512K machine reduced to 20 seconds of your cranking between every game?

NR-35 looks nice and more like the Coin Op classic "Salamander" (the deeper you go into the game, the more of freeballs, the formation of aliens, the closer it gets there. In fact the more I go back to NR-35 the better I get at Salamander (hey, I'm not complaining!)

The most amusing thing about NR-35 is the fact that this game is a budget release. There is a lot of game here as well, so the chances are very unlikely that you will play this game from one end to the other. At first though it takes a lot of playing to get even past the first sector, let alone finish all twelve sectors.

At £8.95 for this fast, sideways scrolling shoot 'em up, NR-35 looks to be one of the best value for money games there is for the Amiga. If there was a game of the month for the Amiga, then this would be it! M.B.

Teacher:

Name: NR-35. **Supplier:** Data Software, 15 West Hill, Buryford, Ayr, SA1 2EL. **Tel:** 0522 82311/9. **Marketing:** Image 512K. **Price:** £8.95.

Originality: 6/10. **Graphics:** 8/10. **Playability:** 8/10. **Value:** 7/10.

Roadwarz

This is the first game I have seen for the Amiga from Melbourne House - and with flashy packaging to accompany this game, it is fairly safe to assume they are back with a bang.



The booklet supplied with the game gives some flap trap about a computer going berserk and you, as ever, having to thwart the rogue machine's attempts at killing you!

All this is utterly unnecessary and gets in the way of a smashing game - the graphics are fine, the animation is reminiscent of the good old days of Atari's Pole Position, and the challenge is infernally addictive.

You are a ball (I know it seems hard to imagine it) but inside the ball is a laser gun barrel. It is up to you to shoot out the rogue blocks that make up the walls and sides of the road, thereby stopping the electric fence that will blow you up if you go through the blue arcing without your shields up. In order to fire out the blocks in the wall, you have to lower your shields - sneaky huh?

That is essentially all there is to the game other than the fact that it is very hard to play, and therefore very addictive. There are satellites that zoom up on the sides (occasionally take pot shots at you with their lasers (you had best shoot them out of the sky) and balls that fly towards you - occasionally turning into minisets!

Forget the story line as it is clearly an afterthought. Roadwarz is an addictive game with some good, but unimpressive graphics. It looks pretty much the same on the Atari ST so I think you can see why the graphics aren't being used to the full.

With the occasional "inhabitant" shooting at you from behind, and some simple music, Roadwarz is definitely a winner in my book. M.B.

Teacher:

Name: Roadwarz. **Supplier:** Melbourne House, 6-10 Paul Street, London EC2A 4QR. **Tel:** 01-377 6631. **Marketing:** Amiga 512K. **Price:** £29.95.

Originality: 8/10. **Graphics:** 8/10. **Playability:** 7/10. **Value:** 8/10.

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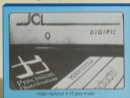


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Ball Raider



Question: If you have some excellent screens (either double or digitized) for the Amiga but wanted to make some money, how would you do it?

The Art of Chess

As is now customary with computer chess packages, the Art of Chess from SPA features every conceivable gimmick when it comes to offering playing options.

The board can be two or three dimensional. You can rotate it to whatever angle you like. The colours of the board can be changed to suit your mood or interior decoration scheme. The shape of the pieces can be changed and you can even introduce your own designs, providing you have a copy of DeluxePaint to produce them. Other features include a voice commentary and an optional performance meter which claims to show who is winning although it only measures material, not position.

The more I use of these gimmicks, the more I wonder how much they are actually necessary or whether they are just there to cover up deficiencies in the playing side of the program. Who actually uses them? Of course, we all play with them when the program is first loaded in, or we are showing it to our friends. But then what? When it actually comes

down to playing a game, I suspect that merely plus per cent of users opt for the clearest image which is the old fashioned 2-D top down view.

When you actually get down to playing the game, the computer's skill level can be set by adjusting the time it thinks for each move. The slider scale ranges from ten seconds to five minutes but you can opt for a rock n roll setting in which the Amiga will think for as long as you want it to.

One nice idea that I had not previously come across was a second slider control that determines how aggressively your opponent plays.

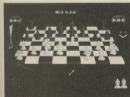
At any stage of the game, you can check on how a given square is being attacked or defended. You can move backwards and forwards through the moves played so far. There is no hint facility as such but you can always swap roles, so what the Amiga does and then swap back again.

Positions can be set up for problem solving or later examination and games can always be saved. Thirty sample games are included on disk for you to examine at your leisure but there is no commentary saying what was special about them, so beginners are not going to get a great deal from them.

Mouse control was not as simple as it should have been; some of the commands were somewhat obscure and the program crashed on me several times.

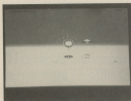
As far as playing strength goes, the Art of Chess, like all similar programs is difficult to assess as my budget does not stretch to two Amigas to play rival programs against each other. Not does the limited disk documentation give any details on the size of its opening library or any indication of an approximate rating at different time levels. From a purely personal point of view, I felt that Christmas 2000 from Software Toolworks offered me a better game and was much the better presented package.

Conclusion:
Name: The Art of Chess. Supplier: SPA, 148 Worcester Place, Oxford OX1 2AR. Tel: 0185 34955. Price: £24.95.
Difficulty: 2/10. Graphics: 6/10. Playability: 6/10. Value: 6/10.



Conclusion:
Name: The Art of Chess. Supplier: SPA, 148 Worcester Place, Oxford OX1 2AR. Tel: 0185 34955. Price: £24.95.
Difficulty: 2/10. Graphics: 6/10. Playability: 6/10. Value: 6/10.

Space Ranger



Around the stately parks and gardens of Great Britain, the theme music for Space Ranger (or "Save the Tuddies" as we call it) is forming just ahead for background for the long winter nights that are slowly drawing to a close. It is another Mastertronic cheapie and is a clever reworking on the old Defender idea, where monsters come down from the sky to steal inhabitants of some unknown world.

The difference is that instead of ships there are monsters; instead of little stick men, there are now animals and creatures, and instead of lots of monsters coming to steal the animals, there is just one "T" shaped adifer that sucks the creatures into itself - rying on the monsters to drag the animals under the space ship.

Your task is to kill all of the monsters but not the animals.

Easy? Don't kid yourself, perhaps I forgot to mention the fact that the space ship and the monsters rotate, throwing switches in, spinning stars, lots (!) and all are extremely well animated. At higher levels, the games become harder with more creatures to rescue, more animals to kill or avoid, and so on.

New features about this game are the scrolling multi-layer backgrounds, the simple and effective music, the great animation, and the Tuddies! I'm sorry, but for me the Tuddies are a vital part of this game, and rescuing them from the nasty baddies gives me cause for concern, after all what would you do if your teddy was whisked away?

Space Ranger is a very good game - not original, but it is one of Mastertronic's latest budget priced games, I think I am willing to overlook the cost. Certainly as it stands, the game could do with some improvements - 30 seconds of disk crunching between levels is beginning to really bug me! A shame as there are no real complaints about this nicely presented game. Heck - I even donated the best part of six shiny tokens while playing the game. A recommendation? I should say so!

My Tuddy agrees.

M.R.

Touchline:

Name: Space Ranger. Supplier: Mastertronic, 8-10 Finsl Street, London EC2. Tel: 01-377 6963. Machine: Amiga. Price: £9.95.

Originality: 8/10. Graphics: 8/10. Playability: 7/10. Value: 8/10. Tuddy Value: 10/10.

Backlash

For once I thought I had found it - the perfect game for the Amiga! In an unassuming tacky box with an equally tacky piece of artwork sporting the name, this game looked to all intents and purposes the prime delight game of the month but upon loading it, Backlash was not over completely.

The game is simple - you are driving very fast across a scrolling terrain. There are occasionally small pyramids to stop you driving in one direction forever.

Now we get to the good stuff! There are silos dotted around, and out of these come all sorts of creatures, flying saucers and the like. They shoot missiles at you and your task (of course) is to dodge them and destroy your opponents.

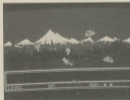
The graphics are excellent. Solid 3D shaped with shadows and very smooth fifteen-minute movements. The explosions are loud (!) as are most of the sound effects, especially the constant drizzle of hissing bombs that you fire bouncing off into the distance if they don't hit anything.

The waves of opponents naturally get nastier as the game progresses. The opponents all change colour to show that you have destroyed one wave, followed by an intermediate wave. Occasionally there is a missile that dodges and serves all attempts at your moving out of the way or blowing it to kingdom come, and it takes skill to shoot it a higher level.

This would have been the perfect shoot 'em up for the Amiga, had there been a little more variety to the game. As it is, the game gets a little repetitive towards level ten and it is a shame that these aim't allow to destroy - as it is, there are about ten different types in all.

If you like to marvel at the excellent programming and the great care and attention to detail New Age have put into this game, and a last example of what the Amiga can do, then probably the game is for you. Fast graphics, loud and dirty sound effects all make for a good game - a few more features and this would have been perfect.

M.R.



Touchline:

Name: Backlash. Supplier: Korogon Software, 142 Avenue Road, Birmingham B13 8NS. Machine: Amiga.

Originality: 8/10. Graphics: 8/10. Playability: 8/10. Value: 7/10.

Emulator —64—

We take a look at the recently updated 64 Emulator - does it really make sense?

By Gordon Hamlett

The general opinion of someone who has recently upgraded from a Commodore 64 to an Amiga, and who is thinking of downgrading again, is that they are living in fantasy land! But the idea is not so stupid as it first sounds. At least Ready Soft Inc. don't think so.

They have just released the 64 Emulator which allows the user to run their old 64 programs on their Amigas. Well, some of them anyway but more of them soon.

What You Get

The key to know the works of the program lies in the serial interface - a cable that connects the parallel port of an Amiga to a 1941, 1571 or similar disk drive. Amiga 1000 users must ensure that they get the right edge connector (it is slightly different from the 500/2000 model). You will also need Kickstart 1.3 and 512K of memory.



What You Can Do

The Emulator allows you to use Amiga disks as well as 64 drives, Standard 5 1/4" disks, hard disks and temporary RAM files can be used. It should be noted that to use RAM requires one megabyte of memory and not all hard drives are compatible. Minus points to Ready Soft Inc. for not saying which ones.

The 1000 5 1/4" disk drive can also be used but you still need a 1541, etc to read the files initially.

Amiga drives may be kept as standard Amiga or toggled to 1541 emulation. Emulation mode restricts the amount of space available on the disk as a standard 1541 disk but is likely to result in higher compatibility. A transfer program is included to help you swap your files over from 5 1/4" to 5 1/8" disks. Either the entire disk or selected files can be copied although the program may not work if the files are copy protected.

Printers and Amiga modems can be selected in the same way as disk drives, but 64 modems such as the 1000 won't work.

All these instructions are easily changed using a pop-up configuration menu and once you have tailored the system to suit your hardware requirements, your customised configuration can be permanently saved.

Occasionally, there will be conflicts when two peripherals require the same port simultaneously, e.g. the Emulator interface and a parallel printer interface. The software will prompt you for the device that is currently required.

Other items that can be changed from the configuration menu include control devices - joysticks, mice, lightpens and paddles. There is a faster monochrome mode if graphics are

unimportant together with an optional improved character set.

What Works

Not every program for the 64 is compatible with the system but by the same token, you wouldn't want to run all your programs this way.

Most utilities will load and run with no trouble at all. Superwrite, GEOS, PaperClip and Printshop are all compatible.

Games however are a different proposition with their fast loaders and extra protection devices. Games that I could load include Infocom's titles and Guild of Thieves from Magnetic Scrolls. I can't really see anyone wanting to try anything other than adventures as arcade games both run still slower (2-3 times) and tend to suffer from some horrible flickering in the graphics, especially when a lot of sprites are shown together. The most recent arcade that I could get to load was Luke Runner which was released a couple of years ago. Modern games from US Guild, Electronic games that I had transferred to disk using a France France cartridge.

Conclusions

So who would find 64 Emulator useful? Certainly not the games played. However, for anyone who has a lot of word processing or data base files and is wondering whether or not to upgrade either software or machine, the 64 Emulator could just help to tip the decision.

Footnote

Name: Emulator 64. Supplier: Robert Ltd, Advertiser Business Complex, 51, John Road, Edwinstown, Middlesex TW7 6AL. Tel: 01-947 4455. Price: 100.00.

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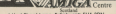
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AiRT



AiRT - a language with a major difference, you don't have to type anything!

By Mary Beardscombe

Learning a new programming language can be a time-consuming task. Initially you have to understand the structure of the language, secondly you have to understand the way the program evolves in memory - are they large or small programs? Do they run fast or slow, and what are their I/O (input/output) commands? How effective a language is it for specialised tasks such as communications or graphics, and how efficient it is for tasks involving the Amiga's (unique) operating system enabling other programs to operate at the same time?

AiRT is an interesting alternative to most of the above problems. It is a general purpose language designed for "popcorn" programming - programs that are designed for one particular use and then discarded. In many respects

BASIC is an ideal programming language for such applications, but on the Amiga is a complex language requiring a lot of "hardlearning" in order to utilize the many new commands Amiga BASIC has to offer.

The difference with AiRT is that it uses pictures. You point at symbols on the screen with a mouse - each symbol represents a function and each function represents a series of commands. There is nothing to type (in fact, of course, no command structures to forget).

Language Similarities

Programmers will often talk about programming structures. What they mean is how a program is stored in memory, how it is arranged so that it

makes logical sense to the programmer and more importantly, how it looks to a programmer just taking over the program. The BASIC programming structure to AiRT is an innovative programming structure called a frame.

Frames are represented on the screen as a square box which are numbered starting from 1 up to 75. Inside each frame are 75 cells, these cells are used to store items that represent different operations - their equivalents can be found in many modern computer languages, such as BASIC, C or Pascal. Instead of having a rigid syntax structure, commands are represented as symbols that can be laid down, one after the other.

Each cell has a "cell map"; this is a way of telling the programmer what is going on, and where each of the items

Continued on page 19

When you have grabbed an image or digitized the picture with a TV camera and DigView, you'll start with two million colours. Yes, two million, two hundred thousand to be exact.

All of these are generated as Raw Data by the hardware/software combination DigView. Overwhelming, isn't it? No need to worry though. For although the Amiga can't display quite that many, even using HAM (Half and Modified), DigView immediately blends the couple of million down to a manageable four thousand and reserves 16 pixels for you: the software displays two graphs under the title Histogram. One is marked Raw Data, it graphs the two million colours. The other graphs Acquired Data or the Mixed down colour.

Here is where the Amiga shows its superiority over what is presently available in MS-DOS or IBM's costing much more. Only with the new CGA and VGA adapters can IBM ever approach the greater colour display of the Amiga. With these adapters they can display 256 colours in the 320x200 resolution mode. With DigView and DigPaint the Amiga uses HAM to show all 4096 colours in the hi-res mode of 320x400.

Without using HAM, the Amiga runs its highest resolution full-screen of 675x444 and using 16 colours (a scalar and slightly less deep than IBM's VGA adapter's 640x480 and 16 colours).

If you wish to display black and white photographs, DigView has a special frame made for doing just that and it is done superbly! You will find it very pleasing, however, to manipulate the photos, snapping heads and bodies of beach swimmers or friends. (This may be dangerous to your health!)

Why not wait all the time in DigPaint with these 4096 colours at your disposal? To be perfectly frank, the painting tools of DigPaint are better suited to a final manipulation and touch-up of your image. It does much that DPaintII cannot do. It acts like a magic colour glazing brush, adding a little colour here, glazing down a colour which is too bright there...even merging and mixing objects and shapes between two pictures.

Continued on page 23



The I.M.P. is out of the bottle

In this follow-up article we look at the IFF system as the basis for smooth integration between DigView, DPaintII and DigPaint

By Lewis Tilley



are. Naturally there is a "frame map" too. The map shows a grid of the 15 possible frames - the ones being used are highlighted. To use a new frame, you point the mouse at an empty frame and press the mouse button.

The cell map is divided into 29 squares and displays co-ordinate pairs X-Y and columns A to Y. The frame map works in exactly the same way as the cell map, and, as you may imagine, it can store quite a sizeable program (nearly 3625 words). Therefore, you are writing popcorn programs that are longer than ART's limit. I would certainly recommend that you start thinking of revising the program in another language and writing it into a properly compiled program using suitable alternative language.

Icons for Commands

Icons are used as the equivalent of a command and are stored in the icon library. When you are creating your program using the ART program editor, the icons are presented in the screen in logical groups.

Forming the mouse at the relevant cell, and then choosing an icon from a list will move that icon into the highlighted cell.

Like all other languages, ART needs temporary storage areas, and to this purpose fields are used. Fields are stored in a field map, i.e. there isn't a permanent symbol to remember, you just have to make sure that you get the right data in and out of the correct fields. There are a possible total of 1250 fields which, on the surface seems a lot, but they do all run up memory. You do have the option to use multiple fields in a single function, which is actually quite a powerful facility, and very much like Pascal in its structure (although Pascal isn't as easy as ART when it comes to field handling).

After a program has been put together by throwing in a few variables, a few icons and a few jumps here and there, you have a program - regardless of whether it is of any use. In order for the rows of FRAMES and CELLS to be used as a program, the file has to be compiled in order to make them run as stand-alone programs.

Each ART program resides in its own workbench drawer. When the Compiler is invoked, it translates the program into ARUN (which means that it can be taken off the ART

disk and used outside of the ART context). On the other hand, the ART compiler came across a command that didn't make any sense, it would abort the compilation process and make an entry into the ART log.

If by the end of the process (the log) is created, then you simply open up the log and look at the last entry to see what went wrong. The system isn't all that friendly, I grant you, and it is reminiscent of some of the older compilers for Fortran and Pascal and Cobol, but the likelihood of making a stupid mistake isn't very high, if you know what you're doing.

The ART Editor

The power and flexibility of a language often rests fairly and squarely on the shoulders of the editor - and with a language such as ART, a fairly powerful editor is needed.

The ART editor is a graphics orientated picture manipulator that is used to select icons from the icon library so that they can be arranged in a logical order within any of the available frames.

The editor resides in the drawer for the program being created or edited. Firstly, you have to open the drawer containing the "Point and Click" icon. This will open up the editor file and put you into the frame map (and from there you can create a program, append a program, and delete or load a program).

Programming and Resolving

Once you start using icons for programming, you will come across the "Resolve Behaviour" screen. This screen is used by ART to collect all parameters necessary to resolve the icon. For example, a cell that uses three or four storage areas needs to be resolved in order to link itself with the storage areas. This is important to remember as compilers, in general, are never wrong when it comes to managing memory resources data.

Luckily, such problems do not occur with the ART compiler as the structure is remarkably self contained (as it should be, considering the way programs are designed).

The ART Compiler

The power of the ART compiler is impressive - there isn't anything I could throw at the compiler that could

not be transformed into executable machine code.

Compiling a program does not take a long time, when it is loaded it usually opens a window displaying the return number of the compiler. The compilation process takes just two passes (as far as I can work out). The first pass being a simple check of the syntax, a look at the variables, and a translation of all the fields defined in the program. The second pass is the full compilation.

At all times the compiler is telling you what is going on (which is a good thing) and the code that is produced at the end of the successful compilation comes with no discernable bugs. ART programs are not all that usual by comparison to traditional programs written in BASIC, but they are stand-alone and can operate alongside each other (perhaps as GARDEN and Workbench without modification or kludging).

In Use

The documentation is awful - it is probably inevitable if you are American, but on this side of the pond it is not acceptable. The manual is full of colourful metaphors that are larded with puns, and to be quite honest, the manual could be better than the vinyl-bound A4 photocopied sheets that I received.

I have used ART for three months now, and I must admit I wasn't too happy about using icons to write a program. I found the environment annoyingly limited and the programs generated by the system to be so small as to be not worth writing. However, after a while, I started writing programs that while they weren't earth shattering, they did give me a lot of time with the workbench. In "purple hot air utility", and a keyboard tester and I slowly started to see how useful popcorn programming really was!

ART would recommend ART if you happen to be a die hard fan of programming in BASIC, Pascal or C, but if you bought your Amiga for speed processing or just for playing games, and you would like to start making your Amiga work for you, then I would say give it a go.

I'm glad I did!

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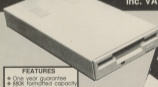
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DPaintII, on the other hand, is a meticulous workhorse. It gives its owner one of the most creative sets of instruments ever available to the artist. The combination of the two programs seems to enable one to emulate the approaches of artists from the past ranging from the delicate glazes of Titian to the wild impasto swirls of Van Gogh.

