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Personal Computing Today

Micro UPDATE Incorporating

JULY 1983

75p

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Improve your technique

SOFTWARE CHECKLIST
Shopping at home for your programs

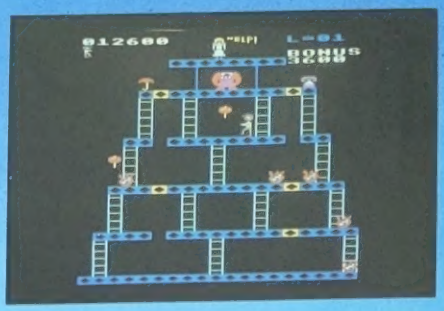


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VOLUME 1 NUMBER 12 JULY'83

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The bucket and spade season is with us once again but I hope it doesn't distract you all from your computing exploits.

To coax you indoors from the good (I hope) weather this month we're running a special feature to help all of you who want to buy a computer but are unsure of which make and model to go for.

In our 'Top 10' article we have picked the 10 best selling home micro computers on the UK market and gone through each one to give you a synopsis of the price, performance and suitability of each computer. At the end of the review there is a table with a whole host of categories that each machine is measured against. That way you can judge for yourselves what you think of each computer, bearing in mind the guidance we give you.



Because we are running this special feature you'll notice that we have dropped the regular Hardware Factfile, as it hardly seems worth duplicating information.

Two special programming technique articles included in this month's issue will help those with VIC -20 and Atari computers improve and develop their programming skills. The VIC article is aimed at games players and shows you how to get more out of your games by using controllers like joysticks and paddles in your programs. For Atari users there is an article on the machine's graphics facilities. Many people find it a problem to use both text and graphics on the same screen. Atari Graphical Text takes you through the process step by step.

In addition there are pages of programs for other computer owners to put their hands to. Our first Lynx program deals with graphics and shows you how to make more of the machine's facilities in this field. There's also a fun Yhatzi program which runs on the Oric-1, as well as an exciting action game on the Atari which follows the traumatic trips of the comic hero the Silver Surfer.

Adventure enthusiasts will be pleased to see a follow-up article to last months' feature about programming colour into adventure programs on the BBC micro computer. Our usual Software Review pages dwell on a few VIC-20 packs as well as software for other computers.



So turn over the page and make the most of your copy of Personal Computing Today.

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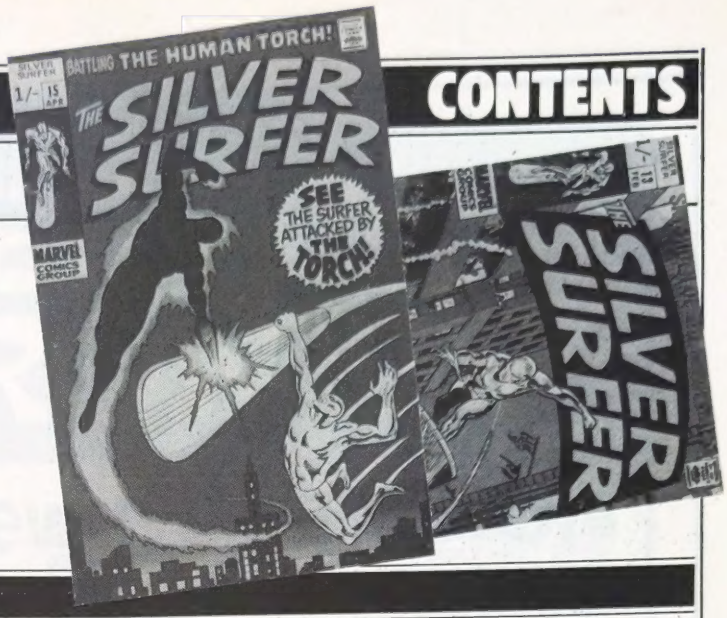


ORIC SOFTW

Yhatzi . . . . .
An old dice game is given a new lease of life on the Oric.

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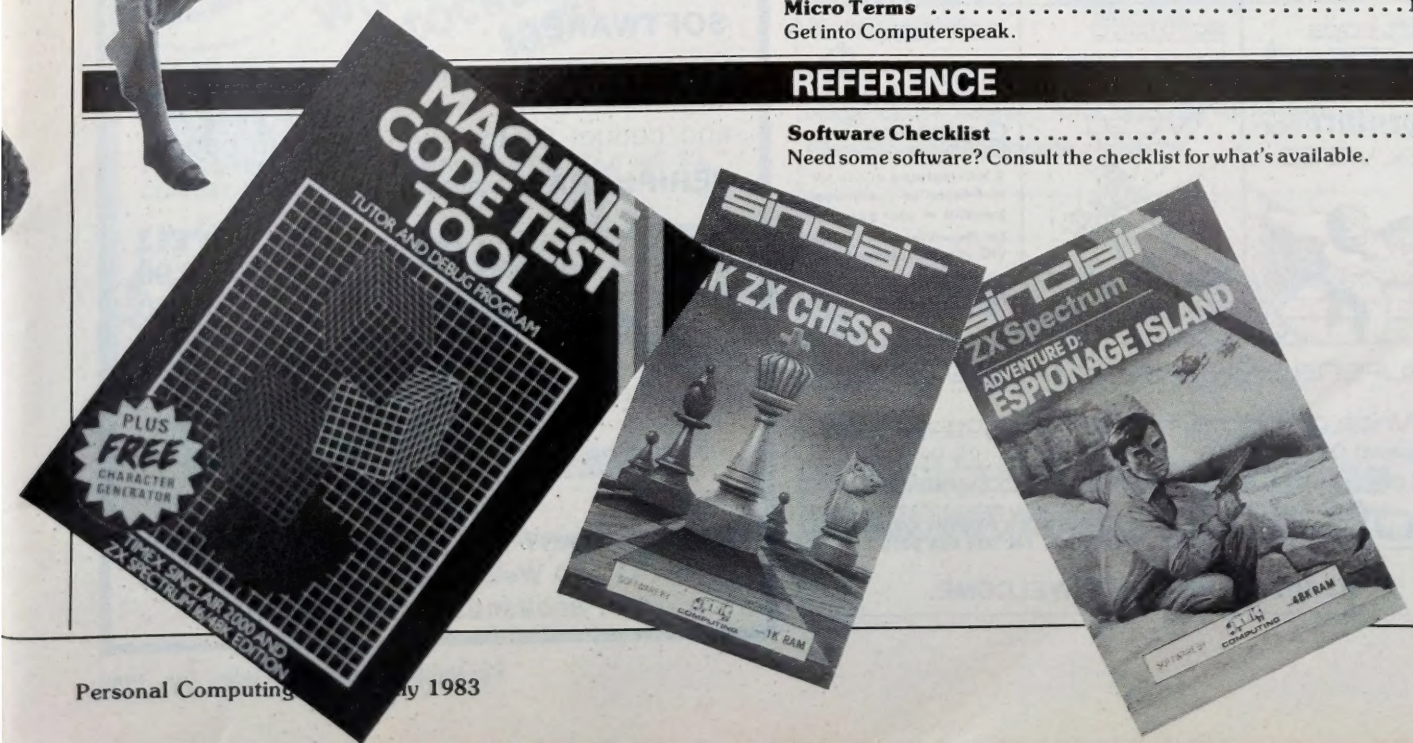
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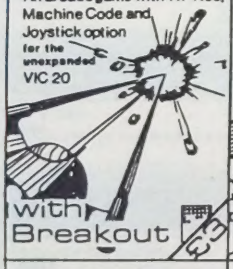
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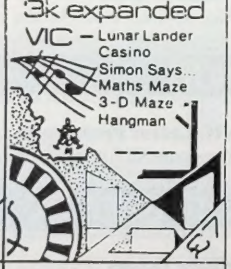
7 Games for VIC Including -

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KILLER PARK,
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6 Games for 3k expanded VIC – Lunar Lander
Casino
Simon Says...
Maths Maze
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Hangman



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The Lair adventure for 16k VIC20



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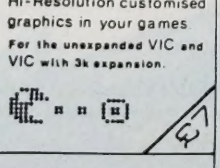


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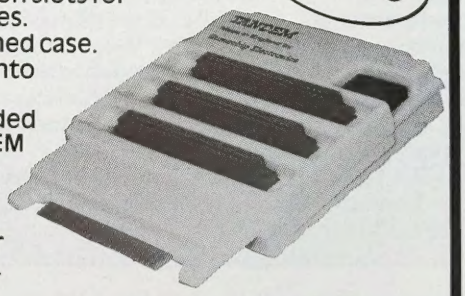


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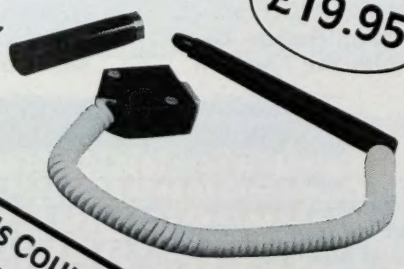


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NEWS NEWS NEWS

Stop Thief!

With a crime being committed every three minutes it's not surprising that computers too are being unplugged and whisked off into the night and a new home.

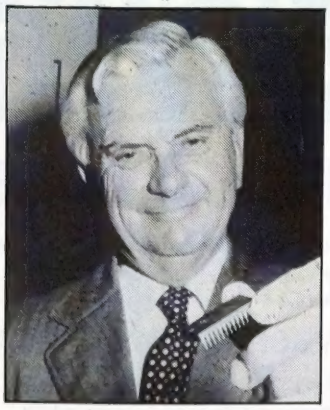
Now a couple of firms have brought out a special anti-theft device for computers and video recorders. The competent burglar can easily find, or saw, his way through locks on cupboards, doors, and the like to get at some worthwhile loot.

Rothtron Electronics of Northants has come up with a brainwave to solve the problem and found a deterrent in the form of a small box which should be attached to your computer. You must attach it to the computer at some point between the mains lead and the mains socket. If anyone tries to take the computer, either by unplugging it from the socket or by trying to remove the anti-theft device, an ear-shatteringly loud tone is emitted from it – and it keeps on going for about 20 minutes. Let's face it, not many people are going to cart off a computer which is wailing its head off.

If this sounds like the sort of thing you are after why not get in touch with Rothtron Electronics at 23 Havelock Street, Desborough, Northants or telephone them on Kettering (0536) 762050. The cost of the unit is £54.50 and it comes with a 12 month guarantee.

Security seems to be on a lot of people's minds including OFCO, an office equipment firm. They too have come up with a device to fit underneath computer typewriters, and video recorders. OFCO's offering consists of two lockable bars which fit underneath whatever you want to protect from burglars. The Securit device comes in three different sizes to cater for a variety of machines. An alternative version is also available, the Wire Securit. This consists of a plate which is attached to your computer and a plastic flexible wire rope which you attach to the desk leg by a special lock which comes with the Securit.

OFCO can be contacted at 64 Tredegar Square, Bow, London E3 5AE. The telephone number is 01-981 7301.



News On Kendall

A good old British voice will soon be booming out its dulcet tones through the speaker of BBC Micro computers up and down the country.

That household name, familiar face and voice of newscaster Kenneth Kendall has quite aptly been put forever on to microchip. Acorn Computer are bringing out the new chip for use with the BBC micro computer and reckon that it's the first time a true English voice has been used on a home computer. In the past all commercially available speech synthesised chips have featured the slow drawl of an American accent in its circuitry.

The hope is that this chip will be of particular use to disabled computer users, especially those who are blind and dyslexic. Acorn also believe this new speaking chip will immensely help school children using computers. Statistics show that 80% of micro computers used in schools are the Acorn made BBC computer.

- If you are thinking of buying a new cassette recorder for use with your computer Ferguson has just brought out a new model for which has special features making it computer compatible.

These include an automatic recording level control, a digital tape counter, a built-in condenser microphone, an auto-stop and pause control, and a retractable carrying handle (though just how useful that is with a computer is anybody's guess). The imaginatively named 3T27 model comes complete with mains lead and will replace the older Ferguson version, the model 3T07. It should be available from all Thorn EMI Ferguson retail outlets.

Electron Action

What you see here is the long awaited £150 Acorn Electron computer.

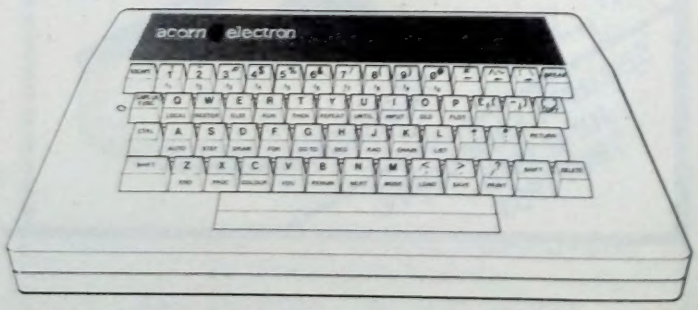
Acorn's aim in producing the Electron was to come up with a 'cut down' version of the BBC Micro computer with a range of add-ons for additional interfaces, the Tube for second processors and Prestel.

The Electron will come with 32K on-board memory which is the same as the BBC Computer and it is built around the same 6502 processor. To look at it resembles the BBC Micro, being roughly the same size and colour. Actual differences are a slower processing speed and only one sound channel. It also lacks the BBC Micro's Mode 7 graphics screen display.

Single key entry for BBC BASIC commands, like CHAIN, MODE, RENUM, COLOUR and LIST, is available using 29 keys with the caps lock key doubling up as a function key. This key also controls 10 keys on the top row of the keyboard which act as programmable function keys.

Acorn hopes to have the Singapore assembled machine in full production by July and there is a chance it could be launched at the Acorn User Exhibition which starts on August 25.

With the Electron comes a power supply and there are ports for connecting the machine up to a colour tv, composite video and PAL or RGB monitors. The cassette input rate is 1200 baud. It is due to be on sale from August.



NEWS NEWS NEWS

Competition Update

We are pleased to announce the winners of the competition held in the February issue of Micro Update.

Winner of the first prize, six boxes of 10 Inmac floppy discs, is Robert Watt of Gourock in Renfrewshire. Congragulations also go to the second prize winner, Mrs Stubberfield of Croydon, who wins two boxes of 10 floppy discs, and Mr Hallsworth of Faringdon who wins the third prize of a £30 storage box to keep your library of floppies safe and secure. Your prizes will be despatched to you immediately.

And if you didn't manage to get in the first three, you won't have completely lost out. All the entrants to the competition will receive a five per cent discount coupon, plus a catalogue from Inmac. All you have to do to qualify for your discount is to purchase at least one box of Inmac Plus floppies.

Our thanks to all of you who entered the competition and to Inmac for providing such splendid prizes. And we are sure the winners will make the most of their prizes.



Write On!

Have you ever wanted to write your own applications software, but balked at the idea of becoming proficient at BASIC or FORTH? Well, Dynatech Microsoftware may have come to your rescue with a program generator called Code-writer designed to run on the Commodore 64.

Complete with comprehensive manual, Codewriter comes on two discs. The first disc is double sided and holds the Data Entry, printed or screen report, and the menu option generators. These three utilities allow the user to write interacting sets of BASIC programs using design instructions in ordinary English – which should bring down your programming time from hours to minutes!

The second disc contains useable, sample programs already prepared by the Codewriter system and are designed to supplement the manual. More information on Codewriter can be obtained from Dynatech Microsoftware Ltd, Summerfield House, Summerfield Road, Vale, Islands or by telephoning 0481 45934.

And while we're on the subject of the Commodore 64, you may be interested to hear about two new products from Commodore Business Machines (UK) Ltd. The first is a new C2N cassette unit, a device for storing and/or recalling programs on ordinary cassette tape, compatible with all Commodore computers. The price of this unit is £45.95. The second product is a package entitled 'An Introduction to BASIC: Part 1' and is designed specifically to help users learn more about every aspect of programming on the Commodore 64. Comprising a self-study text, two cassette tapes with a collection of 64 programs, and a flow-chart stencil, it is priced at £14.95.

For more information on these products and others from the Commodore range, get in touch with Commodore Business Machines (UK) Ltd.

ZX Price Slash

ZX Spectrum and ZX81 are down in price if you buy from W H Smith.

The high street retailer and computer stockist has cut its prices to £99.95 for the Spectrum knocking £25 off the price and £129.95 for a 48K model, which gives a saving of £45. Smiths new price for the ZX81 is £39.95.

Smiths computer department is also being increased during the course of the year, the first of their 'shop within a shop' will open in the next few months.

The new price cuts have been brought into effect because of the volume production involved, and despite rumours to the contrary Sinclair so far has no plans to stop production of the ZX81. 30,000 of them are still being sold a month.

Coinciding with the price slashing announcement Sinclair Research is bringing out additions to its range of software which will be on sale in May. New programs in the range include a version of the language FORTH which has been written by Liverpool based software house Artic. This will cost £14.95. A small business accounts package selling for £12.95 is another new one, written by Wilsden software, and a game called Horace and the Spiders by Psion and Melbourne House costs £5.95.

Anyone keen to lay their hands on a ZX Microdrive will be interested to know that according to the firm the long awaited device will be on sale in limited numbers in the very, very near future. Let's hope that they mean in the next couple of months because it is just over a year since the thing was announced.

THE DRAGON DUNGEON

DRAGONWARE

Whenever the Dungeon Master reads of competitors' amazement that the Dragon 32 is selling so well "despite the lack of software", he rolls around the Dungeon floor, overcome by hysterical laughter! Send for our 30-page Dragonsoft Catalogue and find out why. 50p refundable first order.

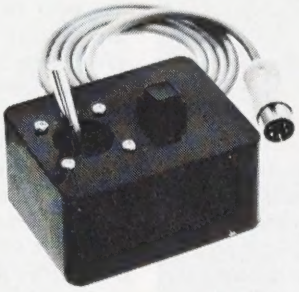
The Dungeon vaults are fairly bulging with the rush of Dragon software and we now offer the widest selection available in the UK.

Latest Games in Stock: Bonka £6.95, Vultures £6.95, Star Jammer £7.95, Night Flight (flight simulation) £7.95, Drone (Tron-type game) £8.75, Ring of Darkness £10.00, Into the Labyrinth £7.95, Pirate £8.50.

Latest Utilities in Stock: Editor/Monitor/Assembler Cartridge £30.45, Hi-Res Screen Cartridge (51 x 24 screen, up to 200 sprites) £25.30, Telewriter Word-Processing System + Tutorials £49.95, Salamander Graphics System £9.95.

COMING SHORTLY — Soundbox for monitor users (connect up to your Hi-Fi!).

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DRAGON CLUB

The Dragon Owners Club at the Dungeon is now the largest in the UK (or, since our members range through Europe to the Gulf and Africa, should we say the world?). Members receive copies of the monthly Club Magazine 'Dragon's Teeth', which includes news, reviews and advice, plus monthly offers and competitions. Win a *Year's Free Software* or use the Advice Service or members' free advertising. Badges and Bomber Jackets for extrovert Dragon-bashers.

the June edition of 'Dragon's Teeth' is packed with information and makes essential reading for any serious Dragon owner!

Annual Membership (including 'Dragon's Teeth') £6 (£8 overseas) or six-month trial subscription £3.25 (£4.25 overseas).

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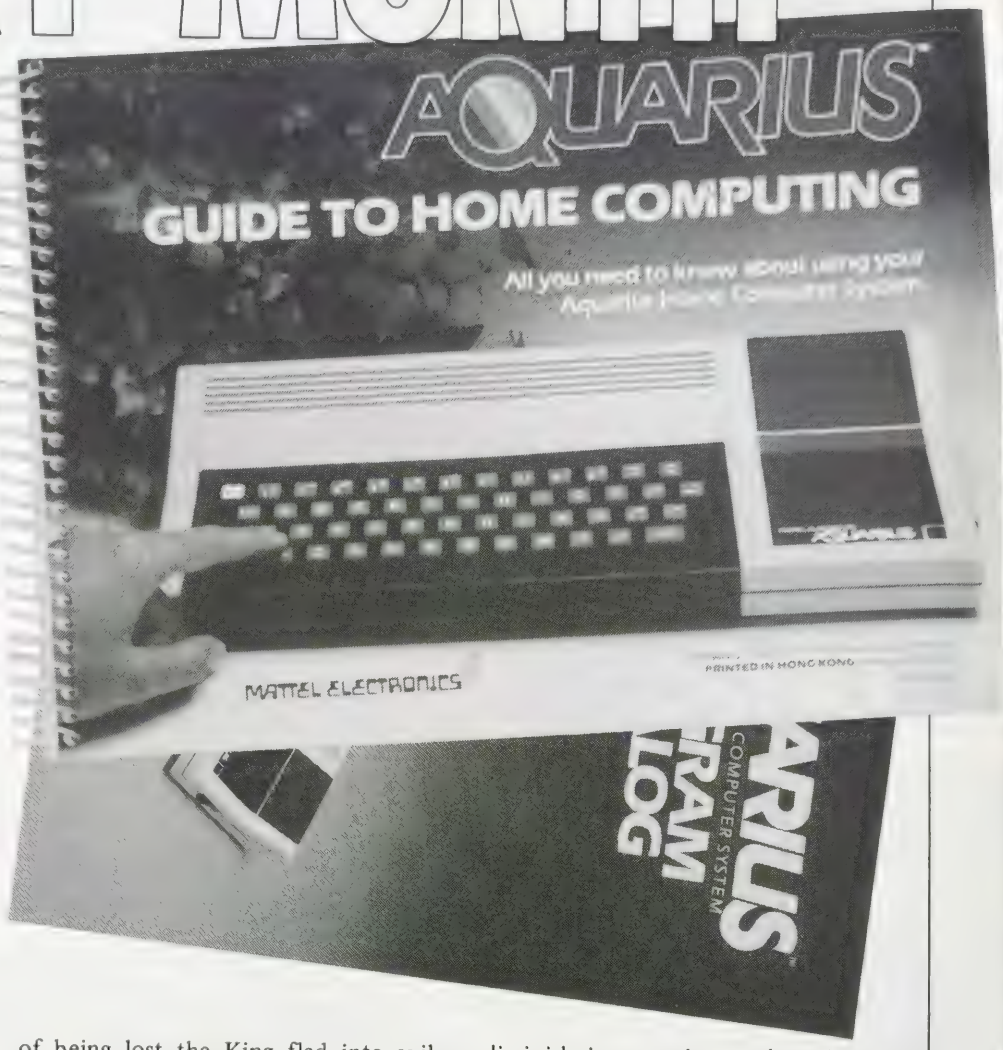
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NEXT MONTH



THE AQUARIUS

A new computer star in the form of Mattel's £100 Aquarius is on the horizon. On show to the public for the first time earlier this year at the British Toy and Hobby Fair the Aquarius looked as if it might be a very successful machine.

Following in the footsteps of Mettoy who diversified into computer manufacturing the Aquarius is the new baby, but certainly no toy, of one of the worlds largest toy manufacturers, Mattel. The firm has come up with an attractive looking product which is aimed at the young home first time buyer. With the initial launch of the computer Mattel has brought out a range of peripherals including a neat printer and 4K and 16K RAM packs all of which hook up snugly with the main computer console. The Aquarius' keyboard feels very similar to the Spectrum's which means they are cold and plasticky to touch, and are not the best for touch typing.

In our August issue we'll have a complete run down on the Aquarius computer giving you the facts and figures to do with this machine.

PROGRAMS TO PLAY WITH

If the weather keeps you indoors we've got a program in our August issue which will make sure you don't spend a single bored moment. Called the Citadel, it's a text only adventure game which runs on the VIC 20 with 3K expansion. The theme revolves around a small kingdom which has been beseiged by a band of brigands. When the Kingdom was on the brink of being lost the King fled into exile and has called upon his brother, who rules a neighbouring country, to restore the oppressed kingdom to its rightful ruler.

This is where the real adventure starts. To get inside the Citadel he has to find three keys in order to unlock a secret door. At the outset of the game you are given a selection of things to help you on your quest. These are the standard sort of things, like warriors, food and gold. According to what course of action you take throughout the game, these will diminish in quantity, and could cause your downfall.

Your quest is finally over when you have gained entrance to the Citadel and defeated the remaining brigands and restored the kingdom to its exiled King. Definitely a program not to be missed. And even if you don't own a VIC you can use the guidelines in Hints on Conversion to put the program onto your computer.

Other programs in our August issue are dedicated to run on the Oric, Commodore 64, BBC, Atari and TI99/4a.

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YOUR LETTERS

This page is where you get the chance to put your opinions in print. Personal Computing Today welcomes letters from you on any aspect of microcomputing and views in general – as long as they're printable!

Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.



Dear PCT,
I am an owner of a ZX Spectrum computer and find that the sound, or the lack of it, irritates me more than anything else. But now I have discovered a way of amplifying the sound through the cassette recorder. The sound coming from the computer is present but additional sound comes from the cassette recorder.

To amplify the sound through a cassette recorder the Spectrum's ear plug should be plugged into its socket on the machine. The other ear plug should be plugged into the MIC socket of the cassette recorder. The cassette recorder is then set to play and then PAUSED via a pause button on the cassette recorder. The sound output from the cassette recorder can now be controlled using the tone and volume controls.

This ability to increase the Spectrum's sound facility improves all games where sound plays a prominent part, and at times can even increase scores.

I enjoy your magazine, particularly the software reviews and the software listings, but I was disappointed that the Invisible Maze program did not work once I had typed it in. I noticed the obvious errors, for instance line 401, and 433 where a '+' sign has appeared but having corrected it, it still refuses to run. I hope that in the June issue you will attempt to rectify these errors. Besides that carry on the good work.
Yours faithfully
Sarbjit Singh Gidda

Editor's reply: There wasn't a correction in the June issue but turn to this month's Micro Answers and you'll find it there.

Dear Editor
I recently bought an Oric 1 micro computer, but found that in high resolution mode the display had a tendency to jump every time an explosion or shoot command was used, which would win any fast and furious game that was being run on the machine.

So I took the Oric back to Lasky's and they promptly gave me a replacement machine, but when I got it home I discovered it too suffered from the same defect. So back I went again and believing that this fault was inherent in the machine I exchanged it for a Sinclair ZX Spectrum and luckily haven't had any trouble with it.
Yours truly
T Tirabi
North London

Dear Sir
I really must protest about your publication of a 'piano player' program for the Sharp MZ-80B.

If you desire to play or compose music for the piano, would it not be much simpler and more convenient to use a piano? There is not one note on the Sharp which can compare for purity or clarity with a piano note. If you want to play tunes on an MZ80B, all well and good: but if you do so, you are playing a Sharp, not a piano. In any case, unless music is simply a succession of notes, played at a certain speed, I rather doubt if you will create anything worth listening to.

Yes, I have an MZ80B. It is a fantastically good machine at its price. No, I do not propose to use it as a piano (I have a piano to do that). The MZ80B is being

overworked at present, keeping various catalogues for me, developing a simple payroll/accounting program for a small local business and being used by my children to help their exam revision.

What's your next program – using an IBM as a church organ?

Yours faithfully
R H Hill
Essex

Editor's reply: We do not claim that a Sharp MZ80B could possibly reproduce the quality of notes or tones that a piano can. That wasn't the purpose of the program. The real use of programs such as this or indeed a church organ program, is as a teaching tool for those who are not very experienced in programming techniques. As *Personal Computing Today* is primarily intended for beginners in computing it makes sense for us to publish such programs.

If you would like more business oriented programs in *Personal Computing Today* may I suggest you send me your payroll/accounts program to learn about the more intricate details of programming?

Dear PCT

Being the owner of a T199/4A home computer I was very happy to find a program for it in the January 1983 edition. However, when I typed it all in, I found that the program did not work as it was supposed to. First of all, the score after hitting the first invader immediately turned to 1000 and stopped there, and also at the end the computer refused to return to the beginning of the program.

After checking for any typing mistakes and not finding any, I started gradually to work through the program and found that to make the program work I had to change lines 780 and 1000 to read:

780 CALL HCHAR (1,26,C + 1) instead of CALL HCHAR (1,25,C + 1)

and

1000 GOTO 10 instead of GOTO 1000.

After the initial frustration and annoyance at the program not working, I realized that in the end it was actually useful, because instead of just typing the lines in I learnt what and how the various parts of the program do and work.

Yours sincerely
Dina Puvacic
Morecambe

Editor's reply: Congratulations on working the bugs out yourself. It's not the ideal way to do it, and indeed we don't go out of our way to let errors get into programs. But you are right in saying it helps you learn about programming.



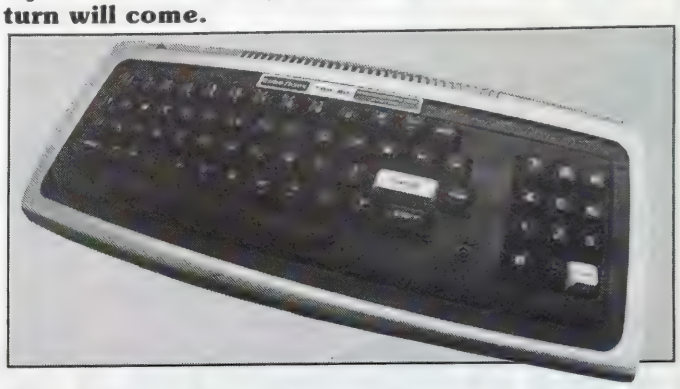
Dear Sir

I have been reading your excellent magazine for three years now and I am pleased with it. However, for the past six months there have hardly been any programs for theTRS-80 Model 1 or III, Level 2 BASIC, 16K. I am sure many people also agree with me, especially those who have just invaded the intrepid regions of computing.

Keep it up, your magazine is great.

Yours faithfully
Toby Green

Editor's reply: I'm afraid that it is virtually impossible to keep everyone happy with the programs we publish, but I can only assure you that I try to cover as many machines as possible. Your turn will come.



Dear PCT

Listed below are some observations on advertisements and computing. They may be a source of enlightenment for people about to buy:

Fantastic Graphics	Low Res
Sound	Beep
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Tests Your Reflexes	Need Extra Fingers
Loads with	Loads Occasionally
The Ultimate Adventure	The Last One He Wrote

Just kidding! – really.

Yours faithfully
Mike Goldberg
Liverpool

Editor's reply: It's refreshing to hear from someone with a sense of humour, although you do have a point in that some adverts can be misleading. Maybe some software suppliers will read your letter, take note and improve the standard of commercial products.

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"INVADERS" £6.50 + VAT	A fast moving space game, compiled in Machine Code It utilises Mode 2 colour graphics and sound

All programs require 32K and run on all operating systems. Disk versions now available. Ask for details. Prices include postage within U.K. Send S.A.E. for full range of programs and price list or ask your local dealer. Trade enquiries welcome.

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MICRO SHOWS

EXHIBITION SPECIAL

We take a break from dealers reporting instead on recent computer shows.

This month Look Before You Leap lets the dealers take a partial rest and instead examines the goings on at some recent shows.

The Hannover Messe is possibly the biggest exhibition ever held in Europe. The computer section alone could probably swallow the NEC, Earls Court and Olympia and probably have room for more. Indeed, to attempt to cover even a fraction of the stands is an ambitious project for the single day that was available.

Germany's Front Line

Heading straight for the market opened up by the Spectrum and the Oric comes the Panasonic Alpha. This new computer features rubber keys and a single-key entry system. It comes supplied with a built in graphics set and 32K of RAM. Coming further down-market is Panasonic's JR100. This will be cheaper than the Alpha, featuring simplified operation and fewer keys. Not to be caught out, the JR100 is already complemented by an expansion unit.



Sharp are making efforts to move into the home market with their MZ-700 computer. Based around the ever popular Z80 processor, the MZ-700 contains 64K of RAM and has a full QWERTY typewriter-style keyboard. The screen display is 25 lines by 40 characters. Available as optional extras are a plug-in, four colour plotter and an on-board microcassette drive.

Casio Goes Personal

Casio, having worked their way up from calculators to hand-held computers are now ready to have a try at the personal computer field. The FX-702P is an extended version of their VX-801P programmable calculator. It will be supplied with 16K of RAM, full keyboard and an inbuilt liquid crystal display. Peripherals will include a numeric keyboard and a four colour plotter.

On show at the Commodore stand was the new DX-64. This is Commodore's first attack at the Osborne portable market. The DX-64 is a restyled Commodore 64 fitted into a portable carrying case. Contained in the case is a half height 5¼ inch disc drive, a five inch black and white monitor and a detachable keyboard built into the lid. If everything goes according to plan the DX-64 will be previewed in Britain at the Commodore Computer Show in June. Retail price is expected to be around £800.

London Calling

On a slightly less majestic scale the Association of London Computer Clubs held the 4th London Computer Fair. Held in the Central Hall, Westminster, even though the show was bigger than previous years it still managed to retain the hobbiest feel. The show marked the release of some interesting software titles.

Software company ASN released four titles for the under-supported Commodore 64. Brain Strain, Squares and Light Bike are all games costing £5.95. Necked is an educational game and takes the form of a multi-lingual hangman game featuring words in French, German, Italian and Spanish. Necked costs £6.95. ASN can be contacted at 17 Adelphi Crescent, Hayes Park, Hayes, Middx UB4 8LY.

E.T.'s New Home

Spectrum software company Abex released a potentially controversial new title for the Spectrum. Called ETX, it bears more than a passing resemblance to



Atari's own E.T. VCS cartridge. ETX costs £5.95 and further details are available from: Abbex, 20 Ashley Court, Great Northway, Hendon NW4.

Fuller Micro Systems released some new Spectrum add-ons. First was the Printerface. This is a £30.00, RS232 interface. Using this a large range of cheap printers and communications equipment can be easily interfaced to the Spectrum. Their second new product, the Orator, will cater for the growing interest in speech synthesis among computer users. For £39.95 you can add this unit to your Spectrum and explore the intricacies of speech.

Micronet 800 were exhibiting at the show and were generating a lot of interest from computer users, especially those who own BBC Micros as they are the only people who could use the system. Already Micronet offer over 100 programs for the BBC Micro through the Telesoftware side of the system and a lot of these are free.

Finally, for BBC users who want to use their machines for serious work. Braintech released a new EPROM based wordprocessor. Designed to run 1.0 and 1.2 operating system Beebpen features a display of 80 characters by 18 lines. The price will be £44.85 and Braintech can be contracted at 81 Rydal Crescent, Perivale, Middlesex UB6 8DZ.

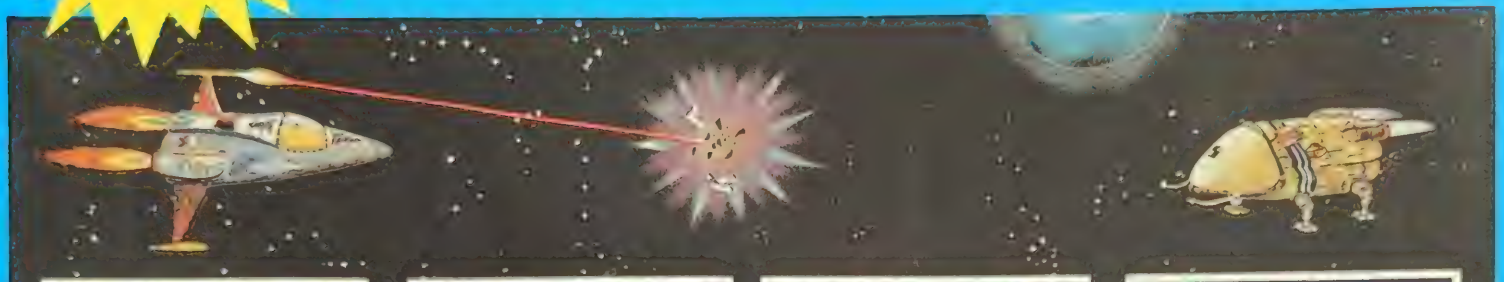
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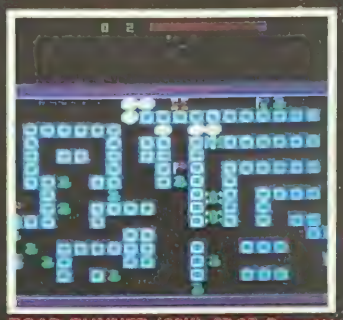
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FROGGER (32K) £7.95 Cassette

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ROAD RUNNER (32K) £7.95 Cassette

The only full feature machine-code version of the arcade game available for the B.B.C. micro. Features include: scrolling screen, radar display, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.

Suitable for use with keyboard or joysticks.

●●● *NEW RELEASE* ●●●



ALIEN DROPOUT (32K) £7.95 Cassette

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"Do not be fooled by their placid appearance – these moths are out to get more than the clothes in your wardrobe." . . . *YOUR COMPUTER*



SPACE FIGHTER (32K) £7.95 Cassette

Arcade-style game based upon features from DEFENDER and SCRAMBLE. 5 types of menacing alien fire at you and may attempt to ram you. Separate attack phases, fuel dumps, repeating laser cannon, asteroids, smart bombs, hi-score, rankings, 6 skill levels, sound effects.

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GALAXIANS (32K) £7.95 Cassette

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"Both . . . are well-produced, with colourful graphics, responsive controls and the usual bunch of extra-terrestrials." . . . *YOUR COMPUTER*



INVADERS (32K) £7.95 Cassette

Superb version of the old classic arcade game, including a few extras. 48 marching invaders drop bombs that erode your defences, and two types of spaceship fly over releasing large bombs that penetrate through your defences. Increasing difficulty, high score, superb graphics and sound.



FRUIT MACHINE (32K) £7.95 Cassette

Probably the best fruit machine implementation on the market. This program has it all . . . HOLD, NUDGE, GAMBLE, spinning reels, realistic fruits and sound effects, multiple winning lines. This is THE fruit machine program to buy.

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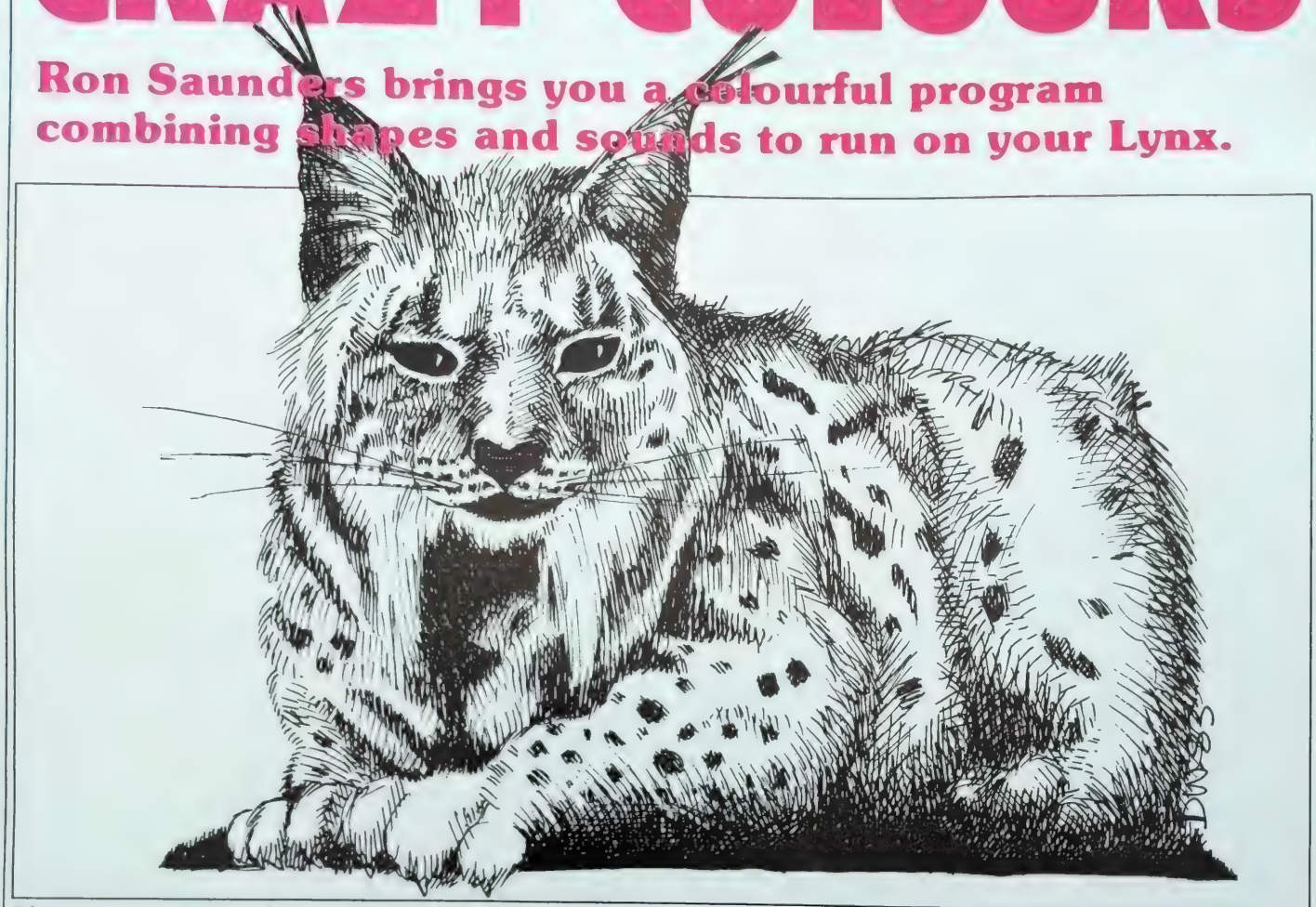
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CRAZY COLOURS

Ron Saunders brings you a colourful program combining shapes and sounds to run on your Lynx.



This program is intended to give an introduction to the graphic, colour and sound commands of the 48K Lynx. It lists several subroutines producing different effects, shapes and sounds. The subroutines can be altered by changing the variables so that they can be incorporated into other programs to add a bit of sparkle and enhance the graphic presentation, which is often the difference between a good and a bad program.

After you've seen how the program runs, try changing some of the variables to produce further effects.

