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Personal Computing Today

July 1984
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Special Supplement:
Your Commodore

Software House survey - Over 200 entries

Which firm does what and where!

Explosive

games to type in for Spectrum and CBM64 plus programs for BBC and Texas

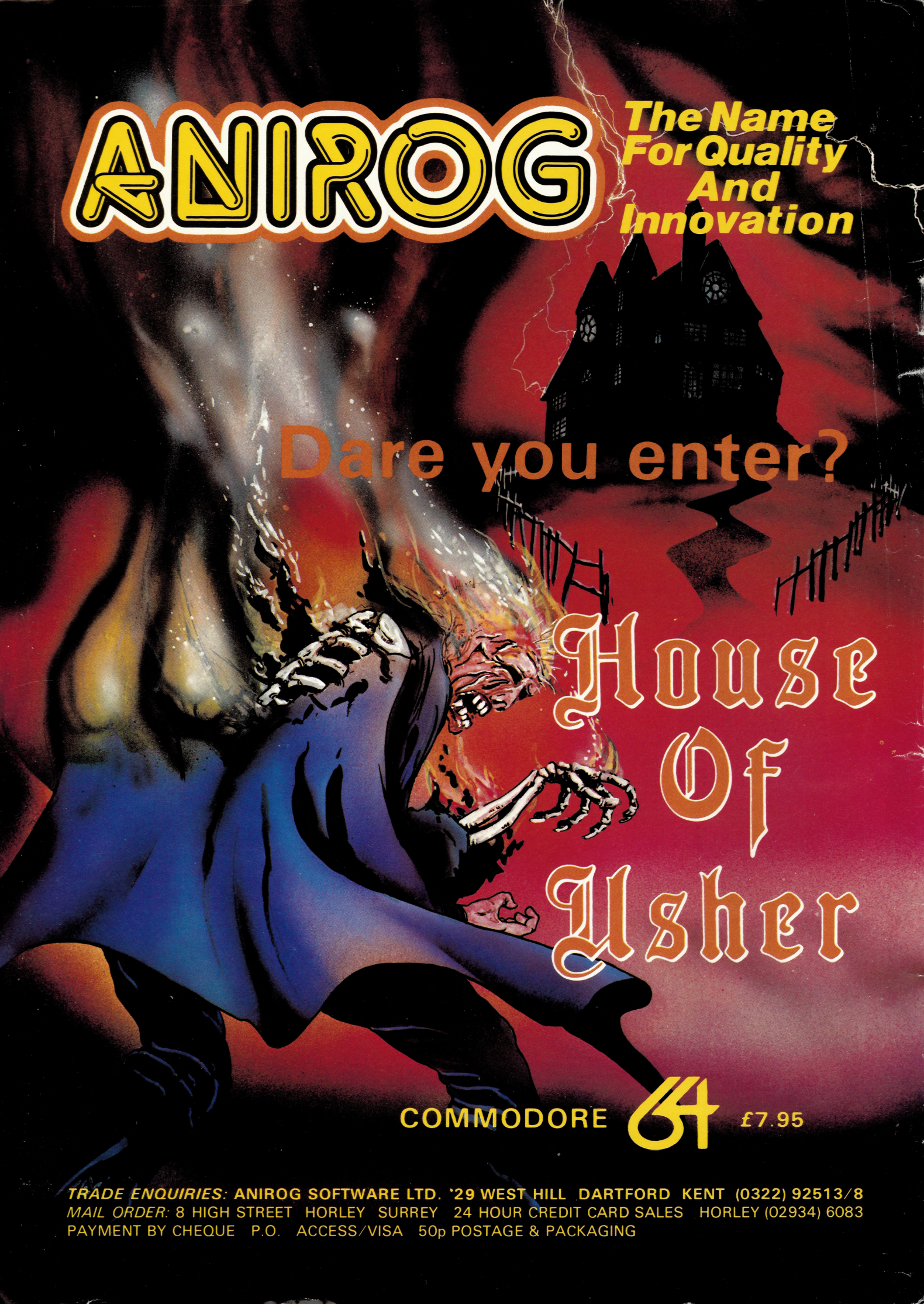
The QL

A quantum leap for Sinclair?



Software Reviews
Games galore for leisure and lessons

Programming
VIC 20 basic procedures explained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ABC

The abundance of software houses in the U.K. is startling with more large companies and individuals turning their skills to producing programs each week. This, while increasing the choice of titles available to you, also has the effect of causing confusion about who produces what and for which micros! It's all very well to walk into your local software store if you've got the time (and the inclination) to browse through their wealth of titles, but if you are looking for a program to do a specific job on your micro, you need to go directly to the potential producers. This is especially important with educational, business and utility programs.

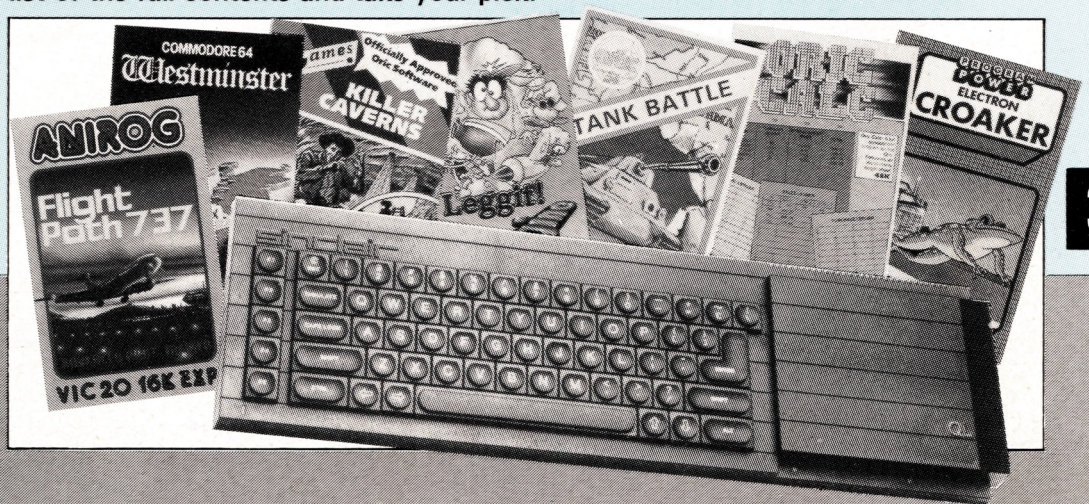
This month in *Personal Computing Today* you will find a directory of software producers in the U.K. For each software house included, there are details of the type of programs produced and which micros they are for. The directory is meant to be a handy reference guide which you can keep. So anytime you need a hand through the software jungle turn to the directory and your problems will be solved quickly and easily.

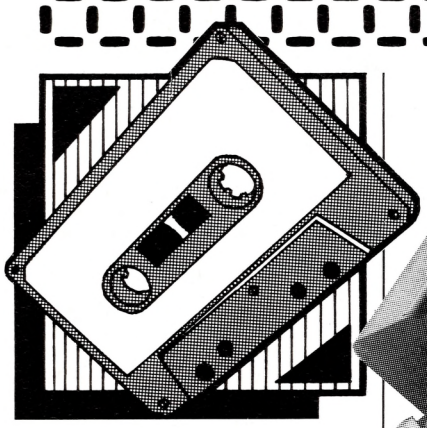
So much has already been written about that all evasive beast — the Sinclair QL. In this issue of *Personal Computing Today* we put all the theory to the test and give this innovative micro a thoroughly practical examination. Everyone has been speculating, now read what it is really capable of in *Personal Computing Today*.

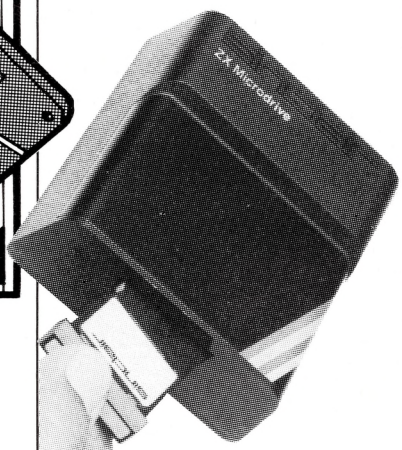
Also in *Personal Computing Today* this month is the start of a series of articles on how to get your VIC20 to perform. For a complete beginner to computing the control of the keyboard functions can be very confusing. The author of these articles was once in that position too and his clear and explicit instructions on how to use the colour codes starts off this informative series which will continue through the summer months.

One of our interesting feature articles this month is based on the results of the readers' survey which we published in the February issue. In conjunction with Iain Peacock of Heriot Watt University, we have collated all the replies we received and the results provide some interesting reading about the state of personal computing today!

Our Teach-in series continue with another lesson in machine code and more about programming the Oric micro. As usual we have some excellent programs for you to type into your own micro. Minefield and Bombshell are particularly good and on the utilities front, there is a definitive character definition program for the BBC. Plenty to keep you riveted, so turn over for a list of the full contents and take your pick!







CONTENTS

NEXT MONTH

Next Month 7
Previews of the August issue to whet your appetite.

NEWS

News 8
Who's going up, who's falling down and what's around. Reports in and about the world of home computers.

FEATURE

Personal Computing Today 13
The results of our own Readers' Survey form the basis of this informative article on the state of home computing today.

BBC SOFTWARE

Characters by Design 18
This is the definitive character definition program for the BBC.

TI99/4A SOFTWARE

Regatta 24
A novel strategy game written in unexpanded BASIC. Plot your course directly to these pages.

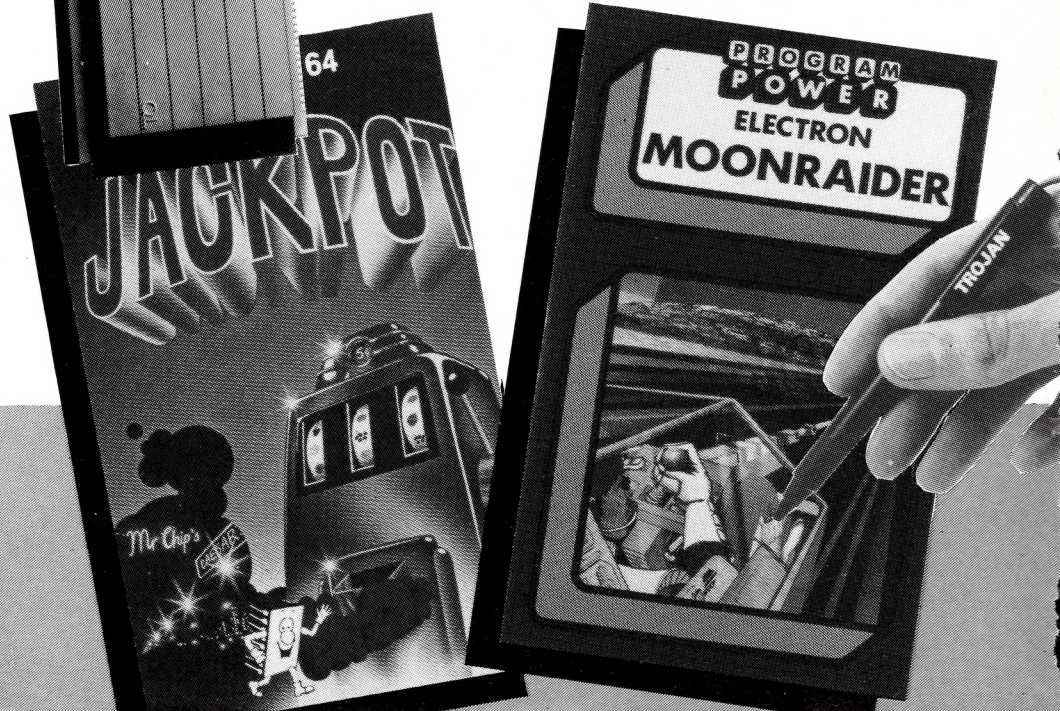
VIEWS

Input 30
The pages where readers get their chance to alter the shape of the magazine or simply find a voice for their opinions.

REVIEW

Software Selection 33
Looking for what to buy next? PCT's software review team have been busy sifting the chaff from the wheat to save your time and money.





1984

ON TEST

The Sinclair QL **37**
All the speculative opinions of the last few months were put to the test when PCT carried out this exciting bench test. Read our report and gen up on Sinclair's hottest machine.

SPECTRUM SOFTWARE

Bombshell **44**
An excellently written, exciting game for the 48K machine.

TEACH IN

VIC20 for Beginners **49**
To kick off this informative series on the VIC, the colour codes of the micro are explained in very clear stages.

TEACH IN

Oric Options Part 4 . . . . . **52**
This series moves on from screen manipulations to the use of sound on the Oric micro.

REFERENCE

Directory of Software Houses **61**
Contact addresses for the majority of software producers in the U.K. along with details of what they produce. An important reference guide for you to keep.

TEACH IN

Machine Code 64 . . . . . **73**
We fill in the cracks in your understanding of this essential tool for home programmers.

CBM 64 SOFTWARE

Minefield **76**
Explosive action on the CBM machine!

REFERENCE

Popular Programming **81**
A useful article explaining how to get your work published.

ON TEST

Testbed **85**
We take a look at the choices of data storage available to the home computer user and bench test some of the systems.

REFERENCE

Hardware Factfile **90**
Specifications for home computers on the market.



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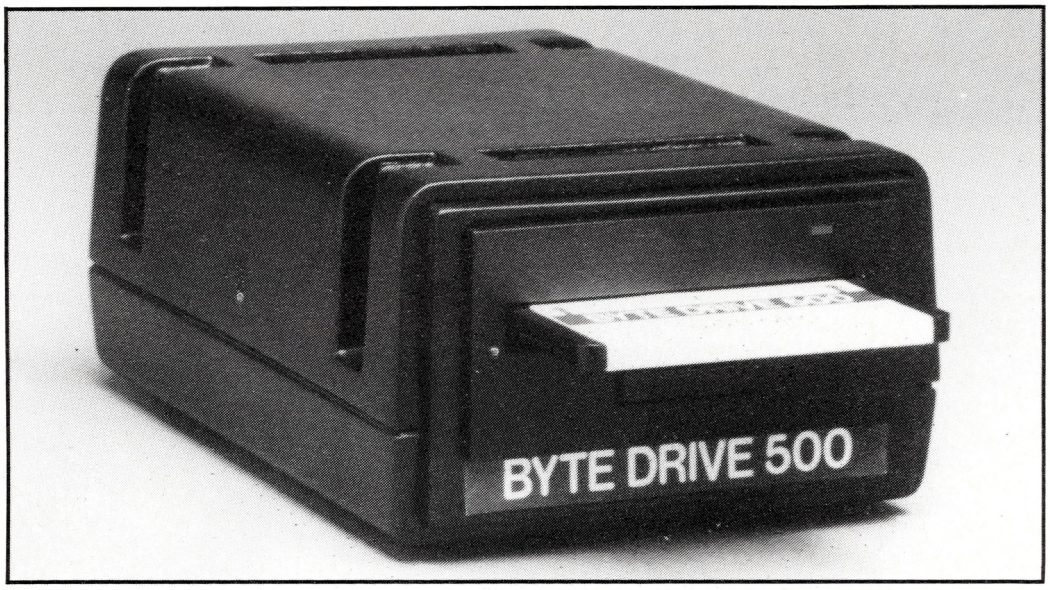
Next Month

Oric Disk Decisions

Our hardware review next month will concentrate on the disk drives available for the Oric and Atmos computers. Oric's own long awaited disk drives have been launched and their performance will be compared to that of a competitive unit, the Byte Drive 500 designed and manufactured by ITL Kathmill Ltd., who also produce systems for the BBC micro.

Both units cost less than £300 complete and have similar storage capacities of about 160K-bytes per side of disk. But how do they perform? Order your copy of the August issue of *Personal Computing Today* today to find the answer.



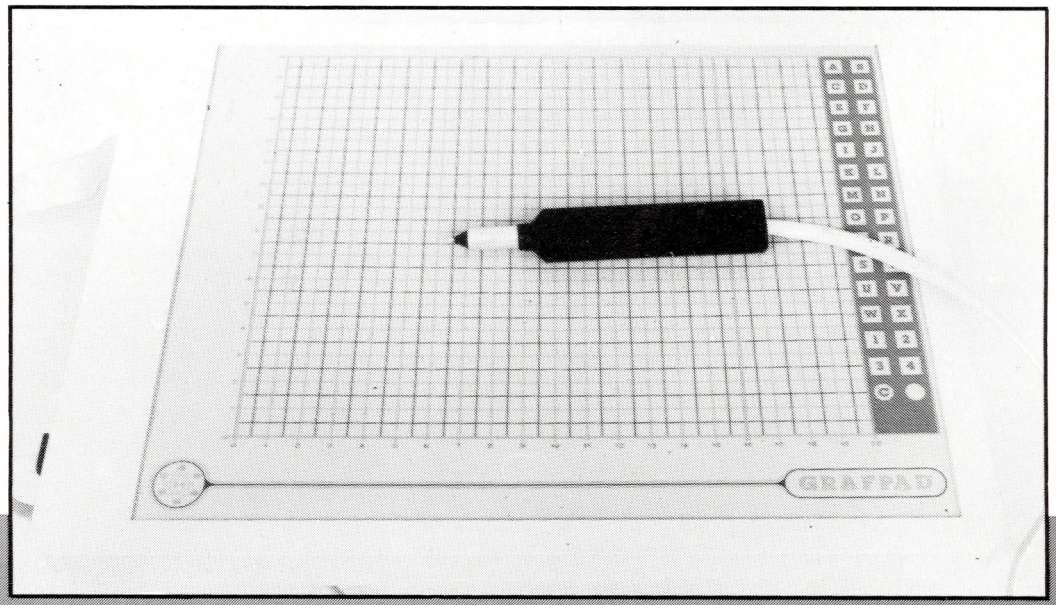
Drawing Devices

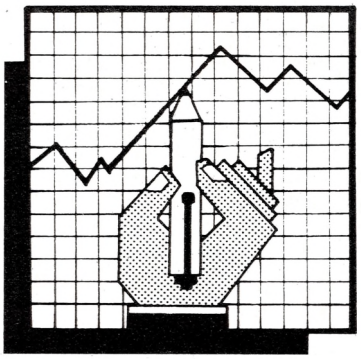
Also next month we'll be taking a look at some of the hardware and software around which turns your micro into a drawing machine. Graphics technology has improved considerably over recent months and there are now many inexpensive peripherals and software packages, from comprehensive drawing programs to the sensational and professionally orientated graphics boards and utilities. Make more of your micro's capabilities and gen up on how to do this by reading August's PCT.

'Edsoft' Scene

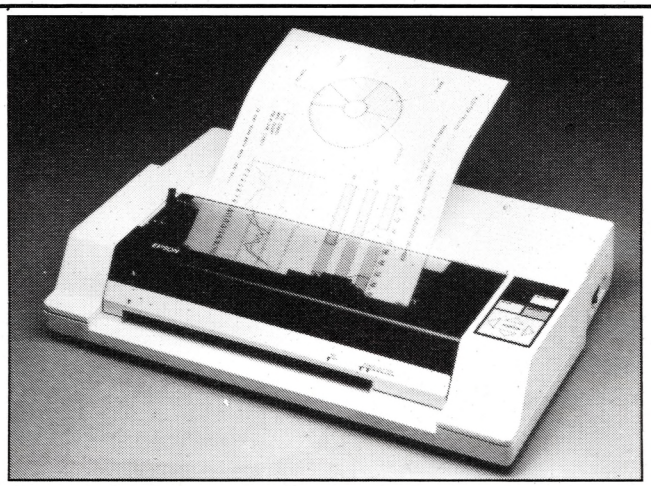
Computers in education are not new. Now even primary school children use them as tools for learning. Next month you can read an article by an experienced educational software supplier about the 'edsoft' scene, the state it's at and where it's going. Don't get left behind in the education race. Catch up with PCT.

As usual the August issue of PCT will be packed with programs for you to put into your own micro, along with detailed documentation so you can learn more about programming while having fun! Reviews of software (games and educational) abound and there will be further 'teach-in' articles for the CBM64, VIC20 and Oric. So, fill in your advance order form below and make sure of your August copy now.





News



Epson Plot Their Way

Four new printers have been announced by leading printer manufacturer Epson, and exciting packages they are too.

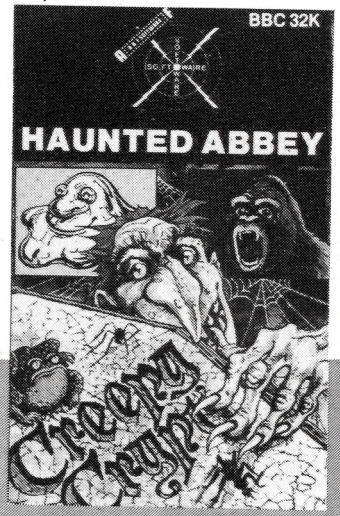
There are two new thermal printers aimed at the home user. The P40 is a compact dot matrix model which uses thermal paper and has 40 columns as standard. It will cost only £95 plus VAT and will be fully available in the U.K. in August. The P80 is a thermal transfer printer with a true 60 column capacity and accepts both plain and thermal paper. It runs at 45 characters per second, printing in both text and graphics mode, and can operate with or without ribbon cassettes. This will retail at £160 plus VAT and will be available in October. Both thermal printers feature rechargeable batteries.

More upmarket, but no less interesting for that, is their new colour printer, the JX-80 which has the useful feature of being able to automatically default to monochrome. It is a high speed dot matrix model running at 160 characters per second and capable of producing up to seven colours. Other features are high resolution graphics, a wide choice of international character sets and a variety of print styles and sizes. The JX-80 will be available in July and will retail at £560 plus VAT. Also announced, and available in August is a colour plotter retailing at £400 plus VAT.

A & F Against The Pirates

The Rochdale based software house of A & F are confident enough of a new software protection procedure to incorporate it into all their products. The idea of this system was the brainchild of Jim Lamont, whose recent hardware anti-piracy protection system was confiscated by the Ministry of Defence leading to an outcry in the Press.

A & F developed Mr Lamont's software protection code to a stage where, they say, it would require an enormous amount of computer time and equipment to crack it. They believe it would take their own development engineers several weeks to get into the system and they know how it works. It is hoped that this system will prevent unlawful duplication of programs thereby increasing legitimate sales. We hope it's successful.



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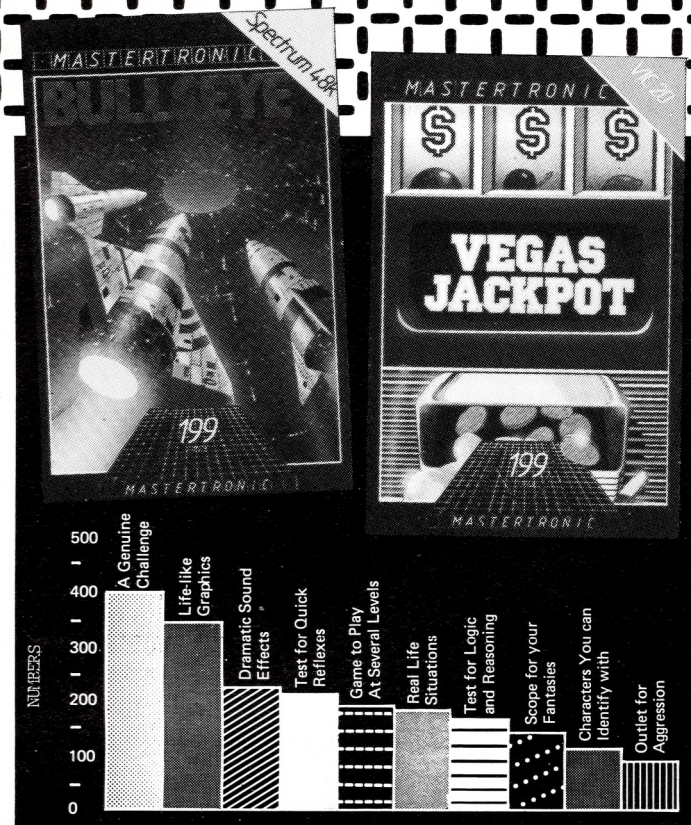


Lower Priced Software May Mean Mediocrity

This was the warning issued by Derek Meakin, head of National Micro Centres, in a recent press release. He made his announcement following the news that a new software company, Mastertronic, aims to flood the market with games costing only £1.99 — more than £5 below the average market price of cassette software.

Mr Meakin fears that other software companies will follow suit by entering into a cut-throat price war. While it has obvious attractions to the consumer, software houses, particularly the smaller ones, already operate on a very tight budget and may well be driven to bankruptcy. Mr Meakin said "One thing that is very certain is that the people who are really going to feel the pinch are software writers, many of them freelancers. They certainly won't want to spend many months dreaming up some new masterpiece, as they do at the moment, if all they are going to get are mediocre royalties. So this means that quality — and standards — will slide rapidly".

Mastertronic's announcement comes hot on the heels of Imagine's decision not to implement their planned dramatic price cuts (from £5.50 to £3.95) because they felt that such an action could have put many of their less profitable competitors out of business.

Maybe protection schemes like the one employed by A & F Software will safeguard companies' revenue and enable them to bear some price cutting in the future.

Diary Dates

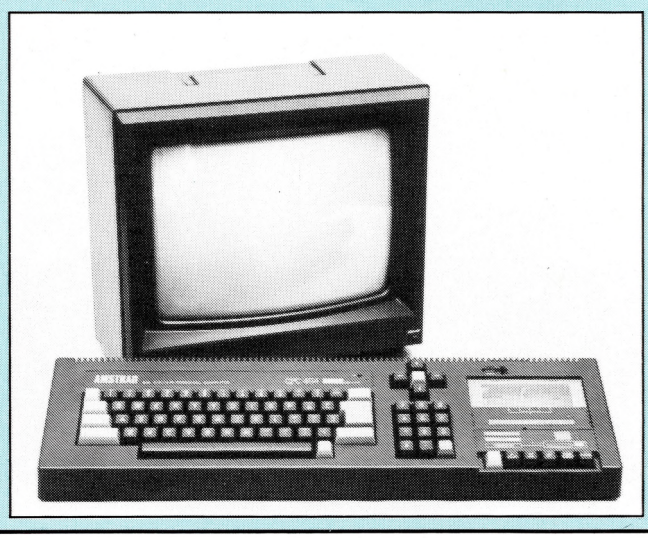
June 7th-9th at the Novotel London Hotel, Hammersmith, London W6 are the dates of the 5th International Commodore Computer Show.

Melbourne House Publishers have extended the closing date for entries to their HURG competition. Game designers will now have until 30th June, 1984 to win the prize of £3,000. Each month until the closing date, Melbourne House will also choose a £250 prize winner.

Amstrad Go Visual

The announcement that this leading manufacturer of budget-priced Hi-Fi systems was to launch a computer was met with a fair amount of sceptism by staff in these offices. Could they succeed at producing precision electronic equipment? A ZX80A, CP/M compatible 64K system was nothing new and from past experience of new computer launches we expected it to be under developed and not yet available to the public. But we were wrong on all counts.

Amstrad have gone about developing their machine (the CPC464) in a very sensible way allowing the designers a lot of flexibility which has resulted in many advanced features. The micro has a high resolution screen (640 × 200 — two colour) with up to 27 colours and an 80 column text feature. The BASIC is fast and from a quick dabble, very nice to use with explicit error messages and a good screen editor, which is a cross between the Oric, Commodore and BBC editors. It has a facility for up to eight windows, but best all, you can write programs using the interrupt from BASIC. This is a very powerful tool, enabling the micro to do a particular job at regular intervals regardless of what the rest of the program is doing. The BASIC is very fast, and claims to be a match for the BBC. Although the sound is a little 'tinny' it is quite acceptable by home computer standards.



The new Electron from Acorn. Ask any child at school why it's worth £199.



Most British children have one thing in common with the new Electron microcomputer: they speak the same language.

You see, the Electron is the first micro remotely in this price range to use BBC Basic, the computer language that is rapidly becoming the standard in British schools.

But that's not all. Most children will feel at home with the Electron as soon as they lay hands on it.

This is because it has developed out of the Micro that has been chosen by over 80% of schools participating in the Government's current Micros In Schools project. It has a similar keyboard and has most of the functions of this much acclaimed (but naturally, more expensive) machine.

So now children will be able to continue their computer studies at home. They'll be able to use the same educational programs they use at school. And, if asked nicely, they'll be able to help willing adults take their first steps into computing.

All this for only £199.



A micro technology break-through.

And now a few reasons for adults why the Electron is such an exceptional machine at the price.

The Electron is neat and compact. Yet it is fast and powerful. (Full details, for the technically minded, are in the box opposite.)

It produces high quality sound using its own internal speaker.

And it offers a range of facilities many larger more expensive machines just cannot match.

For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result, the Electron delivers twice as many characters across the screen as its closest competitor.

Built to last and to grow.

The Electron has been designed and built to be a permanent part of the family, year in year out.

Particular care has been paid to the keyboard. It is electric typewriter style: robustly constructed with a good, solid 'feel'. It has a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style keyboards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.



A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be

ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.



A free taste of its versatility.

You will also receive an "Introductory" cassette which will put the Electron through its paces showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM). The cassette will give you a taste of those exceptional colour graphics we mentioned earlier; of its ability to play and notate music, and show you how it might help in home accounting. It will challenge you to a few games and will, if you ask it, do your whole family's biorhythms in a matter of seconds.

You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal Money Management" through "Starship Command" to "Creative Graphics" (which, incidentally, includes some spectacular three-dimensional rotating shapes). Naturally, with its strong educational links, educational software will be extremely important for the Electron and even now O and A Level revision papers are being processed for Electron users.



How to get your Electron.

The Electron is available from selected W H Smith and local Acorn stockists. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200.



Technical Specifications

Hardware.
2MHz 6502.
32K ROM 32K RAM (64K total).
High resolution graphics 640 x 256 max.
Seven display modes.
8 colours and 8 flashing colours.
1200 baud CUTS tape interface with motor control.
Expansion bus for add-on interface modules.
Internal loudspeaker.
PAL UHF output to colour or black and white domestic TV.
RGB output for colour monitor.
56 key full travel QWERTY keyboard with spacebar.

Software.
BBC BASIC.
Extensions include interger, floating point and string variables, multi dimensional arrays: IF...THEN...ELSE, REPEAT...UNTIL, procedures with local variables.
Operating system allows plot, draw and fill commands.
Event timing.
Built-in assembler.
6502 assembly language can be mixed with BASIC.

The Acorn Electron.

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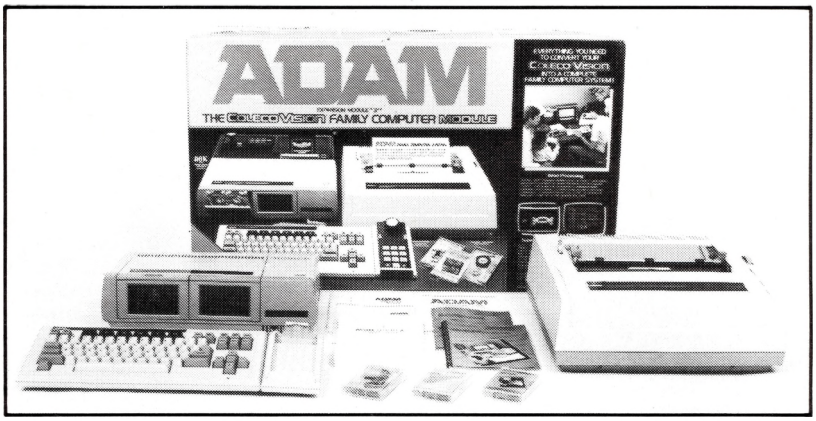

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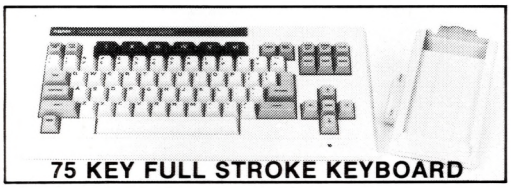

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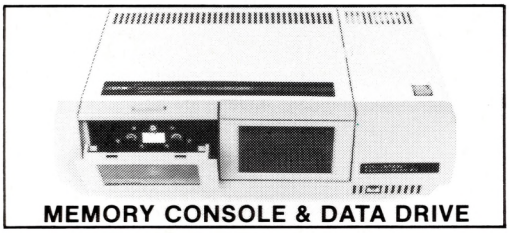

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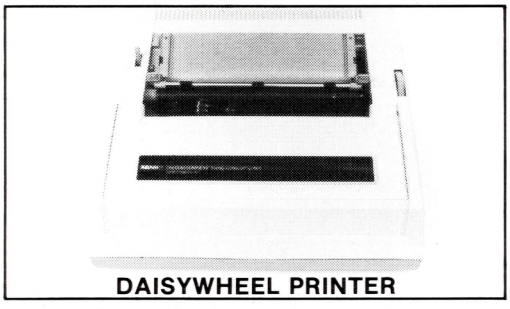

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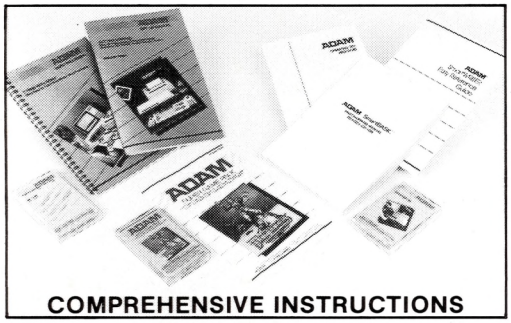

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If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.*

MEMORY CONSOLE/DATA DRIVE: *The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accomodate a second optional digital data drive.

FULL STROKE KEYBOARD: The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

LETTER QUALITY PRINTER: The Smart Writer letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typestyles are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's Smart Writer word processing program or as a stand alone electronic typewriter.

BUILT-IN WORD PROCESSOR: Adam comes with Smart Writer word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

COMPATIBILITY WITH COLECOVISION: By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

WHAT IS COLECOVISION: Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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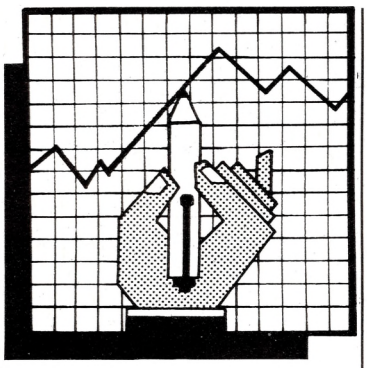


Personal Computing Today

The results of our readers' survey are somewhat surprising. Read on to find out the state of home computing today.



We had a very good response from readers to our questionnaire published in the February issue. Thank you to everyone who took part. Your answers and those from computer user groups around the country have now been analysed statistically by Iain Peacock of Heriot Watt University and have provided the basis of this article.

Battling for position

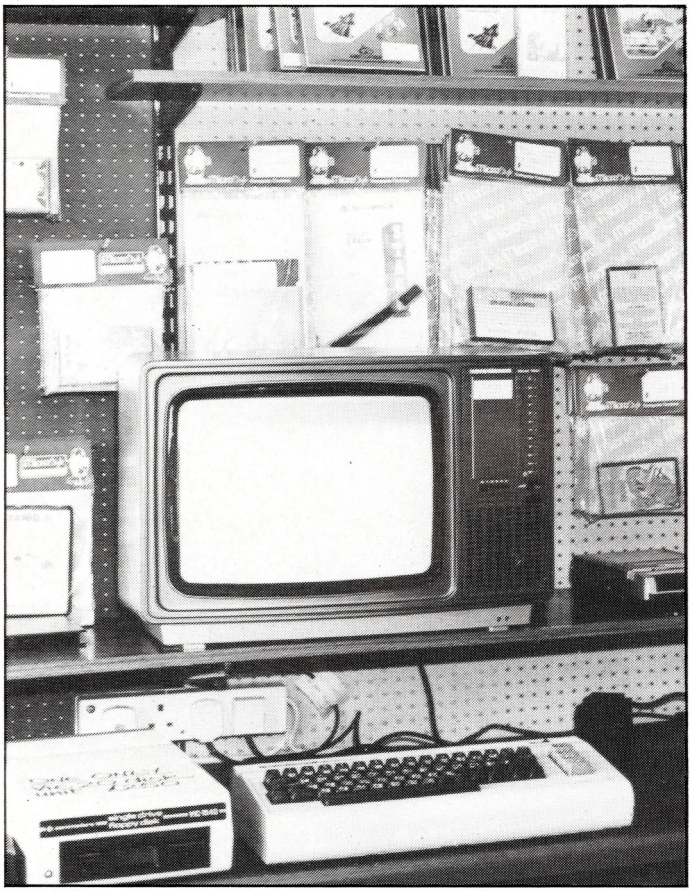
It probably comes as no surprise that the Sinclair Spectrum came out tops in terms of the number owned by our readers, with 21% of you having this particular make of micro.

