

# PERSONAL COMPUTER

**EVERY THURSDAY**

50p OCT 27-NOV 2 1983 Vol 1 No 34

**NEWS**

THE COMPLETE COMPUTING WEEKLY

**THIS WEEK**

**SPECTRUM SPEAKING**  
We sound out the new  
synthesiser from Currah

**PROGRAM PULL-OUT**  
Forth, strings and programming  
efficiency in Micropaedia

**EXCLUSIVE  
PRO-TEST OF  
NEC'S PORTABLE**

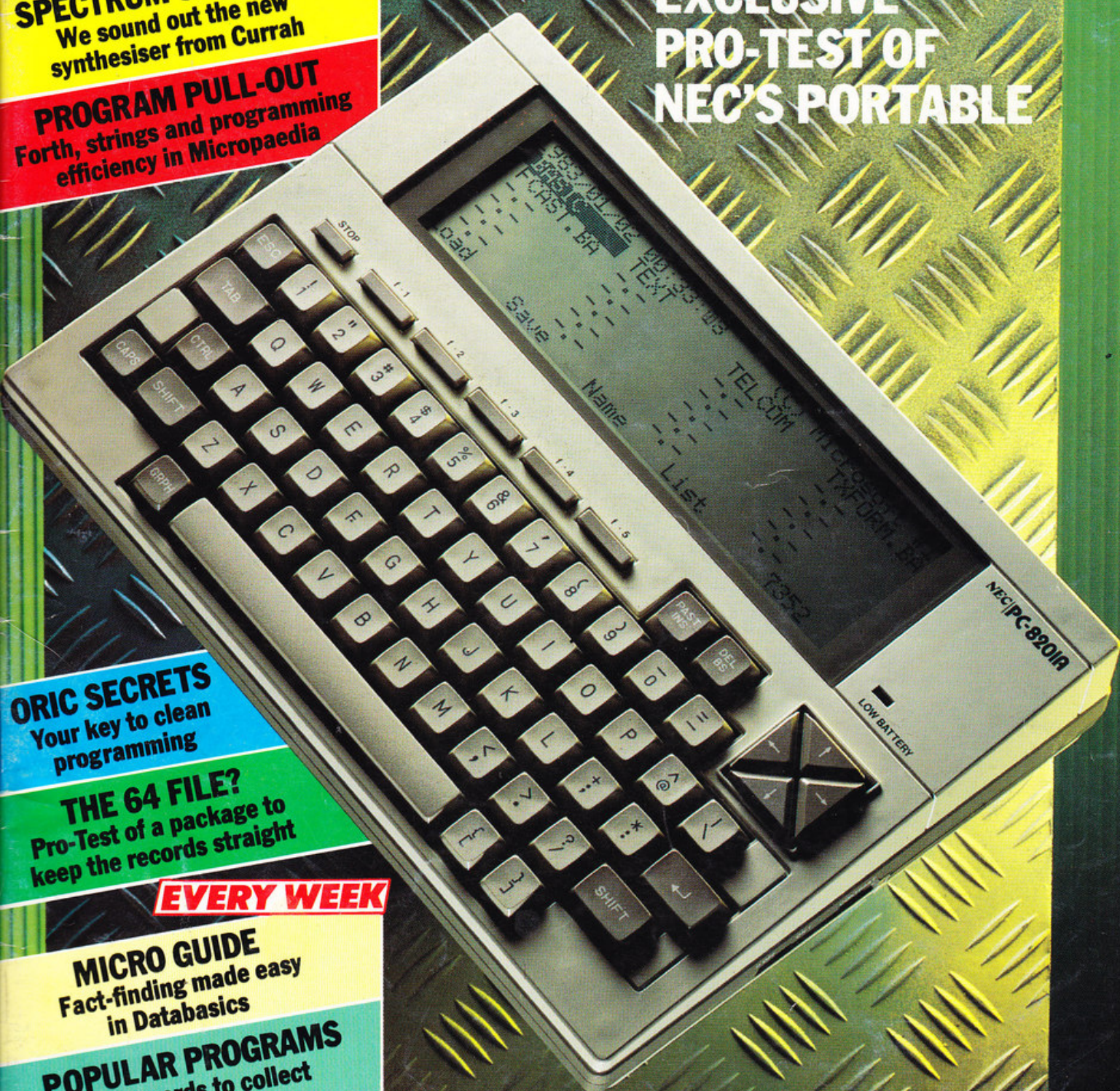
**ORIC SECRETS**  
Your key to clean  
programming

**THE 64 FILE?**  
Pro-Test of a package to  
keep the records straight

**EVERY WEEK**

**MICRO GUIDE**  
Fact-finding made easy  
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**POPULAR PROGRAMS**  
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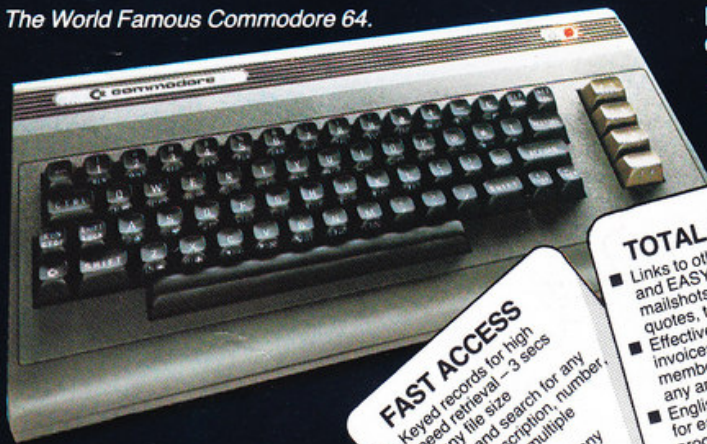


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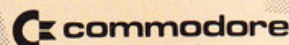
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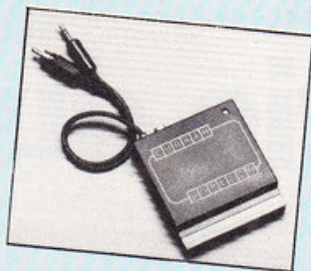
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# Few Electrons for Christmas

By Ralph Bancroft

If you were hoping to buy an Acorn Electron for Christmas you might stand a better chance of finding a needle in a haystack.

Acorn says that it already has advanced orders of 160,000 machines and no hope of satisfying the demand. Those small numbers of Electrons that are starting to trickle into the shops are no sooner put on the shelves than they disappear again, sold to a queue of would-be buyers.

'We are still ramping up production,' an Acorn spokesman said. 'We should reach our target of 25,000 machines a month before Christmas.'

At that level of production it would take Acorn more than six months to clear up the backlog of orders.

To satisfy the demand, Acorn has negotiated with AB Electronics in Wales (which is already one of the sub-contractors on the BBC micro) to start making Electrons. Unfortunately, its production line won't start rolling until the new year.

Acorn is now talking to another British electronics company to open a third factory. 'An announcement of the deal is imminent,' the Acorn spokesman said.

Retailers are finding Electrons in short supply. WH Smith is currently selling the micro in only two branches in London. Existing stocks are sold out and it is uncertain when the next deliveries will arrive. It is not totally upset by the shortage. Apparently some people going into its shops, finding no Electrons on the shelves, are buying BBC Bs instead.

## Radifon sets out future for Aquarius

The Mattel Aquarius may well be the cheapest colour computer in the UK, but it probably won't be for long.

Mattel is dropping out of the computer hardware business and the managing director of Radifon Electronics UK, which is due to take over distribution of the machine next year, plans to raise the price of the machine as soon as 'market forces permit' because he

doesn't believe the price of the machine should have been dropped in the first place.

Mattel dropped the price of the bare-bones 4K machine to £59.95 two weeks ago because, according to a spokesman, 'our plan (for marketing the Aquarius) has been somewhat shaken by the losses of the parent company — we have been forced to reduce prices.'

Radifon managing director Alan Leboff didn't indicate what he thought the price should be, but he hinted that last month's £79.95 price was closer.

'We like to make a profit on whatever we sell,' said Mr Leboff.

He said that the machine will be

## Trickstick on the way

By John Lettice

East London Robotics is confident that it will have overcome production problems with its revolutionary new joystick, the Trickstick, by the end of this week.

The company has been advertising the joystick for some time now, but a working prototype with a hand-built circuit board has only recently been completed.

East London Robotics' Roger Vellacott said that circuit boards made to this pattern are currently in production, and that it should therefore be possible to meet all outstanding orders by the end of this week. He would not reveal how many Spectrum users were waiting

for the £28 Trickstick, but said that the company had 2,000 Tricksticks 'three-quarters completed', simply waiting for the circuit boards.

The Trickstick is revolutionary in that it uses AC hum — this is what you get when you're in the vicinity of an electricity pylon — to control games. It has low voltage pressure pads on it which vary the voltage depending on how hard you grip. It uses a new method — patent applied for — of producing the effect of a digital to analogue converter, and allows you to move in curves rather than in jerks.

It will work with Kempston compatible games, but gives you the potential of writing much more complex software to go with it. Attacktics, which will be available at the same time as the stick for £7.50, allows movement in 64 different directions.

## Memotech glimpsed in shops

One of the summer's more attractive launches, the new Memotech system, has started to appear in the shops, or more accurately, in a shop. Computers of Wigmore

Street in London's West End took deliveries of Memotech 500 and 512 machines last week, and other retail outlets should have the systems in coming weeks.

The Memotech 500 first emerged in late April (PCN, issue 8) and has since been seen at various computer shows.

The 500 has 32K and will sell for £275. The 512, with a similar spec but 64K, costs £315. Both are based on the Z80A with 16K of Microsoft-compatible Basic in ROM and further RAM dedicated to graphics, which is one of the system's significant features.

