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MARCH 1985
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Personal Computing Today

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Personal Computing Today

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MARCH 1985

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ABC

There is something of a software extravaganza in this issue of *Personal Computing Today*. As well as our usual eight pages of reviews of the latest commercial software releases, there are several features on programming aids produced by software houses.

Writing games programs requires a depth of knowledge gained through laborious and concentrated work on your computer. To many people this takes the fun out of computing, and they may well give up and turn to the commercially produced games, which are expensive and might not contain the kind of things they would like to see.

Several software houses have seen the potential of a software package which provides a 'core' program around which games can be written by the end user. Our feature article 'Games Creation' takes a look at some of these packages for a range of home micros and provides guidelines as to the best of the bunch.

ROM Round Up is a second feature article dealing with programming aids. This time the utilities come on Eproms and are for use with the BBC Micro. The ROMs that have been evaluated are machine code monitors which help a programmer working in this most complicated of languages. Again, there are lots to choose from and they are relatively expensive. So, if you're looking for an aid for this area of computing, turn to the article and see what our reviewer thought of the ones on test.

The Commodore 64's BASIC is not the most comprehensive in the world, a fact partly remedied by extended BASIC tapes and disks. To round off our software extravaganza, there is an article on the latest of these, Breden's BASIC from Visions Software.

Hardware is not neglected in this issue of PCT! The Enterprise 64 computer, which has gone through more name changes since its announcement 18 months ago than I care to recall, is given a thorough bench test. It comes out as a very interesting computer and deserves a write up. See what you think by reading our comprehensive review.

Another piece of hardware which has been a long time coming is the Oric modem. This too has been thoroughly tested along with its supplied and additional software.

There is lots more of interest in the March issue of PCT including the results of the *November Graphics Competition*. There are game and utility programs galore, so without further ado get stuck into the fascinating world of home computing through the pages of this magazine.

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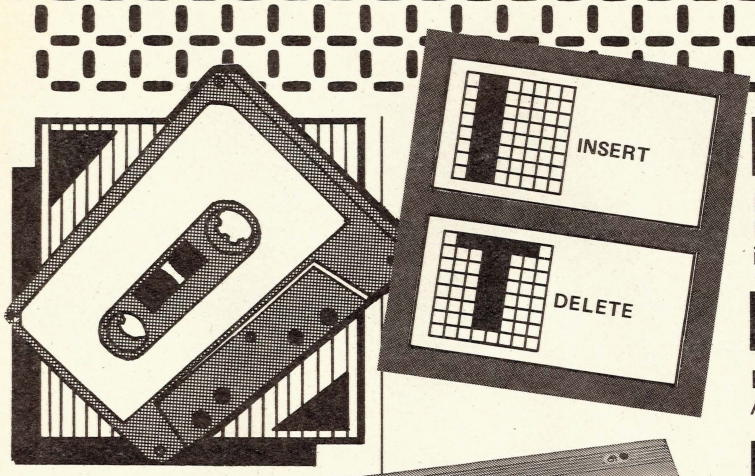

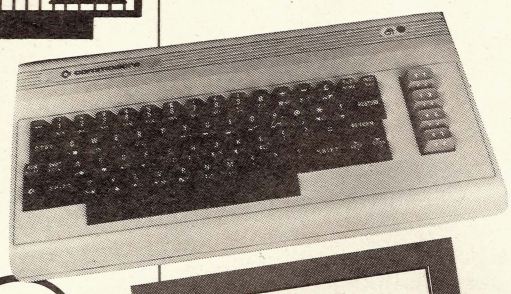

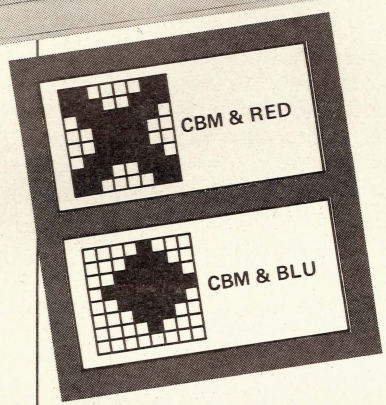

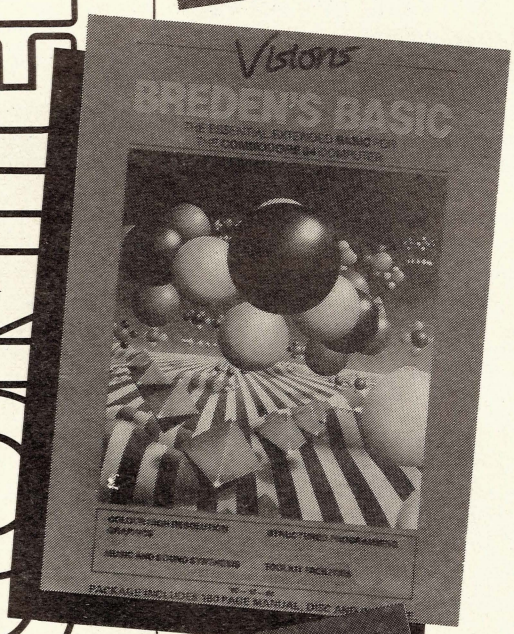

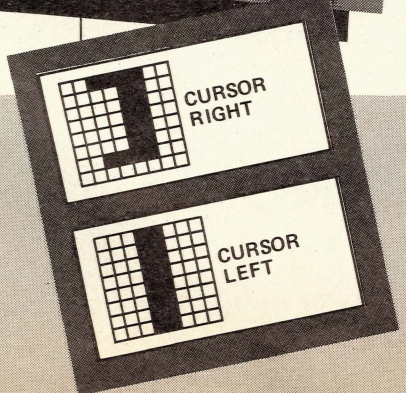

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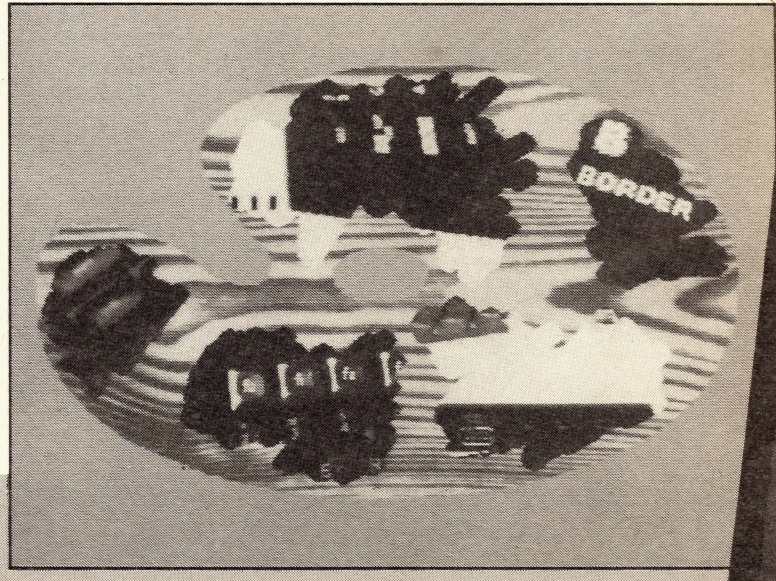

1985

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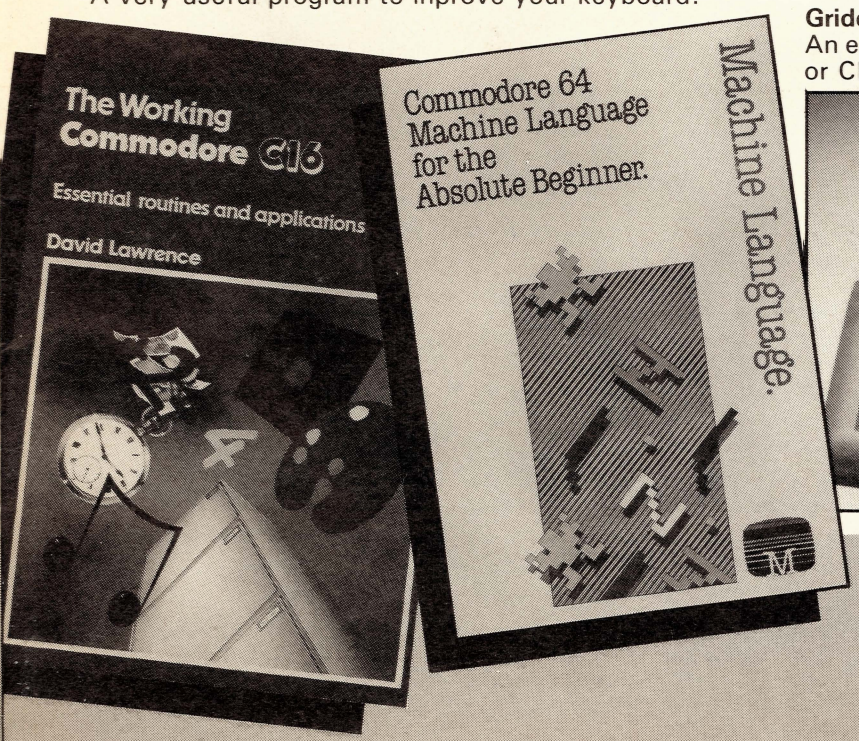
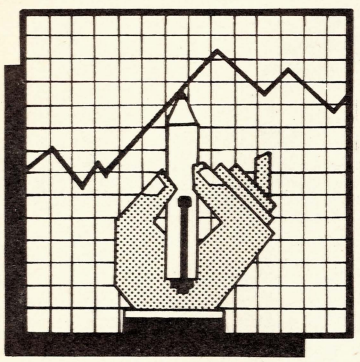






News



ROCK AROUND A MICRO

The Yamaha CX-5M MSX music computer opens up a whole new world to computer buffs. Based on the now well-known MSX standard, this computer breaks out of the mould.It is the only one of the family to feature built-in music making with FM sound synthesis as a standard feature, and add-on keyboards.

The catch is the price! The 64K computer sells for £449 and the add-on keyboards either £85 or £169. Quite a large sum by anyone's standards and it's up to you to decide whether the DX7 professional polyphonic synthesizer and musical keyboard with 46 variable sounds that can store and play back 2500 notes as auto accompaniment is worth it! Hear a demonstration at the London Rock Shop, Camden Lock, London.

HANDY COMPUTER CRIB CARDS

If you're familiar with the problems of trying to work from a book which will never stay open at the right page when propped up beside your computer system, you might be interested in a series of handy reference cards from Phoenix.

The cards, available for the CBM64, Spectrum, BBC and Electron, give easy, instant access to all the main facts that you need while programming. Topics covered include keywords, operating commands, graphic and sound commands, error messages and hints and tips. They pull out at the flick of a finger to give you everything you need at your fingertips. The cards cost £1.99 and are available from Boots, bookshops and computer stores.

YOUNG COMPUTER BRAIN OF 1984

The jointly sponsored Sunday Times/Commodore Young Computer Brain award has gone to a 15-year old Cambridge schoolboy. Peter Chase came up with the bright idea of using a computer/modem system to aid sailors and coastguards in making sailing safer through easier communication and navigation. His system was considered the most outstanding of all entries in the competition, which this year was centred on enhancement of computers through inexpensive communication systems.

Peter is already something of a computer whizz kid, having worked on a number of computers producing programs in his spare time. He hopes to study electronics at university. His prize was £2000 worth of Commodore computer equipment including an SX-64 portable computer complete with colour monitor, printer, software and the new Commodore modem.





MORE TOP US GAMES ON SALE IN UK

The recently launched software house, Ariolasoft, are improving on the availability of chart-topping US software here in the UK. The initial launch package features six titles which made the top ten in the prestige US 'Billboard' chart. All the games are for the CBM64 but future releases will include MSX and Spectrum versions.

To begin with, Ariolasoft will release the titles under licence but have plans to commission and launch their own software in three specific areas: entertainment — action, strategy and adventure games; education and home management. Likely retail prices start at £9.95 for tape and £12.95 for disk versions.

GOLDEN IKON OF RAMESIS CURSE

We were affected by the curse of Ramesis when we published our game for the Amstrad CPC464 in the January issue! Gremlins knocked off some vital data in the following lines which should read as shown:
LINE 130 DATA. . . (as printed until the end of the line which should read as follows) 5,0,8,0
LINE 170 DATA (as shown until end of line) 0,0,0,20
LINE 640 The 'T' was missed off the final word 'NEXT'

In our efforts to give vital help to readers typing in the program we managed to mislead you. We stated that spaces should be entered *exactly* as shown. Because of the Amstrad's knack of splitting lines in the most inconvenient places, there are large gaps in the listing between text. *These spaces are not* necessary and should be closed up to prevent 'OUT OF MEMORY' errors.

However, the spaces between data must be entered as shown. Also, it is essential that after typing 'DATA' no space should be left before the first character of the following word. When you list the program, your machine should insert a space here, but if you put one in physically, the program may not run.

COMPUTER ASSISTED SCHOOL ADMINISTRATION

A practising senior teacher with seven years experience of timetabling/administration on computers has put together an excellent package for the BBC micro.

The suite of programs, which is tailored to individual schools' needs, is written in a way that requires minimum response by the user, while still retaining tremendous flexibility. The computer does what it is good at, and keeps check on all data, thus ensuring simple error-free entry and editing of information.

The package includes a very comprehensive handbook, a complete set of sample print-outs, data preparation sheets and an extra disk with data already entered for experimentation. There are three choices of package — Basic, Exam Entry and Timetabling — priced at £90, £75 and £90 respectively.

Further details can be obtained from John Callaghan, EAS, Somerville House, Brunswich Road, Manchester M20 9GA (tel: 061-445-1379).

QUANTUM LEAP INTO COMMUNICATIONS

O.E. Ltd., established producers of the successful VTX range of modems for the ZX Spectrum and CBM64, are now producing a communications system for the Sinclair QL.

Scicon, who produce the software for the Oric modem, are responsible for the comprehensive communications programs to be used in conjunction with the modem. The three communications modules enable QL owners to use the QL as a VT100 terminal and to access databases such as Prestel, BT Gold electronic mail and Easylink telex. In addition, the package allows user to user communications, telesoftware downloading and integrates with existing QL software.

The starting point is the QCON, an essential pre-requisite, specially designed with an integrated single chip microcomputer which provides efficient flow control of data, VT100 emulation, a full RS232/V24 serial interface connection to any asynchronous modem of speeds between 75 and 9600 baud and software to control all three modules.

The QMOD, a V23 modem, allows direct connection to the telephone line for communication at 1200/75 baud rate or 1200/1200 baud half duplex. Finally, QCALL adds to the QMOD facilities of auto-dial and auto-answer for attended or unattended use.

The QCOM modules stack neatly on top of each other and interconnect via a specially designed module bus keeping the system compact and free from trailing wires. QCOM and QMOD are £75.95 each and CQAL costs £49.95. They are available directly from O. E. LTD., North Point, Gilwilly Ind. Est. Penrith, Cumbria (0786) 66748.

STRONG FUTURE FOR ATARI

At a recent gathering in London, the British Press were given the opportunity of meeting the decisive new chairman of the Atari Corporation, Mr Jack Tramiel.

Already renowned for his drastic changes to the Atari management hierarchy, Mr Tramiel came across as a straight talker whose words hit hard! Through an address followed by questions, he revealed the new corporation's plans for 1985, continually stressing that his aims are to bring personal computing to themasses (i.e. you and me!). By a strategy of streamlining production, Atari have already managed to cut manufacturing costs by 50 per cent, a saving which has been passed on to the end user. The Atari 800XL was reduced by over £100 in the latter months of 1984 — to a price as low as the Spectrum's.

Although stating that Atari will continue as a games manufacturer, Mr Tramiel revealed plans to produce both a 16 bit and a 32 bit machine in 1985. The 16 bit will have a 68000 processor and very high graphic capabilities with a new operating system developed by Digital Research. This will have a minimum of 0.25 Mbyte RAM, expandable to 20 Mbytes. The larger 32 bit machine is aimed at the technical market and will be a work station.



Of more interest to the home user, two 4 and 8 bit machines are planned. These will have the option of 64K or 128K RAM, a 6502 or similar processor and excellent music capabilities. It was also suggested that they would be compatible with the 800XL which is to have a redesigned casing in 1985. There are also a number of peripherals in the pipeline including four printers ranging in price from £59 to £400.

Atarisoft is alive and well and will continue to produce software for the games consoles, Atari micros and other micros presently supported. As to MSX. . . Mr Tramiel commented 'Very pretty. . . '

CASSETTE INTERFACE FOR COMMODORE MACHINES

A new interface from PACT International allows Commodore users to attach a non-Commodore data cassette recorder for storage and retrieval of data. Previously, only the Commodore cassette recorders could be used with the CBM64 and VIC20, adding to the cost of the system. The new interface will allow any make of data recorder to be used. This could mean a large saving to people who already own a recorder.

The interface, which costs £17.99, has been developed to work with virtually all ordinary recorders and features a special phase switch that enables it to cope with different types of recorder and tape quality. It also has a couple of small LEDs that indicate when a program is being saved to or loaded from cassette. The unit loads even 'turbo' load tapes.

ADDITIONS TO AMSTRAD GAMES

Two new entertainment programs for the CPC464 have been released. 'The Saga of Eric the Viking' by John Wiley and Sons will retail at £9.95. This adventure game is already in the charts for the Spectrum, CBM64 and BBC and has over 200 visually dramatic locations.

Following the success of CRL's 'Test Match' cricket simulation for the Spectrum, the company have developed it to run on the CPC464. It now has enhanced graphics with a two innings per side Test Match and a one day limited over contest. Players have the choice of which teams (and which players) are to participate either by accepting the options offered by the computer or by inputting their own teams of players. The game costs £6.95.

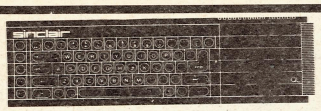
NEW SPECTRUM DISK OPTION FROM THURNALL

Another disk drive has been released for the ZX Spectrum extending the choice available to owners.

Compatible with 16K and 48K Spectrums and Spectrum +, the Thurnall Electronics unit utilises the standard Hitachi 3" disk drive with a capacity of half a Mbyte. The unit is supplied with all necessary leads, manual and introductory programs and is compatible with Microdrives, Interface 1 and all known printer drivers and joysticks.

It is available direct from Thurnall Electronics, 95 Liverpool Road, Cadishead, Manchester (tel: 061-775-7922) for £219.95 including VAT and delivery.





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COMMODORE COMPUTERS
Commodore C16 Starter Pack £145 (£142) £162. Commodore Plus/4 £305 (£281) £301. Commodore 64 £222 (£215) £235. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and the Commodore 64 £9.78 (£9) £11. Bargain package:- cassette convertor + compatible cassette recorder £37 (£38) £44. Commodore cassette recorder £43 (£44) £50. Printer interfaces for Vic20 and the Commodore 64:- Centronics £45 (/41) £46, RS232 £45 (£41) £46. Disc drive £233 (£209) £234. 1520 printer/plotter £165 (£149) £159. MPS801 Printer £235 (£220) £245. Light pen £29 (£29) £33.

ACORN COMPUTERS
Electron £173 (£179) £199. BBC Model B £404 (£357) £387. Kenda double density disk interface system £149 (£131) £141. See below for suitable disc drives.

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PRINTERS
Oki Microline 80 £138 (£135) £165. Brother HR5 £162 (£146) £170. Shinwa CTI CPA80 £237 (£228) £258. Cannon PW1080A £382 (£344) £374. Epson RX80 £277 (£251) £282. Epson RX80F/T £314 (£286) £316. Epson FX80 £399 (£358) £388. Combined matrix printers and electric typewriters:- Brother EP22 £173 (£166) £186, Brother EP44 £258 (£235) £260. MCP40 Oric Colour printer/plotter £134 (£123) £140. Interfaces to run the above printers from Vic and the Commodore 64 £45 (£41) £46. We can supply interfaces to run the above printers from Sharp computers £58 (£52) £55.

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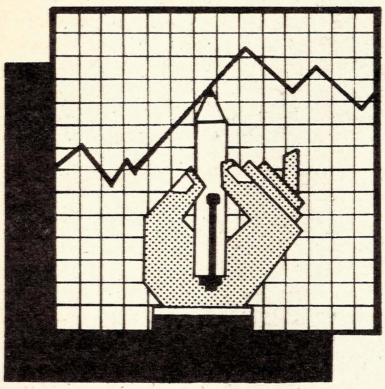
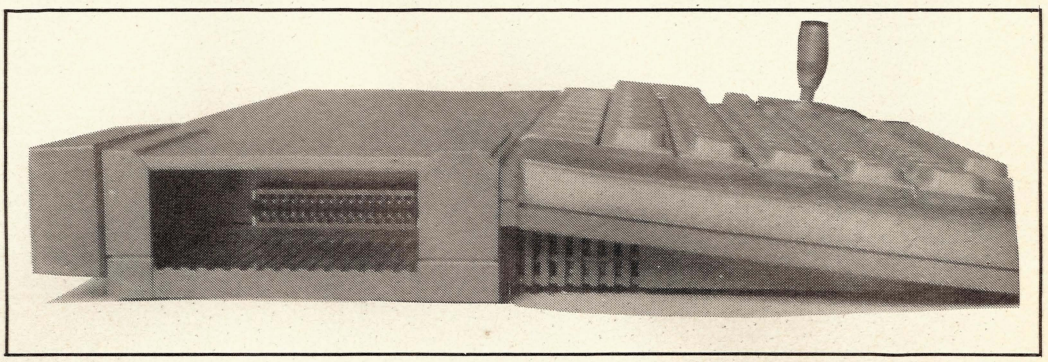


Enterprise 64

The Enterprise should be in the shops now and, despite a few criticisms, Mike Roberts likes it enough to consider buying one!

ENTERPRISE



The long awaited Enterprise 64 has arrived having gone through various guises — Elan, Flan, and finally Enterprise. The odd ancestry of the beast is evident in the insides of the machine. The keyboard insert has © Elan 1983 (1983!) on it, the PCB has issue 4.0 Elan and everything else has Enterprise 64!

Startling design

The outer casing is squarish, with the keyboard taking up most of the room on the front of the case. To the right is the built in joystick that gives the case its 'melted' look. Just above the keyboard are the function keys and a strip above them with room to put in the definitions as on a BBC micro.

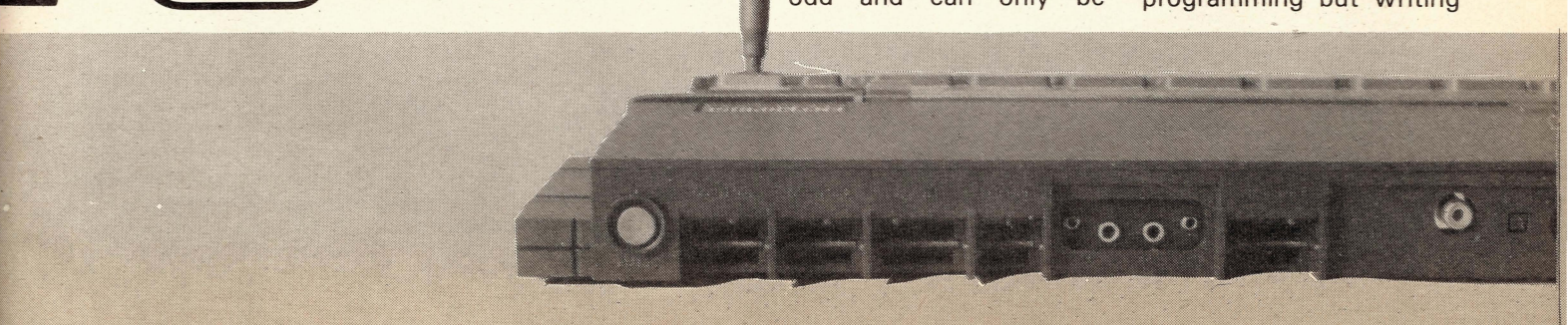
On either side of the rear section of the computer are the expansion slot (sensibly covered with a slide off plastic cover) and the cartridge port. The cartridge slot is quite good quality, as well it must be to stand up to all the use it will get through the BASIC being supplied on cartridge.

The rear of the machine is covered with copious interfaces, most of them with non-standard connections. From right to left there is the power input, similar to a Spectrum's; the RF output; the monitor connection; a non-standard edge connector; the tape I/O system, one out, one in and two REM controllers.

The LAN/serial connector, Centronics printer port and both joystick ports are also edge connectors and require special connections and leads from Enterprise Computers. This is very odd and can only be described as cheapskate cost cutting. The best thing about the BBC is that all its interfaces are standard — likewise the connectors. This typifies the impression that the Enterprise gave me — but more of that later.

The keyboard is multi-coloured, with white on dark grey alpha-numeric keys, eight blue function keys, 12 green control keys, and a large red 'stop' button. There is also a red reset button at the rear that will reset the machine back to BASIC or the built in word processor or, with two presses, into the self-test mode of the operating system.

The feel of the keyboard is attrocious — truly bad. It is a long way above the Spectrum, but surprisingly similar to the dreadful Spectrum Plus or the QL. It's not too bad for programming but writing





this on the built-in text editor was sheer hell.

Hardware facts

Now to the inbuilt hardware. Much has been made of the custom graphics and sound chips 'Nick' and 'Dave'. Both of these chips were meant to make everything else look like ancient relics. I shall start with the sound chip as this represents the biggest disappointment.

'Dave' is housed in a flat pack, a particularly efficient method of housing a chip. Inquisitive Electron users will be familiar with this type, as their general purpose chip is housed in one. The generator has 22 registers, but only 16 of these are involved with sound generation. The rest are to control the main function of the chip — memory and processor management. This single chip handles a lot of the Z80's upkeep functions such as memory decoding, interrupt handling, and I/O functions. This is a very efficient use of hardware and enables the Enterprise to access the huge amounts of memory that it has.

This means that the 64K of RAM advertised is a true figure; minus memory for the screen and system, there is around 50K left — about the same as the Commodore Plus/4 that has a similar memory management system, but unlike the MSM computer which has only 28K left for use.

This allows EXOS, the operating system, BASIC, and the text editor/word processor all to reside on the BUS at the same time yet take up no valuable memory space at all! It also allows you to access up to 4M RAM (apparently) as straight memory.

However impressive the memory management system of the computer is, this is not reflected in the sound output functions of the chip. This is three channels of sound with one noise channel. Sound output is limited to a square wave, with programmable distortion with a simple filter and a certain amount of ring modulation. This is quite crude but the system comes into its own when you realise that there is *true* stereo sound output through the (again non-standard) video output connector.

Software surprise

Ignoring the poor potential of the hardware for a minute, the software to drive it is excellent. Independent envelopes for left and right channels with differing styles (distortion) and the sound queueing is excellent. I must make a point here that the sound is true stereo. The Amstrad has three sound channels, one can be the left channel, one the right, and the remaining one is fed to both. On the Enterprise all four channels go to each side with amptitude and envelope control being independent and only pitch control global.

It is a pity that no synthesis is possible, as on the Commodore 64. The music demo is quite impressive, but the sound produced is very 'robotic'. Another point to mention is the inbuilt sound output. It comes through a single Spectrum-like speaker mounted under the keyboard. This gives a very 'tinny' sound to the music, although, unlike the Spectrum, it can be very, very, loud. This is yet another example of the 'spoiled for a hap'ath of tar' impression that the computer gives me.

'Nick', the graphics chip, lived up to all my expectations. Disregarding sprites, it can do anything that any other computer on the market can and a whole lot more! Programmers are going to have a lot of fun programming this beast. Here is a list of some of its functions:

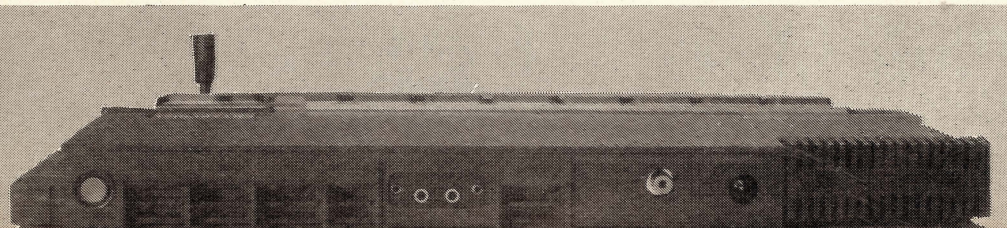
40 or 80 column text.
Bitmapped modes with pixel defined colours with a palette containing up to 256 colours depending on colour/resolution trade off.
Up to 640 x 360 graphics and 80 x 50 text.
Attribute mode like a Spectrum except it has up to 256 colours available.
External video input.

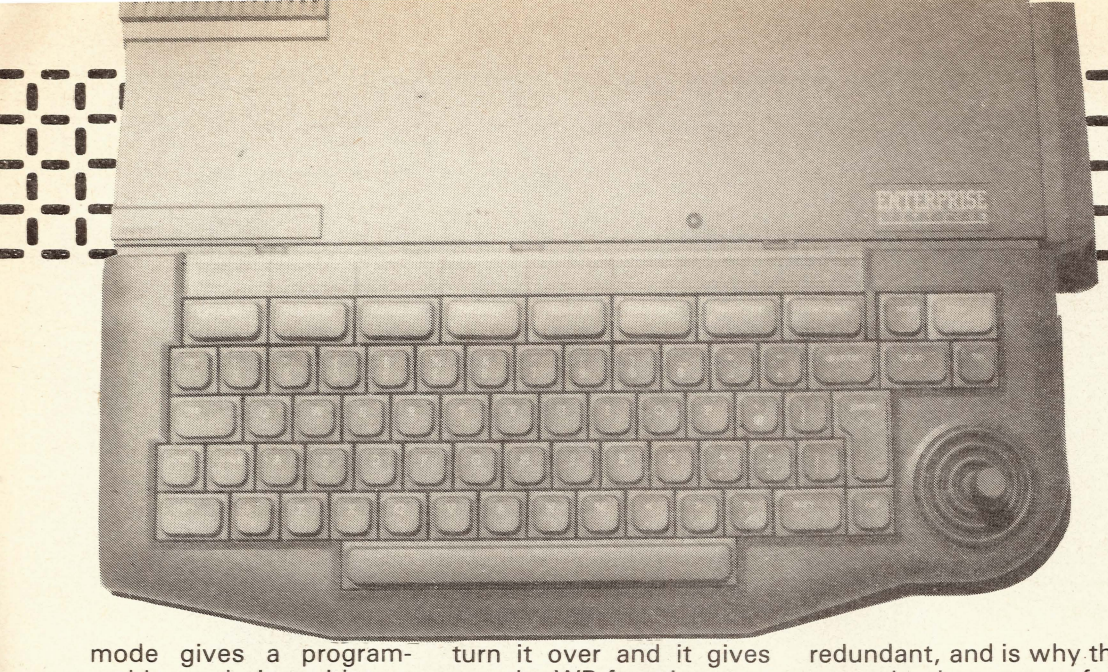
Screen resolution

The whole graphics screen can be reprogrammed in any way, so that each scan line can be in a different mode if need be. There are 256 scan lines on the screen with interlace separately controlled for another 356. With careful programming it is possible to get a 672 horizontal graphics resolution with 512 vertical lines.

There is a software drive on the demo tape to give 640 by 360 graphics, 80 × 50 text and a number of text lines on the bottom of the screen and the status line at the top. The screen flickers a lot and you will need a very good monitor to see the characters (a TV set will just display a series of blobs), but it is possible. The catch comes when you type STATUS to see how much memory is left. The answer — 6990 out of around 50000 to start with — such is the penalty of hi-res, as BBC users will testify.

Text can be displayed at up to 80 characters per line and 256 colours. Each character may be user definable and be composed of 1 to 256 scan lines each. Attribute





mode gives a programmable resolution with two colours selected for each square out of the 256 available (like a Spectrum).

The hi-res and lo-res graphic screens give a very BBC like 2, 4, or 16 colour palette selected from the 256 available. Also if you are willing to accept dreadful resolution, you can have the full 256 on the screen at the one time.

The inbuilt software is EXOS, an excellent operating system that can handle almost anything, and a word processor. The word processor isn't up to the standard of most WP programs but what can you expect for a freebee?

It is more of a text editor than a true word processor. Entry to the processor is direct without BASIC plugged in and by inputting 'TYPE' or function 8 from BASIC. All of the functions are WYSIWYG with 80 or 40 columns selectable. Swopping from BASIC to the WP destroys memory contents, as does switching display modes, which is a real shame.

A very thoughtful feature is the label that goes over the function keys. Normally it displays what the keys do from BASIC, but once in the word processor you can turn it over and it gives you the WP functions.

From the WP each function key has three functions. Each of these is displayed on the screen at all times. The first function is obtained by pressing the key and the other two are invoked by using the CTRL and ALT keys. Here is a list of functions: Justify, Set and clear tabs, Clear all tabs, Toggle ruler, Set right and left margin, Reset margin, Margin release, Move paragraph up or down, Change paragraph or line colours, Centre line, Reform line, Load and save, Print, Help, 80 or 40 column mode, Toggle key click, Exit to BASIC.

Most of these are self explanatory, but others need expansion. **Reform** will tidy up after editing a line but this is very rarely needed. **The ruler** is the dotted strip at the top of the screen that indicates tabs and margins — though it does take up one line that may be needed. **Moving the paragraph** shifts the para that the cursor is on up or down the text. **Help** is a function that makes the manual redundant, and is why the manual only covers a few pages on this subject.

I like the HELP function as it is one of the best. A lot of the more advanced WP functions are missing such as search and replace, but the most useful are still there.

Quirky BASIC

The BASIC is odd to say the least; most of the sound and graphics features have already been discussed so it only remains to talk about the general operation of the system. The BASIC comes on a separate cartridge which plugs into the external cartridge port. All the usual functions are there with full toolkit commands such as AUTO and RENUMBER. Structuring is in evidence with WHILE, WHEN.ELSE, and SELECT CASE. Graphics handling is complete with a FILL command and extensive plotting commands. Sound is similarly catered for.

The option control is the most exceptional of all. The SET command is used quite a lot in the format SET function on or off and there is also the TOGGLE function which will change a function from on to off or vice versa. The ASK command will return the status of any function or parameter.

Almost any function can be controlled in this way. There is a full screen editor for editing programs. Unfortunately (and rather common nowadays it seems) spaces are compulsory. When a program is listed out it is indented in a similar manner to LIST07 on a BBC. This can be stopped and it is advisable to do so on a 40 column screen as listings become a bit difficult to read.

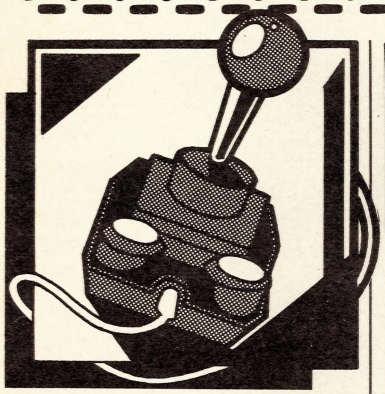
A unique function of this BASIC is the ability to have more than one program in memory at any one time. Each program can have a name, and control can be passed between them.

I have no complaints about the BASIC at all. No doubt midnight will come and it will turn into a pumpkin, but at the present it is one of the best that I have seen.

Conclusions

I was going to buy a BBC micro to use as a development system and word processor but now I am seriously reconsidering this choice and, considering the price, I will keep an eye on the Enterprise 64.

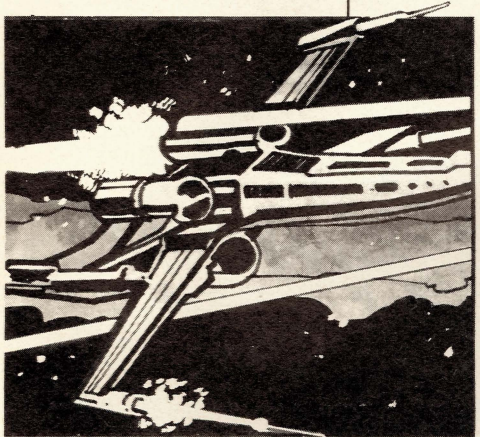
Technical details
Text Resolution: 40 × 25, 80 × 25
Graphics Resolution: Up to 640 × 256 (practical)
Memory: 64K RAM, 50K user max
Colour: 256 available, pallettes of 2, 4, or 16
Sound: Stereo over three channels + noise, internal speaker.
I/O: Joysticks — 2 external + one built in, RS423 Serial, Local Area Network, Centronics printer, Cartridge, RGB, Composite, Video in, Stereo sound out, Cassette in and out with two remote sockets.
Operating system: EXOS, CP/M to come.
Keyboard: Hard plastic over collapsible dome rubber mat type, lots of key with space bar, function keys, special control keys and reset button. Cursor control via built in joystick.
Price: £249.95

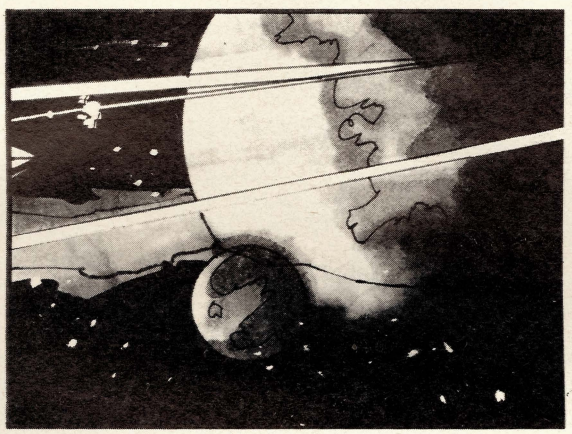


Debroids

An exciting space battle in extended BASIC

by Gordon Tomlinson.