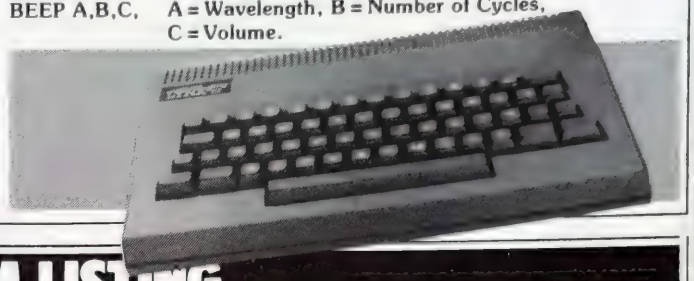
HOW IT RUNS

110	This command ensures that the random numbers are different every time the program is run.
120	Allows the banks of memory for the three primary colours to function.
140-180	This loop chooses a random colour, except black, and prints a dot at a random point. It simultaneously beeps.
190-240	A subroutine which draws a randomly coloured line from a random dot to another random dot.
250	This subroutine draws a red curtain across the screen.
270	Stops the memory devoted to blue and green functioning. It also protects those colours already on the screen giving a net curtain effect and speeding up the drawing.
340-400	Draws a black rectangle in the middle of the screen.
410-490	Draws a triangle three times, each time a different colour. Incorporating K into the BEEP command enables a different tone to be played with each coloured triangle.
500-570	This subroutine draws a blue circle of radius 30.
530	The value of the step has been set so that it takes exactly one minute to draw the circle, enabling this subroutine to be used as a visual timer.
550	The value of the radius is greater in the Y co-ordinate as a correction factor in order to draw a perfect circle instead of an ellipse.
580-730	This subroutine draws a hexagon by drawing six triangles.
620	Commands the data marker to return to the first datum, enabling the data to be used for each turn of the lopp.
740-820	This subroutine fills the screen, first with coloured and then with black rectangles as i plays random notes.

HINTS ON CONVERSION

This program is designed specifically to demonstrate some of the graphic commands of the Lynx and thus is not suitable for conversion. However, if you wish to adapt some of the subroutines for your machine, here are a few points to bear in mind:

VDU 1,X	Selects ink colour X.
VDU 2,Y	Selects paper colour Y.
VDU 24	Doubles the height of the characters.
VDU 25	Returns characters to the normal height.
VDU 4	Clears screen to current paper colour.
CHR$(22)	Backspaces cursor.
CHR$(10)	Moves cursor down one line.
BEEP A,B,C,	A = Wavelength, B = Number of Cycles, C = Volume.



PROGRAM LISTING

```
100  REM RANDOM DOTS
110  RANDOM
120  PROTECT 0
130  VDU 1,7,2,0,4
140  FOR J=0 TO 150
150    VDU 1,RAND(7)+1
160    DOT RAND(246)+5,RAND(238)+5
170    BEEP 40,70,30
180  NEXT J
190  REM RANDOM LINES
200  FOR J=0 TO 100
210    VDU 1,RAND(7)+1
220    DRAW RAND(245)+6,RAND(238)+5
230    BEEP 30,30,30
240  NEXT J
250  REM RED CURTAIN
260  VDU 1,2
270  PROTECT 5
280  FOR J=6 TO 250
290    MOVE J,5
300    DRAW J,242
310    BEEP 20,20,40
320  NEXT J
330  VDU 1,0
340  REM BLACK WINDOW
350  PROTECT 0
360  FOR J=78 TO 167
370    MOVE 76,J
380    DRAW 175,J
390    BEEP 60,10,30
400  NEXT J
410  REM TRIANGLE
420  FOR K=6 TO 0 STEP -3
430    VDU 1,K,2,0
440    FOR J=-39 TO 40
450      MOVE 126,88
460      DRAW 126+J,157
470      BEEP 30+K*3,25,25
480    NEXT J
490  NEXT K
500  REM CIRCLE
510  PROTECT 6
520  VDU 1,1
530  FOR J=0 TO 2*PI STEP PI/180
540    MOVE 125,123
550    DRAW 125+30*COS(J),123+38*SIN(J)
560    BEEP 200,25,30
570  NEXT J
580  REM HEXAGON
590  PROTECT 0
600  FOR L=6 TO 0 STEP -3
610    VDU 1,L
620    RESTORE
630    FOR K=0 TO 5
640      READ A,B,C,D
650      FOR J=0 TO 35
660        MOVE A,B
670        DRAW C+J,D
680        BEEP 100+L*50,10,30
690      NEXT J
700    NEXT K
710  NEXT L
720  DATA 108,82,91,122,126,122,108,82,144,82,126,122
730  DATA 108,162,91,122,126,122,108,162,144,162,126,122
740  REM MUSIC
750  FOR J=0 TO 250
760    VDU 24,2,RAND(7)+1
770    IF J>40 THEN  VDU 1,7,2,0
780    PRINT  @ RAND(126),RAND(250);"    ";CHR$(22);CHR$(22);
       CHR$(22);CHR$(22);CHR$(10);"    ";
790    BEEP RAND(30)*10+30,RAND(30)*10,60
800  NEXT J
810  BEEP 500,500,60
820  VDU 25,4
830  GOTO 100
840  END
```

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HI-RES upgrade to a 51 by 24 display — cartridge £25.30

Just plug this cartridge into your DRAGON, switch on and you have a 51 column by 24 line display with true lowercase characters. This amazing software uses the high resolution mode to draw the characters on the screen and allows you to use BASIC almost as normal. In fact there are a number of extensions to BASIC to allow you to use the many additional features: • mix graphics and text on the same screen • select any of nine standard ASCII character sets for FRENCH, SPANISH, GERMAN, ITALIAN, BRITISH, USA, SWEDISH, DANISH or JAPANESE • redefine any of the 244 characters • SPRITE GRAPHICS MODE enables any character to be an 8 by 8 dot Sprite • a more responsive keyboard with AUTO-REPEAT • extra shift gives the missing characters to the DRAGON keyboard • leaves about 19,500 bytes for BASIC • switch between HI-RES and normal modes at any time • BLACK on GREEN, BLACK on WHITE, GREEN on BLACK or WHITE on BLACK • 32 by 16 compatibility mode for existing programs • Hi-res is a must for serious programming

DASM an easy to use 6809 machine code assemblercartridge £18.95

• Specially designed for convenient use on the DRAGON • Does not use a separate editor • Ideal for producing machine code routines to be called from BASIC • Includes a 6809 Reference Card

Type your assembler program just as you would a BASIC program and use BASIC to call DASM. When DASM has assembled your program it returns to BASIC where you can check for errors and execute the program immediately if required. The source program is saved and loaded using the normal CSAVE/CLOAD. The assembled program may be saved to tape using CSAVEM (this can easily be done automatically in BASIC when the assembly has finished)

DASM is a two pass symbol assembler which allows labels of any length (the first five characters and the last character are used). All the 6809 mnemonics and addressing modes are supported plus comprehensive assembler directives for defining constants, reserving memory, directing output to screen or printer. Errors detected by DASM are reported with easy to understand text messages

DEMON Machine Code MONITOR — cartridge £18.95

DEMON gives you access to the inside of your computer. It features a real time display of memory location in both hexadecimal and alphanumeric codes, a full screen editor for memory and register contents and multiple breakpoints. There are twelve commands designed to assist in debugging and running machine code programs (or BASIC programs with PEEK and POKE)

DEMON, unlike inferior products, has its own documented input and output routines which means that it does not interfere with BASIC. DEMON can be called from a BASIC program and will return control to the BASIC program. A user manual and a 6809 Reference Card are included.

DASM/DEMON — cartridge £30.45

Combines DEMON and DASM in one cartridge. The ideal combination for developing machine code programs on the DRAGON.

DECODE BASIC Converter — cartridge £18.95

DECODE converts BASIC programs between TANDY COLOR format and DRAGON 32 format. Simply CLOAD the "foreign" program from tape, EXEX the cartridge and the program is converted. The same cartridge will work on a DRAGON 32 and a TANDY COLOR (Extended BASIC).

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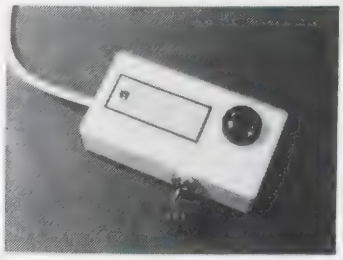
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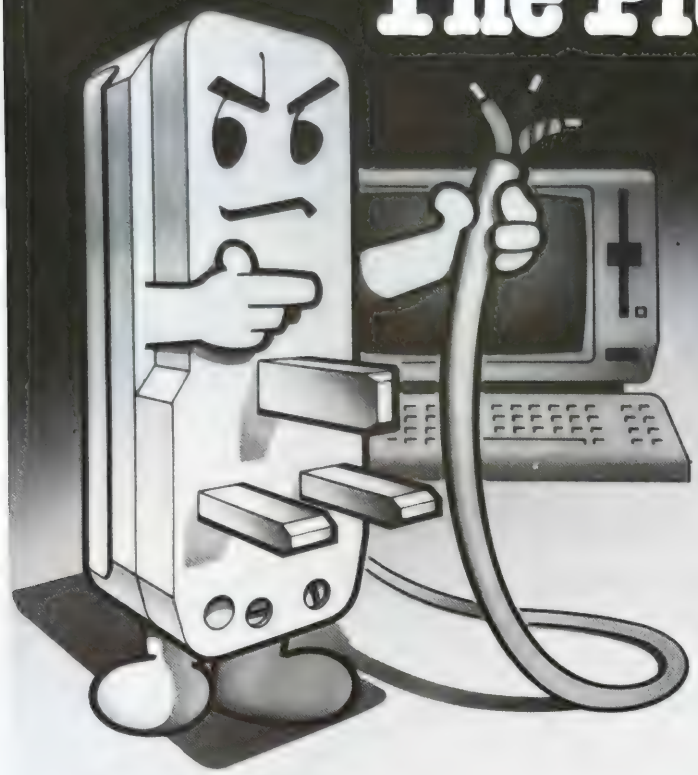
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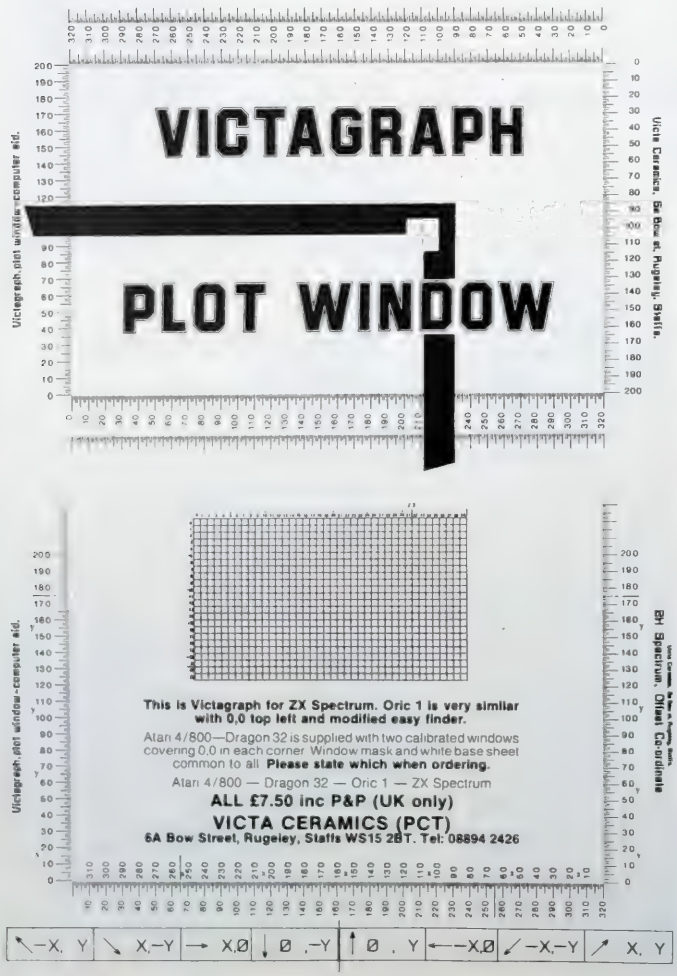


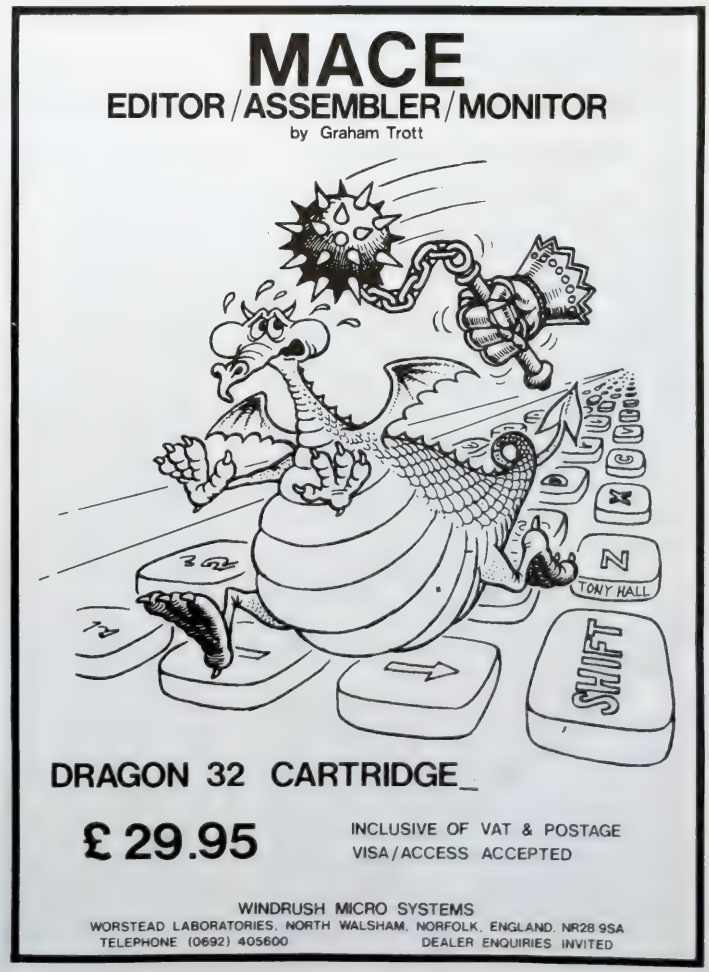
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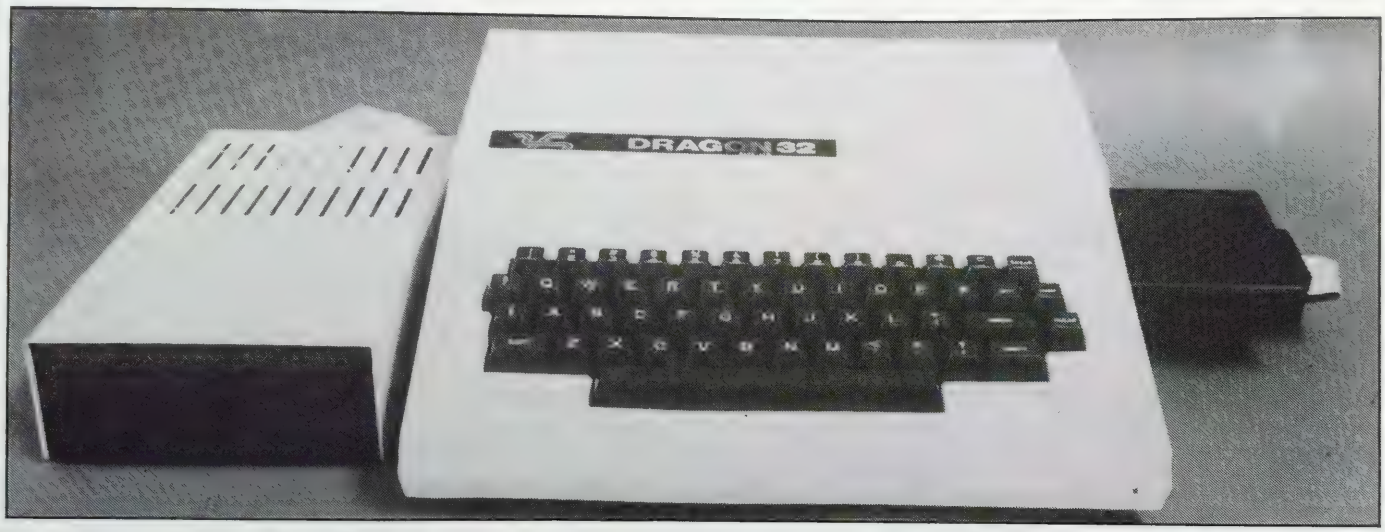
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ADD ONS

Fuel your Dragon 32 with a range of add-ons reviewed here



Delta Disc Systems

As everyone knows, disc drives give your computer fast access to large quantities of information. Premier Publications are providing a range of comparitively cheap disc systems to work with the Dragon 32. The standard DELTA 1 system should be available for around £300 and is made up of the following components: DELTA controller, single-sided CANON 40 track disc drive, connecting cables and manual. This system will give you 100K of storage per disc.

The DELTA controlled plugs into the cartridge slot on the side of the Dragon. It contains all the interfaces necessary and the DOS (Disk Operating System).

The DOS which was written by Premier for the Dragon contains a large range of file handling commands. In addition to the normal LOAD, SAVE and RUN commands it also provides CHAIN. This will let you load programs from within other programs and maintain all the variables. CONFIG allows the user to configure the DOS to run with almost every available disc drive.

The DOS will also support both sequential and random access files. To compliment these a FIND command has been included. This will let you search through either type of file and match a string. The FIND command will allow 'wild card' characters to be used, making it easy to retrieve records for which you only know some of the information. This makes the package ideal for anyone wanting to use their Dragon as a database system.

As if this isn't enough, the interface catridge also has provisions for ENCODER 9 to be fitted. This is a powerful, interactive assembler/disassembler which will work in conjunction with BASIC to the extent of allowing source code to be written into a BASIC program, which when run, will assemble an execute within the program.

The controller and disc worked well when tested. The software was easy to use and effective.

DELTA is available in different configurations. These range from just the controller to a system which contains two double-sided 80 track drives which offer 800K storage and costs £679.95.

Further details of the system can be obtained from Premier Publications, 208 Croydon Road, Anerley, London SE20 7YX. Tel: 01-659 7131.

Sound Extension Module

One of the most criticised aspects of the Dragon is the poor quality of its sound. J.C.B. Systems have now produced an extension module based around a dedicated sound chip which will give the Dragon a wide scope in what sounds it can produce.

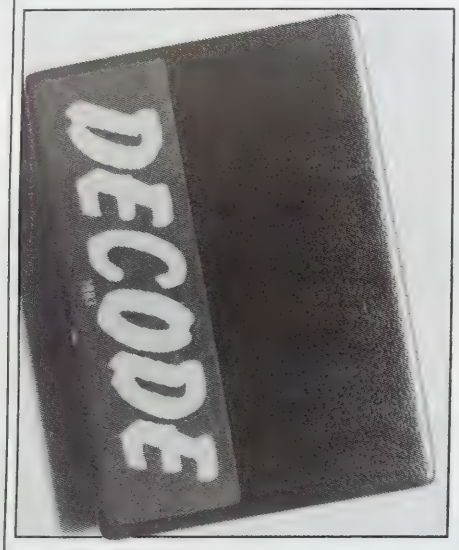
The S.E.M. is built into a case which fits into the expansion port. The unit provides a three channel with both noise and pre-defined, automatic, envelope generation facilities. When the cartridge is operational it adds a new command to BASIC. The command MUSIC enables you to control all the functions. Without this command it would need up to 28 separate POKEs to have the same effect.

The notation used for entering

notes follows the standard A to G form and uses # to indicate a sharp. Full control is given to the user octave, length of note and volume. The user can also select the type of sound e.g. piano, organ.

The Sound Extension Module works independantly of the rest of the computer. This means that a musical accompaniment can carry on without slowing the computer down. The S.E.M. also contains preprogrammed effects such as explosion, ping, falling bomb and photon torpedoe. These can be called by using the MUSIC command in conjunction with an identifying letter.

The Sound Extension Module costs £34.95 and is available from J.C.B (Microsystems), 29 Southborne Road, Bournemouth BH6 5AE. Tel: 0202 423973.



Decode

The last cartridge we are looking at from Compusense is DECODE. This package will come as a godsend to anyone who is having trouble getting software for their Dragon. This neat little cartridge will allow you to load a Tandy Colour Computer programs into your Dragon and have the cartridge convert them. Before you rush out and besiege your local Tandy store there is a drawback. DECODE will only translate BASIC programs, machine code is a bit to much for it.

The operation for translating a program is simple. First insert the cartridge and power up the computer, next load the piece of software you want to translate, type EXEC &HCOOO and wait. DECODE will now run through each line of the program, translating as it goes. When it has finished you can press the Return key and you will be back in BASIC. You can now edit, save or run the program in the normal fashion.

The DECODE cartridge will take care of any errors in the program and will inform you if it finds one. One possible source of error is that the Dragon as yet does not support Disc BASIC. If DECODE finds a reference to disc handling within a program it will treat it like an error.

The DECODE cartridge works well, but it is important that you make sure you know what the program to be translated contains. DECODE cost £15.00 and further details can be obtained from Compusense.

Dasm Assembler

For those who wish to progress into machine language programming, Compusense provide the DASM Assembler. Using this package you are able to write assembly language programs and edit them as if they were BASIC programs. This is particularly useful to people coming straight to machine language direct from BASIC.

The package supports all the 6809 assembler commands and also supports some extra commands to control DASM. The resemblance to BASIC programming makes the cartridge very easy for a beginner to use. It even allows the creation of multi-statement lines, separating the assembler instructions with a colon, just like you would BASIC commands.

Once a program has been typed in you can assemble it using the RUN command. The computer now takes over, running through the listing converting it into machine language and checking for any errors. If it finds an error it will produce an error message, you can then check the manual for a full explanation. You can also check the first DASM memory location to see whether an error has occured. This is very useful as it allows you to put BASIC lines into your assembler listing to check whether the program has assembled correctly. If you find an error you can edit the line on which it occured exactly as if you were editing a BASIC line.

The manual which is provided with DASM does not profess to be a guide to 6809 assembly language and it suggests that if you are not conversant with this language already, you should buy a book to work from. What the manual does is to provide a comprehensive guide to the operation of the DASM assembler and in this it succeeds. Also supplied with the cartridge is a Motorola chip reference card. This provides you with a list of the syntax, form and action of the 6809 command set, along with information about pin specification and look up tables.

The DASM is an obvious step for any Dragon 32 owner who wants to seriously involve himself with machine code programming. DASM costs £0.00 and further details can be obtained from Compusense.

Take A Mace To Your Dragon

Windrush Micro Systems are also producing an aid for Dragon programmers who want to work in machine code. Called MACE, this cartridge based utility contains a full assembler, editor and monitor.

Mace features a comprehensive editorwatch is closer in format to those found with larger two pass assemblers. Both the monitor and the assembler are accessed from the editor and since they are all contained on the same cartridge there is no tedious loading and reloading of different parts. The editor uses a system of single key commands and cursor key movements to alter the source text.

The MACE monitor contains the following commands: V — View memory, M — Examine and change memory, I — Insert (same as fill on other monitors), S — Shift memory, F — Find bytes, C — Calculate (hex/decimal calculator), B — Set breakpoint, R — Display register, J — Jump to address and G — Go.

The MACE assembler features very good error detection and handling. If it finds an error whilst passing through a listing it will indicate which error has occurred and its position on the line.

The manual which accompanies the unit goes into great detail about the use of the package and contains some examples of how the commands and the assembler work. It also contains a breakdown of the 6809 assembler command set.

This package has a very professional feel to it and I think it will appeal more to the programmer who is already used to using assemblers, rather than the first time user. MACE costs £15.00. For further details contact: Windrush Micro Systems, North Walsham, Norfolk, England NR28 9SA.

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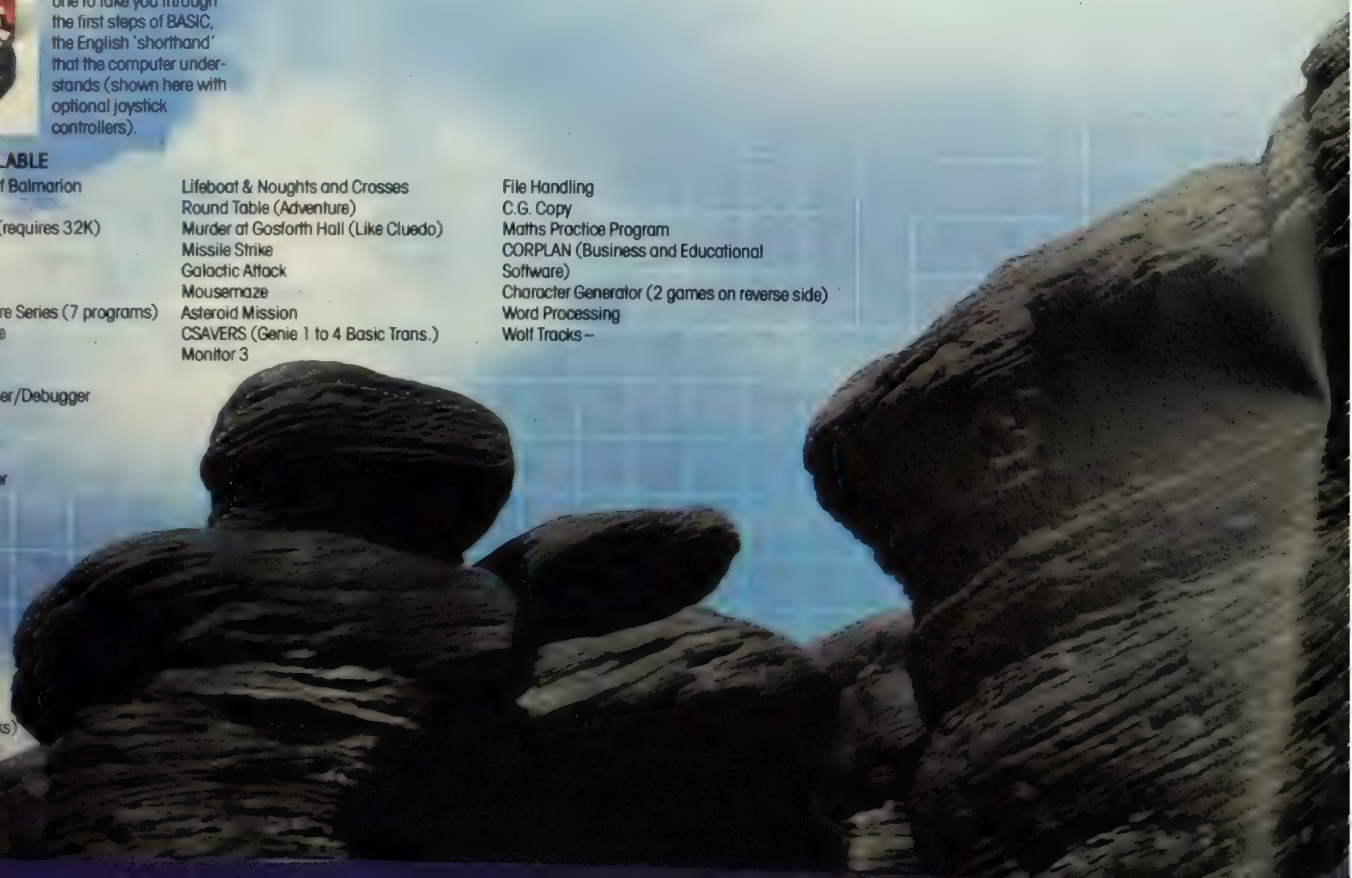
Colour Genie even comes with 2 manuals. A beginner's guide, and one to take you through the first steps of BASIC, the English 'shorthand' that the computer understands (shown here with optional joystick controllers).

SOFTWARE AVAILABLE

Find the Diamond of Balmarion
The Vegan Incident
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Toad Mania!
Space Fighters
Racing Driver
Mysterious Adventure Series (7 programs)
Invaders from Space
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The Deep
Double Agent
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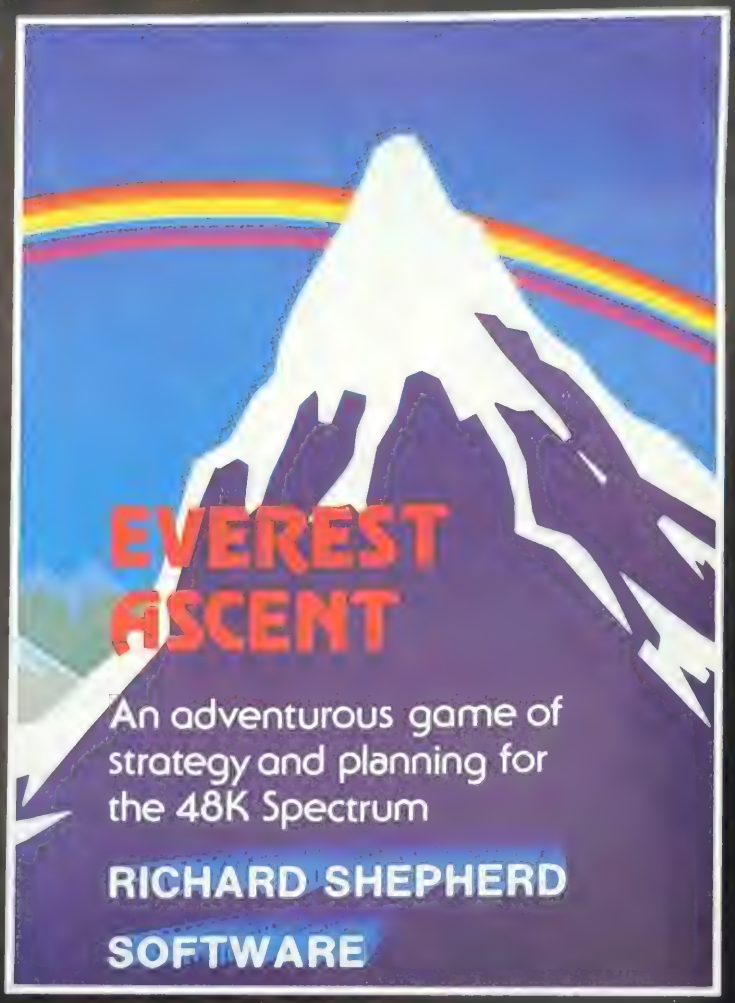
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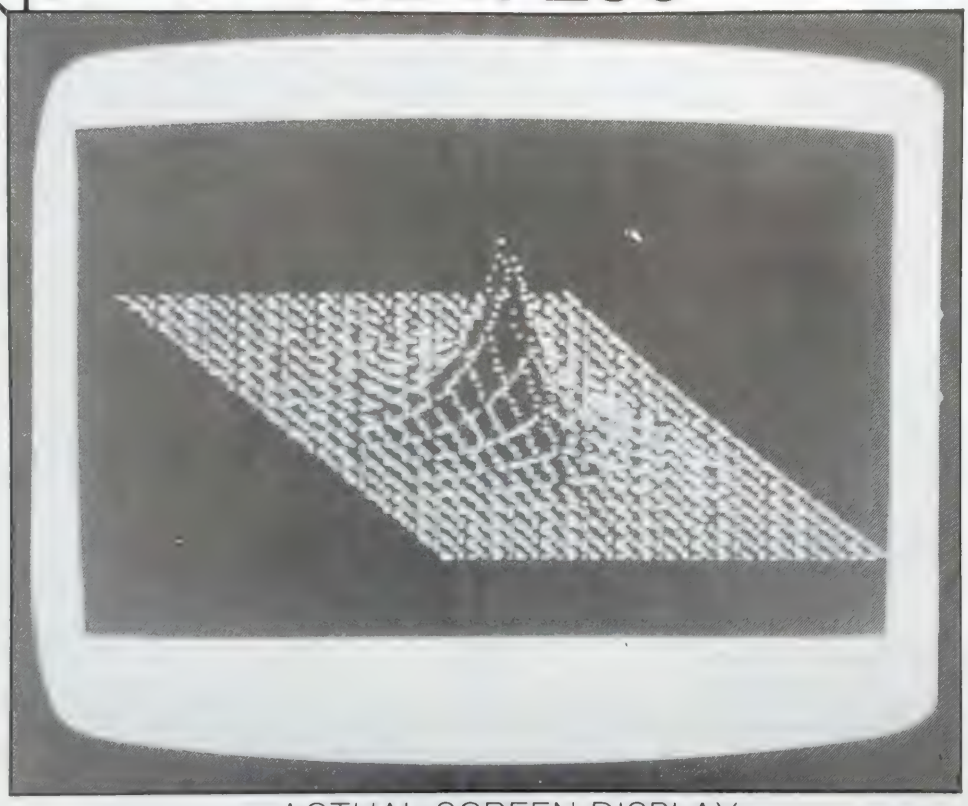
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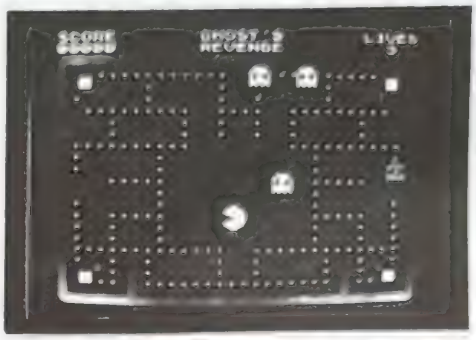
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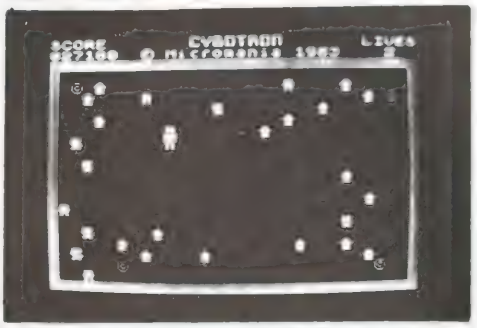


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SOFTWARE

SPECTRUM DATAFILE

Originally written to be used as an address file Michael Welham's data base program can be adapted to cover a multitude of sins.



The idea of the program is to allow names and addresses to be entered into the program, addresses found by entering only the name of the person concerned and the information and program then to be saved on tape for future use.

When the program is run an index is displayed which allows the user to decide which part of the program he wants to use. After using a part of the program you are returned to the index (except when the program is saved).

There are 4 main sections to the program. The first part is the address file which allows you to enter, change and delete addresses. You are asked to enter a number for the address (this gives each component of the address the same subscripted variable), and then you are asked to enter each component of the address (name, street, town, county, postcode).

Inputting

The 2nd part of the program contains the name lists, which allows the user to check which names are in the file and the punctuation of the name. Since you assign a number to each address this allows you to arrange the names in the lists (e.g. alphabetically). This means a lengthy and probably slow sorting process can be omitted from the program.

The third part of the program is the address 'book' which allows addresses to be found by entering just a name. However the name must be entered as it was into the address file e.g. full stops and spaces must be entered if they were originally but the case of the letters doesn't matter. (The program forces the Spectrum into the caps-shift mode). You can always check the name lists.

The fourth part of the program is the save routine which saves the program and addresses onto tape. The program which is loaded by typing LOAD "file" runs automatically once loaded with any addresses previously entered still in the program.

A SAVEing Grace

No special saving/loading techniques are used (except that the program saves itself and runs automatic-

SPECTRUM DATAFILE

ally) because the program is "running all the time" which means none of the addresses and variables are lost. However this does mean that if you break into the program while addresses are in it they will be lost (unless you've already saved them).

This is why some long winded routines are included so as to prevent an accidental stoppage of the program e.g. the name list routine could have been one long list which the computer would have asked several times "scroll" allowing the program to have been stopped by pressing "n". By the inclusion of these routines the program can only be accidentally stopped by entering a letter instead of a number when you are asked to assign a number to each address.

Hints on Conversion

Very little use of the Spectrum's colour and no use of the Spectrum's sound capabilities has been made, but this is almost inevitable with this type of program. The highlighting of the titles in the index is done by pressing Capshift and Symbol shift together, then releasing them both and pressing a number from 1 to 7. The cursor will then be that colour and, to get a normal cursor change the colour to white.

This program fits very easily into the 48K machine and could be expanded to cater for many more addresses very easily. I don't have access to 16K machine but I expect it may fit into 16K.

HOW IT RUNS

Lines 100-145	Reserve space for 50 addresses in the computer.
200-500	Form the index. Options are given and access to routines achieved by pressing single keys.
1000-1030	Prints instructions for the address file.
1035	The pause command prevents someone pressing a key in the index file and before the key is released, the key also giving the command to proceed from the instructions just printed and start.
1040-1050	Waits for key to be pressed. Then acts accordingly.
1060-1080	Inputs a variable X (from I to 50) which then acts as the subscripted variable for each part of the address.
1090	Forces the computer into Capshift Mode.
1100-1110	Inputs the name under the array n$(x).
1120-1130	Inputs house number under the array a$(x).
1140-1150	Inputs town name under the array b$(x).
1160-1170	Inputs county name under the array c$(x).
1180-1200	Inputs postcode under the array d$(x).
1220	Goes to the address print subroutine.
1300	Forces the Spectrum out of the Capshift Mode because the INKEY$ function doesn't work properly in the capshift mode.
1210-1340	Checks to see if address is correct. Returns to instructions if the address is correct, if not then it asks you to enter address again under the value of X first entered.
1500-1600	Prints instructions for name lists. Then waits for key to be pressed. Depending on the key pressed values are given to f (address number to start from) and g (address number to stop at). Then goes to name list FOR NEXT loop.
1800-1840	Prints address numbers and addresses from f to g.
1850	Pauses until key is pressed.
1860	Returns to instructions.
200-2070	Prints instructions to the address display section, then waits for key to be depressed and acts accordingly.
2080-2090	Forces Spectrum into Capshift Mode, then inputs a name under the array e$(I). e$(I) MUST BE EXACTLY the same length as the name array. In the program they are both 16 characters long (only the dimensioning of the arrays the same length at the start matters). This is so when the name inputted (e$(1)) is compared with the names in the file (n$(1 to 50)) the program is comparing strings of the same length, otherwise line 2170 won't work.
2100-2180	FOR NEXT loop compares e$(1) to each name in the file. If it matches a name then it goes to 2200.
2190-2195	Name has not been found so a message saying so is printed. Forces spectrum out of capshift mode. Goes to instructions.
2200	Name has been found. Forces spectrum out of capshift mode, goes to address print subroutine.
2900	Pauses until key is pressed.
3000	Returns to the instructions.
4000-4080	Prints instructions to save routine, waits for key to be pressed and then takes according action.
4200	Tells computer to save the program so that it will automatically start running at line 190. It mustn't run through the DIM statements or an error will result.
4300	Stops the program once it is saved so that it doesn't run into the address print subroutine.
5000-5100	Address print subroutine.