The resolution is 256 by 192 pixels and 16 colours are there to choose from. Memotech's Basic includes graphics commands and has 26 reserved graphics characters.

Memotech is on 0993-2977. Computers of Wigmore Street are at 87 Wigmore St, London W1.

worth any extra money people might have to pay for it, as Radifon has a massive new support plan. First of all, the company is hoping to bring out 50 new cassette programs for the Aquarius by Christmas — and prices are expected to start at about £5.95. The first of those programs should be released next week.

Radifon plans to release an upgraded version of the Aquarius with full-travel keyboard, an extended Basic and a bigger memory capacity, next spring. Provisionally dubbed the Aquarius II the machine will be compatible with existing Aquarius software and be able to take on more complex tasks.

# Business trio due

By Geoff Wheelwright

Three new business micros are planned for release in January — with two of them hoping to outdo IBM and the third setting its sights on the Sirius.

Triumph Adler last week launched what could be the cheapest CP/M-based micro yet.

The Alphatronic PC will sell for about £399 and will include 64K RAM, 32K ROM and software compatibility with the existing range of Alphatronic machines. It will run the CP/M operating system and two 320K disk drives; the first of which costs £379 and the second £310. The extra cost on the first drive is because the disk controller is included with it.

CP/M won't actually come standard with the machine, but will be available for about £30 extra. However, at about £800 for a single-drive CP/M system with full-

travel keyboard, cassette interface, cartridge port, RS-232 and Centronics interface, nobody is likely to complain.

When it does arrive, it will have competition from Sanyo — which is also planning a January release of a cheap business starter system. It's IBM-compatible MBC-555 micro will start at around £699. That price will include a single disk drive and two well-known business packages: Wordstar and Calcstar from Micropro.

A second disk drive for the 16-bit machine will go for an additional £300. And British Sanyo officials are hoping to get a £300 to £400 cassette-based cut-down version of the machine (without any disk drives) ready for the January launch.

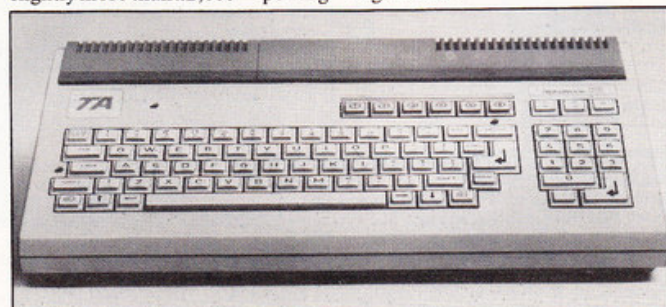
They feel that there's long been a big price gap between the upper-priced machines in the home mar-

ket — stopping at about £400 for the BBC micro — and the lowest-priced business machines — which have started at about £1,000 with disk drives.

Panasonic, meanwhile, has its eyes on wealthier clientele with the planned January introduction of its JB-3000 machine. It hopes to sell the 16-bit MSDOS system for slightly more than £2,000 — putting

it in direct competition with the ACT Sirius.

It will come standard with 96K, run the 8088 processor and will support either colour or monochrome monitors. It's not a totally new machine, however; what will be new is a digital colour plotter which is expected to sell for between £1,300 and £1,800 depending on size.



Triumph Adler's slimline 'tronic won't hit your pocket.



# NewBrainwave

By Geoff Wheelwright

The Phoenix-like Newbrain micro is due for rebirth in the UK within two weeks.

Tradecom International, the Dutch company which rescued the Newbrain from the hands of liquidators last week, has appointed Brainwave Software as its UK distributor and plans are in the works to put the machines back into stores within the next 14 days. Alan Mann, the owner of Brainwave Software and new Newbrain distributor, is optimistic about the future of the machine.

'In a matter of weeks the machine will be on sale again as if nothing had happened,' said Mr Mann. He added that a few extras will be available for the re-released machine when it hits the shops again.

A new 'improved' version of the disk controller will be used on all new disk and CP/M systems sold for the machine and a networking system has been developed for it by a company in Scandinavia.

Mr Mann said he has contacted many of the old Newbrain dealers with a view to getting them to stock the machine again. He claimed that not one of them had turned his offer down. He said even the bigger dealers — which include the Lasky's chain — have agreed to restock the Newbrain.

The price for the machine will be the same as before the Grundy Business System crash that laid the newbrain low — £234 for the Model A and £260 for the Model AD (VAT must be added to both prices).

The disk drive and CP/M expansions will also maintain their pre-crash prices at £395 plus VAT for a single 200K disk drive and about £1,000 for the top of the range system with twin 800K drives and an additional 64K memory.

But with companies like Sanyo and Advance computers planning to introduce IBM-compatible single-disk computers for under £700, the attraction of Newbrain's 'low-cost' business entry system

begins to pale. Mr Mann, however, is committed to the machine and says he's confident the price and competitiveness of the machine will hold — although he concedes a small price drop could be in the offing. 'The prices are being looked at to see where they could be cut,' he said.

He added that there should be no delivery problems as 'more than a thousand' finished machines are sitting at Thorn-EMI, the company that was making them for Grundy.

He is also promising new software for the machine from his own company — including a new disk-based adventure game. Mr Mann claims that more than 500 packages will soon be available running under Newbrain Basic, and well-known commercial packages (including Wordstar) will be available to run under Newbrain CP/M.

Anyone wishing to buy the Newbrain or become a dealer can call Mr Mann on 0787-237-831 or write to him at Brainwave Software Ltd, Tilbury-Juxta-Clare, Essex.

## HP sets up standards

A big shake-up is on the way for Hewlett-Packard (HP) micros as the company moves to standardise some of its machines' features.

For starters the variety of operating systems currently used by HP will progressively merge. On personal computers, MSDOS and HP-UX — (HP's version of the Unix operating system) — are seen as the leading systems.

The company sees MSDOS becoming more Unix-like, the two gradually blending. Lance Mills of HP's personal computer group in California said: 'We are making this move in operating systems for several reasons — but primarily because it will be easier for the user to transport software from one machine to another.'

'In addition, we think that if our machines are more compatible it will minimise the amount of training and expertise needed.' Other areas that will become standardised are disk drives and user interfaces.

HP also sees the present keyboard layout of the HP150 as being the standard.



**THE LABOURS OF HERCULES** — Combining text and graphics on the screen of the IBM PC is the promise offered by this plug-in card available from Reflex (0734-884611). Costing £431 it replaces the standard monochrome card in the PC and spares you the trouble of an extra card and a separate monitor to run graphics applications. If you are running the Lotus 1-2-3 package on the IBM PC the Hercules could be particularly useful as it is said to be the only single card offering that allows you to display all of 1-2-3's graphics. This is no mean feat but from a card called Hercules what else would you expect?

## Adam out at last in US

Coleco has at last started shipping its controversial Adam home computer — but it isn't saying how many are going out.

Deliveries of the \$700 Adam were first due to go to dealers in August, at which time the machine was expected to sell for \$600. Coleco also planned to ship half a million systems by the end of the year — it has now admitted that it won't reach that target.

## Micros make film debut at animation festival

Britain's first Computer Animation Film Festival last week showed that you don't need minis and mainframes to generate interesting animated films.

Two entries were developed on BBC micros — one, ironically, to adorn Independent Television's *The Krypton Factor*. This application formed the basis of the quiz show's mental agility tests. The other was produced for industrial training films on metal fatigue and integrated circuit construction, by the Welding Institute.

The film festival took place at Wembley Conference Centre as part of an annual event called CG83. This combines an exhibition of graphics hardware with a conference on business graphics, computer animation, and computer aided design and manufacture (CAD/CAM).

Computer graphics was once the preserve of universities with enormous powerful mainframes.

But computer animation has already found its way into movies such as *Superman III*, *Star Trek II*, *Return of the Jedi* and particularly *Tron*. In the past couple of years studios have been set up to provide futuristic or eye-catching animated sequences for television commercials and programme title sequences. The work of several of these companies was on show.

The overall winner of the film festival was the New York Institute of Technology's 'Lab Sampler', the video equivalent of a 'greatest hits' album. It was deemed to make the most artistically creative use of computer animation and it was also technically among the best entries.

The film included part of a BBC 'Arena' programme.

## Fuller order overload

By John Lettice

Fuller Micro Systems, which has been unable to fulfill orders for its Spectrum add-ons, is now confident that the situation is under control. Mail orders for the Fuller Box, the Orator and the FD42 keyboard are now being turned round within 21 days.

But demand for the FDS keyboard with space bar is so great that there is a waiting time of around nine weeks, and a number of smaller dealers may have to wait some considerable time — and renegotiate their dealerships — before they get further supplies.

Fuller's Bob Ryland puts the current problems down to the dealer network growing faster than

Fuller could support. 'Our previous general manager was a bit overzealous in appointing dealers.' This meant that demand for Fuller products from dealers could not be satisfied, and began to disrupt mail orders. 'Our mail order had gone to pot,' says Mr Ryland.

Fuller is therefore now supplying only dealers who pay cash up front, and will be renegotiating with other dealers when supplies allow.

Mail order is now up to date for most products, but the FDS is in short supply because of a combination of heavy demand and production problems. These problems, with the moulds, have now been overcome, but it is still likely to be a long wait.



## VIEW FROM JAPAN



## Golf hits the screen, and the ego

by Serge Powell

Among the many frustrations of living in a land where the native population speaks a different language, has not one but three different alphabets, builds tempting hardware, and crams each and every computer store with games software by the lorry load, is the fact that the language and the alphabets make it somewhere between difficult and impossible to learn to play the games.

To a fun-loving games addict this is like being given a selection of the finest games and not knowing which keys control them. By trial and error you might eventually get there, but anything with a substantial amount of text — an adventure game, for example — is out of the question.

