PERSONAL
COMPUTER NEWS
EVERY THURSDAY
THE COMPLETE COMPUTING WEEKLY
JULY 7-JULY 13, 1983
Vol 1 No 18
45p

THIS WEEK

PERSONAL BASIC
The new CP/M86 language from Digital Research

ZX INTERFACING
Link up with Cobra's RS 232

PCN GAMEPLAY
New games for Vic 20, Spectrum, BBC and 64

SOUND MICROPAEDIA
Pull out part 2 for input on Vic 20, TI, Dragon, Apple and BBC

EVERY WEEK

BILLBOARD
Buy, sell or swop in PCN's marketplace

ROUTINE INQUIRIES
Your questions answered

Exclusive Pro-Test of the Tandy Model 100

Welcome to the Incredible World of Captain Lasersound!
Join me on a Journey to the Fun Palace of The Universe!

LASER SOUND

Captain Lasersound PRESENTS
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A Galaxy of New STAR Cassettes making their Screen Debut!

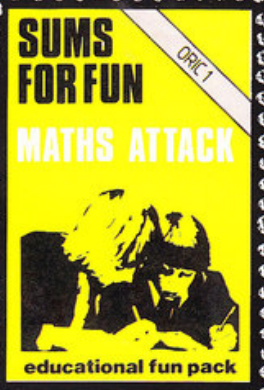
The waiting's over, they're here. A sensational collection of mind warping games, created to stretch the barriers of human endeavour. Do you dare to accept the challenge of Captain Lasersound and enter into the electronic wonderland, a world where only the ultimate warriors survive.

ZX Spectrum 16K/48K **£5.00**

Fantastic collection of arcade thorough-breds and exciting newcomers. Superb hi-res graphics make this pack a visual bonanza. This compendium starts, where others finish.

by Paul A. Thomson and Lyndon John Knowles
ZX Spectrum 16K/48K **£5.50**

You just love eating those green eggs. But watch out, mother hen is getting angry and when she does the feathers start to fly. A fast arcade game that can make even the bravest turn chicken.



by J. S. Bailey
Oric 1. **£5.00**

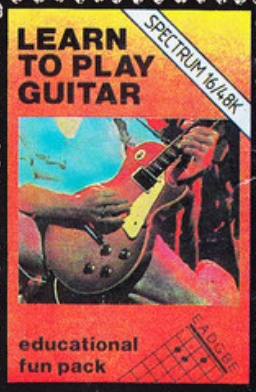
Fun while learning with this dual program cassette. Full colour and excellent graphics combine in a shoot-them-down concept. Only the correct answer will bring success. This cassette serves as an ideal method of introduction into computer assisted education.

Hummer house of horror

superb 3d graphics

by STEPHEN CURTIS
ZX Spectrum 48K **£7.00**

It's too late now to start crying for help. You're on your own, that is apart from the evil spectres that frequent the House of Horror. Is there escape? Or will you be forever entombed in Hummer, house of horror!



by Douglas Barr
ZX Spectrum 16K/48K **£6.00**

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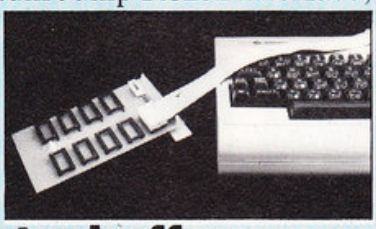

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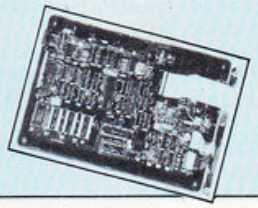

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CHARACTER SET **EDITORIAL: Editor** Cyndy Miles **Deputy editor** Geof Wheelwright **Production editor** Keith Parish **Managing editor** Peter Worlock **Sub editor** John Lettice **News editor** David Guest **News writers** Ralph Bancroft, Wendie Pearson **Software editor** Shirley Fawcett **Systems editor** Max Phillips **Hardware editor** Richard King **Peripherals editor** Ian Scales **Listings editor** Sandra Grandison **Editor's assistant** Harriet Arnold **Art director** Jim Dansie **Art editor** David Robinson **Assistant art editor** Floyd Sayers **Art assistant** Dolores Fairman **Publisher** Fiona Collier **Publishing manager** Mark Eisen **Publishing assistant** Jane Green **ADVERTISING: Advertisement director** John Cade **Advertisement manager** Nic Jones **Assistant advertisement manager** Sue Hunter **Sales executives** Robert Stallibrass, Matthew Parrott, Bettina Williams, Ian Whorley, Sarah Barron, Roxanna Johnston, Christian McCarthy **Production manager** Eva Wroblewska **Advertisement assistant** Jenny Dunne **Subscription enquiries** Gill Stevens **Subscription address** 53 Frith Street London W1A 2HG 01-439 4242 **Editorial address** 62 Oxford Street London W1A 2HG 01-636 6890 **Advertising address** 62 Oxford Street London W1A 2HG 01-323 3211 **Published by** VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

DIY micro go-ahead

by Ralph Bancroft

Microkey is going ahead with plans to build the unique Forth micro, whose spec will be determined by users (*PCN*, issue 12).

The company was set up by Advanced Text Systems to research the idea and build the micro.

'We had no idea what kind of response we would get from the advertisement in *PCN*, but reckoned that if we got more than 500 responses there was a go situation,' said Microkey's managing director Paul Wynter.

In the event there more than 1,700 replies and all have been sent a questionnaire seeking more detailed views as to the kind of machine people were interested in buying.

A large number of replies came from schoolchildren who have experience of RML, Sinclair Spectrum and ZX81 and BBC micros. Many of them were critical about the machines and were looking for a computer that would avoid the problems they had experienced.

'I am amazed at the level of computing knowledge of many of these young people,' said Mr Wynter. Typical complaints, he said, were about the speed of the machines and the quality of the keyboard.

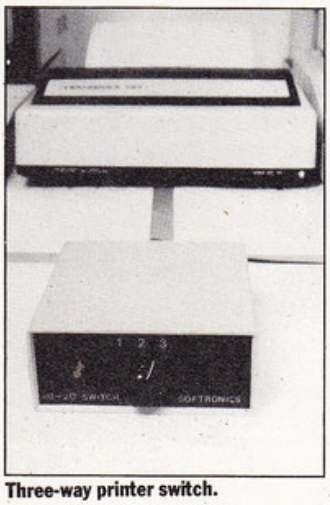
Another interesting fact is that most respondents were looking for a micro costing in the region of £400-£500. 'Most probably they are looking for a new machine they can graduate to,' said Mr Wynter.

Microkey has yet to analyse the questionnaire responses it has received. However, the key features of the machine now look as though they will include a user choice between the 6502 or 6809 processor chips (the circuit board will allow either to be plugged in), 128K of RAM in two blocks of 64K (they can be used separately for two programs running at the same time, opening up the possibility of multi-tasking with two users), high resolution colour graphics and the Sony microfloppy as the disk drive.

It has yet to be decided whether the drive will be included in the price of the standard machine.

Initial inquiries about the project are being handled by software house Remsoft. Mr Wynter says that it is still willing to send out questionnaires to anyone who missed the original ad.

Remsoft's address is FREEPOST, Brighton BN1 1ZW.



Three-way printer switch.

Switch-on to sharing idea

Products loosely described as peripheral sharing devices are beginning to make their presence felt.

The idea is that in a multi-computer environment (small business or classroom) expensive but comparatively little used peripherals like printers can be shared by several computers without the hassle and disruption of physically digging around behind or under computers to change intertwined cables.

The top end of this concept involves sophisticated computer networking where several computers communicate through a complicated system, often with a central file-serving computer.

Next down the line are products like the Vic/64 Switch (*PCN*, issue 1) which monitors the ports of a series of computers and automatically links the relevant peripheral when it is required.

Now a company called Softronics has announced an even simpler solution. At £99 plus VAT the 3-20 Switch simply links a shared printer to one of two or three computers by the turning of a dial. The switch, claims Softronics, is ruggedly built in a rigid and virtually unbreakable ABS casing. Contact (0825) 2179.

Sorcerer reappears

Those of you who were in this business before it was a business will remember the Exidy Sorcerer. One of the early casualties of the micro market, the Sorcerer vanished with the demise of its UK distributor EMG Microcentres.

But the Sorcerer has been taken up by Project Control and Management (01-730 5902). The firm is primarily interested in supporting existing customers and honouring maintenance contracts. However, those of you who collect micros may just be in time to make a valuable cop for your collection.

Mini Pascal for the Beeb

BBC users who want something more than Basic can use a new subset of Pascal on their systems.

For £59 plus VAT the language Pascal-T comes in a 16K EPROM from HCCS Associates and is suitable for teaching and learning purposes. Jim Golightly of HCCS said: 'Many universities and colleges like Pascal and are using it to teach computing.

'It's a language that's gaining a lot of popularity.

Pascal-T will be available in two weeks' time and Mr Golightly said that HCCS will be adapting the package for the Epson HX20.

HCCS has also produced a Logo-Forth for the BBC micro in the form of a 16K EPROM. Aimed at primary school children, Logo-Forth is a very simple way of getting kids to find their way around their machines.

The program includes catalogue disk-files for up to 198 filenames, by-passing Acorn's Basic-orientated filing system. You can therefore save your procedures by name and also examine the large catalogue contents. The whole package costs £59 plus VAT. Contact HCCS Associates, 0632 821924.

Atari XLs on the way

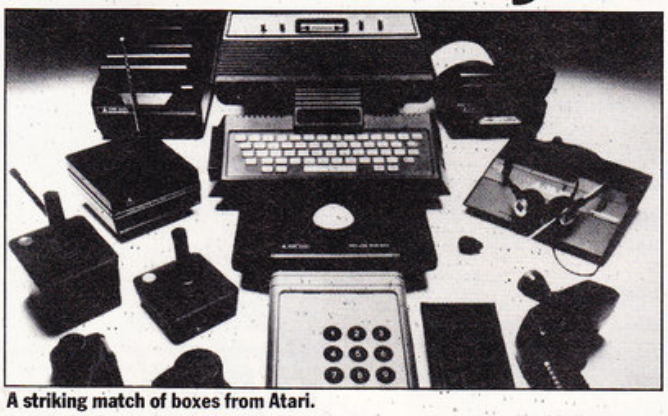
Two of the Atari systems that grabbed the limelight at Chicago's Consumer Electronics Show (*PCN*, issue 14) should be in UK shops later this year.

The Atari 600XL and 800XL were the most prominent features of Atari's challenge to the Coleco Adam and last week in London they headed a bulk launch from Atari of systems, peripherals, accessories and software.

No prices or firm delivery dates were given but in the US the 16K Atari 600XL sells for $150. Based on a 6502C it has built-in Atari Basic, a full keyboard with 29 graphics keys, and compatibility with software written for earlier Atari home computers. You can expand the main memory to 64K and play with up to 128 colours at any one time.

The 800XL costs $300 in the US. Another 6502C system, it has 64K as standard and shares many of the features of the 600XL.

How these prices will travel across the Atlantic is a moot point. Atari has declared that it isn't going to contest the highly competitive sub-£100 business, and a spokesman said last week that the European market might be able to sustain higher prices generally than the US.



A striking match of boxes from Atari.

Atari hopes the machines will recover some lost ground for it, and to back them up it unveiled one of the letter-quality printers that caught several eyes at CES. The 1027, again with no UK price set, is a fairly pedestrian but (in the US, at least) very low cost printer.

Two more printers, the 1020 colour printer capable of four colours and 10cps, and the 1025 dot matrix 80-column unit that runs at 40cps, were also demonstrated for the first time in this country.

These peripherals, along with new storage units and other such devices as a light-pen, can all be attached to existing Atari machines as well as to the 600XL, the 800XL, and the two larger systems, the 1400XL and 1450XL. These last two machines are due here early next year.

Last but not least the new software is an indication that Atari is still firmly bent on providing entertainment. New games appeared with the new machines, and Atari has also made sure that its games will run on some other systems, among them its great rival Commodore.

Torch tri-processor carries fight to US

By Ralph Bancroft

Using the deliberate coincidence of American Independence Day, a British company has launched a triple-processor micro that offers the combination of Unix and CP/M compatibility.

The machine is the 700 series from Torch Computers and it had its first public showing this week.

The 700 series has a triple processor architecture with a 68000 chip to run Unix, using 256K of RAM. A Z80 processor provides the CP/M compatibility and ensures that the micro can run all the software that currently runs on Torch's existing machine, which has been renamed the C-series. A BBC board with a 6502 is used to control all input and output.

Also launched by Torch is the 300 series of workstations. With a BBC board, Z80 and 64K of RAM they are designed to provide low-cost access to peripherals such as disks and printers using Torch's own networking system Torchnet.

Torchnet is an enhanced version of Acorn's Econet system which removes the need to use micros as dedicated file-server and print-server stations.

Any workstation or micro on the net can access any other machine. An 'attach' feature allows a disk drive on one machine to be dedicated for use by a remote machine or terminal.

Torch — aiming for independence from America for UK users.

Two new software packages launched at the same time as the new micros are TorchMail Plus (an enhanced version of Torch's electronic mail system) and Textel which allows users to run their own inhouse Viewdata service over Torchnet.

TorchMail Plus features a high-level compiler called Tobey which allows the user to program his Torch or a remote Torch. Programmed events can either be executed immediately or at some time in the future.

The other software announcement from Torch is that in future all Torch C-Series machines and Z80 disk packs will be issued with a complete suite of software from Perfect Software Inc. Included in the suite is a word processor, spelling checker, spreadsheet and database.

Prices for the new Torch hardware (excluding VAT) are £1,244 for the 301 workstation (synchronous communications cost an extra £205) and £3,150 for the 705 triple processor machine with twin floppy disks. A hard disk version, the 725, costs £5,450.

The flexibility of the Torch hardware was well demonstrated at the launch. This news story was typed on a C-series machine using Wordstar at the launch and then transmitted through to the *PCN* using Torchmail Plus.

More Mates due from NCR

Two more versions of Decision Mate V from NCR (*PCN*, issue 1) should be in the shops in mid-July.

The colour and Winchester disk versions of NCR's business micro series will cost less than originally supposed. 'The Winchester machine is about £1,000 less than we originally thought,' said Lyn Mailey, an NCR sales manager.

The twin processor (Z80A/8088) with integrated 10Mb Winchester plus floppy disk drive and MSDOS will be £3,640. The colour machine with twin processor plus MSDOS and two floppies is £2,410, while its original, the monochrome version at £1,825, will not change in price.

A technical machine, with an 8087 co-processor, is due for release in the last quarter of the year. Networking is expected to be available in September.

International Sinclair club

The International Sinclair User Group has made a modest start in Burnley, Lancashire, with a membership of a handful of local people.

But organisers Peter Paton and Victor Webber have high hopes. Mr Paton said: 'We've got Sinclair Research's blessing, and they will be sending us dealer newspacks. We're planning microfairs in various parts of the country, and in time we hope to have an annual national exhibition, depending on the response we get.'

Anyone wishing to join should contact Mr Paton on Burnley (0282) 53241. The fee, at £10 a year, gives you access to a software library, a monthly newsletter known as *ZX Press* and a quarterly supplement which you can turn into a user manual. This will be based on users' tips, hints and experiences.

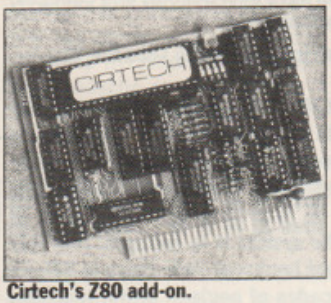
In addition, the group plans to sell hardware and software at 20 per cent off the normal retail price.

Apple upgrade on the cards

Fashions come and go but expansion boards for the Apple II never seem to go out of season.

Two of the latest are from the consultancy and design house Cirtech, and the prices look as trim as the circuitry. Cirtech's Z80 add-on will cost you £51.75, less than half what you might pay elsewhere, and the parallel printer interface card is similarly cheap at £36.80.

The cards measure 4 × 3in and 2.5 × 2.25in respectively, and they are available direct from Cirtech on 0383 729770.



Cirtech's Z80 add-on.

DAISY CHAIN — with an interface from Crown Business Centre you can now turn your Brother EM1 electronic typewriter into a Crown Ranier daisywheel printer. The Crown Ranier runs as a standard printer with line memory, express back space, auto carriage return and lift-off correction. And included in the price of £795 plus VAT you get an IEEE or RS232 interface. The printer is compatible with a wide range of micros and is available from Crown Business Centre, 0323 639983.

Tandys land

Two new Tandy systems have made it across the pond, the Model 4, and the Model 100, which is Pro-Tested in this issue.

The Model 4 is an upgraded version of the well-known Model 3. The most obvious difference is that it isn't that shabby silver colour, but inside it's much bigger. The 3 would only go as high as 48K, but the Model 4 comes with 64K as standard, expandable to 128K.

Other changes are a bigger screen —80 by 24 as against 64 by 16— and it's green too!

A Tandy spokesman said that it will run all software which is written for the Model 3, and that it will cost £1,499.

The Model 100, on the other hand, is a new breed of machine. We look at it on page 42 in close detail. The price is £499 for the 8K version and £649 for the 24K. Both can be upgraded to the maximum of 32K at a cost of £79.95 for each 8K increment.

The third of Tandy's recent releases in the US, the small colour computer, is not expected to make its UK debut until October, according to US sources.

VIEW FROM AMERICA

Computers and the no-go zones

By Chris Rowley

America watchers are always trying to match up the trends. Take for instance the hot young trend of the microcomputer boom and the established MegaTrend, the on-going de-urbanisation of the US. Lately this merger of trends has made the notion of 'cottage industries for the new era' a popular media play.

With a computer and a modem you can live anywhere, hunting elk for breakfast and working on Wall St all day without ever leaving your parlour. Even your pay cheque will come over the phone.

Very nice, except that there is still an awful lot of expensive corporate real estate anchored downtown, and thus corporate America is proving somewhat loathe to set office people free to go home and work. In addition the very phrase 'cottage industry' stirs very potent memories in the minds of those who organise labour. They take a dim view of the whole trend.

But those with the right skills and enough money can get what they want anyway, and so the merging of trends continues. In Benicia, just to the north of San Francisco, there is a brand new 'Computer Ready' housing development. Every home (they start at $131,500) comes pre-wired for your computer system with dual phones lines for humans and modems. If you're freaky and don't have one they'll throw in an IBM PC XT and add $3,500 to the mortgage — no problem.

The logic seems flawless. Commuting is hell; why tolerate traffic, trains, tolls and smog if all you do is work all day with a computer way over in New York? The computer doesn't give a hoot where you are.

So everyone who can make it will split to the woods? Unfortunately — and here's the rub — these aren't the only trends and they aren't merging in a vacuum. Consider the ominous trends in US education. The way things are pointing there, everyone who can will *have* to escape to the woods.

First some good points. Of 77,000 US schools, about 23,000 had some kind of computer installed by the end of 1982. By the end of 1983 more than half of US high schools will have one. Schools and colleges, teachers and professors are going micro-crazy.

Indeed, in the better-off school districts, out in the suburbs, they're putting in micros by the truckload.

TRS Model 100s and Epson HX20s are proving to be the hot graduation presents for 18-year-olds going on to college this Fall. In certain elite private schools the computer is so ubiquitous that anyone without one risks being considered either hopelessly inadequate, neurotic, or Communist.

But at the same time the US public system is in collapse. Just this week the San Jose school system went bankrupt right there in Silicon Valley, the Cradle of High Tech. Decades of neglect, pitiful teaching wages and racial struggles have combined to severely degrade the system.

In poverty-stricken urban school districts they are facing a rather unpalatable truth. They aren't going to get any computers. Indeed these schools already suffer an almost total lack of science teaching.

Of course, the Reagan administration is firmly set against federal aid to schools. Mr Reagan is said to believe 'personally' that every locality should educate its own, and his administration is cutting education spending next year.

Projections for a society just down the road that will be computer segregated bring to mind another new trend, one that is currently getting a lot of attention in the crime-haunted Sun Belt. Known as 'Gateing-off', this is the old, tried and true technology of putting up a wall around one's community with guard posts on the road into town. So far it has been restricted to a few well-to-do townships in California and Florida, but interest is quickening in other states and regions.

What will it be like, growing up in a Gated-off suburb, in a Computer-Ready home, working in the Cottage Industry? Especially with a permanent illiterate underclass abandoned down the road in the urban slums?

Micros on the rates

Computer clubs around the country might do well to follow the lead of the Bolton Computer Club which drew a £5,000 grant from its local council.

On a shopping spree, the club bought an Oric, BBC with single disk drives, a Spectrum, Dragon, Jupiter Ace, Commodore 64, Vic 20, Atari 400, a Newbrain, seven colour TVs, three black-and-white TVs, a monitor and other bits and pieces.

The club was given the grant by Bolton Corporation under the Inner Urban Programme. Bob Crabtree of the corporation said: 'The compute club is seen as a piece of investment for the future and it's a flourishing club.'

At the club's first meeting last October 40 people turned up — it now has 170 members. Christopher Eccles, club treasurer, said: 'We put in an application for the grant last November and received the money on March 31.

'Now we have a fully equipped computer room at Bolton Institute of Higher Education — our weekly venue. And we have an agreement with the college whereby they can use the equipment between 9-5 and we use it in the evenings.

With all its equipment the club offers its members a host of activities. And people in the area thinking of buying a computer can always pop in for advice.

Burnley Computer club, having got wind of Bolton's achievements, approached its council for the same sort of grant. However, the club was too late. The money had already been allocated to highway improvement schemes.

Computer clubs don't have a divine right to this form of grant, but it may be available on a first-come first-served basis. So if you're quick off the mark at the town hall you may be in with a chance.

FREE PORT — Spot the deliberate spelling mistake? It should read 'Vic Parallel Interface'. Its major plus point is that it plugs into the serial interface of the Vic-20 or Commodore 64. As a result it leaves the user port free and doesn't take up valuable memory space. It is Centronics-compatible and is available from Mikrocomputertechnik, Winchenbachstr. 3a, D-5600 Wuppertal 2, West Germany for $110 prepaid. Telephone 010 49 0202-510444.

Plug-in Spirit

Launched in Spirit and available next month is a new British business micro with a combination of familiar features.

Almarc Data Systems' Spirit range is built around the S-100 bus, has Z80 and 8086 processors, and runs operating systems from the CP/M stable. Almarc has taken modular design literally — you are intended to plug processor boards in and out to suit each application.

There are four systems in the range; each has the twin-processor option with an 8087 mathematical co-processor. The Spirit 1 has a five-slot chassis, the Spirit 2 a 15-slot chassis, the 3 is a multi-user system for up to four users, and the 4 supports up to 10 users at the same time.

The machines were launched with 1.6Mb twin floppy disk systems, but from September 40Mb Winchester disk sub-systems should be available. In the same month Almarc hopes to have further processors and operating systems to offer you, with MSDOS and Concurrent CP/M following later.

Almarc started life as a distributor of micro kits from Vector Graphic, of California. It began making its own systems in mid 1982, the Series 8 and Series 16.

Prices start at £2,695 for the Spirit 1 with twin floppies. Almarc is on Marlow (06284) 6419.

ACT's Apricot blossoms

ACT's Apricot: in season in October

By Max Phillips

Meet the Apricot, a brand-new 16-bit micro from Sirius-vendor ACT. Emerging as a top UK company through its success with the Sirius, ACT decided it was about time it had its own micro. And the Apricot really is a case of 'all our own work'.

The Apricot is a very pretty small desktop machine. The keyboard clips to the CPU for carrying, though you have to lug the monitor round separately or make do with the LCD display built into the keyboard.

Inside, the Apricot is a Sirius lookalike. It's based on a 5 MHz 8086 with 256-768K RAM and an 8089 I/O chip; 8087 maths is, of course, optional. Storage is provided by twin Sony microfloppies, giving 315K each. But you can bet your Sirius, ACT will offer a Sirius-compatible 5¼in floppy and probably a built-in 3.5in Rodime Winchester.

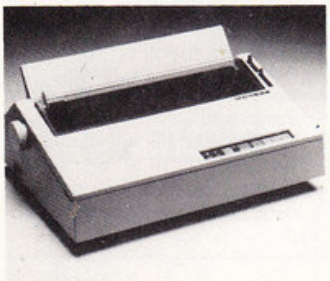
Hardware options will include a built-in auto-dial auto-answer modem. One of the nicest features is a totally soft keyboard featuring a two-line LCD display over six touch-sensitive function keys. This can label the keys or act as a clock and calculator for other applications.

Software will be based on bundled MSDOS 2 and Concurrent CP/M-86. UCSD-p BOS will be optional. The Apricot will come with the two Basics (Microsoft and DRI Personal Basic), a graphics kernal, communications software and a database package called 3D.

But the best bit is the price. The Apricot starts at £1,495 with a working configuration of twin microfloppies and screen being only £1,750, putting it squarely in competition with existing 8-bit machines like the Epson QX10 and the promised Future Computers FX20.

The Apricot will be built in Scotland, but in a curious coals-to-Newcastle deal ACT will be selling Apricots to Victor, manufacturer of the Sirius. ACT claims that the Apricot complements the Sirius. But it looks likely that it will further curtail sales of the 1-2Mb model.

The Apricot is billed as a fourth-generaton microcomputer but won't be in season until October.



Pedestrian but economical Brother

Brotherly love at £500

The downward trend in the cost of high-quality printing continued last week with Brother's release of its HR-15 daisywheel unit.

For a company that made its name in sewing machines and portable typewriters Brother has produced an impressive device in the HR-15. But like many diverse Japanese companies steadily muscling in on the micro business, it isn't doing anything by halves.

The HR-15 has many of the quality features of its more expensive siblings (the company has been active in the business daisywheel market for some time) except speed — it plods along at about 13cps. Where you get low speed, however, you usually get low price as well — the HR-15 costs just over £500.

Speed is less important these days because of low-cost spoolers (*see page 41*). A spooler acts like a large buffer. You simply download text to it from your computer and it feeds the printer at the required pace — the computer is then free to get on with something else.

Brother has already captured 70 per cent of the US under-25cps daisywheel market and hopes to have a similar impact here.

PCN will feature the Brother HR-15 in a future Pro-Test.

Logo logs on the 380Z

Edinburgh University is plotting to wean schoolkids away from their Logo turtles into writing fully-fledged programs, with an all-bells-and-whistles version of the language on the Research Machines 380Z micro.

The Logo in question comes from the Edinburgh University Department of Artificial Intelligence, and it's one of only a handful of 'proper' Logos, according to Kenneth Johnson who wrote it.

'Most of the systems being sold as Logo at the moment are little or nothing more than turtle graphics routines written in Basic,' says Mr Johnson. 'But Logo is actually a full programming language, and it is able to solve problems that would be hard to handle in Basic.'

Turtle graphics make a good introduction to the language, according to Mr Johnson, since they are easy for children to start using, but there's no reason why those kids should not go on from there to learn the full Logo language — except a lack of full Logo interpreters.

The Edinburgh Logo, which is being sold by RML for £59, boasts all the usual control structures and variables whose names may be as wide as the screen.

'You can build procedures which can be recursive and return results,' says Mr Johnson. 'You can create user-defined procedures and store them in a library, and problems like adding up five numbers which is a real headache in Basic needs a two-line program in Logo.'

Interface extras for the Sharp

Sharp MZ80A users short of two serial interfaces, a Centronics interface, user-definable parallel interface and extra ROM should look at a new board from Kuma.

Christened MIB, the board has 4K of ROM.

It will let you attach various printers, and your system can become an intelligent terminal or electronic mailbox.

If you want further information Kuma is in Maidenhead on 0628-71778.

Spectrums hijacked

By Ralph Bancroft

Would-be Spectrum owners may have to wait a couple of weeks before they take delivery of their machines.

Last week's theft of a lorry-load of Spectrums has thrown Prism Microproducts' distribution schedules into chaos. As a result, supplies to shops are running two weeks behind schedule.

Prism is advising anyone who is offered a cheap Spectrum to get in touch with it or TNT, the company owning the warehouse in which the Spectrums were stored. TNT is currently considering offering a reward for information that will lead to the recovery of the micros.

The theft couldn't have come at a worse time for Prism, as the warehouse had just received a large delivery of Spectrums. 'It's the first time for a long, long while that we have had so many machines in the warehouse,' said Terry Brown, Prism's deputy managing director.

The theft was well planned and carried out, he said. 'Unfortunately, a lot of people knew that there were a large number of machines in the warehouse,' he said.

The problem the thieves now face is how to get rid of the Spectrums. 'I can't see any of the High Street chains like WH Smith having anything to do with someone offering Spectrums on the cheap. We are checking with all the shops we deal with to find out if anyone has approached them,' said Mr Brown.

Prism's problems have been compounded because it has had to wait until the insurance company and the police have finished their investigations before being allowed access to the warehouse.

'We don't even know how many machines have been stolen because we haven't been able to count what is left. All we do know is that the gang loaded up two TNT lorries with boxes. On that basis we reckon that around 3,000 Spectrums were stolen but the figure could be higher. When the machines are delivered to us they come in lorry-loads of 5,000,' said Mr Brown.

Nor does Prism have any details of the serial numbers of the missing micros. 'We have gone to our suppliers and they are working out what machines were delivered.

Anyone who is offered a cheap Spectrum or may have information that will help the police should contact their local police station. Alternatively, they could get in touch with Terry Brown at Prism Microproducts on 01-359 7481, or Mick Moger on 01-340 0254.

Each-way bet

Just when you thought the IBM PC look-alike race was well under way, the US communications specialist Paradyne has entered its own outsider.

The Paradyne model, launched last week, matches the spec of the PC in most particulars, but also covers all bets by offering compatibility with the IBM 3270 display terminal as well — this is the device that IBM has turned into a PC with add-ons.

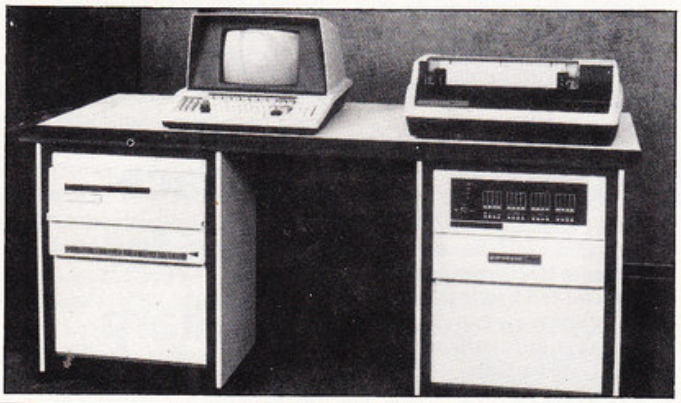
Vital statistics of the Paradyne's PDS/VIP include an 8086 processor, MSDOS operating system, dual double-density disk drives with a total of 640K and a choice of four languages — Basic, Cobol, Pascal and Fortran.

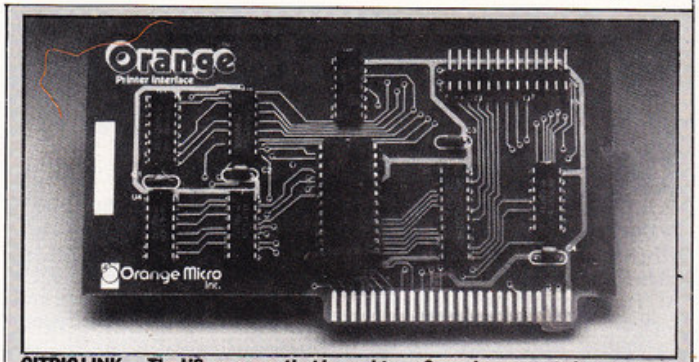
The PDS/VIP offers you both desk-top computing and IBM 3270 interaction with the host computer. And as a complete package for £4,600 a keyboard, monitor and matrix or letter quality printer are thrown in.

Future extras in the pipeline include 10-40 Mb Winchester hard disks, CP/M emulation, graphics support and a multi-user operating system.

Software written for the PC will also run on the Paradyne micro — and as part of the deal the company is giving full on-site service.

First deliveries of the machine will be made in a few months' time. Contact Paradyne on Windsor (95) 56712.





CITRIC LINK — The US company that brought you Grappler seems to have run out of quirky names — this parallel interface for an Apple II, II+ or IIe is called simply the Orange Interface. It costs £64, which may not be the least attractive of its features. For the price you get an 80-column screen dump, 40-column dump, page length and margin sets and add or delete line feeds. When you aren't using it for formating it will serve as a standard parallel interface. It comes with a 5ft cable and a 90-day warranty from Pete and Pam and other UK outlets — for more information contact 0706-227011.

Software on your radio

Sending software out over the airways is catching on, with Radio Victory in Portsmouth the latest to transmit telesoftware.

Following in the footsteps of Bristol Radio West, the first station to broadcast data over the airwaves (*PCN*, issue 4), Radio Victory is holding a competition, in conjunction with systems house Automata, which involves sending a Spectrum program over the air so that you can load it directly from the radio.

The program consists of a line from a song, and entrants have to say which one it comes from. The prize is a £5 gift voucher but plans are in the offing for giving away games, too.

Dave Carson, disc jockey at Radio Victory, said: 'The response has been so amazing that we are looking at ways of making the competition available on other micros as well.

The competition will run for six weeks until July 30 on an experimental basis, and will go out at 1.30pm each Saturday on 95Mhz VHF.

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- INSURANCE IN TRANSIT
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12/500MG — Smart metal cased with plastic front. Anti-Glare high res 12in CRT. 12MHz. Recommended for 80×24 characters.

Green **£82.60** + VAT = £94.99

Amber **£86.00** + VAT = £98.90

SMITH-CORONA TP-I

Microprocessor controlled, letter quality daisywheel printer. 120 wpm. 12cpi (10cpi to order). **STATE:** Serial or parallel.

£485.00 + VAT = £557.75

FREE! WORTH OVER £30 — TWO EXTRA typestyle daisywheels, PLUS SIX film ribbon cartridges

The PRINTERLINK buffer

Available in Parallel/Parallel format only — other interfaces coming soon — these buffers are attractively cased (approx: 5 × 5 × 2 inches) and are presented in either 16K or 48K versions.

£125.00 16K /**£175.00** 48K + VAT = £143.75/£201.25

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- DON'T FORGET TO INCLUDE THE VOUCHER AND DEDUCT £10 FROM YOUR PAYMENT!

Shopped by a micro

A service that lets you shop for hardware and software via your micro has been set up by Maplin Electronic Supplies.

Cashtel, which stands for Computer Aided Shopping by Telephone, can be used on any micro with a modem, according to director Doug Simmonds.

The number to dial is 0702 552941, and any 300 baud modem using European standard CCITT tones can be used. Maplin plans to supply ready made modems, but at present its modems come in kit form, for £49.90.

Goods you can order include micros, games, connectors, microphones, stereo mixers, PCB equipment, panel meters, video components, semiconductors and tools.

The service lets you check Maplin's current stock level and price of any item, and also any previous orders you have made. You can place orders by entering the stock number and quantity of the item you want, which will then give you the appropriate description, unit price and total price.

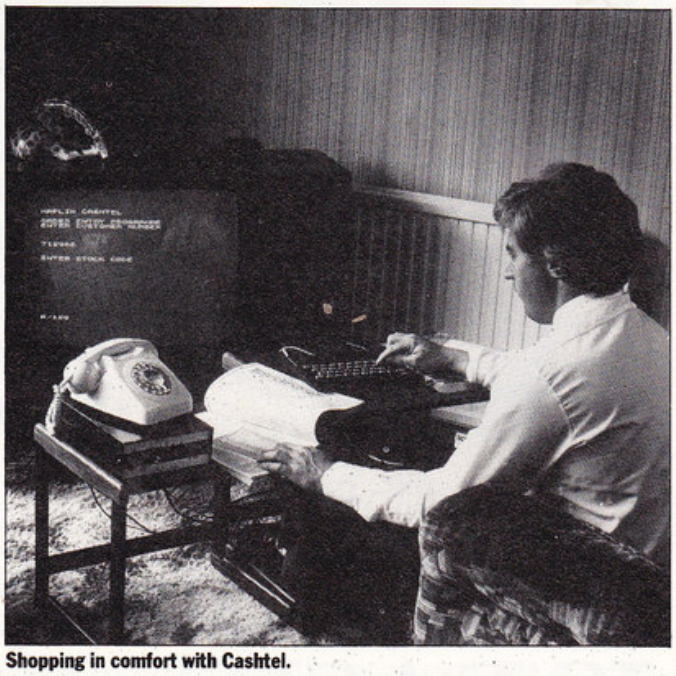
The computer will tell you if any item is out of stock. As soon as the company has it again, it will be sent to you directly, provided you left your order on the operator's computer.

Mr Simmonds said: 'The system is only four weeks old and very busy. Last weekend, we had 150 calls and we get a few dozen more every day.'

It runs during normal office hours and carries messages for Atari users, since two or three people in the company run an independent users' group for Atari machines, and there are plans afoot for contacting other user groups too.

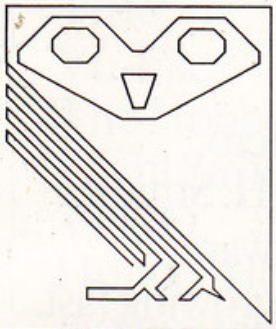
A service for messages is also planned by the company, which is in Rayleigh, Essex.

Cashtel has been demonstrated recently at the Earls Court computer fair where it generated a lot of genuine interest.



Shopping in comfort with Cashtel.

Beeb plots



Schools should take note that more than £250 has been knocked off a package enabling you to transfer existing routines on the BBC micro onto the Strobe Graphics Plotter.

The package consists of the Strobe Graphics Plotter, BBCPlot Software on disk or cassette and interfacing cable. The Plotter and cable are made by Strobe in the US and distributed by Data Efficiency, which wrote the BBCPlot software.

The plotter on its own costs £662.40, so the actual package looks good value at £414.

Phone the company on Hemel Hempstead (0442) 63561.

A bigger Texas — thanks to the Lancastrians

Proving conclusively that not everything is bigger in Texas, a Lancashire company has come up with an expansion board for the Texas Instruments 99/4A.

QA Data Systems of Chorley has produced a unit that gives an extra 32K of RAM including extended Basic, with two or four ports and its own power supply. The board will cost £200 and it will be available ex-stock in about a month.

The company's speciality is quality assurance in the micro business and it also sells a number of packages for 8- and 16-bit systems. The TI expansion board is designed in the UK.

QA Data Systems is a five-year old company with activities in such diverse areas as training and software development.

For more information contact Chorley (02572) 66955.

Machine code on your Oric

Machine-code programming may not be vital on a PC, but if you want to get the most out of your micro you won't be able to ignore it.

On these grounds Kenema Associates has produced the Extension System Monitor for the Oric 1. 'It turns the Oric into a proper computer,' says Kenema's Bob Green.

The Extension Monitor is designed to give an environment in which you can apply the intricacies of machine-code work to your system. Its facilities, Mr Green says, include memory display and change, memory fill, memory move and relocate, hex dump, and more.

Occupying about 5½K, it runs on the 48K Oric. It comes with a 30-page manual.

The software costs £12 from Kenema, Weston-super-Mare (0934) 21315.

NEW DISK SPINS — Televideo has upgraded its TS1603H system to give you a hard disk option with a total capacity of 11Mb. The TS1603H was launched with floppies only, but by the time deliveries begin later in the summer the Winchester version and MSDOS version 2 will be available. Prices start from £2,395. The Winchester is a 5¼in model with a capacity of 10Mb. For more information contact Encotel on 01-686 9687.

Bug Byte's back

A music synthesiser that will give you the range of an octet leads a batch of new releases from Bug Byte.

The Liverpool software producer's Music Synthesiser runs on the BBC micro and imitates five instruments and three voices at one time. According to Bug Byte it helps you to construct your magnum opus by defining the tune with one part as you score another part. It costs £9.50.

Six more games back it up in Bug Byte's new catalogue.

For the BBC there is Sea Lord, £7.50, an underwater battle with frogmen, icebergs and missiles, while Oblivion, at the same price, is an arcade-type game in which birds drop bombs.

In Old Father Time, at £9.50, you type in instructions to rescue the old man's hourglass and staff before the sands of time run out.

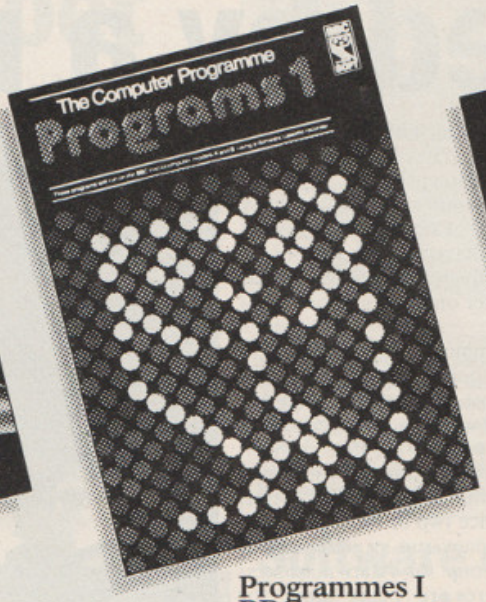
Three more games, all at £5.95, have been devised for the Spectrum. In Styx, you have a laser gun and must get across the river towards Hades.

Aquarius, at the same price, makes you the commander of a team of frogmen pitted against strangleweed, poisonous sea squirts and jellyfish.

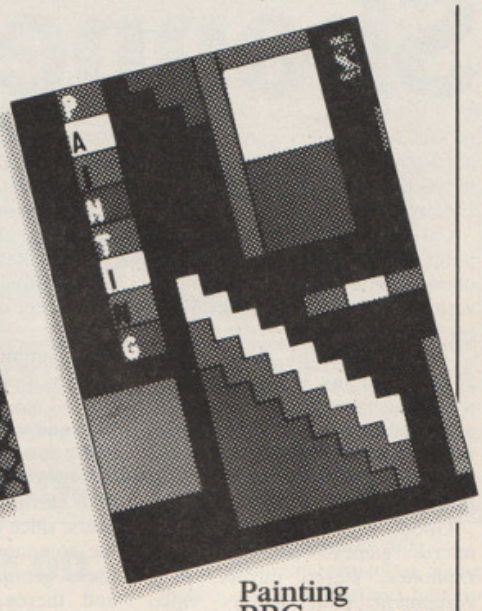
Manic Minor gives you 16 different levels at which to play while you look for treasure.

All these packages are available from independent dealers as well as from Boots, Smiths, Lasky's, Curry's Micro C and Dixons.

Fun Games
BBC £9.95



Programmes I
BBC £9.95



Painting
BBC £9.95

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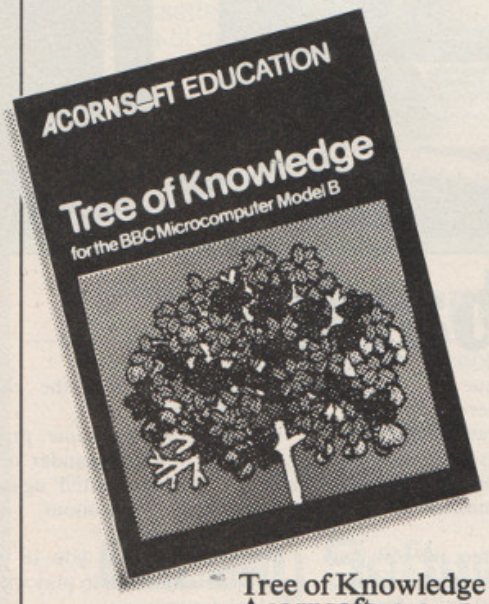
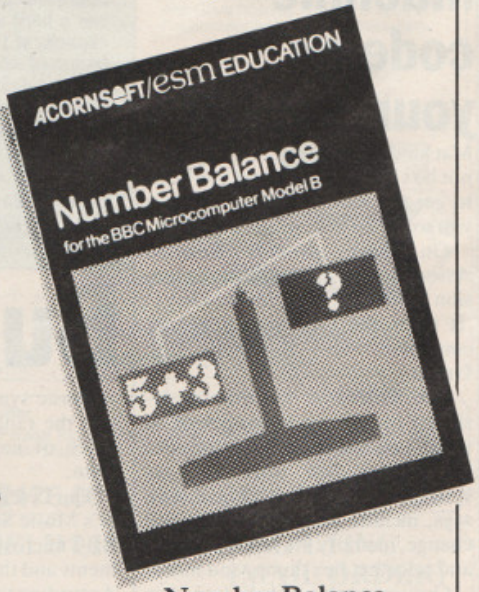
*Acornsoft, BBC, Bug-Byte, Computer Concepts, Micropower Superior Software, Quicksilva, A&F.

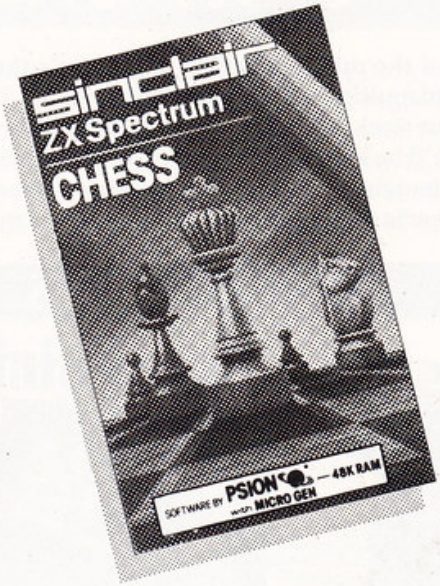


Tree of Knowledge
Acornsoft £9.95

Music Processor
Quicksilva £14.95



Number Balance
Acornsoft £11.90



THE W. H. SMITH SPECTRUM TOP TEN

Chosen from our vast range of software for the Sinclair Spectrum with particular reference to presentation, challenge, excitement and value for money.