PROGRAM LISTING

```
 100 DIM n$(50,16)
 110 DIM a$(50,30)
 120 DIM b$(50,20)
 130 DIM c$(50,20)
 140 DIM d$(50,15)
 145 DIM e$(1,16)
 150
 160 REM    MAIN PROGRAM
 170
 190 CLS
 196 REM
 197 REM © MICHAEL WELHAM 1983
 198 REM
 200 PRINT AT 0,0;"_____
INDEX_____"
 210 PRINT AT 5,0;"ADDRESS FILE-
--Press key '1' to amend address
 file."
 220 PRINT AT 8,0;"NAME LIST---P
ress key '2' to viewname list."
 230 PRINT AT 11,0;"ADDRESS BOOK
---Press key '3' to find address
es."
 240 PRINT AT 14,0;"FILE TAPING-
--Press key '4' to  tape record
the program and file"
 245 PAUSE 50
 250 IF INKEY$="1" THEN GO SUB 1
000
 260 IF INKEY$="2" THEN GO SUB 1
500
 270 IF INKEY$="3" THEN GO SUB 2
000
 280 IF INKEY$="4" THEN GO SUB 4
000
 500 GO TO 200
 997
 998 REM    ADDRESS FILE
 999
1000 CLS
1010 PRINT "_____ADDRESS FI
LE_____"
1020 PRINT AT 5,0;"ONCE STARTED
PICK A NUMBER FOR  EACH ADDRESS
 FROM '1' TO '50'. THEN FOLLOW
  INSTRUCTIONS."
1030 PRINT AT 15,0;"PRESS '1' TO
 START";AT 17,0;"PRESS '0' TO AC
CESS INDEX"
```

```
1035 PAUSE 50
1040 IF INKEY$="1" THEN CLS : GO
 TO 1060
1045 IF INKEY$="0" THEN CLS : RE
TURN
1050 GO TO 1040
1060 PRINT AT 0,0;"PLEASE ENTER
ADDRESS NUMBER"
1065 PRINT "(FROM 1 TO 50)"
1070 INPUT x
1080 IF 1>x OR x>50 THEN CLS : G
O TO 1060
1090 POKE 23658,8
1095 CLS
1100 PRINT AT 10,0;"PLEASE ENTER
  NAME(S)": PRINT "(Maximum 16 c
haracters)"
1110 INPUT n$(x)
1115 CLS
1120 PRINT AT 10,0;"PLEASE ENTER
 HOUSE NUMBER AND   STREET NAME"
: PRINT "(Maximum 30 characters)
"
1130 INPUT a$(x)
1135 CLS
1140 PRINT AT 10,0;"PLEASE ENTER
 TOWN/CITY NAME": PRINT "(Maximu
m 20 characters)"
1150 INPUT b$(x)
1155 CLS
1160 PRINT AT 10,0;"PLEASE ENTER
 COUNTY": PRINT "(Maximum 20 cha
racters)"
1170 INPUT c$(x)
1175 CLS
1180 PRINT AT 10,0;"PLEASE ENTER
 POST CODE": PRINT "(Maximum 15
characters)"
1200 INPUT d$(x)
1205 CLS
1210 PRINT AT 0,0;"IS THIS CORRE
CT ?": PRINT AT 2,0;"(PRESS Y OR
 N)"
1220 GO SUB 5000
1300 POKE 23658,0
1320 IF INKEY$="y" THEN GO TO 10
00
1330 IF INKEY$="n" THEN GO TO 10
90
1340 GO TO 1320
1487
1488 REM  NAME LIST
1489
1500 CLS
1510 PRINT "_____NAME LIST
"
1515 PRINT AT 3,0; FLASH 1;"(PRE
SS ANY KEY TO EXIT LISTS)"
1520 PRINT AT 5,0;"PRESS KEY '1'
 TO VIEW No 1-10"
1521 PRINT AT 7,0;"PRESS KEY '2'
      11-20"
1522 PRINT AT 9,0;"PRESS KEY '3'
      21-30"
1523 PRINT AT 11,0;"PRESS KEY '4
'      31-40"
1524 PRINT AT 13,0;"PRESS KEY '5
'      41-50"
1530 PRINT AT 20,0;"PRESS KEY '0
' TO ACCESS INDEX"
1535 PAUSE 50
1540 IF INKEY$="1" THEN LET f=1:
 LET g=10: GO TO 1800
1550 IF INKEY$="2" THEN LET f=11
: LET g=20: GO TO 1800
1560 IF INKEY$="3" THEN LET f=21
: LET g=30: GO TO 1800
1570 IF INKEY$="4" THEN LET f=31
: LET g=40: GO TO 1800
1580 IF INKEY$="5" THEN LET f=41
: LET g=50: GO TO 1800
1590 IF INKEY$="0" THEN CLS : RE
TURN
1600 GO TO 1540
1800 CLS : PRINT "_NUMBER_____
__NAME_____"
1810 FOR x=f TO g
1820 PRINT
1830 PRINT x,n$(x)
1840 NEXT x
1850 PAUSE 0
1860 GO TO 1500
1997
1998 REM ADDRESS DISPLAY
1999
2000 CLS : PRINT "_____ADDRE
SS DISPLAY_____"
2010 PRINT AT 5,0;"Follow instru
ctions once you    have started.
"
2020 PRINT AT 17,0;"PRESS KEY 1
TO START."
2030 PRINT AT 20,0;"PRESS KEY 0
TO ACCESS INDEX."
2040 PAUSE 50
2050 IF INKEY$="0" THEN CLS : RE
TURN
2060 IF INKEY$="1" THEN GO TO 20
75
2070 GO TO 2050
2075 CLS
2080 PRINT AT 10,0;"PLEASE ENTER
 THE NAME OF THE    PERSON WHOSE
 ADDRESS YOU WANT    (EXACTLY AS
IN THE NAME LISTS)."
2085 POKE 23658,8
2090 INPUT e$(1)
2100 FOR x=1 TO 50
2170 IF n$(x)=e$(1) THEN GO TO 2
200
2180 NEXT x
2190 CLS : PRINT "SORRY!THE NAME
";e$(1),"IS NOT IN THE FILES.PL
EASE CHECK THE    NAME LISTS."
2195 POKE 23658,0: PAUSE 250: GO
 TO 2000
2200 POKE 23658,0: CLS : GO SUB
5000
2210 PRINT AT 20,0;"(Press any k
ey to return.)"
2900 PAUSE 0
3000 GO TO 2000
3997
3998 REM SAVE ROUTINE
3999
4000 CLS
4010 PRINT "_____SAVE ROUTIN
E_____"
4020 PRINT AT 5,0;"When you next
 load the program  type LOAD"fil
e"(type file in    lower case).T
he program plus    any files mad
e will once loaded automatically
 run."
4030 PRINT AT 17,0;"PRESS KEY 0
TO ACCESS INDEX"
4040 PRINT AT 18,0;"PRESS KEY 1
TO START AND FOLLOW INSTRUCTIONS
."
4045 PAUSE 50
4050 IF INKEY$="0" THEN CLS : RE
TURN
4060 IF INKEY$="1" THEN GO TO 40
30
4070 GO TO 4050
4080 CLS
4200 SAVE "file" LINE 190
4300 STOP
4900
4950 REM ADDRESS PRINT SUBRTINE
4960
5000 PRINT
5010 PRINT n$(x)
5020 PRINT
5030 PRINT a$(x)
5040 PRINT
5050 PRINT b$(x)
5060 PRINT
5070 PRINT c$(x)
5080 PRINT
5090 PRINT d$(x)
5100 RETURN
```

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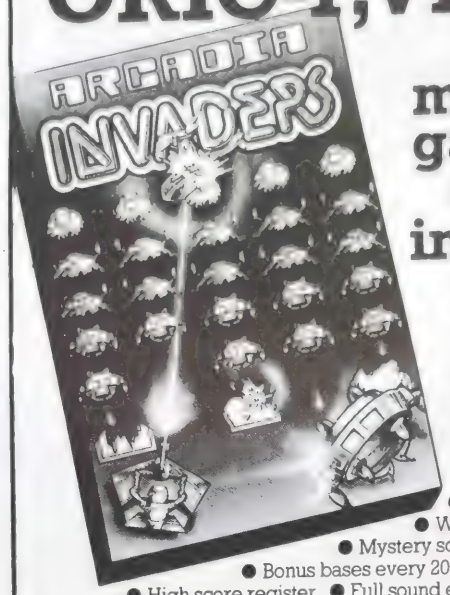
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ORIC-1, VIC-20

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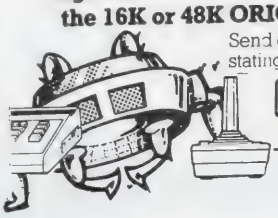
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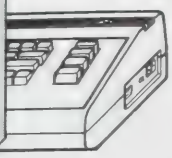
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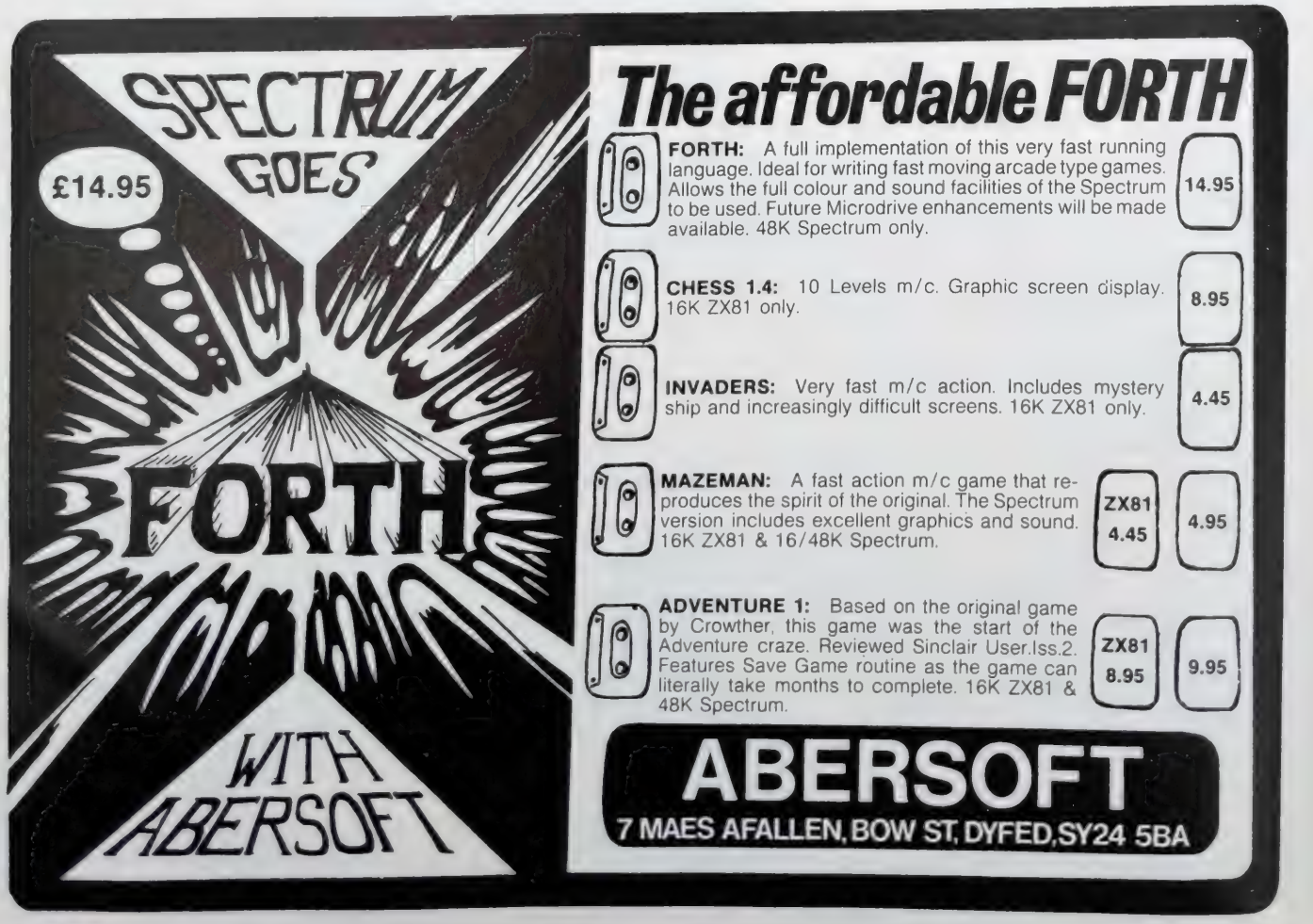
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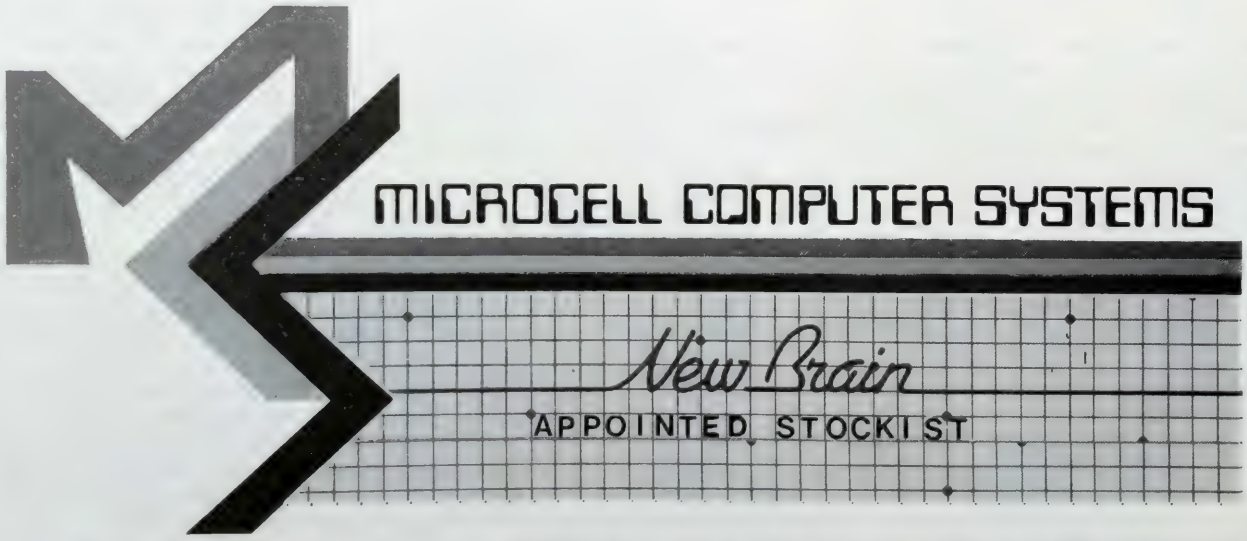
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DRAGON DRAWING

Fiery graphics by Chris Walcot.

Anyone who has tried to create a graphic display knows just how hard it is to do so. This program should make it easier for you to achieve.

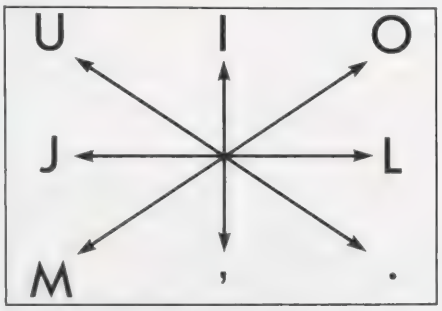
Using Dragon Drawing makes it possible to draw circles, squares and rectangles with the added advantage of copying parts of the picture and saving it on cassette.

How To Use The Program

When you run the program the first thing you see on the screen is "mode". This is a number between zero and four (the same as the normal PMODE settings). Next you enter the screen type you want (zero or one) depending on what set of colours you want. After that you have to input which page of graphic memory you wish to have your picture in. In total there are eight pages for you to use but beware because you cannot always start on page eight. This is because only PMODE 0 uses just one page of memory. An example is PMODE3 and PMODE4, as these both need four pages of graphic memory so that the highest start page for them is number 5.

"Step Size" will appear on the screen next. For that you enter a number which will make the cursor move a certain number of points across the screen with each relevant key depression. You should try to keep it an even number as much as possible to give good diagonal lines. Then you will be asked whether you want to clear the screen. If you input "Y" afterwards you have to enter the number representing the colour you wish the screen to be.

Now you will be able to work in the graphics mode that you have chosen. You may move the cursor in eight different directions by the keys shown in Figure 1. As you move the cursor about it will be followed by a trail in the present ink colour.



A list of the keys and their functions are given in Figure 2.

Figure 2

'1'	Screen clear
'2'	Ink colour change
'3'	Step Size change
'4'	Paint
'5'	Point to Point line draw
'6'	Circle
'7'	Load Screen
'8'	Save Screen
'9'	Box draw
':'	Mode reset
'–'	Page Copy

Most of the functions in Fig. 2 are self-explanatory, but the few which aren't I will explain.

Function Usage

If you press Key '5' then you will be in the "Point to Point line draw" routine. In the routine your cursor is not followed by a line but the cursor is still moved in the same way. The "paint", "ink change" and "step size" still work in this mode. You must move the cursor to where you want the line to be drawn from and press the "enter" key. Then move to the point the line is to be drawn to and press the space bar and your line is drawn. To leave this routine press the "clear " key.

The circle command is obtained by pressing key '6', but before you press it move the cursor to the place on the screen where you wish the centre of the circle to be. Most of it is straightforward except for a few parts which shall be explained. First "Height-Width-Ratio". This is a number between 0 and 255. If you enter '1' you will get a normal circle. Secondly, start position of circle. This is for drawing arcs, a fraction zero to one (0 is the normal position). End position of circle is also a fraction zero to one, but '1' is the normal position.

"Box draw", key '9' is almost the same as the "Point to Point line draw" but it takes the two points as being top left and bottom right corner of the box.

For using the "Page copy" obtained by pressing the '–' key, you just enter the number of the graphic page you want to copy from and enter the number of the page you want to copy it to.

HINTS ON CONVERSION

Many special features of the Dragon are used in the program. It should work without alteration on the 16K Tandy Color Computer because they use almost the same Microsoft BASIC. On the Dragon, the program runs in 16K, but of it 12K is just graphics screen memory. The PMODE would have to be changed to its equivalent (e.g. on the BBC MODE).

The circle command may have to be replaced by the circle formula using "pi". The screen "save" could be replaced in the Spectrum by "SCREENS" but for most machines you would have to have a look at your memory map to find the beginning and end addresses of the graphics screen memory.

The "box" command could be replaced by a simple sub-program as shown in Figure 3.

I think the Microsoft extended basic is the only basic with a "PCOPY" command or it equivalent, so you would probably have to miss this section out.

Figure 3

```
10 FOR A = X2TOX
20 PSET (A,Y,C) or PLOT (A,Y)
30 PSET (A,Y,C) or PLOT (A,Y)
40 NEXT A
50 FOR B = Y2TOY
60 PSET (B,X,C) or PLOT(B,X)
70 PSET (B,X2,C) or PLOT (b,X2)
80 NEXT B
90 END
NB C = a colour number
```

HOW IT RUNS

Line 20	Clears all of the graphic memory.
Lines 40-70	Input and set all the screen settings as well as setting the clear screen colour.
Line 80	Scans the keyboard for any key depressions. If there are none it will scan it again.
Line 90	Sets the foreground colour.
Line 100	Goes to the sub-routine which checks for any cursor movement and two of the function keys.
Line 110	Draws a line from the old cursor position to the new one.
Line 120	Checks whether any of the other function keys has been pressed and will go to the appropriate line.
Line 330	Checks that the new cursor position is not off the screen and if it is, will change the value of the cursor position.
Lines 390-470	Are lines for the "screen clear" subroutine. This clears the screen (PCLS) in the colour number entered.
Lines 480-510	Change the ink colour. This is done by resetting the foreground colour through the variable 'IC'.
Lines 520-570	Are the "Paint" command. The paint command takes the present cursor position as the paint position and paints in the inputted colour until it reaches the inputted border colour.
Lines 580-690	Are the lines for the "line draw" routine. This allows you to draw a line from one point to another.
Lines 700-740	Are the "circle" subcommand which allow you to draw circles, ellipses and arcs.
Lines 750-810	Allow you to load previously recorded pictures off the cassette onto the screen.
Lines 820-940	Are for saving the pictures you have drawn via the command "CLOADM" in line 920.
Lines 950-1190	Are the "box draw" command which is almost the same as the "line draw" routine.
Lines 1100 to 1140	Use the "PCOPY" command to copy one page of graphic memory to another.

Variables Used

MO	**– mode**
PG	**–start page**
SC	**– screen type**
X,Y,X2,Y2	**– cursor positions**
Q	**– step size**
IC	**– foreground colour**

PROGRAM LISTING

```
10 ' Christopher Walcot 1983 28 ROWAN WA
Y,LISVANE,CARDIFF,CF4 5TD
20 PCLEAR8
30 CLS0
40 INPUT"MODE";MO:INPUT"SCREEN";SC:INPUT
"STARTPAGE";PG:INPUT"STEP SIZE";Q
50 GOSUB390
60 PMODEMO,PG
70 SCREEN1,SC
80 A$=INKEY$:IF A$=""THENPSET(X2,Y2,0):P
SET(X2,Y2,1):GOTO80
90 COLORIC
100 GOSUB240
110 LINE(X2,Y2)-(X,Y),PSET
120 IFA$="1"THENGOSUB390
130 IF A$="-"THENGOSUB1100
140 IFA$="4"THENGOSUB520
150 IFA$="5"THENGOSUB580
160 IF A$="6"THEN GOSUB 700
170 IFA$="7"THEN GOSUB750
180 IF A$="8"THEN GOSUB 820
190 IF A$="2"THENGOSUB480
200 IF A$="9"THEN GOSUB 950
210 IFA$=":"THEN30
220 X2=X:Y2=Y
230 GOTO80
240 IFA$="U"THENX=X-Q:Y=Y-Q
250 IFA$="O"THENX=X+Q:Y=Y-Q
260 IFA$="."THENX=X+Q:Y=Y+Q
270 IFA$="M"THENX=X-Q:Y=Y+Q
280 IFA$="I"THENY=Y-Q
290 IFA$="L"THENX=X+Q
300 IFA$=","THENY=Y+Q
310 IFA$="J"THENX=X-Q
320 IF A$="3"THENGOSUB1070
330 IFX>256THENX=256
340 IFY>192THENY=192
350 IFX<0THENX=0
360 IFY<0THENY=0
370 IF A$="0"THENGOSUB1070
380 RETURN
390 '***SCREEN CLEAR***
400 CLS0
410 PMODEMO,PG
420 INPUT"CLEAR SCREEN(Y/N)";YN$:IF YN$<
>"Y"THEN PMODEMO,PG:SCREEN1,SC:RETURN
430 INPUT"WHAT COLOUR";WC
440 PCLSWC
450 PMODEMO,PG
460 SCREEN1,SC
470 RETURN
480 '*** INK CHANGE ***
490 CLS0:INPUT"INK COLOUR";IC
500 SCREEN1,SC
510 RETURN
520 '***PAINT***
530 CLS0:INPUT"PAINT COLOUR";PAC:INPUT"B
ORDER COLOUR";BPC
540 SCREEN1,SC
550 PAINT(X,Y),PAC,BPC
560 RETURN
570 PSET(X,Y,PP)
580 '***LINE DRAW***
590 PP=PPOINT(X,Y)
600 A$=INKEY$:IF A$=""THENPSET(X,Y,0):PS
ET(X,Y,1):PSET(X,Y,PP):GOTO600
610 COLOR IC
620 GOSUB240
630 PP=PPOINT(X,Y):PSET(X,Y,0):PSET(X,Y,
1):PSET(X,Y,PP)
640 IFA$="4"THENGOSUB520
650 IF A$="2"THEN GOSUB 480
660 IFA$=CHR$(12)THEN RETURN
670 IF A$=CHR$(13)THENX2=X:Y2=Y
680 IF A$=" "THENLINE(X2,Y2)-(X,Y),PSET:
X2=X:Y2=Y
690 GOTO590
700 '***CIRCLE***
710 CLS0:INPUT"DRAW A CIRCLE(Y/N)";YN$:I
F YN$<>"Y"THEN SCREEN1,SC:RETURN
720 INPUT"CIRCLE COLOUR";CC:INPUT"RADIUS
 SIZE";RS:INPUT"HEIGHT-WIDTH RATIO";HWR:
INPUT"START POSITION OF CIRCLE";SPOC:INP
UT"END POSITION OF CIRCLE";EPOC:INPUT"DO
 YOU WANT TO ALTER ANY THING(Y/N)";YN$:I
F YN$<>"N"THEN720
730 SCREEN1,SC:CIRCLE(X2,Y2),RS,CC,HWR,S
POC,EPOC
740 RETURN
750 '***LOAD FILE***
760 CLS0
770 MOTORON:AUDIOON
780 INPUT"FILE NAME";F$
790 SCREEN1,SC
800 CLOADMF$
810 RETURN
820 '***SAVE FILE***
830 CLS0
840 MOTORON:AUDIOON
850 INPUT"FILE NAME";F$:INPUT"START PAGE
";ST2:INPUT"END PAGE";EP2
860 ST2=ST2*1536
870 EP2=EP2*1536+1535
880 IF ST2>=EP2 THEN GOTO830
890 CLS0:PRINT"PRESS ANY KEY WHEN TAPE I
S READY";
900 A$=INKEY$:IF A$=""THEN900
910 CLS0:PRINT"SAVING";:SCREEN0,1
920 CSAVEMF$,ST2,EP2,EP2-ST2
930 SCREEN1,SC
940 RETURN
950 '***BOX DRAW***
960 PP=PPOINT(X,Y)
970 A$=INKEY$:IFA$=""THENPSET(X,Y,0):PSE
T(X,Y,1):PSET(X,Y,PP):GOTO970
980 COLORIC
990 GOSUB240
1000 PP=PPOINT(X,Y):PSET(X,Y,0):PSET(X,Y
,PP)
1010 IFA$="2"THENGOSUB480
1020 IFA$="4"THENGOSUB520
1030 IFA$=CHR$(12)THENRETURN
1040 IFA$=CHR$(13)THENX2=X:Y2=Y
1050 IFA$=" "THENLINE(X2,Y2)-(X,Y),PSET,
B:X2=X:Y2=Y
1060 GOTO960
1070 CLS0:INPUT"STEP SIZE";Q
1080 SCREEN1,SC
1090 RETURN
1100 '***PCOPY***
1110 CLS0:INPUT"COPY FORM";CPY:INPUT"TO"
;HTO
1120 PCOPY CPY TO HTO
1130 SCREEN1,SC
1140 RETURN
```

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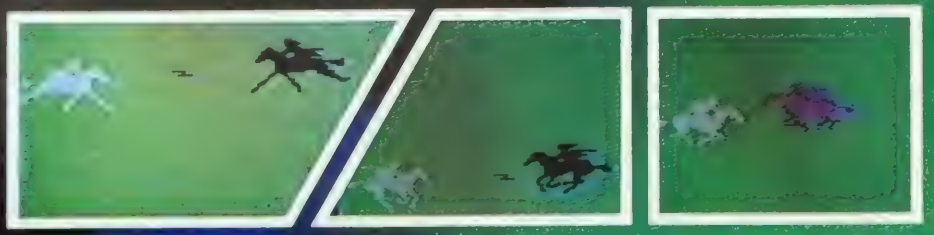
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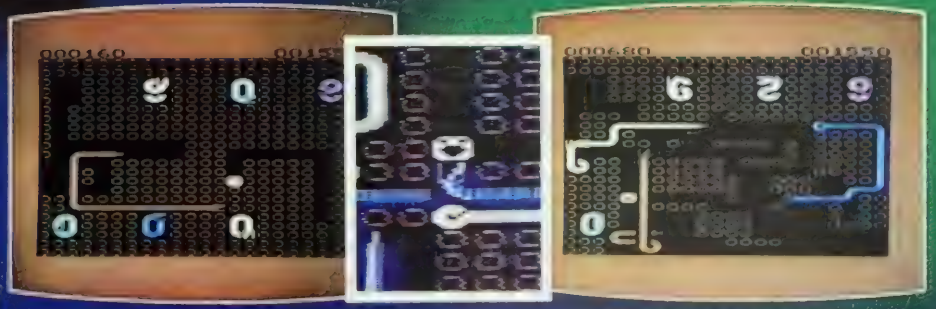
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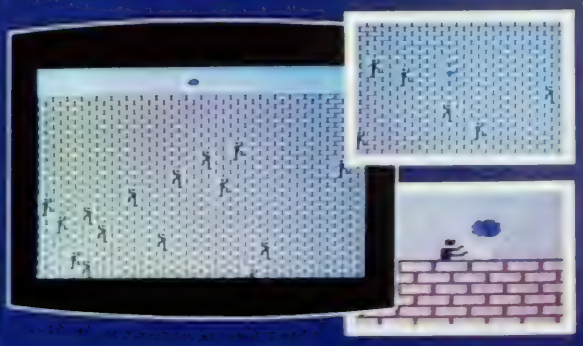
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Luke says — "Bet you can't keep the Glooms away as long as I did?" 4360' to beat! That's difficult.



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COMPUTER TYPE: Tick box

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- BBC 'B'
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The scores quoted were achieved on a Spectrum computer — Different computers give different score potential.

BBC ACCOUNTS



I bought my BBC Micro with the idea of giving my accountant a printout of the accounts rather than a bundle of bills to sort out in the hope of making the computer pay for itself within two years as a direct result of the reduced fees payable to my accountant.

As I have to keep my cheque book stubs filled properly anyway the computer seemed the right place to get my data from. One complication is that the VAT and Tax Office have slightly different ways of taxing my motoring expenses so this has to be taken into account, and in fact I get two print outs from the same program.

The date I typed in from line 500 starts with one of 26 file numbers for my different expenses, followed by the date, the cheque number, – all of which I have put under F$. Then the gross amount of the cheque, which is under X. Then the VAT trip (?) = .0001 for 100% of the VAT being claimable, .0002 for the case of motoring expenses. 0, for nil, or food, or food bills. = .001 for part fuel and other costs when I can enter the actual amount – this does not happen often but I need the use of it.

Being 99% self taught and never having set eyes on a computer before I did not know how to set about writing the program. For instance, when filling in long forms I started at the easy end i.e. the total – in this case line 205.

It is so easy and so obvious that it took a long time to find out how to add a row of figures, you would expect it to be on page one of any book but it hardly appears at all.

From the total I worked up the right hand side of the paper, the next query was how to get in the rest of the information. As I was adding up cheque numbers too, this was coded with the use of the F$ and the array.

I now spent a long time trying to tabulate the information so that it came on the screen in a presentable manner, using CHR$ (11) to lift the cursor and wipe out the VAT trip which was no longer needed, and replace it with the VAT itself.

This turned out to be a waste of time, as by now things looked possible so I bought a printer and printed out the array anyway.

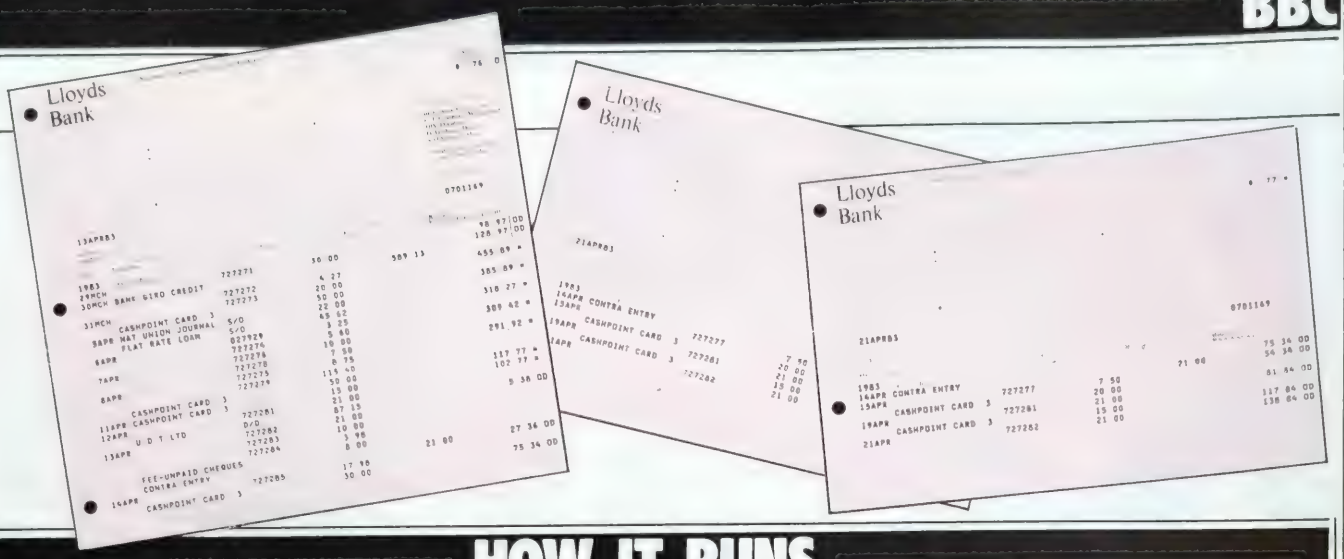
It would have been a great help if the writer of the instruction book had spoken the same language as the writer of the computer book.

I was now ready to sort the files, I tried all the sorts in the books but I could not get them to take the three strings together.

I next listed the telephone list in the Welcome tape supplied by the Beeb and tried to play this into my program as this sorted names and addresses with the telephone numbers. This purely stirred them up, but I did learn a bit about loops by interspersing the lines with other lines saying Print No " ", and doing the actual sort Print 'A' etc so that I had a record of where the computer was stuck and the route it was taking through the loops. It took a lot of paper but the printer did slow it down to a reasonable speed.

I finally sought advice and came up with the routine as shown. I like it, it works, I understand it, and it is easy to type in.

I am sure had I started again I would have written it differently, I admit that I feel it is over-programmed in several places with lines that are now no longer necessary. It lays itself open to being written with Functions and Procedures, but when I started these were on page 15 of the manual and I was only on page 5.



HOW IT RUNS

Lines Description

Lines	Description
2	Set precision to two decimal places, to cancel VAT trips and work the pence.
4-6	Sets up user defined keys.
35	Double size print.
36	Take you back to single height characters.
60	Dimensions main arrays.
80	Read data.
110	Checks for end of data.
130	The VAT sum.
151	Checks accountant.
152	Lifts cursor up and cancels VAT trip.
153	Checks VAT.
200	The new total = the old and the latest entry.
220	The totals.
500	Data from cheque stubs – room for 300.
901	End of data.
940	Turns printer on.
967	VAT or accountant.
975	Print totals.
977	Formats printout.
978	Turns printer off.
1000	Depress tape.
1010	Go to tape routine.
2000	Sets counters.
2006	Sets counters each round.
2070	Sort Routine.
2110	Checks for end of sort.
2210	Printing for the sort routine.

The sort routine works on the idea that ASCI A = 65 – I tried A = A$ but it would not take it so I used line 2005 instead.

Line 2070 is the line that does the sort. I tried many sorts but this I found the best – largely because I can understand it and it allows making a total of each file. By removing line 2006 you can make a running total, but then I already have one in the list.

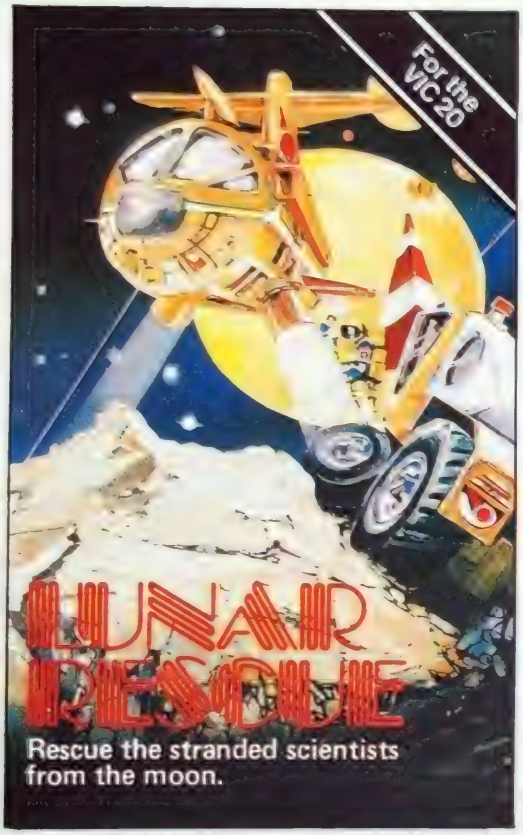
Variables Used

L	Total of entries +1 to cope with line 901
X	Gross amount on cheque
V	VAT trip and VAT paid
K	Net (gross – VAT)
F$	File No, cheque No, date
G,S,R	Totals and sub-totals

PROGRAM LISTING

```
1 REM
2 @%=&20209
3 *KEY 0 000
4 *KEY 1 .0001
5 *KEY 2 .0002
6 *KEY 8"CASH"
7 *KEY 9 DATA
30 CLS
35 PRINTTAB(5,5) CHR$(141); "VATACC"
36 PRINTTAB(5)CHR$(141); "VATACC" PRINTTAB(15)CHR$(140), "MARK.75"
40 INPUTTAB(5,8)"DO YOU NEED THE LIST PRINTED ? Y OR N",A$
41 INPUTTAB(5)"DO YOU NEED THE FILES PRINTED? Y OR N",T$
42 INPUTTAB(5)"THIS DEMO HAS 9 ENTRIES. HOW MANY WILL YOU PUT IN THIS TIME",Z
43 INPUTTAB(5)"DO YOU WANT TO STORE ON TAPE? Y OR N",E$
44 INPUTTAB(5)" IS THIS FOR V.A.T. OR ACCOUNTANCY PURPOSES ? V OR A ",D$
45 IF D$="V" PRINT "V.A.T.**********"
46 IF D$="A" PRINT" ACCOUNTANCY.**********"
49 PRINT"**********"
56 LETL=Z+1
60 DIMF$(L),X(L),V(L)
70 FORH=1TOL
80 READ F$(H),X(H),V(H)
82 ON ERROR RESTORE
85 NEXT H
95 FOR P=1TOL
101 PRINT TAB(0)F$(P),TAB(13)X(P)
105 PRINT TAB(20)V(P)
110 IFF$(P)="ZZZZZ"GOTO 902
130 IF V(P)=0 THEN PRINT CHR$(11)TAB(25)V(P):GOSUB 190
140 IF V(P)>=.001 THEN PRINTCHR$(11)TAB(25)V(P)  GOSUB 190
150 IF V(P)=.0001 THEN GOSUB 180
151 IF D$="A" GOTO 154
152 IF V(P)=.0002THENV(P)=(X(P)*.1305)*.75 PRINTCHR$(11)TAB(25)V(P) GOSUB190
153 IF D$="V" GOTO 155
154 IF V(P)=.0002 THEN GOSUB 180
155 NEXT P
180 LETV(P)=X(P)*.1305 PRINTCHR$(11) TAB(25)V(P)
190 LET K=X(P)-V(P)  PRINT TAB(30)K
200 FOR D=1 TO L
205 G=G+X(P)
210 S=S+V(P)
220 R=R+K
240 NEXT D
460 RETURN
500 DATA Z 12/8 551.4082.50..0001
501 DATA A 13/8 552.10.96..0002
502 DATA V 13/8 553.4.95..0001
503 DATA A 26/8 554.11.03..0002
504 DATA O 9/9 555.61.00.000
505 DATA T 9/9 556.65.52.10.88
506 DATA M 9/9 557.400.32.000
507 DATA J 9/9 558.195.63.000
508 DATA K 9/9 559.25.64..0001
900 RETURN
901 DATA ZZZZZ.000,000
902 PRINT TAB(0) "LINES" H-2,TAB(10) "TOTAL"G/L ,TAB(25)S/L,TAB(30)R
915 REPEAT
940 IF A$="Y" VDU 2
950 FOR C=1 TO L
960 PRINTF$(C),X(C),V(C),X(C)-V(C)
965 NEXT C
966 IF D$="V" PRINT "V.A.T."
967 IF D$="A" PRINT "ACCOUNTANCY"
972 PRINT
973 PRINT"------------------------------------"
974 PRINT"LINES"H-2,"TOTAL" G/L,S/L,(G/L)-(S/L)
975 PRINT"===================================="
976 PRINT
977 PRINT
978 VDU 3
1000 E$="N" GOTO 2000
1005 U=OPENOUT "VAT"
1006 REPEAT
1007 FOR T=1TOL
1010 PRINT#U, F$(T),X(T),V(T)
1020 NEXT T
1030 CLOSE#U
1040 PRINT "TAPE OFF"
2000 G=0 S=0 R=0
2005 FOR A=65 TO 91 STEP 1
2006 G=0 S=0 R=0
2050 IF T$="Y" VDU2
2060 FOR H=1 TO L
2070 IFASC(LEFT$(F$(H),1))=A THEN GOSUB 2500
2080 NEXT H
2090 IF G>0 THEN GOSUB 2100
2110 IF A=91 THEN PRINT "END OF SORT" VDU3 END
2115 NEXT A
2100 PRINT
2190 PRINT
2195 PRINT"------------------------------------"
2200 PRINT"TOTALS"," "G,S,R
2205 PRINT"===================================="
2210 RETURN
2500 PRINTF$(H),X(H),V(H),X(H)-V(H)
2510 LET G=G+X(H) S=S+V(H) R=R+(G-S)
2520 GOTO 2080
2530 RETURN
2540 GOTO 2080
```

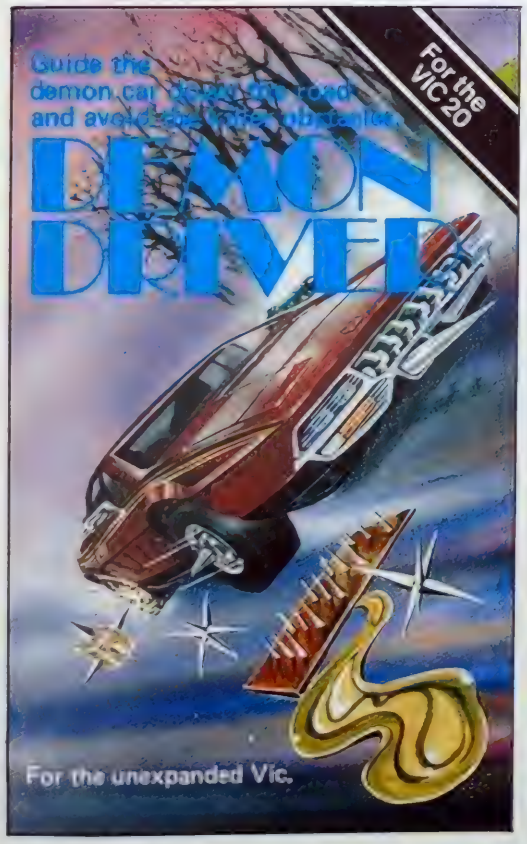
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GAMES

SOFTWARE REVIEWS

Each month PCT will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers, each of whom is a seasoned user of his/her particular machine — and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything else!

Our 'Ratings Table' headings are:

Program Quality

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why *should* simple games cost up to £12 per tape? We judge this one on an overall basis — how much work have the suppliers put into the program and is the price reasonable?

Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package — vital for games!

Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them *all* used!

Supplied Instructions

Regardless of whether the instructions come on sheets of paper, or are presented as text on-screen, they should be as clear and as concise as possible.

Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

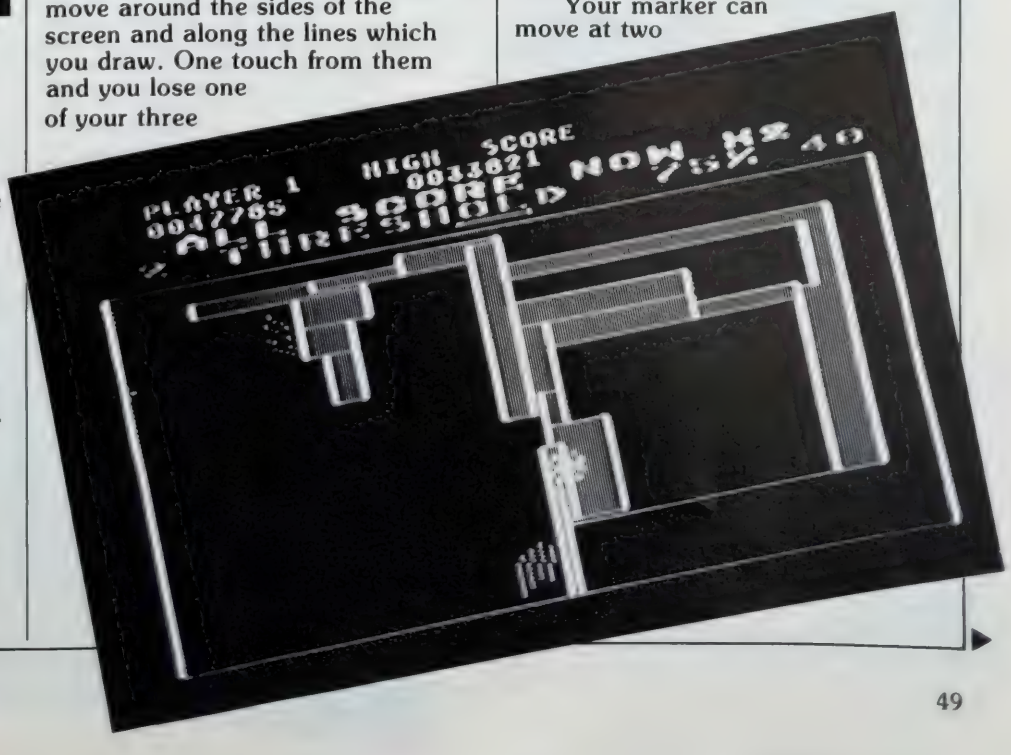
Title:	**Qix**
Type:	**Cartridge**
Supplier:	**Atari**
Machine:	**Atari 400/800**
Price:	**£29.95**

When Qix first appeared in the pubs and arcades of Britain its radical departure from the standard video game format caused quite a stir. Here was a game which required both manual dexterity and a considerable degree of stategy.