In spite of the flicker (which can be tamed considerably with a sheet of grey paper cut to fit your monitor — or use of the proprietary anti-glare screens such as Sanson's GlassDown) which fits the Amiga 1080 monitor), many artists prefer the standard mode of 300 x 400 in DPaintII. In this mode you have the vertical resolution as the hires mode plus the full 32-colours. When you load this mode into DigView, it slips in with no change of image size or proportion. If you work in hires 640 x 400 and bring it into DigPaint 320 x 400, the 640 is compressed into 320 but some of the 4096 colours make up for the loss of resolution... so... you have

what is effectively a 640x400 hires image displaying 4096 plus colours. Yes, 4096 plus colours since there are still more colours achieved with a dithering control.

Let it be known that such manipulations don't come cheap. They eat memory voraciously. Don't even think of the hires mode if you don't have a megabyte tucked away somewhere. Any more than a megabyte doesn't help due to the way the Amiga 1080 manages its graphics. In addition to the advantages to DPaintII's hi-res, the "space page" (alt key II) is usually available since it swags in and out of the megabyte of Fast Ram. When in DPaintII you can check on memory available by hitting CTRL and "M".

To summarize the previous two paragraphs concerning resolution modes and screen swags between the two programs, you can load any DPaintII image into any DigPaint and convert for a correctly presented image...or distort the DPaintII one for a creative effect. However, once into DigPaint you cannot go back into DPaintII!

Fortunately a new program allows you to do that, and also further manipulation to IFF files. Batcher by Eagle Tree Software, P.O. Box 164, Hopewell, VA 22660 USA (800) 432-8623 is a graphics program for the Amiga designed to complement paint programs, and digitizes reads the black on the disk jacket. Batcher also does Edge Mapping, makes a halftone picture of black and white dots, generates unusual colour effects such as positive-negative reversals, complementary colours, false colours, tiling, separations, and will enable you to design any shape you desire for displaying a picture as a mosaic of that shape. The mosaic feature makes any Amiga owner an instant stained glass designer. You can also turn your images into needle point or tapestry designs! More sophisticated utilities are included. The program makes histograms of colour register usage, sorts registers, examines bit-planes and many more miracles.

A final tip about DPaintII mode changes. It means that you can "change up" with a loss in size of the total image, but be careful the way you change a hi-res down to a low-res. By switching numbers of colours in the low-res mode to match or lower than the palette used in hi-res, you can have that hi-res image as a quadruple size image which may be scanned with the arrow keys. Try working on the image in this magnification then relocate it in hi-res using Screen Format Responder.

Starting an Image

Then where shall you get the images to manipulate? That is where our first tool comes in. It is an image grabber from NewToc called DigView which will put any two dimensional picture you digitize with a TV camera using their colour wheel 8240 filters into an IFF file compatible with most Amiga graphic programs. (The preferred camera with clear instructions on its use are discussed in the new User's Manual supplied by NewToc. An excellent article on the whole system was published by the technical computer magazine Byte in March 1987.) We owe the file standardization to Electronic Art's development of the file structure called IFF, or Interchange File Format. If you want to read more about IFF structure, Amiga Technical Support offers a manual called The Electronics Arts IFF 2.0 Manual for \$20. You get both

documents and a disk. Contact: Kim Montgomery, (280) Wilson Drive, West Chester, PA, 19380 USA.)

New developments by programmers at the World's Biggest Computer Magazine (two pounds, four and three quarters ounces by weight - one hundred thirty cubic inches by volume and called Computer Shoppert) have gone even further with interchanging file formats. The October issue contained information on a Public Domain program which will swap images between the Amiga, Atari ST/MSX and MSX68.

There is also a new program which will interchange objects between Segas JD, Videogame JD and Forces in Flight. It is called Interchange and was developed by John Pount who was the Technical Editor of Amiga Computing which is a very good Amiga magazine with a professional slant towards programming. These video programs will have to wait their turn in this series.

Hand Done Images

DigiView has brought photographic imaging to the Amiga user for a reasonable cost. There is, however, the rich world of hand manipulation imaging. The new Summagraphics tablets which have now joined Excel with Amiga compatible digitizing boards, make the transfer from pencil and paper to computer screen drawing simple. Shading used a Koala digitizing tablet on the Commodore 64 for several years, the mouse on my Amiga was an awkward tool when I first tried to draw freehanded. The high prices of the digitizing tablets forced me to stick with the mouse.

Reaction speeds of the mouse can be controlled from Preferences on the Workbench. The surface on which you operate the mouse are also a factor in its control. Try the differences between a polished desktop, a regular rubberized mouse pad and the slight foam texture of some plastics which add friction to the pull of the ball. An occasional shaking of the mouse ball may be needed. Be sure to follow your manual's instructions accurately.

Much of the work using DigiPaint may be done with the commands FILL and MIXCE menu Shading. You may trace the outline of the area you wish to modify by using the one pixel brush. This brush gets progressively difficult to control as you proceed with the shading. You may prefer to use

short segments of the Straight Line tool drawing tool, clicking LEFT mouse button after each segment to form a continuous contour under a greater control. The Right Mouse button sets the line.

Shade Shading is such a powerful modification tool to bring the richness of 4096 colours to your 320x400 image stated in DPaintII, use it fully. When you select Shading, the MENU line will display a thin long box called Dither Control. To its right is the Position Box which displays the position of the greatest density of the colour with which you have chosen to shade. There is a small solid square in the centre when you first activate the feature. Drag it with the LEFT button to the spot where you want the heaviest concentration of the colour. The density will feather out on your image from the spot both horizontally and vertically. If you want shading strictly horizontally or vertically, move over to the directional arrows at the right and click one of them off to reveal a bar inside the Position Box replacing the tiny square. That bar will be either a horizontal or vertical band. Stick it to place your density where you choose.

Hidden in the command AND of DigiPaint is a colour separation utility which artists working with autographics (handmade prints, i.e. silkscreen, black prints, linocut and etchings) will find very useful if they want to try three colour printing. The 35 page manual of DigiPaint fully explains the above procedures as well as the operating instructions for the program. New Doc, by hiding the screen password for DigiPaint therein, requires you to keep that manual before you at all times. As with MacDraw II, the fine copy program, you must look up a page number, a line and a word in the book to answer the question asked before the answer is filed. Unlike MacDraw, who has gone to a built-into-the-program page, line, word list, New Doc's book must always be consulted.

A Step By Step Procedure

The January Year Amiga cover, Space Invaders, was designed on its side to be used as a vertical. I used a tricky technique in DigiPaint to get this out. First, a grid was made with DPaintII and tilted into a perspective which was quipped-up with the anti-shading mode. Then, it was merged from the second plane screen of a blended blue and

black sky made in the HAM mode of DigiPaint. The little space ships arrived and started firing their rays after I discovered the risks of blending those nasty glass bubbles. They were drawn with the circle tool and modified with FILL and Shading.

Another hand made image, the Woe Ladies is a blend using RobThru on DigiPaint. The main man was digitized from a large charcoal drawing. The ladies were duplicated and modified from a painting of one lady done using the Amiga Paint program. They were loaded to DigiPaint's 320x400 and from 500 AP copied to the back spare screen. Using Rob Thru from the main the ladies were revealed through the black front screen by using the oval tool. Ladies, in a similar manner, the man was revealed onto the front screen with a free-form use of the large spot brush.

Balloon Landings started as a DPaintII perspective exercise in HIREN using 16 colours. Half of these colours were used in a spread of values for the browns and half for the blues. The range for each was then used to fill the perspective grids. Later, sorted and transferred, the 4096 colours of DigiPaint HAM added the fiery colours of the landing pit and the cool colours of the balloons. Note the balloons high light done with the combination oval square density placement of Shading. The enlarged pixels of the balloons with its past people in the foreground are purposely enlarged with Butcher to contrast with the tiny pixels of the rest of the distant balloons.

More ways of using these two programs together continue to suggest themselves. If you have any difficulty in understanding some of the more complex operations discussed in the use of DigiPaint and DeluxePaintII my I gladly will review the interactive materials published by BCB Video Creations, 2574 PGA Blvd., Suite 104, Palm Beach Gardens, Florida 33411. HB Marketing of Folsom, Middlesex, U.K. should be handling them soon. They call the series DeluxePaint and have already published disks for DPaintII and DigiPaint. Soon to come is Deluxe Help for Calligrapher. Down-the-road-to-places, using the same natural interaction, will be programs for PageSetup, Photopaint and Express Paint. Your Amiga will be exploring the last mentioned third generation (post DPaintII) painting programs in the near future.

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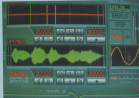
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Sculpt 3D

An innovative graphics package that takes a lot of the hard work out of drawing in perspective

By Mary Branscombe

The Amiga's famed graphics capabilities have always been renowned. All machines in the Amiga range have a number of high resolution modes available, and with a minimum of 512K, in modern Amigas, it is not surprising to see a number of really special graphics packages at last becoming available for this powerful machine.

Sculpt 3D is an interesting package in that it is not a purely art based package, neither is it a typical design package (for example CAD). Sculpt 3D enables the user to draw on the screen in freehand, but in any one of three projections (as is common with technical drawings). It just about allows photographic control over the rendered image, by positioning "lamps" at certain places (either on or off the screen) thus generating literally

thousands, perhaps millions, of possible shades and depth changes.

What is Sculpt 3D?

Sculpt 3D can best be described as an interactive solid modelling editor, combined with ray tracing software to generate very realistic images on the screen. This means that Sculpt 3D can be used to construct a computer simulation of any solid shape you care to imagine. There isn't any conventional parallel I can use to explain the design process, but something in the vein of "carving shapes out of solid air" will probably do.

Details are something Sculpt 3D takes care of quite well - shades, shadows and perspectives are all

handled by the editor. Because the drawing is created on a three screen "board" on the screen, painting a picture must be methodical and planned - you will have to work out things such as depth and angles for yourself, but hidden line removal and perspective can all be handled.

First Steps

The most important thing is to make sure you have a backup of the disk up and running with a copy of the Workbench. If you have a 512K in order to track Sculpt 3D's constant minimum of one Megabyte, you can use Sculpt with a 512K Amiga (for example, a basic Amiga 500) as I have done, but rendering images, drawing screens and using the high resolution



modes are made much simpler when using this package on an Amiga with the one Megabyte upgrade. A dual drive is also a boon as there is some disk swapping from time to time.

Once you have booted up the disk and you are inside the first level of Sculpt 3D, you are presented with three windows, which is called "Tri View". This is a necessity as a computer can only represent images in 3D on a flat 2D screen. In order to actually draw in 3D, you need to display images in orthographic projection, hence the Tri Viewer's approach of front, sides and top view that form part of the complete image.

Each window has a series of gadgets that are used to position the image in each view, each window has a blue cross, and within each window you can zoom in or out of a picture thus reducing the image to your own size. Naturally all windows can be resized to accommodate larger or more detailed drawings as and when necessary.

If you have enough money, (i.e. one Megabyte or more), you can run other packages at the same time. Sculpt 3D supports the Amiga "Intuition" multitasking environment, so it is possible to run a wordprocessor or a few tools from the workbench or any other desktop alongside Sculpt 3D. I have found that it is a good idea to have the "Notepad" and a "calculator" in the RAM disk as you draw.

A word of warning though, Sculpt 3D is not fast. Because of the very complex drawing calculations being performed, running a wordprocessor at the same time as Sculpt 3D will slow things down even more than normal. A standard ray trace of a conical pyramid (i.e. a simple object) will take a few minutes to compute, but with something a little more complex (like the famous byte by byte juggling man) draw these can take literally days per frame.

However, if you have had any experience of technical drawing, then you will find Sculpt 3D's approach delightfully simple.

Menu Operations

Most of the commands needed to Sculpt 3D are made through the use of icons, windows and pull-down menus. To make the menus visible, press the right hand mouse button down and hold it down. The menus show up

(typically enough) as a bar along the top of the screen as PROJECT, EDIT, TOOLS, OBSERVER, and WORLD. To see more of the menu choices you move the pointer over the word in the same way you would by operating Workbench.

Probably the first thing you will want to do is load in a picture that is ready made for you to play with. Sculpt 3D has a lot, but not many, and the few that are supplied on the master disk are very simple examples of how to design simple objects like the coffee cup on the small house.

A "scene" consists of separate entities such as "lamps", "observer", "world" and "objects". You can load in all of these or only one of them if you like - personally at this stage it is good to load in all items but the "lamps" information. Try and experiment with simple light sources to see how effective the shading system really is!

It is now possible to go to the Tri View and have a look at the complete image of the house. By altering your position and relative distance to the house, you can walk around it, and even go inside the house - with a little care!

The backgrounds are interesting in that Sculpt 3D actually draws shadows in perspective, but should you want the idea of perspective made really clear, you could always use the checkered pattern supplied (as part of the package) as a floor or even as a "sky". Some really weird effects can be achieved by using both with mutually opposing chequerboard patterns, so they meet up somewhere on the horizon - it'll screw up your retina, but what a way you to go!

The concept of having a "sky" on the screen is an interesting one, in that it is a horizon bisecting the screen somewhere in the middle. This can be altered so that the line appears more or less anywhere on the screen so the eventual surroundings are very spacious to begin with.

Of the supplied "tools" Sculpt 3D has for drawing, there are many for drawing basic shapes, so, for example it is very easy to create lovely rolling hills on a surface by creating a "disk" in circle with no depth and then rip up a few sheets of "muck" by pulling it out with a "magnet". This has the advantage of making shapes very natural, and if you want undulating shapes (perhaps for the features of a face) then this is a very useful tool. However be warned - this is probably the most memory greedy

and time consuming task you can give to Sculpt 3D to calculate.

Naturally there are other tools that enable you to distort shapes. Out of the other gadgets, the most interesting is the facility to naturally curve a shape (ideal for rounding off ends) and for extruding (similar to the magnet - but this time the "extrude" tool first performs a fill operation, if possible, and then duplicates the selected object and then links the duplicated and the selected object). For these operations the "dragger" is used in one or more of the Tri View windows so that you can create tubes, poles, blocks or any upright or flat regular shape. Even a high-tensile block can be made from an extruded slab.

But the shape distortion tools are not all that Sculpt 3D has to offer. The Observer tools are also very useful because they can alter the overall image - as if you were looking at the whole picture and not just specific items (as you are doing when just using tools). The Observer Painting Mode sets the observer to paint mode thereby enabling you to cover a face with a single colour without using shading or depth effects.

In this mode, shadows are not rendered. Because Sculpt 3D has to calculate the effects of these on the ray trace, leaving out shadows (at the initial design phase) is a quick way of producing an image after its wire frame draft.

Snapshot Observer Mode sets the observer in a mode which creates a ray-traced image which includes the effect of shadows. The time taken to produce an image is proportional to the image size, so small images can be produced much quickly than larger images. This is something to bear in mind when drawing out an image - do you want a large image full of detail that takes five minutes (and probably longer) to compute, or do you just want the general picture (thereby cutting the compute time down to a quarter).

On the Amiga there are different modes that enable the user to specify different resolutions for different applications. While the High Resolution mode (800 x 600) utilizes the best Amiga graphics, some very impressive effects can be rendered using the Low Resolution modes - if HAM Graphics are used, they are displayed in low resolution mode.

Sculpt 3D gives you full control over the screen interface. There is adequate support for adding bit planes with any screen mode - adding bit

plane means that the number of colours you select are raised by the number of the power of your bit planes. So if you are using a bit plane number of greater than 12, then Sculpt 3D will give you the option of saving an RGB file; 0 is the default state.

Using Sculpt 3D

This is a very impressive package and although it is not easy to use, it is certainly worth sitting down for a month or so and really getting to grips with the complete package.

I would not really recommend using the package with a 512K Amiga - a megabyte is a necessity should you want to start drawing more complex shapes and patterns using the higher resolution modes and the HAM mode.

Sculpt 3D is an innovative drawing package which, for once, actually enables the user to draw very impressive pictures with a reasonable perspective calculation system and a very impressive and easy to use shadowing system. The sad thing is that the Ray Tracing computation time takes so long!

Ray Tracing is an innovative and fairly new idea; you do need a lot of memory and processing power and the time required to generate just one simple ray trace is phenomenal, so be prepared to wait around for a few hours if you are drawing complex images consisting of many elements. Small wonder why the package is supplied with a " caution Ray Tracing in Progress" card to put on your keyboard while the machine is calculating your picture.

I have been using Sculpt 3D for over four months now. Initially my attempts at drawing were pathetic. The concept of Ray Tracing was new to me, and I must admit the whole idea daunted me. After all, a drawing package with isometric calculation, shadowing, perspective, rotational and a special distortion system seemed too good to be true. Certainly I have never come across these facilities on a sub-25000 system - a DMC workstation perhaps (you know those lovely ones that support GPX...) but not an Amiga 1000.

My only gripe is the sluggish way the package responds to calculations,

and I know this is because the Amiga has "limitations" and all the other software tools up and running, but it is very slow. I am playing around with the 68020 maths processor instead of the 68000 in an attempt at speeding things up and I will get back to you when something more coherent comes up.

Anyway, if you just want something to paint with, then do not go for this package. It will not have anything additional to offer than DeluxePaint or Digipaint which can be bought at considerably lower cost. Drawing in 3D requires consideration and plenty of planning, but if you're looking for the very best in 3D art packages, Sculpt 3D is certainly worth recommending.

Finalities

Name: Sculpt 3D. **Machine:** Amiga 112K. **Supplier:** Byte By Byte, Abbotston Place II, 9442 Capital of Texas Highway North, Suite 130, Austin, TX 78718.
In the UK: The Amiga Centre Scotland, 4 Bury Street Lane, Edinburgh, Scotland EH3 3RA. Tel: 031-357 4742.

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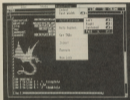


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Abacus

We take an in-depth look at a word processor and a database from Abacus

By Gordon Hamlett



Abacus have released two packages which can profitably be reviewed side by side. TextPro is a wordprocessor and DataBrics is a database. The UK price was not available at the time of going to press but the US price for each package is \$79.95.

Textpro

One of the worse things about being a writer is when somebody gives you a blank piece of paper and says write. Modern technology has replaced the paper with a blank screen but the feeling of helplessness still remains. I thought that nothing could be worse than this except that on first loading TextPro, I was in for something of a shock. The first thing you are asked is how many pages you intend to write. It is bad enough not knowing what you are going to write about without being asked how much! All creative ideas flow straight out of the window.

Because the Amiga can run several programs simultaneously, TextPro needs to know how much memory to reserve for your work. Logical I suppose but somewhat concerning all the same. In practice, you can just hit the default unless you are likely to be doing anything unusual.

There are all the usual features found in wordprocessors. The packaging makes a great play of professional features such as justification, leaders and footers, bold and italic scripts etc., etc. but I would be very disappointed if any WP package in this price range did not include them.

All these features can be controlled either from pull down menus or via the keyboard. There are four main menus - file, edit, style and formatting. The menus worked well and were largely self-explanatory so that flicking through the instruction manual was kept to a minimum. Good points for simplicity.

Missing Features

There were a number of features missing that I would have liked to see included and some quirks among those that were. As a journalist, lack of a wordcount was immediately apparent. There was also no facility to link files together when printing so that each chapter of your novel must be run off individually. There is no spelling checker which may be bad news for some people, especially as it seems that spelling is no longer taught in schools.

Quirks include the automatic hyphenation - I found that I had to go back and make too many corrections - and I would prefer that this was set off rather than on, initially. The search and replace function only highlighted the first letter of the word or phrase rather than the whole thing. On one occasion, the word I was looking for was hidden under the requester box asking me if I wanted to look for the next occurrence. As I couldn't see the

current one ... These are just quirks though. It all depends on what you are used to.

TestPro supports a wide range of printers and there are facilities to set up your own control characters if yours is not on the list given.

Another feature that some might find useful is the ability to include graphics in the text. A copy of the utility BITSnap is included with the package. Graphics can be inserted into the text or overlaid onto the text.

At first glance, the documentation looks very slick; a 120 page perfect bound manual. The blurb claims that you get a complete tutorial in how to use the package but the reality is that the book is little more than a description of the various features with very little rhyme or reason as far as structure goes.

I showed the manual to two people, one with no WP experience at all and the other a professional secretary. Both complained that it was a total hazy patch and very off putting.

This is one area which companies could put a lot more effort into. A package like this, which is presumably aimed at the lower end of the market is going to attract a lot of people who are new to wordprocessing. The manual is their life line and it would be of great benefit to have something that is written in a non-technical way, preferably with an example document or two, just a series of exercises to work through that introduce the different facilities in a logical manner - a lot at a time.

Another necessary main staple is a pull-out reference card detailing all the various commands. Not everybody uses the manual and it is a pain to have to keep trying to find what you want in the manual.