Title	Producer	K RAM	Price
Vu-File	Sinclair	16	£8.95
The Hobbit	Sinclair	48	£14.95
Flight Simulation	Sinclair	48	£7.95
Vu-3D	Sinclair	48	£9.95
Hungry Horace	Sinclair	16	£5.95
Horace Goes Skiing	Sinclair	16	£5.95
Chess	Sinclair	48	£7.95
Jet Pac	Ultimate	16	£5.50
Penetrator	Melbourne House	48	£6.95
Sentinel	Abacus	16	£4.95

COMMODORE 64

Larger branches of W.H. Smith now also stock the Commodore 64 together with a wide range of the latest software.

WHSMITH

Prices correct at the time of going to press. Subject to availability. At selected branches only.

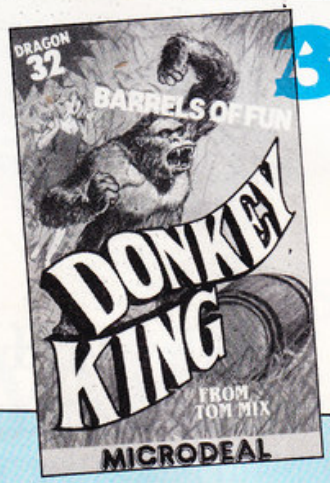
PCN Charts

You've followed the micro charts — now here's the games top 30 compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the four weeks up to June 16 and, like the micro charts, do not take account of mail order sales. We'll be keeping them up to date, showing new positions every two weeks, so watch for the changing status of your favourite games.

The micro charts this week show the number of machines sold in the two-week period

GAMES

Top Thirty



		GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1 (2)	The Hobbit	Melbourne House	Spectrum	£14.95
▲	2 (4)	Arcadia	Imagine	Spectrum	£5.50
▼	3 (1)	Donkey King	Microdeal	Dragon	£8
▼	4 (3)	Flight Simulation	Psion	Spectrum	£5.95
▲	5 (16)	Transylvanian Tower	Richard Shepherd	Spectrum	£6.50
▲	6 (12)	Horace Goes Skiing	Psion	Spectrum	£5.95
▲	7 (9)	Parsec	Texas	TI 99	£25.95
▲	8 (29)	Gridrunner	Llamasoft	Vic 20	£6
▲	9 (—)	Trader	Quicksilva	Spectrum	£9.95
▼	10 (7)	Miner 2049er	Big Five	Atari	£28.95
▲	11 (—)	Attack of the Mutant Camels	Llamasoft	CBM 64	£8.50
▼	12 (8)	Blitz	Commodore	Vic 20	£4.99
▲	13 (24)	Moon Raider	Program Power	BBC	£6.95
▲	14 (25)	3D Tunnel	New Generation	Spectrum	£4.95
▲	15 (19)	TI Invaders	Texas	TI 99	£17.95
▲	16 (—)	Crazy Kong	Interceptor Micros	Vic 20	£6
▼	17 (5)	Penetrator	Melbourne House	Spectrum	£6.95
▼	18 (6)	Panic	Bugbyte	Vic 20	£7
▼	19 (18)	Zaxxon	Datasoft	Atari	£29.90
▲	20 (—)	Jet Pack	Ultimate	BBC	£5.50
▲	21 (—)	Schizoids	Imagine	Spectrum	£6.00
▼	22 (10)	Croaker	Program Power	BBC	£7.99
▲	23 (—)	Preppie II	Atari	Atari	£21.95
▲	24 (—)	Frenzy	Quicksilva	Spectrum	£4.95
▲	25 (—)	Maze Death Race	PSS	Spectrum	£4.95
▼	26 (23)	Flight	Tansoft	Oric	£7.95
▼	27 (11)	Planet of Death	Artic	Spectrum	£6.95
▼	28 (13)	Choplifter	Broderbund	Atari	£29.95
▼	29 (26)	Hungry Horace	Psion	Spectrum	£5.95
▼	30 (22)	Cosmic Invaders	Dragon Data	Dragon	£19.95

PCN Charts

ending two weeks before publication date (July 7), so they tell the story in the high street between June 9 to June 23. Neither mail order nor deposit-only orders are included and the prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, will be updated every alternate week. Watch the arrows to see how they're doing.

PCN Charts are compiled by MRIB (Computers), London, (01) 408 0250.

HARDWARE

Top Twenty up to £1,000

		MODEL	PRICE	DISTRIBUTOR
▶	1 (1)	Sinclair Spectrum	£99	(SI)
▲	2 (6)	Dragon 32	£200	(DR)
▲	3 (7)	Vic 20	£150	(CO)
▼	4 (3)	ZX81	£40	(SI)
▼	5 (2)	BBC B	£399	(AC)
▲	6 (8)	Atari 800	£300	(AT)
▼	7 (4)	Atari 400	£150	(AT)
▼	8 (5)	Oric 1	£100	(OR)
▲	9 (11)	Newbrain A	£228	(GR)
▶	10 (10)	Lynx 48	£225	(CA)
▼	11 (9)	Texas TI 99	£150	(TI)
▲	12 (13)	Colour Genie	£224	(LO)
▲	13 (15)	Commodore 64	£345	(CO)
▼	14 (12)	Epson HX20	£472	(EP)
▲	15 (17)	Apple IIE	£969	(AP)
▶	16 (16)	Sharp MZ80A	£549	(SH)
▲	17 (20)	Sord M5	£189	(SO/CGL)
▲	18 (—)	Nascom 3	£549	(LL)
▼	19 (14)	Jupiter Ace	£90	(JU)
▼	20 (19)	Tandy Colour	£240	(TA)

Top Ten over £1,000

▲	1 (2)	Sirius 1	£2,754	(ACT)
▲	2 (3)	IBM PC	£2,392	(IBM)
▲	3 (4)	Apple 3	£2,780	(AP)
▼	4 (1)	Osborne 1	£1,581	(OS)
▲	5 (6)	Commodore 8032	£1,129	(CO)
▲	6 (—)	Olivetti M20	£2,754	(OL)
▲	7 (8)	DEC Rainbow	£2,714	(DEC)
▲	8 (—)	Rair Black Box	£2,242	(RAIR)
▼	9 (5)	HP86A	£1,541	(HP)
▶	10 (10)	Superbrain II	£2,070	(IC)

AC Acorn Computers. **ACT** — ACT Sirius. **AP** — Apple Computers. **AT** — Atari International. **CA** — Camputers. **CCS** — Colt Computer Systems. **CGL** — Computer Games Ltd. **60** — Commodore. **DEC** — Digital. **DEC** — Digital. **DR** — Dragon Data. **EP** — Epson. **GR** — Grundy Business. **HP** — Hewlett-Packard. **IBM** — IBM. **IC** — Icarus Computers. **JU** — Jupiter Cantab. **LO** — Lowe Electronics. **LL** Lucas Logic. **OL** — Olivetti. **OR** — Oric. **OS** — Osborne Computers Corporation. **SA** — Sanyo. **SH** — Sharp. **SI** — Sincliar. **SO** — Sord. **TA** — Tandy. **TI** — Texas Instruments.

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Floored by the flaws

I recently purchased the Vic 20 computer together with a book called *Games for your Vic 20*. After looking through the book, I decided to try a few games. I managed to make one game work, but throughout the program there was a mistake. I think it is on line 300. It is possible to get the music and the colour changes but the computer spots the mistake and that is as far as it goes.

I also spotted a mistake in another game. There is one thing about writing programs, and that is to avoid the mistakes. I bet there are other mistakes in programs of which you are unaware.
V Rochester,
Peckham, London

That's a bet I'm not taking up! — Ed.

Sharp points for Haine

After going to my first computer show I returned from the Computer Fair very displeased. All there seemed to be were colour computers (mentioning no names) going whizz, bang, zap and so on, accompanied by much swearing and cursing.

I have a Sharp MZ-80A (yes someone did buy one!) and went looking for a better Basic. Not a sausage. There was one stand that had everything to do with the Sharp, that being Kuma, but they had not brought one to the show.

One more point. In response to Chris Haine's Star Letter (*PCN* issue 13) saying that there is one intelligent company realising the shortcomings of Basic then saying that versions are available for most computers. What is he contradicting, himself? Then he says it is a bother to load the language first. Even worse he says you need a disc drive. Well I use Fortran, Forth, yes Forth, Pascal, Basic on my MZ-80A and I have no disk drive. How he convinced you into sending him £10 — well I take that as a syntax error.
Roman Pestha,
London N8

No offence America

Let me start — as all other letters of this genre do — by saying that I enjoy *PCN*. It is the most informative and readable magazine of its type that I have found.

However — somehow you knew I'd get to the 'however' — I do wish that whoever does your hardware reviews would keep his anti-Americanism to himself. I refer to the 'Atari vs Acorn' review (*PCN*, issue 16) in which you refer to the Atari manual as a 'friendly, American-style (read nauseating) guide'.

The fact that Americans express themselves differently than the British has been well documented and I feel there is no need to further belabor the point. Other articles in other issues of *PCN* have similar anti-American biases and statements. You will not find similar comments about British-made products in American magazines.

As one of several thousand American military persons serving in your fair land (read potential market), I am tired of the constant barrage of abuse that I have had to endure for the past two years from nearly all quarters of British society. I would have thought that such biases would have no place in a quality publication such as *PCN*.
James Lake,
Bicester, Oxon

No offence meant — indeed, we've many Americans in this company, and we only tease them a bit . . . Ed.

Oric on the agenda

Does anyone in West Lothian, Scotland, own an Oric? I was toying with the idea of starting an Oric club for the area with a view to organising meetings for swopping tips, etc.

At the moment I have only my own views on how a club should be run but I am open to any ideas on this subject.

If you are interested in starting/joining a group of users in our area could you please phone me on Whitburn 42673.
Stuart Wilson
Whitburn, W Lothian

In a spin over number 14

With reference to *PCN* Micropaedia, Issue 13, which shows the innards of a Shugart 405 disk drive.

May I point out that the component labelled '14', which you state is 'The motor — the electric motor which moves the wheel which turns the belt which moves the drive', is in fact the stepper motor which moves the read/write head across the disk.

The component labelled '13' is in fact the drive motor and not as was stated, 'The magnetic coil which generates the magnetic field necessary to carry out recording'. This statement is completely false. As anyone with the barest knowledge of the operations of a disk drive would know (or should know!) the necessary magnetic field is generated within the head itself and is controlled in this case by the WRDATA line from the host computer.

Please accept my criticism in the spirit in which it was intended, as it is a pity to see an excellent magazine giving false information, no matter how insignificant it may seem.
Simon Birchall
Haigh, Lancs

Oh shame, shame, how right you are. We put the record straight in Syntax Errors, page 88, of the following issue. Ed.

New dimensions of service

I have recently had a lot of pleasure from a ZX Spectrum program which allows me to construct full 3D, wire frame figures, with perspective, which can be rotated around all three axes as well as enlarged or reduced. Figures are made up from lines joining up vertices specified by the user. Up to 500 vertices are available with the 48K Spectrum, allowing very detailed pictures.

The program notes invited comments and suggestions. As I had some particular applications in mind, some changes or additions to the program seemed very desirable.

A week later I received from Mr Orzechowski a new tape incorporating several of my ideas which I found to be of practical value. I have since had two more letters from Mr Orzechowski giving me very helpful information concerning his 3D graphics program.

As I shall be an Old Age Pensioner in a couple of years, and am finding that to teach myself Basic is no easy task, I am particularly encouraged by the excellent after sales service that I have had from Emsoft of Wakefield, Yorkshire.
N W Scott,
Altrincham, Cheshire

Grand Prix crash

In your ninth issue, May 6-May 13, you carried an article on a new software company 'Microsonic', and their first offering 'Grand Prix' for the TI-99/4A.

On the strength of this I wrote off for the game, only to be very disappointed with the results.

I would like to know, does an article written in the style of an advertisement constitute a recommendation from *PCN*?
Peter Shaw,
Tamworth, Staffs

Announcement of Microsonic's Grand Prix appeared in Monitor (PCN, issue 9) as a simple new product report — no recommendations for or against and certainly no advertisement! Also we cannot sample all new products before announcing their existence, but we do test them thoroughly before giving a verdict. Even then, or course, opinions vary. — Ed.

Aid for the Atari

I feel I must write to object to the review of the Atari game QIX. Firstly this is an excellent and thoroughly absorbing game which avoids the normal 'blow 'em up' temptation. How your reviewer can object to proper packaging, large enough to contain a decent instruction book and project the image of a company which provides both superb software and the best documentation of both soft and hardware, I fail to understand.

OK Atari software is expensive but at least it's original.
Brian Curd,
Swindon, Wiltshire

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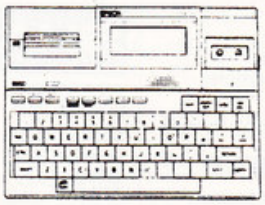

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The Oric as a time bomb

Although it's not in the manual, the Oric does have a clock accessible from Basic. The two-byte number at location #276 is decremented every one-hundredth of a second and can be used as a timer.

To set the clock, use DOKE #276,n and to read it use DEEK(#276). The maximum setting is 65535 so the clock runs for about ten minutes before repeating.

Try this five-second time bomb . . .

```
1000 ZAP
1010 DOKE #276,65535
1020 REPEAT
1030 UNTIL DEEK (#276) = 65035
1040 EXPLODE
```

The clock is interrupt-driven via the 6522 VIA chip. So it stops whenever the interrupts are disabled. . . that's when the screen is scrolled or the cassette interface is used. The clock is also useful for a Spectrum style Randomize. Try DOKE #FB,DEEK(#276): DOKE #FD,DEEK(#276).

R Nicholson,
Sheffield, Yorkshire

Vic screens into place

Vic owners . . . is your screen too far up or too far to the left or right? Two locations control the position of the screen, 36897 and 36896. The best settings on my Vic are POKE 36897,35: POKE 36896,14.

The program below lets you position your screen at the best place for your machine.

```
10  PRINT CHR$(147); "U: UP D: DOWN": PRINT "L: LEFT R: RIGHT"
20  GET A$: IF A$="" THEN 20
30  IF A$= "U" THEN MU = MU - 1
40  IF A$ = "D" THEN MU = MU + 1
50  IF A$ = "L" THEN MA = MA - 1
60  IF A$ = "R" THEN MA = MA + 1
80  IF MU <O OR MU> 125 THEN 20
90  IF MA <O OR MA> 50 THEN 20
100 POKE 36897, MU
110 POKE 36896, MA
120 GOTO 20
```

Philip Harling,
Horsham, Sussex

Keep track of Newbrain streams

If you're developing a Newbrain program, it's quite easy to lose track of which stream is assigned to which device driver. This little routine prints the stream number, device driver number and port number for each opened stream.

What's more, it may be useful to know that the streams print in the order they were opened.

```
10 FOR N=PEEK (86)+256 *PEEK(87) TO PEEK(100)+256*PEEK (101) STEP 6
20 FOR X=0 TO 2: PRINT PEEK(N+X), :NEXT X
30 NEXT N
```

David Mingay,
Wokingham, Berkshire

On location with the Atari

Here are a few useful POKEs for the Atari. Location 87 contains the present graphics mode. 77 is the counter for the 'attract mode' which causes the screen colours to cycle if no keys are pressed for a long time.

77 starts off at 0 every time a key is pressed. It gradually goes up by one until it reaches 128, at which point the Atari goes into attract mode. So you can stop attract mode within a program with POKE 77,0 and start it with POKE 77,128.

After a Basic program is halted, the line number at which it was stopped is contained in locations 186 and 187. Finally, the first three bits of location 755 control the cursor and normal/inverse printing as follows:

Bit 0, if set cursor opaque, if clear cursor transparent. Bit 1 if set cursor on, if clear cursor off, and bit 2 if set inverse printing, if clear, normal printing.

This can be translated to a table of POKEs shown below.

Craig Reading,
Runcorn, Cheshire

VALUE	CURSOR transport	CURSOR opaque	CURSOR on	CURSOR off	PRINTING normal	PRINTING inverse
0	x			x	x	
1		x		x	x	
2	x		x		x	
3		x	x		x	
4	x			x		x
5		x		x		x
6	x		x			x
7		x	x			x

Values for POKE 755 on the Atari

This one will run and run on the Ace

Ace users who want to create auto-run programs should try this.

Suppose the program is started with the word RUN, type : AUTO SAVE RUN ;. Now type AUTO *program name*. Once the program has been SAVED, it will auto run, so make sure you have some way of stopping the program so that you can verify it.

To run the program, type LOAD *program name.*

Ralph Lorenz
Solihull, West Midlands

Don't CALL us, Oric

A non-useful but very entertaining command on the Oric 1 is CALL 59150.

J Howarth,
Hebden Bridge,
West Yorkshire

For added satisfaction, power up your Oric, enter CALL 59150 and press Control T three times — Ed.

Newbrain bits

Newbrain users might appreciate a few more snippets from the 'software manual'. CALL 49373 will reset the machine without turning it off. PEN(9) returns the width of the graphics screen. PEN(7) and PEN(8) give its start and end address in memory.

Barry Taylor,
London NW11

Beeb vanishing trick

It is quite often useful to have programs that vanish after running. On a BBC micro, a good example would be a boot program that would erase itself after it has set up the function keys and so on.

Unfortunately, you can't just put NEW at the end of the program. It's a syntax error. But you can call the language initialisation routines with CALL &8000. OLD will get your program back.

K Wolstenholme,
Deansgate, Manchester

TI99/4A sprites

TI99/4A users may have noticed a slight quirk when using sprites with extended Basic. The following program displays two large sprites, waits for a key to be pressed and then moves one of them over the top of the other:

```
100 DISPLAY ERASE ALL
110 CALL MAGNIFY(4)
120 CALL CHAR(128,RPT$ ("F",64))
130 CALL SPRITE (#1,128,11,40,40)
140 CALL SPRITE (#2,128,14,100,100)
150 CALL KEY(O,K,S):: IF NOT S THEN 150
160 CALL LOCATE (#1,80,80)
170 CALL COINC(ALL,C)
180 PRINT C
```

At 170, CALL COINC is used to detect coincidence of the sprites. Obviously, this should return −1 but most of the time returns 0. The problem seems to be that there isn't enough time for extended Basic to recognise that the sprites have hit each other.

The solution is just to put a short delay before CALL COINC. Try:

```
165 FOR T = 1 TO 2 :: NEXT T.
```

Stephen Godfrey,
Chagford, Devon

ROUTINE INQUIRIES

Lost in a maze of bits and bytes, trapped in a forest of errors, or bugged by Basic? Whatever your problem, access our HELP function . . . better known as Max Phillips.

Write to: Max Phillips, Routine Inquiries, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

Timing the Laser's fazer

Q I'm interested in the Laser 200 which was reported in *PCN issue 5*. You stated that the manuals had to be re-written and the machine wouldn't be released for a month. Since then I've heard nothing about it. Has it not materialised?
Jason Stokes,
Cannock, Staffs

A Fear not! The Laser has emerged in the trusty hands of Computers for All on 0286 418414, price £70. Computers for All has also become the main source for that other Hong Kong based machine, the Comx 35, Pro-tested in *PCN issue 15*.

Unfortunately, the same can't be said for the Texet 8000, the Laser's 8K twin. Texet seems to have disappeared for a quick rethink. *PCN* will be Pro-testing the Laser shortly.

No sources for Sorcerer

Q I own an Exidy Sorcerer Mk 1 32K which I bought at the PCW show in mid-1978. Why on earth don't you mention it in Databasics?

I was interested in the twin disk drive featured in a *PCN* Special offer. You said that this was for the BBC and other micros. Will it work on my Sorcerer? What extras will I need?
N F J Schembri,
Basingstoke, Hants

A A Sorcerer owner . . . those were the days! There's a simple reason why this unfortunate casualty is not in Databasics. You try buying one.

The twin BBC drives offered by *PCN* will not work with the Sorcerer. Well . . . not in any plug-in-and-go way. The phrase 'other micros' should be taken with a pinch of salt.

Some computers/disk interfaces are designed to support a variety of drives . . . the BBC itself being a good example. This isn't a tremendously sensible policy. In its favour, nobody is dependent on supplies from a limited number of sources. Against it, everybody gets confused, various disk formats grow up, and the manufacturer loses out on sales.

Most systems will support only one type of drive, the Sorcerer being one of them. I suspect that other low end manufacturers such as Oric and Sinclair will choose this route as well.

The grander alternatives

Q Please could you tell me how to make double height characters on the Spectrum? I'm writing some programs and they would come in very handy.
Darean Spriggs,
Leicester

A As you've no doubt gathered, the Spectrum doesn't come with a double height character facility. It can be done in software using the 256×192 pixel mapped screen, but Sinclair has chosen not to.

The solution is to write your own machine code routine. It needs to look at the character that is to be printed and produce an enlarged version of it on the screen by using its normal height character definition as a guide. This would produce rather simple characters.

The alternative is to use normal characters to define separate bits (either halves or quarters) of bigger characters and print them together to make up the height. You could produce really fancy characters this way but it does take up a lot of memory.

You can't do very much directly from Basic. It is too slow and fiddly. But just to show you it can be done, here's a little demo program — *below*.

This counts in double height numbers. It works by copying the normal definitions for 0 to 9 into the user defined graphics area from character 144 onwards.

As the definitions are copied, each line of pixels is repeated, stretching the shape over two character definitions. So each alternate character from 144 onwards holds the top and bottom of a digit. The subroutine at 1000 manages this.

The subroutine at line 2000 is one way of implementing these new characters. Just put the number in X and GOSUB 2000. Positive whole numbers only please, unless you want to start fiddling.

Finally, the first few lines of the program are a quick loop to reconfirm your Spectrum's ability to count. Now, about that sideways text . . .

```
  10 REM Double double ...
  20 REM
  30 REM DH chars 48K Spectrum
  40 GO SUB 1000
  50 REM Count
  60 CLS
  70 LET x=1
  80 GO SUB 2000: PRINT " (";x;"
)": PRINT
  90 LET x=x+1
 100 INK x-INT (x/7)*7
 110 POKE 23692,255: PRINT
 120 GO TO 80
1000 REM Create 0-9 DH set
1010 REM
1020 REM Copies 0 to 9 to DH
1030 REM set starting at CODE144
1040 LET c=USR CHR$ 144
1050 FOR p=15744 TO 15824
1060 POKE c,PEEK p: POKE c+1,PEE
K p
1070 LET c=c+2
1080 NEXT p
1090 RETURN
2000 REM print x in DH
2010 REM
2020 LET a$=STR$ INT ABS x
2030 FOR p=1 TO LEN a$
2040 LET z=CODE (a$(p))-48
2050 PRINT CHR$ (144+2*z);
2060 NEXT p: PRINT
2070 FOR p=1 TO LEN a$
2080 LET z=CODE (a$(p))-48
2090 PRINT CHR$ (145+2*z);
2100 NEXT p
2110 RETURN
```

Double height in Basic — see The grander alternatives

Help with the HIMEM horrors

Q I've bought a BBC model A, along with a book, 30 programs for the BBC Microcomputer, by Chris Evans. Many of the games have the line CG?HIMEN = 148:CG?(HIMEN+1) = 157:CG?(HIMEN+2) = 3 which gives a 'No such variable' error.

I phoned the shop where I bought the BBC and they said that they had had similar problems with the programs on a Model B. Can you help?
J D Fletcher,
Sheffield

A Yes, HIMEN should read HIMEM. You will find problems in a lot of listings books, so you should be prepared to do a little work with the manual getting the programs to go.

There are few guidelines as to which books are better. Read reviews, ask shops and friends and try and get the titles of known good ones. Try and avoid books with typeset listings. Those that reproduce programs directly from a computer printout are likely to be much more error free.

Bugged by bugs

Q I think I've found a bug on the Sinclair Spectrum. Try a simple program like this:
10 PRINT "HELLO"
20 GOTO 10

Run it, and when it asks 'Scroll?', push SYMBOL SHIFT and CAPS SHIFT then press any letter. You get a mixed up version of the character set. Is it a bug?
Kevin Harper,
Newmarket, Suffolk

A Well, it isn't a feature. I suppose it's technically a bug, but it doesn't get in the way much does it? It is also quite well known — there are too many Spectrum owners for these things to go unnoticed.

No doubt somebody has figured exactly what happens and why. It obviously involves the two shift keys recalling what's in the keyboard buffer (that's why the RUN comes back), but I doubt that pursuing the grizzly details is worth it.

ROUTINE INQUIRIES

It's all most off-putting

Q Every time I type PUT 15 on our school's RML 380Z the keyboard packs in. If I press a lot of keys at once, it starts working again, except that it repeats any letter you type. Eventually this stops, but if you try to enter anything it just reprints it underneath with a question mark.

Could you tell me why it does this? And how do I get it working again without switching it off and starting again?
Tom Kane,
Glasgow

A Why do you keep typing PUT 15 if you don't like what it does? By all means experiment with the 380Z (or any micro). You can't possibly hurt it, but you'll learn a lot more if you follow what you're doing in the manuals.

The PUT command sends a particular character to the screen. In this case, code 15 is for Control-O, one of the 'invisible' characters that has a special meaning to the screen. So PUT 15 has the same effect as typing Control O (hold down the CTRL key and press O) on the keyboard.

Control O doesn't pack in the keyboard. What it does do is switch off the screen . . . the keyboard still works, you just can't see what you've typed. You've evidently learnt the age-old trick of pressing hundreds of keys at once as a panic procedure. Avoid doing this . . . it has unpredictable results. It's more of a standing joke than a serious technique.

If you look in the manuals, you'll discover that Control D switches the screen back on. So, after a PUT 15, just type a Control D (or PUT 4) to get the screen back. This Control O — Control D feature might come in useful. Entering passwords in a program, for example.

Your heavy handed technique has evidently managed to switch the screen back on, but it's also crashed Basic. Your last symptom — your commands being retyped with a question mark following — is a sign that you're back in the 380Z's CP/M operating system. Unless you're careful, you will lose any Basic program you may have been working on.

Fortunately, the 380Z provides a unique route back into Basic. Type a Control F (you know, hold down 'CTRL' and press F). You'll get a formidable screenful of nasty numbers. This is the 'Front panel'. Now type 'J'. The 380Z prompts with J>. Enter 103 and press 'return'. You should get the message 'recovered' and be back in Basic.

If you get the chance, get someone who knows to show you the relationship between all the programs in the 380Z and how to move between them. You'll learn a lot more about the way the machine works . . .

The road to stardom

Q While reading *PCN*, an inspiration flashed in my brain. I've thought of a great new arcade game, but I've no idea how to write a program for it.

Will software companies accept ideas and turn them into tapes? What guidelines should I follow?
H Gouh,
Sutton Hill, Southgate

A Many software houses will take ideas and turn them into products. This is a big business, and it's short of ideas — the situation is one of desperation. But don't rush anything — extreme caution is in order.

The usual practice is for the inventor of a game to come up with the goods and write the program. If you can, team up with someone who'll write the program for you. Make sure that you both agree and sign a contract produced by your solicitors.

If you have a progam accepted for publication, you can expect between 10% and 20% royalties. You'll get less for raw ideas. Go for a royalty deal. The companies should be only too pleased, and you'll come off best if the program's a success.

Approach well known software houses with products on the market. Many of these have changed from being a bunch of programmers to the dangerously attractive role of publishers. You'll notice lots of small ads from unknowns promising fame and fortune for little more than your soul. Ignore them. The good ones will make it.

Whatever you decide, make sure it's a signed contract that's been checked by your solicitor. By all means have ideas. The industry needs them. But go carefully . . .

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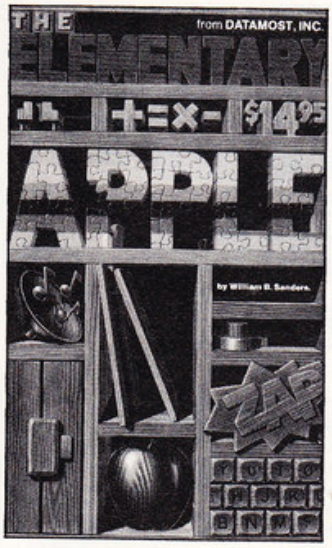


'The Elementary Apple' by William B Sanders, published by Prentice-Hall at £12.70 (spiral-bound paperback, 150 pages).

Many suns have risen and set since the dawn of the Apple II. So why should Datamost and William B Sanders wait till now to produce a 'learn it from scratch' guide. This exercise really has been done so much better before — more information, easier to read and simpler to understand.

I suppose if you have set your heart on an Apple II and want to learn more about it then this is not that bad. It seems such a shame that the opportunity for a really good book should be spoiled by the super-cool, laid-back southern Californian approach.

The style of the writing is remarkably trite and the illustrations look as if they dropped out of a Fabulous Furry Freak Brothers fanzine. Still, what can you expect from a writer who adds to his acknowledgments one for his dog!

For all these complaints, this book does explain a lot of the tricky bits associated with the Apple, but so do the rivals.

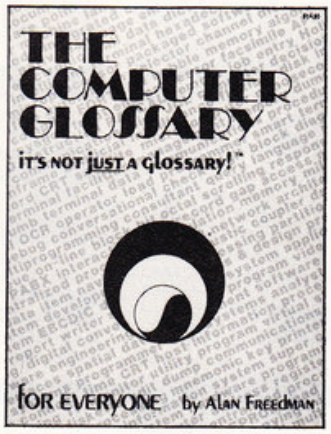
At least *The Elementary Apple* keeps a suitable level of humour throughout and maintains interest. Other than that, I find it hard to recommend it to anyone. **NC**

PEEKing inside your Apple, from 'The Elementary Apple'

'The Computer Glossary' by Alan Freedman, published by Prentice-Hall at £12.70 (paperback, 298 pages).

The subtitle of *The Computer Glossary* is 'it's not *just* a glossary' — very true. This book is an excellent introduction to all aspects of computing as well as being a first-class reference for those already familiar with computer jargon.

Unlike many glossaries, it deals with many topics at length. I looked up 'computer' in the glossary to see if anyone was capable of defining one of the most over-used buzzwords in the English language. It was,



of course, one of the longest entries in the book. There it was, in plain English: 'Computer — a programmable machine that processes information.' Followed by four pages of detailed explanation of just what makes a computer.

Words and concepts with their own entries elsewhere in the book are printed in RAISED TYPE for handy reference. A small touch perhaps, but one I'm sure readers will appreciate as they work their way through.

You soon become hooked and find yourself spending hours looking up definitions of words you've first heard of when reading another part of the book.

The large format is another plus. The book lies flat on a desk and is printed in big bold type (myopics take heart).

Since *The Computer Glossary* hails from America there are few entries, if any, that relate specifically to the British computing world. For example, the Apple II is listed under 'A' while in the 'S' section there's no Sinclair. Perhaps some enterprising UK computer buff will produce a British version.

More than 1,000 definitions are included in this somewhat expensive book. They're evenly divided between the theoretical and the practical for the most part, though there's a tendency to steer away from some of the more esoteric areas of computer theory.

This is a book that will without doubt become dog-eared in no time. It seems destined to find its place as a standard reference work for hobbyists and professionals alike. Highly recommended. **SM**

'First Byte, choosing and using a home computer' by Mike Scott Rohan, published by EP Publishing (0924 823971) at £3.95 (paperback, 94 pages).

A glossy number, this, and written by a true enthusiast for the would-be micro buyer and user in a chatty conversational style. It is splendidly presented with diagrams, illustrations, cartoons and impressive colour photographs. Moreover, it is price-oriented throughout, which should reassure the prospective buyer.

Of course, it kicks off with a background to computers. First principles and all that binary, Boole and Babbage. But main components are neatly introduced and explained along the way.

The buyer's inevitable query 'Do I really need all that?' is answered by a rundown on what you get out of various peripherals. Sometimes, we're told, it is wise to buy only manufacturer's add-ons.

When it comes to you taking that really big step of going out and buying a micro the author is at pains to point out all the possible pitfalls, as well as help you establish your needs and wants. This is a prelude to a survey of currently and soon to be available machines with details and comments. Of course, the prices quoted have changed, and even briefest

Shape of things to come, from 'First Byte'

reviews of machines not yet out have limitations.

With the choice of machine settled you then sit back and get a short introduction to languages as well as programming and how to do it.

This guide is informative, lovely to look at and shot through with enthusiasm. **HA**

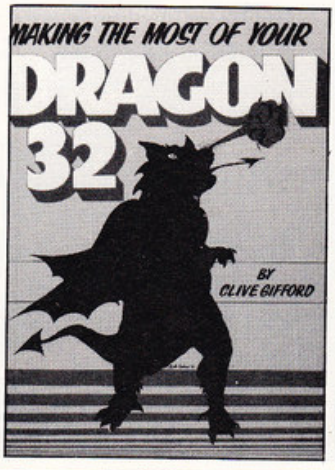
'Making the Most of your Dragon 32' by Clive Gifford, published by Interface Publications (01-794 4495) at £5.95 (paperback, 295 pages).

Following hard on the heels of *Making the most of . . .* series of books, here is yet another — same format, same rehashing of the manuals, same style of dull, dreary example programs. 'Type this one in, you don't have to understand it, it shows the full potential of the machine' — that sort of thing.

I'm not really enamoured with this type of work. Educational-style books for beginners such as this should contain an index or, at the least, a contents section with page numbers.

References to other machines are irrelevant yet still appear. However, even though the language explanation is not brilliant, it is a vast improvement on the standard documentation.

One interesting idea is the small section on how to make money out of your Dragon. 'Write articles and features for magazines', it extols. Nice idea, but you'd better ring with an idea for the article first. **NC**



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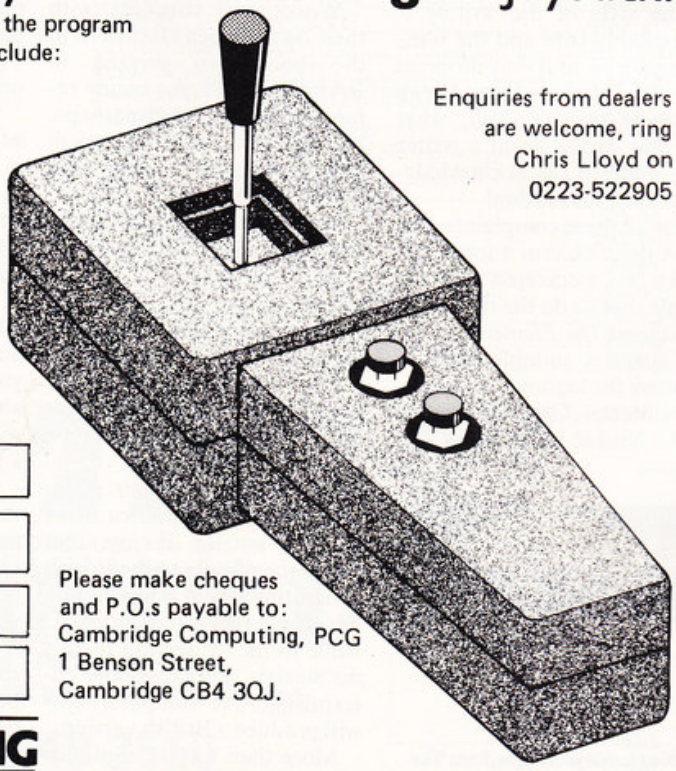

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LEASING: PART 2

John King looks at the ways you can keep your finances on a short lease.

Make your micro a credit to you

With the price of micros tumbling day by day, you might think that the problems of buying computers would be considerably eased. But for many small businesses, the reverse can be the case, simply because businesses that would never have dreamed of buying a micro are now at least able to consider it.

Equipment to the tune of £2-3,000 will often be equivalent to a quarter of the user's net income. This means you've got to think hard before you decide what to buy, but it also means you could have a large scale headache financing the purchase.

It will be out of the question for most small businesses to buy a micro cash, so the various avenues have to be explored. Credit card purchase is a possibility, but the scope of this method is limited first by your credit limit, and second by your ability to make repayments.

The kind of micro you want will usually be beyond your credit limit, and even if it is not, credit cards are only an efficient way of borrowing if you repay the debt quickly. A small business rolling over a £2,000 debt on credit card at an interest rate of 20% + per annum is probably not going to last long!

So other avenues must be explored. Your own bank should be your first port of call, but over the past few years both banks and finance companies have been demanding stronger security, and even personal guarantees from directors.

There are a number of HP/leasing methods you'll want to look at. Among others, you could consider leasing purchase, leasing secondary hire, sale and leaseback and secured loans. It's worth noting that the method you eventually choose will depend on, and possibly affect, the nature of your business, as these methods are linked to capital allowance claims and eligibility for reclaiming VAT.

The table on page 23 should help you compare hire purchase and leasing. HP generally requires a deposit of up to 20%, with repayments plus interest over two to five years. Depending on the agreement you enter into, the interest rate can be fixed at the time of purchase, or linked to, say, bank base rate.

A bank loan is superficially the same as the sort of HP agreement you'd enter into with a finance house — and note that, even if the shop arranges your HP, you'll almost inevitably end up with a finance house — but there are some important differences.

First, the rate of interest will tend to be lower, and the term of repayment will tend to be shorter. Second, a bank loan doesn't tie you to one particular supplier, so you should be able to shop around, and get your micro cheaper.

Banks and finance houses vary greatly in the terms and conditions of their loans. Generally they require repayment over two or three years, with occasional exceptions for different periods. Repayments are usually made monthly. However, they are usually only willing to make a loan covering 80% or so of the purchase price.

In certain methods — leasing, for example — you may have to put down the first few months' rental in advance as a deposit. Naturally this will have a significant effect here on the cash flow of the undertaking.

Banks themselves do not go in for hire purchase agreements, but all the major clearing banks operate loan packages. There is often a small extra payment included in the repayment schedule to allow for an insurance element.

One point in their favour is that they are begining to recognise micros and high technology equipment as a special case. This is in part because of the potential for expansion of the loan during its period, *ie* for extra software, peripherals and new cards. Too often there is a frequent but agonising realisation that the hardware needs improving or that the programs which were originally bought have either been upgraded beyond recognition or cannot do the job for which they were originally intended.

Banks and finance houses are now developing various ground rules for this sort of business. And they are paying more attention to leasing as a financial tactic.

Technically a lease is a contract for the hire of a specific asset. The lessor (finance company) retains ownership, but conveys the right to use the asset to the lessee for an agreed period of time in return for the payment of specified rentals.

There are two main forms of lease. A finance lease is one where the user pays for everything, and in return earns everything from the use of that asset. But he does not have legal ownership. An operating lease is usually for much less than the period of the useful life of the asset — however, the finance company normally assumes responsibility for repairs, maintenance and insurance.

Almost all the leases set up for micros are finance leases, although in many instances there is a choice between a normal lease/purchase and a lease/secondary hire. There is a difference between these two in their treatment of VAT. In the former VAT is paid at once, while in the latter VAT is included in each of the repayment amounts. Some of the major points of leasing are as follows:

- If you do any self employed work, rentals may be offset in full against taxable profit.
- Since the finance company retains the title to the asset, no additional security will be required. And since the company can claim capital allowances this helps to

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reduce the necessary rental payments.

■ While the primary period is agreed at the start, at the end of the loan agreement you can choose to continue to use the goods for an almost nominal amount, rather than the asset being sold to a third party.

■ The key point is often felt to be the certainty of budgeting, since the rentals are fixed in advance and generally do not vary even if interest rates fluctuate.

■ For larger companies, minor changes can be brought in. For instance, the interest rate may become variable or packages can be developed covering multiple purchases over a period of time. This may even exceed the life of individual items.

Hire purchase is a different kettle of fish. The buyer gets full legal ownership as a matter of course—but usually at the end of the chain of repayments. For the same underlying legal reasons it is now the buyer who can claim capital allowances and thereby gain the relevant tax advantage. Because of this the finance company, which now loses this benefit, will want a higher rental.

Servicing is a frequent problem. Once the asset is bought, servicing is the responsibility of the new owner, while during some forms of hiring servicing can be included. In such cases it often seems that servicing is performed more quickly. As a corollary to this a special financial offer is not worthwhile if the back-up is useless.

Remarkably few buyers consider how to plan their financial affairs so as to get the benefits of being part-time self employed. The only thing which makes such claims reasonably acceptable to the taxman is the inflow of at least some income from the new activities. Generally most micro buyers will not be able to alleviate VAT—nor will they easily be able to claim tax allowances or interest payments against tax.

A major advantage of the type of purchasing agreements offered by most of the High Street shops is that there is seldom any minimum base level. Leasing is seldom considered unless the cost involved is at least £3,000, and it is rare that an ordinary mortal considers such a purchase. The scale of involvement does frequently hit £1,000 or more at the outset, but it is only over a period of time that a system will build up to the £3,000 plus range.

Bank loan

Repayment over	monthly cost		loan		APR (annual premium rate)
	Basic	+insurance	Basic	+insurance	
1 year	£91.50	£95	£1,100	£1,140	18.5%
2 years	£50	£52	£1,190	£1,250	18.7%
3 years	£36	£38	£1,300	£1,375	18.4%
4 years	£29	£31.50	£1,400	£1,510	18.1%
5 years	£25	£27.50	£1,500	£1,660	17.8%

Leasing

Repayment over	Purchase		Secondary rental	
	monthly cost	total cost	monthly cost	total cost
2 years	£49	£1,200	£46	£1,110
3 years	£36	£1,300	£32.50	£1,160
4 years	£28	£1,350	£24.50	£1,180
5 years	£24	£1,450	£20.50	£1,230

The above figures show typical repayment/leasing figures for a basic £1,000 worth of goods. The advantages of being a company and able to claim tax allowances are made obvious by the figures for secondary rental. Insurance *must* be taken into account if you go for a bank loan, as you really do need the protection. HP figures have been omitted because they vary so much.

Banks do not have an official points systems for calculating whether or not to allow a loan, but they do require a fair deal of information. A typical form will need to show income from all sources, mortgage, rent, rates, other HP and fixed outgoings, including credit cards *etc.* They'll want to know your employment and housing movements over the past few years, and will probably ask for a couple of references.

The finance companies are concerned with the buyer's ability to repay, so for this reason they are much less willing to lend to self-employed people. If you are self-employed, or if you are a borderline case, it can make a real difference if you can say with reasonable proof that you will be able to make some income by using the new asset. Everyone should tell themselves ten times before breakfast that it is not that hard to find some method to earn money with a computer.

It is important to think about the secondary factors which should affect the financing decision. Included in these are obsolescence, resale value and upgrading possibilities. The buyer must be sure that his purchase will remain worthwhile throughout the repayment period, and hopefully for a while longer. Generally if he is buying a system for more than, say, £500 and if the system is one of the few that takes off, there will probably be a reasonable variety of hardware and software improvements available.

Once you have your new computer, you'll be able to prepare for your next purchase by analysing the problem with financial assessment programs.

The key problem is generally how to allocate the cost of the package between immediate — *ie* capital — outlay and gradual — *ie* income — outflow. This decision is crucial but the determining factors are often very personal. What is important is that you should begin to plan your financial activity.

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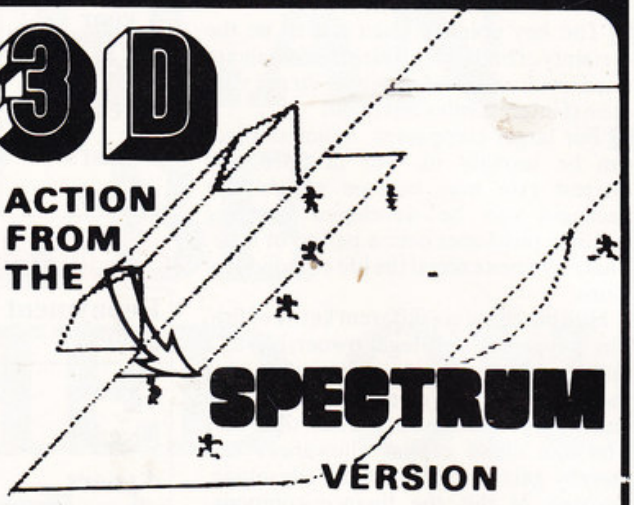

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SINCLAIR USER FEBRUARY 1983

Although I'm no great football fan, I really enjoyed playing this game — excellent use is made of colour and user-defined graphics. The game is very logically put together, so that the development of strategy and tactics has a real effect. For example, one of my teams got through to the fourth round of the F.A. Cup where it was beaten by a second division side. This upset morale and meant that our promotion bid failed. Perhaps I should have given up the F.A. Cup run and held some good players back — the possibilities are endless. Brian Clough had better watch out!

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There's more to cat music than a night on the tiles. Ted Ball takes command of the Lynx.

Lyrical lilts for the Lynx

Giving a rather feeble, poor-quality tone through a small pizeo buzzer, the Lynx finds it difficult to produce the eloquence of C3PO or the beats of the latest single. However, it is possible to have fun with simple tunes and sound effects.

Of the two Lynx Basic commands BEEP and SOUND, BEEP is the easiest to use but is more limited in the sounds it can produce.

You can, however, get simple sound effects with BEEP. For example the following program gives repeatedly rising and falling tones, making a recognisable siren noise:

```
10 FOR N = 25 TO 75
20 BEEP N,1,63
30 NEXT N
40 FOR N = 75 TO 25 STEP -1
50 BEEP N,1,63
60 NEXT N
70 GOTO 10
```

Some preparation is required before playing tunes on the Lynx. The BEEP command works with the wavelength and number of cycles in a note. For music you want to be able to give the pitch or frequency and the duration of the note. It is easy to convert from frequency to wavelength with the formula: Wavelength = Velocity of sound/Frequency.

The velocity of sound is approximately 1,100 feet per second, and you can look up the frequencies of musical notes in Hertz (cycles per second). From this formula you can calculate the wavelength of any note in feet.

The Lynx manual gives no indication of what units the wavelength in the BEEP command is measured in — it simply says it must be a number from 0 to 65535. To find this out you can use a stopwatch. You will find that BEEP 0,50000,63 takes 4.1 seconds to execute, and BEEP 10,50000,63 takes 8.6 seconds to execute. The 4.1 seconds with wavelength 0 is the overhead for generating 50,000 cycles, so the time taken for 50,000 cycles at wavelength 10 is 4.5 seconds, which gives a frequency of 50000/4.5 = 11,111 Hz. We can now calculate that a Lynx wavelength of 10 is actually 1,100/11,111 = 0.99, or near enough 0.1 feet, so the wavelength in the BEEP command is in units of one-hundredth of a foot.