Back home, which for me is a land where two languages are spoken but only one alphabet used, there is a simple way of working off such frustrations. You walk the local golf course and take things out on some poor golf ball, or on the carefully manicured fairways, or the neatly raked bunkers. Mayhem can be a rewarding pastime. But in Japan, by the time you add up the green fees, the transportation costs and so on, you could find yourself out of pocket to the tune of \$100 or \$200. In its way this is even more frustrating.

But a compromise is at hand. What could be more logical than to take it out on a computer golf game? The game costs a mere 3500 yen (about £10), needs only 32K of RAM, and should surely not tax my functional illiteracy. Any 12-year-old ought to be able to knock a white spot around a green screen with a minimum of instruction.

When you approach software in that frame of mind you can begin to understand how far superior artificial intelligence could be to our own. The moment you underrate it, be prepared for it to show up your naivety in the most humiliating fashion.

I had to be rescued from 'Golf' by my six-year-old son. Having loaded and started the program I was pretty well stymied, but all that the screen was asking for (in the most basic Japanese alphabet) was the player's name and handicap.

The next challenge was to determine in which of eight points on the tee I wanted to position the ball. Also which club I wished to assault it with — there was a choice of 5 wood, 9 iron, sand wedge, pitching wedge and putter. Also what angle I wished it to take off in — the right of the screen was 0°, the top 90°, the bottom 270°, and the other angles proportionate to these bearings.

I was given the option of striking the ball with one of three intensities. This too had to be explained to me, but the hazards of the game were plain to see — which made them child's play, if you'll forgive the expression. In living colour I faced rough to right and left, a bunker on the left, and (in case I ever got close to the green) bunkers to left, right and behind. For comic relief there was a tree in the middle of the fairway.

On the plus side I was offered a cross-section of the hole and thanks to translation from my wife could work out the variable wind speed and direction. Golf is not commonly thought of as a family game but in this household only the cat hadn't taken part by this stage.

The game was for three players. I selfishly took all three hands and hit drives well to the left, along the edge of the fairway, and smack down the middle towards where the tree lay in wait. After numerous false starts I made the green in five.

The visual scale now grew to take in the whole green and its attendant bunkers. A handy distance scale appeared on the screen, and another string of funny characters to tell me which way the green slopes and how well trimmed the grass is. Armed with this information I eight-putted.

So never let it be said that games software is trivial and devoid of educational value. Under the right circumstances it can be highly instructive. But it won't necessarily help you let off steam. There is one gret consolation, though; with the money I'm not spending on real golf I can get psychiatric help after a round or two of the computerised version.

# IBM enlarged

IBM has added fuel to the flames of speculation surrounding its Peanut by launching two new versions of its PC, but for corporate rather than home users.

Both of the products that came out of IBM last week are destined for executives linked to a larger system — usually an IBM mainframe. But they could eventually prove important to other PC users of more slender means, as the breadth of software available for the PC in its new versions is bound to increase.

For the record, the units are the 3270-PC and the XT-370. The 3270-PC brings windows to IBM's PC range, seven of them at a time on a high resolution colour screen. Reports from the US say that the system can be attached to such mainframes as the 4300 line and the 308X series, suggesting that IBM has facilitated software development by implementing software capable of making sense of the various mainframe operating systems it uses.

The XT-370 can be linked to an IBM 370 mainframe, and current

users of the PC XT will be able to upgrade to this workstation.

These systems are souped-up PCs for business users. There is still no clear sign of when a souped-down PC, the Peanut, (officially PC Junior) is likely to hit the streets. But the latest speculation (on which IBM disdains to comment) hints at two models, one with 64K and the other with 128K.

The smaller unit is expected to cost around \$750 and the larger system, with twice the main memory and a built-in floppy, about \$1,300. A feature of both is expected to be an infra-red line-of-sight connection between the keyboard and the main unit.

Meanwhile Peanut fever seems to be sweeping some regions of the US, with potential users placing non-refundable deposits with dealers.

This will put them close to the head of the queue when the system is eventually launched; but it also assumes that the thing exists and that it will work, and even IBM has been known to launch computers that didn't work properly.

## An Oasis of add-on units

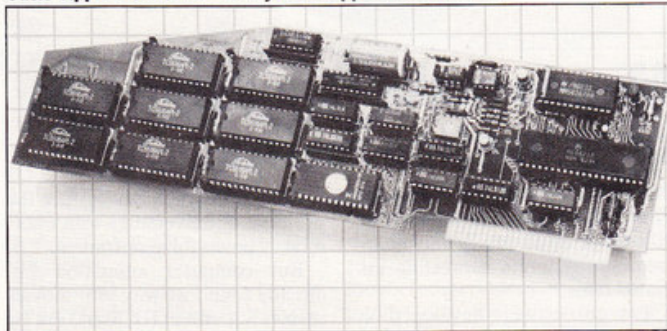
A set of hardware add-ons for Apple and BBC users are the first products to be unveiled by Oasis Electronics.

Oasis (0603 503275) grew out of the instrumentation field and its first batch of products reflects this background. If you have a scientific or educational application that needs the intelligence of a micro, the modules and boards launched

last week could set up the connection.

For both the Apple and BBC micros there are data acquisition modules and EPROM programmers. For the Apple alone there is a firm time store, carrying a real time clock and battery support for 16K of RAM (£169), and an appointment scheduling system with software, clock and memory (£199).

**Oasis' Apple store card — five years' support for 16K RAM.**



## Microspeech

By Sandra Grandison

Add-on expert Kempston Micro Electronics has produced a speech synthesiser for the Spectrum.

The Kempston  $\mu$  Speech, selling at £29.99, is a plug-in device that retains allophones in the memory as the basis for forming words.

The vocabulary of the synthesiser is infinite and it can include foreign languages. Other features of the system include a built-in speaker, volume control, a comprehensive dictionary and the ability to amplify

the Spectrum bleep sound.

Mr Pandaal, manager of the company said: 'This product is primarily aimed at the educational market to be used as a tool. And we shall be developing software in this direction.'

The Kempston  $\mu$  Speech comes with a free cassette which has a dictionary and a musical guessing game on it. You can get your first glimpse of the speech synthesiser at the Northern Computer Fair, November 20 at Birmingham.

■ PCN will Pro-Test the unit in a forthcoming issue.



# IBS cache and carry

By Geof Wheelwright

All the show-stoppers at last week's International Business Show in Birmingham could have been smuggled out of town together in a small suitcase: none of them much bigger than a breadbox and most a good deal smaller.

The show pointed to a rosy future for portable computers, with new entries from Canon, Sharp, Ricoh and Commodore leading the way. Two of the new machines use a built-in Liquid Crystal Display while the other two have built-in conventional CRT monitors (a colour monitor on the Commodore 64 Portable).

The cheapest of the new entries is Canon's X-07—an A-5 battery-operated micro that is expected to sell for about £200 when it's officially released in January next year. The machine will come with Microsoft Basic, 8K of CMOS non-volatile RAM (you don't lose information when you turn the machine off) and a five-key cursor arrangement.

The really interesting bit is the



The Ricoh system's 1 1/2in screen — minituarisation in true Japanese style.

things you can plug into it. The 'Look, Ma — No wires' option uses an infra-red optical data transfer system that allows you to transfer information with a small device that looks like a periscope on both the sending and receiving machines.

The system works like remote control TV module, sending an infra-red signal from one machine which is interpreted by a receiver on the other. It will also have the industry not-quite-standard RS-232C serial interface, so you can send information typed on the X-07 to most larger business micros.

Moreover, the machine uses a unique 'credit card' system of cartridge information storage that not only gives you the now traditional ROM utility programs (such as word processors and spreadsheets) on a cartridge slightly larger than the average credit card, but also extra non-volatile RAM. The RAM is backed up by a thin lithium battery so the cartridge won't lose



Sharp's PC5000: not the newest portable at the show but it looks to be one of the most capable.

information when you unplug it from the X-07.

The RAM cards will come in two sizes: 4K or 8K. More conventional cassette storage is also possible through the cassette port provided on the machine.

Data will be directly dumpable to a printer as the machine supports a standard Centronics interface. But a fully-formatting word-processor is unlikely to fit easily onto the machine as it has only a 20 character by 4 line display.

The keyboard will be a hard plastic non-typewriter job, something like the Tandy Colour Computer — providing five function keys, as well as a shifted 'numeric pad' like the Tandy Model 100 portable.

Slightly upmarket and a good deal less portable than the Canon machine is Commodore's portable version of the Commodore 64.

It will be available 'before Christmas' at an estimated price of about £800 — including a single disk drive and a small built-in colour monitor. It has all the same options as the standard Commodore 64, but should offer good value as a complete portable system with the built-in extras.

Ricoh's portable is something else again. Firstly, it won't be sold in any shops until at least some time next year and secondly, it won't be sold under Ricoh's name. Ricoh will be making computers on what's known as an OEM (Original Equipment Manufacturer) basis and letting any interested company put their name on the product.

And it does look like a product any company would be proud to slap its name on. It's actually a range of two machines. The more interesting of the two is the SP-50, a portable business micro with detached keyboard, built-in 1 1/2in screen and up to 576K of CMOS non-volatile RAM.

The screen is a 'pop-up' affair to the left of the processor box and neatly tucks away when it's not being used, so that the keyboard can be clipped to the main box to make the machine portable. The

SP-50 offers standard RS-232C and Centronics interfaces as well as a TV monitor output.

The basic machine comes with 32K RAM and weighs just under 6 lbs. It also has slots for what look like two disk drives, but in fact appear to be memory expansion cartridges to allow for the move up to 576K. Like most machines of this type, it's expected that some of that expansion will be allowed for inside the machine, with the rest taking place in replaceable CMOS memory cartridges.

The second machine in the Ricoh range is a little pocket-calculator

sized computer with a 16 character by two line display and an RS-232 port. Memory on the smaller machine is also 32K standard, but expansion is only up to 64K.