The program has been written so that, if you desire it, a speech synthesiser may be used. Control is via keyboard or joystick. There are four screens to the game. Your aims and controls are as follows.

SCREEN ONE: Rotate your ship using 'S' or 'D' or the joystick. To move the ship round the screen press 'E' or push up the joystick. This activates the engines and the ship will move in the direction it is facing. To stop the ship, turn it in the direction opposite to the way of travel and apply the engines until it comes to rest. To destroy the asteroids, you launch your mines by pressing 'Q' or the fire button. In case of panic, you can press 'T' which activates your hyper space facility!

SCREEN TWO: You can get bonus points by hitting the ship at the top of the screen. If the ship reaches the opposite side of the screen, you progress to the next one.

SCREEN THREE: In which you have to find a lost lifeboat. You find it by listening to the emergency beacons. The sound gets louder and higher pitched as you get closer to it. If you find it, you are rewarded with an extra ship for your fleet. If not you proceed to the next screen.

SCREEN FOUR: You must avoid being hit by the suicidal Blomoids but you can destroy them with some well-placed space mines.

The speed of the asteroids and Blomoids increases after each round of four screens.

TEXAS

variables used

TIME	time left for search
DIF	distance between ship and life boat
SO,V	set volume on engines
HI	number of asteroids destroyed
P	indicator for pattern of ship
S	number of ships left
DM(J)	array for indicating status of asteroids
SC	holds score
HC	holds high score
GO$	is set to print ''GAME OVER''
SA,AS	hold maximum speed of asteroids
SA$	indicates if speech synth attached
M(X,Y)	holds velocity of ship
ZI	indicates if you are using joystick or keyboard
PO1,PO2	hold position of ship
SI	fire button indicator
H	used for sprite coincidences

Temporary variables

X, Y, J, I, A, B, XI, YI, Q, W, C, VP, ACR, M.

Debroids

hints on conversion

Most TI extended BASIC is similar to most popular home computers. The major differences are screen and sound handling routines which are provided rather than POKES and PEEKS. If you do not have a sprite facility you will find the program hard to convert.

Listed below are the screen and sound handling routines.

CALL HCHAR (A,B,C,D)	This will place a character on the screen. A is the row number, B is the column number. C is the ASCII character to be placed on the screen. D is the number of horizontal repetitions.
CALL VCHARA (A,B,C,D)	Same as HCHAR but repeats vertically.
CALL KEY (3,K,S)	Is a keyboard scan. '3' is the type of scan, K returns the ASCII value of the key pressed. $ is set to '-1' if a key is pressed.
CALL SPRITE (A,B,D,D,E)	Sets up a sprite on the screen. A is the sprite number, B the ASCII code, C is the colour of the sprite, D is the row number and E the column number where the sprite is to be placed.
CALL MOTION (A,B,C)	Gives the sprite a heading and motion. A is the sprite number, B is the vertical velocity, C is the horizontal velocity.
CALL PATTERN (A,B)	Changes the pattern of the sprite. A is the sprite number, B is the new ASCII character number.
CALL SCREEN (A)	Changes the colour of the screen.
CALL COLOR (A,B,C)	Changes the colour of the character set(s). A is the character set number, B is the foreground colour, C is the background number.
CALL CHAR (A,B$)	Redefines the characters. A is the ASCII number to be redefined, B$ is the string containing the new character pattern.
CALL GCHAR (A,B,C)	Similar to PEEK. Looks up the ASCII character at the screen position specified by A, the row number, and B, column number, with the result placed in C.

how it runs

Line	Effect
4-24	Set up title screen and check for speech synthesiser
170-210	Set variables to start values
310-330	Get the type of control method (joystick or keyboard)
340	Sets colours for character sets
341-570	Data and routines for defining characters
356	Sets up search grid for screen 3
580	Introductory sounds
590	Displays score, high score and number of ships at start
610-615	Place and set asteroids in motion
620	Resets asteroids' status indicators to zero
630	Displays update of ships and places ship at the start position
640	Blanks out search grid and sets pattern of ship
650-660	Wait for fire button to be pressed before starting
670	If DM(J) equals 3 then delete that sprite
680	Tests for input for joystick
690-700	Test for input from key board
710-740	Routine for moving ship and engine noise
750-770	Change ship's pattern, look for collisions, see if panic button has been pressed
780-890	Routines for launching space mine and detecting a hit.
900-960	Routine for ship being hit by asteroids
970-1050	Routine for end of game
1070-1110	Routine for completing all four screens
1200-1210	Give ship a new random location when panic button pressed
1800-2040	Define sprites and set up screen 2
2050	Tests for input from either keyboard or joystick
2060-2070	Check positions of ship and alien craft
2100-2102	Fire space mine, check for hit with alien craft
2200-2301	Routine for end of screen 2
2500-2515	Set up screen 4, define and set alien craft in motion
2517-2518	Wait to fire button to be pressed before starting
2520-2550	Routine for moving ship and checking for collisions
2600-2610	Routine for when hit by alien craft, GOTO screen one
2800-2810	Routine for launching space mines looking for a hit, check if any aliens left
3200-3220	Set up screen 3, set time limit, place ship and life boat
3230-3260	Routine for moving ship, look to see if you have found the life boat and sound audible indicator
3270	If time running out gives warning if speech synth attached
3300-3320	Routine for successfully finding life boat
3400-3410	Routine for running out of time
9000	Speech for next screen
9020	Speech for losing a ship

program listing

```
4 CALL CLEAR :: CALL SCREEN(2)::
 FOR X=0 TO 14 :: RANDOMIZE :: C
ALL COLOR(X,INT(RND*13+3),1):: N
EXT X
5 DISPLAY AT(12,1)BEEP:"HAVE YOU
 GOT THE SPEECH": :"SYNTHESIZER
ATTACHED Y/N ?" :: ACCEPT AT(14,
28)SIZE(1)BEEP VALIDATE("YN"):SA
$
7 PRINT "      BY GORDON TOMLINSO
N": : :"  PERSONAL COMPUTING TOD
AY": :"*************************
***": : :TAB(11);"PRESENTS": :
8 PRINT TAB(11);"********": :TAB
(12);"******": :TAB(13);"****":
:TAB(11);"DEBRIODS": :TAB(11);"*
*******": : :"   PRESS ANY KEY T
O START"
21 FOR X=1 TO 12 :: CALL COLOR(X
,12,2):: NEXT X :: IF SA$="Y" TH
EN CALL SAY("BY GO+DONE TONE+IN+
SUM. PRESS ANY KEY TO START")
23 FOR X=1 TO 75 :: CALL KEY(3,K
,S):: CALL COLOR(2,INT(RND*16+1)
,1):: IF S<>0 THEN 170
24 NEXT X :: GOTO 21
170 CALL CLEAR :: CALL DELSPRITE
(ALL):: RANDOMIZE :: CALL MAGNIF
Y(3)
180 OPTION BASE 1 :: P,R=1 :: S=
3 :: AS=15 :: SA=10
190 DIM M(8,2),DM(8)
200 DATA -20,0,-20,20,0,20,20,20
,20,0,20,-20,0,-20,-20,-20
210 RESTORE 200 :: FOR I=1 TO 8
:: FOR J=1 TO 2 :: READ M(I,J)::
 NEXT J :: NEXT I
310 DISPLAY AT(12,4)ERASE ALL:"M
ETHOD OF INPUT:": :"      1. JOYS
TICK. ": :"      2. KEYBOARD."
315 IF SA$="Y" THEN CALL SAY("PR
ESS ONE FOR JOYSTICK OR TWO FOR
KEYBOARD IN+PUT")
320 CALL KEY(0,Z1,Z2):: IF Z1<49
 OR Z1>50 THEN 320 ELSE IF Z1=49
 THEN CALL SPGET("JOYSTICK",CF$)
ELSE CALL SPGET("KEYBOARD",CF$)
330 IF SA$="Y" THEN CALL SAY("YO
UR CHOICE IS",CF$)
340 CALL CLEAR :: CALL COLOR(1,1
5,1,3,16,1,4,16,1,5,2,16,6,2,16,
7,2,14,8,9,1)
341 RESTORE 350 :: FOR X=1 TO 34
 :: READ A,A$ :: CALL CHAR(A,A$)
:: NEXT X
350 DATA 48,"007E42424242427E",4
9,"0008080808080808"
355 DATA 33,"FF80808080808080",3
4,"FF01010101010101",35,"0101010
1010101FF",36,"80808080808080FF"
356 FOR X=3 TO 22 STEP 2 :: FOR
Y=2 TO 30 STEP 2 :: CALL HCHAR(X
,Y,33):: CALL HCHAR(X,Y+1,34)::
CALL HCHAR(X+1,Y,36):: CALL HCHA
R(X+1,Y+1,35):: NEXT Y :: NEXT X
360 DATA 50,"007E02027E40407E",5
1,"007E02027E02027E"
370 DATA 52,"004242427E020202",5
3,"007E40407E02027E"
380 DATA 54,"007E40407E42427E",5
5,"007E020202020202"
390 DATA 56,"007E42427E42427E",5
7,"007E42427E02027E"
394 DATA 60,"000009330D1B2C2B1D0
702000000000000000000040A0C838C04
0"
396 DATA 64,"000000000001020E0B0
502000000000000000000005080E0408
040"
398 DATA 76,"000000030101111F110
101030000000000000080000010F0100
00080"
410 DATA 74,00FFFFFFFFFFFFFF,80,
"003C40405C444438003844447C44444
400446C5454444444007C40407840407
C"
420 DATA 84,"001F11111111111F002
1213312120C0C003C20203820203C00F
09090F0A3A393"
430 GO$=CHR$(80)&CHR$(81)&CHR$(8
2)&CHR$(83)&CHR$(84)&CHR$(85)&CH
R$(86)&CHR$(87)
450 DATA 88,001818183C7E6642,92,
"0000070A12223C20203C22120A07000
00000E05048443C04043C446850E0"
460 DATA 96,"0045104022000881002
400411002200010004800842002008 92
44008002884"
470 DATA 100,"80400822080114050B
012208422040800110045800 08C01040
308024008C0201"
480 DATA 104,"000000000101010307
0F0808000000000000000808080C0E0
F01010"
490 DATA 108,"0000000000000F1703
010000000000000000000002070E0C0C0
C0C04080"
500 DATA 112,"000000000E03030303
03030E00000000000000000000080F0F0
80"
510 DATA 116,"000000000000010317
0F00000000000000000008040C0C0C0C0
E07020"
520 DATA 120,"0000000008080F0703
010101000000000000000001010F0E0C0
808080"
530 DATA 124,"000000010203030303
070E04000000000000000000080C0E8
F0"
540 DATA 128,"000000000000010F0F
010000000000000000000070C0C0C0C0
C0C070"
```

program listing

```
550 DATA 132,"00000000040E070303
0303020100000000000000000F0E8C0
80"
560 DATA 136,"302854F7BDCB3515C5
9B35390F7D322C20609CD6C95FED9820
B955BF4AEA1C"
570 DATA 140,"00000000000000001010
0000000000000000000000000000080
"
580 CALL SOUND(100,900,0):: CALL
 SOUND(100,700,0):: CALL SOUND(1
00,880,0):: CALL SOUND(100,1000,
0)
590 CALL HCHAR(1,3,48,6):: DISPL
AY AT(1,10):"HIGH :"&RPT$("0",6-
LEN(STR$(HS)))&STR$(HS):: CALL H
CHAR(2,12,74,4):: CALL HCHAR(1,2
5,88,S-1)
610 CALL DELSPRITE(ALL):: FOR I=
2 TO 4 :: CALL SPRITE(#I,136,INT
(RND*12+3),95,125,INT(RND*AS+1),
INT(RND*AS+1)):: NEXT I
615 FOR I=5 TO 7 :: CALL SPRITE(
#I,136,INT(RND*12+3),95,125,INT(
RND*AS+1)*-1,INT(RND*AS+1)*-1)::
 NEXT I
620 FOR I=2 TO 7 :: DM(I)=0 :: N
EXT I
630 IF S<0 THEN 970 ELSE DISPLAY
 AT(1,23):RPT$(CHR$(88),S-1):: C
ALL SPRITE(#1,104,7,95,125,0,0)::
 CALL SOUND(-50,900,5):: X,Y=0
640 CALL COLOR(1,1,1):: CALL PAT
TERN(#1,92)
650 CALL COLOR(#1,9):: CALL KEY(
1,S1,S2):: CALL COLOR(#1,5)
660 IF S1<>18 THEN 650 ELSE CALL
 SPRITE(#1,104,11,95,125,0,0)
670 IF DM(J)=3 THEN CALL DELSPRI
TE(#J):: CALL COLOR(#1,11)
680 IF Z1=49 THEN CALL JOYST(1,A
,B):: GOTO 710
690 CALL KEY(1,S1,S2)
700 IF S1=2 THEN A=-4 :: B=0 ELS
E IF S1=3 THEN A=4 :: B=0 ELSE I
F S1=5 THEN A=0 :: B=4 ELSE A,B=
0
710 IF X<>0 OR Y<>0 THEN V=30-MA
X(ABS(X),ABS(Y)):: CALL SOUND(-1
000,-6,V,110,V,110,V)
720 IF A<>0 OR B<>4 THEN 750 ELS
E X1=X+M(P,1)/10 :: X=MIN(ABS(X1
),20)*SGN(X1)
730 Y1=Y+M(P,2)/10 :: Y=MIN(ABS(
Y1),20)*SGN(Y1)
740 CALL MOTION(#1,X,Y):: GOTO 7
60
750 P=P+SGN(A):: IF P=0 THEN P=8
 ELSE IF P=9 THEN P=1
760 CALL PATTERN(#1,(4*P)+100)::
 FOR J=2 TO 7 :: IF DM(J)=3 THEN
770 :: CALL COINC(#J,#1,10,H)::
IF H THEN 900
770 NEXT J :: CALL KEY(1,Q,W)::
IF Q=11 THEN 1200 :: CALL KEY(1,
C,D):: IF C<>18 THEN 680
780 CALL POSITION(#1,P01,P02)
790 CALL SPRITE(#12,140,16,P01,P
02,M(P,1),M(P,2)):: CALL COLOR(#
1,8):: CALL PATTERN(#1,92)
800 CALL SOUND(-500,-4,4,110,9,1
000,15,220,10)
810 FOR J=2 TO 7 :: IF DM(J)=3 T
HEN 820 :: CALL COINC(#J,#12,18,
H):: IF H THEN 860
820 NEXT J :: VP=VP+1 :: IF VP=2
 THEN 840 ELSE 810
840 CALL DELSPRITE(#12):: VP=0 :
: GOTO 670
860 CALL DELSPRITE(#12)
870 IF DM(J)=0 THEN CALL PATTERN
(#J,60)ELSE IF DM(J)=1 THEN CALL
 PATTERN(#J,64)ELSE IF DM(J)=2 T
HEN CALL PATTERN(#J,96)
872 IF DM(J)=0 THEN DM(J)=1 ELSE
 IF DM(J)=1 THEN DM(J)=2 ELSE IF
 DM(J)=2 THEN DM(J)=3
874 CALL SOUND(-500,-7,0):: IF D
M(J)=3 THEN CALL DELSPRITE(#J)::
 DM(J)=3
875 IF RND>.5 THEN CALL MOTION(#
J,INT(RND*AS+1),INT(RND*SA+1)*-1
)ELSE CALL MOTION(#J,INT(RND*AS+
1)*-1,INT(RND*SA+1))
876 IF SA$="Y" AND RND>.7 THEN C
ALL SAY("WELL DONE YOU GOT ONE")
880 SC=SC+30+((INT(RND*10)+1)*5)
:: VP=0 :: DISPLAY AT(1,1)SIZE(6
):RPT$("0",6-LEN(STR$(SC)))&STR$
(SC)
890 HI=HI+1 :: IF HI>=18 THEN 18
00 ELSE 670
900 CALL COLOR(#1,9):: CALL PATT
ERN(#1,100)
910 CALL SCREEN(12):: CALL SCREE
N(9):: CALL SCREEN(16):: CALL SC
REEN(14)
920 CALL SCREEN(2):: FOR I=0 TO
30 STEP 2 :: CALL SOUND(-500,-6,
I):: NEXT I
930 FOR I=1 TO 3 :: CALL SCREEN(
12):: CALL SCREEN(9):: CALL SCRE
EN(16):: CALL SCREEN(2):: NEXT I
 :: S=S-1
955 GOSUB 9020 :: IF HI>=18 THEN
 1800
960 IF S<>0 THEN P=1 :: GOTO 630
970 AS=15 :: CALL DELSPRITE(#1):
: FOR I=30 TO 0 STEP -1 :: CALL
SOUND(-200,-5,I):: NEXT I
980 FOR I=1 TO 3 :: CALL SCREEN(
12):: CALL SCREEN(9):: CALL SCRE
```

program listing

```
EN(4):: CALL SOUND(-200,-5,0)::
CALL SCREEN(2):: CALL SOUND(-200
,-6,0):: NEXT I
990 CALL SOUND(-400,-7,0)
1000 IF SC<HS THEN 1040 ELSE HS=
SC
1010 FOR I=1 TO 200 :: NEXT I ::
 DISPLAY AT(1,16)SIZE(6):RPT$("0
",6-LEN(STR$(HS)))&STR$(HS)
1020 FOR I=1 TO 10 :: CALL COLOR
(5,2,7,6,2,7):: CALL SOUND(-200,
900,0)
1030 CALL COLOR(5,2,16,6,2,16)::
 CALL SOUND(-200,800,0):: NEXT I
1040 X,Y,SC,HI=0 :: R,P=1 :: S=3
 :: DISPLAY AT(24,10):GO$
1045 IF SA$="Y" THEN CALL SAY("U
HOH THAT IS THE END OF THIS GAME
S SPACE COMMAND+OR.PRESS HIGHER
BUT+ON OR Q TO TRY AGAIN")
1050 CALL COLOR(7,14,2):: CALL K
EY(1,A,B):: CALL COLOR(7,2,14)::
 IF B=0 THEN 1050 ELSE CALL HCHA
R(24,1,32,32):: GOTO 580
1070 IF SA$="Y" THEN CALL SAY("W
ELL DONE SPACE COMMAND+OR AN+OTH
ER ROUND COMPLETED NOW TRY THE N
EXT ONE")
1085 CALL DELSPRITE(ALL):: AS=AS
+5 :: IF AS>45 THEN AS=45
1090 CALL SOUND(200,9999,30):: C
ALL SOUND(20,1100,0):: CALL SOUN
D(60,9999,30):: CALL SOUND(300,1
100,0)
1100 P=1 :: R=MIN(R+1,4):: HI=0
:: IF S<=0 THEN 970 ELSE 610
1200 CALL DELSPRITE(#1):: FOR N=
1 TO 5 :: CALL SOUND(100,-N,2)::
 NEXT N
1210 CALL SPRITE(#1,(4*P)+100,3,
INT((177-12+1)*RND)+12,INT((230-
10+1)*RND)+10,X,Y):: GOTO 680
1800 IF S<0 THEN 970 :: GOSUB 90
00 :: CALL COLOR(1,1,1):: CALL D
ELSPRITE(ALL):: CALL SPRITE(#3,1
04,12,177,125)
1810 SP$(1)="0000001F3F7FFFAAAA7
F3F1F000000000000F8FCFEFF5555F
EFCF8"
1820 SP$(2)="00000001F3F7F557F3
F1F000000000000000F8FCFEAAFEF
CF8"
1830 SP$(3)="000000000F1F3F1F0
F000000000000000000000F0F85CF8F
0"
1840 SP$(4)="00000000000070F070
300000000000000000000000E0F0E0C
0"
1850 SP$(5)="0000000000001030000
000000000000000000000000080C0000
0"
2000 PC=0 :: ACR=15 :: FOR X=300
 TO 3000 STEP 100 :: CALL SOUND(
-99,X,15):: CALL SOUND(-99,X-190
,15):: NEXT X
2005 Z=RND :: DDD=5
2020 IF Z>.5 THEN DR=(DDD*-1)::
COL=230 ELSE DR=DDD :: COL=10
2030 PC=PC+1 :: SC=SC+50+(PC*10)
:: IF PC>5 THEN PC=5
2040 CALL CHAR(40,SP$(PC)):: CAL
L SPRITE(#2,40,INT(RND*12)+3,40,
COL,0,DR)
2050 CALL JOYST(1,X,Y):: CALL KE
Y(1,C,D):: IF X=0 AND D=0 THEN X
X=0 ELSE IF X=-4 OR C=2 THEN XX=
-24 ELSE IF X=4 OR C=3 THEN XX=2
4
2060 CALL MOTION(#3,0,XX):: IF C
=18 THEN CALL POSITION(#3,AA,BB)
:: GOTO 2100 ELSE CALL POSITION(
#2,CC,DD):: IF DD>245 THEN 2200
2070 CALL SOUND(-1000,999,15,-7,
10,39000,25,20900,15):: GOTO 205
0
2100 CALL MOTION(#3,0,0):: CALL
SPRITE(#1,140,INT(RND*12)+3,AA+1
0,BB,-45,0):: CALL SOUND(-1000,-
4,5,1000,10,440,4,222,2)
2102 CALL COINC(#1,#2,ACR,H):: I
F H=-1 THEN 2109 ELSE CALL POSIT
ION(#1,A,B,#2,K,F):: IF A<35 THE
N CALL DELSPRITE(#1):: GOTO 2050
2104 IF F>240 THEN 2200 ELSE 210
2
2109 CALL MOTION(#2,0,0):: CALL
DELSPRITE(#1):: CALL SOUND(1000,
-7,10,40000,30,20000,28,500,10)
2110 IF Z>.5 THEN Z=.3 ELSE Z=.8
2120 DDD=DDD+3 :: ACR=ACR-3 :: I
F DDD>25 THEN DDD=25
2125 IF ACR<7 THEN ACR=7
2130 DISPLAY AT(1,1)SIZE(6):RPT$
("0",6-LEN(STR$(SC)))&STR$(SC)::
 GOTO 2020
2200 CALL DELSPRITE(ALL):: FOR X
=1 TO 16 :: CALL SCREEN(X):: CAL
L SOUND(-100,-4,4,40000,30,20000
,29,330,15):: NEXT X :: CALL SCR
EEN(2)
2300 CALL DELSPRITE(ALL):: CALL
CHAR(44,"8CC4E6B7B77F753D151D1F1
B0E07030131236 7EDEDFEAEBCA8B8F8D
850E0C080")
2301 GOTO 3200
2500 GOSUB 9000 :: CALL COLOR(1,
2,1):: KI=0 :: CALL SPRITE(#1,92
,10,180,INT((230-30+1)*RND)+30,0
,0)
2510 FOR X=3 TO 5 :: CALL SPRITE
(#X,44,INT(RND*12)+3,1,INT((246-
10+1)*RND)+10,10+INT(AS*RND)+2,8
```

Debroids

program listing

```
+INT((10-3+1)*RND)+3):: NEXT X
2514 FOR X=3 TO 7 :: DM(X)=0 ::
NEXT X
2515 FOR X=6 TO 7 :: CALL SPRITE
(#X,44,INT(RND*12)+3,1,INT((246-
10+1)*RND)+10,10+INT(AS*RND)+4,-
8+(-INT((15-5+1)*RND)+5)):: NEXT
 X
2517 CALL KEY(1,Y,W):: IF W=0 TH
EN 2517 ELSE CALL PATTERN(#1,104
)
2518 FOR X=600 TO 1200 STEP 100
:: CALL SOUND(-100,-1,5,X,5,330,
10):: NEXT X
2520 CALL JOYST(1,X,Y):: CALL KE
Y(1,C,D):: IF C=18 THEN 2800 ELS
E IF D=0 AND X=0 AND Y=0 THEN XX
=0 ELSE IF X=-4 OR C=2 THEN XX=-
34 ELSE IF X=4 OR C=3 THEN XX=34
2530 CALL MOTION(#1,0,XX):: CALL
 SOUND(-500,-8,9,600,14,110,16,5
50,16)
2540 CALL MOTION(#1,0,0):: FOR J
=3 TO 7 :: IF DM(J)=1 THEN 2550
:: CALL COINC(#1,#J,16,H):: IF H
 THEN 2600
2550 NEXT J :: XX=0 :: GOTO 2520
2600 CALL PATTERN(#1,96,#J,100):
: FOR X=2000 TO 110 STEP -100 ::
 CALL SOUND(-99,X,10):: NEXT X
2610 GOSUB 9020 :: CALL DELSPRIT
E(ALL):: S=S-1 :: GOTO 1070
2800 PV=0 :: CALL PATTERN(#1,92)
:: CALL POSITION(#1,AA,BB):: CAL
L SPRITE(#10,140,12,AA-5,BB,-15,
0)
2810 CALL SOUND(-500,-4,6,500,10
,110,10,700,10):: FOR J=3 TO 7 :
: CALL COINC(#10,#J,16,H):: IF D
M(J)=1 THEN 2820 ELSE IF H THEN
2900
2820 NEXT J :: PV=PV+1 :: IF PV>
4 THEN 3000 ELSE 2810
2900 CALL DELSPRITE(#10):: CALL
PATTERN(#J,100):: CALL SOUND(100
0,-7,0,500,5,110,5,150,5):: CALL
 DELSPRITE(#J):: CALL PATTERN(#1
,104)
2910 DM(J)=1 :: SC=SC+100+(AS*2)
:: DISPLAY AT(1,1)SIZE(6):RPT$("
0",6-LEN(STR$(SC)))&STR$(SC):: K
I=KI+1 :: IF KI>=5 THEN 1070 ELS
E 2520
3000 CALL DELSPRITE(#10):: CALL
PATTERN(#1,104):: GOTO 2520
3100 FOR X=200 TO 3000 STEP 150
:: CALL SCREEN(INT(RND*16)+1)::
CALL SOUND(-100,X,10):: NEXT X :
: CALL SCREEN(2):: GOTO 1070
3200 CALL SCREEN(12):: GOSUB 900
0 :: DEF DIF=INT((SQR(DIS)/10)):
: TIME=101 :: CALL CHAR(40,SP$(4
)):: CALL COLOR(1,10,12)
3210 CALL SPRITE(#1,40,2,INT((17
0-20+1)*RND)+20,INT((237-20+1)*R
ND)+20,#2,140,1,INT((185-20+1)*R
ND)+20,INT((230-20+1)*RND)+20)
3220 FOR X=1 TO 10 :: CALL SOUND
(-100,200,10):: CALL SOUND(-100,
500,10):: NEXT X :: CALL SOUND(1
000,-4,4)
3230 XX=0 :: YY=0 :: CALL MOTION
(#1,0,0):: CALL JOYST(1,X,Y):: C
ALL KEY(1,C,D):: IF C=2 OR X=-4
THEN XX=-4 ELSE IF C=3 OR X=4 TH
EN XX=4
3240 IF Y=4 OR C=5 THEN YY=-4 EL
SE IF C+1=1 OR Y=-4 THEN YY=4
3250 CALL MOTION(#1,YY,XX):: CAL
L DISTANCE(#2,#1,DIS):: SO=DIF*2
 :: IF SO>30 THEN SO=30
3260 CALL SOUND(100,800-(18*SO),
SO):: TIME=TIME-1 :: DISPLAY AT(
24,12):TIME :: IF TIME<=0 THEN 3
400 ELSE IF DIF<=0 THEN 3300
3270 CALL MOTION(#1,0,0):: IF TI
ME=25 OR TIME=20 OR TIME=15 OR T
IME=10 OR TIME=5 AND SA$="Y" THE
N CALL SAY("HURRY UP TIME ALL MO
ST OUT"):: GOTO 3230 ELSE 3230
3300 S=S+1 :: CALL MOTION(#1,0,0
):: FOR X=200 TO 2500 STEP 100 :
: CALL SOUND(-100,X,10):: CALL S
CREEN(INT(RND*16)+1):: NEXT X
3310 CALL SCREEN(2):: SC=SC+400+
(TIME*8):: DISPLAY AT(1,1)SIZE(6
):RPT$("0",6-LEN(STR$(SC)))&STR$
(SC)
3320 CALL HCHAR(24,1,32,32):: GO
TO 2500
3400 CALL SCREEN(10):: FOR X=201
0 TO 110 STEP -100 :: CALL SOUND
(-100,X,10):: CALL SOUND(-100,X+
100,10):: NEXT X
3405 IF SA$="Y" THEN CALL SAY("U
HOH OUT OF TIME SPACE COMMAND+OR
")
3410 CALL SCREEN(2):: CALL HCHAR
(24,1,32,32):: GOTO 2500
9000 IF SA$="Y" THEN CALL SAY("T
IME TO MOVE ON TO THE NEXT SCREE
N SPACE COMMAND+OR"):: RETURN EL
SE RETURN
9020 IF SA$="Y" THEN CALL SAY("U
HOH GOT YOU THAT TIME COMMAND+OR
"):: RETURN ELSE RETURN
```

QL NEWS

News from the world of Sinclair QL computing.



One year old... and look how we've grown!

When we launched the QL last year, we knew we were starting a revolution.

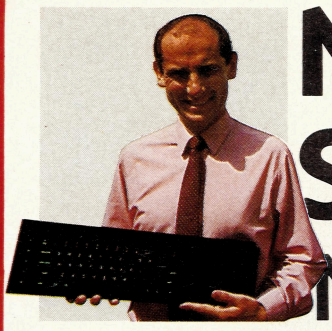
For the first time, the serious computer hobbyist could afford the same power and performance as the professional computer user.

A year later, and the QL is more than a unique computer, it's the heart of a unique system.

And the next 12 months promise even more for QL owners... new software options, extra storage devices, printers, monitors...

Read on, and see how far we've come, and how much further we're going!

Nº1



NIGEL SEARLE

Now it's the quantum leap for QL software and peripherals

Without doubt, the QL was the computer innovation of 1984. Launched to outstanding reviews, it soon gathered thousands of happy owners, and recognition from people like ICL, who have incorporated QL technology and its Microdrives into the new One Per Desk.

The quickest glance at the QL's specification shows what the fuss was all about...128K RAM, 32-bit processor architecture, 200K built-in mass storage, bundled software, They're features that would normally cost you three or four times as much!

But that's only half the story, because the QL is now the heart of a computer system, with a growing library of software...

As you'll see from these pages, 1985 is the year of the quantum leap for software and peripherals. Already there are no less than five QL languages together with special programs for software developers, a world-beating chess game... and much more on the way!

On the hardware side, there's a special QL monitor to make the most of that high-resolution 512 x 256 pixel display. There are memory expansion boards, Winchester disk drives, printers, and low-cost Microdrive cartridges.

In fact, there's so much going on, we'll be running these regular Newsletters just to keep you in touch!

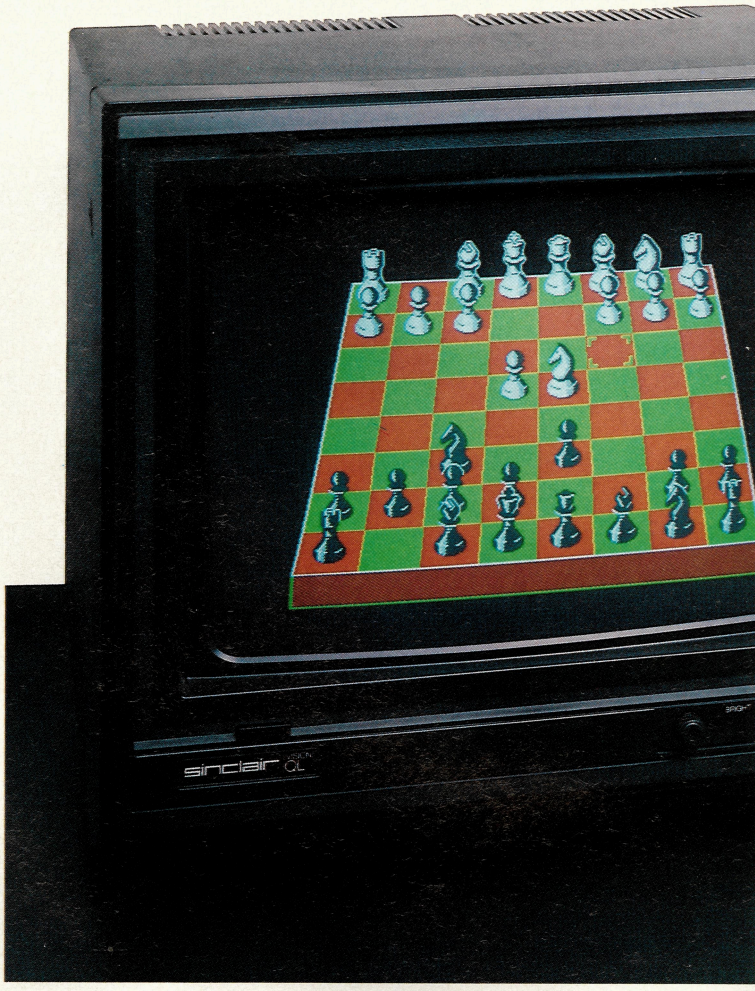
If you already own a QL, the next few pages will give you a taste of the exciting year ahead.

And if you don't . . . take a look at what you're missing. It should be all the persuasion you need!

Now read on...the quantum leap into serious computing starts here.

Nigel Searle

Nigel Searle, Managing Director, Sinclair Research Limited.



From sophisticated business packages to superb animated games... QL software makes the most of the computer's extraordinary specification.

New QL Software

Utilities, languages, games and business packages...with more on the way!

Two things are now certain about QL software. First, there's going to be plenty of it. And second, it's going to set completely new standards for microcomputers...

At the moment, there are well over 100 software programs in development. And the first software releases, shown here, demonstrate how exceptional the best QL software will be.

The QL already has five languages, superb programs for software developers, a top quality accounting package and in QL Chess it has its first game.

QLUB: 10,000 members and growing!

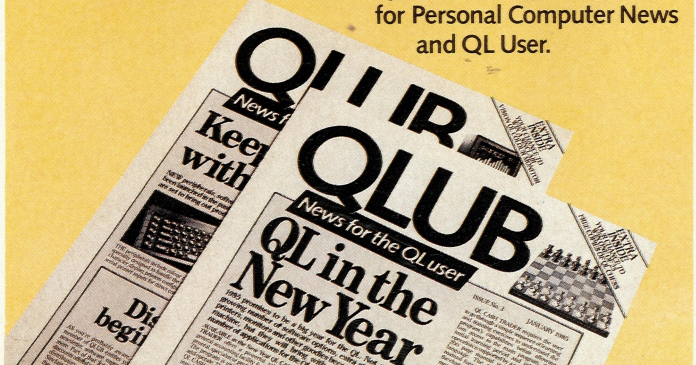
QLUB is the special Users Bureau for Sinclair QL owners. There are now well over 10,000 QLUB members, and membership is growing all the time.

For their annual subscription of £35, QLUB members are enjoying a whole range of information and advisory services, exclusive offers and special discounts.

One of the most important QLUB benefits is the special news magazine, appearing six times a year. The magazine provides a forum for QL owners to exchange views and keep in touch with all the latest developments.

Each issue is packed with updates on QL hardware and software, tips on applying the four QL Programs, and news of how other people are using the QL. QLUB members also receive a range of special discounts, with savings of at least 20% on selected software products.

Current special offers include:
QL Chess for £14.95
QL Toolkit for £19.95
QL Assembler for £31.95
QL Cash Trader for £54.95
Special subscription rates for Personal Computer News and QL User.

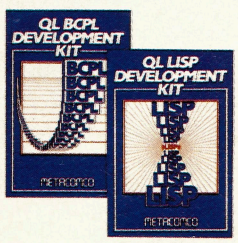




The multilingual Sinclair QL

BCPL – a forerunner of C, BCPL has been described as a systems programmer's delight. In the words of QL User, this compiler is a 'brilliant compromise between a high-level language and a low-level systems language'. Whilst not for beginners, this is an essential buy for anyone with a good knowledge of systems programming. Complete with manual.
Available from Metacomco – £59.95. Tel: 0272 428781.