The musical scale works on an exponential basis, with an increase in pitch of one octave being equivalent to doubling the frequency of the note. The intervals between 12 notes in an octave, A, A#, B, C, C#, D, D#, E, F, F#, G, G#, sound the same to the human ear, but it is the ratios between the frequencies that are the same and not the differences.

The standard frequencies for musical notes are based on A above middle C having a frequency of 440 Hz, so from the doubling principle we can see that the A in the next highest octave will have frequency 880 Hz, the A below middle C will have frequency 220 Hz, etc.

To calculate the intermediate notes start from the frequency of A and get the frequencies for successive notes by multiplying by the twelfth root of 2. The following program will calculate the frequencies, and the wavelengths to use in the BEEP command, for the octave containing middle C.

It will play the notes as they are calculated.

```
10 LET R = 2**(1/12)
20 LET N = 220
30 FOR I = 0 TO 12
40 LET W = INT(0.5 + 110000/N)
50 PRINT N, W
60 BEEP W,100,63
70 LET N = N*R
80 NEXT I
```

This program calculates the following frequencies and wavelengths:

Note	Frequency	Wavelength
A	220	500
A#	233.082	472
B	246.942	445
C	261.625	420
C#	277.182	397
D	293.664	375
D#	311.126	354
E	329.627	334
F	349.227	315
F#	369.993	297
G	391.994	281
G#	415.303	265
A	439.998	250

It is easy to modify the program to give wavelengths for other octaves.

The SOUND command is rather more difficult to use, as the manual does not give explicit information. It is possible to find out something about how it works by trial and error.

To begin the experiment type in RESERVE &9000 to make it safe to use memory from address 9000 hex onwards, and type in the following program:

```
10 POKE &9100,0
20 FOR J = 1 TO 255
30 PRINT J
40 FOR I = &9000 TO &90FE STEP 2
50 DPOKE I, 65535
60 NEXT I
70 SOUND &9000,100
80 NEXT J
```

This will produce a series of faint clicks. To get more sound changes are necessary.

Lines 40 to 60 are filling the 256 bytes of memory from &9000 with 255. If you change line 50 to DPOKE I, J+256 you'll get odd-numbered bytes filled with 1 and even-numbered bytes filled with the value of J. Running the program now will produce short beeps, increasing in volume as J increases, reaching a maximum volume for J = 64. It will then drop to the minimum and increase again. Only six bits of the number in the memory are used, and the volume of the sound depends on the difference between the contents of two consecutive memory locations.

To confirm this, change line 50 to DPOKE I,J+16065 so you'll get odd-numbered bytes filled with 63. Running the program now you will hear the voume starting at maximum, decreasing until J = 63 then jumping to the maximum again when J = 65 (equivalent to J = 1 when only the low six bits are used).

You can continue this experiment by trying different formulae in line 50, or changing the program to fill the memory with different types of sequences of values.

Sound commands in Basic

BEEP
wavelength 0 to 65535
number of cycles 0 to 65535
volume 0 to 63

The BEEP command produces a note whose pitch and duration are determined by the wavelength and number of cycles. A low number for the wavelength gives a high-pitched tone. Higher numbers give lower pitch, and very high numbers produce a series of separate clicks.

SOUND address
delay between outputs: 0 to 65535

The SOUND command converts the contents of the computer's memory from the specified address onwards into noise, ending when it finds a zero in the memory.

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Max Phillips asks whether Digital Research's Personal Basic is a dream interpreter.

Personal Basic talks your language

It's not every day you meet a brand new shiny Basic. And when you do, you can expect to spend weeks delving into its weird, wonderful and frequently murky depths.

But not with the new £100 Personal Basic from Digital Research. Personal Basic is an interpreter for CP/M-86 systems, and you'd find it hard to tell from Microsoft Basic if you met it on a dark night.

It might seem odd to launch a new Basic that's more or less the same as an old Basic. The story begins long, long ago, in a galaxy far away . . . Digital Research used to supply operating systems (CP/M) and Microsoft had the Basic to go with it.

More recently, there's been a little strife between the two companies and their 16-bit operating systems, CP/M-86 and MSDOS. At some point during this fabled clash Microsoft quietly withdrew support for its Basic under CP/M-86.

In terms of the story, Microsoft just pulled out the rug from under its rivals. Even now, people still feel the need for Basic. The answer had to be a new supported CP/M-86 interpreter. One that wouldn't alienate the hundreds of programmers who grew up on Microsoft. The answer had to be Personal Basic.

Features

PB (must we call it that?) is the equivalent of Microsoft's standard Basic 86 or MBasic. It's written in BCPL, and ran with around 43K of free memory on the review IBM PC. Apart from a few oddments, the only major additions are a range of unusual debugging tools.

Personal Basic will do tricks like single stepping programs, on-entry syntax checking and so on. The emphasis is not on program performance but on program development.

And the emphasis is in the right place. Personal Basic is for the casual programmer and novice. DRI has CBasic as its 'professional' tool. So PB should be easy to learn and easy to use. It is . . . to an extent, but the opportunity to go the whole hog and provide masses of disk-based development utilities — global editors, cross referencers and so on — has been missed.

Personal Basic doesn't have support for modern developments such as graphics, sound and keyboards with function keys on them, so there's a horrible feeling of working with a powerful and expensive machine with your hands tied behind your back.

But you can get round this, just like people do with Basic 86. You have OS configure routines that set character sets and keyboard definitions, BLOADed graphics support and fancy BIOSes with lots of PRINT CHR$. Thanks a million.

```
Ok old demo
Ok list
List of DEMO.BAS

    10    i=1
    20    print i
    30    i=i+1
    40    goto 20
Ok break 30
Ok run
 1
b   30    i=i+1
Br step
s   40    goto 20
Br
s   20    print i
Br
 2
s   30    i=i+1
Br end
Ok edit 40
    40    goto 20
Ed        iif i<11 then
    40    if i<11 then goto 20
Ed
Ok replace
Ok
```

A sample session with Personal Basic showing some of its unusual debugging aids and its not-so-nice line editor.

What people need these days is a Basic that supports the hardware it's running on, like Microsoft's GWBasic, developed for the IBM, does. GW supports sound, graphics, communications, joysticks and so on and so on.

Personal Basic has none of these — not yet. So meet Son of Personal Basic. PB2 is a new version of the interpreter scheduled for November. It will provide compatibility with GWBasic under the Digital Research GSX graphics standard, but though it may be right, it is also going to be late.

The review copy was minus its packaging, but the format will be the usual DRI A4 plus binder manuals — and hopefully a nice, shiny box.

Documentation

PB scores in documentation, and not just for its standard and complete reference manual modelled closely on Microsoft's documentation. PB comes with a tutorial, and this is a vital part of any Basic interpreter and a dreadful omission from Microsoft's stuff.

The tutorial is spot on. It's not the kind of patronising kiddy thing you get with a home computer, but a straightforward and sensible text. It's ideal for the sort of serious newcomer who might meet PB.

My only quibble is that it stops short, with more complex topics being run over into the reference manual. Fortunately, the reference work is in the same easy-going style as the tutorial, and DRI has not fallen into the trap of having a gap between tutorial and reference works big enough to swallow users whole.

Getting started

Booting Basic couldn't be simpler, as because Personal Basic has no machine dependence, it doesn't need to be installed. You just type BASIC and hit return.

There doesn't appear to be any of the magic command line options you can use when starting Microsoft Basic. This is good in parts, as you don't have to reserve space for random file buffers bigger than 128 bytes (/S: under Microsoft). PB can do all this dynamically, up to a 4K record buffer.

Unfortunately, you can't include a program name on the command line and get Basic to load and autostart the program for you, and experiments with SUBMIT failed to fudge this. It's a serious drawback wherever there are normal people trying to use your programs.

In use

If you've used Microsoft Basic, it won't take long to adapt. Features and performance are both closely matched. The important differences are for development.

PB names its programs — you can include a file name after NEW and PB will remember it. It appears on LISTings and you can type just SAVE to save your program. SAVE won't overwrite an existing file, but you've got REPLACE, and this will. Typing REPLACE every ten minutes or so is an easily picked up and healthy habit.

Programs are loaded from disk using OLD rather than LOAD. Quite why this arcane word has re-emerged is unclear. Most of tomorrow's Basic programmers will associate OLD with recovering NEWd programs, Acorn style.

As you enter lines, PB checks them for syntax. You get the polite 'Something is wrong' message plus a helpful omission mark under the offending characters if you make a mistake.

But even if the line is wrong, PB accepts it. When you LIST the program, offensive lines have a question mark beside them. This unique and apparently strange feature is a lot better than it first seems. You can give a listing to a non-programmer, and say, 'type that in'. The typist can bash in the

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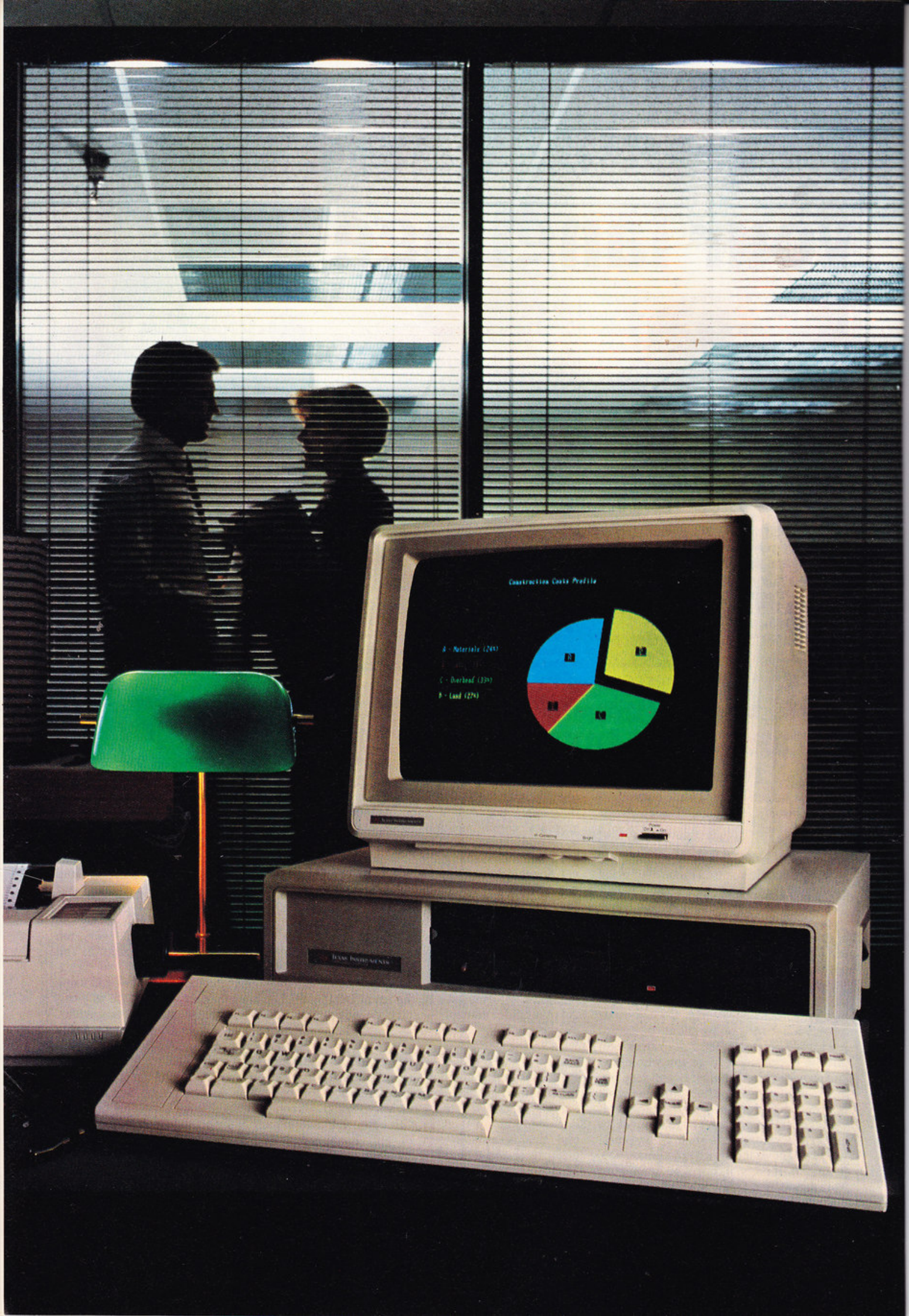
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program, ready for the programmer to come back, LIST it, and correct any errors.

Debugging is great fun under Personal Basic. TRON and TROFF provide the usual line number trace, and you've also got TRACE and UNTRACE, which lists the line to be executed as well as its number. These two can be selective. If you specify a list of line numbers with the commands, only those lines count in the trace. To avoid confusion, lines which are selected for tracing are flagged with a 't' in LISTings.

FOLLOW and UNFOLLOW (Yuk!) print out variables and their values whenever they change. Programs are interrupted with Control-C, but this doesn't return you to Basic's command level. Instead, you land in 'break mode' prompted by Br. The other way into break mode is to use the helpful BREAK and UNBREAK (Double yuk!) BREAK lets you specify break-points at certain lines in the program. Breakpoints are flagged in LISTings with a 'b'.

What can you do in BREAK mode? Anything you like. Most of the commands you'd want to use while debugging work as normal. You can list bits of program, print variables, fiddle their contents and so on.

CONT resumes execution of the program. STEP lists and executes the next line. Even aged Basic hacks will have fun with this. If the program hangs, you can hit Control-C and then STEP round the offending loop. But newcomers who learn on Personal Basic will have problems working with lesser things.

Talking of lesser things, there's the line editor, and this is the weak link amid all these wonderful new tools. It's one of those horrible nasty old serial-based line editors, and not a good one at that. You get into it with EDIT, or by pressing Escape if you want to edit the current line. It's also worth complaining that you can't automatically retype the last command. The line editor prompts with Ed (not a reassuring choice) and lists the line to be edited with the cursor below it. You space along the line, blindly wreaking havoc with a set of Microsoft style single letter commands.

Behaviour is unusual. To insert, you type 'I' followed by the characters to insert and a return. But be warned — I inserts before the character above it, not after it as on almost all similar editors. Typing X return leaps onto the end of the line being edited rather like X under Microsoft's editor. And you can't edit line numbers in order to copy lines. Curiouser and curiouser.

There is an excuse for having a serial editor. But it's not a good one. Obviously, if you are working with a teletype for a terminal (teletype: elderly VDU with paper where the glass should be) you can't provide fancy on-screen editing.

But of course, more than 90 per cent of CP/M-86 users have screens — usually with fancy graphics. And there's no reason why there shouldn't be two editors, either as a switch in the Basic source for different machines or simply two commands in the finished product.

PB also won't let you have lines longer than one screen-line unless you personally put in the Line-feed. And one last moan . . . RENUM uses a disk file as a scratch pad. It's very unusual for a renumber to need this. I wouldn't mind, but PB forgets to delete the file (BASK.WRK) afterwards.

Error messages are remarkably clear and helpful. But 'you cannot divide by 0' should be fatal. PB prints a warning, and continues happily with the program. It's a dangerous (if not fatal) error on the part of the designers.

There are a few extras in the language. LOG 10(X) is a quick way of writing LOG(X)/LOG(10). FLOAT converts an integer into a single precision number. There are a few extras in the language. The OS commands DIR and ERA are available from Basic. ERA erases files even though the Microsoft equivalent of KILL is also there.

DIR is a sore point. Microsoft Basic uses FILES — a command not present in Personal Basic — to list the directory. It's possible to use FILES A$ MBasic to list files which fit the file specification in A$. Under PB, DIR A$ searches the directory for a file called A$, so there could be conversion problems here.

The only other point that might cause trouble is that there are differences in the floating point accuracy. Programs which rely on maths may give different results. But then it is the programmer's fault if he or she is careless enough not to be wary of floating point maths. Beyond that Personal Basic is everything you heard it would be. A 16K Microsoft Basic.

Verdict

Personal Basic is a real success, and newcomers and casual programmers will enjoy its extended development aids and friendly documentation. But it's a shame that we'll have to wait for graphics support and a real pity that the line editor is a mess.

Personal Basic fills a hole now . . . a cared-for Basic under CP/M-86. Hopefully, come November, the shortcomings will be removed.

RATING

Features	■■■
Documentation	■■■■
Performance	■■■
Useability	■■■■
Reliability	■■■■
Overall value	■■■■

Name Personal Basic **Application** Basic interpreter **System** CP/M-86, MP/M-86 **Price** £100 **Publisher** Digital Research **Format** Disk **Language** BCPL **Outlets** Selected manufacturers and dealers

HOW PERSONAL BASIC COMPARES

Test	Personal Basic/CP/M-86	IBM Basic/PC-DOS
Sort	17.6 secs	21 secs
Maths	52.6 secs	45 secs
Disk	6 mins 6 secs	3 mins 58 secs

We benchmarked Personal Basic against its most obvious rival. We ran PB under CP/M-86 on an IBM PC and compared it with IBM Basic under PC-DOS.

The tests were three short Basic programs, a sort of 50 numbers, repeated evaluation of a complex mathematical formula and a disk test. This last program creates a 250K data file and then re-orders the records within it.

Remember that the maths benchmark does not take account of accuracy. Although PB and IBM Basic work to superficially the same accuracy, the actual accuracy of the calculations may be different.

Personal basic line editor commands

A	Ignore changes and restart edit
[n]C	Replace n characters with characters following C
[n]D	Delete characters
E	End edit. Same as 'return'
Escape	End insert
H	Delete from cursor to next line feed then enter insert mode
I	Insert the characters following I
K	Delete characters up to the character following K
L	Cursor to left of line
Q	Quit edit without changes
R	Cursor to end of line
S	Moves cursor to next occurrence of character following S
X	Moves cursor to end of line and enters insert mode

Personal Basic extensions

BREAK DIR ERA FLOAT FOLLOW LOG10 OLD REPLACE STEP TRACE TRON TROFF UNBREAK UNFOLLOW UNTRACE

QUESTION

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FORTH: A full implementation. Ideal for writing fast moving arcade type games. Allows the full colour and sound facilities of the Spectrum to be used. Future Microdrive enhancements will be made available. — **Spectrum £14.95**

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CHESS 1.4: Ten levels of play with this m/c program.
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NewBrain Software Selection

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Machine code takes you to the heart of your micro. Ted Ball grapples with an assembler and Toolkit.

Into the Spectrum

Name Astron **Application** Z80 assembler **System** ZX Spectrum, 16K or 48K **Price** £9.95 **Publisher** DK'tronics Ltd, Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AX **Format** Cassette **Language** Basic and machine code. **Outlets** Mail order and dealers.

Astron is a Z80 assembler and editor for the Spectrum, and can be used on a 16K or 48K machine.

There are three parts to Astron: a small Basic program, and two machine code programs — the assembler and the 'Toolkit/Editor'. In the 48K version the two machine code programs are loaded together, but a 16K Spectrum does not have enough memory to hold both of them, so you have to keep reloading when you want to change from one to the other.

Features

Assembly language source code goes into REM statements in lines of Basic, and you can type in and edit the source code using the Spectrum's Basic editor. Astron's Toolkit/Editor gives you extra editing facilities, including searching for and replacing strings in the source code, copying, moving and renumbering blocks of lines, and auto line-numbering with REM for entering source code.

The assembler accepts standard Zilog opcode mnemonics, but is very limited and non-standard in the syntax that it will accept. Labels must begin with a capital letter but otherwise can be of any length and include any characters, but upper and lower case letters in a label are not treated as distinct. So, for example, FRED and Fred are the same label.

Because any sequence of characters beginning with a capital letter is regarded as a label, opcode mnemonics and register names in operands must be in lower case.

Numeric constants may be in decimal or hexadecimal, but hex numbers must be in a non-standard form, beginning with '&' instead of beginning with a decimal digit and ending with 'H'. Binary and octal constants, required by the Zilog standard, are not allowed.

The biggest limitation, however, is that no expressions can be included in operands.

Astron allows a few directives, *org*, *datab*, *dataw* (instead of the usual *defb* and *defw*), *defs*, *defm*, and *equ* (which has to be used in the form of equ 100 CONST, instead of the usual CONST equ 100).

There are many more non-standard details in Astron, and all the advanced features of the Zilog standard — macros, conditional assembly etc — are missing. However, these advanced features are rarely found on small machines and no assembler for the Spectrum includes them.

On the positive side, Astron does allow you to assemble a program into a different area of memory from that in which it will run, so you can assemble a program to run at addresses used by the source code or the Astron machine code, and you can assemble a large program in sections, carrying over part of the symbol table by using 'permanent labels'.

Keiren Phelps

Presentation

The cassette provided for review was unlabelled, and as the 16K version is on one side and the 48K version on the other, I had to label the cassette for myself.

The documentation consists of a small eight-page booklet which is mostly taken up with a description of the commands for the assembler and Toolkit functions.

In use

There was no problem loading the tape, and the program auto-runs when it has loaded. However, although the instructions give a brief but clear explanation of the assembly and editing commands there is very little on the actual syntax required. I had to find out by trial and error what the assembler would and would not accept.

The program has a main menu that you use to get the assembler, toolkit, and a few other functions, and a separate menu for the toolkit. Most of the functions provide their own prompts but in order to stop in the middle of a procedure you have to know how to break out of INPUT. The program does not ask for confirmation of a command, even when deleting lines.

Most of the assembler and toolkit functions take you back into Basic when they have finished, so to continue you have to run the program again.

There are several options for the output provided during the second pass of the assembly: you can get no listing, object code listed on the screen with or without scrolling after each screenful, or object code listed on the ZX Printer. The listing consists of addresses in decimal, object code in hex (an annoying mixture), and the source code, with directives and labels highlighted. All labels and their values are printed at the end of the listing.

The assembler is reasonably fast — it took about three seconds to assemble 100 lines with no listing, and about eight seconds with a listing on the screen.

Reliability

Astron provides very few of its own error messages and most of the error messages you get are the usual Basic messages.

However the Basic messages are related to the cause of the error. For example, when the assembler stops because of an undefined label in an operand the message is 'Variable not found'. The documentation says nothing about the error messages, so you have to work out what they mean.

There are several bugs in the assembler, and it will produce object code from invalid source code without giving an error message.

The assembler's syntax-checking is completely inadequate, many bugs being due to HL, IX and IY being treated on the same footing throughout, although there are many differences in the way these registers can be used, and many more bugs are caused by the assembler skipping to the next instruction as soon as it has found something it can assemble.

Verdict

Although Astron has some good features in the assembly options and the toolkit, it cannot be recommended in its present form. Apart from the bugs, the numerous non-standard points in the syntax make the assembler unsuitable either for use while learning Z80 assembly language or for serious programming, and its inability to handle expressions is a serious limitation.

The documentation is inadequate for a learner, even in conjunction with a good textbook, and experienced Z80 programmers will have problems in finding out what the assembler will accept.

RATING

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

Walter Knight finds the Brainwriter a justifiable expense for the Newbrain.

The Newbrain writes

The Newbrain has a good deal of potential, but so far the support from software houses has not been great — perhaps because everyone has assumed that when disk drives and CP/M come along in a couple of months the market for dedicated software will dry up.

Still, at least one software producer has come out with the goods for this neglected micro. Brainwriter, the newest offering from Brainwave Software, is a package which allows the unexpanded Newbrain to be used as a handy word processor with some fairly advanced facilities.

Brainwriter is supplied either as an EPROM for installation in the Grundy expansion box, or on cassette. In the EPROM version, which I tested, there are three pages of up to 79 columns by 66 lines — in the taped version there are about two and a half.

The difference is caused by the fact that the tape program occupies about 8K of memory.

Features

Once the program is loaded, a menu appears offering 12 options: Create document, Load and save it, Display and amend it, Print it, Format and re-format, Search for word, Search and replace, Right justify, Copy, Set printer speed, and Exit the program.

Choosing option 1, Create document, invites you to format the first page, choosing left and right margins anywhere between the second and 79th column, and any number of lines up to 66 per page. You are then presented with an 80-column line of dashes, with the right and left margins marked as you have set them, and a flashing cursor in the 'home' position.

All the keyboard functions are available, except that you cannot perform calculations, nor can you reach Basic from within the package.

Printer control codes are inserted into the text following ASCII code 27, generated by Keying Graphics/opening bracket (easier to do than to read about). When your page is complete, it can be entered into the memory with 'Escape' — or you can abandon it at any stage by keying 'Stop', which prompts the question 'Do you want to stop y/n', in case you have inadvertently hit 'Stop' at the end of a long page of text.

'Escape' eventually brings you back to the menu, where you can re-format the page by setting new margins or page-length, justify each line to the right-hand margin, replace any chosen word with another — it does this automatically for all occurrences — send the page to the printer, or start another page. Text can be copied from one page to another, or from one part of a page to another part of the same page.

Documentation

Documentation comes in the form of a well written nine-page printout explaining all the control commands. The EPROM version comes with printed diagrams showing how and where to install the chip in Grundy's expansion box. This is a bit of a disappointment since although there are four vacant slots, the first three overwrite Basic, the operating system, and the graphics — which means in effect that you pay around £55 for a single slot.

However, it does give you the program up and running just five seconds after switching on, and it does leave the cassette player free to load pages of text without constantly changing tapes.

In Use

Apart from the copying function, all Brainwriter's options are carried out on the screen in front of you. Re-format, for instance, sets up a blank screen to the new dimensions, and then writes the text to it letter by letter at about 120 letters per minute, pausing for word-wraparound to operate.

Anything you have managed to enter to the left of the margin is lost by Re-format, as are any lines left over at the bottom of the page. There is, however the chance to reject the re-formatted page by keying 'Stop', which returns you, via the menu, to your original layout.

All the functions certainly work, but some have drawbacks. I find the word-wraparound annoying, because it is slower in operation than my usual typing speed — so I am already part of the way into the next word before word-wrap has worked. Within its limitations — mainly a tendency to lose bits of text typed outside the pre-set margins — the Re-format function is effective, though slow in operation, and inclined to leave spaces at the beginning of lines where it has brought a word down from the line above.

But the most serious drawback of Brainwriter for me, as a fast if inaccurate typist, is that the Newbrain's normally quick response to the keyboard is very much reduced. This is apparently a function of the fact that cursor movement is handled by a subroutine.

Constant GOSUBs and RETURNs stack up to slow the operation of the program down to the point where letters are missed from words typed in at any speed — producing, for instance, from the beginning of the previous sentence, 'Thi i pprety fnton' in place of 'This is apparently a function'. Very irritating if, like me, you are the kind of typist who looks more at the keyboard than at the screen.

However, this stack can be cleared by keying 'Stop', and then answering No to the prompt — and the advantage of the system is that it neatly overcomes one of the Newbrain's resident bugs, which is that using the 'Insert' function further than 24 lines down the page causes the screen to dance a maddening jig before settling down to display the line you are working on at the bottom of the screen, no matter where it was when you started on it.

For those who use a TV set rather than a monitor, this can put the line out of sight, so Brainwriter deserves praise for overcoming this Grundy design fault.

Reliability

Although I tried hard, mis-using Escape, Stop and Control keys, I could neither crash the program nor inadvertently lose the data. The only real weakness of the program seems to be the slow response to the keyboard.

Verdict

Overall, Brainwriter scores on its ability to manipulate text within and between pages, in any format, word by word, line by line or page by page. The no-nonsense 80-column display means that you see your page laid out on the screen just as it will appear in print — which makes word processors of 50 or so columns seem like toys by comparison.

The added facilities of Re-format, Right justify, and Search and replace are well thought out and easy to use. The prompts are all in plain English, and the most technical thing you will need to know to use it is the baud rate of the printer if you want to alter it from the pre-set 9600.

The most likely users of Brainwriter will be people who want to get into affordable word processing without laying out a lot of money. With a basic Newbrain costing around £234, a cheap printer for £250-£300 and this package, you can be up and running for less than £600 — not bad value.

Students, teachers, academics and journalists should all be reasonably happy with it, and until the Grundy disk system comes along, Brainwriter does provide a cheap and available word processing system on a machine well suited to the purpose.

RATING

Name Brainwriter **Application** Word processing package **System** Newbrain **Price** £41.40 (EPROM) or £36 (cassette) **Publisher** Brainwave Software, 2-3 Belchamp Road, Tilbury-juxta-Clare, Halstead, Essex, (0787) 237 831. **Format** EPROM or cassette **Outlets** Mail order.

Henri Bujko

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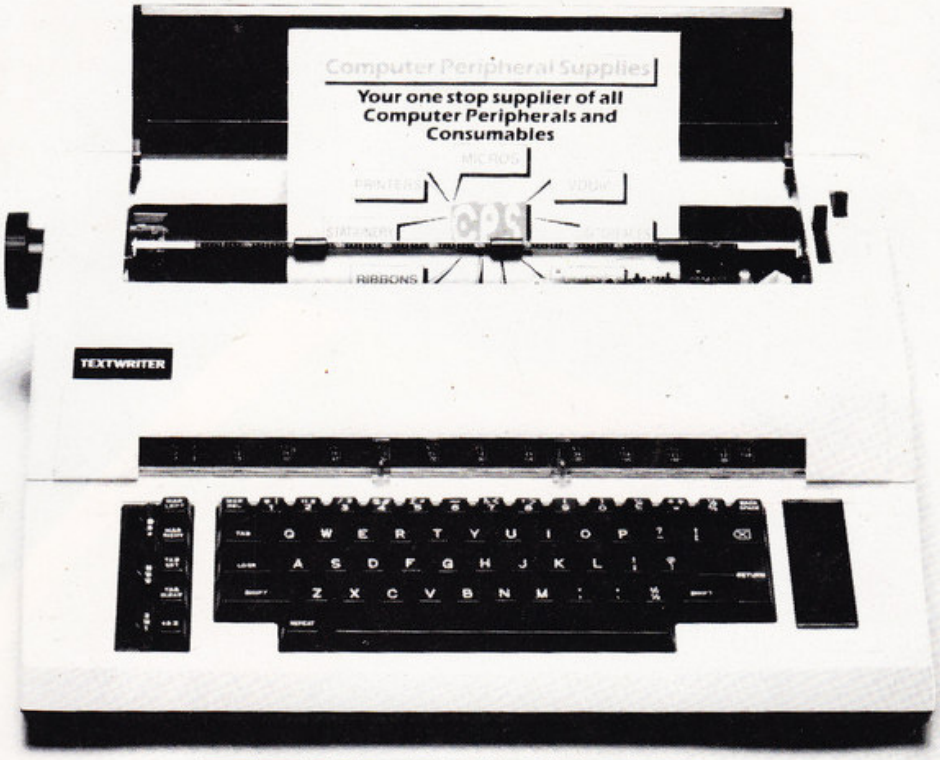

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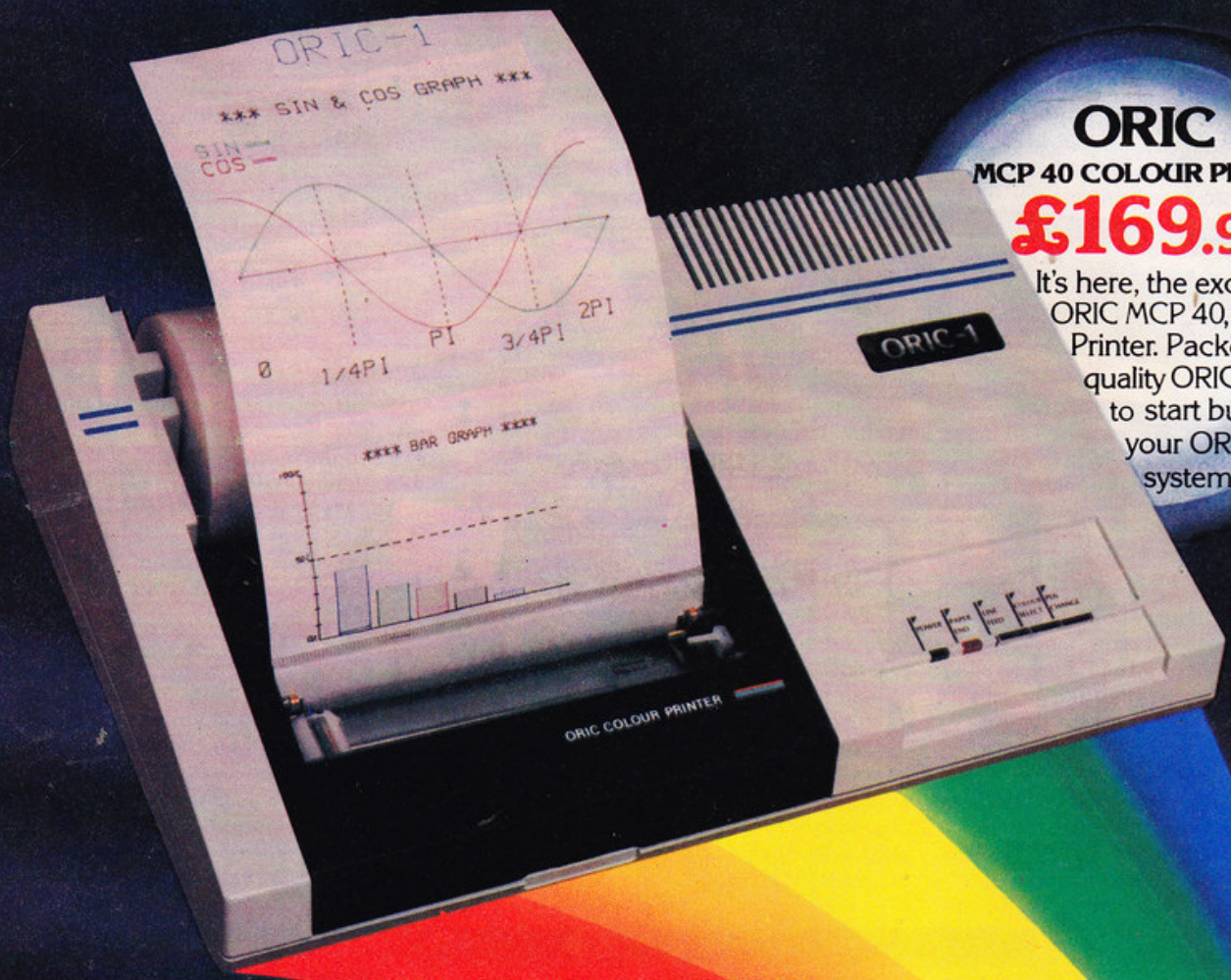

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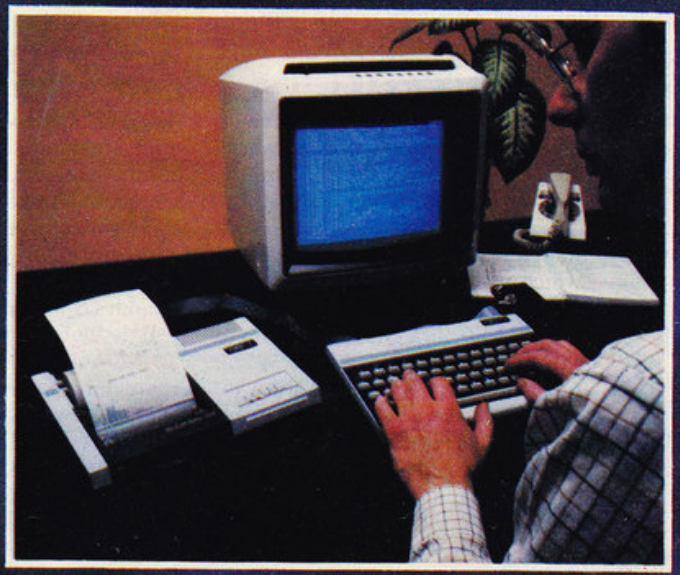

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David Janda lights up as *PCN* uses the Quantum Jump to plug him and his ZX81 into a mainframe.

The ZX81 on-line

Communications will probably be the next big area of interest in personal computing.

Happily, you no longer require a sophisticated micro and expensive peripherals to communicate with database or mainframe computers. Cobra Marketing has released the Quantum Jump, an asynchronous RS232 interface for the humble ZX81 which enables you to 'hook up' via an acoustic or hard wired modem (*PCN issue 10, Peripherals*) through the telephone system. And Cobra is soon to release an acoustic coupler for around £60.

The Quantum Jump comes with some relevant Terminal Management System software. The hardware plugs on the edge connector at the back of the ZX81 and the cassette software turns the micro into a 'dumb terminal' for transmitting and receiving data at 300 or 1200 baud. Cobra does not guarantee the operation of the interface at 1200 — due, I imagine, to the slow screen-printing speed of the ZX81.

The hardware comes as a small black plastic ABS box looking rather like a RAMpack. It has a male edge connector at the rear so the ZX printer or RAM can be added as well. The unit will not work with another printer.

Three feet of cable leads from the interface to the plug, which can be connected to either a 3-pin DIN or 25-way D-type socket.

The Terminal Management System 1000 software supplied comes with a seven page manual describing the features and use. There is a variety of transmission formats available, and the software is very flexible considering its host computer.

During operation you can scroll by line or flick through by page. The screen can be expanded to 23 lines and lower-case ASCII can be transmitted, or text can be output to the ZX Printer.

Although there is no 75 baud transmit, so you can't dial up Prestel, you can use the 300 baud service instead. The only operational problem was that the machine tended to crash quite often, but this could be down to the early production software I was using. These problems will apparently be ironed out by the time the unit hits the streets.

Cobra is setting up a service on Telecom Gold which will allow users to phone up and order items by Access and Barclaycard. I used the Cobra Quantum Jump to dial up the service.

Before any service is used the software has to be set up by accessing the 'front panel' of the TMS software where such things as parity, scroll and page mode can be entered. The number of the service is then dialled and the receiver placed into the acoustic coupler. The ZX81 can then be used as a dumb terminal. Only upper case letters (and numbers) can be displayed on screen, but it is possible to send lower case as well as control codes.

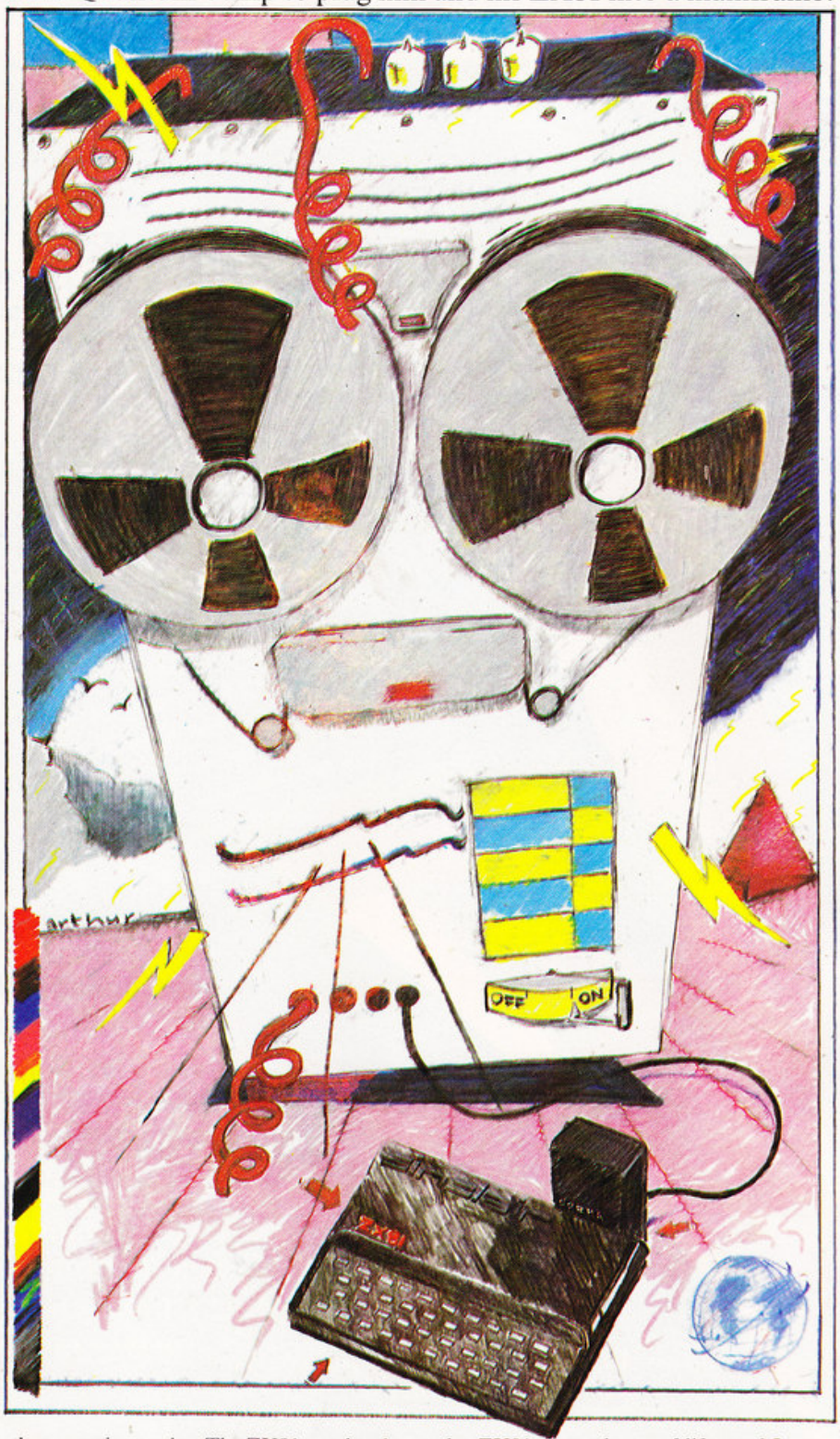
Any receiving graphic or unrecognisable characters such as '@' will be printed as a graphics character.

It is worth noting that many bulletin boards and mainframes operate at 72 characters per line and the ZX81 will 'wrap' the words down onto the next line. This looks a little confusing at first but some services allow you to specify what line length you're using.

Cobra says the Quantum Jump has given the ZX81 a new lease of life, and I must agree. Although interactive computing cannot be done, you can access the many bulletin boards and viewdata services.

Before you decide to opt for communications, it is also worth bearing in mind the cost. A Quantum Jump will set you back £30, an appropriate plug £3 or £4 and an acoustic coupler (the cheapest) £50 to £60, totalling £80 to £90. You also have the costs of the various information services . . . beware, it can be expensive.

Name Quantum Jump RS232 interface **Computer** ZX81 and ZX Spectrum **Price** £30 **Contact** Cobra Technology, 378 Caledonian Road, Islington, London N1.



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Barry Miles tests an eight-way ROM board from Jaytee, one of an attractively priced series.

COMMODORE PIN-UP

For a number of years now, the empty sockets on the printed circuit boards of Commodore computers have been the subject of considerable interest.

The first use was a source of satisfaction to the software producers, and an irritation to the users in many cases: putting a ROM in one of the sockets gave security to the software producers.

After a while other uses came along. Programmers' aids such as Toolkit were developed, and the availability of EPROM programmers and EPROMS at greatly reduced prices enabled many users to do it themselves. But there was a snag. The sockets were of low quality and were not designed for repeated insertion and removal, and after a few such manoeuvres, they became sloppy and unreliable.

This opened the way for entrepreneurial activity, and a number of boards started to to appear offering peaceful coexistence to a number of EPROMS, some with manual switching and some under software control. The maximum number of ROMs was eventually reached at eight per slot and the boards were rather expensive.

Against this background it is encouraging to note that the price reductions prevalent in the industry at the moment are reaching this type of product. Jaytee Electronics, of Herne Bay, has come up with a range of such boards at very attractive prices, and in a variety of configurations to suit most people.

The simplest board to use is the eight-way board controlled by a single-position switch which can be set into one of eight positions by means of a small screwdriver, or a strong fingernail. The board measures 3½ × 6in and is supplied with three self-adhesive feet with which you can stick the board in a convenient place inside your computer, or indeed on the table beside it.

Construction

The components are of good quality, and the Texas Instrument sockets used are of a spring-loaded type which really click home. They are even able to grip firmly the legs of another socket.

This sounds a rather strange idea, but one of the uses to which these sockets have been put is to install various brands of proprietory RAM. This has enabled people to put any program they like into the memory at locations Hex A000 and Hex 9000, and also to put copies of any ROMs which they own onto a disk and load them into RAM at will, thereby reducing wear and tear on the sockets.

These RAM devices are quite expensive, typically £60, and breaking a pin usually destroys the product. Cautious users are inclined to mount such devices in a carrier for safety.

The only technical criticism I would level at the board tested is that the layout of the sockets is not consistent.

My electronics engineering friends tell me that good practice insists that pin one is lined up consistently on any printed circuit board, even if this causes the tracks to be longer, and the board larger or double-sided, as a result.

The Jaytee board has each row of four sockets lined up so that pin one is along the centre of the board. Thus if you move a chip from one row to another, you must remember to turn it through 180 degrees, otherwise you will reverse the polarity and destroy the chip. This is very serious, especially if we are talking about the protection ROM for a frequently used, and perhaps vital, program.

Jaytee does its best to warn you about this: the individual sockets each have pin 1 clearly indicated with a white triangle, and a black blob of paint on the board close to pin 1 emphasises the situation, but I cannot help feeling that somebody will make this mistake, and once is too often.

Additional products available, but not tested, are similar boards which are switchable in software through the user port, including ones with a facility to have one board connected to each of two sockets, and have the whole lot controllable in software from the user port.