The machines are manufactured in Japan and Ricoh says it should have English language keyboards for them 'within six months'.

Sharp's new PC-5000 portable rounded up the range of new machines, clocking in with the most expensive price and perhaps the best specifications. It uses the 8088 16-bit processor and will run the MS-DOS operating system, driving a built-in 80-column liquid crystal display. Included is 192K ROM, 128K CMOS RAM (expandable to 256K) and it will sell for £1,295.



Commodore's 64 portable.



Periscope up: Canon's heat-seeking communications device.

## Oric lit up

About 7,000 Oric machines have been destroyed in a fire at Kenure Plastics in Feltham, Middlesex, but according to Oric the effect on deliveries won't be too serious.

The blaze began at 9pm on Thursday, October 13 at the assembly plant where the micros are produced. At the time of going to press investigations into the cause of the fire were still being carried out. By the time the fire was brought under

control several thousand pounds worth of damage had been done.

Despite its alternative production arrangements, Oric could hardly have suffered the loss of the systems at a worse time. With Christmas approaching it looks as though every manufacturer is going to need something in reserve.

Meanwhile it seems certain the new ROM will appear before Christmas.



# U-Net rivals Acorn Econet

U-Microcomputers has adapted its U-Net Micronetwork, previously available for Apple II computers, to link the BBC micro in competition with Acorn's own Econet.

U-Microcomputers claims the availability of a comparable Econet product has been hampered by the non-availability of the second 6502 processor. As the 6502s won't be pouring into Acorn's factories until the end of this year, Acorn's level 2 Econet won't be available until early next year.

U-Net organises up to 32 BBC micros into a network. The BBCs can share up to six disk drives and two printers. An advanced feature is the file server/controller unit's ability to act as a printer spooler.

The system also supports an effective password security system. This is especially important, says U-Microcomputers, in the school environment where you want to prevent pupils getting into places where they're not supposed to be. U-Microcomputers feels the U-Net will provide an effective challenge to Level 1 Econet as the Acorn system supports neither of these facilities and is hampered by the Acorn DFS's 31 files per disk side.

The controller/file server is a black box with spare slots for interface cards and various add-ons and 64K or RAM on-board. This costs £450, with an extra £400 or so for software, interface and manuals. An eight-machine configuration would cost around £1,200. The more you net, the less it costs per machine — 20 machines linked up costs about £1,800. U-Microcomputers can be contacted on (0925) 54117/8.

Econet has been there to be shot at for several months now. Originally designed to be a schools networking system using Acorn Atoms, it has never quite made the switch to the BBC environment with much confidence.

The level of network tested by PCN back in March was uncomfortable in operation and barely economical unless the configuration included ten micros.

Further enhancements have been held back by the lack of an officially available, Acorn-supplied second processor. The second level of file-server should provide extra utilities and features, crucial if Econet is to perform the kind of job for which it is intended.

out Canada and the US. They run on Apple, CP/M, and MSDOS systems.

Despite the UK's international reputation for high quality software the US has been a graveyard for many British companies. Silicom International expects Tabs (0264 64166) to fare better than some of the companies that have gone before it across the Atlantic; a spokesman commented: 'We conducted extensive research into the software market in Canada, the US, and finally in the UK, and decided that Tabs offered the best.'

## Tabs set to break into US market

Hampshire software house Tabs is moving into North America through an agreement that will see its business software sold there by a Canadian company.

Silicom International Software Services Inc will sell the Tabs and Easytabs business suites through-

## Sharp score

Software for Sharp's new MZ700 is rolling out in bulk from Kuma, which has released 20 titles and plans 20 more for November 14.

The present offering comprises ten games and ten applications and utilities. These include word processing and VAT accounts, a Pascal compiler, a Forth implementation, and a ZEN editor-assembler, with prices ranging from £6.95 to £39.50.

Also out now is a modem interface for the Newbrain, for £80. The software to drive it is £35 and the interface itself interfaces to any modem, the cheapest being the Prism modem at £69. This interface allows you to link the Newbrain to Telecom Gold and electronic

mailbox. Kuma also has a Z80 board and a 64K printer buffer at £80 and £217.

Any competition fans should also note that Kuma has a program out called Competition for the MZ700. Anyone managing to finish this adventure goes into a draw of the first 50 correct entries.

First prize is a printer/plotter for the MZ700 and other prizes, probably peripherals, are yet to be decided.

The game is due out at the beginning of November, when the competition starts, and costs £9.95. All hopefuls should send their entries to Kuma computers Ltd, 11 York Road, Maidenhead, Berks.

## Publishers get in on software act

The trend among publishing houses to sell software with books has been drawn in McGraw-Hill with a selection of offerings for Spectrum owners.

Profile 1, spreadsheet database with 12-page manual, can be yours for £9.95, and for an extra £6.95 you can buy the book 'Information Handling for the ZX Spectrum', by C A Street. This describes the way you can write file and data handling routines.

Also on cassette for the Spectrum is 'Spectrum Information Handling Routines', providing 30 programs for use by anyone who has read the above book. This is intended to help you write your own programs.

'The Spectrum Workshop, Word Processing and Beyond', a book by Randle Hurley, describes how to write office and home applications programs.

'We are expecting the series to be added to continually and we are

expanding the list for the BBC micro, Spectrum and Oric,' said John Watson, McGraw-Hill's editor for the UK Computing Series.

'We will also be involved with educational computing as well as software and books for small and medium sized businesses,' he continued.

A piece of software called 'Spectrum' has developed out of Randle Hurley's book, consisting of a full word processor system for the 48K Spectrum.

'We are thinking of making software for the Microdrive when there are enough of them around,' said Mr Watson.

Books and software can be bought direct from the company in Maidenhead, Berks or from bookshops and computer stores which are currently receiving their first deliveries.

McGraw-Hill isn't the only one producing books with complementary software. London based publishing company Dorling Kindersley will be jumping on the software bandwagon in the spring, joining companies such as Mosaic Publishing, Melbourne House, Heinemann and Longman.



**MAGNETIC FLOPPIES** — Another addition to the mass of floppy disks on the market is Xidex's new line of 5¼in and 8in Precision flexible disks. With 96 tracks per inch the disks are made of the latest magnetic materials, the company says. To reduce head-to-disk interchange problems due to shifting of the disk in the drive, Xidex has improved the tolerance on the inside diameter of the disk's centre hole by fifty per cent. Contact BFI, 01-941 4066.

## PC gets cards

Add-ons for IBM PC users are among a rash of releases from Dataflex, UK distributor for Ferox International of the US.

Out this week, the IBM Trio Board has two serial ports for either RS232 or Current Loop — a method of connecting up modems. It should be useful to owners of the IBM who want to connect to a mainframe or communications device, and comes with 64K of fitted memory at £257.25 either direct, or from IBM dealers.

This board, like all Dataflex IBM and Sirius expansion boards, comes complete with Magic memory, the company's in-house software which comes on 100RAM disk with the board and is claimed to improve the response time of applications by up to five times. You also get print spooling on Magic Memory.

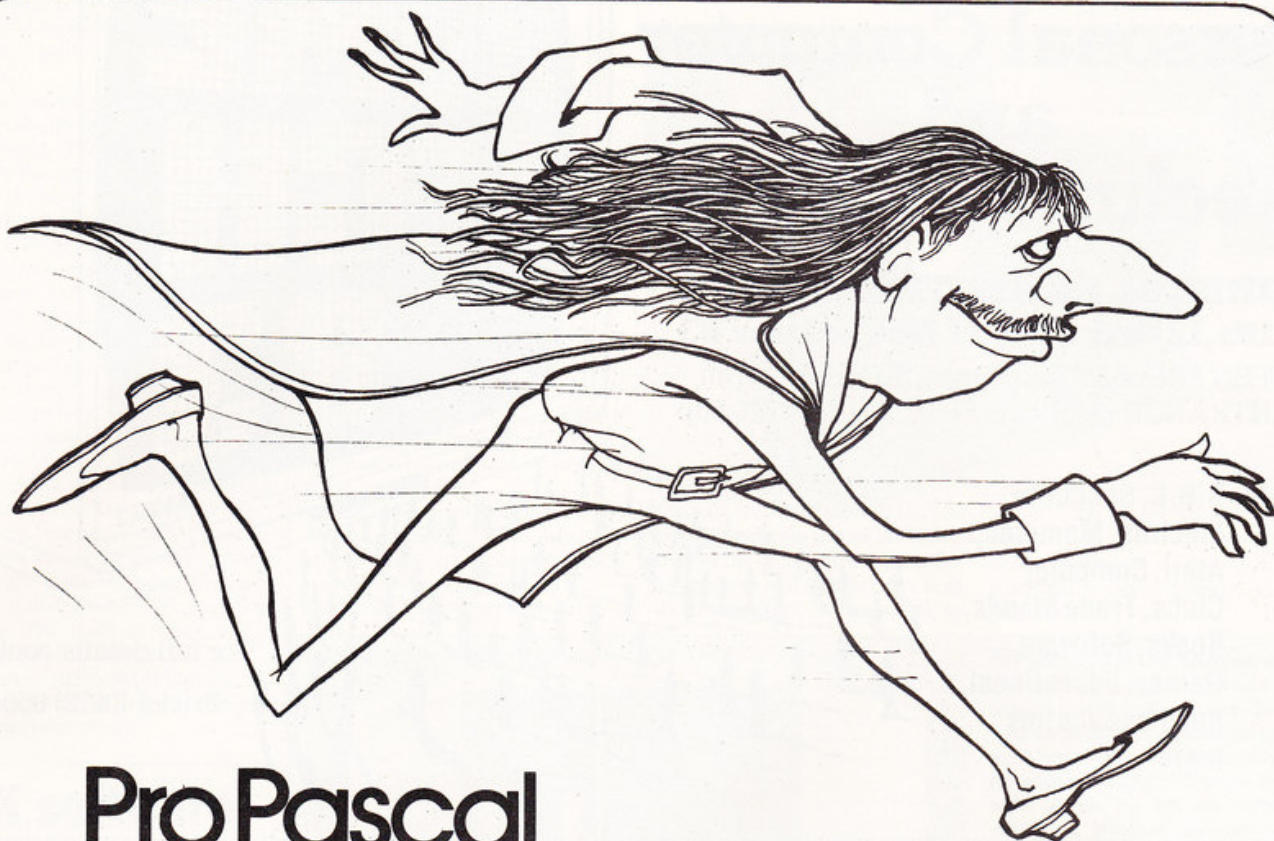
A further recent addition to Magic Memory is Diary, which lets you record simple one-line entries for appointments — this will be out in late November.