The Commodore machines also did very well. The VIC 20 and CBM 64 were the next most frequently owned micros. These machines are to be found in over 30% of readers' homes, a figure Commodore can be rightly proud of in such a competitive market as home computing.

Somewhat surprising perhaps is the fact that almost 12% of you own the Texas TI99/4A. It makes one wonder about the causes for this machine's sad demise. This micro is presently more popular than Acorn's BBC Micro and the Oric which appear to have cornered about 15% of the market in total. Of course, these figures will be on the change as the Texas machine will not appeal to new owners in the light of future lack of support.

Atari machines are also very popular among readers. Percentage ownership of their three most popular home machines — the 400, 800 and the new 600XL is over 5%. Dragon is the only remaining micro to be owned by you in any large number, with more than 2% of readers having them. New computers which featured in the ownership ratings were the Memotech MTX 512 and the Electron, although as yet these are not owned by you in any large numbers.

It is interesting to look at the computers which started many of you along the road to computing. Top of the list was the Sinclair ZX81, one of the earliest computers to be brought within the grasp of home users. The VIC20 is another micro which was popular as a first machine among those of you who have now moved on to more advanced computing. Of the readers who replied over 36% had owned at least one previous computer and



more than 6% had had more than two.

Electronic timing

Ownership of computers in the home has been increasing steadily over the past six years or so but the biggest increase in home ownership took place last year. The computer price war and the launches of new, lower priced micros such as the Electron, CBM64 and Memotech in the price range £200-300 has enabled more people to afford them for recreational use. Of course, being a beginner's magazine, a high proportion of our respondents would be expected to have bought their machine fairly recently, but this trend appears to be valid overall. The majority of the purchases took place in November and December and reflects the buying draw of Christmas.

Peripheral power

We thought it would be interesting to investigate what peripherals, if any, are owned by home computer enthusiasts. Top of the list came the cassette recorder/player, followed a long way behind by RAM pack extensions. With so many of you owning machines with larger memories such as the CBM64 and 48K Spectrum extension RAM packs are not likely to be popular or necessary add-ons. Quite a few of you have the luxury of dedicated monitors thereby avoiding the need to subject the whole family to 'zap the aliens' on the TV set. Printers are also quite popular now and the rapidly falling prices and technological advances are likely to bring them into the range and desire of even more of you this year. Modems are also owned by a significant number of you and as these appear to be the up-and-coming add-on we expect this figure to increase further over the next year or so.

Software selection

Some of the respondents owned no software at all! A very surprising find — you must find the listings in *PCT* all you require! However, the vast majority of respondents owned between one and five programs brought commercially with a significant number having more than twenty in their libraries. Arcade games proved the most popular but educational and business/home economics programs were not too far behind. This reflects the increasing use to which computers are being put in the home and their more serious applications.

All that remains on the software front is the amount of time you spend programming and using your computers. Very few respondents do not do any programming at all and over a quarter of you spend between 30 and 50% of computing time actually writing programs.

Retail results and future plans

It appears that you prefer to buy computers from specialist computers shops where you can obtain good advice and back up service. The High Street chain stores are also a popular place but come a long way behind the more informed centres.

Of those of you considering changing your computer, the most popular choices would seem to be the BBC, CBM64, Memotech and Elan — the latter of which is surprising in view of the fact that this micro will not be available until September at the earliest. These choice will understandably be subject to fluctuation as new micros are launched.

Literature

You are a greedy lot when it comes to reading about your subject. There is a proliferation of books and magazines available to you and it seems that you make good use of the choice. Of course, *PCT* came top of the list of magazine, only to be expected since the questionnaire was contained in it. Almost 20% of you read five or more magazines per week!

Ownership profile

Disappointingly 93.5% of respondents were male and two age groups were prominent. These were the 13-19 and 31-40 year old brackets and almost 20% of respondents belonged to computer user groups.

It was interesting to find out more about our readers and your computing habits and the results will help us produce a magazine which is superbly tailored to your needs. Thanks for taking part in our survey and happy computing!

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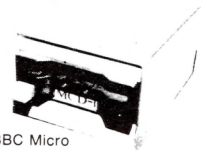

Micro Disc Drive for the BBC Micro

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5¼" disc drive and offers similar features to the larger drive. The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch. The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system allows 60 files per disc surface and it can read and write to Acorn DFS discs. Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transfered between them.
Capacity: 80.64 K bytes **Transfer Rate:** 125kbit/s

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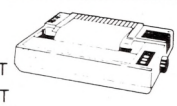
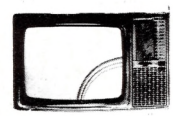


RX-80 FT £263.12 + VAT
FX-80 £365.09 + VAT
Printer price includes cable for BBC and screen dump rom is available for £7.50



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MNM1441	Microvitec 1441 High Res 14" BBC Monitor	440.00	506.00
MNM1451	Microvitec 1451 Medium Res 14" BBC Monitor	299.00	343.85
MNN1534	Nordmende 14" TV/Monitor	217.00	249.55
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MNN4430	Nordmende 20" Prestige TV/Monitor remote	417.00	479.55
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provides you with the utilities for circles, squares, triangles, free-hand, erasing line-drawing etc, and of course, full "Fill-in" facility in 16 different colours by the simple use of the pen!

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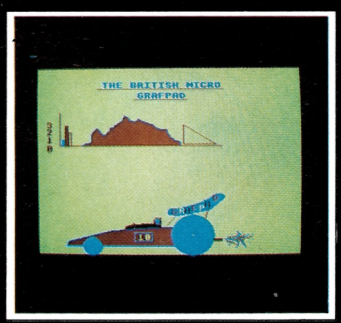

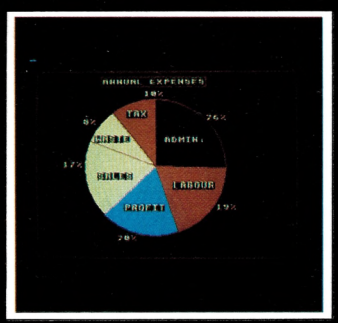

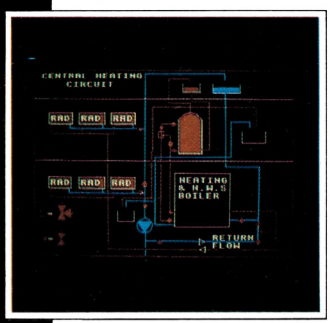

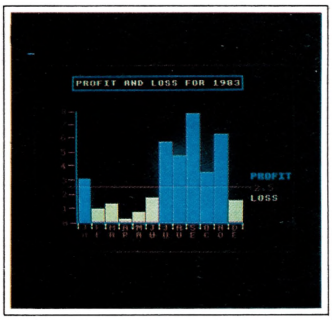

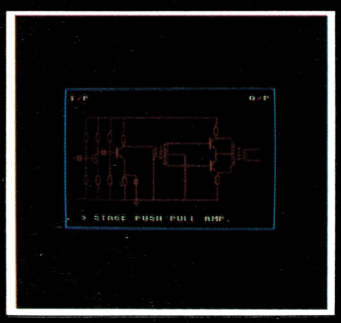

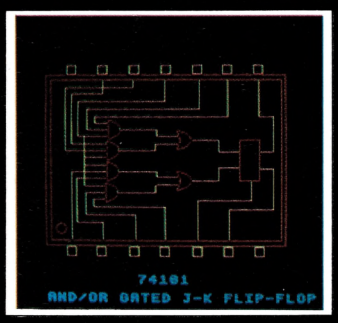

(The above designs were drawn by a 12-year-old at our showrooms!)

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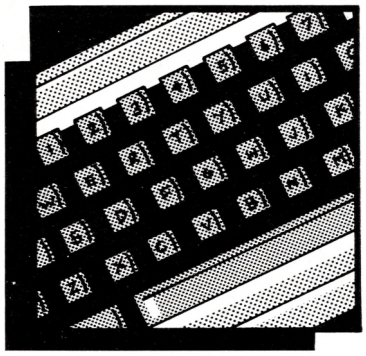

Characters by Design

This is perhaps the *definitive* character definer. We have included copious notes to help you learn more about your Beeb whilst getting it to do some interesting things.

By B. Spencer.

BBC B

There have been several recent publications of character definition utility programs. Most, if not all of these allow the user to create a single character and give the associated line code. The more sophisticated ones store the character in the system workspace for definable characters, but none have allowed the wide variety of options offered by this program.



The title page

This screen is only viewed from RUN and is not recalled in the program, as written. 'VDU23' is displayed in the format that will be used in the program. This consists of an 8 × 8 grid of red stars per character, upon which is superimposed in yellow, stars representing the 'on' pixels in the character. The VDU23 heading is taken from a data set held in the listing and is not therefore dependant upon any definable characters being set up.

The rest of the title screen gives a general reminder of the VDU23 syntax for character definition, followed by a brief summary of the main facilities offered by the program. All modes and functions are selected by single key presses, except where a character number has to be entered. This must be typed in and followed by RETURN.
TAB = Continue F = finish with program

The menu

A grid of two rows of four squares is drawn, and each is filled with an 8 × 8 set of red stars. This is the drawing board. The drawing board is present

all the time and only the text area below the board changes with each mode selected. On returning to the menu, all the artistic creations are retained on the drawing board. In this way, it is possible to build up multi-character pictures for use in games, and it doesn't matter how the character was put on the screen.

Key presses offered are:

1 = Create a new character code
2 = Recall an existing character
3 = Analyse a character code
4 = Display the currently held character set
5 = Clear the drawing board/store
F = Finish with program

Create a new character

Selected by keying 1 on the menu, the lower text area of the screen is cleared and the user is asked for the square number in which the new character is to be created. Because this is selectable at *every* new creation, the facility automatically exits to build pictures from new characters, entered into any square to suit.

Key a single number from 1 to 8 and the user is asked for the character number which is to be created. This must be typed in as 224 to 255 followed by RETURN. Any numbers outside of the acceptable range on both entries are rejected, and the user is informed of the first available character that is undefined. A rectangle is drawn below the input line in which the line code will appear as the character is built. The building options by key presses are shown and the cursor is positioned at the top, left-hand pixel of the selected character square.

The cursor control keys will move the cursor about the selected square, but it will not go outside that square, until the process is completed and the character stored. Pressing TAB once will change the red star to yellow and the next press will revert back to red. Yellow stars indicate 'on' pixels. As soon as TAB is pressed for the first time, the line code for the character appears in the lower rectangle and the actual size character is printed in front of this code. This builds exactly as the large square on the drawing board, because *every* change made updates the 8 bytes of the character stored in page &COO.

Pressing COPY will cease the process and store the last set of data, following which the option to repeat the process or return to the menu is given. The drawing square, character number, line code and full size character all remain on screen at this point in order that note may be made of the code, although this can be recalled later if wanted. During the create process, the option to press DELETE exists at all times. This will completely clear the selected square back to red and cancel the stored character, as well as set the line code to eight zeros.

Key presses as encountered:

TAB = Change value of bit
COPY = Store new character code
DELETED = Clear selected square
RETURN = Create another character
TAB = Return to the menu

Recall an existing character

Selected by pressing 2 on the menu, the lower text area of the screen is cleared, and the user is asked to nominate the square and the character number to be recalled. The input process is the same as for creation of a new character.

As with other displays the full size character and its line code are displayed as well as setting the appropriate yellow stars in the nominated square of the drawing board.

The only options available are to repeat for another character (or the same one) to another square (or the same one) or to return to the menu.

Key presses offered are:

RETURN = Recall another character
TAB = Return to the menu

Analyse a character code

Selected by pressing 3 on the menu, the lower text area of the screen is cleared, and the user is asked for the square into which the analysed line code is to be placed. On selection of the square number, instructions are given for entering the line code to be analysed. The input requires all the line code to be typed in before pressing RETURN. The code is then stored in any array for further processing. Upon RETURN the code is analysed and the selected square is displayed showing the correct pixels 'on' which are represented by the code.

This can now be stored, or ignored. If it is to be stored, press COPY and give the line code a character number where asked. Following RETURN the new shape of the character is displayed preceeding the line code and this confirms the storage in page &C00. As before the character on the drawing board remains where it was placed. If the line code is incorrectly typed with any digit larger than 255 then that line of stars appears white and the digit in error appears white, with an error message. An attempt to store a code such as this will not be allowed and the user is told so.

Display of the character set

Selected by keying 4 on the menu, the lower text area of the screen is cleared and the current status of the memory page &COO is displayed in 4 rows of 8 characters, the beginning and end characters of each row being numbered. If the display is selected from the first menu after RUN, then the only character to contain any information will be 224. Because this is the first character held in page &COO and stored as the first 8 bytes, the page marker i.e. 255, is present as the first byte, thus giving rise to a character which shows a bar in its top most row of pixels. This situation is remedied

the first time PROCsearch is called by the program. The only action possible from this screen is to return to the menu.
TAB = Return to the menu.

Housekeeping routine

Selected by keying 5 on the menu, the lower text area of the screen is cleared and the user is presented with three "clearing up" routines. A nominated square on the drawing board can be cleared of yellow stars, or the entire drawing board can be set red. Either of these actions will only affect the drawing board and will not alter the character store. A third option to clear the entire character store is also offered. If this is selected, then a message to confirm the action is printed, and a 'Y' reply will go ahead and delete the entire contents of page &COO, otherwise it is saved. Each routine, when complete, returns the menu.
Key presses offered are:

1 = Clear a nominated square
2 = Clear all the squares
3 = Clear the defined character store



how it runs

The main program is listed from line 10 to line 230, with the main execution loop held between 110 and 190. The error trap used in developing the program has been left in place.

Line 70 dimensions the arrays used and gets the key press variable K% and loop control variable N% known to the computer. Mode 1 is selected and the cursor is turned off in line 80. The cursor control keys are also disabled such that they now return ASCII codes when pressed (*FX4,1). Line 90 disables the ESCAPE key (*FX200,1).

Following an error detection or command to finish the program, the screen is cleared and all special functions are restored to normal use giving a clear screen in Mode 1.

The PROCedure definitions have been liberally documented with REM statements describing the function of each procedure. Obviously it is not necessary to type in all the REM statements, but it will make reading the program easier at a later date, especially as variable names have been deliberately kept to the use of the resident integer variables where possible to conserve the space. In addition there are some useful routines included which could be extracted for use in other programs.

The memory allocations for this program are as follows:

PAGE	= &0E00	3584	(Normal)
TOP	= &28CE	10446	(Limit of program listing)
HIMEM	= &3000	12288	(Mode 1)
	&2BDD	11229	(Top of variables store)

Listing length	=	6,701 bytes
Screen allocation	=	20,000 bytes
Variables store	=	765 bytes
Free space	=	1,034 bytes
		28,500

As can be seen, the program with all its REM statements fits comfortably into a BBC-B machine.

If the program is to run on OS 0.1 then the cursor control codes will need adjusting and *FX200 is not available to disable the ESCAPE key.

variables used

A$,B$,C$,D$	Text variables read in from DATA store.
A% (8)	Array to hold 8 bit values of generated line code
B% (8)	Array to hold 8 bit values of input line codes
D% (8,8)	Data array holding colour of pixel as last updated
C%	Column loop counter.
G%	Grid square selector.
K%	Key press variable (all key presses except where G% is used.)
M%	Holds the contents of a memory location while under examination.
N%	General purpose primary loop counter
P%	Returns the bit value of an input error encountered in PROCanalyse, ready for printing.
Q%	Secondary loop counting variable where conflict occurs with N%
R%	Row loop counter.
T%	Tests for an error in the input line code when decoding in PROCanalyse. Set to 0 normally, and set to 1 if error detected.
V%	Input CHR$ No.
X%	Whole square, horizontal location co-ordinate.
Y%	Whole square, vertical location co-ordinate.
Z%	Controls printing of line code, If = 0, line code is not printed. IF = 1, line code is printed in the text area of the screen.

1. For disc based BBC machines

The program as written will just fit into the Model B machine, with approximately 1000 bytes free, after variables have been stored. The Acorn DFS requires PAGE to set at &1900 and other types require PAGE to be at &1500. None of these, if fitted, will leave enough space to run the program. The Author's own disc system is one of the latter and it was found necessary to split the program into two parts, i.e. a loader program that CHAINS the main program.

If the instructions below are followed, the re-allocation of memory space will certainly do for the DFS with PAGE at &1500 and may just, accommodate the Acorn DFS. If it is just too marginal in practice, then one can always resort to loading the program from disc and moving it down in memory prior to running.

Construct your loader program using the following lines from the main program:
10-40, 60-100 (changing line 100 to CHAIN the second program)
210-230, 400-650, 2050. Line 60 could usefully be altered to allow for error 17 (escape pressed) to be trapped into CHAINing the disc menu, with other errors causing a tidy exit via line 210. The main program can then have all unnecessary lines removed including REM statements, as this saves a lot of space, and then be saved under a new title, which is the title to be CHAINED by the loader program. It is advisable to alter ?&DFF in line 1740 to ?&8F to avoid any possibility of conflicting with DFS workspace occupying page &ODOO. When run, the effect will be to display the title page as before.
Pressing .TAB-ȯ- will cause the main program to load and run, or pressing .ESC-ȯ- will cause the disc menu to load and run.

For other micros

Because of the similarities between the BBC and the Electron, it is conceivable that with very little modification, the program can be made to run on the Electron.

When considering micros ''outside of the family'' there are many things to take into account. It is best therefore to document the peculiarities of the BBC Micro in this context rather than state what should be done, to use this type of program on any other micro.

Having established that your machine will support user-definable characters, you will need to know how they are stored in the machine and how they may be altered. In the BBC Micro, the memory map of the RAM area is divided up into 256 byte sections called pages. User defined characters are stored as contiguous sections of 8 bytes in the page whose start address is &OCOO. Each character (numbered as CHR$ 224-255) has its own unique place in the page and if only CHR$ 240 for example were defined, then the 8 bytes for CHR$ 240 will stand alone in splendid isolation in the middle of page &OCOO.

The BBC Micro command to set up CHR$ 240 is VDU23, 240,n,n,n,n,n,n,n,n, where 'n' is a whole number in the range 0-255. The 8 consecutive 'n's become the line code that is stored for future recall. Line 1570 actally stores the code every time you update it.

The BBC Micro procedure calls may all be replaced by GOSUB routines pointing to the REM line. The DEFPROC lines should be left out and the ENDPROC lines replaced by RETURN.

In BBC terminology the % symbol following a variable name indicates an integer variable (whole number only). The three arrays need not be integer variables if your machine will not support this, and neither need any of the other numeric variables. In the BBC Micro, the variables A% to Z% inclusive are called resident integers, and they are stored in the system workspace rather than in the program variables store. This is a great advantage in so far as it cuts down the variables space required. Obviously it follows that your variables may be called anything you like — but watch the space it occupies!

In an earlier part of this article, details of how the memory is used up is given as a guide. Mode 1 is a high resolution graphics mode supporting four colours on screen at any one time. All four default colours (black, red, yellow and white) are in use. It is the mode best suited to the screen display required because the amount of text possible is the maximum in the 40 column modes, having 32 lines available for use. The colours also are sufficiently different to be easily identified on monochrome screens.

Each procedure is given a short explanation of its purpose. In addition:

Line 50	*TV255, 1 set the text area down one line on the TV frame and controls the interlacing (wavy line) effect.
Line 70	*FX15,0 Flushes all internal buffers.
Line 80	*FX4,1 Enables the cursor keys to return ASCII codes when pressed as well as continue to move the cursor. These are tested for in lines 820-850 and is reset by *FX4,0 line 220.
Line 90	*FX200, 1 Disables the ESCAPE key. This is considered worthwhile because extensive use is made of the TAB key. This is reset by *FX200,0 in line 210.
Line 570	*@% = 4 is a command to divide the text into zones of 4 columns for automatic print spacing.*
Line 690	The DRAW and MOVE command cause the graphics boxes to be drawn on the screen.
Line 710	VDU31,X%,Y% positions the cursor at TAB positions X% (horizontal) and Y% (vertical) without printing anything.
Lines 1020,1740	The ''?'' in front of a variable or section of calculation is equivalent to the peek or poke command. For example ?&8F = 0 means POKE 0 into location &8F (&8F is a hexcode, 8F = 143 decimal) and IF ?&8F = 0 THEN.... means if PEEKing into location 8&f finds 0 THEN....

Characters

program listing

```
  10 REM  ----------------------------
  20 REM  CHARACTER DEFINITION PROGRAM
  30 REM  BBC(MODEL B)     32K     OS1.2
  40 REM  ----------------------------
  50 *TV255,1
  60 ON ERROR CLS:REPORT:PRINT" at line ";ERL:GOTO 210
  70 DIM A%(8),B%(8),D%(8,8):K%=0:N%=0:*FX15,0
  80 MODE1:PROCoff:*FX4,1
  90 PROCtitle:*FX200,1
 100 IF K%=70 THEN 200 ELSE CLS:PROCboard
 110 REPEAT
 120 PROCclrscrn:COLOUR3:RESTORE 2060:FOR N%=19 TO 27 STEP 2:READ A$:PRINT
TAB(6,N%)A$:NEXT
 130 COLOUR2:PRINTTAB(9,29)"?F'=finish with program":REPEAT:K%=GET:UNTIL K
%=70 OR K%>48 AND K%<54
 140 IF K%=49 PROCcreate
 150 IF K%=50 PROCrecall
 160 IF K%=51 PROCanalyse
 170 IF K%=52 PROCdisplay
 180 IF K%=53 PROCclear
 190 UNTIL K%=70
 200 CLS
 210 COLOUR3:*FX200,0
 220 PROCon:*FX4,0
 230 END
 240
 250 DEFPROCoff
 260 REM Turns cursor off
 270 VDU23,1,0;0;0;0;
 280 ENDPROC
 290
 300 DEFPROCon
 310 REM Turns cursor on
 320 VDU23,1,1;0;0;0;
 330 ENDPROC
 340
 350 DEFPROCclrscrn
 360 REM Clears screen lower text area
 370 FOR N%=19 TO 29:PRINTTAB(0,N%)SPC(40):NEXT
 380 ENDPROC
 390
 400 DEFPROCdecode
 410 REM Breaks down line code row by row and prints red or yellow stars
 420 T%=0:FOR R%=1 TO 8
 430 IF Z%=1 COLOUR2:PRINTTAB(4*R%,22)A%(R%)
 440 FOR C%=1 TO 8
 450 IF A%(R%)+1-2^(8-C%)<=0 THEN 480
 460 A%(R%)=A%(R%)-2^(8-C%)
 470 COLOUR2:VDU31,X%+C%,Y%+R%,42:GOTO 490
 480 COLOUR1:VDU31,X%+C%,Y%+R%,42
 490 NEXT
 500 IF A%(R%)<>0 COLOUR3:T%=1:PRINTTAB(X%+1,Y%+R%)STRING$(8,"*"):IF Z%=1
P%=255+A%(R%):PRINTTAB(25,20)STRING$(8,"*");"=error":PRINTTAB(4*R%,22)P%
 510 NEXT
 520 ENDPROC
 530
 540 DEFPROCtitle
 550 REM Prints title page and program information
 560 COLOUR2:PRINTTAB(2,0)"CHARACTER DEFINITION UTILITY PROGRAM":GCOL0,2:M
OVE65,980:DRAW1220,980:X%=-1:Y%=1
 570 @%=4:REPEAT
 580 FOR N%=1 TO 8:READ A%(N%):NEXT
 590 Z%=0:PROCdecode:X%=X%+8
 600 UNTIL X%>32:COLOUR3:VDU31,0,11
 610 PRINT"IF chr$=a decimal number from 224 to 255AND 'n'=a decimal numbe
r from 0 to 255,":COLOUR2:PRINTTAB(4,14)"THEN VDU23,chr$,n,n,n,n,n,n,n,n":C
OLOUR3:PRINTTAB(0,16)"is the correct syntax for the line code of the specif
ied user defined character."
 620 PRINTTAB(4,19)"This program will allow the creationand updating of an
y nominated character,as well as permit the recall of stored  characters.
  In addition, the program will analyse a specified line code into a user d
efined shape."
 630 PRINTTAB(4,26)"Finally, a facility exists to build combinations of ch
aracters into picturesfor use in games etc.":COLOUR2:PRINTTAB(1,30)"TAB=con
tinue"SPC(3)"?F'=finish with program"
 640 REPEAT:K%=GET:UNTIL K%=9 OR K%=70
 650 ENDPROC
 660
 670 DEFPROCboard
 680 REM Prints drawing board and fills with red stars
 690 FOR N%=1007 TO 431 STEP-288:MOVE111,N%:DRAW1263,N%:NEXT:FOR N%=111 TO
1263 STEP 288:MOVEN%,1007:DRAWN%,431:MOVEN%+1,431:DRAWN%+1,1007:NEXT
 700 FOR Y%=0 TO 9 STEP 9:COLOUR3:IF Y%=0 PRINTTAB(0,4)"1-4" ELSE PRINTTAB
(0,13)"5-8"
 710 FOR X%=3 TO 30 STEP 9:VDU31,X%,Y%:PROCclrchr:NEXT:NEXT
 720 ENDPROC
 730
 740 DEFPROCcreate
 750 REM Creates character in selected square and stores the code
 760 PROCclrscrn
 770 REPEAT:Z%=1
 780 PRINTTAB(4,27)SPC(110)TAB(4,22)SPC(35):PROCinput:IF V%=0 THEN 920 ELS
E RESTORE 2070:FOR N%=25 TO 29 STEP 2:READ A$:PRINTTAB(6,N%)A$:NEXT
 790 COLOUR2:PROCclrchr:VDU31,X%+C%,Y%+R%:PROCon
 800 REPEAT
 810 K%=GET
 820 IF K%=139 AND R%>1 R%=R%-1
 830 IF K%=138 AND R%<8 R%=R%+1
 840 IF K%=137 AND C%<8 C%=C%+1
 850 IF K%=136 AND C%>1 C%=C%-1
 860 PROCoff
 870 IF K%=135 PROCstore
 880 IF K%=127 PROCclrchr:PROCstore
 890 IF K%=9 PROCencode
 900 VDU31,X%+C%,Y%+R%:PROCon
 910 UNTIL K%=135
 920 PROCoff:PRINTTAB(0,25)SPC(199):PROCreturn
 930 PRINTTAB(0,22)SPC(3)
 940 UNTIL K%=9
 950 ENDPROC
 960
 970 DEFPROCrecall
 980 REM Recalls a character currently held in page &C00
 990 PROCclrscrn
1000 REPEAT:Z%=1:K%=2
1010 PRINTTAB(0,22)SPC(3)TAB(4,22)SPC(34)TAB(5,27)SPC(110):PROCinput:IF V%
=0 THEN 1050
1020 G%=V%-224:FOR N%=0 TO 7:A%(N%+1)=?(&C00+(8*G%)+N%):NEXT
1030 PROCdecode
1040 COLOUR3:PRINTTAB(0,22)CHR$V%;" ="
1050 PROCreturn
1060 UNTIL K%=9
1070 ENDPROC
1080
1090 DEFPROCanalyse
1100 REM Analyses input line code into corresponding character shape
1110 PROCclrscrn
1120 REPEAT:Z%=0:RESTORE 2090:READ A$,B$,C$,D$
1130 PRINTTAB(4,22)SPC(34)TAB(6,24)SPC(75)TAB(5,27)SPC(110):PROCinput
1140 PRINTTAB(6,24)A$TAB(6)B$
1150 PROCon:INPUTTAB(4,22)" "B%(1),B%(2),B%(3),B%(4),B%(5),B%(6),B%(7),B%(
8):PROCoff:FOR N%=1 TO 8:A%(N%)=B%(N%):NEXT:Z%=1
1160 PROCdecode
1170 PRINTTAB(0,24)SPC(80):COLOUR3:PRINTTAB(5,25)C$:PROCreturn:IF K%=9 OR
K%=13 THEN 1220
1180 IF K%=135 AND T%=1 COLOUR3:PRINTTAB(5,24)D$:GOTO 1200
1190 IF K%=135 AND T%=0 COLOUR3:PROCsearch:REPEAT:PRINTTAB(36,20)SPC(3):IN
PUTTAB(24,20)"CHR$ number="V%:UNTIL V%=0 OR V%>223 AND V%<256:IF V%=0 THEN
1200 ELSE FOR N%=1 TO 8:A%(N%)=B%(N%):NEXT:PROCstore
1200 PRINTTAB(0,25)SPC(40)
1210 REPEAT:K%=GET:UNTIL K%=9 OR K%=13:PRINTTAB(0,22)SPC(3)TAB(0,24)SPC(40
)
1220 IF T%=1 VDU31,X%,Y%:PROCclrchr
1230 UNTIL K%=9
1240 ENDPROC
1250
1260 DEFPROCdisplay
1270 REM Prints current contents of page &C00
1280 PROCclrscrn
1290 COLOUR3:R%=21:FOR N%=224 TO 255 STEP 8:PRINTTAB(5,R%)N%;"  ";
1300 FOR G%=0 TO 6:PRINTCHR$(N%+G%);"  ";:NEXT:PRINTCHR$(N%+G%);"  ";N%+7;
:PRINT
1310 R%=R%+2:NEXT:PROCreturn
1320 ENDPROC
1330
1340 DEFPROCinput
1350 REM Takes input of CHR$ No.and locates display in selected square
1360 PRINTTAB(1,20)SPC(38)
1370 MOVE110,270:DRAW110,335:DRAW1265,335:DRAW1265,270:DRAW110,270:MOVE112
,270:DRAW112,335:MOVE1268,335:DRAW1268,270
1380 COLOUR3:PRINTTAB(4,20)"Square number=":VDU31,18,20:REPEAT:G%=GET:UNTI
L G%>48 AND G%<57:VDU31,18,20,G%:IF Z%=0 THEN 1410
1390 IF K%=13 OR K%=49 OR K%=135 PROCsearch
1400 REPEAT:PRINTTAB(36,20)SPC(3):INPUTTAB(24,20)"CHR$ number="V%:UNTIL V%
=0 OR V%>223 AND V%<256
1410 IF G%<53 Y%=0 ELSE Y%=9:G%=G%-4
1420 X%=3+9*(G%MOD49)
1430 VDU31,X%,Y%
1440 ENDPROC
1450
1460 DEFPROCencode
1470 REM Updates array with values to print red or yellow stars
1480 IF D%(C%,R%)=2 D%(C%,R%)=1 ELSE D%(C%,R%)=2
1490 A%(R%)=0
1500 FOR N%=1 TO 8:COLOURD%(N%,R%):IF D%(N%,R%)=2 A%(R%)=A%(R%)+2^(8-N%)
1510 VDU31,X%+N%,Y%+R%,42:NEXT
1520 PROCstore
1530 ENDPROC
1540
1550 DEFPROCstore
1560 REM Stores selected CHR$ in page &C00 for future recall
1570 VDU23,V%,A%(1),A%(2),A%(3),A%(4),A%(5),A%(6),A%(7),A%(8)
1580 COLOUR3:PRINTTAB(0,22)CHR$V%;" ="
1590 COLOUR2:VDU31,4,22:FOR N%=1 TO 8:PRINTA%(N%);:NEXT
1600 ENDPROC
1610
1620 DEFPROCclrchr
1630 REM Clears selected CHR$ square and sets array elements to red
1640 COLOUR1
1650 FOR R%=1 TO 8:A%(R%)=0
1660 FOR C%=1 TO 8:D%(C%,R%)=1
1670 VDU31,X%+C%,Y%+R%,42
1680 NEXT:NEXT
1690 C%=1:R%=1
1700 ENDPROC
1710
1720 DEFPROCsearch
1730 REM Searches page &C00 for first available undefined character
1740 IF ?&DFF=0 ?&C00=0:?&DFF=1
1750 PRINTTAB(4,22)SPC(33):V%=223
1760 FOR N%=3072 TO 3320 STEP 8:V%=V%+1:M%=0
1770 FOR G%=N% TO N%+7:M%=M%+?G%:NEXT
1780 IF M%=0 THEN 1810
1790 IF V%=255 PRINTTAB(7,22)"All characters are now defined":NEXT N%:ENDP
ROC
1800 NEXT N%
1810 N%=3320:NEXT
1820 PRINTTAB(8,22)"CHR$ ";V%;" is not yet defined"
1830 ENDPROC
1840
1850 DEFPROCclear
1860 REM Housekeeping PROC to clear screen squares or store
1870 PROCclrscrn:RESTORE 2100:READ A$,B$,C$,D$
1880 COLOUR3:PRINTTAB(6,23)A$TAB(6,25)B$TAB(3,27)C$:REPEAT:K%=GET:UNTIL K%
>48 AND K%<52
1890 IF K%<>49 THEN 1930 ELSE COLOUR2:PRINTTAB(7,29)"Enter square number
(1-8)":REPEAT:G%=GET:UNTIL G%>48 AND G%<57
1900 IF G%<53 Y%=0 ELSE Y%=9:G%=G%-4
1910 X%=3+9*(G%MOD49)
1920 VDU31,X%,Y%:PROCclrchr:ENDPROC
1930 IF K%<>50 THEN 1940 ELSE PROCboard:ENDPROC
1940 COLOUR2:PRINTTAB(6,29)D$:REPEAT:K%=GET:UNTIL K%=78 OR K%=89
1950 IF K%=78 ENDPROC ELSE FOR N%=3072 TO 3327:?N%=0:NEXT
1960 ENDPROC
1970
1980 DEFPROCreturn
1990 REM Prints return to menu messages
2000 RESTORE 2080:READ A$,B$
2010 COLOUR2:IF K%=52 THEN 2020 ELSE PRINTTAB(5,27)A$
2020 PRINTTAB(10,29)B$:REPEAT:K%=GET:UNTIL K%=9 OR K%=13 OR K%=135
2030 ENDPROC
2040
2050 DATA 102,102,102,102,102,60,24,0,120,108,102,102,102,108,120,0,102,10
2,102,102,102,102,60,0,60,102,6,12,24,48,126,0,60,102,6,28,6,102,60,0
2060 DATA '1'=create a new character code,'2'=recall an existing character
,'3'=analyse a character code,'4'=display full character set,'5'=clear the
board/store
2070 DATA 'TAB'=change value of bit,'COPY'=store new character code,'DELET
E'=clear selected square
2080 DATA 'RETURN'=process another character,'TAB'=return to the menu
2090 DATA "Enter the 8 digits of the code,",each being followed by a comma
,'COPY'=store analysed character,Storage of code error not allowed
2100 DATA '1'=clear a nominated square,'2'=clear all the squares,'3'=clear
the defined character store,Do you really mean that?  (Y/N)
```

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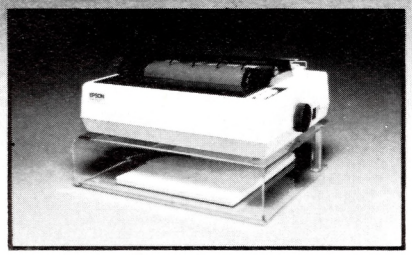

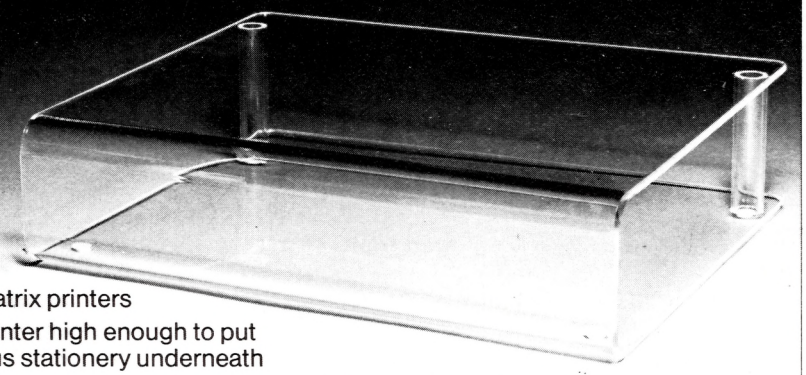

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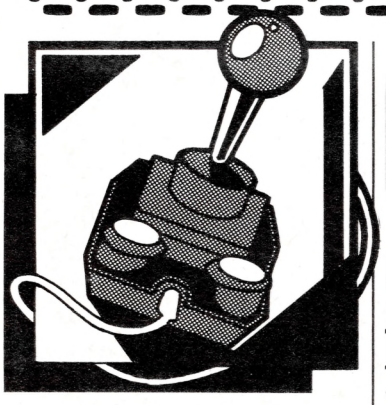


Regatta '99

Rig your computer for sail power! This is a tactical and fast moving game for machines with BASIC and extended BASIC.