To sum up, TestPro is a simple to use wordprocessor, suitable for beginners but raised by poor documentation. Experienced users will probably prefer something with a bit more meat to it though and will find that it is not powerful enough for their requirements.

Data Retrieval

Whichever TestPro was very simple to use, DataRetrieve goes to the opposite extreme. I found it to be very unfriendly throughout and never really came to grips with it at all - a combination of the program and the

documentation which is considerably worse than the manual for TestPro.

The packaging starts off by claiming how fast the program is, this sounds impressive until you turn to page three of the manual where it apologises for being so slow compared to other programs. This is because every record in your database is disk based rather than memory based. This has the advantage of being a safer method, but fast, it sure ain't.

The main feature that you have to come to terms with when using DataRetrieve is that of masking. The mask is a template that you tailor to your own requirements. Only information that appears in the 'slots' that you have created is displayed rather than the complete record. For example, suppose you are running a mail order business and want to print off some address labels to send out catalogues to your existing customers. The only part of each customer's record that you are interested in is their name and address, so you mask off all the details of past purchases, etc.

Your database can be password protected for either user or operator. User stops unauthorised access to database while operator stops anyone amending it.

Fields can be one of six types - text, date, time, number, graphic or choice, i.e. specific answers only. One thing I particularly didn't like about setting up choice fields was that when it came to entering data, a typing error would default to the last choice rather than prompting for a correct entry. For example, suppose you wanted a choice A, B or C. You set up your choice field to accept a/b/c/1/b/c. Now when you are entering your data, you intend to press the 'A' key but accidentally hit the 'C' key next to it on the keyboard. The entry will actually read 'C' which is not what you wanted and requires you to check everything you enter very carefully. A warning beep and a default to move onto the next field until a correct key is pressed would be much better.

Searching your database can be decidedly tedious, especially if it is a long one so you will need to set up an index or multiple index e.g. sort by last name, first initial, second initial.

On screen establishment of records and masks was confusing to the extreme and not something that can be tackled without considerable reference to the manual which brings me nicely

to my little snipe - the documentation.

Dubious Documentation

Horrorshow was the first word to spring to mind. The manual was little more than a description of what each function was for, poorly structured and highly technical. A first time database user would stand very little chance of coming to terms with this package without considerable effort on his or her part and not a little technical knowledge.

It is not good enough to say here are the tools, now go away and use them. You have to be shown how to use them. Up to eight databases can be open at any given time. Fair enough but why would anyone want to do it. A few examples would not go amiss. Sample records and masks for various uses would be a great help. Again, why is there no reference card of all the various commands.

One example that highlights the user unfriendliness especially can be found in the accompanying packaging. "You can exchange data with TestPro... to easily produce mailing lists etc". This is one of the commonest uses of a database yet searching the indexes of both manuals gave no clue as to where I might find information on how to do this. Scanning the manuals themselves proved to be little better until eventually, I found this reference. It was in the glossary under 'form letters' and the entry read: "Several text editors allow you to produce form letters... If you've created an address file using DataRetrieve, you can write the file to disk so that you can see the file for text editing." That is the sum total of what you are told. The TestPro manual has no entry for form letters whatsoever. Well, at least I know that I can do it, I just don't know how!

I found little in DataRetrieve to recommend. People who have some strange ideas about databases may enjoy it but anyone who has bought their Amiga expecting that all software will be user friendly to the nth degree should give this package a very wide berth indeed. ☹

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Adventure Kit V



By Allen Webb

In the final article of the series we look at the final pieces of code and summarise the package

In previous articles dealing with exits and objects, options were provided to allow you to display text in a specific window. The allows you to give information in a clear manner rather than use a scrolling window. The first piece of code allows the easy manipulation of screen windows. The code occupies the block of memory from \$C300 to \$C34B and has one entry point. The window position is specified by four parameters:

XC - the X or horizontal coordinate of the top left corner of the window. It's value can range from 0 to 38

YC - the Y or vertical coordinate of the top left corner of the window. It's value can range from 0 to 23

WE - the width of the window (1 to 48)

HE - the height of the window (1 to 25)

As usual, I have not included any data verification routines and you should ensure that the following inequalities are fulfilled:

$0 < XC < 39$

$0 < YC < 24$

$XC + WE < 49$

$YC + HE < 25$

The syntax of the commands is as follows:

Scroll window up: SYS 4920,1,XC, YC,WE,HE

Both the character and colour information are specified up. The top line of information is lost and the bottom line is filled with spaces.

Scroll window down: SYS 4922,2,XC, YC,WE,HE

This is essentially the same as scroll

up except, of course, for the direction of action.

Invert screen: SYS 4923,3,XC, YC, WE,HE

This flips the top bit of each screen code in the window. In the same way as the cursor acts, calling the routine again restores the screen contents.

Fill window: SYS 4924,4,XC, YC, WE, HE,CHAR,COLOUR

This fills the window with the specified character (POKE value) and the specified colour.

Erase window: SYS 4925,5,XC, YC, WE,HE

This clears the window and sets it to the current cursor colour.

With these five simple tools, you can perform a wide range of useful actions on the screen contents.

Up to now we have dealt with the basic mechanics of the adventure such as well defined actions and movement. If that were the sum total of the game, things would be very boring indeed. The things which help set the atmosphere of an adventure are random and semi-random events. In BASIC there are several ways of generating such events:

1. You can use the random number generator to initiate events. By using the internal seed to create a fixed sequence, a predictable series of events can be used.
2. A simple counter in the main program loop can be used to generate regular time independent events.
3. The internal clock can be used to

create time dependent events.

The drawback with the timer is that there is only one. To overcome this limitation the second piece of code provides you with eight independent event timers.

The system centres on an interrupt driven routine which counts elapsed time one second at a time. This timer is linked to eight counters which are used



to verify whether an event has occurred. Before describing how to use the system, it will be useful if I tell you how it works.

Each event timer has four values, each being in a table. These are:

1. A counter.
2. A flag. A zero value means that the timer is off, a non-zero value means that the timer is active.
3. An interval value.
4. A register.

Each time a second elapses, the timer increments each counter. Each event counter is checked in turn to establish whether the event's interval has elapsed. If the interval has not elapsed, the next event timer is checked. If the interval has elapsed, one of three routines is executed, depending on the event timer concerned. These routines alter the register related to the event timer and may also zero the event's counter. You then act according to the value in the register.

Three types of timer are provided:

Count up - each time the interval is reached, the register is incremented by one and the timer is zeroed. Event timers 0 to 3 are of this type.

Count down - each time the interval is reached, the register is decremented by one and the timer is zeroed. Event timers 4 and 5 are of this type.

Zeroing - when the interval is reached, the register is zeroed. Since this is a one shot timer, the timer is not zeroed. Event timers 6 and 7 are of this type.

The code occupies the area \$C680-\$C6DC. The event tables occupy the following areas:

- Timer table: \$C700-\$C70F
 - Flag table: \$C700-\$C70F
 - Interval table: \$C710-\$C71F
 - Register table: \$C710-\$C71F
- To access the tables, point a timer *i* where *i* has a value from 1 to 8, i.e.:
- Timer Table: \$094+*i*
 - FLAG table: \$093+*i*
 - Interval table: \$093+*i*
 - Register table: \$092+*i*

Event TIMER *i* uses the first value in each table. Timer 1 uses the second and so on.

There are four entry points:

SYS 50688: This turns on the main timer. This need usually be performed once during the program, unless you wish to access a disk drive.

SYS 50691: This turns off the main timer. You should call this before using disk access.

SYS 50694, TIMER, INTERVAL: This turns on the specified timer and sets its interval. (E to 255 seconds).

SYS 50697, TIMER: This turns off the specified timer.

The count up and count down registers allow you to count up to 255 intervals of 255 seconds. This gives a range from a second to roughly 18 hours. The zero timers give a range from one to 255 seconds.

Here are three examples of how to use the package:

- Imagine that you want a stage position to last for 60 seconds and while it is active, a flag FL has a value of one. The easy way to do this is with a single shot "zero" timer. The following code would do this:

```
SYS 50688: SYS 50694,60: POKE
50742,FL=1
IF PEEK(50742)=0 THEN FL=0
SYS 50694,5
```

The first line starts the timer, sets timer six to a 60 second interval and starts it, sets the register for timer six to one and sets FL. The second line checks the register for timer six to see if 60 seconds have elapsed. If the time has elapsed, the timer is turned off and FL set to zero.

- Suppose that you want the hero's strength to decrease by one every two minutes and he dies when it reaches zero. We use a decrementing timer:

SYS 50694,120: POKE 50928,0

```
IF PEEK(50928)=0 THEN SYS
50697,4: PRINT"YOU ARE DEAD"
51 is the starting strength of the character.
```

- Imagine that you want day and night to occur and change every 60 minutes. A flag DAY is zero at night and equal to 1 at day.

```
60 minutes = 3600 seconds
If we use an interval of 200 seconds,
this gives a maximum register value of
5000/200 or 18.
SYS 50694,0:200: POKE 50948,0
DAY=1
```

```
IF PEEK(50948)=0 THEN POKE
50948,0: DAY = ABS(1-DAY)=1
```

The first line sets things going using timer 0. The second line checks to see if 3600 seconds have elapsed. If this time has elapsed, the register is zeroed and DAY toggled. Since this is a continuing operation, the event timer is left running.

That's all the code dealt with. It may be of value if we review the package. The memory occupied by the full package is shown in Table 1.

Table 1 - Memory occupied

| | | |
|-------------------|-----------|-------------|
| Parser code | 5700-574E | 24671-24674 |
| Verb table | 5750-57FF | 54951-54975 |
| Noun table | 5760-57CF | 30976-31099 |
| Adjective table | 57D0-57D9 | 12006-12259 |
| Adverb table | 57E0-57EF | 12256-12511 |
| Object table | 5800-58FF | 12756-14815 |
| Location code | 5900-592F | 16864-17631 |
| Direction tables | 5930-59FF | 17632-17687 |
| | 5960-594F | 17688-18143 |
| | 5950-5900 | 18144-18794 |
| Destination table | 5A00-5BFF | 40956-48151 |
| Lower verb area | 5C00-5C20 | 49152-49872 |
| Object code | 5C30-5C50 | 49876-50253 |
| Window code | 5C60-5C6D | 50688-50988 |
| Timer code | 5C70-5C7F | 50944-50975 |
| Timer tables | 5C80-5C8F | 51988-52225 |
| Verb code | 5C90-5C9F | 52234-52547 |
| Verb tables | 5C90-5C9F | 52548-52547 |
| Upper verb area | 5E00-5E1F | 57341-59335 |

If you want to use your own machine code or setup data tables, you can use the following areas:

\$580-5BFF (34816-34863)

\$C00-5C4F (51200-51863)

Since the code encroaches into memory usually used by BASIC, you must remember to stack the top of memory pointer. You can do this by using the following line at the start of your program:

POKE 56,13 CLR

The code makes extensive use of the memory areas \$E2A7-\$E2FF (679-767) and \$01C-\$01B (628-609) so take care not to use these areas.

This pretty well covers things for this time. In the conclusion I will provide a simple adventure which will show you how to load data and use the routines. ■

C128 FKeys Swapper

Store four sets of function key definitions with this handy utility

By John Yonnie

Isn't it nice to be able to define the function keys on the C128 to carry out standard commands? I used to have five or six short programs that did just that. However when using different ones I had to save whatever I was working on and then load the key program that I wanted and then reload the original program, which can be very tedious after a while.

Flipping through the chapters in the Programmer's Reference Guide on the Kernel routines I noticed \$FKEYS FKEY program a function key. Having fiddled with Machine Code for a while I decided to give it a go. The routines used by the FKEY routine are: A pointer to string address (a/b/c/d/e/f/g/h/i) for which I used \$FA-\$FH and \$I, \$JA-\$JA being stored in the accumulator, Y length of string to be assigned to the key and X the key number (1 to 10), \$ being the run stop key and 10 the help key. The values for X and Y I stored above the machine code that does the swap—more on that later.

For those of you who don't want to know the ins and outs of the program just type in the basic loader and \$FAVE is before running it as it will explain itself if the checksum is correct. It will also \$FAVE a binary file called FKEYS.MC.COD to disk. If you use

the basic loader the help key is already set up for swapping between the four sets of definitions, the other keys are as normal. Press the HELP key and a SYS 4584 will be emitted outputting the Flays to the disk key set. Type KEY < return > to see what the keys 1-10 are set to.

Most of the keywords are abbreviated to save space and the functions are as follows:

- F1: Prints RUN+esc 1 (end of current line)+move cursor 2 spaces left+esc (clear screen from cursor to end)+<return>
- F2: Same as above but DELAYS file selected
- F3: SCNCLR and DIRECTORY
- F4: REMEMBER+<RETURN>
- F5: Prints \$FAVE+cursor down four lines and back to beginning of line+PRINT VERIFY+up to start of \$FAVE to wait for file name. Once file is saved the cursor ends up on the D of VERIFY. Enter the filename after the " and press return
- F6: BLOADS a file as per F2
- F7: SCNCLR and LIST
- F8: Prints SCRATCH+as per F1 each onwards. Answer Y to scratch N not to
- F9: Normal SHIFT/RUN STOP
- F10: Carries out an SYS 5001 for Keypad keys

The keypad Flays are set up as follows:

- F1: Prints PRINT
- F2: As per Disk F2
- F3: Prints *
- F4: SCNLR and DIRECTORY
- F5: Prints/
- F6: Carries out an AUTOH
- F7: Prints DATA
- F8: SCNLR and LIST
- F9: As per disk F9
- F10: Carries out SYS 5123 for the Hkeys to be set up.

The fullstop on the keypad is set up to be a command for ease of entering DATA.

The Hexkey definitions are as follows:

- F1: Prints A
- F2: As per disk F2
- F3: Prints B
- F4: SCNCLR and DIRECTORY
- F5: Prints C
- F6: Prints PRINTDEC* (and positions the cursor after the first "ready for a hex number to be input and return to be pressed to give the decimal value.
- F7: Prints D
- F8: Prints PRINTHEX (and positions the cursor after the 1 to convert a decimal number into hex. If

the number is less than four digits then it is not used to close the closed bracket up, just press return.

PS: As per disk PS

F10: Comes out on SYS 3558 to set up the Normal Flaps.

The full stop on the keypad is set up as a comma, the plus will print E and the minus will print F.

The Normal Keys are set up as default on power up except the F9 (SHIF/RLN/STOP). Pressing F9 will carry out an SYS 4884 to return the definitions to the Disk keys.

To use the RUN/LOAD/LOAD and SCRATCH keys, press F8 to bring up the directory and run the cursor up to the file you want to load or scratch. Press the key for the function you want and the command string will be carried out without having to shift the cursor across to delete the file type. This makes those one stroke commands.

If you use the basic loader always reset the computer before loading and naming the program otherwise if you have altered any of the FKeys the help key when pressed will contain garbage. If you use the Machine Code file

created by the basic loader then start it up with SYS 4884. You can load a Machine Code file over the top of a basic program without disturbing it as long as they don't occupy the same memory but the basic loader will replace the basic program in memory.

The actual program sits in memory from \$1308 (\$884) to \$1704 (\$652). The lengths of the strings are stored at the following locations:

Disk Keys - \$16D5 to \$16D6 (\$845 to \$846)
Keypad Keys - \$16DF to \$16E8 (\$855 to \$864)
Helppad Keys - \$16F9 to \$16F2 (\$865 to \$874)
Normal Keys - \$16F3 to \$16FC (\$875 to \$884)

The FKey Strings are stored from:

Definitions - \$16FD to \$17A4 (\$885 to \$652)

On my disk the basic DATA took up 23 blocks and the FKeys MCode took up five blocks.

If you do change any of the definitions to suit yourself, remember

to change the string length and the low/high/blank that are stored in zero page. When the Keypad and Helppad routine change the keys the characters are stored from \$1808 (\$812) to \$1828 (\$800) so don't use this area.

One point to remember is because I use 80 columns most all the time, at the start of each wrap routine the computer is put into FAST and at the end is put into SLOW. On the 40 column screen it causes the screen to flash quickly, however I don't think this will bother anyone unduly. If it does then try in the following lines:

```
125 REM **REPLACE 255 with 252
TO CAPCEL FAST**
126 POKE 4863,252:POKE
5092,252:POKE 3324,252:POKE
5202,252
```

If anyone wants to learn Machine Code on the C128 I can recommend 128 Machine Language for Beginners by Robert Mandel. This is a COMPUTE! Books publication and the Label Assembly in the back is well worth typing in - it makes it almost as easy as writing basic programs. ☺

See listing on page 109

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Continued on page 89

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C128 HELPER

Here I am, sitting at my C128 begging for help with my latest program. I want to use a sprite but can't remember the correct syntax for the command. With relief, I notice a button marked HELP in bold letters - very comforting. I press it but nothing useful happens. My only recourse is thumbing through the swatched manual - or is it? Not with the C128 Helper on board. I press the help button and lo and behold, I can call up any keyword and see a description of the command and an example of its syntax.

The C128 Helper is a clever utility which uses specially created disk files to instantly display information on the screen using a small resident program. The usefulness of the program can also grow as your knowledge expands through a special editing program.

Each page of information is stored as a separate file on the disk and the ingenious operating system allows about 106 files to be held on each Helper disk. This exceeds the stated maximum disk capacity of 104 files and this is one good reason why a Helper disk should never be validated. Owners of double-sided disk drives will have access to twice as many files, which means that all of the Basic commands could be stored as well as almost 200 extra pages of information on pecks and pokes, as even a complete memory map!

The disk contains two utility programs to assist in the creation of customised screens and an associated

*A friend in need is a friend indeed. Meet a utility which
throws you a line or two*

By Eric Doyle

Key Peko Locations

| <u>Keywords: HEL,HELP</u> | <u>Descriptions:</u> |
|---------------------------|---|
| 20,40 1120-2020..... | Start of BASIC text. See also 1120, 2000, 2001. |
| 22,40 1121-2021..... | Start of BASIC variables in BASIC 2, 3, 4, 50 format. |
| 230, 230 2020-2021..... | BASIC memory buffer. |
| 300 11200..... | BASIC 1.0/2.0 - Graphic Utility (HELP100) base. |
| 320-330 10011-10011..... | Resolved Utility, 100 (basic) |
| 3201 10201..... | Resides first of resolved buffer. |
| 3202 10211..... | 11 10, then again until a key is hit (see also MEMO11) |
| 3200 10201..... | BASIC 1.0/2.0 - Graphic Utility base (HELP11) |
| 3200 10201..... | Graphic Utility base - Graphic 1-10 in 20 column position |
| 3200 2020 10001-10001 | Graphic Utility base (HELP12) |
| 1020 1020 10001-10001 | Graphic Utility base (HELP13) |
| 1020 1020 10001-10001 | Graphic Utility base (HELP14) |
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| 1020 1020 10001-10001 | Graphic Utility base (HELP100) |

48K Disk Keys -

(cont. p. 255)

Keys are HEL key down, release 10, and then again 200 of 250
 (colours here to see the nearest similar function)

| | |
|----------------------------|------------------------------|
| 0 - Blank to end of row | 1 - Get serial screen number |
| 1 - Horizontal cursor mode | 2 - Blank cursor mode |
| 2 - Set cursor location | 3 - Blank to start of line |
| 3 - Blank cursor mode | 4 - Blank to end of line |
| 4 - Blank cursor mode | 5 - Set cursor location |
| 5 - Blank cursor mode | 6 - Set blank screen |
| 6 - Set blank screen | 7 - Set end of screen |
| 7 - Set blank screen | 8 - Set blank screen |
| 8 - Set blank screen | 9 - Set blank screen |
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Example: Press DEL, release 10, and then again 0, and then again
 will change to a blank line instead of a blank.

ScreenDraw 64

A powerful background and character editor

By Paul Williams

When writing on the Commodore it is common to draw each screen, and to use sprites and more user-defined characters for the objects that move.

ScreenDraw is a machine-code program to assist with the design of such screens. There are already a few programs around to do this, but I for one, have found them cumbersome to use as they often involve selecting one screen option for designing a character, then going to a page display to insert that character into the picture, then if it doesn't quite look right going back to the character edit screen where you can't see the character in context, and so on. With this in mind I have written a screen designer which is extremely simple and quick to use, and most importantly displays everything on the same screen at the same time. A joystick in Port 2 does the bulk of the work, assisted by a few easy to remember keypresses. SYS 49153 runs the program. The screen then shows the following:



The program works with a picture 256 characters across by 64 characters down. This is to enable any size of screen to be drawn and because of the simple way such a picture is stored in memory it is easy to extract completed screens for use in your own programs (refered to later). The top corner of the screen displays a 40x16 window of the page - when you move off the screen with the joystick the window scrolls.