LISP – already well-known for its artificial intelligence applications, LISP is a powerful and versatile language. This is a sophisticated implementation of LISP, by one of its leading exponents, Dr Arthur Norman. This package features full QL graphics, and a full manual is supplied.
Available from Metacomco – £59.95. Tel: 0272 428781.



Pascal – probably the most popular high-level language of all. Pascal is particularly well-suited to structured programming, sophisticated data manipulation and algorithmic problems. Pascal interpreter complete with 87-page manual.
Available from Computer One – £39.95. Tel: 0223 862616.



Forth – this 'new generation' language is proving both popular and easy to learn. The program provides a full implementation of the latest Forth 83 standard with graphics and sound extension.
Available from Computer One – £29.95. Tel: 0223 862616.

APL – the compact mathematics-based interpreted language designed for scientists and mathematicians.

APL keyword interpreter complete with manual.
Available from MicroAPL – £99.95. Tel: 01-622 0395.

Programmer's packs

QL Assembler – two programs operating in tandem. The first is a full-screen editor for creating and altering program files. The second, a Motorola-format compatible 68000 assembler which converts source files written in M68000 assembly language into machine code files which can run on the QL.

Both assembler and editor are written in machine code and can be multi-tasked with SuperBASIC, so you can switch between editor, assembler and SuperBASIC instantly.
Written by GST Computer Systems – £39.95.*

QL Toolkit – a programmer's toolkit with over 70 programs. and extensions to SuperBASIC. Most are linked to SuperBASIC initially and can then be used from commands or from within a program. Enhancements include printer spooling (print a file while running a SuperBASIC program); improved file access (with full random input/output command); job control (allows management of multi-tasking programs including the ability to display, alter priorities, and delete jobs from the QL); and SuperBASIC screen editor.
Written by Q Jump – £24.95.*

World-beating chess!

QL Chess – fresh from its victory at the World Microcomputer Chess Championship. This program sets a completely new standard for games software.

There's a high resolution display, animated 3-D graphics, and 28 levels of play from novice to champion. Features include an openings book of nearly 4000 moves, HINT and TAKEBACK functions that help you learn from your mistakes, and the option to play a human opponent or the computer.
Written by Psion – £19.95.*

Software at work

QL Touch 'n' Go – a unique approach to learning touch-typing skills. The program is designed to give you mastery of the standard QWERTY keyboard in just 24 hours. With practice, you should soon reach 40 words per minute, with over 95% accuracy.
Written by Harcourt – £24.95.*

QL Cash Trader – a unique computerised book-keeping system for small businesses. The program provides a complete course in the principles of accountancy, and goes on to become an essential aid in the day-to-day running of a business. Complete with comprehensive manual.
Written by Accountancy Software of Torquay – £69.95.*

***This title is available from Sinclair Research on 0276 686100, and selected Sinclair stockists nationwide.**

Psion trouble-shooting service

All QLUB members can obtain special assistance from Psion on using the QL Quill, Abacus, Archive and Easel programs supplied with the computer. Psion will normally answer any queries within 48 hours.

Free updates

QLUB members will also receive one free update of each of the four QL Programs – incorporating many new developments.

New QL Hardware
An industry is born

From the moment of its launch, the revolutionary QL attracted massive interest from all quarters.

In one area, the interest quickly turned to action, as high-tech hardware manufacturers realised the immense potential of the QL for vast expansion, for system development and for widespread networking. Already the list of peripherals for the QL is very exciting – and lengthening by the day!

Here, we've covered many of the latest, most important developments.

As more appear, be sure to keep in touch with QL News!



The dedicated Sinclair Vision QL monitor

Once you see the incredible graphics capabilities of the QL you may decide an ordinary TV just can't do them justice.

If that's the case, a high-resolution monitor is needed. (And if you're creating presentation-quality charts, for example, it's quite essential.)

The new Vision QL monitor is specially designed for the computer by Kaga Electronics, with full support from Sinclair Research.

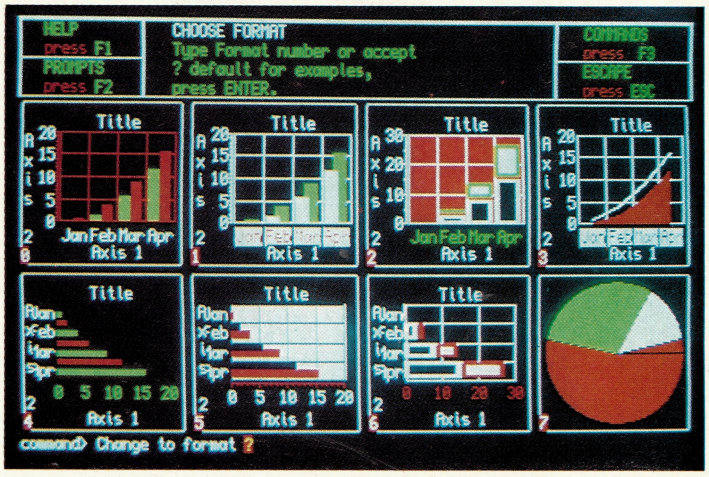
So it exploits the QL's maximum 512 x 256 pixel resolution to the full, with a pin-sharp 85 column display.

It's also specially styled to suit the QL – in looks, and in use. There's a 12" non-glare tube, and etched screen to diffuse reflections.

So the display is bright, sharp, *much* easier to look at . . . and invaluable for those late-night programming sessions!

And like the QL, the Vision monitor is designed with space in mind: it has a compact footprint of just 12½" by 15" – no more than a typical portable typewriter.

It's available from MBS Data Efficiency on 0442 60155 and selected Sinclair stockists.



Microdrive cartridges. Another Sinclair first!

Microdrive cartridges are the QL's own unique storage media. Each stores up to 100K of information, on a cartridge no bigger than a matchbox!

Access is within seconds. And in tests, Microdrive cartridges have made over 50,000 passes without loss of data.

Over 500,000 cartridges are now being used throughout Britain. And QL Microdrives themselves are standard equipment on the new ICL One Per Desk.



Sinclair Microdrive cartridges – up to 100K of programs and data on a medium so compact you can pop it into your pocket.

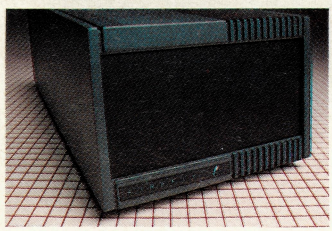
Powerful hard-disk system

For the QL business user, the new Firefly QL Winchester disk will boost the QL's power in one huge leap.

Designed by Quest, it uses CP/M and offers all the benefits of Winchester technology: fast access, reliability, compact size and quiet operation.

With 7.5 Mb storage, the Quest Firefly is ideal for large databases such as stock or customer lists. And at under £1,200, it represents exceptional value for money.

The Firefly will be available very shortly from Quest on 04215 66488.



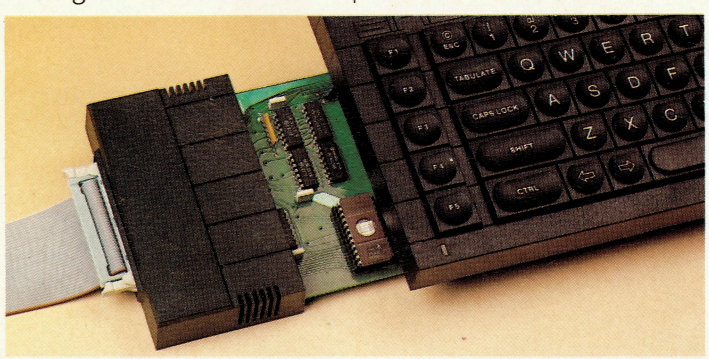
Winchester hard disk drives supplement your QL's built-in mass storage.

Interface options

The QL comes complete with two built-in RS-232C interfaces.

In addition, interfaces for Centronics printers are widely available from manufacturers such as CST, Miracle Systems and Sigma Research . . . with prices from only £35.

And that's just the beginning. For attaching scientific and laboratory instruments to the QL, CST even offer an IEEE-488 interface, which can handle up to 16 connected devices simultaneously!



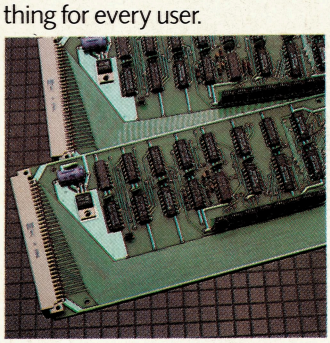
A Centronics interface slips discreetly into place.

Expansion boards for up to 4 times more memory!

Also from Quest, a simple and inexpensive way to expand the QL's RAM: with memory expansion boards.

These compact units connect to the standard QL expansion port, using the QL's internal power source or, for larger boards, an external power source.

The units range from 64K and 128K RAM boards to massively powerful 256K and 512K RAM boards, so there's something for every user.



Compact expansion boards.

Prices start at £117, and the 512K board is a very cost-effective investment at just £587.

With affordable memory like this, the QL is more than a match for any other micro under £2,000!

Where to find the QL.

The Sinclair QL is available at selected branches of Dixons, W H Smith, John Lewis Partnership, Currys, Greens in Debenhams and Ultimate, and larger branches of Boots, John Menzies and specialist computer stores nationwide.

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The spec behind the spectacle

CPU – Central Processing Unit
Fast, powerful Motorola 68008 chip. A second processor, an Intel 8049, controls the keyboard, generates the sound, and acts as an RS-232C receiver.

RAM
128K. Now expandable to 640K.

ROM
48K.

Operating system
Qdos – revolutionary single-user, multi-tasking, windowing operating system.

Storage
Twin built-in QL Microdrives. Up to 100K storage each – transfer rate, up to 15K per second.

Keyboard
Full moving 65-key QWERTY, five function keys, four cursor keys.

Language
Sinclair structured SuperBASIC.

Application software
QL Quill – word processor
QL Abacus – spreadsheet
QL Easel – graphics
QL Archive – database
All four packages supplied with the QL.

Interfaces
Two serial RS-232C interfaces, Microdrive expansion port (up to 6 may be added), ROM cartridge port, local area network, 2 joystick ports, RGB monitor and TV output.

Text screen
Various modes – up to 85 columns by 25 rows on monitor. On TV, up to 60 columns.

Graphics resolution
512 x 256 pixels (four colour), 256 x 256 pixels (eight colour).

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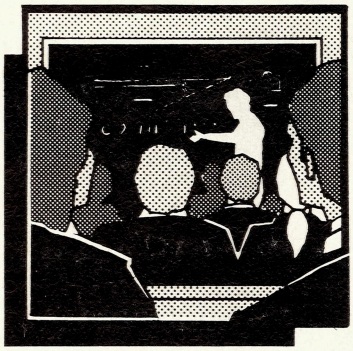

Game Tricks Part 2

Last month, Alan Rowley introduced you to writing games programs. Now he gets down to the nitty gritty of writing a bat and ball game for the Amstrad CPC464.

Most games involve moving things around the screen, either interactively, that is in response to key presses or perhaps a joystick, or under the control of some timing software. In the game of bat and ball that we are working on we will want to move the bat, whereas we want the ball to move continuously in the 'background'. Moving the bat will require input from the keyboard.

Quicker responses

Normally when you are entering information at the keyboard, say a program line, you type the whole line and the computer does nothing until you send the line by pressing 'ENTER'. In games this is not satisfactory as we want an instantaneous response to a key press without needing to press ENTER.

Taking keyboard input in this way is called 'reading' or 'testing' the keyboard. The Amstrad BASIC provides two ways of doing this with the INKEY and INKEY$ keywords. INKEY is used to test if a *specified* key is being pressed whereas INKEY$ checks the whole keyboard and returns the character corresponding to the key pressed. Try this little routine:

```
10 A$=INKEY$
20 PRINT A$
30 GOTO 10
```

You should see nothing on the screen until you press a key and then the character of the key will be repeatedly displayed as long as you hold it down. Notice that even when you are not pressing the key the screen is scrolling. Actually INKEY$ is returning a blank. This is important to realise: INKEY and INKEY$ test the keyboard instantaneously and do not wait for a key to be pressed, you have to generate the wait yourself if you want it. Change line 10 in the routine above to:

```
10 A$=INKEY$:IF
   A$=”” GOTO 10
```

Notice that after the equals sign we have two double quotes with nothing in between, i.e. a blank. Now we have frozen operation at line 10, so that nothing happens until a key is pressed. You will now find that the screen only scrolls when you press a key.

INKEY$ is best adapted to reading the keyboard when you want to actually use the character corresponding to a key. If, as in games programming, you are just interested in checking whether the key is up or down you should use INKEY. This is used in the form:

```
10 IF  INKEY(n)>-1
   THEN.....
```

The 'n' is the key number,

CPC 464

program listing

```
10 GOSUB 1000
20 GOSUB 2000
299 REM*Main Loop*
300 batrt%=17:batdn%=16:dummy%=0
310 WHILE dummy%=0
320 LOCATE #1,batrt%,batdn%:PRINT #1,bat$;
330 WHILE INKEY$="":WEND
340 LOCATE #1,batrt%,batdn%:PRINT #1," ";
350 IF INKEY(1)>-1 THEN batrt%=batrt%+1:IF batrt%>36 THEN batrt%=36
360 IF INKEY(8)>-1 THEN batrt%=batrt%-1:IF batrt%<1 THEN batrt%=1
370 WEND
999 REM*initialise*
1000 SPEED KEY 3,3
1010 bat$=CHR$(208)
1060 RETURN
1999 REM*Set up Screen*
2000 REM**************************
2010 REM*  Routine published in  *
2020 REM*  last month's article  *
2030 REM**************************
```

as shown on page 16 of Appendix III of your manual. INKEY will return −1 if the specified key is not pressed, and zero if the key is pressed alone. Larger values are returned if the key is pressed in conjunction with SHIFT or CTRL but the example above will test for the key being pressed in general, and, for example, be unaffected by the state of the CAPS LOCK key. With INKEY$ we could only achieve this by testing for both high and low case letters.

Joysticks can also be read with INKEY since they too have a 'key' number. For example, we test for joystick 0 being moved to the right by:

```
10 IF INKEY (75)>−1
   THEN . . . . .
```

Bat movement

Let us now turn to moving our bat. The appropriate routine is shown in Program 1. In order to test it I enclose it in an infinite WHILE . . . .WEND loop which can only be left if the variable 'dummy' changes from zero, which it never does.

I decided to use character 208 for the bat and, in order to make the program more readable, I have defined it as 'bat$' in the initialisation subroutine, starting at line 1000. As you can see there are several other similar jobs done in this routine which I will add to as the program develops.

Line 300 merely defines a starting position for the bat in line 16, column 17 of window 0, we then start to test the keyboard. Line 330 simply waits until a key press is detected. When a key is detected the first job is to erase the bat from its current position, line 340, by printing a space. Line 350 then tests to see if the right cursor key is being pressed. If this is the case the value of 'batrt%' is increased by one, making sure that when the bat is next printed it will be moved one character position to the right.

It is finally necessary to check that the bat is not being moved off the right hand side of the screen window. This would be the case if 'batrt%' exceeded 36, since the playing area window is 36 characters wide as defined in the last article. The last part of line 350 takes care of this by restoring the value of 'batrt%' to 36 if it tries to increase.

The resulting statement, 'IF batrt%>36 THEN batrt%=36' is a good example of the sort of thing that occurs in the logic structure of computer programs. Mathematically it is nonsense but then it is not a mathematical expression, it is a logical expression. The resemblance to algebra is only superficial resulting from the use of similar signs such as '='.

Notice that if the initial test for the cursor key, in line 350, fails, then *none* of the rest of line 350 is executed. The computer passes on immediately to the next line. This is a standard feature of BASIC and allows you to have quite a complex routine, the execution or non-execution of which is controlled by a single 'IF' statement.

Line 360 carries out a similar test for the left cursor key and makes adjustments if you try to move the bat off the left of the window. If you have a joystick why not try to make these routines work on the joystick or the keyboard? You will need to modify lines 350 and 360 to rest for a key press 'OR'(hint) a joystick movement. The joystick 'key' numbers are also on page 16 of Appendix III of your manual. When the new bat position has been computed, execution returns to line 310 where the bat is reprinted, but now in its new position.

The final point to look at is the key response and repeat speed. When I first tested this routine I found that the key response was not satisfactory. The default settings give a longish wait, after the key is first pressed, before repeating starts and then the repeat rate is rather slow. By trial and error I found the 'SPEED KEY 3,3' was about right and I have included it in the initialisation routine.

I would recommend that, before you test the program, you enter 'KEY 128, ''SPEED KEY 10,10'' + CHR$(13)'. You can then restore the key response to a state suitable for normal use by pressing '0' on the numeric keypad. If you do not do this you will have problems entering *anything* once you break out of the program, since the key repeat rate will be far too high. Unless you have the touch of a concert pianist that is!

Well that's all for this month, next month we will get the ball moving and have a look at interrupts.



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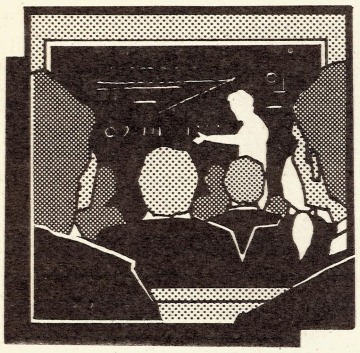


Class of '64

Last month, Bob Harwood introduced you to the Commodore 64 hi-res screen. This month he begins to show you how to create a powerful graphic programming aid.

In last month's article we investigated the principles of the Commodore 64's hi-res graphics. Now we will start to use those principles to create a powerful graphics aid with many of the features that you might expect to find in a commercial program.

All of the actual graphics routines are written in BASIC but a memory management machine code program is used to speed up the proram where large numbers of bytes are moved around in memory. This article gives information on setting up this machine code and also includes the first part of the main program which initialises the screen.

You will need either two separate tapes at first, or two clear sides on a single tape that have been clearly marked. One will contain the machine code program and the other the BASIC. Eventually you will be able to combine them, but a separate tape would not be wasted. 'Blocksave' by Allen Webb, the m/c routine, is a program that I'm sure you will want to keep for itself. It is a very powerful and versatile utility, as you will see in a moment.

Getting the machine code taped

The real beauty of Blocksave is that it SAVEs itself and so avoids many of the problems of machine code handling. If you have never tried a machine code program, then this is a good one to start with.

Written by Allen Webb, it was featured in the 'Your Commodore' supplement in July's *PCT*, so you may well already have a copy. If that is the case, then you may use it as it stands. If not, then simply follow the instructions below.

- First type in Listing 1 very carefully. A little care at this stage will save you a lot of grief later on! The best way to do this is to have a friend read out the data statements for you whilst you type them in.
- Now RUN the program. After a brief pause you should be greeted by the statement: DATA CHECKSUM VERIFIED: and if this is the case you can go on to SAVE the program. If you get the message: ERROR IN DATA FILE: then you must check the data statements in your program for errors and re-run the program until it clears.
- Saving 'Blocksave' is simplicity itself. Simply type in direct mode:
SYS 49152 ''BLOCKSAVE'', 1, 1, 49152, 49528
and Blocksave will save itself. (See explanation below).
- To VERIFY the program simply use VERIFY '' '', 1,1. If it fails to SAVE properly (highly unlikely) then start again.

Blocksave facilities

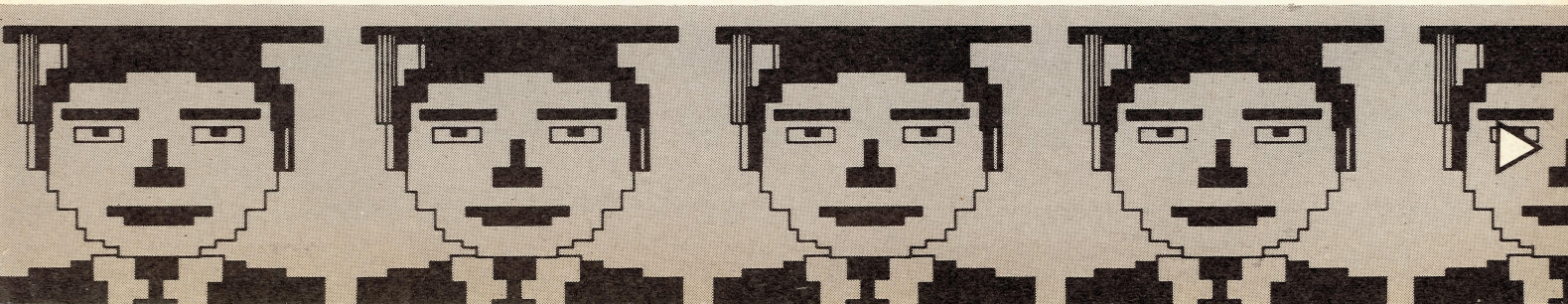
By calling various machine code routines you can obtain the following facilities. (In each case the variables, SA, EA, DA, have these meanings. SA = Start Address of a block of memory. EA = End Address of the block, which is the first clear byte. DA = is the Destination Address, or the first byte of the block to which data is to be transferred.)

BLOCKSAVE will save any block of memory to tape or disk; using the format:
SYS 49152''Title'', device, file number, SA, EA (see above).

To VERIFY or LOAD a program that has been saved with this routine, you must add the device number and logical file number to the instruction, for example, LOAD ''title'', 1,1. If you do not use this format the file will not be loaded to the correct address.

BLOCKMOVE as its name suggests, will move any block of memory from one location to another. The block is copied across, so that two copies are retained in memory. This is used in the program to save three complete screens in memory. The command used is:
SYS 49158, SA, EA, DA

BLOCKFILL is a specialised form of Blockmove that will fill a specified block of memory with a specific character. It is particularly useful for clearing out a hi-res screen by filling the memory with zeroes. It reduces screen set-up time from around fifteen seconds down to less than one second. Use:
SYS 49161, SA, EA, C



how it runs

Line	Effect
0	Jumps the subroutines at 1,2 and 3, allowing them to have short line numbers (and work faster).
1 *	Draws an indicator bar I spaces along the top of the screen ,in the Hth bit.
2 *	Erases any bar drawn by subroutine 1.
3	Not called by the program, but in Direct Mode. Any error reports will produce multicoloured blocks on the screen and the program will stop. To read them, type GOTO 3 (you won't be able to read it) and press RETURN. You will then be able to read the screen. CLEAR THE SCREEN BEFORE !ENTERING ANOTHER COMMAND!
4 *	A LOAD instruction called within a program will make the program autorun on completion. This line checks to see if the machine is in hi-res mode. If it is, then execution is returned to the correct line.
5	Checks to see if BLOCKSAVE has been loaded. If it has not, it LOADs it.
6-8 *	These are 'control strings' and their use will be explained next month. Those containing graphics characters are as follows:
7	V2$ = "csr up, csr down, * , csr left, * , * , * ,csr right, * , * "
8	V3$ holds non-printable characters.
9	A very simple title page. Memory is too short for anything more complex. Graphics characters are as follows: "clear screen,13 x csr down 14 x spaces HI RES 64"
100	Gets a character from keyboard.
125-140	Input colour data and file name.
145 * *	As explained in last month's introduction, the colour memory for the hi-res screen will hold two colour codes. The background colour goes into the lower four bits and the foreground colour into the upper four bits. This line sets up three variables to hold colour data: DC, SC and TC.DC is used for monochrome drawing and the others for recolouring, in any of the sixteen colours.
155	Sets screen and border colours.
300 * *	BASE is the start of the hi-res screen. 53272 tells the computer where to find the screen * * .
305 * *	Enter Standard Bit Mapped Mode * * .
310 * *	Blockfill called to clear out screen memory by filling it with zeroes. All bits turned off.
315 * *	Blockfill is used this time to clear colour memory by filling it with the value of DC, the primary drawing colours.
900 * *	Turn on pixel at screen centre. (Or any pixel with coordinates X,Y)
5000-5010 * *	This is the algorithm that does all the work. Given values for the coordinates X and Y it will rturn values for the correct bit(T) in the correct byte (B) of screen memory. (See Programmer's Reference Guide)
10000	Gets a character from the keyboard buffer. If no character is present it will keep looping back until a character is found, ie, a key is pressed. The character is stored in A$. Then returns from whence it came.

* Use will become apparent in later issue.
* * Explained in last months article.

where C is the poke code of the character, or any value 0-255.)

CHARMOVE is another specialised form of Blockmove. In this case it will copy down the character set from the ROM to *any* location in RAM as you will see later. Use:
SYS 49164, DA

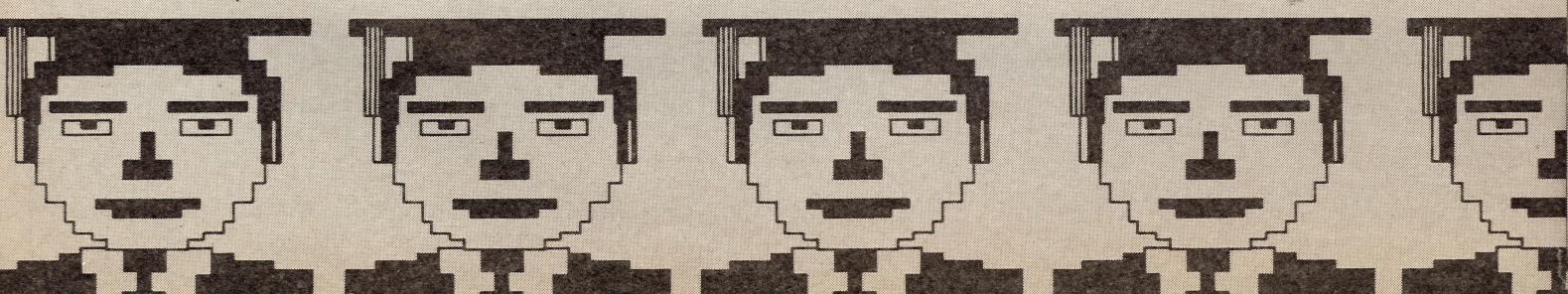
PEEKALL is not used in this program directly but may well come in useful. It allows any location to be PEEKed, returning the value in locations 998. Use:
SYS 49155, Address followed by x = PEEK (998)

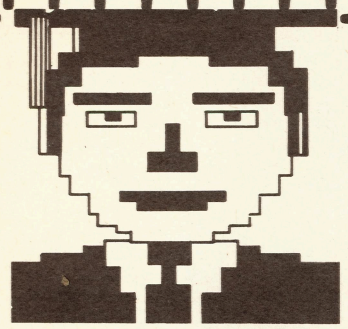
Adding a character set

Later on we will need to make use of a partial character set to allow us to use letters and numbers on the hi-res screen. Blocksave ends at location 49528 in memory, and there is a useful space between here and location 50000 where the colour memories will start. We can use this space to hold the eight-byte patterns of the first 65 characters in the character set. (See last month's article.)

We do this by using CHARMOVE and BLOCKSAVE. Type in, in Direct Mode:
SYS 49164,49528
and then press RETURN. The screen will clear and the READY prompt will appear.

Now reload the Blocksave tape and rewind it (or use a fresh tape if you are of a nervous disposition.) Now type:
SYS 49152"Blocksave", 1, 1, 49152, 50000 to save both the machine





code file and the first characters of the character set. You should use this tape for the Hi-Res 64 program.

Back to BASIC

After messing around with Blocksave, the BASIC program is simplicity itself. Just type in Listing 2 and RUN it. You will be greeted by a PRESS PLAY ON TAPE prompt. Place the Blocksave tape into the recorder and press PLAY, and the machine code will load automatically.

After selecting colour codes, the screen will clear and a single pixel will be turned on in the centre of the screen. This is as far as it goes for the moment, but in the next Class of '64 article we will be adding a complex control system that will allow you to draw onto the screen with either a joystick or the keyboard, or both.

In the meantime why not experiment with your own controls? As explained last month, you simply input coordinates X and Y into the subroutine at 5000 to obtain values for B and T and then turn pixels on or off using the following lines:

ON — POKE B, PEEK(B) OR 2↑T
OFF — POKE B, PEEK (B) AND (255-2↑T)

Before doing any experiments, however, do remember to save an unadulterated version of Listing 2 on a separate tape which is clearly marked.

Two final points. Firstly, any of the experiments mentioned in last month's article will work with this program. Note the increase in speed obtained by replacing slow BASIC loops with Blocksave. Secondly, Blocksave is a good deal more versatile than I have had room to explain here. For more information see the original article. My thanks to Allen Webb for a brilliant utility.

program listing 1

```
1 PRINT"□"
2 PRINT"□"
10 DATA 76,15,192,76,59,192,76,94,192,76,211,192,76,20,193,32,212,225,32,110
20 DATA 193,165,20,72,165,21,72,32,110,193,166,20,164,21,104,133,21,104,133
30 DATA 20,173,232,3,240,4,169,54,133,1,169,20,32,95,225,169,55,133,1,96,32
40 DATA 110,193,165,20,133,251,165,21,133,252,160,0,165,1,141,231,3,41,248,120
50 DATA 133,1,177,251,141,230,3,173,231,3,133,1,88,96,32,110,193,165,20,133
60 DATA 251,165,21,133,252,32,110,193,165,20,141,222,3,165,21,141,223,3,32,110
70 DATA 193,165,20,133,253,165,21,133,254,173,228,3,240,8,169,254,141,229,3
80 DATA 76,147,192,169,248,141,229,3,165,1,141,231,3,45,229,3,120,133,1,160
90 DATA 0,177,251,145,253,165,251,24,105,1,133,251,165,252,105,0,133,252,165
100 DATA 253,24,105,1,133,253,165,254,105,0,133,254,165,251,205,222,3,208,219
110 DATA 165,252,205,223,3,208,212,173,231,3,133,1,88,96,32,110,193,165,20,133
120 DATA 251,165,21,133,252,32,110,193,165,20,141,222,3,165,21,141,223,3,32
130 DATA 110,193,165,20,133,253,160,0,165,253,145,251,165,251,24,105,1,133,251
140 DATA 165,252,105,0,133,252,165,251,205,222,3,208,232,165,252,205,223,3,208
150 DATA 225,96,32,110,193,165,20,133,251,165,21,133,252,169,0,133,253,169,208
160 DATA 133,254,173,14,220,41,254,141,14,220,165,1,41,251,133,1,160,0,177,253
170 DATA 145,251,24,165,251,105,1,133,251,165,252,105,0,133,252,24,165,253,105
180 DATA 1,133,253,165,254,105,0,133,254,165,253,208,222,165,254,201,216,208
190 DATA 216,165,1,9,4,133,1,173,14,220,9,1,141,14,220,96,32,253,174,32,138
200 DATA 173,32,247,183,96
250 B=0
300 FOR I=49152 TO 49527:READ A:POKE I,A:B=B+A:NEXT
310 IF B=49676 THEN PRINT"DATA CHECKSUM VERIFIED":END
320 IF B<>49676 THEN PRINT"ERROR IN DATA FILE":END

READY.

READY.
```

program listing 2

```
0 GOTO 4
1 FORG=0TO7:POKEBASE+G+(I*8),PEEK(BASE+G+(I*8))OR2↑(HAND7):NEXT:RETURN
2 FOR G=0TO7:POKE BASE+(8*I)+G,PEEK(BASE+(8*I)+G)AND(255-2↑H):NEXT:RETURN
3 POKE53272,21:POKE 53265,PEEK(53265)AND223:STOP
4 IF PEEK(53272)<>21 THEN 2275
5 IF PEEK(49152)<>76 THEN LOAD"BLOCKSAVE",1,1
6 V1$="UD*LQZERPM":V2$="□**■*****■**":V4$="1230E45"
7 V3$="":FOR X=133TO138:V3$=V3$+CHR$(X):NEXT
8 X1$="2223332111":Y1$="3122312231"
9 PRINT"□■■■
```

Rom Round Up

Shingo Sugiura has been monitoring ROMs for your Acorn machines. This month he has done some research into machine code monitors.

BBC owners are lucky to have access to such a nice implementation of BASIC. With its structured commands and its incredible speed, you may wonder why there are any other languages. However, if you've tried writing any arcade style games you'll realise that BASIC is neither compact nor fast enough. You can try programming in languages such as BCPL, Forth or Pascal but they aren't much faster.

The obvious step to take is to program in machine code. Even though this is difficult to write, the very powerful built-in assembler in the BBC positively encourages you to program in machine code. The only problem is if you make a mistake in machine code you do not get informative error messages such as ''Syntax error'' or ''Bad command''. Instead, a mistake in machine code usually results in a ''crash'', ie an inexplicable black out!

This is where machine code monitors can help. They allow you to step through machine code, one instruction at a time, displaying the contents of the registers as each instruction is executed. This is just one of the variety of facilities offered by a good machine code monitor. The problem is there is such a bewildering array of machine code monitors available for the Beeb and since good ROM based monitors are quite expensive, it helps to make the right choice first time around. In this article, I have looked at four of the many machine code monitors available today.

GREMLIN

A unique feature of this monitor is its ability to work in any screen mode (although inevitably the screen update in any mode other than MODE7 is incredibly slow). The top row shows the contents of the registers and the second row the stack pointer. The third row shows the program counter with the first 8 bytes. Then there's hex dump. The commands are entered and executed in the lower half of the screen.

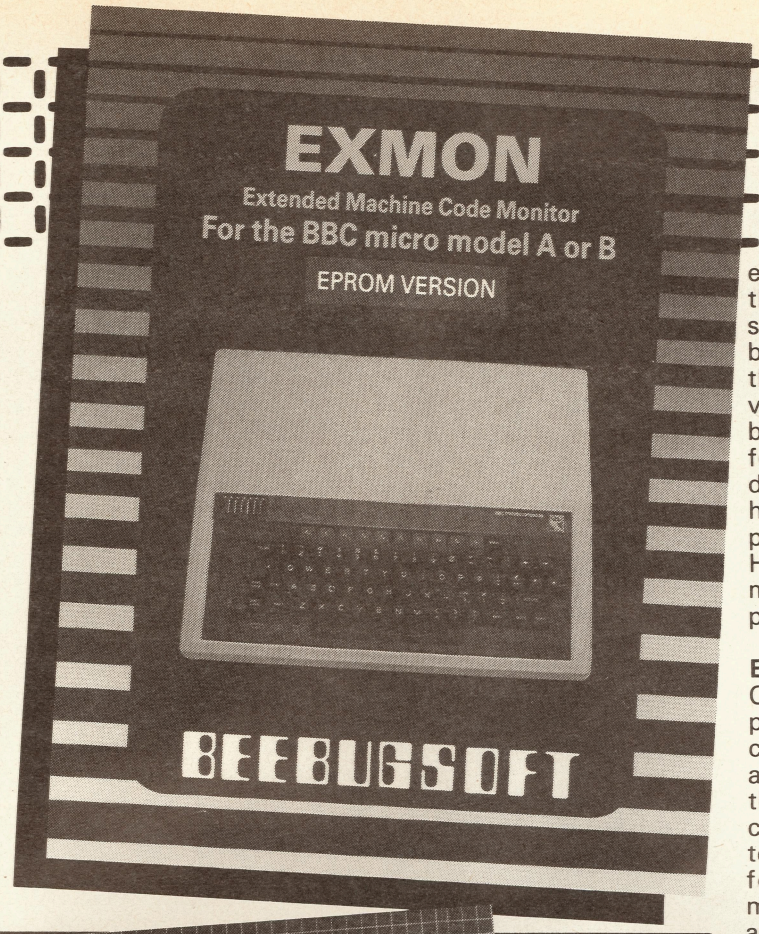
Gremlin is characterised by its use of system variables, a very powerful expression evaluator and a full two pass assembler. Although there is no full screen memory editor, there is a very powerful ''punch'' facility. This is similar to the BASIC's indirection operator except the data is automatically poked to the address pointed to by the system variable M. You can punch in whole expressions such as ''56 + 5 * 3''. Also, you can enter assembler mnemonics or characters. The memory counter is automatically updated by the correct number of bytes.

As I said earlier, Gremlin supports a full two pass assembler. Since it can assemble directly from disk/tape, the size of the source code is not restricted by the memory capacity like the BASIC assembler. Also, this offers a way of relocating machine code programs. You can disassemble to file and reassemble it using Gremlin's assembler at a different address.

Gremlin is probably one of the most sophisticated machine code monitors available for the Beeb. As a result, it isn't the easiest to use and beginners may find it hard going. Also, because the expression evaluator is based on C, even although it is incredibly powerful with many useful operators, people reared on BASIC alone, take a while to adjust to it.

```
   A=E0     X=C5     Y=DE
S  =01FF  89 10 E3 B8 93 93 DC 89 ........
PC=A4EB  74 20 6F 70 65 6E 87 42 t open.B
         ???
    7FF0  20 20 20 20 20 20 20 20
    7FF8  20 20 20 20 20 20 20 20
M  =8000  00 00 00 4C 65 80 82 1A ...Le...
    8008  09 44 49 53 43 20 44 4F .DISC DO
    8010  43 54 4F 52 20 00 31 2E CTOR .1.
    8018  30 39 00 28 43 29 20 20 09.(C)
-----------------------------------------
GREMLIN

!M8000
!$ROM=3
!IM 7C00 1900 400
```



BEEBMAN

On entry, MODE7 is selected and a little command strip is displayed along with a command request. Main facilities offered are: memory editor, compare two blocks of memory, memory checksum, memory move, relocate, string search, star commands, single stepping and breakpoints.