The theme of the game is the capture of a roaming entity called Qix. The Qix is displayed as a multicoloured spark which moves around the screen. To capture the Qix you move your marker around the screen, laying a trail as you go. If you manage to completely enclose an area, either by joining up with one of your own lines or making it to the edge of the screen, the area is then shaded in and your score is increased by a factor of the percentage of the screen area you captured. Each phase ends when more than 75% of the screen has been captured.

To further hamper your progress you have to contend with two 'Sparx'. These luminous beasts move around the sides of the screen and along the lines which you draw. One touch from them and you lose one of your three lives. Finally there is the 'Fuse'. This only appears if you stop in the middle of drawing a line. It will follow your trail until it touches you and its curtains again.

Your marker can move at two



different speeds. The normal speed gives you blue areas when you complete a box and the slow speed gives you brown boxes, these are worth twice the normal value but you run a greater chance of being hit by the Qix when drawing them.

After you have successfully captured two Qix's the third screen provides you with two at the same time. If you manage to separate these your subsequent scores are doubled. Split them again and your scores are trebled.

If my memory serves me correctly, it was Atari who originally developed the arcade version of Qix on which this computer version is based. So I was a little disappointed when, on plugging in the cartridge, I was not greeted with the superb colour graphics which the arcade game sports.

Despite lacking the visual impact of its arcade brother, the game is more or less faithful to the original. It is superb entertainment which is guaranteed to have you fixed to your screen for many hours. A good buy.

Ratings Table

Program Quality:	* * * * *
Value for Money:	* * * * *
Presentation On-screen:	* * *
Ease of use:	* * * *
Crashproofing:	* * * * *
Supplied Instructions:	* * * * *
Overall	90%

C.P.

Title:	**Vic-Panic**
Type:	**Tape**
Supplier:	**Bug-Byte**
Machine:	**Unexpanded Vic-20**
Price:	**£7.00**

In this game you are a little man on board a space ship which has been taken over by little blue things not unlike that arthropod on the front of every Bug-Byte cassette. Your sole purpose is to get rid of them (what else?), and you do that by digging holes in the walkway for them to fall through. Let one get out, and it turns a different colour: red the first time, then white, and they have to be knocked through more levels before they get sent to their maker. If they get you first time — then tough mate. You have three lives and your oxygen is running out. Once they all turn white, you don't have a hope — so you can start to PANIC!

Like most of Bug-Byte's games, you load the machine-code loader first, run it, then wait two minutes for the machine code to be loaded. If it loads, then you should be presented with a black screen with yellow ladders and walkways, four blue aliens and your little fellow. You either press F7 to start, or press the fire button on your joystick if you have one. A joystick is optional as the game is keyboard controlled, but it is easier and more positive.

The game is crashproof — it even disconnects power to the cassette unit making the cassette keys inoperable. This is the only game that I've seen that has this odd gimmick.

PANIC is very addictive, and well worth the money. The graphics are superb and the speed of action brings it up to arcade standards. But beware...if you don't have a joystick, then your keyboard is going to get one hell of a bashing!!!

Ratings Table

Program Quality:	* * * * *
Value for Money:	* * * *
Presentation On-screen:	* * * * *
Ease of use:	* * * *
Crashproofing:	* * * *
Supplied Instructions:	* * * *
Overall:	95%

S.P.

Title:	**Astro Blaster**
Type:	**Tape**
Supplier:	**Quicksilva**
Machine:	**Spectrum**
Price:	**£4.95**

Whilst Astro-Blaster is of a fairly common type — 'here come the alien hordes again' — it is unique in throwing the most awkward wave at you ahead of the cannon fodder.

To get past the first screen you'll have to cope with bird-like aliens who rapidly change height and direction, dropping a horrendous amount of bombs in the process. Thankfully one hit takes the little flappers out neatly and you aren't left with the distracting spectacle of trying to shoot at dismembered pieces of birdie, as in some games of this type.

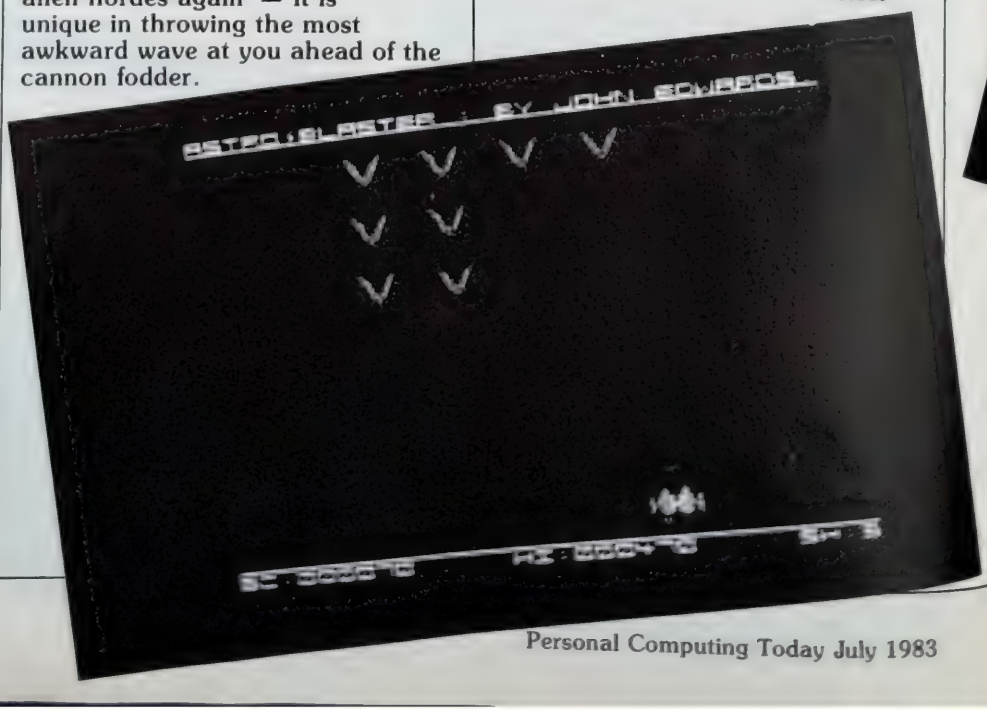
Assuming your five shields are sufficient to protect you this far, you're treated to a shot at what is presumably an egg(?), which wanders about trying to kill you, and a line of regimented aliens who fly in formation at a set speed and are fairly easy to put holes in. The wave ends with a panic inducing meteor storm, which will test your nerves as much as your reflexes.

All this is accomplished with excellent graphics and sound and the chance to use a joystick for your carnage. I tried the Kempston product and found that I died a lot more that way! Nothing against the stick, but the keyboard controls are more positive — they need to be. Overall an excellent arcade game and hopefully recommended to all Defenders of Humanity!

Ratings Table

Program Quality:	* * * *
Value for Money:	* * * *
Presentation On-screen:	* * * * *
Ease of use:	* * * *
Crashproofing:	* * * *
Supplied Instructions:	* * * *
Overall	95%

R.H.

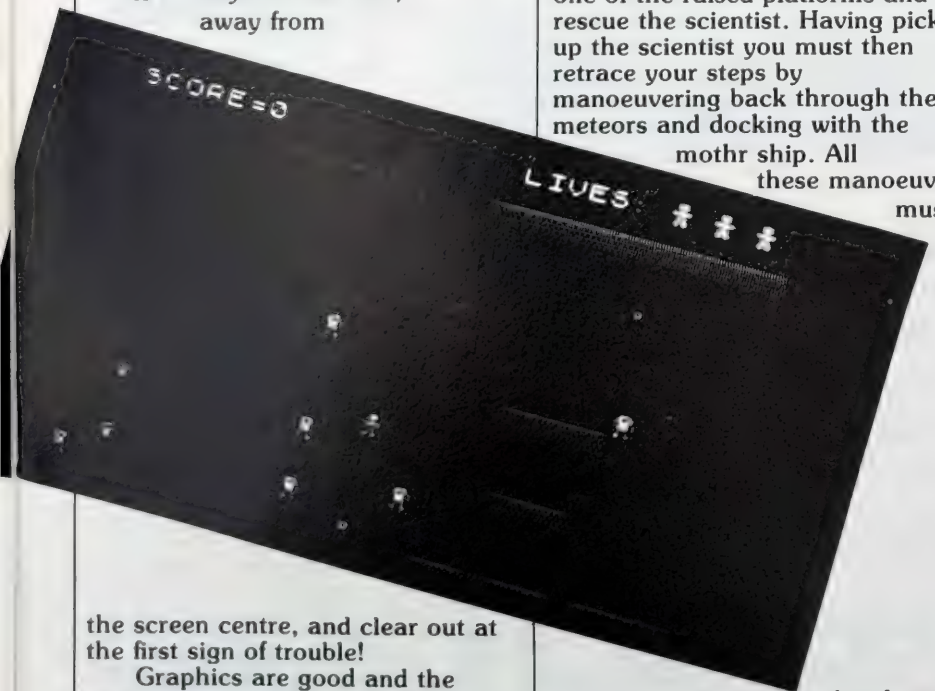


Title:	**Frenzy**
Type:	**Tape**
Supplier:	**Quicksilva**
Machine:	**Spectrum**
Price:	**£4.95**

Something of an odd title that. It implies a frantic, sudden death struggle, sweat beading the brow and dampening the palms. In reality, however, the game is a fairly unhurried annihilation of a large number of robots, hastened only by the appearance of an unstoppable killer face (?) from the centre of the screen. This charming little soul can walk through walls and will ignore all your attempts to inflict pain and death on him. The only defence is to move rapidly into the next room, i.e. run away.

Frenzy is laid out as a series of adjoining rooms, which you can move freely through, decimating the robots as you go. Mine layers will attempt to complicate matters as you get more proficient, and there are a few nasties lurking in the game designed to keep you alert!

You may only fire in the direction you're moving (or last moved if you're resting). Embarassing that, a times. The face can't be stopped, so one tactic is to stay near an exit, away from the screen centre, and clear out at the first sign of trouble!



Graphics are good and the game plays easily, although the keyboard controls are difficult to use. Putting both horizontal and vertical movement keys next to each other is a bad thing for quick control, and Frenzy would benefit enormously from a joystick facility.

Ratings Table

Program Quality:	* * *
Value for Money:	* * * *
Presentation On-screen:	* * * * *
Ease of use:	* *
Crashproofing:	* * * *
Supplied Instructions:	* * *
Overall	70%

R.H.

Title:	**Lunar Rescue**
Type:	**Tape**
Supplier:	**Lyversoft**
Machine:	**VIC 20**
Price:	**£5.95**

The scenario for Lunar Rescue has you trying to rescue stranded scientists from the surface of the moon. To do this you must release your lunar lander from the mother ship and descend through a metoer storm to the surface below.

You have just two controls for the craft: left and right thrusters. At the start of the game you are displayed at the top of the screen, contained with the mother ship. By pressing one of the thruster keys you are released and you begin to fall towards the surface.

If you clear the meteors you then have to steer your craft onto one of the raised platforms and rescue the scientist. Having picked up the scientist you must then retrace your steps by manoeuvering back through the meteors and docking with the mothr ship. All these manoeuvers must be completed without touching anything but the scientist or else your craft will explode.

This game suffered the fate of most others written to run in the unexpanded machine, that of good graphics but jerky movement. Given that the VIC has a small screen coupled with large characters, it makes it very difficult to steer the craft when it moves in character size jumps.

Ratings Table

Program Quality:	* * *
Value for Money:	* * * *
Presentation On-screen:	* * * *
Ease of use:	* * *
Crashproofing:	* * * *
Supplied Instructions:	* * *
Overall	70%

Title:	**Skramble**
Type:	**Tape**
Supplier:	**Sumlock**
Machine:	**Vic-20**
Price:	**£7.95**

There are almost as many version of Scramble available for the VIC as there are PacMans. Unfortunately Sumlock's Skramble doesn't contain anything to set it above the normal.

The game is based around the first and third phases of the arcade game. In the first phase you guide your ship over mountainous terrain, bombing fuel dumps and moon bases as you go. To make life a little more hazardous the enemy defends its installation with a rocket fusillade.

All the time you are in motion you are using fuel at an alarming rate. This makes it imperative to bomb the fuel dumps as often as possible. On this version you are only allowed one bomb in the air at a time. With this game it is in fact easier to use the keyboard controls as opposed to the joystick. This is because you have four keys to move your craft, one to fire the cannon and one to drop the bombs.

The second phase of the game involves you dodging fireballs which career towards you from the right of the screen. These little blighters can't be shot down so it is up to you to dodge them, trying at the same time to refuel.

Ratings Table

Program Quality:	* * *
Value for Money:	* * *
Presentation On-screen:	* * *
Ease of use:	* * *
Crashproofing:	* * * *
Supplied Instructions:	* * *
Overall	66%

0

The June Top Ten in Spectrum software at W.H. Smith.



Flight Simulation
Sinclair
48K £7.95



Penetrator
Melbourne House
48K £6.95

The range of software available for the Sinclair Spectrum is to say the least, extensive.

So every month at W. H. Smith, we review the range with particular reference to presentation, challenge, excitement and value for money. And because we're quite severe it's a difficult job finally to arrive at a Top Ten. But as you can see, not impossible.

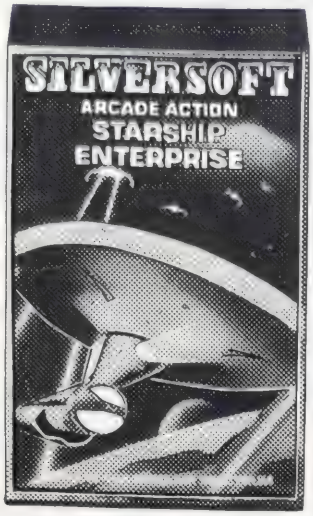
You don't have to take our word for it.

At W. H. Smith we stock the widest selection of Spectrum Software, so you can judge for yourself.

Title	Producer	K RAM	Price
Arcade Games			
Meteor Storm	Quicksilva	16	£4.95
Space Intruders	Quicksilva	16	£4.95
Time Gate	Quicksilva	48	£6.95
Gulpman	Campbell	16	£4.95
Spectral Invaders	Bug-Byte	16	£5.00
Meteoroids	Softek	16	£4.95
Planetoids	Sinclair	16	£4.95
Hungry Horace	Sinclair	16	£5.95
Space Raiders	Sinclair	16	£4.95
Mazeman	Abersoft	16	£4.95
Nightflight	Hewson	48	£5.95
Ground Force Zero	Titan	16	£5.00
Caterpillar	CDS	16	£5.95
Leapfrog	CDS	16	£5.95
Gobble-A-Ghost	CDS	16	£5.95
Centi-Bug	DK Tronics	16	£4.95
3D Tanx	DK Tronics	16	£4.95
Cruising	Sunshine	16	£4.95
Blind Alley	Sunshine	16	£4.95
Derby Day	Computer Rentals	48	£5.95
Jackpot	Computer Rentals	48	£4.95
Escape	New Generation	16	£4.95
3D Tunnel	New Generation	16	£5.95
Gobbleman	Artic	16	£4.95
Galaxians	Artic	16	£4.95
Invasion Force	Artic	16	£4.95
Sentinal	Abacus	16	£4.95



Chess
Sinclair
48K **£7.95**



Starship Enterprise
Silversoft
48K **£5.95**



Horace Goes Skiing
Sinclair
16K **£5.95**



Schizoids
Imagine
16K **£5.50**



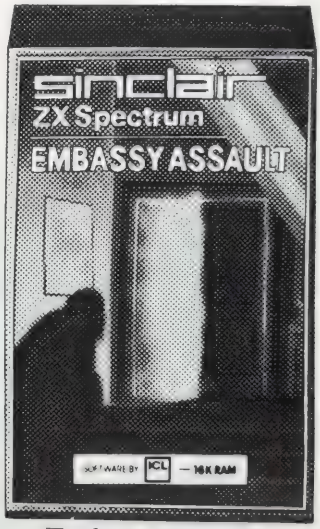
Muncher
Silversoft
16K **£5.95**



Mined-Out
Quicksilva
48K **£4.95**



Transylvanian Tower
Shepherd
48K **£6.50**



Embassy Assault
Sinclair
48K **£4.95**

Title	Producer	K RAM	Price
Avenger	Abacus	16	£4.95
Cyber Rats	Silversoft	16	£5.95
Arcadia	Imagine	16	£5.50
Ground Attack	Silversoft	16	£5.95
Orbiter	Silversoft	16	£5.95
Slippery Sid	Silversoft	16	£5.95
Strategy Games			
Battle of Britain	Microgame	48	£5.95
Novotnik Puzzle	Phipps	16	£4.95
Chess	Artic	48	£9.45
Voice Chess	Artic	48	£9.95
Superchess II	C P Software	48	£7.95
Football Manager	Addictive	48	£6.95
Chess-The Turk	Oxford	48	£8.95
Dictator	DK Tronics	48	£4.95
Everest Ascent	Shepherd	48	£6.50
Dallas	CCS	48	£5.95
Adventure			
Labyrinth	Axis	16	£5.95
Planet of Death	Sinclair	16	£6.95
Inca Curse	Sinclair	48	£6.95
The Hobbit	Sinclair	48	£14.95
Ship of Doom	Artic	48	£6.95
Espionage Island	Artic	48	£6.95
Rescue	Computer Rentals	48	£5.95
The Orb	Computer Rentals	48	£5.95
Utility			
M/C Code Test Tool	Oxford	16	£9.95
Editor/Assembler	Oxford	16	£9.95
Compiler	Softek	16	£14.95
Soft Talk II	C P Software	48	£6.95
Spectsound	PDQ	16	£5.95
Family Games			
Reversi	Sinclair	16	£7.95
Othello	CDS	16	£5.95
Golf	R and R	16	£3.75
Conflict	Martech	48	£11.95
Test Match	Computer Rentals	48	£5.95
Backgammon	C P Software	48	£5.95
Draughts	C P Software	48	£6.95
Practical			
Vu-Calc	Sinclair	16	£8.95
Vu-File	Sinclair	16	£8.95
Vu-3D	Sinclair	48	£9.95
Collectors Pack	Sinclair	48	£9.95
Club Record Controller	Sinclair	48	£9.95
Address Manager	Oxford	16	£8.95
Finance Manager	Oxford	16	£8.95
Dietron	Custom Data	16	£4.75
Program Collections			
Shiva Special 1	Shiva	16	£5.95
Over The Spectrum 1	Melbourne House	16	£5.95
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Over The Spectrum 3	Melbourne House	16	£5.95

WHSMITH

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YHATZI

Play an old, favourite dice game on your Oric.



All you Oric owners out there who are frustrated by the lack of software for your machines don't panic, help is on its way. After only a few weeks experience on his new Oric, R.M. Dutton converted a VIC program from Personal Computing Today to run on it. The program is Yhatzi and it is listed here complete with their instructions for you to type in.

Yhatzi

The object of the game is to achieve certain combinations of five dice. These combinations are:-
A – 2 Pairs: Two pairs with an odd die left. Order does not matter e.g. 46456
B – 1 Prile: Three dice with the same number and two odd dice in any order e.g. 53655
C – 1 Four-fold: Four dice with the same number and one odd die e.g. 33353
D – 1 Poker: A Prile and a Pair in any order e.g. 26262
E – 1 Five—fold: All dice with the same number e.g. 44444
F – 1 YHATZI: A run in numbers from 1 to 5 or 2 to 6 in any order e.g. 26453

Each player has only three throws. At the end of each throw the player may hold any number of dice to achieve a combination, but once held that die will be held for the duration of the go. When a player reaches a combination which he wishes to keep, he types 'S' to score it. The computer will then ask for the combination the player wishes to have his throw scored against. The player types in the letter corresponding to the combination. The computer will then check the die and score the throw accordingly. The game progresses with the next player taking his turn.

The game ends when a player has scored all the combinations. Between two and eight people may play the game.

PROGRAM LISTING

```
1 DIMD$(6)
2 D$(1)="[1]"
3 D$(2)="[2]"
4 D$(3)="[3]"
5 D$(4)="[4]"
6 D$(5)="[5]"
7 D$(6)="[6]"
8 CLS:PAPER0:INK7:INPUT"HOW MANY PLAYERS
";P
9 IFP>8ORP<2THEN8
10 IFINT(P)<>PTHEN8
11 FORG=1TOP
12 PRINT"PLAYER'G' NAME":INPUTN$(G)
13 TS(G)=0:S1(G)=0:S2(G)=0:S3(G)=0:S4(G)
=0:S5(G)=0:S6(G)=0
14 AA(G)=0:BB(G)=0:CC(G)=0:DD(G)=0:EE(G)
=0:FF(G)=0
15 NEXTG
16 G=0
17 G=G+1:IFG>PTHEN16
18 GOSUB2000
20 GOSUB3000
21 PRINTN$(G)" YOUR GO"
22 PRINTD$(6);TAB(1)D$(6);TAB(2)D$(6);TA
B(3)$(6);TAB(4)D$(6)
23 PRINT:PRINT:PRINTTAB(2)"1":TAB(5)"2";
TAB(8)"3";TAB(11)"4";TAB(12 )"5'
24 R1=0:R2=0:R3=0:R4=0:R5=0:R6=0:T=0
25 GOSUB27
26 GOTO35
27 PRINTCHR$(30):FORZ=1TO12:PRINT:NEXT:P
RINT"A 2 PAIRS     "TAB(14) S1(G)
28 PRINT"B 1 PRILE      "TAB(14)S2(G)
29 PRINT"C 1 4-FOLD     "TAB(14)S3(G)
30 PRINT"D 1 POKER      "TAB(14)S4(G)
31 PRINT"E 1 5-FOLD     "TAB(14)S5(G)
32 PRINT"F 1 YHATZI     "TAB(14)S6(G)
33 PRINT" TOTAL         "TAB(14)TS(G)
34 RETURN
35 IFT>3THEN17
36 PRINTCHR$(30):FORZ=1TO20:PRINT:NEXT:P
RINT" HIT <T> KEY              "
37 GETQ$:IFQ$=""THEN37
38 IFQ$<>"T"THEN37
39 PRINT"
40 T=T+1
41 GOSUB57
42 A=D(1):B=D(2):C=D(3):D=D(4):E=D(5)
43 PRINTCHR$(30):FORZ=1TO7:PRINT:NEXT:PR
INTD$(A);D$(B);D$(C);D$(D); D$(E)
44 PRINTCHR$(30):FORZ=1TO20:PRINT:NEXT:P
RINT"  HOLD NUMBERS      "T
45 INPUTH$:PRINT"                    "
46 IFLEFT$(H$,1)="S"THEN68
47 FORI=1TO5
48 Z$=MID$(H$,I,1)
49 Z=VAL(Z$)
50 IFZ=1THENR1=1
51 IFZ=2THENR2=1
52 IFZ=3THENR3=1
53 IFZ=4THENR4=1
54 IFZ=5THENR5=1
55 NEXTI
56 GOTO35
57 IFR1=1THEN59
58 D(1)=INT(RND(1)*6)+1
59 IFR2=1THEN61
60 D(2)=INT(RND(1)*6)+1
61 IFR3=1THEN63
62 D(3)=INT(RND(1)*6)+1
63 IFR4=1THEN65
64 D(4)=INT(RND(1)*6)+1
65 IFR5=1THEN67
66 D(5)=INT(RND(1)*6)+1
67 RETURN
68 PRINTCHR$(30):FORX=1TO20:PRINT:NEXTX:
PRINT"HOW WOULD YOU LIKE TO
 SCORE ?"
69 GETSC$:IFSC$=""THEN69
70 QQ=ASC(SC$)-64
71 IFQQ>6ORQQ<1THEN68
72 ONQQGOTO73,84,95,107,122,127
73 CK=0:IFAA(G)=1THEN81
74 FORU=1TO10
75 READK:READL
76 IFD(K)=D(L)THENCK=CK+1
77 NEXTU
78 RESTORE
79 DATA1,2,1,3,1,4,1,5,2,3,2,4,2,5,3,4,3
,5,4,5
80 IFCK=2THEN82
81 GOTO145
82 S1(G)=(A+B+C+D+E)*10
83 AA(G)=1:GOTO144
84 CK=0:IFBB(G)=1THEN92
85 FORU=1TO10
86 READK:READL:READM
87 IFD(K)=D(M)ANDD(K)=D(L)ANDD(L)=D(M)TH
ENCK=1
88 NEXTU
89 RESTORE
90 DATA1,2,3,1,2,4,1,2,5,1,3,4,1,3,5,1,4
,5,2,3,4,2,3,5,2,4,5,,4,5
91 IFCK=1THEN93
92 GOTO145
93 S2(G)=(A+B+C+D+E)*15
94 BB(G)=1:GOTO144
95 CK=0:IFCC(G)=1THEN104
96 FORU=1TO5
97 READK,L,M,N
98 IFD(K)=D(L)ANDD(K)=D(M)ANDD(K)=D(N)AN
DD(L)=D(M)ANDD(L)=D(N)THEN9
8
99 IFD(M)=D(N)THENCK=1
100 NEXTU
101 RESTORE
102 DATA1,2,3,1,2,4,1,2,5,1,3,4,1,3,5,1,
4,5,2,3,4,2,3,5,2,4,5,3,4,5
103 IFCK=1THEN105
104 GOTO145
105 S3(G)=(A+B+C+D+E)*20
106 CC(G)=1:GOTO144
107 CK=0:IFDD(G)=1THEN119
108 FORU=1TO10
109 READK,L
110 IFD(K)=D(L)THENCK=CK+1
111 NEXTU
112 FORU=1TO10
113 READK,L,M
114 IFD(K)=D(L)ANDD(K)=D(M)ANDD(L)=D(M)T
HENCK=CK+1
115 RESTORE
116 DATA1,2,1,3,1,4,1,5,2,3,2,4,2,5,3,4,
3,5,4,5,1,2,3,1,2,4,1,2,5
117 DATA1,3,4,1,3,5,1,4,4,2,3,4,2,3,5,2,
4,5,3,4,5
118 IFCK>3THEN120
119 GOTO145
120 S4(G)=(A+B+C+D+E)*25
121 DD(G)=1:GOTO144
122 CK=0:IFEE(G)=1THEN124
123 IFA=BANDA=CANDA=DANDA=EANDB=CANDB=DA
NDB=EANDC=DANDC=EANDD=ETHEN
125
124 GOTO145
125 S5(G)=(A+B+C+D+E)*30
126 EE(G)=1:GOTO144
127 CK=0:IFFF(G)=1THEN141
128 J(1)=A:J(2)=B:J(3)=C:J(4)=D:J(5)=E
129 FORI=1TO4
130 X=0
131 FORV=1TO4
132 IFJ(V)<=J(V+1)THEN137
133 W=J(V)
134 J(V)=J(V+1)
135 J(V+1)=W
136 X=1
137 NEXTV
138 IFX=0THEN140
139 NEXTI
140 IFJ(5)=J(4)+1ANDJ(4)=J(3)+1ANDJ(3)=J
(2)+1ANDJ(2)=J(1)+1THEN142
141 GOTO145
142 S6(G)=(A+B+C+D+E)*50
143 FF(G)=1
144 TS(G)=S1(G)+S2(G)+S3(G)+S4(G)+S5(G)+
S6(G)
145 GOSUB27
146 IFAA(G)=1ANDBB(G)=1ANDCC(G)=1ANDDD(G
)=1ANDEE(G)=1ANDFF(G)=1THEN
151
147 PRINT"         HIT (RET) KEY'
148 GETQQ$:IFQQ$=""THEN148
149 IFQQ$=CHR$(13)THEN17
150 GOTO148
151 CLS:PRINT" PLAYER"G;N$(G)" HAS WON"
152 FORG=1TOP
153 PRINTN$(G)TAB(14)TS(G)
154 NEXTG
155 END
2000 WAIT10
2010 PRINTCHR$(12)
2020 PRINTCHR$(4);CHR$(27);"N
   YHATZI"
2030 PRINTCHR$(4)
2040 RETURN
3000 PRINT
3010 PRINT"Converted from a (VIC-20) pro
gram by"
3020 PRINTTAB(10)"Robert Dutton":PRINT:P
RINTTAB(10)"15/3/83'
3040 WAIT500
3050 CLS
3060 RETURN
```

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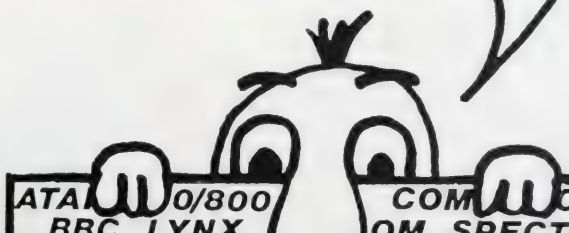
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An E-XPANDED-D screen presentation with superb action packed space thriller, written entirely in machine code with four action packed stages. To destroy the power source of Xeno II, you have to fight off waves of robot attack, plasma bombing by the legions of the outer sanctum and finally attack the power source protected by a force field, continuous bombardment by guardians and blockading by wild whirling suicidal space ships. Truly a game for all arcadians

JS **VIC 20** **16K** **£7.90**

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All M/C version of SCRAMBLE. Lasers, bombs, continuous scoring and sound effects give all the thrills of arcade game. Pilot your space ship through the tortuous tunnels and caverns destroying enemy missile launchers, fuel dumps and airborne fire saucers. Four ships to complete mission. 10 skill levels

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All M/C version of Centipede. Homing spiders, mushroom laying fleas and multi-direction travel makes this game fast and furious, with 10 skill levels

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PHARAOH'S TOMB

Once you enter, the only way out is with the aid of a key which unlocks the mystery of the Pharaoh's tomb. Beware of the mantraps the ancient Egyptians so painstakingly built. One false move and you will meet the same fate as befell other tomb robbers over thousands of years. A multi-screen big graphical adventure with M/C movements

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Your starcruiser badly damaged in a meteor storm is forced to crash land on the planet ruled by ZOK, a time space generated image of Dracula. You are challenged to a battle of wits and endurance as the battle for survival starts in earnest in this big multi-screen graphical adventure in hi-res graphics and M/C movements.

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An E-XPANDE-D screen large graphics, rolling barrels, hammer, fireballs, lifts, handbags and umbrellas as you try to rescue the damsel Kong has abducted. Spectacular collapse of Kong's lair in the fourth screen. Uses all 21K of your expanded Vic for this 100% M/C thriller. Complete with high score table

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A stunning action packed game which uses all of your TV screen for the superb large animated graphics. Giant Space Hawks whirl and weave in intricate patterns as they drop their deadly homing mines which will destroy your base on contact. While you are busy defending yourself the Hawks will feed on your helpless population returning only their skulls. All M/C game complete with high score table that will blow your mind with its graphics and sound effects

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Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs

KB/JS	**VIC 20**	**Unexp.**	**£6**
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Count Dracula is asleep somewhere in his castle. He rises at midnight and you must find him and drive a stake through his heart before he rises. A multi-screen graphic adventure

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Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap, O's and X's, Word Jumble, Bomber, Duck Shoot and Mad Drivers

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At last a 3D game for the VIC! Although badly wounded, you are determined to seek and destroy the marauding space pirates who have now dispersed around the galaxy in search of fresh prey. A brilliant Startrek game with a difference — spectacular 3D graphics and real arcade actions

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We are looking for top class writers to join our growing software team. If you have written a quality game for VIC 20, SPECTRUM, DRAGON 32, ORIC 1 or COMMODORE 64, then contact us. We pay top royalties for accepted programmes.

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HARDWARE

THE TOP 10 MICROS

There are so many low-cost home computers on the market that it can be something of a nightmare when you decide to go out and buy one.

In the launch issue of *Personal Computing Today* way back in August of last year we ran an article on 12 of the most popular micro computers then on sale. It turned out to be so popular that we are doing a similar feature this month. And this is it. What follows is a run-down on all the salient facts about the top 10 best selling machines.

So often newcomers to computing find themselves awash in a sea of confusion regarding the facts and figures about home computers. We hope this article will help you decide which computer best suits your needs both computing wise and financially speaking.

At the end of the feature you'll find a comprehensive table full of facts about each computer mentioned in the article. Using this we hope you will be able to make good comparisons of the different computers included in the article.

When you have made up your mind which computer you want to buy just go along to your local computer dealer or high street hi-fi/ electrical retailer to see what they've got in stock.

Atari 400



The Atari 400 is the cheaper of the two machines from Atari that are on sale in this country at the moment. Despite its age it still offers some of the best graphics and sound available on any micro. If you are considering buying a micro with games playing in mind then you should give the Atari 400 considerable scrutiny.

The 400 comes with 16K of RAM built in but no provision made for expansion by the user. This is, however, not as restrictive as it sounds because many Atari dealers will internally upgrade the Atari 400 to either 32K or 48K when you buy it. Of course, you will have to ask your dealer to do this and pay the set fee.

The major criticism levelled at the Atari 400 is the provision of a flat touch-sensitive keyboard. Given that the keyboard fitted to the computer is one of the best of this sort available it still becomes tiresome using it, especially if you have large amounts of data or long programs to key in. Once again there are replacement keyboards available which can be fitted, but they are not standard.

The Atari computers have a large following in America and this has produced quite a substantial software base. Most of this software is comprised of games, and very high quality they are too.

The BASIC which is resident in the machine is of Atari's own devising. It bears a close resemblance to standard Microsoft, but includes commands to easily access the graphics and sound. There is also a version of Microsoft BASIC which is available for the computer.

The Atari computers, like the VIC, need their own cassette decks for program storage. This does make cassette saving and loading a lot more reliable but unfortunately adds nearly £50 to the price of a basic system.

This computer is a good buy for anyone wishing to surpass even the most powerful dedicated games system and have a computer as well.

Address: **Atari UK Ltd**
Atari House
Railway Terrace
Slough Berkshire
SL2 5B2

Price: **£159.99**



BBC Model B

The BBC Micro was produced by Acorn computers under commission from the BBC itself as a computer around which they could base their computer project. Because of this backing the BBC Micro is one of the most comprehensive computers available in the price range. It offers very powerful graphics and sound which are complemented by a superb version of BASIC. BBC Basic contains virtually every command you could ever want on a micro.

The BBC Micro is offered in two versions, the Model A and the Model B. The Model A has 16K of RAM and fewer interfaces than the 32K Model B. Because of this the top two graphics modes are not available on the Model A. Most of the best software written for the BBC Micro will only run on the Model B so it makes sense to buy this version if your budget will stretch to it.

Another point in the BBC Micro's favour is that it is very quickly becoming the standard computer for use in schools. This has lead to a lot of software being developed for both class and home tutorial. On the whole the quality of the software produced so far has been very good.

The BBC Micro is also well supported with peripherals. Already there are many companies producing disc drives, printer interfaces, joysticks and other add-ons for use with this computer.

One criticism which has been levelled at the BBC Micro is that the machine's operating system has been upgraded several times since its launch. This has caused a few problems with software, as programs written for one operating system will not always work on another.

In conclusion, if you can afford to buy the BBC Model B you are assured of a machine that will cater for almost all your needs and will grow with your demands on it.

Address: BBC Microcomputer Systems
PO Box 7
London W3 6JX

Price: £399

Commodore 64



The '64 is the latest machine to emerge from the Commodore stable. It was designed to fill the gap left by the VIC's move to the lower end of the market and the ascension of the PET to the dizzy heights of business computing. In many respects it functions like an uprated VIC, featuring more memory, larger screen and better sound. However, despite Commodore having had the time to learn from the mistakes they made with the VIC, e.g. small screen size, lack of memory, they have still decided to leave some of the VIC's idiosyncracies in the '64.

Perhaps the best example of this is within the graphics and sound operation of the machine. The '64 features vastly superior sound and graphics capabilities but unfortunately it does not provide any specialised commands to handle them. Everything to do with the sound and graphics has to be achieved by POKEing and PEEKing positions in the memory map, a time consuming and needless task.

Software support for the Commodore '64 started slowly but is now starting to pick up. As with other machines in the Commodore range, software is being converted from previous machines to run on it.

As the name suggests, the '64 contains 64K of RAM, although not all of this is available to the user. Because of the way in which the machine has been designed it is very easy to run alternative languages such as FORTH or PASCAL on it. As mentioned earlier the '64 features excellent graphics and sound. It can support up to eight sprites (moveable characters giving a 3-D effect) and it includes a three voice sound synthesiser chip which make it one of the best machines for people wishing to explore music on a micro.

Because of its large memory and 40 column screen, the Commodore 64 has found favour with people looking for a computer which can also be used as a small business machine. To this end there are some good quality business software packages on the market for the '64.

While it is a powerful home computer the Commodore 64's price does put it outside the class of micro's usually chosen as a first machine. However, it is a good choice as a machine to upgrade to.

Address: Commodore Business
675 Ajax Avenue
Slough
Berkshire

Price: £350

HARDWARE

Colour Genie

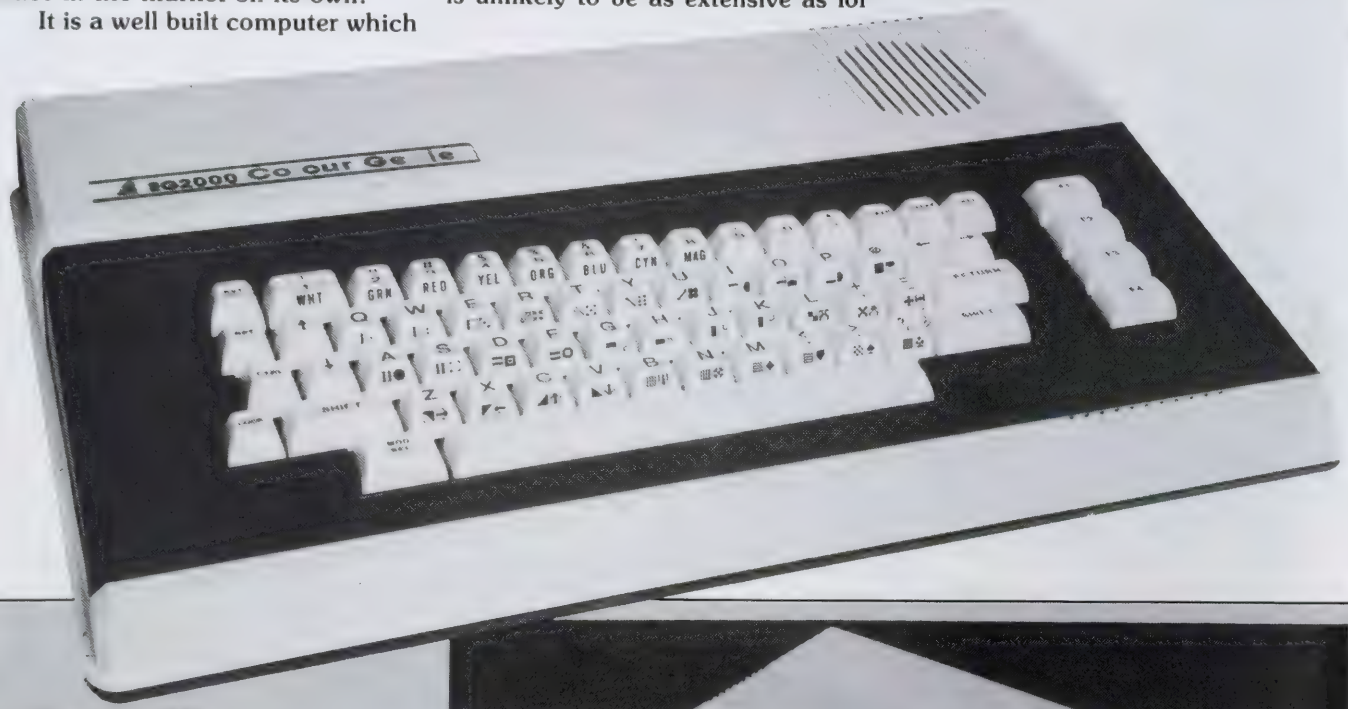
The Colour Genie hails from the Far East. It is the latest in a long line of Genie computers. The early Genie's were originally copies of the successful Tandy computers. The Genie bears a passing resemblance in the way it operates to the Dragon and the Tandy Colour, but is sufficiently different to warrant a place in the market on its own.

It is a well built computer which has a good quality keyboard. The BASIC is sufficient for most purposes and the manual is fairly adequate. Graphics and sound are reasonable. The BASIC provides some quite useful commands for manipulating graphics shapes on the screen.

Unfortunately, because the Colour Genie is regarded as a minority machine, the software support for it is unlikely to be as extensive as for other machines. For the enterprising programmer it should be possible to convert published listings for the Dragon or Tandy Color to run on the Colour Genie.

Address: **Lowe Computers**
Bentley Bridge,
Chesterfield Road,
Matlock
Derbyshire DE4 5LE

Price: **£499**



Dragon 32

The Dragon 32 was designed as a low-cost colour computer for people who want something a little more robust than a Sinclair machine. It is housed in a high quality plastic case and sports a typewriter style keyboard. It has 32K of RAM onboard and will accept expansion cartridges to the memory.

The resident BASIC is extended Microsoft colour BASIC. While this is a powerful language, some of the commands are quite complex and could provide some headaches for beginners. This is not helped by the manual which is involved and hard to understand in places, even if you know something about computers.

The quality of the graphics and sound are not as good as many other micros, but they are still usable. The Dragon does have the advantage of being able to accept software both on tape and cartridge, thus pushing its standing as a games machine up.

Once again software support for the Dragon has been slow to appear, but this is countered by its similarity to the Tandy Colour Computer. Both machines have nearly identical BASICs which make conversion of software from one to the other a relatively simple task. In some cases it is even possible to use one machines' software directly on the other.

The Dragon is certainly worth looking at as a first computer, but you could be in for a little bit of a struggle as you work your way through the manual.



Address: **Dragon Data**
Kenfig Industrial Estate
Margan,
Port Talbot
West Galmorgan
SA13 2PE

Price: **£199**

Texas TI99/4a

The TI99/4a has had a chequered past. It was released initially in a form that would only work on NTSC (American) standard television. Subsequently it has been released in a PAL version to make it compatible with the British television system. It is the only micro in this price range that is based around 16 bit central processor. Unfortunately, due to a poor design the speed advantage which a 16 bit processor usually brings is lost and the TI99/4a is in fact slower than most other micros.