Trio Board's big brother, the IBM Multi, comes with 64K of memory upgradable to 256K and will comprise one parallel and one serial port, an optional second signal port and Magic Memory. This is due out in early November and will cost £339.25 for the basic 64K.

You'll be able to get additional upgrades of 64K, each for £62.75 and additional serial ports for both models are £51.75.

Dataflex also hopes to release a colour controller card for the PC, with a parallel port fitted, costing £264.50 and due to appear some time before Christmas.





## Pro Pascal goes like Blaises!

Pascal is now recognised worldwide as one of the standard languages for microcomputers. It is named after Blaise Pascal, a French mathematician and mystic who in 1644 constructed an "arithmetical machine".

The electronic wonder which is today's microcomputer would make Pascal jump for joy. And in Pro Pascal, the user of such an "arithmetical machine" has a marvellous tool for converting his reliable, well-structured code into fast, efficient machine programs.

For the serious programmer, Pro Pascal is a passport to the three most important microcomputer environments: the 8-bit CP/M world, and the newer 16-bit worlds of CP/M-86 and MS-DOS.

The 8-bit compiler runs on Z80-based micros with 56K RAM and CP/M; the package costs £220 + VAT.

The 16-bit compilers run on 8086/88-based micros with 86K RAM and CP/M or MS-DOS; the price of either version is £320 + VAT.

  
LANGUAGES FOR MICROCOMPUTERS

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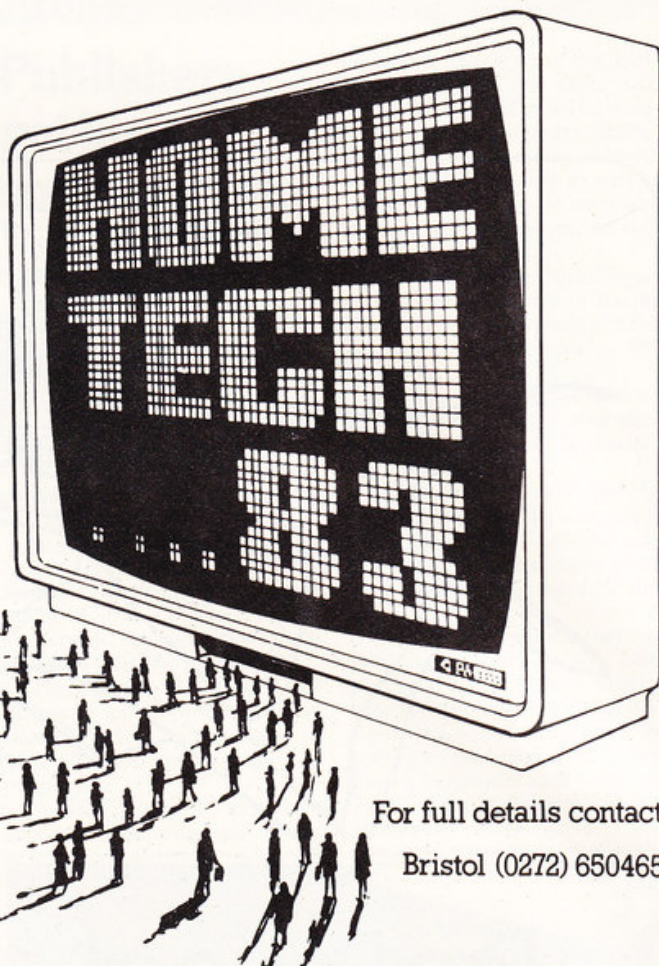


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## Micro floppy, micro price

The Hitachi 3in disk drives have appeared in the UK in a new guise, and the price could tumble as a result.

The 3in microfloppies were developed jointly by Hitachi and Panasonic. The newcomer to the UK is Panasonic's version, essentially the same unit but with minor differences on the driver boards.

According to Panasonic's UK distributor Ambar Components, the units will be sold to systems builders at a rate of around £100 each in quantities of 100. Its official pricing isn't yet determined but the drives should still reach end users for well under £200.

Their capacity is 500K-250K per side, but you can't access both sides without taking the disk out, flipping it over, and putting it back in.

The drives are directly compatible with Panasonic's 5¼in models, using the same recording method, data transfer and disk rotation speed. The track to track access time is three milliseconds.

Ambar (0296-34141) plans an official launch for the disk drives at Compec next month.

## UK software for Lisa appears

The first UK-produced package for Apple's Lisa has been released by Business Systems International (BSI).

Busifile is an information retrieval program selling at £402.50, and it takes advantage of the mouse technology on the Lisa which means you don't have to use the keyboard.

Written in Pascal, some features of the package are built-in tutorial screens and help screens, user defined reporting facilities and integrated work processing and label printing facilities.

Busifile is also available for the Apple III, IBM PC, Sage and Sirius computers. The price is the same but these versions use the UCSD-p system.

BSI is also offering an add-on module for Busifile, converting the package to a multilevel structure. This will enable system designers to write application software around Busifile. The next step is a multi-user version which is in the pipeline.

BSI has been closely involved in the Lisa software development program, at Apple's request. Another new piece of software to be released by the company is a prescription label package for £345. Busi Labeller will initially be available for the Kaypro to be featured in PCN, Issue 35 and the Apple range of computers.

# Nascom no more

Lucas Microcomputers has released a new business micro that signals the end of the Nascom name.

Selling at £2,064.25 the Lucas LX Microcomputer is a Z80-based micro with 64K RAM, full qwerty keyboard and a 12in monochrome monitor. Running CP/M, users also have a choice of NAS-SYS or NAD. Software available for the machine includes Wordstar, Calcstar, FMS 80 and Finas.

The Lucas LX is the first of a series of machines that will come under the Lucas Microcomputer range. And the company, which also produces Nascom machines, has made a historic name change for these computers.

From now on all Nascom micros will be sold under the Lucas LX name except the Nascom 3 which will retain its own title.

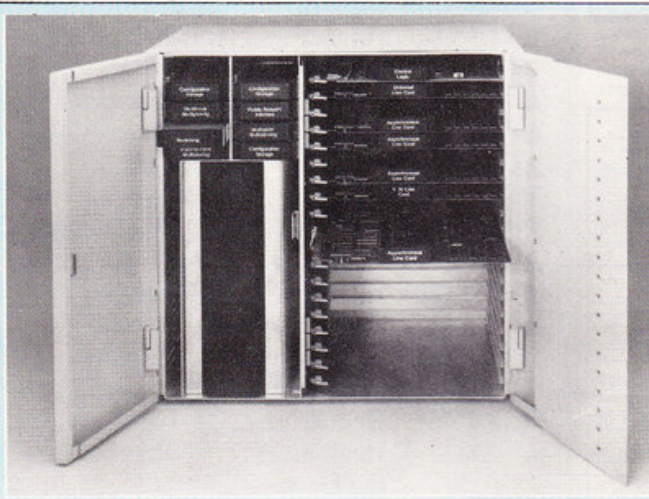
In addition, as part of its revised



Lucas LX spells the end for the Nascom name.

strategy the company will be opening up a national network of Lucas Microcomputer Centres to back up

their existing and new line of machines. Sic transit gloria Nascom...



**CUPBOARD LOVE** — CommPonents is a modular data communications system you can fit in a cupboard. On the right hand side you see the shelf-like hardware boards, with plenty of room for adding the odd half dozen more, while at the top left are software cartridges. Whereas normally hardware and software are provided on the same card, Network Products (08677 4804) has split this to allow greater flexibility. You therefore perform a range of tasks, from low-end networking to talking to mainframes. It's the sort of system that offers a desktop way of linking a few thousand PCs. If you've only got four, Network can link them up for £1,800-£2,000; if you're ITT, the Department of Trade or the CIA, it may cost a little more.

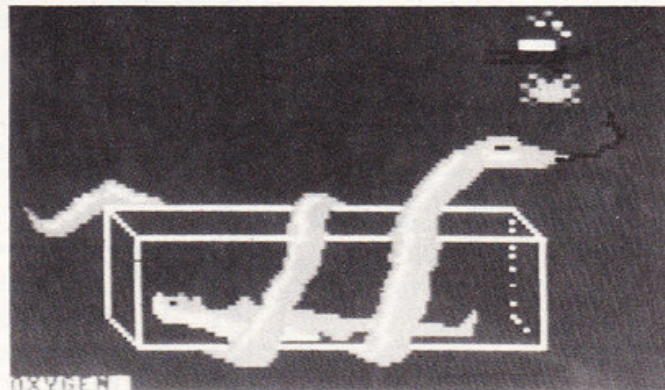
## Cartridge contest

Undeterred by Sinclair's move into cartridge software, Thorn EMI Video has branched out from its Commodore and Atari background into producing Sinclair games.

It has five titles ready for release on November 14 — Gold Rush, Volcanic Planet, River Rescue, Blockade Runner, and Road Racer. These games will cost about £6.95 each.