Memory editing on this monitor is very powerful indeed. It is a full screen scrolling memory editor. You can edit in hexadecimal or ASCII and go back or forward through memory. The disassembler is also a scrolling type but the ability to edit it by typing over the disassembled code in standard assembler mnemonics makes this a class above the rest.



When it comes to debugging, this monitor is unmatched. In single stepping, you can set limits to the code to be single stepped so, for example, you can treat all operating system subroutines as one step by setting the upper limit to &C000. Breakpoints can have conditions set to them. For example, you can cause a break only when the accumulator contains 23.

You may be thinking this monitor can't be faulted. Well, it's not quite perfect. It would have been nice if the operating system subroutines were labelled by the disassembler. The commands cannot have expressions included in them (ie you cannot have something like Disassemble &1900+3*4) and there is no facility to convert hex to decimal or binary. Setting conditions for breakpoints is very fiddly and the manual could have been a lot more comprehensive with an index. However, overall, Beebman is simple to use, yet powerful in operation.

EXMON

On entry, a part of zero page is dumped and the contents of the registers are displayed at the top of the screen. Commands consist of one or two letters. Main facilities offered by Exmon are: memory dump, disassembler, assembler, memory editor, string search, memory block move, code relocate, compare two blocks of memory, star commands, fill memory, calculate, single stepping and break point.

The disassembler allows you to disassemble to file in the usual BASIC format complete with line numbers so that you can reassemble it at another address. It would have been nice, however, if the operating system subroutines were labelled so that instructions like "JSR &FFEE" should be "JSR oswrch".

The memory editor is rather crude. Calculate allows you to evaluate expressions such as "&10 * 3 + 5". This is a very useful command but expressions cannot be included in commands. The inclusion of an assembler may be puzzling at first but if you are debugging a routine and you have located the mistake, it is useful to be able to edit it in standard assembler

```
                EXMON by BEEBUG
A   X   Y   S   P   flags     PC     stack
00  00  00  FF  30    B       0000

0000  :  24  19  24  19  00  7C  00  7C  $.$..|.|
0008  :  00  30  01  0B  00  00  FF  65  .0.....e
0010  :  FF  7F  00  02  05  00  00  00  ........
0018  :  19  00  07  00  00  19  00  00  ........
0020  :  00  24  02  FF  C3  07  00  40  .$.....@
0028  :  FF  00  07  00  00  00  00  00  ........
0030  :  03  00  00  00  00  C3  07  00  ........
0038  :  07  EE  20  00  FF  01  19  08  ..  ....
0040  :  03  00  00  00  86  81  06  00  ........
0048  :  00  00  00  00  00  00  00  19  ........
0050  :  10  00  10  00  10  00  FF  FF  ........
0058  :  FF  FF  FF  FF  FF  FF  FF  FF  ........
0060  :  00  06  FC  15  06  00  00  00  ........
0068  :  00  00  1C  00  00  00  00  C4  ........
0070  :  41  3C  66  66  7E  66  66  66  A<ff~fff
0078  :  00  00  C0  03  00  00  00  00  ........
Type ? for command list
```

mnemonics (after all, how many people know all the opcodes off by heart!). The assembler is a single pass type and thus cannot accept forward jumps.

Single stepping facility allows you to single step every instruction whilst updating the registers, or you can single step through code, treating subroutines as a single step. There is also an option to single step N times. Five breakpoints may be set but they may not reside in ROM and they cannot have conditions set to them as with Beebman or Starmon. On hitting a breakpoint, the registers are displayed.

The manual is A6 size with 26 pages. Because of its rather small size, some of the instructions aren't as comprehensively described as they should be. However, it is easy to understand and contains enough information for a beginner to get to grips with the monitor.

Exmon was, in fact, the first machine code monitor to be marketed on ROM. As such, some of the facilities are crudely implemented (notably the assembler, disassembler, memory editor and the breakpoint). However, it is user friendly and is deservedly one of the most popular machine code monitors for the Beeb. There is also a tape version for the Electron.

STARMON

Starmon is in fact the only monitor on the market which is specifically designed for the Electron. You may think it's silly to market a ROM-based program for the Electron since it doesn't support paged ROMs, but Slogger Software (who wrote this monitor) just happens to be marketing a ROM box for the Electron. Starmon is for the Beeb as well (even with a second processor unlike much firmware).

On entry, MODE6 is selected in yellow and the registers are displayed together with 18 bytes of memory. The commands are entered in a little command strip situated at the bottom of the screen. One nice feature about command entry is that the last command can be repeated or even edited.

The main facilities offered are: memory dump/edit, memory move, memory fill, disassembler, compare two blocks of memory, single step, breakpoint handling. The disassembler, memory fill and compare memory are competently provided. A strong point about this monitor is its breakpoint handling facility. You can have conditions set to them as you can in Beebmon. However, setting conditions is a lot easier in Starmon. For instance, to cause a break when memory location 70 contains 20, you would type "E 70 =20". The snag is, you can only have one breakpoint set at a time. The memory editor is full screen but it is not scrolling. Memory may be edited in hex (at nibble level) or ASCII.

The A5 sized manual is 42 pages long and is nicely written. It would have been nice if there was an index, but overall it is comprehensive and easy to understand.

Conclusion

It must be said that all the ROM-based machine code monitors for the BBC micro and Electron are of very high quality. They are well thought out and usually accompanied by a reasonable manual. As a result, it is difficult to pick out the "best". For Electron users, the choice is rather limited and Starmon is a very nice monitor but it does need a ROM Box.

For the BBC owner, Gremlin offers incredible power but is also pretty difficult to use and could not be recommended to beginners. Beebmon and Exmon are, however, both very user friendly and can be recommended. I think Beebmon has a slight edge over Exmon because of its superior memory editor and its break point handling facility but you should look out for Exmon-II which at the time of writing this article, looks very interesting indeed!

Product details

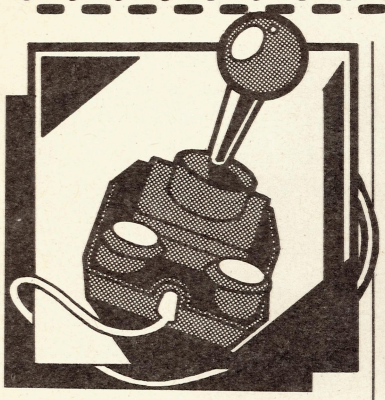
Gremlin — Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts. HP2 6EX. **Price £33.35**

Beebmon — Watford Electronics, Cardiff Road, Watford, Herts. **Price £22**

Exmon — Beebugsoft, PO Box 50, St. Albans, Herts. **Price (Exmon II) £29**

Starmon — Slogger Software, 215 Beacon Road, Chatham, Kent. **Price (BBC) £27.50; (Electron)£22.50**

Next month the author will report on utility ROMs for the Beeb and Electron



Software Reviews

REVIEWS

Title: Return to Eden

Format: Tape
Software House: Level 9 Computing, 229, Hughenden Road, High Wycombe, Bucks. HP13 5PG
Price: £9.95

Machine: CBM 64

Return to Eden is Level 9 Computing's sixth adventure and I have been waiting, having finished Snowball, for quite a long time for it to be produced. It is the second Silicon Dream adventure and starts where Snowball left off, (though you don't need to have played Snowball first).

You play Kim Kimberley and have just saved the interstar transport, Snowball 9, from disaster. Unfortunately the control room vidcoms show a different story. Kim seems to enter, hurl a bomb and the room is engulfed in flames. The evidence is damning.

Forced to flee, you reach a stratoglider lifeboat before the Waldroids close in, and later you become the first human to land on Eden. Snowball 9 is in orbit, crewed by people who believe you are a murderer. The only civilisation on Eden is a Robot City far to the east and there begins your adventure.

Return to Eden is the first Level 9 adventure with graphics. There are some 250 locations, each fully described with masses of puzzles for you to ponder. I am not sure that the pictures do anything for the adventure but at least we have got away from the boring blue screen. The 'drawing' of the pictures slows down the adventure slightly. But all this aside, Level 9 have again produced a wonderful fantasy to tickle your imagination for months to come. **A.O.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	95%

Title: The Wrath of Magra

Format: Tape
Software House: Mastervision, Park Lane, Park Rd., London
Price: £12.50

Machine: Spectrum 48K

This offering from Mastervision is the latest in the 'Third Continent', adventure series. Included in the package are three episodes (contained on two cassettes), and a book entitled 'The Book of Shadows'.

It seems that although you managed to slay Magra once before, she has been returned to life by her dark and evil servants and now has only one thought in mind-**revenge**! Therefore you are required to journey into Magra's domain and once again seek out and destroy her once and for all.

Each episode is actually a complete adventure in itself and as such must be completed in its entirety, before being allowed to carry on to the next stage. The game is in the, by now familiar, format of mixed text and graphics, with the facility to remove the graphics at will.

This package has been put together with great attention to detail and as such it is destined to become one of the all time great adventures. **G.W.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	95%

Software Reviews

Title: Beach Head
Format: Tape
Software House: Ocean, Ralli Bldg, Stanley St., Manchester
Price: £7.95
Machine: 48K Spectrum

This is a game of skill and strategy, which is a mixture of several games. There are five screens to the game.

In the first you have to land your forces so that they may capture the enemy. In the second you must avoid torpedoes and mines and make your way across the screen. The third set is similar to the first, and the fourth and fifth are 3-D battles.

The game is tricky to play at first but you soon get the hang of it. The sound is very good, as are the graphics which are large and flicker free. This game is well thought out and great fun to play. **A.S.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	95%

Title: Eddie Kid Jump Challenge
Format: Tape
Software House: Software Communications Ltd
Price: £6.95
Machine: 48K Spectrum

The idea of this game is to jump as many barrels as possible on a BMX bike, then as many cars as possible on a motor bike. First you jump the barrels then the cars and back to the barrels again mounting up as high a score as possible. This game is tricky but easy to use and the sound is pretty good, especially for the motor bike. The graphics are very good and flicker free but the thing that will make this game a hit is its addictiveness. There is also a competition attached to the game, but the closing date was the end of January! **A.S.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	95%

Title: Oricaid 2
Format: Tape
Software House: Micrograf, PO Box 17, Bracknell, Berks
Machine: Oric 48K/Atmos

From personal experience, Oricaid is undoubtedly one of the best toolkit/assembler programs for the 48K Oric 1 and Atmos computers. So, an extended version of this program, Oricaid 2, should be good news to advanced BASIC and machine language Oric programmers.

The review copy of Oricaid 2 supplied to me was a 'pre-production' version and the instructions assumed a lot of prior knowledge of Oricaid 1, something that must be corrected in the final version.

Two versions of the program were on tape; one for the Oric 1 and one for the Atmos. It was the Atmos version which was tested. This loaded successfully only after trial and error adjustments of the tape recorder settings, something which is normally not necessary.

The toolkit part of Oricaid contains 12 commands to help with writing BASIC programs. All are accessed by two symbols, the '!' followed by a letter. Some of the more useful are !D, to delete a block of lines; !F to display all lines which contain a specified command, variable, or string; !R to renumber; !S to shrink a program (i.e. remove all REM lines); !V to verify, and !P to add copy protection to a program about to be saved.

The assembler is excellent. You write assembly language programs as you would BASIC, with line numbers. This source code can be saved and modified as if it were a BASIC program. Using the command !.A instantly assembles your source, or reports errors you have made.

The machine code monitor is entered with !M, and provides 20 commands to aid programmers. There is a disassembler; breakpoints can be set; you can 'walk' through a program — go through it slowly to pick out the bugs; plus lots of other features to help in writing machine code.

Overall, Oricaid 2 is a highly desirable piece of software for the advanced Oric programmer. **D.N.**

STAR TABLE	
Screen display	★★★
Addictiveness	★★★★
Ease of use	★★★★
Overall	75%

Title: Universal Q/A (Ed)
Format: Tape
Software House: Maysoft (DMB), 50 Thompson Avenue, Colchester, Essex, C03 4HW
Price: £5.95
Machine: Sharp MZ 700

Don't be misled by the educational tag on this software. It is as the name implies, a question and answer routine.

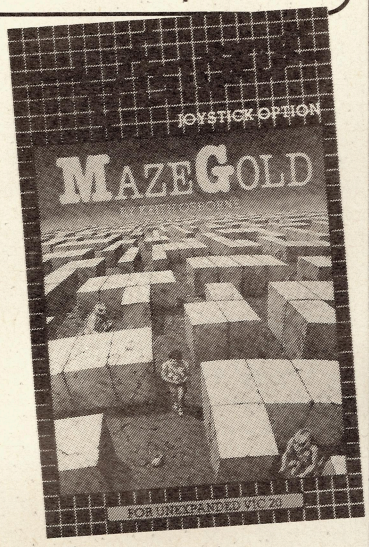
The great thing is that you can set up your own Qs and As, up to 99 of them in fact. Very handy for revision or languages or indeed countless other applications. If you wish to save the questions to tape this can be done and a new set of questions set.

All in all a very useful piece of software. **R.C.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★
Ease of use	★★★★★
Overall	85%

Title: Maze Gold
Format: Tape
Software House: Visions, Feldgate Mews, Studland St., London W6 9JT
Price: £5.95

Machine: VIC 20 (Unexp.)



Wander through Hampton Court maze and see if you dare grab as many bags of gold as you can. But be careful as one touch of the maze sides or columns spell instant death in this fast, all machine code game from Visions.

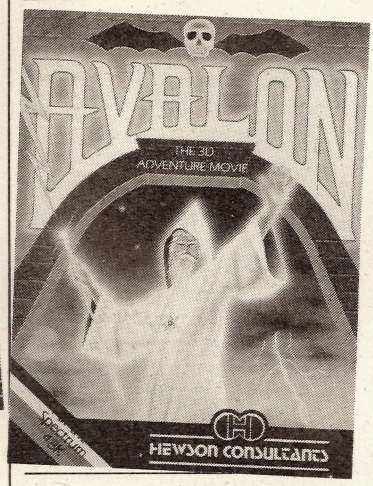
The maze contains five bags of gold and you have to dash around and pick them up to progress to the next level. Sounds easy, but this game requires careful thought and lightening reactions to evade the guardians of the maze whose touch, needless to say, is fatal.

There are four exits through which you can escape to another maze if the going gets tough but this then increases the number of guardians out to get you. There are six skill levels and up to six types of guardian. You start out with four lives and you'll need every one of them believe me. An excellent game for the unexpanded VIC 20.

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★
Ease of use	★★★★
Overall	75%

Title: Avalon
Format: Tape
Software House: Hewson Consultants Ltd, 56B Milton Trading Est., Milton, Abingdon, Oxon
Price: £7.95

Machine: 48K Spectrum



Avalon is classified as a graphic adventure as it combines the need for strategy and adventure with the fast, smooth graphics of an arcade game.

The Scenario: The year is 408 AD and the Roman Empire is crumbling. Maroc the Mage is a lore seeker and is given a map of Avalon and a staff and led to an island where he enters the castle. The idea is to make your way through the different levels of Avlon increasing your rank; you start as a Lore Seeker and the highest rank is Lore Lord.

This, like many games, is a little tricky until you get the hang of it but afterwards it becomes no problem to play. It is a brilliant program all round; excellent sound and graphics and a great addictive quality. The game is well worth having and great value. **A.S.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	95%

Title: Back Track
Format: Tape
Software House: Incentive Software Limited, 54 London Street, Reading RG1 4SQ
Price: £6.50

Machine: Dragon 32

This arcade style graphics adventure is not only a very good game but a national competition as well.

Poor Eddie has been captured by the mad professor who is cruelly plumbing the innermost depths of the human psyche. Unfortunately for Eddie he has to go through five labyrinths before he can get out.

In the labyrinths there are a certain number of keys (depending on the test number) which you have to find in order to escape. Eddie's will power (to live) is reduced by encountering skeletons, a genetically mutated rug and time. It is increased by eating fruit and finding keys. If his will power reaches zero, Eddie dies.

Also in the maze are snakes which will eat Eddie. If you are lucky you will find a map which will make life a bit easier. I thought that the option of changing the keys with which you move Eddie was a nice idea.

Once you have completed test five Eddie does something which you write down on the entry form, complete a slogan and send off to ICL hoping you will win the Cumuna disk drive.

The graphics were amazing and in some places amusing but the sound only average. This is definitely a game worth buying. **S.F.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

Software Reviews

Title: Waxworks
Format: Channel 8 Software
Software House: Tape
Price: £6.95

Machine: Spectrum 48K

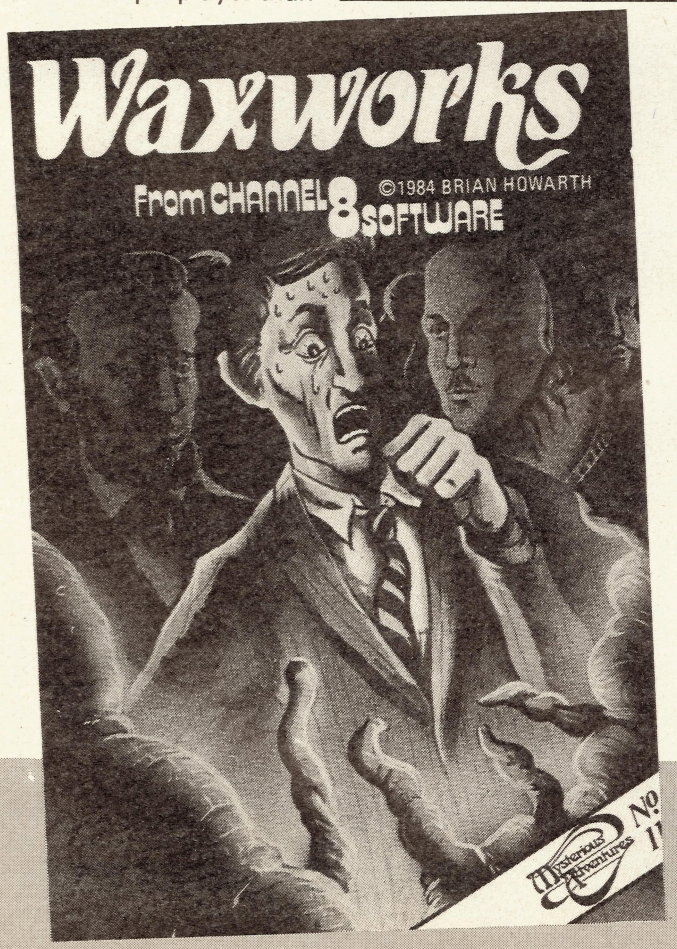
This adventure places you in the foyer of a museum, which is full of all the usual paraphernalia, including a vandalised telephone booth. The aim, I think, is to find the exit of this intriguing building and nip off home (who wants to leave a play like this anyway!!)

As is becoming the norm in adventures these days this one is a mixed text/graphics game. Also a norm is the facility to switch the graphics off and leave you with a short description of the location you are in. As usual with Channel 8 adventures, the objects and surroundings always hold more in store for the intrepid player than at first meets the eye.

Although some of the riddles put forward may seem a little incongruous, there is a definite reason (or excuse), for each difficulty. As well as this the computer seems sympathetic to your cause, which is demonstrated by some of its replies.

This is definitely not an adventure of the normal type, but has a certain intriguing quality all the same. **G.W.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★
Ease of use	★★★★
Overall	80%



Title: Zim Salabim
Format: Cassette
Software House: Castle Yard, Richmond TW10 6TF. Herts.
Price: £9.95

Machine: CBM 64

Zim Salabim is a graphical adventure set in Arabia. Your village has been raided by the sultan, and at the start of the game you find yourself outside the palace walls with no money or food.

Your objective is to break into the palace and recover the gold from the Sultan's bedroom. This is not easy as the palace is well guarded and you will require nourishment to keep you going. Although the vocabulary is limited, consisting of two word (verb/object) input, the novelty of this game is that you actually move your character around the screen using either keyboard or joystick! This feature, combined with an excellent soundtrack set this game apart from the usual run of the mill adventure.

The problems set are not particularly difficult to overcome but there is enough to keep the average adventurer amused for many hours.

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	85%

Title: Yumping Yosser
Format: Tape
Software House: Knight Software, 93A High Street, Eston, Cleveland, TS6 9JD.
Price: £5.95

Machine: Dragon 32/64

Your girlfriend Daisy has been captured by some evil monsters and after getting over the shock, you run to the house in which she is being held. As you enter you see the monsters guarding the route which leads to Daisy.

Generally this is a 'Manic Miner' type game for the Dragon. It has, in total, 15 screens which increase in difficulty from quite easy to absolutely impossible. Each screen has its own unique set of monsters which travel along their own personal routes.

The object of each screen is to get from your starting position in the bottom right to the key in the top left by jumping up and down levels whilst avoiding monsters and any of the background.

Once you have the key you have to go to the door on the top right and open it to get onto the next screen.

All the graphics are well presented and the music adds to the game's appeal. I would say that this is a worthwhile addition to anybody's collection. **S.F.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	95%

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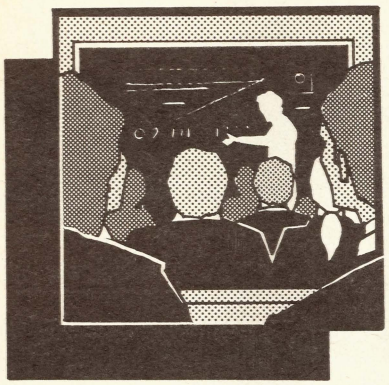


Games Creation

SOFTWARE

This month Phil South has been dabbling with games designer programs and found it difficult to tear himself away to write this article just for you!

You sit in the cockpit of your very own spaceship, your face lit by the blue light from your radar screen and the stars blinking in the darkness beyond the transparent canopy. Your ship executes a graceful swoop to greet a wave of oncoming alien fighters, and the computer screen flashes a message "FOUR TARGETS . . DEAD AHEAD . . LASERS ARMED . . SWITCHING TO MANUAL CONTROL."

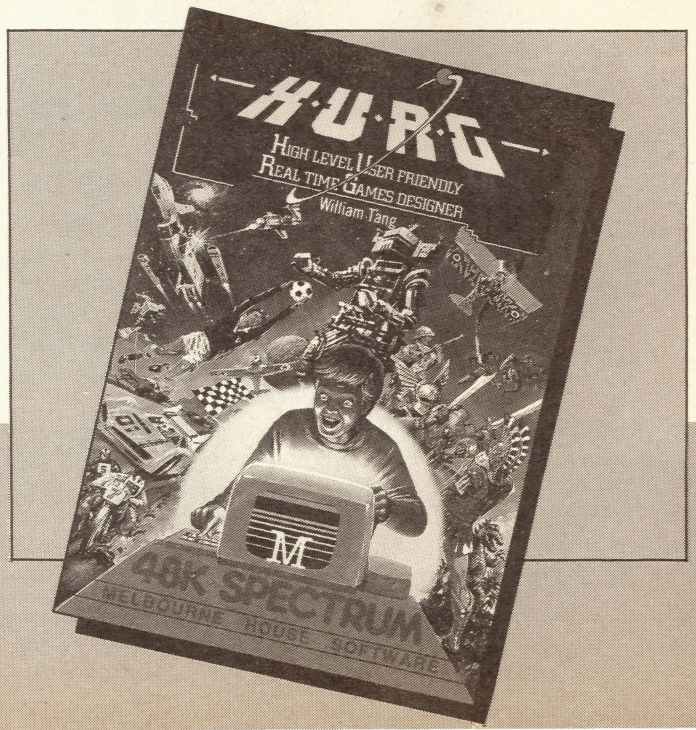
Have you ever wished you could write your own computer games, but lacked the necessary skill? Ever since I got into computing, games and simulations have been to me the most interesting field. The only problem was that all my favourite games, like Star Trek (sadly now a bit of an old chestnut), took a tremendous amount of time and skill to program, even in BASIC.

The problem is even greater now, with the advent of cheap colour computers with large memories and sophisticated graphics; the number of people capable of turning out exciting state-of-the-art games is quite small. However, due to the escalation of programming talent, we now find ourselves presented with programs capable of helping us generate smooth, noisy, machine code arcade games.

The games designers, as they are called, are a bit limited as yet but do turn out nice games. Most need the main program in your computer to run the games (you can't run them independently), but some generate machine code which can be booted up as a self contained program.

Generation

On the simplest level, character and sprite





generators can be of use in making characters for your own programs. This is OK but the results will be only as good as your grasp of BASIC and will be painfully slow. The best character generator I've come across has to be Specgraf (Anirog) for the Spectrum. At first, both the program and the documentation are a bit woolly but after a little trial and error you get the hang of it.

The best way to use the program is with a Kempston joystick, as the cursor keys are a trifle sluggish and the more time you can save on a task like this, the better. The ways in which you can manipulate and bolt characters together is very good, and you have a bank of over 200 user definable graphics characters (UDG's) to choose from! More than enough for anybody. Oh, by the way, don't bother looking at the demo, it's completely naff. A little man, a black and white line drawing, performs very slow head-over-heels across the screen, taking what seems like a year to do so. Fascinating!

Moving up market, Go Sprite by Mirrorsoft is a superb piece of kit. It's just a sprite creation utility, but it peforms this function with a lot of finesse. It's surely the CBM64's most user-friendly piece of software; designing sprites in full colour at two magnifications is easy, especially if you use a joystick.

You input your instructions using mouse-like icons, moving the cursor to the function you want and pressing the fire button. This is an advanced function on small computers, making Go Sprite an exceedingly pleasant program to use.

Using this system you can even animate your sprites, by placing them on a picture of a movie film strip, and sequencing the "frames". This part is a lot of fun and almost qualifies as a game in itself. I highly recommend this package for any 64 user, as a good quality utility, and as a prime example of how to produce a first class, user-friendly, value for money package.

Everything done for you.

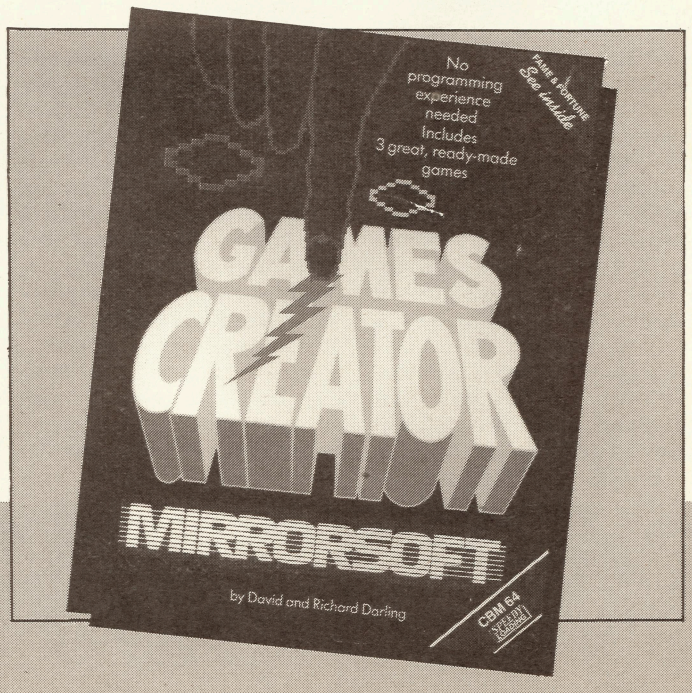
The next class of games designers are those which do all the work for you; they take you through a series of menus, giving you the option of altering the games variables, like speed, direction and pattern of your player, the aliens, the laser beams and the game backgrounds. These menus also offer you the option of setting collision detection, that is to say when a bullet, or alien collides with you and blows you up.

Games Designer from Quicksilva is a package for the Spectrum, specialising in the shoot-'em-up type of game. This is a good utility, but it is basically just a sprite maker and sound manipulator, with four basic game scenarios bolted on. You can play Invaders types, with the aliens coming down at you; Asteroids type, where the aliens or objects come at you from all around, and you can spin around; Scramble type, where you fly left to right and the aliens fly right to left; and finally (thank goodness) Berserk type, where you can trundle around in three dimensions.

This sounds great on paper, but the combination of user designed aliens, noises, backgrounds (stars, scrolling stars, or no stars), and four frame animation (going around in a fixed order) are pretty limited. This gets boring quite quickly, although it's OK for a laugh every once in a while.

Moving on to a similar, but to my way of thinking superior piece of software for the same machine, HURG, from the makers of Horace and The Hobbit, Melbourne House. Like it says in the manual, it was designed with two things foremost in their minds; 1) it must be easy to use, and 2) it must be powerful.

It is very easy to use, and much more powerful than GD in all sorts of ways. Sprites, for example, can be enormous and can have eight frame animation, whereas in GD you are limited to a 12 x 12 character and four frames. The game backgrounds can be anything you like, as you load them from a draw program like Melbourne's own excellent 48K Melbourne Draw. This means the backgrounds can be amazingly detailed, and limited only by your imagination.



All the menus can be controlled by joystick, and in this way the parameters of the program can be very quickly and easily altered. The same goes for the creation of sprites, as you just draw them into a large square on the screen, and then save them to any eight locations for animation. The resultant sprites can then be animated in real time, so you can see if your attempts at animation work.

Nice touches to the flexibility of games are the ability to assign EAT, CRASH or NOGO functions to the colours of objects in the games. EAT means things of this colour will be digested and produce a score (a Pacman eating pill), CRASH means if you touch this colour you blow up (the colour of your bullets), and NOGO means, as in the case of a wall in a background, that your player may not pass this colour.

The variety of games you can produce is virtually unlimited, but HURG suffers from the same deficiency as GD, in that you or your friends can't use any of the games you make with it without the main program resident in the computer, controlling events. For all this, however, HURG is still one of the best of its type.

For the Commodore 64 you could do far worse than Games Creator, another startlingly good utility from those Mirrorsoft chappies. Once again, the use of joysticks is encouraged and this makes for rapid assembly of interesting games. The tree-like structures of the menus are similar to those in HURG, and they are just as easy to use. The one thing which makes a games designer on a 64 superior to that of a Spectrum, is the sounds. GC makes stunning explosions, wangy laser beams and tricky music. Oh, yes, the music is excellent, and the way you write the musical score is very easy to follow. I'm very impressed by the quality of GC, and I think that anybody will find it easy to operate and fun to use.

To the board

On a slightly different track, Game Core by BBC Soft designs board games. No, I don't mean Monopoly, I mean brain games like draughts, nim, reversi (othello), chess and 3D noughts and crosses. These are the most difficult kind of games to design from scratch, as they involve simulations of human thought processes.

In some ways, like most BBC soft products, this package serves an educational purpose, exploring and explaining computer-based artificial intelligence (AI). The good bit is that the most difficult parts of the programming for these games has been done for you; all you do is add the new game program to the Game Core program, and it does all the thinking for the computer. This is done with a process called ''game trees'', a standard AI tool which simulates the reasoning mind, following complex pathways along forked branches or decisions. Sounds complicated? It is, but as I said this program is designed to improve your programming skills. It is a slightly serious proposition for your average first computer buyer, but for the more well seasoned, red-eyed midnight hackers it presents an interesting challenge. One night in Bangkok coming right up!

Games development

The only other way of generating machine code games, if none of the above mentioned products appeals to you, is the new ''games development'' software by Oasis. Basic Lightning, for instance, is a multi-tasking extension of Commodore BASIC for the CBM64.

With this you can write good quality games (if a little slow) from scratch, with the benefit of structured programming (IF-THEN-ELSE, PROC etc), simplified sound control, sprite creation and handling routines, and split graphics/text routines. If you know a bit about BASIC anyway, then BL presents no real problems, and can use the 64's excellent graphics and sound abilities to the full.

The real point of BL, though, is that is is a neat introduction to Oasis games development techniques; you actually get BL free with the other titles in the series. White





Lightning (also available in Sinclair Spectrum format) is an implementation of FORTH-79, with a sub-language called IDEAL, which compiles the FOURTH source code into fast machine code. Machine Lightning is an advanced Assembler/Dissembler/monitor, with sprite generation and handling, plus all the same corner-cutting graphics routines you get with the other two.

All of these packages can team their unique properties to make games which are BL/BASIC/-machine code hybrids; easy to program, but lovely to look at. And the best bit is, not only can you make a stand-alone (runs without the main program) machine code game, but you can market it without restriction! Oasis say that all they want out of the deal is that you give them a small credit on the packaging. Could this be your road to riches? Could this be the best reason for buying a Commodore 64? I reckon so.

So, what have we learned by all this? Nothing but it was great fun! No, seriously, in the end the piece that will be the best for you depends on what you want to do, and the extent of your programming skills. If you can't cope with anything too advanced, then I'd suggest you go for one of the all-in packages like HURG or Games Creator. If it's the greatest chess program in the world you're after, then Game Core is your obvious choice. If you want to be the next Jet Set Matthew Smith or Jeff Minter in Space, then you must get one of the Oasis Lightning series, forthwith!

Too late, you notice a laser beam streaking right at you on the port side- . . . it strikes the side of your ship with a blinding flash and a terrible dull boom. The vacuum of space drags all the air from the cockpit and your canopy explodes, pieces of glass raining all around you. The last thing you see before you lose consciousness, those letters burning out in an eerie gold light above you. . . - GAME OVER. . .

PRODUCT DETAILS

SPECGRAF
Made by: Anirog
Price: £9.95

GO SPRITE
Made by: Mirrorsoft
Price: £9.95 tape,
£12.95 disk

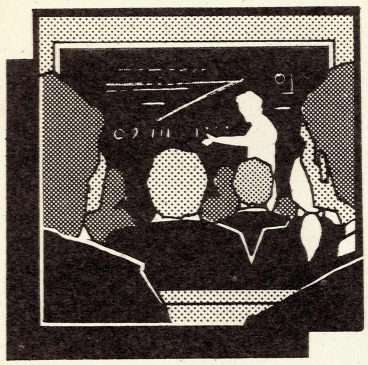
GAMES DESIGNER
Made by: Quicksilva
Price: £14.95

HURG
Made by: Melbourne House
Price: £14.95

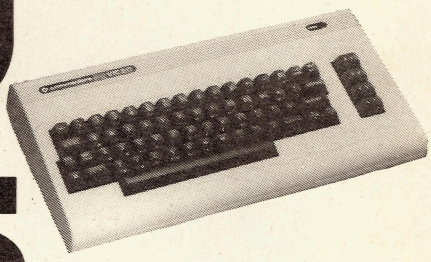
GAMES CREATOR
Made by: Mirrorsoft
Price: £12.95 tape,
£15.95 disk.

GAMES CORE
Made by: BBC Soft
Price: £10.95

BASIC LIGHTENING
Made by: Oasis
Price: £14.95 tape,
£19.95 disk.



VIC20 basics



And so to our last article in this series. Over the past few months, Bob Wallace has gently guided you through the mysteries of the VIC. He rounds off his instruction series with a short program to put a message along the top of the screen while the VIC gets on with other things.

In my last article we looked at a fairly simple routine which made a beeping sound every time a key was pressed. This routine continued even if you were running another program on the VIC. How was it done?

The answer is fairly simple if you know a little about how the VIC operates. Built into the VIC are some very interesting routines which tell it exactly what is going on at any one time. One of these routines is called up every sixtieth of a second and is used to update the systems clock among other things.

The routine known as the HARDWARE IRQ is pointed to by the contents of locations 788 and 789. These points normally vector the request, when an interrupt is sensed, to the routine starting at 60095 in ROM. Now we all know that any information in ROM cannot be changed, but the nice thing about locations 788 and 789 is that they are in RAM, and can therefore be changed very easily.

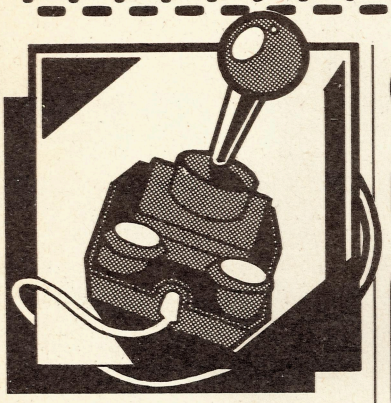
If we change the values held in these two locations to point to a routine that we have written, we can have our own routine called and used every sixtieth of a second. However, when the routine is finished we must jump to the normal updating routine or the computer will get very confused and probably crash.

It must also be noted that while your own routine is being used it confuses the systems clock and can cause problems when loading or saving programs. If you are going to load or save, it is as well to disable the routine by hitting RUN/STOP and RESTORE.