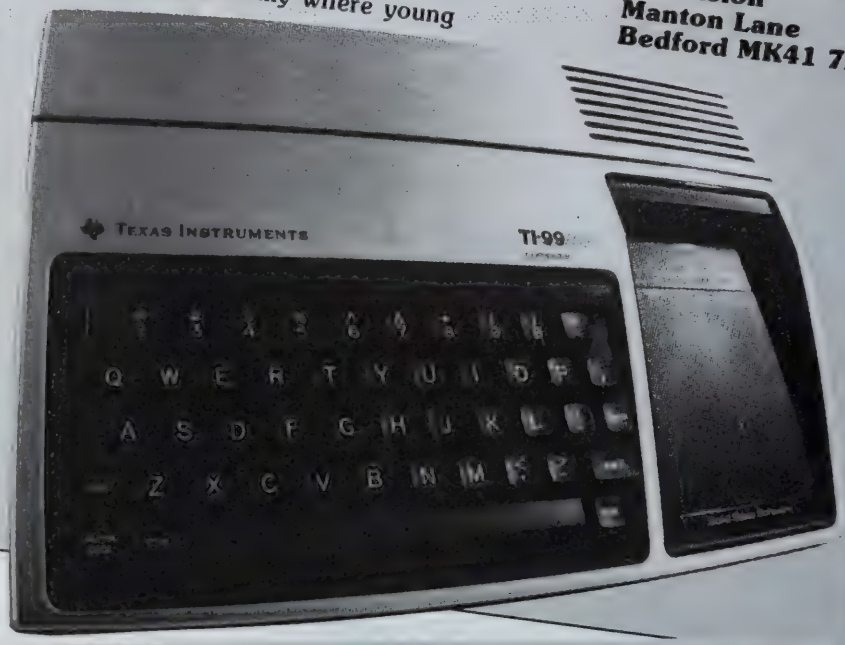
The BASIC which is resident in the machine is not the industry standard Microsoft. It offers a good, well documented range of commands to control the graphics and sound, along with normal BASIC functions. Texas also sell an Extended Basic cartridge which provides commands to control some of the TI994/a's more advanced graphics features, such as sprites. These are characters which can be moved around the screen giving a 3-D effect.

Texas also produce a comprehensive range of peripherals for use with the computer. As a rule the TI99/4a is quite expensive to expand.

Software for the computer comes mainly from Texas themselves and is good quality but the range is small. Quite a lot of the software is designed for educational use. This coupled with the provision of the educational LOGO language makes the TI99/4a a useful educational tool, especially where young children are concerned.

Overall the TI/99/4a is not one of the best computers around but its low price makes it a viable choice as a first micro. TI cut the price by £50 a few months ago which has increased its sales figures.

Address: Texas Instruments
European Consumer Division
Manton Lane
Bedford MK41 7PA



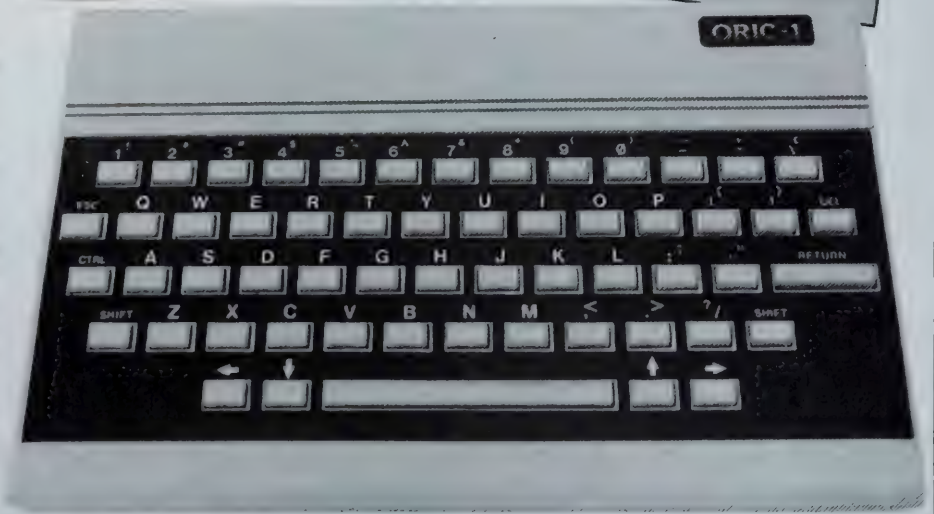
Oric-1

The Oric-1 is the first micro which could prove to be a serious rival to Sinclair's computers. Similar in price and specification to the Spectrum, the Oric-1 was designed by Tangerine, a company which entered the computer field back in the days when owning a personal computer meant you had to be good with a soldering iron.

Oric Products makes the machine in two versions based on the same computer. One comes with 16K of on-board memory, the other has 48K of memory. Obviously, it is more expensive but for those of you who want to write and store long programs it would be worth spending the extra cash.

The Oric-1 features a push-button keyboard which is certainly better than a touch sensitive keyboard, but is not quite good enough to allow you to touch type. Each key produces an audible tone through the inbuilt loudspeaker when pressed.

The computer is well supplied with interfaces. These include RGB monitor output, Centronics printer interface, expansion port and cassette output. The BASIC contained in the machine is once again fairly standard and includes commands to produce sound and high resolution graphics. The Oric is also fairly unique in having a set of onomatopoeic sound commands such as ZAP and PING.



Software development for the Oric got off to a slow start, mainly due to the number of bugs present in the early machine's operating system. But like the Spectrum, as more Orics are sold the incentive for software companies to bring out oric compatible products increases, so I do not think there will be any great software shortage just yet.

On the whole the Spectrum still has as slight edge over the Oric, but the Oric does provide a viable alternative to those who do not wish to partake of the Sinclair syndrome.

Address: Oric Products International
Coworth Mansion
Coworth Park
London Road
Sunninghill
Ascot
Berkshire SL5 7SE
Price: £99 or £169 (48K version)

HARDWARE

VIC 20



Over the past year the VIC has reached the status of being one of the most popular computers on sale in Britain. It is small, cheap and user-friendly. One of its most commendable features is that it is one of the few machines in its price bracket which offers a typewriter style keyboard.

The VIC 20 has a noble lineage, being created by the same company which produced the well respected PET series of computers. Because of this heritage it has a big software and peripherals base already established. A large number of the people who produced software and add-ons for the PET have now expanded their operations to cover the VIC 20.

Perhaps the two biggest criticisms of the VIC are the lack of memory supplied with unit and the restrictive screen size. The memory problem is aggravated by the relatively expensive cost of additional memory and the fact that when the machine is expanded software which has been written for one memory size will not run on a different size machine. The VIC is also not capable of high resolution graphics in its standard form. This can be achieved, however, through the addition of an expansion cartridge, or through writing your own software package.

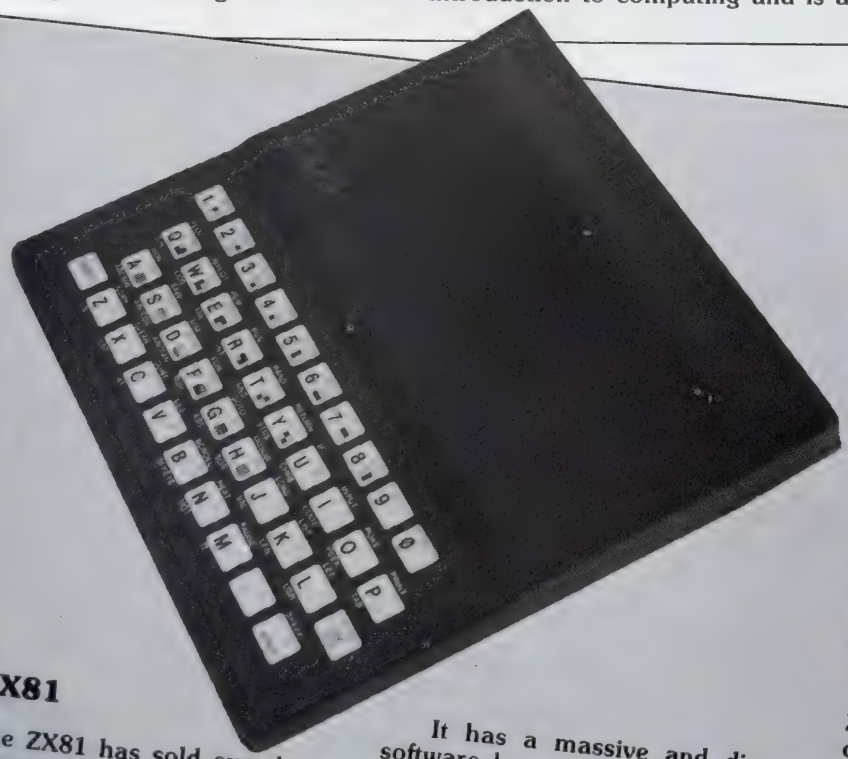
The VIC is used in many schools, so if you are buying a micro for your children to use it may be worth checking whether the school has a VIC.

On the whole the VIC is a good introduction to computing and is a reliable, well supported computer.

Commodore is now offering a special deal costing £139.99. It consists of a VIC-20 with cassette deck, Introduction to BASIC Part I and four cassette games.

Address: Commodore
Business Machines
675 Ajax Avenue
Slough
Berkshire

Price: £129.99



ZX81

The ZX81 has sold over half a million units in Great Britain since its launch and is still selling at the phenomenal rate of thirty thousand a month. This makes it the most popular home computer on sale to date.

It has a massive and diverse software base. You can guarantee finding software to cover virtually every task you ask of it. Its appearance on the market has spawned hundreds of small firms who make peripherals and add ons. It is possible to turn the ZX81 into a quite sophisticated system by just plugging extra units into it.

The basic machine offers 1K of onboard RAM and a black and white display. The touch sensitive keyboard is difficult to use and has become the major point of criticism about the computer. Another part of the design which has caused dissatisfaction has been the connection to the expansion RAM pack. When fitted, most RAM packs have a tendency to wobble about resulting in the loss of any program in the computer.

If you are considering buying a ZX81 as the basis of your computer system you must take into account the cost of the extra peripherals — such as a replacement keyboard and RAM pack — as these can add up to the cost of the ZX81 itself.

It only remains to say that the ZX81 is still the best introduction to computing. It certainly is a cheap way to find out if you are going to enjoy computing or not.

Address: Sinclair Research
6 Kings Parade
Cambridge CB2 1SN

Price: £39.95

ZX Spectrum

What more can be said about the Spectrum. It surely is one of the most publicised home computers on sale.

Despite early supply problems this must be the one of the most popular computers on sale. For a relatively cheap price it offers all the functions which most people require from a computer.

On the basic machine you have colour, sound, high resolution and definable graphics. The standard memory of 16K is enough for most people to progress a fair way with their programming and even if this is restrictive there are plenty of upgrades available to take the machine to 48K.

Because of the support industries which sprang up around ZX81, the Spectrum is now very well catered for. Almost everyone who produced add-ons or upgrades for the ZX81 has now produced a Spectrum version of the same product. The same goes for software. Companies like Quicksilva and Psion all had software for the Spectrum ready very shortly after its launch. The Spectrum has been blessed with some really first class software. Games such as Quicksilva's Timegate, and Penetrator from Melbourne House have stretched the limits of the Spectrum to the extreme and offer a good arcade quality feel.

The two main criticisms of the Spectrum are its keyboard and the general reliability of the computer. The keyboard is constructed out of rubber and is mounted on a touch sensitive base. This puts it slightly above the ZX81's keyboard put it is still not good enough to touch type on. The Spectrum is prone to many faults, from colour failure to total demise. Luckily Sinclair seems to be improving its after sales service so replacement of faulty machines is not as traumatic as it used to be.

Overall you cannot beat the Spectrum as a low cost introduction to computers.

Address: Sinclair Research
6 Kings Parade
Cambridge CB2 1SN

Price: £125



COMPARISON TABLE

	Standard Memory	Maximum Memory	Text Format	Colours Available	High Resolution Graphics	Highest Resolution	User-definable Graphics	No. of Sound Channels	Documentation	Suitability as First Computer	Suitability as Games Computer	Suitability as Business Computer	Software Support	Average Price
Atari 400	16K	48K	40c 24r	256f 256b	Yes	320 192	Yes	4	6/10	7/10	9/10	4/10	9/10	£160
BBC Model B	32K	32K	80c 30r	8f 8b	Yes	640 256	Yes	4	9/10	8/10	8/10	7/10	8/10	£399
Colour Genie	16K	32K	40c 24r	8f 8b	Yes	160 96	Yes	3	5/10	7/10	6/10	6/10	5/10	£224
Commodore 64	64K	64K	40c 25r	16b 16f	No	N/A	Yes	3	4/10	7/10	8/10	7/10	6/10	£399
Dragon 32	32K	64K	32c 16r	8f 8b	Yes	256 192	No	1	4/10	7/10	6/10	6/10	6/10	£200
Oric-1	16K	48K	40c 28r	8f 8b	Yes	240 200	Yes	3	5/10	8/10	7/10	4/10	5/10	£100
Texas TI 99/4a	16K	52K	32c 24r	16f 16b	No	N/A	Yes	4	6/10	7/10	7/10	4/10	5/10	£150
VIC 20	5K	32K	22c 23r	8f 16b	No	N/A	Yes	4	5/10	8/10	7/10	4/10	7/10	£170
ZX81	1K	16K	32c 24r	N/A	No	N/A	No	0	7/10	8/10	6/10	3/10	9/10	£40
ZX Spectrum	16K	48K	32c 24r	8f 8b	Yes	256 192	Yes	1	7/10	9/10	8/10	4/10	9/10	£125

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Atari

400 16K less BASIC	£149
400 48K less BASIC	£229
Basic Programmer Kit	£36
800 48K inc BASIC	£369
410 Cassette Deck	£47
810 Disk Drive	£279
850 RS 232 Interface	£130

Commodore

VIC-20 £117
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C2N Cassette £39
Commodore 64 £319
1541 Disk Drive £279

Texas

TI99/4A £147

Sinclair

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Epson

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Expansion Unit	£89

Osborne

01 Double Density	£1349
01 Double Density 80 col	£1479

Printers

EPSON RX80	£429
EPSON FX80	£589
RS 232 Interface	£68
Seikosha GP 100 A	£216
Seikosha GP 100 VC for Commodore	£239
Seikosha GP 250 X	£259
Smith-Corona TP1	£496

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Silver Reed EX44 (RS 232)	£489

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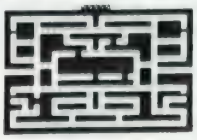
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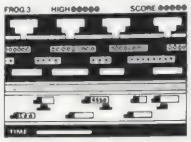
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VIC TIPS

Learn how to incorporate joysticks and paddles into your VIC programs.



What To Buy

'Games controller' is the posh name given to both joysticks and paddles. The VIC can accept a wide variety of different makes as well as from those sold under the Commodore logo so the choice is really up to you. All you need to consider when buying a controller for the VIC is that it is fitted with a nine pin D-type plug. The easiest way to determine this is to find out whether it is Atari compatible, as any controller which works with the Atari will also work with the VIC.

Once you have your controller the next problem is to use it in your own programs. Unfortunately the manual you get with your VIC has only the following words to say about the subject of games controls; 'The VIC Game Port allows you to hook up joysticks, light pens and paddles, so that you can easily play exciting arcade type games without having to use the keyboard.' Great, so you know it can be done — but how?

The rest of the manual gives no advice as to how you read the controllers and turn them into values which you an use in the program. This article will give you two programs which you can use as a basis for your own programs, as well as explaining a little bit of how you go about reading and using game controllers.

The joystick is the most common games controller used and probably the most effective. Most types are built with four switches inside which are closed when the joystick is moved to either North, South, East or West. The VIC has just one socket for games controllers and if you study the pin-out specification on page 149 of the VIC manual you will see that pins one to four are used to input the signal from these switches.

When you move the joystick to any one of the four diagonal positions then the two adjoining switches will be closed. For instance if you push the joystick to the North-East, then both the North and the East switch will be closed. This means that with a four switch joystick, a total of eight positions can be read.

First Steps

To start the process of reading the joystick you must understand the function of a few memory locations in the VIC. The first pair of these are called Data Direction Registers. Their function is to tell the VIC which of the pins on the games port are being used to input information and which of the pins are being used to output information. This is achieved by having each bit of the DDR byte representing the state of the one of the pins. If a bit is set to one then the corresponding pin will be set for output. Conversely, if the bit is set to 0 then the pin will be configured for input.

For those of you who have experimented with user-defined graphics regarding the way in which a single number in a POKE statement can be broken down into its constituant bit values will hold no mystery. If however you have not encountered this yet it would be best to take it as read that the POKE numbers you see in the program will set the correct bits to their correct values.

If you are getting fed up with tangling your digits around your latest video game creation then it might be time to invest in a games controller for your VIC.

Getting Going

Unfortunately the four joystick pins on the VIC are controlled by two different Data Direction Registers and one of these is also involved with input of signals from the keyboard. This makes a life a little more complex but the problem is by no means insurmountable. Data Direction Register A which is located at 37139 contains the bits for the joystick pins 0,1 and 2, along with the bit for the joystick fire button. Register B which resides at 37154 contains the information for joystick pin 3. To set the first three pins and the fire button to be read register A is POKEd with a value of 0. Register B is POKEd with a value of 127 and when pin 3 has been read it is set back to 255. You may find that if you break the joystick

program when it is running you will lose the use of some of keys, to restore this press the RUN/STOP and RESTORE keys simultaneously.

Now we have set up the games port all we have to do is read and analyse the values from the joystick. To do this you have another two memory locations which serve as Input/Output ports. Port A contains the first three joystick pins and the fire button and port B contains the fourth pin. When the joystick is moved these locations are loaded with the values of the joystick switches. To get into a form where you can use them in the program you will have to get them out of these memory locations. This we do with the PEEK command.

Take A Peek

You could just PEEK the values and use a statement like: IF PEEK(37137) = 4 THEN ... For the sake of clarity in the program I have analysed the PEEK value so as to end up with a value which is 0 if the joystick switch is open and a value of 1 if it is closed. This you can see in lines 2080-2110 and 2030. Rather than go into the intricacies of local ANDs I think it is best that you just use this in your programs.

The example program shows a diagramatic representation of a joystick. When the stick is moved to any one of the four primary positions then it is shown on the diagram. In lines 4000-4060 you can see how the four joystick positions and the fire button are analysed and the appropriate graphics are printed. Of course in your own programs this could be anything from steering a spaceship to moving a pacman type monster. The general routine is contained in lines 2000-2120 and line 20 sets up the variables. The variables will toggle between 1 for active and 0 for inactive. The following variables indicate the direction of joystick movement: JO = North, J1 = East, J2 = South, J3 = West and FR = Fire.

Paddle

The same rules for choosing joysticks apply to choosing paddles, that is as long as they have an Atari D-type connector and are Atari compatible, they will work. Reading the paddles is more or less the same as reading the joystick, except that instead of five switch values to read, you have the two values for the fire buttons and two digitised values for the position of each paddle.

The two values for the paddle positions are read in by the computer and placed in two registers within the VIC chip. They can be PEEKed out and used directly within a program. The values for the paddle position range from 0 to 255 and can be scaled to fit the requirements of your program.

To read the fire buttons on the paddles we have to go back and use the same methods as for the joysticks. To read button B you POKE the Data direction Register for port B with 127, read output register B and then reset the DDR to 255. To read output register A you must first POKE the Data Direction Register for port A with 0 and then PEEK the output register. Both the registers have been subjected to the logical AND so as to produce a value of 1 when the button is pressed and a value of 0 when it has not been pressed.

The example program once again contains a general routine which can easily be added to your own programs. The variables are set up in lines 20-70 and the reading and analysis routine is in lines 1000-1100.

Using these two programs it will be possible for you to add joysticks and paddles to any of your games.

PROGRAM LISTING

```
0 PRINT"♫■":POKE36879,8
10 REM JOYSTICK SETUP
20 D1=37139:D2=37154:RA=37137:RB=37152
30 U$="S▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶▶┼▮▮|▮▮┴"
35 UR$="S▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶▶| ▮▮ ▮▮─"
40 D$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶├▮▮|▮▮┼"
45 DR$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶─▮▮ ▮▮ "
50 R$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶|├┼"
55 RR$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶▶▶▶|   "
60 L$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶┼─┤"
65 LR$="S▯▯▯▯▯▯▯▯▯▶▶▶▶▶▶▶   |"
70 F$="S▯▯▯▯▯▶▶▶▶▶▶▶▶╯ ╰▮▮├,╯"
75 FR$="S▯▯▯▯▯▶▶▶▶▶▶▶▶,╭▮▮╰╯"
80 GOSUB3000
100 GOSUB 2000
110 GOSUB 4000
120 GOTO 100
2000 REM GENERAL JOYSTICK ROUTINE
2010 POKE D1,0:POKE D2,127:REM SET DATA DIRECTION REGISTERS
2020 REM READ JOY3 FIRST
2030 J1=-((PEEK(RB)AND128)=0)
2040 REM RESET D2
2050 POKE D2,255
2060 REM READ REGISTER A FOR OTHER POSITIONS
2070 R=PEEK(RA)
2080 J0=-((R AND 4)=0)
2090 J2=-((R AND 8)=0)
2100 J3=-((R AND 16)=0)
2110 FR=-((R AND 32)=0)
2120 RETURN
3000 PRINT"♫▯▯▯▶▶▶▶▶▶▶▶,─────────,"
3010 PRINT"▶▶▶▶▶▶▶|  ◠        |"
3020 PRINT"▶▶▶▶▶▶▶|  ◡        |"
3030 PRINT"▶▶▶▶▶▶▶|           |"
3040 PRINT"▶▶▶▶▶▶▶|    ╭─╮    |"
3050 PRINT"▶▶▶▶▶▶▶|    | |    |"
3060 PRINT"▶▶▶▶▶▶▶|    ╰─╯    |"
3070 PRINT"▶▶▶▶▶▶▶|           |"
3080 PRINT"▶▶▶▶▶▶▶|           |"
3090 PRINT"▶▶▶▶▶▶▶|           |"
3100 PRINT"▶▶▶▶▶▶▶╰───────────╯"
3110 RETURN
4000 REM PLACE DIRECTION
4010 IF J0=1 THEN PRINTU$:FORT=1TO400:NEXT PRINTUR$
4020 IF J1=1 THEN PRINTR$:FORT=1TO400:NEXT:PRINTRR$
4030 IF J2=1 THEN PRINTD$:FORT=1TO400:NEXT:PRINTDR$
4040 IF J3=1 THEN PRINTL$:FORT=1TO400:NEXT:PRINTLR$
4050 IF FR=1 THEN PRINTF$:FORT=1TO400 NEXT PRINTFR$
4060 RETURN
```

PROGRAM LISTING

```
10 REM SET UP VARIABLES
20 R1=36872
30 R2=36873
40 D1=37139
50 D2=37154
60 OA=37137
70 OB=37152:PRINT"♫"
80 GOSUB 1000
90 GOSUB 2000
100 GOTO 80
1000 REM READ PADDLES
1010 REM SET DATA DIRECTION REGISTER
1020 POKE D1,0
1030 P1=PEEK(R1)
1040 P2=PEEK(R2)
1050 REM CHECK FOR BUTTONS
1060 POKE D2,127
1070 B2=-((PEEK(OB)AND128)=0)
1080 POKE D2,255
1090 B1=-((PEEK(OA)AND16)=0)
1100 RETURN
2000 REM DISPLAY
2010 PRINT"S▯PADDLE (1)=■";P1;"▮    "
2020 PRINT"▯PADDLE (2)=■";P2;"▮    "
2030 PRINT"▯BUTTON (1)=■";B1;"▮    "
2040 PRINT"▯BUTTON (2)=■";B2;"▮    "
2050 RETURN
```

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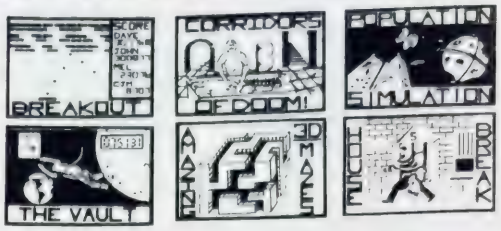
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ATARI SOFTWARE

SILVER SURFER

Rule the space waves with this fast and furious Atari game.



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In this game you take the part of the famous comic character, the Sliver Surfer. While you were flying through space on your silver surfboard you rediscovered the City of Ohmanu. When sweeping low for a closer look you discovered that you were trapped by some form of forcefield. However, each time you can reach the limits of the forcefield (or the top of the screen) you weaken it a little. If you reach it five times it is weakened enough for you to escape. One slip, though, and you will meet death on the hard roofs of the city below.

To help you in your task you have many silver surfboards on the screen. If you land on one of these it will carry you in the direction it is pointing. You also have golden lifts to aid you. These will carry you straight to the top of the screen. The game can be re-started by pressing the fire button.

This game has been made to run as fast as possible by making the main loop as short as possible and putting the rest of the program in subroutines. It uses the user-defined graphics facility of the ATARI, as this is much more effective than simple block graphics. It also uses graphics Mode one, as this allows more than one colour to be used at the same time. By use of the SETCOLOU comand to change the intesity of the screen colours the colours silver and gold can be achieved.

HOW IT RUNS

Line	Function
10-97	Define six characters (DH) as a lift, a surfboard pointing right, a surfboard pointing left, a man, a spike and a dead man. The data for these characters is stored in lines 1000-1060.
110	Clears the screen, setting it to graphics Mode 1 (four colours, double width characters). It also enables the graphics characters made up in lines 10-97 to be used.
120	Finds the location in the memory of the part of the memory used for the screen. This is stored in the variable SCREEN.
130	Sets the variable for the location of man to 10.
135	Places a row of spikes along the bottom of the screen.
140-220	Places surfboards and lifts randomly on the screen.
225	Places a surfboard pointing right on the screen underneath the man.
227	Sets the colours of the objects on the screen to:- Surfboards and surfer (upper-case characters): silver Lifts (lower case characters): gold Spikes (inverse upper-case characters): red Background: deep purple.
230	START OF MAIN LOOP Places man on the screen.
235	Turns off the sound if the man has reached the top of the screen.
240	Reads the joystick and stores the result in the variable D.
250-270	Check to see if the man has a surfboard or lift beneath him. If he has the program is sent to the relevant subroutine.
280	Checks to see if there is a space below the man. If he has he is moved down and a sound is made.
290	Checks for movement of the joystick (If D is 15 the joystick has not been moved) and sends the program to the movement routine at line 5000 if the stick has been moved.
310	Checks to see if the man has hit the bottom of the screen and sends the program to line 6000 if he has done so.
320	Checks to see if the man has reached the top of the screen. If he has his score is increased by one.
330	Sets the variable DROP to 1 if the man has fallen below the second line. Points can only be scored if DROP = 1.
340	Checks to see if the player has won yet. If he has the program is sent to the winning routine at line 7000.

350	END OF MAIN LOOP Returns to the start of the main loop at line 230.
1000-1060	Data for user-defined graphics characters.
2000	START OF SUBROUTINES FOR MOVEMENT BY SURFBOARD OR LIFT Subroutine for surfboard travelling right moves the man to the right.
2005	Makes a sound.
2010	Erases man character from the screen. Also erases the surfboard character.
2020	Places the surfboard below the man.
2030	Returns to main loop.
3000	(Subroutine for surfboard travelling left). Moves the man to the left.
3005-3030	Do the same as lines 2005-2030.
4000	(Subroutine for lift). Moves the man upwards.
4005-4030	END OF SURFBOARD SUBROUTINES Do the same as lines 2005-2030, but with lifts instead of surfboard.
5000	MOVEMENT SUBROUTINE
5010-5020	Check to see if the joystick is moved to the right or left, moves the man if it is and erases him from the screen.
5030	END OF MOVEMENT SUBROUTINE Returns to main loop.
6000	LOSING SUBROUTINE Puts a dead man on the screen.
6002	Blows a raspberry!
6004	Clears the screen setting it to graphics Mode 2 (double height double width characters). Position the cursor zero columns across and four rows down.
6005	Turns off the sound.
6010	Prints a message on the screen.
6020	Delays the program for a short while to prevent anyone who is holding the fire button down re-starting the game accidentally.
6030-6040	END OF LOSING SUBROUTINE Checks to see if the fire button is held down re-starting the game if it is.
7000-7040	WINNING SUBROUTINE Do the same as line 6004-6040 (but with a different message).

HINTS ON CONVERSION

At first sight this program appears almost impossible to convert. It is full of POKEs, which are almost certainly different for each machine. However all the POKEs are only concerned with two things. The first of these is making up the user-defined graphics characters. Machines with this facility are the VIC, BBC, Spectrum etc. Each of these machines make up graphics characters in approximately the same way, so the data in lines 1000-1060 should work for all of them. Only the area of memory this data is stored in should be changed.

The second function of the POKEs in the program is to place graphics characters on the screen. The screen in the graphics mode used (GRAPHICS 1) is 20 characters wide, so the parts of the program increasing or decreasing the variable MAN move the character down or up respectively. The area of the memory which is used for the screen is given in the ATARI in the memory locations 88 and 89. This varies depending on the memory size of the ATARI, but in the program the screen memory area is stored in the variable SCREEN, so it should work on any ATARI.

VARIABLES USED

P,N,DROP	Temporary storage variables.
SCREEN	Location of the screen memory in the ATARI memory.
MAN	Location of the man on the screen.
D	Variable containing the result of reading the joystick.
SCORE	Number of times the man has reached the top of the screen.

PROGRAM LISTING

```
 10  GRAPHICS 0
 20  POKE 106, PEEK (106)-8
 30  P = PEEK (106)
 40  N = P* 256
 60  FOR M = 0 TO 7: READ D: POKE N+D+(36*8),D: NEXT M
 70  FOR M = 0 TO 7: READ D: POKE N+D+(37*8),D: NEXT M
 80  FOR M = 0 TO 7: READ D: POKE N+D+(38*8),D: NEXT M
 90  FOR M = 0 TO 7: READ D: POKE N+D+(39*8),D: NEXT M
 96  FOR M = 0 TO 7: READ D: POKE N+D+(41*8),D: NEXT M
 97  FOR M = 0 TO 7: READ D: POKE N+D+(42*8),D: NEXT M
100  REM SET UP SCREEN
110  GRAPHICS 1+16: POKE 756,P
120  SCREEN = PEEK(88)+PEEK(89)*256
130  MAN = 10
135  FOR N = 420 TO 439: POKE SCREEN+N,169: NEXT N
140  FOR N = TO 10
150  M = INT(RND(1)*400): POKE M+SCREEN,100
160  NEXT N
170  FOR N = TO 10
180  M = INT(RND(1)*400): POKE M+SCREEN,37
190  NEXT N
200  FOR N = TO 10
210  M = INT(RND(1)*400): POKE M+SCREEN, 38
220  NEXT N
222  DROP=0: SCORE=0
225  POKE MAN+SCREEN+20,37
227  SETCOLOR 0,0,12: SETCOLOR 4,6,2: SETCOLOR 1,1,10: SETCOLOR 2,3,6
230  POKE MAN+SCREEN,39
235  IF MAN<21 THEN SOUND 0,0,0,0
240  D = STICK(0)
250  IF PEEK(MAN+SCREEN+20)=37 AND MAN<400 THEN GOSUB 2000
260  IF PEEK(MAN+SCREEN+20)=38 AND MAN>0 THEN GOSUB 3000
270  IF PEEK(MAN+SCREEN+20)=100 AND MAN>20 THEN GOSUB 4000
280  IF MAN  400 AND PEEK(MAN+SCREEN+20) = 0 THEN POKE MAN+SCREEN,0: MAN=MAN+20
     SOUND 0,MAN/2,10,8
290  IF D <>15 THEN GOSUB 5000
310  IF MAN>380 THEN 6000
320  IF MAN<40 AND DROP = 1 THEN SCORE = SCORE+1: DROP=0
330  IF MAN>40 THEN DROP=1
340  IF SCORE = 5 THEN 7000
350  GOTO 230
1000  DATA 126, 129, 129, 126,0,0,0,0
1010  DATA 1,2,252,0,0,0,0,0
1020  DATA 128, 64,63,0,0,0,0,0
1030  DATA 24,24,16,254,16,56,68,130
1050  DATA 0,0,16,16,16,56,134,254
1060  DATA 0,0,0,0,18,17,210,252
2000  MAN = MAN+1
2005  SOUND 0,5,0,8
2010  POKE MAN+SCREEN-1,0: POKE MAN+SCREEN+19,0
2020  POKE MAN+SCREEN+20,37
2030  RETURN
3000  MAN = MAN-1
3005  SOUND 0,5,0,8
3010  POKE MAN+SCREEN+1,0: POKE MAN+SCREEN+21,0
3020  POKE MAN+SCREEN+20,38
3030  RETURN
4000  MAN = MAN-20
4005  SOUND 0,5,0,8
4010  POKE MAN+SCREEN+40,0: POKE MAN+SCREEN+20,0
4020  POKE MAN+SCREEN+20,100
4030  RETURN
5000  REM MOVEMENT
5010  IF D = 7 AND MAN  400 THEN POKE MAN+SCREEN,0: MAN = MAN+1
5020  IF D = 11 AND MAN  0 THEN POKE MAN+SCREEN,0: MAN = MAN-1
5030  RETURN
6000  POKE MAN+SCREEN+20,42
6002  FOR N = 1 TO 125: SOUND 0,135,12,9: NEXT N
6004  GRAPHICS 2+16: POSITION 0,4
6005  SOUND 0,0,0,0
6010  PRINT £6; "YOU LOST!! HA! HA!!"
6020  FOR N = 1 TO 100: NEXT N
6030  IF STRIG(0) = 0 THEN 100
6040  GOTO 6030
7000  GRAPHICS 2+16: POSITION 6,4
7005  SOUND 0,0,0,0
7010  PRINT £6; "YOU WON!!"
7030  IF STRIG(0) = 0 THEN 100
7040  GOTO 7030
```



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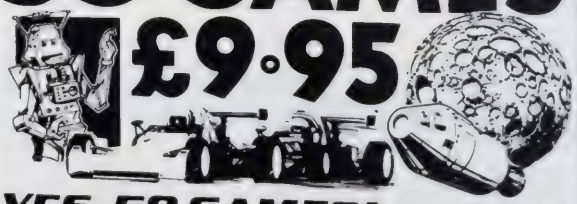
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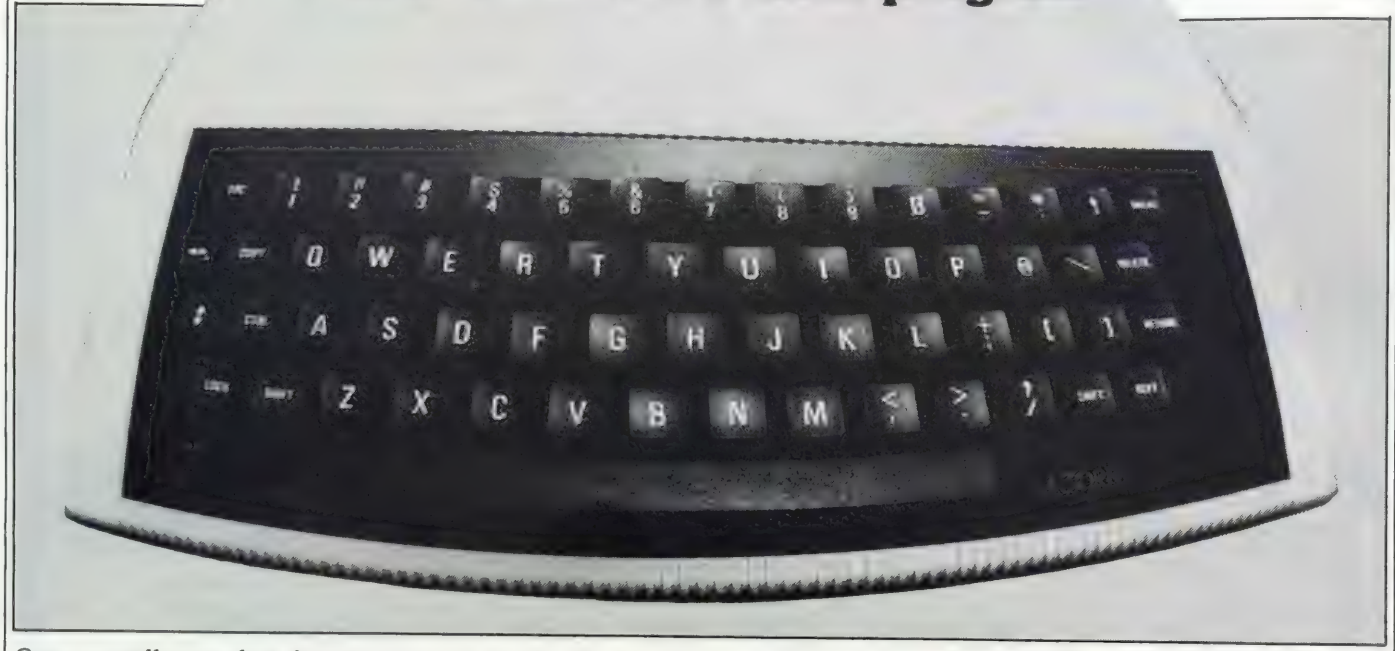
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MORSE CODE

Brush up on your dots and dashes with Chris Johnston's tutor program



Can you tell your dots from your dashes? No? Well, now is your chance to learn the art of one of the oldest secret languages, Morse Code.

This is purely a fun program for you and your family to play with. You'll find it very useful too for teaching the kids about computer programming in a painless way.

The program allows you to type in a sentence in Morse Code and the computer will almost instantly translate it for you. If you don't already own a book on Morse Code either go out and buy one or look at lines 310 — 345 of this program. They will give you the information you need.

Morse Code is easy to use, because all you need do is type in the Morse itself. The keys used are "." and "—" for "dot" and "dash" respectively. After each letter you key in you must hit the space bar and after each word hit RETURN.

The computer outputs the "dots" and "dashes" in three ways:
1. The "."'s and "—"'s
2. Short and long buzzes.
3. A flashing block in the top left-hand corner of the screen.

The program is easy to type in using the Atom's EDIT features from lines 310 — 345. If you prefer the program to translate letters to Morse, all that needs to be done is to change the key-in routine and lines 310-345.

Once you have the program in the computer's memory, type in the following famous sentence to check that everything is working ("/" denotes a new letter):

```
-/...././  --.-/../-/./-.-/-./-/  -.../.-./---/.--/-./
../--/-./-/  .---/./-/--/./--/./-/  ---/.../-/./.-./
-/...././  .-.././-/--././-.--/  -../---/--./
```

HOW IT RUNS

Line 20	Dimensions strings and array.
Line 30	Turns screen off.
Line 40	Assembles key-reading routine.
Line 50	Sets Q = 1 if printout wanted.
Line 70	Blank $A.
Lines 80-150	Main Loop.
Line 80	Links to assembler key-in routine, which outputs the key hit to the screen and stores the value of the key hit in ?L.
Lines 100-120	Calls subroutines: subroutine "a", if the "—" key was hit; subroutine "b", if the "." key was hit; put white block in top left-hand corner of the screen and "GOTO c", if the space bar was pressed.
Line 125	Moves cursor down two lines, if cursor is at the end of the line.
Line 130	Outputs to printer, if "ctrl-f" was pressed and if Q = 1
Line 140	Moves cursor down one line, if "return' has been pressed.

Subroutines

Subroutine "a"	loops 55 times, — placing a grey square in top left-hand corner of screen, and buzzing. Blank top left-hand corner of screen. Makes string A equal to string A plus string B.
Subroutine "b"	is as subroutine "a", except loops 15 times, and makes string A equal to string A plus string C.
Subroutine "c"	moves the cursor down one line and across one space and if Q has been set output to printer. Look at $A and print its Morse equivalent. Move on one space, if $A is not recognised. Turn off printer, move cursor up one line, and "GOTO g".
Subroutine "e"	prints out instructions.

Variables

A12	String for storing "."'s and "—"'s.
B1	"—" string.
C1	"." string.
LL0	Array for machine code.
L	Value of key pressed.
Q	If Q = 1 printout is wanted.
X	Variable used in loops.



HINTS ON CONVERSION

Use is made of the ATOM's abbreviations throughout the program. They are:
G. — GOTO
GOS. — GOSUB
P. — PRINT

The key-in routine could be replaced by a BASIC subroutine as long as it allows the key pressed to be output onto the screen and stores the value of the key in L. The ATOM has a different PEEKing and POKEing system from most micros. So replace "?#8000 = 32" with a "POKE" statement to the top left-hand corner of the screen with your computer's VDU code for a space. Other VDU codes are: "#FF"-a grey square, and "#7F"-a white square. The numbers with dollar signs in front of them are control codes and are, I believe, standard ASCII; "P.$21" turns the output to the screen off, "p.$6' turns the output to the screen on again. Other codes are given in the "HOW IT RUNS" section.

The "IF Q" statements in "ATOM BASIC" means "IF Q<>0". "$A" should be replaced by "A$' etc.
?#B003 = 4;?#B003 = 5" makes a buzzing sound. Make sure the two loops in lines 200 and 250 are of different duration.
"$A + LEN(A)" means in standard BASIC "A$ = A$ + B$" or similar statement. The "THEN" statement is not necessary in "ATOM BASIC", so add them were applicable. The same applies for the "LET" statement.