Last week also saw new games from two new companies. Beyond Software of London (01-240 1042) makes its debut with Up Periscope for the Dragon 32, at £6.95. The company will also produce games for the Spectrum, Atari, BBC, Electron, Commodore 64 and Vic 20.

Joe the Lion is the name of a company rather than a game: based in Hyde (061-366 7431) its first products are Bimbo, a maze game for the Spectrum costing £5.45,



Neptune's Daughters — rescue the damsel from the coiled serpent.

Loki, a Nordic version of a familiar theme for the 48K Oric at £6.45, and Challenger, for the BBC B at £7.45.

Also in the Manchester area is English Software (061-835 1358) which has Batty Builders, Tarot Card, Caverunner, Airstrike 2, and Captain Sticky's Gold at £14.95 for

the Atari range—including the new XL systems. For the Commodore 64 at £9.95 there is Neptune's Daughters.

Texas Instruments, a pioneer of cartridge games, has seven new titles out for the 99/4A. The list includes five games.



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# PCN Charts

This top 30 games list is compiled from both independent and multiple sources across the nation. It reflects what's happening in high streets in the two weeks up to October 13 and, like the micro charts, does not take account of mail order sales. The micro charts this week show the number of machines sold in the same two-week period so they tell the story in the high street between September 30 and October 13.

## GAMES

### Top Thirty

	GAME TITLE	PUBLISHER	MACHINE	PRICE
▲ 1 (3)	Jet Pac	Ultimate	Spectrum	£5.50
▲ 2 (10)	Kong	Ocean	Spectrum	£5.95
▼ 3 (1)	Flight	Psion	Spectrum	£5.95
▲ 4 (15)	Zoom	Imagine	Spectrum	£5.50
▲ 5 (8)	Penetrator	Melbourne	Spectrum	£6.00
▲ 6 (7)	Manic Miner	Bug Byte	Spectrum	£5.95
▼ 7 (2)	3D Tanx	DK Tronics	Spectrum	£5.50
▲ 8 (27)	Hobbit	Melbourne	Spectrum	£14.95
▼ 9 (6)	Horace and the Spiders	Psion/Melbourne	Spectrum	£5.95
▲ 10 (17)	Harrier Attack	Martech/Durell	Oric	£7.95
▲ 11 (14)	Jumbo Jet Pilot	Thorn/EMI	Atari	£29.95
▲ 12 (13)	Pool	CDS	Spectrum	£5.50
▼ 13 (4)	Arcadia	Imagine	Spectrum	£5.50
▼ 15 (12)	Spawn of Evil	DK Tronics	Spectrum	£5.50
▲ 16 (—)	Yomp	Virgin	Spectrum	£5.95
▲ 17 (20)	Zip Zap	Imagine	Spectrum	£5.50
▲ 18 (—)	Hall of Things	Crystal	Spectrum	£6.00
▼ 19 (11)	Football Manager	Addictive	Spectrum	£5.95
▼ 20 (5)	Heathrow ATC	Hewson	Spectrum	£5.50
▲ 21 (—)	Devil of the Deep	Shepherd	Spectrum	£5.95
▲ 22 (—)	Xenon 1	IJK	Oric	£6.00
▲ 23 (—)	Tranz AM	Ultimate	Spectrum	£5.50
▲ 24 (28)	Monsters in hell	Softtek	Spectrum	£6.00
▲ 25 (—)	747 Flight	Dr. Soft	BBC	£8.00
▲ 26 (—)	Zaxxon	Datasoft	Atari	£29.95
▲ 27 (—)	Hovver/Bovver	Llamasoft	CBM 64	£8.00
▲ 28 (—)	Armageddon	Ocean	Spectrum	£5.95
▶ 29 (29)	Mad Martha	Mikrogen	Spectrum	£6.00
▼ 30 (9)	Gridrunner	Llamasoft	Vic 20	£8.00

## NEW RELEASES

ARMAGEDDON, COMMODORE 64,  
MR. WIMPY\* SPECTRUM 48K,  
RESCUE, SPECTRUM 48K  
ROLLERBALL, COMMODORE 64

\*Copyright of Wimpy International Ltd



# PCN Charts

Neither mail order nor deposit-only orders are included in these listings. 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, is updated every alternate week.

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

## HARDWARE

### Top Twenty up to £1,000

MODEL		PRICE	DISTRIBUTOR
▶ 1 (1)	Spectrum	£99	(SI)
▶ 2 (2)	Vic 20	£140	(CO)
▶ 3 (3)	CBM 64	£299	(CO)
▶ 4 (4)	BBC B	£399	(AC)
▲ 5 (7)	Oric 1	£130	(OR)
▶ 6 (6)	Texas 99/4A	£99	(TI)
▲ 7 (9)	Dragon 32	£174	(DR)
▶ 8 (8)	Atari 800	£300	(AT)
▼ 9 (5)	ZX 81	£40	(SI)
▲ 10 (12)	Sharp MZ80A	£349	(SH)
▶ 11 (11)	Colour Genie	£168	(LO)
▼ 12 (10)	Atari 400	£150	(AT)
▲ 13 (14)	Tandy colour	£240	(TA)
▲ 14 (15)	Aquarius	£80	(MA)
▼ 15 (13)	Lynx 48/96	£225	(CA)
▲ 16 (18)	CGLM 5	£150	(SO)
▲ 17 (—)	Sharp MZ700	£240	(SH)
▼ 18 (17)	Epson HX20	£472	(EP)
▲ 19 (20)	Nascom 3	£500	(LL)
▼ 20 (16)	Apple IIe	£969	(AP)

### Top Ten over £1,000

▶ 1 (1)	IBM PC	£2,390	(IBM)
▶ 2 (2)	Act Sirius	£2,525	(ACT)
▲ 3 (8)	DEC Rainbow	£2,714	(DEC)
▲ 4 (5)	Commodore 8000 series	£1,200	(CO)
▼ 5 (3)	HP86A	£1,438	(HP)
▲ 6 (7)	Olivetti M20	£2,400	(OL)
▼ 7 (6)	Epson QX10	£1,995	(EP)
▲ 8 (—)	British Micro	£1,495	(BM)
▶ 9 (9)	Ajile	£2,995	(AJ)
▲ 10 (5)	Apple III	£2,780	(AP)

AC Acorn Computers. ACT — ACT. AJ — Anderson Jacobson. AP — Apple Computer. AT — Atari International. BM — British Micro. CA — Computers. CO — Commodore. DEC — Digital. DR — Dragon Data. EP — Epson. HP — Hewlett Packard. IBM — IBM. LO — Lowe Electronics. LL — Lucas Logic. MA — Mattel. OL — Olivetti. OR — Oric. SH — Sharp. SI — Sinclair. SO — Sord. TA — Tandy. TI — Texas Instruments.

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## A reply from Corby Co-op

I have been a PCN reader since the beginning and have found this an advantage in my work. I work at the local Co-op store selling computers — yes, I'm a shop assistant!

However, after reading Stephen Baker's letter in issue 32 I just had to write. I find it very hard to swallow; after all we don't know everything and we are human. I try my best to give the right advice to customers, but there is no way that I or anyone else could possibly know everything about every computer we stock.

I agree there are some assistants who don't even know the basics, but remember, computer sales are new and many sales assistants are on average about 30.

Stephen, if you're reading, how many of those assistants who knew nothing were young? Not very many I bet. I was lucky I got two years on computers at school.

You also have to remember that people who need us don't usually know much about computers themselves or else they might just ask for the one they

### PCN £10 Star Letter



wanted and ask no questions at all. But there are very few computer experts about. Please remember we are trying to help you buy the right computer — something most customers don't know themselves.

I don't mean to go on, but please don't waste our time by trying to catch us out; we do try, you know, as I'm sure many customers will agree.

I am just wondering how Stephen & Co would go about selling a computer. It's not as easy as you think. You can't go on about modems, interfaces, disk drives, ROM and RAM and totally baffle the customer into thinking computers are hard to use and totally beyond them.

Please, readers of PCN, don't make our lives harder by playing tricks on us as we are only trying to help you.

Marco Dawson,  
Corby, Northants.

# RANDOM



# ACCESS

Don't carry a LOAD on your shoulders,  
unburden yourself on PCN's letters page.

## A welcome BBC (non) bug

I am writing in reference to the BBC Micro's bug (*Microwaves PCN Issue 29*). This is not an operating system bug or even a Basic bug; but is a consequence of having the command OLD available. When NEW is executed, the high byte of the first Basic line number is altered to 255 which LIST etc regards as the end of the program. When OLD is executed, the 255 is replaced by 0 (zero). The net effect is that, if the first line of a program is greater than 255, after OLD it becomes (original line no.) MOD 256.

I am sure we proud BBC owners would rather put up with this (non-existent) 'bug' than lose the valuable facility of recovering a 'NEWed' program.

P. Barwick,  
Grimsby, South Humberside.

## Calling all Kent Oric owners

Where have all the Oric owners in Kent got to? Surely with the volume of sales professed by Oric Products there must be at least a few owners that would be interested in joining a club in this area.

PCN Clubnet has published the contact address for a proposed Kent club for some weeks now but apparently there has been little response. Is it that Oric owners are too insular or afraid of being embarrassed by people who might know more than they do? Come on all you Oric programmers, each one of us is still in the early stages of discovering the marvellous

capabilities of this impressive little machine.

Roger Pyatt, (Orpington 0689-20281) and I wish to broaden our horizons and swap experiences with fellow users. How about contacting him tonight?

John Stubbins,  
Maidstone, Kent.

## Adverts — a cause for concern?

I'm fairly tolerant of advertisements in computer magazines but I was most annoyed at the Oric advertisement on Page 45 (PCN No 28). My objections are:

1 Apart from the word advertisement in small print at the foot of the page it seems to have been laid out deliberately to appear as a magazine feature page.