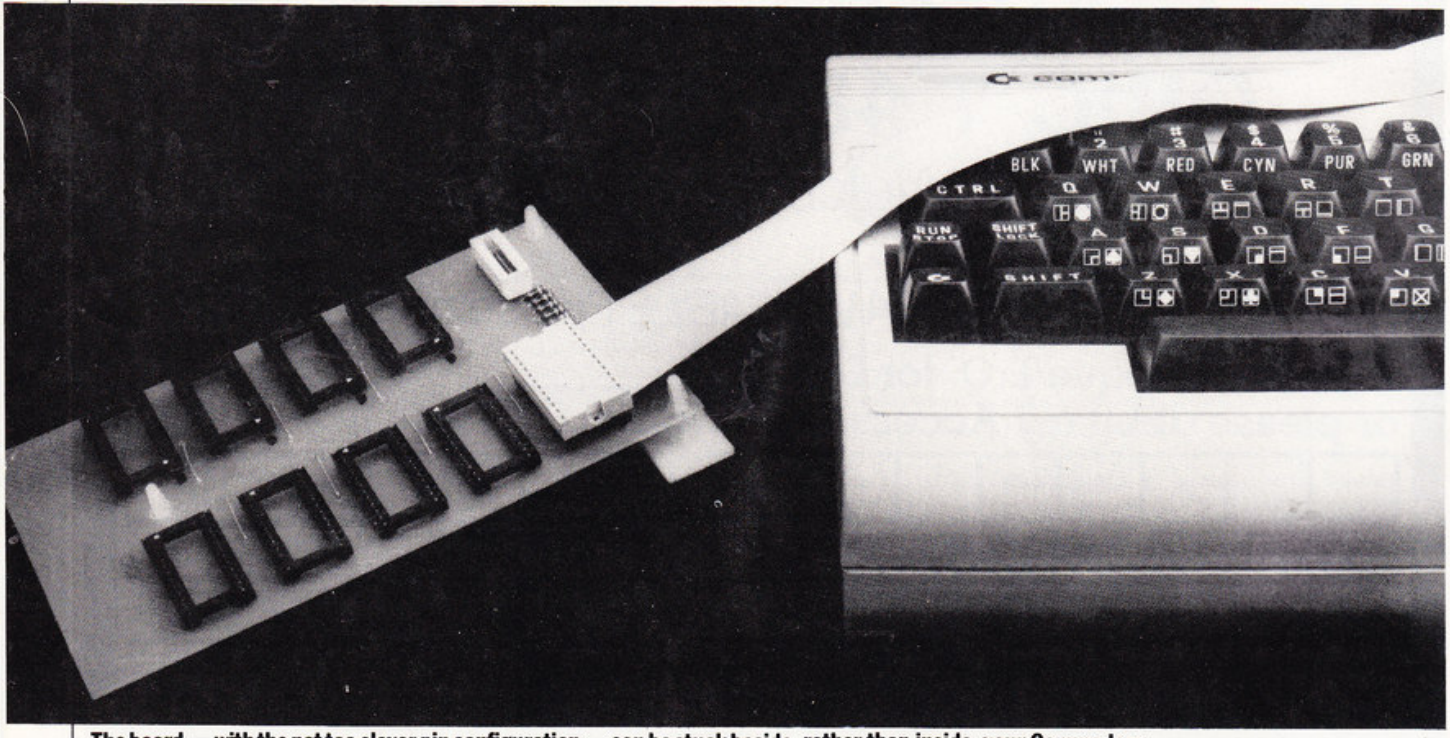
Verdict

The prices for these boards are extremely low, and the producers deserve to succeed. Members of the Independent Commodore Users group even get a discount.

With the reservation about the pin configuration, the products are highly recommended.

Name Jaytee ROM/EPROM Pager **Price** £26 ex VAT **Capacity** up to 8 2716 or 2532 or equivalents **Total capacity** 32K, switched in 4K byte blocks **Connection** 12in 24 pin dip to 24 pin header assembly as supplied **Supplier** Jaytee Electronics Services, 4 Halford Close, Herne Bay, Kent, 02273 5254.

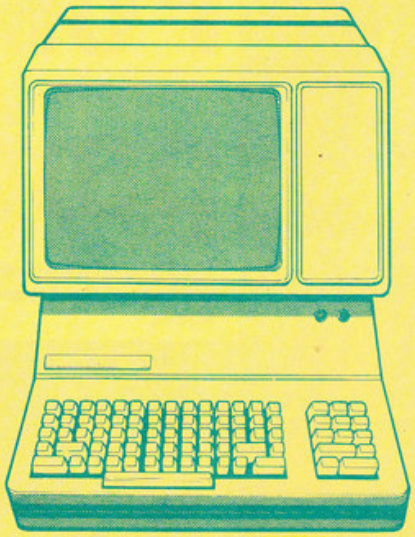
Photo by Naru



The board — with the not too clever pin configuration — can be stuck beside, rather than inside, your Commodore.

Barry Miles tells a baudy tale of Interface Systems' new Printer Interface Buffer

New buffer on station



Advertising Arts — photo by Naru

In the early days of microcomputing, users were more tolerant of hardships and irritations than they are now. We used to put up with integral VDUs which were at the wrong height for comfort, had barely adjustable brightness, and fuzzy characters. Similarly we put up with very noisy printers with the same stoicism.

Things are changing now — users demand, if not comfort, at least convenience. This applies right across the board and printers are no exception. Some want the fastest print obtainable, and will go for a good quality dot matrix printer working at, say, 160 cps (the Epson FX80 is a good example). Others will want daisywheel quality.

They will find speed is restricted, often to as low as 30 cps, or even 17. Now this poses problems in terms of throughput. If your printer is going to take half an hour to print something out, you often do not want the rest of the machinery to lie idle during that time. The better word processors don't put you in this position, because they permit background printing, but this does not solve the problem if your particular computer does not support this, or if the program you are running does not lend itself to it.

What is really required is a device to which the computer can dump its data at the fastest transfer rate the computer is capable of, and then send it to the printer at the rate at which the printer can cope with it, leaving the computer and disk drives free for some other task.

This is perhaps more important in business situations where time is money, but even the enthusiast places a value on time, and wants to get on with the job rather than watch a printer do its thing. Even watching logic-seeking taking place loses its fascination after a while.

Printer buffers do exactly this — it's just like having an extremely fast printer hooked up to your machine. The data is stored in the RAM of the buffer, and off you go with some other task. Many printers have buffers of up to 16K built in or as an optional extra. This is often not so convenient as a separate buffer, because you may find that pressing the button on the printer to take it off has no effect until the buffer is empty. This is a bit sad if the reason for wanting to stop is for something important, like a paper jam, or an incoming phone call.

Interface Systems of Bexhill on Sea has produced a series of buffers which should go a long way towards solving the problems I have mentioned. The designer of these products previously designed a sort of multiway buffer, which could connect 'anything to anything', but this led to a high price of around £350 and the average owner used only part of the circuitry available inside the box.

Configuration swop

The new approach is refreshingly simple. The idea is to provide a buffer which is suitable for the user's current configuration, and to be willing to do a swop when the machinery is changed. Thus you may start with a Centronics to Centronics parallel buffer, and later change it to IEEE to IEEE!

The current model range includes 16K and 48K capacity, in Centronics to Centronics, RS232 to RS232, and IEEE to IEEE configurations. We tested the Centronics 48K version.

The device takes data from the computer at a rate of up to 10,000 characters per second, and is both small and robust. It measures 5 × 5.25 × 1.5in, and is very light. It comes with its own transformer, which is integral with a 13 amp plug and input and output cables of 0.5m and 1m length respectively. Longer cables are available if required. The connections are of the usual 36-way Centronics type.

Other versions offering IEEE to Centronics, IEEE to RS232, RS232 to Centronics and Centronics to RS232 are in the pipeline, together with a full Duplex RS232.

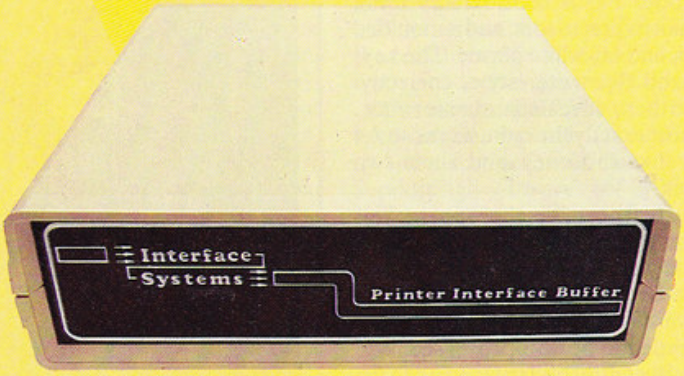
For the less technically minded reader, the bottom line is that, having got hold of the appropriate model for your machinery, you simply hook it up together, and switch on. The LED comes on and stays on if everything is OK, and away you go.

The most interesting feature is that you regain control of your computer almost immediately. If you send 48K of data to the printer, and that at 30cps this will take your printer 30 minutes to digest. I find this extremely attractive, as someone who has recently disposed of a fast daisywheel in favour of a much slower one, principally on the grounds of less noise and more ergonomic satisfaction.

There is a fully detailed manual, with all the technical data in it to enable you or your dealer to make sure that the device will suit your computer and printer, and to enable you to troubleshoot. The fact that the buffer is made in the UK and can therefore be changed here is an added advantage.

I found absolutely no problems in operation, and recommend the product. The extra cost of the 48K as against the 16K is only £30 plus VAT, and that seems a very small price to pay for being able to add extra data to the queue.

Name Printer Interface Buffer **Manufacturer** Interface Systems, Trenton House, 16 Eversley Road, Bexhill on Sea, East Sussex TN40 1HA, 0424 225656 **Details** Data transfer rate 10000 baud, dependent on computer capability **Versions** Centronics parallel to Centronics parallel, others available **Price** £139 to £159 dependent on memory size



The Tandy TRS-80 Model 100 offers real micro mobility. Richard King reports from a park bench.

Porta perfe

Almost as soon as I saw the Tandy TRS-80 Model 100, I decided to give it what must be the ultimate test of a 'truly-portable' micro . . . writing the actual review on the machine itself, unaided. The machine, I mean.

I hereby swear that I wrote this entire text on the Tandy TRS-80 Model 100. I did so stretched out on my sofa at home, on the Bakerloo line, in a cafe over lunch, and on a bench in Soho Square, among other places.

It's an amazing sensation to be walking down the street, have an idea of something worth including in the review, and then and there to be able to switch on the machine and add it. Get some pretty odd looks, though, but it's a great conversation-starter.

Presention

The machine comes in a substantial cardboard box with adequate foam packing. Included are a large ring-bound manual, a small (and very useful) quick-reference guide, and a rather nasty leatherette carrying-case. This needed a pocket for the little book at least.

The manual is to the usual Tandy standard. It's clear, tersely printed, in very wide spacing, and probably uses a lot of trees. Certainly, the two books do their job, especially the quick reference guide.

This alone makes the machine completely useable, even if not totally understandable. I only collected the machine at 2.30, and during the afternoon I used it to do a bit of fiddling, but didn't do anything much apart from clear up the garbage left over from the previous occupant.

I don't normally expect to get really conversant with a new machine in less than a week (unless it uses stuff like boring old WS.COM), certainly not enough to do my job on it, but I soon felt sufficiently confident to have started writing this just as the nine o'clock news came on.

Construction

This is the first machine from Tandy which doesn't look (with some due respect) tatty.

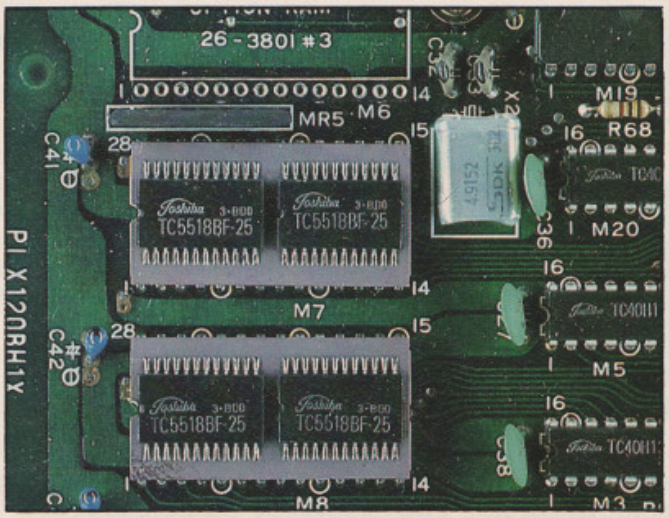
For some reason, voluptuous curves on an essentially rectangular box give a machine an air of cheapness, especially with certain colours, and more so if it's dull silver.

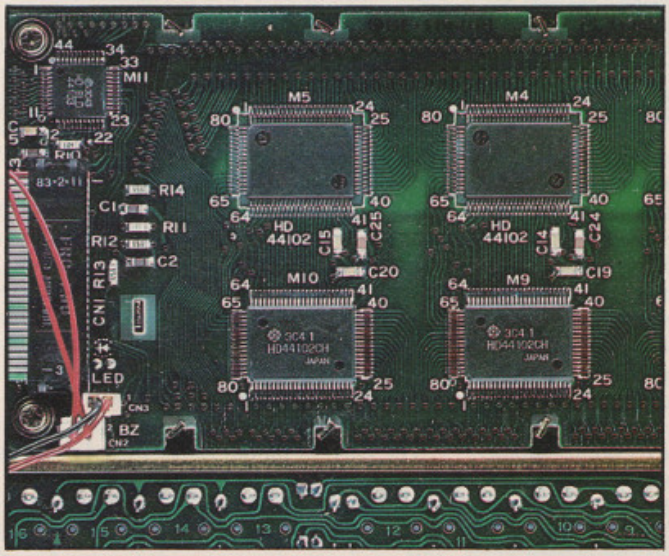
The Model 100 is considerably more angular than its precursors, and is moulded from black and off-white plastic. The keys are full-sized typewriter style, correctly-spaced and there's a real spacebar for once.

It is almost exactly the same size as an A4 magazine (like this one), and about two inches thick.

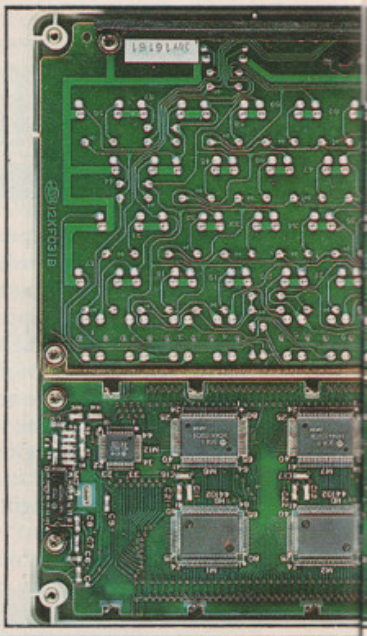
Like any real portable, there are sockets and hatches of all kinds, on all surfaces, as well as a couple of switches and a thumbwheel control for display contrast.

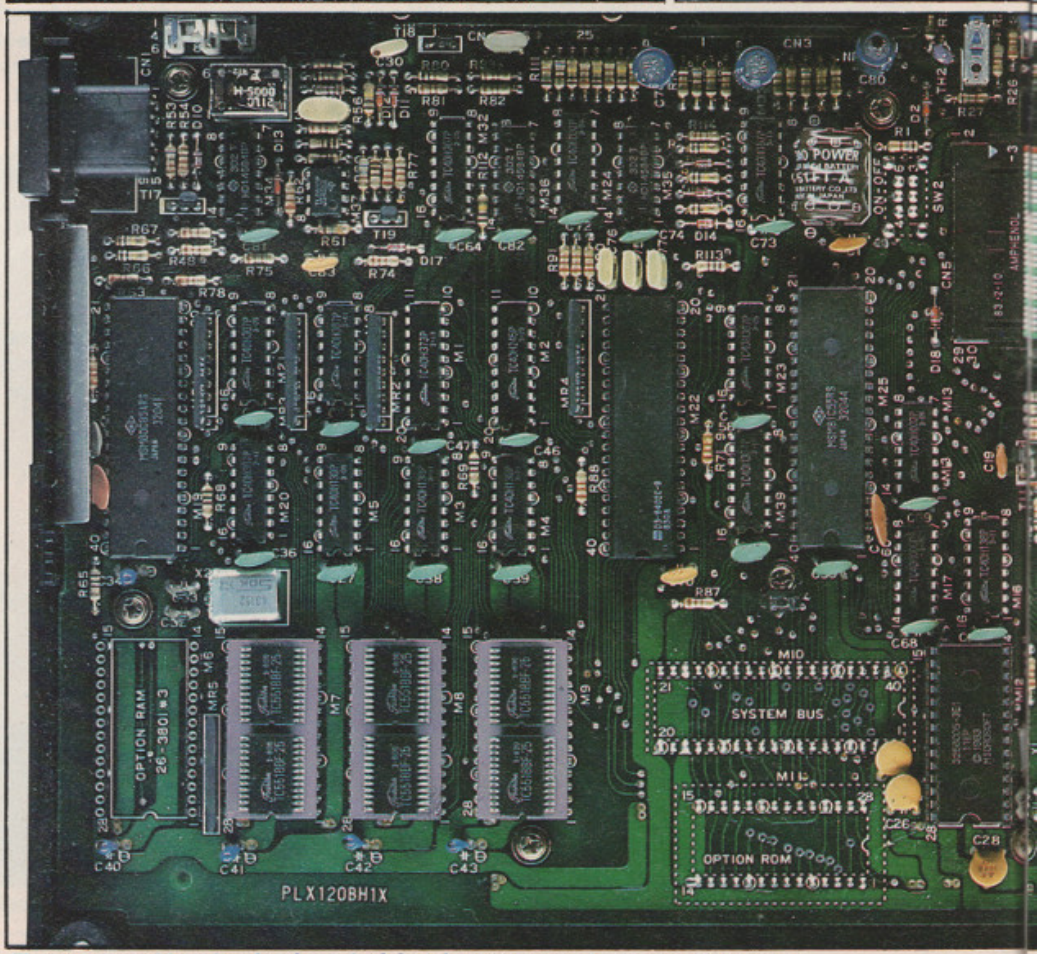
The overall construction, while not being intended to be dolt-proof, seems to be quite sufficiently solid to stand up to the treatment which most delicate-but-portable equipment receives.





The 8K by 8K RAM chips (top left) an the back of the keyboard shows th screen.

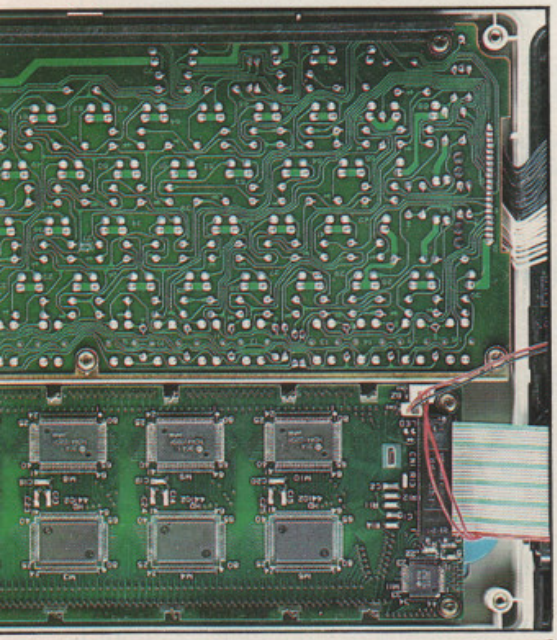


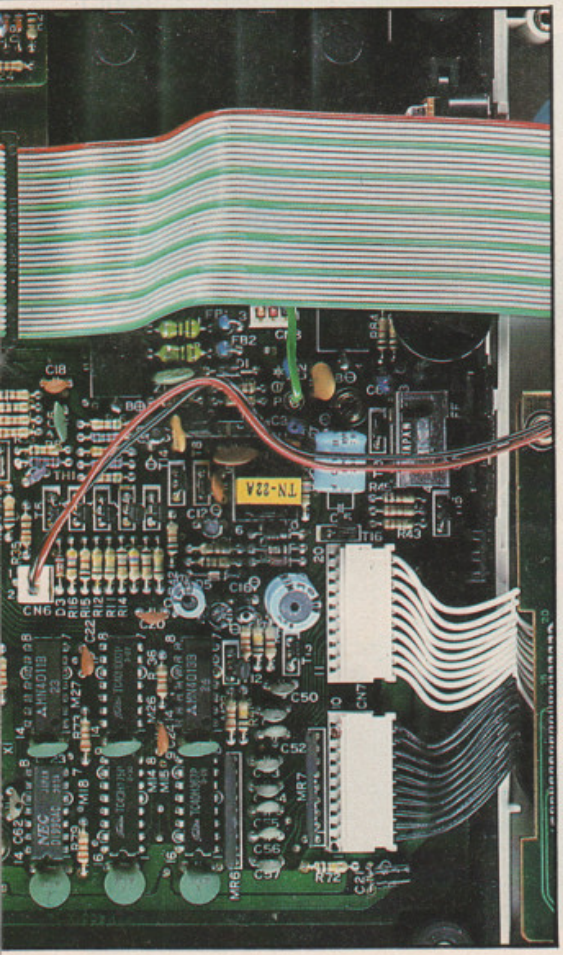


The main board is quite closely packed, but there are more densely packed boards.

ble
ction

the display drivers (bottom left) are package-type, while ten calculator-type microcircuits which drive the LCD





Screen

The display is very impressive. For the first time in my experience of using portables, I actually felt that I was using a real machine, with a proper screen. Before I get jumped on, I am excluding 'moveables' . . . the kind of portables that need mains power to work.

There are eight lines of 40 characters, which isn't that many after 80 x 24, but oddly enough, it doesn't feel at all cramped, even though it doesn't resort to horizonal scrolling. I think this is because 320 chars is a pretty solid paragraph. A bigger screen would be nice, but not necessary.

The major benefit of an LCD screen, quite apart from its being flat, is the fact that it gets more contrasty the brighter the ambient light; the reverse of the CRT, which is useless in bright sunlight. Certainly, it helps to have a good bright light over one shoulder when you're using it.

The actual characters are made up from a 5 x 7 matrix, arranged so that there are sort-of-true descenders. The actual dots are quite sizeable, larger than the Epson HX-20 with which this machine competes, so perhaps Tandy could have squeezed more, small characters in. I don't think it would have improved it any, since the size chosen makes for comfortable reading even on a moving Tube-train.

The character-set is very complete, with the usual ASCII set, as well as line and block graphics, lots of little doodly things including a telephone, a couple of little men and a house, a collection of mathematical symbols complete with real fractions, as well as a whole lot of vowels with accents. The total comes to 223 displayable symbols.

Since the screen is a liquid crystal display, the speed of response is not particularly fast, but then it isn't slow either. There's many machines driving TVs more slowly.

Keyboard

The keyboard is a pleasure as well. The touch is light, but not at all slushy, it has all the proper keys in sensible (but not particularly standard) positions. For example, the apostrophe is on an unshifted key on the far right. This will doubtless annoy some people, but it is very quick to use.

In most other respects the keyboard is fairly ordinary, until you start using the GRPH, CODE or NUM keys, which effectively remap the keyboard, CODE and GRPH act as SHIFT keys, except that they produce symbols. There are, in fact, six completely different sets of characters produced by this machine, since the actual SHIFT keys work at the same time as the GRPH and CODE keys.

The slightly odd (and marginally frustrating) thing about the keyboard is that these symbols (which have perfectly good ASCII codes) are not produced by keys with related codes. This is because the arrangement of the keyboard is totally illogical (qwerty) whereas the graphics demand some kind of logical arrangement.

For this reason, Tandy appears to have 'moved' everything about to make some kind of sense. I can't argue with the idea, but I also wish it were slightly easier to remember where everything is.

There are two locking keys, labelled CAPS LOCK and NUM. The former needs no explanation, but the NUM key is really neat . . . unless it's locked down when you don't expect it, in which case, y64 get a33 25nds 6f f4nny st4ff!

What it does is convert a section of keyboard into a numeric keypad. The keys concerned are 7,8,9, U,I,O, J,K,L, and M. These produce 7,8,9, 4,5,6, 1,2,3, and 0.

I don't really need anything like this myself (and until Tandy produces some kind of spreadsheet, neither do many others) but it will be very useful for people who do a lot of number entry.

There is a row of function-keys across the top of the keyboard, just underneath the screen. There are eight programmable ones, a set of four predefined ones, labelled PASTE, LABEL, PRINT and BREAK/PAUSE, and four cursor-keys at the extreme right.

PASTE is used to copy whatever is in the PASTE-buffer into the keyboard-buffer, as though it were being typed very fast. This may be done anytime, anywhere, which can produce some hilarious results. Shades of Lisa . . . it works just like the clipboard.

LABEL is used to toggle the command-line labelling. This uses the bottommost line of the screen to put up explanations of the current definitions of the eight function-keys.

PRINT will transfer the contents of the screen to the printer, and if shifted, will dump the whole file.

Any operation may be temporarily halted by pressing the PAUSE key, but if you SHIFT it, the process will be terminated.

Storage

All over the place . . . that's where. The Tandy Model 100 considers all output devices as forms of storage. You can store programs or data-files on the CAS: device, which is the tape, or you can keep them in the machine itself by using a device called RAM:.

For simple output, there are the LPT: and LCD: devices, which are the printer and the screen. About halfway in between the real storage and the (unreal, I suppose) 'copying' devices lies the COM: device.

This uses the RS-232 port on the back of the machine. Naturally, it could be used for a serial printer, but in view of the supporting software (of which more, later), it is mainly intended as a communications line.

The reason I describe it as a kind of halfway house is because it can be made to act as though it were a device from which one can load-and-run programs. Normally a Comms line transmits data which is filed and then it can be EXECed into the BASIC. After that you type RUN or

46►

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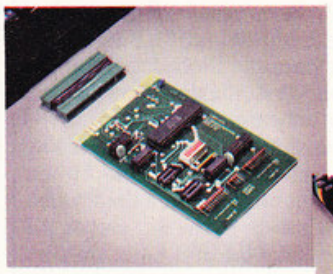

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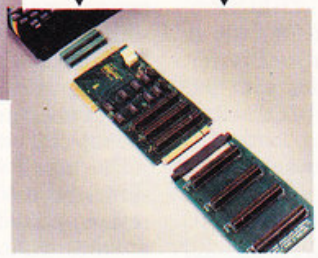

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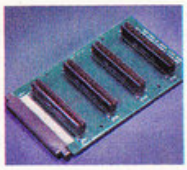

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whatever, and away it goes.

On the Model 100 these intermediate steps may be automated. I didn't have time to get deeply into this area, but I strongly suspect that this is where much of the real flexibility of this machine lies. For example, you could send a program to the Model 100 instructing it to send back a copy of the RAM: directory, then you could return a list of required files. This list could be saved as a RAM: file itself, and using it, the files could be chosen and transmitted.

You can even do so at specified times, which again could be input at the remote terminal, sent to the 100, filed and used, then the time-file could be deleted.

Expansion

A considerable amount of expansion is built in; much more than you would think from taking a quick look at the outside.

Almost the first thing you notice when you peer around the back is a pair of large sockets. One is labelled PRINTER, and the other RS232. There is also an 8-pin DIN socket for the cassette lead, and a well-recessed RESET button.

On the left side is a plastic pop-off cover with the letters BCR embossed on it. Removing it reveals a 9-pin Cannon D-plug, and this is where the bar-code reader plugs in.

On the other side is the power-socket, a normal low-voltage co-ax, of the type which often falls out and spends its time delivering 6 volts to the carpet. In front of that is the thumbwheel adjuster for the screen-contrast, and the power switch. This last is almost flush with the surface, so that it won't be switched on by mistake. Switching off is less dangerous, since any files are automatically saved by hitting f8.

On the bottom are two hatches and a slider switch. The hatch at the back covers the battery-compartment, which takes four penlight cells, providing power for about 20 hours of continuous use of a 24K machine, and about 8 days of power for the RAM with the rest of the machine switched off.

The front access-hatch reveals some much more interesting things . . . one's a damned great 40-pin DIL socket, which the documentation says carries the system bus, and the other is a 28-pin ROMpack socket, rather like the ones on HP-41Cs. This is for add-on ROMs.

I am told that the system bus will be used to provide a connection to a larger box, probably with disk drives, but which will allow the machine to drive a TV or monitor. This will put the Model 100 in a class all its own.

Operation

If all that has gone before has whetted your appetite, then this section will cause permanent brain damage.

In use the Tandy Model 100 is quite simply unbelievable! I know it isn't very polite to say so, but for the first time Tandy has produced a machine which is actually a pleasure to use. In fact I'd say that it's far better than anything else in its price range.

When you turn on the machine, a directory of all RAM: files appears. At the top left there is a Visi-type cursor. Moving this around with the cursor-movement keys (just like VisiCalc) and pressing ENTER will select a file for use.

There are three main kinds of files: system (BASIC, TEXT, TELCOM, SCHEDL and ADDRSS), text files, which have the suffix .DO (document) or BA. for Basic, and machine-code files with the suffix. CO (presumably for .COM, *à la* CP/M).

A very clever feature is the way that the machine puts you into the correct environment for the type of file. Selecting a file with the .BA suffix will drop you into Basic, and will then attempt to run the program. A bit of a pest when you know that the program isn't complete, but no more.

Picking a .DO file will put you into the editor, and choosing a .CO file will just run it.

The TEXT program is in most respects really good, as it should be considering it's the most used piece of code in the machine. It is generally used as a straightforward editor, but it's also used by the EDIT function of the Basic.

When used for normal text, it is reasonably quick and simple. The whole screen is used, unless the LABEL function is on, and the special control keys such as DEL/BKSP, TAB and so on are fully active. Cursor moves may be done with either the cursor-keys on the top right, o by control key combinations.

These latter are assigned such functions as 'move to top of text', 'move cursor to right end of line' and so on, but I confess that apart from moving to the top or bottom of text with W and Z, I didn't use them much, since the SHIFT key 'amplifies' the cursor-keys, making them do their normal jobs, only more so.

So when unshifted, the cursor-left key moves one character at a time; when shifted, it moves one word at a time; when 'controlled' it moves to the left end of the line. Up goes one line at a time; shift-up moves one screen, and control-up goes to the top of the file.

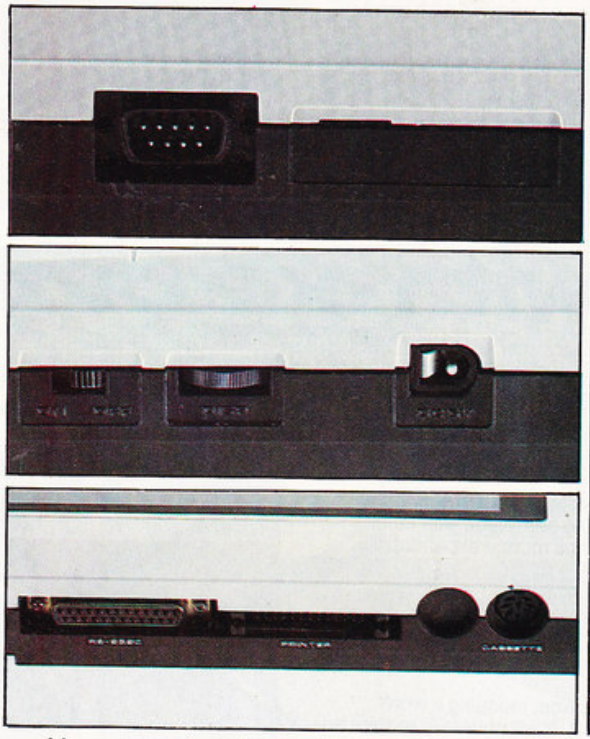
The result is that these provide quite sufficient control to have written this review, edited it, decided to move bits around, without any need of the extra controls available. And I'm a messy writer . . . I usually write the middle bits in rough form, then the intro, then I fill in the middle, tack on the conclusion, go back to the middle again and fiddle with it until I'm happy, and finish up by rewriting either the first or last paragraph, or even occasionally both.

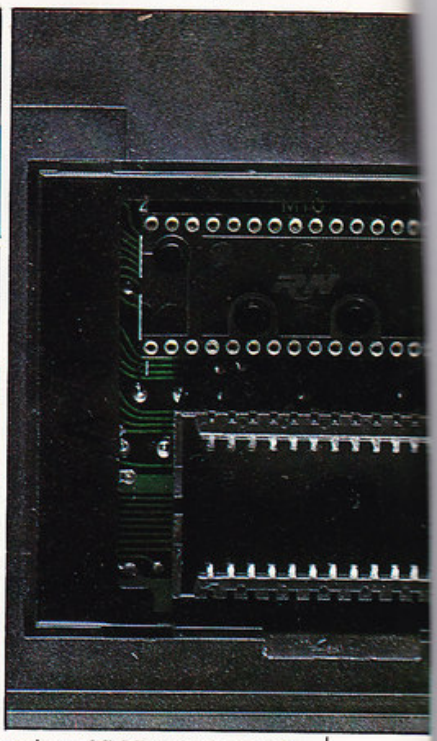
That needs a really flexible and effective editor.

This one is. My only complaint is that there doesn't appear to be any 'search-and-replace' function. Find, sure, but you have to do the alteration by hand. For some reason I didn't seem to miss it, which is odd, since I'd normally damn outright any editor lacking this. Don't ask me why, I don't know.

The thing I liked most about it, though, was the way that it automatically wrapped words so that they were not broken at the ends of screen-lines. Even more cleverly, it doesn't do it in Basic.

The Basic is pretty good, too. In most repects it's a fairly normal Microsoft, complete with line and point drawing commands, single and double precision reals, and so on. It doesn't have WHILE . . . ENDWHILE, or REPEAT . . . UNTIL, but those are just handy and make for easier reading. They can be synthesised





Centre: Expansion bus connector and program expansion socket. Right: Battery hatch. Below (top to bottom): Bar-code wand socket; power switch, screen contrast and 6V socket; reset switch, RS232, Centronics and cassette ports.

perfectly well with loops and conditions, though they will be less legible, I admit.

The differences come in the facilities added to it specially for this machine. There are, in particular, several interrupts generated by the function-keys, the clock, or the COM: device.

These are used by an expanded ON command, so you get ON TIME$ GOSUB, or ON COM GOSUB, which will jump you to a subroutine to handle it. The function keys do the same, and a subtle blend of these facilities, together with some elegant code to handle things, will produce a very powerful tool.

I can't say as much for the other 'system' programs. These aren't exactly impressive, especially in view of the fact that an emulation of them, in Basic, would consist of about twenty lines. Admittedly pretty complicated ones, but still not a lot.

Worse, two of them are in almost all respects exact duplicates of each other. I refer to SCHEDL and ADDRSS, the notebook and address book, respectively. What these do is allow you to search a file, and to print the result on either the screen or the printer (but not, as far as I can see, the RAM: COM: or CAS: devices).

Neither of them allows you to add, change, delete or otherwise modify the data. If you want to do that, you call up the editor which has a perfectly good 'find' facility of its own, as well as the ability to send stuff to the printer.

These two programs are a very feeble attempt at a filing system, which don't do much between them apart from clog up the directory. A shame after the editor.

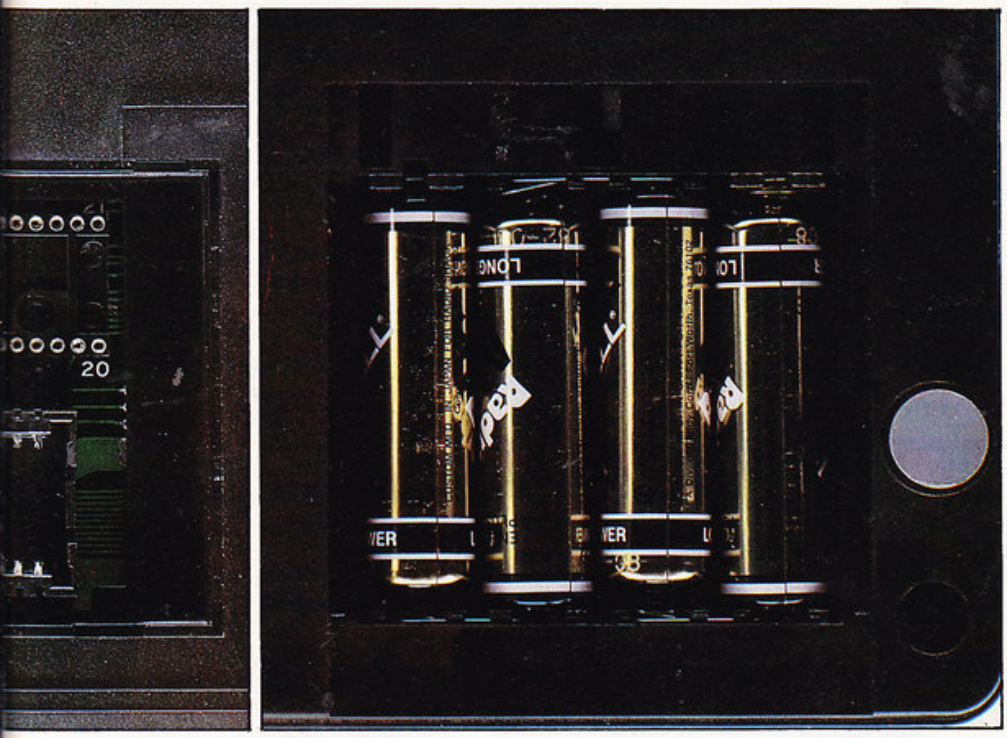
There is a socket under the front underside access-hatch which takes ROM-packed software, and a Tandy spokesman suggested that such things as a good filer or a spreadsheet could be plugged in here.

True, they could be, but I feel strongly that the aforementioned programs would be so widely used that they should be in the system, leaving the expansion socket for programs to do astral navigation, seismographic analysis, or something.

The TELCOM program isn't the same as the other two, but it can't be much bigger either, since most of it's done by either the INPUT# file, variable-list or OUTPUT# file, variable-list commands, after a COM ON, which enables the communications-interrupt, and an OPEN "COM: configuration" which actually opens the line.

The minor details of collecting the text from RAM:, or stashing it there as it comes in, are mere exercises.

It's worth saying (so I will) that a better program could be written by a reasonably good programmer in a matter of days. Tandy has proved that it can do it with the editor . . . what made it get so lax with TELCOM, ADDRSS and SCHEDL.



However, all is not lost. With the superb facilities offered by this machine, it is only too easy to overcome this limitation by doing exactly what I've suggested . . . writing your own (highly sophisticated) filing, communications, or spreadsheet programs. The last would be a beast, but far from impossible, especially if the actual work can be done on a better development machine. Not that it couldn't be done, just that the Model 100 isn't totally suited to the job.

In sum, the software is good in parts. If it were to be augmented by a better file-handler and a spreadsheet it would be unbeatable.

Another Tandy spokesman said there will be a spreadsheet, but that it's destined for the expansion socket. Nice, but there goes my astral navigation program.

Support

All Tandy equipment is sold through its own shops, and is not available through any other outlet. This has its pros and cons, particularly if you don't happen to have a Tandy store near you, but it does mean that you can get it attended to by any Tandy outlet worldwide.

The level of outside support will depend very much on the amount and quality of the technical information available or squeezable from Tandy itself. I would make the comment that this machine is bound to sell to a much wider audience than the company has reached before, so they absolutely must get away from the 'Well it works with Tandy equipment, and we neither know (nor care much) about the rest,' attitude.

This machine could sell very well among people who already have a perfectly good computer, and despite what Tandy imagines, relatively few have the TRS-80 logo on them. But it will only do so if those people are absolutely dead sure that they will be able to get help in connecting it to their 'home machine'.

Verdict

Given enough tries, anybody's going to get it right eventually, and with the Model 100, Tandy has. It isn't perfect, but it's a lot better than anything else around, and all the faults (by my reckoning) are in the support-software, rather than in the system itself.

To enumerate, I would have liked a search-and-replace function in TEXT, a decent configurable card index instead of ADDRSS and SCHEDL, a more flexible TELCOM, and a spreadsheet if it isn't practical to build that into the FILER (and why should it be?). If it had those I could live happily with it as a portable extension to my home-base computer system.

Come to think of it, even without the bits I want, I probably will anyway!

SPECIFICATION

Price	£649 for 24K version
Processor	80C85 running at 2.4 MHz
RAM	8K expandable in 8K increments to a limit of 32K
ROM	32K
Text screen	40 x 8, 5 x 7 dot matrix
Graphics screen	240 x 64
Keyboard	57 keys, 8 programmable function keys, 4 command keys, 4 cursor keys
Storage	Cassette or in RAM
Interfaces	Centronics, RS232, cassette, bar-code reader
OS/Language	Menu-system & Microsoft Basic
Distributor	Tandy (UK)
Software included	Basic, Edit, Schedl, Addrss, Telcom

INDOOR GAMES

SPECTRUM

Pass the ouzo

Name Backgammon **System** Spectrum 16K/48K **Price** £5.95 **Publisher** Hewson Consultants 0491 36307 **Format** Cassette **Language** Basic **Other versions** None **Outlets** Mail order

There is no doubt that the best place to play backgammon is in a Greek taverna on a hot day with a generous supply of ouzo to hand, but due to a distinct lack of all three it is back to the trusty Spectrum to try and brush up the game.

First impressions

The tape from Hewson Consultants comes well documented, with four pages of instructions on the insert, both about the game in general and this version in particular. While the rules are necessarily brief, there is certainly enough information for the absolute beginner to learn how to play, though if you want to know about tactics too, you'll need to read up on the game.

In play

This version is purely you against the Spectrum, which is preferable to sacrificing some quality just to enable two people to play — if you have a real opponent you should be using a proper board, not the TV screen. But within that limit, the menu presents you with four options: a single game, a points series of up to nine games, a gambling series at £10 per game, each player starting with £200, or finally a demonstration game.

On the right of the screen are the two large dice, while the information printed below the board shows the previous move as well as the current one.

If you make an invalid move the computer points out exactly what was wrong, and suggests the move you might have made instead, if that applies.

The counters are easily and quickly moved by inputting first the start point (lettered from A-Z) and then the number on the dice. In deliberately trying to crash the program or get away with an incorrect move, my opponent never behaved other than impeccably, letting me get away with nothing. It offers you eight levels of play, the response time on the highest being as instantaneous as the beginners' level.

Verdict

Given the confines of 16K, this is a good value game for those just learning Backgammon.

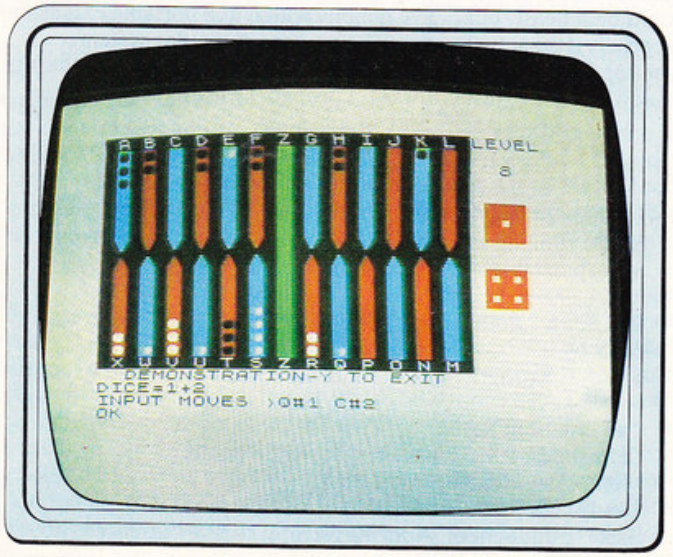
The operation is smooth and clear, with plenty of time to study moves.

But the more experienced player might prefer to look round for a tougher opponent — or book that holiday in Greece.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of the machine	
Overall value	



BBC MODEL B

Hurricane Acorns?

Name Snooker **System** BBC Model B **Price** £9.95 **Publisher** Acornsoft, 4A Market Hill, Cambridge CB2 3NJ, (0223) 316039 **Format** Cassette **Outlets** Acorn dealers.

With Acornsoft's Snooker for the BBC micro there is a strong temptation to spend most of the game walking around the monitor stroking your chin and chalking an imaginary cue. If you can persuade a cigarette company to donate some free samples, so much the better. This game is a taste of the big time.

First impressions

The green ball, in order to stand out against a green table, is coloured light blue. The brown is pink and it throbs noticeably to enable you to distinguish it from the pink ball. The cue, which you construct by pressing the appropriate keys, grows in the direction of the shot rather than behind the cue ball.

Snooker is short on visual prompts but the booklet covers most eventualities. The ones it omits present themselves soon enough.

In play

Snooker's cue is an implement of limited precision. Its length gives you strength in the shot, its angle gives you direction, and you can select topspin or backspin to actually play the ball. But the direction is not always exactly what you imagine it to be, and your judgement of strength is practically useless because strange things happen when the cue ball strikes its object.

Cannons of exaggerated violence send balls all over the table from the mildest shot. Topspin and backspin are apparently transferred from the cue ball to the ball struck and the mayhem is even more pronounced. It is possible to play a subtle shot with great gentleness but this seems to have more to do with luck than skill.

Otherwise the game proceeds easily enough. Nomination of colours is straightforward; when you've potted a red, a bar at the foot of the screen shows you what has been pocketed, and token sound effects can be ignored.

You can refine the direction of your shot by changing the order of commands with which you build your cue (or, presumably, by using a joystick — I used an ordinary keyboard).

One quibble — when the white goes down you aren't allowed to determine where in the D to position it.

Verdict

This is a shadow of the real thing, but fun nonetheless. Over time its main shortcoming will be the difficulty of making it into a game where skill counts, but that will only really count against it with people who know how to handle a cue. For anybody else it is probably as good a way of mis-spending your youth as any. **David Guest**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

Pete Gerrard faces death by camel, droid, pod, meteorite, Black Rider . . . and boredom.

Commodore combat

This week it's time to take a look at a clutch of the latest arcade-action style games for the Commodore 64.

Some are good, some are undeniably bad, while others are merely indifferent — but certainly, new releases for the 64 are starting to come in thick and fast. Among the goodies are Attack of the Mutant Camels, Gridrunner and Shadowfax; bad is Tank Atak, and merely indifferent is Rox 64.

ATTACK OF THE MUTANT CAMELS

Attack of the Mutant Camels, from Llamasoft, is a gem! Enemy aliens have abducted some normally harmless camels, and turned them into 90ft high, neutronium-shielded laser-spitting, death camels.

As defender of the planet Earth, your mission is to destroy these camels by setting your highly manoeuvrable spaceship into position and firing repeatedly at them until their neutronium shields are reduced to nothing and they are annihilated.

As you're doing this, they are slowly marching towards your scanner defences, and if they reach them you are destroyed in a devastating display of graphical pyrotechnics.