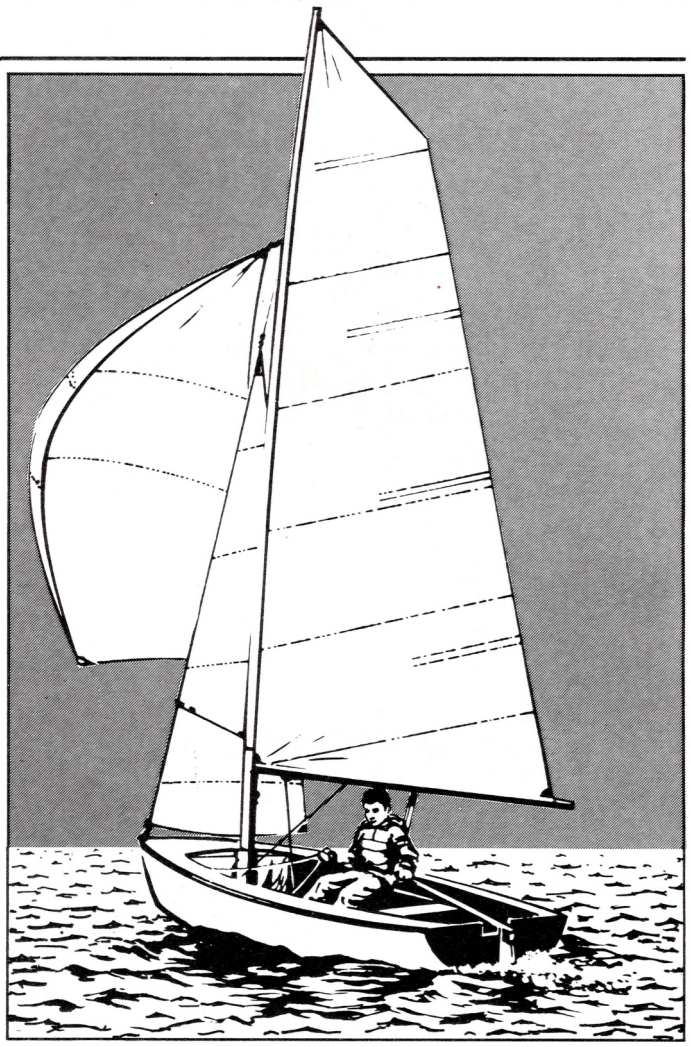
By B. Johns.

This is a game designed for two players which relies on strategy rather than 'shoot em up'. Although as in real yacht racing there is ample opportunity for underhand tactics (try cutting across the front of your opponent — this takes the wind out of his sails in more ways than one).

Setting course

The screen shows two islands in the centre of a lake around which the yachts race. You may follow any course that is agreed upon between you, providing the yachts commence moving in a clockwise direction and finish at their original starting point. An easy race would be a simple loop but a figure eight course could be used which would obviously be more taxing or you could design your own course which could be as complicated as you wish.

Players should take careful note of the wind direction and strength displayed as this will affect the yachts' movements e.g. if players input a bearing of due east for a duration of six minutes when the wind shows strength 2 due south, their yacht will move four spaces east then two southeast as the wind takes hold. If the player had only input five minutes the yacht would move four spaces east then one southeast.

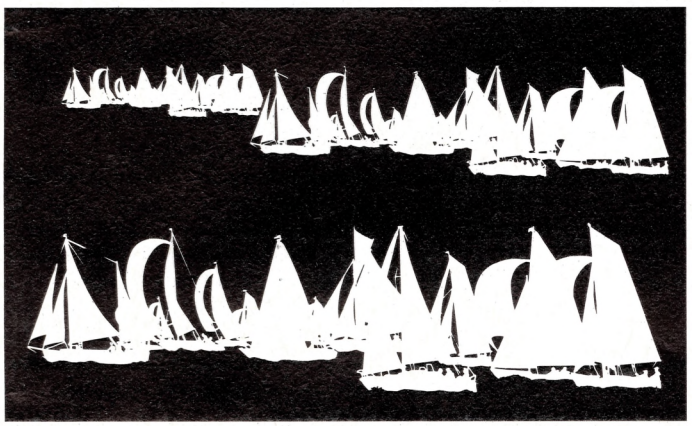


The program runs in BASIC or extended BASIC and REM statements may be omitted when keyed in as none are referenced by GOTO's etc.

TEXAS

how it runs

110-590	Updates moving display and tests for position
600-660	"Print At" subprogram for benefit of TI Basic
670-910	Player bearing and duration input routine
920-1160	Player movement factors
1170-1370	Collision or grounding routine
1380-1430	New game routine
1440-1670	Title and instructions
1680-1710	Blank out screen
1720-1870	Define characters
1880-2110	Set up screen
2120-2150	Initialise player positions
2160-2240	Restore screen colours
2250-2310	Selection of wind strength and direction
2320-2640	Wind strength and direction bias factors
2650-2680	Graphics data statements
2690-2700	End routine



variables used

A, B	Counters for loops
AC, BC	Players' present column numbers
AD, BD	Players' duration on set bearing
AHM, BHM	Players' horizontal movement factors
AL, BL	Players' present line numbers
AVM, BVM	Players' vertical movement factors
C	Column number for 'Print At' routine
C	Column number for 'Print At' routine
GET	Current ASCII value of GCHAR command
HD	Horizontal distortion caused by wind direction
HM	Horizontal movement factor
L	Line number for 'Print At' routine
MISS	Counter to halt a yacht where collision threatens
M	Current message
P	Player number
SHIPS, SHIPB	ASCII value of players' yachts present graphic
VD	Vertical distortion caused by wind direction
VM	Vertical movement factor
WD	Wind Direction
WD	Wind Strength

hints on conversion

This program should be easy to convert with a good working knowledge of your own computer. The Texas does have its own peculiar commands and those used have been explained below:

CALL KEY (O,K,S)	is used to detect input from the keyboard, (O) merely sets the keyboard up for use, (K) returns the ASCII value of the key pressed and (S) returns a value of 0 until a key is pressed.
CALL COLOR (A,B,C)	takes character set (A) and colours foreground (B) and background (C)
CALL SCREEN (A)	colours screen (A) according to the Texas colour list. The colours and codes used in this program are White — 16, Light Red — 10, Light Yellow — 12, Light Blue — 6 and Dark Green — 13.
CALL CLEAR	clears the screen and would just be replaced by own command.
CALL GCHAR (A,B,C)	reads the ASCII value of the character found at line (A), column (B) and assigns that value to (C)
CALL CHAR (A,A$)	uses the Hexadecimal code in (A$) to redefine the character (A)
CALL HCHAR (A,B,C,D)	prints the character with the ASCII value (C) at line (A) and column (B) and continues to print horizontally (D) times. Where (D) is not quoted, the computer assumes (D) to be 1.

The only parts which may cause problems with conversion are the Print statements in lines 1890 to 2110, each character used has been previously redefined in lines 1730 to 1870. For ease of conversion the symbols used are listed below with their ASCII equivalents:
% 37 & 38 (40) 41 * 42 + 43 , 44 - 45 . 46 / 47 a 97 b 98 x 120 y 121 h 104 i 105 j 106 k 107 l 108 m 109 n 100 o 111 p 112 q 113 r 114 s 115 t 116 u 117 v 118 w 119
The final point to note is that as Texas basic lacks AND and OR statements, in certain lines * replaces AND and + replaces OR.

program listing

```
 10 REM  ***************
 20 REM  *             *
 30 REM  * YACHT  RACE *
 40 REM  *             *
 50 REM  * B.JOHNS  84 *
```

program listing

```
60 REM  *               *
70 REM  ***************
80 REM
90 CALL CLEAR
100 GOTO 1450
110 REM  MOVE
120 FOR A=1 TO 6
130 IF A<>(7-WS)THEN 180
140 AVM=AVM+VD
150 AHM=AHM+HD
160 BVM=BVM+VD
170 BHM=BHM+HD
180 P=1
190 IF AD=0 THEN 380
200 AD=AD-1
210 CALL GCHAR(AL+AVM,AC+AHM,GET
)
220 IF GET<>37 THEN 230 ELSE 250
230 GOSUB 1180
240 IF MISS=1 THEN 370
250 IF AHM<0 THEN 280
260 SHIPA=97
270 GOTO 290
280 SHIPA=98
290 CALL HCHAR(AL,AC,37)
300 AL=AL+AVM
310 AC=AC+AHM
320 CALL HCHAR(AL,AC,SHIPA)
330 IF ((AC=9)+(AC=10))*((AL<9)*
(AL>3))THEN 340 ELSE 380
340 M$="PLAYER 1 IS THE WINNER"
350 GOSUB 610
360 GOTO 1330
370 MISS=0
380 P=2
390 IF BD=0 THEN 580
400 BD=BD-1
410 CALL GCHAR(BL+BVM,BC+BHM,GET
)
420 IF GET<>37 THEN 430 ELSE 450
430 GOSUB 1180
440 IF MISS=1 THEN 570
450 IF BHM<0 THEN 480
460 SHIPB=120
470 GOTO 490
480 SHIPB=121
490 CALL HCHAR(BL,BC,37)
500 BL=BL+BVM
510 BC=BC+BHM
520 CALL HCHAR(BL,BC,SHIPB)
530 IF ((BC=9)+(BC=10))*((BL<9)*
(BL>3))THEN 540 ELSE 580
540 M$="PLAYER 2 IS THE WINNER"
550 GOSUB 610
560 GOTO 1330
570 MISS=0
580 NEXT A
590 GOTO 680
600 REM   PRINT AT ROUTINE
610 L=24
620 C=15-LEN(M$)/2
630 FOR B=1 TO LEN(M$)
640 CALL HCHAR(L,C+B,ASC(SEG$(M$
,B,1)))
650 NEXT B
660 RETURN
670 REM  PLAYER INPUT
680 FOR P=1 TO 2
690 M$="PLAYER "&STR$(P)&" INPUT
 YOUR COURSE"
700 GOSUB 610
710 CALL KEY(0,K,S)
720 IF S=0 THEN 710
730 ON POS("ERDCXZSW",CHR$(K),1)
+1 GOTO 710,930,960,990,1020,105
0,1080,1110,1140
740 IF P=2 THEN 780
750 AVM=VM
760 AHM=HM
770 GOTO 800
780 BVM=VM
790 BHM=HM
800 M$="PLAYER "&STR$(P)&" TIME
COURSE HELD "
810 GOSUB 610
820 CALL KEY(0,K,S)
830 IF S=0 THEN 820
840 IF (K<49)+(K>54)THEN 820
850 IF P=2 THEN 880
860 AD=K-48
870 GOTO 890
880 BD=K-48
890 NEXT P
900 CALL HCHAR(24,3,38,28)
910 GOTO 120
920 REM  COURSE SETTINGS
930 VM=-1
940 HM=0
950 GOTO 740
960 VM=-1
970 HM=1
980 GOTO 740
990 VM=0
1000 HM=1
1010 GOTO 740
1020 VM=1
1030 HM=1
1040 GOTO 740
1050 VM=1
1060 HM=0
1070 GOTO 740
1080 VM=1
```

program listing

```
1090 HM=-1
1100 GOTO 740
1110 VM=0
1120 HM=-1
1130 GOTO 740
1140 VM=-1
1150 HM=-1
1160 GOTO 740
1170 REM  COLLISION
1180 ON P GOTO 1250,1190
1190 IF (GET=120)+(GET=121)THEN
1370
1200 IF (GET=97)+(GET=98)THEN 12
10 ELSE 1310
1210 M$="2 SLOWS TO AVOID COLLIS
ION"
1220 GOSUB 610
1230 MISS=1
1240 GOTO 1370
1250 IF (GET=97)+(GET=98)THEN 13
70
1260 IF (GET=120)+(GET=121)THEN
1270 ELSE 1310
1270 M$="1 SLOWS TO AVOID COLLIS
ION"
1280 GOSUB 610
1290 MISS=1
1300 GOTO 1370
1310 M$=STR$(P)&" HAS GROUNDED S
O "&STR$(3-P)&" WINS  "
1320 GOSUB 610
1330 FOR A=1 TO 1000
1340 NEXT A
1350 CALL CLEAR
1360 GOTO 1380
1370 RETURN
1380 M$="      [ANOTHER GAME ?]
     "
1390 GOSUB 610
1400 CALL KEY(0,K,S)
1410 IF S=0 THEN 1400
1420 IF K<>89 THEN 2670
1430 GOTO 1690
1440 REM  INSTRUCTIONS
1450 CALL CLEAR
1460 CALL SCREEN(13)
1470 M$="YACHT RACE"
1480 L=10
1490 GOSUB 620
1500 M$="A STRATEGY GAME FOR TWO
"
1510 L=13
1520 GOSUB 620
1530 M$="BY BARRY JOHNS"
1540 L=16
1550 GOSUB 620
1560 FOR A=1 TO 500
1570 NEXT A
1580 CALL CLEAR
1590 PRINT "  PLAYERS MOVE BY SE
TTING     A COURSE THEN THEY MUS
T     DECIDE HOW LONG TO HOLD"
1600 PRINT "  TO THAT COURSE ALL
OWING     FOR DIRECTION AND FORC
E     OF THE WIND, THE LONGER"
1610 PRINT "  ANY COURSE IS HELD
, THE     GREATER THE TENDENCY T
O     BE BLOWN OFF COURSE AND"
1620 PRINT "  THE HIGHER THE FOR
CE OF     THE WIND, THE SOONER I
T     WILL HAPPEN.":::
1630 PRINT "   INPUT COURSE BY M
EANS      OF ARROW KEYS AND FOR
      A DIAGONAL MOVE WRCZ."
1640 PRINT "   HOLD COURSE FOR U
P TO      SIX MINS. INPUT [1-6]
":::
1650 PRINT "   PRESS ANY KEY....
THEN      PLEASE WAIT FOR SETUP
"
1660 CALL KEY(0,K,S)
1670 IF S=0 THEN 1660
1680 REM  COLOUR WIPE
1690 FOR A=1 TO 14
1700 CALL COLOR(A,1,1)
1710 NEXT A
1720 REM   CHAR. DEFINITION
1730 CALL CHAR(37,"FFFFFFFFFFFFF
FFF")
1740 CALL CHAR(38,"0")
1750 RESTORE 2650
1760 FOR A=40 TO 47
1770 READ A$
1780 CALL CHAR(A,A$)
1790 NEXT A
1800 FOR A=97 TO 120 STEP 23
1810 CALL CHAR(A,"040C1C3E7F04FF
7E")
1820 CALL CHAR(A+1,"2030387CFE30
FF7E")
1830 NEXT A
1840 FOR A=104 TO 119
1850 READ A$
1860 CALL CHAR(A,A$)
1870 NEXT A
1880 REM  SCREEN SET UP
1890 PRINT "&&&T&&&&&&&&&UTU&&&T
UT&&&U&&"
1900 PRINT "&&H%JT&&&&UTI%%%KUH%
%%JTI%K&"
1910 PRINT "&P%%%%JUTH%%%%%%%%%
%%%%%%%J"
```

```
1920 PRINT "&I%%%%%%%%%%%%%%%%%%%%%%%%%%%N"
1930 PRINT "Q%%%%%%A%%%%%%%%%%%%%%%%%%%%R"
1940 PRINT "H%%%%%%X%%%%%%%%%%%%%%%%%%%%S"
1950 PRINT "M%%%%%%%%%%%%%%%%OVL%%%%%%%%R"
1960 PRINT "P%%%%%%%%%%%%%%%N&&&M%%%%%%%S"
1970 PRINT "Q%%%%%OWVWL%%%%R&&&&M%%%%%%R"
1980 PRINT "P%%%%N&&&&&L%%%K&&&&&VM%%%%S"
1990 PRINT "Q%%%%R&&&&&P%%%%S&&&&&H%%%%R"
2000 PRINT "H%%%%J&&&&&&M%%N&&&&&I%%%%%S"
2010 PRINT "M%%%%%K&&&&&P%%R&&&&Q%%%%%%J"
2020 PRINT "&L%%%%%R&&&TH%%S&&&&I%%%%%%N"
2030 PRINT "&P%%%%%J&&I%%%O&&&&H%%%%%%%R"
2040 PRINT "&&M%%%%%SQ%%%%R&&UI%%%%%%%%R"
2050 PRINT "&&&VL%%%KH%%%%JTI%%%%%%%%%%K"
2060 PRINT "W&E&RM%%%%%%%%%%%%%%%%%%%%%%N"
2070 PRINT "&/()&M%%%%%%%%%%%%%%%%%%%%%%J"
2080 PRINT "S.&*DP%%%%%%%%%%%%%OVL%%%NVMO"
2090 PRINT "&-,+&Q%%%%%%%%%%%%N&&&WVW&&&&"
2100 PRINT "Z&X&C&L%%NVM%%%%OBEAUFORT&&&"
2110 PRINT "&&&&&&&VW&&&VWVW&&&&&&&&&&&&"
2120 AL=5
2130 AC=10
2140 BL=6
2150 BC=10
2160 REM  COLOUR SETS
2170 CALL COLOR(1,6,13)
2180 FOR A=2 TO 8
2190 CALL COLOR(A,16,13)
2200 NEXT A
2210 CALL COLOR(9,10,6)
2220 CALL COLOR(10,13,6)
2230 CALL COLOR(11,13,6)
2240 CALL COLOR(12,12,6)
2250 REM  WIND STR. AND DIR.
2260 RANDOMIZE
2270 WS=INT(RND*4)+1
2280 CALL HCHAR(22,29,WS+48)
2290 WD=INT(RND*8)+1
2300 ON WD GOSUB 2330,2370,2410,2450,2490,2530,2570,2610
2310 GOTO 680
2320 REM  WD & WS SETUP
2330 VD=-1
2340 HD=0
2350 CALL HCHAR(22,30,40)
2360 RETURN
2370 VD=-1
2380 HD=1
2390 CALL HCHAR(22,30,41)
2400 RETURN
2410 VD=0
2420 HD=1
2430 CALL HCHAR(22,30,42)
2440 RETURN
2450 VD=1
2460 HD=1
2470 CALL HCHAR(22,30,43)
2480 RETURN
2490 VD=1
2500 HD=0
2510 CALL HCHAR(22,30,44)
2520 RETURN
2530 VD=1
2540 HD=-1
2550 CALL HCHAR(22,30,45)
2560 RETURN
2570 VD=0
2580 HD=-1
2590 CALL HCHAR(22,30,46)
2600 RETURN
2610 VD=-1
2620 HD=-1
2630 CALL HCHAR(22,30,47)
2640 RETURN
2650 DATA 081C2A0808080808,0F030509102,00000402FF0204,0000201009050 30F,08080808082A1C08,00000408 90A0C0F0
2660 DATA 00002040FF402,F0C0A090 0804,FEFCFCF8E0C0C080,FFFCF0C0E0F0E080,7F3F3F1F07030301,FF3F0F03070F0701
2670 DATA 80C0C0E0F8FCFCFE,8080C0C0E4EEFEFF,010303071F3F3F7F,00030F3F1F0F1F7F,FEFFFEFCFCFEFFFE,FFFEF8FCF0F8FEFE
2680 DATA 7FFF7F3F3F7FFF7F,7F7F1F0F3F1F7FFF,FFFFFFFFFFFFE742,FFFFFFFFEFCBC301,42E7FFFFFFFFFFFF,80C3D3F7FFFFFFFF
2690 CALL CLEAR
2700 END
```

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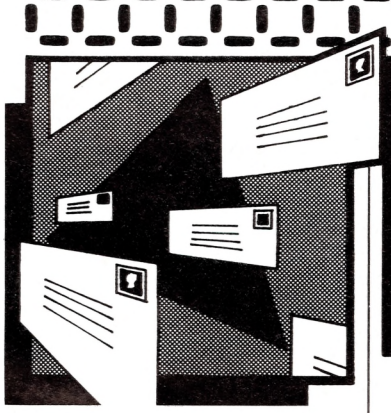

Input

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LETTERS

Dear PCT
Firstly a big thank you for producing an extremely interesting and helpful magazine.

I hope you can help me with the following inquiry. I would like to know if a Digital Equipment Corporation RX50 Diskette Drive can be linked to a BBC Micro Model B. If this is possible, would a special interface be required?

I hope you can supply the answer.
Yours faithfully,
J Richards
London

From studying the specifications for the RX50, it appears to be a perfectly ordinary 80 track disk drive. However, no details are given as to what type of bus connector it has. The BBC needs a standard Shugart bus and of course, will require a disk interface and disk filing system. Contact a dealer who can supply the interface and check that it can be used with your drives. If necessary request a 'test run' as interfacing is not always simple. It is much safer to choose a system your dealer supports and to choose a dealer who is competent at supplying correct information about the equipment.

Dear PCT
According to the Oric I handbook it should be possible to print out data on the office Epson MX-100 printer.

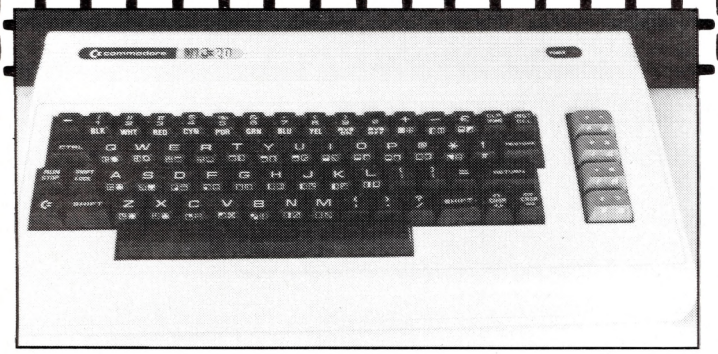
However, when I connect them up, not only can I not print, but the Oric turns sulky and many of the keys will not operate. Can you give me any advice as to how to debug the hardware.
Yours faithfully,
M S Howells
Milford Haven

The reason for this is that the Oric will not print to an Epson which has an RS232 interface fitted even if you are only using the centronics port.

Dear PCT
I own a VIC20 and printer and although the VIC satisfies most of my requirements, I would like to buy a Commodore 64. Could you tell me whether any companies or shops carry out a 'part exchange' scheme for computers.
Yours faithfully,
Stephen Hammond
Camberley

It is often possible to persuade your dealer to part exchange your old computer for a new one but as second hand computers have such a low re-sale value, the exchange is done as a favour by dealers eager to ensure your custom rather than as a cash-earning deal. For this reason do not expect to get very much for your computer.
A small ad in your local paper is probably the best solution. As you will want to keep the C2N cassette deck remember that the purchaser will have to spend a further £40 on a cassette unit, so do not put too high an asking price on your VIC. The VIC is, however, still selling very well so providing you ask the right price you should have no problem finding a buyer.

Dear PCT
Please enlighten me on the following:
1. When one programs the expanded VIC 20, which gets used up first, the expander or the internal RAM?
2. Can either RAM be freely selected in any way?
As 'non volatile' RAM units are on offer, I would



like to be certain that these would be first in line for program writing, otherwise there would be no protection in the event of power failure while writing.

I would like to use 'self-powered' RAM expanders as a means of instant access to a few favourite programs selectable by line number, yet prevent their destruction when loading from cassette tape in the normal way.

Yours faithfully,
E L Bands
South Africa

When you switch on a VIC 20 it checks all the RAM by writing to every byte and then checking that it has written correctly. This means that even if you did not switch off the RAM the program would be destroyed when the VIC was switched back on. You can prevent this by disabling the write line to the RAM when you switch on. However, as the RAM in the VIC will be reset this would cause the start of a BASIC program and any pointers to be lost. For this reason non volatile RAM is only suitable for storing machine code programs.

Dear PCT

Being a regular reader of your excellent magazine I often see complaints about overpriced micros. Having recently sold my ZX-81 64K I put an advert in a national newspapers, looking for a more advanced micro. A woman phoned me up and offered me a Sinclair QL, which delighted me as it looks to be an excellent computer. I decided against buying it when she told me the price — £5600!!

When I had recovered from the shock I bought a brand new VIC 20 Starter Pack for £441. So computer enthusiasts in the U.K. think yourselves lucky!

Yours faithfully,
Andrew Marais
Zimbabwe

We take your point, Andrew. Compared to that sort of price, we really do have little to moan about and with the continued price war between manufacturers real bargains can now be had. The QL does look on paper to be a fairly remarkable machine, but you probably did the right thing in not taking up the offer. Apart from the extortionate price (U.K. price is £399) you would probably have had a very long wait for delivery since, at the time of writing this, no machines have been released to the public.

Dear PCT

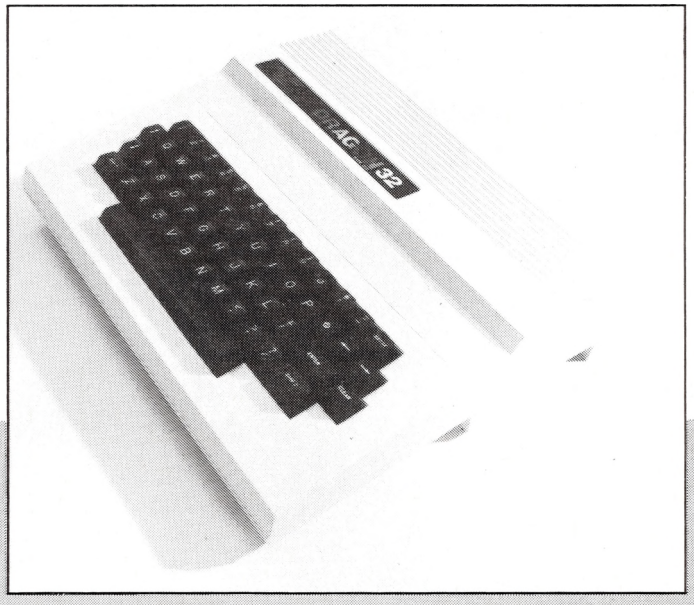
I am writing to ask two basic questions concerning the Dragon 32 micro. I have read some reports on the Dragon (not in PCT) which state it has a 16 bit microprocessor and others which state it has an 8 bit! Please tell me which is correct.

My second question is what is the maximum RAM expansion of the Dragon? Does it enlarge to 64K. Thanks for an interesting magazine.

Yours faithfully,
Stephen Bunting
Powys

The number of bits any chip has is a very vague quantity. The Dragon uses the 6809E as a CPU (central processing unit). The usual definition of the number of bits in a chip is the number it can read in from outside memory at any one time. Judged on these standards the Dragon is an 8 bit computer. However, once read in the data can be added to other data inside the chip so that it exceeds 8 bits. A 6502 CPU, as found in the BBC Micro and VIC 20 would receive a bit and send the message 'Hey, this number is too big for me to handle'. The programmer would then have to deal with the number as if it were two smaller numbers. The 6809 chip has double length registers (16 bits) and although this does not make it a true 16 bit chip, it does make it superior to an 8 bit.

Remember the CPU is not the only thing to consider when buying a computer. The standard of the BASIC, the operating system, the running speed and various other factors should be weighed against your requirements and budget. Because the 6809E is an 8 bit chip it can address 2^8 bytes of memory. This works out to 65535 bytes or 64K. In the Dragon 32, 32K is used by the computer to store the BASIC and all the information it needs to talk to you. All this is held in the ROM (random order memory). The other 32K is held in the RAM (random access memory) and this is where programs are stored. The Dragon 64 has two lots of RAM, each of 32K and when running can switch between them. This is known as pageing and in theory it allows for infinite expansion of RAM. However, such a system is difficult to cope with and awkward to use. It can also be very slow. For this reason it is not possible to expand beyond 32K. Besides, unless you are writing very complex programs, 32K should be enough for most people. If you have a lot of data consider a disk drive.



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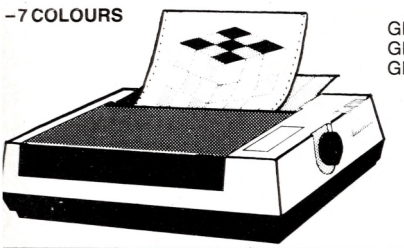

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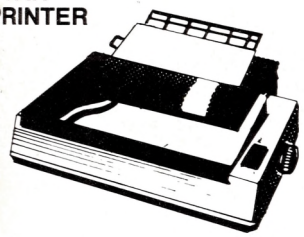

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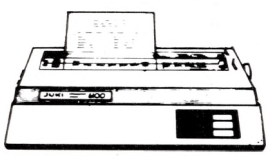

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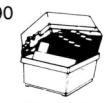

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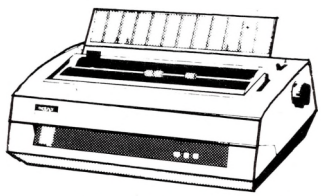

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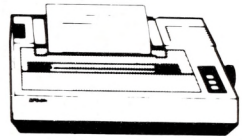

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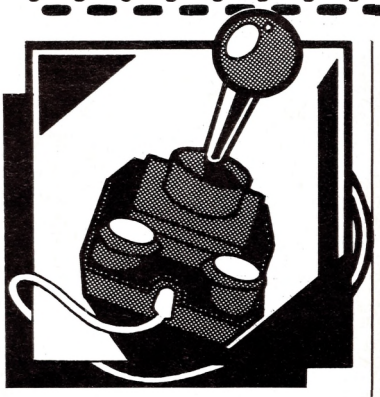


Software Reviews

REVIEWS

Title:	**Jackpot 64**
Type:	**Cassette**
Software House:	**Mr. Chip Software, 1 Neville Place, Llandudno, Gwynedd LL30 3BL**
Price:	**£5.50**
Machine:	**CBM 64**

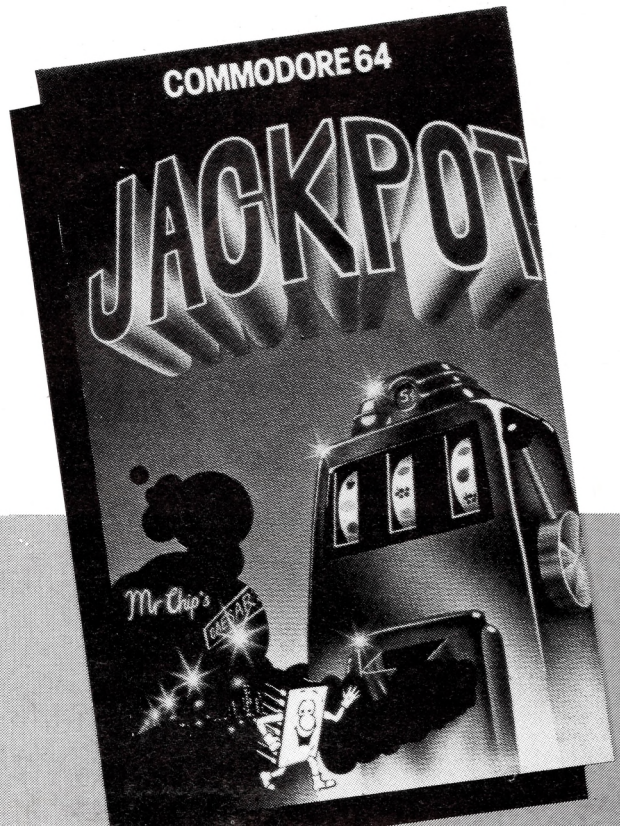
My initial thoughts whilst loading this program were that it wouldn't hold my attention for more than five minutes.

However, I must confess I was strangely addicted by this game.

The object of the game is simple. You start the game with £100 cash and the aim is to reach the jackpot figure of £250 by playing the machine, which costs £1 for each spin of the reels. The graphics for the fruits and the actual spinning of the reels is excellent and the game offers the usual hold, nudge and gamble features as in real life. You operate these features by pressing the appropriate function key, apart from the hold feature which is operated by typing in the number of the reel to be held (1-4). Even though there was no money to be made, or lost in my case, I found the temptation to 'have just one more go' kept me occupied far longer than I had originally expected. After playing many frantic 'shoot-em-up' type arcade derivations of space invaders, I found this game very relaxing. It is obviously no match for 'Revenge. . .' or 'International Soccer', but then it isn't meant to be and at least you know what to expect.

In conclusion if you are looking for a fruit machine program then this very neat implementation of one will suit you. However, if you are used to the high speed thrills of 'Gridrunner' or the outstanding graphics of ''International Soccer'' then you may be disappointed. I have a feeling you may be pleasantly surprised. **J.G.**

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



Software Reviews

Title:	**Laser Zone**
Type:	**Tape**
Software House:	**Salamander Software, 17 Norfolk Rd., Brighton BN1 4AA**
Price:	**£7.95**
Machine:	**Dragon 32/64 (1-2 joysticks)**

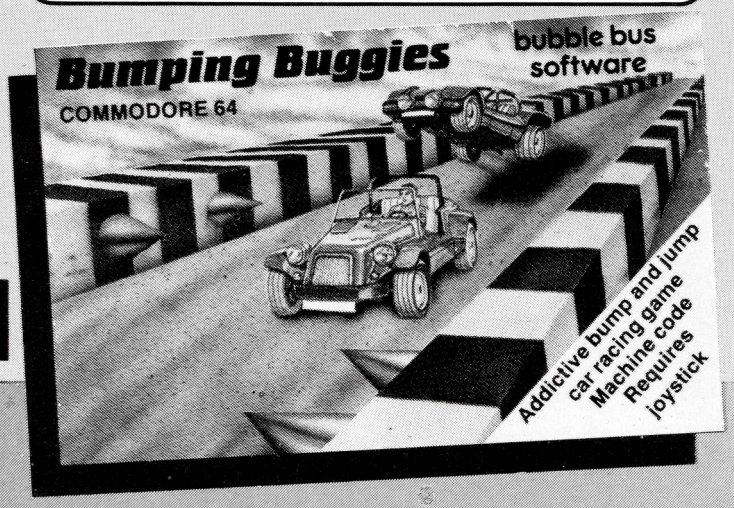
The difference between this game and others of its genre (shoot-em-up, machine code) is that you control two ships at once. The FIRE button allows both ships to fire at once and learning to control this two takes a great deal of skill and practice.

The aim of the game is to prevent the aliens reaching your two lines of movement. This is accomplished by shooting them. If, however, they reach your axis and begin to move towards you all is not lost. You have a limited supply of Electros which clear both lines of movement of any aliens present. In later stages of the game, pods appear which can explode and damage your ship, whereupon you lose a life.

The graphics are good, though not spectacular but the sound effects are excellent. The screen is well laid out with options for 1 or 2 players. Overall a good game and very addictive. **S.M.**

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

Title:	**Bumping Buggies**
Type:	**Tape**
Software House:	**Bubble Bus, 87 High Street, Tonbridge, Kent TN1 1LS**
Price:	**£6.99**
Machine:	**CBM 64**



Bumping Buggies is evidence that the Commodore 64 is a games player's dream. Graphics, sound and the game itself are all excellent.

This a racing game with a difference: instead of just driving faster than the other cars, you have to jump onto and destroy them, which makes for much better fun!! If you have ever had a secret desire to be Mad Max III, then this is the game for your.

My own quibble is that the background is slightly plain. However, this has no effect on the very addictive nature of the game. Bubble Bus have exploited the large memory of the '64 and have included a very melodious tune to liven up the period in between games.