The bottom left section of the screen shows the full character set available to be used and edited, in full colour. The program allows hi-resolution 3-colour and lower-

resolution 4-colour characters (multicolour), and lets you assign a particular unique colour for each character which is remembered in a table. This seems to be the most efficient and easy-to-use method of defining all the colours for a multicoloured screen.

The bottom right corner of the screen shows an 8x8 grid which displays the exact pixel representation of the current character, and is also used to edit the character.

Below the picture window is a line containing useful information, the current location in memory of the picture window (in hex), the four colours relevant to the current character (in hex), and the number of the current character (decimal 0-255). This area is also used for saving filenames and telling you what is going on when disk operations are happening.

On the screen, there are three modes of operation, depending on which part of the screen your joystick-controlled cursor is in. Moving between the screen windows is performed by the keys SPACE for the picture, E for editing a character and F for selecting a character from the palette (i.e. character set).

Picture Mode - the FIRE button draws the current character (displayed on the bottom-right grid) onto the picture. The following keys have the following:

- P - Move to Palette to select a character, see PALETTE MODE >
- B - Get character under cursor and make it the current character (so you don't have to go to the palette to get a previously-used character).
- D - Duplicate character under cursor onto current edit character. After selecting a character with P or C, it is to be similar to another character, use D to set its grey and colour to that of the old character, and then use E to edit it.
- E - Moves you to character EDIT MODE (see below), STOP ends the program.

L - Takes a 40x25 image of the picture using the cursor position as the top left corner of the image and puts it away in a 1K block of memory at 15368-16356, for use in your own programs. Alternatively you can read the picture memory block directly with your own BASIC or machine-code program (see later).

CLR Clears everything, and copies the ROM character set into your character space.

CURSOR Inserts a space in the current line and shifts left

RIGHT Further right characters up one.

CURSOR Deletes the character under the cursor and shifts.

LEFT all the rest down.

L Load character set from disk.

SHIFT-L Load picture from disk.

SHIFT-R Save picture to disk.

SHIFT-1 Mark this position as the top left corner of a block to be copied.

SHIFT-2 Mark this position as the bottom right corner of a block to be moved.

SHIFT-3 Copy the screen block defined by SHIFT-1 and SHIFT-2 to where the cursor currently is.

PALETTE MODE - you use the joystick to position the cursor over the character you want, then FIRE to select that as the current character and move you back to PICTURE MODE.

CHARACTER EDIT MODE - the FIRE button is used to draw and erase pixels in the character being edited. The 8x8 pixel grid shows an exact enlarged version of the character, and when in multicolour mode the colours here also reflect the colours of the character, even though every pair of bits is there used to define one coloured pixel in the character (this follows the usual convention of Commodore 64 multi-coloured character).

SPACE Takes you back to PICTURE MODE.

CLR Clears the current character.

L Advance screen background colour by 1.

C16 & Plus/4 Software Offer

Do you wish that more C16 and Plus/4 programs were available on disk or cassette? Well here's our third C16 and Plus/4 software collection

Due to the great length and complexity of the programs that are published in *Your Commodore*, many people find that once they have typed them in they do not work. Usually, this is not the fault of the magazine, but rather, due to the program, being typed incorrectly.

To help readers we do provide a *Software for Sale* service that makes all of the programs from each month's magazine available on disk or tape. Due to the small number of programs that we publish for the C16 and Plus/4 we only place the software for those machines on the disk with all of the other software from the issues.

In this issue we are pleased to announce the launch of our third C16 and Plus/4 four collection containing no fewer than eight programs from past issues of *Your Commodore*.

Documentation

All of the programs that are on the tape or disk are from recent issues of the magazine, however, instructions are included with the programs in case you missed any of the magazines.

What Do You Get?

So just what is on the latest Software cassette or Disk and which machines do they work on?

On both cassette and disk you will find the following:

C16 SPRITES - taken from our August 1987 edition, this program gives C16 and Plus/4 owners access to sprites, just like those to be found on the C64. A demonstration program is also included to show just what is possible.

44 ANIMATOR - a simple demonstration program showing how you can store a series of pictures in memory to give the appearance of animation (Plus/4 and Expanded C16 only.)

HEROBLIND - an excellent version of the latest breakout type games.

EMSE MENUS - find and load your programs with ease using this program. Obviously this requires a disk drive.

TEPRO - our extremely popular 'typewriter' program from December 1987. Turn your Plus/4 computer and printer into a powerful electronic typewriter.

Plus/4 Assembler - an excellent machine code assembler program for Plus/4 owners.

TRANSCRIPT - owners of the Script Plus Cartridge can now convert their Plus 3 text files to work with this wordprocessor.

PLUS/4 EXTENDED BASIC - Add almost 40 new commands to the Basic on your Plus/4, or C16 with memory expansion. Including commands for accessing the disk drive, drawing graphics etc. as well as a whole range of new Basic functions.

C16's and Memory Expansion

The C16 and Plus/4 computers are almost identical, except for the fact that the C16 has far less memory than its big brother the Plus/4. This compatibility means that programs for one of these computers will work on the other, so long as enough memory is available. The exception to this being programs that access the in-built software of the Plus/4, for example, the TRANSCRIPT program on this disk or tape.

A number of companies produce memory expansion cartridges for the C16 and expand its memory to varying degrees. If you have expanded your C16's memory to 64K then all of the programs, except TRANSCRIPT will work on your machine.

How Much Is The Software?

The price of the software is £5.00 for cassette and £7.00 for disk, this includes instructions. Orders should be sent to the address on the order for *Reader Service*, they should NOT be sent to the editorial address.

Orders should be accompanied by a cheque or postal order for the correct amount made payable to *Argus Specialist Publications*.

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| LIFESAVERS 10 | DD1 | DEVICE-SET | L/1 |
|--|-----|--|-----|
| <p>If you always use disk for all of your LOAD and SAVE operations it can be a bit annoying having to place the 'B' after every disk operation.</p> <p>This handy routine will let you set the device (disk or tape) for all loading and saving operations.</p> <p>Once set you don't even have to type the closing quotes or device number at the end of the filenames.</p> <p>The program works by re-directing the LOAD and SAVE vectors (\$0330 and \$0332) to a new routine, stored at \$78 (\$0C97). To use the routine enter:</p> <p>SYS 679 For Disk; SYS 708 For Tape; SYS 700 For normal operation.</p> <p style="text-align: right;">Neil Higgins</p> | | <p>10 REM ***** ***** 20 REM * DEVICE-SET * 30 REM ***** ***** 40 REM * SYS 679 :- DEFAULT TO D ISK * 50 REM * SYS 708 :- DEFAULT TO T APE * 60 REM * SYS 700 :- RESET TO NOR MAL * 70 REM ***** ***** 80 FORL=679D0758:POKAO:POKEL,A:O -B-A:REST 90 IFD:66666666PRINT"DATA ERROR" ".END 100 DATA155,0,141,830,2,141,261, 2,155,899,141,48,3,155,245,141 110 DATA5,3,155,4,141,48,3,155, 2,141,81,3,88,32,175,2 120 DATA155,1,141,830,2,141,261, 2,95,155,155,141,48,3,155,245 130 DATA141,48,3,155,237,141,80, 3,155,245,141,81,3,98,159,2 140 DATA138,155,155,0,133,10,75, 155,245,155,2,133,155,76,237,245</p> | |

Listings

Get it right first time with our deluxe program system for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. For no more, it's all part of our easy entry set.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an asc of spaces in layman's terms, and [SAB] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realize that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SPPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as [CTRL N, DOWNLEFT,BLUE, F5C].

This would be achieved by holding

down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked B.L.F. while holding down the CTRL key, press the F5 key and, finally hold the Commodore key down while pressing the number two key (C2) would of course make the computer print as follows.

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears: [SS][C+]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (BNV9), type the relevant number of reversed Ts and then hold down CTRL and press zero (BNV0FF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT using the symbol for pi. This may appear when its value is needed in a calculation so they may look something like:

```
CC=PI*(R/2)
Ignore the square brackets and just type in a shifted apostrophe pointing arrow (i.e. the pi symbol).
```

PROGRAM: SYNTAX CHECKER

```

5 REM SYNTAX CHECKER - NEW WORLD
10 BE=0: A=0: B=0: C=0: D=0: E=0
20 FOR L=0 TO 50:GOTO 30:END 50
30
40 READ A:IF A=0:PRINT:GOTO 60
50 IF L=0:PRINT "(S)I:GOTO 70
60 GOTO 80:PRINT:GOTO 80:GOTO 80
70
80 READ A:IF A=0:PRINT:GOTO 100
90 IF L=0:PRINT:GOTO 100:GOTO 100
100 READ A:PRINT:GOTO 100
110 IF L=0:PRINT:GOTO 100:GOTO 100
120 IF L=0:PRINT:GOTO 100:GOTO 100
130 IF L=0:PRINT:GOTO 100:GOTO 100
140 IF L=0:PRINT:GOTO 100:GOTO 100
150 IF L=0:PRINT:GOTO 100:GOTO 100
160 IF L=0:PRINT:GOTO 100:GOTO 100
170 IF L=0:PRINT:GOTO 100:GOTO 100
180 IF L=0:PRINT:GOTO 100:GOTO 100
190 IF L=0:PRINT:GOTO 100:GOTO 100
200 IF L=0:PRINT:GOTO 100:GOTO 100
210 IF L=0:PRINT:GOTO 100:GOTO 100
220 IF L=0:PRINT:GOTO 100:GOTO 100
230 IF L=0:PRINT:GOTO 100:GOTO 100
240 IF L=0:PRINT:GOTO 100:GOTO 100
250 IF L=0:PRINT:GOTO 100:GOTO 100
260 IF L=0:PRINT:GOTO 100:GOTO 100
270 IF L=0:PRINT:GOTO 100:GOTO 100
280 IF L=0:PRINT:GOTO 100:GOTO 100
290 IF L=0:PRINT:GOTO 100:GOTO 100
300 IF L=0:PRINT:GOTO 100:GOTO 100
310 IF L=0:PRINT:GOTO 100:GOTO 100
320 IF L=0:PRINT:GOTO 100:GOTO 100
330 IF L=0:PRINT:GOTO 100:GOTO 100
340 IF L=0:PRINT:GOTO 100:GOTO 100
350 IF L=0:PRINT:GOTO 100:GOTO 100
360 IF L=0:PRINT:GOTO 100:GOTO 100
370 IF L=0:PRINT:GOTO 100:GOTO 100
380 IF L=0:PRINT:GOTO 100:GOTO 100
390 IF L=0:PRINT:GOTO 100:GOTO 100
400 IF L=0:PRINT:GOTO 100:GOTO 100
410 IF L=0:PRINT:GOTO 100:GOTO 100
420 IF L=0:PRINT:GOTO 100:GOTO 100
430 IF L=0:PRINT:GOTO 100:GOTO 100
440 IF L=0:PRINT:GOTO 100:GOTO 100
450 IF L=0:PRINT:GOTO 100:GOTO 100
460 IF L=0:PRINT:GOTO 100:GOTO 100
470 IF L=0:PRINT:GOTO 100:GOTO 100
480 IF L=0:PRINT:GOTO 100:GOTO 100
490 IF L=0:PRINT:GOTO 100:GOTO 100
500 IF L=0:PRINT:GOTO 100:GOTO 100
510 IF L=0:PRINT:GOTO 100:GOTO 100
520 IF L=0:PRINT:GOTO 100:GOTO 100
530 IF L=0:PRINT:GOTO 100:GOTO 100
540 IF L=0:PRINT:GOTO 100:GOTO 100
550 IF L=0:PRINT:GOTO 100:GOTO 100
560 IF L=0:PRINT:GOTO 100:GOTO 100
570 IF L=0:PRINT:GOTO 100:GOTO 100
580 IF L=0:PRINT:GOTO 100:GOTO 100
590 IF L=0:PRINT:GOTO 100:GOTO 100
600 IF L=0:PRINT:GOTO 100:GOTO 100
610 IF L=0:PRINT:GOTO 100:GOTO 100
620 IF L=0:PRINT:GOTO 100:GOTO 100
630 IF L=0:PRINT:GOTO 100:GOTO 100
640 IF L=0:PRINT:GOTO 100:GOTO 100
650 IF L=0:PRINT:GOTO 100:GOTO 100
660 IF L=0:PRINT:GOTO 100:GOTO 100
670 IF L=0:PRINT:GOTO 100:GOTO 100
680 IF L=0:PRINT:GOTO 100:GOTO 100
690 IF L=0:PRINT:GOTO 100:GOTO 100
700 IF L=0:PRINT:GOTO 100:GOTO 100
710 IF L=0:PRINT:GOTO 100:GOTO 100
720 IF L=0:PRINT:GOTO 100:GOTO 100
730 IF L=0:PRINT:GOTO 100:GOTO 100
740 IF L=0:PRINT:GOTO 100:GOTO 100
750 IF L=0:PRINT:GOTO 100:GOTO 100
760 IF L=0:PRINT:GOTO 100:GOTO 100
770 IF L=0:PRINT:GOTO 100:GOTO 100
780 IF L=0:PRINT:GOTO 100:GOTO 100
790 IF L=0:PRINT:GOTO 100:GOTO 100
800 IF L=0:PRINT:GOTO 100:GOTO 100
810 IF L=0:PRINT:GOTO 100:GOTO 100
820 IF L=0:PRINT:GOTO 100:GOTO 100
830 IF L=0:PRINT:GOTO 100:GOTO 100
840 IF L=0:PRINT:GOTO 100:GOTO 100
850 IF L=0:PRINT:GOTO 100:GOTO 100
860 IF L=0:PRINT:GOTO 100:GOTO 100
870 IF L=0:PRINT:GOTO 100:GOTO 100
880 IF L=0:PRINT:GOTO 100:GOTO 100
890 IF L=0:PRINT:GOTO 100:GOTO 100
900 IF L=0:PRINT:GOTO 100:GOTO 100
910 IF L=0:PRINT:GOTO 100:GOTO 100
920 IF L=0:PRINT:GOTO 100:GOTO 100
930 IF L=0:PRINT:GOTO 100:GOTO 100
940 IF L=0:PRINT:GOTO 100:GOTO 100
950 IF L=0:PRINT:GOTO 100:GOTO 100
960 IF L=0:PRINT:GOTO 100:GOTO 100
970 IF L=0:PRINT:GOTO 100:GOTO 100
980 IF L=0:PRINT:GOTO 100:GOTO 100
990 IF L=0:PRINT:GOTO 100:GOTO 100
1000 IF L=0:PRINT:GOTO 100:GOTO 100

```

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk

immediately because it will be used with most of the present and future listings appearing in *Your Commodore*.

















At the start of each programming session, load *Checksum* and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

















If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and

press RETURN again.

If you want to turn off the checker simply type SYS49132 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where *Checksum* has you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one *Many* of the listings are presented in lower case mode press the Commodore key and the SHIFT key at the same time. 

| Mnemonic | Symbol | Keypress |
|----------|---|-------------------------|
| [RIGHT] |  | CBSR left/right |
| [LEFT] |  | SHIFT & CCSR left/right |
| [DOWN] |  | CBSR up/down |
| [UP] |  | SHIFT & CCSR up/down |
| [F1] |  | F1 key |
| [F2] |  | SHIFT & F1 key |
| [F3] |  | F3 key |
| [F4] |  | SHIFT & F3 key |
| [F5] |  | F5 key |
| [F6] |  | SHIFT & F5 key |
| [F7] |  | F7 key |
| [F8] |  | SHIFT & F7 key |
| [HOME] |  | CLR/HOME |
| [CLR] |  | SHIFT & CLR/HOME |
| [RVSON] |  | CTRL & 4 |
| [RVSOFF] |  | CTRL & 9 |

| Mnemonic | Symbol | Keypress |
|-----------|---|------------------|
| [BLACK] |  | CTRL & 1 |
| [WHITE] |  | CTRL & 2 |
| [RED] |  | CTRL & 3 |
| [CYAN] |  | CTRL & 4 |
| [PURPLE] |  | CTRL & 5 |
| [GREEN] |  | CTRL & 6 |
| [BLUE] |  | CTRL & 7 |
| [YELLOW] |  | CTRL & 8 |
| [POUND] |  | £ |
| [ARROW] |  | ⇐ |
| [UPARROW] |  | ↑ |
| [P8] |  | SHIFT & ↑ |
| [INST] |  | SHIFT & INST/DEL |
| [REV T] |  | see text |
| [Clear] |  | CBM + Insert |
| [Sister] |  | SHIFT + Sister |

YOUR

COMMODORE

Listings

CHARACTER GRABBER



PROGRAM: CHARACTER GRABBER

22 1020 NEW * CHARACTER GRABBER
 DEED
 39 1020 NEW *
 B1 1040 NEW * WRITTEN BY ARDRE
 N LEXTER
 B2 1050 NEW * JANUARY, 19
 68
 B3 1070 NEW *

 77 2000 FORK-C2288-C5-6,PO00-02
 028,SEXIAL-CAC009+6,PO009009+1,
 *00-45,8,00070
 B2 2010 MEMOS,1PAC<C5X5C9P00T>
 *0000 10 1180,2040+11*01 02
 TOP
 06 2020 RECTL
 71 2040 DETA1003.1,41,354,100.1,
 249,10,141,33,208,249.0,140,
 134,2,1020
 92 2050 DETA1019,047,31,220,375,
 32,240,10,32,261,17,32,84,38,
 140,8,1020
 22 2080 DETA120,321,189,35,320,
 202,32,17,38,249,90,133,205,
 52,228,205,2145
 73 2090 DETA121,40,240,67,301,6
 7,340,32,261,109,240,23,200,
 134,240,30,2000
 20 2095 DETA1201,138,240,33,202,
 136,140,30,261,85,248,134,20,
 1,218,240,217,2000
 60 2095 DETA125,45,16,143,35,160
 48,202,20,78,277,10,189,84,
 102,40,1403
 B3 2100 DETA182,40,78,177,10,10
 9,128,240,30,182,40,76,177,3,
 0,109,182,1000
 30 2110 DETA200,55,162,40,76,17
 7,16,174,204,4,239,209,240,3,
 78,182,140,2018
 C3 2200 DETA204,6,184,232,106,2,
 30,136,136,136,134,136,134,1,
 30,232,32,17,2099

F3 2120 DETA19,76,45,16,174,204
 4,234,30,240,140,233,142,20
 4,8,104,1000
 31 2140 DETA229,309,180,208,200
 200,200,200,200,132,202,32,
 17,10,78,40,2024
 60 2150 DETA15,134,225,120,222,
 200,180,8,240,0,133,201,142,
 204,4,30,2000
 CE 2160 DETA17,20,76,40,16,78,1,
 83,264,32,224,16,240,0,140,3,
 2,200,1000
 F2 2170 DETA190,7,200,200,30,20
 8,340,30,64,37,32,119,17,76,
 0,20,1400
 76 2180 DETA180,0,100,200,10,10
 9,150,7,200,100,11,200,245,0,
 4,500,24,2000
 F8 2200 DETA240,10,32,240,200,0,
 52,0,134,200,32,240,200,240,
 240,170,141,2000
 G8 2200 DETA3,50,13,240,62,104
 0,00,221,82,140,30,204,10,24
 0,200,300,2000
 99 2210 DETA3,200,208,240,0,317
 78,17,240,221,200,290,20,20,
 6,240,32,2000
 B4 2220 DETA210,200,107,19,20,2,
 30,240,100,107,200,7,50,240,
 1,204,8,2091
 31 2230 DETA240,107,202,32,218,
 290,76,247,64,96,8,17,18,18,
 29,29,2000
 C8 2240 DETA250,21,132,124,120,1,
 30,107,139,139,140,144,144,1,
 40,240,147,240,2004
 M7 2260 DETA100,207,100,100,160
 4,100,5,20,150,100,7,200,10
 2,14,200,1000
 36 2260 DETA240,32,228,200,240,
 241,201,84,240,7,201,200,240,
 8,70,70,2400
 G3 2270 DETA17,163,1,96,143,8,0
 6,30,173,18,169,140,7,0,10,2,
 00,100,1700
 FF 2280 DETA1,160,3,32,180,200,
 202,202,162,19,200,20,32,180,
 200,180,2000
 64 2280 DETA90,160,35,160,0,133,
 220,160,8,220,204,200,220,22,
 224,200,2000
 78 2290 DETA98,160,240,141,234,
 0,240,237,241,60,8,160,4,241
 200,217,2000
 40 2300 DETA141,60,218,160,0,16
 8,160,107,200,8,107,60,4,240,
 0,127,2044