The camels, six per screen, have two main weapons. One fairly harmless missile wanders vaguely in your direction, and you can withstand four hits from that. The other missile is lethal, and homes in on you with frightening accuracy, taking one of your five lives in the process.

Destroy all six camels, and you have to dodge a hail of rockets before progressing on to the next screen, where you find more camels. There are 31 levels in all, and I defy anyone to get to the end without cheating. A brilliant piece of software, which shows just what the machine can really do. Great sound, stunning graphics, incredibly fast re- what the machine really can do.

Great sound, stunning graphics, incredibly fast response, and an addictive quality that will have you reaching again for the joystick before you can say Darth Vader.

GRIDRUNNER

Another game from Llamasoft, which makes you wonder why all computer arcade games cannot be like these two.

Upgraded from an earlier Vic 20 game, it puts you in charge of the Gridrunner, a spaceship sent out to combat the invading hordes of enemy droids.

The fast action all takes place on a grid, which features a variety of enemies out to destroy you.

The gridsearcher squads consist of linked droid segments and as they move across the grid they must be destroyed. Hit one, and the rest of the squad splits up into two smaller segments, and so on until you have a number of individual droids whizzing about the place.

Collision with these is lethal, but even when you hit one they have two final weapons. Any one you hit turns into a pod, which lodges itself on the grid, and these must be hit a number of times before final annihilation.

If left alone they gradually change shape until finally unleashing a bolt of energy at you. This bolt is lethal, and must be avoided.

Also on the rampage are the X-Y zappers, which roam about the boundaries of the grid, periodically firing bolts of energy across it. Again, a hit from one of those is usually deadly, and another one of your five lives disappears in a cloud of vapour.

With a bonus life achieved after successfully destroying every droid, you move on to the next level, and more of everything.

There are 31 levels in all, and at the top level I can guarantee your destruction after about five seconds!

Another fast and furious game, it's difficult to grow tired of this one. It uses the power of the 64 to the full.

TANK ATAK

Alas for Supersoft, this game is a disaster. Based on the popular arcade game of usually the same name, it is hopeless.

You are in front of a range of mountains, out of which come various machines bent on your destruction. Using very simple line graphics, tanks, pods and saucers come at you, and you must train your sights on them before shooting and hopefully destroying them.

Points are scored for each one you hit, and a primitive early warning system tells you when more enemy are in range.

Slower than Geoff Boycott crafting a century, this game has no lasting appeal. Better sound can be obtained from the Spectrum, and the graphics are a joke.

Forget it.

ROX 64

The opening screen scenario describes you as being in charge of lunar defences against a barrage of deadly meteorites.

Your defence module is equipped with three lasers, which can fire vertically up the screen or diagonally to left or right, plus a special 'panic button', which you can use four times only in case of dire emergency.

You survive for as long as you can, but each meteorite getting through does just that little bit more damage to the lunar surface, until, ultimately, you are wiped out.

The game is tediously slow, and your ship cannot be moved, thus affording only limited defence possibilities. Only one missile can be fired at a time (you gain points for each meteorite destroyed, plus a bonus after each attack wave), and although you're promised an 'awesome mothership display' if you manage to save your base, I've seen more awesome sights around Piccadilly Circus on a Saturday night.

Slow, boring and predictable, Llamasoft has made a great mistake here. On the plus side, the program can be listed (it's all in Basic), and beginners to the art of programming can at least see how the sprites are manipulated and the sound generated.

Not worth £4.95.

SHADOWFAX

You are the legendary wizard Gandalf the White, riding Shadowfax, the swiftest steed ever to grace Middle Earth.

Towards you are riding wave after wave of Black Riders, some slow, some fast, but all with one mission in life: to destroy you!

One touch from a Black Rider means instant death, so avoid them at all costs. However, to justify your status as a White Wizard you must destroy them by hurling bolts of awesome energy.

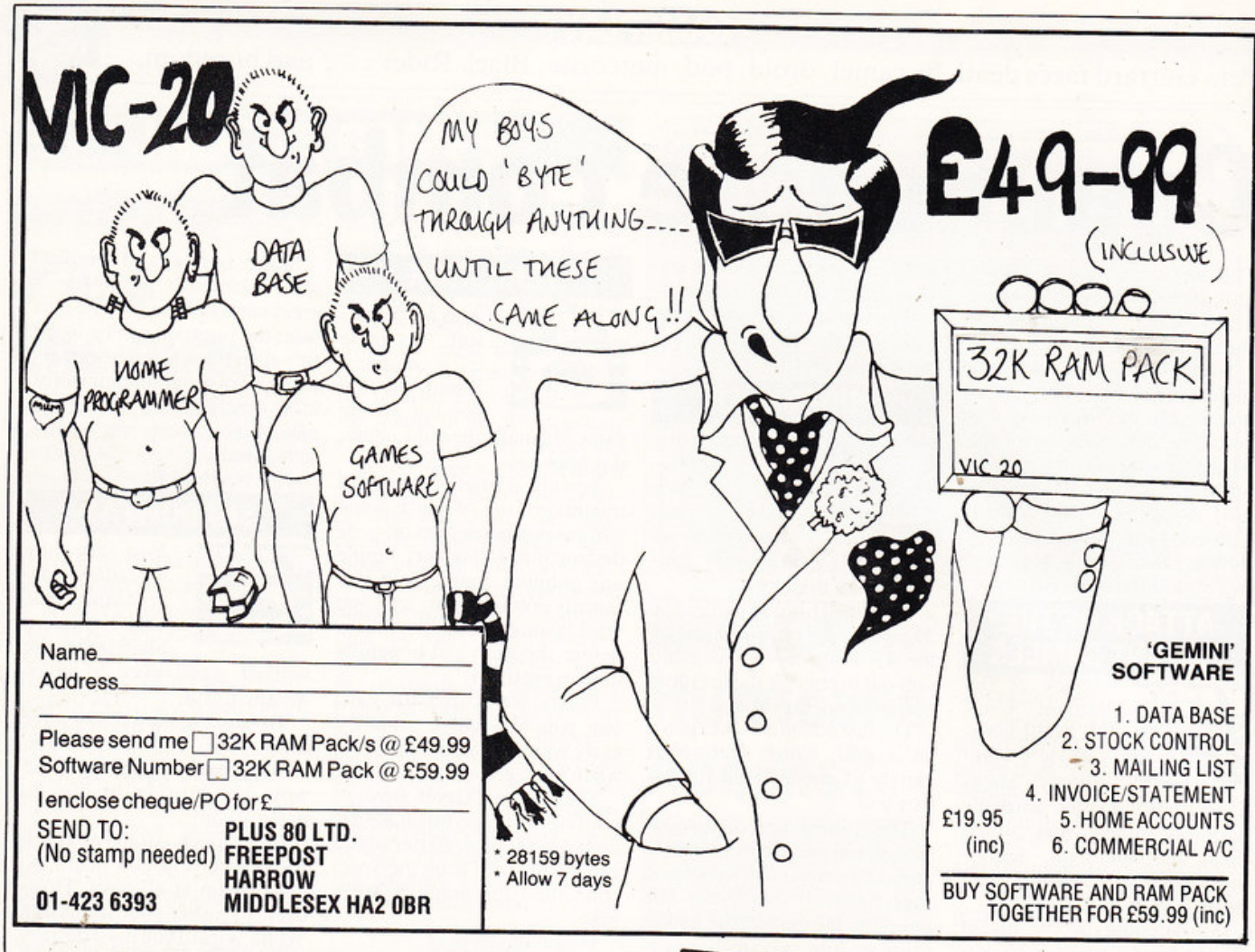
From such a scenario has sprung many a dreadful game, but this is very much an exception to the rule.

The superb graphics as Gandalf gallops along, the sound of the horses' hooves as the Black Riders charge to meet you, and the interesting way of firing, all add up to a very good and addictive game.

The bolts you fire will explode only when you take your finger off the fire button, and a rider can be killed only when a bolt is detonated next to him. Rapid eye-finger co-ordination is required.

Points are scored for each rider you kill, and the longer the game progresses the faster the action gets. There are no different levels of play. Superb!

Llamasoft, 49 Mount Pleasant, Tadley, Hants, tel 07356-4478 — Rox, £4.95; Gridrunner, £8.50; Attack of the Mutant Camels, £8.50.
Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex, tel 01-861 1166 — Tank Atak, £8.
Postern Ltd., PO Box 2, Seven Hampton, nr Andoverford, Cheltenham, Gloucestershire, tel 0242-82741 — Shadowfax, £7.99.



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PLANTS AND PYTHONS

VIC 20

In the snakepit

Name Serpentine **System** Unexpanded Vic 20 **Price** £24.95 **Publisher** Creative Software **Format** Cartridge **Language** Machine code **Other versions** Probably for the Commodore 64 **Outlets** Audiogenic, PO Box 88, Reading, Berkshire. (0734) 586334

No, nothing to do with the pond in Hyde Park — this game is a variation on a Centipede theme, with just a dash of Pacman thrown in as well.

Objectives

You control a serpent, which runs about a maze trying to avoid being eaten by other serpents.

You can attack them, but only from the rear, so that you don't have to face their mouths. After a number of attacks they become shorter than you, turn green, and can then be attacked from the front.

Meanwhile, you are attempting to survive long enough to lay some eggs and raise some young. The hostile serpents also lay eggs from time to time, but these are merely there to provide a points scoring feast for you.

These eggs serve another purpose: when a serpent lays one it also loses a segment, and thus will eventually become short enough to be attacked. But if you try laying an egg when you're too short, you will simply lose a life.

So you must roam about the maze, eat the enemy and their offspring, while staying out of trouble and laying your own eggs.

In play

The action starts immediately, but you'll have to spend an annoying second or two centring up the Vic's screen with the joystick: why can't programmers manage to get the screen to somewhere where you can actually see it?

The graphics and sound are none too wonderful, but at least suffice to make everything distinguishable.

Once you have started, you realise an immediate shortcoming. Pressing the fire button on the joystick halts everything.

Now this might be very useful if the 'phone rings, but on some joysticks it's almost impossible not to press the fire button while you're trying to hold the stick steady.

Having successfully eaten all the serpents, another screen of faster and more vicious snakes appears, and so it goes on, getting more and more difficult, until the inevitable happens and you get eaten.

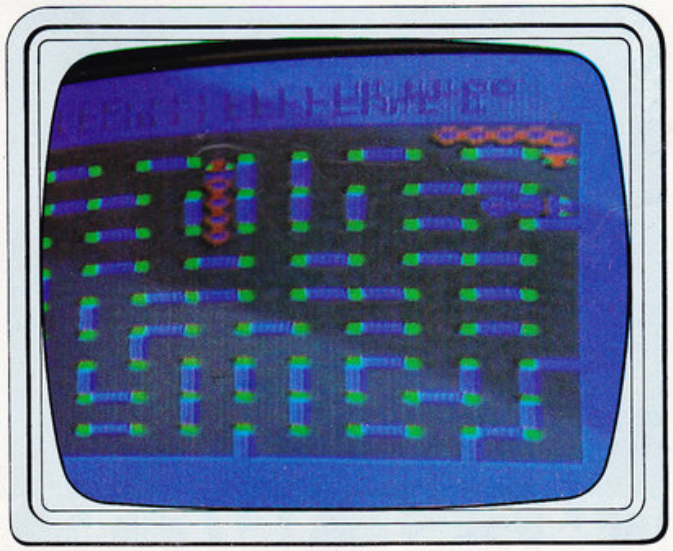
Verdict

An original idea (albeit based on two different existing ones), but the game is not too long in losing its initial appeal.

Play it at a friend's house by all means, but sadly not a game that I recommend you to purchase yourself. **Pete Gerrard**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



SPECTRUM

Bed of snails

Name Pssst **System** Spectrum 16K/48K **Price** £5.50 **Publisher** Ultimate Play the Game 0530-411485 **Format** Cassette **Language** Machine code **Outlets** W H Smith, Menzies, Sinclair dealers, mail order

If this is based on an arcade game then I've regrettably missed it, as I'm sure I'd remember one where, instead of killing aliens, you had to encourage a Thyrgodian Megga Chrisanthodil to grow in your back garden.

Objectives

This amazing plant starts life as a tiny shoot at the bottom of the screen, and your task as Robbie the Robot (who looks more like a blue owl to me) is to keep the garden pests at bay for the few minutes it takes this miraculous flower to grow up and bloom. That may not sound too exciting if you're more used to defending the universe and other simple tasks, but it provides a game that's as challenging and amusing as any I've come across in recent months.

In play

The plant is growing up the middle of the screen, and in the garden walls on either side are five crevices, in which are tucked three different types of spray cans, one for each of the various pests whose pleasure it is to nibble at your bloom. The instructions describe these as Interstellar Space Slugs, Scuttling Leeches and Menacing Midges, though I'd describe them as snails, bugs and wasps.

First come the snails, crawling out of the empty crevices, and you must discover which spray can despatches these to a snaily celestial bliss. The wrong spray merely stuns them a moment. This part is none too difficult, as Robbie moves about smoothly and speedily, picking up bonus points by helping himself to growbags, watering cans etc.

Keeping the creatures at bay is his main task, though, as too much nibbling will cause the plant to die, or at least reduce the number of leaves and slow down its growth rate.

The plant could be described as a sunflower when it finally bursts forth, if it wasn't for the fact that it's purple, but once it has bloomed it's back to square one with a new shoot and a new wave of pests.

Progress is impeded by the fact that if they've nothing better to do, the nasties will occasionally have a nibble at you instead of the plant. You do have four lives, and one of the easiest ways of losing them is by going to deposit your spray can on a crevice only to find a pest emerging just as you get there.

Verdict

An excellent and amusing game with a difference, colourful and quick, it should provide a challenge to anyone, even if you don't have green fingers. In fact if you play the game as long as I did, you'll probably end up with red ones from too much bashing the keyboard or joystick. **Mike Gerrard**

RATING

Lasting appeal	
Playability	
Use of the machin	
Overall value	

TRY FIGHTING THESE WITH YO

UR BARE HANDS.

Slot "Mutant Herd" into your VIC 20 computer and all of a sudden plutonium-crazed mutants will try to eat you alive.

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ISLAND ESCAPE

SPECTRUM

Suffering Safaris!

Name Spectrum Safari **System** Spectrum 48K **Price** £5.95 **Publisher** A J Rushton, 194 Shay Lane, Walton, Wakefield, W Yorks. (0924) 250736 **Format** Cassette **Outlets** Mail order

Safaris are dangerous enterprises, and A J Rushton's Spectrum Safari is no exception.

The game's appeal lies mainly in its perverse (and sometimes irritating) wit. While many other computer games revel in violence and death, there's enough of an element of black humour in Safari to make it a healthy excercise in pure fun.

Objectives

The objective of Safari sounds simple enough. You and two other intrepid explorers must reach the southeast corner of an island on which you are trapped, starting at the northwest corner of said island. On the way you and your fellow worthies must trade with members of various native villages for food and the boat you need to leave the place. Only one of the villages has the boat, however.

Sounds easy, right? Wrong. This island has more tricks up its figurative sleeve than Mandrake the Magician.

The game's real challenge lies in trying to outwit a variety of nasty creatures that pop up on screen with alarming regularity. Unless you perform the tasks outlined by those beasties you're dead meat.

You must also be able to make canny deals with the natives for food. Otherwise you can lose members of your party through starvation.

First impressions

This is a game with any number of possible courses of action. But at the same time Safari's opening set of instructions are clear, concise and relatively free of mumbo-jumbo — a pleasant relief.

The game's witty style is apparent from the beginning as the instructions flash on to a decidedly off-beat musical accompaniment.

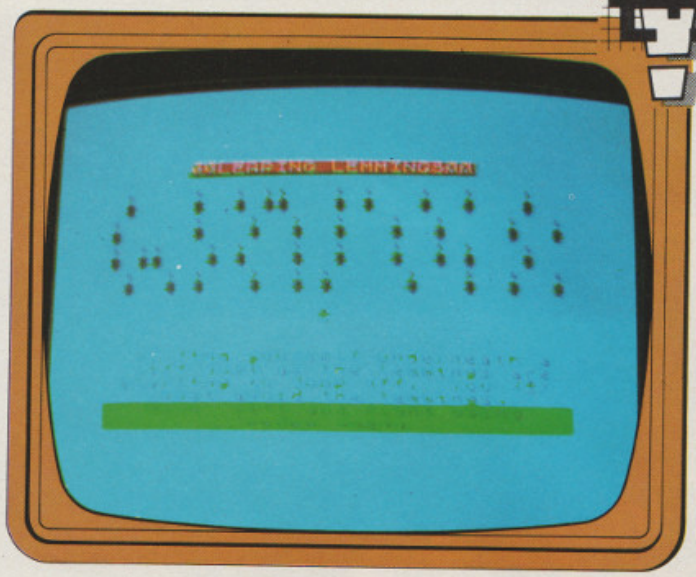
The cassette sleeve gives no indication of Safari's high quality. Rushton and friends should have been a little more market-conscious, perhaps, and designed a more visually appealing package.

In play

You move your exploration party north, south, east, or west by hitting, logically enough, one of the N, S, E or W keys. But there's not a lot of moving about in Safari. Before you've moved more than two or three steps in any direction you're likely to meet one of the animal challengers.

Before moving anywhere it's important to remember that each time you move, each man uses up one food pack. So it's best to try to walk in a straight line towards your goal, the southeast corner of the island.

The island is divided into open country, with a lake surrounded by a swamp in the centre. As the game's instructions make clear, it's wise to avoid the swamp as much as possible, despite the fact that native villages are located just inside its boundaries. It was my bad luck to fall victim to the dreaded swamp, and I found my party had been reduced by one man even without the intervention of an animal.



About those animals. The difficulties posed by these critters vary widely. For example there's a lion whose purpose in life is to try to get you to remember his name.

This he does by flashing his name on the screen ever so briefly. If you type his correct name into the computer good for you. If not, you become Leo's (or Herbert's or Chris's) dinner.

It should be mentioned that the lion announces his presence with a tasteful electronic version of the opening bars of *The Lion Sleeps Tonight.*

Similarly, animal challenger Bruce the Koala's arrival on the scene is heralded by a brief rendition of *Waltzing Matilda.*

Unfortunately cute little Brucie is quite likely to bring tears to the eyes of the unsuspecting Safari player who must guess which of 100 eucalyptus trees Bruce is hiding behind. You've six chances, and should you fail, another explorer bites the dust.

Bruce is rather sporting, though, and gives you clues like 'Pretty Good For A Pommy' when you're hot on his trail.

Less wonderful is the arcade-style Maze of Crocodiles, which is much more a test of skill than friendly Bruce amid the trees. Negotiating this takes some quick thinking and a fair degree of manual dexterity. Should you fail, that awful Funeral March comes on again.

Other animals the intrepid Safari player will encounter include the Mathematical Marmosets, who are displayed in alarming profusion on screen in just a few brief seconds. If your estimate of their number is off, then it's goodbye to you.

There is also the snake shoot, in which you have a set amount of time to shoot off a series of arrows at the dreaded snakes, who will reduce you to so much adder fodder should you fail to kill enough.

But the award for Safari's most frustrating foe goes to the Kicking Sheep. Here you've got to guess which of the sheep's legs will kick next. If you don't obtain a score of at least five correct guesses in the ten chances you have you're out. This is one of the few weak areas of the game, as it's well-nigh impossible to guess correctly.

Should you be skilful — and lucky — enough to get past all the other animal menaces you'll eventually reach the edge of the sea and make your escape.

But since that's rather hard to do, Rushton has thoughtfully provided a practice mode that enables you to hone your skills against any of the various animal challengers.

Verdict

An excellent game, well thought out and beautifully executed. Safari has great sound effects and graphics that are neither gimmicky nor confusing. **Steve McClure**

RATING

Lasting appeal	
Playability	
Use of machine	
Value for money	

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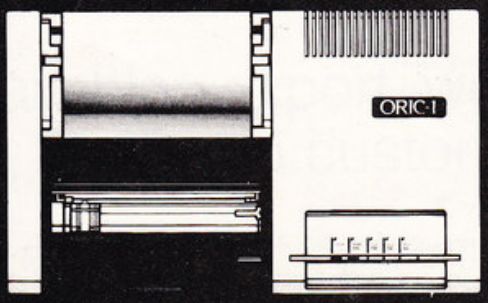

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PCN ProgramCards

We complete the bargain basement home word processor for the BBC model B this week. Since originally testing the program and seeing its worth we've been making occasional use of it to produce some of the shorter articles in the magazine. *PCN* practises what it preaches!

No doubt the sharp-eyed among you have recognised James Bridson's name as the author of a variety of hints and tips for BBC users peppering our Microwaves columns. Obviously a man intent on sharing his knowledge and experience — and more power to his programming!

Nudge, nudge

For all you Sinclair Spectrum gamblers we have a simulation of a standard fruit machine from L Martin. It seems that Rugby League is in danger of losing some of its following, what with this contribution from Whitehaven, Cumbria, and Philip Green's Atari rendering, Pirate Island, from St Helens only a couple of issues ago.

L Martin's program contains all the requirements of a normal fruit machine and yet it gives you the chance to increase the features available.

One or two things, we noticed, could be adjusted to user requirements: for example, the facilities to show a greater fruit machine-like window, plus the fact that the sound could be used as an attraction feature, as in the arcade technique.

Our Program Tally last week suggests that some of you might be feeling hard done by, notably the proud owners of the Vic 20, MZ80K, Lynx, ZX81, Colour Genie and TI99/4A machines. These are all tying for last place in the number of published programs, with only one set of ProgramCards each. Well, we can only point out that the ball is in your court . . .

A RUN for our money

We pay for published programs on a sliding scale which takes into account length, complexity, originality and the programming skill demonstrated in the program. So why not give us a RUN for our money?

As well as the cash, you receive the satisfaction of seeing your byline on the ProgramCard — which will, of course, be snipped out and filed away in the libraries of thousands of micro enthusiasts throughout the country.

Send your contribution, on disk or cassette, together with a plain paper listing and brief summary notes to:
The Programs Editor, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

All disks and cassettes will be returned as soon as possible after evaluation or publication, at our expense.

Program panel

PCN has built up a panel of experts for assessing submitted programs.

If you are interested in becoming one of these referees please send details of your experience and specialities, mentioning expertise in any particular machines, to the Programs Editor at the address given above.

PCN ProgramCards

Word Processor Card 5 of 9

8318WP5/9

BBC model B/BBC Basic/James Bridson/ continued

```
1590DEF PROCempty
1600LOCAL X%
1610FOR X%=&3000 TO &3F9F
1620?X%=32
1630NEXT
1640p%=12288
1650x%=0
1660y%=0
1670ENDPROC
1680
1690DEF PROCwordwrap
1700LOCAL pos%,lastsp%,a1%
1710pos%=(p%+(y%*80)+x%)
1720lastsp%=pos%
1730IF ?(pos%-1)=32 THEN VDU31,x%,y%: ENDPROC
1740REPEAT
1750lastsp%=lastsp%-1
1760UNTIL (?lastsp%=32) OR (lastsp%<12288)
1770IF lastsp%<12288 THEN VDU31,x%,y%:ENDPROC
1780FOR a1%=lastsp%+1 TO pos%-1
1790?(p%+(y%*80)+x%)=?a1%
1800?a1%=32
1810x%=x%+1
1820IFx%=80 THEN y%=y%+1:IF(y%=24)AND(p%<14368) THEN p%=p%+80:y%=23:x%=0:
    PROCscreen(p%)
1830NEXT
1840VDU31,0,0
1850FORa1%=p% TO pos%+80
1860VDU?a1%
1870NEXT
1880VDU31,x%,y%
1890ENDPROC
1900
1910DEF PROCmovecursor
1920ON (as%-135) GOTO 1930,1950,1970,1990
1930PROCleft
1940VDU31,x%,y%: ENDPROC
1950PROCright
1960VDU31,x%,y%: ENDPROC
1970PROCdown
1980VDU31,x%,y%: ENDPROC
1990PROCup
2000VDU31,x%,y%: ENDPROC
```

1590-1670	Routine to clear text storage area
1690-1890	Routine to deal with line/word overflow and wraparound
1910-2000	Routine to facilitate use of cursor for editing purposes

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PCN ProgramCards

Word Processor Card 6 of 9

8318WP6/9

```
2010
2020DEF PROCprint
2030LOCAL a1%
2040VDU 1,10
2050FOR a1%=12288 TO 16287
2060VDU 1,?a1%
2070NEXT
2080VDU 1,10
2090ENDPROC
2100


2110DEF PROCload
2120LOCAL yes%
2130PRINT TAB(0,24);SPC(79);
2140PRINT TAB(0,24);"Insert tape and hit <SPACE BAR> ('E' to exit)";
2150yes%=FNtapeorexit
2160IF yes%=FALSE THEN PROCchoice: ENDPROC
2170*LOAD "Text_file" 3000
2180PROCchoice
2190ENDPROC
2200
2210DEF PROCsave
2220LOCAL yes%
2230PRINT TAB(0,24);SPC(79);
2240PRINT TAB(0,24);"Insert tape and hit <SPACE BAR> ('E' to exit)";
2250yes%=FNtapeorexit
2260IF yes%=FALSE THEN PROCchoice: ENDPROC
2270*SAVE "Text_file" 3000 3F9F
2280PROCchoice
2290ENDPROC
2300
2310DEF PROCopen
2320LOCAL b1%,c1%
2330PRINT TAB(0,24);SPC(79);
2340PRINT TAB(0,24);"How many spaces opened?";
2350b1%=FNinput
2360PRINT TAB(0,24);SPC(79);
2370PRINT TAB(0,24);"Opening....Please wait";
2380FOR c1%=16287 TO (p%+(y%*80)+x%+b1%) STEP-1
2390?c1%=?(c1%-b1%)
2400NEXT
2410FOR c1%=(p%+(y%*80)+x%) TO (p%+(y%*80)+x%+b1%-1)
2420?c1%=32
2430NEXT
2440PROCchoice
2450ENDPROC
```

2020-2090	Routine to print data from text area. Set for printers at 80-character width. If your printer allows greater width then send "CR" (ASC(13)) after each 80 characters using:— IF((A1%-12287) DIV 80) = (A1%-12287)/80 THEN . . . SEND "CR"
2110-2190	Routine to load text into memory
2210-2290	Routine to save text to cassette
2310-2450	Routine to allow opening of spaces in text for insertion

PCN ProgramCards

Word Processor Card 7 of 9

8318WP7/9

```
2460
2470DEF PROCclose
2480LOCAL b1%,c1%
2490PRINT TAB(0,24);SPC(79);
2500PRINT TAB(0,24);"How many spaces closed?";
2510b1%=FNinput
2520PRINT TAB(0,24);SPC(79);
2530PRINT TAB(0,24);"Closing....Please wait";
2540FOR c1%=(p%+(y%*80)+x%) TO (16287-b1%)
2550?c1%=?(c1%+b1%)
2560NEXT
2570FOR c1%=(16287-b1%+1) TO 16287
2580?c1%=32
2590NEXT
2600PROCchoice
2610ENDPROC
2620
2630DEF PROCexit
2640LOCAL yes%
2650PRINTTAB(0,24);SPC(79);
2660PRINTTAB(0,24);"Are you sure?";
2670yes%=FNyesorno
2680IF yes% THEN CLS: END
2690PROCchoice
2700ENDPROC
2710
2720DEF PROCclear
2730LOCAL yes%
2740PRINT TAB(0,24);SPC(79);
2750PRINT TAB(0,24);"Are you sure?";
2760yes%=FNyesorno
2770IF yes%=FALSE THEN PROCchoice: ENDPROC
2780PRINT TAB(0,24);"Clearing....Please wait";
2790PROCempty
2800PROCchoice
2810ENDPROC
2820
```

2470-2610	Routine to close text file area
2630-2700	Routine to exit Word Processor —but only if sure
2720-2810	Routine to clear text file area— checks allowance of this function

sinclair special 1

Inside...
Latest prices round-up...
Latest software...
Order form...

Introduction

One thing's certain about the Sinclair world – there's never a dull moment.

Every month sees new software and new hardware, produced by Sinclair enthusiasts, or produced by Sinclair itself.

The magazines do a fantastic job of keeping you up to date with the input of enthusiasts. We want to keep you in touch with Sinclair's own developments.

Every month, there'll be a Sinclair Special in this magazine.

Sometimes, inevitably, there won't be anything new to say – we want to break away from the breathless announcements of hardware and software you just can't buy.

But when something new *is* available, we want you to have accurate information – fast. You'll find it here.

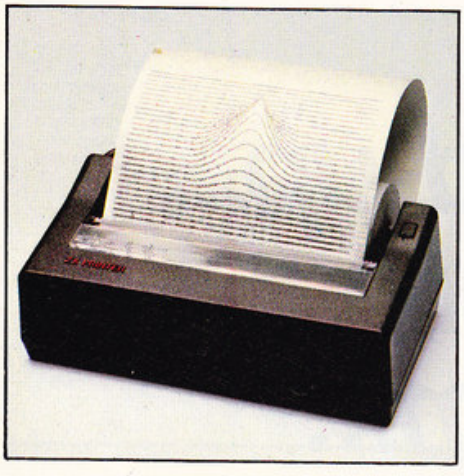
This month, we're giving you the latest information on the recommended retail prices of Sinclair equipment. They're *our* prices, and you may well find things cheaper (or dearer) in the shops. If they're cheaper – terrific! Snap them up. Note, however, that from us the ZX81 is down to £39.95.

We're also announcing six superb new Sinclair cassettes for the Spectrum, and three more which make full use of the ZX81. There's an order form at the back of this Special.

Next month... but there, next month is another story! Watch (as they say) this space.

Nigel Searle

Nigel Searle.
Managing Director,
Sinclair Research Ltd.



Spectrum – latest recommended retail prices.

16K was £125.00
16K now £99.95

48K was £175.00
48K now £129.95

ZX Printer was £59.95 — ZX Printer now £39.95
ZX81 was £49.95 — ZX81 now £39.95

Six new ways to make more of your Spectrum.

Take a look at these brand-new titles. Each is an outstanding new program using the full potential of the Spectrum, for games with stunningly animated graphics, for strategies of fiendish cunning, for masterly applications of computing capability...

Cyrus-IS-Chess Based on the Cyrus Program, which won the 2nd European Microcomputer Chess Championship *and* trounced the previously unbeaten Cray Blitz machine. With 8 playing levels, cursor piece-movement, replay and 'take-back' facilities, plus two-player option. The 48K version has many additional features including an extensive library of chess openings. For 16K or 48K RAM Spectrum.

Horace and the Spiders Make your way with Horace to the House of Spiders, armed only with a limited supply of anti-spider-bite serum. In the house, destroy the webs before the spiders can repair them. Then destroy the spiders, before *they* destroy Horace! Undoubtedly the creepiest Horace program ever produced! For 16K or 48K RAM Spectrum.

Computer Scrabble The famous board game, on-screen – with the whole board on view! A huge vocabulary of over 11,000 words. Full-size letter tiles, four skill levels – the highest of which is virtually unbeatable. For 1 to 4 players. For 48K RAM Spectrum.
(SCRABBLE trademark and copyright licensed by Scrabble Schutzrechte und Handels GmbH – a J.W. Spear and Sons PLC subsidiary.)

Backgammon A fast, exciting program, with traditional board display, rolling dice and doubling cube. Four skill levels. For experts – or beginners. (Rules are included – it's the quickest way to learn the game.) For 16K or 48K RAM Spectrum.

FORTH Learn a new programming language, as simple as BASIC, but with the speed of machine code. Complete with Editor and User manual. For 48K RAM Spectrum.

Small Business Accounts Speeds and simplifies accounting work, produces Balance Sheets, Profit and Loss information *and* VAT returns. Complete with User manual. For 48K RAM Spectrum.

Overleaf – your Sinclair order form.

Three new ways to get the best out of your ZX81.

The range of Sinclair software for the ZX81 continues to grow.

These three new cassettes offer two totally different challenges to you and your ZX81. The games – like so many ZX81 games today – really do use the ZX81's capability. The FORTH program is a fascinating extension of your own computer understanding.

Sabotage Defender or attacker? The choice is yours in this exciting game.

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Written by Macronics for a ZX81 with 16K RAM. Cassette price: £4.95.

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FORTH Discover a new programming language which combines the simplicity of BASIC with the speed of machine code.

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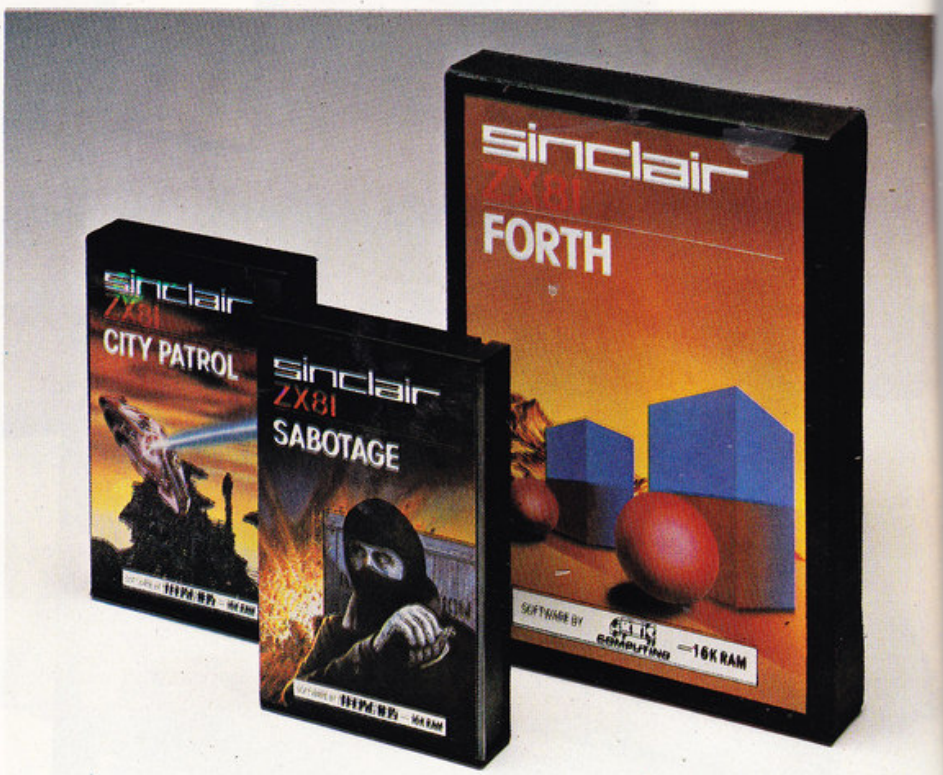
Written by Artic for a ZX81 with 16K RAM. Cassette price: £14.95.



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	ZX Spectrum – 16K	3002	99.95	
	ZX 81 (including 1.2A Mains Adaptor)	1003	39.95	
	16K RAM pack for ZX81	1010	29.95	
	ZX Printer	1014	39.95	
	1.2A Mains Adaptor, for use with ZX81 computer/ZX Printer combination (only required if you have an early ZX81 with 0.7A Adaptor)	1002	7.95	
	Printer paper (pack of 5 rolls)	1008	11.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: software purchase

Qty	Cassette	Code	Item Price £	Total £
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	G23/S:Cyrus-IS-Chess	4023	9.95	
	G24/S:Horace & the Spiders	4022	5.95	
	G25/S:Scrabble	4024	15.95	
	L1 /S:FORTH	4400	14.95	
	B6 /S:Small Business Accounts	4605	12.95	
	FOR ZX81			
	G25: Sabotage	2124	4.95	
	G24: City Patrol	2123	4.95	
	L1: FORTH	2400	14.95	
			TOTAL £	

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*Delete/complete as applicable. (Please print)

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PCN907

PCN ProgramCards

Word Processor Card 8 of 9

8318WP8/9

```
2830DEF PROCprinterselect
2840LOCALa,b
2850PRINT TAB(0,12);"Parallel or serial printer (P/S)";
2860*FX4,1
2870a=GET
2880IF NOT ((a=80) OR (a=112) OR (a=83) OR (a=115)) THEN 2870
2890IF (a=80) OR (a=112) THEN 3040 ELSE *FX5,2
2900PRINT TAB(0,14);"Select baud rate and then <RETURN> :-"
2910PRINT'"75,150,300,1200,2400,4800,9600,19200      ";
2920VDU 8,8,8,8,8,8
2930INPUT b
2940IF NOT ((b=75) OR (b=150) OR (b=300) OR (b=1200) OR (b=2400) OR (b=4800)
    OR (b=9600) OR (b=19200)) THEN 2910
2950IF b=75 THEN *FX8,1
2960IF b=150 THEN *FX8,2
2970IF b=300 THEN *FX8,3
2980IF b=1200 THEN *FX8,4
2990IF b=2400 THEN *FX8,5
3000IF b=4800 THEN *FX8,6
3010IF b=9600 THEN *FX8,7
3020IF b=19200 THEN *FX8,8
3030ENDPROC
3040*FX5,1
3050ENDPROC
3060
3070DEF PROCgetinput
3080LOCAL as%,flag%
3090VDU 31,x%,y%
3100as%=GET
3110IF as%<1 THEN 3100
3120IF as%=9 THEN x%=(INT((x%/10)+1))*10: IF x%=80 THEN x%=70
3130IF as%<9 THEN PROCcommand(as%)
3140IF as%=13 THEN VDU 10,13: x%=0: y%=y%+1: IF y%=24 THEN y%=23: IF p%<14368 T
HEN p%=p%+80: PROCscreen(p%)
3150IF (as%=127) AND (x%<>0 OR y%<>0) THEN VDU127: x%=x%-1
3160IF (as%<140 AND as%>135) THEN PROCmovecursor
3170IF x%=-1 THEN x%=79: y%=y%-1: IF y%=-1 THEN y%=0:
    IF p%>12288 THEN p%=p%-80: PROCscreen(p%)
3180IF (as%=127) AND NOT (x%=0 AND y%=0) THEN ?(p%+(y%*80)+x%)=32
3190IF ((as%>126) OR (as%<32)) THEN 3090
```

2830-3050 Routine to allow user to configure program for appropriate printer output

3070-3190 Routine to accept input and action correct operating procedure (first part)

PCN ProgramCards

Word Processor Card 9 of 9

8318WP9/9

```
3200VDU as%
3210?(p%+(y%*80)+x%)=as%
3220x%=x%+1
3230IF x%=80 THEN x%=0: y%=y%+1: flag%=TRUE ELSE flag%=FALSE
3240IF y%=24 THEN y%=23: IF p%<14368 THEN p%=p%+80: PROCscreen(p%)
3250VDU 31,x%,y%
3260IF flag% THEN PROCwordwrap: flag%=0
3270ENDPROC
3280
3290DEF FNtapeorexit
3300LOCAL a1%
3310*FX15,1
3320REPEAT
3330a1%=GET
3340UNTIL (a1%=32 OR a1%=69 OR a1%=101)
3350IF (a1%=69 OR a1%=101) THEN =FALSE ELSE =TRUE
3360
3370DEF FNinput
3380LOCAL a1%,t$
3390a1%=GET
3400a1%=a1%-48
3410IF ((a1%<0 OR a1%>9) AND (a1%<>-35) AND (a1%<>79)) THEN 3390
3420IF a1%=79 AND LEN(t$)=0 THEN 3390
3430IF a1%=-35 THEN 3480
3440IF a1%=79 THEN VDU 127: t$=LEFT$(t$,LEN(t$)-1): GOTO 3390
3450VDU a1%+48
3460t$=t$+STR$(a1%)
3470GOTO 3390
3480=VAL(t$)
3490
3500IF ERR=17 THEN CLEAR: x%=0: y%=0: p%=12288: GOTO90
3510MODE7: REPORT: PRINT" @ line ";ERL: *FX4
3520END
```

3200-3270 Second part of input acceptance routine

3290-3350 Function to check that tape required for SAVE or LOAD feature

3370-3480 Function for general input to word processor

3500-3520 Routine for full error trap and appropriate reporting

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Name _____

Address _____

_____

PCN/7/83

PCN ProgramCards

Fruit Machine Card 1 of 4

8318FM1/4

A simulation of a fruit machine incorporating interesting graphics and random hold features.

```
  1 CLS : FOR q=21 TO 0 STEP -1: PRINT AT q,0: PAPER 4;"
      ": NEXT q: PRINT AT 10,10: INK 2;"FRUIT MACHINE": PRINT £0: INK 3;"SETTI
NG UP GRAPHICS!": INK 2: POKE 23658,0: POKE 23609,30: LET first=0: LET money=105
: GO SUB 9000: GO SUB 8000

  2 BORDER 7: PAPER 7: CLS : FOR a=175 TO 0 STEP -1: PLOT 133,a: NEXT a
  4 IF money<=0 THEN  GO TO 7000
  5: PRINT AT 21,0; INK 2;"Any key to start": PRINT AT 0,17; INK 3; BRIGHT 1;"W
IN LINES";AT 1,17; BRIGHT 0;"qr qr qr=500p";AT 2,17;"st st st";AT 3,17;"qr qr ?=
50p";AT 4,17;"st st";AT 5,17;"ab ab ab=200p";AT 6,17;"cd cd cd";AT 7,17;"ab ab ?
=90p";AT 8,17;"cd cd";AT 9,17;"ef ef ef=50p";AT 10,17;"gh gh gh";AT 11,17;"ef ef
 ?=10p";AT 12,17;"gh gh";AT 13,17;"ij ij ij=10p";AT 14,17;"kl kl kl";AT 15,17;"i
j ij ?=5p";AT 16,17;"kl kl";AT 17,17;"mn mn mn=20p";AT 18,17;"op op op";AT 19,17
; BRIGHT 1;"WIN LINES"
  6: IF INKEY$="" THEN  GO TO 6
  7 BEEP 0.01,1: LET money=money-5: PRINT AT 12,0; INK 1;"Money=";money;" ": PR
INT AT 10,0;"                "
  9 IF first>0 THEN  LET d=INT (RND*10): IF d=1 THEN  GO SUB 5000
 10 LET a=INT (RND*100)+INT (RND*10)
 20 LET b=INT (RND*100)+INT (RND*10)
 30 LET c=INT (RND*100)+INT (RND*10)
 40 PRINT AT 4,0;"                    ": IF a>=0 AND a<15 THEN  GO SUB 500
 50 LET first=first+1: IF a>=15 AND a<25 THEN  GO SUB 600
 60 IF a>=50 AND a<70 THEN  GO SUB 700
 70 IF a>=70 THEN  GO SUB 800
 80 IF a>=25 AND a<50 THEN  GO SUB 900
 90 IF b>=1 AND b<15 THEN  GO SUB 1000
100 IF b>=15 AND b<25 THEN  GO SUB 1100
110 IF b>=50 AND b<70 THEN  GO SUB 1200
120 IF b>=70 THEN  GO SUB 1300
130 IF b>=25 AND b<50 THEN  GO SUB 1400
```

Sinclair Spectrum
Spectrum Basic
Requirement: 48K
Application: game
Author: L Martin
Where '£' is printed, type '#'

1	Initialise screen and variables, perform set up of user defined graphics, perform instruction routine
2-5	Set up screen and win lines
6	Input routine
7	Display money line
9	Random hold feature
10-30	Select random symbol number
40-130	First part of symbol display check

PCN ProgramCards

Fruit Machine Card 2 of 4

8318FM2/4

```
140 IF c>=1 AND c<15 THEN  GO SUB 1500
150 IF c>=15 AND c<25 THEN  GO SUB 1600
160 IF c>=50 AND c<70 THEN  GO SUB 1700
170 IF c>=70 THEN  GO SUB 1800
180 IF c>=25 AND c<50 THEN  GO SUB 1900
195 IF a>=70 AND b>=70 THEN  PRINT AT 10,0;"WIN 05p": LET money=money+5
200 IF a>=70 AND b>=70 AND c>=70 THEN  PRINT AT 10,0;"WIN 10p": LET money=money
+10
215 IF a<15 AND b<15 THEN  PRINT AT 10,0;"WIN 50p": LET money=money+50
220 IF a<15 AND b<15 AND c<15 THEN  PRINT AT 16,0;"JACKPOT WIN 500p": FOR p=-45
TO 45 STEP 1: BEEP 0.01,p: NEXT p: LET money=money+500
245 IF a>=15 AND a<25 AND b>=15 AND b<25 THEN  PRINT AT 10,0;"WIN 90p": LET mon
ey=money+90
250 IF a>=15 AND a<25 AND b>=15 AND b<25 AND c>=15 AND c<25 THEN  PRINT AT 10,0
;"WIN 200p": LET money=money+200
275 IF a>=50 AND a<70 AND b>=50 AND b<70 THEN  PRINT AT 10,0;"Win 10p": LET mon
ey=money+10
280 IF a>=50 AND a<70 AND b>=50 AND b<70 AND c>=50 AND c<70 THEN  PRINT AT 10,0
;"Win 50p": LET money=money+50
310 IF a>=25 AND a<50 AND b>=25 AND b<50 AND c>=25 AND c<50 THEN  PRINT AT 10,0
;"Win 20p": LET money=money+20
330 GO TO 4
500 PRINT AT 0,0; INK 1;"qr";AT 1,0; INK 1;"st": RETURN
600 PRINT AT 0,0; INK 3;"ab";AT 1,0;"cd": RETURN
700 PRINT AT 0,0; INK 4;"ef";AT 1,0;"gh": RETURN
800 PRINT AT 0,0; INK 5;"ij";AT 1,0;"kl": RETURN
900 PRINT AT 0,0; INK 0;"mn";AT 1,0;"op": RETURN
1000 PRINT AT 0,6; INK 1;"qr";AT 1,6;"st": RETURN
1100 PRINT AT 0,6; INK 3;"ab";AT 1,6;"cd": RETURN
1200 PRINT AT 0,6; INK 4;"ef";AT 1,6;"gh": RETURN
1300 PRINT AT 0,6; INK 5;"ij";AT 1,6;"kl": RETURN
```

140-180	Second and final part of symbol display check
195-310	Win line checking routine
330	Round again for another go
500-1300	First part of symbol display section

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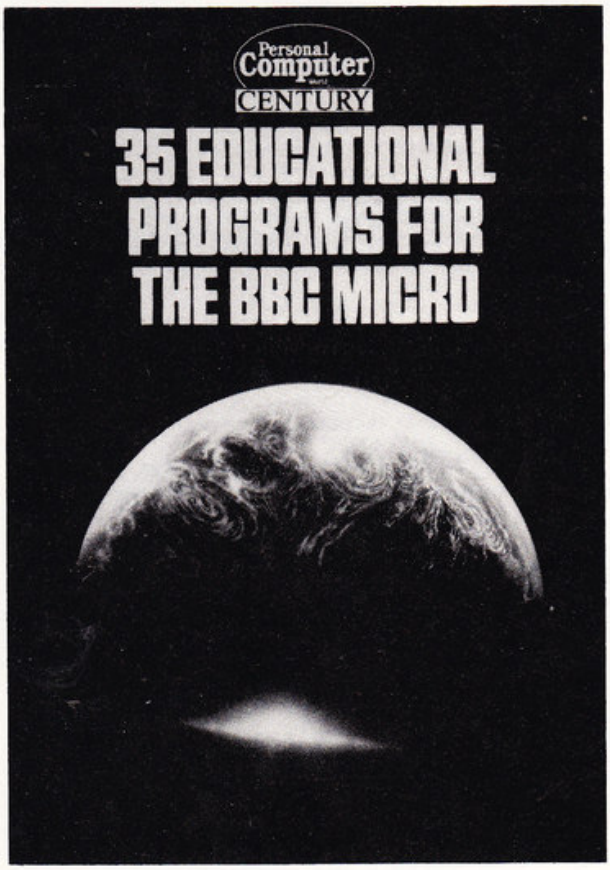

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CENTURY

PCNProgramCards

Fruit Machine Card 1 of 4

8318FM1/4

A simulation of a fruit machine incorporating interesting graphics and random hold features.

```
  1 CLS : FOR q=21 TO 0 STEP -1: PRINT AT q,0: PAPER 4;"
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: GO SUB 9000: GO SUB 8000

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PCNProgramCards

Fruit Machine Card 2 of 4

8318FM2/4

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220 IF a<15 AND b<15 AND c<15 THEN  PRINT AT 16,0;"JACKPOT WIN 500p": FOR p=-45
TO 45 STEP 1: BEEP 0.01,p: NEXT p: LET money=money+500
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250 IF a>=15 AND a<25 AND b>=15 AND b<25 AND c>=15 AND c<25 THEN  PRINT AT 10,0
;"WIN 200p": LET money=money+200
275 IF a>=50 AND a<70 AND b>=50 AND b<70 THEN  PRINT AT 10,0;"Win 10p": LET mon
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280 IF a>=50 AND a<70 AND b>=50 AND b<70 AND c>=50 AND c<70 THEN  PRINT AT 10,0
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700 PRINT AT 0,0; INK 4;"ef";AT 1,0;"gh": RETURN
800 PRINT AT 0,0; INK 5;"ij";AT 1,0;"kl": RETURN
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1000 PRINT AT 0,6; INK 1;"qr";AT 1,6;"st": RETURN
1100 PRINT AT 0,6; INK 3;"ab";AT 1,6;"cd": RETURN
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1300 PRINT AT 0,6; INK 5;"ij";AT 1,6;"kl": RETURN
```

140-180	Second and final part of symbol display check
195-310	Win line checking routine
330	Round again for another go
500-1300	First part of symbol display section

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London W1M 5AB

Clubnet keeps you in touch with the microcosm of personal computer enthusiasts throughout the UK. It is divided into two sections — clubs and user groups.