Now to a new routine. This will allow you to display a 22 character message at the top of your TV screen whilst the computer gets on with other things. The routine is in a BASIC listing for you to enter. Having entered the program save it first as any typing errors may well cause the computer to crash.

Since this is my last article for the VIC all that remains to be said is that with a lot of patience and the will to go on you will soon find that no problem is too large a task for you and your VIC.

VIC20



Software Reviews

REVIEWS

Title:	**The Moors Challenge**
Format:	**Tape**
Software House:	**Timeslip Software, Stoneyburn Workshops, The Old Primary School, Main Street, Stoneyburn, West Lothian, Scotland.**
Price:	**£6.95**
Machine:	**Amstrad CPC 464**

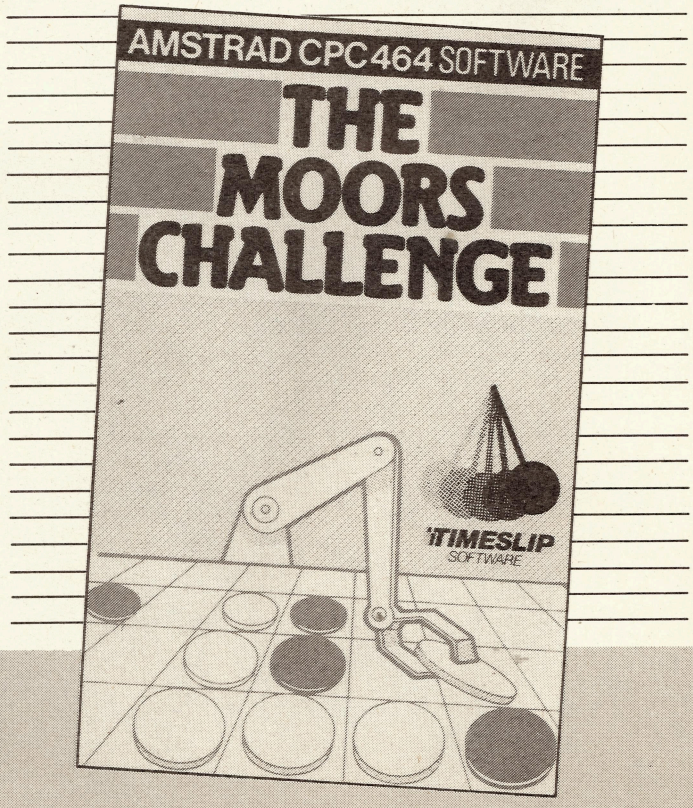
This is one of a series of three games from a new company in Scotland which is producing software for the Amstrad. This game is better known as Othello. For those who haven't heard of this game, it is played on an 8 × 8 board and each player takes it in turn to place one of his counters in such a position on the board that it traps at least one of his opponent's counters. Any counter trapped is 'flipped' over to become 'your' counter. The game is won when all the squares are filled with counters and the player with the most counters of his colour wins the game.

As with all strategy games of this sort, it is very easy to play but very hard to master, especially when your opponent plays as well as this program.

The program features five skill levels, with the option to either play another human or the computer, or to watch a demo game. The program is written in BASIC and as such on the harder skill levels the response from the computer is slow (I even managed to make a cup of tea before the computer responded). The screen display in my opinion lets this game down as the board is rectangular and not square which at times makes it hard to visualise your next move.

However, if you want a good game of Othello that is certainly not easy to beat, then this game, despite its faults, is a good one to consider. **P.S.**

STAR TABLE	
Screen display	★
Addictiveness	★★★
Ease of use	★★★★
Overall	70%



Title:	**Number Painter**
Format:	Tape (disk version also available)
Software House:	Applied Systems Knowledge, London House, 65 Upper Richmond Rd., London
Price:	£9.95 (tape)

Machine: BBC B

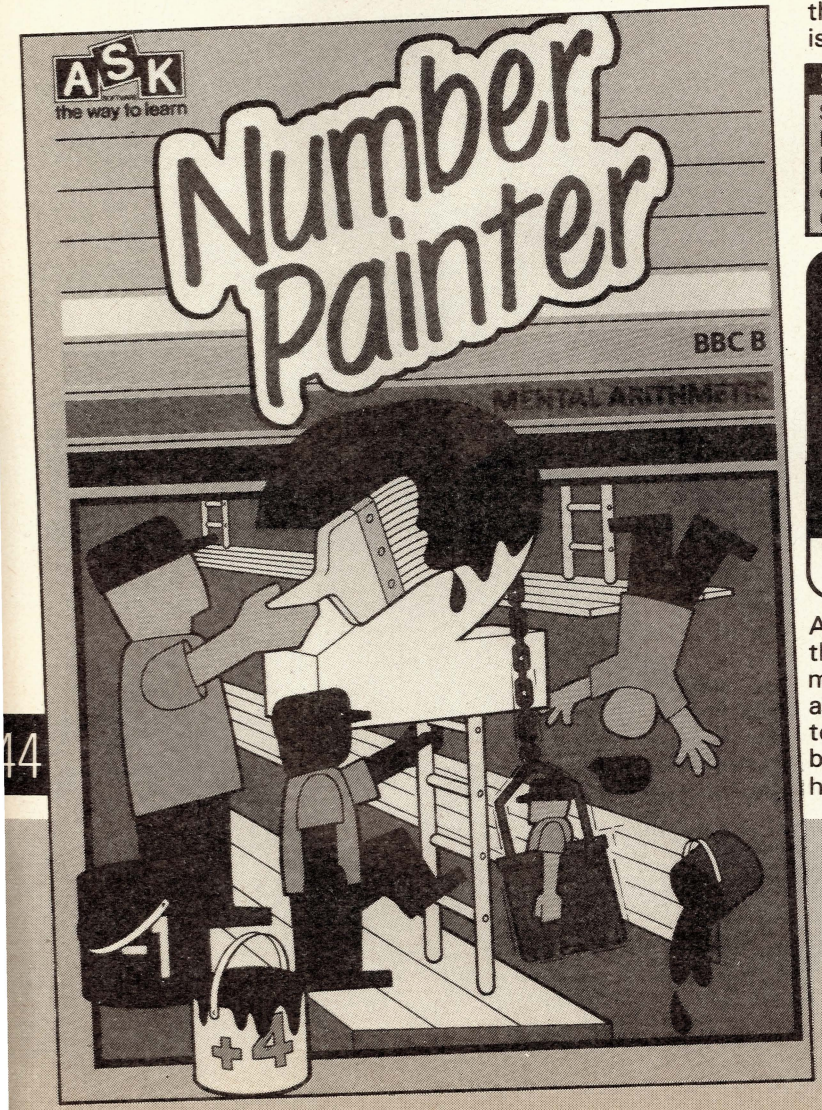
In common with most primary teachers, I have found A.S.K. software to be consistently reliable, well-programmed and imaginative. The last tape I reviewed from them was Podd, and I was sorely disappointed, because it fell short of their excellent standards. I am delighted to be able to report that A.S.K. have excelled even their own high standard with this superb program. It brilliantly combines good number practice, with an exciting and compelling game format.

Many primary age children will have played Monsters, or similar ladder and platform games. This program uses the same format, but the child has to practise number bonding in order to succeed. The menu asks for a difficulty level to be selected from a choice of 12. The number range that each would use is clearly shown at this stage, so that the teacher/parent will select a suitable level. There are then four men to select. Mr Plod moves fairly slowly and therefore gives the child more time to think, but Mr Speedy fairly whizzes along, and reac tions have to be perfect in order to achieve success.

A monster type screen is drawn, with two numbers clearly written at the top of the scene. One is labelled TOTAL, while the other is the TARGET. The idea is to make the TOTAL match the TARGET. Arrayed along the platforms are blocks with e.g. +4, ÷5, −7, ×3 etc. with the range of these numbers determined by the level. The child soon realizes that numbers grow by adding or multiplying, while the total can be made smaller by subtracting or dividing.

When the painter figure is required to move, the Z,X, *, ; combination is used. Should the operation be required, the space bar is hit as the painter arrives at the block, otherwise it is ignored. Care has to be taken in division, for only a factor will be accepted. There is even a little routine when the little painter falls through one of the gaps in the girders, involving the numbers becoming scrambled.

I have tried this out with my class of lower juniors and they love it! They think they are playing, but I know they are having to work hard on their number facts. It is a game with a purpose and the educational content is vital to the whole. There are few educational programs I have seen which match this one and I've seen hundreds! It could be used with much younger children, with a smaller number range and yet the upper levels are a challenge that I found difficult. Super — buy it! **P.T.**



STAR TABLE	
Screen display	★★★★★
Educational value	★★★★★
Ease of use/ documentation	★★★★★
Overall	100%

Title:	**Toy Bizzare**
Format:	Activision (UK) Inc., 15, Harley House, Marylebone Road, Regents Park, London NW1
Software House:	Tape
Price:	£9.99

Machine: CBM 64

As the balloons fill up at the valves, Merton the maintenance man runs and jumps around the factory turning them off before they change into helicopters. With the toys, joined by Hefty Hilda, in pursuit the journey around Gizmoe Automated Toy Works gets underway.

Each screen has to be completed in a 'computer

hour', the number of balloons to be destroyed being indicated at the top of the screen. When my daughter saw Toy Bizzare on the monitor she could not wait to play but got bored after several minutes, and left me to get on with it.

The Activision games I have seen previously have contained good graphics and game implementation. Toy Bizzare is a poor game idea and contains some suspect animation. Activision must be one of the only software houses not using a fast loading system, another minus in their favour.

I have seen a lot of computer games and this one is a below average game for a top price. Definitely not a classic 64 game. **A.O.**

STAR TABLE	
Screen display	★★★
Addictiveness	★★
Ease of use	★★★★
Overall	55%

Title: Boulder Dash
Format: Tape
Software House: State Software Ltd
Price: £7.90

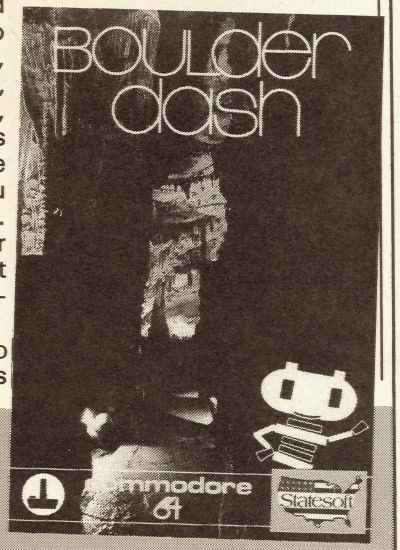
Machine: CBM 64

The principle character in this game is Rockford whose objective is to search each cave and collect as many jewels in as short a time as possible. Once the indicated number of jewels is collected, the door to the mysterious escape tunnel is revealed and then you may pass to the next level.

Strategy and planning will help you master the physics of Boulder Dash. Boulders drop predictably enough, but you and Rockford also have to block growing amoebae, transform butterflies, outmanoeuvre fireflies, and overcome numerous other obstacles. There are sixteen caves, but you may only start from four. On difficulty levels four and five you *must* start from the first of the sixteen caves.

This game is very fast to load. The playing area has four way scrolling but on my copy, at the edges of the playing area, there were corrupted shapes. In my opinion the animation is very good indeed. A nice little touch is that when Rockford is kept waiting he becomes impatient and starts tapping his foot. **A.T.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	95%



Title: Ancipital
Format: Tape
Software House: Llamasoft, 49 Mount Pleasant, Tadley, Hants.
Price: £7.50

Machine: CBM 64

Yet another Jeff Minter classic! Ancipital features the half man/goat character from 'Sheep in Space' in a game which has both arcade and adventure elements. You control the Ancipital through a 10×10 maze, each one containing the usual collection of bizarre alien life forms.

Movement from one room to the next is made by weakening the wall sufficiently to force an opening. Unfortunately not all walls are penetrable. Some are impervious to any form of attack, whilst others require possession of a 'camel key' which you need to locate first.

Even the manner in which you damage walls changes from room to room requiring a swift change of tactics. The movement of the Ancipital is hilarious, particularly the way its legs bend when landing! The graphics are up to the usual Jeff Minter standard and the music played whilst the game is loading is brilliant. Go out and buy it now! **J.G.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

Title: Zaxxon
Format: Tape
Software House: U.S. Gold Ltd., Unit 10, The Parkway Ind. Centre, Birmingham B7 4LY
Price: £9.95

Machine: CBM 64

Zaxxon is a classic space game in which you find yourself at the controls of an attack shuttle spacecraft. You must strafe the enemy Asteroid City in an attempt to destroy fuel tanks, gun emplacements, missiles and enemy aircraft.

With the aid of an altimeter you must barnstorm your way through narrow wall openings, lethal electronic barriers and deadly rocket fire. A successful attack run across Asteroid City leads you into a deep space dogfight with squadrons of enemy planes. Surviving the perils of outer space brings you to another Asteroid City and a showdown with the insidious robot, Zaxxon.

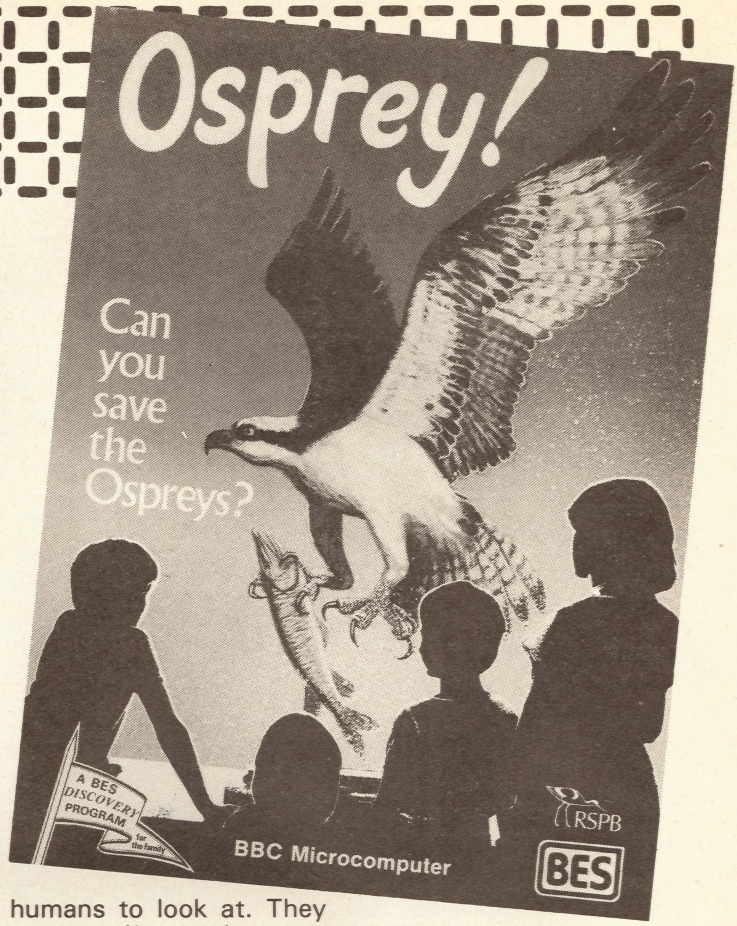
The incredible 3-D graphics scroll diagonally across the screen leaving you breathless after your first journey over Asteroid City.

Zaxxon is easily the best shoot 'em up game for the Commodore 64. It is an unsurpassable experience, even at £9.95. **A.O.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

Software Reviews

Title:	**Osprey**
Format:	Tape (Disk version available for BBC)
Software House:	Bourne Educational Software, Bourne House, Romsey Hampshire
Price:	£9.95 (tape)
Machine:	BBC/Electron (also available for Spectrum 48K, Commodore 64, Amstrad CPC464, MSX micros)



On the BBC Welcome tape, there is a rather addictive little program called Kingdom. The idea is not new, with the resources of the village being used by yourself as leader of the tribe, with the idea being to survive as leader for as long as possible. This program takes the identical theme, but the village has been replaced by a nesting colony of Ospreys, with the intention being to enable them to survive and breed as long as possible.

Each loop of the game gives the player a number of breeding pairs of Ospreys and also a number of wardens at your disposal. They may be deployed for guarding the nesting sites themselves, supervising the general site, and also in publicising the site to avoid accidental damage caused by casual visitors.

What makes this progam stand head and shoulders above the Kingdom program is the superb standard of animation and graphics. The scene is drawn quickly and makes subtle and sensible use of colour. The birds are shown quite well animated, although I did find the egg-stealers a little more like dogs than humans to look at. They are sadly only one character large, with only one colour. The exercise itself will either appeal to you greatly, or will soon bore you to tears. I must confess that I fell into the latter group very quickly, and it isn't the kind of program that I would particularly want to go back to again. Still, it is a change from the mainstream of computer games and the glossy booklet accompanying the tape is superbly produced. **P.T.**

STAR TABLE	
Screen display	★★★★★
Educational value	★★★
Ease of use/ documentation	★★★★★
Overall	90%

Title:	**Buzz Off!**
Format:	Tape
Software House:	Electric Software Ltd, 8 Green St, Willingham, Cambridge CB4 5JA
Price:	£5.95
Machine:	CBM 64.

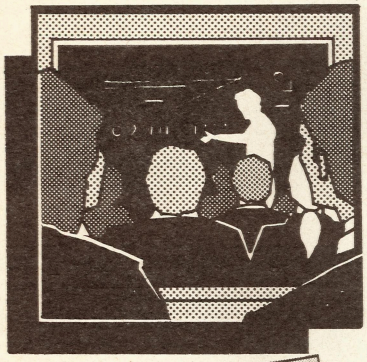
The idea of this game is quite simple and also very original. You have to guide Bertie the bee around the screen eating as much fruit as possible. Each item of fruit you manage to eat increases your score but also uncovers a segment of a spiders web. Contact with these segments or the sides of the screen spells instant death for poor Bertie so you must be careful where you fly.

Movement is by keyboard or joystick and the flapping of Bertie's wings is very realistic. You have the choice of fast or slow movements and there are several levels of difficulty, each level having more web segments visible to start with.

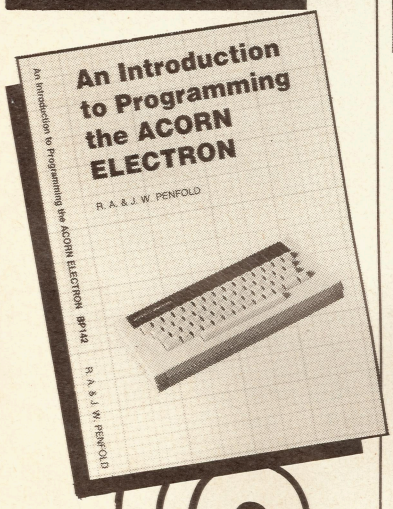
A catchy soundtrack and good sound effects give a very addictive game. It is by no means easy and is a welcome debut for this new software house. **J.G.**

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	90%





Book List



BOOKS

AN INTRODUCTION TO PROGRAMMING THE ACORN ELECTRON
Author: R.A. & J.W. Penfold
Publisher: Bernard Babani
Price: £1.95

This book is inexpensive, a factor which is reflected in the type of paper used. However, the contents are thorough and cover the fundamentals of basic programming.

The book begins with variables and arrays, and continues through print formatting, input mechanisms, procedures and functions. These are covered well in a pleasant easily readable style. Throughout the chapters there are examples.

The opening four chapters certainly live up to the title of being an introductory text. The same is true of Chapters 6,7 and 8 which cover hexadecimal, binary, graphic modes, colours and the drawing and filling of lines and shapes. In my opinion chapters 9 and 10, covering soft-sprites and interfacing, go beyond the scope of this sort of book. However, I must say that these chapters certainly made interesting reading and provided much useful information. The final chapter looks at data file handling and includes a long (by this book's standards) program on database handling. The program is based on providing a telephone directory but is a useful start for similar database-type programs. I find it strange that this chapter comes after those on soft-sprites and interfacing.

This book is excellent value for money. It provides a good firm basis for learning the rudimentary aspects of programming, whilst tempting the reader to move onto more advanced topics. **G. de B.**

SPECTRUM MACHINE CODE
Author: Ian Stewart & Robin Jones
Publisher: Shiva Publishing Ltd
Price: £5.25

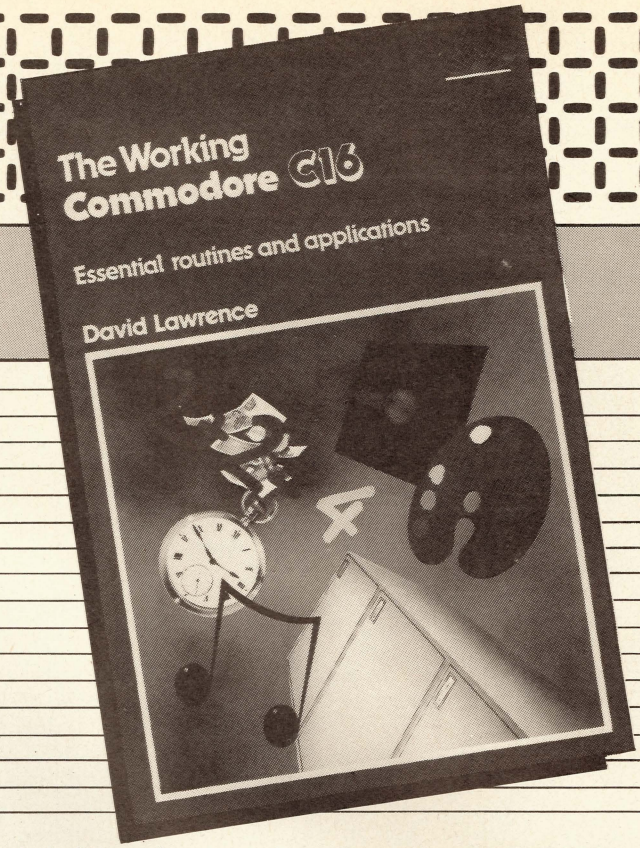
The task of teaching machine code to someone with no prior knowledge is never an easy one and much of its success can depend upon the approach used. In this respect there can be no doubt that Ian Stewart and Robin Jones have come up with a very effective technique.

The book begins with a few machine code routines which are meant to whet your appetite and they do. Then starts the onslaught of converting your decimal bound mind into thinking in terms of binary and hexadecimal, and quite a task that is. Once you have managed to grasp these basics, the next phase is to teach you how the processor goes about doing its business. This is accomplished with the use of a highly simplified version of the Z80 processor.

In so doing, they are able to convey some of the fundamental rules that have to be applied in order to write machine code and to show that it is not really as bad as it looks. This idea is continued and further instructions are added, until sufficient insight has been gained into the processor's *modus operendi.* It is at this stage that the actual Z80 is introduced, along with practical examples of the instructions set at work. As each section is explained the text moves on to another area, and thus spreads out over a substantial portion of instructions and their uses.

As is to be expected in books of this nature, the last section is taken up by the appropriate appendices, which are imperative to anyone wishing to actually write some code. Included at the end, as a final helping hand, is a short program in BASIC, which makes the handling of the your finalised machine code a little easier. It is the small efforts like this, which raises the level of the book above the majority of its competitors. **G.W.**

Book List



THE WORKING C16
Author: David Lawrence
Publisher: Sunshine Books
Price: £6.95

The Working C16 is one of the latest of David Lawrence's popular line of Working Micro books, and one of Sunshine's already wide range of books for the two new Commodore computers, the C16 and Plus/4. Although the machines have only just been launched, Sunshine say that their authors have had the machines for several months, so they certainly know what they are talking about.

This book is proof of this fact. David Lawrence has made full use of the C16's capabilities to such an extent that you would not believe that the machine has only 16K. All the programs have been written in small modules so that they may be tested easily as you type them in. The modular form of the programs also makes it easy for you to alter them, and include sections in your own programs. Each module is fully explained, so newcomers to computing can improve their programming skills as they type in the programs.

The programs themselves are extremely good and cover a wide range of topics, such as time, graphs, sound, graphics and business. I found no problems at all in typing in the programs and due to the way they are written in modules, debugging was extremely easy. The programs are all very useful and work well, in fact I was pleasantly surprised to find such useful programs as a user-defined graphics designer, an artist program and even a simple word processor. There are, in all, seventeen programs, each of which is well worth the time required to type it in and to read the explanation properly.

The programs are at their best when used with a disk drive, but they will work fairly well without one.

People looking for an advanced programming book, or even just for a good program book, will find this book suits their needs very well. **D.L.**

ADVANCING WITH THE ELECTRON
Author: Peter Seal
Publisher: Micro Press Ltd.
Price: £5.95

The Electron is now over one year old. There are many people around who have passed the stages of zapping aliens and collecting treasures; they now want to go on to some *real* computing. But what *is* real computing?

This book offers the opportunity to learn some commercial programming techniques and at the same time construct a useful program. In the words of the author the book's aim is to 'write a tape storage general-type database program for use on the Electron microcomputer'.

The author has struck on the excellent idea of going stage-by-stage through building the database, or record-handling, program which, when finished, may be used for keeping names and addresses, indices to records or books and the like.

The features of the complete product allow the display, entry, changing, deletion, sorting (more you say!), saving and printing of data records.

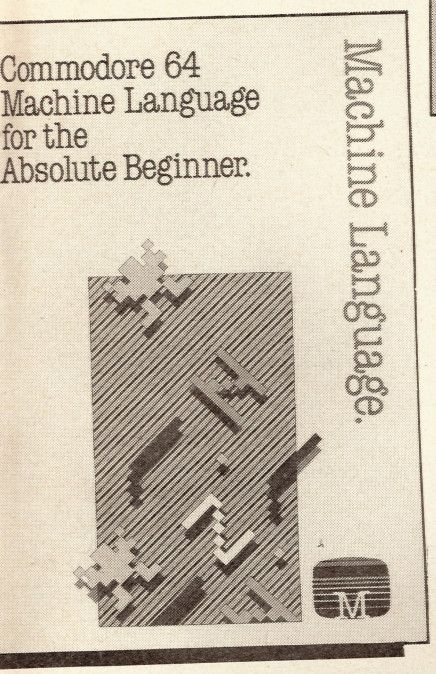
The book's structure has been well thought out. Of course over half the book is taken up with the code for the program and clear explanations of the methods and structures used. But the other half is not to be discarded. These pages look at how programs should be written, how debugging (i.e. the elimination of programming errors) should be approached and how important documentation is.

The final very short chapter is on "future expansion" with very little space taken up on the possibilities of using discs.

At the back of the book there is a condensed form of the program which has the same facilities as that constructed but without REMs and multi-statement lines. No good for debugging, but essential for the conservation of RAM.

At £5.95 this book represents superb value for money. I loved the hints of humour and the respect that the author has for practicality in this program. **G. de B.**

C64 MACHINE LANGUAGE FOR THE ABSOLUTE BEGINNER
Author: Danny Davis
Publisher: Melbourne House Ltd
Price: £6.95



Machine Language for the Absolute Beginner may be a book for the beginner at machine language but it assumes that you are quite proficient in BASIC programming. Included is a BASIC program called ALPA (Assembly Language Programming Aid) which puts your machine code programs into memory, although the typing in of the programs is somewhat of a mammoth task, being about nine pages long.

Once ALPA has been typed in and running correctly you can then venture into the depth of machine code. The book gently leads you in, starting with an introduction, which shows you how to use a machine language program and briefly describes memory addressing. When you have passed through this section, which is comparatively easy to understand, you are dropped firmly into the clutches of hexadecimal, binary, absolute addressing and converting hexadecimal to decimal. Danny Davis does his best to explain all this in simple (not too simple) to understand terms rather than in over-the-top computer jargon.

The rest of the book, as you progress further into program control, counting, looping and pointing processor status codes, logical operators and bit manipulators gets more involved and more difficult to grasp. You will need to go through the book either slowly or several times before you can understand the workings of machine language.

As stated earlier, you will have to be completely conversant with BASIC before you can attempt this book. The book is a very good start for the novice machine code pupil.

My only criticism is the need to type in ALPA, it would have been a nice package if it came with a tape of ALPA. **A.O.**

ELECTRON GRAPHICS AND SOUND
Author: Steve Money
Publisher: Granada-Collins
Price: £6.95

Once you've had your Electron some time and you've read all the books that you ever want to read about BASIC programming, no doubt you will be looking for something different. Some will go to machine-code programming and so use the wonderful assembler on the Electron. Others, however, will want to find out more about the BASIC. This book offers the opportunity to investigate two of the good points of the Electron, its graphics and sound.

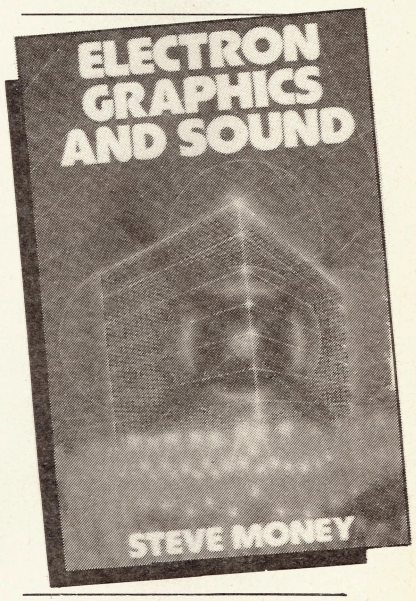
This book has been structured rather strangely. Of the ten chapters, the first four deal very crisply and efficiently with the basics behind the Electron's graphics. Topics covered include descriptions of the different modes, the use of the draw and plot commands and methods of erasing lines in crude but effective ways.

Once these concepts have been dealt with the author diverts to sound. Two chapters introduce the description and use of sound on the Electron. Attempts are made to link the SOUND and ENVELOPE commands to music. I say attempts because for the non-musically talented (like yours truly) there was a wealth of confusion. However, I was assured by a friend that there were no gross inaccuracies.

The final four chapters go back to the graphics — this time dealing with more exotic subjects such as graphs and charts, animation and multi-user defined graphics (i.e. animation made up of several character codes).

I said earlier that I found the sequence of the book strange. I feel that this was because the chapters on sound were short and few compared with those on graphics. The book would have been much better structured without the chapters on sound. But then a book called "Graphics and Sound" without sound . . . . . .

There is a lot of information in this book, mostly well described and accurate. Even though I wasn't enamoured with the chapters on sound I recommend this book for the more advanced BASIC programmer. **G. de B.**





WE'RE ON THE LOOKOUT!





Here is your chance to get involved with what is, after all, *your* magazine. If you can put pen to paper (or better still finger to keyboard) and have something to say, then we want to hear it!

We would be happy to receive articles, games programs, utility programs or even just letters about subjects close to the hearts of computer enthusiasts. Even problems will be welcomed, whether they be related to material already published in this magazine, or just of a general nature.

Every month, we give up two pages of *PCT* to you, the readers, to fill with hints, comments on anything pertaining to home computing or requests for help. There is a specialist team of computer journalists here eager to get to grips with your problems and produce a solution. It's what they are paid for, so get writing!

Our increase in programming instruction articles over recent months has been aimed at what we believe to be our core readership — people new to computing who buy *PCT* in the hope of finding useful, clearly expressed information to help them in their computing quest.

Maybe we're wrong; write and tell us what you would like to see in *PCT* and we'll do our best to provide it. Do you want more competitions, or do you groan inwardly when you see yet another *'fantastic easy to enter competition'* on our pages? Do you feel we neglect any particular home micros? Whatever your views, please let us know by writing today to **The Editor, Personal Computing Today, 1 Golden Square, London W1R 3AB.** We're looking forward to hearing from you!

Oric Modem

Oric's modem, the V23, has been a long time coming. David Nowotnik reviews a pre-production model.

It must be painful to the present marketing arm of Oric Products, Tansoft, to be reminded of the fact that the original advertisements for the Oric 1 computer in October 1982 contained a promise that a modem for that computer was 'coming soon'. So, now, only two years late, here it is!

For those not familiar with modems, they allow you to link your computer to another computer via a telephone line connection. The Oric V23 modem provides the link between an Oric 1 or Atmos computer and a British Telecom wall socket. The Oric modem displays the green 'BT approved' symbol, so you can make the connection to your telephone socket with confidence. If you have the old-fashioned junction box telephone system in your home, you'll need to convert it to the new-style sockets to use any modem.

Matching livery

The V23 modem is housed in a rectangular box (9" × 6.5" × 2"), black in colour, to match the Atmos computer. On the front there are three LED lights; green for 'Line', yellow for 'DCD' and red for 'ON' (in effect, 'ready, 'steady', 'go'!). There is also a three-way switch, to select Prestel, Tx (transmit), and Rx (receive).

On the rear of the box are leads to mains power and to the BT telephone socket. This telephone lead is a handy 9 ft in length, so you shouldn't have to re-organise your computer room just to add a modem.

There are also two sockets on the rear of the box; one is a BT telephone socket for your telephone, and one a 'data' line. This is a seven pin DIN socket which is connected to the Oric computer's expansion port via a lead provided with the modem, which converts the DIN arrangements to the expansion port arrangement. The 'daisy chain' arrangement of the leads connecting to the expansion socket of the compute is convenient to use, but results in a very untidy tangle of leads at the back of the computer.

Open up communication

For the technically minded, the modem's specifications are shown in Table 1. The main uses of the modem will be in communication with established databases and electronic mail services such as Prestel and Micronet 800, but communication with other Oric users and other computers should be possible.

Two pieces of software were supplied with the review modem. One is included in the price (£99.99) of the modem, the other is an extra, produced by a new name in the software business, Cytel. In fact, Cytel are another off-shoot of Oric Products; they will be the main distributor of the modem.



Both the Oric and Cytel software are designed to access Prestel. Naturally, as you are paying extra for the Cytel software (£45), it offers a few extra facilities.

Prestel facts

In order to use Prestel, not only do you have to have a modem, but you have to register with British Telecom as a user. They will provide you with the 'phone number of the nearest Prestel computer to you (there are several around the country), plus your own code number, and identification code.

This is provided as a security measure. For while the basic service is free, charges are made for certain items and these are automatically charged to your telephone account. So you'll need to

keep your code and ID number a secret, otherwise you'll get charged for more than you have used!

Both Oric and Cytel software for the V23 modem were supplied on 3" microdisk, for use with the Oric Disk drives, but cassette-based versions should also be available.

Oric Prestel

After connecting all the bits and pieces, the Oric Prestel disk is placed in the drive. On power-up, a new version of DOS (version 2.2) is booted into RAM and the Prestel program is automatically loaded with the main menu displayed on the screen. This gives three options; key '1' to access Prestel, key '2' to retrieve pages from disk, and key '9' to return to BASIC. There is a big gap on the screen between '2' and '9', suggesting that Oric were thinking about providing other options, but changed their minds. Perhaps that's how the £45 Cytel program was born!

By pressing '1' you are led through the procedure required to become linked to the Prestel computer. This involves dialling the Prestel number (your telephone should be connected to the BT socket on the modem). If anything goes wrong, an appropriate message appears on the screen. But all being well, you will hear the continuous tone which tells you you have been connected. Then replace the receiver, and away you go!

In test, there were few problems (at first — more on that later!). Pages of information could be saved to disk when required and recalled later (selection '2' on the main menu of the Oric program) once the user has disconnected the link with Prestel.

Option '9' of the Oric program — return to BASIC — is curious. Pressing '9' re-boots DOS and the Prestel program autostarts if you happen to leave the Oric Prestel disk in the drive. So remember to remove the disk before selecting this option.

Cytel software

The Cytel Prestel software was a disappointment. By rushing a copy for me to review, this 'preproduction' version contained several omissions and bugs, which coloured my opinion against it. User instructions amounted to one photocopied page! All this, I am told, will be rectified once the full version will be made available.

The disk version of the Cytel program is booted into RAM in the same way as the Oric program. The first thing to appear on the screen is the attractive Cytel logo, followed by a menu with three options — '1' is 'Prestel', '2' is 'Database' and '3' is 'Word processing'. On the review copy, pressing '2' or '3' gave an error message. Presumably the database and word processing options do not yet exist, but these will be on the final production version. This will make the Cytel Prestel program quite a powerful piece of software, which it needs to justify its rather high price (for the home computer market). One thing to bear in mind is that Cyte will offer free updates to the Prestel software whenever they bring out a new version.

So selecting the only option available gives a second menu with several new choices. These are:

Auto supply of ID number
Input of Telephone, ID and pin number
Screen to printer dump
Build a letter in buffer
Execute letter from you
Put screen to disk/tape
Load picture from disk/tape

To take these one at a time; the first allows you to automatically dial another computer and supply the security codes necessary to gain access to that computer. Up to six computer details can be stored at any one time. That avoids you making any frustrating mistakes, but there is, of course, some risk in having your security codes so readily available (one incentive not to load out this particular disk!). Apart from Prestel, no details of any computer contact were stored in the review copy (presumably, none will be available on the final version), so the 'input' option allows you to enter those extra numbers and codes.