71 2320 DETA210,117,157,69,210,
 232,224,30,200,230,169,230,1,
 41,7,8,100,2000
 G2 2330 DETA103,140,177,8,240,0,
 140,7,200,240,127,210,162,0,
 100,240,2040
 60 2340 DETA10,24,100,120,157,8,
 4,100,8,107,8,230,200,204,0,
 0,200,1740
 B7 2350 DETA107,160,0,100,65,10
 100,171,6,200,204,34,200,34,
 0,100,0,3110
 06 2360 DETA109,100,10,137,100,
 4,200,1,137,200,200,200,204,
 100,200,240,2004
 71 2370 DETA79,100,200,191,04,0,
 140,202,141,80,3,100,0,130,
 200,100,2000
 17 2380 DETA98,130,200,160,0,177
 100,140,200,24,160,201,100,
 1,200,201,2010
 F5 2390 DETA160,200,100,0,100,2,
 32,34,100,200,100,1,100,200,
 140,200,100,2000
 36 2400 DETA100,130,104,100,24,0,
 01,18,200,200,170,04,0,100,2,
 01,170,80,2010
 B3 2410 DETA95,130,200,96,100,64
 1,130,200,100,4,200,200,200,0,
 1,200,200,2000
 68 2420 DETA100,0,100,0,160,0,1,
 40,201,100,200,240,8,100,2,3,
 00,78,2000
 46 2430 DETA100,16,100,100,200,
 100,20,200,200,24,100,201,10,
 0,40,130,201,2100
 23 2440 DETA100,202,100,0,100,2,
 102,102,100,0,100,1,200,200,0,
 200,210,2010
 00 2450 DETA98,100,100,201,140,
 20,3,200,10,141,21,2,200,120,
 141,24,2040
 40 2460 DETA200,200,20,141,17,0,
 00,100,127,141,33,230,80,84,
 120,100,0,2010
 69 2470 DETA141,30,200,200,200,
 161,13,200,100,40,141,20,3,7
 60,204,541,2000
 51 2480 DETA95,3,100,21,140,24,
 200,80,80,160,1,141,20,200,3,
 52,21,1400
 68 2490 DETA240,0,170,10,200,10,
 1,100,240,4,802,10,100,140,1,
 01,24,200,2000
 61 2500 DETA102,30,200,100,10,
 00,175,10,200,74,144,0,76,40
 2,204,78,1010

LISTINGS

| | | | | | |
|-----|---|----|---|-----|---|
| 62 | 770 DETA3,179,65,3,41,2,208, 28,324 | 57 | 5180 DETA181,8,208,184,163,9 -18,125,1890 | 86 | 3598 DETA8,104,241,64,3,188, 189,3,673 |
| 63 | 780 DETA173,75,3,281,15,208, 19,175,643 | 58 | 5190 DETA189,187,328,158,187 -248,218,187,1842 | 87 | 3608 DETA87,153,8,47,31,237, 174,7,742 |
| 64 | 790 DETA87,3,203,48,240,13,3 38,60,883 | 59 | 5200 DETA194,219,157,64,219,9 -77,104,219,1583 | 88 | 3618 DETA87,193,50,153,183,3 2,189,189,2018 |
| 65 | 800 DETA3,208,67,3,20,37,203 -78,448 | 60 | 5210 DETA197,144,218,157,164 -229,157,1204,1481 | 89 | 3628 DETA78,178,183,82,17,17 3,78,3,742 |
| 66 | 810 DETA1,184,208,75,9,173, 85,3,808 | 61 | 5220 DETA208,282,18,208,78,9 80,189,9,1124 | 90 | 3638 DETA141,214,208,173,168 -184,184,78,1928 |
| 67 | 820 DETA1,18,208,14,32,114, 174,173,814 | 62 | 5230 DETA8,6,124,3,203,6,6,2 83,74,2 | 91 | 3648 DETA141,173,71,3,140,212, 189,173,874 |
| 68 | 830 DETA84,3,143,253,32,37,3 83,78,881 | 63 | 5240 DETA253,173,78,3,24,188 -3,15,843 | 92 | 3658 DETA184,184,141,75,3,82 -145,189,978 |
| 69 | 840 DETA179,193,35,228,223,2 40,148,201,1378 | 64 | 5250 DETA20,26,233,1,50,143, 3,208,829 | 93 | 3668 DETA178,89,3,41,4,208,5 6,173,877 |
| 70 | 850 DETA208,3,78,117,194,261 48,308,1877 | 65 | 5260 DETA48,6,189,6,140,18 208,173,852 | 94 | 3678 DETA70,3,203,32,140,3,2 68,78,828 |
| 71 | 860 DETA3,78,121,184,203,48, 228,3,887 | 66 | 5270 DETA71,3,10,18,13,24,10 3,48,281 | 95 | 3688 DETA173,78,3,281,28,248 3,230,987 |
| 72 | 870 DETA128,107,184,200,147,2 88,5,78,1104 | 67 | 5280 DETA228,3,208,238,37,20 6,173,248,1208 | 96 | 3698 DETA70,3,173,89,3,41,3 3,208,764 |
| 73 | 880 DETA288,188,203,78,208,5 -78,211,1222 | 68 | 5290 DETA2,141,248,7,1 63,48,168,1198 | 97 | 3708 DETA10,173,71,3,203,17 245,9,718 |
| 74 | 890 DETA208,281,83,208,3,78, 8,281,808 | 69 | 5300 DETA138,208,223,203,2 68,228,173,828 | 98 | 3718 DETA208,71,3,273,83,3,4 3,230,94 |
| 75 | 900 DETA203,204,208,3,78,71, 251,281,1188 | 70 | 5310 DETA203,241,83,3,88,8 8,3,22 | 99 | 3728 DETA208,10,173,71,3,281 24,248,228 |
| 76 | 910 DETA181,868,6,78,183,203 281,35,1784 | 71 | 5320 DETA175,173,79,6,141,8 24,193,813 | 100 | 3738 DETA3,208,71,3,173,63,8 40,877 |
| 77 | 920 DETA3,78,187,208,203,73, 289,3,822 | 72 | 5330 DETA78,218,208,141,76, 3,173,71,1848 | 101 | 3748 DETA108,240,108,22,218,3 88,248,173,1288 |
| 78 | 930 DETA8,217,281,208,83,28 9,8,78,1188 | 73 | 5340 DETA141,213,208,173,3 27,108,141,1868 | 102 | 3758 DETA201,208,3,78,218 187,223,1183 |
| 79 | 940 DETA8,203,281,24,208,3 78,42,78,1104 | 74 | 5350 DETA71,3,15,143,203,173 -22,3,887 | 103 | 3768 DETA8,3,78,148,187 221,51,1831 |
| 80 | 950 DETA281,281,25,208,3,78, 58,221,982 | 75 | 5360 DETA1,4,208,6,173,70,9 -248,743 | 104 | 3778 DETA208,3,78,127,187,13 2,143,208,1173 |
| 81 | 960 DETA203,3,248,3,78,176,1 83,12,824 | 76 | 5370 DETA3,238,78,3,173,63,8 -40,884 | 105 | 3788 DETA8,78,238,227,203,73 -208,3,887 |
| 82 | 970 DETA208,188,31,40,182,14 2,78,148,1688 | 77 | 5380 DETA8,208,18,173,78,3,2 14,203,784 | 106 | 3798 DETA7,188,208,281,17,2 8,3,78,888 |
| 83 | 980 DETA107,6,3,223,14,28 3,84,723 | 78 | 5390 DETA84,6,238,70,3,173, 52,3,78,2 | 107 | 3808 DETA188,201,148,208, 3,74,63,888 |
| 84 | 990 DETA203,108,21,40,182,14 3,84,723 | 79 | 5400 DETA2,1,288,10,173,71, 3,281,708 | 108 | 3818 DETA201,28,208,3,78 88,188,881 |
| 85 | 1000 DETA128,281,24,173,78,3,1 94,68,822 | 80 | 5410 DETA17,140,3,208,71,3,1 73,83,778 | 109 | 3828 DETA281,257,208,3,78,87 -178,271,1131 |
| 86 | 1010 DETA87,3,223,22,84,22, 188,287,878 | 81 | 5420 DETA5,40,3,268,10,173,9 3,3,521 | 110 | 3838 DETA147,208,3,78,128,19 8,281,52,921 |
| 87 | 1020 DETA74,64,3,189,8,47,4 2,12,533 | 82 | 5430 DETA121,24,240,3,238,78 3,173,855 | 111 | 3848 DETA240,3,78,212,208,17 3,78,3,882 |
| 88 | 1030 DETA40,189,189,268,200 -1,33,21,1,208,1823 | 83 | 5440 DETA28,3,41,36,208,180, 273,78,787 | 112 | 3858 DETA141,155,208,173,214 -183,241,78,1212 |
| 89 | 1040 DETA3,228,223,188,6,141 1,208,183,2028 | 84 | 5450 DETA8,58,223,17,18,20,2 8,3,28,248 | 113 | 3868 DETA178,71,3,241,186, 285,173,828 |
| 90 | 1050 DETA173,808,185,168,6,1 78,23,173,1873 | 85 | 5460 DETA28,24,188,78,3,143, 84,3,404 | 114 | 3878 DETA208,208,141,71,5,78 -178,193,1682 |
| 91 | 1060 DETA189,189,177,95,168, 7,74,72,874 | 86 | 5470 DETA22,237,284,173,70,3 -141,218,2084 | 115 | 3888 DETA8,187,188,147,173,7 3,2,223,884 |
| 92 | 1070 DETA189,3,248,3,148,208 -148,281,1138 | 87 | 5480 DETA99,173,71,3,141,21 9,190,173,1188 | 116 | 3898 DETA17,208,28,173,78,3 283,32,782 |
| 93 | 1080 DETA184,136,38,240,48,3 9,178,189,898 | 88 | 5490 DETA14,288,141,78,3,167 3,218,109,1228 | 117 | 3908 DETA70,177,89,95,181,1 87,148,89,1191 |
| 94 | 1100 DETA193,177,89,168,7,16 7,8,147,248 | 89 | 5500 DETA14,288,141,78,3,167 3,218,109,1228 | 118 | 3918 DETA207,207,284,173,8,22 2,41,31,928 |
| 95 | 1120 DETA18,183,74,64,138,3 98,74,48,882 | 90 | 5510 DETA45,71,3,273,6,238, 40,18,848 | 119 | 3928 DETA203,15,848,247,78,2 21,185,128,1234 |
| 96 | 1130 DETA28,182,78,174,234, 183,288,141,1238 | 91 | 5520 DETA177,280,141,84,3,93 -237,184,1689 | 120 | 3938 DETA4,32,18,8,4,2,1,18 9,284 |
| 97 | 1140 DETA189,147,253,136,189 -127,182,240,1388 | 92 | 5530 DETA78,178,183,22,237,1 84,168,8,1174 | 121 | 3948 DETA133,208,173,88,3, 11,28,827 |
| 98 | 1150 DETA184,184,136,38,240, 48,3,9,178,189,898 | 93 | 5540 DETA150,245,184,203, 157,3,218,109,1228 | 122 | 3958 DETA208,208,180,10,38 108,133,208 |
| 99 | 1160 DETA18,183,74,64,138,3 98,74,48,882 | 94 | 5550 DETA75,58,218,194,177 -22,241,1888 | 123 | 3968 DETA8,95,208,33,208,22 188,178,188 |
| 100 | 1170 DETA189,147,253,136,189 -127,182,240,1388 | 95 | 5560 DETA64,3,32,237,184,168 7,177,874 | 124 | 3978 DETA20,273,184,208,34,2 98,73,187,1842 |
| 101 | 1180 DETA108,184,136,38,240, 48,3,9,178,189,898 | 96 | 5570 DETA89,148,181,138,34,2 48,174,84,884 | 125 | 3988 DETA74,78,121,184,208, 22,228,21,1288 |

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| 14 | 2090 BATH007, 104, 78, 221, 184, 574, 84, 3, 1125 | 27 | 2410 BATH169, 8, 139, 281, 249, 4 8, 133, 232, 1273 | 50 | 2820 BATH142, 84, 148, 5, 187, 8, 145, 251, 931 | 68 | 2920 BATH171, 89, 8, 32, 253, 189, 152, 28, 921 |
| 18 | 2020 BATH204, 8, 47, 289, 0, 47, 4 3, 15, 595 | 45 | 2430 BATH142, 84, 148, 5, 187, 8, 145, 251, 931 | 55 | 2830 BATH162, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 80 | 2930 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 24 | 2020 BATH157, 8, 47, 32, 297, 184 32, 183, 882 | 73 | 2430 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 62 | 2840 BATH162, 8, 189, 3, 187, 0, 4 7, 232, 770 | 84 | 2930 BATH194, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 28 | 2020 BATH142, 82, 268, 189, 32, 3 7, 182, 76, 893 | 51 | 2440 BATH162, 8, 189, 3, 187, 0, 4 7, 232, 770 | 69 | 2850 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 | 88 | 2940 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 32 | 2040 BATH220, 198, 32, 189, 297, 189, 7, 338, 1149 | 81 | 2440 BATH208, 209, 78, 120, 193, 49, 49, 75, 804 | 78 | 2860 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 94 | 2940 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 36 | 2020 BATH177, 89, 290, 148, 99, 1 29, 289, 247, 1211 | 74 | 2450 BATH152, 52, 52, 54, 25, 56, 5 7, 1, 779 | 86 | 2870 BATH2, 8, 4, 5, 8, 72, 74, 74, 248 | 98 | 2950 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 40 | 2020 BATH208, 0, 148, 99, 32, 237 184, 78, 923 | 87 | 2470 BATH2, 8, 4, 5, 8, 72, 74, 74, 248 | 91 | 2880 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 104 | 2960 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 44 | 2070 BATH221, 184, 32, 189, 187, 189, 8, 280, 1285 | 88 | 2480 BATH24, 74, 178, 288, 83, 18 7, 223, 120, 1289 | 93 | 2890 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 110 | 2970 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 48 | 2080 BATH277, 89, 136, 148, 99, 1 29, 289, 247, 1211 | 89 | 2490 BATH2, 8, 4, 5, 8, 72, 74, 74, 248 | 95 | 2900 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 116 | 2980 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 51 | 2090 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 92 | 2500 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 96 | 2910 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 122 | 2990 BATH169, 189, 32, 210, 28, 2, 232, 208, 1185 |
| 55 | 2100 BATH194, 74, 221, 184, 32, 1 89, 187, 180, 1275 | 94 | 2510 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 97 | 2920 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 128 | 3000 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 59 | 2110 BATH177, 89, 74, 148, 99, 1 29, 289, 247, 1211 | 98 | 2520 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 99 | 2930 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 134 | 3010 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 63 | 2120 BATH189, 187, 180, 7, 277, 8 8, 12, 348, 984 | 100 | 2530 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 101 | 2940 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 140 | 3020 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 64 | 2140 BATH99, 129, 18, 248, 32, 23 7, 184, 76, 1039 | 102 | 2540 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 103 | 2950 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 146 | 3030 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 68 | 2150 BATH211, 198, 32, 189, 187, 189, 7, 338, 1149 | 104 | 2550 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 105 | 2960 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 152 | 3040 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 72 | 2160 BATH99, 73, 225, 148, 99, 1 29, 289, 247, 1211 | 106 | 2560 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 107 | 2970 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 158 | 3050 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 76 | 2170 BATH202, 227, 104, 74, 221, 1 84, 32, 399, 1287 | 108 | 2570 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 109 | 2980 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 164 | 3060 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 80 | 2180 BATH107, 240, 7, 148, 0, 148 8, 39, 308, 923 | 110 | 2580 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 111 | 2990 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 170 | 3070 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 84 | 2190 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 112 | 2590 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 113 | 3000 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 176 | 3080 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 88 | 2200 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 114 | 2600 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 115 | 3010 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 182 | 3090 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 92 | 2210 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 116 | 2610 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 117 | 3020 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 188 | 3100 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 96 | 2220 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 118 | 2620 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 119 | 3030 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 194 | 3110 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 100 | 2230 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 120 | 2630 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 121 | 3040 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 200 | 3120 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 104 | 2240 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 122 | 2640 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 123 | 3050 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 206 | 3130 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 108 | 2250 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 124 | 2650 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 125 | 3060 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 212 | 3140 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 112 | 2260 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 126 | 2660 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 127 | 3070 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 218 | 3150 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 116 | 2270 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 128 | 2670 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 129 | 3080 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 224 | 3160 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 120 | 2280 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 130 | 2680 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 131 | 3090 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 230 | 3170 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 124 | 2290 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 132 | 2690 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 133 | 3100 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 236 | 3180 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 128 | 2300 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 134 | 2700 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 135 | 3110 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 242 | 3190 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 132 | 2310 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 136 | 2710 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 137 | 3120 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 248 | 3200 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 136 | 2320 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 138 | 2720 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 139 | 3130 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 254 | 3210 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 140 | 2330 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 140 | 2730 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 141 | 3140 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 260 | 3220 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 144 | 2340 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 142 | 2740 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 143 | 3150 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 266 | 3230 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 148 | 2350 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 144 | 2750 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 145 | 3160 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 272 | 3240 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 152 | 2360 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 146 | 2760 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 147 | 3170 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 278 | 3250 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 156 | 2370 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 148 | 2770 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 149 | 3180 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 284 | 3260 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 160 | 2380 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 150 | 2780 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 151 | 3190 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 290 | 3270 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 164 | 2390 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 152 | 2790 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 153 | 3200 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 296 | 3280 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |
| 168 | 2400 BATH208, 209, 32, 1, 299, 292 3, 203, 288, 244, 1297 | 154 | 2800 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 155 | 3210 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 | 302 | 3290 BATH208, 209, 32, 8, 290, 18, 9, 7, 141, 918 |