We publish a list of these two groups on alternate weeks. This week it is the turn of user groups, which are listed alphabetically by machine and special interest.

Each issue will also focus on the activities of an individual club or group with a fly-on-the-wall report. This week we feature the Harrow Computer Group.

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HS.

The user groups listing is based on that of the Association of Computer Clubs.

Micro Harrovians

The topic on the Harrow Computer Group's agenda was to have been Pet databases, but the speaker scheduled to talk didn't show up.

But that didn't stop group members from trading knowledge and establishing contacts at one of its regular group's fortnightly meeting, held at the Harrow College of Higher Education.

About 25 people turn up on average for the meetings, according to club chairman Basil Butcher. He says it's hard to say how many active members the group has in total, because it's been rather a while since the membership list was updated.

The group has between 300 and 400 members all told, Mr Butcher estimates, adding that many people on the list may no longer be active in the computer field.

It seems that its membership is increasingly made up of hobbyists, as opposed to those with a professional interest in computers.

'Most of the experts are being chased away by the influx of kids,' Mr Butcher says.

'Some of the old hands have disappeared, but the hard core who keep the club running are still here,' he says.

Members of the Harrow Computer Club watch a demonstration

Mr Butcher estimates that five per cent of the group's members are computer professionals, 15 per cent are involved in one or another facet of the electronics industry, while the rest are hobbyists.

The group, founded in 1978, is connected with a variety of sub-groups and other computer clubs in the London area. Because the group has no one machine as its focus members interested in specific computers meet on the Wednesdays when the main club doesn't meet.

Membership in the group is free, and among the services it provides is a lending library.

Steve McClure

Name Harrow Computer Group **Venue** During the school year at room W24 of the Harrow College of Higher Eduction, but this summer at the YWCA, rear room, Sheepcote Road, Harrow **Meetings** First and third Wednesdays with sub groups meeting on alternate Wednesdays. **Contact** Basil Butcher, 01-950 7068.

CLUBS

AVON

Bristol Micro Computer Club. Meets at the Pavilion, Southend Road, Filton, Bristol, every other Tuesday. Subs: £1. Contact Darryl Collins, 60 Mackie Rd, Filton, Bristol BS12 7NA, tel: 0272 792982.

Multi-User Club produces bi-monthly magazine, subs: £7.50. Contact Valerie Boyde-Shaw, Nailsea 851337.

Worle Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm (annual subs: £15). Contact H Bennett, 0934 514902 or F Feeney, 0934 833122.

BEDFORDSHIRE

Bedford Amateur Computer Club. Meets at Star Rowing Club, Bedford, on the first and third Tuesday of each month at 8pm (annual subs: £3). Contact Rowan Bird, 74 High Street, Great Barford, Beds MK44 3LB, tel: 0234-870763.

Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month (annual subs: £2 senior members, £1 under-14s). Contact Steve Betts, 42 Wallace Road, Eaton Bray, Bedfordshire OU6 2DF, tel: 0525-220922.

Luton College Computer Club. Contact John Rodger, tel: 0582-3411.

Luton Computer Club. Contact J P Fletcher, 1 Trowbridge Gardens, Luton, Beds LU2 7JY, tel: 0582-450687.

BERKSHIRE

Easthampstead Computer Club. Meets at Easthampstead Park School, Easthampstead Park Mansions, Bracknell, on the first Wednesday in month at 8pm. Contact Brian Poulton, tel: 0344-84423.

BIRMINGHAM

Birmingham Amateur Computer Club. Meets at CBS Consultants, Watery Lane, Small Heath, Birmingham 10, on the first and third Wednesday of each month at 7pm (annual subs: £4.20 adults, £1.50 juniors). Contact Dr M Bayliss, 125 Berryfield Road, Sheldon, Birmingham B26 3UU, tel: 021-743 7197.

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm (annual subs: £5). Members also meet at Mandsville County Secondary School the first Thursday of each month at 7pm. Contact Ken Knight, 22 Mount Street, Aylesbury, tel: 0296-5181.

Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month (annual subs: £4 for six months). Contact Mrs W Tibbitts at Ellwood, Deanway, Chalfont St Giles, Buckinghamshire, tel: 024-07 4906.

Iver Computer Club. Contact P A Seal at 1 Ormonde Flats, Church Road, Iver Heath, tel: 0753-652792.

Iver Computer Society meets at Huntsmoor room, Iver Village Hall on the second and fourth Thursday every month at 7.30. Contact John Haigh, 141 Leas Drive, Iver Bucks, SL0 9RP.

CAMBRIDGE

Cambridge Microcomputer Club, meets on the third Wednesday of each month. Contact Derek Tripp at 3 Spurgeons Avenue, Waterbeach, tel: 0223-315662.

Haverhill Microcomputer Club, meets at St Marys' Church Hall, Camps Road, Haverhill, on the second, third and fourth Wednesday of each month at 7.30 to 10.30pm (annual subs: £3 adult: £1 OAP and students: meetings 25p). Contact Andrew Holliman, at 5 Trinity Close, Balsham, Cambridge CB1 6DW, tel: 022 029-583.

Peterborough Personal Computer Club meets at Crosfield Electronics Social Club, fortnightly on Mondays. Contact Andrew Pike, tel: 0733-44342 after 5pm.

CHESHIRE

Altrincham Computer Club. Meets at N. Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Contact Martin Hickling at 39 Barrington Road, Altrincham, Cheshire WA14 1H2, tel: 061-941 4547.

Brunel Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Contact Mr R Simpson at 4 The Coots, Stockwood, Cheshire.

Cheshire Computer Club. Contact W Collins at 37 Garden Lane, Chester, Cheshire.

Crewe Computer Users Club meets at Buffaloes Club, Earl Street, Crewe, Cheshire, on the third Thursday of each month at 8pm. Contact Bram Knight on 0270-623375.

Holmes Chapel Micro Club meets at Liesure Centre, Holmes Chapel at 7.30 to 9.30pm on the first and third Tuesday of each month (annual subs: £5 adults: £2.50 children, OAP and students. Or weekly subs: 30p adults, 20p children). Contact Margaret Baker, at 1 Helton Close, Crewe, Cheshire, tel: 0477-34238.

Kinder Peek Computer Club meets at Bew Mills School every Monday, sub: £2 per quarter, £1 members under 11. Contact John Eary, New Mills 43870.

New Mills & District PCC meets at New Mills School, fortnightly on Fridays at 7 to 9.30pm, meetings 35p. Contact Mr G M Flanagan at 11 Sundown Close, New Mills, Stockport, Cheshire SK12 3DH, tel: 0663-44051.

Northwest Computer Club meets fortnightly, meetings 25p. Contact John Lightfoot at 13 Aston Drive, Frodsham, Warrington, Cheshire WA6 7PU, tel: 0728 31519.

Northwest Computer Club, weekly meetings. Annual subs: £1; meetings 30p (vistors 50p). Contact Tom Wyatt at 29 Summer Lane, Halton, Runcorn Cheshire WA7 5PG, tel: Runcorn 77545.

Mid-Cheshire Computer Club meets at Winsford Library on the second Friday every month at 7.30pm contact Simon Sadler, Winsford 53339.

CLEVELAND

Cleveland Micro Club meets on the second and third Tuesday of each month, under 18s on second of the month, over 21s on third Tuesday of the month. Contact J Telford at 13 Weston Crescent, Norton.

Stockton Amateur Computer Club meets at YMCA, Stockton, each alternate week at 7-9pm. Subs: adults £4, families £6, juniors £2, meetings 30p. First week: programmer's evening, second week: workshop/games evening. Contact Peter Cheshire, 60 Croft Road, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0DY.

CORNWALL

Cornish Radio Amateur Club — Computing Section. Contact Bob Reason at 24 Mitchell Road, Camborne, Cornwall.

Cornwall Area PAICC meets at the Penzance Micro Centre every Friday. Contact S Zenith, tel: Hayle 754845.

St Austell Computer Club and Computer Town meets at ECIP Labs, Penpewan

70 ▶

Road, St Austell, fortnightly on Mondays at 7.30pm. Contact N G Day at 2 Cilendale Close, St Austell, Cornwall PL25 3DD.

DERBYSHIRE

Derby Micro Society meets at Littleover Church Hall, Sheperd Street, on every other Thursday at 7pm. Annual subs: £5, £2.50 children, £7.50 for families, 50p entrance non-members. Contact Mike Riordan, tel: 0332-769440.
Glossop Computer Club. Contact John Dearn, 2 Spinney Close, Glossop, Derbyshire.

DEVON

Exter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month. Annual subs: £7.50 adults, £2.00 for students. Technical library. Contact T G Holden, 14 Greenville Avenue, Teignmouth, Devon TQ14 9NT.
Exeter & District Amateur Computer Club meets second Tuesday every month. Annual subs: £7.50. Contact Doug Bates, Fortescue House, Stoke Cannon, Exeter. Specialist meetings on third and fourth Tuesday.
Torbay Users Computer Club meets at Devon Computers, 39 Totnes Road, Paignton on Mondays fortnightly. Annual subs: £2.00 juniors, £5.00 adults, meetings 20p, children welcome. Technical library available.

DORSET

Bournemouth Area Computer Club meets at Kinson Community Centre on the third Wednesday every month. Annual Sub: £5 adults; £2.50 juniors. Contact Peter Hibbs, 54 Runnymede Avenue, Bournemouth, Dorset BH11 9SE, tel: 0202 576547.
TOPIC meets at Canteen English Truck Centre on the second and fourth Wednesday every month at 7pm. Annual subs: £5, reduced fees for students. Contact David Washford, 1 Alexander Road, Bournemouth, Dorset BH6 5JA.
Purbeck Computer Club, contact 31 North Street, Wareham, Dorset BH20 1AD.

DURHAM

Darlington Computer Club, weekly meetings and informal discussion. Technical library available. Contact L Boxell, 8 Vane Terrace, Darlington DL3 7AT, tel: 0325-67766.

ESSEX

Genius Computer Club, subs: £1 ZX81 members, £1.50 Spectrum members. Contact 30 Webber House, North Street, Barking, Essex.
Brentwood Amateur Computer club, meets once a month. Contact R Sadler, 18 Warescot Road, Brentwood, Essex CM15 9HD, tel: Brentwood 232463.
Springfield Computer Club meets on the first Friday of every month. Contact Stephen Cousines, 1 Aldeburgh Way, Springfield, Chelmford, Essex CM1 5PB, tel: 0245 50155.
Colchester Microprocessor Group meets at University of Essex on the second and fourth Wednesday of every month at 7.30pm. Annual subs: £5. Contact Information Centre, University of Essex, near Colchester.
Stanway School Computing Club, only school members at present. Contact G Floyd, c/o Physics Department, Stanway School, Stanway, Colchester, Essex.
Dragon Independent Owners Association, produces newsletter, gives discount on software, subs: £8. Contact Doug Bourne, School House, Nevern Road, Rayleigh, Essex.
Romford Club, a new club. Contact Mr D Norden, 138c Church Road, Romford, Essex.
South East Essex Computer Society meets at Hockey Club at Roots Hall, near Southend Football Stadium on Wednesday at 7.30pm. Open to members over 14. Contact Robin Knight, 128 Little Wakering Road, Little Wakering, Southend-on-Sea, Essex, tel: 0702-218456.

GLOUCESTERSHIRE

British Amateur Electronics Club. Independent club with newsletter, beginner's section, library, annual exhibition catering for all ages. Contact Mr J Margetts, 3 Bishopstone Close, Golden Valley, Cheltenham.
Cheltenham Amateur Computer Club meets on the third Tuesday of each month at 7.30pm. Contact Mike Pullin on 0242-25617 or Robin Phelps on 0242-584343.
GCHQ. Contact D W Adam, 16 Court Road, Prestbury, Cheltenham.
Cheltenham Amateur Computer Club meets at Prestbury Scout Headquarters, on the third Tuesday of every month at 7.30pm. Annual subs: £3. Contact M Hughes, 36 Riverviews Way, Cheltenham, Gloucs.

HAMPSHIRE

Commodore Computer Club, This new club meets on the first friday of every month at Bury House, Bury Road, Gosport at 7.30pm. For further information contact Brian Cox, Fareham 280530.
Fareham and Portsmouth Amateur Computer Club. Contact Alan Smith, c/o Francis Close, Lee-on-the-Solent, Gosport, Hants PO13 8HB, tel: 0705-550907.
RAF Odiham Computer Club. Contact c/o Officer i/c, Royal Air Force, Odiham, Nr Basingstoke, Hants.
Southampton Amateur Computer Club meets at Crestwood Centre, Shakespeare Road, Boyatt Wood, Eastleigh, Hants. on the second Wednesday of every month at 7.30pm. Annual subs £5, £3.50 students & OAPs. Contact Paul Blitz, tel: Chandlers Ford 69050.

HEREFORD

Hereford Amateur Computer Club, proposed new club. Contact Stuart Edinborough, 2 Warwick Walk, Bobblestock, Hereford HR4 9TG, tel: 0432-269700.

HERTFORDSHIRE

Harpenden Microcomputer Club meets at Silver Cap, Harpenden on alternate Mondays. Annual subs £2.50. Contact David James, 5 Ox Lane, Harpenden, Hertfordshire AL5 4HH.

HUMBERSIDE

Grimsby Computer Club meets at Grimsby Central Library fortnightly on Mondays at 7.30pm. Contact Jenson Lee, 29 Park View, Cleethorpes, tel: 0472-4259.
Scunthorpe & District Microprocessor Society meets at Community Centre, Lindun Street, Scunthorpe, every Tiesdau at 7.30pm. Annual subs £2, families £5. Contact G Hinch, 21 Old Crosby, Scunthorpe, South Humberside DN15 8PU.

KENT

Canterbury ACC proposed new club. Contact L Fisher, 21 Manwood Avenue, St Stephens, Canterbury, Kent CT2 7AH.
Medway Amateur Computer & Robotics Organisation meets on the first Tuesday and third Wednesday of every month. Annual subs £5. Contact Paul Cameron. Small Community Centre, Lordwood Lane, Lordwood, Chatham, Kent, tel: 0634-63036.
North Kent Amateur Computer Club meets at Lecture Theatre, Charles Darwin School, Jail Lane, Biggin Hill, Kent, on the first Thursday of every month at 7.30pm. Annual sub £3, £1 students. Contact Iain House, 28 Canadian Avenue, Catford SE6 3AS, tel: 01-690 5441.
Orpington Computer Club meets at The Large Hall, Christ Church, Chaterhouse Road, Orpington, Kent, every Friday at 8pm-10.30pm. Insurance cover for all members' equipment while on club premises. Contact Mr R Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF, tel: Orpington 20281.
Amateur Computer Club, annual subs: £4.50 (£2 for under 18s, OAPs). Contact Rupert Steele, St John's College, Oxford OX1 3JP.
National Personal Computer User Association, annual subs £12. Contact Eric Keeley, 11 Spratling Street, Manston, Ramsgate, Kent.
Sevenoaks School Computer Club. Contact G Sommerhoff, Technical Centre, Sevenoaks School, Sevenoaks, Kent, tel: 0732-456340.
Tonbridge & Tunbridge Wells ACC. Contact Ray Szatkowski, 1 Cromer Street, Tonbridge, Kent, tel: 0732-355960.

LANCASHIRE

Blackburn Micro Computer Club. Contact Roger Longworth, 12 Sharp Close, Accrington, Lancs.
Bolton Computer Club meets at E4/24 Bolton Institute of Higher Education, Deane Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Asherton, Manchester M29 9FB, tel: 0942-876210.
Burnley Computer Club meets at Carleton Hotel, Standish Street, on Tuesdays 7.30-11pm. Contact Clive Tallon, 27 Basnett Street, Burnley, Lancs BB10 3EQ.
Chorley Computer Club meets at Townley Arms, Chorley, every other Tuesday at 8pm. Contact Chris Hicks, 131 Market Street, Chorley, Lancashire.
Ribble Valley Computer Club meets at Staff Canteen, Pendle Carpets Ltd, West Bradford, on the second and fourth Monday of every month at 7-9pm. Contact Ian Thornton-Bryar, 25 Southfield Drive, West Bradford, Clitheroe, Lancs BB7 4TU.
Lancaster & Morecambe Computer Club. Contact Sarah Blackler, tel: 0524-33553.
South Chadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton, on Thursdays at 7-9.30pm. Contact Mr Jakeman, 26 Marble Street, Derker, Oldham, Lancs. Tel: 061-678 0547.

LEICESTERSHIRE

East Leake Computer club. Contact Andrew Jones, 59 Bateman Road, East Leake, Loughborough, Leicestershire LE12 6NN.

LINCOLNSHIRE

Lincoln Computer Club, meets at Blandings Public House, High Street, Lincoln on the frist and third Wednesday of every month. Contact John Clifford, 448 Newark Road, Lincoln LN6 8RX, tel: 0522 2168.
Skegness Computer Club, meets at County Hotel every other Monday, 7.30-9.30pm. Contact Reg Potter, 118 Beresford Avenue, Skegness, tel: 0754 3594.

LIVERPOOL

BBC Microgroup Liverpool meets at Old Swan Technical College, Liverpool, on the first Wednesday of every month. Contact Nick Kelly, 56 Queens Drive, Walton, Liverpool L4 6SH.

LONDON

Croydon Micro-Computer Club meets on the first and fourth Tuesday of every month. Contact Vernon Gifford, 111 Selhurst Road, Selhurst SE25 6LH, tel: 01-653 3207.
Computer Users Club. Contact Tony Latham on 01-304 3910.
East London Amateur Computer Club meets at Harrow Green Library, Cathall Road, E11, on the second and fourth Tuesday of every month at 7-10pm. Annual subs: £5. Contact Fred Linger on 01-554 3288.
Forum-80 London, contact Leon Jay on 01-286 6207.
Forum-80 Wembley, contact Victor Saleh on 01-902 2546.
Harrow Computer Group meets at Harrow College of Higher Education, Room W24, Northwick Park, on alternate Wednesday at 7pm. Contact Bazyle Butcher on 01-950 7068.
Imperial College Microcomputer Club meets at room 145, level 1, on Tuesdays at 7.30pm. Contact Tim Panton, c/o I.C. Union Office, Prince Consort Road, London SW7 2BB.
London School Computer Club. Contact Burlington Danes School, Dane Building, DuCane Road, Hammersmith, London.
Metropolitan Police Amateur Computing Club meets on the first Thursday of every month at 7pm. Contact S Farley on 01-725 2428.
68 Microgroup meets at Regents Park Library, Robert Street, NW1, on the third Tuesday of every month at 7.30pm. Annual subs: £5. Contact Jim Anderson, 41 Pebworth Road, Harrow, Middlesex.
North London Hobby Computer Club meets at the Polytechnic of North London, Holloway, London N7 8DB, on every Monday, Tuesday, Wednesday and Thursday during term time and one evening a week during holidays. Annual subs: adults £25, family £40, jobless, pensioners, poly students £5. Contact Robin Bradbeer 01-607 2789.
Paddington Computer Club meets at Paddington College, 25 Paddington Green, London W2 1NB. Contact Peter Hill on 01-723 5762.
Post Office HQ Microcomputer Club meets at room B145, River Plate House, 12-13 South Place, off Moorgate, on the second Thursday of every month. Contact Vernon Quaintance, British Telecom Enterprises, Cheapside House, 138 Cheapside EC2U 6JH, tel: 01-726 4716.
The SOBAT Computer Club meets once a fortnight. Subs: £4. Produces monthly letter. Contact Mr T Kayani, Berridge House, Hillfield Road, London Nw6.
South East London Microcomputer Club meets at Thames Polytechnic, Greens Ends, Woolwich SE18, on alternate Wednesdays at 7pm. Annual subs: £5. Contact Peter Phillipps, 61 Graigerne Road, SE3, tel: 01-853 5829.
Southgate Microcomputer Club meets at Room B106 Southgate Tech, fortnightly on Thursdays at 7.30pm. Annual subs: £5. Contact Kevin Pretorius on 01-882 2282. See Prestel page 25820645 for details.
West London Personal Computer Club meets at Back room, Fox & Goose pub, Hanger Lane, Alperton, on the first Tuesday of every month at 7.45pm. Annual subs: £5 adults, £2.50 under 16s & pensioners. Contact Graham Brain on 01-997 8986.

MANCHESTER

Manchester Computer Club meets at the Department of Computer Science, Manchester University, Oxford Road, Manchester, on the first and third Thursday of every month at 7.30pm. Contact David Wade, 061-941 2486.
Small Business Computer Users Club. Proposed new club to meet the last Tuesday every month, subs: £7.50. Contact K Wadsworth on 061-740 7232 after 5pm.

MERSEYSIDE

Bolton Computer Club meets Room E4/E24 Bolton Institute of Higher Education, Deene Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Atherton, Manchester M29 9FB.
Merseyside Microcomputer Group meets

Remember

Let us know about your micro club or user group so we can be sure the information printed here is up to date. Drop a card to Wendie Pearson, Listings Editor, at *Personal Computer News*, 62 Oxford Street, London W1A 2HG, or give her a call on 01-636 6890.

at Merchant Taylor's School, Crosby, on second Thursday every month. Contact Mr F Shaw, 14 Albany Avenue, Eccleston Park, Prescot, tel: 051-426 5536.
Southport Computer Club meets weekly. Contact Ian Bristone, 28 Weld Road, Southport, Merseyside PR8 2DL, tel: 0704-64524.
Wirral Microcomputer Users Group meets at Birkenhead Technical College every Monday. Contact J Phillips, 14 Helton Close, Birkenhead, Merseyside L43 9HP.

MIDDLESEX

Sunbury Computer Club meets at St Benedicts Hall, Napier Road, Ashford, on the last Tuesday of every month at 8pm. Contact Simon Taylor, 8 Priory Close, Sunbury-on-Thames, Middlesex. Contact Simon Clark, 83 Watling Street, Towcester, Northants NW12 7AG.

NOTTINGHAMSHIRE

Ashfield Computer Club meets at Carsic Junior School, St Mary's Road, Sutton in Ashfield on the first and third Thursday every month. Annual subs £3. Contact Derick Daines, c/o Cuttings Avenue, Sutton in Ashfield, Notts.
Eastwood Town Micro Computer Club meets at Devonshire Drive Junior School every Wednesday at 5.45pm. Annual subs: £5.50 adults, £2.75 juniors, £4.50 OAPs. Contact Ted Ryan, 15 Queens Square, Eastwood, Nottingham NQ16 3BJ.
Nottingham Microcomputer Club meets at Castle Gate Centre, Nottingham, every Monday at 7.30pm. Subs: full, £6.50; students, £3.25; family, £9.75. Contact Mr E Harvey, 68 Roseleigh Avenue, Nottingham NG3 6FH, tel: Nottingham 608491.
Worksop Computer Group. New club, first meeting June 14 in Worksop library lecture room. Contact Mr Andrews, Worksop 487327.

NORFOLK

Anglia Computer User Group. Contact Jan Rejzl, 128 Templemere, Sprowton Road, Norwich, tel: 0603-29652.
East Anglian Computer User's Group meets at Crome Community Centre, Telegraph Lane, Norwich. Contact Gill Rijzi, 88 St Benedicts, Norwich.
South Northants Computer Group meets at Anchor House, Moat Lane, Towcester, on Wednesdays at 7.30pm.

OXFORDSHIRE

Association of Computer Clubs. Annual subs: £5, £2.50 under 18s and OAPs. Contact Rupert Steele, St John's College, Oxford OX1 3JP.
Microsoc meets at Clarendon Lab, Parks Road, Oxford, every week during term. Contact Rupert Steele, St John's College, Oxford OX1 3JP.
Oxford Personal Computer Club. Annual subs: £8. Contact Len Phelps, Southport Cottage, Sutton Courtenay, Nr Abingdon, Oxon OX14 4AU.
Ridgeway Computing Club meets at Swan Hotel, East Ilsley, on the second Tueday every month. Contact Mike Magney, Beavers, South Street, Blubury, Didcot, Oxon OX11 0JU.

SHROPSHIRE

Ludlow & District Microcomputer Club meets at Diocesan Education Centre, Lower Galdeford, Ludlow, on the second Monday of every month at 7.30pm. Annual subs £7.50 family, £5 adult, £2.50 student.
Shrewsbury Micro Club meets at Shrewsbury Shirehall once a month. Beginners' Basic course and many machines on display. Contact Mr V Ives, 6 Bramley Close, Severn Meadows, Shrewsbury SY1 2TP.
Telford Computer club meets at Telford ITEC on every Monday 6-9pm. Annual subs: £3.50, £1.50 unemployed. Contact John Murphy, 10 Brichmore, Brookside, Telford TF3 1TF, tel: 0952-595959.

SOMERSET

Sharp MZ80 Club, contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset.
Yeovil Computer Club. Contact D G Carrington, 2 Romsey Road, Yeovil, Somerset BA21 5XN.

STAFFORDSHIRE

Alsager Computer Club, meets at Alsager Comprehensive School, Stoke-on-Trent, Staffs, fortnightly on Tuesday. Contact Rex Charlesworth on 09363-77270.
The Amateur Computer Club of North Staffs meets on the third Wednesday every month. Annual subs £3. Contact J Roll, 16 Hill Street, Hednesford, Staffordshire WS12 5DS.
ICL Birmingham Branch Micro Club, c/o WBA Ecclestone, 26 Browns Lane, Tamworth, Staffs.
Tame Valley Computer club, contact Tim Marshall, 32 Milton Avenue, Leyfields, Tamworth, Staffordshire B79 8JG.

SUFFOLK

Suffolk Microcomputer Club meets monthly. Annual subs £5. Contact Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich, Suffolk.

SURREY

Ashtead Computer Club meets on the last Thursday of every month. Contact P Palmer, 8 Corfe Close, Ashtead, Surrey.
Thames Valley Computer Club meets in Griffin Pub, Caversham. Annual subs £1, 50p a meeting. Contact Phil Warn, Reading 594874.
Thames Valley Amateur Computer Club meets at Griffon, Caversham, on the firs Tuesday every month. Contact Brian Quarm, 25 Roundway, Camberley, Surrey GU15 1NR, tel: Camberley 22186.
Ewell Micro Club, contact Dave De Silva. 316 Kingston Road, Ewell, Surrey KT19 0SU.
Farnham Computer Club, meets at Farnham 6th Form College, Morley Road, Farnham, Surrey on the second Wednesday every month. Annual subs: £2. Contact Adam Sharp, 14 Thorn Road, Boundstone, Farnham, Surrey.
West Surrey Computer Club meets at Paddock Room, Green Man Public House, Burpham, Guildford, the first Thursday of every month. Annual subs £5. Contact Chris Karney on 0483-68121.
ITN Computer Club meets on Fridays. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, tel: 0485 62035.
TI Home Group, annual subs: £12. Contact P Dicks, 157 Bishopsford Road. Morden, Surrey.
CBBS London meets on Sundays 4-10pm. Contact P Goldman, PO Box 100a, Surbiton, Surrey KT5 8HY.
Sutton Library Computer Club meets at Central Library, St Nicholas Way, Sutton, Surrey, on the first Friday of every month at 6pm and second and third Tuesday of every month. Annual subs: £6, £4 OAPs, £2 family. Contact Dave Wilkins on 01-642 3102.
Atari Computer Enthusiasts meets at 8 Cosdach Avenue, Wallington, Surrey SM6 9RA, subs: £20. Contact Adrian Miles, tel: 01-647 1713.
Association of London Computer Clubs, contact Len Stuart, 89 Mayfair Avenue, Worcester Park, Surrey KT4 7SJ.
Worthing & District Microcomputer Club meets at Rose Wilmot Youth Centre, Littlehampton Road, Worthing, on alternate Sundays 11am-1pm. Annual subs £4 adults, £2 students, £5 family. Contact B. Thomas, 11 Gannon Road, Worthing, W. Sussex, BN11 2DT, tel: 0903 36785.
Richmond Computer Club meets at Richmond Community Centre, Sheen Road, on the second Monday of every month at 8pm. Contact Bob Forster, 18a The Barons St Margarets, Twickenham, Middlesex, tel: 01-892 1873.

SUSSEX

West Sussex Microcomputer Club meets at Room RO6, Robinson Road Annexe, Crawley, on the first and third Monday every month. Annual subs: £6 adults, £3 students. Contact J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, W Sussex, tel: 0293-884207
Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hillary Close, East Grinstead, W Sussex RH19 3XQ.
Micro Enthusiasts, new club proposed. Contact G Diannage, 16 Malvern Street, Hove, Sussex BN3 3YR.
Arun Microcomputer Club meet at Wick Amenity Centre, Wick Farm Road, Littlehampton, W Sussex, on the first Monday of every month at 8pm, and third Sunday of every month at 6pm. Fees: £3 six months, £1 joining fee. Contact P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL

TYNE & WEAR

Newcastle upon Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. Anual subs £6. Contact Pete Scargill, 21 Percy Park, Tynemouth, tel: 0632-573905.

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Annual subs: £3 adults, £1 students. Contact Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.
Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday every month 6.45-9.45pm. Annual subs £5 adults, £3.50 students. Contact Alison Hunt, 58 Princes Avenue, Walsall, W Midlands, WS1 2DH, tel: 0922-23875.
National Westminster Personal Computer Society. Contact P Moore 021-2366176, ext 382.
Central Program Exchange, annual subs: full membership £25 Europe, small users service £10 Europe. Contact Mrs Judith, tel: Wolverhampton 28521.
West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday every month. Annual subs £4, £3 full-time students. Contact John Tracey, 100 Booth Close, Brierley Hill, Kingswingford, W Midlands, tel: 0384-70097.

WILTSHIRE

Chippenham and Calne, proposed new club. Contact Matthew Jones, Pinhills, Calne SN11 0LY.

WORCESTER

Worcester & District Computer Club meets at Old Pheasant Inn, New Street, Worcester, on the second Monday every month at 8pm. Contact D Stanton, 55 Vauxhall Street, Rainbow hill, Worcester WR3 8PA

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday every month at 7.30pm. Annual subs £1. Contact James Bridson, c/o 39 Kereforth Hall Road, Barnsley, South Yorks S70 6NF, tel: 0226-41753.
Doncaster Amateur Computer Society meets in YMCA, Wood Street, on the first Wednesday every month. Contact John Wilkinson, 316 Bawtry Road, Doncaster, S. Yorkshire, tel: 0302-868379.
Greenhead Grammar School Computer Club. Contact Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, tel: 0535-62828.
Huddersfield Computer Club meets every Monday. Contact Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, tel: 0484-657299.
Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. Contact David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.
Program Power, contact R Simpson, 5 Wemsley Road, Leeds Ls7 2BX, tel: 0532-683186.
Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Contact Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, tel: 0535-43007.
Shipley College Computer Group meets on Tuesdays. Contact Paul Channell, tel: 0274-595731.
South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday every month at 7.30pm. Annual subs: £4. Contact Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.
Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, every Wednesday at 7.30pm during school term. Contact Mr James Davis, 62 Tudor Street, Thurnscoe East, tel: 0709-893880.
West Yorkshire Microcomputer Group meets on Tuesdays. Contact Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, tel: 0532-632532.
York Computer Club meets at the Enterprise Club every Monday at 8pm. Contact K Thomas, Green Lea, Ripon Road, Harrogate, North Yorkshire HG1 2BY, tel: 0904-38239.

SCOTLAND

Bishopton Computer Club meets at 'Cwa Ben', Sachelcourt Avenue, Bishopton, Renfrewshire, on Sunday once a month (next meeting May 22 at 2.30pm). Contact Alasdair Law, 10 Dunglass Road, Bishopton, Renfrewshire PA7 5EF.
Edinburgh Home Computing Club meets at Claremont Hotel, Edinburgh, on the 2nd, 3rd and 4th Wednesday of the month, produces bi-monthly newsletter. Contact I. Robertson, 031-441 2361.
Scottish Amateur Computer Society, contact Mike Anthony, 46 Moredun Park Gardens, Edinburgh EH17 7JR.
Central Scotland Computer Club meets at Falkirk College of Technology, Grangemouth Road, Falkirk, on the first and third Thursday every month. Contact James Lyon, 78 Slamannan Road, Falkirk FK1 5NF.
Fife Computer Users Club meets fortnightly. Annual subs: adults, £5; under 18s, £3. Contact Murray Simpson, 31 Tom Steward Lane, St Andrews, Fife, Scotland KY16 8YB.
Grampian Amateur Computer Society meets at 35 Thistle Lane, Aberdeen, on the second and fourth Monday every month at 7.30pm. Annual subs: £12, £5 student, £2.50 junior. Contact Alan Morrison, 21 Beech Road, Westhill, Skene, Aberdeenshire AB36 WR.
Kemnay Computer Club meets weekly. Contact S Stubbs, 15 The Glebe, Kemnay, Inverurie, Aberdeenshire.
Inverness Personal Computing Club meets every second Tuesday at 7.30pm. Subs: adults £5, juniors £2.50. Contact Gyl Mackenzie, 38 Ardconnel Street, Inverness IV2 3EX, tel: 0463-220922.
Perth & District Amateur Computer Society meets at Hunters Lodge Motel, Bankfoot, on the third Tuesday of every month at 7.30pm. Annual subs £5. Contact Alastair McPherson, 154 Oakbank Road, Perth PH1 1HA.
Skye and Lockalsh Computer Society, proposed new club. Contact C Manvell, 25 Breacais Isol, Isle of Skye IV42 8QA.
Strathclyde Computer Club meets at Wolfson Centre, 106 Rottenrow, Glasgow, on the third Wednesday of every month. Contact B Duffy, 24 Lomand Drive, Condorrat, Cumbernauld G4 8NW.

WALES

Abergele Computer Club meets at Abergele CI Offices every Thursday at 7.30-10pm. Annual subs: £5 adults, £2.50 juniors. Contact W Jones, 77 Millbank Road, Rhyl, Clwyd, North Wales.
Colwyn Computer club meets at the Greens Hotel, Colwyn Bay, at 7pm. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.
81 Club annual subs: £30 + vat. Contact Mike Hayes, tel: 0222-371732.
Gwent Amateur Computer Club meets at St Mary's Institute, Stow Hill, every Thursday at 7.30pm. Annual subs: £3.50. Contact Rothery Harris, 16 Alanbrook Avenue, Newport, Gwent, Wales NPT 6QJ.
Pencoed Amateur Computer Club meets fortnightly on Saturdays at Pencoed Library. Subs: adults, £5; OAP's and students, £3.50. Contact Philip Williams, 38 Bryn Rhedyn, Pencoed, Bridgend, Mid-Glamorgan CF35 6TL, tel: 0656 860307.
Pontypool Computer Club meets at The Settlement, Roackhill Road, Pontypool, Gwent, on every Friday. Contact Graham Loveridge, on Pontypool 2827.
Swansea & Southwest Wales Amateur Computer Club meets on the last Friday every month. Contact Paul Griffiths, 1 Prescelli Road, Penlan, Swansea SA5 8AF.

NORTHERN IRELAND

Bangor Computer Club (N Ireland). New club. Contact Derek Blanc, c/o Queen's University, Belfast, Northern Ireland.

EIRE

Cork Amateur Computer Club. Talks and demonstrations. Hardware, programming and games. Contact T Moriarty, Tiger Bay, Rochestown, Douglas, Cork, Eire.

NOTE TO EXHIBITORS

1982: 47,543 reasons to be at the 5th PCW Show

1983: 20 chances to be at the 6th

Six months before the doors open on the 6th *PCW* Show, Britain's number one micro event, only 20 stands* are available for allocation. Need we say more. . .?

To discuss stand availability today, phone Timothy Collins on 01-486 1951. For exhibitor list and further information write to Montbuild Ltd, 11 Manchester Square, W1M 5Ab, Telex 24591.

* correct at 20.4.83

BARBICAN CENTRE, CITY OF LONDON
28 September — 2 October 1983

DATABASICS

This six-page guide lists as many of the micros on the market for under £12,000 as possible. In Databasics you'll find all the specifications for the machines, add-ons and software necessary to make your buying decisions.

PCN keeps you up to date in three-week cycles, starting with hardware, then peripherals and finally software.

PRICE Specifications listed for each machine indicate what you get for the basic price quoted, which includes VAT.

PROCESSOR TYPE a microprocessor is the heart of the computer. The Z80 and 6502 are popular 8-bit chips. The 8088 and 68000 are common 16-bit chips. If a machine has an 8-bit and a 16-bit processor we have listed the 16-bit only. Cust. means custom-built.

SPEED IN MHz Speed of the clock used to drive the microprocessor, measured in MegaHertz (million cycles per second).

STANDARD RAM Amount of main memory used on the system. The capacity is expressed in kilobytes.

MAX RAM normally at extra cost Amount of memory to which the system can be expanded.

MAX CHARACTERS columns × lines The number of characters that can be displayed across the screen and the number of lines down.

METHOD (at extra cost) This indicates the way the computer displays information. **M** on its own means that a monitor is included in the basic price. **Tv** indicates that you can plug the computer into a television set (**M+**) indicates that the monitor costs extra. **LCD** = Liquid crystal display.

COLOUR CAPABILITY tells you whether the machine can give colour at the basic price quoted.

MAX DOT RESOLUTION gives the maximum number of points across the screen by the number of points down the screen that are available for graphics.

KEYBOARD This tells you the type of keyboard that comes with the machine. **W** = word processing, **C** = calculator and **T** = touch-sensitive.

No OF FUNCTION KEYS refers to the number of keys that can be used for different jobs by different programs.

NUMERIC PAD indicates whether the machine has a separate calculator-style group of number keys to enter data quickly.

INTERFACES BUILT-IN shows the number of standard connections built into the machine.

CASSETTE FACILITY gives a yes or no as to whether or not the machine can use a cassette to store data.

CAPACITY PER DISK AND DISK SIZE tells you how many disk drives come with the machine, and the amount of data in kilobytes (K) or megabytes (Mb) that can be stored on each drive. There are two sizes for disks, 5¼" or 8", and they can be floppy **(F)** or hard **(H)**.

OPERATING SYSTEM gives the program that looks after the general running of a computer.

LANGUAGES INC is a column which lists the programming languages that come with the machine at the basic price.

OTHER LANGUAGES AVAILABLE indicates whether or not other programming languages are available for the machine.

DISTRIBUTOR To find which company distributes the machine refer to the distributor table from the code listed in this column. The table is at the end of the listings, and gives the distributor's name and telephone number.

All details given are the latest available. We ask distributors to let us know as soon as machine specifications change so Databasics can be kept right up to date. This guide has been meticulously researched and the information collected from individual distributors listed.