This game is one of the best I have seen on the '64, and deserves a place in every '64 owner's software library. **D.L.**

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

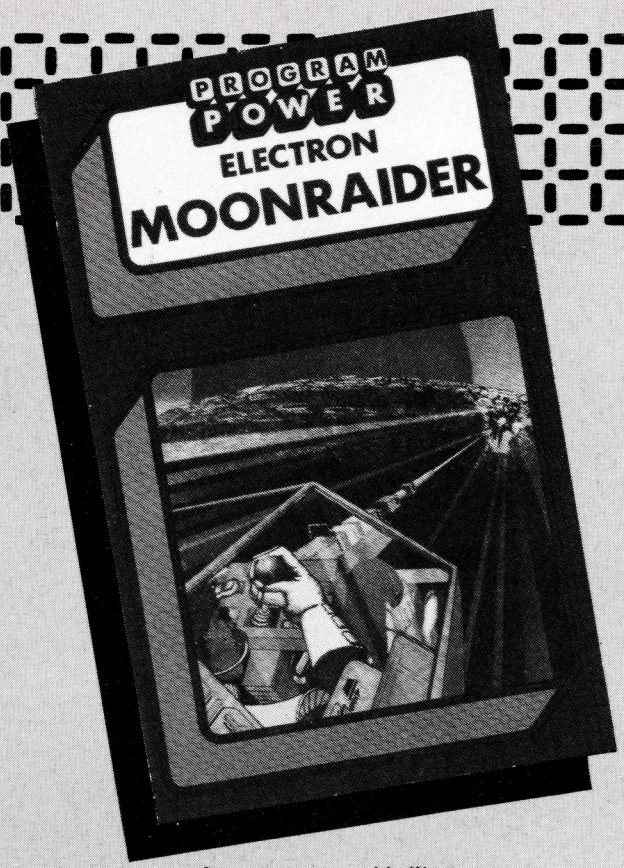
Title:	**Space Swarm**
Type:	**Tape**
Software House:	**Software Projects, Bear Brand Complex, Allerton Rd, Woolton, Liverpool L25 7SF**
Price:	**£5.95**
Machine:	**VIC 20 unex.**

A nice but fairly widely used 'Slaughter the Alien' type game. The instructions supplied give you a lot of chit chat about who you are supposed to be and the space craft you are flying, but not a lot on the game itself.

When the game is presented on the screen the score and high score cannot be seen. Nowhere does it mention that you need to use the cursor key to centre the screen. F1 starts the game. You pass through five waves of play and when you finish the fifth wave you start on wave one again.

There is a high score table for the top four scores, but you cannot add your name to the table which takes a little of the excitement away. The sound and graphics are reasonable and for the price you cannot really complain, but a little more effort on the instructions would have been helpful. **J.E.S.**

STAR TABLE	
Screen display	★★
Addictiveness	★★★
Ease of use	★★★★
Overall	60%



Title: Androids 1
Type: Tape
Software House: Vortex Software, 280 Brooklands Rd, Brooklands, Manchester M23 9HD
Price: £5.95
Machine: Spectrum 16K/48K

This program from Vortex is the first in a series of real time arcade games featuring a highly manoeuvrable android. The idea of the game is to blast your way to the reactor, which is about to explode and destroy the world. When you reach your goal, which you must do in a preset time, you are required to destroy the reactor to complete your mission. Trying to prevent you from doing this are various obstacles, including walls which you must blast your way through, mazes to confuse your sense of direction and four types of mutants who defend their territory vigorously. Your only weapon is the latest in android technology which has an unlimited energy supply, but unfortunately only has five lives and five shields. The android is a little difficult to control at first, but at least the Kempston joystick is catered for. However, the key configurations are very wide-ranging and a suitable set can soon be found. The screen displays are very comprehensive with a direction and position indicator, showing the correct course to follow.

This first program in the android series has certainly set an excellent standard in both graphics and game content which will, hopefully, be continued in Android 2.

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

Title: Moonraider
Type: Tape
Software House: Micro Power, Northwood Hs, North St, Leeds LS7 2AA
Price: £7.95
Machine: Acorn Electron

I thoroughly enjoyed playing Moonraider. It's one of those addictive games where you're left wondering whether it's more likely the keyboard will wear out first due to the constant bashing it receives, or whether you will.

You have five different screens in which to zap, bomb and manoeuvre your spacecraft to penetrate various alien defences and destroy the central nucleus of their moonbase. Unfortunately your spacecraft consumes fuel at such a rapid rate that in order to continue the game, fuel dumps must be attacked to replenish your supply. You do, of course, earn points throughout and if lucky enough this will qualify you to enter the high score table at the end of a run.

Unlike most games you don't have to begin on screen one. You may start at any phase of the mission you wish. This is more satisfying than fighting your way through preliminary screens, never lasting long enough to see the others — and getting fed up of trying. Indeed this facility gives five games in one and with a choice of five skill levels included, what more could you ask for? **J.V.W.**

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

Title: Killer Gorilla
Type: Tape
Software House: Micro Power, Northwood Hse, North St, Leeds LS7 2AA
Price: £6.95
Machine: Acorn Electron

I'm sure that Program Power have come up with a best-seller here. Killer Gorilla has elements of speed of thought, judgement and tenacity that

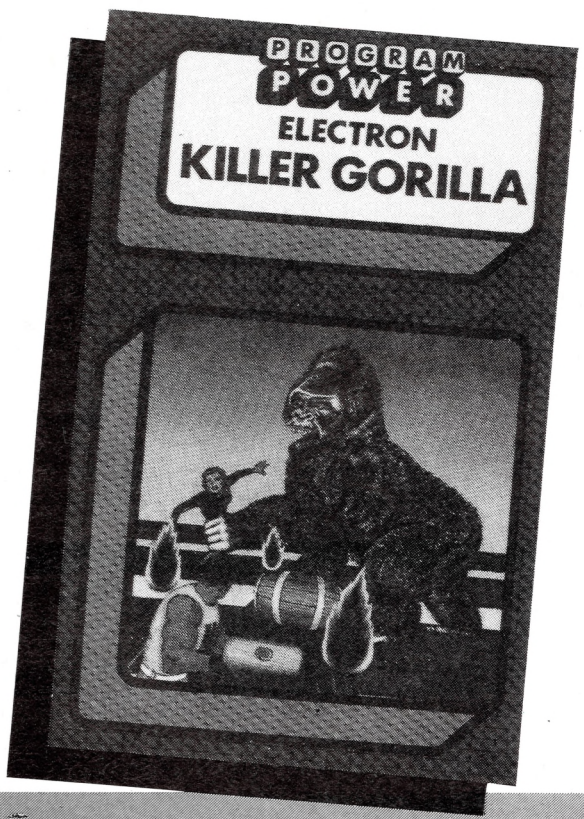
combine to make a game that I have come back to many times.

The object of the game is to climb to the top of each stage as quickly as possible, extra points being given for speed, whilst avoiding various hazards. There are four stages which are cyclical.

The first stage has ramps along which you must guide the man that you control, trying to avoid the barrels that are rolling down to flatten you. The second stage consists of conveyors along which appear custard pies (!) which must be avoided. The third stage has lifts and steps which involve jumping from place to place with immaculate timing. The final stage has a pyramid which once completely traversed (which isn't easy) collapses and defeats the gorilla. At each stage axes are available which may be used to destroy nasties, but this involves losing time which is limited. At the top of each stage there lies an heiress who is rescued once you reach her. The relevance of the heiress and the gorilla eludes me, but the game is still a delight to play.

The graphics are excellent, especially on the third stage, and combined with smooth movement this game must be a winner. **G. de B.**

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



Title: Gridtrap
Type: Cassette
Software House: Livewire, Sumlock, 198 Deansgate, Manchester
Price: £7.95

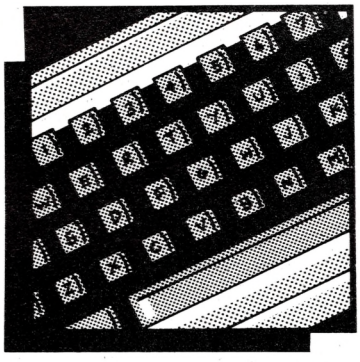
Machine: CBM 64

The idea of this game is to move your character, Mr. Livewire, around a room defusing time bombs. These bombs are counting down from 30 and you hav to defuse them before they explode. The playing area is a grid of squares in which your character, known as LW, can move in any of the four usual directions. However each square LW steps on immediately becomes a trap and cannot be stepped on again. You are able, however, to step off each edge and reappear on the opposite side and also there is a facility to scroll the row you are on either left or right. This has the effect of shuffling the squares in either direction and adding extra squares to the appropriate ends of the row you are on. There are 4 'bones' squares indicated by flags and also 'death squares' indicated by skull and crossbones which must be avoided at all cost! All this complicated by the fact that a rather large pair of brown boots are also wandering the grid attempting to 'boot' LW out of the room! If you manage to defuse the bomb another appears, up to a maximum of five, after which you go up to the next level. There are nine levels in all, each one progressively more difficult with more 'death squares' and more 'big boots' to avoid. On higher levels the boots even acquire strategy as they appear to stalk you!

Although at first this seems quite complex you soon get the hang of the game and I found it rather exciting. There are plenty of features added to the game and the graphics are excellent. Throughout the game a background tune is played, but you have an option to suppress this.

I particularly enjoyed the introduction which displayed all the function keys being 'pressed' by the aforementioned 'big boots', and the game has been very well thought out. There is even an option to redefine the playing keys for anyone who doesn't own a joystick, and I got the impression that a lot of work had gone into the design of this game. **J.G.**

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



SINCLAIR QL

Sinclair Q.L. Reviewed

The Q.L. has finally arrived! Simon Rockman examines it.

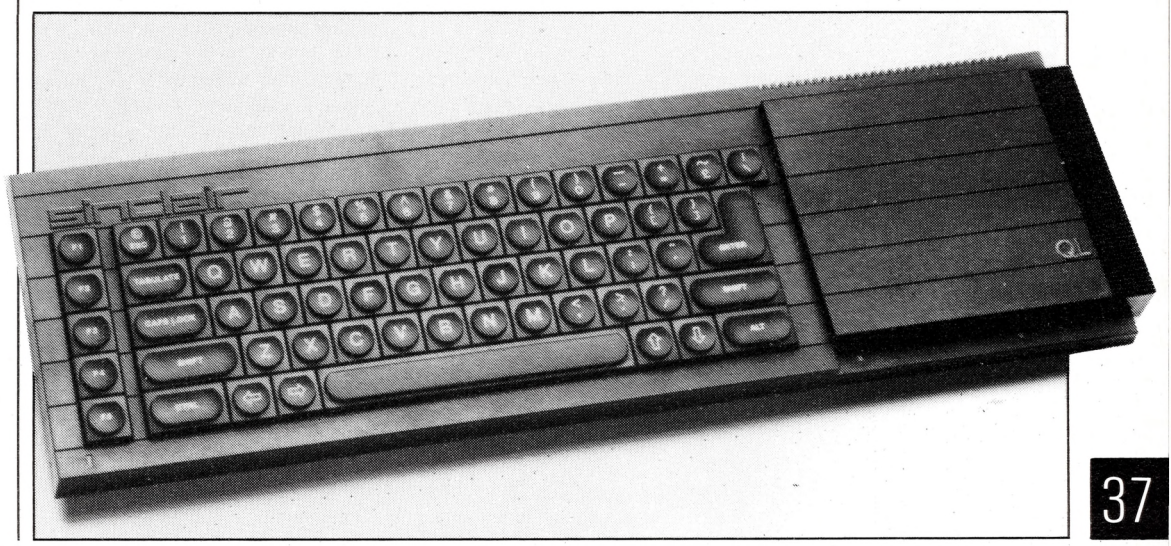
The situation regarding the Sinclair QL changes so rapidly it is hard to keep up to date with the news. This article reflects the situation on April 26th.

The new Sinclair QL is a black box, measuring 138mm by 46mm by 472mm and comes with small pegs to place over the rubber feet so that it can be propped up. This is necessary because the keyboard is flat, not stepped like on most micros, so you need it to be presented to you at an angle. Beneath the black full stroke keyboard lies a membrane similar to that on the Spectrum. However, the QL is much nicer to use. The early cases had problems with sticking keys but this seems to have been sorted out and all the QL's customers will receive fine keyboards, quite pleasant to use.

Internal power

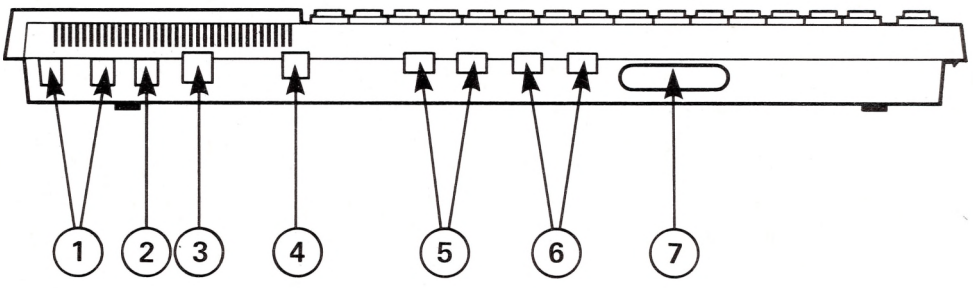
The QL's 68008 CPU (central processing unit) is one of the most powerful in widespread use. It has a 32 bit internal archetecture which allows it to crunch numbers very rapidly, and has divide and multiply functions in its instruction set. Many larger micros use a similar chip, including the Sage super micro, the Apple Lisa and the IBM XT 370 (which is so powerful that you need Pentagon permission to buy one!)

There has been such rapid growth in the use of the 68000 family of chips that many new programs have been written to take advantage of it. One of



Sinclair Q.L. Reviewed

the most impressive uses has been to implement Unix, an operating system, which serves the same sort of function as CP/M but is friendlier, easier to use and offers more flexibility; it does, however, require a vast amount of disk space (around 11 megabytes or 235 Spectrum-fulls) so it will be a while before it is available for the QL. You will need a hard disk and the promised 1/2 Megabyte ram pack, as well as a lot of money to buy Unix. It was surprising to learn that the RAM pack design has been finished, but the chips it requires will be very expensive for a fair while. A 128K version, using cheaper, compatible chips is possible and would be nice in the interim. Nigel Searle, M.D. of Sinclair Research, said recently that a hard disk interface or a hard disk unit would be available at the end of this year. If that arrives on time I will be **very** surprised.



Rear of QL showing connector ports

1 Connections to Q.L. Network
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5 RS 232 ports (one to send, one to receive)
6 Joystick ports
7 ROM socket

Premature launch?

There was no mention of the machine being unfinished at the launch but a month later no-one outside Sinclair, or the favoured software houses had seen one. It was then that Sinclair started to admit that the computer was unfinished, problems in the final stages of production put deliveries back a month, to the end of March. However, Sinclair was not promising anyone delivery before the end of April, so when the March deadline came and went without a single machine being delivered (only a short test run of 80 machines had gone through the Feltham factory), no-one made a fuss.

The delay would appear to be due to problems regarding the operating system. Even in July the machines will have an extra board carrying EPROMs with the parts of the BASIC and operating system that the Sinclair engineers were unable to fit inside the specified 32K of ROM.

The new ROM is 48K long of which 8K is unused and has the bonus of LOGO type commands, some new graphics routines such as recolour to give you BBC type colour rotation, and an odd fill command which fills unexpected parts of the shape, added to the resident language (SuperBASIC). There are some extra keyboard commands which allow you to wait a specified time. This ROM pack slots into the cartridge port but because it uses physically large EPROMs rather than the tiny masked ROMs, used for the Spectrum games, it looks untidy. It also means that you cannot use cartridges, not a major worry because by the time cartridges are available this should have been fixed.

QL on test

The QL should be fast; it uses a 68008 running at 7.5 MHz and all the machine code programs I've seen have been very fast, but SuperBASIC is slow and loses out badly to the BBC when running standard benchtests. David Karlin, the QL's designer, said that this was partly due to the FOR..ENDFOR (QL for FOR...NEXT), loop not being very fast, and that this would be seen to. He also pointed out that the QL's speed is consistent, so even the longest programs do not slow down. The basic editor is more than a little crude, again this will be fixed by the end of the month but I will be very surprised if it is the full screen editor we were promised at the launch. The SuperBASIC interpreter is so fussy about spaces that this can be very annoying. If you enter the line:

```
190 PRUNT V$
```

the QL gives the error message: Bad Name.

This is very nice; like the Spectrum it will not allow you to enter a line containing syntax errors. However it will not allow you to edit this by just changing the U to an I, you have to retype the whole line. If you do write a program that contains an error then you can edit it with an EDIT line number command. This is like the old machines harking back to the days of the teletype terminal, not what I would expect from the latest in friendly, superpowerful home micros. It seems that Sinclair Research are to make full use of the clause

which every manufacturer puts on his brochure; 'due to a policy of on-going improvement the manufacturer reserves the right to change the specification and colour from that stated' or words to that effect. Well you can be sure the colour will stay the same but with weekly, and maybe even daily changes to the BASIC and frequent changes to the operating system it may well be that in the short term no two month's QLs will be the same, as machines are de-bugged during production.



Software from Psion

I have also seen the Psion packages running, these are a word-processor (QL Quill), a database manager (QL Archive), a spreadsheet (QL Abacus) and a graphics program (QL Easel). After beginning to see the QL as just-another-micro these programs really bucked up my expectations. They are on a par with, if not better than, the best business software around. Quill is a very good wordprocessor, with all the standard features, but the screen mimics the printed copy as closely as possible. Large documents are hindered by the microdrives but a 128K RAM pack cannot be far away, either from Sinclair or an outside supplier. Quill has some very nice special features, like the ability to number pages automatically, with roman numerals, and Quill can show you the layout of a 160 column document by representing each character with a pixel and each highlighted character with two pixels.

Archive is very, very powerful, it can either be used as a simple database (like Vu-File for the BBC or Spectrum) or as a database language. Like all the Psion packages it has an extensive help command to guide you through the options. Psion expect a lot of other companies to cash in on the power of QL Archive in the way that they have done with DBase II for machines like the Sirius and IBM. In fact most of the comparisons made were between the Psion package and similar programs on computers costing many times more than the QL.

QL Abacus is a friendly spreadsheet. Instead of referring to each cell with a co-ordinate you can use labels. This makes working out what you are doing the prime concern, and not how to work the program. The ability to handle text simply makes the output much easier to read. Psion intend selling Abacus for the DEC VAX as well as for various other computers.

QL Easel is fun. Given a dull set of figures Easel can turn them into line, bar or pie charts; it can take or send data to any of the other programs, apply formula to your figures and then dump the whole lot onto a printer. Even losses can look good.

Data can be moved between all the Psion programs using the import and export commands, so you could type a letter using Quill and incorparate a table of figures from Abacus, sending it to the relevant people, with labels printed using Archive. You could even include a graph of the figures from Easel.

I went to Sinclair and Psion in the same week. I left the former angry that the machine was so late and unfinished and a little despondent that the SuperBASIC was not so super. I left the latter Excited and once more itching to get my hands on a QL. Psion — have shown what can be done with the QL and given the right documentation there should be some stupendous software for the black box. If the C language compiler which is under development, is as good as the other QL software no-one will use BASIC.

Overall I am still excited about Sinclair's new machine. It has great possibilities and may be the computer trend setter it promised to be on that long gone launch day.

Since writing this article, the author has taken delivery of his Q.L. Any changes to the opinions expressed here will be published next month.

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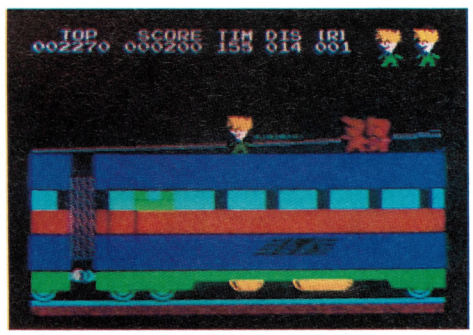
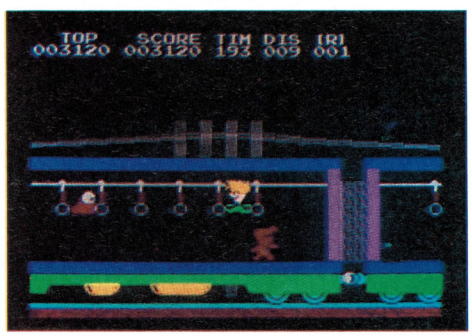
Will you ever get to the front and halt the train? Or will you be well and truly bumped off?







Still of Buster Keaton from The General © Raymond Rohauer 1984

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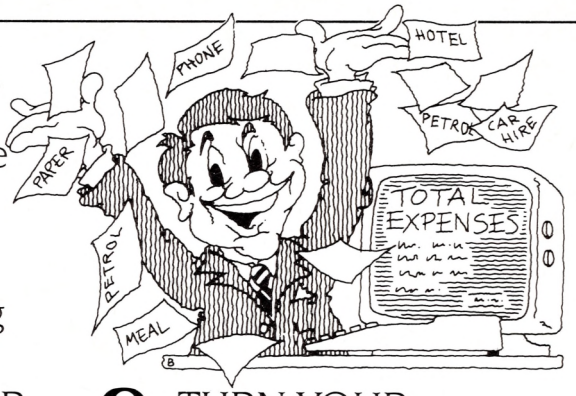

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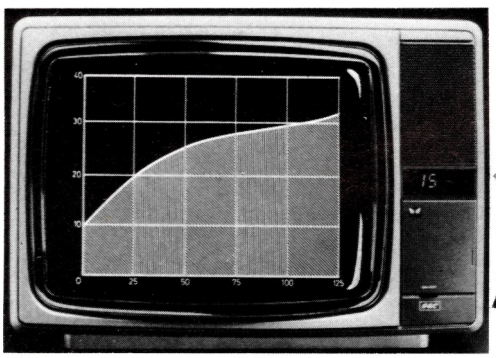

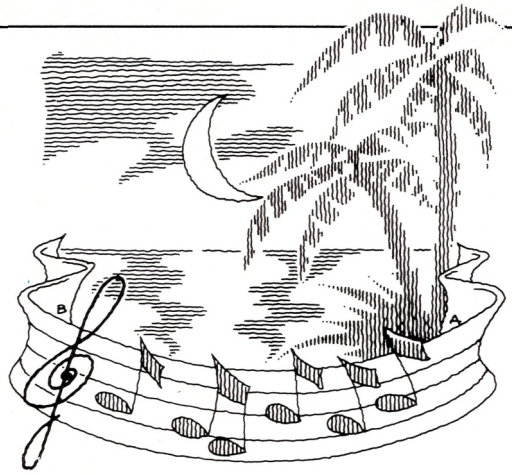

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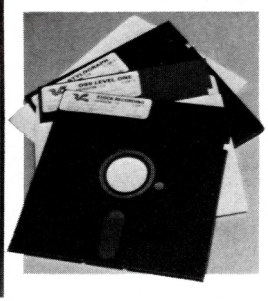

It's no dumb computer, either—you can even get it to talk to you.





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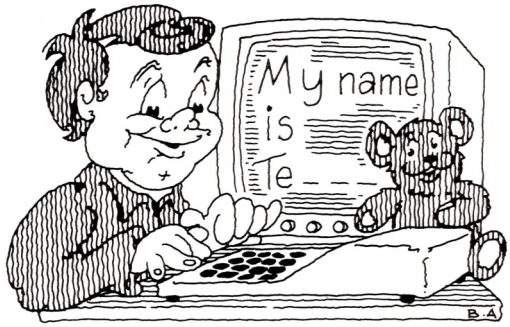

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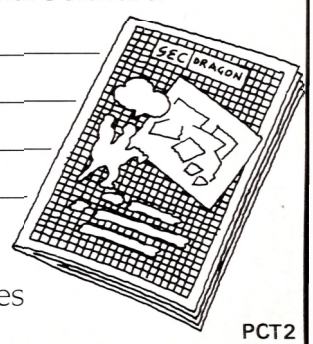
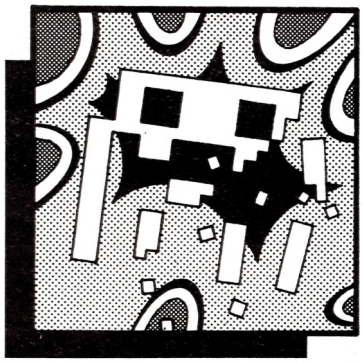


PCT2



Bombshell

Type in this ultra fast and exciting arcade game for the Spectrum and have an explosive time! By Matthew Taylor.

SPECTRUM

Bombshell is an abstract arcade game for the 16 or 48K Spectrum. The program consists of two parts: the first contains full instructions, generates the user defined graphics and allows the user to define his own control keys. The second is the game itself. Two programs are used to allow the game to fit into 16K.

You are Fred, who must try to defuse a bomb before time runs out. You must avoid the deadly skulls, especially the yellow one which will chase you. You get a bonus of 250 points for catching a flag. As you walk around the grid, you leave a trail of blank squares behind you. You cannot step on these squares again, so alternatively you can slide the row along to avoid leaving a trail.

When (if) you have diffused five bombs you are given the chance to score a bonus: hit any key when Fred is over the flag. You now have to diffuse another five bombs, only this time it will be harder. If you reach 20000 points you will be awarded an extra life.

How to type it in

The first program should be typed in and saved under the name ''BOMBSHELL'' LINE 5. The second should be saved under the name ''BOMBSHELL2''LINE10.

The program uses many colour control codes (see Sinclair manual, page 114 — chapter 16) embedded in the listing. These are essential to the operation of the program and it is imperative that they are typed in correctly or the program will not function correctly. Below is an explanation of their whereabouts in the listing:

Both the paper and the ink codes should be put before each pair of characters in the string as mentioned above even if it seems as though you are repeating yourself. For example Line 1300 you must enter both the INK and PAPER codes although this seems unnecessary. Also in lines 8230 and 8240 the codes should be entered before each pair of characters. If you have never used these codes before, it might be an idea to practise before you

Program one

LINE	INK	PAPER	CHARACTER
1010	magenta	blue	Fred
	red	black	Number (23)
	yellow	black	TNT
	cyan	black	1st skull
	yellow	black	2nd skull

Program two

LINE	INK	PAPER	CHARACTER
1105	yellow	blue	Blocks
1112	yellow	black	Skull
1300	black	black	Spaces
1368	magenta	black	Fred
6034, 6035, 6530	black	black	Spaces
7520, 7350	cyan	black	Skull
7570	red	black	Flag
7580	yellow	black	Pole
7610	black	black	Spaces
7620	yellow	black	TNT
7640, 7650	magenta	black	Fred
8230, 8240	yellow	blue	Blocks

EACH INDIVIDUAL BLOCK (see below)

type in the program. Try and form a string with several different colours inside it.

A brief explanation of the program's operation might help to clarify these codes: The display is stored in the string array a$(20,96). This enables it to be scrolled in BASIC. Each row of 96 is divided into 16 sections of 6 characters. The first four in each section hold the ink and paper codes, the fifth and sixth the actual graphics to which the colour codes apply.

The final two bytes must be preceeded by the colour codes, otherwise the program will not be able to address the strings properly. Thus each of the strings in the program that are mentioned in the list above (for program two) should contain six characters — it seems that there are only two in the listing because the codes are invisable. The strings in lines 8230 and 8240 should contain 96 characters.

If lines which contain strings with both paper and ink black (eg. line 1300) it is a good idea to change to different colours after the string, so you can read the rest of the program. However, you must put these extra codes outside the quotes so the string is the right length.

hints on conversion

For a successful conversion, without extensive rewriting, it is essential that there is some way of embedding colour control codes inside strings on your micro. They ought really to take up two bytes for each code or again extensive rewriting will have to be done (you will have to change all the complicated expressions inside the a$ brackets.)

The Specrum's screen is 22 rows of 32 columns. In PRINT AT and ATTR statements the first number is the row, the second the column (ie. PRINT AT row, column;). The VAL function is used frequently to save memory so the program could fit into 16K. This also explains the lack of potentially helpful REM statements. In this form the programs occupy about 10-11K together.

Below is a list of some of the Spectrum's peculiarities used in this program.

i) CLEAR 32593 — clears six bytes of memory above RAMTOP in which to store the codes of the user defined keys.

ii) STRINGS — A string on the Spectrum is like a one dimensional array:
a$(1) is the first character of a$
a$(3 to 6) are the 2nd to 6th characters.
a$(20,96) is an array of 20 strings each length 96 characters.

iii) PRINT' — Miss a line, as in Atom/BBC BASIC.

iv) INPUT LINE — Just ignore the 'LINE'

v) CODE a$ — Character code of a$

vi) USR''a'' — This gives the address of the first user defined grapic in RAM.

vii) LOGIC — On the Spectrum true is 1, false is 0.
eg. PRINT 1 = 1 gives 1 (-ve 1 on some machines).
PRINT 1 = 2 gives 0

viii) ATTR(y,x) — This gives the colour of the screen position y,x — a number between 0 and 255: = INK + 8 * PAPER + 64 * BRIGHT (bright on or off)

CODE COLOUR
0 Black
1 Blue
2 Red
3 Magenta
4 Green
5 Cyan
6 Yellow
7 White

how it runs

Program One: Bombshell

Lines	
1	Loads Bombshell 2
5-70	Main Loop
80-240	User defined control keys
1000-1100	Instructions
9000-9990	Generate user defined graphics

Program Two: Bombshell2

Lines	
37,38	Get correct control key codes
40,80	Main loop
1101-1112	Move yellow skull
1300-1369	Move Fred, check for collisions
1370-1410	Scroll screen
3000-3120	Tunes
4000-4350	'Bonus stage'
5010-5090	End of game
6000-6040	Loss of Life
6500-6550	'In between screens' routine.
6800,6810	'Time up' routine
7000-7990	Generate screen
8000-8260	Set variables

variables used

Graphics

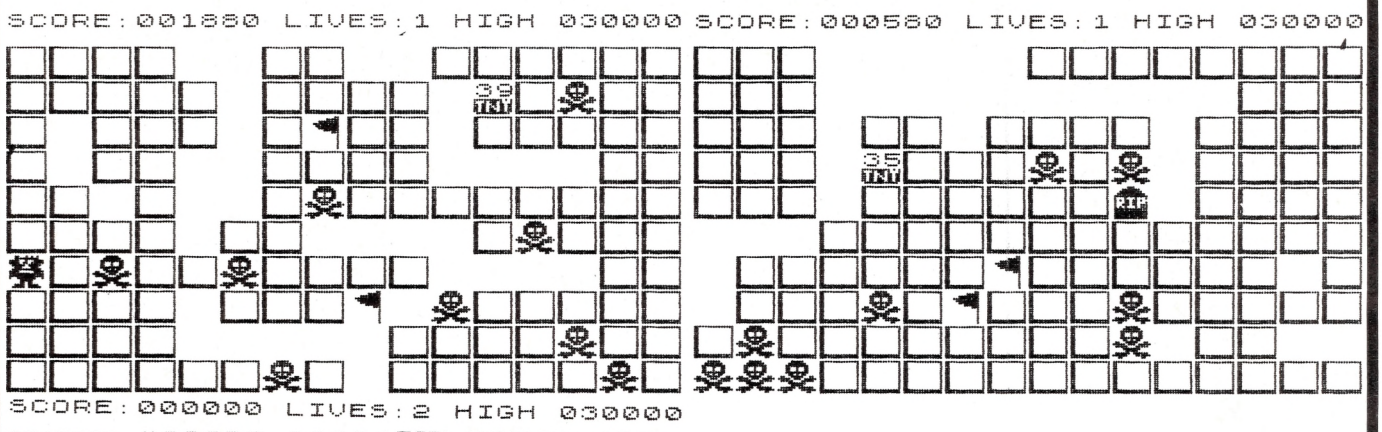
A	Box (top left)
B	Box (top right)
C	Box (bottom left)
D	Box (bottom right)
E	Skull (top left)
F	Skull (top right)
G	Skull (bottom left)
H	Skull (bottom right)
I	Grave (top left)
J	Grave (top right)
K	Grave (bottom left)
L	Grave (bottom right)
M	Fred (top right)
N	Fred (top right)
O	Fred (bottom right)
P	Fred (bottom right)
Q	Flag (top right)
R	Flag (top tight)
S	Flag (bottom right)
T	TNT (bottom left)
U	TNT (bottom right)

User Defined Graphics have been printed as upper case letters in the listing.