The only significant addition of the Cytel program over that supplied with the modem (Oric Prestel) is an ability to write and store messages (with a mail box number) in the computer. This can be transmitted far more rapidly while 'online' than typing the message 'live'. This obviously will cut costs when sending electronic mail.

The review program had a bug in the 'store message' routine; when writing a block of test messages to disk, the main program on disk became corrupted, and unusable. Hope that one is fixed before the program goes on sale!

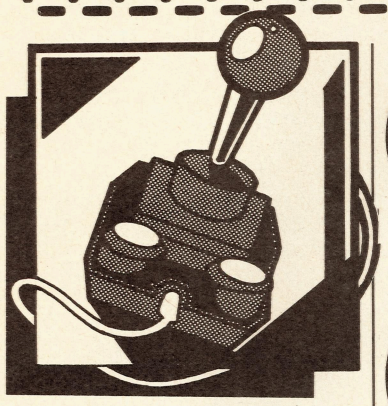
There isn't that much more, at present, to be gained by buying Cytel's program when you compare it with the 'free' program Cytel are supplying with the modem. I guess it will be a case of watching the advertising claims once the program finally becomes commercially available. But it does need a lot more to justify the extra £45!

Table 1. Technical Specifications of the Oric V23 Modem

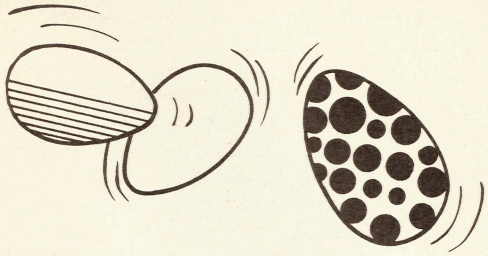
Modulation system	Frequency shift keying
Operation	Asynchronous full-duplex (1220/75 baud); half duplex (1220/1220 baud)
Receive channel	
Frequency	Binary 0: 2100 Hz
Data rate	1200 baud
Carrier detect level	−43 dBm at 1300 Hz
Transmit channel	
Frequency	Binary 0: 450 Hz (full duplex) 2100 Hz (half duplex) Binary 1: 390 Hz (full duplex) 1300 Hz (half duplex)
Data rate	75 baud (full duplex) 1200 baud (half duplex)
Output level	−13dBm

Price

Oric Modem + supplied Prestel Software	£99.95
Cytel Prestel Software	£45.00



Egg Catcher



ORIC/ATMOS 48K

This game requires fast reactions if you don't want to end up with egg on your chin! By Shingo Sugiura.

This is your chance to play the part of 'Sid' who must tackle the incredibly difficult task of catching eggs that are falling off the back of a lorry. Unfortunately, this job is fiercely competitive and you will be fired as soon as you drop 20 eggs. The rather cheap equipment doesn't help matters either. Will you be able to meet the challenge?

Type in the program and save it before you run it. This is very important because there is a short machine code routine in this program. If you have made any typing mistakes, you won't get any of the normal friendly error messages. Instead, you are most likely to be faced by an inescapable crash!

When you run it, the whole of the character set will be redefined. This process takes a couple of seconds, after which a brief set of instructions will be printed and the computer will wait for you to press the space bar. When you do, the game will start immediately. You control the basket near the bottom of the screen left and right with Z and X respectively. You will notice that there are holes in your basket. You have to position it so that the eggs do not fall into the holes. You will stop the eggs from falling onto the ground but you will not score anything. The game ends when you drop 20 eggs but if you have done well, you will be asked to enter your name into the hall of fame for posterity.

how it runs

10-40	REM statements
50	Selects TEXT mode and sets HIMEM to its correct value.
60	Defines DIMs
70	Calls a subroutine which pokes in the machine code in page 4.
80	Calls a subroutine which redefines the characters.
90	Calls a subroutine which prints the instructions.
100-140	Main-loop. This loop calls the actual games subroutine and the hall of fame subroutine and they are repeated indefinitely.
160	Beginning of the subroutine which handles the actual game.
170	Calls a subroutine which sets up the screen.
190	Scans keyboard. The content of #208 contains the address of the key pressed. This method of scanning the keyboard is a great deal quicker than using KEY$.
200	Updates the position of the basket according to the key pressed.
210	Decides whether to print an egg or not.
220	Prints the basket.
240	Calls the machine code routine which moves down the eggs by one line and checks whether any of them have hit the ground or the basket.

250	Checks whether an egg has hit the basket or the ground and takes appropriate action.
260	Checks whether 20 eggs have fallen to the ground.
280	End of this subroutine.
300	This subroutine is called when an egg hits the ground.
310	Increments counter which keeps count of the number of lost eggs.
320	Prints the number of eggs lost.
340	Checks whether you've dropped more than 20 eggs. If you have, set boolean DEAD to TRUE.
350	End of this routine.
370	This subroutine is called when a egg hits the basket.
380	Increments score by 10.
390-400	Make a sound.
410	End of this subroutine.
440	This subroutine is called when you have dropped 20 eggs.
450-510	Play a short burst of music to indicate that you are a failure!
540-670	This subroutine sets up the screen before each game.
680	Hall of fame subroutine.
690	Calls a subroutine which updates the current top eight scores.
700-770	Print the top eight scores and the names of the scorers and wait for the space bar to be pressed.
780	End of this subroutine.
800	This subroutine is called from within the above subroutine and is used to update the top eight scores.
810	Checks whether your score is greater than the lowest score in the hall of fame. If it isn't, exit this subroutine immediately.
820-1030	Input name.
1040	End of this subroutine.
1060	Instructions subroutine.
1070	Selects black background and white foreground colours then clears screen.
1080	Gets rid of key-click and flashing cursor.
1090	Gets rid of CAPS message at the top of the screen.
1100-1210	Print the instructions.
1220-1240	Initialise the hall of fame.
1250	Waits for the space bar to be pressed.
1260	End of this subroutine.
1280-1350	This subroutine pokes the machine code routine into page 4. Contrary to what the user guide says, it is quite safe to use more than first 32 bytes of page 4 for machine code.
1360-1760	Data for machine code. There is a disassembly of the data following each piece of code (preceded by an apostrophy). These do not have to be typed in.
1780	Data for music.
1790-1890	This subroutine redefines the character set and the character needed for the game.
1910-2100	Data for the characters above.

hints on conversion

The main difficulty of converting this program to run on other machines is the short machine code routine. If you are an experienced 6502 machine code programmer, you should have no difficulty converting it, but if you have a Z80 based machine, it is probably best to rewrite the machine code routine and just follow the general structure of this program. Since I have tried to use modular programming techniques (no GOTOs, GOSUBs, jumping out of subroutine, POP, etc), you should find it easy to follow. Here is a list of Oric Basic's peculiarities:

A hash preceding a number signifies that it is in hexadecimal (base 16).

A percentage sign preceding a number means that it is an integer.

Location #208 contains the address of the current key pressed. K = PEEK(#208) in line 190 should be replaced by K = INKEY$(0) or something similar.

PLOTX, Y is equivalent to PRINT TAB(X,Y), PRINT AT X,Y or PRINT CURSOR (X,Y).

Replace all sound commands by commands on your own micro.

The value for TRUE and FALSE are −1 and 0 respectively. This is used in the boolean algebra in line 200.

All characters printed in this program in the format CHR$(X) are escape codes and can be ignored.

All the data statements at the end of the program are for the redefined characters and are not machine code data. As a character on the Oric is 6 × 8, the data in this program should not be used.

The good thing about Oric Basic is the inclusion of the REPEAT-UNTIL structure. Unfortunately, this is not implemented on many micros and thus must be replaced by messy GOTO statements.

Also take into account the fact that Oric Basic is incredibly slow (just faster than Spectrum Basic, in fact!).

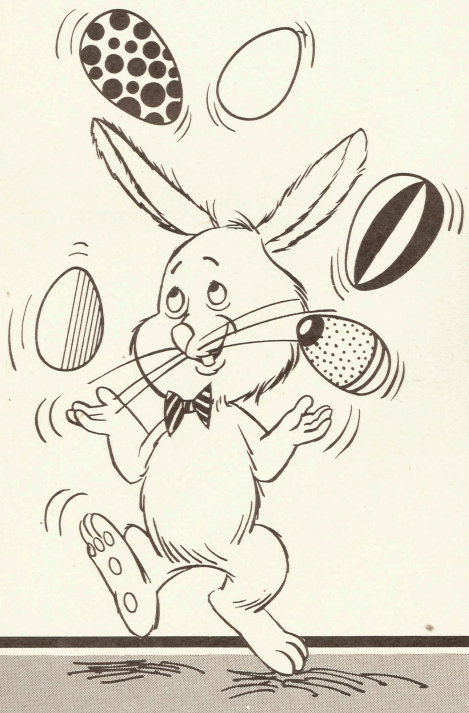
Lastly, for detailed instructions on how the program works, read the HOW IT WORKS section.

variables used

FAME	A DIM which holds the top eight scores.		holds the notes for the end of game music.	XC%	X co-ordinate of basket.		#208, accessed by peak).
NA$	A DIM which holds the names of the top eight scorers.	SC%	current score.	X	X co-ordinate of an egg.	I,O,A	General FOR-NEXT loop variables.
MU	A DIM which	DEAD	A boolean which indicates whether Sam is dead or not.	HIT	Number of eggs dropped so far.		
				K%	Key pressed (content of		

program listing

```
10 REM EGG CATCHER
20 REM BY SHINGO SUGIURA
30 REM AUGUST 1984
40 :
50 TEXT:HIMEM#97FF
60 DIM FAME(9),NA$(9),MUS(14)
70 GOSUB1290'POKE IN MACHINE CODE
80 GOSUB1800'REDEFINE CHARACTER SET
90 GOSUB1070'INSTRUCTIONS
100 REPEAT
110 SC%=0
120 GOSUB170'GAME ITSELF
130 GOSUB690'HALL OF FAME
140 UNTIL FALSE
150 :
160 REM GAME ITSELF
170 GOSUB550
180 REPEAT
190 K%=PEEK(#208)
200 XC%=XC%+(K%=170 AND XC%>2)-(K%=176 AND XC%<20)
210 X%=RND(1)*33+3
220 PLOTXC%,20," a a a a a a a a a "
230 IF RND(1)<0.2 THEN PLOTX%,2,"b":MUSIC1,4,11,0:PLAY1,0,2,100
240 CALL#400
250 IF PEEK(#455)<>0 THENGOSUB310ELSEIF PEEK(#456)<>0 THENGOSUB380
260 UNTIL DEAD
270 GOSUB450'DROPPED 20 EGGS
280 RETURN
290 :
300 REM EGG HITS GROUND
310 HIT=HIT+1
320 PLOT29,0,STR$(HIT)
330 PLAY0,2,1,800
340 IF HIT=20 THEN DEAD=TRUE
350 RETURN
360 :
370 REM EGG HITS BASKET
380 SC%=SC%+10
390 MUSIC2,4,5,0
400 PLAY7,0,2,100
410 PLOT7,0,STR$(SC%)
420 RETURN
430 :
440 REM DROPPED 20 EGGS
450 PLAY7,0,0,0
460 FOR A=0 TO 14
470 MUSIC1,3,MUS(A),10
480 WAIT20
490 NEXT
500 PLAY0,0,0,0
510 WAIT100
520 RETURN
530 :
540 REM SET UP SCREEN
550 INK7:CLS
```



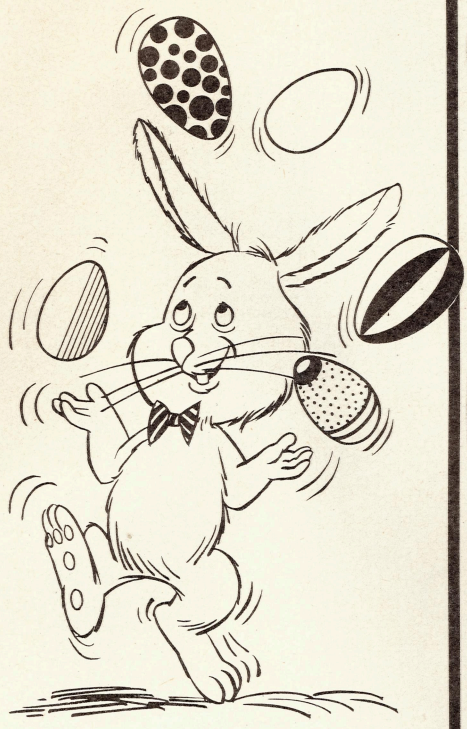
Egg Catcher

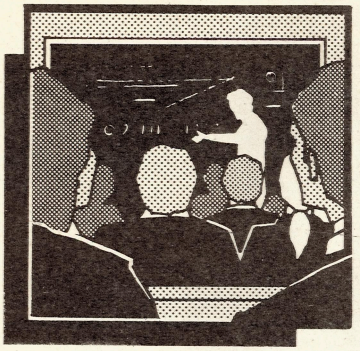
program listing

```
560 XC%=17:HIT=0
570 PLOT2,0,"SCORE"+STR$(SC%)
580 PLOT1,0,3
590 PLOT20,0,"LOST EGGS"+STR$(HIT)
600 PLOT19,0,3
610 DEAD=FALSE
620 PLOT2,24,"ccccccccccccccccccccccccccccccccccccc"
630 PLOT1,24,5
640 PLOTXC%,20," a a a a a a a a a "
650 PLOT1,20,4
660 RETURN
670 :
680 REM HALL OF FAME
690 CLS:GOSUB810
700 PRINT:PRINTSPC(5)CHR$(131)"EGG CATCHER HALL OF FAME"
710 FOR A=1 TO 8
720 PLOT2,A*2+3,STR$(A)+".":PLOT8,A*2+3,STR$(FAME(A)):PLOT20,A*2+3,NA$(A)
730 PLOT8,A*2+3,1
740 NEXT A
750 PLOT1,23,6:PLOT2,23,12
760 PLOT4,23,"PRESS THE SPACE BAR TO REPLAY."
770 REPEAT:UNTIL KEY$=" "
780 RETURN
790 :
800 REM UPDATE SCORES
810 IF SC%<FAME(8) THEN RETURN
820 N$=""
830 FOR A=8 TO 1 STEP-1
840 IF SC%>FAME(A) THEN FAME(A+1)=FAME(A):F=A:NA$(A+1)=NA$(A)
850 NEXT A
860 FAME(F)=SC%
870 REM INPUT NAME
880 PLOT11,2,"CONGRATULATIONS"
890 PLOT11,6,"YOUR GREAT SCORE"
900 PLOT3,8,"QUALIFIES FOR THE HALL OF FAME"
910 PLOT8,10,"PLEASE ENTER YOUR NAME"
920 PLOT9,14,22:PLOT28,14,16
930 PLOT9,15,22:PLOT28,15,16
940 PLOT9,16,22:PLOT28,16,16
950 INK1
960 REPEAT
970 GET A$
980 CALL#FBOB
990 IF ASC(A$)=127 AND LEN(N$)>=1 THEN N$=LEFT$(N$,LEN(N$)-1)
1000 IF ASC(A$)<>127 AND LEN(N$)<15 THEN N$=N$+A$
1010 IF LEN(N$)<15 THEN PLOT11,15,N$+" " ELSE PLOT11,15,N$
1020 UNTIL ASC(A$)=13
1030 NA$(F)=N$:CLS
1040 RETURN
1050 :
1060 REM INSTRUCTIONS
1070 PAPER0:INK7:CLS
1080 POKE#26A,10
1090 POKE#BBA3,0
1100 PRINTSPC(10)CHR$(131)"EGG CATCHER"
1110 PRINT:PRINTSPC(8)CHR$(130)"BY SHINGO SUGIURA":PRINT
1120 PRINT"      YOU PLAY THE PART OF 'SID' WHO"
1130 PRINT"MUST TACKLE THE DIFFICULT JOB OF"
1140 PRINT"CATCHING THE EGGS THAT'S FALLING FROM"
1150 PRINT"THE BACK OF A LORRY."
1160 PRINT:PRINT"HE'LL BE FIRED IF HE DROPS 20 EGGS SO"
1170 PRINT"BE CAREFUL.":PRINT
1180 PRINT:PRINTSPC(10)CHR$(131)"CONTROLS:":PRINT
1190 PRINTSPC(12)"LEFT .. Z"
1200 PRINTSPC(11)"RIGHT .. X":PRINT
1210 PRINT:PRINTCHR$(134)CHR$(140)"PRESS THE SPACE BAR TO CONTINUE."
1220 FOR A=0 TO 8
1230 FAME(A)=100:NA$(A)="SHINGOSOFT"
1240 NEXT
1250 REPEAT:UNTILKEY$=" "
1260 RETURN
1270 :
1280 REM POKE IN MACHINE CODE
1290 FOR A=#400 TO #454
1300 READB:POKEA,B
1310 NEXT
1320 FOR A=0 TO 14
1330 READMUS(A)
```

program listing

```
1340 NEXT
1350 RETURN
1360 DATA #A9,#00      'LDA#0
1370 DATA #8D,#56,#04 'STA$456
1380 DATA #8D,#55,#04 'STA$455
1390 DATA #A9,#90      'LDA#$90
1400 DATA #85,#00      'STA$0
1410 DATA #A9,#BF      'LDA#$BF
1420 DATA #85,#01      'STA$01
1430 DATA #A0,#00      'LDY#0
1440 DATA #B1,#00      'LDA($00),Y
1450 DATA #C9,#62      'CMP#ASC("b")
1460 DATA #D0,#26      'BNE$43E
1470 DATA #A9,#20      'CMP#ASC(" ")
1480 DATA #91,#00      'STA($00),Y
1490 DATA #A0,#28      'LDY#40
1500 DATA #B1,#00      'LDA($00),Y
1510 DATA #C9,#20      'CMP#ASC(" ")
1520 DATA #D0,#06      'BNE $42A
1530 DATA #A9,#62      'LDA#ASC("b")
1540 DATA #91,#00      'STA($00),Y
1550 DATA #D0,#14      'BNE$43E
1560 DATA #C9,#63      'CMP#$63
1570 DATA #D0,#07      'BNE $435
1580 DATA #A9,#FF      'LDA#$FF
1590 DATA #8D,#55,#04 'STA$455
1600 DATA #30,#09      'BMI $43E
1610 DATA #C9,#61      'CMP$61
1620 DATA #D0,#05      'BNE $43E
1630 DATA #A9,#FF      'LDA #$FF
1640 DATA #8D,#56,#04 'STA$456
1650 DATA #C6,#00      'DEC$0
1660 DATA #A5,#00      'LDA$0
1670 DATA #C9,#FF      'CMP#$FF
1680 DATA #D0,#02      'BNE $448
1690 DATA #C6,#01      'DEC$01
1700 DATA #A5,#01      'LDA$01
1710 DATA #C9,#BB      'CMP#$BB
1720 DATA #D0,#C2      'BNE $410
1730 DATA #A5,#00      'LDA$00
1740 DATA #C9,#CF      'CMP#CF
1750 DATA #D0,#BC      'BNE $410
1760 DATA #60          'RTS
1770 :
1780 DATA3,5,6,8,10,6,10,10,9,5,9,9,8,4,8
1790 REM REDEFINE CHARACTER SET
1800 FOR A=46080+(ASC("0")*8) TO 46079+(ASC(":")*8)
1810 READ B:POKE A,B
1820 NEXT
1830 FOR A=46080+(ASC("@")*8) TO 46079+(ASC("Z")*8)
1840 READ B:POKE A,B
1850 NEXT
1860 FOR A=46080+(ASC("a")*8) TO 46079+(ASC("d")*8)
1870 READ B:POKEA,B
1880 NEXT
1890 RETURN
1900 :
1910 DATA #1C,#32,#32,#32,#32,#32,#1C,#00,#0C,#1C,#0C,#0C,#0C,#0C,#0C,#00
1920 DATA #1C,#26,#06,#0C,#18,#30,#3E,#00,#1C,#26,#06,#0C,#06,#26,#1C,#00
1930 DATA #0C,#1C,#3C,#2C,#3E,#0C,#0C,#00,#3E,#30,#3C,#0E,#06,#26,#1C,#00
1940 DATA #1C,#32,#30,#3C,#32,#32,#1C,#00,#3E,#06,#06,#0E,#1C,#38,#30,#00
1950 DATA #1C,#32,#32,#1C,#32,#32,#1C,#00,#1C,#26,#26,#1E,#06,#26,#1C,#00
1960 DATA #22,#3E,#22,#3E,#22,#3E,#22,#3E,#1C,#32,#32,#3E,#32,#32,#32,#00
1970 DATA #3C,#32,#32,#3C,#32,#32,#3C,#00,#1C,#32,#30,#30,#30,#32,#1C,#00
1980 DATA #3C,#32,#32,#32,#32,#32,#3C,#00,#3E,#30,#30,#3C,#30,#30,#3E,#00
1990 DATA #3E,#30,#30,#3C,#30,#30,#30,#00,#1C,#32,#30,#30,#36,#32,#1C,#00
2000 DATA #32,#32,#32,#3E,#32,#32,#32,#00,#18,#18,#18,#18,#18,#18,#18,#00
2010 DATA #06,#06,#06,#06,#06,#26,#1C,#00,#32,#32,#36,#3C,#3E,#36,#32,#00
2020 DATA #30,#30,#30,#30,#30,#30,#3E,#00,#22,#36,#2A,#2A,#22,#22,#22,#00
2030 DATA #32,#32,#3A,#3E,#36,#32,#32,#00,#1C,#32,#32,#32,#32,#32,#1C,#00
2040 DATA #3C,#32,#32,#3C,#30,#30,#30,#00,#1C,#32,#32,#32,#32,#34,#1A,#00
2050 DATA #3C,#32,#32,#3C,#32,#32,#32,#00,#1C,#32,#30,#1C,#06,#26,#1C,#00
2060 DATA #3E,#18,#18,#18,#18,#18,#18,#00,#32,#32,#32,#32,#32,#32,#1C,#00
2070 DATA #32,#32,#32,#32,#32,#1C,#08,#00,#32,#32,#32,#32,#32,#3A,#14,#00
2080 DATA #22,#22,#14,#08,#14,#22,#22,#00,#32,#32,#32,#1C,#08,#08,#08,#00
2090 DATA #00,#00,#00,#3F,#33,#00,#00,#00,#0C,#16,#2F,#2F,#2F,#2F,#16,#0C
2100 DATA #15,#15,#3F,#3F,#3F,#3F,#3F,#3F
```





Key Facts

If you're finding that the manual is a little difficult to follow in the area of key redefinition, read on for a full explanation and program. By David Ellis.

The keyboard of the Amstrad CPC64 must be one of the most versatile ever produced on a micro — it is entirely 'soft'. All of the keys, including the joystick, can be programmed to produce any character with any key, in both shifted and unshifted modes, and also when the 'CTRL' key is used. Any key can be programmed to auto repeat or not, when held down, and the initial delay and repeat speed can also be set.

Commands are available to test not only which key is pressed — as is usual on most micros — but whichever combination of keys is pressed. You could specify that four keys (or even more) have to be pressed simultaneously, before a certain operation is performed. Add to this the fact that up to 32 of the keys can be used as function keys, and that each function key can consist of 255 characters, and this gives a total of nearly 8K of user defined keyboard functions.

Now that last statement may be a little confusing to those of you who are familiar with the CPC464. Perhaps you thought that only the numeric pad could be used for funtion keys, and everyone knows that the maximum number of characters allowed is 120 in total. On the first point, the manual is not very clear. You can indeed use any key as a function key. On the second point — well it is possible very easily by using a machine code routine just 9 bytes in length.

CPC 464



Key definition

Before showing how this is done let's look at the basic operation of defining keys, and please don't confuse this with redefining of the ASCII characters themselves — this is done with the SYMBOL AFTER command and does not concern us here.

Each of the keys on the keyboard (including the joystick) is given a number between 0 and 79. There is an apparent logical sequence for the way in which the keys are numbered. Appendix III page 16 in the user manual shows all the various numbers for the keys.

The KEY DEF command is used to determine which characters appear on the screen when that particular key is pressed, and whether or not the key will auto repeat. Five parameters are required by this command:

- The number of the key
- Whether the key will auto repeat (1) or not (0)
- Character when UNSHIFTED
- Character when SHIFTED
- Character when CTRL key is used

For example, the 'A' key could be redefined to print the letter 'B' when unshifted, 'C' when shifted, and 'E' with the CTRL key, and auto repeat by the following line:

```
KEY DEF 69,1,66,67,69
```

69 is the key number for 'A'. Auto repeat is indicated by '1', 'B', 'C' and 'E' by 66, 67, and 69 respectively. Any number in the range 0 to 255 could be used for the last three parameters. However, the numbers from 128 to 159 are set aside for the 'expansion characters'. I shall refer to these as the keyboard functions.

These are merely a string of characters which will be printed out when the appropriate key is pressed. The CHR$ function can be used at the beginning or at the end of the string if required. The function is set up by the keyword KEY. This is simply KEY, followed by a number between 128 and 159, followed by the character string. For example:

```
KEY 128,"CLS"+CHR$(13)
```

When the key that uses this function is pressed, CLS will be printed on the screen, and the CHR$(13) will cause a carriage return to be issued — thus the screen will clear. All that needs doing is to assign this function to whatever key you wish by using the KEY DEF command. To put this function on the CLR key (number 16) the following could be used:

```
KEY DEF 16,1,16,16,128
```

The operation of the CLR key will remain the same in the unshifted and shifted states but with the CTRL key pressed, it will call the key function assigned to 128 — ie it will clear the screen.

Key assignations

It is now a simple matter to define whatever string function you require for the remaining function codes 129 and 159 and then assign these to whichever keys you desire. In most cases it will be better to use the CTRL key, but for some of the keys you could use the function in the shifted state — the RETURN key, SPACE BAR, and the keys on the NUMERIC PAD for instance, which are not normally used with the shift key.

The only problem now, is that once the 120 characters are used up for the function strings, the BASIC interpreter will return an error condition and will not accept any more KEY functions. It is possible through the 'JUMPBLOCK' though, to set the starting address and the size of the buffer that is to hold the function characters.

Line 10 in Listing 1 sets the 'Top of BASIC' to &9000 (36846), which is also the start of the 9 byte machine code program held in line 40. The start address for the buffer is held in the second and third bytes of the program, and this starts immediately after the machine code program at &900A (36874). Bytes 5 and 6 hold the length of the buffer (LSB/MSB), in this instance set to 0 and 4 (4 * 256 + 10 = 1024), which is 1K.

For most cases this

program listing 1

```
10 MEMORY &8FFD:location=&9000
20 FOR offset = 0 TO 9:READ objectcode
30 POKE location+offset,objectcode:NEXT: 'Routine to expand buffer size
40 DATA 17,10,144,33,0,4,205,21,187,201
50 CALL &9000:DIM function$(32):DIM ucase(32):DIM lcase(32)
60 FOR X=1 TO 20:READ function$(X):NEXT
70 FOR X=21 TO 32:READ control$:function$(X)=control$+CHR$(13):NEXT
80 FOR X=128 TO 159:KEY X,function$(X-127):NEXT
90 FOR X=1 TO 32:READ keynumber,lcase,ucase
94 KEY DEF keynumber,1,lcase,ucase,X+127:NEXT
96 FOR X=1 TO 12:READ keynumber,character:
100 KEY DEF keynumber,0,character:NEXT:NEW
110 '*****************************************************************
120 DATA "ASC(","BORDER ","CHR$(","DRAW ","EVERY ","FOR X=","GOSUB "
130 DATA "HEX$(","=INKEY$ ","LEFT$(","MID$(","NEXT ","ORIGIN ","PEEK("
140 DATA "RIGHT$(","SOUND ","TAGOFF ","UPPER$(","VAL(","WINDOW "
150 DATA "MODE 0","MODE 1","MODE 2","PRINT HIMEM,FRE(0),HIMEM-FRE(0)-368"
160 DATA "FOR X=0 TO 255:?X;CHR$(61);CHR$(32);chr$(1)+CHR$(X),:NEXT"
170 DATA ":PRINT PEEK(X);:NEXT","INK 0,20:INK 1,1:BORDER 20"
180 DATA "PRINT INT(TIME/18000)","AUTO","RENUM","CLS","LIST"
190 '*****************************************************************
200 DATA 69,97,65,54,98,66,62,99,67,61,100,68,58,101,69,53,102,70,52,103,71
210 DATA 44,104,72,35,105,73,36,108,76,38,109,77,46,110,78,34,111,79,27,112
220 DATA 80,50,114,82,60,115,83,51,116,84,42,117,85,55,118,86,59,119,87,32
230 DATA 48,95,64,49,33,65,50,34,57,51,35,56,52,36,49,53,37,48,54,38,41,55
240 DATA 39,40,56,40,33,57,41,16,16,16,24,94,163,6,13,7,46,15,48,13,49,14,50
250 DATA 5,51,20,52,12,53,4,54,10,55,11,56,3,57
```

Program to redefine 32 function keys

Key Facts

table 1

LIST OF KEY FUNCTIONS

KEY NO.	KEY	FUNCTION	KEY NO.	KEY	FUNCTION
69	A	ASC(	46	N	NEXT^
54	B	BORDER^	34	O	ORIGIN^
62	C	CHR$(	27	P	PEEK(
61	D	DRAW^	67	Q	not used
58	E	EVERY^	50	R	RIGHT$(
53	F	FOR X=	60	S	SOUND^
52	G	GOSUB^	51	T	TAGOFF^
44	H	HEX$(	42	U	UPPER$(
35	I	=INKEY$^	55	V	VAL(
45	J	not used	59	W	WINDOW^
37	K	not used	63	X	not used
36	L	LEFT$(	43	Y	not used
38	M	MID$(	71	Z	not used

^ denotes a space

amount will be ample. To set aside more buffer space, then the top of BASIC address, the LOCATION address, and the start of the buffer address should all be lowered by the same amount in bytes 5 and 6 of the mahine code program.

The rest of the program sets up the various functions and assigns them to the keys as shown in Table 1. The first 20 function stings will return the string shown, whilst the last 12 function strings (Table 2) are used with the carriage return to perform some useful operations. You can change any of the strings to whatever you like. The ones presented here are the ones that I find are most useful for myself. You may prefer your layout to be different from mine.

Remember to SAVE the program before RUNning it for the first time as the program NEWs itself in line 100. You have been warned!

Hopefully your friends with other micros will be green with envy when they see the functions that you can call up at the touch of one key — well two to be exact . Look — single key entry — à la SPECTRUM!!

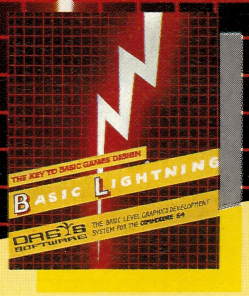
table 2

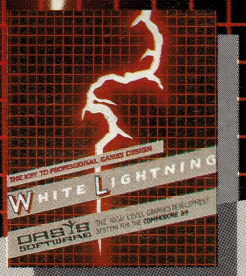
The following perform functions as opposed to printing a keyword

KEY NO.	KEY	FUNCTION PERFORMED
32	0	MODE 0 + CHR$(13)
64	1	MODE 1 + CHR$(13)
65	2	MODE 2 + CHR$(13)
57	3	PRINT HIMEM,FRE(0),HIMEM-FRE(0) - 368 + CHR$(13)
56	4	FOR X=0 TO 255:PRINT X;CHR$(61);CHR$(32);CHR$(1);+CHR$(X);:NEXT
49	5	:PRINT PEEK(X);:NEXT + CHR$(13)
48	6	INK 0,20:INK 1,1:BORDER 20 + CHR$(13)
41	7	PRINT INT(TIME/18000) + CHR$(13)
40	8	AUTO + CHR$(13)
33	9	RENUM + CHR$(13)
16	CLR	CLS + CHR$(13)
24	£/^	LIST + CHR$(13)

N.B. Key 3 prints TOP of BASIC, MEMORY LEFT, and SIZE of BASIC PROGRAM
key 4 prints out all 255 ASCII CHARACTERS and CONTROL CODES (0-31)
key 5 is for use with the 'F' key function
key 6 sets up a clear 80 column mode
key 7 prints out the TIME in MINUTES since SWITCH-ON or RESET.







BASIC LIGHTNING

WHITE LIGHTNING

MACHINE LIGHTNING

LIGHTNING STRIKES AGAIN

THREE HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE COMMODORE 64.

OASIS SOFTWARE

Totally dedicated to writing very fast, video games, BASIC Lightning is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.

As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.

A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.

White Lightning is a complete games writing package comprising a high level, Forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful sprite Generator Program. Programs can even be written in a combination of Forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.

The Basic Lightning part of the package can be used to experiment quickly and easily before the Forth program is developed.

The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or inverted.

MULTI-TASKING Without doubt the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc. effortless.

The BASIC Lightning Sprite Generator Program is also included in the package.

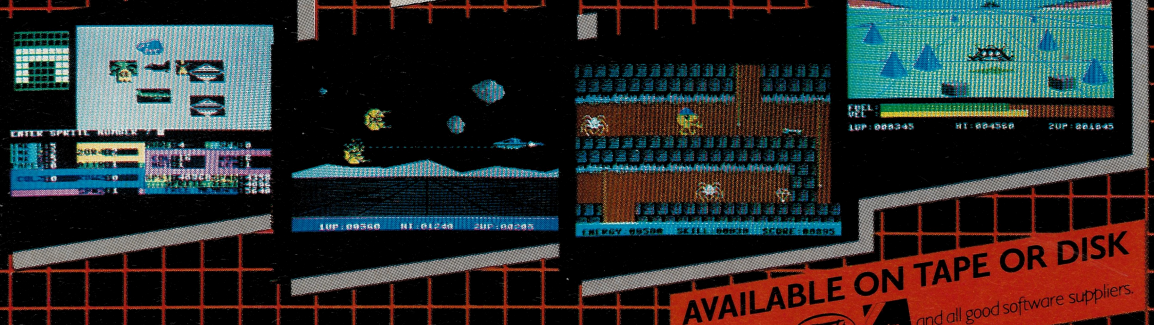
Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts:

MACRO ASSEMBLER/ MONITOR/DISASSEMBLER This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.

BASIC LIGHTNING BASIC Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.

SPRITE GENERATOR Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.

OBJECT LIBRARY This is Machine Lightning's most powerful feature. 10k of re-entrant code with more than 130 documented entry points. These are the routines that provide all the superfast graphics routines in White and Basic Lightning. They contain virtually every routine you'll ever need to write an Arcade Game and multi-tasking in Machine Lightning is covered in the comprehensive accompanying manual.



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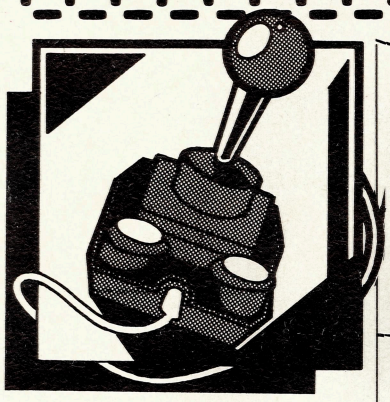

Fred in the Forest

A horde of spiders is attacking Fred. See if you can help him obliterate them in this time-limit game by Steve Lucas.

In this game, you must guide Fred through the forest to try and capture as many spiders as he can before the time runs out. Only one spider will appear on the screen at any one time. Each spider is worth one point and if you manage to get home before the time runs out, you will get another screen. Each successive screen has to be completed in a shorter time than the previous one.