PROGRAM LISTING

```
  1 REM ---------------------
  2 REM                      !
  3 REM !  M O R S E        !
  4 REM !     C O D E       !
  5 REM !  by               !
  6 REM !    Chris          !
  7 REM !      Johnstone     !
  8 REM !                    !
  9 REM ---------------------
 10 GOS.e
 20 DIM A12,B1,C1,LL0,P-1:L=#80:Q=0
 25 REM Key Reading Routine
 30 P.$21
 40(:LL0)$8 #FFE3:STA L:N1S:)
 50 P.$6:INPUT"DO YOU WANT A PRINTOUT "$A';IFCH$A=CH"Y":Q=1
 60 INPUT"DO YOU WANT INSTRUCTIONS "$A';IFCH$A=CH"Y":GOS.f
 65 GOS.e
 70g$A=""
 75 REM Main Loop
 80hLINK LL0
 90 $B="-":$C="."
100 IF ?L=45 GOS.a
110 IF ?L=46 GOS.b
120 IF ?L=32:?#8000=#7F:G.c
125 IF(?#E0)=#1E)&(?#E0(#20) OR ?#E0)=#3C:P.$13$:0$:0
130 IF ?L=#6:IF Q : P.$20$:C:P.$3
140 IF?L=13 P.$10
150 G.h
195 REM Dash
200aFORX=0 TO 55:?#8000=#FF:?#B003=4:?#B003=5:NEXT:?#8000=32
210 $A+LEN(A)=$B
220 RETURN
245 REM Dot
250bFORX=0 TO 15:?#8000=#FF:?#B003=4:?#B003=5:NEXT:?#8000=32
260 $A+LEN(A)=$C
270 RETURN
295 REM Translation
300cP.$S$10:IFQ P.$3
310 IF $A=".-"P."A":G.c
311 IF $A="-...":P."B":G.d
312 IF $A="-.-.":P."C":G.d
313 IF $A="-..":P."D":G.d
314 IF $A=".":P."E":G.d
315 IF $A="..-.":P."F":G.c
316 IF $A="--.":P."G":G.d
317 IF $A="....":P."H":G.d
318 IF $A="..":P."I":G.d
319 IF $A=".---":P."J":G.d
320 IF $A="-.-":P."K":G.d
321 IF $A=".-..":P."L":G.d
322 IF $A="--":P."M":G.d
323 IF $A="-.":P."N":G.d
324 IF $A="---":P."O":G.d
325 IF $A=".--.":P."P":G.d
326 IF $A="--.-":P."Q":G.d
327 IF $A=".-.":P."R":G.d
328 IF $A="...":P."S":G.d
329 IF $A="-":P."T":G.d
330 IF $A="..-":P."U":G.d
331 IF $A="...-":P."V":G.d
332 IF $A=".--":P."W":G.d
333 IF $A="-..-":P."X":G.d
334 IF $A="-.--":P."Y":G.d
335 IF $A="--..":P."Z":G.d
336 IF $A=".----":P."1":G.d
337 IF $A="..---":P."2":G.d
338 IF $A="...--":P."3":G.d
339 IF $A="....-":P."4":G.d
340 IF $A=".....":P."5":G.d
341 IF $A="-....":P."6":G.d
342 IF $A="--...":P."7":G.d
343 IF $A="---..":P."8":G.d
344 IF $A="----.":P."9":G.d
345 IF $A="-----":P."0":G.d
350 P.$9
395 REM Return
400dP.$3
410 P.$11
420 G.g
495 REM Title
500eP.$12"   *MORSE CODE*"':R.
595 REM Instructions
600fP.$12"INSTRUCTIONS:"''
605 P."   KEYS:""       '-' → DASH""       '.' → DOT"''
610 P."   TYPE IN THE MORSE,HITTING THESPACE BAR AFTER EACH"
620 P." LETTER.""   AT THE END OF EACH WORD TYPE 'RETURN'."'
630 P."   IF YOU WANT A PRINTOUT""TYPE 'CTRL-F'."''
640 P."    ****PRESS*SPACE****":LINK #FFE3
650 RETURN
```

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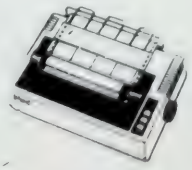
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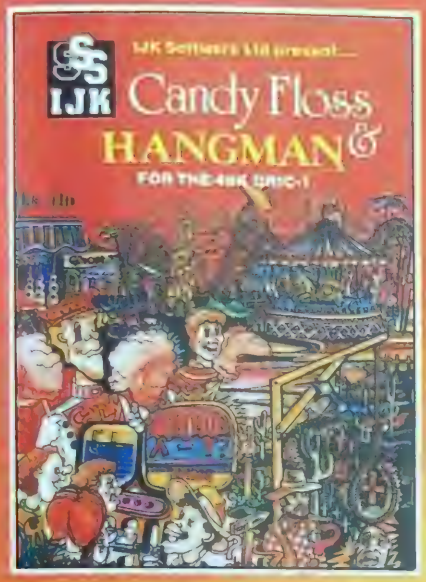
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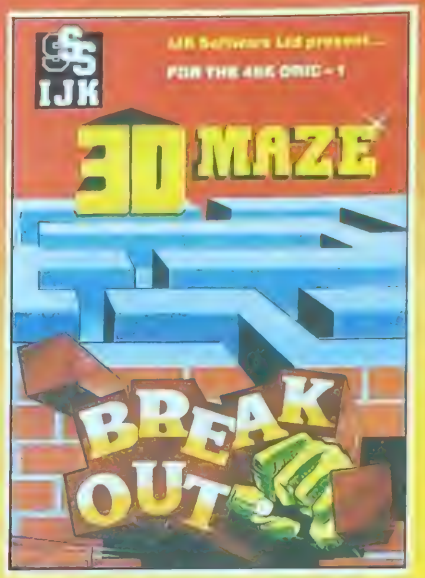
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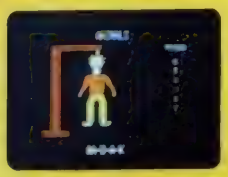




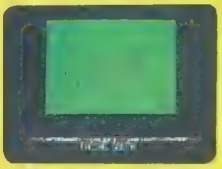




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The BBC Micro met their priorities exactly: it is economical yet fast and powerful, and it can justify the investment involved, through its capability to grow with the needs of the user and with the rapid changes in technology.

Teachers and education authorities agreed, and today it represents over three-quarters of all micros being ordered for schools across the country under the DOI scheme.

The BBC's choice too.

In choosing a machine to put their name to for their massive Computer Literacy Project, the BBC had the same set of priorities as the DOI. The BBC Micro is now an integral part of that project, which includes books, software, courses and a number of major television series, one of which, "Making the Most of the Micro" is now being broadcast.

All this for only £399.

The BBC Micro is light and compact. It generates high resolution colour graphics, and is capable of synthesising music and speech using its own internal speaker. The keyboard uses a conventional layout and typewriter feel.

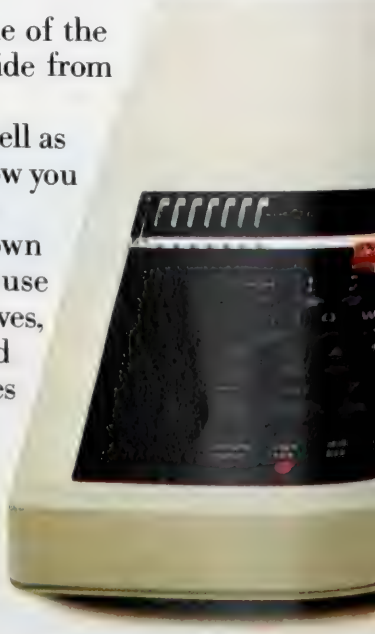
The most sophisticated version (called Model B) is available for only £399. (There is also a basic model available, the Model A, at £299.)

Designed to grow.

Last year the magazine "Which Micro?" said that the most attractive and exciting feature of the BBC Microcomputer was its 'enormous potential for expansion'.

This is indeed one of the features that sets it aside from the competition.

For example, as well as interface sockets to allow you to connect to a cassette recorder, and to your own television, you can also use video monitors, disc drives, printers (dot matrix and daisy wheel) and paddles for games or laboratory use.



You can also plug in ROM cartridges containing games with specialist application programs.

The Tube. A unique feature.

The Tube, which is unique to the BBC Micro, provides for the addition of a second processor via a high speed data channel. The possibilities are enormous. For example, the addition of a second

3MHz 6502 processor with 64K of RAM doubles processing speed. While a Z80 with 64K of RAM opens the door to a fully CP/M* compatible operating system, with all the benefits for business applications.

Linking up with other computers.

The BBC Micro also offers a facility of immense potential value to schools, colleges and businesses. It's called Econet® – a system which uses telephone cable to link with other BBC Micros. A number of machines can then share the use of expensive disc drive and printer facilities.

Make full use of Prestel & Teletext.

With special adaptors you will not only be able to turn your TV set into a Prestel terminal and Teletext receiver, but you can also take data and programs direct from these services. (The programs, which are known as telesoftware, are already being broadcast by BBC's Ceefax service.) This is another first for the BBC Micro.

BASIC plus.

A sophisticated version of BASIC has been chosen for the BBC Micro, which incorporates features normally found only in more advanced high level languages. However, there is also a facility allowing access through a simple command to another language – for example, PASCAL, FORTH and LISP.

*Trademark of Digital Research.



A full range of software.

Applications software for the BBC Micro already cover a very wide field. Packages covering games, education and business applications are available on cassette. All developed to the same high standards set by the hardware.

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PROGRAMMING TECHNIQUE

GRAPHICAL TEXT

Using both text and graphics on-screen at the same time is no easy task. John Hodgson takes you through it step by step.

Printing characters and using graphics on-screen at the same time ie. using graphics on-screen at the same time can be difficult to achieve. It can be done using the POSITION/PRINT command in the non-text modes.

Naturally, if you try to PRINT text in any of these modes, (3 to 11), then you won't get very far, under normal circumstances, because they don't have their own character sets. In which case you have to devise your own. Part of this program does just that, to a small extent.

So what happens if you try to PRINT text into graphics Mode 5 for example? Enter the following in direct mode, and you'll see:

```
GRAPHICS5/:?#6;"ABCDABCDABCD"
```

It's not much, but basically that's all you have to do. The letters A,B,C and D give you all the colours available in this mode. D is the same colour as the background. By arranging them in various ways, you can build up graphics display or even a character set.

POKEing Around

This program uses graphics Mode 10, in which there are 9 colours available, although it only utilises 7 of them. In the print sequences, numbers are used instead of letters. Table 1 gives a breakdown of how the colour of each number is controlled:

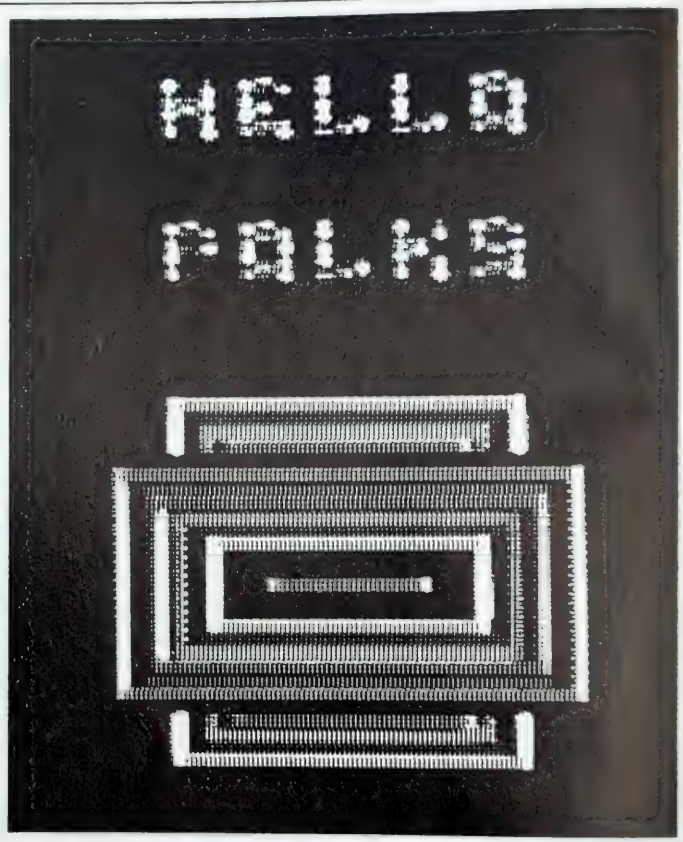
Table 1

NUMBER		COLOUR REGISTER	DEFAULT VALUE
0	controlled by	704 (same as background)	0
1	"	705	0
2	"	706	0
3	"	707	0
4	"	708	40
5	"	709	202
6	"	710	148
7	"	711	70
8 & 9	"	712	0

However I only want to use numbers 1 to 7, so the first thing I must do is POKE the colour values I want into the colour registers 705 to 711. The default values of 704 and 712 are both zero, so there is no need to adjust them.

Printing

By dimensioning A$ and B$, and filling them with a series of numbers, it is relatively easy to print them in order to obtain a pattern on the screen. The first part of the program PRINTs a column of each string, down either side of the screen, but with the strings stepped. This gives a multicoloured 'barber's shop pole' effect.



PRINTing Letters

The next part of the program is used to draw a set of characters. I wanted the letters to be three pixels wide, and 12 pixels deep. So what I had to do was PRINT a block of 36 pixels that would define each letter. This is achieved by PRINTing 12 lines of three numbers. By varying the sequence of numbers in each line, a set of multicoloured letters was obtained.

Each letter is held as a line of numeric data. A series of FOR/NEXT loops is used to retrieve the DATA and POSITION it on the screen, in the correct order.

Out Of Print

The next section goes back to using PLOT/DRAWTO commands, to produce a pattern of variously coloured rectangles in the empty space at the bottom of the screen. A bit of a cheat really. So to make amends, the last section of the program rotates the values of the colour registers. This sets the barber's shop pole into motion and shows the beauty of being able to draw a character set in graphics Mode 10.

HOW IT RUNS

Line 40 — Sets up colour register variables.

Line 50 — Enters graphics mode, and POKEs colour registers with required values.

Line 60 — Dimensions strings for column print section.

Line 70 — Prints columns down sides of screen. Steps in the printing of the columns are provided by 'A' (steps A$ to the left), and 'B'(steps B$ to the right).

Lines 80-90 — Print character set by retrieving data from lines 230-320, and positioning it on the correct part of the screen. The 'L' loop represents the number of letters in a word. Each word starts 29 screen columns in from the left. The first word starts on screen row 13. The 'R' loop increments the screen row position. As each letter is made up from 12 rows of numbers, the first word is printed from row 13 down to row 24. When each letter is complete, 'Z' increments the column position four pixels to the right. Allowing three pixels for each letter, and one pixel for the space between each letter. When the first word is finished, Z is reset to zero, so that the second word can start at column 29. The R loop in this case runs from 43 to 54. Otherwise the second word is printed in the same way.

Lines 100-140 — Use PLOT/DRAWTO to produce a series of rectangles, which are at first printed one inside the other. At the centre they start to grow outwards again.
Line 100 sets up initial co-ordinate values, and COLOUR of rectangle.
Lines 110 & 120 draw rectangle.
Line 130 changes co-ordinate values, and COLOUR of rectangle. Apart from determining COLOUR of rectangle, 'SET' counts the number of rectangles printed. At 24, SET jumps program to the next section.

Line 150 — Small time delay.

Lines 160-200 — Rotate colours through the colour registers. The GOSUBs to line 30 introduce a small time delay between each change, to make the colours 'move' smoothly.

List Of Variables

T — Time loop

COLOUR REGISTER VARIABLES:

YEL, RED, PUR, GRE, BLU, ORA, BLK

COLUMN PRINT ROUTINE VARIABLES:

A$, B$ — Used to store pattern
A, B — Used to form steps in A$,B$ printing
SKIP — Counts number of sections in routine. Jumps to next routine, when this one is finished.

CHARACTER PRINT ROUTINE VARIABLES:

L — Letter
R — Row (each letter has 12 rows)
Z — Letter spacing

PLOT/DRAWTO ROUTINE VARIABLES:

ULX, ULY — Upper left X,Y co-ordinates
URX, URY — Upper right X,Y co-ordinates
LRX, LRY — Lower right X,Y co-ordinates
LLX, LLY — Lower left X,Y co-ordinates
SET — Increments 'COLOUR' for PLOT/DRAWTO routine. When is reached, SET acts like SKIP and jumps to next routine. i.e. colour rotation.

PROGRAM LISTING

```
10 REM "PRINTING" IN GR.10
20 GOTO 40:REM BY JOHN HODGSON 1983
30 FOR T=0 TO 20:NEXT T:RETURN
40 YEL=250:RED=52:PUR=70:GRE=200:BLU=148:ORA=40:BLK=0
50 GRAPHICS 10:POKE 705,YEL:POKE 706,RED:POKE 707,PUR:POKE 708,GRE:POKE 709,BLU:POKE 710,ORA:POKE 711,BLK
60 DIM A$(18),B$(18):A$="111222333444555666":B$="666555444333222111"
70 B=18:FOR A=1 TO 18:? #6;A$(A,18);A$(1,A),,,,B$(B,18);B$(1,B):B=B-1:NEXT A:SKIP=SKIP+1:IF SKIP<10 THEN 70
80 FOR L=1 TO 5:FOR R=13 TO 24:READ N:POSITION 29+Z,R:? #6;N:NEXT R:Z=Z+4:NEXT L:Z=0
90 FOR L=1 TO 5:FOR R=43 TO 54:READ N:POSITION 29+Z,R:? #6;N:NEXT R:Z=Z+4:NEXT L
100 ULX=29:ULY=80:URX=47:URY=ULY:LRX=URX:LRY=160:LLX=ULX:LLY=LRY:SET=1
110 COLOR SET:PLOT ULX,ULY:DRAWTO URX,URY:DRAWTO URX,URY+1:DRAWTO ULX,ULY+1:DRAWTO ULX,ULY+2:DRAWTO URX,URY+2
120 DRAWTO LRX,LRY:DRAWTO LLX,LLY:DRAWTO LLX,LLY-1:DRAWTO LRX,LRY-1:DRAWTO LRX,LRY-2:DRAWTO LLX,LLY-2
130 DRAWTO ULX,ULY+1
140 ULX=ULX+1:ULY=ULY+3:URX=URX-1:URY=ULY:LRX=URX:LRY=LRY-3:LLX=ULX:LLY=LRY:SET=SET+1:IF SET<24 THEN 110
150 FOR T=0 TO 500:NEXT T
160 POKE 705,YEL:POKE 706,RED:POKE 707,PUR:POKE 708,GRE:POKE 709,BLU:POKE 710,ORA:GOSUB 30
170 POKE 710,YEL:POKE 705,RED:POKE 706,PUR:POKE 707,GRE:POKE 708,BLU:POKE 709,ORA:GOSUB 30
180 POKE 709,YEL:POKE 710,RED:POKE 705,PUR:POKE 706,GRE:POKE 707,BLU:POKE 708,ORA:GOSUB 30
190 POKE 708,YEL:POKE 709,RED:POKE 710,PUR:POKE 705,GRE:POKE 706,BLU:POKE 707,ORA:GOSUB 30
200 POKE 707,YEL:POKE 708,RED:POKE 709,PUR:POKE 710,GRE:POKE 705,BLU:POKE 706,ORA:GOSUB 30
210 POKE 706,YEL:POKE 707,RED:POKE 708,PUR:POKE 709,GRE:POKE 710,BLU:POKE 705,ORA:GOSUB 30
220 GOTO 160
230 DATA 372,175,276,574,643,431,312,125,276,574,673,471
240 DATA 312,125,256,577,677,437,317,177,677,564,643,431
250 DATA 477,377,177,277,577,677,477,377,125,256,564,643
260 DATA 477,377,177,277,577,677,477,377,125,256,564,643
270 DATA 312,125,256,564,673,471,372,175,256,564,643,431
280 DATA 312,125,256,577,677,431,325,177,277,577,677,477
290 DATA 312,125,256,564,673,471,372,175,256,564,643,431
300 DATA 477,377,177,277,577,677,477,377,125,256,564,643
310 DATA 372,175,276,574,647,437,317,127,276,574,673,471
320 DATA 312,125,256,577,677,431,312,775,776,564,643,431
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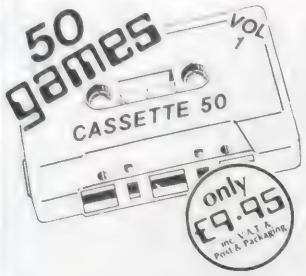
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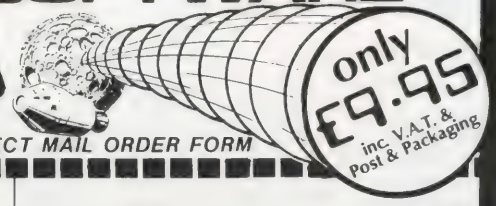


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Dear PCT

Ever since buying my ZX Spectrum I have been trying to find ways in which to make fuller use of its capabilities by exploring what additions could be connected up to the basic machine. I read with interest your special article on Spectrum add-ons in the April issue of PCT, but found little to go on where Spectrum communications facilities are concerned.

For instance, I have, as I'm sure others have, waited in the vain hope of learning of the launch of the Sinclair RS232 interface unit. Is there any other reliable unit on the market which might be used instead to hook up to printers, and which models of printer (apart from the Sinclair) would you suggest are best suited to using the Spectrum graphics or user-defined characters?

Also, what news is there of telesoftware for the Spectrum? I heard some months ago, of a Prestel backed project called Micronet to allow most computer users to receive a plethora of programs via the telephone lines but have heard nothing of it since. Are there any other such projects and what equipment is needed to receive such a service? I would be very grateful if you could supply me with some answers as these questions have intrigued me for some time.

Yours sincerely,
A. Czaban

At the time of writing, we have no news of the Sinclair RS232 interface unit. However, if you are looking for a cheap way of replacing the ZX Printer there are several firms who are producing Centronics type interfaces for the Spectrum. With this interface it is possible to connect your Spectrum to a large range of printers.

One printer which has gained favour with ZX owners is the CGP-115 Tandy printer. This printer uses a system of coloured pens to produce the printout. It is fitted with both RS232 and Centronics interfaces, making it easy to interface. The CGP-115 costs around £149 inclusive.

By the time you read this there should be provisions available for Spectrum users to tie-in to the Micronet system. The equipment you need costs £54.00 and this includes the telephone modem, software and cables. For further information about Micronet 800 you should write to Micronet 800, Bushfield House, Orton Centre, Peterborough PE2 0UW. Tel: 0733 237111.

For £45.00 you can buy a Centronics interface from Hilderbay. This price includes a printer cable and a wordprocessing program. Further information can be obtained from Hilderbay, 8-10 Parkway, Regents Park, London NW1 7AA.

Dear Sirs

We would appreciate your advice on the purchase of a home computer, since we have experienced difficulties in obtaining a computer compatible with our domestic colour TV.

We were able to borrow an ORIC 1 computer last weekend, but when connected to our Grundig A6400 colour remote control teletext TV (six months old), the quality of the picture was very poor. The colours were not true, the border edges were fuzzy and there was a shimmer, making the printed words difficult to decipher. On reading a review of ORIC by Jim Lennox, we found we had borrowed a machine with the old modulator and it MIGHT be possible to adjust the picture quality by turning the screw underneath the machine. Obviously, since it was a borrowed machine, we could not do this. Would the improved ORIC with a new modulator have worked any better?

Even so, we are not impressed with the ORIC or its manual and would probably not consider its purchase unless as a last resort. So yesterday we went to W H Smith and bought a 48K Sinclair Spectrum, after having told the assistant of the trouble we had with the ORIC. We got home, connected the TV to the Spectrum and found the colour quality was even worse! The border colour was again fuzzy, the colours not true, the logo"Sinclair Research" etc. could not be made out at all. (Please note, we are familiar with tuning our set both to borrowed computers and our Atari VCS Games System). I phoned Sinclair immediately for guidance and was informed "the colour chip on the Spectrum is not compatible with some TVs, including Grundig, Hitachi and Toshiba. Please return your set to the shop and get a refund. You can do nothing". I asked why they did not publicise this fact a little more, and was told they were considering doing so. W H Smith were very good, taking the machine back and refunding our money 45 minutes after its purchase (note: is this a record for length of ownership of a Sinclair machine?).

The thing is, where do we go from here? Do we need to go upmarket pricewise to get a compatible machine? What machine is compatible with our set? Where can we get advice about this? We know a VIC 20 will work on our TV, but we don't particularly want a VIC 20 – it's too much like a games machine, we would want a larger memory too. Your advice would be most appreciated as to our next step. We don't want to buy a computer only to find once again it is incompatible. We bought our TV

with a view to home computing (for games, 0 Level Computer Studies, general home accounts, etc.). We certainly can't afford another TV or monitor. Note: both computers worked on our Pye black and white portable fairly well, but we would like a machine that works in colour too.
Yours faithfully
Mrs C Morden

Since your problems stem from your television I think the best course of action you can take is to go straight to Grundig and quiz their engineers on the best micro for your television. You are not alone in this sort of problem. Many people have problems of this nature with their own micro's and the answer seems to be to consult someone who knows about television, rather than micro's.

As for a choice of machine I can only advise that the two micro's which we have had least problems with are the Atari 400/800 and the BBC Micro. Still, it would be best to get Grundig's advice before you buy. They can be contacted at the following address: Grundig International Ltd, Mill Road, Rugby, Worcester.

Dear PCT

Since I purchased my BBC Model B last Christmas I have had no end of fun with both commercially written software and listings from magazines such as yours, however, I have had no end of trouble when trying to load these listings back from ordinary C60 tape. Saving appears to be fine but when I come to reload I continually get the three cassette error messages: Block? Data? and Header? Please could you advise me on either how to rid myself of the gremlins or with the name of a shop local to Birmingham where I could see someone who might be able to assist me. At the moment I am using a Slim 3G cassette recorder from Sanyo and a 5-pin DIN plug.

Also to save further harassment from my very musically minded family, please could you advise on whether more sophisticated musical software packages and or keyboards are available, also if any are going to become available in the future.

Thank you
Jonathan Lawrence
Sutton Coldfield

The BBC is one of the better micro's as far as cassette operations goes. The only problem that I know about is that on some of the earlier models the amplifier chip which serves the cassette port had a tendency to blow.

The cassette recorder which you are using is the same model as the one we use with our office machine and we have had no problems so far. This suggests that your problem may be one of two things. Firstly, it is always best to use the shortest tape length possible. The longer the tape, the more likely it is to stretch and cause tape drop-out. This doesn't make a lot of difference for audio recordings, but on digital it can spell disaster. The best length of tape to use is either C10 or C15.

Seeing as how commercial software loads without any problem I would think that the volume setting you are using for saving might be too low. If you are getting ready to input a long listing into the computer with a view to saving it on tape afterwards then it is a wise move to 'calibrate' your tape recorder. Write a short program of about twenty or thirty lines and save it. You can then try and reload it. If it loads properly then you can progress to the long program, if it doesn't then you have only lost a few minutes work and not a few hours. Repeat the procedure until you are confident that your program can be saved and loaded properly.

As for your interest in music programs, Quicksilva has just come to your rescue. They have recently released a music package called the BBC Music Processor. This looks like being quite a good program and we will be reviewing it soon.

Corrections

Some people have been having trouble getting Invisible Maze and Brain Boggler from our May issue to work. In Invisible Maze lines 401 and 433 were causing the problems. The corrections are as follows:

In the second part of line 401, the plus sign following the 10,13 is extraneous and should be removed. In line 443 the plus sign which follows INK 0 should be replaced with a semi-colon. This should allow these lines to be inputted.

In Brain Boggler, two lines were missed from the listing. These are:

```
520  PRINT@ 299+(I*3),CHR$(S)
530  NEXT I
```

Line 9750 also caused some problems. The first part of the PLAY statement should begin T20 (twenty) and not T2O.

Corrections to Dragon Star Trek

```
2440 IF DM(1)>0 THEN A$="REPORTS@UNAVAILABLE":GOSUB 3750:FOR D=1 TO 1000:NEXT D:
RETURN
2450 GOSUB 3830:A$="DAMAGE@REPORT":GOSUB 3750
2460 DRAW"BM2,166":A$="ENGINES@":GOSUB 3750:X=DM(0):Y=2:GOSUB 3770:A$="@STARDATE
S@TILL@REPAIRED":GOSUB 3750
2470 DRAW"BM2,172":A$="REPORTS@":GOSUB 3750:X=DM(1):Y=2:GOSUB 3770
2480 DRAW"BM2,178":A$="PHASORS@":GOSUB 3750:X=DM(2):Y=2:GOSUB 3770
```


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July 1983 Issue

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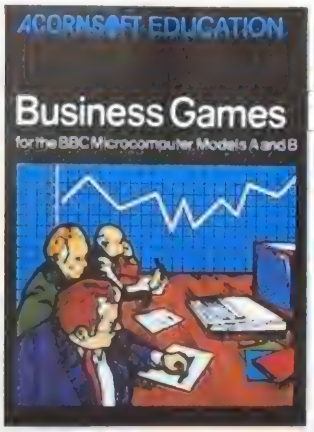
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MICROSPOT

NUMBER QUIZ



Here's a simple but fun number game from Carl Ellis for you to play.

Think of a number is a basic thinking "game" for the ZX81. First the player must think of a number between 1 and 100. Divide it by 3, 5, and 7 and then enter the remainders. The program then works out your original number providing of course all your inputs have been correct.

HOW IT RUNS

Lines	
30, 50, 70	REMAINDERS INPUTED
120 to 150	ROUTINE TO RECONSTRUCT ORIGINAL NUMBER
10 to 20, 40, 60	PRINT STATEMENTS AND CLS COMMAND
80 to 110	ROUTINE FOR DISPLAYING "THINKING"
160 to 290	PART OF PROGRAM TO DISPLAY ANSWER, ASK FOR ANOTHER GO, ETC

Variables used

D3 number divided by 3
D5 number divided by 5
D7 number divided by 7
X original number
N loop for pausing

HINTS ON CONVERSION

As ZX basic is fairly standard it shouldn't be too difficult to convert my program. In some basics the PRINT and INPUT lines (eg lines 40 and 50) could be combined. Also the word LET in line 120 could be left out.

PROGRAM LISTING

```
 1 REM"THINK OF A NUMBER. BY CARL ELLIS"
 10 CLS
 20 PRINT"THINK OF A NUMBER BETWEEN 1 & 100. DIVIDE IT BY 3 AND TYPE THE REMAIND
ER"
 30 INPUT D3
 40 PRINT"SECONDLY DIVIDE YOUR NUMBER BY 5 AND TYPE THE REMAINDER"
 50 INPUT D5
 60 PRINT"AND FINALLY DIVIDE YOUR NUMBER BY 7 AND TYPE IN THE REMAINDER
 70 INPUT D7
 80 FOR N=0 TO 20
 90 PRINT AT 16,12;"THINKING"
 100 PRINT AT 16,12;"THINKING"
 110 NEXT N
 120 LET X=70*D3+21*D5+15*D7
 130 IF X<=105 THEN GOTO 160
 140 LET X=X-105
 150 GOTO 130
 160 PRINT"THE ZX81 THINKS,YOUR NUMBER WAS",X,," RIGHT?"
 170 INPUT A$
 180 IF A$="YES" THEN GOTO 220
 190 IF A$="NO" THEN GOTO 240
 200 PRINT"PLEASE ANSWER AGAIN"
 210 GOTO 170
 220 PRINT"HOWZAT"
 230 GOTO 250
 240 PRINT"YOU GOT YOUR SUMS WRONG"
 250 PRINT"ANOTHER GO?"
 260 INPUT B$
 270 IF A$="YES" THEN GOTO 5
 280 PRINT"THANKS FOR THE GAME"
 290 STOP
```

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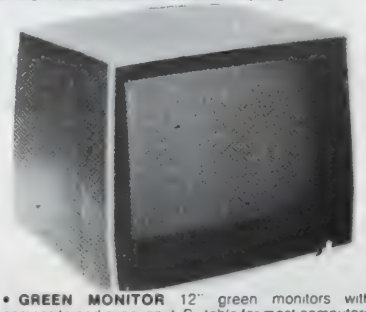
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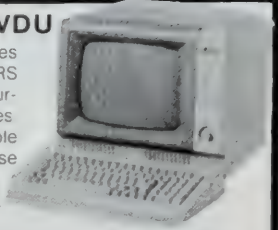
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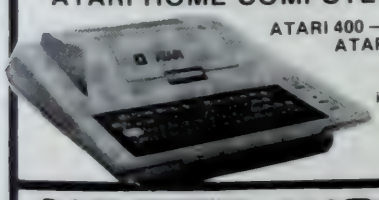


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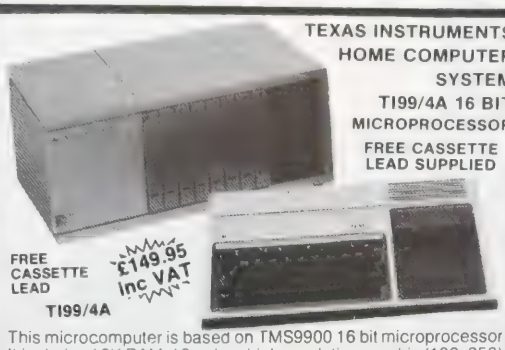
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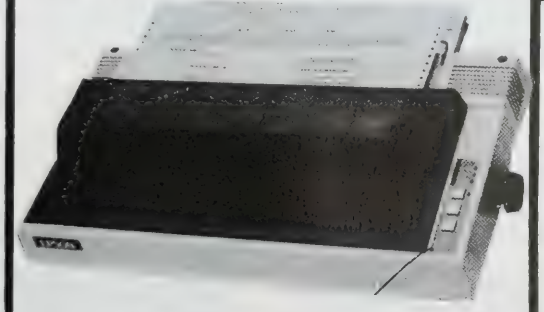
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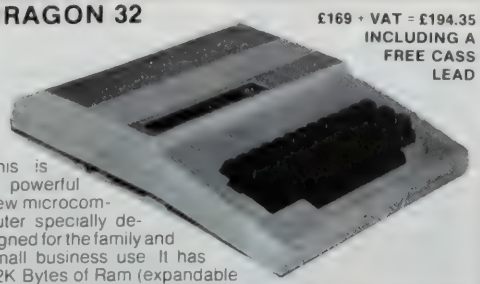


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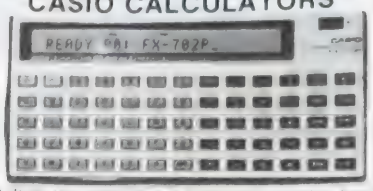
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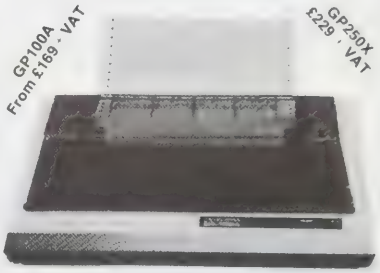
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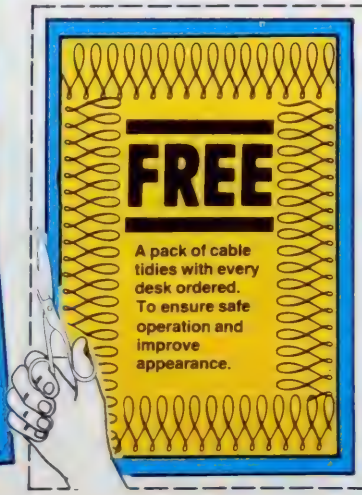
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VIC LETTER WRITER

Turn your personal or business letters into neat printouts with the help of N. Jayakumar's utility program



This is a useful program designed for the Commodore VIC-20 with any amount of memory and with a printer. It's purpose is to process and print letters on a VIC printer with spacing and as many times as the user would like. There are four sections to this program; the first is to input the letter, the second is to see the letter, the third is to edit it and the fourth and final stage is to print it out.

When you type in this program you should change lines 700,720, 730 and 740 to enable you to input your own personal name, address and telephone number.

HOW IT RUNS

Lines 1-9	Rem statements
Lines 20-87	Input statements
Lines 400-450	Letter input routine
Lines 500-520	Letter output routine
Lines 600-630	Edit routine
Lines 700-900	Print letter routine

When the program is run it will automatically ask you to input the name of the person you are writing to. You should enter his or her name and then press RETURN. After that, input the person's address and press RETURN. Once this has been done you will automatically be transferred into command mode and five commands will appear as follows on the screen:

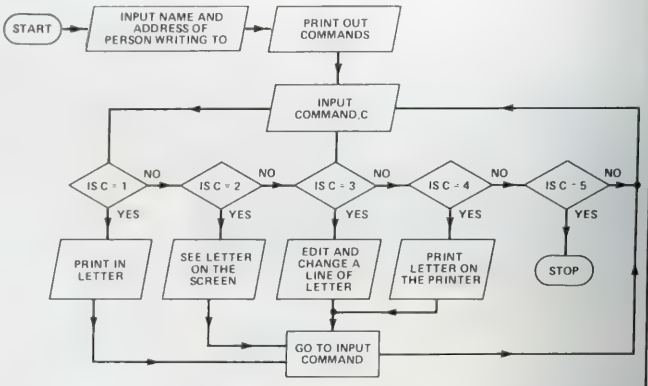
1 GOTO LETTER
2 SEE LETTER
3 EDIT LETTER
4 PRINT LETTER
5 STOP

First you should input the number one and two things will happen. The screen should clear and a note should appear on the screen saying that when you have finished your letter input the character '@' and press RETURN to return to command mode. then the screen should once again clear and you should enter your first line with an inverted comma sign at the beginning of your letter. Then press the return key. If this first line is too long the computer will ask you to enter the line again. Any line longer than 4 lines on the VIC TV set (80 characters) is too long. If you line is less than 80 characters then the computer will print 'O.K. next line please' and you should keep entering as many lines as you like until the computer runs out of memory and tells you to stop.

When you have finished typing your letter enter the character '@' and you should return to command mode. Now you should input the number 2 to see your letter. You will then see the first line of your letter with its line number. Press any key and you should see the next line of the letter and so on.

To edit it, input the number 3 and the screen should clear and the computer will ask you which line you want to edit. You should input its line number and then press return. It will print a copy of the line and ask you what it should be changed to. Then type its new line with an inverted comma sign at the beginning and press return. The computer will then return to command mode. Now you can either see your letter again, and some mode lines, edit it again or print your letter out. To do this input the number 4 and the computer should automatically start printing your letter. When it has finished you can either ask it to print the letter again or any other of the five commands. To stop the program input 5 and the screen will clear and print 'bye-bye'

Fig. 1
Here is a flowchart for the program.

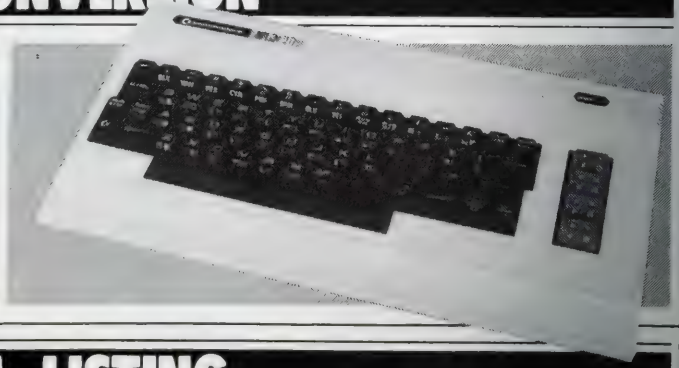


If the program is being typed into a 5K VIC then change lines 210 to DIM A$(30) and change the 800 in line 440 to 30.

HINTS ON CONVERSION

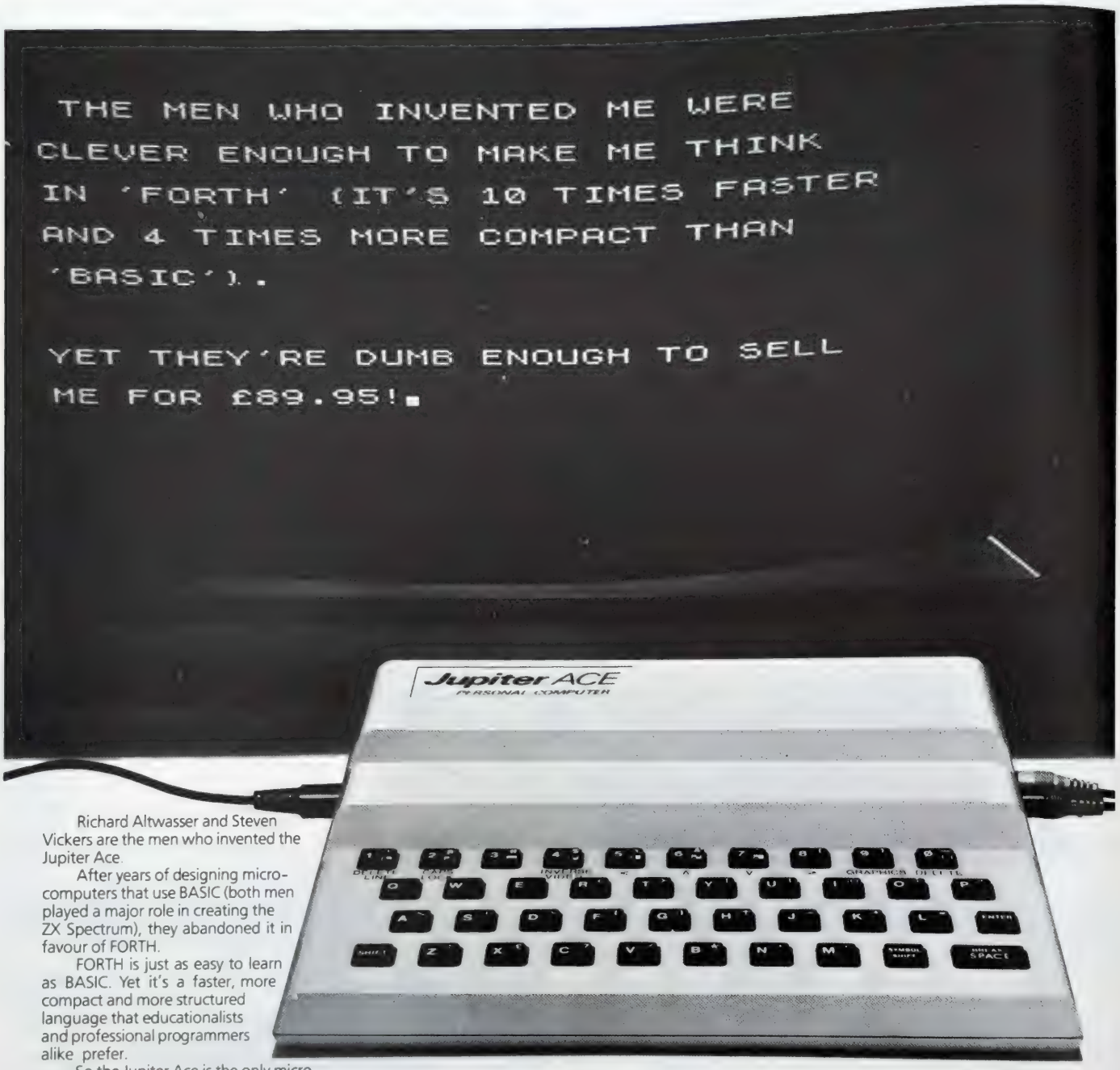
Converting this for other computers should not be difficult. The only problem that could arrive are the cursor control graphics:-

■ THIS CLEARS THE SCREEN (CLS)
■ THIS TELLS CURSOR TO MOVE ONE LINE DOWN
■ THIS TELLS CURSOR TO MOVE ONE SPACE RIGHT
■ THIS TELLS CURSOR TO PRINT IN REVERSE FIELD
■ THIS TELLS CURSOR TO PRINT IN NORMAL FIELD



PROGRAM LISTING