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112 3950 DATA0,0,0,0,0,0,0,0,0,0
113 3960 DATA0,0,0,0,0,0,0,0,0,0
114 3970 DATA0,0,0,0,0,0,0,0,0,0
115 3980 DATA0,0,0,0,0,0,0,0,0,0
116 3990 DATA0,0,0,0,0,0,0,0,0,0
117 4000 DATA0,0,0,0,0,0,0,0,0,0
118 4010 DATA0,0,0,0,0,0,0,0,0,0
119 4020 DATA0,0,0,0,0,0,0,0,0,0
120 4030 DATA0,0,0,0,0,0,0,0,0,0
121 4040 DATA0,0,0,0,0,0,0,0,0,0
122 4050 DATA0,0,0,0,0,0,0,0,0,0
123 4060 DATA0,0,0,0,0,0,0,0,0,0
124 4070 DATA0,0,0,0,0,0,0,0,0,0
125 4080 DATA0,0,0,0,0,0,0,0,0,0
126 4090 DATA0,0,0,0,0,0,0,0,0,0
127 4100 DATA0,0,0,0,0,0,0,0,0,0
128 4110 DATA0,0,0,0,0,0,0,0,0,0
129 4120 DATA0,0,0,0,0,0,0,0,0,0
130 4130 DATA0,0,0,0,0,0,0,0,0,0
131 4140 DATA0,0,0,0,0,0,0,0,0,0
132 4150 DATA0,0,0,0,0,0,0,0,0,0
133 4160 DATA0,0,0,0,0,0,0,0,0,0
134 4170 DATA0,0,0,0,0,0,0,0,0,0
135 4180 DATA0,0,0,0,0,0,0,0,0,0
136 4190 DATA0,0,0,0,0,0,0,0,0,0
137 4200 DATA0,0,0,0,0,0,0,0,0,0
138 4210 DATA0,0,0,0,0,0,0,0,0,0
139 4220 DATA0,0,0,0,0,0,0,0,0,0
140 4230 DATA0,0,0,0,0,0,0,0,0,0
141 4240 DATA0,0,0,0,0,0,0,0,0,0
142 4250 DATA0,0,0,0,0,0,0,0,0,0
143 4260 DATA0,0,0,0,0,0,0,0,0,0
144 4270 DATA0,0,0,0,0,0,0,0,0,0
145 4280 DATA0,0,0,0,0,0,0,0,0,0
146 4290 DATA0,0,0,0,0,0,0,0,0,0
147 4300 DATA0,0,0,0,0,0,0,0,0,0
148 4310 DATA0,0,0,0,0,0,0,0,0,0
149 4320 DATA0,0,0,0,0,0,0,0,0,0
150 4330 DATA0,0,0,0,0,0,0,0,0,0
151 4340 DATA0,0,0,0,0,0,0,0,0,0
152 4350 DATA0,0,0,0,0,0,0,0,0,0
153 4360 DATA0,0,0,0,0,0,0,0,0,0
154 4370 DATA0,0,0,0,0,0,0,0,0,0
155 4380 DATA0,0,0,0,0,0,0,0,0,0
156 4390 DATA0,0,0,0,0,0,0,0,0,0
157 4400 DATA0,0,0,0,0,0,0,0,0,0
158 4410 DATA0,0,0,0,0,0,0,0,0,0
159 4420 DATA0,0,0,0,0,0,0,0,0,0
160 4430 DATA0,0,0,0,0,0,0,0,0,0
161 4440 DATA0,0,0,0,0,0,0,0,0,0
162 4450 DATA0,0,0,0,0,0,0,0,0,0
163 4460 DATA0,0,0,0,0,0,0,0,0,0
164 4470 DATA0,0,0,0,0,0,0,0,0,0
165 4480 DATA0,0,0,0,0,0,0,0,0,0
166 4490 DATA0,0,0,0,0,0,0,0,0,0
167 4500 DATA0,0,0,0,0,0,0,0,0,0
168 4510 DATA0,0,0,0,0,0,0,0,0,0
169 4520 DATA0,0,0,0,0,0,0,0,0,0
170 4530 DATA0,0,0,0,0,0,0,0,0,0
171 4540 DATA0,0,0,0,0,0,0,0,0,0
172 4550 DATA0,0,0,0,0,0,0,0,0,0
173 4560 DATA0,0,0,0,0,0,0,0,0,0
174 4570 DATA0,0,0,0,0,0,0,0,0,0
175 4580 DATA0,0,0,0,0,0,0,0,0,0
176 4590 DATA0,0,0,0,0,0,0,0,0,0
177 4600 DATA0,0,0,0,0,0,0,0,0,0
178 4610 DATA0,0,0,0,0,0,0,0,0,0
179 4620 DATA0,0,0,0,0,0,0,0,0,0
180 4630 DATA0,0,0,0,0,0,0,0,0,0
181 4640 DATA0,0,0,0,0,0,0,0,0,0
182 4650 DATA0,0,0,0,0,0,0,0,0,0
183 4660 DATA0,0,0,0,0,0,0,0,0,0
184 4670 DATA0,0,0,0,0,0,0,0,0,0
185 4680 DATA0,0,0,0,0,0,0,0,0,0
186 4690 DATA0,0,0,0,0,0,0,0,0,0
187 4700 DATA0,0,0,0,0,0,0,0,0,0
188 4710 DATA0,0,0,0,0,0,0,0,0,0
189 4720 DATA0,0,0,0,0,0,0,0,0,0
190 4730 DATA0,0,0,0,0,0,0,0,0,0
191 4740 DATA0,0,0,0,0,0,0,0,0,0
192 4750 DATA0,0,0,0,0,0,0,0,0,0
193 4760 DATA0,0,0,0,0,0,0,0,0,0
194 4770 DATA0,0,0,0,0,0,0,0,0,0
195 4780 DATA0,0,0,0,0,0,0,0,0,0
196 4790 DATA0,0,0,0,0,0,0,0,0,0
197 4800 DATA0,0,0,0,0,0,0,0,0,0
198 4810 DATA0,0,0,0,0,0,0,0,0,0
199 4820 DATA0,0,0,0,0,0,0,0,0,0
200 4830 DATA0,0,0,0,0,0,0,0,0,0

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201 DATA0,0,0,0,0,0,0,0,0,0
202 DATA0,0,0,0,0,0,0,0,0,0
203 DATA0,0,0,0,0,0,0,0,0,0
204 DATA0,0,0,0,0,0,0,0,0,0
205 DATA0,0,0,0,0,0,0,0,0,0
206 DATA0,0,0,0,0,0,0,0,0,0
207 DATA0,0,0,0,0,0,0,0,0,0
208 DATA0,0,0,0,0,0,0,0,0,0
209 DATA0,0,0,0,0,0,0,0,0,0
210 DATA0,0,0,0,0,0,0,0,0,0
211 DATA0,0,0,0,0,0,0,0,0,0
212 DATA0,0,0,0,0,0,0,0,0,0
213 DATA0,0,0,0,0,0,0,0,0,0
214 DATA0,0,0,0,0,0,0,0,0,0
215 DATA0,0,0,0,0,0,0,0,0,0
216 DATA0,0,0,0,0,0,0,0,0,0
217 DATA0,0,0,0,0,0,0,0,0,0
218 DATA0,0,0,0,0,0,0,0,0,0
219 DATA0,0,0,0,0,0,0,0,0,0
220 DATA0,0,0,0,0,0,0,0,0,0
221 DATA0,0,0,0,0,0,0,0,0,0
222 DATA0,0,0,0,0,0,0,0,0,0
223 DATA0,0,0,0,0,0,0,0,0,0
224 DATA0,0,0,0,0,0,0,0,0,0
225 DATA0,0,0,0,0,0,0,0,0,0
226 DATA0,0,0,0,0,0,0,0,0,0
227 DATA0,0,0,0,0,0,0,0,0,0
228 DATA0,0,0,0,0,0,0,0,0,0
229 DATA0,0,0,0,0,0,0,0,0,0
230 DATA0,0,0,0,0,0,0,0,0,0
231 DATA0,0,0,0,0,0,0,0,0,0
232 DATA0,0,0,0,0,0,0,0,0,0
233 DATA0,0,0,0,0,0,0,0,0,0
234 DATA0,0,0,0,0,0,0,0,0,0
235 DATA0,0,0,0,0,0,0,0,0,0
236 DATA0,0,0,0,0,0,0,0,0,0
237 DATA0,0,0,0,0,0,0,0,0,0
238 DATA0,0,0,0,0,0,0,0,0,0
239 DATA0,0,0,0,0,0,0,0,0,0
240 DATA0,0,0,0,0,0,0,0,0,0
241 DATA0,0,0,0,0,0,0,0,0,0
242 DATA0,0,0,0,0,0,0,0,0,0
243 DATA0,0,0,0,0,0,0,0,0,0
244 DATA0,0,0,0,0,0,0,0,0,0
245 DATA0,0,0,0,0,0,0,0,0,0
246 DATA0,0,0,0,0,0,0,0,0,0
247 DATA0,0,0,0,0,0,0,0,0,0
248 DATA0,0,0,0,0,0,0,0,0,0
249 DATA0,0,0,0,0,0,0,0,0,0
250 DATA0,0,0,0,0,0,0,0,0,0
251 DATA0,0,0,0,0,0,0,0,0,0
252 DATA0,0,0,0,0,0,0,0,0,0
253 DATA0,0,0,0,0,0,0,0,0,0
254 DATA0,0,0,0,0,0,0,0,0,0
255 DATA0,0,0,0,0,0,0,0,0,0
256 DATA0,0,0,0,0,0,0,0,0,0
257 DATA0,0,0,0,0,0,0,0,0,0
258 DATA0,0,0,0,0,0,0,0,0,0
259 DATA0,0,0,0,0,0,0,0,0,0
260 DATA0,0,0,0,0,0,0,0,0,0
261 DATA0,0,0,0,0,0,0,0,0,0
262 DATA0,0,0,0,0,0,0,0,0,0
263 DATA0,0,0,0,0,0,0,0,0,0
264 DATA0,0,0,0,0,0,0,0,0,0
265 DATA0,0,0,0,0,0,0,0,0,0
266 DATA0,0,0,0,0,0,0,0,0,0
267 DATA0,0,0,0,0,0,0,0,0,0
268 DATA0,0,0,0,0,0,0,0,0,0
269 DATA0,0,0,0,0,0,0,0,0,0
270 DATA0,0,0,0,0,0,0,0,0,0
271 DATA0,0,0,0,0,0,0,0,0,0
272 DATA0,0,0,0,0,0,0,0,0,0
273 DATA0,0,0,0,0,0,0,0,0,0
274 DATA0,0,0,0,0,0,0,0,0,0
275 DATA0,0,0,0,0,0,0,0,0,0
276 DATA0,0,0,0,0,0,0,0,0,0
277 DATA0,0,0,0,0,0,0,0,0,0
278 DATA0,0,0,0,0,0,0,0,0,0
279 DATA0,0,0,0,0,0,0,0,0,0
280 DATA0,0,0,0,0,0,0,0,0,0
281 DATA0,0,0,0,0,0,0,0,0,0
282 DATA0,0,0,0,0,0,0,0,0,0
283 DATA0,0,0,0,0,0,0,0,0,0
284 DATA0,0,0,0,0,0,0,0,0,0
285 DATA0,0,0,0,0,0,0,0,0,0
286 DATA0,0,0,0,0,0,0,0,0,0
287 DATA0,0,0,0,0,0,0,0,0,0
288 DATA0,0,0,0,0,0,0,0,0,0
289 DATA0,0,0,0,0,0,0,0,0,0
290 DATA0,0,0,0,0,0,0,0,0,0
291 DATA0,0,0,0,0,0,0,0,0,0
292 DATA0,0,0,0,0,0,0,0,0,0
293 DATA0,0,0,0,0,0,0,0,0,0
294 DATA0,0,0,0,0,0,0,0,0,0
295 DATA0,0,0,0,0,0,0,0,0,0
296 DATA0,0,0,0,0,0,0,0,0,0
297 DATA0,0,0,0,0,0,0,0,0,0
298 DATA0,0,0,0,0,0,0,0,0,0
299 DATA0,0,0,0,0,0,0,0,0,0
300 DATA0,0,0,0,0,0,0,0,0,0

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IBM MAINS



```

10 REM *****
11 *****
12 REM --PAGES SWAPPED BY JOHN Y
13 CURIE DEPT 97 **
14 30 REM **PROGRAM ENDS AT 4100
15 0 GOTO 4041
16 40 REM **SOURCE CODE-- COMPUTE'S
17 LABEL SWAPPAGE**
18 50 REM **RADIO DATA -- 10PM/9 B
19 1/10/1000 100 **
20 60 REM **COMPUTE -- CLIP 04/4
21 0 COLLAPSE **
22 70 REM *****
23 *****
24 80 PLOT
25 90 READ 4,PAGE 4000,4,0-0+0
26 100 FOR 3=1 TO 0:READ 4,PAGE 410
27 4,1-0+0:PRINT 0
28 110 FOR 5=1 TO 1000:READ 4,PAGE
29 400+0,4,0-0+0:WRITE
30 120 IF 5=1:PRINT THIS PRINT:END
31 00 IN CHECKOUT:GOTO:GOTO
32 130 GOTO:WRITE "CODE R/CODE".NO.
33 400:GOTO 500
34 140 REM **INITIAL HELP SET**
35 150 DATA 9,00,00,00,00,00,00,00,
36 00,00
37 160 REM **KEY PROG**
38 170 DATA 100,200,141-00,200,32,1
39 00,200
40 180 DATA 00,70,00,70,32,70,00,00
41 190 DATA 00,32,40,70,70,70,32
42 200 DATA 00,70,00,70,70,00,32,40
43 210 DATA 07,00,00,41,0,100,00,1,
44 00
45 220 DATA 300,100,32,100,101,100,
46 0,100

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LISTINGS

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8500 DATA 132,251,169,250,172,229
    -22,153
8600 DATA 9,32,101,288,348,44,133
    -290
8700 DATA 568,28,133,251,169,250,
    172,229
8800 DATA 32,543,8,32,161,258,169
    -290
8900 DATA 129,258,169,28,133,251,
    169,290
9000 DATA 172,250,22,342,9,32,161
    -288
9100 DATA 169,208,133,250,169,25,
    133,251
9200 DATA 169,250,172,132,22,162,
    28,32
9300 DATA 100,250,32,169,22,169,2
    52,141
9400 DATA 40,208,94,249,252,241,8
    8,288
9500 DATA 32,125,255,79,68,98,88,
    80
9600 DATA 68,32,79,68,98,88,32,40
9700 DATA 74,79,32,79,82,88,78,82
9800 DATA 78,79,68,32,40,52,98,88
9900 DATA 40,0,169,218,133,250,18
    9,28
10000 DATA 132,251,169,8,250,252,1
    69,250
10100 DATA 169,7,133,258,249,22,13
    2,251
10200 DATA 169,250,172,229,22,162,
    2,32
10300 DATA 501,288,168,118,133,250
    -249,23
10400 DATA 132,251,169,250,172,229
    -22,250
10500 DATA 2,32,181,288,249,17,229
    -250
10600 DATA 169,28,133,251,169,258,
    172,229
10700 DATA 22,342,4,32,161,258,169
    -133
10800 DATA 132,250,169,28,133,251,
    249,290
10900 DATA 171,237,22,162,3,32,101
    -259
11000 DATA 169,121,133,250,169,25,
    133,251
11100 DATA 548,288,172,229,22,162,
    8,32
11200 DATA 201,225,258,189,133,230
    -169,25
11300 DATA 129,251,169,288,172,229
    -22,162
11400 DATA 7,32,161,258,169,136,13
    3,290
11500 DATA 169,28,133,251,169,250,
    251,248
11600 DATA 22,162,8,32,101,258,168
    -81
11700 DATA 132,250,169,22,133,251,
    169,258
11800 DATA 171,231,22,162,8,58,161
    -288
11900 DATA 169,247,133,250,169,23
    -133,251
12000 DATA 169,250,172,248,22,162
    -18,32
12100 DATA 100,250,32,165,22,32,2
    87,22
12200 DATA 568,282,161,48,208,98,
    159,288
12300 DATA 241,48,208,32,125,250,
    78,78
12400 DATA 82,77,65,78,51,79,68,8
    9
12500 DATA 68,32,40,74,79,72,78,3
    2

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12600 DATA 89,79,68,78,79,68,32,4
    8
12700 DATA 87,68,68,40,8,169,178,
    229
12800 DATA 250,169,208,133,250,18
    9,250,140
12900 DATA 82,3,248,250,240,82,3,
    248
13000 DATA 25,158,252,169,250,172
    -249,22
13100 DATA 342,1,32,161,258,169,2
    88,233
13200 DATA 288,169,208,133,250,18
    9,250,179
13300 DATA 244,22,162,1,32,100,25
    8,169
13400 DATA 281,133,250,169,258,13
    3,251,169
13500 DATA 250,172,248,22,162,3,3
    2,161
13600 DATA 288,169,208,133,250,18
    9,288,133
13700 DATA 251,169,250,172,248,22
    -162,8
13800 DATA 32,181,258,249,208,133
    -250,169
13900 DATA 208,233,251,169,250,17
    2,247,22
14000 DATA 162,8,32,101,252,169,2
    14,133
14100 DATA 250,258,258,158,281,16
    9,250,172
14200 DATA 248,22,162,4,32,181,25
    8,249
14300 DATA 218,133,258,249,208,23
    3,251,169
14400 DATA 258,172,248,22,162,7,3
    2,161
14500 DATA 258,169,228,133,208,24
    8,288,133
14600 DATA 251,169,208,172,250,22
    -162,8
14700 DATA 32,501,255,169,256,139
    -258,169
14800 DATA 22,133,251,169,250,172
    -251,32
14900 DATA 162,9,32,100,258,169,2
    48,169
15000 DATA 250,169,208,133,251,18
    9,288,172
15100 DATA 282,22,162,30,22,100,2
    58,169
15200 DATA 252,240,48,208,98,160,
    8,169
15300 DATA 128,248,183,8,27,208,1
    82,88
15400 DATA 208,248,173,187,18,9,1
    28,141
15500 DATA 187,28,169,0,141,62,9,
    169
15600 DATA 27,141,83,8,168,44,241
    -92
15700 DATA 27,98,169,68,141,73,27
    -169
15800 DATA 70,141,74,27,98,18,18,
    9
15900 DATA 8,25,25,8,21,8,8,1
16000 DATA 19,1,7,1,8,2,8,8
16100 DATA 8,1,18,1,7,1,14,1
16200 DATA 11,8,9,7,8,10,7,8
16300 DATA 4,8,8,8,82,213,27
16400 DATA 75,257,157,157,27,84,3
    8,48
16500 DATA 284,27,78,157,157,257,
    27,84
16600 DATA 13,88,192,13,88,70,218
    -133
16700 DATA 68,69,76,213,13,88,212
    -28
16800 DATA 94,187,31,17,17,27,17,
    287

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16900 DATA 157,227,157,60,214,54,
    54,157
17000 DATA 58,145,148,145,148,157
    -68,204
17100 DATA 27,78,187,187,237,27,4
    4,13
17200 DATA 82,188,33,78,231,13,82
    -67
17300 DATA 218,37,78,157,157,157,
    27,64
17400 DATA 13,68,294,88,68,13,82,
    213
17500 DATA 13,83,68,68,32,83,48,3
    7
17600 DATA 48,13,68,68,47,67,11,69,
    68
17700 DATA 48,13,68,183,32,68,69,
    67
17800 DATA 32,53,51,58,51,13,88,4
    8
17900 DATA 67,63,68,68,67,40,24,3
    4
18000 DATA 41,127,127,148,148,148
    -148,68
18100 DATA 63,32,157,48,41,157,14
    8,148
18200 DATA 248,148,248,83,88,83,3
    2,58
18300 DATA 22,32,58,18,83,88,83,3
    2
18400 DATA 82,84,84,82,13

```

DESIGNER



GETTING IT ALL IN

Type in and SAVE each of the programs presented here. You will NOT be able to run the program until you have all of the sections. These will appear over the next two months.

| PROGRAM DESIGNER MAIL | | |
|-----------------------|----|---|
| 87 | 12 | 81-0289 -LH-58 -88-0288 |
| 88 | 08 | FOR LHM TO 88, CH-8, FOR 2-8 TO 18, SEND A CONCERN FORM 88-10-1, 8 NEXT 2 |
| 89 | 08 | 88 SEND A IF MAIL THROUGH "RECORD IN LINE", 18-11-18-08 08 |
| 90 | 08 | 88 NEXT 1, 8-08 |
| 91 | 08 | 88 DATA 81, 8, 8, 188, 88, 70, 2 |

LISTINGS

| | | | |
|-----|--------------------------------|----|--------------------------------|
| 4 | 48 00 0000 100,000,000,100,000 | 49 | 48 00 0000 100,000,000,100,000 |
| 50 | 48 00 0000 100,000,000,100,000 | 51 | 48 00 0000 100,000,000,100,000 |
| 52 | 48 00 0000 100,000,000,100,000 | 53 | 48 00 0000 100,000,000,100,000 |
| 54 | 48 00 0000 100,000,000,100,000 | 55 | 48 00 0000 100,000,000,100,000 |
| 56 | 48 00 0000 100,000,000,100,000 | 57 | 48 00 0000 100,000,000,100,000 |
| 58 | 48 00 0000 100,000,000,100,000 | 59 | 48 00 0000 100,000,000,100,000 |
| 60 | 48 00 0000 100,000,000,100,000 | 61 | 48 00 0000 100,000,000,100,000 |
| 62 | 48 00 0000 100,000,000,100,000 | 63 | 48 00 0000 100,000,000,100,000 |
| 64 | 48 00 0000 100,000,000,100,000 | 65 | 48 00 0000 100,000,000,100,000 |
| 66 | 48 00 0000 100,000,000,100,000 | 67 | 48 00 0000 100,000,000,100,000 |
| 68 | 48 00 0000 100,000,000,100,000 | 69 | 48 00 0000 100,000,000,100,000 |
| 70 | 48 00 0000 100,000,000,100,000 | 71 | 48 00 0000 100,000,000,100,000 |
| 72 | 48 00 0000 100,000,000,100,000 | 73 | 48 00 0000 100,000,000,100,000 |
| 74 | 48 00 0000 100,000,000,100,000 | 75 | 48 00 0000 100,000,000,100,000 |
| 76 | 48 00 0000 100,000,000,100,000 | 77 | 48 00 0000 100,000,000,100,000 |
| 78 | 48 00 0000 100,000,000,100,000 | 79 | 48 00 0000 100,000,000,100,000 |
| 80 | 48 00 0000 100,000,000,100,000 | 81 | 48 00 0000 100,000,000,100,000 |
| 82 | 48 00 0000 100,000,000,100,000 | 83 | 48 00 0000 100,000,000,100,000 |
| 84 | 48 00 0000 100,000,000,100,000 | 85 | 48 00 0000 100,000,000,100,000 |
| 86 | 48 00 0000 100,000,000,100,000 | 87 | 48 00 0000 100,000,000,100,000 |
| 88 | 48 00 0000 100,000,000,100,000 | 89 | 48 00 0000 100,000,000,100,000 |
| 90 | 48 00 0000 100,000,000,100,000 | 91 | 48 00 0000 100,000,000,100,000 |
| 92 | 48 00 0000 100,000,000,100,000 | 93 | 48 00 0000 100,000,000,100,000 |
| 94 | 48 00 0000 100,000,000,100,000 | 95 | 48 00 0000 100,000,000,100,000 |
| 96 | 48 00 0000 100,000,000,100,000 | 97 | 48 00 0000 100,000,000,100,000 |
| 98 | 48 00 0000 100,000,000,100,000 | 99 | 48 00 0000 100,000,000,100,000 |
| 100 | 48 00 0000 100,000,000,100,000 | | |