2 Various criteria for computers which are set out are purely subjective, chosen to reflect well upon the Oric, and therefore meaningless.

3 Most annoying was a photograph in which an Atari, Commodore, two Sinclairs and a TI99/4 were posed in front of a dustbin into which pound notes were falling. The visual image clearly meant: these are rubbish, don't throw your money away on them.

I've nothing against the Oric, nor any brief for the computers being rubbished. I just feel that the advertisement went beyond the bounds of jocular, robust, rivalry. When IBM launched its Personal Computer all the distributors, salesmen etc, were told that rival machines must not be denigrated.

Oric's advertising agency

could learn a lesson from them. Peter Millen, Gregabby, Co. Down, Ireland.

We made sure the word advertisement was clearly visible in this case and design of this page is far removed from its editorial neighbours. — Ed.

## Suffering for the Sinclair ZX81

I am writing on behalf of thousands of ZX81 owners, who like myself are suffering from the decrease in 81 software.

I feel that priority is being given, and will always be given, to Clive Sinclair's infamous Spectrum. Only last week I ventured into WH Smith only to find the same, dusty old 81 tapes, lying in the same old place. The real heartbreaker is that a certain retailer will not be buying new 81 tapes to sell, but will try and sell the old ones at a cheap rate, then replenish their shelves with Spectrum, Dragon and Oric tapes, and as a final blow, sell the 16K ZX81 for £45. I paid a hard earned £80 for the once then, highly acclaimed ZX81. I am disgusted with the degrading actions of these retailers and if these things go on, I'm afraid the writing's on the wall for the ZX81.

Paul Hampton  
Cumbernauld

PCN can help. Send us more programs and we'll include them in Program Cards — Ed.

## King of the Island

I own a ZX81 and I've just received a copy of 'Island', a software cassette where you are stranded on, of all things, an island. I've become monster bane grade 21 with 30 ZAP rings, 19 ZZZ rings and 2 robots. Also with 17 EXPL rings. I've escaped with 903210 gold pieces and 703621 life points. Can anyone beat me ...?

Stephen Schofield,  
Reading, Berks.

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### Upgrading a 16K Spectrum

**Q**Where could I buy an upgrade kit for my 16K Spectrum? Are there any good 16K adventure games?

Julius Uzu,  
Hallam, Sheffield

**A**There are three basic ways of upgrading your Spectrum. First, if you check out the small ads in computer magazines, you'll find upgrade kits consisting of chips which you slot into the sockets in the Spectrum board (on issue 2 and 3 Spectrums) or of a plug-in board for issue 1 machines. If you can't find any locally, try the Buffer Micro Shop on 01-769 2887, or Fox Electronics on Basingstoke 20671.

The second method is to buy the Cheetah RAMpack, which is more expensive, but means you don't have to open up your machine and invalidate your guarantee. Cheetah is on 01-240 7939.

The third method is to contact Sinclair, which will do you a fairly expensive upgrade which won't invalidate your guarantee.

There are very few 16K adventure games, but try Artic's Planet of Death, and watch out for the green dwarf. As for the chip you also mentioned in your letter, if we mean the same chip, it is already inside your machine!

### Read around the Commodore

**Q**I have recently purchased a Commodore 64, and though I have no complaints about the machine I am far from impressed by the manual supplied. It does not explain the capabilities of the machine very well and some parts are written in a very complicated manner.

Perhaps you could advise me of a book I can buy which will give me more information.

Can you also tell me what the four keys on the right of the keyboard are for? There is nothing in the manual on how to use them.

J. Friend,  
Sale, Cheshire.

**A**This is perhaps the most common complaint associated with Commodore's machines although to be fair to the company they have made the position clear enough. The manual that comes free with your 64 (and the Vic for that matter) is the User's Guide. This is aimed solely at the buyer who wants to use commercial software but also gives a very simplified account of the machine's abilities if you want to go further.

Commodore says that it has followed this line to avoid buyers paying for a book they might never use.

Obviously, you do want more information and the official book for you, not surprisingly, is called the Programmers Reference Guide. This is a monster tome containing a vast amount of detail about programming in Basic and machine code, full appendices, memory maps, input/output handling and has a fair sprinkling of demonstration programs.

On the whole, it is well written and certainly worth the money. You should be able to get it from your local dealer.

The four keys on the right of the keyboard are user-definable function keys. In other words, you can use them for whatever you wish — provided that you know how.

From within a Basic program this is easy. Like all other keys they have their own unique CHR\$ codes: F1, F3, F5 and F7 are CHR\$ 133, 134, 135, 136 respectively. The even-numbered keys run from 137 to 140.

So to use them in a program you could do something like the following:

```
10 GETAS: IF AS = "" THEN
10
20 IF AS = CHR$(133) THEN
PRINT "THIS IS F1"
30 IF AS = CHR$(134) THEN
PRINT "THIS IS F2"
and so on.
```

Alternatively, you can do a much faster PEEK to location 203 which holds the value of the current key pressed. Unfortunately these are unique values. The following program will reveal the value of each key as it is pressed. Note that 64 is the value for no key pressed.

```
10 PRINT (clear screen)
20 PRINT (cursor home, 3
spaces, 3 cursor lefts);
30 PRINT PEEK(203)
40 GOTO 20
```

Although this is better than the first method it still confines you to fairly simple applications within a Basic program. You can, however, get the keys to do extremely useful things, but it takes a good knowledge of machine code to do it. This is because you need to make use of the 64's hardware interrupt facility.

The good news is that many commercial tool kit programs now available make this facility very simple to implement. Among them are Simons Basic, Sysres, Power and a few others. These allow you to define each key to execute a command at a single key press. For example, you might choose to have an automatic RUN and LIST command plus the ability to change screen and border colours simply.

The function keys are extremely useful — it's a shame Commodore made them so difficult to use.

### No problem with issue 3 loading

**Q**I recently bought a Spectrum, and found out that it was an issue 3 machine with the loading hitch. I am now wondering what software I could buy that would load OK.

David Brown,  
Woodloes Park, Warwick.

**A**If you're sticking to software produced by the bigger companies, you shouldn't have any problems. PCN has tested most of the Spectrum games in the PCN Top 30 on an issue 3 machine, and they all seem to load with no trouble.

Similarly, newly-produced software should have been checked to run on issue 3s by the manufacturer. The only problems you might run into would be with old stock, probably from smaller manufacturers.

### Joystick compatibility

**Q**Is it possible to use joysticks connected to the Fuller Box with Kempston joystick compatible games? And is it possible to upgrade the Fuller Box to the Master Unit by plugging in the speech chip needed?

Graham Wilson,  
London

**A**The Fuller Box allows you to use Atari-type joysticks with the Spectrum, and these won't work with Kempston compatible games. Fuller is, however, producing a tape which you load before you load the game, and will allow you to play Kempston games.

As for the Master Unit, yes, you can upgrade your Fuller Box to one, but it is not simply a matter of slotting the G1-SP0256 voice chip into the vacant slot. The standard Fuller upgrade also involves the installation of a 'clock' device to get things running at the right speed.

### Locations in the Oric ROM

**Q**I own a 48K Oric-1 and I wish to write machine-code programs. Could you tell me where such routines as the IF, KEY\$, DRAW and CURSET are held in the ROM? Also, could you tell me how to find out where other routines are held?

Matthew Villard,  
London

**A**Unfortunately, neither the Oric manual nor Bob Maun-der's useful book 'The Oric Companion' give the information you require. I wonder why you want the IF routine in the Basic interpreter when you want to use assembly language? In this, there are a number of 'BRANCH' instructions which act like Basic's IF... THEN GOTO... To use these you do some operation like compare the value in a register with another value; this sets a flag. The BRANCH instruction will then pass control to a given label if the condition is met.

There is no need to use the KEY\$ function in the ROM, you would collect the contents of location 735, then AND this with 127 to get the ASCII code of the last key pressed — see PCN, issue 31.

While you could do a JSR to the DRAW, CURSET etc routines, you would have to know which registers to load with such factors as the row and column of the screen location you were using.

One way to find out more about the routines would be to approach Oric International Ltd. This organisation is on 0990-27641.



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### Prevent disaster while programming

When writing a long program, on the Dragon 32, I like to make a backup copy after every couple of lines. I always call these copies 'COPYX' ie *COPY1, COPY2, etc.*

But the thinking involved in writing the sections in between always makes me forget what number I am up to. The line: `FOR A=474 TO 482:PRINT CHR$(PEEK(A));:NEXT A` print the last file name **SAVED** or **LOADED**. If for any reason you like to use the ASCII format for saving and loading then change 474 to 466 and 482 to 474.

Paul Crabtree  
Whitworth, Lancs

### Put your Vic in the middle

If you have ever tried using a Vic-20 on a 12", or smaller television screen, you will know that the off-centring of the screen is annoying and on certain games, can be costly in points. The screen can be adjusted by using `POKE 36896,10` or `11`.

If this is entered before loading a game ie `POKE 36896,10:LOAD` this will centre the screen giving a better chance of not being obliterated at the right hand edge. The location for horizontal screen movement as above is 36896 which has a normal value of 12, the location for vertical movement is 36897, which has a normal value of 38. These locations are very useful for games titles where instructions can be moved off, the screen blanked and then new instructions sent on. For example: `1?"[clear screen]"` `2?TAB(4);"now you see it"`

### BBC Basic — verifying A or B

The BBC program shown here is a verify routine for either model A or B. Type it in, in immediate mode, and press return afterwards. After saving a Basic program, simply rewind the tape to the appropriate place and press function key 0. After you have responded to the prompts, the computer will check whether the file, on tape, is identical to the one in memory.

If your cassette unit does not have a remote facility, you will have to stop the tape between each block. If you have a disk drive, change all references to &E01 to &1901 and from &E00 to &1900.