z zero o one s six	To save memory

skill	Skill level
l	Spare lives
et	Flag (set to zero when extra life has been awarded)
hs	High score
h$	Name of top scorer
x,y	Position of Fred
xd,yd	Fred's new direction
xt,yt	Position of bomb
xs,ys	Position of yellow skull
sk	Flag so skull moves slower than Fred
a$(20,96)	Stores screen
t	Time left
g	Number of screen in between each Bonus Stage
k$(6)	Codes of control keys (can be 'Normal' or 'User defined')

program listing




```
   2 REM BOMBSHELL version 2.1
   3 REM Matthew Taylor 1984
  10 RANDOMIZE : LET z=0: LET o=1: LET s=6: LET hs=VAL "3000
0": LET h$="MATTHEW
TAYLOR"
  30 GO SUB VAL "8000"
  35 INPUT "Skill level (1-9) ?";skill
  36 IF skill<o OR skill>9 THEN  GO TO VAL "35"
  37 INPUT "(U)ser defined keys or (N)ormal ?"; LINE b$
  38 IF b$="u" OR b$="U" THEN  FOR i=1 TO 6: LET k$(i)=CHR$
(PEEK (32593+i)): NE
XT i
  40 GO SUB VAL "7000": GO SUB VAL "1000": GO SUB VAL "4000"
: GO SUB VAL "8200"
  80 GO TO VAL "40"
1010 FOR g=o TO VAL "5"
1100 LET xd=z: LET yd=z: LET t=t-o: IF t=z THEN  GO TO VAL "
6800"
1101 IF sk<2 THEN  GO TO 1111
1105 PRINT AT xs,ys;"AB";AT xs+o,ys;"CD": LET a$(xs-o,ys*3+o
 TO ys*3+s)="AB": LE
T a$(xs,ys*3+o TO ys*3+s)="CD"
1106 LET xs=xs+2*((x>xs)-(x<xs)): LET ys=ys+2*((y>ys)-(y<ys)
)
1107 IF xs=xt AND ys=yt THEN  LET xs=xs+2: IF xs=22 THEN  LE
T xs=2
1109 IF x=xs AND y=ys THEN  GO TO VAL "6000"
1110 LET sk=z
1111 LET sk=sk+o
1112 PRINT AT xs,ys; INK s;"EF";AT xs+o,ys;"GH"
1120 PRINT AT xt,yt; INK 2; BRIGHT o;t;: IF t<10 THEN  PRINT
 " "
1130 IF sc>=20000 THEN  LET l=l+el: LET el=z
1140 IF INKEY$="" THEN  PAUSE VAL "20": GO TO VAL "1100"
1150 IF INKEY$=k$(5) OR INKEY$=k$(6) THEN  GO TO 1370
1300 LET a$(x-o,y*3+o TO y*3+s)="  ": LET a$(x,y*3+o TO y*3+
s)="  "
1320 LET xd=2*((INKEY$=k$(2))-(INKEY$=k$(1)))
1325 LET yd=2*((INKEY$=k$(4))-(INKEY$=k$(3)))
1326 PRINT AT x,y; INK z;"  ";AT x+o,y;"  "
1327 BEEP .01,50
1328 LET x=x+xd: LET y=y+yd
1330 IF x=22 THEN  LET x=2
1340 IF x=z THEN  LET x=20
1350 IF y=32 THEN  LET y=z
1355 IF y=-2 THEN  LET y=30
1359 IF ATTR (x,y)=6 THEN  GO TO VAL "6000"
1360 IF ATTR (x,y)=2 THEN  LET sc=sc+VAL "250": PRINT AT z,(
12-LEN (STR$ sc)); I
```

```
NK 4;sc
1361 IF ATTR (x,y)=5 THEN  GO TO VAL "6000"
1362 IF ATTR (x,y)=66 THEN  GO TO VAL "6500"
1363 IF ATTR (x,y)=z THEN  LET x=x-xd: LET y=y-yd
1364 IF x=22 THEN  LET x=2
1365 IF x=z THEN  LET x=20
1366 IF y=32 THEN  LET y=z
1367 IF y=-2 THEN  LET y=30
1368 LET a$(x-o,y*3+o TO y*3+s)="MN": LET a$(x,y*3+o TO y*3+
s)="OP"
1369 GO TO 1400
1370 IF INKEY$=k$(5) THEN  LET t$=a$(x-o,o TO s): LET a$(x-o
,o TO 90)=a$(x-o,7 T
O 96): LET a$(x-o,91 TO 96)=t$: LET t$=a$(x,o TO s): LET a$(
x,o TO 90)=a$(x,7 TO
 96): LET a$(x,91 TO 96)=t$: LET y=y-2: IF x=xt THEN  LET yt
=yt-2
1380 IF INKEY$=k$(6) THEN  LET t$=a$(x-o,91 TO 96): LET a$(x
-o,7 TO 96)=a$(x-o,o
 TO 90): LET a$(x-o,o TO s)=t$: LET t$=a$(x,91 TO 96): LET a
$(x,7 TO 96)=a$(x,o
TO 90): LET a$(x,o TO s)=t$: LET y=y+2: IF x=xt THEN  LET yt
=yt+2
1381 IF yt=32 THEN  LET yt=z
1382 IF yt=-2 THEN  LET yt=30
1383 IF y=32 THEN  LET y=z
1384 IF y=-2 THEN  LET y=30
1400 PRINT AT x,z;a$(x-o);AT x+o,z;a$(x)
1410 GO TO 1100
3010 FOR i=VAL "30" TO VAL "40": BEEP VAL ".1",i: NEXT i: RE
TURN
3030 BEEP VAL ".3",VAL "20": BEEP VAL ".15",VAL "20": BEEP V
AL ".15",VAL "22": B
EEP VAL ".3",VAL "24": BEEP VAL ".3",VAL "20": BEEP VAL ".15
",VAL "27": BEEP VAL
 ".15",VAL "29": BEEP VAL ".15",VAL "27": BEEP VAL ".15",VAL
 "29": BEEP VAL ".6"
,VAL "27": RETURN
3060 BEEP VAL ".3",VAL "5": BEEP VAL ".3",VAL "5": BEEP VAL
".15",VAL "5": BEEP
VAL ".3",VAL "5": BEEP VAL ".3",VAL "8": BEEP VAL ".15",VAL
"7": BEEP VAL ".3",V
AL "7": BEEP VAL ".25",VAL "5": BEEP VAL ".25",VAL "5": BEEP
 VAL ".3",VAL "4": B
EEP VAL ".6",VAL "5": RETURN
3090 BEEP VAL ".5",VAL "9": BEEP VAL "1",VAL "12": BEEP VAL
".5",VAL "11": BEEP
VAL "1",VAL "9": BEEP VAL ".5",VAL "9": BEEP VAL ".5",VAL "7
": BEEP VAL "1",VAL
"2": BEEP VAL ".25",VAL "4": BEEP VAL ".25",VAL "5": BEEP VA
L "1",VAL "4": RETUR
N
3120 BEEP VAL ".3",VAL "12": BEEP VAL ".07",VAL "12": BEEP V
AL ".07",VAL "14": B
EEP VAL ".07";VAL "16": BEEP VAL ".07",VAL "17": BEEP VAL ".
15",VAL "19": BEEP V
AL ".15",VAL "19": BEEP VAL ".15",VAL "19": BEEP VAL ".15",V
AL "16": RETURN
4020 CLS : PRINT AT 20,z; INK 5;"EFEFEFEFEFEFEFEFEFEFEFEFEFE
FEFEFGHGHGHGHGHGHGHG
HGHGHGHGHGHGHGHGH"
4030 LET p=INT (RND*VAL "15")*VAL "2"
4040 PRINT AT VAL "20",p; INK VAL "2";"QR";AT VAL "21",p; IN
K s;" S"
4050 FOR x=z TO VAL "18" STEP VAL "2": FOR y=z TO VAL "30" S
TEP VAL "2"
4060 PRINT AT x,y; INK VAL "3";"MN";AT x+z,y;"OP"
4065 IF INKEY$<>"" THEN  GO TO VAL "4200"
4070 PRINT AT x,y;"  ";AT x+o,y;"  "
4080 NEXT y: NEXT x
4090 PRINT AT VAL "20",VAL "30"; INK VAL "3";"MN";AT VAL "21
",VAL "30";"OP"
4100 GO TO VAL "4300"
4200 PRINT AT x,y;"  ";AT x+o,y;"  "
4210 FOR a=x+VAL "2" TO VAL "18" STEP VAL "2"
4220 PRINT AT a,y; INK VAL "3";"MN";AT a+o,y;"OP"
4230 PAUSE VAL "10"
4240 PRINT AT a,y;"  ";AT a+o,y;"  "
4250 NEXT a
4260 PRINT AT a,y; INK VAL "3";"MN";AT a+o,y;"OP"
4300 IF y=p THEN  PRINT AT VAL "11",z; INK VAL "2"; BRIGHT o
;"BONUS ";(skill*VAL
 "50");" X ";(VAL "10"-x/VAL "2");" = ";((VAL "10"-x/AL "2")
*skill*VAL "50"): LE
T sc=sc+((VAL "10"-x/VAL "2")*VAL "50"*skill): GO SUB VAL "3
000"
4310 IF p<>y THEN  PRINT AT VAL "11",z; INK VAL "2"; BRIGHT
o;"NO BONUS !": BEEP
 VAL "2",VAL "-40"
4320 FOR i=o TO VAL "200": NEXT i
4340 IF skill<VAL "9" THEN  LET skill=skill+o
4350 RETURN
5010 GO SUB VAL "3080": CLS
5020 PRINT AT o,z; PAPER o; INK s; FLASH o; BRIGHT o;"
     GAME OVER
      "
5030 IF hs<sc THEN  PRINT AT VAL "3",z; INK VAL "2"; BRIGHT
o;"CONGRATULATIONS!A
 NEW HIGH SCORE": GO SUB VAL "3000": LET hs=sc: INPUT "Type
in your name "; LINE
 h$
5040 PRINT ' INK s; BRIGHT o;"SCORE:";sc
5050 PRINT ' INK VAL "5"; BRIGHT o;"HIGH SCORE:";hs: PRINT "
by ";h$
5090 GO TO VAL "30"
6010 FOR i=o TO VAL "7": FOR j=o TO VAL "7": PRINT AT x,y; I
NK j;"MN";AT x+o,y;"
OP": NEXT j: NEXT i
6020 PRINT AT x,y; INK 7;"IJ";AT x+o,y;"KL"
6030 IF l>o THEN  GO SUB VAL "3050"
6034 LET a$(x-o,y*3+o TO y*3+s)="  ": LET a$(x,y*3+o TO y*3+
s)="  "
6035 LET a$(xt-o,yt*3+o TO yt*3+s)="  ": LET a$(xt,yt*3+o TO
 yt*3+s)="  "
6036 LET l=l-o: IF l=z THEN  GO TO VAL "5000"
6040 GO SUB VAL "7600": GO TO VAL "1100"
6510 CLS : PRINT AT VAL "9",z; INK VAL "2"; BRIGHT o;"TIME L
EFT :";t;AT VAL "11"
,z;"BONUS = ";(skill*VAL "10");" X ";t;" = ";(skill*VAL "10"
*t)
6515 GO SUB VAL "3110"
6516 FOR i=o TO VAL "100": NEXT i
6520 LET sc=sc+skill*t*VAL "10"
6530 LET a$(xt-o,yt*3+o TO yt*3+s)="  ": LET a$(xt,yt*3+o TO
 yt*3+s)="  "
6540 IF g<VAL "5" THEN  GO SUB VAL "7600"
6550 NEXT g: RETURN
6800 PRINT AT o,z; FLASH o; BRIGHT o; INK s; PAPER o;"
      TIME UP!
      "
6810 GO TO VAL "6010"
7010 BORDER z: INK VAL "7": PAPER z: CLS
7505 PRINT AT o,z; PAPER o; INK s; BRIGHT o; FLASH o;"
      LEVEL ";skill;
"                "
7506 GO SUB VAL "3020"
7507 FOR i=o TO (skill*VAL "9")
7510 LET x=INT (RND*10+o)*2: LET y=INT (RND*15)*2
7520 LET a$(x-o,y*3+o TO y*3+s)="EF"
7530 LET a$(x,y*3+o TO y*3+s)="GH"
7540 NEXT i
7550 FOR i=o TO 4+skill
7560 LET x=INT (RND*10+o)*2: LET y=INT (RND*15)*2
7570 LET a$(x-o,y*3+o TO y*3+s)="QR"
7580 LET a$(x,y*3+o TO y*3+s)=" S"
7590 NEXT i
7600 LET xt=INT (RND*10+o)*2: LET yt=INT (RND*15)*2
7610 LET a$(xt-o,yt*3+o TO yt*3+s)="  "
7620 LET a$(xt,yt*3+o TO yt*3+s)="TU"
7630 LET x=INT (RND*10+o)*2: LET y=INT (RND*15)*2
7635 IF x=xt AND y=yt THEN  GO TO 7630
7640 LET a$(x-o,y*3+o TO y*3+s)="MN"
7650 LET a$(x,y*3+o TO y*3+s)="OP"
7660 LET xs=INT (RND*10+o)*2: LET ys=INT (RND*15)*2
7670 IF (xs>x-2 AND xs<x+2) OR (ys>y-2 AND ys<y+2) OR (xs>xt
-2 AND xs<xt+2) THEN
  GO TO 7660
7700 CLS : PRINT AT z,z; INK 4; BRIGHT o;"SCORE:000000 LIVES
:0 HIGH 000000"
7705 PRINT AT z,12-LEN (STR$ sc); INK 4; BRIGHT o;sc;AT z,19
;l;AT z,32-LEN (STR$
 hs); INK 4;hs
7710 FOR i=o TO 20: PRINTAT i+o,z;a$(i): NEXT i
7720 LET t=(10-skill)*2+23
7730 PRINT AT xt,yt; BRIGHT o; INK 2;t
7740 PRINT AT xs,ys; INK s;"EF";AT xs+o,ys;"GH"
7990 RETURN
8010 LET sk=z: LET sc=z: LET l=VAL "3": LET el=o: DIM k$(6):
 LET k$(o)="7": LET
k$(VAL "2")="6": LET k$(VAL "3")="5": LET k$(VAL "4")="8": L
ET k$(VAL "5")="4":
LET k$(s)="9"
8210 DIM a$(VAL "20",VAL "96")
8220 FOR i=o TO VAL "19" STEP VAL "2"
8230 LET a$(i)="ABABABABABABABABABABABABABABAB"
8240 LET a$(i+1)="CDCDCDCDCDCDCDCDCDCDCDCDCDCDCD"
8250 NEXT i
8260 RETURN
```

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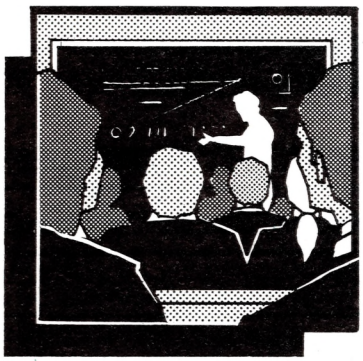

VIC 20 for Beginners

For newcomers to this machine we explain how to get to grips with its capabilities.

By Bob Wallace.

The purpose of this series of articles is to give the newcomer to the VIC 20 a chance to make easy progress into the world of the micro.

How many times have you reached for your copy of *PCT*, to find a listing that sounds really good? Yes, I bet its quite a number of times. How many times have you spent two hours or more typing in the listing, only to find that the computer crashes or produces the most unusual display that you have ever seen followed by that all too familiar screen prompt 'SYNTAX ERROR IN 100' etc? The problems can be enough to put off the newcomer from home computing for life (if not longer!)

The aim of these articles it to allay all your fears about the mythical mysteries of the VIC 20, and enable you to become both happy and proficient at using the machine. OK, so lets get down to some serious business.

Control codes

Probably the biggest cause of all problems is the funny symbols or characters that appear in the listing since they are not easily found on the keyboard! Well what do you need to know in order to produce these wierd and wonderful characters?? The answer is in fact found on the keyboard. Probably the commonest occurrence of these characters is in the more than versatile PRINT statement, which is usually followed by one of the above named oddities. eg. 10 PRINT ''[THIS LINE WILL BE PRINTED IN GREEN''

You may be confused by the funny looking arrow just after the opening speech marks. This character tells the computer to print in *GREEN* on the screen, so whatever you write as text following the arrow will appear in green on the screen of your TV. This arrow is called a CONTROL CODE, and is one of several which tell the VIC to print in different colours. They are very easy to obtain from the VIC keyboard by using Table 1.

It should be noted that the control codes will only appear as the character or symbol when placed in speech marks. To get the desired code, simply type in the line number followed by PRINT, open speech marks, then hold down the CTRL key and whilst this is held down, hit the key which is labelled with the colour you want. Finally close speech marks and hit RETURN. Program 1 illustrates the use of the colour control codes.

Table 1 Control codes for print commands

" ■ "	IS CTRL AND BLK
" ■ "	IS CTRL AND WHT
" ■ "	IS CTRL AND RED
" ■ "	IS CTRL AND CYN
" ■ "	IS CTRL AND PUR
" ■ "	IS CTRL AND GRN
" ■ "	IS CTRL AND BLU
" ■ "	IS CTRL AND YEL
" ■ "	IS CTRL AND RVS ON
" ■ "	IS CTRL AND RVS OFF

Program 1: demonstration of colour commands

```
10 PRINT"■"
20 PRINT"■THIS LINE IS BLACK"
30 PRINT"■THIS LINE IS RED  "
40 PRINT"■THIS LINE IS CYAN"
50 PRINT"■THIS LINE IS PURPLE"
60 PRINT"■THIS LINE IS BLUE"
70 PRINT"■THIS LINE IS YELLOW"
80 PRINT"■THIS ■IS ■MU■L■T■ICO■LO■URED"
```

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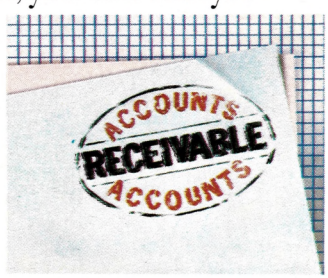

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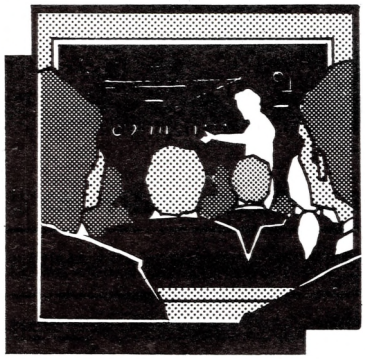


Oric Options

David Ellis concludes his examination of the Oric's screen display facilities and enters the realms of sound. Read this fascinating article and liven up your programs.

ORIC 48K

I stated in a previous article (PCT, May 1984) that POKEing was the only way to send characters and attributes to the top line of the screen 48000-48039. There is actually quite a useful way of getting around this problem. The start of the screen location (48000) is held in memory locations 621 and 622. Furthermore, the number of lines on the screen (27) is held in location 623. Very useful effects can be achieved by changing the values in these locations. If 621 is DOKEed with 47960, then the top line of the screen is freed and can be used quite normally. However, a PLOT command will still work on the same lines as previously. It is therefore only possible to use a PRINT statement for this new 'top line'. The bottom line of the screen will not scroll now and could thus be used as the status or prompt line. If the location 623 is POKEd with 28 however, all 28 lines on the screen can now be used quite normally.

Choosy scrolling

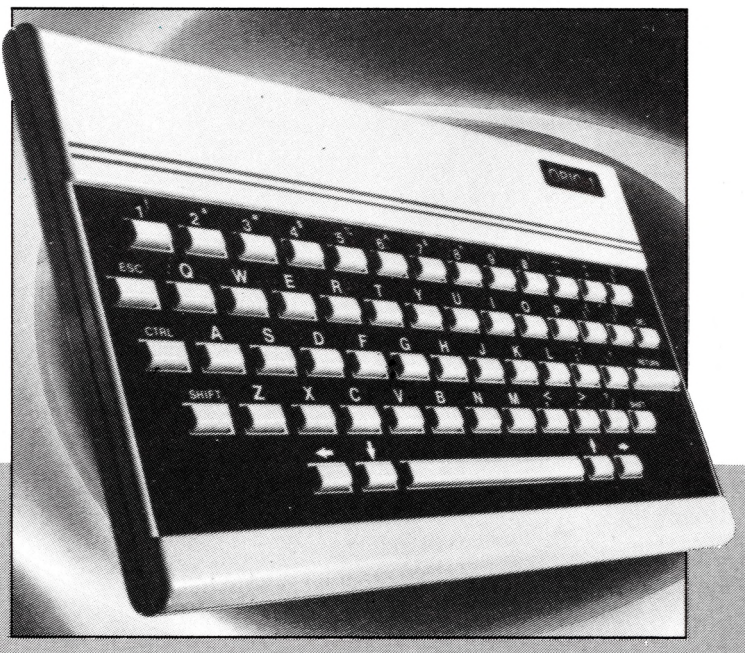
By setting the start address of the screen printing and the number of lines to print, the number of scrolling lines and their position can be chosen at will, thus freezing the remaining parts of the screen for displays or prompts etc. For example, to scroll the middle 10 lines of the screen enter the following program:

```
10 CLS
20 DOKE 621,48320 :
   POKE 623,10
30 PRINT
40 FOR X=1 TO 500 :
   PRINT X;: NEXT X
50 GET K$
60 DOKE 621,48000 :
   POKE 623,27
```

Line 20 sets the start of the screen 9 lines down, with 10 scrolling lines. A 'dummy' PRINT statement is used in line 30 which will start the printing at the correct place. Line 40 will show how just the middle 10 lines of the screen are used to print out the X values. Press any key when the printing is finished and this will reset the values to normal. Be careful not to overflow the start and end of screen display as unusual results may occur. If you change the number of lines in line 20 to 27 you will see what I mean!

Screen foolery

Once you have set a scrolling area such as this, the 'frozen' parts of the screen can only be printed to by PLOT and POKE. One very exciting prospect is that it is now possible to set up the HIRES screen and fool the computer into thinking that it is using the TEXT



screen. If you enter these two lines:

```
10 HIRES
20 DOKE 621,40920 :
   POKE 623,199
```

and RUN the program then you will see the flashing cursor at the top left hand corner of the HIRES screen. The value of the ASCII character that you type on the keyboard is what is displayed on the HIRES screen and not the character itself as you will understand when you read further. For example '?' will produce a continuous line, '@' will produce a blank, '*' will produce a dotted line. Of course all of the attributes can now be entered directly by using the 'ESC' key and the keyboard character, as explained in the article in the April edition of PCT. The number of lines set up is 199 so the cursor can be positioned anywhere on the HIRES screen. Fortunately the standard HIRES cursor is not affected, so all the HIRES commands can be used as normal. HIRES displays could therefore be set up and saved to tape in the same manner as the TEXT screen was. A program could be written to take full advantage of this technique which opens up all sorts of possibilities.

Inverse characters

A similar effect to the plotting routines described earlier can be achieved, albeit with some limitations, by using inverse characters. For some unknown reason Oric omitted a routine to create inverse characters directly from a BASIC keyword, although having the keywords inverse and normal stored in the Oric ROM obviously indicated the possibility of implementing them.
However, it is a fairly simple matter to create an inverse character by adding 128 to its ASCII number, which is encoded by Oric, and printed out as an inverse character. Try the following short program:

```
10 CLS:W$ = ''INVERSE
   VIDEO''
20 Y = 10:X = 5
30 FOR Z = 1 TO LEN
   (W$)
40 PLOT X+Z,Y,
   ASC(MID$(W$,
   Z,1)) + 128
50 NEXT Z
```

Run the program and the string 'INVERSE VIDEO' will be printed in inverse to the screen at the X and Y co-ordinates. The colours will however depend on the F/B attributes that are set to the left of the string; see Figure 1.

If the nearest background attribute to the left of the string is blue, then the string will be printed to the screen in a 'yellow' box. The character colour will be determined by the nearest foreground attribute to the left of the string. If this is white then the characters will be printed in black.

Speed through redefinition

A quicker way to achieve inverse characters (if the alternate character set — ACS — is not required) is to redefine them. Unfortunately it is not possible to redefine the whole ASCII character set as this would overflow into the screen memory. However the following program will redefine from ASCII 32 (space), to ASCII 111 (lower case 'o'):

```
10 FOR X = 46336 TO
   46855
20 POKE X + 1024,
   63-PEEK(X)
30 NEXT X
```

All that has to be done now when plotting a string is to add the ACS CHR$ number to the beginning of the string. Thus if W$ holds the word to be printed then:

```
PLOT X,Y,CHR$(9) + W$
+CHR$(8)
```

would print W$ as an inverse string — CHR$(9) selecting the ACS and CHR$(8) switching back to the standard set.

As indicated in a previous article it is not possible to print a word where each character changed colour, unless there is a space between the characters, although this could be achieved with some manipulation of the inverse colours. The following program achieves this effect:

```
10 CLS : W$ =
   ''ALTERNATE
   COLOUR''
20 Y = 10 : Y = 10
30 FOR Z = 1 TO LEN
   (W$) STEP 2
40 N = ASC(MID$(WS,
   Z,1)
50 V = ASC(MID$(W$,
   Z+1,1)) + 128
60 PLOT X+Z,Y,N :
   PLOT X+Z+1,Y,V
70 NEXT Z
```

The program plots the characters in W$ alternatively in standard and inverse form and each position therefore changes colour, albeit in the same pattern, showing what can be achieved with a little fore-thought. Remember to keep the length of W$ to an even number.

Oric's sensational sound

Now we pass into another exciting, and to my mind, underrated facility on the Oric — sound. Not only does the Oric have four sound channels, with envelope control, it is also very loud! Even better, the Oric's sound output can be channelled through your hi-fi system. The neighbours may not take too kindly to this, and disturbing Granny's forty winks with a salvo of 'zaps' would be most unkind but it has its uses. The resulting sound output on a good system is impressive to say the least.

Pre-programmed sound effects

There are four useful pre-programmed sound effects on the Oric, which are as follows:

EXPLODE	— produces an explosion sound
PING	— Produces a bell-line tone
SHOOT	— Produces a short gunshot sound
ZAP	— Produces a typical 'space invader' sound.

All of these sounds can be used freely within a program. Note that the first three return control to the

Figure 1 Inverse colours used on the Oric.

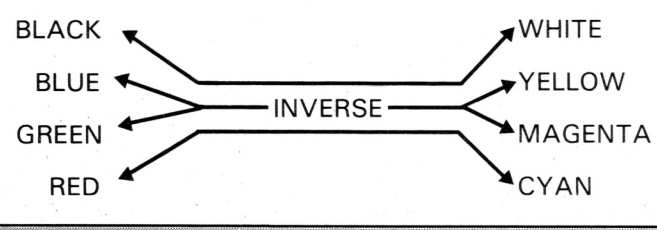


Table 1

ROM ADDRESS	SOUND	X	Y
£F418	EXPLODE	185	250
£F412	PING	141	250
£F415	SHOOT	163	250
£F41B	ZAP	235	250
£FAFA	KEYCLICK	2	251
£FB10	'RETURN' CLICK	24	251

program without any pause.
For example:

```
10 EXPLODE
20 PRINT "EXPLODE"
```

'EXPLODE' will be printed before the explosion sound dies away, but:

```
10 ZAP
20 PRINT "ZAP"
```

'ZAP' will only be printed *after* the ZAP sound has finished. This is useful in a FOR...NEXT loop as in:

```
10 FOR X = 1 TO 10
20 ZAP : NEXT X
```

A salvo of 10 ZAPS will be produced (remember your Granny!) — the typical 'space invader' sound. If any other sound commands are placed in this loop no difference will be apparent. None of these sounds can be altered, and the volume level is preset. They all actually jump to the same ROM routine at £FA6C, and it is only the values that are passed via the X and Y registers that are different. The ROM addresses of these sounds and the values passed to the X and Y registers are as in Table 1.

Table 2 Machine code program to POKE values into registers.

```
LDX, 0      162,0          ; Load X register with
                             value
LDY, 0      160,0          ; Load Y register with
                             value
JSR, £FA6C  32,108,250;    Jump to £FA6C
                             subroutine
RTS         96             ; Return to BASIC
```

The 'keyclick' and 'return click' are the keyboard clicks and are not available through a BASIC command (except for on/off using PRINT CHR$(6)). The short machine code program shown in Table 2 will pass values to the X and Y registers and then call the £FA6C subroutine.

The values for the X and Y registers will be POKEd in by the BASIC program. The machine code program can be placed high up in RAM — say 40000, by the following two lines:

```
10 FOR X = 0 TO 7 :
   READ A : POKE
   40000 + X,A :
   NEXT X
20 DATA 162,0,
   160,0,32,108,
   250,96
```

The BASIC part of the program to input the values for the X and Y registers, and to call the machine code program will be:

```
30 INPUT "VALUE FOR
   X REGISTER"; X
40 INPUT " VALUE FOR
   Y REGISTER" ; Y
50 POKE 40001, X :
   POKE 40003, Y
60 CALL 40000 : PRINT
   : GOTO 30
```

Line 50 will place the X and Y values into the machine code program. These values must be between 0 to 255. Try entering 2 and 4 for the values as this is the most common sound effect. Some very interesting sounds can be produced by entering different values, and you may well discover some really good ones. Remember that there are 65536 possible combinations! If you are feeling lazy then put the program in an X and Y loop to pick its own numbers (with a time delay). Print out the X and Y values so that when a good sound is produced you can make a note of the values. Try some of the values given in Table 3 as an example of the different types of sound that can be produced. You may not agree with some of my descriptions of these sounds but you will find them very useful to incorporate into your programs.

Next month David Ellis will go into details of how the MUSIC, SOUND and PLAY commands are used to program the Oric for sound.

Internal workings of the Oric I.

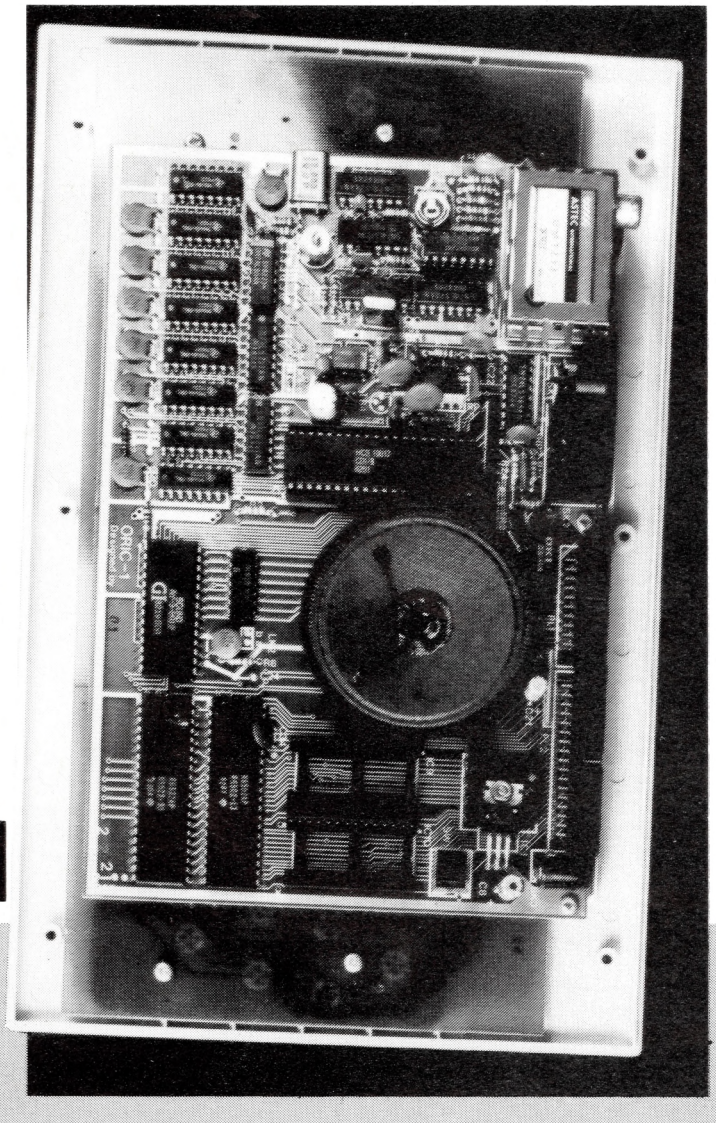


Table 3 Different sounds produced by varying values of X and Y

X	Y	TYPE OF SOUND
2	3	Explosion
2	2	Raspberry ping!
234	2	Steam train
200	254	Blacksmith with wind
184	250	Siren
33	211	Repeating explosions
141	254	Jet engine
33	208	Helicopter
221	211	Aeroplane
111	255	Big Ben gone wrong?
111	253	Breaking waves
127	237	Deep chime

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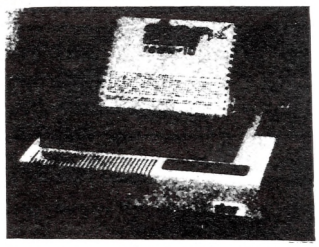

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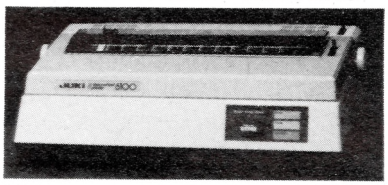

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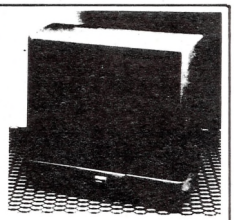

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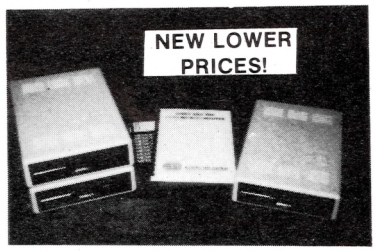

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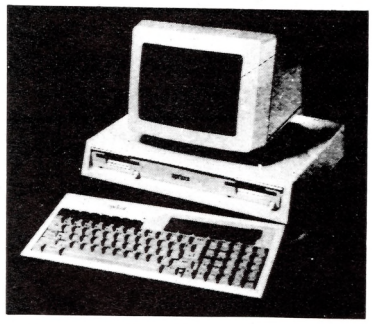

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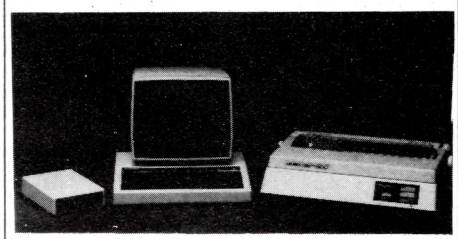

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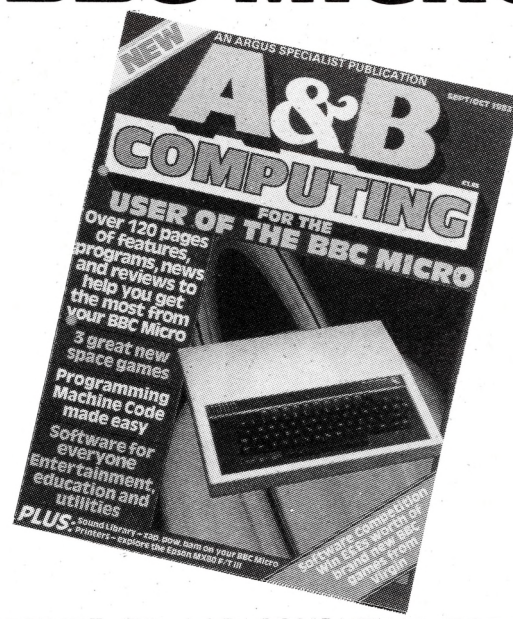

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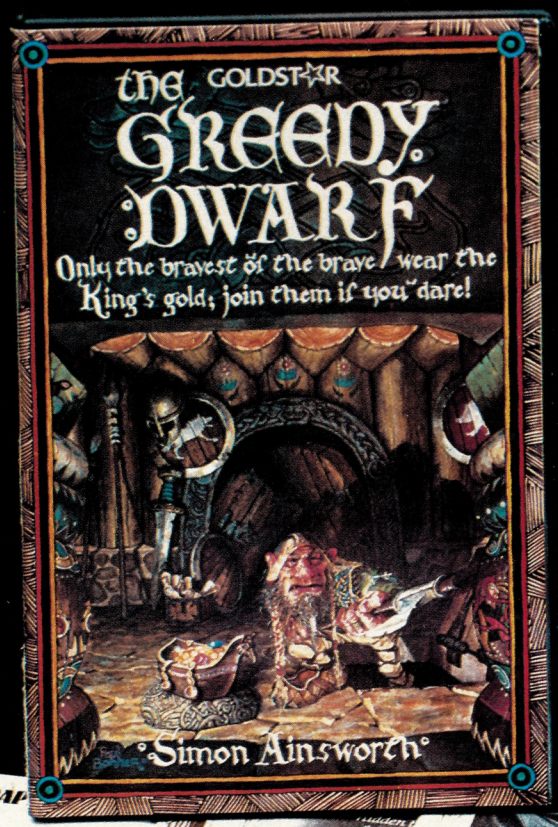

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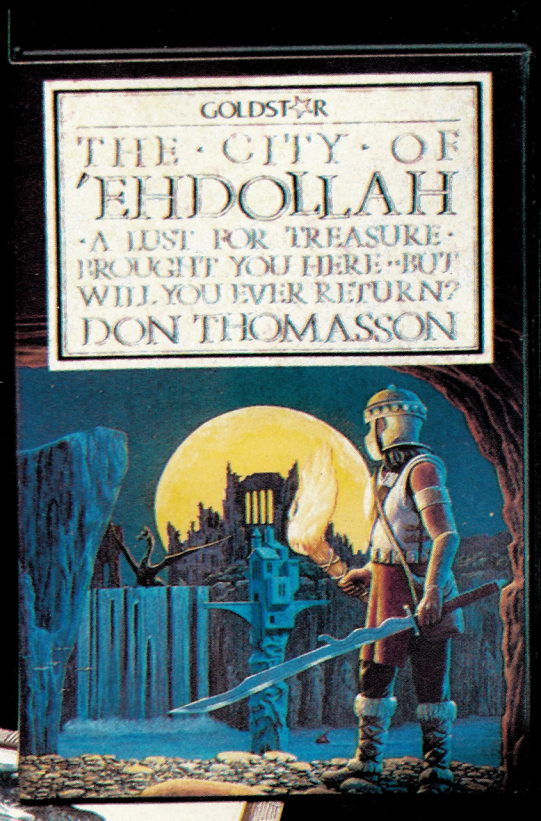

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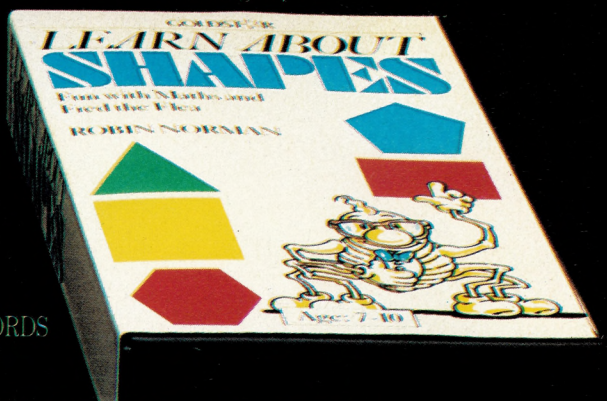

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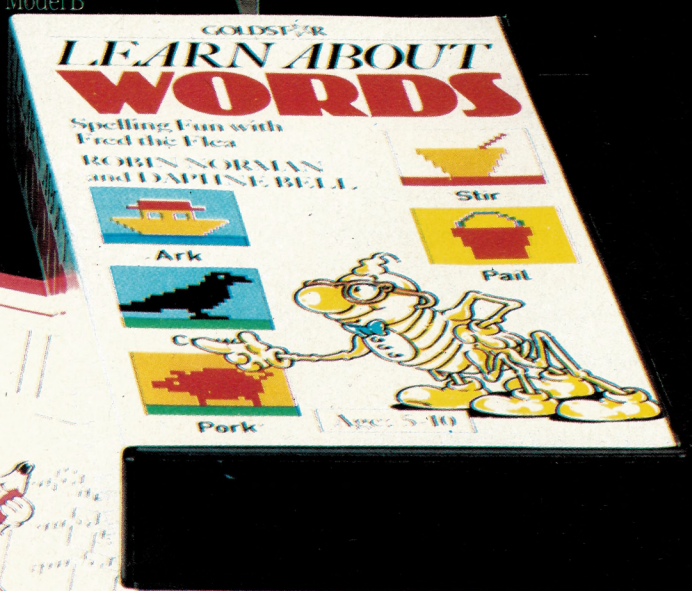



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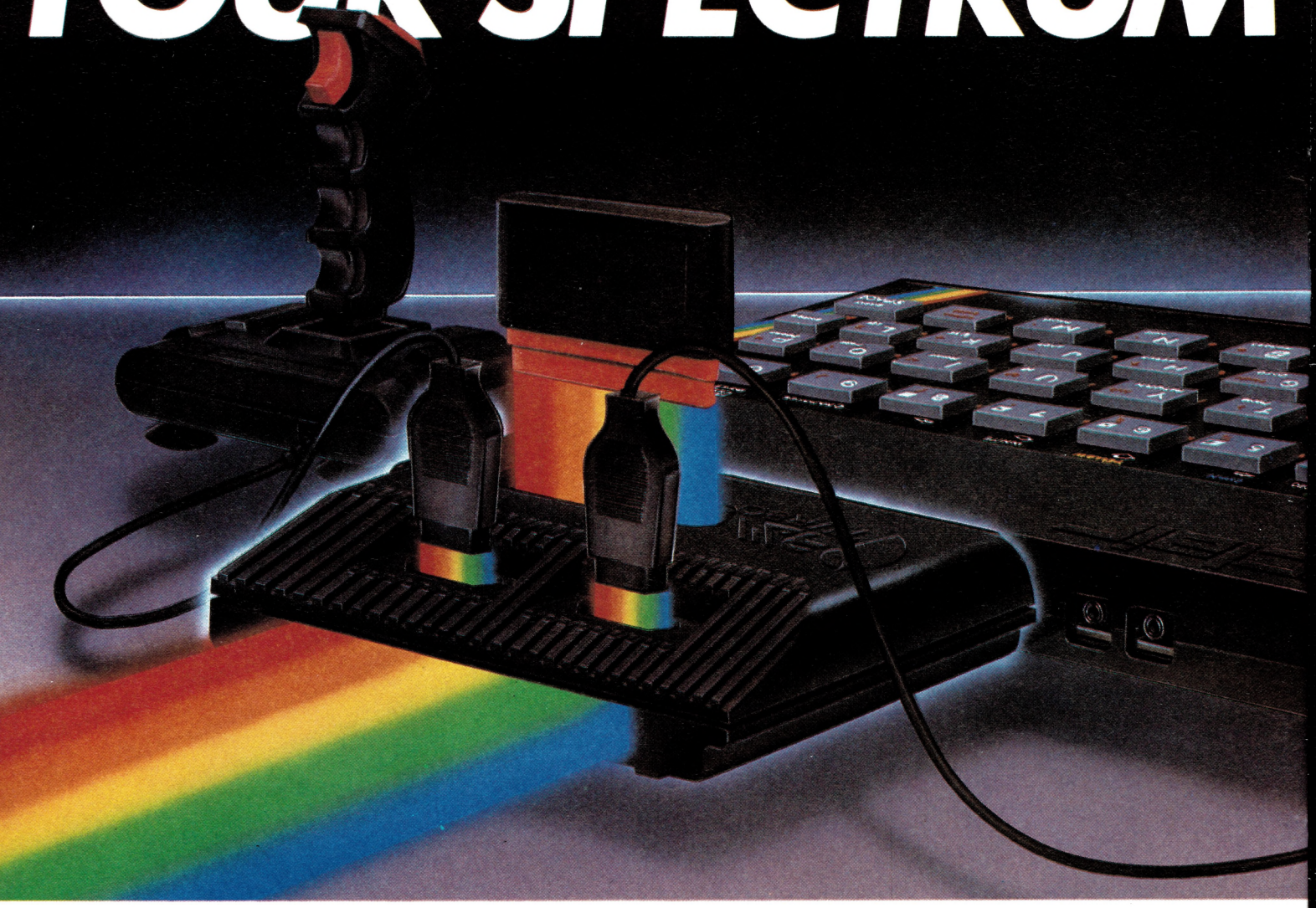

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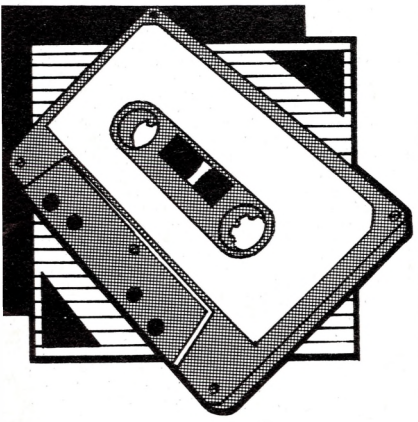


Directory of Software Houses

REFERENCE

PCT has compiled this useful directory of more than 200 software houses for you to keep as a handy reference guide.