```
5 REM**VIC-LETTER PROCESSOR BY N.M.JAYAKUMAR**
10 INPUT"NAME";S$
20 INPUT"ADDRESS 1";V$
30 INPUT"ADDRESS 2";I$
40 INPUT"ADDRESS 3";O$
80 INPUT"DATE";O$
85 INPUT"YOUR REF";K$
87 INPUT"OUR REF";L$
90 OPEN1,4
210 DIMA$(800):A=1
220 PRINT"■■■■■COMMAND MODE"
230 PRINT"■■■1 GO TO LETTER"
240 PRINT"■■■2 SEE LETTER"
250 PRINT"■■■3 EDIT LETTER"
260 PRINT"■■■4 PRINT LETTER"
270 PRINT"■■■5 STOP"
280 GETA$ IFA$=""THENGOTO280
290 IFA$="1"THENGOTO400
300 IFA$="2"THENGOTO500
310 IFA$="3"THENGOTO600
320 IFA$="4"THENGOTO700
330 IFA$="5"THENFORF=1TO100 PRINT"■■BYE BYE" NEXT END
340 GOTO280
400 PRINT"■■INPUT LINES OF LETTER ■WHEN FINISHED PRESS ■@."
410 PRINT"THE KEY '@' TO RETURN ■TO COMMAND MODE." FORZ=1TO5000 NEXT PRINT"■
420 INPUTB$
425 IFB$="@"THENGOTO220
430 IFLEN(B$)>80THENPRINT"TOO LONG!!!!!!!!!!":GOTO420
440 A$(A)=B$:A=A+1:IFA=800THENPRINT"OK, THATS ENOUGH" FORZ=1TO1000 NEXT GOTO220
450 PRINT"O.K NEXT LINE PLEASE" GOTO420
500 PRINT"■" FORZ=1TOA-1 PRINT"■"Z"■"A$(Z)■
510 GETZ$ IFZ$=""THEN510
520 NEXT:GOTO220
600 PRINT"■■INPUT LINE TO EDIT" INPUTY:PRINT"■PREVIOUS LINE WAS■":PRINTA$(Y)
610 PRINT"■NEW LINE IS" INPUTB$
620 IFLEN(B$)>80THENPRINT"TOO LONG"::GOTO610
630 A$(Y)=B$ PRINT"O.K..." FORZ=1TO500 NEXT GOTO220
700 PRINT#1,CHR$(14) "MR. P.D.NOBOD■ "CHR$(15)"                                    129 NONE
LANE"
720 PRINT#1,"                                                                      NOWHERE"
730 PRINT#1 "                                                                      OLDHAM"
740 PRINT#1,"TELEPHONE 001-001-0001                                                0I5 9JF
"
750 PRINT#1,"                                                                      "O$
755 PRINT#1 PRINT#1 "                    YOUR REF "K$
757 PRINT#1,"                        OUR REF "S$/"L$
758 PRINT#1 PRINT#1
780 PRINT#1 S$
790 PRINT#1 V$
800 PRINT#1 I$
805 PRINT#1 O$
810 PRINT#1 PRINT#1
900 FORZ=1TOA PRINT#1,A$(Z) PRINT#1 NEXT PRINT"O.K...." FORZ=1TO500 NEXT GOTO220
```



Richard Altwasser and Steven Vickers are the men who invented the Jupiter Ace.

After years of designing micro-computers that use BASIC (both men played a major role in creating the ZX Spectrum), they abandoned it in favour of FORTH.

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MICROTERMS

Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

Address
A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

Array
A special variable that is used to hold large amounts of string or numeric information in a row and column format.

Assembly Language
Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC
Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit
A single *binary* digit, representing either a 'one' or a 'zero'.

Bug
An error in *software*.

Byte
A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

Cartridge
A self-contained unit storing either ROM or RAM which plugs into a computer to expand the memory or provide a program.

Character Set
The list of letters, numbers and symbols that you can use to write programs and display information.

CP/M
A standard disc operating system that in theory allows software packages to be run on different machines. It stands for Control Program for Microcomputers.

Cursor
Character or graphic symbol used by the computer to denote where it's printing. Also used as a prompt to input information or a command.

Data
Simply, information. The raw material that the computer processes.

Debug
To correct the errors in a *program*.

Disc
Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 *megabytes* or more; a smaller *floppy disc* typically holds from 80 to 250 *kilo* bytes but in either case the capacity is being increased all the time.

Display Mode
Means of indicating the form in which the computer's output will appear on the *VDU* screen. It is either text only, text and graphics or graphics only. The display mode is usually represented by a number and the difference between these numbers indicates the change in the display capabilities of the screen, for instance on the BBC computer Mode O gives a higher resolution than Mode 1.

DOS
Disc Operating System. This refers to the piece of computer code that controls the action of the disc drive. On some machines this code has to be loaded into the machines memory and on others it is present in the *ROM* onboard the disc drive. The DOS tells the disc drive how to load and save programs on the disc as well as carrying out any disc management functions such as updating the directory.

Dummy Variable
This is a variable that is defined at the beginning of a program that has no use until later on in the program.

EPROM
Erasable Programmable Read Only Memory. When programming, writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Get
A BASIC command. It tells the computer to search the keyboard and bring back the value of the first key pressed.

Gosub
A BASIC command telling the computer to go to a subroutine within a program.

Gcol
A colour command used in BBC Basic.

Hard Copy
A computer printout or listing on paper.

Hardware
All the electronic and mechanical components making up a computer system.

Hex
Shortened version of hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

High Resolution
This means that you can pinpoint one dot on a screen rather than one square, giving you graphical pictures of much greater detail and accuracy.

Instruction
A set of *bits* which causes the *CPU* to carry out a particular task in a program.

Interface
Circuit which connects different parts of a system together and performs any processing of signals in order to make transfer possible (ie serial-parallel conversion).

I/O
Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — *peripheral* devices such as a *keyboard*, video display *(VDU)*, *printer* etc. An I/O port may be just an input or just an output or it can be bidirectional.

Kilo (K)
Normally means 1000, but stands for1024 (2^{10}) when referring to memory.

Language
A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute.

Location
Physical position; *memory* location is the same as *address*.

Loop
Program technique where one section of program (the loop) is performed many times over.

Machine Language (or Code)
The lowest (and most tediously detailed)

level of *program instructions*. All higher level coding must be converted to *machine language* (by *compiler* or *interpreter)* before a *processor* can obey it.

Memory Map
Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

Menu
A set of options displayed on-screen by a computer program from which the computer user can make a selection to implement.

Modulator
A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display.

Monitor
(1) The first level of computer *operating systems:* the *program* which turns *machine code* commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle video signals from a computer that does not have a *modulator*.

Parallel/Serial
Denotes the manner in which the computer's output is sent to its peripheral devices. Serial means that the information is passed out one byte after another and it uses a system of special characters to signify control codes of the device. Parallel communications are sent out along a series of wires using the high or low state of the wire to indicate which bits are set and therefore making up a byte.

Pascal
A very powerful, structured computer language, available on a variety of microcomputers.

Peek
This BASIC command reads a value from a location in the computer memory. It can be used to access either RAM or ROM.

Peripheral
Device attached to a computer, eg *printer, plotter, disc* unit, but not necessarily essential to its use.

Pixel
The single dot that is used to create characters displayed on the VDU. Also the smallest display unit when using high resolution graphics.

Poke
This command places a value in a location of the computer's memory. It can only be used to access RAM or control registers.

Port
Terminal which the *CPU* uses to communicate with the outside world.

Print At
A BASIC command telling the computer where to begin printing.

Print Out
Same as *hardcopy*.

Program
A set of *instructions*, which tells the computer to perform a sequence of tasks also called software.

PROM
Programmable Read Only Memory. Proms are a special form of *ROM*, which can be individually programmed by the user.

Qwerty
The traditional typewriter keyboard layout adopted by computer designers.

RAM
Random Access Memory. *Data* may be written to or read from any location in this type of memory.

Register
A general-purpose *memory*, or set of memory *locations*, built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

RND
In BASIC this stands for RANDOM and instructs the computer to select random numbers, it is often used in games programs. Because the numbers thrown up are mathematically related to the number preceding they are called pseudo-random numbers, not true random-numbers.

ROM
Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

Routine
A whole *program* or part of a program designed to perform a single function or action.

RS232
A communications *interface* used for *modems* and for serial *printers*.

Sequential File
This is a data file that can be created on either a disc or a cassette system. As its name suggests, the information is stored one piece after another. If this information is to be changed or modified in any way then the whole file has to be read back into memory and then written back again once the changes have been made.

Software
The different kinds of *program* required to work a computer.

Source Code
Program written in one of the *high-level languages* and requiring *compilation* into *machine language* before use.

String
A sequence of characters used in a program.

Subroutine
A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax
The grammar of a programming *language*.

Tab
Really stands for tabulate and allows you to automatically put figures and/or words into columns, forming a table.

Toolkit
Name given to a piece of code that runs in a computer independantly of any other programs and adds commands to the machines language to make the process of programming or debugging easier. Commands such as Renumber, Auto and Trace are common in toolkits. Toolkits take the form of a program that is loaded into the machine on power-up or a chip that is inserted on the circuit board which is then initialised by a SYS or USR call from the operator.

Variable
A symbol used in programming which is assigned a numeric memory address. You can change the value of variable at will to suit the program you are writing.

VDU
Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

Z80
Widely used microprocessor. It is used in the ZX81, Spectrum and TRS-80.

6502
Another widely used microprocessor. It is the heart of the PET, Apple and Atari computers.

SPECTRUM 16/48

AWARI

★ The ancient African game of logic. It takes 2 minutes to learn the rules but far longer to master the tactics.

★ Select the 'Goat-herd' level of play and it's an addictive game for children (8+) that exercises their minds – not their laser fingers.

★ Select the 'Witch-doctor' level and it's a threat to your sanity. We haven't beaten it and we wrote it!

ZX81 16K

ADVENTURE

★ Over 200 places to explore in this machine code game using advanced data compression techniques.

★ No random elements – you will need skill, cunning and a sense of humour as you explore caves, forest and castles.

★ Evade ruthless pursuers and overcome a host of obstacles.

★ Multiple word commands and single letter abbreviations!

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This real-time graphics simulation set inside the human body was written by a lecturer in anatomy. You are injected into the blood stream in your miniature submarine. Navigate the arteries, veins and heart to the brain, where a blood clot must be destroyed. Features a real vascular map. You will be attacked by lymphocytes which must be destroyed using arcade game type graphics. Everything you do uses up precious energy. Three display formats – a lateral and frontal body scan plus blood vessel name, a close-up scan and a laser-sight for fighting lymphocytes.

★★ Buy both Awari and Adventure and enter the 'Foilkade Challenge' competition. Details with cassette or send SAE.

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TELESOUND 84 FEATURES

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TELESOUND 84 comes complete with a free sound effects program and costs **£9.95** inclusive of post, packing etc. Please state your computer when ordering (allow 28 days delivery). Also available Beep Booster/Radio. Simply plugs into the ear socket. The cost effective way to Boost your Beep for only **£5.95** inclusive of post etc.

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Arriving soon, by the author of Softlink 1, Tim Gilbert, the amazing new super game (with Kempston joystick option) for any Spectrum — Hidden City **£5.95**

See this game at the 7th ZX Microfair, Alexandra Palace, June 4

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7th ZX MICROFAIR

SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

GM = Game
BS = Business routine
UT = Utility (ie. programming aid)
DO = Domestic
ED = Educational

How Sold

R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

Due to overwhelming response we have been forced to alternate machines included in our checklist each month. Out this month are the Atom, Atari, Spectrum and ZX81. But don't panic, they will be featured in August for you to make your software selection. You'll notice that this month we have reverted to our policy of including suppliers address. This will help you order your software immediately.

Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for *any* of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please*!) or ring Chris Palmer on 01-437 1002 as soon as possible.



SOFTWARE LISTING

BBC

Title	Program Type	Program Produced By	How Sold		Supplier Codes	Prices
Action of the Heart	Ed	Garland Comp.	32K	C	JX	£11.76
Adventure	Gm	Micro Power	32K	C	GK	£6.95
Adventure	GM	Program Direct	32K	C	NP	£5.99
Adventure Quest	Gm	Level 9 Computing	32K	C	CU	£9.90
Algebraic Manipulation	Ut	Acornsoft	16K	C	AL,GA	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C	AL,GA	£9.95
Alien Destroyers	Gm	Micro Power	32K	C	GK	£6.95
Alien Dropout	Gm	Superior Software	32K	C	KH	£6.50
Arcade Action	Gm	Acornsoft	16K	C	GA	£11.90
Arrow of Death (1)	Gm	Digital Fantasia	16K	C	IT	£6.95
Arrow of Death (2)	Gm	Digital Fantasia	16K	C	NT	£8.95
Airlift	Gm	Bug Byte	32K	C	KP	£5.50
Angle(4)	Ed	Chalksoft	32K	C	KT	£6.95
Append It	Ut	Aztec S/W	16K	C	IB	£3.00
Asteroids/Frong	Gm	Aardvark Software	16K	C	IU	£4.00
Asteroid Belt	Gm	Electronics Appplied	32K	C	IF	£11.50
Asteroid Belt	Gm	Computer Concepts	16K	C	GJ	£7.80
Astro Navigator	Gm	Micro Power	32K	C	GK, NR	£6.95
Atlantis	Gm	IJK Software	32K	C	IT	£6.95
Awari	Gm	Foilkade	16K	C	NR	£5.95
Backgammon	Ut	Bug Byte	32K	C	EA,KP	£8.00
Balloons	Gm	C J E Microcomputers	32K	C	NV	£6.00
Basic Maths	Ed	Aztec S/W	16K	C	IB	£3.00
Battlefield	Gm	Micro-Aid	32K	C	IZ	£2.50
Banner	Do	Micro-Aid	16K	C	IZ	£2.95
Beeb-Chase	Gm	Database Software	32K	C	NU	£7.50
Beebmunch	Gm	I.J.K. S/W	32K	C	IT	£5.95
Beebtrek	Gm	Software for All	16K	C	KN	£7.95
BEEP-BEEB	Gm	IJK	32K	C	IT	£3.95
Bounty Pirates	Gm	Aztec S/W	16K	C	IB	£5.50
Break-Up	Gm	Miking S/W	32K	C	KC	£3.95
Breakout	Gm	I.J.K. S/W	16K	C	IT	£3.95
Breakout	Gm	Bryants S/W	32K	C	HW	£3.75
Bridgeman	Gm	Bridge S/W	32K	C	KJ	£7.90
Call Your Bluff	Gm	Square Software	16K	C	NY	£6.00
Capitol Cities	Ed	Square Software	16K	C	NY	£6.00
Carbohydrate Metabolism	Ed	Garland Comp.	32K	C	JX	£18.24
Cashbook A	Do	Micro-Aid	16K	C	IZ	£3.95
Cashbook B	Do	Micro-aid	16K	C	IZ	£3.95
Cat & Mouse	Gm	Micro Power	16K	C	GK	£4.95
Cells and Serpents/ Stockmarket	Gm	ASP Software	16K	C	OD	£11.45
Cells & Serpent	Gm	Hexagon S/W	16K	C	JA	£5.00
Centipede	Gm	Superior S/W	32K	C	KH	£7.00
CESCIL	Ed	Eduquest	16K	C	NW	£19.95
Character Builder	Ut	Davensoft	16K	C	NX	£4.95
Characters	Ut	Computer Concepts	32K	C	GJ	£6.67
Character Generator	Ut	MP S/W	32K	C	JZ	£3.00
Character Generator	Ut	Software for All	32K	C	KN	£4.95
Characters	Ut	Computer Concepts	16K	C	GJ	£6.67
Characters & Envelope Definer	Ut	Electronics Applied	32K	C	IF	£5.50
Chess	Gm	Bug Byte	32K	C	EA	£11.50
Chess	Gm	Micro Power	32K	C	GK	£6.95
Circus	Gm	Digital Fantasia	32K	C	NT	£8.95
Claws	Ed	Bryants S/W	16K	C	HW	£3.75
Cards	Gm	Micro-Aid	16K	C	IZ	£2.95
Cobra/Robo-Swamp	Gm	Software for All	16K	C	KN	£6.95
Cobra Robo-Swamp	Gm	Software for All	32K	C	KN	£6.95
Code Race	Gm	Computer Concepts	16K	C	GJ	£6.67
Code Race	Ut	Computer Concepts	32K	C	GJ	£6.67
Colossal Adventure	Gm	Level 9 Computing	32K	C	CU	£9.90
Connect 4	Gm	Database Software	32K	C	NU	£5.90
Constellation	Ed	Micro Power	32K	C	GK	£5.95
Cookbook Wizardry	Do	Database Software	32K	C	NU	£7.50
Cowboy Shoot-out	Gm	Micro Power	32K	C	GK	£5.95
Creative Graphic Pack	Ut	Acornsoft	16K	C	AL,GA	£9.95
Creative Graphics	Ut	Acornsoft	32K	C	AL,GA	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	IB	£6.50
Data-Quiz	Ut	Bryants S/W	32K	C	HW	£4.88
Database	Bs	Computercat	16K	C	IJ	£11.95
Database	Bs	Software for All	16K	C	KN	£9.95
Defchr	Ut	Micro-Aid	16K	C	IZ	£2.95
Defender	Gm	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	16K	C	AL	£9.95
Devil's Causeway	Gm	Anirog Computers	16K	C	0A	£6.00
Dissassembler	Ut	Micro Power	16K	C	GK	£5.95
Dissassembler	Ut	Program Direct	16K	C	NP	£3.00
Dissassembler	Ut	Davansoft	16K	C	NX	£5.95
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DNA Replication	Ed	Garland Comp.	32K	C	JX	£17.65
Dragon Rider	Gm	Salamander Software	32K	C	NZ	£6.95
Dragon Quest II	Gm	Bug Byte	32K	C	KP	£11.50
Dragon Quest	Gm	Bug Byte	32K	C	KP	£11.50
Drawing	Ut	B.B.C.	16K	C	KB	£10.00
Dungeon Adventure	Gm	Level 9 Computing	32K	C	CU	£9.90
Early Learning	Ed	B.B.C.	16K	C	KB	£10.00
Early Numbers	Ed	Bryants S/W	32K	C	HW	£4.80
Early Warning	Gm	A&F Software	16K	C	GE	£6.00
Educational (1)	Ed	Golem	16K	C	OB	£8.05
Educational (2)	Ed	Golem	16K	C	OB	£8.05
7 Educational Games	Gm	Micromail	32K	C	OE	£5.75
Eldorado Gold	Gm	Program Power	32K	C	GK	£7.99
Electric	Ed	Database Software	16K	C	NU	£5.50
European Studies	Ed	Aztec S/W	32K	C	IB	£6.50
Escape from Pulsar 7	Gm	Digital Fantasia	32K	C	NT	£8.95
Fairytale	Gm	Molimerx	32K	C	AJ	£10.06
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Flags	Ed	Micro-Aid	16K	C	IZ	£2.95
Flush	Ut	Micro-Aid	16K	C	IZ	£1.00
Football Pools Predictor	Do	Mayday Software	16K	C	IX	£4.99
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Frenzy	Gm	Persoft	16K	C	IY	£5.75
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Fruit Machine	Gm	Bug Byte	32K	C	KP	£5.50
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Fun Games	Gm	B.B.C.	16K	C	KB	£10.00
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Games Pack 1	Gm	Computersmith	16K	C	LC	£5.50
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Genetic Code	Ed	Garland Comp.	32K	C	JX	£17.65
Geography Italy	Ed	Corona S/W	32K	C	JY	£5.00
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Grand Prix	Gm	Software for All	32K	C	HN	£5.95
Golf	Gm	Bryants S/W	32K	C	HW	£4.88
Golf	Gm	Bug Byte	32K	C	GA,EA	£7.00
Golf	Gm	Computersmith	32K	C	LC	£5.50
Gomoku	Gm	Micro Power	16K	C	GK	£3.95
Graphics Package	Ut	Salamander Software	32K	C	NZ	£24.95
Graph and Charts Pack	Bs	Acornsoft	32K	C	AL,GA	£9.95
Graph and Charts Pack	Bs	Acornsoft	16K	C	AL,GA	£9.95
Great Britain Ltd	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
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Hangman	Gm	Aztec S/W	16K	C	IB	£5.50
Hangman	Gm	MP S/W	32K	C	JZ	£4.00
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Home Finance	Do	B.B.C.	16K	C	KB	£10.00
Hydraulics	Ed	Database Software	16K	C	NU	£5.50
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Invaders	Gm	Software for All	16K	C	KN	£6.95
Invaders	Gm	Hexagon S/W	16K	C	JA	£6.00
Invaders	Gm	MP S/W	32K	C	JZ	£6.50
Invisible Man	Ed	Chalksoft	32K	C	KT	£5.95
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Inheritance	Ed	Garland Comp.	32K	C	JX	£34.70
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Jumbles	Ed	Bryants S/W	32K	C	HW	£4.88
Jumbo	Gm	Molimerx	32K	C	AJ	£17.25
Junior Maths Pack	Ed	Micro Power	32K	C	GK	£5.95
Katakombs	Gm	Golem	32K	C	0B	£9.20
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Laser Command	Gm	Micro Power	32K	C	GK	£6.95
Letters	Ed	Chalksoft	32K	C	KT	£6.95
Library Dewey Classification	Ed	Aztec S/W	32K	C	IB	£6.50
Link-4-Plus	Gm	ABC Software	16K	C	KR	£6.95
Lisp	Ut	Acornsoft	32K	C	AL,GA	£16.85
Lisp	Ut	Acornsoft	16K	C	AL,GA	£16.85
Logo 2	Ut	Computer Concepts	32K	C	GJ	£10.00
Lunar Lander	Gm	A&F Software	32K	C	GE	£6.90
Mailing A	Bs	Micro-aid	16K	C	IZ	£3.95
Mailing B	Bs	Micro-Aid	16K	C	IZ	£3.95
Martians	Gm	Micro Power	32K	C	GK	£5.95
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BL Peach Tree Software
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MSA House
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BM ACT (Microsoft) Ltd
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021 454 8585

BN Personal Computer Palace
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BP Leicester Computer Centre Ltd
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BT The Essential Software Co.
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BX Abbey House
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CA Terodec Ltd
Unit 58
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Earley
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0734 664343/6

CB Poolsoft
17 Blatchington Road
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0323 890604

CC Highlight Software
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CE Southern Software
PO Box 39
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CF Sigma Systems
54 Park Place
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Cardiff 21515/34869

CG Planet Software
10 Norton Drive
Eaton
Norwich

CH Brighton Gamer
24 Gloucester Road
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Sussex
0273 698424

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CJ 7 Lidgett Crescent
Roundhay
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Herts
74569

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CM Simple Software
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374A Streatham High Road
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London W1 48HF

CP Computics Microsoft
1 Bell Lane
Wheatley
Oxford
0X9 1XY

CQ KW Software
155 Ronginglow Road
Sheffield
S11 7PS

REFERENCE

SOFTWARE LISTING

BBC

Title	Program Type	Program Produced By	How Sold	Supplier Codes	Price
Maze Invaders	Gm	Micro Power	32K	C GK	£4.95
Maze Man	Gm	C J E Microcomputers	32K	C NV	£6.00
Micro Budget	Do	Micro Power	16K	C GK	£6.95
Metrics (5)	Ed	Chalksoft	32K	C KT	£9.95
Micro Maths	Ed	LCL	16K	C KA	£24.50
Minefield	Gm	Eduquest	16K	C NW	£5.95
Master Copier	Ut	Aztec S/W	16K	C IB	£6.50
Maths Translation	Ed	Corona S/W	32K	C JY	£5.00
Micro-Derby	Gm	Bug Byte	32K	C KP	£5.50
Micro Man	Gm	Pro S/W	32K	C LD	£8.00
Middle Kingdom	Gm	Pro S/W	16K	C LD	£8.00
Minefield	Gm	A&F Software	16K	C GE	£6.00
Missile Control	Gm	C J E Microcomputers	32K	C NV	£9.00
Mission Impossible	Gm	Aztec S/W	16K	C IB	£6.50
Mixed Games	Gm	I.J.K. S/W	16K	C IT	£3.95
Model A Invaders	Gm	I.J.K. S/W	16K	C IT	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C IT	£6.95
Money Box	Ed	Bryants S/W	32K	C HW	£4.88
Monsters	Gm	Acornsoft	32K	C AL,GA	£9.95
Monster Battles	Gm	Bryants S/W	32K	C HW	£4.80
Multifile	Bs	Bug Byte	16K	C EA	£25.00
Multiple Choice	Ed	Eduquest	32K	C NW	£25.00
Munchyman	Gm	Micro Power	16K	C GK	£5.95
Music	Do	B.B.C.	16K	C KB	£10.00
Music Maker	Gm	Rainbow S/W	16K	C KS	£3.50
Musical Numbers	Ed	Bryants S/W	32K	C HW	£4.88
Musical Number Box	Gm	Bryants S/W	16K	C HW	£3.75
Music Program	Do	Golem	32K	C OB	£6.90
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MX 80 Type 3 Screen Dump	Ut	Software for All	16K	C KN	£6.95
Othello	Gm	Computer Concepts	16K	C GJ	£8.95
Othello	Gm	Computer Concepts	32K	C GJ	£8.95
Othello	Gm	Computercat	16K	C IJ	£8.95
Parity	Ed	N. Darwood	16K	C JB	£6.00
Payroll	Bs	Micro-Aid	32K	C IZ	£5.95
Payroll 2	Bs	Micro-Aid	32K	C IZ	£5.95
Peeko Computer	Bs	Acornsoft	16K	C AL,GA	£9.95
Pete the Plastered Postman/	Gm	ASP Software Asteroid Lander	16K	C OD	£8.50
Pharoah's Tomb	Gm	A&F Software	32K	C GE	£8.00
Philospher's Quest	Gm	Acornsoft	16K	C GA	£9.95
Picsave	Ut	Hexagon S/W	16K	C JA	£6.00
Painting	Ut	B.B.C.	16K	C KB	£10.00
Peeko Computer	Ut	Acornsoft	32K	C AL,GA	£9.95
Procflush	Ut	Micro-Aid	16K	C IZ	£1.00
Powerboat Race	Gm	Futura S/W	32K	C JC	£7.95
Polaris	Gm	Bug Byte	32K	C KP	£5.50
Procvar	Ut	Micro-Aid	16K	C IZ	£1.95
Princess	Gm	Aztec S/W	16K	C IB	£6.50
Punctuation	Ed	Bryants S/W	32K	C HW	£4.88
Reversi & Gomuko	Gm	Pro S/W	16K	C LD	£8.00
Reversi 1	Gm	Micro Power	16K	C GK	£4.95
Reversi 2	Gm	Micro Power	32K	C GK	£4.95
Road Runner	Gm	A&F Software	32K	C GE	£6.90
Robot	Gm	Miking S/W	32K	C KC	£4.95
Roulette	Gm	Micro Power	32K	C GK	£4.95
Searchbas	Ut	Micro-Aid	16K	C IZ	£1.95
Seed Germination	Ed	Garland Comp.	32K	C JX	£18.82
Sequences	Ed	Chalksoft	32K	C KT	£5.95
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Sort M/C	Ut	Micro-Aid	16K	C IZ	£1.00
Sortbas	Ut	Micro-Aid	16K	C IZ	£1.00
Soundplan	Ut	ME & P Products	16K	C KK	£10.00
Spacehawks	Gm	Computer Concepts	32K	C GJ	£7.80
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Speechparts	Ed	Bryants S/W	32K	C HW	£4.88

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FC Zenith Data Systems
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FD Commodore Information
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Squash	Gm	Aztec S/W	16K	C	IB	£5.50
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Star Trek	Gm	Micro Power	16K	C	GK	£4.95
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IT	£5.95
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Stats 1	Bs	ME & P Products	16K	C	KK	£15.00
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Superlife	Gm	Golem	32K	C	OB	£9.20
Super Hangman	Gm	I.J.K. S/W	32K	C	IT	£3.95
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The Golden Baton	Gm	Digital Fantasia	16K	C	NT	£8.95
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The Time Machine	Gm	Digital Fantashia	16K	C	NT	£8.95
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Tower of Alos	Gm	A&F Software	16K	C	GE	£6.90
Towns of Britain	Ed	Aztec S/W	16K	C	IB	£6.50
The Computer Programme Programs Vol 2	Do	B.B.C	32K	C	KH	£10.00
The Computer Programme Programs Vol 1	Do	B.B.C.	16K	C	KB	£10.00
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3-D Maze	Gm	Hexagon S/W	16K	C	JA	£6.00
3D Maze	Gm	Earthshock S/W	16K	L	KI	£3.00
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Utility A	Ut	Micro-Aid	16K	C	IZ	£4.95
Valley	Gm	ASP Software	32K	C	OD	£11.45
Varkman/Meanies	Gm	Aardvark Software	16K	C	IU	£4.00
Vogon Attack	Gm	Micromail	32K	C	OE	£6.33
Water Relations of Plant Cells	Ed	Garland Comp.	32K	C	JX	£18.82
Whole Number Arithmetic	Ed	W.E. Hunt	32K	C	KQ	£7.95
What's my number	Gm	Square Software	16K	C	NY	£6.00
Where?	Ed	Micro Power	32K	C	GK	£5.95
White Barrows Conquering Everest	Gm	ASP Software	16K	C	OD	£11.45
Wordwise	Gm	Computer Concepts	32K	C	GJ	£74.75
Word Processor	Bs	Rainbow S/W	32K	C	KS	£8.00
Word Processor	Bs	Pro S/W	32K	C	LD	£19.95
Wordy	Gm	Square Software	16K	C	NY	£6.00
World Geography	Ed	Micro Power	32K	C	GK	£5.95
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Astroblast	Gm	Dragon Data	16K	R	R KY	£19.95
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Berserk	Gm	Dragon Data	32K	R	DN,KY	£19.95
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Breaker	Gm	Wizard S/W	32K	C	KU	£3.50
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Dragon Mountain	Gm	Dragon Data	16	C	KY	£7.95
Dragon Invaders	Gm	Microdeal	16K	C	KY	£8.00
Dragon Selection 1	Gm	Dragon Data	32K	C	DN	£7.95
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Dragon Startrek	Gm	Wizard Software	32K	C	KU	£8.45
Examples from the Manual	Ut	Dragon Data	32K	C	DN	£7.95
Escape	Gm	Microdeal	16K	C	KY	£8.00
Evictor	Gm	Wizard Software	32K	C	KU	£7.00
Flag	Gm	Dragon Data	16K	C	KY	£7.95
Flipper	Gm	Microdeal	16K	C	KY	£8.00
Forbidden City	Gm	Apex S/W	32K	C	JT	£4.95
Fruita	Gm	Wizard S/W	32K	C	KU	£6.50
Galleons	Gm	Wizard S/W	32K	C	KU	£5.00
Gamestape 1	Gm	Apex S/W	32K	C	JT	£1.95
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Ghost Attack	Gm	Dragon Data	32K	R	DN	£24.95
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FS RAM Computer Services Ltd
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SOFTWARE LISTING

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Invaders Revenge	Gm	Microdeal	16K	C	KY	£8.00
Jerusalem Adventure	Gm	Microdeal	16K	C	KY	£8.00
Lightpen	Ut	Microdeal	16K	C	KY	£12.00
Madness and the Minotaur	Gm	Dragon Data	32K	C	DN,KY	£7.95
Mansion Adventure	Gm	Microdeal	16K	C	KY	£8.00
Meteoroids	Gm	Dragon Data	32K	R	DN,KY	£19.95
Personal Finance	Do	Dragon Data	32K	C	DN,KY	£7.95
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Program Pack 1	Gm	Microdeal	16K	C	KY	£8.00
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Scarfman	Gm	Microdeal	4K	C	KY	£8.00
Smash	Gm	Wizard Software	32K	C	KU	£7.00
Space War	Gm	Microdeal	16K	C	Ky	£8.00
Space Monopoly	Gm	Microdeal	16K	C	KY	£8.00
Sirius IV	Gm	Wizard S/W	32K	C	KU	£6.50
Sixth Sense	Gm	Kent Computer Co	32K	C	Ky	£9.95
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Special Selection 2	Gm	Dragon Data	16K	C	KY	£7.95
Triplet	Gm	Wizard S/W	32K	C	KU	£5.50
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Williamsburg Adventure	Gm	Microdeal	16L	C	KY	£8.00
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3-D Basic	Gm	Kuma	6K	C	AX,AO,AB	£6.32
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Address Book	Do	DCS	48K	C	JQ	£3.00
Address/Telephone Book	Do	Plymouth Computers	6K	C	OG	£4.99
Agent 007	Gm	DCS	24K	C	JQ	£3.00
Air Bomber	Gm	Plymouth Computers	6K	C	OG	£4.99
Aladdin's Cave	Gm	Kuma		C	AX,CH	£6.32
Aldebaren I	Gm	Sharpsoft	20K	C	CH	£5.85
Alien Attack	Gm	Sumlock	48K	C	DN	£6.50
Alien Attack	Gm	J Wolsencroft	24K	C	CZ	£4.60
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Block Stop	Gm	J Wolstencroft	24K	C	CZ	£4.60
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Bomb Run	Gm	Sumlock	48K	C	DN	£7.50
Bomber	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Breakout	Gm	Kuma	48K	C	AX,AO,AB	£6.32

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GR Pro Software
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SA12 8YE

GS Sussex Software
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GT Rose Cassettes
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GV PR Software
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GW Bridge Software
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GX Video Software Limited
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Kinver 2462

GY J M Steadman
6 Carron Close
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GZ Transform Ltd
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01 658 1661

HA Baust Computing Consultants
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0329 281480

HB University Computers
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HC Educare
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Colditz	Gm	Sharpsoft	20K	C	CH	£8.46
Combat	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Combat	Gm	Kuma	12K	C	AX,AO,AB	£6.32
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Concentration	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Conflict	Gm	Sumlock	48K	C	DN	£6.33