You move Fred around the screen with the following keys:

left = z
right = x
up =)
down = /

how it runs

40	Resets the keyboard repeat rate when escape is pressed
50	Defines keyboard repeat rate
60-70	Select move, colours and starting positions
80-150	Define character set
160-270	Draw screen
280-380	Main control loop
290-300	Move Fred.
390-400	Graphics for movement
410	Checks if completed screen or lose game
420-450	Catch spider
460-490	Clear screen and display messages
500-540	Lose game
550	Resets keyboard repeat

variables used

X%, Y%	Coordinates for Fred.
man$	Graphics for Fred.
xa%, xb%	Coordinates of spider
s%	Score
t%	Time limit
TI	Initial value of time
h%,k%	Flags
j%	Jump size for movement

CPC 464



hints on conversion

1. Speed key is used to alter the auto repeat rate of the keyboard and should be changed as appropriate.
2. SYMBOL and SYMBOL after are used to redefine the characters from 250-255.
3. INK is used to select the colours available from the palette
4. PEN selects the colour from the inks available
5. PAPER selects the background colour
6. WINDOW is used to define different windows which can be cleared individually by CLS £1 etc.
7. LOCATE x,y is used to move the text cursor to position x,y and is equivalent to PRINT TAB (X,Y) on the BBC, PLOT X,Y on the Oric and PRINT AT on the Spectrum.
8. The program checks the length of time since starting the game using the real time clock. If your machine does not have this facility available, you will need to increment a variable such as TI each time you go through the control loop.

program listing

```
10 REM ** Fred in the Forest **
20 REM ** a game for the Amstrad CPC 464 **
30 REM **  by Steve W. Lucas **
40 ON BREAK GOSUB 550
50 SPEED KEY 1,1
60 MODE 1: s%=0:t%=5000:h%=0:k%=50:j%=1:y%=22:x%=2
70 INK 0,1:INK 1,24:INK 2,20:INK 3,6
80 SYMBOL AFTER 242
90 SYMBOL 255,255,255,255,255,255,255,255,255
100 SYMBOL 254,28,28,8,127,8,20,34,65
110 SYMBOL 253,8,28,62,127,8,8,8,8
120 SYMBOL 252,8,62,42,8,127,73,8,8
130 SYMBOL 251,32,124,254,255,106,126,122,122
140 SYMBOL 250,36,60,24,255,153,165,165,129
150 man$=CHR$(254)
160 PEN 3:LOCATE 1,2:PRINT STRING$(40,CHR$(255));:LOCAT
E 1,23:PRINT STRING$(40,CHR$(255));
170 FOR x=2 TO 22: LOCATE 1,x:PRINT CHR$(255);:LOCATE 4
0,x:PRINT CHR$(255);:NEXT
180 PEN 1:LOCATE 1,1:PRINT"Score ":LOCATE 31,1:PRINT"Fi
nish";:LOCATE 1,24:PRINT"Start";
190 WINDOW #1,2,39,3,22
200 PEN 1: FOR t=1 TO 50:x=INT(RND(1)*33)+2:y=INT(RND(1
)*20)+3:LOCATE x,y:PRINT CHR$(253);:NEXT
210 LOCATE 10,1:PRINT"Time(limit=";t%/100;")";
220 FOR t=1 TO k%:x=INT(RND(1)*33)+2:y=INT(RND(1)*20)+3
:LOCATE x,y:PRINT CHR$(252);:NEXT
230 ti=TIME
240 PEN 2:LOCATE 37,2:PRINT CHR$(251): LOCATE 2,23:PRIN
T CHR$(251);
250 xa%=INT(RND(1)*20)+10:xb%=INT(RND(1)*10)+10
260 PRINT CHR$(22)+CHR$(1)+CHR$(23)+CHR$(3): LOCATE x%,
y%:PEN 3:PRINT man$;
270 LOCATE xa%,xb%:PRINT CHR$(250);
280 xx%=x%:yy%=y%
290 aa$=INKEY$:aa$=LOWER$(aa$)
300 IF aa$="z" THEN x%=x%-j%:h%=1:l%=1: IF x%<2 THEN x%
=2
310 IF aa$="x" THEN x%=x%+j%:h%=1:l%=2: IF x%>39 THEN x
%=39
320 IF aa$="]" THEN y%=y%-j%:h%=1:l%=3:m%=y%+j%:IF y%<3
 THEN y%=3
330 IF aa$="\" THEN y%=y%+j%:h%=1:l%=4:IF y%>22 THEN y%
=22
340 GOSUB 390
350 LOCATE x%,y%:PEN 3:PRINT man$;
360 IF x%=xa% AND y%=xb% THEN GOSUB 420
370 PEN 1:LOCATE 6,1:PRINT CHR$(22)+CHR$(0);s%:LOCATE 2
6,1:PRINT INT((TIME-ti)/200);:PRINT CHR$(22)+CHR$(1)
380 IF (x%>37 AND y%<4) OR (TIME-ti)>t%*2 THEN 410 ELSE
 280
390 IF h%<>1 THEN LOCATE xx%,yy%:PEN 1:PRINT man$;:RETU
RN
400 LOCATE xx%,yy%:PEN 0:PRINT man$;:RETURN
410 IF x%>37 AND y%<4 THEN GOSUB 460 ELSE GOSUB 500
420 PRINT CHR$(22)+CHR$(0):s%=s%+1:LOCATE x%,y%:PRINT"
 ":LOCATE x%,y%:PEN 0:PRINT man$;:LOCATE xa%,xb%:PRINT
CHR$(255);:PRINT CHR$(22)+CHR$(1)
430 xa%=INT(RND(1)*20)+10:xb%=INT(RND(1)*10)+10
440 PEN 3: LOCATE xa%,xb%:PRINT CHR$(250)
450 SOUND 1,478:RETURN
460 CLS#1:PRINT CHR$(22)+CHR$(0):LOCATE 4,5:PEN 1:PRINT
"Well Done. You made it home safely"
470 LOCATE 6,10:PEN 3:PRINT"and scored :-";s%: t%=t%-20
0:PEN 2:LOCATE 8,20:PRINT"Press <Space Bar> to continue
."
480 aa$=INKEY$:IF aa$<>" " THEN 480
490 y%=22:x%=2:CLS#1:GOTO 160
500 CLS #1:PRINT CHR$(22)+CHR$(0):LOCATE 5,5:PEN 2:PRIN
T"Oh dear! You ran out of time"
510 PEN 1:LOCATE 10,10:PRINT"You scored :-";s%
520 PEN 2:LOCATE 4,20:PRINT"Press <Space Bar> for a new
 game."
530 aa$=INKEY$:IF aa$<>" " THEN 530
540 RUN
550 SPEED KEY 10,10
```

ON SALE FROM 1 MARCH

Next Month

THE MARCH OF THE ROBOTS:

Christmas saw the launch of a race of domestic and educational robots. They are fascinating, fun and sometimes useful. The April issue will contain reviews of the most endearing and the most useful!

BBC UTILITY ROMS:

The ROM roundabout can be very confusing with so many products to choose from. We pick out the best of the toolkits in an informative article.

AMSTRAD CPC464 TOP GAMES:

More and more software houses are supporting the CPC464; and with so many games to choose from, it can be very bewildering. PCT has been surveying the market and has come up with its own top chart!

CONVERTING TACTICS:

Wouldn't it be nice if you could convert program listings from magazines to run on your new CPC464? Well, beginning in April, PCT will be running a series explaining how to do this. So make sure you get the facts!

DIY COMPUTER:

Want a computer, but haven't got the spare cash? Well, why not build your own! We will be reviewing one of the latest kit computers which you put together with your own hands. It'll give you plenty to do in the Easter hols!

WINNER OF EINSTEIN COMPETITION ANNOUNCED:

The lucky prize winner of our Einstein competition will be given in the April issue. Also we will be printing the answers to our December teaser!

SOFTWARE SCENE:

The April issue of PCT contains over 20 reviews of the latest games and utilities for home micros. Read us before you buy!

GAMES GALORE:

Games and utilities for you to try your hand at! All popular home computers catered for.

Coming next month in *PERSONAL COMPUTING TODAY*

Make sure of your copy by handing this form to your newsagent today!

GIVE THIS TO YOUR NEWSAGENT

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Graphic Competition

O.K. you've had three months to stew over your graphic competition entries, now here's the page to put you out of your misery and to make eleven of you smile!

The November **Graphic Competition** was a little tricky to say the least. You had to identify six computers from various constituent parts. Not very easy in itself but, rotters that we are, we made it even more difficult by allowing distortion to creep into the photographs.

However, there are some very observant hackers amongst you and the bag of correct entries was overflowing! For those of you who were foxed here are the correct answers:

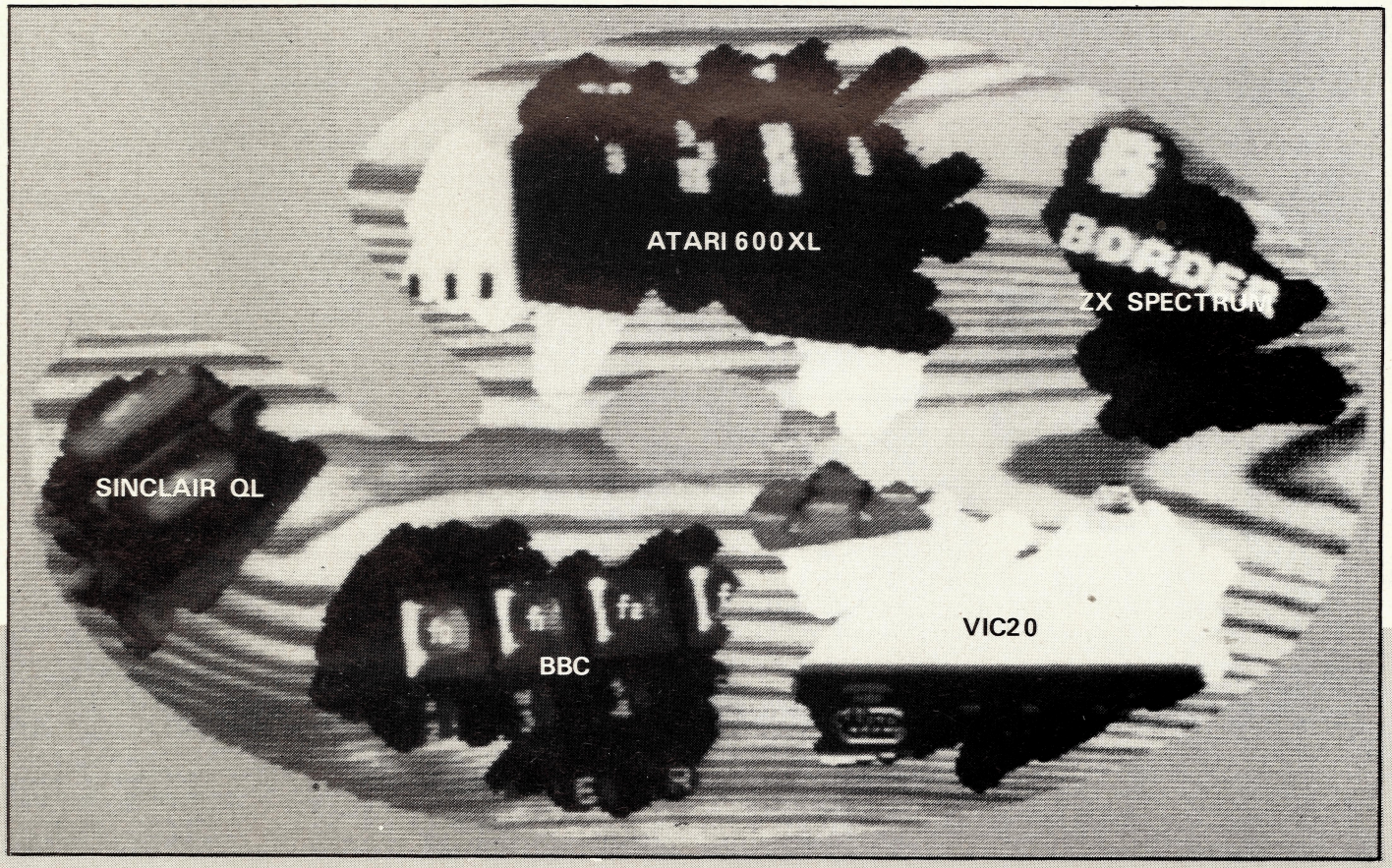
SINCLAIR QL
ZX SPECTRUM
BBC
ATARI 600XL
VIC20

You will remember that we promised a first prize of an Atari 600XL. Sadly, since we published the competition, Atari have withdrawn this micro from their range. It would seem senseless therefore to give away a defunct computer so a Commodore C16 starter pack will be winging its way to our first prize winner who is. . . **M.Convery of Edinburgh.** This lucky reader will also have a day out in the great metropolis spending some time at the I.M.A.G.I.N.E. design studio in the West End.

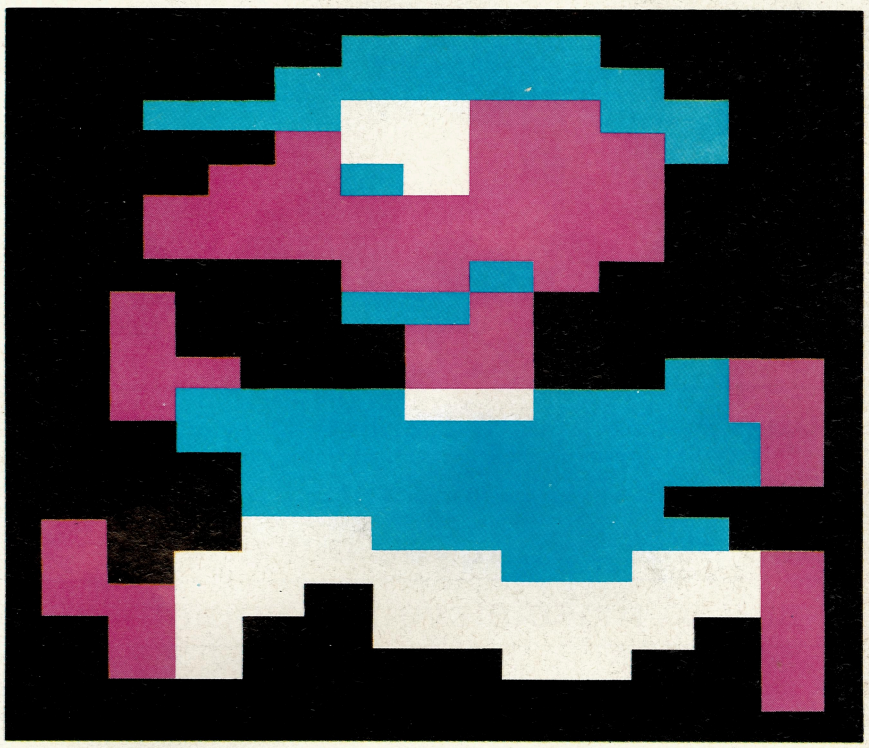
Another ten lucky readers will be receiving graphic software or lightpens. The roll of honour is as follows:

M.Beaton, Shaftesbury; G.Brennan, Strathclyde; C.Charlton, Penn; D.Goodman, London; N.Hardwidge, Cleethorpes; A.Murray, Glasgow; S.Swanson, Dresingham; D.Taylor, Huddersfield; P.Wake, London; D.Wilkin, Blackburn.

All those scottish readers. . . . !



Make new friends,



With Mirrorsoft games, you can make loads of new friends like Mr. Bounce and Ceasar the Cat. Or, now, like Dr. Frankenstein, you can create your very own monsters and aliens. As well as friends and heroes to defeat them.

GAMES CREATOR

Invent your own games. As simple or as complex as you care to make them. The only real limit is your imagination.

For the CBM64, the Games Creator comes with a step-by-step manual and three ready-to-play games. Each demonstrates some of the programs exceptional features: shapes, movement, speed, scrolling backgrounds, scoring, music, sound effects and many more. And you don't need to know any program language to work it.

On fast loading cassette for the CBM64. **£12.95.**

STAR EGGS

A space fantasy. Earth is threatened by attack from Alien life-forms hatching out in space. You must first overcome the Guardians. Then into the Hatchery, up and down escalators and ladders to crack the eggs before the aliens escape.

On fast loading cassette for the CBM64. **£6.95**

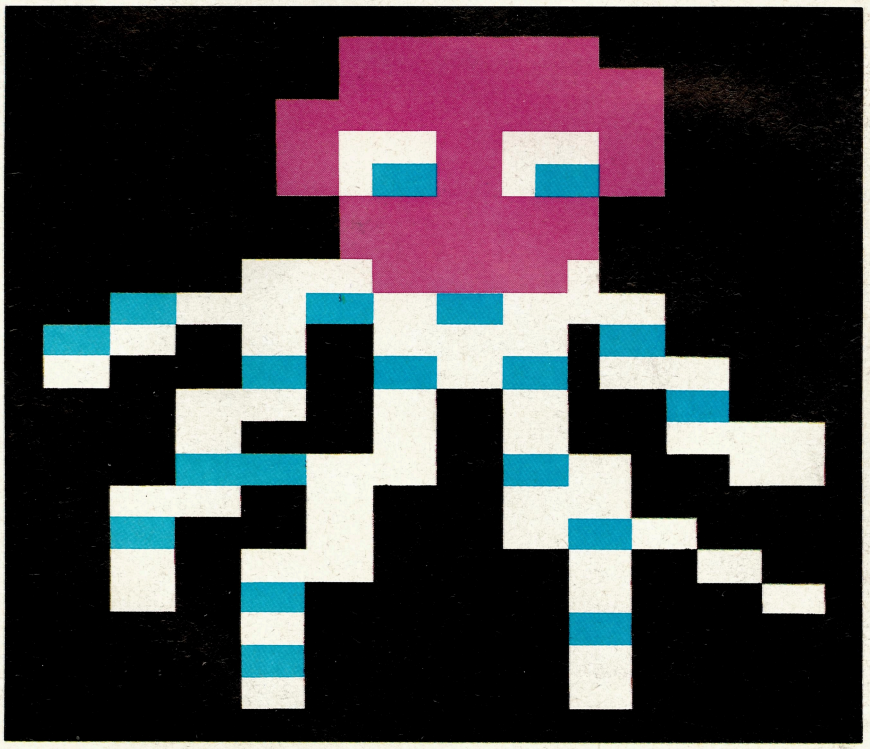
CATASTROPHES

Use a helicopter to build a hotel on an island paradise. But you have to move fast and design your building carefully because earthquakes, floods, storms and lightning can strike at any moment.

For one or two players. On fast loading cassette for the CBM64. **£6.95**

and enemies.





HI-BOUNCER

An arcade type game featuring Mr. Bounce and the Mr. Men. But don't get the idea that it's just a kids' game. Far from it. There are four main screens each with eight levels of difficulty and complexity. Don't worry, there's also a practice program with slower speeds.

On cassette for the BBC B. **£6.95.**

CEASAR THE CAT

Ceasar's cute and quick. Help him hunt the crowded shelves for mice who eat all the food. He must catch the mice before the food disappears. Outstanding graphics, animation and sound.

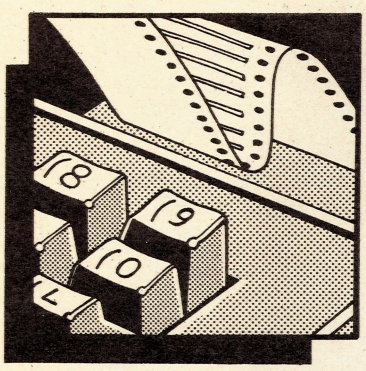
On cassette for the CBM64, Spectrum 48K, BBC B. **£6.95.**



MIRRORSOFT

SOFTWARE FOR ALL THE FAMILY

Available from Boots, W.H. Smith, Spectrum and all good software stockists. Write for a free catalogue to: Mirrorsoft, Holborn Circus, London, EC1P 1DQ.



Breden's BASIC

The CBM64 has no hi-res graphics commands readily available from BASIC. There are lots of commercial programs to supplement the Commodore BASIC and here Bob Wallace looks at the latest from Visions.

CBM64

Commodore have recently released a new range of machines (C16 and Plus 4) which offer a much improved version of BASIC over that which the earlier VIC 20 and CBM 64 machines had installed.

Most of the newer micros seen in the high street have the ability to produce hi-res graphics with very simple commands from BASIC. It is sad that the CBM 64 has no such commands readily available in ROM, so the only solution is to buy an extended BASIC or write your own. The former is by far the simplest method and certainly less time consuming.

There are a number of packages available commercially at the moment, and here we will look at a new one from Visions, Breden's BASIC.

The package, which is supplied on both tape and disk, offers an astounding 125 extra commands over those already resident in BASIC. They fall into the following categories;

Sprite graphics commands
Graphics and screen control commands
Sound commands
Input/output manipulation
Disk commands
Numeric manipulation
Error trapping
Programming aids
Enhanced programming structures

It would be impossible to deal with all the commands in this article, so I will restrict myself to the most useful.

There are 11 commands which enable sprites to be used to the full: EMOB enables a sprite; XMOB allows expansion in X and Y directions; MOVEMOB allows the sprite to be moved smoothly around the whole of the screen; MDCOLL and MMCOL are used to detect sprite to sprite collisions or sprite to screen data collisions.

PMOB is probably the most interesting command as it allows the priority of sprites to be easily defined, so sprites can be made to move in front or behind graphics already on the screen, producing stunning 3D displays.

Breden's BASIC

Graphics and screen.

This section offers no less than 30 new commands to enable easy access to the world of hi-res graphics. They include PLOT, DRAW, LINE, REC all with simple and easy to understand parameters. Screen and border colours are easily changed with SCOL and BCOL. Text can be shown on the hi-res screen in both upper and lower case. The CAT command allows text to be positioned easily on the screen.

Sound

Anybody who has tried to play a complex tune from BASIC will know that about 10 million POKEs are needed and the results are usually not worth the time and effort. Breden's BASIC takes the pain out of the process by adding 22 easy to use commands which allow setting of all sound parameters such as waveform, envelope, attack, delay, sustain, release etc. These commands are well worth experimenting with.

I/O manipulation

This is a small selection of commands which allow easy access to reading joysticks, light pens, paddles etc. Very handy for the ardent games writer and player. The ability to read ASCII codes directly from the keyboard is also available.

Disk commands

The most useful command is DOS which allows the user to send commands to the disk drive without having to type OPEN 15,8,15 etc. This speeds up programming considerably.

Numeric functions

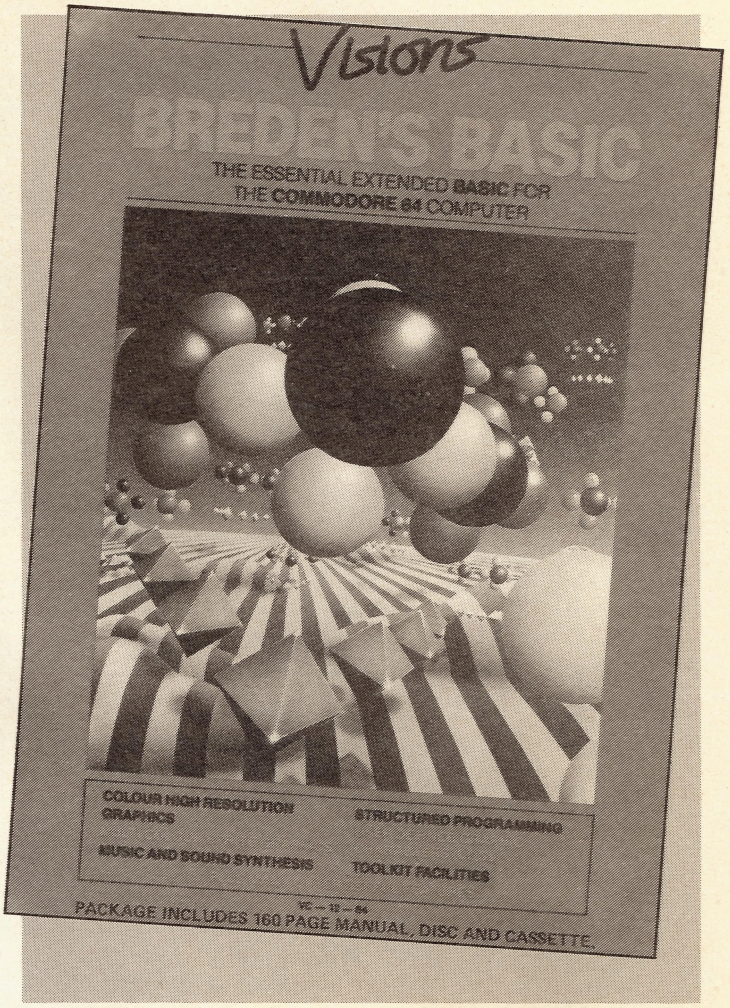
If manipulating figures is not your strong point, then some of the new maths commands will help you considerably. Functions include DIV, MOD,RAD,DEG,LSB and MSB of which DIV and MOD are probably the most useful as they allow simple division giving the integer part of the answer as well as the remainder. Other useful commands are DEEK and DOKE.

Error trapping

The ability to trap errors as they happen can be of immense use to the programmer in the prevention of loss of data. TRAP sends the program to a specific line number when an error is detected. ERRN gives the error number which relates to the specific error, ERRL gives the number of the line where the error occured. HELP displays the line where the error occured and highlights the position of the error.

Programming aids.

The set of commands available to the user is vast and allows the user to program the function keys and save the values assigned to them. The FIND command allows one to find a given string or variable within a program. ERASE will remove from a program any specified line numbers. OLD is used to restore a program which has accidently been NEWED.



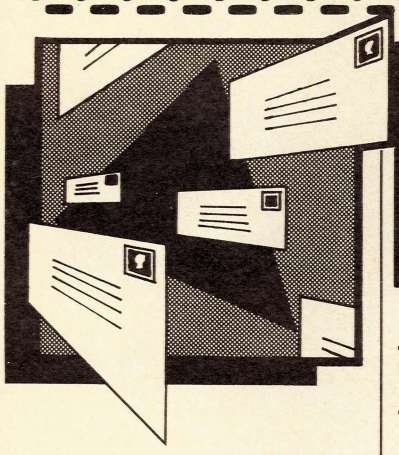
Enhanced programming

By far the most useful commands in this section are WHILE. . DO ELSE, which allow very structured programs to be developed and complex one liners to be produced. Other commands are REPEAT. . UNTIL LOOP. . UNTIL.

Conclusion

The package offers a large number of commands all of which appear to be bug free. Each command is well documented in the manual supplied. At just under forty pounds, each command works out to about 32 pence which I feel is very good value for money. If you want to program in a structured and easy way, Breden's BASIC is well worth buying.

Breden's BASIC is produced by Visions on tape or disk for the CBM 64 and costs £39.95. The package includes an excellent manual and there is a scheme for updating the software when Visions bring out new releases.



Input

Whatever your problems or comment, we want to hear it. Send your letters to 'Input', Personal Computing Today, 1 Golden Square, London W1R 3AB

LETTERS

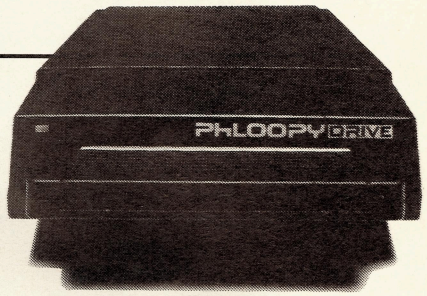
Dear PCT
My son and I have shared an expanded VIC20 and peripherals for some time now but we are beginning to find our needs and uses for computers have developed to such an extent that we will need to upgrade. We are considering computers other than the Commodore range.

However, we wish to continue using our Commodore 1520 printer/plotter which we find extremely good. Can we interface this piece of equipment to another make of computer and if so, who produces the necessary interfaces?
Yours faithfully
J. Gibson
Co. Durham

I'm afraid that we don't know of anyone who produces an interface to allow Commodore printers to be used with non-Commodore micros. Exhaustive enquiries to Commodore themselves, and manufacturers of interfaces have led us to believe that no such interfaces exist.

Have you considered the new Commodore Plus 4? This is a good home and small business micro which comes supplied with four excellent programs including a word processor, spreadsheet and business graphics.

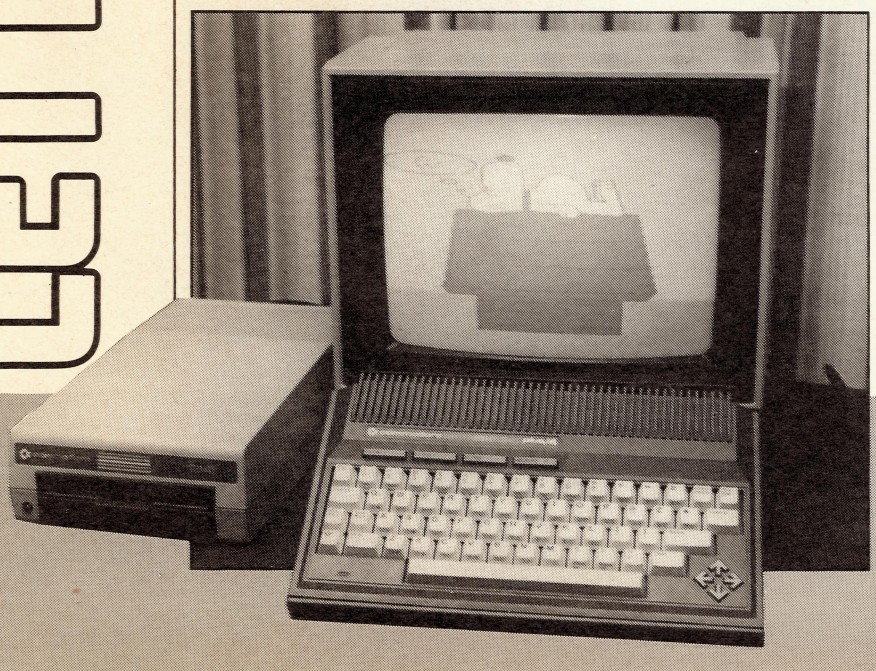
It might well be the sort of micro you require for your developing needs.

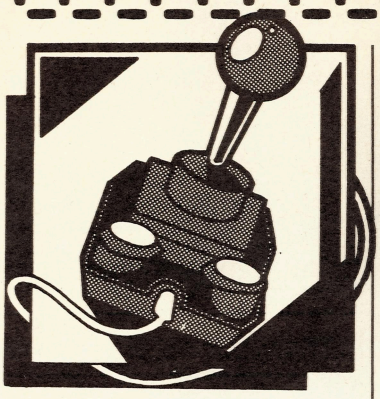


Dear PCT
We were pleased to see you had taken the time to answer a query on the 'Phloopy' Data Drive (December, Input) regarding the transfer of existing software. Unfortunately your reply was a little misleading. In fact, the Phloopy *TRANSFER command will transfer commercially protected software from cassette to Phloopy. The command is fully supported by ROM based screenouts and by our information sheets.

The *TRANSFER does not allow multiple copies of protected software to be made because all the manufacturers' original protection is transferred intact to the Phloopy version.

*TRANSFER works with most commercial software, but as with all Transfer programs the continual updating of protection methods will introduce exceptions.
Yours faithfully,
M.S. Malir
Marketing Director,
Phi Mag Systems Ltd

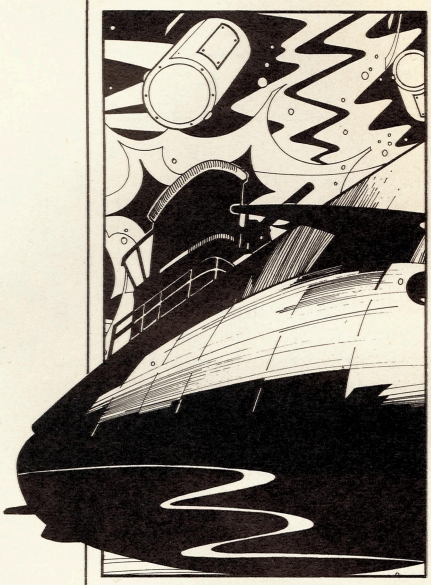




U-Boat

Terror and excitement on the High Seas with this submarine battle by Kevin Freeman.

ORIC/ATMOS 48K



You are the commander of a U-boat which has penetrated the defences of a North Sea convoy. You have 30 torpedoes at your disposal and with these you must sink as many ships as you can to gain the highest score. Different coloured ships have different values:

BLACK	295 points
WHITE	350 points
MAGENTA	425 points
GREEN	530 points
YELLOW	625 points
CYAN	680 points
RED	750 points

To RUN the program on a 16k Oric, see notes in Hints on Conversion Section.

variables used

C1,C2,C3,C4,C5	Colours of ships
N,M,B,V,C	Spread of ships and their directions
TP$,TP	Number of torpedoes
T,T$	Position of torpedo, shape of torpedo
SR$,SI$,SC$,S,SC	Score
HR$,HS$,HI	Hi score
A1$,A2$,A3$,A4$ A5$,A$,B$,C$,S$	Strings containing ships

how it runs

Line	Effect
0	GOSUB instructions and redefines character routine
1	Sets colour, clears screen
2	Sets sound
3	Plots colours of ships
4	POKEs colour to top section of screen (rows 0-4)
5	POKEs colour to top row of screen; normally reserved for messages
6	Sets variables
10-32	Set strings
40-50	Print onto screen
90-99	Main loop
100-199	Move and display ships on screen
300-399	Convert scores into strings and display on screen
600-699	Fire torpedo routine: plots torpedo, moves ships, checks for hit
700-1199	Hit ship routine: resets string, blanks out ship, moves other ships, plots sinking ship, improves score
1200-1299	End of game routine. Another go?
4000-4599	Instructions and score table
4800	Sets colours of ships
5000-5999	Redefine characters routine
6000-6100	Get key to start game
4998,4999	Contain instructions for 16K owners

hints on conversion

This program should run on the Atmos without any changes. If you want to run it on a 16K Oric, then you must use the GRAB command before typing it in.

Screen size is 0-39 x 0-26.

The REPEAT..UNTIL loop (lines 90-99) may have to be replaced with 90 IF TP=0 THEN 1200 and 99 GOTO 90.

SCRN(X,Y) is a screen PEEK which returns ASCII code of contents of the screen location X,Y.

EXPLODE, PLAY and SOUND are sound commands which may be omitted.

PLOT X,Y is the same as PRINT @ X,Y.

MID$ (X$,N,M) returns a substring of X$ of length M characters starting at character at position N in X$.

KEY$ scans keyboard.

WAIT is the same as pause and could be replaced with FOR..NEXT for delay.