PRICE GUIDE

Sinclair ZX81	£40	Sharp MZ80A	£549	Sord M23	£1,932	Sord M23P	£2,369	Eagle III	£2,950	Vector 4	£3,852	TI System 200-250	£6,695
Casio PB100	£50	Commodore 4016	£632	Kaypro II	£1,949	TI Prof. Computer	£2,386	Zenith Z89-81	£2,978	Sage II	£4,019	Compucorp 675	£6,780
TRS-80 PC4	£50	Research Machine 480Z	£650	Transtec BC2	£1,949	IBM PC	£2,392	Monroe EC 8800	£2,990	Eagle IV	£4,190	Wicat 150	£6,846
Sharp PC1251	£80	DAI PC	£684	Kenilworth 83G	£1,953	Xerox 820 Model II	£2,415	Philips P3500	£3,000	C-1010	£4,197	Sundance I	£6,969
Aquarius	£90	Apple II	£776	Transam Truscan	£1,983	Haywood 3000	£2,439	Tanberg EC10	£3,000	Tandy TRS-80 Model 16	£4,199	Pascal Mod. Microengine	£7,003
Casio FX702P	£90	Commodore 500	£799	Epson QX10	£1,995	LSM4	£2,472	Archives 1	£3,003	Hytech H4500	£4,310	Diablo 3000	£7,250
Jupiter Ace	£90	HP 75C	£883	IDS Datamachine	£1,995	Canon CX-1	£2,500	Cromemco System 1	£3,025	BMC OK 11 F800, Model 20	£4,360	Onyx 5001 MU	£7,607
Sinclair Spectrum	£99	Sharp MZ80B	£900	Tandy TRS-80 Model II	£1,999	Adler Alphatronic P2U	£2,524	DECPC 325	£3,080	ADS 42	£4,500	Sundance II	£8,205
Comx 35	£120	Apple IIe	£972	Kenilworth 83N	£2,012	IO Tech Iona	£2,539	Direct 1000	£3,093	Televideo TS-80ZH	£4,533	Haywood Hinet	£9,550
Tandy TRS-80 Pocket 2	£130	Commodore 8032	£1,129	Caltext Micro	£2,019	HP 87XM	£2,571	Equator	£3,099	Country Com'ters C1000	£4,542	Altos 856-10	£9,631
Atari 400	£150	Commodore 710	£1,144	LSIM3	£2,064	Quantum 2000	£2,587	Clenio Table-Tops 925	£3,105	Corvus Concept	£4,887	Apple Lisa	£9,775
TI-99/4A	£150	Microdecision	£1,144	Haywood 9000 Composite	£2,064	Canon AS100	£2,633	ITT 3030	£3,105	ICL PC Model 31	£4,939	Micro Five 3000	£10,350
Commodore VIC 20	£170	Fujitsu FM8	£1,150	Hawk Model 110	£2,070	CP1100	£2,639	Monroe OC 8810	£3,162	Cromemco System 3	£5,170	Sundance 16	£10,480
Sharp PC1500	£170	Sanyo MBC 1000	£1,195	Positron 9000	£2,134	Seed System 19	£2,600	HP Series 200 Model 16A	£3,211	Micro Five 1000	£5,175	Spectrum	£11,442
Acorn Atom	£174	Positron 900	£1,259	Research Machines 380Z	£2,147	Enterprise 1000	£2,645	Cifer Series 1	£3,214	Fortune 32:16 System 2	£5,204		
Colour Genie	£194	Tandy TRS-80 Model III	£1,299	Superbrain JR	£2,150	Facit 6520	£2,645	Samurai	£3,214	Zeus 4	£5,400		
Sord M5	£190	Commodore 8096	£1,374	Future Computers FX-20	£2,156	Olympia Boss Model A	£2,645	Torch	£3,214	Hawk Model 2110	£5,405		
Dragon 32	£200	Pasca 640	£1,437	Comart Communicator	£2,180	Britannia Baby	£2,657	Sord M223	£3,277	Molecular M200	£5,462		
Camputers Lynx	£225	NEC PC8000	£1,454	Adler Alphatronic P2	£2,197	Adler Alphatronic P3	£2,696	Kontron RS180	£3,306	Altos 800/15	£5,663		
Tandy TRS-80 Colour	£240	Irvine Business Systems	£1,489	Country Com'ters C3000	£2,242	Eagle II	£2,702	Columbia PC 1600-1	£3,392	Durango F85	£5,744		
New Brain A	£269	Televideo TS-800 Series	£1,495	Kemitron K2000E	£2,242	Almarc 801	£2,708	Digico Prince	£3,392	Triton 4	£5,744		
Multitech MPS II	£269	HP 86A	£1,541	Rair Black Box 320S	£2,242	DEC Rainbow 100	£2,714	OEM Orion	£3,392	Marin Chip M9900	£5,750		
BBC Micro Model A	£299	Osborne I	£1,581	Sanyo MBC 2000	£2,242	ICL PC Model 10	£2,754	Ajile	£3,400	SW Tech. Products S0/9	£5,750		
Genie II	£299	Signet 10025	£1,599	Toshiba T-200	£2,242	Millbank SX10	£2,754	Barcellos AMT 100	£3,450	BASF 7100	£5,805		
Atari 800	£300	APL Signet	£1,610	TMK 332	£2,242	Olivetti M20D	£2,754	Kalamazoo 1050	£3,450	Compustar	£5,837		
Nascom 2	£327	Zenith Z89-81	£1,668	Bonsai SM 3000	£2,294	Sirius I	£2,754	Cromemco System 2	£3,560	Sord M243	£5,842		
Genie I	£330	Basis 108	£1,683	CAL PC	£2,294	Victor 9000	£2,754	Digital Microsystems 3	£3,576	Archives IV	£5,905		
Commodore 64	£345	Commodore Spr. Pet 9000	£1,719	North Star Horizon	£2,294	North Star Advantage	£2,766	Decision-1 Computer 012	£3,674	Sage IV	£5,962		
Microtan 65	£389	Gemini Galaxy 2	£1,719	Sanyo MBC 1250	£2,294	Apple III	£2,780	Televideo TS 1602-C	£3,714	ICL PC Model 32	£6,037		
BBC Micro Model B	£399	British Micro Mini 803	£1,720	Casu Mini C2	£2,300	Sanyo MBC 4050	£2,817	Adds Multivision	£3,795	Rair Business Computer	£6,037		
Datac Micro Controller	£431	Microsolution Brit. Genius	£1,840	Seed System I	£2,300	Bonsai SM 4000	£2,842	Clenio Pronto	£3,795	Digital Microsystems 4	£6,210		
Cortex	£454	Globe 101	£1,850	Sharp PC3201	£2,300	Logica VTS Vitesse	£2,863	Panasonic JD800M	£3,795	Superstar	£6,296		
Epson HX20	£472	Genie III	£1,897	HP 85	£2,360	Decision-1 Computer O11	£2,869	Kemitron K3000	£3,795	Racal 6000	£6,327		
Nascom 3	£549	Toshiba T-100	£1,900	HP Series 100, 120	£2,362	DMS Fox	£2,875	DEC PC 350	£3,850	Eagle 1600	£6,497		

ABBREVIATIONS

Ap: APL
As: Assembly
Ba: Basic
Co: Cobol
Cm: Comal
Fr: Forth
Fn: Fortran
Pa: Pascal

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Acorn Atom	£174	6502	1	2K	40K	32×16	Tv(M+)	●	256×192	W							1	●		Cassette	BaAs	●	A1	Hobbyist micro
Adds Multivision	£3,795	8085A	5	64K	256K	80×25	M		640×240	W	28		1			1			1×350K5¼F	CP/M2.2, Muon	Ba	●	A2	Multi user system
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80×24	M			W	6	●	2			1	3		2×160K5¼F	CP/M	Ba	●	T1	Good software choice
Adler Alphatronic P2U	£2,524	8085A	3	64K		80×24	M			W	6	●	2			1	3		2×320K5¼F	CP/M	Ba	●	T1	£327 buys extra storage
Adler Alphatronic P3	£2,696	8085A	3	64K		80×24	M			W	6	●	2			1	3		2×790K5¼F	CP/M		●	T1	16 bit option-promised
ADS 42	£4,500	8085A	4	32K		40×8	M		40×8	W		●	3				3	●	1×82K5¼F	Holland Automation	Ba		A3	Intelligent cash register
Ajile	£3,400	8088	4	256K		80×25	M		640×250	W	10	●	1	1		2			2×320K5¼F	MS-DOS	BaAs	●	A9	16-bit portable micro
Almarc 801	£2,708	Z80	4	64K	512K	80×25	(M+)	●		W			2				11		2×800K5¼F	CP/M		●	A4	8-bit range goes to 20Mb
Almarc 1601	£3,445	8086	8	128K	1Mb	80×25	(M+)	●		W			2				11		2×800K5¼F	CP/M86		●	A4	Pseudo 16-bits go to 20Mb
Aquarius	£90	Z80A	4	4K	52K	40×24	TV	●	320×192	C							1	●		Cassette	Ba		M7	Competition for Uncle Sir Clive
Altos 800/15	£5,663	Z80	4	192K	208K	80×24	M			W	8	●		1					1×450K5¼F	MP/M		●	L1	Multi user business machine
Altos 856-10	£9,631	8086	10	512K	1Mb	80×24	M			W	16	●	6						2×500K5¼F	Xenix	Xenix	●	L1	The 16-bit version
APL Signet	£1,610	Z80A	4	64K		80×25	Tv(M+)*	●		*			2						2×188K5¼F	APL, CP/M	Ap	●	M1	*APL terminal recommended
Apple II	£776	6502	1	48K	128K	40×24	Tv(M+)	●	256×192	W							8	●		CP/M, DOS 3.3, UCSD-P	Ba	●	A8	Plenty of software and extras
Apple IIe	£972	6502		64K	128K	80×24	M+	●		W					1		8			DOS	Ba	●	A8	Not an Apple II!
Apple III	£2,780	6502	2	128K	256K	80×24	(M+)	●	560×192	W		●	1				4		1×140K5¼F	SOS, DOS		●	A8	Will emulate Apple II
Apple Lisa	£9,775	68000	8	1Mb		120×30	M		792×360	W		●	2	1			3		2×860K5¼F	Lisa		●	A8	Learning time 30 mins
Archives I	£3,003	Z80	4	64K		80×25	M	●	240×100	W	23	●	2	1		1	5		2×386K5¼F	CP/M		●	S1	Standard CP/M + graphics
Archives IV	£5,905	Z80	4	512K		80×25	M	●	240×100	W	23	●	1			1	3		1×10Mb5¼H+1×7445¼F	CP/M, MP/M		●	S1	Hard disk version
Atari 400	£150	6502B	1.79	16K		40×24	Tv	●	320×192	T	3					7		●		Cassette	Ba	●	A5	Games computer, Basic extra
Atari 800	£300	6502	1.8	48K		40×24	Tv(M+)	●	320×192	W	3					7	4	●		Cassette	Ba	●	A5	Versatile, good graphics
Barcellos AMT 100	£3,450	Z80A	4	64K	256K	80×24	TvM			W	8	●	1	1		2	3		2×500K8F	CP/M	BaCo	●	B1	Up to four users
BASF 7100	£5,805	Z80A	4	64K		80×24	M			W	26	●	1	1					3×163K5¼F	BOS	Ba	●	C1	Hard disc promised
Basis 108	£1,683	6502	1	64K	126K	80×24	TvM	●	820×168	W	15	●	1	1			6	●				●	C12	Apple bus, Z80, 80 columns
BBC Micro Model A	£299	6502	1.8	16K	32K	40×30	Tv(M+)	●	320×256	W	10					1		●		MOS	BaAs	●	A1	Upgradable to Model B
BBC Micro Model B	£399	6502	2	32K		80×30	Tv(M+)	●	640×256	W	10			1		5	3	●		MOS	BaAs	●	A1	Versatile and expandable
BMC OKI if 800, Model 20	£4,360	Z80B	5	64K	256K	80×25	M	●	640×200	W	15	●	1					●	2×340K5¼F	CP/M	Ba	●	E1	Built-in printer
Bonsai SM 3000	£2,294	Z80	2	64K		80×24	M		80×24	W	14	●	1	1					2×350K5¼F	CP/M		●	B2	CP/M business machine
Bonsai SM 4000	£2,842	8088	5	128K	256K	80×24	M			W	14	●	1	1						CP/M, MP/M, MS-DOS		●	B2	Z80 for 8 bit software
Britannia Baby	£2,657	8085	6.14	64K		80×25	Tv(M+)		80×25	W	11	●	2	1					2×500K5¼F	CP/M	AsBaCo	●	B3	Cobol language included
British Micro Mimi 803	£1,720	Z80A	4	64K		80×25	(M+)		512×256	W	17	●	1	1		1			2×400K5¼F	OS/M		●	B4	This is CP/M compatible
C-1010	£4,197	6502	1	64K	128K	80×24	TvM		256×192	W	12	●	1	1		1	8	●	1×1405¼F+1×10MbH	CP/M, DOS, UCSD-P	Ba	●	C2	Apple II compatible
CAL PC	£2,294	8088	5	128K	256K	80×25	TvM	●	256×512	W		●	2	1		1	5		2×400K5¼F	CP/M	Ba	●	C3	Also Z80B Processor
Caltext Micro	£2,019	Z80A	4	64K	256K	80×24	TvM			W	36	●	1	1			3		2×400K5¼F	CP/M		●	C3	Range of software included
Camputers Lynx	£225	Z80A	4	48K	192K	40×24	Tv(M+)	●	248×256	W			1	1				●		Cassette	Ba	●	C5	Unusual — promise of CP/M
Canon AS100	£2,633	8088	4	128K	512K	80×25	M	●	640×400	W	12	●		1			4		2×640K5¼F			●	C4	Choice of CP/M86 or MS-DOS
Canon CX-1	£2,500	6809	4	128K	256K	80×24	M		80×25	W	15	●	3	1	1		2		2×320K5¼F	MCX	BaAs	●	C4	Pascal, Fortran as extras
Casio FX 702P	£90	Cust.		2K		20×1	LCD			C								●		Cassette	Ba		C6	Pocket computer
Casio PB100	£50	Cust.		0.7K	1.7K	60×1	LCD			C		●					1	●		Cassette	Ba		C6	Business pocket computer
Casu Mini C2	£2,300	Z80A	4	64K		*	(M+)		*	*			4	1			6		2×1Mb8F			●	C7	*Choose your own terminal
Cifer Series 1	£3,214	Z80	4	128K	320K	132×32	TvM			W	40	●	3	1					2×800K5¼F	CP/M		●	C17	Other models available
Clenlo Pronto	£3,795	Z80A	4	64K	1Mb	*	Tv(M+)		*	*			2	2			18		2×600K8F	CP/M	Ba	●	C8	*Choice of terminal
Clenlo Table-Top 925	£3,105	Z80A	4	64K	128K	80×25	M			W	11	●	2	2					2×600K8F	CP/M		●	C8	Watch out for the weight
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80×24	M	●	640×200	W	10	●	2	1			8		2×320K5¼F	CP/M, MS-DOS	Ba	●	I1	An IBM lookalike
Commodore VIC 20	£170	6502	1	5K	32K	22×23	Tv(M+)	●	176×158	W	8					3	1	●		Kernal	Ba	●	C9	Very popular home micro

Commodore 64	£345	6510	1	64K		40×25	Tv(M+)	●	320×200	W	8					3		●		Kernal	Ba	●	C9	Good value for money
Commodore 500	£799	6509	1	128K	896K	40×25	Tv(M+)	●	320×200	W	10	●	1		1	3	1	●		Kernal	Ba	●	C9	Available by summer?
Commodore 4016	£632	6502	1	16K	32K	40×25	TvM			W		●			1	1	3	●		Cassette, PETDOS	Ba	●	C9	The original PET
Commodore 710	£1,144	6509	2	128K	896K	80×25	TvM			W	10	●	1		1	2	1	●		Kernal	Ba	●	C9	Might be a long wait
Commodore 8032	£1,129	6502	1	32K	96K	80×25	TvM			W		●			1	1		●		Cassette, PETDOS	Ba	●	C9	The 80-column PET
Commodore 8096	£1,374	6502	1	96K		80×25	TvM			W		●			1	1		●		Cassette, PETDOS	Ba	●	C9	Fully expanded PET
Commodore Super Pet 9000	£1,719	6502	2	96K		80×25	TvM			W		●	1		1	1	2	●		Cassette, PETDOS	Ba	●	C9	Top of the range
Compucorp 675	£6,780	Z80	4	64K	256K	80×20	M			W	20	●	1				4		2×655K5¼F	Compucorp		●	C10	Unusual O/S
Compustar	£5,837	Z80A	4	64K		80×25	M			W		●	2						1×10Mb8H+1×350K5¼F	CP/M	Ba	●	I10	Networking system
Comart Communicator CP100	£2,180	Z80	4	64K	512K	80×24	M			W		●	2	1			10		2×390K5¼F	CP/M		●	C13	Business CP/M micro
Comx 35	£120	1802		35K	67K	40×24	Tv	●		C								●		Cassette	Ba		C14	Built-in joystick
Cortex	£454	9995	12	64K	1Mb	40×24	Tv(M+)	●	256×192	W	12	●	1					●			BaAs		M2	Mainly sold as £340 kit
Corvus Concept	£4,887	68000	8	256K	1Mb	120×60	M		720×560	W	10	●	2			1	4			Merlin	Pa	●	K1	A4 shaped screen
Country Computers C1000	£4,542	6502	1	64K	128K	80×24	M		280×192	W	12	●	1				3		1×10Mb5¼H+1×140K5¼F	DOS, CP/M	Ba	●	C16	Runs all Apple software
Country Computers C3000	£2,242	Z80A	4	64K	256K	*	*			*			1	1					1×5Mb5¼H+1×500K5¼F	CP/M		●	C16	*Terminal own choice
CP1100	£2,639	8086	6	128K	1Mb	*	(M+)*			*			2	1			7		2×390K5¼F	CP/M 86		●	C13	Choose your own terminal
Cromemco System 1	£3,025	Z80	4	64K		80×24	(M+)	●	450×735	W	20	●	1				8		2×390K5¼F	CDOS, Crom		●	C13	Designed for business
Cromemco System 2	£3,560	Z80	4	64K		80×25	(M+)			W	20	●	1				21		2×390K5¼F	CDOS, Crom		●	C13	Large business machine
Cromemco System 3	£5,170	Z80	4	64K		80×25	(M+)			W	20	●					21		2×1.2Mb8F	CDOS, Crom		●	C13	Top end Cromec
DAI PC	£684	8080	2	48K		60×24	Tv(M+)	●	255×335	W			1					●		Cassette	Ba		D9	Optional maths chip
Datac Micro Controller	£431	Z80	2	16K		40×24	Tv(M+)		80×60	W			1			1	1	●			Ba	●	D1	Mainly used in labs
DEC Rainbow 100	£2,714	8088	N/A	64K	192K	132×24	M	●	960×240	W	20	●	2				3		2×400K5¼F	CP/M		●	D2	Competitor for IBM PC
DEC PC 325	£3,080	PDP11/23	N/A	256K		132×24	M	●	960×240	W	20	●	2				1		2×400K5¼F	P/OS		●	D2	Mini in micro clothing
DEC PC 350	£3,850	PDP11/23	N/A	256K		132×24	M	●	960×240	W	20	●	2				4		2×400K5¼F	P/OS		●	D2	Mini in micro clothing
Decision-1 Computer MDC-011	£2,869	Z80A	4	64K	192K		(M+)*			*			3	1		1			2×400K5¼F	CP/M	Ba	●	I2	*Buy your own terminal
Decision-1 Computer MDC-012	£3,674	Z80A	4	64K	192K		(M+)*			*			3	1		1			1×400K5¼F+1×5Mb5¼H	CP/M	Ba	●	I2	*You choose the terminal
Diablo 3000	£7,250	8085	3	32K	64K	80×24	M			W	8	●	1				4		2×1.8Mb8F	DACL	Ba	●	B5	Unusual O/S
Digico Prince	£3,392	Z80A	4	64K		80×25	M			W	50	●	2				7		2×400K5¼F	CP/M		●	D3	Unusual keyboard
Digital Microsystems DMS-3	£3,576	Z80A	4	64K			(M+)*			*			3			1			2×512K8F	CP/M		●	D4	*Choice of terminal
Digital Microsystems DMS-4	£6,210	Z80A	4	128K	½Mb		(M+)*			*			4						2×512K8F	MP/M		●	D4	*Depends on terminal chosen
Direct 1000	£3,093	Z80	4	64K		80×25	M		132×28	W			2						2×300K5¼F	CP/M		●	D5	Standard CP/M machine
DMS Fox	£2,875	Z80A	4	64K		80×24	M			W	16	●	3	1		1			1.2Mb5¼F	CP/M		●	D4	Portable machine
Dragon 32	£200	6809E	1	32K	64K	32×16	Tv(M+)	●	256×192	W				1		4	1	●		Cassette	Ba		D6	Tandy colour lookalike
Durango F85	£5,744	8085A	5	64K	196K	80×64	Tv(M+)			W		●	4			1	12		2×1Mb5¼F	Star Basic	BaCo	●	C3	Built in printer
Eagle II	£2,702	Z80A	4	64K		80×24	M		80×24	W		●	2	1		1			2×500K5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle III	£2,950	Z80A	4	64K		80×24	M		80×24	W		●	1						2×1Mb5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle IV	£4,190	Z80A	4	64K		80×24	M			W		●	2	1		1			1×1Mb5¼F+1×12.5Mb5¼H	CP/M	Ba	●	M3	Includes WP/SS software
Eagle 1600	£6,497	8086	8	128K	512K	80×25	M	●	720×352	W	24	●	2	1		1	8		1×1Mb5¼F+1×12.5Mb5¼H	MS-DOS, CP/M 86		●	M3	High speed IBM copy
Enterprise 1000	£2,645	*	8	64K			M			W	10	●	2			2			2×358K5¼F	Enterprise		●	D7	Micro Nova 16-bit
Epson HX20	£472	6301	1	16K	32K	20×4	LCD		120×32	W	13	●	2				2	●		Cassette	Ba		E2	Powerful portable
Epson QX10	£1,995	Z80	4	192K	256K	80×25	M		640×400	W	18	●	1	1			5		2×320K5¼F	CP/M	Ba	●	E2	Expansion required for Valdocs
Equator	£6,842	Z80A	4	64K	448K	80×24	M		255×560	W	14	●	7	1		1	8		1×5Mb5¼F+1×750K5¼F	CP/M, MP/M, Turbo DOS		●	E3	Two bigger models available
Facit 6520	£2,645	Z80	4	64K	128K	80×24	M		80×24	W	8	●	2						2×320K5¼F	CP/M, Facit DOS	Ba	●	F1	Concurrent printing
Fortune 32:16 System 2	£5,204	68000	6	256K	1Mb	80×24	M	●	1024×1024	W	16	●	1				20		2×800K5¼F	Unix		●	I3	Genuine 16-bit
Fujitsu FM8	£1,150	6809	1	64K		80×25	(M+)	●	640×200	W	10	●	1	1		4	1	●		Flex	Ba		S2	Good for business graphics
Future Computers FX-20	£2,156	8088	8	128K	1Mb	80×25	M		800×400	W	20	●	2			2			2×800K5¼F	CP/M 86, MS-DOS		●	E1	Still on a promise
Genie I	£330	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W			1	1			1	●		Cassette	Ba	●	L2	Compatible with TRS 80/I
Genie II	£299	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W	4	●	1				1	●		Cassette	Ba	●	L2	Speeded-up Genie I
Genie III	£1,897	Z80A	3.2	64K		80×24	M		160×72	W	8	●	1	1		1	3		2×700K5¼F	New DOS	Ba	●	L2	CP/M costs extra
Colour Genie	£194	Z80	2.2	16K	32K	40×24	Tv(M+)	●	160×96	W	8		1	1		2	1	●		Cassette	Ba		L2	Home games machine
Gemini Galaxy 2	£1,719	Z80	4	64K	512K	80×25	M		160×75	W	10	●	1	1		1	5	●	2×400K5¼F	CP/M		●	G1	Low cost British system
Globe 101	£1,850	8085	3	64K		80×24	M			W	20	●	3						2×325K5¼F	CP/M		●	G4	Wordstar plus Mail Merge inc.
Hawk Model 110	£2,070	Z80A	4	64K	256K	*	(M+)*	●	*	*			2	1			3		2×390K5¼F	CP/M, MP/M2		●	L6	*Choose your terminal
Hawk Model 2110	£5,405	Z80A	4	64K	256K	*	(M+)*	●	*	*			2	1			3		1×390K5¼F+1×21MbH	CP/M, MP/M2		●	L6	*Choose your terminal
Haywood 9000 Composite	£2,064	Z80A	4	64K	192K	80×25	M		64×255	W	34	●	2				8		2×320K5¼F	CP/M	As	●	H1	Designed for network

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Haywood Hinet	£10,982	Z80	4	64K	128K	80×24	M			W	34	●	3	1		1			1×11Mb8H	CP/M		●	H1	Large network machine
HP 75C	£883	Cust.	N/A	16K	24K	32×1	(M+)			C						1	4	●	1.3K card reader	HP	Ba		H2	Calculator/computer
HP 85	£2,360	Cust.	N/A	16K	32K	32×20	M		255×191	W	8	●	1			4	4	●		Cassette	Ba	●	H2	Engineers' machine
HP 86A	£1,541	Cust.	N/A	64K	512K	80×24	M		544×240	W			1	1		2	4			HP	Ba	●	H2	CP/M optional
HP 87XM	£2,571	Cust.	N/A	128K	640K	80×24	M		544×240	W	14	●	1	1	1	3	4			HP DOS	Ba	●	H2	Special technical uses
HP Series 100, 120	£2,362	Z80A	3.68	64K		80×24	M		80×24	W	8	●	2			1				CP/M	Ba	●	H2	Top end HP business system
HP Series 200 Model 16A	£3,212	68000	8	128K	750K	80×25	M			W	5		1		1		2			HP		●	H2	Genuine 16-bit
Hytech H4500	£4,310	Z80	4	64K	208K	80×25	M		80×25	W	26	●	1				3		2×403K5¼F	CP/M	Ba	●	H3	Standard CP/M micro
IBM PC	£2,392	8088	4.7	64K	576K	80×25	(M+)	●	640×200	W	10	●		1			5		1×360K5¼F	MS-DOS	Ba	●	I9	Slow but reliable
ICL PC Model 10	£2,754	8085	3	64K	256K	80×24	Tv(M+)			W	11	●	2				8		2×700K5¼F	CP/M	Ba	●	I4	Repackaged Rair Black Box
ICL PC Model 31	£4,939	8085	3	128K	256K	80×24	(M+)		80×24	W	11	●	4				8		1×250K5¼F+1×5MbH	CP/M, MP/M	Ba	●	I4	Multi user Black box
ICL PC Model 32	£6,037	8085	3	256K		80×24	(M+)		80×24	W	11	●	8				8		1×250K5¼F+1×5MbH	CP/M, MP/M	Ba	●	I4	Top of ICL range
IDS Datamachine	£1,995	Z80	4	64K	1Mb	*	Tv(M+)		*				2				15		2×400K5¼F	CP/M	Ba	●	I8	*Depends on terminal
IO Tech Iona	£2,539	Z80	4	69K	960K	80×24	M	●	160×75	W	12	●	1	1			8	●	2×400K5¼F	CP/M		●	I5	Good colour versatility
Irvine Business Systems	£1,489	Z80	4	64K		80×25	M			W		●	2						2×400K5¼F	CP/M		●	I6	Inexpensive CP/M machine
ITT 3030	£3,105	Z80A	4	64K	256K	80×24	Tv(M+)		80×24	W	8	●	1			1	1		2×280K5¼F	CP/M, BOS		●	I7	Top end business system
Jupiter Ace	£90	Z80	3.25	3K	51K	32×24	Tv(M+)		64×46	C		●					1	●			Fr		J1	Native Forth machine
Kalamazoo 1050	£3,450	8085	6	64K		80×24	Tv(M+)		80×24	W	10		1						2×250K5¼F	Kalamazoo		●	K3	Only Kabol language
Kaypro II	£1,949	Z80	4	64K		80×24	M			W		●	1	1					2×200K5¼F	CP/M	Ba	●	C15	A portable business machine
Kemitron K2000E	£2,242	Z80	4	64K		80×24	(M+)		80×24	W			2	1			11		1×300K5¼F	CP/M		●	K4	Scientific Keyboard
Kemitron K3000	£3,795	Z80	4	64K	256K	80×24	(M+)		80×24	W		●	2				14		2×1Mb8F	CP/M, MP/M		●	K4	For scientific use
Kenilworth 83G	£1,953	Z80A	4	64K		80×25	TvM		160×75	W	10	●	1	1			5		2×350K5¼F	CP/M		●	K5	British portable
Kenilworth 83N	£2,012	Z80	4	64K		80×25	TvM		160×75	W	10	●	1	1			5		2×350K5¼F	CP/M	Ba	●	K5	Includes Basic
Kontron RSI 80	£3,306	Z80	4	64K	128K	80×25	M		256×512	W	16	●	2	1			8		2×303K5¼F	Kontron	Ba	●	K6	O/S CP/M based
LSI M3	£2,064	Z80	2.5	64K		80×24	M		80×24	W	31	●	1	1					2×200K5¼F	CP/M		●	L3	Big, British and CP/M
LSI M4	£2,472	8088	5	128K	256K	80×24	M		160×72	W	31	●	2	1			1		2×400K5¼F	CP/M 86, CP/M80		●	L3	Z80 for 8-bit software
Logica VTS Vitesse	£2,863	8086	5	64K	256K	80×24	M	●	640×288	W	12	●	1	1			4		2×1Mb5¼F	CP/M, MS-DOS	Ba	●	L4	High-res colour graphics
Marin Chip M9900	£5,750	9900	3	64K	1.6Mb	24×80	M		24×80	W	8	●	4				12		2×1.2Mb8F	MOS, MDEX	Ba	●	M2	Genuine 16-bit
Micro Five 1000	£5,175	8088	8	128K	512K	25×80	TvM		512×512	W	20	●	10				2		2×1Mb5¼F+2×6.3Mb5¼H	*		●	F2	*Choose your own O/S
Micro Five 3000	£10,350	8086	5	128K	1Mb	25×80	TvM		512×512	W	20	●	5				3	●	1×10Mb8F	*		●	F2	*Choose your own O/S
Microdecision	£1,144	Z80	4	64K		80×24	(M+)			*			2						1×200K5¼F	CP/M	Ba,Pilot	●	I2	*Terminal extra
Microsolution British Genius	£1,840	Z80	4	64K		80×24	TvM		80×24	W	21	●	1	1					2×160K5¼F	CP/M		●	M4	'Genius' by nature?
Microtan 65	£389	6502	1	8K	48K	25×64	(TvM+)			W		●	1	2				●		Tanbug	Ba	●	M8	Expandable in many ways
Millbank SX10	£2,754	Z80A	4	65K	256K	80×25	M		80×25	W	10	●	2			1			2×350K5¼F	CP/M	As	●	M5	Scientific applications
Molecular M200	£5,462	Z80	4	64K	320K		(M+)*			*			2			1	16		1×10Mb8H+1×500K8F	CP/M	BaAs	●	G2	*Terminal required
Monroe EC8800	£2,990	Z80A	3	128K		40×24	M		240×240	W	32	●	3			3			1×320K5¼F	Monroe	BaPaPilot	●	F3	Only 40-character screen
Monroe OC8810	£3,162	Z80A	3	128K		80×24	M		80×24	W	32	●	3			2	1		1×320K5¼F	Monroe	BaPa	●	F3	Bigger model available
Multitech MPFII	£269	6502	1.2	64K		40×24	Tv(M+)	●	280×192	C				1		1	1	●		Cassette	Ba	●	S8	Apple soft compatible
Nascom 2	£327	Z80A	4	2K	64K	16×48	Tv(M+)		48×96	W			1				4	●		NAS, SYS	BaAs	●	L5	Old reliable
Nascom 3	£549	Z80	4	48K		16×48	Tv(M+)		48×96	W			1				4	●		NAS, SYS	BaAs	●	L5	Fully expanded Nascom
NEC PC8000	£1,454	Z80	4	32K	64K	80×25	M	●	160×100	W	10	●	2	1					2×300K5¼F	CP/M, NEC, DOS	Ba	●	N1	Superb colour graphics
New Brain A	£269	Z80A	4	32K	512K	80×30	Tv(M+)		640×220	C			2				1	●		Cassette	Ba		G3	A lot of promise
North Star Advantage	£2,766	Z80	4	64K		80×24	M		640×240	W	15		1				6		2×360K5¼F	CP/M		●	T9	16-bit option
North Star Horizon	£2,294	Z80	4	64K	512K		*		*	*			2	1		1	9		2×360K5¼F	North Star DOS	Ba	●	T9	*Choose your own terminal
OEM Orion	£3,392	8086	8	128K	896K	80×25	TvM		800×400	W	13	●	11				6		2×500K5¼F	CP/M 86	BaCo	●	O5	*Full communications machine.

Olivetti M20D	£2,754	Z8000	3	160K	512K	80×25	M	●	512×256	W		●	1	1			5		2×320K5¼F	PCOS	Ba	●	B6	Real 16-bitter
Olympia Boss Model A	£2,645	Z80A	4	64K		80×28	M	●	80×28	W	10	●	1				4		2×140K5¼F	CP/M		●	O1	Useful 28 lines on screen
Onyx 5001 MU	£7,607	Z80A	4	128K	256K	*			*	*			5	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	*Terminal extra; other models
Oric 1	£169	6502A	1	48K		40×28	Tv(M+)	●	240×200	C				1		1		●		Cassette	Ba		O2	16K promised
Osborne 1	£1,581	Z80	4	64K		52×24	M		128×32	W	10	●	1		1				2×185K5¼F	CP/M	Ba	●	O3	Portable, includes software
Panasonic JD 800M	£3,795	8085A	4	60K		80×24	M		80×24	W	21	●	3						2×250K8F	CP/M	Ba	●	P1	Larger model costs £5,002
Pasca 640	£1,437	Z80A	4	64K		80×24	M			W		●	1	1					2×250K8F	CP/M		●	W1	Regular CP/M micro
Pascal Modular Microengine	£7,003	WD9000	2	128K		*	*		*	*			4				8		2×1.2Mb8F	UCSD-P	Pa	●	P2	*Terminal extra
Philips P3500	£3,000	Z80A	4	64K	320K	80×25	M			W	11	●	2						2×0.6Mb5¼F	Turbo-DOS	Co	●	P3	Fast O/S as standard
Positron 900	£1,259	6809	1	64K	256K	*	(M+)		*	*			4		1		3			O/S 9	Ba	●	P4	*You choose your terminal
Positron 9000	£2,134	6809	1	64K	256K	80×24	TvM	●	480×240	W	12	●	4		1		3			O/S 9	Ba	●	P4	Multi user version
Quantum 2000	£2,587	Z80A	4	64K	192K	80×25	M		160×75	W	18	●	1	1			5	●	3×860K5¼F	CP/M		●	Q1	Mono, low-res graphics
Rair Black Box Model 3/20S	£2,242	8085	5	64K	512K	80×24	(M+)			*			2				8		2×1Mb5¼F	CP/M	Ba	●	R1	*VDU extra; many versions
Rair Business Computer	£6,037	8088	5	256K	1Mb	80×25	M	●		W	10	●	2			4	8		1×19Mb5¼H+1×1Mb5¼F	CP/M, PCDOS	Ba	●	R1	Hybrid 8/16 bit
Racal 6000	£6,327	Z80	5	64K	256K	80×26	M		80×26	W	21	●	1	1					1×600K8F	CP/M		●	R2	CP/M languages available
Research Machines 380Z	£2,147	Z80A	4	32K	56K	40×24	Tv(M+)			W			1	1			4	●	2×144K5¼F	CP/M	Ba	●	R3	Widely used in schools
Research Machines Link 480Z	£650	Z80A	4	32K	256K	40×24	Tv(M+)			W	4		2	1		1	2	●		Cassette	Ba		R3	CP/Net version available
Sage II	£4,019	68000	8	128K	512K	*	(M+)		*	*			2	1	1				2×640K5¼F	UCSD-P System	BaAsPaFn	●	T10	*Terminal extra
Sage IV	£5,962	68000	8	128K	1Mb	*	(M+)	●		*			6	1	1				2×640K5F+1×6MbH5¼	UCSD-P System	PaBaFn	●	T10	*Terminal own choice
Samurai	£3,214	8086	4.6	128K	768K	80×25	M	●	720×400	W		●	3	1			3		2×1.2Mb8F	MS DOS, CP/M 86		●	M6	High-res colour graphics
Sanyo MBC 1000	£1,195	Z80A	4	64K		80×25	M		80×25	W	17	●	1	1					1×320K5¼F	CP/M	Ba	●	L1	Standard CP/M model
Sanyo MBC 1250	£2,294	Z80	4	64K		80×40	M		640×400	W		●	1	1					2×640K5¼F	CP/M	Ba	●	L1	High-res graphics
Sanyo MBC 2000	£2,242	8085A	5	64K		80×24	M		80×24	W	24	●	2	1			2		2×328K5¼F	CP/M	Ba		L1	Big disc model costs £3,622
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80×24	M		80×24	W			1	1					2×640K5¼F	CP/M 86	Ba	●	L1	Pseudo 16-bit
Seed System 1	£2,300	6800	2	32K	64K	80×24	M		80×24	W	3	●	2				8		2×160K5¼F	DOS 68 Flex	Ba	●	S3	Ageing business machine
Seed System 19	£2,600	6809	2	48K	1Mb	80×24	M			W	3	●	2				8		2×160K5¼F	OS-9		●	S3	Latest from Seed
Sharp MZ80A	£549	Z80	2	48K		40×25	M		80×50	W		●						●		Sharp Basic	Ba	●	S4	CP/M facility extra
Sharp MZ80B	£900	Z80A	4	64K		80×25	M		320×200	C	10	●						●		Sharp Basic	Ba	●	S4	Unusual keyboard
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD		24×1	C	18	●					1	●		Sharp Basic	Ba		S4	Pocket computer
Sharp PC1500	£170	Cust.	1.3	3.5K	11.5K	26×1	LCD		156×7	C	6	●	1	1		.	2	●		Cassette	Ba		S4	Optional 4-pen plotter
Sharp PC3201	£2,300	Z80A	2.6	64K	112K	80×25	M		160×50	W	10	●					5		2×500K5¼F	Sharp Basic	Ba	●	S4	Powerful Sharp Basic
Signet 10025	£1,599	Z80B	6	64K		80×24	M	●	512×512	W		●	2	1			1		2×200K5¼F	CP/M, Macnos		●	A6	Choice of keyboards
Sinclair ZX81	£40	Z80A	3.5	1K	16K	32×24	Tv		64×44	C							1	●		Cassette	Ba		S5	Sold a million
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32×24	Tv	●	256×192	C							1	●		Cassette	Ba	●	S5	Very popular home micro
Sirius I	£2,754	8088	5	128K	896K	80×25	M		800×400	W	7	●	2		1		4		2×600K5¼F	CP/M 86, MS/DOS	Ba	●	A7	IBM style
Sord M5	£190	Z80A	4	4K	16K	40×24	Tv(M+)	●	256×196	C				1		2		●		Cassette	Ba		S6	Japanese home computer
Sord M23	£1,932	Z80A	4	128K		80×25	M	●		W	14	●	2	1		2	3		2×330K5¼F	Sord O/S, SB80	BaPips	●	S6	CP/M compatible
Sord M23P	£2,369	Z80A	4	128K		80×25	Tv(M+)	●	640×200	W	14	●	2	1		2	2		2×290K3½F	Sord O/S, SB80	BaPips	●	S6	Complete with suitcase
Sord M223	£3,277	Z80	4	64K		80×25	M			W		●	2			4			2×350K5¼F	Sord O/S, SB80	BaPips	●	S6	Standard business machine
Sord M243	£5,842	Z80	4	192K		80×25	M	●	640×400	W	15	●	4	1		4			2×1Mb8F	Sord O/S, SB80	BaPips	●	S6	Large and powerful
SW Technical Products SO/9	£5,750	6809	2	256K	1.2Mb	80×24	M			W	15	●	1	1					2×1.5Mb5¼F	Flex, Uniflex		●	S7	Top end SWTP
Spectrum	£11,442	68000	8	256K	4Mb	*	(M+)		*	*			4				16		2×720K5¼F	Mirage	Ap	●	M1	*As terminal
Sundance I	£6,969	Z80A	4	64K	256K	132×24	M			W	4	●	1	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	Ordinary CP/M machine
Sundance II	£8,205	Z80A	4	128K	256K	132×24	M			W	4	●	1	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	Middle-range Sundance
Sundance 16	£10,480	Z8001	6	256K	1Mb	80×24	M			W		●	5	1				●	1×14Mb5¼H	BOS		●	T2	Tape backup for hard disc
Superbrain JR	£2,150	Z80	4	64K		80×24	M		560×240	W		●	2				1		2×160K5¼F	CP/M	Ba	●	I10	Bigger models available
Superstar	£6,296	Z80	4	64K		80×24	Tv(M+)		80×24				1	1			8		1×10Mb5¼H+1×400K5¼F	CP/M 80	Ba	●	B7	Includes hard disk
Tandberg EC10	£3,000	8080A	2	64K		80×25	M			W		●	7						1×250K8F	CP/M, TOS	Ba	●	T3	Very early machine
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80×24	M		80×24	W	2	●	2	1					1×500K8F	TRS-DOS	Ba	●	T4	Big business machine
Tandy TRS-80 Model III	£1,299	Z80A	2	48K		64×16	M		128×48	W		●	1	1		1		●	2×184K5¼F	TRS-DOS	Ba	●	T4	Latest TRS80
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80×24	M			W	2	●	2	1					2×1.2Mb8F	TRS-DOS	BaAs		T4	True 16-bit
Tandy TRS-80 Colour Computer	£240	6809E	1	16K	32K	32×16	Tv	●	256×192	W			1					●		Cassette	Ba	●	T4	Very popular
Tandy TRS-80 PC4	£50	Cust.	N/A	½K	1½K	12×1	LCD		12×1	C	9	●				1	1			Cassette	Ba		T4	Low-cost pocket computer
Tandy TRS-80 Pocket Computer 2	£130	Cust.	1.3	2.6K	16K	26×1	LCD		156×7	C	6	●						●		Cassette	Ba		T4	Plotter available
Televideo TS-80ZH	£4,533	Z80	4	64K		80×24	M		80×24	W	15	●	2			1			1×256K5¼F+1×7Mb5¼H	CP/M		●	C11	Recently upgraded

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Televideo TS-800 Series	£1,495	Z80A	4	64K		80×24	M		80×24	W	15	●	2			1				CP/M		●	C11	Standard CP/M machine
Televideo TS 1602-C	£3,714	8088	5	128K	256K	80×24	M		576×424	W	15	●	2			1			2×256K5¼F	CP/M-86		●	C11	Graphics, but no colour
TI Professional Computer	£2,386	8088	5	64K	256K	80×25	M			W	12	●		1					1×320K5¼F			●	T5	Choice of operating systems
Texas Instruments TI-99/4A	£150	9900	3.5	16K	52K	32×24	Tv(M+)	●	256×192	W						2		●		DOS	Ba	●	T5	This has sprite graphics
TI System 200-250	£6,695	9900	4	64K		80×24	M		80×24	W	12	●	1						1×5Mb5¼H	UCSD-P, PX10		●	T5	Bigger version available
TMK 332	£2,242	8085A	5	64K		80×24	M		190×96	W	22	●	2	1					2×320K5¼F	CP/M	Ba	●	P5	*6502 I/O processor
Torch	£3,214	Z80*	4/2	96K		80×30	TvM	●	640×256	W	15	●	1	1		4		●	2×400K5¼F	CPN	Ba	●	T6	CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80×25	TvM	●	640×200	W	8	●	1	1	1		2		2×256K5¼F	CP/M	Ba	●	O4	Pro test March 18
Toshiba T-200	£2,242	8085	2.6	64K		80×24	M		80×24	W	15	●	1		1				2×256K5¼F	CP/M	Ba	●	O4	Standard CP/M machine
Transam Truscan	£1,983	Z80A	4	64K		80×24	TvM		640×288	W		●	2	1		1	5		2×190K5¼F	CP/M		●	T7	S-100 machine
Transtec BC2	£1,949	Z80A	4	64K	256K	80×24	M		80×24	W	13	●	2	1			8		2×386K5¼F	CP/M		●	T8	Fully definable characters
Triton 4	£5,744	Z80A	4	64K	160K	80×24	M			W	8	●	1	1			3		2×1.2Mb8F	MPSL-BOS		●	T11	Upgradable to Winchester disk
Vector 4	£3,852	8088	5	128K	256K	80×24	M	●	640×312	W	15	●	1	1		1	2		2×630K5¼F	CP/M, CP/M 86	Ba	●	A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80×25	M		800×400	W	7	●	2	1			4		2×600K5¼F	CP/M 86, MS-DOS	Ba	●	D8	Same as Sirius 1
Wicat 150	£6,846	68000	8	256K	1.5Mb	80×25	M		400×300	W	20		2	1			1		2×616K5F	MCS	Ba	●	S10	Upgradable to 32 user system
Wilkes YD8110	£4,025	8086	5	128K	896K	80×24	M	●	960×624	W	21	●		1			6		2×1.2Mb8F	CP/M 86	Ba	●	W2	Standard CP/M machine
Xerox 820 Model II	£2,415	Z80A	4	64K		80×24	M		1024×512	W		●	2	2			2		2×160K5¼F	CP/M		●	R4	Powerful graphics
Zenith 120-22	£2,978	8088	5	128K	192K	80×25	M		640×225	W	18	●	2	1	1	1	5		2×320K5¼F	CP/M, MS-DOS, Z Basic		●	Z1	Graphics includes turtle
Zenith Z89-81	£1,668	Z80	2.5	48K	64K	80×24	M			W		●	2	1					1×100K5¼F	CP/M	Ba	●	Z1	Elderly CP/M machine
Zeus 4	£5,400	Z80	4	64K	320K	80×25	(M+)		80×25	W	11	●	10						1×6Mb5¼H+1×250K5¼F	CP/M, Muse	As	●	M5	Designed as multi-user

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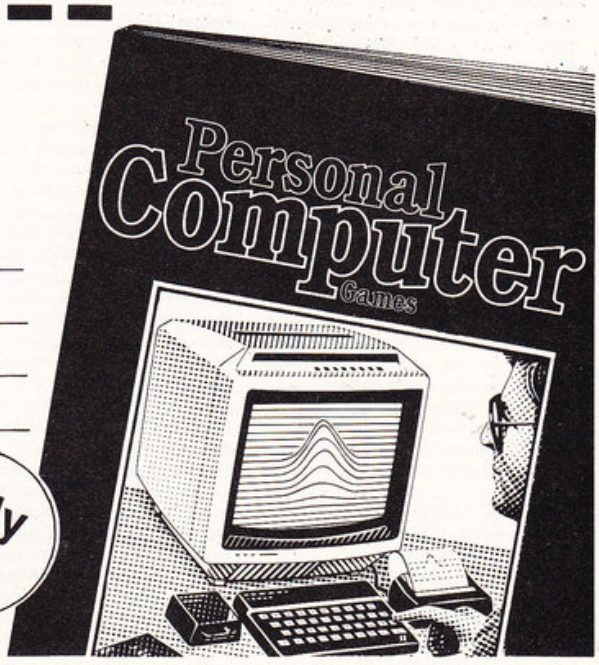

PCN Billboard

Help. Have printout of Apple program made for TV. I own BBC B, hence problem. Never been published. Tel: John. 0202 296253 (Bournemouth).

Atari VCS, Space Invaders, Asteroids, Defenders, Pitfalls, Missile Command, Vanguard, Star Raiders, Berserk, Adventure, Superman, Haunted House, Super Breakout, Outlaw, Combat, cover, £140. Tel: 0703 869775.

Atari 400/800 software Centipede, Missile Command, £20 each; Preppie £15. SSAE for details to Y P Cheung, 15 Albert Road, Retford, Notts DN22 6JD.

BBC DFS wanted, also software wanted to exchange/buy. Vic-20 software also wanted for BBC software. Tel: Martin on 0924 404921 (after 6.30pm please.

Sharp MZ80K (48K), plus Dot matrix, printer and interface unit. As new + £100s software. Bargain buy at £500 ono. Tel: 01-891 3413 (evenings).

Atari VCS plus 22 cartridges including Pac-man, Defender, Kaboom, Asteroids, Missile Command, Space Invaders. Cost over £500, will accept £150. Tel: 01-969 5255 (before 6pm).

Casio PB-300 Personal, Basic incredible, portable, built-in printer, cassette interface possible. Business, games, scientific applications. Offer includes manual, charger. S.A.E. for info £89. Terran, 17A Regents Park Road, London NW1.

Hewlett Packard HP-41 CV programmable calculator with card reader and printer, excellent condition, might sell separately, £200 ono for all equipment. Tel: Pill 2029 (after 7pm).

BBC B 1.2 + DFS + Shugart disk drive + Wordwise word processor + AP100A graphics printer + over £100 software. Worth £1,200, accept £850 ono. Tel: Kevin, St Athans 751241 (evenings).

Pet 32K 12in screen cassette player, toolkit type chip, 44 programs inc Arcades Petchess. 18, months' old, immaculate condition. Reasonable offers. Tel: 0332 556503.

Atari 400 48K, four months' old, including Recorder, Basic cartridge, manuals and over 40 program listings. Must sell, £200 ono. Tel: Dundee (0382) 76554.

ZX81 16K complete with manual and books, 25 taped programs from 3D Monster Maze to World Cup, all for £65. Tel: Silverstone (0327) 857596.

TRS-80 with new monitor, cassette, sound, hi-res, books, manuals. Very large software collection. Value £1,000+. Accept £390. Without software £340. Tel: Long Eaton (06076) 68602.

ZX81 16K games to swop. Excellent games, i.e. 3D Monster Maze, 3D Defender etc. Tel: Garston 61468.

Seikosha AP100 printer; Centronics interface with cable, only six months' old, little used, £175. BBC Rocket Raid and Arcade Action, £6 each. Tel: Broadstone (0202) 698015.