Judging by the numerous enquiries we handle every week from readers trying to trace a particular program for their micro, there are many of you who need a guiding hand through the software jungle.

There are now many thousands of programs available for home computers ranging from educational games for three year olds, through adventures, simulations and arcade-type to business accounting and marketing packages. Although quite often a producer will convert these programs to run on a range of micros, several limit their range to one, two or a group of similar micros such as the BBC and Electron or VIC 20 and CBM64. Such complications can lead to confusion, and advice from dealers is often none too helpful.

We thought that a directory such as this would provide a handy reference guide for readers. Obviously, providing details of every program produced by a software house is outside the scope of the directory — such information would fill the pages of the magazine — and besides, there is our own Software Checklist to refer which is fairly comprehensive in this respect. There are also magazines available which are dedicated to providing this sort of information and you should turn to these for reviews, listings and ideas of what to buy.

But if you know what kind of program you want and the machine you want it for, there are to our knowledge, no reference sources to which to turn to find out where to obtain it. It is hoped that this directory will go some way to filling that gap by referring you directly to the producers of the programs.

What is included

The directory provides the names and addresses of more than 200 software houses and in most cases gives the telephone number of the company. Each producer listed has been contacted for details of the type of software available and the machines catered for. Thus if you want a specific educational program for say the VIC20, all you need to do is to look down the list of suppliers until you find one producing this type of software for that machine. Then telephone them for further details. Simple isn't it?

Detailing the suppliers under various categories would result in mass duplication since most software houses produce a range of types of programs for different machines.

Who's included

We have included details of every software producer who has come

to our attention. A large number of small companies who run their businesses on a part-time basis have not been included. This is not to say that we consider such operations disreputable, but we have no way of checking out details for the hundreds of such companies which exist.

All details given in this guide were correct at the time of going to press.

How to use this guide

To save space we have abbreviated the software categories as shown below. Some names of microcomputers have been abbreviated into their common forms e.g. Commodore 64 is written as CBM64. The suppliers are listed in alphabetical order.

CODE	CATEGORY
Ad	Adventure Games
Ar	Arcade Games
Bs	Business
Do	Domestic
Ed	Educational
Gm	Games — family entertainment
Si	Simulation Games
St	Strategy Games
Ut	Utility

A & F SOFTWARE

Unit 8 Canalside Ind. Estate
Woodbine Street
Rochdale
OL16 5LB
Tel: (0706) 341111

Ad, Ar, Bs, St, Ut
BBC, CBM64, Dragon, Electron, MSX

AARDVAAK S/W

100 Ardleigh Green Rd
Hornchurch
Essex
RM11 2LG
Tel: (04024) 53131

Ar
BBC

ABERSOFT
Maes Afallan
Bow St.
Dyfed
SY24 5BA
Tel: (0970) 828851

Ad, Ar, St, Ut
BBC, CBM64, Electron, Lynx, Spectrum, ZX81

ABRASCO LTD
The Grange Barn
Pikes End
Eastcote
Middx.
HA5 2EX
Tel: 01-866 2518

Bs, Gm
CBM 64, Dragon, Spectrum, VIC 20

ACORNSOFT LTD
4a Market Hall
Cambridge
CB2 3NJ
Tel: (0223) 316039

Bs, Ed, Gm, Ut
BBC, Electron

ACS SOFTWARE
7 Lidgett Crescent
Rounday
Leeds
LS8 1AN
Tel: (0532) 667440

Ed, Ut
BBC, IBM-PC, Spectrum, ZX-81

ADAMSOFT
18 Norwich Ave
Rochdale
OL11 5JE
Tel: (0706) 524304

Ar, Ut
CBM 64, VIC 20

ADDICTIVE GAMES
7a Richmond Hill
Bournemouth
BH2 6HE
Tel: (0202) 296404

Gm
BBC, CBM 64, Dragon, Oric, Spectrum, ZX 81

ADDISON-WESLEY PUBLISHERS LTD
53 Bedford Square
London
WC1B 3DZ
Tel: 01-631 1636

Ed
BBC, ZX-81



ADVENTURE ZONE S/W LTD
10 Eanis Close
Harpenden
Herts.

AL5 1SS

Ad
Atari

ALLIGATA S/W LTD
178 West St.
Sheffield
S1 4ET
Tel: (0742) 755005

Ar, Gm, Bs, Ut
BBC, CBM 64, Dragon, Electron, Oric, Spectrum

ALLRIAN DATA SERVICES
1000a Uxbridge Road
Hayes
Middx.
UB4 0RL
Tel: (0753) 45201

Ad, Ar, Bs, Do, Ed, St, Ut
CMB 64, Atari

AMPALSOFT
Ampal Computer Services
31 Woodbridge Rd
Derby Green
Blackwater
Camberley
Surrey
Tel: (0252) 876677

Ed
BBC, CBM 64, Dragon, Electron, Spectrum

ANIROG S/W
29 West Hill
Dartford
Kent
DA1 2EL
Tel: (0322) 92513/8

Ar, Ut
VIC 20, CBM 64, Spectrum

APPLIED SYSTEMS KNOWLEDGE LTD (ASK)
London Hse
68 Upper Richmond Rd
London
SW15 2RP
Te: 01874 6046

Ed
BBC, VIC 20

ARCADE S/W LTD
Technology Hse
32 Chislehurst Rd
Orpington
Kent
BR6 0DG
Tel: (66) 35639

Ar, Gm
Spectrum

ARCADIA
Freepost
Swansea
SA3 4ZZ
Tel: (0792) 403363

Ar
Atmost, Oric

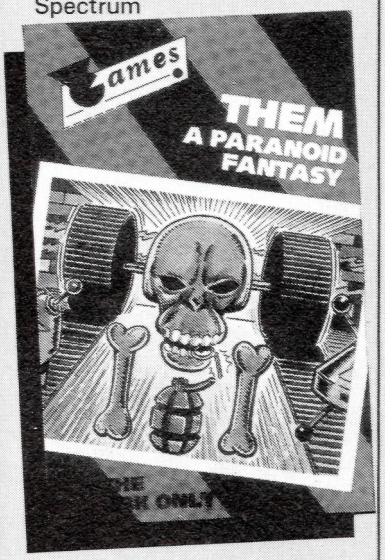
ARGUS PRESS SOFTWARE
1 Golden Square
London

W1R 3AB
Tel: 01-437 0626

Ad, Ar, Ed, St
Atari, BBC, CBM 64,
Dragon, Electron, Spectrum,
VIC 20

ARROW PUBLICATIONS
Hutchinson Hse
17-21 Conway St
London
WIP 6JD
Tel: 01-387 2811

Bs, Ed
Spectrum



ARTIC S/W
Main St
Brandesburton
Driffield
YO25 8RG
Tel: (0401) 43553

Ed, Gm, Ut
Atari, CBM 64, Oric,
Spectrum, VIC 20, ZX-81

ATARI INTERNATIONAL
(UK) LTD
Atari Hse
Railway Terrace
Slough
Berks.
SL2 5BZ
Tel: (0753) 33344

Bs, Ed, Gm, Ut
Atari, BBC, CBM 64,
Electron, Spectrum, VIC 20

ATLANTIC SOFTWARE
18b Thorpe Rd
Kinston
Surrey
KT2 5EV

Bs
VIC 20

AUDIOGENIC LTD
39 Suttons Ind. Park
Reading
Berks
Tel: (0734) 509709

Bs, Gm
CBM 64, VIC 20

AUTOMATA UK LTD
27 Highland Rd
Southsea
Portsmouth
Hants
PO4 9DA
Tel: (0705) 735242

Ad, Ar, Gm
Spectrum

AVALON HILL GAMES
650 High Rd
North Finchley
London
N12 ONL
Tel: 01-445 3044

Ad, Ar, St
Apple, Atari, Pet, TRS-80

AVC S/W
PO Box 415
Birmingham
B17 9TT
Tel: 021-426 6762

Ed
BBC, Electron, Spectrum,
ZX-81

AZTEC S/W
18 Gregory Springs Lane
Mirfield
N. Yorks
WF14 8LE
Tel: (0924) 492826

Gm, Ut
BBC, CBM 64

BBC PUBS
35 Marylebone High St
London
WIM 4AA
Tel: 01-580 5577

Ad, Ar, Bs, Do, Ed, Gm, Ut
BBC, Electron

BELLFLOWER S/W
6 Rosewood Avenue
Greenford
Middlesex
Tel: 01-903 1816

Do
Spectrum

BEL TECH S/W
Stanmore Industrial Estate
Bridgnorth
Shropshire
WV15 5HP
Tel: 07462 5420

Bs, Ed, Ut
BBC, CBM 64, Spectrum

BEYOND S/W
Durrant Hse
8 Herbal Hill
London
EC1R 5EJ
Tel: 01-251 8496

Ad, Ar, St
Atari, CBM 64, Dragon,
Spectrum

BOURNE EDUCATIONAL
S/W
Bourne Hse
Three Hundred
Romsey
Hants
SO5 8BY
Tel: (0794) 523301

Ed
BBC, Electron

BRIDGE S/W
36 Fernwood
Marple Bridge
Stockport
Cheshire
SK6 5BE
Tel: 061-832 4209

Ar, Ad, Ed
BBC, CBM 64, Spectrum,
VIC 20, ZX 61, ZX 81

BRYANTS EDUCATIONAL
S/W
1 The Hollies
Chalcrast Lane
North Derster
Bognor Regis
Tel: (0243) 829478

Ed, Ut
BBC, Spectrum

BUBBLE BUS
87 High St
Tonbridge
Kent
TN1 1LS
Tel: (0732) 355962

Bs, Ed, Gm, Ut
CBM 64, VIC 20

BUG BYTE
Mulberry House
Canning Place
Liverpool
L1 8JB
Tel: 051-709 7071

Ad, Ar, Do, Ed, Ut
BBC, CBM 64, Electron,
Spectrum, VIC 20, ZX81

CALPAC COMPUTER S/W
LTD
108 Hermitage Woods Cres
St. Johns
Woking
Surrey
GU21 1UF
Tel: (04867) 2584

Ed
CBM 64, Spectrum, ZX81

CAMEL MICROS
33a Commercial Rd
Weymouth
Dorset
Tel: (03057) 70092

Ed, Ut
Spectrum

CAMPUTERS
33a Bridge St
Cambridge
CB2 1UN
Tel: (0223) 315063

Bs, Ed, Gm, Ut
Lynx

CARNELL SOFTWARE LTD
North Weylnds Ind. Est.
Molesey Rd
Hersham
Surrey
KT12 3PL
Tel: (0932) 245812

Directory

Gm
CBM 64, Spectrum, ZX81

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SN7 8JN
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Ed
BBC, Electron

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14 Langton Way
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SE3 7TL
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Ad, Bs, Ed, Gm, St
BBC, Electron, Oric, Spectrum, ZX81

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Silver Hse
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Ad, Ar, Ed, St
Atmos, CBM 64, Oric, Spectrum, ZX-81

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Tel: 021-520 7591

Ad, Ar, Bs, Do, Ed, St, Ut
Atari, CBM 64, Dragon, Lynx, Oric, Spectrum, VIC 20

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Goldings Hill
Loughton
Essex
IG10 2RR
Tel: 01-508 5600

Ed, Gm, Ut
CGL/Sord M5

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WR3 7QP
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Ed, Gm
BBC, Electron, Spectrum, VIC 20

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PR1 8BH
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Gm
Atari, CBM 64, VIC 20

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Herts
WD2 6AS
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Ad, Ar, St
Texas

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Northwich
Cheshire
CW9 7DS
Tel: (0606) 48511

Ut
BBC

CLOUD 9 S/W
4 Dolvin Rd
Tavistock
Devon
DL19 9EA
Tel: (0822) 5737

Ed
Spectrum

COLLINS S/W
8 Grafton St
London
WIX 3LA
Tel: 01-493 7070

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BBC, CBM 64, Electron, Spectrum

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Bucks
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N13 5XA
Tel: 01-882 0681

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Dragon

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BS4 2DF
Tel: (0272) 777431

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BBC, CBM 64, Spectrum

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Glos.
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Ad, Ed, Ut/BS
BBC, CBM 64, Spectrum

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Kirton Lindsey
Gainsborough
DN21 4PH
Tel: (0652) 648550

Ed, Gm
Dragon

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South Woodford
London
E18 2QP
Tel: 01-530 3747

Ed
BBC

CREATIVE SPARKS
Thomson Hse
296 Farnborough Rd
Farnborough
Hants
Tel: (0252) 543333

Gm
Atari, CBM 64, Spectron, VIC 20

C TECH
184 Market St
Hyde
Cheshire
SK14 1EX
Tel: 061-366 8223

Bs
BBC

CYLINDRICAL SOFTWARE
3/177 College Rd
Moseley
Birmingham
B13 9LJ

Gm
BBC

DARKSTAR
32 Sovereign St

Leeds
LS1 4BJ
Tel: (0532) 452223

Ed, Gm, Ut
Oric, Spectrum

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Bramhall
Stockport
SK7 3BJ
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Bs, Ed, Gm/Ut
Sharp

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Cheshire
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Bs, Ed
BBC

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Tel: 01-485 3484

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Taunton
TA4 1AB
Tel: 0823 54489

Ar, Gm, Ut
CBM, Oric Spectrum

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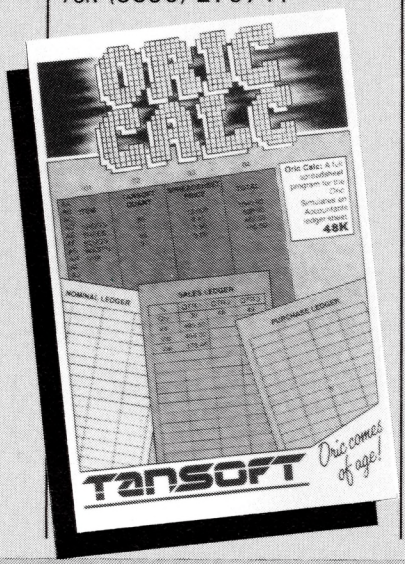
Wide Lane
Morley
Leeds
LS27 8UL
Tel: (0532) 835401

Ar, Ut
BBC, Electron

EBURY SOFT
72 Broadwick St
London
WIV 2BP
Tel: 01-439 7144

Do, Ed
BBC, CBM 64, Spectrum

ED-SOFT EDUCATIONAL
Trevor Lope
76 Woodville Rd
Exmouth EX8 1SW
Tel: (0395) 275741



Ed
BBC, Dragon, Spectrum, Video Genie

EGA BEVA S/W
SESS Ltd
CEntral Trading Est.
275-277 Bath Rd
Bristol BS4 3EH
Tel: (0272) 710103

Ed, Gm, Ut
BBC, Electron, Enterprise

ELKAN ELECTRONICS
11 Bury New Rd
Prestwick
Manchester
MZ5 8JZ
Tel: 061-798 7613

Bs, Ut
Dragon, Sharp PC1251, Tandy

ENGLISH SOFTWARE COMPANY
50 Newton Street
Piccadilly
Manchester
M1 2EA
Tel: 061-835 1358

Ad, Ar, Ed, Ut
Atari, CBM 64

EXPRESS SOFTWARE
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73 Watery Lane
Bordesley
Birmingham
B9 4HN
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Ed, Gm
GBM 64, Oric, Sharp MZ700, Spectrum 48K

FANTASY S/W
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Cheltenham
Glos.
GL50 3DT
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Gm, Ut
CBM 64, Spectrum

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Main Centre
Derby
DE1 2PE
Tel: (0332) 365280

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BBC, Electron

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Walsall
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Lancs.
BB9 8AD
Tel: (0282) 865837

Ed, Ut
Spectrum

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Ilminster, Somerset
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Herts.
AL8 6NU
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BBC, CBM 64, Spectrum, VIC 20

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London
NW10 6JP
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Gm
BBC, CBM 64, Spectrum

GARLAND COMPUTING
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Plymouth
PL9 9AF
Tel: (0752) 41287

Directory

Ed
BBC, Dragon, Electron

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70 Stoke Rd
Bletchley
Milton Keynes
MK2 3AD
Tel: (0908) 648368

Ed
BBC

GEM SOFTWARE
The Maltings
Sawlondgenorth
Herts.
Tel: (0908) 565007

Gm, Ut
BBC, Dragon, Lynx,
Spectrum, ZX81

GEMINI MARKETING SERVICES
18A Littleham Rd
Exmouth
EX8 2QG
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Dragon, Electron, Oric,
Spectrum, VIC 20



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ZX-81

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BBC, Electron

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Norwich
Tel: (0603) 616221

Bs, Ed
BBC, CBM 64

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Crowthorne
Berkshire
RG11 7LT
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Bs, St, Ut
CBM 64, VIC 20

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Low Fell
Gateshead
NE9 5EY
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Bs, Ed
BBC

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Oxon
OX14 4RX
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BBC, Dragon, Spectrum,
ZX-81

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Treliegh
Redruth
Cornwall
TR16 4AW
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Moor Park Ave
Bisham, Blackpool
Lancs. FY2 0JY
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BBC, Oric

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Liverpool
L1 6BN
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Gm
Atari, BBC, CBM 64,
Dragon, Electron, Spectrum,
VIC 20

IMPACT S/W
70 Redford Ave
Edinburgh
EH13 0BW
Tel: 031-441 4257

Ad, Ar, Ed
BBC, Dragon, Oric,
Spectrum, VIC 20

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153 Churchill Rd
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Dorset
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Ar, Ad, St
Spectrum

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Tel: (0734) 591678

Ad, Ar
CBM 64, Spectrum

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Brockenhurst
SO4 72W
Tel: (0590) 23733

Ar
Spectrum

INTERCEPTOR MICROS
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Basingstoke
Hants.
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Ad, Ar, Ut
Atari, CBM 64, VIC 20

JOE THE LION
213/215 Market St
Hyde
Cheshire
SK14 1HF
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Ar, Ut
BBC, CBM 64, Oric,
Sinclair, QL, Spectrum

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Lea
Malmesbury
SN16 9PB
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Bs, Ed, Ut
Amstrad, Atmos, Dragon,
Oric

KEMP LTD
43 Muswell Hill
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N10 3PN
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Bs
CBM 64, Spectrum

KINDERSOFT UK LTD
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Atmos, CBM 64, Oric,
Spectrum

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1 Pilgrims Close
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Bedfordshire
LU5 6LX
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Ed
BBC, Spectrum

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11 Medway
Hailsham
E. Sussex

BN27 3HE
Tel: (0323) 846110

Ar, Bs, Do, St, Ut
Spectrum

K-SOFT COMPUTERS
56 Bolham Lane
Retford
Notts.
DN22 6SY

Gm, Ut
Sharp

KUMA COMPUTERS LTD
12 Horseshore Park
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RG8 7JW
Tel: (07357) 4335

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Sharp, CBM 64, Spectrum

LEVEL 9 COMPUTING
229 Hughenden Rd
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HP13 5PG
Tel: (0494) 26871

Ad
Atari, BBC, CBM 64, Lynx, Memotech, Oric, Spectrum

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48 Westbourne Rd
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S. Glams
Tel: (0222) 703749

Gm
Sharp

LIVEWIRE S/W
Sumlock Microware (M/Cr) Ltd
198 Deansgate
Manchester
M3 3NE
Tel: 061-834 4233

Ad, Ut
CBM 64, Sharp M280, MZ711, VIC 20

LLAMASOFT
49 Mount Pleasant
Tadley
Hants.
RG26 6BN
Tel: (07356) 4478

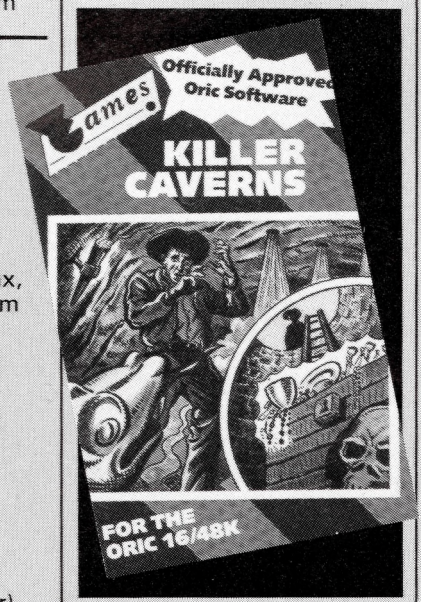
Gm
Atari, CBM 64, Spectrum, VIC 20

LOGIC 3
Mountbatten Hse
Victoria St
Windsor
SL4 1HE
Tel: (07538) 57181

Ed, Ut
Spectrum

LONGMAN S/W
Longman Hse
Burnt Mill
Harlow
CM20 2JE
Tel: (0279) 26721

Ed,
BBC, CBM 64, Spectrum



LOTHLORIEN
56a Park Lane
Poynton
Cheshire
SK12 1RE
Tel: (0625) 876642

Ad, Ar, St
BBC, Dragon, Oric, Spectrum, ZX-81

LYNDENHURST LTD
38 Ashley Rd
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N19 3AF
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Ar, Bs
CBM 64, Spectrum

LYVERSOFT
66 Lime Street
Liverpool L1 1JN
Tel: 051-708 7100

Ar
CBM 64, Dragon Spectrum, VIC 20

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Goddard Rd
Whitehouse Ind. Est.
Ipswich
IP15 NP
Tel: (0473) 462721

Bs, Ed, Gm, Ut
CBM 64, VIC 20

MARTECH GAMES
Martech House
4 Bay Terrace
Pevensey Bay
East Sussex
BN24 6NE
Tel: (0323) 768456

Ad, Ar, Ed
Atmos, CBM 64, Spectrum

MELBOURNE HOUSE
Castle Yard House
Castle Yard
Richmond
TW10 6TF
Tel: 01-940 6064

Ad, Ar
CBM 64, Dragon, Oric, Spectrum, VIC 20

MED
Microtol Engineering Design
640 Melton Rd
Thurmaston
Leicester
LE4 8BB
Tel: (0533) 839170

Ut
BBC

MICRO-ANTICS
Littlehome
Hawthorne Lane
Codsall
Staffs
Tel: (09074) 5147

Gm
VIC 20

MICRODEAL LTD
41 Truro Rd
St Austell
Cornwall
PL25 5JE
Tel: 0726 3456

Gm
Atari, BBC, CBM 64, Dragon, Oric, Spectrum, Tandy

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14 Lower Hill Road
Epsom
Surrey
KT19 8LT
Tel: (03727) 20152

Ar
Spectrum

MICROMEGA
230-236 Lavender Hill
London SW11 1LE
Tel: 01-223 7672/7904

Bs, Ed, Gm
Spectrum

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North Street
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Tel: (0532) 458800

Ad, Ar, Ed, Ut
BBC

MIKROGEN
1 Devonshire Cottages
London Rd
Bracknell
Berks.
RG12 2TQ
Tel: 0344 427317

Ad, Ar, Do, Ut
Spectrum

MINATRON COMPUTING
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Westbury on trim
Bristol
BS9 4AJ
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Ad, Do, Ut
Spectrum

MIRRORSOFT
Holborn Circus
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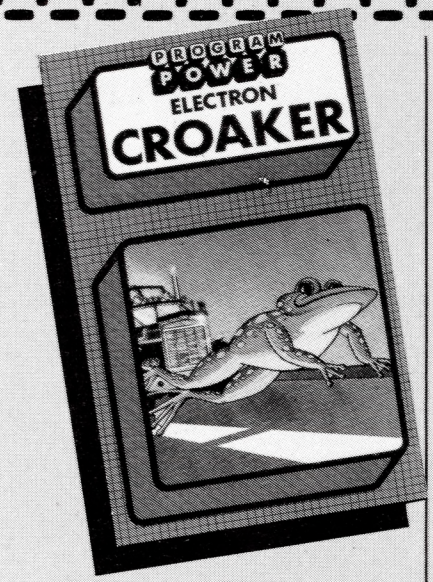
EC1P 1DQ
Tel: 01-353 0246

Ed, Gm

Directory



BBC, CBM 64, Electron, Spectrum

MISTER MICRO
69 Partington Lane
Swinton
Mancheter
M27 3AL
Tel: 061-728 2282

Ad, Ar, St, Ut
Amstrad, Atmos, BBC, CBM 64, Dragon, Oric, Spectravideo, VIC 20

MOGUL
PO Box 4BT
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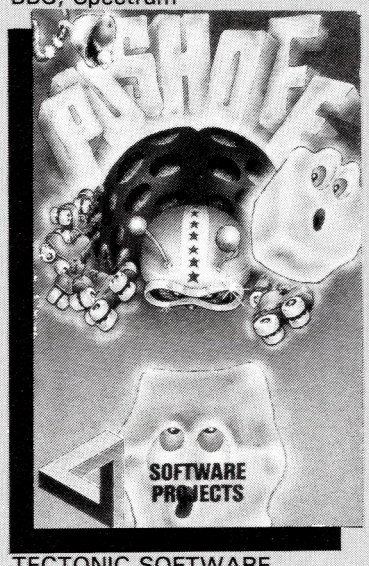

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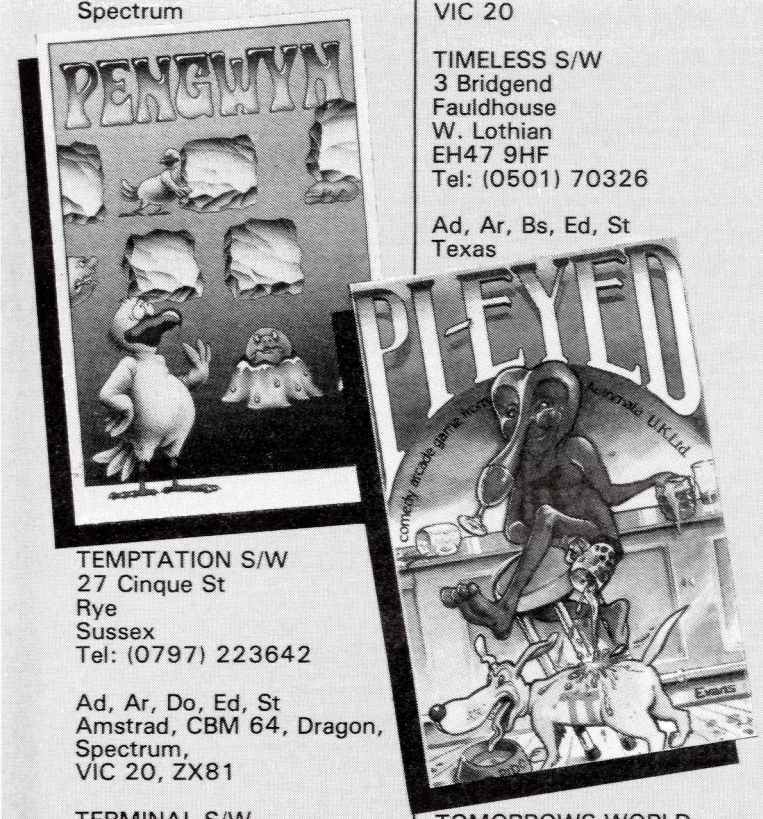

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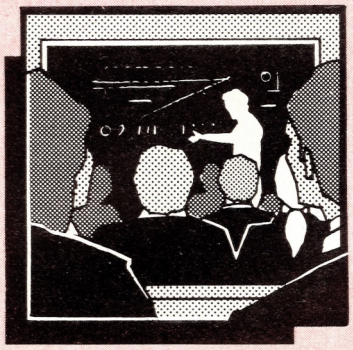
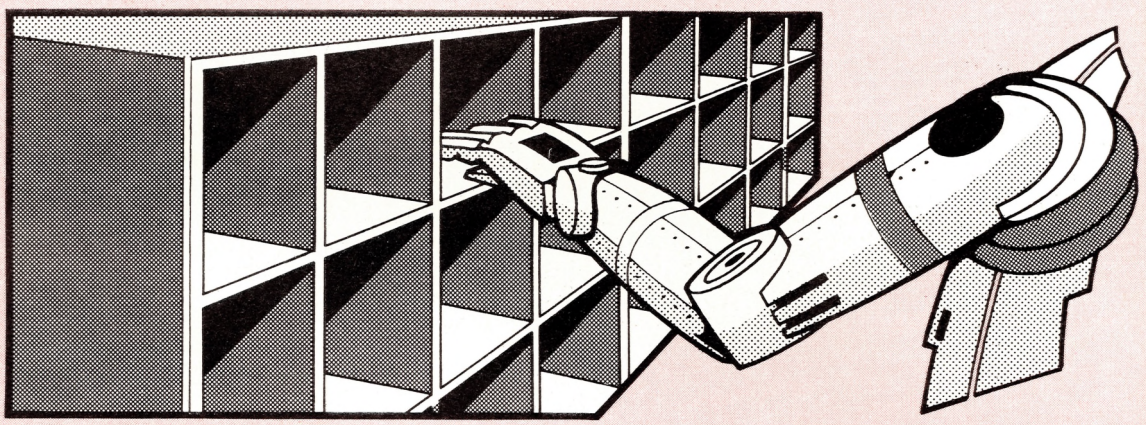


Machine Code '64



We continue our 'cracking' of this fascinating code.

CBM64

Last month we looked at what machine code is. Now it is time to actually start using it. As you will have found using BASIC, the Commodore 64 is full of registers, they do things like change the border colour, switch sound on or off and switch between the test and graphics screens. Now while typing in a load of POKEs may be a real pain in BASIC it is something that machine code is very good at.

Accumulator loading

The computer spends its time shuffling data through its pigeon holes of memory. One of the most fundamental machine code statements is LDA which stands for LoaD the Accumulator. The accumulator is a special memory location; think of machine code as only having three variables, A, X and Y. These have some special functions but for a start can serve as simple variables. The Accumulator can be loaded with either a number or it can take the number from another location, like a PEEK. There are more complicated ways of doing this but we will save those for later. The way the computer knows that the data are numbers to be loaded into A, rather than an actual memory location to be PEEKed from, varies with the assembler. The Doctor Watson type uses the letter N after the LDA to specify number, Supersoft's MIKRO uses the more conventional # for number. So to say the machine code equivalent to BASIC's A=42, you enter LDA £42, and the equivalent of A=PEEK (42) is LDA 42. It is more usual, as we explained last month, to use hexadecimal, the symbol for hex being a dollar sign. This makes LDA #$2A the same as A=42,

because 2A is the hex for 42. To complement LDA there are LDX and LDY commands. The opposite to LDA is STA. This stands for STore the Accumulator and is an equivalent of POKE, the syntax is the same as for LD and also works on the X nd Y registers. So a small routine to set the border colour to red would be:

```
LDA #$02
STA $D020
```

You cannot write an equivalent to A=A+1 in machine code, but you do have the ADC instruction. This stands for ADd with Carry. Because you can only count up to 255 in one byte (one pigeon hole) and because if you go over that limit the number becomes zero, you need a sort of warning that this has happened. The carry flag does this for you, we will use and deal with this later. Suffice it to say that we have the carry to deal with. When adding we always want the carry reset. For this we have the instruction CLC, meaning CLear Carry. We have to have a CLC before every ADC. Because it is not possible to add a number to the X or Y registers we have commands to just add one to each of these. These are the INX and INY commands standing for increment X and increment Y.

Memory locations

Machine code does not have line numbers, it uses memory locations. The Dr. Watson assembler asks you where you want to put your programs. MIKRO assumes the cassette buffer unless you use a * = to specify a different location.The cassette buffer is fine for small programs. It starts at 828 decimal or $033C hex. The locations can be used like line numbers in a way, but whereas you can have as many statements to a line as will fit in BASIC, you can only have one byte per location. Different instructions have different lengths. INX is one byte long, LDA# is two and LDA is three. This means that you have to be careful when calculating jumps. Like BASIC, machine code has a GOTO and an IF. .THEN structure. The GOTO lookalike is JMP, this must be pointed at another bit of program or else the whole thing is likely to crash. There are several ways of simulating IF. .THEN, the simplest being BEQ and BNE. These test the last operation for being equal or not equal to zero, and then jumping (or branching), hence the memnonics BEQ for Branch if EQual to zero and BNE for Branch if Not Equal to zero.Remember that 255+1=0, so we can use this to test when counting both upwards and downwards.