LISTINGS

| | | | | |
|----|-------------------------------|-------------------------------|----|-------------------------------|
| 66 | 190,100,1070 | 669,000,100,100,070,030,107,1 | 68 | 800 0070 200,07,100,00,007,1 |
| 67 | 300 0070 200,100,070,000,100, | 1,107,00,0000 | 69 | 100,000,0,00,00,000,007,03 |
| 68 | 100,000,0,000,070,007,107,7 | 0,000,007,0000 | 70 | 0,000,07,0000 |
| 69 | 500 0070 47,100,0,00,03,000, | 100,000,100,000,00,10,10,10 | 71 | 000 0070 100,100,000,000,100 |
| 70 | 100,000,100,000,00,10,10,10 | 000,100,100 | 72 | 000 0070 100,100,000,000,100 |
| 71 | 000 0070 5,000,00,0,00,0,00, | 000,00,00,00,00,00,00,00,00, | 73 | 000 0070 07,100,100,000,00,0 |
| 72 | 000,00,00,00,00,00,00,00,00, | 000,00,00,00,00,00,00,00,00, | 74 | 000 0070 07,100,100,000,00,0 |
| 73 | 000 0070 000,100,100,00,000, | 000,100,000,000,000,000,000, | 75 | 000 0070 000,100,100,00,000, |
| 74 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 76 | 000 0070 100,100,000,000,000, |
| 75 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 77 | 000 0070 100,100,000,000,000, |
| 76 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 78 | 000 0070 100,100,000,000,000, |
| 77 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 79 | 000 0070 100,100,000,000,000, |
| 78 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 80 | 000 0070 100,100,000,000,000, |
| 79 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 81 | 000 0070 100,100,000,000,000, |
| 80 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 82 | 000 0070 100,100,000,000,000, |
| 81 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 83 | 000 0070 100,100,000,000,000, |
| 82 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 84 | 000 0070 100,100,000,000,000, |
| 83 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 85 | 000 0070 100,100,000,000,000, |
| 84 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 86 | 000 0070 100,100,000,000,000, |
| 85 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 87 | 000 0070 100,100,000,000,000, |
| 86 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 88 | 000 0070 100,100,000,000,000, |
| 87 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 89 | 000 0070 100,100,000,000,000, |
| 88 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 90 | 000 0070 100,100,000,000,000, |
| 89 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 91 | 000 0070 100,100,000,000,000, |
| 90 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 92 | 000 0070 100,100,000,000,000, |
| 91 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 93 | 000 0070 100,100,000,000,000, |
| 92 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 94 | 000 0070 100,100,000,000,000, |
| 93 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 95 | 000 0070 100,100,000,000,000, |
| 94 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 96 | 000 0070 100,100,000,000,000, |
| 95 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 97 | 000 0070 100,100,000,000,000, |
| 96 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 98 | 000 0070 100,100,000,000,000, |
| 97 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 99 | 000 0070 100,100,000,000,000, |
| 98 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | 00 | 000 0070 100,100,000,000,000, |
| 99 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | | |
| 00 | 000 0070 100,100,000,000,000, | 000,000,000,000,000,000,000, | | |

PROVIDED BY COMPASS DATA

LISTINGS

| | | | | | |
|----|---|-----|---------------------------------------|-----|--------------------------------------|
| 50 | 501-110-0, A. WEST 2 | 80 | 100-104, 213, 244, 41, 100, 100, 2 | 60 | 212, 212, 212, 200, 100, 27, 100, 1 |
| 51 | 200 200 200 200 200 200 200 200 | 81 | 11, 90, 200, 2000 | 61 | 90, 200, 100, 200, 2001 |
| 52 | 500 500 500 500 500 500 500 500 | 82 | 200 2000 200, 80, 210, 100, 40, 1 | 62 | 500 500 100, 100, 200, 200, 100, 100 |
| 53 | 100 100 100 100 100 100 100 100 | 83 | 100, 100, 20, 200, 20, 1, 200, 210, 2 | 63 | 100 100 100, 100, 100, 200, 20, 10 |
| 54 | 200 200 200 200 200 200 200 200 | 84 | 200 200 200, 100, 100, 100, 100, 100 | 64 | 500 500 200, 100, 100, 100, 100, 100 |
| 55 | 300 300 300 300 300 300 300 300 | 85 | 100 100 100, 100, 100, 100, 100, 100 | 65 | 100 100 100, 100, 100, 100, 100, 100 |
| 56 | 400 400 400 400 400 400 400 400 | 86 | 100 100 100, 100, 100, 100, 100, 100 | 66 | 100 100 100, 100, 100, 100, 100, 100 |
| 57 | 500 500 500 500 500 500 500 500 | 87 | 100 100 100, 100, 100, 100, 100, 100 | 67 | 100 100 100, 100, 100, 100, 100, 100 |
| 58 | 600 600 600 600 600 600 600 600 | 88 | 100 100 100, 100, 100, 100, 100, 100 | 68 | 100 100 100, 100, 100, 100, 100, 100 |
| 59 | 700 700 700 700 700 700 700 700 | 89 | 100 100 100, 100, 100, 100, 100, 100 | 69 | 100 100 100, 100, 100, 100, 100, 100 |
| 60 | 800 800 800 800 800 800 800 800 | 90 | 100 100 100, 100, 100, 100, 100, 100 | 70 | 100 100 100, 100, 100, 100, 100, 100 |
| 61 | 900 900 900 900 900 900 900 900 | 91 | 100 100 100, 100, 100, 100, 100, 100 | 71 | 100 100 100, 100, 100, 100, 100, 100 |
| 62 | 1000 1000 1000 1000 1000 1000 1000 1000 | 92 | 100 100 100, 100, 100, 100, 100, 100 | 72 | 100 100 100, 100, 100, 100, 100, 100 |
| 63 | 1100 1100 1100 1100 1100 1100 1100 1100 | 93 | 100 100 100, 100, 100, 100, 100, 100 | 73 | 100 100 100, 100, 100, 100, 100, 100 |
| 64 | 1200 1200 1200 1200 1200 1200 1200 1200 | 94 | 100 100 100, 100, 100, 100, 100, 100 | 74 | 100 100 100, 100, 100, 100, 100, 100 |
| 65 | 1300 1300 1300 1300 1300 1300 1300 1300 | 95 | 100 100 100, 100, 100, 100, 100, 100 | 75 | 100 100 100, 100, 100, 100, 100, 100 |
| 66 | 1400 1400 1400 1400 1400 1400 1400 1400 | 96 | 100 100 100, 100, 100, 100, 100, 100 | 76 | 100 100 100, 100, 100, 100, 100, 100 |
| 67 | 1500 1500 1500 1500 1500 1500 1500 1500 | 97 | 100 100 100, 100, 100, 100, 100, 100 | 77 | 100 100 100, 100, 100, 100, 100, 100 |
| 68 | 1600 1600 1600 1600 1600 1600 1600 1600 | 98 | 100 100 100, 100, 100, 100, 100, 100 | 78 | 100 100 100, 100, 100, 100, 100, 100 |
| 69 | 1700 1700 1700 1700 1700 1700 1700 1700 | 99 | 100 100 100, 100, 100, 100, 100, 100 | 79 | 100 100 100, 100, 100, 100, 100, 100 |
| 70 | 1800 1800 1800 1800 1800 1800 1800 1800 | 100 | 100 100 100, 100, 100, 100, 100, 100 | 80 | 100 100 100, 100, 100, 100, 100, 100 |
| 71 | 1900 1900 1900 1900 1900 1900 1900 1900 | | | 81 | 100 100 100, 100, 100, 100, 100, 100 |
| 72 | 2000 2000 2000 2000 2000 2000 2000 2000 | | | 82 | 100 100 100, 100, 100, 100, 100, 100 |
| 73 | 2100 2100 2100 2100 2100 2100 2100 2100 | | | 83 | 100 100 100, 100, 100, 100, 100, 100 |
| 74 | 2200 2200 2200 2200 2200 2200 2200 2200 | | | 84 | 100 100 100, 100, 100, 100, 100, 100 |
| 75 | 2300 2300 2300 2300 2300 2300 2300 2300 | | | 85 | 100 100 100, 100, 100, 100, 100, 100 |
| 76 | 2400 2400 2400 2400 2400 2400 2400 2400 | | | 86 | 100 100 100, 100, 100, 100, 100, 100 |
| 77 | 2500 2500 2500 2500 2500 2500 2500 2500 | | | 87 | 100 100 100, 100, 100, 100, 100, 100 |
| 78 | 2600 2600 2600 2600 2600 2600 2600 2600 | | | 88 | 100 100 100, 100, 100, 100, 100, 100 |
| 79 | 2700 2700 2700 2700 2700 2700 2700 2700 | | | 89 | 100 100 100, 100, 100, 100, 100, 100 |
| 80 | 2800 2800 2800 2800 2800 2800 2800 2800 | | | 90 | 100 100 100, 100, 100, 100, 100, 100 |
| 81 | 2900 2900 2900 2900 2900 2900 2900 2900 | | | 91 | 100 100 100, 100, 100, 100, 100, 100 |
| 82 | 3000 3000 3000 3000 3000 3000 3000 3000 | | | 92 | 100 100 100, 100, 100, 100, 100, 100 |
| 83 | 3100 3100 3100 3100 3100 3100 3100 3100 | | | 93 | 100 100 100, 100, 100, 100, 100, 100 |
| 84 | 3200 3200 3200 3200 3200 3200 3200 3200 | | | 94 | 100 100 100, 100, 100, 100, 100, 100 |
| 85 | 3300 3300 3300 3300 3300 3300 3300 3300 | | | 95 | 100 100 100, 100, 100, 100, 100, 100 |
| 86 | 3400 3400 3400 3400 3400 3400 3400 3400 | | | 96 | 100 100 100, 100, 100, 100, 100, 100 |
| 87 | 3500 3500 3500 3500 3500 3500 3500 3500 | | | 97 | 100 100 100, 100, 100, 100, 100, 100 |
| 88 | 3600 3600 3600 3600 3600 3600 3600 3600 | | | 98 | 100 100 100, 100, 100, 100, 100, 100 |
| 89 | 3700 3700 3700 3700 3700 3700 3700 3700 | | | 99 | 100 100 100, 100, 100, 100, 100, 100 |
| 90 | 3800 3800 3800 3800 3800 3800 3800 3800 | | | 100 | 100 100 100, 100, 100, 100, 100, 100 |

YOUR COMMODORE Listings

88-COL VIDEO



```

10 REM *****
20 REM ***** PROGRAM TO RETRIEVE *****
30 REM ***** COMP-SET FILE FROM DISC ****
40 REM ** AND REPLACE IN 88-COL SCREEN **
50 REM ***** 100 B.PROGRAM 1000 *****
60 REM *****
70 DATA 80,1F,00,00,00,00,00,00,00,00
80 DATA 00,70,00,00,00,00,00,00,00,00
90 DATA 80,80,7F,00,00,00,00,00,00,00
100 DATA 00,00,00,00,00,00,00,00,00,00
110 DATA 00,00,00,00,00,00,00,00,00,00
120 DATA 00,70,00,00,00,00,00,00,00,00
130 DATA 00,70,00,00,00,00,00,00,00,00
140 DATA 00,70,00,00,00,00,00,00,00,00
150 DATA 00,00,00,00,00,00,00,00,00,00
160 DATA 00,00,00,00,00,00,00,00,00,00
170 DATA 00,00,00,00,00,00,00,00,00,00
180 DATA 00,70,00,00,00,00,00,00,00,00
190 DATA 00,00,00,00,00,00,00,00,00,00
200 DATA 00,00,00,00,00,00,00,00,00,00
210 DATA 00,00,00,00,00,00,00,00,00,00
220 FOR #=0 TO 3
230   : FOR #=0 TO 3
240   :   READ #
250   :   POKE DECI"ADDR"+(4*#)+0,DECI#
260   :   CS=CS+DECI#
270   :   NEXT #
280   :   READ CS-1F C1=CS THEN PRINT "DATA OK"
290   :   CS=0
300 NEXT #
310 DISCS "COMP-SET"
320 DATA 8-BYTES DECI"ADDR"+1,RET DEVICE# CONTENTS OF 8880-8888
330 160 88-COL COMP SET

4 REM ***** 001 B.PROGRAM 1000 *****
10 PRINT:GOTO 8880 8-BYTES DECI"ADDR"
20 #L=0:GOTO PRINT#(1)
30 IS="#####"
40 US="#####"
50 #L=#
60 PRINT "###"
70 PRINT "###"
80 PRINT "###"
90 PRINT "###"
100 PRINT "###"
110 PRINT "###"
120 PRINT "###"
130 PRINT "###"
140 PRINT "###"
150 PRINT "###"
160 PRINT "###"
170 PRINT "###"
180 PRINT "###"
190 PRINT "###"
200 PRINT:GOTO 8880
210 DISCS "1"
220 GO
230 : GOTO 88
240 : IF 128="?" AND 130 IS 128="?" AND 131 IS 128="?" AND 132
OR 128="?" AND 131 IS 128="?" OR 128="?" THEN GOTO
250 : PRINT "###"
260 : IF 131,130 THEN PRINT " "
270 : GOTO
280 : IF 128="?" AND 130 THEN #=#+1:GOTO 130
290 : IF 128="?" THEN GOTO 130
300 : IF 128="?" THEN GOTO 130
310 : IF 128="?" AND 131 THEN #=#+1:GOTO 130
320 : IF 128="?" AND 130 THEN #=#+1:GOTO 130

```


ADVENTURE #11 (Cont.)

```

83 2040 DATA113,204,84,204,0,14
1,21,198,204,8,204,204,8,204
275,4,2045
85 2050 DATA120,140,4,180,170,8
,204,141,3,180,30,10,180,204
8,177,1919
87 2060 DATA223,193,14,180,177,
212,183,88,180,204,204,7,195
,204,140,204,2704
89 2070 DATA3,180,173,8,180,140
,4,195,173,3,195,141,3,180,3
3,21,1875
91 2080 DATA190,160,0,180,24,20
9,140,201,180,20,180,240,203
,200,204,7,2080
93 2090 DATA205,206,240,206,13,
180,179,11,180,204,8,195,240
,8,204,8,2044
95 2100 DATA195,78,75,180,204,8
,180,179,8,180,241,4,195,179
8,180,2045
97 2110 DATA41,3,180,30,21,204
,149,8,0,148,32,249,201,204,28
4,7,198,1844
99 2120 DATA208,240,80,180,8,14
3,13,180,204,8,180,24,179,6,
204,180,2044
01 2130 DATA3,240,141,8,180,204
,8,180,179,8,204,141,4,245,1
79,9,2044
78 2140 DATA180,240,3,180,32,11
,180,240,0,177,251,153,24,29
9,177,252,2120
84 2150 DATA180,80,198,200,204,
7,188,240,240,206,8,195,173,
6,195,141,2401
86 2160 DATA4,180,179,3,180,140
,8,180,32,11,180,240,0,180,3
4,180,2784
91 2170 DATA40,251,160,30,240,
240,241,200,204,7,180,204,24
6,204,21,180,2707
93 2180 DATA173,11,180,207,8,20
9,240,8,204,8,180,78,213,180
,204,8,2137
95 2190 DATA180,179,8,180,241,4
,180,173,0,180,242,3,180,32,
11,180,2045

```

88-COL VIDEO (Cont.)

```

990 RETURN
992 REM PRINT OVER SETS
9940 : FOR #=2 TO 820
9910 :   POKE DECI*#*8775,INT(12000*#/12500)*POKE DECI*#*8775,
<12000*#> AND 255 : POKE DECI*#*8775,8*878 DECI*#*8775
9920 :   POKE DECI*#*8775,INT(12000*#/12500)*POKE DECI*#*8775,
<12000*#> AND 255 : POKE DECI*#*8775,16*878 DECI*#*8775
9930 :   POKE DECI*#*8775,INT(12000*#/12500)*POKE DECI*#*8775,
<12000*#> AND 255 : POKE DECI*#*8775,24*878 DECI*#*8775
9940 :   NEXT #
9950 : FOR #=6 TO 250
9960 :   POKE DECI*#*8775,INT(12000*#/12500)*POKE DECI*#*8775,
<12000*#> AND 255 : POKE DECI*#*8775,4*878 DECI*#*8775
9970 :   POKE DECI*#*8775,INT(12000*#/12500)*POKE DECI*#*8775,
<12000*#> AND 255 : POKE DECI*#*8775,12*878 DECI*#*8775
9980 :   NEXT #
9990 RETURN
0000 REM 3-FLIP
0100 : FOR Y=1 TO 8
0110 :   FOR X=1 TO 8
0120 :     M=CINT(Y)
0130 :     NEXT X
0140 :     NEXT Y
0150 :     GOSUB 500
0160 :     RETURN
0170 REM 5-FLIP
0180 : FOR #=2 TO 4
0190 :   FOR #+1 TO 6
0200 :     CHECK,Y1=CINT(X),Y1=CINT(X),Y1=8
0210 :     NEXT Y
0220 :     NEXT #
0230 :     GOSUB 500
0240 REM 7-FLIP
0250 : FOR Y=1 TO 8
0260 :   FOR Y+1 TO 8
0270 :     IF CINT(Y)+8 THEN CINT(Y)+8,ELSE CHECK,Y1=1
0280 :     NEXT X
0290 :     NEXT Y
0300 :     GOSUB 500
0310 RETURN
0320 REM ***** MACHINE CODE *****
0330 DATA 02,17,02,02,00,00,00,00,00
0340 DATA 14,FB,00,01,00,00,00,00,00
0350 DATA 02,02,FF,00,00,00,00,00,1E,7F
0360 DATA 0A,0A,0A,0A,1C,00,00,00,00
0370 DATA 70,00,00,00,00,00,00,00,00
0380 DATA 00,00,00,00,00,00,00,00,00
0390 DATA 00,FB,00,00,00,1F,00,00,00,0000
0400 DATA 0C,00,00,10,FB,00,01,00,0000
0410 DATA 00,00,3E,00,00,FF,00,00,0000
0420 DATA 00,00,00,00,00,00,00,10,1700
0430 DATA 00,FB,FB,30,00,10,00,00,0000
0440 DATA 00,00,00,00,00,00,00,00,0000
0450 DATA 3E,00,00,00,FB,00,00,00,1700
0460 DATA 00,00,00,FF,00,10,00,00,0000
0470 DATA 00,30,00,00,00,00,00,00,00,FF
0480 DATA 00,00,00,00,20,00,00,10,780
0490 DATA 00,30,00,00,00,00,00,00,00,75
0500 FOR #=6 TO 16
0510 : FOR #=6 TO 9
0520 :   FOR # TO 8
0530 :     NEXT #
0540 :     PRINT "OVER ERROR",END
0550 NEXT #
0560 RETURN

```

BUYING INTO 6510

ROUTINE TO BE INSERTED INTO MAIN ROUTINE

```

760 /END, IF @@, OF NEXT LINE
800 STA TEMP+50H
820 LDA #100H
830 STA -11(MEMORY)
840 LDA #100H
850 STA -11(MEMORY)
870 LDA #200
880 COMPARE LDA #00000000H
890 STA -11(MEMORY)
900 BNE COMPARE1
910 LDA #00000000H
920 STA -11(MEMORY)
930 BNE COMPARE1
950 IF YES, CALL MEMORARY ROUTINE
960
970 JNE MEMORARY
980 JMP COMPARE1
990
1000 COMPARE1 CLR
1010 LDA -11(MEMORY)
1020 AND #40
1030 STA -11(MEMORY)
1040 BNE COMPARE1
1050 LDA -11(MEMORY)
1060 COMPARE2 OR
1070 BNE COMPARE1
1080
1090 J
1100 #INITIALIZE RECEIVE LETTER AND
1110 #FORM TIME TO RECEIVE
1120 J
1130 #INITIALIZE LOG TEMP+50H

```

```

PROGRAM: BUY TEMPORARY
FILENAME: MEMORARY.BIN.