Vic-20 Super Expander cartridge, books, magazines, cassette software. Excellent condition, boxed, as new, quick sale, £100 ono. Tel: Adam on 01-727 3606.

Sharp MZ80K 48K, excellent condition, much software including Pacman, Frogger and Pascal Forth and several Basics, ROM listing and manuals, Zen Assembler with compatible disassembler, £320 ono. Tel: Cheltenham (0242) 23091.

T199/4A for sale inc Parsec Soccer, Invaders, Yantzee manuals, leads, three months' old. Accept £130. Tel: 041-883 1522 (weekends or after 6pm).

ZX81 16K Maplin keyboard, manual, leads, power pack, modified keyboard port, 80 games. Full working order. Worth £180, asking £120 ono. Tel: 0632 852455.

Wanted. 16K ZX81 RAMpack in reasonable condition, £10 ono. Tel: Crawley (0293) 514201 (anytime).

Sharp MZ-80K, one year old, excellent condition. Software including Basic Toolkit, Chess, Munchies and Scrambler extra orogramming manual. All for £300. Tel: Rowe, 0285 4194.

Lynx 48K, £185, boxed, as new. Also books, manual and software etc. Tel: 01-399 4321.

BBC Micro games: Snapper Planetoid, Rocket Raid, Meteors Arcadians, Monsters, all for £20. Send to E P S Mackenna, Paridae House, Fishers Wood, Sunningdale, Ascot, Berks SL5 0JF.

Atari 400/800 for sale, E.M.T. Jumbo Jet Pilot, six weeks' old, £25. Tel: 0443 225009 (after 5.15pm Mon-Fri).

Bargain offer! Atari 400 (16K) with Basic, manuals, joysticks, recorder and Miner 2049'er, Preppie, Baja Buggies guaranteed. £160. Tel: Hexham 604294.

Sharp MZ-80K 48K, 18 months' old, includes books, user notes, joystick and Epson printer card, £240 ono. Tel: Milton Keynes (0908) 677508.

Sharp MZ-80K software to value of £400+. Includes Wordpro, Calc, Database, Forth, Sargon, Draughts, Bridge, Othello, The Valley etc. £75 ono. Tel: 0908 677508.

UK101 8K RAM, cased, 300/600 BAUD, ½ Maz, sound, joysticks, simple output port, number pad, many games, Forth. £100 ono. Contact M. Leslie, Welwyn Garden City 35949.

Apple II plus with two disk drives, printer, reference guides, mint condition, unwanted competition prize. £1,800 ono. 27 Blenheim Park Road, South Croydon, Surrey. 01-686 5471 evenings.

Acorn AP-100A printer, £238 ono, inc paper, friction feed, dustcover, connections + manual. Two weeks old, working perfectly. Tel: Medway 51777 after 6pm. (P.S. includes screendump).

Atari computer cartridges, Defender, Wizard of War, Jumbo Jet pilot, Centipede, K-Razy Shoot-out, Missile Command, Asteroids. £14 each. Tel: (0253) 403994.

ZX81 plus 16K RAMpack, plus manual, leads, plus Quicksilva Scramble. All boxed, excellent condition. Accept £40 for quick sale. No offers. Tel: Neil, 0224 820940.

The overwhelming response to PCN's Billboard service is causing delay in publication of some advertisements. To solve this growing backlog and to cover some of the publication costs we are now charging £1.50 for each ad. Every form received at PCN's offices, 62 Oxford Street, London W1A 2HG, must be accompanied by a postal order or cheque for £1.50 made payable to VNU Business Publications.

Vic 20 software. Sargon 2, £15; Vicat, £5; Krazy Kong, £4; Arcadia, £3; Space Storm, £2.50; Andes Attack, £4; or the lot £30. Tel: 031-556 5233 (evenings).

Korg Mono/poly, £450; Powertrain Vocoder, £190; or part exchange for Apple computer with disk drive. Stuart, 59 Saint Mildred Road, London SE12. Tel: 01-253 4399, ex 3828.

Dragon 32, complete with joysticks, cartridge, games cassettes, original box and as new, £155. This also includes lots of books. Mr S Kwan, 25 Milton Road, Gravesend, Kent. Tel: 0474 64608.

Atari machine code copier with five games, £5; or will swop for Atari books. Also Caverns by Titan, £4. Tel: Hartlepool 78064.

Philips G7000 Videopac console plus Satellite Attack and Skiing for only £50, boxed, five months' old. 7 Elmbourne Drive, Belvedere, Kent. Tel: Erith 40403.

Acorn Atom, fully expanded, lots of software, complete with original packing, manual, leads, PSV, program books, magazines etc. Bargain for £118. Tel: Omar now! 01-472 3507.

Vic 20 + cassette deck + 3K RAMpack + £90 software including cartridges + Super Expander + joystick + book. Worth £250, will sell £200. Tel: Yorkshire, Bradford 587480.

BBC B 1.2 OS, as new, plus new compatible cassette recorder, books and Acornsoft games; seen in Southgate, North London, £415. Tel: 01-882 4444 (daytime), 01-368 2756 (evenings).

Atari 400 48K + recorder, joysticks, Basic and manuals, games, Defender, Galaxian, Gorf, Shamus, Caverns of Mars, Centipede, Star Raiders, Pacman, Apple Panic, Missile Command, Space Invaders – blank cassettes, programme magazines. All boxed, all under guarantee, everything less than six months old, can deliver anywhere. £650 new, will accept £450 ono. Tel: 041-647 3770 after 7pm.

Teletype Model 33, complete with floorstand, papertape punch and reader. Excellent condition. £49. Tel: Hemel Hempstead (0442) 67918 after 6pm.

LYNX 48K boxed, 5 months old. Excellent condition. Reason for sale upgrading to Apple. Accept £150 for quick sale. No offers. Tel: 0224-820940 (Neil).

Wanted Epson MX80FT/3 printer in good condition with Centronics interface. Tel: Hemel Hempstead (0442) 67918 after 6pm.

Commodore 64, brand new, manual, TV and power leads, in box, two weeks old, unwanted gift. £250 ono. Contact Phil, tel: 0732 844339 (evenings). Larkfield near Maidstone, Kent.

Spectrum software for sale: Arcadia, Spectres, Scramble, Planetoids, Inheritance, GB-Ltd, Timegate and many more. All £2.75 each. Mike Russell, 10 Gwastod Terrace, Abertillery, Gwent.

BBC Model B, plus 15 MHz RGB monitor, both under guarranty, lots of software and books, £550. Genuine reason for sale. Contact Steve 0925 50485.

Oric printer cable £15, suit any printer with Centronics interface. Tel: 0222 568924 after 6pm.

Vic 20, C2N, +8K, Ratrace, Jelly Monsters, Boss, Vic Revealed, Joystick, Arcadia, Frantic. Sell £300 or swop for BBC B. Tel: St Helens (0744) 52354 evenings.

Sharp MZ-80A plus manual and many programs including Pac-man, Chess, Fender. Eight months old, £400. Tel: Nantwich (0270) 780084 evenings.

Atari 400/800 software, 10 games, £12 each or £20 for two. Tel: 0732 863815 after 4pm.

Atari game cassettes, all originals with instructions, 16 + 32K. Cost £350, £125 ono. Tel: Broadstone 691306.

48K Oric for sale + £230 of software, as new in box + 2 cassette leads. Tel: Orpington 33369. Will have to collect, £150.

BBC compatible printer, Star DP8480 dot matrix, 80 col, 80 cps, hi-res screen dumps, Centronics, tractor/friction feed, excellent value. Deliver in Kent. £225 ono. Canterbury 750600.

Exchange Atari video computer system, under guarantee, plus seven cartridges for ZX81-16K and ZX-printer or Spectrum. Robinson, 21 Summerfield Road, Luton, Beds, LU1 1UH.

S100 bus card frame and case, mother board takes 12 edge connectors, six fitted, case size 420mm x 290mm x 195mm, £55 including postage. Tel: (021) 357 7621 evenings.

Spectrum software: Meteor Shower, Spectral Invaders, Space Intruders. Books: Cambridge Colour Collection, Over The Spectrum, £15 altogether. Clive Newton, 371 Llantarnum Road, Cwmbran, Gwent.

Pet 16K Basic 4 cassette deck plus manuals, magazines, software etc, £100. Philip Samsworth, 32 Highbridge Road, Aylesbury, Bucks. Tel: Aylesbury 86310 buyer collects.

TRS80 16K Model 1, still in box. Excellent condition with software. Sell for £195. Tel: 021 449 8699 ater 5pm. Ask for Abid.

ZX81 complete with television, cassette recorder, manual and tape, £60 ono. Tel: Winchester 883306.

16K ZX81 software for sale or swop, including Flight Simulation, Gulp, Scramble, Black Crystal, Asteroids and Castle Adventure. Tel: Blyth (Notts) 791.

Sell or swop excellent Spectrum software (16K/48K). Must sell Casio FX502P personal computer with manuals, cassette interface etc., £40 ono. Tel: 01-531 2892.

48K Lynx three weeks old, not even opened. Full year's guarantee, all leads, manuals, PSU software, unwanted gift, unused, £200 no offers. Tel: Waltham Cross 28173 (Clive).

Oric-1 48K, new Rom. Six weeks old, owner needs cash, free Zodiac adventure, original packing, £145 ono. Tel: 01-669 6487 evenings.

28K Vic20 extra 3K, includes cassette player, joysticks and over £70 worth of software including Defender, Space Invaders, ROM cartridge and Chess. Cost over £430 accept £250. Tel: 01-954 5005 (Stanmore Middx).

Atari 400 with Basic cartridge, program recorder, two joysticks, three manuals, Star Raiders, Missile Command and Pacman cartridges. Worth over £400, accept £250. J. Trainor, 1 Park Drive, Littleover, Derby.

Spectrum and ZX81. I buy all your unwanted original software tapes. Send list with prices to: Will Denissen, Alpenlaan 105, 5022 LH, Tilburg, Holland.

BBC disk manual wanted in good condition. Tel: Cambridge (0223) 245799.

Acorn Atom 12K, 12K floating point ROM, various software and books, leads and power pack, £110 ono. Tel: 01-644 7351 evenings.

Vic 20 Adventureland cartridge, sell or swop for another Vic adventure cartridge game, £20. Tel: Guildford 571878 after 6pm.

32K ZX81 with DK Tronics professional keyboard, also £50 of software and books, £10 of magazines and compactable tape recorder, mint condition, a gift, £100 ono. Tel: Wrexham 758842 after 5pm.

Software for Vic 20, cartridges, £10. Original cassettes, £3. All leading software houses, sale due to change of machine. Tel: 0772 323148 (Preston, Lancs).

Vic 20 software, Bomb Against Time, At The Races, Bingo, Higher or Lower, Noughts and Crosses, all five games, £2.50. Gary Cochrane, Montana, Silksworth Lane, Sunderland SR3 1PD. Tel: (0783) 227774.

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Adventure games, Scott Adams, Voodoo Castle and Adventureland plus Omega Race, exchange for other Scott Adams games. Tel: Kirkcaldy (0592) 68181 ext. 159 daytime only. (Saywell).

TI-99/4A with cassette leads, magazines and games tape, total cost £170, three months old, sell for £135. Tel: Leicester (0533) 707351.

Philips C7000 TV game, four cartridges, also can be simple computer, £60ono. or swop for a ZX speaker. Tel: Hastings 428318 4-9pm.

Software for BBC B and Vic 20, Vicmen, £3, Myriad Hopper both £5, Acornsoft Chess. Planetoid, both £5. Vic joystick, brand new, £4. Tel: 01-460 3171.

ZX81 16K video inverter plus £100 worth cassettes, books, programs, still under guarantee. Total cost over £160, will accept £90 ono. Tel: Southend (0702) 617608 after 6pm.

Exchange complete Super-8 cine kit, camera, projector, editor, splicer, + films, + cash for computer, any make considered. Contact me at: 31 Burdon Close, Newton Aycliffe, Co. Durham DL5 4ES.

Pirates Cove adventure cartridge for Vic 20, good condition, £15 ono. Tel: Hitchin 811696 after 6pm.

ZX 81 plus 16K RAM, ZX printer, Kayde keyboard, leads, manual etc., hardly used, all in A1 condition, only £70. Tel: Ingrebourne 70937.

ZX81 plus 16K RAM pack, little used, £60 worth of software, all boxed, total value £140, will sell for £70. Tel: 0564 826 781 after 6pm.

Wanted: 48K Camputers Lynx, needs to be in excellent condition, will pay up to £175, collect in Leeds area. Tel: Dewsbury 466179 after 6pm.

Acorn Atom 12K RAM and 12K ROM, complete with PSU leads, 3 books and software, which includes Galaxian. Sell for £125. Tel: Cardigan 0239 612821 after 4.30pm.

Swop Atari 400/800 Centipede cartridge for Wizard of Wor or Gorf cartridge. Tel: 04446 41118 after 4pm.

Sinclair ZX81, and 16K RAM, plus £60 worth of software, some educational, all boxed, total value £140, accept £70. Tel: 0564 826 781 after 6pm.

Acorn Atom 12K + 12K + VIA, Acorn PSU, leads, manuals, original box, vgc, software, Atom Forth, Protector, Star Trek, 42 column soft VDU £140 + carriage. Tel: Richard (0536) 519667 after 5pm.

Philips G7000 Video Computer Console with four cartridges, very good condition, £95 the lot or swop for a Spectrum 16K. Appleton, 5 Throstle Drive, Middleton, Leeds LS10 4JW.

ZX Spectrum software, sell or swop Penatrator, Galaxians, Football Manager, Chess, Arcadia, Ground Attack, four adventure games £3 each. Tel: Rossendale, Lancs 216238.

BBC B 1.2 ROM, Apple II, monitor joysticks and software under guarantee £400 ono. B. Whateley. Tel: 0742 397136, Sheffield.

VIC 20 cassette unit, software beginning Basic Part One, books, everything in immaculate condition, sell for £135 ono or will swop for 16K or 48K Spectrum. Tel: Richard, 021-357 9900.

Acorn Atom fully expanded, BBC Basic, F/PROM, Willow Utility ROM, Toolbox, two Atom books, soft VDU, Invaders, Peeko-Computer cassettes £210 ono. Tel: Sheffield (0742) 339003 after 7pm.

Vic 20 C2N cassette, Super Expander, Programmer's Reference Guide, Vic Revealed, heavy duty joystick, much software, 80+ magazines, still under guarantee £200 ono. Tel: Perranporth (Cornwall) 3592.

If you nave any programs for the Vic 20 and would like to swop them, Tel: Burgess Hill (Sussex) 5869 weekends or evenings after 5pm.

ZX81, 16K RAM, Filesixty keyboard in original packaging with software, £60 ono. Tel: 01-272 9911.

Mattel Intellivision, plus 5 cartridges including Golf, Soccer, Basketball, Boxing, Astrosmash, sell for £100 ono. Tel: 01-540 5600 after 5pm.

Sinclair ZX81, and leads, power pack and programs book, plus £60 of software, includes: Fun to Learn series, Flight Simulation etc, cost £140 accept £70. Contact 0564 826 781 after 6pm.

CB Home Base rig, incl. 120 channel Silver Rod Antenna, 5-amp power pack, 20ft heavy duty cable £90 incl. vgc, need money to buy Spectrum. D. Kelly, P.O. Box 109, Rathcoole, Co. Dublin, Eire.

ZX81 (16K) + Kempston keyboard + Zon-X sound unit and Spectrum board + over £20 software, manual, leads etc. Cost over £180, accept £127 ono. Mint condition, offer includes one book. Tel: S. Kenton on 01-660 6007.

1K ZX81 with power pack, leads etc for £30. 16K Memopak for £20, tape recorder with well over £100 worth of games for £60. Will sell together for £100. Tel: Exeter 71723.

Vic 20 Mission Impossible cartridge, Pharoahs Tomb, Space Storm, for swop with similar software. Tel: Swindon (0793) 615299 (days), or (0793) 823806 eves.

Spectrum software, five tapes, Vu-Calc, Plantetoids, Space Raiders, Hungry Horace, and Horace Goes Skiing, new condition, sell for £20, will split, offers (16K). Tel: Eastergate 2244.

ZX81 + 16K RAM, sound board I/O port, books, software, Monster Maze, 3D Defender, Gulp etc. Will split and offers accepted, £115 ono the lot. Tel: Waltham Cross 30077 eves, ask for Gary.

BBC Micro software: Program power Swoop £4, BBC soft drawing package £7 or the pair for only £10! Original tapes. 12a The Avenue, Stoke Bishop, Bristol BS9 1PA.

TI 99/4A cassette leads, manuals. Extended Basic, Minimemory (Assembly + extra RAM) Parsec, Chess, Video Graphics, plus games cassette, £350. Tel: Rushden 316486.

16K ZX81 + ZX printer, £30. Software including 3D Defender, 3D Monster Maze, Progmerge etc + two books, mags, value after Sinclair price cut, £145, sell for £90 ono. Tel: (0344) 882295 (after 3.30pm).

Vic 20 + 8K RAM pack, cassette deck, joystick, lots of software including Andes Attack, Traxx, Blitz, Amok, Asteroids, Invaders, only six months old, cost £225 accept £119. Tel: Rochdale 33475.

SWOP Elvis record collection worth over £700 for Atari 800 48K with disk drive or similar. Write with details, 34 Wilson Terrace, Silksworth, Sunderland, Tyne & Wear.

ATARI 400 16K, still under guarantee (boxed), programmers kit, cassette deck, Pointmaster joystick, over 60 games, Shamus, Darts, Caverns of Mars etc. Worth over £800, accept £450. Tel: Swanley 67367.

Atari VCS + 8 cartridges including Asteroids, Space Invaders, Star Raiders and Adventure. Cost over £250, sell for just £170 ono. Tel: 0603 53597 (Norwich) after 6pm.

ZX81 with 16K RAM, including manual, six games, Munchman, Defender, Bomber, Space Invaders, Asteroids, Monster Maze, five months old, £70. Tel: Royston 72195 after 6pm.

Intellivision system, plus four cartridges — Soccer, Lock 'n' Chase, Tron + Demon Attack £99 ono. Also Atari VCS + Combat £50 ono. Tel: 01-980 7058.

Intellivision with voice module and 13 games, still under guarantee, best offer over £200. Tel: 01-891 3079.

TI 99/4A + Parsec cartridge, joysticks, cassette leads and software £150 ono. Tel: Glenboig (0236) 874389.

ZX Spectrum business/home programs, Database, Mailist, Home A/C, Commercial A/C, Stock Control, worth £20 each, will accept £5 each or £25 the lot. K Lim, 11 Bramley Road, North Kensington, London W10 6SZ, s.a.e. please!

Atari VCS plus Combat, five months old, £70 o.n.o. Tel: Knarr Cross 262.

Quality games wanted for Atari 800, in good condition. Tel: Knarr Cross 262.

Atari VCS, nine cartridges including Asteroids, Maze Craze, Basic Programming with keyboards worth £270, will accept £135. Tel: Bromsgrove (0527) 73186 evenings.

Atari VCS and seven cartridges including Asteroids, Warlords, Yars Revenge and Star Wars etc, original box, bargain £135. Tel: Leatherhead (0372) 376883.

ZX81 16K plus £100 of software which includes Invaders, Pac-man, Defender, Asteroids, Scramble, etc. plus magazines, worth £160. Bargain at £75 o.n.o. Tel: Leeds (0532) 691952.

Wanted Apple II computer system, disk drives, monitor and printer. Will collect London area. Tel: Mike, 01-582 3261.

Dragon 32 unwanted birthday present, two weeks old, under guarantee for one year, over £15 of software with over 35 programs. Bargain £195. Tel: Harlow (0279) 30665 after 4pm.

ZX81 16K with manual and leads plus three tapes, Monster Maze, Defender, Space Raiders, worth £88.95, sell for £65 o.n.o. Good condition. Tel: 01-402 8551 evenings, must sell.

Joysticks, for BBC Micro, brand new, still boxed, £10. Tel: Twyford (0734) 345959 after 6pm.

BBC software, swop: Castle of Riddles, Atlantis, Leapfrog, Monsters, Asteroids, etc. Wanted: Painter, Road Runner, Snooker, Missile Base, Starship Command, anything considered, originals only. Tel: 031-449 3471 after 6pm.

ZX81 16K as new, boxed, complete with manual, £42 o.n.o. Tel: Newcastle, Staffs (0782) 618400 (Martin).

Atari 400 16K complete with Basic cartridge and Basic manuals, also Star Raiders, Energy Czar, Submarine Commander and two joysticks and tape recorder. S Shulman, 1A Prince Arthur Road, London NW3 6AX.

16K Spectrum with seven M/code games + five rolls of printer paper + about 15 Basic programs on tape + magazines worth over £175. Sell for £130 o.n.o. Tel: 01-570 7830, ask for Paramjit. Wanted, BBC Model B.

ZX81 16K RAM (Sinclair) and program book and two cassettes, £25. Tel: 01-693 8248 after 6pm.

Atari 400 plus Atari tape recorder, 16K RAM, joysticks, games including Star Raiders, Basic cartridge plus manual as new, only three months old. S Shulman, 1A Prince Arthur Road, London NW3 6AX.

I will swop Atari VCS including Starmaster and Chopper Command worth £140 for Vic20 16K RAM pack in good condition. Tel: 01-593 6579 after 4pm.

Mattel Intellivision console plus Intellivoice (voice synthesis module) one voice cartridge, also 13 normal cartridges, five months old, worth £460, will accept £350 o.n.o. Tel: (0324) 562051 (after 5pm, weekends).

Centronics printer cable for BBC suit Seikosha etc, 36-way ampenol plug, to 26-way, £13. Tel: Spilsby (0790) 52120 (Mr Swanson) after 5pm.

Atari VCS boxed complete plus Othello, Casino, Asteroids, Missile Command, Bowling, Basketball, Air-Sea Battle, Combat, £80. Tel: 01-577 3593 evenings.

Atari VCS cartridges, Slot Racers, Outlaw, £10 each. Atari 400/800 cassette North Atlantic Convoy Raider exchange for similar cassette. Tel: Wilkinson, Scunthorpe 845252.

BBC B Acornsoft Meteors, Arcadians, Rocket Raid, Philosopher's Quest, Castle of Riddles, £8 each o.n.o. Bug Bite, Dragons Quest, Fruit Machine, Program Power, Alien Destroyers, Moon Raiders, offers. Tel: (0332) 672897.

ZX81 16K, plus keyboard and two manuals, including M/code, £60 ono. Tel: 01-450 9652 evenings.

Vic 20 C2N cassette unit with programs, joystick, 4 games including Space Invaders, 8K RAM cartridge. New from Christmas £70, or sold separate. Tel: Swansea (0792) 865345.

Spectrum software original tapes Flight Simulation, Chess £4, Adventure B Inca Curse, Space Raiders £3. Tel: (0332) 559233 after 5pm or weekends, ask for John Bell. Also Vic 20 programs.

Atari VCS still with warranty plus cartridges Combat, Starmaster, Missile Command, Defender, Raiders of the Lost Ark, £130 ono. Tel: 01-731 0435 after 6pm.

Sharp MZ80K, 48K RAM, 10 months old, boxed with dust cover, 2 basics, Pascal compiler, Assembler plus other software, books etc, £350. John Harrison, Hatfield College, Durham DH1 3RQ.

Acorn Atom, 8K ROM, with audio computers 64K RAM card. Value, without PSU, £204, asking £130, inc PSU. Tel: 0527 43037, Mike Powell, 2 Downsell Road, Webheath, Redditch, Worcs. B97 5RT.

Interton VC4000 plus five cartridges (cost over £200), bargain £75. Also Aculab floppy tape system for Video Genie, £75. Tel: Carlo, 01-732 6456, Peckham, London.

ZX81 character board, allows redefining of 128 characters + mother board, over 15 16K tapes, some for use with board. Bargain at £20, will separate. Tel: 01-291 3318 after 6.30pm.

ZX81-16K all leads, power pack, plus battery pack, ten program tapes plus books, all five months old, £85. More details, West Kingsdown (Kent) 2039, evenings.

Jupiter Ace for sale, £60. Tel: Chesterfield 70730 after 6pm.

Wanted ZX81 magazine for less than brought price, write to Sara Hill, 26 Hamilton Road, Wimbledon, SW19. Hurry, hurry, swop magazines on all other computers.

Atari VCS with Donkey Kong, Asteroids, Air-Sea Battle and Combat, good condition but needs adapter, will accept £75 ono. Tel: 01-920 7149, Crosby, after 4pm.

Sharp PC-1500 Pocket Computer + three pocket computer books for sale, £125 ono. Tel: Oxford (0865) 58152, evenings. Unwanted gift.

Interton VC 4000 + five cartridge, Invaders, Hyperspace, Golf, Boxing and Cockpit, excellent condition, worth £140, bargain at £75. Tel: Ascot 22942, (after 3pm).

BBC software to sell or swop, including Acornsoft Program Power, IJK and Level 9 Computing. Tel: 01-808 8906 after 6pm.

TRS 80 16K LII complete with manuals, leads, large amount software including 12 adventure games. Software alone is worth £100+, total package only £280. PJ Buxton, 33 Argles Road, Leek, Staffs. Tel: Leek 371231 anytime.

For sale, Zenith E camera plus 300mm lenses plus tripod plus carrying cases, worth over £130, will sell for £80. Tel: Goole (0405) 60700 or write to 14 Hood Grove.

PCN Billboard

Vic20 3K RAM expansion, £17.50 o.n.o. Tel: Hetton le Hole 264435.

Three pairs of snow skis, one pair with carrier and sticks, one pair with boots and sticks, will swop for Atari printer or sell, offers. Tel: 01-584 1151.

TRS80/L2 Genie panic fast M/C arcade game + 2 other M/C programs, £3.95. C Wilson, 5 Durward Drive, Glenrothes, Fife KY6 2LB, Scotland.

11-5K Vic20, C2N cassette, joystick, Pirates' Cove, adventure cartridge, £100 worth of games including Defender, Omidor, Power Closter, complete with manuals and magazines, four months old. Tel: Huntingdon 860482.

Spectrum 48K, ZX printer, Tensai cassette, custom carrying case, manuals, books; software: Vu-call, Flight Simulator, Home Accounts, boxed, as new. £230. J Wingate, 32 Gastein Road, London W6 8LU.

Exchange EMI submarine Commander for EMI Soccer or Star Raiders, buying any Atari 400/800 software, details to R Drinning, 12 Carlton Terrace, Swansea SA1 6AB. Tel: Swansea 43125 anytime.

WANTED, members for a 16K ZX81 postal software swopping club: Send SAE with list of software you have to Greenhaven, Clay Lane, Whitegate, Wingford, Cheshire CW7 2QE. First ten people accepted only.

Sinclair ZX81 and 16K RAM, plus £60 worth of software (some educational) all boxed, total value £140, accept £70. Tel: 0564 826 781 after 6pm.

Atari 800 48K disk drive Microsoft basic, Macro Assm, text editor manuals disk tool, lot's programs, games worthy books, total £1,200, will sell for £850. Tel: 021-449 2840 after 7pm, Taz.

Epson (RS232) 2K buffer serial interface board for MX, RX or FX printers, brand new, unused, RRP £69, accept £50 for quick sale. Complete with instruction manual etc. Tel: (0295) 720812.

Exchange 1978 Skoka coupe, perfect'ish order, no paperwork, probate, for any system for beginner, prefer Min 32K with all extras including games: S Smith, 2A Dagmar Road, Dagenham, Essex.

Vic-20 computer, 16K cartridge, cassette recorder, Super Expander, joystick, Rat Race cartridge, introduction to basic part 2, £40 software, only £250. Tel: (0227 79) 3486.

Exchange complete CB system worth £200 for Vic 20 printer or disk drive or Commodore 64 or any other Vic hardware. Tel: Letchworth 6854.

Atari 400/800 owner would like to exchange games. Many games to swop. Tel: 0453 843828 after 7pm.

CBM3032 desktop computer with cover, built-in monitor, green display, 32K RAM, 3600 baud cassette, cassette decks, toolkit, resident assembler and disassembler, many programs, £500 ono. Tel: Lowestoft 64160.

Sharp MX80K 48K 4MHz CPU double speed cassette reset switch, extended Sharp basic, Xtal basic, Zen Assember, Disassembler, Probe, games etc, £299 or swop Epson MX80FT or WHY. Tel: Guildford (0483) 33536.

Atari VCS excellent condition, plus three cartridges, £70. ZX81 plus 16K and software, great value, £40. Also Atari 400 sound and graphics book, £4. Tel: Chesterfield 852822 after 6pm.

ZX81 wanted 1K to 16K, or similar micro, must be in perfect working order + good condition, £20-£35. Also TV, (ZX81 compatible), £5-£10. Maximum £40 together. Tel: Herne Bay (Kent) 3348.

Newbrain Model A with Kuma word processing tape only two months from purchase and under guarantee, as new £200. Tel: Staley, Leeds, 0532 869178.

Sharp MZ80K software for sale, various business and games programs, all cassette varsions including Walkways, Creatures, Stock Control, Inventory, and many, many more. Tel: Runcorn (09285) 76911.

Technics SLQL1 linear tracking turntable only seven months old, cost £199 new, yours for only £150 ono. Tel: Allan (0454) 414708, 4.30-6.30pm. Will pay postage.

UK-20 original cassettes for sale, including Space Phreeks, Asteroids, Cosmiad and many, many more, £3 to £4 each. Also Cartridges at half price. Tel: 01-574 4122 after 5pm.

Spectrum software 16K/48K for sale, exchange, Chess Player, Flight Simulation, Penetrator, Death Race, T. Tower, etc, etc. Tel: Wigan (0942) 497352, 6pm to 7pm weekdays.

ZX81 1K with software, manual, leads and programs magazines, software includes Orbital Invaders, Skier, Star Destroyer and many more, worth £55, sell for £45. Tel: 01-501 0359 evenings, guaranteed.

BBC Genetic Engineer 32K (OSIO) + notes, demonstrates genetic crossing principles (O Level) via construction of model plants, £5.50. Tony Fewell, 91 Little Bushey Lane, Bushey, Herts.

For sale ZX81 machine code books, £6 each, also Hints and Tips for £3, and The ZX80 Magic Book for £4. Tel: Stonehenge 42324, evenings/weekends.

Texas TI 99/4A, brand new, hardly used, in original packaging, joysticks and Attack games cartridge included. Worth £190, sell for £120. Tel: 01-949 2351 after 7pm.

Atari 400 guaranteed and boxed, unwanted gift with two joysticks, Basic manuals, recorder and three games, Preppie, Miner 2049ER, Baja Buggies, cost £360, accept £250. Tel: Hexham 604294 (after 6pm).

Apple II software, ridiculously low prices, games include Choplifter, Frogger, Super Puckman, Sabotage, Chess, Raster Blaster, Snake Byte. Tel: Luke 01-589 8801, weekdays 4-8pm and weekends.

Tele-Type, Data Dynamics, model 390, includes Punch, Reader, spare paper, stand and TTL interface, £60 ono. Tel: 0703 845734.

Swop, Vic20 Adventureland or Mission Impossible for Pirate Cove or Voodoo Castle or The Count. Tel: 0924 370494.

Wanted, Nascom disk system or Micropolis drives (no controller board required) or cheap CP/M computer-bridge. 363 Kennington Lane, Vauxhall, London SE11.

Oric 1 48K, mint, full manual cassette lead, £145. Tel: Sheffield 460004.

16K, Spectrum with book Arcadia and Spectrum tape header reader programs and about £20 worth of mags. Worth £160, offers. Tel: 01-267 6201.

Atari VCS with nine cartridges including Star Raiders, Asteroids, Defender, Pac-Man, Riddle of Sphinx, Pitfall, extra paddles for four players, cost owner £350, accept £200 ono. Tel: Bob after 5pm, (0642) 763171.

Commodore 64 software, Attack of Mutant Camels £6; Renaissance £6; Hitch Hiker's Guide to the Galaxy £8, all original. Tel: Gary, 01-435 6500 days, 01-958 6408 eves.

Wanted — for TI 99/4A, computer adventure and pirate module in good condition, also any 99'ER magazine. Tel: Blackpool (0253) 64386 after 6pm (weekdays), anytime weekends.

Radofin colour TV game, plus Invaders, Codebreaker, Circus, Grand Prix cartridges, all in excellent condition, £40 for the lot. Tel: Holbeach 364061.

Vic20 Pirate Cove cartridge, £17 ono. Physics Revision pack as new £6, also Arrow of Death part 1 £5. Tel: Neil Rodgers, Sheffield 344427 days, 0742 698756 eves.

TRS 80 Mod L2 software, books, sound, spare cassettes, unwanted present, worth over £270, only four months, a bargain at £165 ono. Tel: Paul, Scunthorpe (0724) 782548.

Atari 800/400 Basic cartridge £20, Star Raiders, £18, all boxed and in perfect condition. Tel: 01-908 0492 after 6pm or Sundays, ask for Kenn.

Vic20 cartridge to sell including Golf, Chess, £15 each. Also Star Battle, Alien, Mole Attack and many more £11 each. Also cassettes for sale. Tel 01-574 4122 after 6pm.

Torch Z80 disk pack wanted, also BBC A interface and upgrade kits, and Epson MX80 FT III printer. Tel: 051-644 6568 after 6pm.

48K Spectrum four months old, £90. Over £120 worth of software, just £60. ZX printer with five rolls paper, £25. Tel: 0734 783563 after 5pm.

BBC B with colour monitor and cassette, also books and programs. All seven months old. Offers? Tel: Mansfield 550372 after 6pm, buyer collects, must sell.

Joysticks for the BBC Micro, brand new, still boxed, £10. Tel: Twyford (0734) 345959 after 6pm.

Intellivision plus Voice Module, eight cartridges, value £200+ will accept £160. Tel: 01-309 0743.

Spectrum 16K tapes, Silversoft Orriter, Abacus Avenger, £9 to lot, or will swop for BBC software. Tel: Danny, Wellingborough (0933) 673261.

Atari 400 three months old, excellent condition, Basic cartridge and various cartridges including Star Raiders. Simon Shulman, 1a Prince Arthur Road, Hampstead, London NW3 6AX. Tel: 01-435 7336.

Mattel Intellivision plus three cartridges, will swop for a Vic20. Tel: Bolton 61256 (Lancs).

For sale, ZX81 computer plus 16K RAMpack plus Chess and Gulp (Pac-man type game), three months old, £40. R Bruton. Tel: Glos (0452) 730213.

16K ZX81, professional keyboard, plus 12in black and white TV, £45 of software, all leads, manuals, books, magazines included, worth £200, bargain for £125. Tel: Steve, 01-859 2360 (Eltham SE9).

Acornsoft, Monsters and Snapper cassettes, £6 each or will swop for other BBC software. E Horn, 25 Ardnahoe Avenue, Toryglen, Glasgow G42 0DH.

Sharp PC1500, powerful pocket computer, perfect condition, expandable, cost £170, selling for £125 or swop for Spectrum or similar. Tel: Salford 061-792 3968, ask for Stefan.

UCSD p-system version IV for Apple, complete and unused with registration documents, superfluous to requirements. Offers around £350 (it cost £495). Tel: 01-286 8151 evening only.

Dragon 32K computer with hi-res, text cartridge, all leads, joysticks, games plus books, cost over £275, accept £175. Tel: Ely (Cambs) (0353) 4677 after 6pm and weekends.

Texas T199/4A 16K boxed, complete with leads, manual, also Basic for Beginners, cassettes and manual, including Budget Management and Personal Record Keeping modules, 16 colour graphics and sound, £240 ono. Tel: Farnborough (0252) 511248 any time.

Video Genie with many arcade games, £50 of magazines plus OPC computer monitor. Will sell for £210 ono. Tel: 01-857 4501 after 6pm and ask for Dave.

ZX81 1K four months old with leads, manual, cassette player and some tapes, mags. Write or ring Bryan O'Hara, 8 Knowlys Ave, Heysham, Lancs. Will accept £50. Tel: Heysham 52507.

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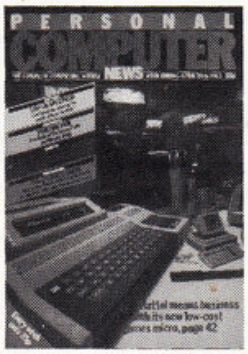
BACK ISSUES SERVICE

FILL THE GAPS IN YOUR PCN COLLECTION

Issue 1, March 11-18.
Pro-Tests: Apple's Lisa, Texet TX8000; Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.
Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).
Databasics: micros and peripherals.

Issue 2, March 18-25.
Pro-Tests: Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrum spreadsheet, IBM graphics, BBC word processing.
Features: Colecovision, micro backgammon, nursery computing.
Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).
ProgramCards: String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extract/replace.
Databasics: full software listings.

Issue 3, March 25-April 1.
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).
ProgramCards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).
Databasics: micros.
Micropaedia: Anatomy of the BBC, part 3.



Issue 4, April 1-8.
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunesmith (Oric), Array Editor.
Databasics: peripherals.
Clubnet: Clubs and user groups.
Micropaedia: Go Forth, part 1.

Issue 5, April 8-15.
Pro-Tests: Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.
Features: speech packs, monitors.
Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).
ProgramCards: Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.
Databasics: Software.
Clubnet: full list of user groups.
Micropaedia: Go Forth, part 2.

Issue 6, April 15-22.
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.
Features: IBM PC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Leeper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databasics: micros.
Micropaedia: Graphics, part 1.

Issue 7, April 22-29.
Pro-Tests: Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergraf on Victor/Sirius.
Features: Dealer support, Atari graphics.
Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).
ProgramCards: CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.
Databasics: Peripherals.
Micropaedia: Graphics part 2.

Issue 8, April 29-May 6.
Pro-Tests: Atari Home Files Manager, Kobra's Vic Stat for the Vic 20, Hestacrest's Accounts for the Spectrum; Epson RX80 printer, NCR's Decision Mate V, Future Computer's FX20.
Features: Micronet, Compact programming on the TI99/4A.
Gameplay: Harvester (Vic 20), Strategic Command (Dragon 32), A first Book of Micro Rhymes (BBC), Telling the Time/Money (Spectrum).
ProgramCards: Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.
Databasics: software.

Issue 9, May 6-13.
Pro-Tests: Structured Basic on the Apple, Pixel Power on the Vic 20; Star DP510 printer, Dams and Interpod interfaces for Commodore 64; Micro-Professor.
Features: BBC function keys, Atari word-processing part 1.
Gameplay: Dungeons of Intrigue (Oric), The Castle (Oric), Starship Command (BBC B), Dragon Trek, Nowotnik Puzzle (Spectrum).
ProgramCards: Lower case (Dragon 32), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MBasic).
Databasics: hardware.
Micropaedia: Graphics, part 4.

Issue 10, May 13-20.
Pro-Tests: Infomast on Commodore 64, Dragon Mace; MC202 and CMU800 music synthesisers (Apple), Prism directly coupled modem; Epson QX10.
Features: ZX81 graphics part 1; Atari word-processing part 2.
Gameplay: Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).
ProgramCards: Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).
Databasics: peripherals.
Micropaedia: Graphics, part 5.

Issue 11, May 20-26.
Pro-Tests: BBC Vufile, PFS:File for IBM, Apple Pascal; printer comparison, Pickard Joystick Controller for ZX81 and Spectrum; C9E Computer Board.
Features: ZX81 graphics part 2, Basic on the Sharp MZ80K.
Gameplay: Motor Mania (Commodore 64), Oric Flight, BBC Music Synthesiser, Music Maker (Spectrum), Embassy Assault (Spectrum), Tobor (Spectrum).
ProgramCards: Homeward Bound (ZX81), Connect Four (Dragon 32), CBM Database, cards 10 — end.
Micropaedia: Keyboards.

Issue 12, May 27-June 2.
Pro-Tests: Spectrum word processor, PFS:Report on IBM, File Handling for Colour Genie; CTI CP80 type 1 printer, TG Trackball; Sord M5.
Features: Epson Basic, Oric sound part 1, Tandy Colour graphics.
Gameplay: Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.
ProgramCards: Election Barchart (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).
Databasics: Hardware.
Clubnet: clubs (Cambridge Microcomputer Club special).
Micropaedia: Disk Drives, part 1.

Issue 13, June 3-9.
Pro-Tests: Telewriter for Dragon 32, Abersoft Forth for Spectrum, GPS graphics processing system for Apple II+; joysticks, rulers; Ajile.
Features: Dragon meets Tandy, Oric music part 2, transferring Basic for Colour Genie and Genie 1.
Gameplay: Everest Ascent (Spectrum), Colour Genie roundup, Micro Maze (Jupiter Ace), Qix (Atari).
ProgramCards: Cupid (Oric), Alien (Dragon 32), Time Bomb (Atari).
Databasics: peripherals.
Micropaedia: Disk Drives, part 2.

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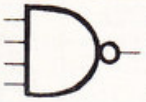

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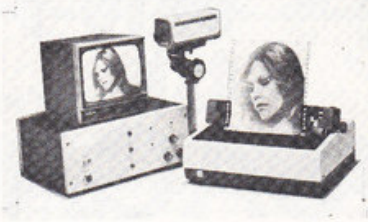

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SYNTAX ERRORS

Vizawrite righted

In our round-up of word processing packages for the Commodore 64 in Issue 16, we failed to mention the spelling checker available to use with Vizawrite. And, though, as our reviewer pointed out, Vizawrite's maximum text area is the equivalent of 875 40-character lines, more can be stored since unused parts of lines are ignored. So really it's a free-format area holidng up to 35,000 characters.

Next week

- The real 16-bit story: the chips in detail
- Software Pro-Tests: Stock control on Epson; Torchmail Plus
- ZX81 word processing
- New games reviewed: Atari, Apple, Commodore 64, Spectrum
- Make sense of micro insurance
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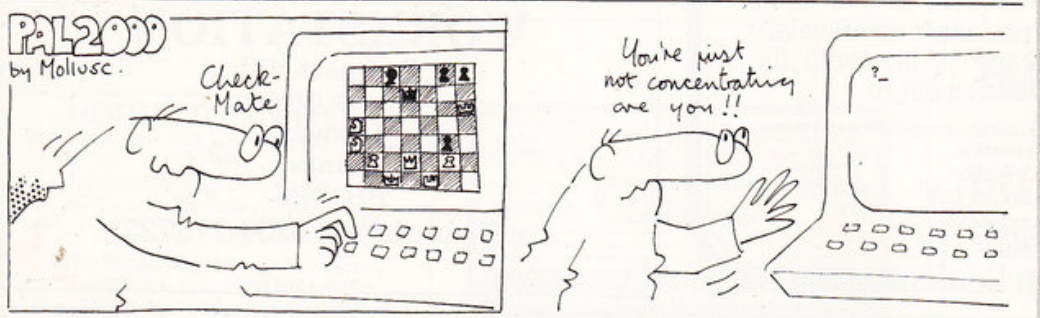

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Computers in Personnel	July 12-14	Royal Lancaster Hotel, London	Peter Mirrington Exhibitions, 0277 232030
8th ZX Microfair	August 20	Alexandra Palace, London	Mike Johnstone, 01-801 9172
Acorn User Exhibition	August 25-18	Cunard International Hotel, London	Computer Marketplace Ltd, 01-930 1612
Computer Open Day	September 1	Draganora Hotel, Leeds	Tony Kaminiski, Couchmead Communications Ltd, 01-778 1102
Home Entertainment Show	Sep 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
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Microcomputers in Business	Sep 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
Personal Computer World Show	Sep 29-Oct 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	Oct 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown Welwyn Garden City 23367

OVERSEAS

Event	Dates	Venue	Organisers
International Micro Computer Exhibition	Aug 2-5	Kuala Lumpur, Malaysia	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8 Taman Megah, Petaling Jaya, Selangor
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland
Personal Computers & Office Automation Systems Exhibition	Sep 5-8	Amsterdam, The Netherlands	RAI Gebouw BV, Europaplein 2, 1078 GZ, Amsterdam
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
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As part of the plan to expand their range to cover all the most popular personal computers QUICKSILVA are proud to introduce 3 new programs for the BBC Computer, plus a version of their popular "MINED-OUT" game for the Dragon and also a character generating program for the Atari 400/800 "MAGIC WINDOW".

DRAGON

MINED-OUT

On Screen Features: Tricky Mines, Damsels in distress, Mine detection indicator, 7 levels of minefield, Safe area, Progressive difficulty, Scoring, High score feature, Full instructions.
Controls: Up-Down-Left-Right.
Special Features: Bill the Worm, Bugs (mines with legs).
Action Replay
Authors: **I. & C. Andrew**

ATARI 400/800

MAGIC WINDOW

Define characters on 8x8 grid. Save to tape. Load from tape. Freely merges character sets into existing programs. Hex & Dec. O/Ps. Character manipulation: Mirror, rotate, invert, left, right, up, down, hold, wipe, cancel. Redefine whole character set. Also works in colour mode. Excellent examples supplied.
16K RAM or more.
Author: **M. Walker**

BBC GAMES

MUSIC PROCESSOR

Exploits your BBC music potential to its limits.
Features: Full push button operation, over 30 separate functions for recording, mixing, editing and sound effects etc. 4 channels, 5 octaves, 100,000 envelopes easily selected. Over 2000 note storage capacity. Ready made music files included.
Author: **Andy Williams**
For model A or B

PROTECTOR

Features: Pods, monsters who kill on contact, mine laying UFO's, monsters increase in size as game progresses, new pods every 1000 pts., hyperspace function. Full colour hi-res graphics, sound. Joystick control.
For the model B with 16K + Joystick.
Author: **Andy Green**

WIZARD

The lands most beautiful maidens are being sacrificed by an evil King. Can you be their saviour, fighting off hordes of evil demons armed only with your wand and magical powers. A most compulsive and original game with hi-res colour graphics and full sound.
Author: **A. R. Buckley**
For the model B with 32K

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BBC GAMES
Music Processor ..... £14.95 ☐
Protector ..... £7.95 ☐
Wizard ..... £6.95 ☐

DRAGON GAME
Mined-Out ..... £5.95 ☐

ATARI 400/800
Magic Window ..... £8.95 ☐

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Access VISA

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