The data for redefining characters cannot be converted to other machines as an Oric character is 6 x 8.

program listing

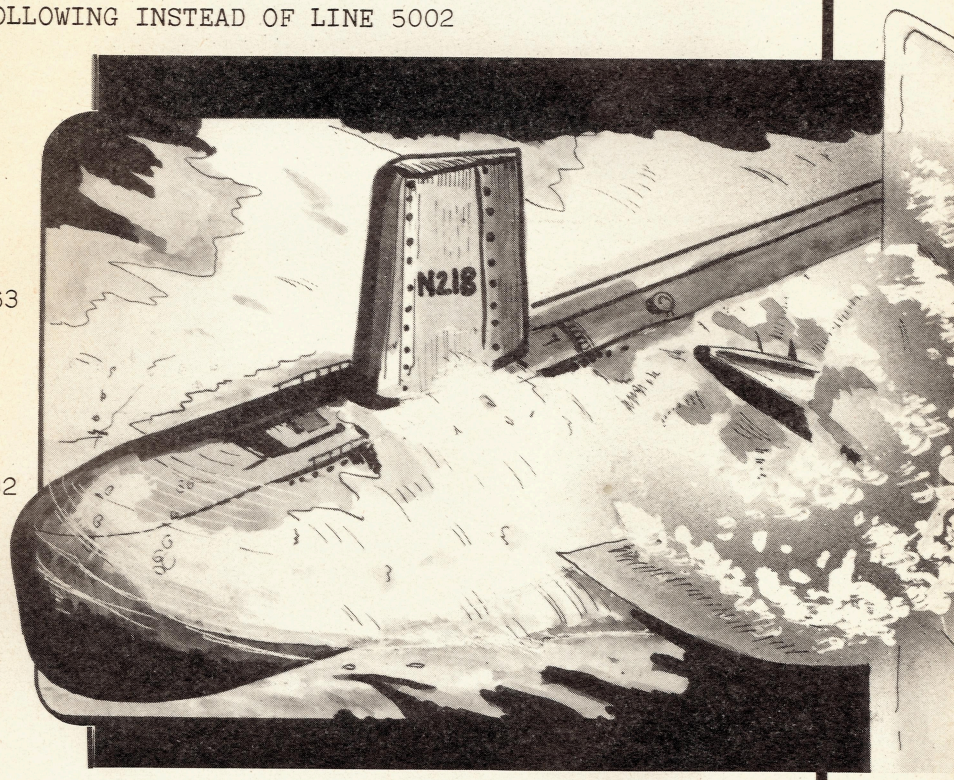
```
0 GOSUB4000
1 CLS:INK7:PAPER4
2 EXPLODE:SOUND4,9000,0:PLAY7,7,4,9000
3 PLOT0,5,C1:PLOT0,7,C2:PLOT0,9,C3:PLOT0,
  11,C4:PLOT0,13,C5
4 FORX=0TO39:POKE48000+X,22:NEXT
5 FORX=40TO240STEP40:POKE48000+X,22:NEXT
6 N=1:M=145:B=1:V=130:C=9:SC=0:TP=30
10 T1$="abbbcdg":T2$="gfcbbbe"
20 S$="
30 A$=S$+T1$+S$+S$
31 B$=S$+T2$+S$+S$
32 C$=S$+S$+T1$+S$
40 PLOT2,26,"SCORE :"
42 PLOT19,25,CHR$(18)+CHR$(1)+" READY
   "+CHR$(20)
44 PLOT19,26,"TORPEDO´S :"
46 PLOT19,24,"FIRE CONTROL"
50 PLOT2,24,"HI    :"
90 REPEAT
95 Q$=KEY$
96 IFQ$=" "THENGOSUB600
97 GOSUB100:GOSUB300
99 UNTIL TP=0:GOTO1200
100 A1$=MID$(A$,N,36):PLOT2,5,A1$
105 N=N+1:IFN>100THENN=1
110 A2$=MID$(B$,M,36):PLOT2,7,A2$
115 M=M-1:IFM<1THENM=150
120 A3$=MID$(C$,B,36):PLOT2,11,A3$
125 B=B+2:IFB>145THENB=1
130 A4$=MID$(B$,V,36):PLOT2,9,A4$
135 V=V-2:IFV<1THENV=145
140 A5$=MID$(C$,C,36):PLOT2,13,A5$
145 C=C+3:IFC>145THENC=1
199 RETURN
300 REM PLOT SCORES.....
305 SR$=STR$(SC)
310 S1$=RIGHT$(SR$,LEN(SR$)-1)
315 SC$=RIGHT$("0000"+S1$,5)
320 TP$=RIGHT$("  "+STR$(TP),3)
322 PLOT9,24,HI$
325 PLOT9,26,SC$:PLOT30,26,TP$
330 IFHI>SCTHENRETURN
332 HI=SC
335 HR$=STR$(HI)
337 HS$=RIGHT$(HR$,LEN(HR$)-1)
339 HI$=RIGHT$("0000"+HS$,5)
340 PLOT9,24,HI$
399 RETURN
600 REM TORPEDO.....
601 TP=TP-1
602 SOUND1,1000,0:PLAY7,7,4,5000
603 PLOT17,24,"r":WAIT4
604 PLOT19,25,CHR$(17)
605 FORT=24TO6STEP-2
608 IFT>16THENT$="s"ELSET$="|"
610 PLOT17,T,T$:PLOT17,T+2," "
612 IFSCRN(17,T-1)=98THENEXPLODE:WAIT4:
    GOTO620
615 GOTO630
620 ON(T-4)/2GOSUB700,800,900,1000,1100
622 PLOT17,T," "
625 T=6
630 GOSUB100
635 NEXT
640 PLOT17,6," "
645 SOUND4,9000,0:PLAY7,4,4,9000
650 PLOT19,25,CHR$(18)
655 RETURN
700 REM.....HIT SHIP.....
701 N=1
702 PLOT13,5,"          "
705 FORCN=1TO3
710 A2$=MID$(B$,M,36):PLOT2,7,A2$
715 M=M-1:IFM<1THENM=150
720 A3$=MID$(C$,B,36):PLOT2,11,A3$
725 B=B+2:IFB>145THENB=30
730 A4$=MID$(B$,V,36):PLOT2,9,A4$
735 V=V-2:IFV<1THENV=145
740 A5$=MID$(C$,C,36):PLOT2,13,A5$
745 C=C+3:IFC>145THENC=1
750 IFCN=1THENSN$="jkkklm"
```

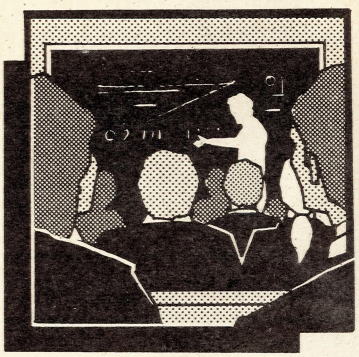
program listing

```
755 IFCN=2THENSN$="nnnnon"
760 IFCN=3THENSN$="    n "
765 PLOT13,5,SN$
776 WAIT1:NEXT
778 IFC1=0THENC1=7:S=295:GOTO780
779 C1=0:S=350
780 PLOT0,5,C1:SC=SC+S
785 PLOT13,5,"      "
795 RETURN
800 REM.....HIT SHIP.....
801 M=150
802 PLOT12,7,"          "
805 FORCN=1TO3
810 A1$=MID$(A$,N,36):PLOT2,5,A1$
815 N=N+1:IFN>100THENN=1
820 A3$=MID$(C$,B,36):PLOT2,11,A3$
825 B=B+2:IFB>145THENB=30
830 A4$=MID$(B$,V,36):PLOT2,9,A4$
835 V=V-2:IFV<1THENV=145
840 A5$=MID$(C$,C,36):PLOT2,13,A5$
845 C=C+3:IFC>145THENC=1
850 IFCN=1THENSN$="plkkkq"
855 IFCN=2THENSN$="nonnnn"
860 IFCN=3THENSN$=" n    "
865 PLOT13,7,SN$
876 WAIT1:NEXT
878 IFC2=7THENC2=3:S=350:GOTO880
879 C2=7:S=630
880 PLOT0,7,C2:SC=SC+S
885 PLOT13,7,"      "
895 RETURN
900 REM.....HIT SHIP.....
901 V=145
902 PLOT13,9,"          "
905 FORCN=1TO3
910 A1$=MID$(A$,N,36):PLOT2,5,A1$
915 N=N+1:IFN>100THENN=1
920 A2$=MID$(B$,M,36):PLOT2,7,A2$
925 M=M-1:IFM<1THENM=150
930 A3$=MID$(C$,B,36):PLOT2,11,A3$
935 B=B+2:IFB>145THENB=30
940 A5$=MID$(C$,C,36):PLOT2,13,A5$
945 C=C+3:IFC>145THENC=1
950 IFCN=1THENSN$="plkkkq"
955 IFCN=2THENSN$="nonnnn"
960 IFCN=3THENSN$=" n    "
965 PLOT13,9,SN$
976 WAIT1:NEXT
978 IFC3=2THENC3=0:S=530:GOTO980
979 C3=2:S=295
980 PLOT0,9,C3:SC=SC+S
985 PLOT13,9,"      "
999 RETURN
1000 REM.....HIT SHIP.....
1001 B=1
1002 PLOT13,11,"          "
1005 FORCN=1TO3
1010 A1$=MID$(A$,N,36):PLOT2,5,A1$
1015 N=N+1:IFN>100THENN=1
1020 A2$=MID$(B$,M,36):PLOT2,7,A2$
1025 M=M-1:IFM<1THENM=150
1030 A4$=MID$(B$,V,36):PLOT2,9,A4$
1035 V=V-2:IFV<1THENV=145
1040 A5$=MID$(C$,C,36):PLOT2,13,A5$
1045 C=C+3:IFC>145THENC=1
1050 IFCN=1THENSN$="jkkklm"
1055 IFCN=2THENSN$="nnnnon"
1060 IFCN=3THENSN$="    n "
1065 PLOT13,11,SN$
1075 WAIT1:NEXT
1078 IFC4=3THENC4=5:S=625:GOTO1080
1079 C4=3:S=425
1080 PLOT0,11,C4:SC=SC+S
1085 PLOT13,11,"      "
1099 RETURN
1100 REM.....HIT SHIP.....
1101 C=1
1102 PLOT13,13,"          "
1103 FORCN=1TO3
1110 A1$=MID$(A$,N,36):PLOT2,5,A1$
1115 N=N+1:IFN>100THENN=1
1120 A2$=MID$(B$,M,36):PLOT2,7,A2$
1125 M=M-1:IFM<1THENM=150
1130 A3$=MID$(C$,B,36):PLOT2,11,A3$
1135 B=B+2:IFB>145THENB=30
1140 A4$=MID$(B$,V,36):PLOT2,9,A4$
1145 V=V-2:IFV<1THENV=145
1150 IFCN=1THENSN$="jkkklm"
1155 IFCN=2THENSN$="nnnnon"
1160 IFCN=3THENSN$="    n "
1165 PLOT13,13,SN$
1175 WAIT1:NEXT
1178 IFC5=1THENC5=6:S=750:GOTO1180
1179 C5=1:S=680
1180 PLOT0,13,C5:SC=SC+S
1185 PLOT13,13,"      "
1195 RETURN
1200 REM.....END OF GAME.....
1205 PLOT9,0,CHR$(0)+CHR$(12)+"END OF GAME"
1207 PLOT10,2,"ANOTHER GO Y/N?"
1210 REPEAT
1215 Q$=KEY$
1225 UNTILQ$="N"ORQ$="Y"
1230 IFQ$="N"THEN1290
1235 GOTO1
1290 POKE618,3
1299 END
4000 REM.....INSTRUCTIONS.....
```

program listing

```
4001 CLS:PAPER4:INK7
4002 POKE618,10:HI=0
4100 PLOT2,4,"YOU ARE THE COMMANDER OF A U-BOAT"
4102 PLOT2,5,"WHICH HAS PENETRATED THE DEFENCES"
4104 PLOT2,6,"OF A NORTH SEA CONVOY.30 TORPEDOS"
4105 PLOT2,7,"ARE AT YOUR DISPOSAL,SINK AS MANY"
4106 PLOT2,8,"SHIPS AS YOU CAN."
4107 PLOT5,9,CHR$(5)+"USE THE SPACE BAR TO"+CHR$(1)+"FIRE"
4500 REM.....SCORE TABLE.....
4505 PLOT1,12,CHR$(21)+CHR$(0)+">>>>>>>>>>>SCORE TABLE<<<<<<<<<  "+CHR$(20)
4506 PLOT1,14,CHR$(0)+"abbbcd.....295"
4508 PLOT1,16,CHR$(7)+"abbbcd.....350"
4510 PLOT1,18,CHR$(5)+"abbbcd.....425"
4512 PLOT1,20,CHR$(2)+"abbbcd.....530"
4514 PLOT1,22,CHR$(3)+"abbbcd.....625"
4516 PLOT1,24,CHR$(6)+"abbbcd.....680"
4518 PLOT1,26,CHR$(1)+"abbbcd.....750"
4800 REM SET COLOURS.....
4801 C1=0:C2=7:C3=2:C4=3:C5=1
4997 REM.....
4998 REM  16K OWNERS USE THE FOLLOWING INSTEAD OF LINE 5002
4999 REM...5002 POKE14088+ZZ,D
5000 REPEAT
5001 READ D
5002 POKE46856+ZZ,D
5003 ZZ=ZZ+1
5005 UNTIL D=255
5100 DATA0,0,0,0,63,15,3,1
5101 DATA0,0,0,0,63,63,63,63
5102 DATA63,21,63,63,63,63,63,63
5104 DATA0,0,0,0,60,56,48,32
5105 DATA0,0,0,0,63,60,56,32
5106 DATA0,0,0,0,15,7,3,1
5107 DATA0,0,0,0,0,0,0,21
5108 DATA63,63,31,15,7,7,3,1
5109 DATA63,63,60,60,56,48,48,32
5110 DATA0,0,0,0,0,63,15,3
5111 DATA0,0,0,0,0,63,63,63
5112 DATA0,63,21,63,63,63,63,63
5113 DATA0,0,0,0,0,60,56,48
5114 DATA0,0,0,0,0,0,0,63
5115 DATA0,0,0,63,21,63,63,63
5117 DATA0,0,0,0,0,15,7,3
5118 DATA0,0,0,0,0,63,60,56
5119 DATA10,37,45,20,32,3,40,10
5120 DATA12,12,12,12,12,30,30,30
5200 DATA255
5999 REM .....GET KEY TO START.....
6000 PLOT9,11,CHR$(3)+"PRESS"+CHR$(12)+"'Y'"+CHR$(8)+"TO PLAY"
6002 FORW=1TO10:PLAY7,0,1,W*10:WAIT2:NEXT
6010 REPEAT
6012 Q$=KEY$
6014 UNTILQ$="Y"
6100 RETURN
```





Gridder

A fun educational program for the BBC *or* CBM64 by Jamie Clyde.

BBC/CBM64

Gridder is an educationally directed game program with versions for the Commodore 64 and the BBC micro model B. They both contain a cartesian graph test and the BBC version has a picture plotter which allows you to design shapes and pictures on a grid by entering co-ordinates.

Both the programs are suitable for children aged 8-12 for improving their graph skills.

The test is in two parts:

- In the first, you have thirty seconds, to type in the co-ordinates of the points which appear on the grid.
- In the second and final test, you are shown four points on a grid, marked A, B, C & D, and you have to type the name of the appropriate point when its co-ordinates are displayed. This should be done in the quickest time possible.

At the end of this, your results will be displayed along with what the micro thinks of you. On the CBM64 version, you also get a histogram showing your score. As far as using the program is concerned, to enter an answer in the first test all you need to do is to press the correct figure key — if you are wrong you will not see your answer on the screen and so you have to try again. In the second test, you just need to press A, B, C or D for your answer to the points given.

The picture plotter

For the benefit of readers with BBC's, I will outline the way to use the picture plotter. Firstly, you must press '1' at the menu and you will be greeted with a request for information. So enter the required value for the maximum 'x' axis number and press RETURN. (Maximum allowed is 99.) Do also for the 'y' axis. If you have followed these instructions correctly you should see in front of you a labelled pair of axes which means you can begin. You have four options:

'P'lot Point:
You will be asked for the co-ordinates of the proposed point e.g. (02,10). Then you must give it a name e.g. 'A', before it will ask you if you want the name displayed against the point and whether you want it to be joined up with the previous point by a line. After you have done all this you should be able to see your point on the graph.

'D'raw line:
This enables you to draw a line between named points.

'E'rase line/point:
You can remove points and lines with this command. Press 'P' to erase a point and 'L' to erase a line. Then do as requested.

Escape:
You can return to the menu by pressing either ESCAPE or '!'.

Additional features of the BBC version:

From the menu, you can also:
Turn off sound :
by pressing 'N'
Turn on sound :
by pressing 'O'
Get test instructions by pressing '3'

how it runs

BBC Version:

0-200	Menu
1000-2000	Test
5000-10000	Picture plotter
10000-15000	Extra routines
16000 +	Instructions and noise routines.

CBM64 version:

0-500	Start routines
1000-2000	Test1
2000-3000	Test2
3000-10000	End test
10000 +	Other routines

hints on conversion

One or other of these listings should suit most other dialects of BASIC with small changes. For example, the BBC version should run on the Electron with little change, if any, and likewise on the VIC20 with the '64 listing.

loader program

Loader program (for BBC)

```
  10REM      **************
  20REM      * Loader for *
  30REM      *            *
  40REM      *  GRIDDER   *
  50REM      *            *
  60REM      * (C)J.C '83 *
  70REM      **************
  80:
  90:
 100 MODE 7
 110FORT=1TO20:PRINTCHR$(132)CHR$157:NEXT
 115PRINTTAB(3,3)CHR$135STRING$(33,CHR$255)
 120PRINTT"
 130PRINTTAB(5,6)CHR$130          "
 140PRINTTAB(5,7)CHR$ "
 150PRINTTAB(5,8)CHR$130      "
 160PRINTTAB(5"
 170FORT=1TO7:PRINTTAB(3,3+T)CHR$135CHR$255;TAB(3
5,T+3)CHR$135CHR$255:NEXT
 180PRINTTAB(3,11)CHR$135STRING$(33,CHR$255)
 185PRINTTAB(8,12)CHR$131"(C) Jamie Clyde Dec '83
"
 190PRINT''CHR$132CHR$157TAB(4)CHR$135CHR$157CHR$
129"A Tutor of  Cartesian Graphs";CHR$132CHR$157
 200PRINT''CHR$132CHR$157CHR$141TAB(12)CHR$136CHR
$135"Now Loading:"
 210PRINTCHR$132CHR$157CHR$141TAB(12)CHR$136CHR$1
35"Now Loading:"
 220FORT=1TO3:PRINTTAB(0,19+T)CHR$132CHR$157;TAB(
8)CHR$156TAB(31)CHR$132CHR$157
 230NEXT:PRINTCHR$132CHR$157
 250 VDU28,10,22,30,20,135
 260CHAIN""
>L.
```

BBC program

```
   0REM ***********
   1REM * Gridder *
   2REM *         *
   3REM * (C) J.C *
   4REM ***********
   9:
  10VDU23;8202;0;0;0;
  12ONERRORRUN
  80DIMP(4,2),X1(4),Y1(4),X(4),Y(4),CH(4),PO(100,
2),P$(100):FORT=1TO4:READP(T,1),P(T,2):NEXT
  90VDU23,255,65,34,20,8,20,34,65,0
  95VDU23,254,&FF,&FF,&FF,&FF,&FF,&FF,&FF,&FF
  99MODE7:VDU23;8202;0;0;0;
 100CLS:REM * Menu *
 110PRINTTAB(10,1)CHR$141"Gridder";CHR$140:PRINTT
AB(10,2)CHR$141"Gridder";CHR$140:PRINTTAB(10,3)CHR
$129"______"
 120PRINTTAB(5,5)"1> Plot Points"
 130PRINTTAB(5,7)"2> Super Test"
 135PRINTTAB(5,9)"3> Instructions for Test"
 137PRINTTAB(4,15)CHR$(136)"0"CHR$137" for no sou
nd,"CHR$136"N"CHR$137" for sound"
 140PRINTTAB(5,11)CHR$(136)CHR$(134)"Press '1','2
 or '3'"CHR$137
 145PRINTTAB(5,20)CHR$157CHR$129"(c) Jamie Clyde
1983 ";CHR$156CHR$135
 150PROCkey
 160IFR$<>"1"ANDR$<>"2"ANDR$<>"3"ANDR$<>"N"ANDR$<
>"0"GOTO150
 170IFR$="1" MODE1:PROCplot:MODE7
 180IFR$="2" MODE1:PROCtest:MODE7:PROCendTest
 190IFR$="3" MODE7:PROCins
 192IFR$="N" PROCnonoise
 194IFR$="0" PROCnoise
 200GOTO100
1000DEFPROCtest:S=0:VDU23;8202;0;0;0;
1010PROCgrid:PROCaxis:VDU4
1015PRINTTAB(15,0)"Super Test"
1020S=0:PRINTTAB(30,0)"Score :";S
1030TIME=0:REPEAT
1040X=RND(9):Y=RND(9):G=0
1050X1=X*70-12:Y1=Y*70+12:IFPOINT(X1,Y1)=3 GOTO10
40ELSEMOVEX1,Y1:VDU5:GCOL0,3:PRINTCHR$255
1055VDU5:MOVE-90,-104:PRINT"( , )"
1060REM * Input *
1070REPEAT:SOUND1,-15,TIME/200,1:VDU4:PRINTTAB(0,
0)" Time :";TIME/100:IFTIME>3000 GOTO2000
1080I=INKEY(0):UNTILI<>-1
1085I=I-48:SOUND3,-15,255,1
1090VDU5:IFG=0 IFX=I SOUND0,-15,10,2:G=G+1:MOVE-3
40,-104:PRINTI:GOTO1070
1100IFG=1IFY=I SOUND0,-15,20,2:MOVE-290,-104:PRIN
TI:GOSUB1500:UNTILTIME>30000:GOTO2000
1110GOTO1070
1498STOP
1499REM * Correct *
1500FORT=1TO4:SOUND1,-15,P(T,1),P(T,2):NEXT
1510MOVEX1,Y1:PRINTCHR$254
1520VDU4:PRINTTAB(0,29)"            "
1530VDU4:PRINTTAB(0,28)"            "
1535S=S+10
1540PRINTTAB(30,0)"Score :";S
1550RETURN
1590STOP
1999REM * Test Two *
2000:FORT=100TO150STEP10:SOUND1,-15,T,2:FORT1=T T
O255
2010SOUND1,-15,T1,0.1:NEXTT1,T
2020VDU5:CLS
2030VDU4,19,3,14,0,0,0:PRINTTAB(13,10)" T e s t 2
"
2035FORA=1TO10000:NEXT:VDU19,3,3,0,0,0
```

BBC program

```
 2040CLS:PROCgrid:PROCaxis:COLOUR3
 2050VDU4:PRINTTAB(5,0)"Score :";S;TAB(15)"Super T
est"
 2100FORT=1TO4:CH(T)=0
 2110X=RND(9):Y=RND(9)
 2120X1=X*70-12:Y1=Y*70+12:IFPOINT(X1,Y1)=3 GOTO21
10ELSEMOVEX1,Y1:VDU5:GCOL0,3:VDU255
 2130MOVEX1+18,Y1-18:VDU64+T:X(T)=X:Y(T)=Y:X1(T)=X
1:Y1(T)=Y1:NEXT
 2200FORT=1TO4
 2210B=RND(4):IFCH(B)=1THEN2210
 2220VDU4:PRINTTAB(5,29)"Which has coordinates of
(";X(B)",";Y(B);")?";
 2230PROCkey:IFASC(R$)<>64+B THEN2230
 2240VDU64+B:S=S+10:PRINTTAB(5,0)"Score :";S
 2250FORD=1TO4:SOUND1,-15,P(D,1),P(D,2):NEXT
 2260PRINTTAB(3,29)SPC(40)
 2270CH(B)=1:NEXT
 3000ENDPROC
 3999STOP
 4000DEFPROCendTest
 4010PRINTTAB(8,10)CHR$141"Test Completed":PRINTTA
B(8,11)CHR$141"Test Completed"
 4020PRINTTAB(5,15)CHR$129"Your Score : ";CHR$(136
)CHR$130S:PRINT'TAB(4)CHR$(129);" In ";CHR$(136)CH
R$130TIME/100CHR$(137)"Seconds."
 4030PRINTTAB(7,20)CHR$(130)"Personal Rating:"
 4040A$="Pathetic":IFS<60ANDS>40THENA$="Could Be B
etter"
 4050IFS>50ANDS<100THENA$="Not Bad"
 4060IFS>90ANDS<150THENA$="Good"
 4070IFS>140THENA$="Excellent"
 4080A$=CHR$(129)+CHR$(157)+CHR$130+A$+"  "+CHR$(1
56)
 4085PRINT'TAB(8)A$
 4090Q=GET:ENDPROC
 4990STOP
 4996REM ********
 4997REM * Plot *
 4998REM ********
 5000DEFPROCplot:N=1
 5010PRINTTAB(10,1)"Picture Plot"
 5020 PRINTTAB(5,5);:INPUT"Maximum 'x' coord.?"X:I
FX=0ORX>90THENSOUND1,-15,15,10:GOTO5020
 5025SOUND3,-15,200,5
 5030 PRINTTAB(5,7);:INPUT"Maximum 'y' coord.?"Y:I
FY=0ORY>90THENSOUND1,-15,15,10:GOTO5030
 5035SOUND3,-15,200,5
 5036CLS
 5040 PROCgrid:FORT=0TO9:IF(X+T)/10=INT((X+T)/10)T
HENX%=T+X:X2%=X%/10
 5050IF(Y+T)/10=INT((Y+T)/10)THENY%=T+Y:Y2%=Y%/10

 5060NEXT
 5090GCOL0,2:MOVE0,0:DRAW700,0:MOVE0,0:DRAW0,700
 5092A=1:IFX%>9THENA=2
 5100FORT=1TO10STEPA:VDU5:MOVET*70-300,-10:PRINTX2
%*T:NEXT
 5110FORT=1TO10:VDU5:MOVE-350,T*70:PRINTY2%*T:NEXT
 5200REM * Start *
 5205COLOUR2:GCOL0,3:VDU4,23;8202;0;0;0;
 5210PRINTTAB(10,0)"Picture Plotter"
 5211PRINTTAB(30,3)"The Keys:"
 5212PRINTTAB(30,5)"'P'-Point"
 5213PRINTTAB(30,7)"'D'-Draw"
 5214PRINTTAB(30,9)"'E'-Erase"
 5215PRINTTAB(30,11)"'|'-Stop"
 5220PRINTTAB(5,28)"       Option Required:"SPC(15
)
 5300PROCkey:IFR$="P"THENPROCpoint:GOTO5220
 5310IFR$="D"THENPROCdraw:GOTO5220
 5320IFR$="E"THENPROCerase:GOTO5220
 5330IFR$="|"THENENDPROC
 5400GOTO5220
 5500DEFPROCpoint:VDU5:PRINTTAB(10,28)SPC(35):VDU4

 5510PRINTTAB(10,28)"Coordinates :(      ":R1$="":F
ORD=1TO2
 5520PROCkey:R=ASC(R$):IFR<48ORR>57THEN5520ELSER1$
=R1$+R$:PRINTTAB(23+D,28)R$:NEXT
 5525IFVAL(R1$)>X R1$="":GOTO5510
 5530PRINTTAB(26,28)",":R2$="":FORD=1TO2
 5540PROCkey:R=ASC(R$):IFR<48ORR>57THEN5540ELSER2$
=R2$+R$:PRINTTAB(26+D,28)R$:NEXT
 5545IFVAL(R2$)>Y GOTO5530
 5550PRINTTAB(5,28)SPC(28)
 5555PRINTTAB(10,28)"     Name  ";:INPUTP$(N)
 5560SOUND3,-15,150,10:FORJ=0TON-1:IFP$(J)=P$(N) J
=N-1:NEXT:GOTO5555
 5570NEXT:PO(N,1)=VAL(R1$)/X2%*70:PO(N,2)=VAL(R2$)
/Y2%*70+2
 5580PLOT69,PO(N,1),PO(N,2)
 5590PRINTTAB(10,28)"Display Name?    ":PROCkey:IFR
$<>"N"ANDR$<>"Y" GOTO5590ELSEIFR$="Y"VDU5:MOVEPO(N
,1)-30,PO(N,2)+30:PRINTP$(N)
 5592VDU4:PRINTTAB(10,28)SPC(30)
 5595IFN=1THENN=N+1:ENDPROC
 5600VDU4:PRINTTAB(5,28)"Join up with Previous Poi
nt?":PROCkey
 5610IFR$<>"Y"ANDR$<>"N" PROCkey:GOTO5610
 5615PRINTTAB(5,28)SPC(30)
 5620IFR$="N" N=N+1:ENDPROC
 5630MOVEPO(N,1),PO(N,2):DRAWPO(N-1,1),PO(N-1,2)
 5650N=N+1:ENDPROC
 5700DEFPROCdraw:IFN<3 ENDPROC
 5710PRINTTAB(10,28)"Point to Draw From";:INPUTP$:
SOUND3,-15,200,10
 5720PRINTTAB(10,28)"Point to Draw to  ";:INPUTT$:
SOUND3,-15,200,10
 5730FORG=1TON:IFP$(G)=P$ O=G ELSENEXT:GOTO7510
 5740G=N:NEXT:FORG=1TON:IFP$(G)=T$ O1=G ELSENEXT:G
OTO5720
 5750G=N:NEXT:MOVEPO(O,1),PO(O,2):DRAWPO(O1,1),PO(
O1,2)
 5760ENDPROC
 5800DEFPROCerase:IFN=1 ENDPROC
 5805PRINTTAB(10,28)"Erase (L)ine or (P)oint?"
 5807PROCkey:IFR$<>"L"ANDR$<>"P" GOTO5807
 5808PRINTTAB(10,28)SPC(30)
 5809IFR$="L" PROCedraw:ENDPROC
 5810PRINTTAB(10,28)"Name of point to erase";:INPU
TQ$
 5820FORT=1TON:IFQ$=P$(T) T1=T:T=N:NEXT ELSENEXT:P
RINTTAB(10,28)SPC(30):ENDPROC
 5830GCOL0,0:PLOT69,PO(T1,1),PO(T1,2):GCOL0,3
 5840GCOL0,0:VDU5:MOVEPO(T1,1)-30,PO(T1,2)+30:PRIN
TP$(T):GCOL0,3:VDU4
 5845P$(T1)="":PO(T1,1)=0:PO(T1,2)=0
 5850ENDPROC
 5900DEFPROCedraw
 5910PRINTTAB(10,28)"Remove from point";:INPUTQ$
 5915FORT=1TON:IFQ$=P$(T) T1=T:T=N:NEXT ELSENEXT:P
RINTTAB(10,28)SPC(30):GOTO5910
 5920PRINTTAB(10,28)"Remove to   point";:INPUTQ$
 5930FORZ=1TON:IFQ$=P$(Z) T2=Z:Z=N:NEXT ELSENEXT:P
RINTTAB(10,28)SPC(30):GOTO5920
 5940GCOL0,0:MOVEPO(T1,1),PO(T1,2):DRAWPO(T2,1),PO
(T2,2):GCOL0,3:PLOT69,PO(T1,1),PO(T1,2):PLOT69,PO(
T2,1),PO(T2,2)
 5990ENDPROC
 6000,
 9999STOP
10000DEFPROCkey
10010R$=GET$
10020SOUND3,-15,255,1
10030ENDPROC
```

BBC program

```
10100 DEFPROCgrid:GCOL0,1
10110VDU29,200;200;
10120FORA=0TO700STEP70:MOVE0,A:DRAW700,A:MOVEA,0:D
RAWA,700
10130FORG1=1TO100:NEXTG1,A:ENDPROC
10200DEFPROCaxis:GCOL0,2
10210MOVE0,0:DRAW0,700:MOVE0,0:DRAW700,0
10220VDU5:FORA=0TO700STEP70:MOVE-350,A:PRINTA/70:N
EXT
10230FORA=70TO700STEP70:MOVEA-300,-10:PRINTA/70:NE
XT
10250ENDPROC
15110FORT=1TO10:VDU5:MOVE-350,T*70:PRINTY2%*T:NEXT
16000 DEFPROCins:CLS
16010PRINTCHR$132CHR$157TAB(13)CHR$141CHR$135"Supe
r Test"
16020PRINTCHR$132CHR$157TAB(13)CHR$141CHR$135"Supe
r Test"
16040PRINTTAB(5,5)"TEST 1:"
16050PRINTTAB(4,6)CHR$129"_______"
16060 PRINTTAB(1)CHR$130"In this test you have 30
seconds to"
16070 PRINTTAB(1)CHR$130"name the coordinates o
f as many"
16080 PRINTTAB(1)CHR$130"points which appear on t
he gird ."
16090PRINTTAB(5,11)"TEST 2:"
16100PRINTTAB(4,12)CHR$129"_______"
16110 PRINTTAB(1)CHR$130"In this test you have
to say"
16120 PRINTTAB(1)CHR$130"if the coords. of point
listed are"
16130 PRINTTAB(1)CHR$130"'A','B','C'or 'D'."
16140 PRINT''TAB(1)CHR$133"When you have finished
this , your"
16150 PRINTTAB(1)CHR$133"score,time& personal rati
ng will be"
16160 PRINTTAB(1)CHR$133"displayed."
16170PRINT'CHR$132CHR$157TAB(13)CHR$141CHR$135"Pre
ss SPACE"
16180PRINTCHR$132CHR$157TAB(13)CHR$141CHR$135"Pres
s SPACE"
16190 A=GET:IFA<>32 GOTO16190
16200ENDPROC
17000DEFPROCnoise
17010*FX210,1
17020ENDPROC
18000DEFPROCnonoise
18010*FX210,0
18020ENDPROC
20000DATA53,2,49,2,53,2,101,15
```

CBM 64 program

```
10 :
20 :
100 DIMC(4),X(4),Y(4),E%(3),E$(3)
199 REM * MENU *
199 REM CLR-CTH
200 POKE53280,2:POKE53281,6:PRINT"■"CHR$(142):CLR
202 F$="          G R I D D E R - WRITTEN BY JAMIE CLYDE COPYRIGHT(C) MARCH'84"
204 F$=F$+" SOFTWARE EXPERIANCE - THE WAY TO MASTER CARTESIAN GRAPHS.          "
209 REM HOM
210 PRINT"■"
214 REM RVS-YEL-CRU
215 FORT=1TO3:PRINT"■■                                                    ":NEXT
219 REM RVS-YEL PUR-CRR LGN PUR LGN PUR LGN PUR CRR-YEL
220 PRINT"■  ■    ■■■
```

CBM64 program

```
380 GETR$:IFR$=""THEN380
390 IFR$=CHR$(13)ANDA$<>""THEN500
400 IFR$=" "THEN430
409 REM PUR   2*CRL-CYN-RVS OFF-CRL
410 IFR$=CHR$(20)ANDLEN(A$)>0THENPRINT"■-■■■■ ■■■";:A$=LEFT$(A$,LEN(A$)-1)
420 R=ASC(R$):IFR<65OR(R>90ANDR<192)ORR>223THEN380
429 REM RVS OFF-CRL
430 IFLEN(A$)<14THENPRINTR$"■ ■■■";:A$=A$+R$
440 GOTO380
499 REM   3*CRD-  6*CRR-YEL-RVS
500 D$=A$:PRINT:PRINT"■■■■■■■■■■■■■■■■ WANT INSTRUCTIONS?(Y/N)"
510 GOSUB10100:IFR$<>"Y"ANDR$<>"N"THEN510
520 IFR$="Y"THENGOSUB11000:POKE53280,2:POKE53281,6
529 REM CLR- 10*CRD- 12*CRR-RVS-PUR
530 PRINT"■■■■■■■■■■■■■■■■
```

CBM 64 program

```
1999 REM CLR
2000 PRINT"■":POKES1+4,16:POKES1+11,32:POKES1+1,0
2010 GOSUB10000
2019 REM HOM-CRR-LGN ORN PUR LRD
2020 PRINT"■■SCORE :■"S;TAB(15)"■SUPER TEST      ■TEST2"
2020 REM HOM-  4*CRD YEL
2021 PRINT"■■■■■"TAB(29)"■NAME  THE"
2021 REM CRD YEL
2022 PRINT"■"TAB(28)"■POINT WHOSE"
2022 REM CRD YEL
2023 PRINT"■"TAB(28)"■COORDINATES"
2023 REM CRD
2024 PRINTTAB(28)"■ARE"
2029 FORT=1TO4
2030 GOSUB1700:IFPEEK(55343+X%+40*Y%)=1THEN2030
2035 X(T)=X:Y(T)=Y:C(T)=0
2040 POKE1071+X%+40*Y%,T
2050 POKE55343+X%+40*Y%,1:NEXT
2060 FORU=1TO4
2070 R%=RND(1)*4+1:IFC(R%)=1THEN2070
2071 REM HOM- 10*CRD CYN GR1 CYN-CRL GR1 CYN-CRL
2072 PRINT"■■■■■■■■■■■■"TAB(32)"■(■"X(R%)"■■,■"Y(R%)"■■)":C(R%)=1
2080 GOSUB10100:IFR$<"A"ORR$>"D"THEN2080
2090 IFR%<>ASC(R$)-64THEN2080
2099 REM HOM ORN
2100 GOSUB10200:S=S+10:PRINT"■"TAB(9)"■"S
2110 NEXTU
2120 A$=TI/100-20
2200 REM * FINISH OFF *
2210 GOSUB10300
2219 REM CLR- 11*CRD-  7*CRR-RVS-RED
2220 PRINT"■■■■■■■■■■■■
```

CBM 64 program

```
3399 REM CRD-RVS-WHT
3400 PRINTTAB(27)"■■■"E$(3)
3499 REM HOM-  2*CRD-  6*CRR-RVS-WHT
3500 PRINT"■■■■■■■■■■■ PRESS SPACE TO RESTART "
3510 GOSUB10100:IFR$<>" "THEN3510
3520 GOTO200
9988 REM HOM
9989 PRINT"■":END
9990 STOP
9994 :
9995 REM ******************
9996 REM * OTHER ROUTINES *
9997 REM ******************
9998 :
9999 REM * GRID *
9999 REM HOM-  2*CRD-  6*CRR-CYN CRR-RED
10000 PRINT"■■■■■■■■■■■
```

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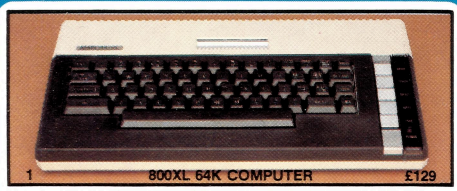

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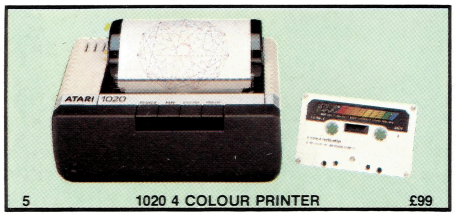

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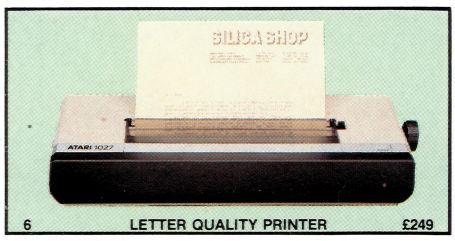

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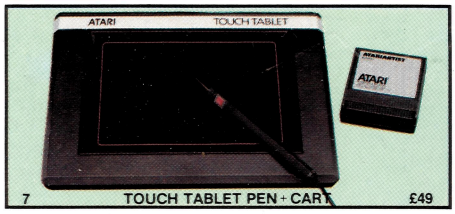

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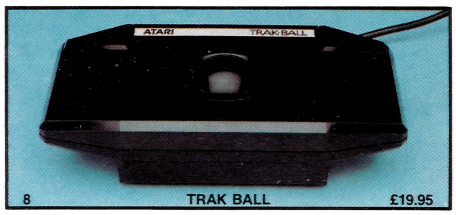

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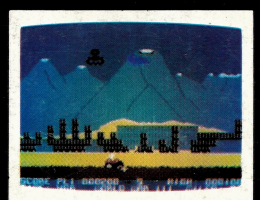



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