The last command we will cover this month is RTS. This stands for ReTurn from subroutine and is similar to the BASIC RETURN. Although we are not using a true subroutine in machine code we are in effect simulating one. When we use the BASIC SYS828 to call the program we are in effect gosubbing the machine code. We are now armed with enough instructions to write a simple program which will show how fast machine code is. The job of this program is to flash the screen colour and every 255 changes to change the border colour. This adds up to over 65,000 POKEs. In BASIC it looks like this:

```
10 FORA=0TO255
20 POKE53280,A
30 FORX=0TO255
40 POKE53281,X
50 NEXT X
60 NEXT A
```

In machine code, using the Commodore or MIKRO assembler:

```
100 LDA #$00
110 LDX #$00
120 BORDER STA
    $D020
130 SCREEN STX
    $D021
140 INX
150 BNE SCREEN
160 CLC
170 ADC#$01
180 BNE BORDER
190 RTS
```

Or in BASIC to be POKEd in as machine code

```
10  FOR X = 828 TO
    847
20  READV:POKEX,V
30  SYS828
40  END
50  DATA 169,0,
    162,0,141,32,
    208,142,33
60  DATA208,232,
    208, 250,24,105,
    1,208
70  DATA 242,96,0
```

The third program may be written in BASIC but all it does is to fill the pigeon holes and then run in machine code. With the second program you will need to assemble it and then call it with a SYS 828.

The speed difference is remarkable: program 1 takes over 20 mins to run and the machine code versions run in .65 of a second! that's some improvement. THIS is the reason that games need machine code.



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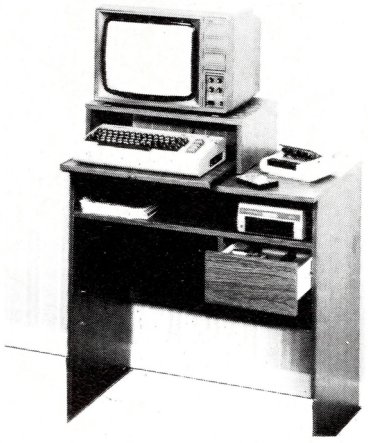

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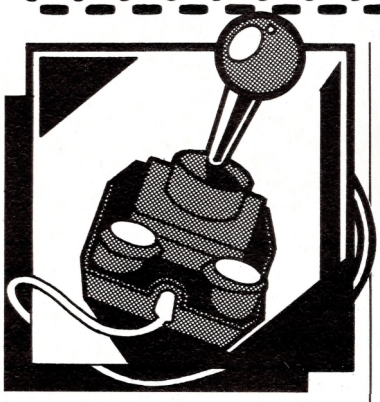

Minefield

Sapper Sid to the rescue in this game of skilful manoeuvring by Derek Waldron.

Minefield is a game that requires a certain amount of luck with a measure of skill if you are to reach a 'decent' score.

Sapper Sid has been left in charge of a group of men whom he must guide back to safety. Unfortunately all the fields between him and home are mined and he is in charge of the one remaining mine detector. Even more unfortunate is the fact that the detector is not 100 per cent reliable. It will warn him when there is a mine within one step of his present position, but it won't tell him in which direction. Armed with this knowledge, he (you) has to find his way safely across each of the fields he comes to.

He does have one trick up his sleeve which quite often proves in-



CBM64

valuable, namely a mine detonator. This device, when used, will detonate all the mines that are currently being 'detected' by the mine detector. The only drawback of this device is that it may only be used once in any field.

Sapper Sid starts each field in the bottom left corner and must find his way to the top left corner. The first field contains ten mines and five more are added every other field. To get a high score, I recommend that as many of the earlier fields be cleared as possible, as the later fields become a pure test of survival!

If the number of lives remaining is getting low, it usually proves best to try and complete the field to obtain an extra life. Also, if you find that you can complete a field without having to use the detonator, go back and use it where it will give you the most points. You cannot carry an unused detonator into the next field. Instructions to play the game are contained within the program, including which keys to use for movement.

how it runs

Line(s)	
10-50	Initialise variables and read data for sprites and tune.
75-100	Set colours of sprites. Set multicolours for multicoloured sprites.
110-230	Print title page.
260-620	Instruction pages.
650-662	Sub-routine for detonation.
700-716	Sub-routine to move man up.
750-766	Sub-routine to move man down
800-810	Sub-routine to move man left
850-862	Sub-routine to move man right
1000	Sub-routine to print 'MINEFIELD'.
1010-1040	Sub-routine to print warning signpost.
1150-1180	Sub-routine to fill in safe square.
1200-1240	Sub-routine to print explosion.
1250	Sub-routine to print score.
1300	Sub-routine to print lives left.
1400-1430	Sub-routine to update mine detector.
1500-1590	Print field boundary and set variables to values required at the start of each new field.
1600-1660	Place mines at random positions within the field.
1700-1750	Accept input for movement.
1760-1780	Check if any lives are left or if field has been completed. If not another key input is requested.
1900-1930	Sub-routine to produce audible warning when a mine is detected.
2000-2030	Sub-routine to produce explosion noise.
2100-2160	Sub-routine to play tune when field is completed.
3000-3210	End routine when all lives have been lost.
5000-5550	Data for sprites.
5560-5570	Data for tune.

Lines 712, 762, 808 and 858 are too long to get on one line as printed, and all basic keywords should be abbreviated as shown on page 130 (Appendix D) of the CBM User Manual. It is also necessary to remove all spaces in the line, including the one between the line number and the start of the line.



variables used

A	Used in read statements for reading sprite data
F	Current field number
L	Lives left counter
M	Mines left counter
S	Set to start of SID (sound) chip
T	Used in FOR NEXT loops
V	Set to start of video chip (for control of sprites)
X	Used to represent the current position in
Y	the field in the array which holds information concerning the field
DE	Detonator flag. Used to check if detonator has been used
F1, F2, FP, FX	Used to determine where in the screen and colour memory maps should be poked to turn a 'safe square' green
HI, LO, DR	Used in read statements to read data for tune
HS	High score
FR, FQ	Used to determine frequency in audible detector warning
HF, LF	High frequency and low frequency for sound effects

Minefield

MC	Mine count for number of mines to be placed in field
SC	Score
MX, MY	x and y co-ordinates for man (necessary for positioning of sprite)
XX, XY	x and y co-ordinates for explosion sprites
A$, B$, C$, D$	Strings containing information to print 'MINEFIELD' in title
N$	String containing name of current high score holder
K$	Used in GETK$ statements
H(13)	Arrays containing high and low frequencies
L(13)	and duration of notes for the tune
D(13)	Array representing the field. Contains information concerning mine positions, and is referred to whenever a change of circumstances arises (e.g. whenever the man moves)
A(x,y)	

hints on conversion

Owing to the use of sprites it will not be possible to convert this program exactly as it runs on the CBM64 for the majority of other home micros. However, the principle behind the working of the program should be easy enough to adapt if the working of the program is understood.

Reverse video characters within quotes after a print statement wil be one of the following:

Reversed heart	Clear screen and place cursor at to left
Reversed S	Place cursor at top left (without clearing screen)
Reversed R	Inverse video on
Reversed -	Inverse video off
Reversed Q	Cursor down
Reversed O	Cursor up
Reversed	Cursor right
Reversed	Cursor left

Other reversed characters change the current colour of the 'pen'. 53280 and 53281 control the colour of the border and background respectively. Any address POKEd which contains a V is connected with the use of sprites. Any address POKEd which contains an S is connected with producing sound.

The POKE instruction in line 1170 POKEs a solid coloured square directly at the screen and may be replaced with an appropriate PRINT AT instruction. The POKE instructions in lines 1410 and 1420 POKE a solid coloured square directly to the screen, either red or green depending on the state of the mine detector (true or false return from the detector sub-routine).

The workhorse of the program is the array A(x,y). All values are initially set at zero. A value of 1 is placed in any position determined to contain a mine. This is later cleared either by the use of the detonator (if in range) or by the man 'stepping' on that square. A value of 3 is placed in any position 'visited' by 'Sapper Sid', which then reduces the workload of some of the sub-routines. A(1,1) represents the bottom left square, and A(10,8) represents the top right square, and are never mined for the sake of fairplay.

CBM Graphics

One of the most common queries received by *PCT* regarding listings for the CBM64 concerns the symbols that are used for graphics. Here are some tips to help you understand them.

The 64 allows you to specify control keys, etc. in print statements so that these functions can be executed within a program. For example it is possible to position the cursor or clear the screen using the relative symbol with the quotation marks. The following list shows the symbols and the keys that generate it (don't forget the quotes).

clear screen	–	shift+clr/home	
HOME CURSOR	–	CLR/HOME	
CURSOR DOWN	–	CURSOR DOWN	KEY
" " UP	–	" " UP	" "
" " LEFT	–	" " LEFT	" "
" " RIGHT	–	" " RIGT	" "
BLACK	–	CTRL	+ 1
WHITE	–	" "	+ 2
RED	–	" "	+ 3
CYAN	–	" "	+ 4
PURPLE	–	" "	+ 5
GREEN	–	" "	+ 6
BLUE	–	" "	+ 7
YELLOW	–	" "	+ 8
REVERSE ON	–	" "	+ 9
REVERSE OFF	–	" "	+ 0
ORANGE	–	C=	+ 1
BROWN	–	C=	+ 2
LT RED	–	C=	+ 3
GREY1	–	C=	+ 4
GREY2	–	C=	+ 5
LT GREEN	–	C=	+ 6
LT BLUE	–	C=	+ 7
GREY3	–	C=	+ 8

program listing

```
0 REM**********************************
1 REM**                              **
2 REM**          MINEFIELD           **
3 REM**                              **
4 REM**       BY D. WALDRON          **
5 REM**                              **
6 REM**********************************
10 POKE53281,0:POKE53280,0:V=53248:S=54272
20 PRINT"■■■
```

program listing

```
 190 PRINT"■■■■■■■■■■":GOSUB1000
 200 PRINT"■■■■■■■■■■■■■■■■■■■PRESS 'I' FOR INSTRUCTIONS,"
 210 PRINT"■■■■■■■■■■■■■■■OR 'P' TO PLAY."
 220 GETK$:IFK$=""THEN220
 230 IFK$="P"THENGOTO1500
 260 POKEV+21,0:PRINT"■":GOSUB1000:GOSUB1010
 270 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■INSTRUCTIONS"
 280 PRINTTAB(17)"────────────"
 290 PRINTTAB(12)"■■THE OBJECT OF THE GAME IS TO"
 300 PRINTTAB(12)"■GUIDE YOUR MAN FROM THE"
 310 PRINTTAB(12)"BOTTOM LEFT OF THE FIELD, TO"
 320 PRINTTAB(12)"■THE TOP RIGHT CORNER."
 330 PRINT"■■■NTO HAMPER YOU IN YOUR QUEST, THE FIELD"
 340 PRINT"■■HAS BEEN SEWN WITH MINES. YOU HAVE A"
 350 PRINT"■■MINE DETECTOR WHICH INDICATES WHEN A"
 360 PRINT"■■MINE OCCUPIES A SQUARE NEXT TO YOU, BUT"
 370 PRINT"■■IT DOESN'T INDICATE IN WHICH DIRECTION."
 380 PRINTTAB(8)"■■PRESS ■SPACE■ TO CONTINUE"
 390 GETK$:IFK$<>" "THEN390
 400 PRINT"■":GOSUB1000:GOSUB1010
 410 PRINT"■■■■■■■■"TAB(12)"■■USE THE FOLLOWING KEYS TO "
 415 PRINTTAB(12)"MOVE."
 420 PRINTTAB(12)"■  W.........UP"
 430 PRINTTAB(12)"■  Z.........DOWN"
 440 PRINTTAB(12)"■  A .........LEFT"
 450 PRINTTAB(12)"■  S .........RIGHT"
 460 PRINTTAB(12)"■SPACE.......DETONATE"
 470 PRINTTAB(8)"■■■PRESS ■SPACE■ TO CONTINUE"
 480 GETK$:IFK$<>" "THEN480
 490 PRINT"■":GOSUB1000:GOSUB1010
 500 PRINT"■■■■■■■■"TAB(12)"■■THE DETONATE FUNCTION WILL"
 510 PRINTTAB(12)"DESTROY ANY MINES ON SQUARES"
 520 PRINTTAB(12)"■NEXT TO YOU, BUT MAY ONLY BE"
 530 PRINTTAB(12)"■USED ONCE PER FIELD."
 540 PRINTTAB(12)"■■■YOU START WITH 5 LIVES, AND"
 550 PRINTTAB(12)"WILL NEED EVERY ONE OF THEM!"
 560 PRINT"■■SCORING DURING THE GAME IS AS FOLLOWS:-"
 570 PRINT"■■DETONATE A MINE.............5 POINTS"
 580 PRINT "■■FIND A SAFE SQUARE.........10 POINTS"
 590 PRINT "■■OMPLETE FIELD.............50 POINTS  +    EXTRA LIFE"
 600 PRINTTAB(10)"■■■PRESS ■SPACE■ TO PLAY"
 610 GETK$:IFK$<>" "THEN610
 620 GOTO1500
 650 IFDE=0THENRETURN
 652 IFA(X+1,Y)=1THENXX=MX+23:M=M-1:SC=SC+5:DE=0:A(X+1,Y)=0:GOSUB1200
 654 IFA(X-1,Y)=1THENXX=MX-23:M=M-1:SC=SC+5:DE=0:A(X-1,Y)=0:GOSUB1200
 656 XX=MX
 658 IFA(X,Y+1)=1THENXY=MY-23:M=M-1:SC=SC+5:DE=0:A(X,Y+1)=0:GOSUB1200
 660 IFA(X,Y-1)=1THENXY=MY+23:M=M-1:SC=SC+5:DE=0:A(X,Y-1)=0:GOSUB1200
 662 XY=MY:POKEV+21,16:GOSUB1250:GOSUB1350:GOSUB1400:RETURN
 700 IFY=8THENRETURN
 702 Y=Y+1:FP=FP-120:FX=FP
 706 FORT=MYTOMY-23STEP-1:FORTX=1TO5:NEXT:POKEV+8,MX:POKEV+9,T:NEXT:MY=T:XY=MY
 708 IFA(X,Y)=3THENGOSUB1400:RETURN
 710 IFA(X,Y)<>1THEN716
 712 GOSUB1200:L=L-1:M=M-1:SC=SC+5:GOSUB1250:GOSUB1300:GOSUB1350:FORT=1TO500:NEX
T:POKEV+21,16
 714 IFL=0THENRETURN
 716 GOSUB1150:SC=SC+10:GOSUB1250:GOSUB1400:A(X,Y)=3:RETURN
 750 IFY=1THENRETURN
 752 Y=Y-1:FP=FP+120:FX=FP
 756 FORT=MYTOMY+23:FORTX=1TO5:NEXT:POKEV+8,MX:POKEV+9,T:NEXT:MY=T:XY=MY
 758 IFA(X,Y)=3THENGOSUB1400:RETURN
 760 IFA(X,Y)<>1THEN766
 762 GOSUB1200:L=L-1:M=M-1:SC=SC+5:GOSUB1250:GOSUB1300:GOSUB1350:FORT=1TO500:NEX
T:POKEV+21,16
 764 IFL=0THENRETURN
 766 GOSUB1150:SC=SC+10:GOSUB1250:GOSUB1400:A(X,Y)=3:RETURN
 800 IFX=1THENRETURN
 802 X=X-1:FP=FP-3:FX=FP
 804 FORT=MXTOMX-23STEP-1:FORTX=1TO5:NEXT:POKEV+8,T:POKEV+9,MY:NEXT:MX=T:XX=MX
 805 IFA(X,Y)=3THENGOSUB1400:RETURN
 806 IFA(X,Y)<>1THEN810
 808 GOSUB1200:L=L-1:M=M-1:SC=SC+5:GOSUB1250:GOSUB1300:GOSUB1350:FORT=1TO500:NEX
T:POKEV+21,16
 809 IFL=0THENRETURN
 810 GOSUB1150:SC=SC+10:GOSUB1250:GOSUB1400:A(X,Y)=3:RETURN
 850 IFX=10THENRETURN
 852 X=X+1:FP=FP+3:FX=FP
 854 FORT=MXTOMX+23:FORTX=1TO5:NEXT:POKEV+8,T:POKEV+9,MY:NEXT:MX=T:XX=MX
 855 IFA(X,Y)=3THENGOSUB1400:RETURN
 856 IFA(X,Y)<>1THEN862
 858 GOSUB1200:L=L-1:M=M-1:SC=SC+5:GOSUB1250:GOSUB1300:GOSUB1350:FORT=1TO500:NEX
T:POKEV+21,16
 860 IFL=0THENRETURN
 862 GOSUB1150:SC=SC+10:GOSUB1250:GOSUB1400:A(X,Y)=3:RETURN
1000 PRINTA$:PRINTB$:PRINTC$:PRINTD$:RETURN
1010 PRINT"■■■■■■■■■■■■■■■■■■■
```

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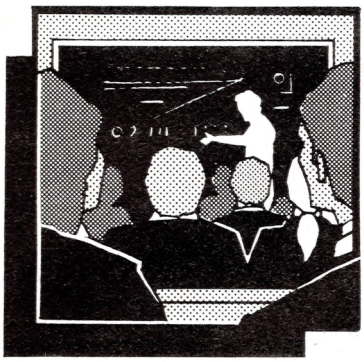
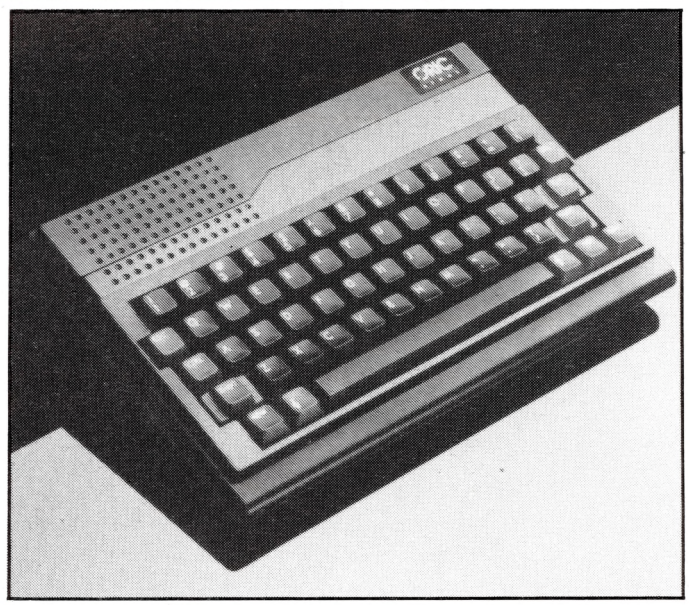


Popular Programming

PCT is always on the look out for good programs to publish. Here are some hints on how to get your work in print.

REFERENCE

All of the programs published in *Personal Computing Today* are written and submitted by readers. This method works well — not only do we provide the springboard for your entry into the world of programming but other readers are given the opportunity of sharing your ideas and of having fun. It is profitable for you too! We pay good rates for the work we publish enabling you to expand your computer system and open up the way to greater programming power!



Popular computers

While we like to cover a wide range of home computers, space is limited and we have to give preference to the most popular computers owned by our readers. So while it is pleasing to see an excellent real-time adventure for the Atom, it would have such a limited appeal among our readership that publication would not be justified. Thus, we would prefer a simple well-written program for the ZX Spectrum for example.

Program assembly

Remember that your program will be seen by many thousands of people, some of whom will be beginners to computing. So, keep the program simple. Multi-statement lines may be more efficient in terms of memory needed but the program will be easier to follow (and debug) if the line holds one command rather than twenty. This makes it easier to trace the "SYNTAX ERROR IN 100".

REMS are invaluable but they must explain clearly what is going on. For example: 5010 AN=C(A+I):REM GOTTIT! is not as helpful as 5010 AN=C(A+I):REM PUT ANSWER IN AN. This does not mean that you have to stick to a rigid PASCAL-type structure, which is often as hard to follow and is inefficient. Structure code where it helps and use sensible names for the variables used.

We like to include detailed notes on how to convert programs to run

on other machines, so that any reader interested in the program can make an attempt at running it on his/her own machine. Bear this in mind when writing the program and while making full use of the capabilities of the 'base' micro try to view your program in terms of how it can run on other machines. Please include detailed documentation on how it may be converted. You will be paid for this as well as for the program itself and the better it is the more likely we are to accept the program.

Give a description of the function of every variable. Lines such as GET A$:IF A$ = "" THEN 90 may seem obvious to you but it may be double dutch to some readers and should therefore be expanded. Also give a detailed line by line account of what each major section of the code is doing. This is particularly helpful to people who do not know the 'base' micro's BASIC but who are competent enough to convert it to their own machine.

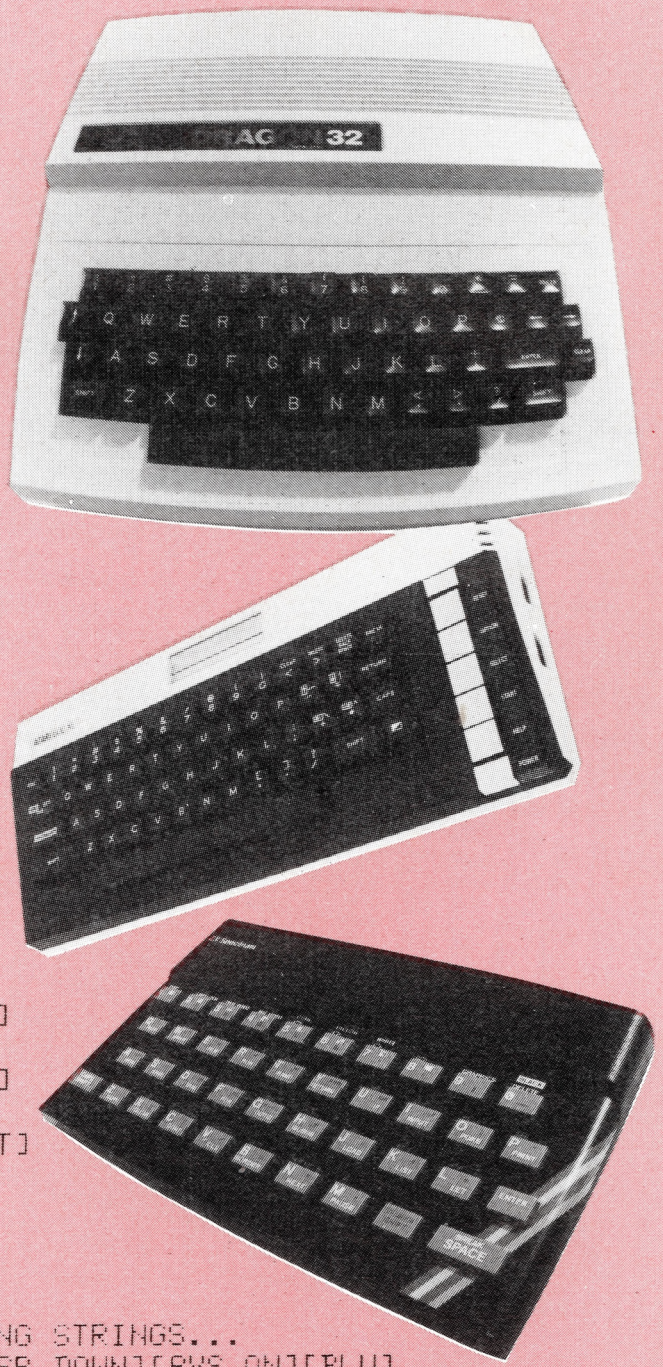
A good package

If possible, type all text in double spacing with a 1" margin on each side of the paper. Along with the hints on conversion, line annotation and list of variables, don't forget to send an introductory section explaining what the program is about and how to use it.

Always send the documentation and a cassette of the program in a well padded envelope (Jiffy bags are ideal for this) and label each part of the package with your name, address and telephone number, the

Table 1 Showing how to REM control codes for the VIC 20 and CBM 64.

```
10 REM [BLK]
20 PRINT"■"
30 REM [WHT]
40 PRINT"■"
50 REM [RED]
60 PRINT"■":REM POUND SIGN ON THE 64
70 REM[CYN]
80 PRINT"■"
90 REM[PUR]
100 PRINT"■"
110 REM[GRN]
120 PRINT"■"
130 REM[BLU]
140 PRINT"■"
150 REM[YEL]
160 PRINT"■"
170 REM[RVS ON]
180 PRINT"■"
190 REM[RVS OFF]
200 PRINT"■"
210 REM[COM 1]
220 PRINT"■"
230 REM[COM 2]
240 PRINT"■"
250 REM[COM 3]
260 PRINT"■"
270 REM[COM 4]
280 PRINT"■"
290 REM[COM 5]
300 PRINT"■"
310 REM[COM 6]
320 PRINT"■"
330 REM[COM 7]
340 PRINT"■"
350 REM[COM 8]
360 PRINT"■"
370 REM[CRSR UP]
380 PRINT"■"
390 REM[CRSR DOWN]
400 PRINT"■"
410 REM[CRSR LEFT]
420 PRINT"■"
430 REM[CRSR RIGHT]
440 PRINT"■"
450 REM[CLR]
460 PRINT"■"
470 REM[HOME]
480 PRINT"■"
500 REM...COMBINING STRINGS...
510 REM[CLR][3 CRSR DOWN][RVS ON][BLU]
520 PRINT"■■■■THATS THE WAY TO DO IT"
```



name of the program, the machine it runs on and the memory required. Since we often change the name of the program it would be helpful if you could keep the program listing free of your own title. You can still, of course, include a REM statement with your name.

Every program we receive is looked at carefully with a view to publication in a future issue of the magazine. Testing the submissions takes some time, so while you will receive an immediate acknowledgement of receipt, be patient as it may be some time before we can notify you of our decision. Always keep a copy of the program so that if we need to contact you about any problems you have the program to hand.

If we think the program is up to our usual standard we will write to you accordingly. The copyright in such works which will pass to Argus Specialist Publications Limited will be paid for at competitive rates. This means that you will not be able to publish the program through any other media and for this reason we cannot return your cassette of the program. If, however, we cannot accept the program for publication for any reason, we will notify you of this decision and return your cassette and documentation. Should this be the case, don't be disheartened. Go back to your micro and have another go.

Notes for specific micros

Oric I and Atmos

1. Always state memory size.
2. SAVE programs at SLOW speed.
3. Send more than one copy of each program on the tape.

VIC 20

1. State memory size and any expander cartridge required.
2. REM POKES (e.g. sound and user defined graphics extensively).
3. Try to avoid long strings of control chracters.
4. Insert a REM, as shown, above lines using control characters to explain what they do.

CBM 64

1. Do not rely on any BASIC extensions e.g. Simon's BASIC or BC BASIC.
2. If you move screen memory of POKE sound, REM the procedures thoroughly.
3. Use checksums to ensure details such as sprite data are OK.
4. REM control codes as for the VIC (see Table 1).

BBC/Electron

1. Try to keep to "legal" calls
2. Do not use embedded mode 7, CHR$ as they cannot be printed. Use the CHR$ function instead.
3. State which operating system and BASIC is necessary and if relevant, which DFS and version.
4. Try to check the program on an Electron.
5. Save at 1200 baud or on 40 track disks.

Electron

1. Try to check if it will work on a BBC — some negative INKEYS may not.
2. Save at 1200 baud.

Spectrum

1. State memory size, 16K or 48K.
2. Do not make program auto run.
3. Try to explain UDGs in REMS.
4. Save more than one copy on the tape.

Atari

1. State memory size.
2. State type of recorder used (old 410, new 410 or 1010).
3. Save several copies on tape.
4. Do not LIST "C:".

Machine code

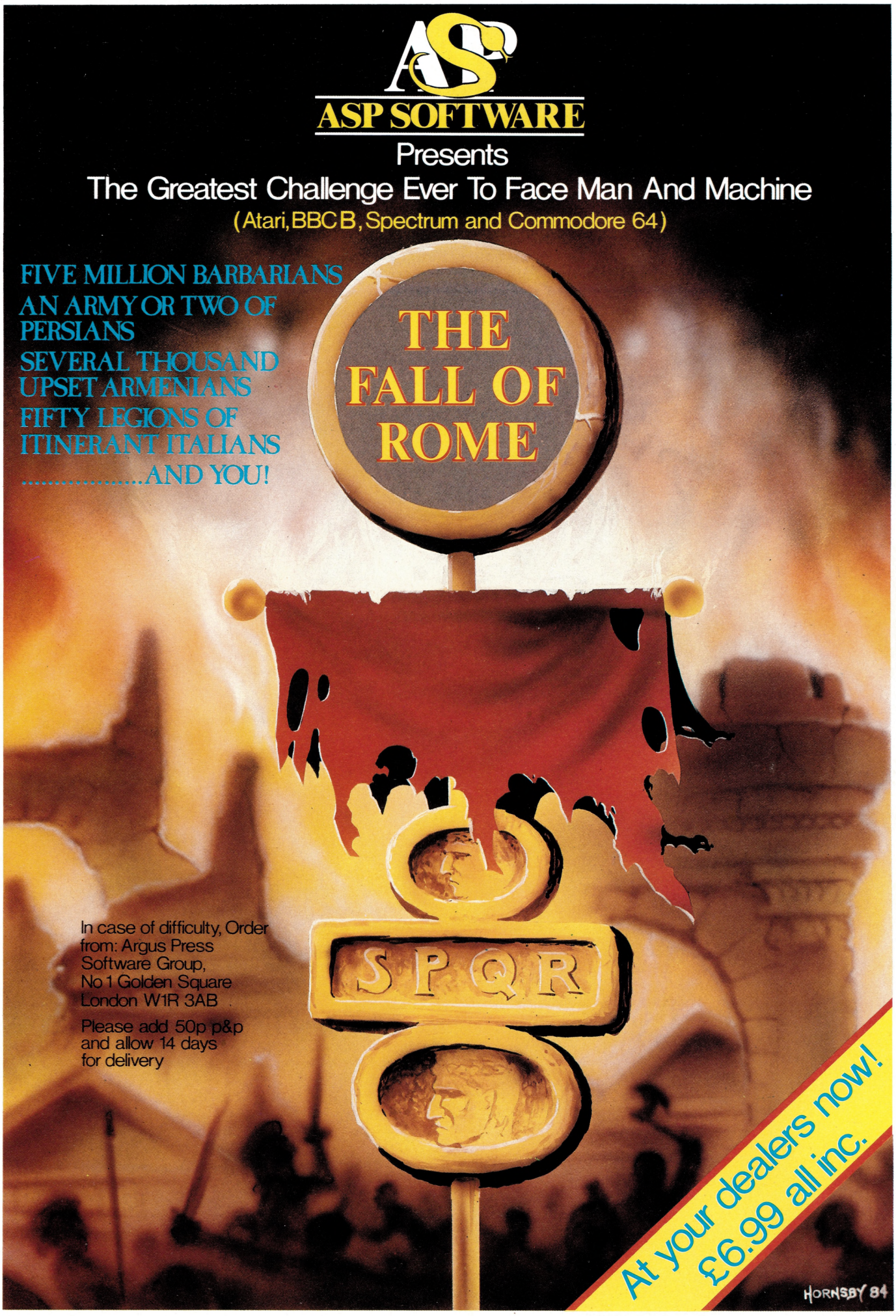
1. Use a BASIC program which reads and POKEs data.
2. Use a checksum.
3. We will not print disassemblies but sufficiently commented source code may be used.

General points on non-protection

1. Do not auto run.
2. Do not disable or trap Break, Stop or ESCAPE keys.
3. It is not necessary to protect your program so do not cause the program to NEW or delete itself when ending. Programs which do this wil have the subroutine removed.

Summary

1. Include an introduction, line by line annotation, list of variables used and detailed hints on conversion, and of course, a cassette of the program.
2. Take note of the instructions for specific machines.
3. Label all parts with your name, address and telephone number and package the parcel well so that bits do not go 'astray' in the post.
4. Sit back and look forward to seeing your name in print. Then get to work on another submission! Good luck, we look forward to seeing your work.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Testbed

Disk drives are an important peripheral to home computer users. We explain what they do and put some through their paces.

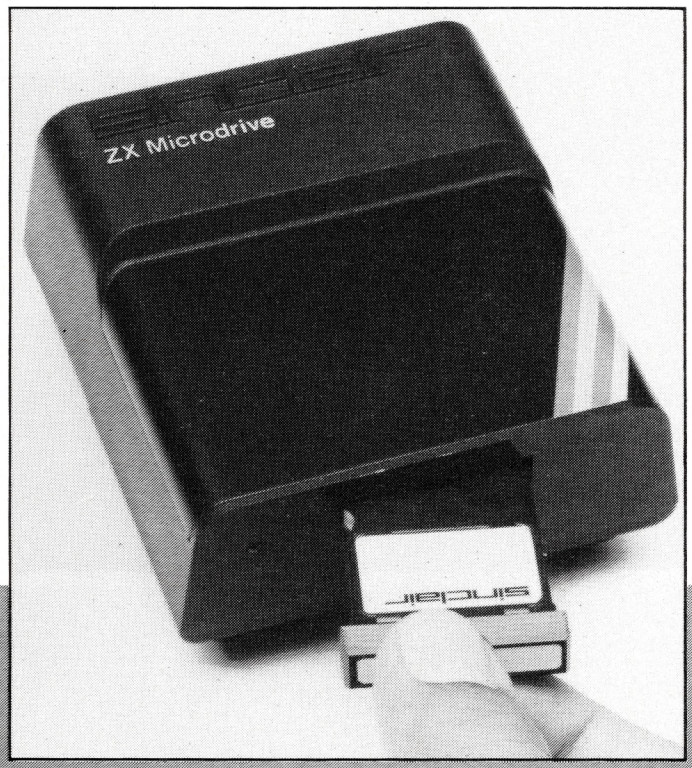
Anybody who regularly saves and loads programs to and from tape storage will know the inconvenience of waiting (and wasting!) ten or so minutes for data transfer to be completed. It is frustrating to have at your fingertips an ultra-fast electronic brain, capable of carrying out mammoth calculations in fractions of seconds, only to be held back by slow subsidiary procedures. Such a method of data transfer can also be unreliable.

However, cassette data storage is cheap and most owners of micros already possess at least one cassette recording/playback system. Even if they do not, a suitable one can be purchased for less than £30 (unless you own a Commodore machine, in which case you will need to spend about £50 for a dedicated data recorder).

On disk

Disk drives are fast, reliable and falling in price, bringing them into the range of home computers users. All makes of home micro can now be interfaced to a system quite simply. The cheapest and most widely used are 5¼inch floppy disk drives. The data are stored on diskettes which are basically circular patches of magnetic tape with a hole in the centre. They are enclosed in a flexible envelope, hence the name floppy disk. Like a record, a disk has "grooves" in which the data are stored. These are called tracks. Unlike a record these tracks are not visible, and are paths taken by the disk head on the magnetic surfaces. The more tracks on a disk the more storage space there is available. Most floppies have between 48 and 100 TPI (Tracks Per Inch). Therefore an 80 track dirve can store twice as much as a 40 track drive. The new generation of disks are 3" disks. These are the same as floppies except that the envelope is rigid making the disk more durable and ideal for use in schools. At the moment these drives ae slightly more expensive and non standard, but the price should go down as demand increases and more companies start to support them. You could pick up a 5¼" drive for as little as £150, if you shop around, these prices are going down all the time so keep tuned to the adverts.

A more powerful and expensive storage medium are hard disks.



These are exactly the same as floppy disks except the diskette is fixed inside the drive and is rigid. Due to the superior quality, a hard disk allows much higher storage capacities. They usually have 100 to 400 TPI and can store tens of millions of characters. As you would expect you have to pay for this power, they start at about £1000.

Tape loops

The more recent advances in technology have given tapes a new lease of life. The more famous of these is the Sinclair Microdrive. This uses high quality video tape which is arranged so that it is wound in an endless loop. This means that when the tape is read, instead of being wound on to a second reel, it is fed back to the centre of the original reel. The data is recorded in the same way as conventional tape, one BIT (Binary Digit, as the characters are converted into base 2 first) at a time. The other difference is that the tape motor runs much faster to allow faster data access speeds. These speeds may result in reliabilty problems and tape wear. The microdrive is designed for the Sinclair Spectrum and retails for £50. Read on for a test reort of this system.