Connect 4	Gm	Highlight S/W	6K	C	CC,AB	£4.60
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Cosmiad	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Cosmiad	Gm	Kuma	12K	C	AX,AC,AO,AB	£9.20
Count and Add	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Cribbage	Gm	Kuma	12K	C	AX,AO	£12.00
Critical Path Analysis	Bs	NCG Ltd	36K	C	KW	£40.00
Cricket	Gm	Kuma		C	AX	£6.32
Cursed Chambers	Gm	J Wolstencroft	48K	C	CZ	£5.75
Data Bank	Ut	DCS	48K	C	JQ	£6.00
Data Base	Bs	Kuma	48K	C	AX,AO	£33.95
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Demon Drive	Gm	DCS	24K	C	JQ	£3.00
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Donky Derby	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Double Precision Basic	Ut	Sharp	48K	C	AB	£28.75
Double Precision Basic	Ut	Sharp	48K	D	AX	£46.00
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Editor Assembler	Ut	Sharp	48K	C	AB	£15.50
Editor Assembler	Ut	Sharp	48K	D	AX	£51.75
Editor/Disassembler	Ut	DCS	20K	C	JQ	£12.00
Election '84	Gm	Sharpsoft	20K	C	CH	£8.45
Electronic Organ	Gm	Kuma	12K	C	AX	£6.32
Electronic Organ	Gm	DCS	48K	C	JQ	£3.00
Electrons I	Ed	Kuma		C	AX	£12.00
Electrons II	Ed	Kuma		C	AX	£12.00
Empire II	Gm	Sharpsoft	20K	C	AB	£5.85
Enigma	Gm	Kuma	12K	C	AX	£6.32
Escape Forth	Gm	J Wolstencroft	24K	C	CZ	£4.60
Evasion	Gm	Kuma	6K	C	AX,AO	£6.32
Executive	Gm	Kuma	6K	C	AX,AB	£9.20
Exploring Africa	Gm	Kuma	6K	C	AX,AB	£6.32
F DOS	Ut	Sharp	48K	C	AB	£57.50
Fall Out	Gm	Kuma	6K	C	AX,AO	£6.32
Finance	Bs	DCS	20K	C	JQ	£3.00
Fireballs	Gm	Kuma	6K	C	AX,AB	£6.32
Fishing	Gm	Sumlock	48K	C	DN	£8.50
Football League	Do	Plymouth Computers	10K	C	OG	£4.99
Football Manager	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Forth	Ut	Kuma		C	AX	£40.20
Foundry Package	Bs	Microtek	48K	C	EQ	POA
Four in a Row	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Fox and Geese	Gm	Highlight S/W	6K	C	CC,AB	£4.60
French Vocab	Ed	DCS	20K	C	JQ	£3.00
Fruit Machine	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Fruit Machine	Gm	DCS	20K	C	JQ	£3.00
Full Accounting	Bs	Microtek	48K	C	EQ	POA
Games Pack 1	Gm	Sumlock	48K	C	DN	£8.50
Games Pack 2	Gm	Sumlock	48K	C	DN	£8.50
Gamestape 1	Gm	DCS	48K	C	JQ	£8.00
Gamestape 2	Gm	DCS	48K	C	JQ	£8.00
Gamestape 3	Gm	DCS	48K	C	JQ	£8.00
Gamestape 4	Gm	DCS	48K	C	JQ	£8.00
Geography	Ed	DCS	20K	C	JQ	£3.00
Guess Word	Gm	Kuma	6K	C	AX,AB	£6.32
Hangman	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Hangman	Gm	DCS	20K	C	JQ	£3.00
Head On	Gm	Highlight S/W	10K	C	CC,AB	£6.90
Head On	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Head On	Gm	Sharpsoft	20K	C	CH	£5.85
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JN Terminal Software
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Manchester
M25 5AJ

REFERENCE

SOFTWARE LISTING

SHARP

Title	Program Type	Program Produced By	How Sold		Supplier Codes	Prices
Home Budget I	Do	Kuma	6K	C	AX,AC,AO,AB	£6.32
Hunter Killer	Gm	Kuma	48K	C	AX,AB	£6.32
I Spy	Ed	Highlight S/W	22K	C	CC	£5.75
Instant Addition And The Four Rules	Ed	Kuma		C	AX	£6.32
Intruder	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Invaders	Gm	Kuma	20K	C	FZ	£6.30
Invoice Control	Bs	David Computer Software	48K	C	JQ	£6.00
J S Line 4	Gm	Kuma	48K	C	AX,AB	£6.32
Junior Maths and Stepping Stones	Ed	Kuma		C	AX	£6.32
Juntori	Gm	Sharpsoft	20K	C	AB	£5.85
Kentucky Derby	Gm	Kuma		C	AX	£6.32
Knights Commander	Ut	Knights	48K	C	AX	£28.75
Knights Commander	Ut	Knights	48K	D	AX	£74.75
Knights Fortran	Ut	Knights	48K	C	AX	£34.50
Knights Wee Pascal	Ut	Knights	48K	C	AX	£23.00
Large Display	Gm	Kuma	48K	C	AX	£6.32
Las Vegas	Gm	Sharpsoft	20K	C	AB	£5.85
Ledger	Bs	NCG Ltd	40K	C	KW	£90.00
Letterwriter WP	Bs	David Computer Software	48K	C	JQ	£10.00
Life	Gm	Kuma	48K	C	AX,AO,AB	£9.20
Linear Programming	Bs	NCG Ltd	20K	C	KW	£45.00
LP Gas Flow	Bs	DCS	20K	C	JQ	£3.00
Lunar	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Lunar Lander	Gm	Kuma	48K	C	AX,AO,AB	£6.32
MZ Othello	Gm	Kuma	48K	C	AX	£12.00
Machine Code Editor	Ut	DCS	24K	C	JQ	£14.00
Machine Code Editor	Ut	DCS	48K	C	JQ	£14.00
Madness	Gm	J Wolstencroft	24K	C	CZ	£4.60
Mailing List	Bs	DCS	48K	C	JQ	£6.00
Maniac	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Man on the Run	Gm	Sumlock	48K	C	DN	£6.33
Map of England	Gm	Kuma	48K	C	AO	£6.32
Map of Englad	Gm	Kuma	48K	D	AX	£12.00
Marauders	Gm	Plymouth Computers	13K	C	OG	£4.99
Mastermind	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Mastermind	Gm	Kuma	48K	C	AX,AO,FZ,AB	£6.32
Match the Character	Ed	Highlight S/W	22K	C	CC,AB	£4.60
Match the Word	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Maths	Ed	Highlight S/W	22K	C	CC	£5.75
Maths 1	Ed	DCS	48K	C	JQ	£3.00
Maths 2	Ed	DCS	48K	C	JQ	£3.00
Maths 3	Ed	DCS	48K	C	JQ	£3.00
Maths 4	Ed	DCS	48K	C	JQ	£3.00
Maths 5	Ed	DCS	48K	C	JQ	£3.00
Maths 6	Ed	DCS	48K	C	JQ	£3.00
Melody	Gm	Kuma	48K	C	AX	£6.32
Memory Tests	Ut	Kuma	20K	C	AX,AO,AB	£6.32
Minefield	Gm	Kuma	48K	C	AX	£6.32
Missle Defence	Gm	Sumlock	48K	C	DN	£8.50
Missile Defence	Gm	Plymouth Computers	18K	C	OG	£4.99
Miz-Maze	Gm	Kuma	48K	C	AX,AO	£6.32
Monkey Climb	Gm	Kuma	48K	C	AX,AO	£6.32
Moonlander	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Mortar Attack	Gm	Kuma	48K	C	AX,AO	£6.32
Munchie Men	Gm	Plymouth Computers	22K	C	OG	£4.99
Music Composer/Editor	Ed	Kuma	48K	C	AX,AC,AB	£12.00
Multiple Regression	Ed	NCG Ltd	24K	C	KW	£65.00
Narpex	Ed	Kuma		C	AX	£28.70
Newton/Conservation	Ed	Kuma		C	AX	£12.00
Number Advance	Gm	Plymouth Computers	3K	C	OG	£4.99
Oil Strike	Gm	Plymouth Computers	14K	C	OG	£4.99
Pac Man	Gm	Kuma		C	AX	£9.20
Pascal	Ut	Sharp	48K	C	AB	£34.50
Patience	Gm	Kuma	48K	C	AX,AO	£6.32
Payroll	Bs	Microtek	45K	C	EQ	£65.00
Payroll	Bs	NCG Ltd	40K	C	KW	£150.00
Payroll 81-C	Bs	Sumlock	48K	C	DN	£74.75
Payroll 81-D	Bs	Sumlock	48K	D	DN	£74.75
Payroll	Bs	Tridata	48K	D	ID	£170.00
Pelmanism	Gm	Sumlock	48K	C	DN	£5.75
Physics 1	Ed	DCS	48K	C	JQ	£3.00
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Picture Count	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Pilot	Ut	Kuma		C	AX	£17.25
Poker	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Polaris	Gm	Sumlock	48K	C	DN	£6.50
Pontoon	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Poseidon	Gm	Highlight S/W	6K	C	CC, AB	£5.75

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KX Broadwater Economic Simulations
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KY Kent Computer Company
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KZ Cases Computer Simulations
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LA Juniper Computing
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Quadrax	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Quest	Gm	J Wolstencroft	48K	C	CZ	£4.60
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Racing	Gm	Kuma	48K	C	AX	£6.32
Raider	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Ram Test	Ut	DCS	48K	C	JQ	£3.00
Reactor	Gm	Kuma	48K	C	AX,AB	£6.32
Reportwriter WP	Bs	David Computer Software	48K	C	JQ	£8.00
Rhymes	Gm	Kuma	48K	C	AX,AB	£6.32
Road Alignment	Bs	Canal Computing	16K	C	OF	£60
Road Hunter	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Rocket	Ed	Kuma		C	AX	£6.32
Roulette	Gm	Sumlock	48K	C	DN	£6.33
Tank Wall	Gm	Kuma	48K	C	AX,AO	£6.32
Tank Practice	Gm	DCS	48K	C	JQ	£3.00
Target Practice	Gm	DCS	48K	C	JQ	£3.00
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Trench Mortars	Gm	DCS	48K	C	JQ	£3.00
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A-Maz-Ing	Gm	Molimerx	4K	C	AJ	£6.33
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Adventure III	Gm	Adventure Int.	16K	D	AJ	£13.77
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					OH	£15.25
Adventure Mysterious	Gm	Adventure Int.	16K	C	AJ	£10.06
Adventure Mysterious	Gm	Adventure Int.	32K	D	AJ	£13.50
Aid, Basic	Ut	J.K. Gosden S/W	16K	C	LB	£9.00
Air Raid	Gm	MA	16K	C	IS	£7.50
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Airflight Simulation	Gm	Instant S/W	16K	C	GB,AB	£9.95
Airmail Pilot	Gm	Instant S/W	16K	C	GB,AB	£8.50
Ajedit	Bs	Molimerx	32K	C	AJ	£49.95
Aladdin	Ed	Bryants S/W	16K	C	HW	£3.75
Alien Armada	Gm	Molimerx	16K	C	IS	£11.50
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Alien Attack Force	Gm	Instant S/W	16K	C	GB,AB	£8.50
Alien Attack	Gm	Kansas	16K	C	IH	£9.50
Alien Defence	Gm	Soft Sector Mkting	16K	C	IS	£11.50
					GB	£15.50
Alien Defence	Gm	Soft Sector Mkting	16K	D	IA	£11.95
All Stars	Gm	Instant S/W	16K	D	GB	£26.50
					AB	£28.95
All Turret Gunner	Gm	Instant S/W	16K	C	GB,AB	£8.50
Amateur Log	Ut	Molimerx	32K	D	AJ	£18.40
Amazing Maze Touchdown	Gm	Kansas	16K	C	IH	£7.50
Angel Worms	Gm	Adventure Int.	8K	C	AB	£14.35
Animation	Ut	Molimerx	16K	C	AJ	£17.20
Animation	Ut	Molimerx	32K	D	AJ	£20.65
Android Nim	Gm	Molimerx	16K	C	IS	£7.50
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Arcade Invaders	Gm	Kansas	16K	C	IH	£9.50
Arcade Scramble	Gm	Kansas	16K	C	IH	£9.50
Armoured Patrol	Gm	Adventure Int.	16K	C	IS	£15.00
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Armoured Patrol	Gm	Adventure Int.	16K	D	AB	£18.99

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TRS-80

Title	Program Type	Program Produced By	How Sold		Supplier Codes	Prices
Ascertain	Ut	Kansas	16K	C	IH	£6.25
Assembly Package	Ut	Molimerx	32K	D	AJ	£74.75
Asteroids	Gm	Molimerx	16K	C	AJ	£10.06
Asteroids	Gm	Molimerx	32K	D	AJ	£13.50
Astro Navigator	Gm	Molimerx	16K	C	AJ	£14.95
Astroball	Gm	Molimerx	16K	C	AJ	£13.77
Astrolog	Ed	Molimerx	16K	C	AJ	£10.93
Astronomical Calendar	Ed	Molimerx	16K	C	AJ	£10.93
Asylum	Gm	Med Systems	16K	C	IS	£9.50
					BT	£12.00
Atlantian Odyssey	Gm	Guild	16K	C	IS	£11.50
					GB	£19.75
Atlantian Odyssey	Gm	Guild		D	GB	£21.50
					GB,BT	£10.95
Attack Force	Gm	Big 5 S/W	16K	C	IS	£11.50
					OH	£11.25
BI Nuclear Bomber	Gm	Instant S/W	16K	C	GB	£12.50
					BT	£12.95
					OH	£11.50
BQ81	Bs	Baust Computing	48K	D	HA	£79.95
Back 40	Gm	Molimerx	16K	C	AJ	£10.06
Back 40	Gm	Molimerx	32K	D	AJ	£13.50
Back 40 III	Gm	Adventure Int.	16K	C	AB	£14.35
Backgammon	Gm	Adventure Int.	16K	C	IS	£7.50
					AB	£7.99
Backgammon	Gm	Kansas	16K	C	IH	£8.50
Balrog Sampler	Gm	Adventure Int.	16K	D	AB	£33.70
Bandito	Gm	Acorn	16K	C	AJ	£7.49
Barricade	Gm	MA	16K	C	IS	7.50
Bandit/Maze Chase	Gm	Kansas	16K	C	IH	£7.50
Banner	Ut	Kansas	16K	C	IH	£7.50
Basic Bidding	Gm	Bryants S/W	16K	C	HW	£9.00
Basic Compiler Accel.	Ut	Microsoft	16K	C	AJ	£22.94
Basic Compiler Accel. 3	Ut	Microsoft	16K	C	AJ	£45.95
Basic Compiler Accel. 3	Ut	Microsoft	16K	D	AJ	£49.95
Basic Insert	Ut	Molimerx	16K	C	AJ	£10.95
Basic Insert	Ut	Molimerx	32K	D	AJ	£14.39
Basic Programming System	Ut	Instant S/W	16K	C	AB	£12.50
Basketball	Gm	Molimerx	16K	C	AJ	£10.95
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Battle Bastogne	Gm	MA	16K	C	IS	10.50
Battle St. Vith	Gm	MA	16K	C	IS	10.50
Battle of Britain	Gm	Molimerx	16K	C	AJ	£15.55
Battle Ground	Gm	Instant S/W	16K	C	GB,AB	£8.50
Bearings	Ed	Bryants S/W	16K	C	HW	£3.75
Bedchest III	Gm	Adventure Int.	16K	C	AB	£20.95
Beewary	Gm	Molimerx	16K	C	IS	£7.50
					AJ	£10.06
Beginner's Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
Biorhythm	Ed	Molimerx	16K	C	AJ	£8.63
Biorhythms	Do	Kansas	16K	C	IH	£7.50
B-I Nuclear Bomber	Gm	Avalon Hill	16K	C	IA	£11.95
Blackboard	Ut	Molimerx	16K	C	AJ	£10.06
Blackjack Master	Gm	Molimerx	16K	C	AJ	£21.15
Blackjack Master	Gm	Molimerx	32K	D	AJ	£25.42
Blink 1	Ut	Molimerx	32K	D	AJ	£17.00
Blockade	Gm	Molimerx	16K	C	AJ	£7.48
Bradley Estate Mystery	Gm	Ogre	16K	C	IC	£10.00
Bridge Partner	Gm	MA	16K	C	IS	£13.50
Bridge 2.0	Gm	MA	16K	C	IS	£13.50
Bright & Early	Ed	Molimerx	16K	C	AJ	£8.90
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Knights Tour	Gm	Kansas	16K	C	IH	£7.50
Business Analysis	Bs	Instant S/W	16K	C	GB	£59.25
Business Analysis	Bs	Instant S/W	16K	D	GB,AB	£82.00
Buzzword	Ed	Molimerx	16K	C	AJ	£5.75
Byte Saver	Ut	Kansas	16K	C	IH	£6.25
CTN Stock	Bs	Baust Computing	48K	D	HA	£79.00
Calendar	Ut	Molimerx	16K	C	AJ	£10.29
Car Doctor	Do	Kansas	16K	C	IH	£7.50
Cash Register	Bs	Molimerx	16K	C	AJ	£10.29
Catalogue	Do	Bryants S/W	16K	C	HW	£3.75
Character and Monster Generator	Gm	Ogre	16K	C	IC	£12.00
Checker King	Gm	Personal S/W	16K	C	AJ	£16.10
Chemical Formulae	Ed	Molimerx	16K	C	AJ	£10.95
Cheque Book	Dm	Molimerx	16K	C	AJ	£15.53
Chess Partner	Gm	MA	16K	C	IS	£9.50
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City Encounters	Ut	Molimerx	16K	C	AJ	£17.20
Climate Comp	Bs	Instant S/W	16K		AB	£20.50
Cload Cassette	Gm	Cload Inc	16K	C	IA	£5.75
Cloze	Ed	Bryants S/W	16K	C	HW	£3.75
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Code Breaker	Gm	Molimerx	16K	C	AJ	£7.49
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Company Director	Gm	Molimerx	16K	C	AJ	£17.19
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Computer Acquire	Gm	Adventure Int.	16K	C	IA	£10.15
Computer Acquire	Gm	Avalon Hill	16K	C	IA	£17.25
					OH	£13.50
Computer Pools	Do	Molimerx	16K	C	AJ	£16.68
Conflict	Gm	MA	16K	C	IS	£10.50
Conflict 2500	Gm	Avalon Hill	16K	C	IA	£12.95
Consequest of Chester Wood	Gm	Adventure Int.	16K	C	AB	£18.99
Constellation	Ed	Molimerx	16K	C	AJ	£14.30
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Conv/CPM	Ut	Molimerx	32K	D	AJ	£20.70
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Cop 16K	Ut	Molimerx	16K	C	AJ	£12.95
Copsys	Ut	Molimerx	16K	C	AJ	£12.95
Corplan	Gm	Molimerx	16K	C	AJ	£32.79
Cosmic Fighter	Gm	Big 5 S/W		C	IA	£10.95
Cosmic Fighter	Gm	MA	16K	C	IS	£11.50
					OH	£11.25
Cosmic Patrol	Gm	Instant S/W	16K	C	GB,AB	£12.50
Cosmic Patrol	Gm	Instant S/W	16K	D	GB,AB	£16.25
Cowboys	Gm	P.C.S.	8K	C	IE	£4.25
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Cribbage Player	Gm	MA	16K	C	IS	£9.50
Cribbage	Gm	Molimerx	16K	C	AJ	£14.38
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Cross Reference	Bs	Molimerx	16K	C	AJ	£8.45
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Crown of CWL IMDRAS part 2	Gm	Ogre	16K	C	IC	£10.00
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DLDIS	Ut	Instant S/W	16K	D	GB	£15.50
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DSM	Ut	Racet Computers	32K	D	AJ	£46.00
D-Day	Gm	MA	16K	C	IS	£10.50
Danger in Orbit	Gm	Instant S/W	16K	C	AB	£12.50
Danger in Orbit	Gm	Instant S/W	16K	D	GB	£15.50
Daredevil	Gm	Instant S/W	16K	C	IA	£8.50
Dark Void	Gm	Molimerx	16K	C	AJ	£10.06
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Eliminator	Gm	Adventure Int.	16K	d	AB	£18.99
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Epson Patch	Ut	Molimerx	32K	D	Aj	£17.25
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Escape	Gm	Kansas	16K	C	IH	£7.50
Everest Explorer	Gm	Molimerx	32K	D	AJ	£13.50
Everyday Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
F for Freddie	Gm	Kansas	16K	C	IH	£9.50
Facto Bingo	Ed	Bryants S/W	16K	C	HW	£3.75
Facto Finder	Ed	Bryants S/W	16K	C	HW	£3.75
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Fastgammon	Gm	MA	16K	C	IS	£14.00
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					AB	£40.95
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Flippy	Gm	MA	16K	C	IS	£10.50
Flight Simulator	Gm	MA	16K	C	IS	£20.00
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					GB	£25.00
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Fortran	Ut	Molimerx	32K	D	AJ	£74.75
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Fortress	Gm	Soft Sector Mkting	16K	C	IA	£11.95
Fortress	Gm	MA	16K	C	AJ	£10.50
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Galatic Empire	Gm	Adventure Int.	16K	C	IS	£10.50
					AJ,AB	£9.78
Galatic Firebird	Gm	Kansas	16K	C	IH	£9.50
Galactic Revolution	Gm	Adventure Int.	16K	C	AB	£18.99
Galactic Revolution	Gm	Adventure Int.	16K	C	IS	£10.50
Galactic Trader	Gm	Adventure Int.	16K	C	IS	£10.50
Galactic Trader	Gm	Adventure Int.	32K	D	AB	£18.99
Galaxy Invasion	Gm	Big 5 S/W	16K	C	IS	£11.50
Gamesaver	Ut	J.K. Gosden S/W	16K	C	LB	£6.50
Game Of Life	Gm	MA	16K	C	IS	£6.50
Gammon Challenger	Gm	MA	16K	C	IS	£10.50
Gammon Challenger	Gm	Molimerx	16K	C	AJ	£10.06
Gammon Challenger	Gm	Molimerx	32K	D	AJ	£13.51
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
G.C.E. O'Levels						
Tape 1	Ed	Bryants S/W	16K	C	HW	£9.00
Tape 2	Ed	Bryants S/W	16K	C	HW	£9.00
Gencop	Ut	Molimerx	16K	C	AJ	£10.06
Geography Explorer	Ed	Instant S/W	16K		AB	£40.95
Ghost Town	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Golfers Challenge	Gm	MA	16K	C	IS	£10.50
Golden Voyage	Gm	Adventure Int.	16K	C	IS	£15.00
					AB	£18.99
					OH	£15.25
Golf	Gm	Molimerx	32K	D	AJ	£17.19
Good Games No.I	Gm	Cload Inc	16K	C	IA	£11.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	IA	£12.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	D	IA	14.95
Gun World	Gm	Ogre	16K	C	IC	£10.00
Graphics Assembler	Ut	Kansas	16K	C	IH	£7;50
Graphs	Ed	Bryants S/W	16K	C	HW	£3.75
Graphit	Ut	Molimerx	48K	D	AJ	£19.55
Gridref	Ed	Bryants S/W	16K	C	HW	£3.75
Hellfire Warrior	Gm	MA	16K	C	IS	£21.00
Highway Code	Do	Bryants S/W	16K	C	HW	£3.75
HMS Impetuous	Gm	Adventure Int.	32K	D	AB	£18.99
Home Budget Planner	Bs	Emjay	16K	C	IG	£8.00
House of 30 Gables	Gm	Instant S/W	16K	C	AB	£8.50
Hyperlight Patrol	Gm	Fantastic S/W	16K	D	GB	£11.25
ID Mailing List	Ut	Instant S/W	16K	D	GB	£19.50
					AB	£20.50
IRV	Ut	Instant S/W	16K	D	GB	£23.75
IRV	Ut	Instant S/W	16K	C	IS	£16.50
					AB	£20.50
Infinite Startrek	Gm	Kansas	16K	C	IH	£9.50
Inventory Control	Bs	MA	16K	C	IS	£11.00
Inventory Control	Bs	MA	32K	D	IS	£50.00
Inventory'S'	Bs	MA	16K	C	IS	£17.00
Invoicing	Bs	Tridata	48K	D	ID	£140.00
Instant Calculator	Do	MA	16K	C	IS	£8.50
Interlude	Gm	Syntonic S/W		C	GB	£20.25
Interlude	Gm	MA	16K	C	IS	£14.00
Invaders From Space	Gm	MA	16K	C	IS	£10.50
Invasion Orion	Gm	Automated Simulation		C	IS	£18.50
Invasion Orion	Gm	Automated Simulation		D	GB	£15.75
Investor's Paradise	Gm	Instant S/W	16K	C	AB	£8.50
Jabbertalky	Gm	Automated Simulation	16K	D	GB	£18.95
Jet Fighter Pilot	Gm	Instant S/W	16K	C	GB,AD	£12.50
Jumbo	Gm	Molimerx	16K	C	AJ	£17.25
Jumbo	Gm	Molimerx	32K	D	AJ	£19.55
Jumbles	Ed	Bryants S/W	16K	C	HW	£3.75
KFS-80	Ut	MA	32K	D	IS	£75.00
Keyboard 80	Do	MA	16K	C	IS	£7.50
KVP	Ut	MA	16K	C	IS	£10.50

SOFTWARE LISTING

TRS-80

Title	Program Type	Program Produced By	How Sold		Supplier Codes	Price
KVP Disk	Ut	MA	16K	D	IS	£18.50
Keyspeed	Ut	Kansas	16K	C	IH	£6.25
Kid's Gallery	Gm	Instant S/W	16K	C	AB	£8.50
Kid Venture I	Gm	MA	16K	C	IS	£12.50
Kreigspiel II	Gm	MA	16K	C	IS	£10.50
Kwik-key	Ut	T. Smith Software	16K	C	OH	£5.25
Label	Gm	Instant S/W	16K	C	GB	£18.75
					AB	£20.50
Labyrinth	Gm	Med Systems	16K	C	IA	£11.75
					BT	£10.95
Labyrinth	Gm	MA	16K	C	IS	£10.50
Laser Defence	Gm	Med Systems	16K	C	GB	£11.95
Laser Defence	Gm	Med Systems	16K	D	GB	£14.50
LED	Ut	Molimerx	48K	D	AJ	£19.55
Life Two	Gm	MA	16K	C	IS	£7.50
Little Red Riding Hood	Gm	Adventure Int.	16K	C	AB	£14.35
Local Call for Death	Gm	Adventure Int.	32K	D	AB	£18.99
Lords of Karma	Gm	Avalon Hill	40K	D	IA	£14.95
Lord of the Rings	Gm	Kansas	16K	C	IH	£9.50
Lost Dutchmans Gold	Gm	MA	16K	C	IS	£9.50
Lunar Lander	Gm	Adventure Int.	16K	C	IS	£11.50
					AB	£12.50
Lunar Lander	Gm	Adventure Int.	16K	D	AB	£18.99
Lprint	Ut	Kansas	16K	C	IH	£6.25
Mach 1	Ut	J.K. Gosden S/W	16K	C	LB	£9.00
Mach 4	Ut	J.K. Gosden S/W	16K	C	LB	£14.00
Magic Paper Calculator	Do	MA	16K	C	IS	£9.50
Mail File	Ut	Instant S/W		D	GB	£75.25
Maillist Mod III	Bs	MA	48K	D	IS	£55.00
Martian Adventure	Gm	Emjay	16K	C	IG	£12.00
Master Cab	Ut	Bryants S/W	16K	C	HW	£3.75
Master Directory	Ut	Instant S/W	16K	D	GB	£21.00
Master Reversi	Ut	Instant S/W	16K	D	GB	£23.75
Matchmaker	Gm	Adventure Int.	16K	C	AB	£14.35
Maths Master	Ed	Instant S/W	16K	C	AB	£8.50
Maxi-Micro Manager	Bs	Adventure Int	48K	R	AB	£84.50
MDOC	Ut	J.K. Gosden S/W	16K	C	LB	£7.50
Memdump	Ut	MA	16K	C	IS	£6.00
Mentor	Ut	J.K. Gosden S/W	16K	C	LB	£16.00
Mean Checkers	Gm	MA	16K	C	IS	£11.50
Merge	Ut	Kansas	16K	C	IH	£6.25
Merge	Ut	T. Smith Software	16K	C	OH	£7.00
Meteor Mission	Gm	Big 5 S/W	16K	C	IA	£10.95
Meteor Mission II	Gm	MA	16K	C	IS	£11.50
Microcosm I	Gm	Basic & Beyond	16K	C	IA	£11.95
Microcosm 2	Gm	Basics & Beyond	16K	C	IA	£19.95
Microcosm 3	Gm	Basics & Beyond	16K	C	IA	£19.50
Microtype	Do	Kansas	16K	C	IH	£12.50
Midway Campaign	Gm	Avalon Hill	16K	C	IA	£10.95
Minicrossword	Ed	MA	16K	C	IS	£12.50
					OH	£11.50
Minotaur	Gm	Instant S/W	16K	C	AB	£8.50
Missile Attack	Gm	Adventure Int.	16K	C	AB	£12.50
Mission Impossible	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Model 1 to 3	Ut	Kansas	16K	C	IH	£8.50
Monopolist	Gm	Baust Computing	4K	C	HA	£7.95
Monopolist	Gm	Baust Computing	4K	D	HA	£10.95
Morloc's Tower	Gm	MA	16K	C	IS	£14.50
Mortgage Calculator	Do	MA	16K	C	IS	£5.00
Mountain Shoot	Gm	Adventure Int.	16K	D	AB	£18.99
Multiple Choice Creation	Ed	Kansas	16K	C	IH	£12.50
Multiprint	Ut	Kansas	16K	C	IH	£8.50
Music Master	Gm	Instant S/W		C	GB,AB	£8.50
Musical Yat-C	Gm	Adventure Int.	16K	C	AB	£12.50
Money Box	Ed	Bryants S/W	16K	C	HW	£3.75
Mystery Funhouse	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Newdos-80 Ver 2.0	Ut	MA	16K	D	IS	£110.00
Newdos +	Ut	MA	16K	D	IS	£45.00
Newdos + 40 Track	Ut	MA	16K	D	IS	£47.50
News 80	Bs	Baust Computing	48K	D	HA	POA
Night Flight	Gm	Instant S/W	16K	C	GB,AB	£8.50
Nominal	Bs	Tridata	48K	D	ID	£170.00
Norton Forth	Gm	Adventure Int.	32K	D	AB	£33.70
North Atlantic Raiders	Gm	Tridata	16K	C	IA	£11.95
Number Bonds	Ed	Bryants S/W	16K	C	HW	£3.75
Number Series	Ed	MA	16K	C	IS	£12.50
Nuke War	Gm	Avalon Hill	16K	C	IA	£10.95
					OH	£11.50
Office Accouting	Bs	MA	16K	C	IS	£15.00
Oil Tycoon	Gm	Instant S/W	16K	C	AB	£8.50
					GB	£9.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£14.35
Olympic Decathlon	Gm	MA	16K	C	IS	£15.50
On Guard	Ed	Bryants S/W	16K	C	HW	£3.75
Pascal-80	Gm	MA	48K	D	IS	£75.00
Paraform	Ut	Molimerx	32K	D	AJ	£18.98
Patience	Gm	Bryants S/W	16K	C	HW	£3.75
Payroll	Bs	Tridata	48K	D	ID	£170.00
Perfect Pong	Gm	Instant S/W	16K	C	GB,AB	£12.75
Periodical X-Ref	Do	MA	16K	C	IS	£9.50
Personal Bill Paying	Do	Instant S/W	16K	C	AB	£6.50
Personal Accounts	Do	Kansas	16K	C	IH	£9.50
Personal Finance	Do	MA	16K	C	IS	£8.50
Pinball	Gm	MA	16K	C	IS	£10.50
Pinball Bounce/Robots	Gm	Kansas	16K	C	IH	£7.50
Pirate Adventure	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Pilot	Ut	MA	16K	C	IS	£23.00
Pits of Angband	Gm	Kansas	16K	C	IH	£9.50
Planet Miners	Gm	Avalon Hill	16K	C	IA	£10.95
					OH	£11.50
Planetoids	Gm	Adventure Int.	16K	C	IS	£15.00
					AB	£12.50
Plus Sound	Ut	Kansas	16K	C	IH	£7.50
Pre Flight	Do	MA	16K	C	IS	£7.50
Programmer and Primer	Ut	Instant S/W	16K	C	AB	£8.50
Programmer's Converter	Ut	Instant S/W	16K	C	AB	£8.50
Pontoon	Gm	Kansas	16K	C	IH	£8.50
Pork Barrel	Gm	MA	16K	C	IS	£6.50
Punctuation	Ed	Bryants S/W	16K	C	HW	£3.75
Purchase	Bs	Tridata	48K	D	ID	£170.00
Pyramids of Doom	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
QSL Manager	Do	Instant S/W	16K		AB	£16.50
Quick Change	Bs	Baust Computing	16K	C	HA	£9.95
Quick Change	Bs	Baust Computing	16K	D	HA	£12.95
Random Dungeons	Gm	Ogre	16K	C	IC	£10.00
Random Dungeons	Gm	Ogre	4K	C	IC	£5.75
Renumber and Compress	Ut	Instant S/W	16K	C	AB	£8.50
Renumber	Ut	MA	16K	C	IS	£6.50
Re-Number	Ut	Kansas	16K	C	IH	£6.25
Remodel & Proload	Ut	MA	16K	C	IS	£26.00
Repeat	Ut	Kansas	16K	C	IH	£6.25
Rescue	Ut	Kansas	16K	C	IH	£6.25
Rescue At Rigel	Gm	MA	16K	C	IS	£18.50
Road Alignment	Bs	Canal Computing	16K	C	OF	£60
Road Safety	Ed	Bryants S/W	16K	C	HW	£3.75
Robot Attack	Gm	Big 5	16K	C	IS	£11.50
Roots	Do	MA	32K	D	IS	£17.00
RPN Calculator	Do	MA	16K	C	IS	£7.50
RSM 2 Monitor	Ut	MA	16K	C	IS	£16.00
RSM 2D Monitor	Ut	MA	16K	D	IS	£20.00
SDM	Gm	Adventure Int.	16K	C	AB	£20.12
Sales	Bs	Tridata	48K	D	ID	£170.00
Santaparavia	Gm	Instant S/W	16K	C	AB	£8.50
Sargon II	Gm	MA	16K	C	IS	£20.50
Sargon II Disk	Gm	MA	32K	C	IS	£23.50
Savage Island I	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Savage Island II	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Scarfman	Gm	Cornsoft	16K	C	IS	£11.50
					OH	£11.25
Scientific Calculator	Ed	MA	16K	C	IS	£14.50
Screen Print	Ut	Kansas	16K	C	IH	£6.25
Screenhold	Ut	MA	16K	C	IS	£6.00
Seadragon	Gm	MA	16K	C	IS	£15.00
Sea Wolf	Gm	Kansas	16K	C	IH	£9.50
Sea Wolf	Gm	Molimerx	16K	C	AJ	£10.06
Sea Wolf	Gm	Molimerx	32K	D	AJ	£12.65
Semi Conductor Theory	Ed	MA	16K	C	IS	£9.50
Showdown	Gm	Adventure Int.	16K	C	AB	£12.50
Silverflash	Gm	Adventure Int.	16K	C	AB	£12.50
Simutec	Gm	Adventure Int.	16K	C	AB	£12.50
Simplify It	Ut	MA	32K	D	IS	£12.00
Six Microstories	Gm	Adventure Int.	32K	D	AB	£14.35
Skirmish 80	Gm	Instant S/W	16K	C	IA	£8.50
Sky Warrior	Gm	Adventure Int.	16K	C	IS	£11.50
					AB	£18.99
Slag	Gm	Adventure Int.	16K	C	IS	£10.50
					AB	£14.35
smal-LDOS	Ut	Molimerx	16K	D	AJ	£43.70
Smartwork	Gm	Instant S/W	16K	C	IA	£8.00
Snake Eggs	Gm	MA	16K	C	IS	£7.50
Space Castle	Gm	Instant S/W	16K	C	IA	£11.95
					OH	£1.00
Space Intruder	Gm	Adventure Int.	16K	C	AB	£14.35
Space Intruders	Gm	MA	16K	C	IS	£15.00
Space Intruders	Gm	MA	32K	C	IS	£18.50
Space Shuttle	Gm	Instant S/W	16K	C	AB	£12.50
Special Sampler	Gm	MA	16K	C	IS	£6.50
Star Fighter	Gm	Adventure Int.	16K	C	AB	£20.95
Star Scout	Gm	Adventure Int.	16K	C	AB	£14.35
Star Trek 3.5	Gm	Adventure Int.	32K	D	AB	£18.99
Space Trek	Gm	Instant S/W	16K	C	IA	£6.50
Speechparts	Ed	Bryants S/W	16K	C	HW	£3.75

Spelling Builder	Ed	MA	32K	C	IS	£15.00
Spellsort	Ed	Bryants S/W	16K	C	HW	£3.75
Spelltest	Ed	Bryants S/W	16K	C	HW	£3.75
Spider Mountain	Gm	MA	16K	C	IS	£9.50
Starfighter	Gm	MA	16K	C	IS	£18.50
Starfleet Orion	Gm	MA	16K	C	IS	£18.50
Starflite	Gm	MA	16K	C	IS	£10.50
Starlord	Gm	Bryants S/W	16K	C	IC	£10.00
Statistics	Ed	MA	16K	C	IS	£6.50
S.T.A.D	Ut	MA	16K	C	IS	£15.00
Storybuilder	Ed	Bryants S/W	16K	C	IS	£12.50
					HW	£3.75
Stock	Bs	Tridata	48K	D	ID	£170.00
Stock or Bonds	Gm	Avalon Hill	16K	C	IA	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	D	AB	£33.70
ST-80	Ut	MA	16K	C	IS	£34.00
ST-80D	Ut	MA	16K	D	IS	£45.00
Strange Odyssey	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Structural Analysis	Bs	Casual Computing	16K	C	OF	£60
Sunday Golf	Gm	Adventure Int.	16K	D	AB	£18.99
Surveyor's Apprentice	Ed	Instant S/W	16K	C	AB	£8.50
Super Breakthrough	Gm	Kansas	16K	C	IH	£8.50
Super Copy	Ut	Kansas	16K	C	IH	£9.50
Super Nova	Gm	Big 5	16K	C	IS	£11.50
Super Pims Data Base	Do	MA	16K	C	IS	£10.50
Super T-Legs	Ut	MA	16K	C	IS	£7.50
Superscript	Ut	MA	32K	D	IS	£21.00
Superkeys	Ut	MA	32K	D	IS	£35.00
Super Simon	Ut	MA	16K	C	IS	£7.50
Swamp War	Gm	Instant S/W	16K	C	AB	£12.50
Swords and Socery	Gm	Kansas	16K	C	IH	£9.50
Sword Of Zedek	Gm	MA	16K	C	IS	£11.50
System Copy Mod I	Ut	MA	16K	C	IS	£9.50
System Master Monitor	Ut	Kansas	16K	C	IH	£17.00
System to Basic	Ut	Kansas	16K	C	IH	£8.50
Tcopy III Mod III	Ut	MA	16K	C	IS	£10.50
T-Step	Ut	MA	16K	C	IS	£7.50
TL DIS	Ut	Instant S/W	16K	C	AB	£12.50
TRS Test	Ut	Instant S/W	16K	C	AB	£8.50
TRS-80 Opera	Do	MA	16K	C	IS	£7.50
Tables Test	Ed	Bryants S/W	16K	C	HW	£3.75
Tanktics	Gm	Avalon Hill	16K	C	IA	£15.95
					OH	£15.50
Targetsounds	Ed	Bryants S/W	16K	C	HW	£3.75
Teachers Assistant 1	Ed	MA	16K	C	IS	£9.50
Teachers Assistant 2	Ed	MA	16K	C	IS	£9.50
Teachers Assistant 3	Ed	MA	16K	C	IS	£9.50
Teacher's Aid	Ed	Instant S/W	16K		AB	£34.50
Temple Of Apshai	Gm	MA	16K	C	IS	£18.50
Temple of the Sun	Gm	Instant S/W	16K		AB	£16.50
The Count	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
The Mean Checkers Machine	Gm	Adventure Int.	16K	C	AB	£14.35
The Congo Mission	Gm	Bryants S/W	16K	C	IC	£10.00
The Quest	Gm	Bryants S/W	16K	C	IC	£12.00
The Secret Wilderness	Gm	Ogre	16K	C	IC	£6.50
Toolkit	Ut	Kansas	16K	C	IC	£12.00
Time Traveller	Gm	MA	16K	C	IS	£10.50
Time Trek	Gm	MA	16K	C	IS	£10.50
Tiny Pascal	Ut	MA	16K	C	IS	£17.00
Timser	Ed	MA	16K	C	IS	£10.50
Tiny Compiler	Ut	MA	16K	C	IS	£12.50
Towers	Ed	Bryants S/W	16K	C	HW	£3.75
Treasure Quest	Gm	Adventure Int.	16K	C	AB	£14.35
Tunnels of Fahad	Gm	Adventure Int.	16K	C	AB	£12.50
Turret & Track	Gm	MA	16K	C	IS	£7.50
Two Heads of the Coin	Gm	Adventure Int.	32K	D	AB	£18.99
Typing Teacher	Ed	Instant S/W	16K	C	AB	£8.50
Typing Tutor	Do	MA	16K	C	IS	£12.00
Typewriter	Ut	Kansas	16K	C	IH	£6.25
Ultra Man	Ut	Instant S/W	16K		AB	£21.50
Ultra Mon	Ut	MA	16K	C	IS	£17.00
Up Periscope	Gm	MA	16K	C	IS	£10.50
Utility II	Ut	Instant S/W	16K	C	IA	£8.50
Valley	Gm	CT Software	16K	C	PF	£9.95
Valley of the Kings	Gm	Instant S/W	16K	C	IC	£10.00
Venture	Gm	Horizon S/W	16K	C	IA	£11.95
Vocabulary Builder 1	Ed	MA	16K	C	IS	£12.50
Vocabulary Builder 2	Ed	MA	16K	C	IS	£12.50
Voodoo Castle	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
					OH	£15.25
Voyager	Gm	Avalon Hill	16K	C	IA	£12.95
What Next?	Gm	Baust Computing	4K	D	HA	£6.95
What Next?	Gm	Baust Computing	4K	C	HA	£3.95
Word Processor	Bs	Kansas	16K	C	IH	£19.50
Word Watch	Ed	Instant S/W	16K	C	IA	£6.50
X-Wing Fighter II	Gm	MA	16K	C	IS	£7.50
X-Ref	Ut	MA	16K	C	IS	£7.50
Y-Y Bar	Bs	MA	16K	C	IS	£10.50
Yahtzee	Gm	Kansas	16K	C	IH	£8.50
Your Life Score	Do	Bryants S/W	16K	C	HW	£3.75
Zossed in Space	Gm	Adventure Int.	16K	D	AB	£14.35
Zossed in Space	Gm	Adventure Int.	16K	C	CH	£10.00
9 Kid's Games	Ed	MA	16K	C	IS	£12.50
76 Basic Programs	Do	MA	16K	C	IS	£23.00

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3-D Maze	Gm	Adcom	8K	C	AB	£7.50
3-D Maze	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C	AA,CH,HM	£6.99
Alpha Blaster	Gm	Sumlock	5K	C	LE	£7.95
Alien	Gm	Commodore	3K	R	FZ,AB,GF	
					CF,DM,CH	
					FD,FP,AA	£19.95
Alien Attack	Gm	Adcom	5K	C	AB	£7.00
Alien Attack	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Alien Blaster	Gm	Paysoft	5K	C	FP	£5.25
Alien Blaster	Gm	MAC	3K	C	JM	£5.50
Alien Blitz	Gm	Audiogenic	3K	C	AA,HM	£7.99
Alien Blitz	Gm	Audiogenic	5K	C	CH	£7.99
Alien Maze	Gm	Adcom	8K	C	AB	£7.50
Alien Maze	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
Alien Invasion	Gm	Computermat	3K	C	IP	£8.95
Alien Wars	Gm	Hi-Tech	3K	C	FZ	£8.30
					AY	£7.80
					CF,AO	£8.62
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Asteroid Blitz	Gm	Mossoft	3K	C	JO	£6.00
Asteroids	Gm	Bug Byte	5K	C	HN	£8.99
Asteroids	Gm	Arcadia	3K	C	KQ	£1.99
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					CF,DM,CH	
					FD,FP,AA	£19.95
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Blitz	Gm	Commodore	3K	C	FD	£4.99
Blitzkrieg	Gm	Llamasoft	3K	C	KG	£4.95
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Bomber	Gm	Mossoft	3K	C	JO	£4.00
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Car Drive	Gm	Hi-Tech	3K	C	FZ	£8.30
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Car Race	Gm	Adcom	5K	C	AB	£7.00
Car Race	Gm	Hi-Tech	3K	C	CF,AO	£8.62
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Charset 20	Gm	Rabbit S/W	3K	C	AH	£4.99
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Deflection	Gm	Adcom	5K	C	AB	£7.00
Deflection	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Destoryer	Gm	Sumlock	5K	C	LE	£7.95
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Diggles Kitchen Vol 2	Do	Micro Computer S/W	16K	C	HK	£4.99

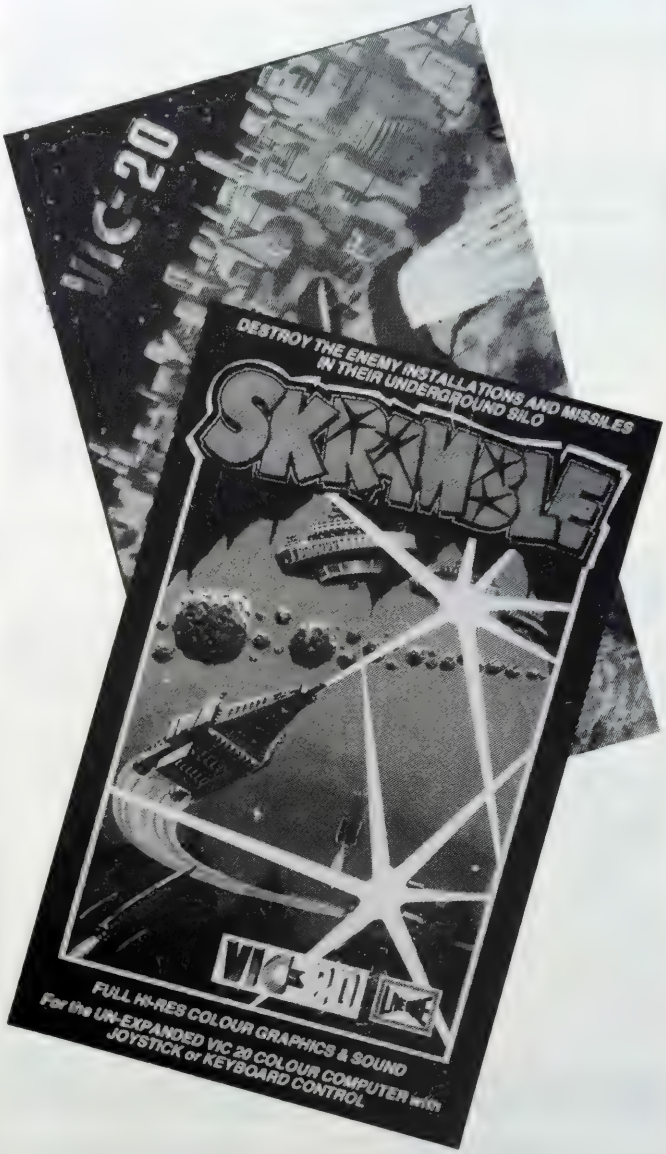
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VIC 20

Title	Program Type	Program Produced By	How Sold	Supplier Codes	Prices
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Dissasembler/Data Writer/Joystick Read	Ut	Aardvark S/W	8K	C IU	£5.00
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Dragon Maze	Gm	Adcom	8K	C AB	£7.50
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Fire Trek	Gm	Hi-Tech	3K	C AY	£7.80
				FZ	£8.30
				CF,AO	£8.62
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				GV	£7.50
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Frogger	Gm	Rabbit S/W	8K	C AH	£7.99
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Graphvics	Ut	Adamsoft	8K	C IR	£19.00
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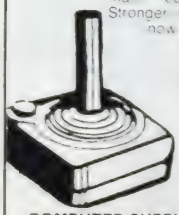
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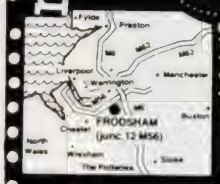
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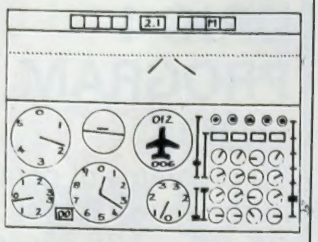
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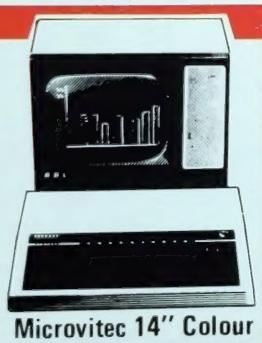
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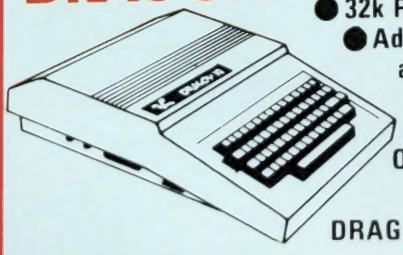


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