```

```

10 JNE #00000000
20 J
30 TEST+IVE OR #40
40 MEMORARY OR #70
50 COL+SAVE OR #70
60 J
70 IF CURRENT LETTER IS A SPACE,
80 #INIT FOR NEXT RECEIVED AND EXIT
900 LDA TEMP+50H
910 OR #20
920 BNE #0000
940 #CHECK JNE #0000
950 #GO TO #100
970 STA TEMP+50H
980 STA
990 #END COMMENT #11 FILE, SCREEN
1000 #END COL+SAVE SCREEN POSITIONS
1010 #INIT LDA #10000000
1020 STA -11(MEMORY)
1030 LDA -11(MEMORY)
1040 STA -11(MEMORY)
1050 LDA -11(MEMORY)
1060 STA -11(MEMORY)
1070 STA -11(MEMORY)
1080 STA -11(MEMORY)
1090 STA -11(MEMORY)
1100 STA -11(MEMORY)
1110 STA -11(MEMORY)
1120 STA -11(MEMORY)
1130 STA -11(MEMORY)
1140 STA -11(MEMORY)
1150 STA -11(MEMORY)
1160 STA -11(MEMORY)
1170 STA -11(MEMORY)
1180 STA -11(MEMORY)
1190 STA -11(MEMORY)
1200 STA -11(MEMORY)
1210 STA -11(MEMORY)
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1330 STA -11(MEMORY)
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1370 STA -11(MEMORY)
1380 STA -11(MEMORY)
1390 STA -11(MEMORY)
1400 STA -11(MEMORY)
1410 STA -11(MEMORY)
1420 STA -11(MEMORY)
1430 STA -11(MEMORY)
1440 STA -11(MEMORY)
1450 STA -11(MEMORY)
1460 STA -11(MEMORY)
1470 STA -11(MEMORY)
1480 STA -11(MEMORY)
1490 STA -11(MEMORY)
1500 STA -11(MEMORY)

```

ADVENTURE BIT (CONT.)

```

94 2400 DATA 0.189,32.148,38
1.208,204.7,139,280,248,84,3
2.289,174,2974
2D 2410 DATA 138,273,32,247,1
83,248,20,184,21,94,15,88,88
,98,98,1870

```

PROGRAM: LOG.BIN

```

AF 10 #END*****
BC 30 #END ADVENTURE BIT 0 1
DE 80 #END EVENT DRIVEN 1
CG 40 #END*****
3F 2040 DATA 138,273,32,247,1
83,248,20,184,21,94,15,88,88,
17,247,8,2870
6C 2010 DATA (F8) #CHECKPOINT#
#BOOK IS LINE# 2040+17,200,0
TOP
6F 2020 DATA 138,273,32,247,1
83,248,20,184,21,94,15,88,88,
17,247,8,2870
2D 2040 DATA 138,273,32,247,1
83,248,20,184,21,94,15,88,88,
17,247,8,2870
8A 2050 DATA 143,154,234,183,200
,188,188,188,188,188,188,188
,200,128,200,80,204
7F 2060 DATA 141,20,3,109,188,14
1,21,3,88,188,0,141,22,188,3
68,0,1484
40 2070 DATA 200,0,120,0,189,120
,8,189,188,1,120,28,289,280,
182,8,2818
83 2080 DATA 200,208,88,220,188,
88,181,20,3,189,234,141,21,3
88,88,1785
8C 2090 DATA 208,12,188,173,22,1
88,221,20,208,28,204,0,141,2
2,188,182,2022
1B 2100 DATA 204,0,204,202,224
,8,208,208,202,0,188,8,189,2
88,28,2184
00 2110 DATA 200,18,189,201,0,19
8,208,20,188,22,188,141,82,3
,188,12,2864
80 2120 DATA 198,141,82,3,188,82
,3,220,229,8,188,223,74,88,3
84,284,2088
60 2130 DATA 24,189,258,0,127,3,
188,74,120,288,22,24,188,18
8,0,187,2828
40 2140 DATA 209,74,120,188,18
8,0,187,24,188,74,120,188,32
,208,189,2084
62 2150 DATA 72,20,208,188,173,3
84,248,188,183,24,189,188,0,
253,0,189,2877
99 2160 DATA 189,1,253,0,189,84,
81,208,188,188,188,0,153,8,1
87,84,1887
30 2170 DATA 202,202,124,32,188,1
72,32,247,282,182,20,98,251,
73,128,248,2542

```

BITING INTO 4810 (CONT.)

```

3008      1
3110      104  <DECRINCR,V
3210      000  <DECRINCR
3310      000  <DECRINCR
3410      000  <DECRINCR
3510      1
3610      104  <DECRINCR
3710      000  <DECRINCR
3810      000  <DECRINCR
3910      000  <DECRINCR
4110      1
4210      104  <DECRINCR,V
4310      000  <DECRINCR
4410      000  <DECRINCR
4510      100
4610      000  <DECRINCR
4710      1
4810      104  <FORWARD TO END OF WORD
4910      1
5010      104  <FORWARD INC COUNTERS
5110      000  <DECRINCR
5210      100  <DECRINCR
5310      1
5410      000  <DECRINCR
5510      000  <DECRINCR
5610      000  <DECRINCR
5710      1
5810      000  <DECRINCR
5910      000  <DECRINCR
6010      000  <DECRINCR
6110      1
6210      104  <FORWARD TO NEW POSITION AND
6310      100  <END OF OLD LINE 4810 SPACES
6410      1
6510      000  <DECRINCR,V
6610      000  <DECRINCR,V
6710      1
6810      104  <DECRINCR,V
6910      000  <DECRINCR,V
7010      000  <DECRINCR,V
7110      000  <DECRINCR,V
7210      1
7310      104  <DECRINCR,V
7410      000  <DECRINCR,V
7510      000  <DECRINCR,V
7610      000  <DECRINCR,V
7710      1
7810      100
7910      1
8010      000
8110      1
8210      000
8310      1
8410      000
8510      1
8610      000
8710      1
8810      000
8910      1
9010      000
9110      1
9210      000
9310      1
9410      000
9510      1
9610      000
9710      1
9810      000
9910      1
10010     000
10110     000
10210     000
10310     1
10410     104  <DATE TEST FILE, GORHAM AND
10510     100  <DATE GORHAM POSITION
10610     1
10710     104
10810     000
10910     000
11010     000
11110     000
11210     000
11310     1
11410     000
11510     000
11610     000
11710     000
11810     000
11910     000
12010     1
12110     000
12210     000
12310     000
12410     000
12510     000
12610     000
12710     1
12810     104  <DATE INCR TO NEW POS AND INC
12910     1
13010     000

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MAY I INTERRUPT



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00 00 000
01 00 00000000,0,00000000,0,0
02 00000000,00000000,00000000
03 00000000
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99 00 00000000000000000000

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LISTINGS

| | | | | | |
|----|---|----|--|----|--|
| CC | 1180 DATA 3,1,18,13,14,18,3, 1,18,13,14,18,3,1,18,13,18 | 74 | 1480 DATA 52,8,52,59,81,4,83 ,58,59,82,4,83,84,84,81,4,85 | 87 | 1780 DATA 15,17,18,19,20,20, 20,17,18,19,20,20,20,18,17,20,1 8,200 |
| 47 | 1170 DATA 14,13,3,1,24,8,4,3 ,1,24,8,4,3,1,1,24,8,200 | 82 | 1580 DATA 53,58,59,54,4,53,5 ,58,59,58,17,18,19,54,38,4, 800 | 88 | 1770 DATA 30,30,18,17,18,18, 30,30,18,17,18,18,39,32,1,20 4,700 |
| 38 | 1160 DATA 19,59,38,38,100,87, 3,1,8,7,7,8,8,8,7,7,7,7,7,7 | 85 | 1570 DATA 18,17,18,19,24,34, 27,88,27,88,88,84,87,4,88,88 ,888 | 89 | 1760 DATA 100,84,38,38,16,17 ,18,18,84,38,7,88,89,81,7,87 ,870 |
| 06 | 1150 DATA 80,87,7,1,8,8,84, 7,4,8,8,84,7,4,8,8,84 | 88 | 1560 DATA 59,58,5,83,88,84,8 2,4,83,84,38,14,100,101,84,3 8,800 | 92 | 1800 DATA 88,84,8,4,87,88,8 8,17,18,18,87,88,87,81,7,87, 700 |
| 18 | 1140 DATA 84,7,4,8,8,84,7,4, 8,8,84,7,4,8,8,84 | 89 | 1550 DATA 17,18,17,18,28,84, 37,8,18,17,18,18,84,38,3,89, 999 | 93 | 1810 DATA 88,84,8,4,8,88,8,8 8,18,17,18,18,84,38,31,7,8,8 ,80 |
| 52 | 1130 DATA 7,4,8,8,84,7,4,8,8, 7,7,48,84,38,88,88,388 | 90 | 1540 DATA 100,84,38,3,16,17, 18,18,84,38,3,140,170,84,38, 83,150 | 97 | 1810 DATA 3,1,89,8,7,3,1,84, 8,7,8,1,84,8,4,3,200 |
| 80 | 1120 DATA 7,7,8,8,84,7,8,8, 7,7,7,8,8,84,7,8,8 | 93 | 1530 DATA 18,17,18,19,29,84, 7,84,84,58,7,83,88,84,82,4,8 ,88 | 98 | 1820 DATA 1,18,19,18,3,1, 17,18,19,89,8,3,18,13,14,2000 |
| 07 | 1110 DATA 9,8,8,84,7,8,8,8, 9,7,8,8,84,7,8,8,8 | 94 | 1520 DATA 83,88,84,58,7,83,8 8,8,84,58,8,83,88,87,88,84,38, 888 | 99 | 1830 DATA 19,3,1,87,8,7,3,1, 8,7,8,7,3,1,84,8,8,8,87 |
| 17 | 1100 DATA 8,84,7,4,8,8,84,7, 4,8,8,84,7,4,8,8,84 | 95 | 1510 DATA 88,81,84,38,86,87, 88,87,88,8,38,39,39,38,37,88 ,878 | 00 | 1840 DATA 1,84,8,4,3,1,84,8, 4,3,1,84,8,4,3,1,80 |
| 44 | 1090 DATA 84,7,4,8,8,84, 8,8,84,84,7,4,8,8,84 | 98 | 1500 DATA 84,38,8,83,84,81,8, 3,82,84,88,7,83,88,84,81,4,7 ,82 | 03 | 1850 DATA 84,8,4,3,1,84,8, 4,3,1,84,8,4,3,1,80 |
| 08 | 1080 DATA 7,4,8,8,84,7,4,8,8, 8,8,84,84,7,4,8,8,84 | 99 | 1490 DATA 53,52,59,81,4,53,5 ,58,14,100,100,84,38,88,83, 84,700 | 06 | 1860 DATA 1,18,19,18,15,3,1, 18,14,14,15,3,1,1,84,8,3,177 |
| 00 | 1070 DATA 7,4,8,8,84,7,4,8,8, 8,8,84,84,7,4,8,8,84 | 00 | 1480 DATA 25,26,27,38,84,38, 8,38,24,38,38,27,38,38,38,15 3,830 | 07 | 1870 DATA 3,1,84,8,4,3,1,84, 8,4,3,1,84,8,4,3,1,80 |
| FE | 1060 DATA 80,84,38,88,18,114 ,157,84,84,38,18,52,84,81,4, 53,890 | 03 | 1470 DATA 208,38,180,34,38, 38,27,38,38,38,380,191,84,3, 2,58,870 | 10 | 1880 DATA 1,84,8,4,3,1,84,8, 4,3,1,84,8,4,3,1,80 |
| 40 | 1050 DATA 250,27,38,38,82,87, 105,38,87,38,84,38,100,87,84 ,18,1000 | 08 | 1460 DATA 23,24,38,38,37,38, 84,38,48,88,84,81,4,53,52,84, 81,7,7,80 | 13 | 1890 DATA 18,18,14,18,3,1,84, 14,18,3,1,18,14,18,13,2,181 |
| 14 | 1040 DATA 3,84,38,18,38,84,8, 7,4,88,88,84,87,4,88,88,84,8 ,80 | 09 | 1450 DATA 81,4,83,88,84,81,7 ,83,88,84,84,7,83,88,81,88,7, 80 | 16 | 1900 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 1F | 1030 DATA 4,88,88,87,88,8, 4,88,88,87,84,81,83,88,81,5 8,800 | 04 | 1440 DATA 80,84,38,88,88,88, 84,38,48,88,84,81,4,53,52,84, 81,7,7,80 | 19 | 1910 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 93 | 1020 DATA 80,84,38,88,18,114 ,157,84,84,38,18,52,84,81,4, 53,890 | 05 | 1430 DATA 80,84,38,88,88,88, 84,38,48,88,84,81,4,53,52,84, 81,7,7,80 | 22 | 1920 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 78 | 1010 DATA 88,84,84,4,83,88,8, 4,81,4,83,88,81,88,88,84,38, 700 | 06 | 1420 DATA 80,83,88,84,81,4,8 3,88,84,81,4,53,52,84,81,7,7, 80 | 25 | 1930 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 3 | 1000 DATA 84,8,8,3,1,84,8,3, 3,4,84,88,78,53,84,53,790 | 07 | 1410 DATA 83,84,38,84,100,18, 1,59,38,38,88,87,88,88,38,38, 82,800 | 28 | 1940 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 00 | 990 DATA 81,53,88,81,81,88, 88,88,78,18,18,113,84,38,8, 0,800 | 01 | 1400 DATA 81,53,88,84,81,4,8 3,88,84,81,4,53,52,84,81,7,7, 80 | 31 | 1950 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 87 | 980 DATA 1,84,8,3,1,84,8,3, 3,4,84,88,81,18,120,110 | 04 | 1390 DATA 88,88,84,81,4,8 3,88,84,81,4,53,52,84,81,7,7, 80 | 34 | 1960 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 07 | 970 DATA 183,38,87,38,13,88 ,84,81,4,83,88,84,81,4,83,88, 790 | 05 | 1380 DATA 83,83,88,84,81,4,8 3,88,84,81,4,53,52,84,81,7,7, 80 | 37 | 1970 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 0E | 960 DATA 84,88,4,83,88,81,8, 1,88,88,84,38,43,7,7,8,8,820 | 08 | 1370 DATA 83,84,38,84,100,18, 1,59,38,38,88,87,88,88,38,38, 82,800 | 40 | 1980 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 40 | 950 DATA 84,7,4,8,8,84,84,7, 4,83,84,84,84,3,53,52,84,81, 810 | 09 | 1360 DATA 81,53,88,88,88, 87,88,88,38,38,88,81,88,83,8, 4,380 | 43 | 1990 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 78 | 940 DATA 3,8,8,84,7,4,8,8,8, 7,48,88,78,18,18,17,88,100 | 00 | 1350 DATA 88,88,84,31,89,88, 8,88,84,81,4,53,52,84,81,4,8 ,80 | 46 | 2000 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 06 | 930 DATA 84,88,84,81,4,83,88, 84,81,4,83,88,84,81,4,83,88, 80 | 03 | 1340 DATA 83,848,81,82,83,84, 83,83,84,84,81,4,83,88,81,81, 81,810 | 49 | 2010 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 0A | 920 DATA 83,88,84,81,3,88,8, 8,84,38,83,88,8,8,8,8,84,88, 800 | 06 | 1330 DATA 83,88,84,81,4,8 3,88,84,81,4,53,52,84,81,7,7, 80 | 52 | 2020 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 18 | 910 DATA 84,38,8,82,81,88,8, 3,84,84,84,38,18,18,52,84,81, 800 | 09 | 1320 DATA 88,88,84,31,89,88, 8,88,84,81,4,53,52,84,81,4,8 ,80 | 55 | 2030 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 08 | 900 DATA 53,52,59,81,4,53,5 ,58,17,1,80,100,84,38,88,88, 81,700 | 12 | 1310 DATA 83,848,81,82,83,84, 83,83,84,84,81,4,83,88,81,81, 81,810 | 58 | 2040 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 18 | 890 DATA 80,81,88,87,84,88, 84,88,88,87,87,87,83,84,88,8, 4,800 | 15 | 1300 DATA 84,38,7,88,84,84,8, 1,8,87,88,89,81,4,87,88,84,8, 80 | 61 | 2050 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |
| 78 | 880 DATA 80,81,88,87,84,88, 84,88,88,87,87,87,83,84,88,8, 4,800 | 18 | 1290 DATA 84,38,7,88,84,84,8, 1,8,87,88,89,81,4,87,88,84,8, 80 | 64 | 2060 DATA 7,4,8,8,84,7,4,8,8, 7,4,8,8,84,7,4,8,8,84 |

Competition Winners

Peagus

Find out if you're one of the lucky winners in the Peagus competition from November 1987. Read on:

Adrian Patterson, Darsham; Peter Dred, Seaham; R.H.H. Gittenbeck, Don Heider, Netherlands; G. Tsougaridis, London SW1; W.E. Price, Baddley; K. Magro, London E17; G.R. Davies, Radford; Chris Garbutt, Baddley; K.R. Blackwell, Chatham; Lars Blomqvist, Bjornelov, Sweden; Robert Tomlinson, Nykvarn, Sweden; Richard Waller, Sedgley, West Midlands; Rashid Qurshi, Karachi, Pakistan; WuTanTie, Berkshire; D. Cook, Blackpool; James Laidlaw, Hykeham, Lincoln; M. Lynn, Plymouth; G. Kenon, Rye, L.D.W.; Nicholas Wright, Preston; J. Al-Jafed, Mid Glamorgan; John Crenshaw, St. Paulby, North Westmorland; John Wastles, Bambern; M.E. Venham, Radon,

Hart; Sacha Dawes, Lewes; Eyal Teler, Jerusalem, Andrew Cobb, Sawbridgeworth; Steve; Stephen Citron, Washington, Tyne & Wear; W.R. Asaria, Penryn, Plymouth.

Football Manager II

Well the lucky winner of our Spot the Ball competition which we ran in the December issue of *Your Commodore* is Mr H. Nichols from Paignton, Devon. Mr Nichols will have the chance to take part in a game of Football Manager II against three competition winners from other magazines. The overall winner of this game wins a trip to see the European Football Championship finals in Munich in June 1988. Good Luck! Mr Nichols also wins a video of the 1986 World Cup, as does Martin Gingles, Glasgow; Katali Karyanagi, Pinner; D. Kasch, Abingdon; Edward News, Brighton.

Konis Jostick

Have you won the revised Konis Jostick as a result of our competition in the January issue? Read on and find out.

T. Preston, Kidlington, Oxford; M. Dav, Norwich; A.J. Spiby, Barton-on-Sea; Rachel Longue, Charnfield; Bryan Lewis, Redcar; Dave Parish, West Wickham; Graeme Gilman, Darham; K. Williamson, London, E17; Norman Stone, Chelmsford; Darren Nolan, Weston, Southampton.

Hunt for Red October

Find out if you're one of the lucky winners in the Hunt for Red October competition from February 1988. Read on:

J.A.O. Airie, London; N. Street, London; Stephen Bourke, Chess; Bo-Goran Skansen, Sweden; E. Taylor, Barnsley; Landrum François, France; G.D. Hudson, Essex; J.P. Rankin, Birmingham; F. Eastman, Northampton; P. Fullwood, West Midlands.

Bag Finder

We'd like to remind our readers that we run a Bag Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.

A description of your problem.

If possible a listing of your work (you may omit this).

A stamped, self-addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors, and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check a several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

Notes: we can only deal with problems relating to programs published in *Your Commodore*.

Program Submissions

Due to the illness of our software evaluator some people may be experiencing a delay in getting replies regarding submissions. We are trying to clear the backlog of programs as quickly as we can but this is taking some time. This backlog also affects Bag Finders and Lifesavers.

We apologise for the delay and would ask that you would bear with us while the backlog is cleared.

The publication of Lifesavers has also been halted because of this software backlog. We will be bringing you more short programs and tips as soon as we can.

Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U.K. Many people, after referring to their computer manuals, believe them to be based in Corby.

The Commodore plant at Corby was closed down some time ago. Reproduced here you will find the correct address for Commodore U.K.

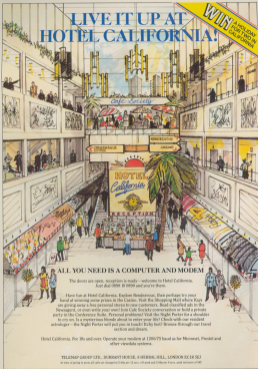
We suggest that you write this correct address in the front of your computer's manual for future reference.

Commodore Business Machines (UK),
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At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an a.s.c. will guarantee a reply, although this may still take time to arrive.

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We have been writing programs for Commodore computers since 1976 and now have hundreds of programs for the PET, VIC 20, C64, C64, C128, even the C16 and Plus/4. So why aren't our programs in the charts?

Because our programs aren't one minute wonders, here today and gone tomorrow. Programs we released for the first in 1982 are still selling — and even more important, the people who bought them then are still using them.

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