A very new competitor in this area is the Phloopy data storage system. This also uses the endless loop method, but instead of using reels the tape is allowed to form natural loops within the casing. The Phloopy system uses a nine track recording head, this means that data are recorded one byte

(character) at a time, which enables more storage in the 12 foot long tape strip. This allows the tape to run at slower speeds, not much faster than a normal cassette, which means high reliability and less tape wear. As the Phloopy system is so new it has yet to be proved and is totally non standard. It is designed to run on a BBC Micro (which requires an interface for £26 + VAT which includes its own filing system), but versions for other machines are also promised in the near future. The Phloopy system itself retails for £99 + VAT.

A disk drive allows direct access to a particular program on file. It is therefore quicker to reach your goal than with tape cassette systems. Disk drives are also more reliable and allow the user to make back up copies quickly and easily in case of corruption of files stored. Thus the advantages of disk drives over cassette tape storage are obvious.

Another consideration is the price of the diskettes or tape cartridges. Whereas the tapes and 3" diskettes cost around £5, the floppy diskettes sell for as little £2. When buying any of the described devices it is advisable to stay with the standard system for your micro, as only that system will certainly be supported.

Unfortunately, one of the most useful purposes of a disk drive would be to have all your favourite programs on one disk so that they may be loaded quickly but this is normally not possible. The efforts of software companies to minimise piracy has meant that innocent people who just want a copy of a program supplied on cassette put onto disk may not load from cassette and then save due to the inbuilt protection in the program. Also, producing software on disk is more difficult to protect and the cost of the disk has to be included, thus putting the cost of the software up. So if you do decide to move onto floppies, for goodness sake don't trade in your cassette recorder when you do so!

Testbed has taken a look at some disk and continuous loop systems. The reports on performance follow.

COMMODORE 64 DISK STORAGE

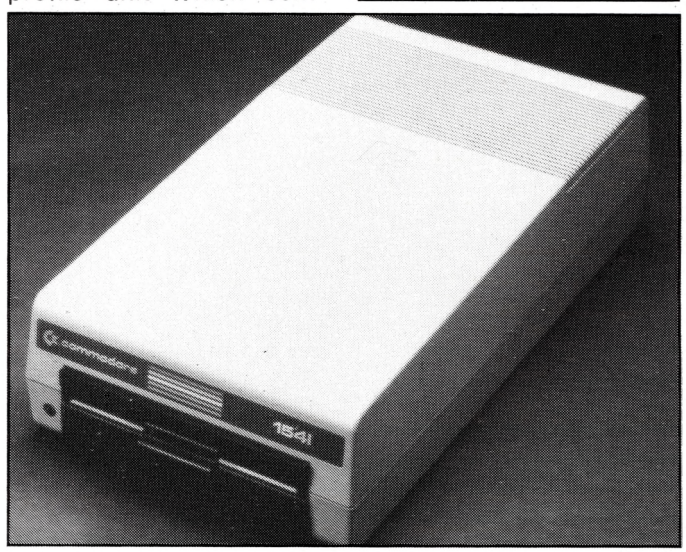
There can be few owners of CBM 64s who do not own a cassette player suitable for this popular computer. Indeed, the majority of software available comes on this convenient medium. Virtually all of these owners must be frustrated by the slowness of the data transfer. The Commodore system is particularly slow in comparison with the likes of Sinclair and so on but it has the advantage of being more reliable overall. Incidentally, the reason for this is that the CBM cassette system was designed for the 8K Pet. On this machine you would only be likely to load up to 6K of program at any one time which would take about 4 mins — a lot less time than loading 48K of your favourite adventure program!

It therefore follows that the question of a floppy disk drive will quickly arise to owners of CBM machines. For the CBM 64, there are really only two methods to consider. Firstly, the CBM 1541 disk drive which is specifically designed for the CBM 64 and connects directly to it, and secondly connecting any IEEE disk drive via an IEEE interface.

CBM 1541 disk drive

This is by far the cheapest of the two methods and the most popular but it does (of course) have drawbacks. The 1541 is a smart, low profile unit which complements the physical appearance of the CBM 64 nicely. It is a single drive unit with a capacity of 165K which is more than adequate for the average home use. Indeed, most people do not write enough programs in one year to fill one disk. In practice, most disks are only partly filled, mainly due to the inconvenience of finding a program on a disk containing up to 150 directory entries. In business applications, the programs take only a small percentage of disk space, the data using the majority. The 1541 is a reliable piece of equipment but users of it should note that saving programs using the command 'save ''@:filename'',8' has been known to cause corruptions. Therefore a routine such as the following should be used instead:

```
63899   end
63900   open1,8,15:f$ = ''file-
        name'':fl$ = f$ + ''.bak''
63910   print£1,''sO:'';fl$ :go-
        sub63980
63920   print£1,''r0:'',fl$;'' = '';
        gosub63980
63930   savef$,8:gosub63980:
        end
63980   get£1,a$:printa$;:ifa$
          chr$(13)then 63980
63990   return
```



and should be called by run63900.

The 1541 is readily available at £200 + VAT from your local computer shop who will probably throw in lots of free software with it. Hopefully, this software will include a utility for copying part of or a complete disk. This is the major drawback with a single drive unit of course. Backing up a disk can mean swapping source and destination disks several times which is time consuming and

tedious and eventually the user gives up this practice which he will regret heavily when his most important disk goes down.

IEEE interface

The second option is to buy an IEEE interface such as the Interpod which retails for £100 + VAT and then to buy any of the Commodore IEEE disk drives. Officially the only drives available from Commodore are the 8250 — 2 Megabyte of twin disk drive and at £895 + VAT, no more need be said, and the SFD1001 which is an 8250 cut in half costing £495 + VAT. This gives the Megabyte of storage in a single drive unit thereby having advantages over the 1541 in terms of capacity. Speed increase over the 1541 is not significant with any of these drives as any additions to the CBM 64 through the serial bus must automatically be limited by the speed of this bus.

The ideal drive to use with the IEEE interface is the 4040. All Commodore twin disk drives such as this model have proven reliability (not saying it is good or bad — just proven) and hold their second hand value remarkably well. The 4040 provides the advantage of twin drives making backups quicker and easier. This speed increase is due to the operating system inside the drive. The programmer can send a command to copy the whole of drive zero to drive one and there will be no data transfer to the CBM64 (save for the reporting of error messages) thus enabling the drive to work at full speed. All Commodore drives have a built in controller like this, meaning that adding a drive to your system involves no memory penalty (unlike other home computers). The retail price of a 4040 was £695 + VAT and although it is officilly "discontinued" by Commodore, you may still be able to get hold of a new one. In any case, I do not know of any Commodore drives that have had to be scrapped so there must be a lot of second hand ones out there somewhere. Another advantage of the 4040 is that is compatible with the 1541. That is to say that disks created on one model may be read by the other. In theory, writing to a disk created by the other model is possible but this will almost certainly lead to disk corruptions and is therefore not be recommended.

Information about Commodore disk drives is available from: **The Commodore Information Centre, 675 Ajax Ave, Slough, Berks. SL1 4BG or telephone (0753) 79292.**

SINCLAIR ZX MICRODRIVES

The ZX Microdrive is a tape storage system specifically designed for the Sinclair Spectrum. Up to eight can be hooked up to the Spectrum via an interface that also acts as a link to a printer and to other Spectrums. The drives themselves are slightly smaller than the Spectrum power supply and have a hold in the front to accept the tape cartridges (and dust). Each cartridge, which is the size of a match-book, can hold in excess of 85K of data on a continuous loop. The amount of data varies depending on the quality of the tape and how much has to be masked out because it may not store data properly.

The first thing one tends to notice when getting used to the drives are the long winded commands that are needed to access them. Instead of the usual 'LOAD "title" ', where "title" is the program name, you have to type, 'LOAD* "m"; "title" ', where * "m" signifies microdrive and "n" is a drive number from 1 to 8. The SAVE and VERIFY commands change accordingly, and some new commands are added to the BASIC, for formatting a cartridge, obtaining a catalogue of what is on the cartridge and erasing an unwanted program.

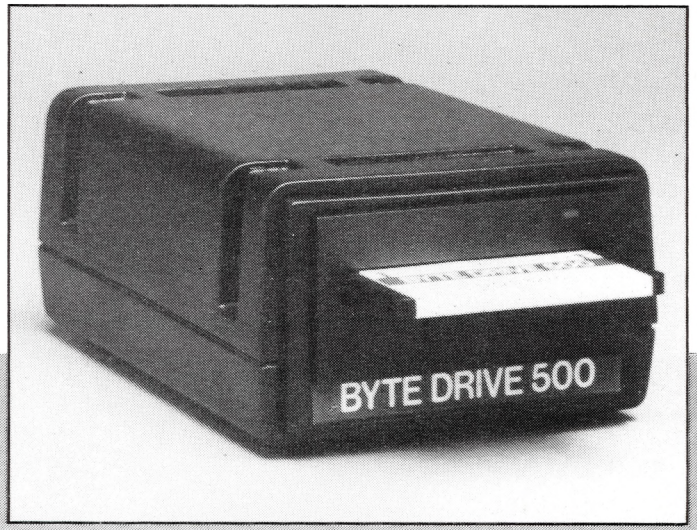
In use, the system is quite reliable and compared to the normal loading speed of the Spectrum, it is very fast, with a transfer speed of about 16K a second. This time is usually slowed down because of the access time. i.e. the computer scans the whole tape until the program is found, which can take up to 7 seconds. What it boils down to is an average loading time for a program of about 10 seconds.

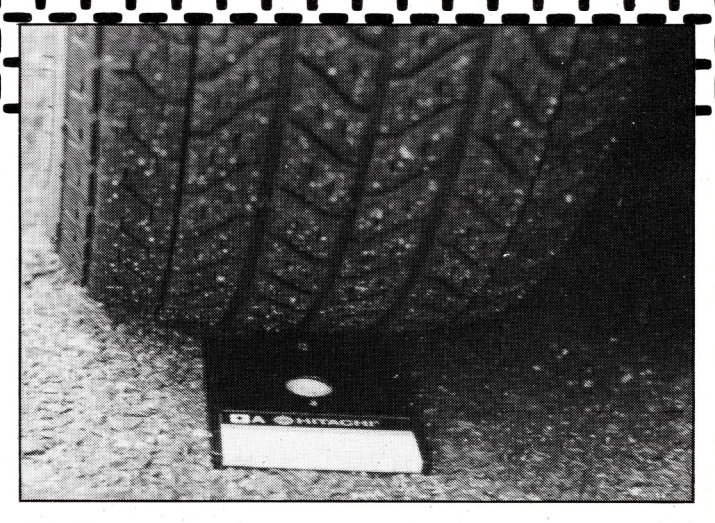
The drives are meant mainly for program storage but do have the provision for handling data files, but as you would expect from any tape storage, this is quite slow. All in all, the Microdrive is an ideal system for the home enthusiast who would like an increase over the speed of cassette storage, without having to spend hundreds of pounds.

Sinclair Microdrives retail at £49.95. The Interface 1 costs £49.95 and blank cartridges are £4.95 each. The Interface 2, which allows the use of joysticks, costs £19.95. For further information contact **Sinclair Research, 23 Motcomb St, London SW1X 8LB or telephone 01-235 9649.**

CUMANA 40 TRACK SINGLE 5½" VS BYTE DRIVE 500, 40 TRACK 3" DRIVES

After spending £95 for a disk interface for the BBC Micro, you would want to make sure you get the best drive for your needs. In this article we compare a Cumana 40 track single 5¼" disk drive with a Byte Drive 500, a 3" 40 track drive.





The first thing to note is the Cumana drive comes with a disk interface, only the connecting cables are included in the price. The Cumana drive has an integral power supply, and a heat sink sits nicely on the back to dissipate the heat. The Byte Drive has its power supply separate to the main unit. The Acorn Disk Filing System was used for both tests, but I cannot see any reason why any other filing system could not be used instead.

The Cumana drive was standard Teac slimline disk drive. Included in the price was a system disk which provided the user with formatting the verifying utilities. A disk has to be formatted using the formatter before it can be used. The one supplied worked perfectly and even had graphics and sound effects built in. The verifier was straightforward and just went through the disk checking for any errors. The manual was very full and served its purpose.

The drive itself was the new Teac slim line model and had a cream coloured casing to match that of the BBC's. The drive door was closed by turning an elongated knob down from a horizontal to vertical position. The door does not close if the drive is empty. At first I thought the drive door was broken, but this becomes useful as you always know when there is a disk in the drive. The drive ran smoothly and was reasonably quiet, although the sound of the head stepping in and out can be heard in a quiet environment.

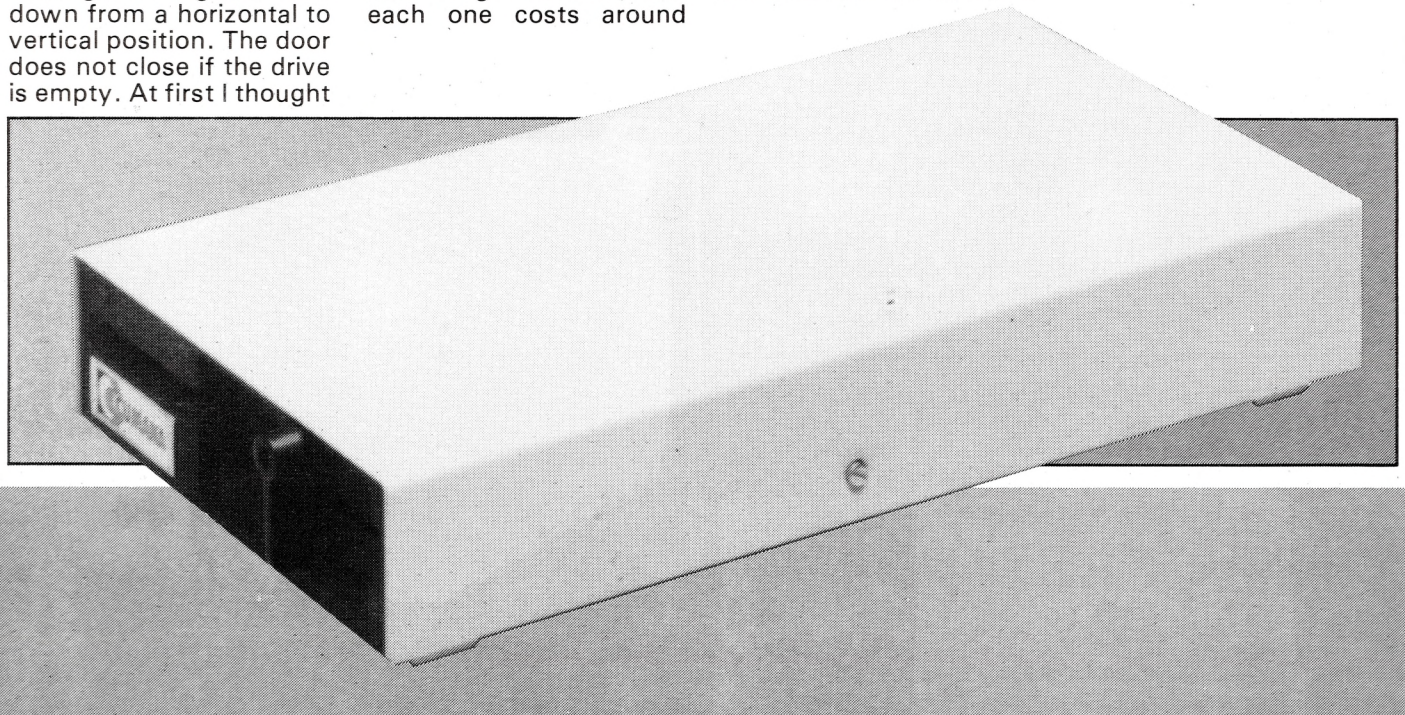
The Byte Drive is coloured matt black and is square in shape. As it was designed to be used with a variety of computers it cannot really match any of them in design. The drive performed perfectly and I found it was fully compatible with the Acorn DFS. A formatter is part of the package — it comes on the special 3" diskette.

Both drives have a 40 millisecond track to track access time (this is the time taken for the disk drive head to move to the next track), and both drives also have a maximum of 100k storage per disk. The second side of the 3" diskette can also be used on the Byte Drive, effectively giving 200K storage per diskette. Only one side of the diskette can be used with the Cumana drive. The Byte Drive uses a special 3" diskette which may be hard to get hold of, and each one costs around £5. The Cumana can use any 5¼" floppy diskette, and these are readily available costing less at about £2 each.

The main disadvantage of the Byte Drive is the price of the diskettes. Another main downfall is the lack of software available on 3" format, and it seems unlikely that the software companies will cater for it unless it has phenomenal sales. The Cumana drive on the other hand is very standard and their use has been tried and tested for the past six years. The Cumana drive also has 40 tracks which is the most popular format on the beeb and all disk software will be compatible. If you decide that you are not interested in any commercial software, then a Byte Drive would be useful if you upgrade to another machine as ITL Kathmill produce interfaces for a number of computers, where only the cable has to be changed.

Cumana Disk Drives reviewed cost £169 including leads and manual and further information is available from **Cumana Ltd, Pines Trading Estate, Broad St, Guildford GU3 3BH or telephone (0483) 50321.**

The Byte Drive 500 System for the BBC is available as a special offer package at the moment. This costs £190 plus VAT and includes the Interface, cable, manual and Zap software. Further details from **ITL Kathmill Ltd, The Old Courthouse, New Rd, Chatham, Kent ME4 4QJ or telphone (0634)815464/409433.**



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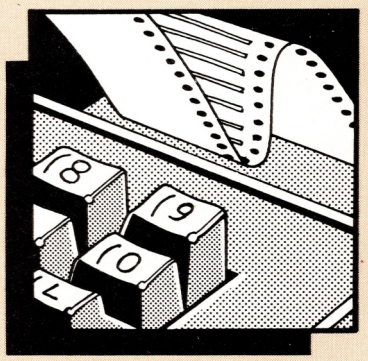
FILESIXTY

Filesixty Ltd., 25 Chippenham Mews, London W9 2AN, England. Tel: 01-289 3059. Telex: 268 048 EXTLDN G 4087.



Hardware Factfile

Factfile is our guide to buying a microcomputer. We have included all computers which cost less than £500. In order to help you through the decision computer jungle, we have put the most important specifications for each of the micros into a clear format so you can see at a glance which one has the features you are looking for. The layout also makes it easier to compare different manufacturer's machines without having to wade through the reams of brochures supplies by them.

Factfile sorts it all out for you! Just look down the price index to discover what is available in your range and then consult the facts given for each. The section is presented alphabetically.

Since most peripherals are made to interface with lots of different micros, we have not included information as to whether the micro's manufacturer produces items specific to the machine. Various Printers, disk drives etc. will be reviewed in our add-ons section throughout the year. Specific information can be obtained by contacting the manufacturer directly.

FACTFILE PRICE INDEX

MICROS UNDER £500 (prices given in chart are recommended retail. For average selling prices see under machine)

less than £100

- Aquarius
- Oric 1 16K
- Spectrum 16K
- Texas TI99/4A
- ZX81

£100-200

- Atari 400
- Atari 600XL
- Atari 800
- Atmos
- CGL/Sord M5
- Dragon 32
- Electron
- Enterprise 64K
- Oric 1 48K
- Spectrum 48K
- VIC 20

£200-300

- Atari 800 XL
- Commodore 64
- Enterprise 128K
- Lynx 48,96K
- Sharp MZ700
- Spectravideo SV318

more than £300

- BBC Model B
- Spectravideo SV328

MICRO

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in ''thousands of bytes'' or ''K'' ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline – you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate – don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look and see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

SIZE OF BASIC: The number of bytes occupied by the BASIC language is important, as it is an approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

VIDEO OUTPUT: an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

AMSTRAD

Amstrad Consumer Electronics
Brentwood House
169 Kings Road
Brentwood
Essex CM14 4EF



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 20,40 or 80 characters
Expansion Sockets	Centronics Parallel printer port
Tape Included?	Yes
Monitor Included?	Yes – green or colour
Size of BASIC	16K
R.R.P.	£299, £329 (extra with disk drives)
Average Price	**£229, £329**

ATARI 400

Atari Int. (UK) Inc.,
PO Box 407,
Blackhorse Rd,
London SE8 5JH



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
R.R.P.	–
Average Price	**£80**

ATARI 600XL

Atari Int. (UK) Inc,
PO Box 407
Blackhorse Road
London SE8 5JH



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Size of BASIC	8K
R.R.P.	£159.99
Average Price	**£159.99**

ATARI 800

Atari Int. (UK) Inc.,
PO Box 407
Blackhorse Road
London SE8 5JH

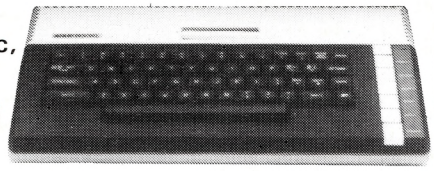


STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	8K
R.R.P	–
Average Price	**£199**

Hardware Factfile

ATARI 800 XL



Atari Int. (UK) Inc,
PO Box 407
Blackhorse Road
London SE8 5JH

STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Size of BASIC	8K
R.R.P.	£249.99
Average Price	**£249.99**

ATMOS

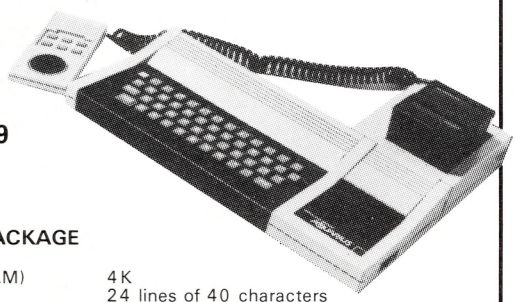


Oric Products Int.
Cowarth Mansion
Cowarth Park
London Road
Sunninghill
Ascot SL5 75E

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	28 lines of 40 characters
Expansion Sockets	Centronics printer and Oric expansion connection
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
R.R.P.	£170
Average Price	**£170**

AQUARIUS



Radofin
Hyde House
Colindale
London NW9

STANDARD PACKAGE

Memory Size (RAM)	4K
Screen Size	24 lines of 40 characters
Expansion Sockets	Yes
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	2K
R.R.P.	£54
Average Price	**£49.95**

BBC MICROCOMPUTER



Acorn Computers Ltd
Fulbourn Road
Cherry Hinton
Cambridge CB1 4JN

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	30 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue output, printer BUS connection
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	16K
R.R.P.	£399
Average Price	**£399**

CGL M5

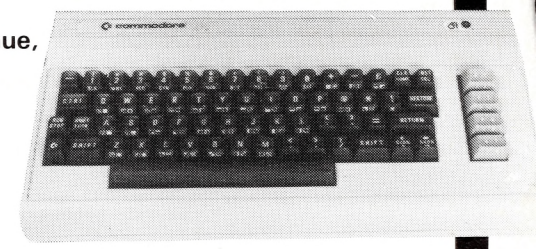


CGL
Computer Games Ltd,
CGL House,
Goldings Hill
Loughton,
Essex.

STANDARD PACKAGE

Memory Size (RAM)	20K
Screen Size	24 lines of 40 characters
Expansion Sockets	Parallel
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	1K
R.R.P.	£149.95
Average Price	**£149.95**

COMMODORE 64



Commodore
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS, Serial, Video
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
R.R.P.	£229
Average Price	**£199**

COMMODORE VIC20

Commodore
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	3·5K
R.R.P.	£149.99
Average Price	**£139.99**

DRAGON 32

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Kenfig Ind. Est.
Port Talbot
W. Glam. SA12 2PE



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
R.R.P.	£159.95
Average Price	**£159.95**

ELECTRON

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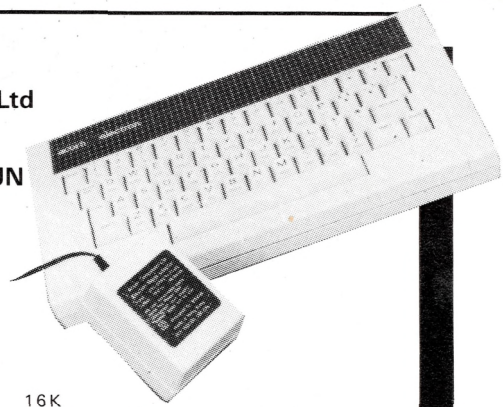
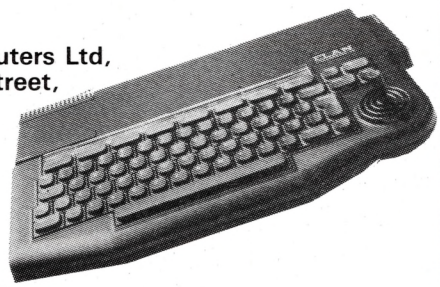


STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	30 lines of 80 characters (max)
Expansion Sockets	BUS connection
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	16K
R.R.P.	£199
Average Price	**£199**

ENTERPRISE 64

Enterprise Computers Ltd,
31-37 Hoxton Street,
London N1 6NJ,



STANDARD PACKAGE

Memory Size (RAM)	64K, 128K
Screen Size	84 lines of 56 characters
Expansion Sockets	BUS (64 way) ROM Socket RS423 Centronics monitor
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	12K
R.R.P.	£199, £299
Average Price	**Not available**

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Camputers
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Cambridge CB2 1UW



STANDARD PACKAGE

Memory Size (RAM)	48K,96K,128K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	1.5K
R.R.P.	£255, £299, £445
Average Price	**£225, £229, £445**

Hardware Factfile

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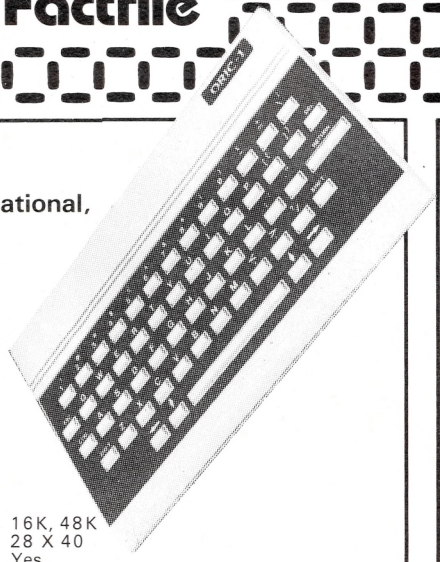
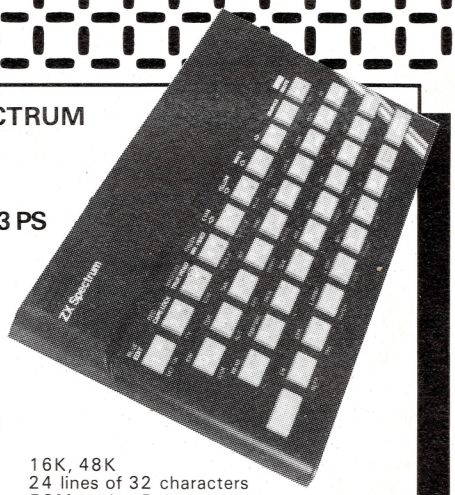


**Oric Products International,
Cowarth Mansion,
Cowarth Park,
London Road,
Sunninghill, Ascot,
Berkshire, SL5 7SE.**

STANDARD PACKAGE

Memory Size (RAM)	16K, 48K
Screen Size	28 X 40
Expansion Sockets	Yes
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
R.R.P.	£99.95, £139.95
Average Price	**£99.95, £139.95**

SINCLAIR ZX SPECTRUM



**Sinclair Research,
Stanhope Road
Camberley, GU15 3PS**

STANDARD PACKAGE

Memory Size	16K, 48K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM packs, Bus connector, joystick, socket
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
R.R.P.	£99.95, £129.95
Average Price	**£99.95, £129.95**

SHARP MZ-700



**Sharp UK Ltd,
Thorn Road
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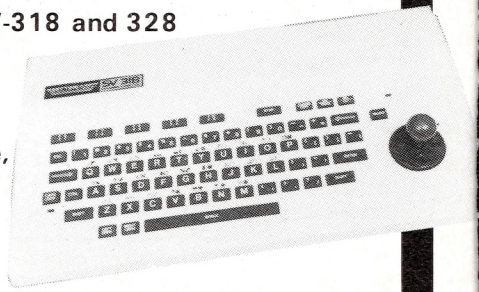
Manchester
M10 9BE**

STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	N/A
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	28K
R.R.P.	£249.95
Average Price	**£249.95**

SPECTRAVIDEO SV-318 and 328



**CK Supplies,
Unit 5 Norside,
Oldmixon Cres,
Weston-Super-Mare,**

STANDARD PACKAGE

	318	328
Memory Size	32K	80K
Screen Size	40 lines of 24 char.	40 lines of 24 char.
Expansion Sockets		
Tape Included?	Yes	Yes
Usable Domestic TV?	No	No
Size of BASIC		
R.R.P.	£226	£305
Average Price	**£226**	**£305**

SINCLAIR ZX 81



**Sinclair Research,
Stanhope Road
Camberley GU15 3PS**

STANDARD PACKAGE

Memory Size (RAM)	1K
Screen Size	34 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of BASIC	8K
R.R.P.	£39.95
Average Price	**£39.95**

TEXAS TI99/4A



**Texas Instruments,
European Consumer
Division,
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Bedford MK41 7PA**

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	34 lines of 32 characters
Expansion Sockets	ROM pack, BUS connector, joystick, socket
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
R.R.P.	None available
Average Price	**£79**

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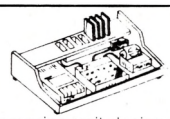

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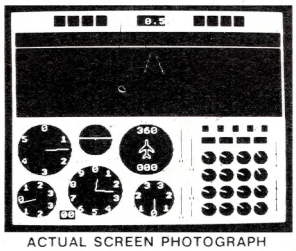

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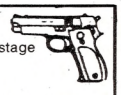

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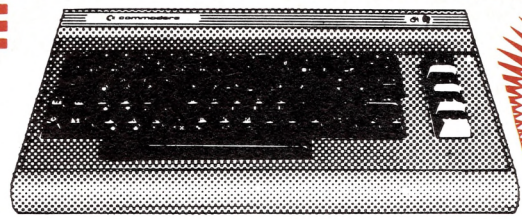

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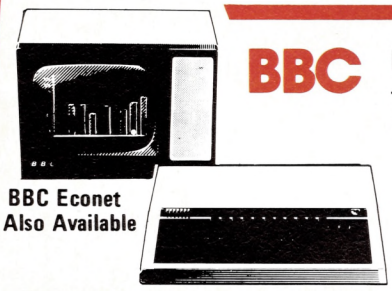

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C.C.S. 29
Cheetah Soft 57
Curtis Computers 75
Compusound..... 40

Dorling Kindersley.....58, 59
Dragon Data 42, 43

Evesham Cabinets..... 75
Electronequip 15

File Sixty..... 89
First Byte 80

Micropower 72
Mayfair Micros 75
Microdeal .....OBC

P&R Computers 75

R&R Software 48
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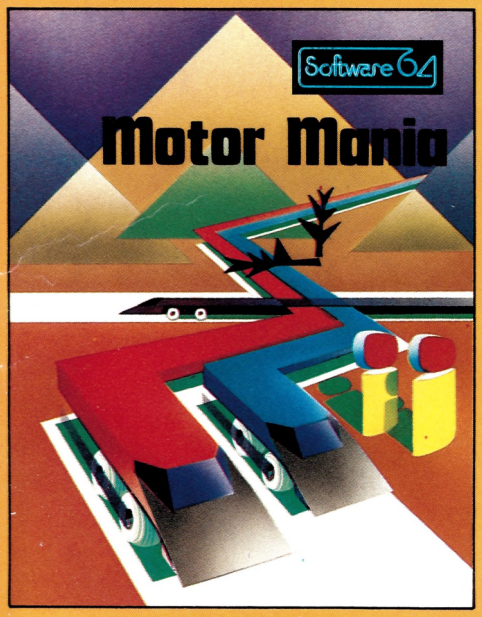

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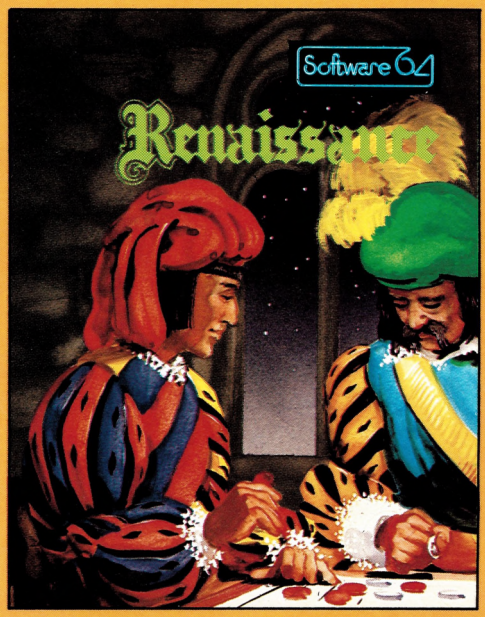

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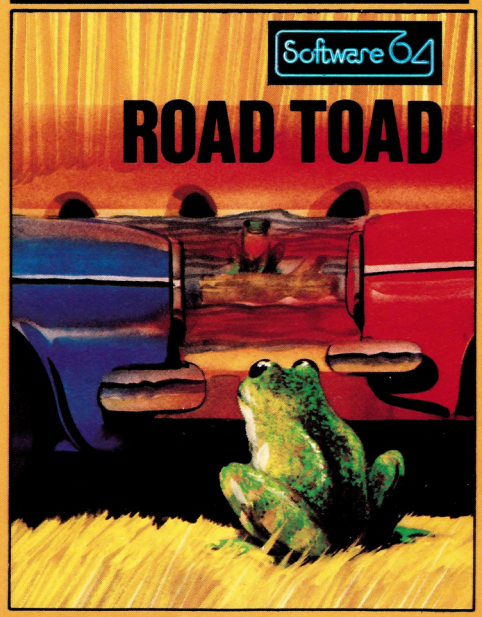

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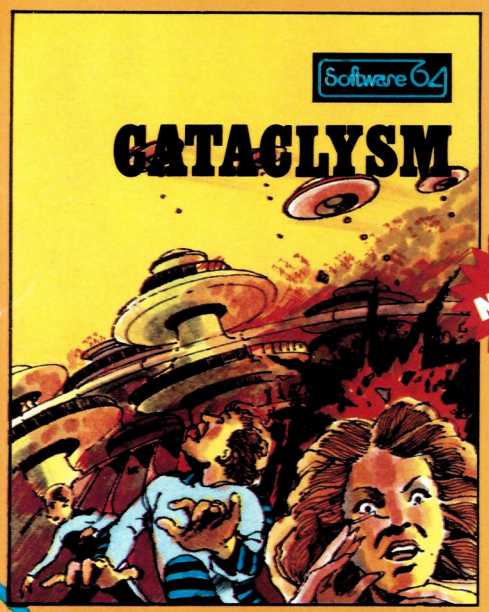

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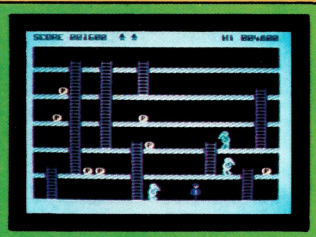

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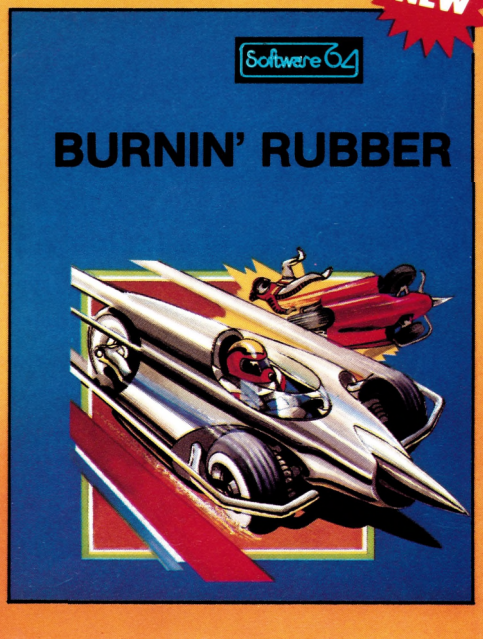

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