G M Bhanap, Stirchley, Birmingham.

```
*KEYOCLEAR:DIMAX(TOP-&E01):CLS:INF
UT"FILENAME ";F$:PRINT"SEARCHING
":Z=OPENUP(F$):FOR I=0 TO TOP-&E01
:A%(I)=BGETEZ:NEXT I:CLOSEEZ:FOR J
=0 TO TOP-&E01:IF?(&E00+J)<>A%(J)
PRINT"ERROR ";J:NEXT J:ELSE NEXT J
:PRINT"OK":IM
```

```
3FOR A=38 TO 255:POKE
36897,A:NEXT A
4?"[Clear screen]"
5?TAB(2);"Now you don't"
6FOR A=255 TO 38 STEP
-1:POKE 36897,A:NEXT A
Michael Cairney,
Formby, Lancs.
```

### A swifter 64

Commodore 64 owners may like to try the following poke to speed Basic up: `POKE 53265,PEEK(53265) AND 239`

This blanks the screen to the border colour without destroying the contents of the screen (as in loading and saving). When blanked, Basic runs 5.5 per cent faster. The screen can be returned to normal with `POKE 53265,PEEK(53265) OR 16`

David Gristwood,  
Sunderland, Tyne and Wear.

### Paging all Newbrain owners . . .

Here's a program which demonstrates a practical application of paging on the Newbrain. It allows the creation of four numbered pages, each of length ten lines and with 40 characters per line. There's no reason why the length of the page can't be adjusted or 80 characters not selected. Change the loop number to the number of pages. Change line 20:2 parameter to vary each page.

Line 50 opens device 5 which allows input by use of the get function. Line 60 invites selection of the page by inverse video prompt. Lines 80/100 establish the page number and stream. Line 110 places the cursor (PUT6) and GETs a character from the keyboard. Lines 115 and 116 check the position of the cursor to open the next page

before the current one runs out of space.

Line 120 allows you to return to the page selection prompt by use of the `ESCAPE` (control code 27). Lines 120/130 `PUT` the character to the current page to complete the loop.

I believe that this program will solve many Newbrain system queries about paging and the use of some of the more obscure control codes.

```
10 PUT31,23,68:FORp=1
TO4
20 CLOSE#p:OPEN#p,0,p,
"S10"
30 PUT#p,22,30,1:
PRINT#p,"Page: ";p
40 NEXTp
50 CLOSE#5:OPEN#5,5
60 PUT14:PUT31,22,12,12:
PRINT#0,"Select
Page No. ";
PUT15
70 GET.1195,p$
80 p.004VAL(p$)
100 IFp>4THEN60
110 PUT#p,6:GET#5,a
115 PUT#p,21:GET#p,x,y:
IFY>9THENp=p+1
116 IFy>9THEN100
120 IFa=27THEN60
130 PUT#p,a
140 GOTO100
200 END
P M Stevenson,
Fareham, Hants.
```

### Washers for the ZX printer

Sinclair Research has come in for more than the average share of brickbats since the launch of the ZX81 more than two and a half years ago, but may be that should change.

My ZX printer gave up the ghost recently after a lot of hard work and, resigned to not seeing it again, I popped it into a jiffy bag and posted it off. Three weeks later to my great surprise a printer, in perfect condition, arrived on the doorstep!

Any readers who still have problems with paper feed may find this tip of interest. A printer I borrowed squashed the printed lines at intervals and gave somewhat ragged characters. The cure was simple. Small washers, just thick enough to take up the sideways movement on the spool holder, were slipped over the end pieces and fixed into place with a spot of glue. Suitable washers can be obtained at any electrical or hardware shop.  
R G Taylor,  
Farlington, Hants.

### Programming sound on the Vic 20

This program is written for the Vic-20. The program is in machine code and locates itself at 02A1 hex or 673 decimal. The program will run on any Vic with any memory configuration.

The program is designed to be an aid for programming sound. After running type: `SYS 673,S1,S2,S3,S4,VL`

Where: S1=Bass voice — Limits 127-255  
S2=Tenor voice — Limits 127-255  
S3=Treble voice — Limits 127-255  
S4=Noise generator — Limits 127-255  
VL=Volume control — Limits 000-015

```
10 DATA 32,253,206,32,158,215,138,72,32,253
20 DATA 206,32,158,215,138,72,32,253,206,32
30 DATA 158,215,138,72,32,253,206,32,158
40 DATA 215,138,72,32,253,206,32,158,215
50 DATA 138,201,21,16,20,141,14,144,104
60 DATA 141,13,144,104,141,12,144,104,141
70 DATA 11,144,104,141,10,144,96,169,21
80 DATA 141,15,144,96,0,0,0,0
90 FORI=673TO745:READA:POKEI,A:NEXT
Steven Jones, Thorpe Bay, Essex.
```



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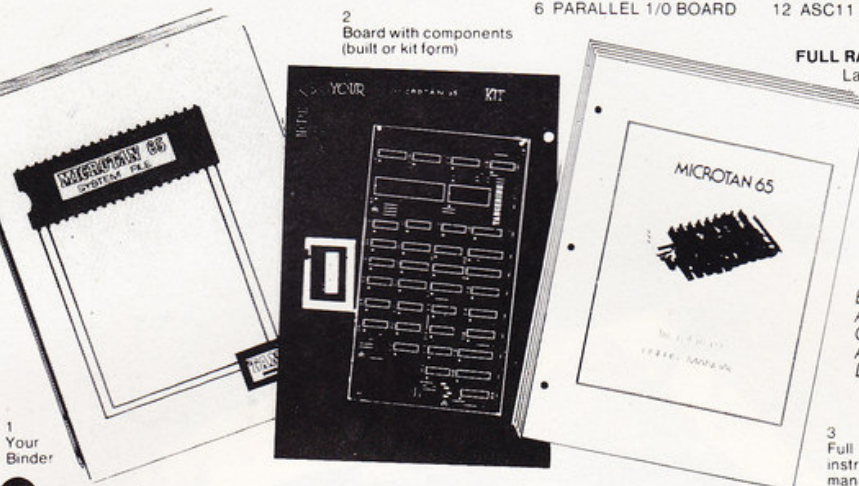
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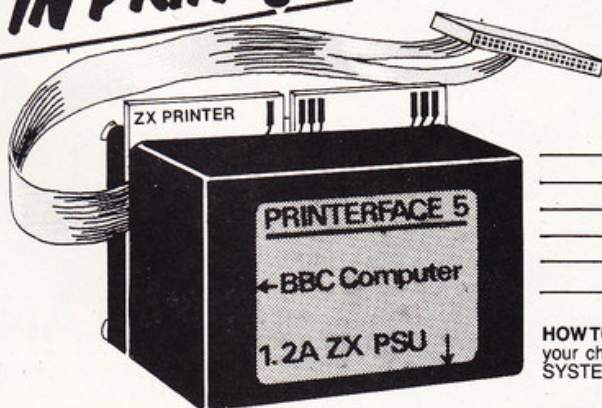
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Not the Tandy 100 — Geof Wheelwright discovers more to the PC-8201A than cosmetic changes.

# NEC's mighty midget

**T**he Nippon Electric Company has long been famous in Japan for producing television, home entertainment and video equipment — but until recently has not made too many waves in the UK computer market.

But in the past two months, NEC has launched two very substantial micros in this country: the NEC Advanced Personal Computer (reviewed in *PCN*, issue 30) and the NEC portable PC-8201A. The portable 8201A, due for release this month, is the subject of this review and probably the

object of many double-takes by people who get a strong sense of *deja-vu* when they see the machine.

If you think you've seen it before, you're at least half right. Both NEC's PC-8201A and Tandy's Model 100 portable computer (reviewed in *PCN*, issue 18) were designed by the Japanese company, Kyocera. They share the same processor, have substantially the same built-in word processing system and a similar implementation of Microsoft Basic.

The prices for bottom-line models of each machine are also about the same (£475 for NEC's and £499 for Tandy's) although the NEC comes with twice as much memory as the Tandy 8K base model.

On the outside, however, the two machines look pretty much identical. Although their function and cursor keys are configured differently and the colour scheme is slightly different, you could still be forgiven for the double-take.

But like most fraternal twins, the Tandy and NEC machines have entirely different personalities. It seems that although Tandy and NEC decided they would both produce machines based around the Kyocera, each company had its own ideas about the tasks the book-size portable would be put to.

Tandy took the not unreasonable viewpoint that the machine would become the electronic equivalent of the executive's

20 ▶



The PC-8201A can take up to 64K of non-volatile RAM inside the machine (sockets for which are shown in the small picture on the left) as well as an interchangeable 32K memory module which slots into the left side of the machine. The 32K module is powered by its own battery and will maintain its memory even when not plugged into the computer.



19 daybook and chose to include an address-book, schedule organiser, telecommunications program and text editor resident in ROM. Tandy has been quick to bring out a battery-powered plug-in acoustic modem for the Model 100 and have stressed its compatibility with the Tandy range of business computers.

The NEC machine, however, wears no such pin-striped strait-jacket. It seems that NEC has designed the PC-8201A to be an "open" computer and that the last thing the company wants is for the machine to be limited to the business user.

## Presentation

The machine comes in a small cardboard box replete with pictures of the machine on front and back and either side. It is packed inside with styrofoam and wrapped in plastic.

The box includes a "leatherette" imitation leather case for the computer, three manuals, a set of batteries, a cassette recorder cable and a cassette containing the "Software Application Kit", as well as the computer containing at least 16K of CMOS non-volatile memory.

## Documentation

There are three manuals: one for the computer, one for the applications program cassette and one for the N82 extended Basic built in to the PC-8201A.

Although the documentation is quite complete, it is certainly idiosyncratic and somewhat the worse for wear in its translation from Japanese to English. (The documentation for the 32K RAM cartridge we received with our test model didn't have any English documentation — it was all in Japanese).

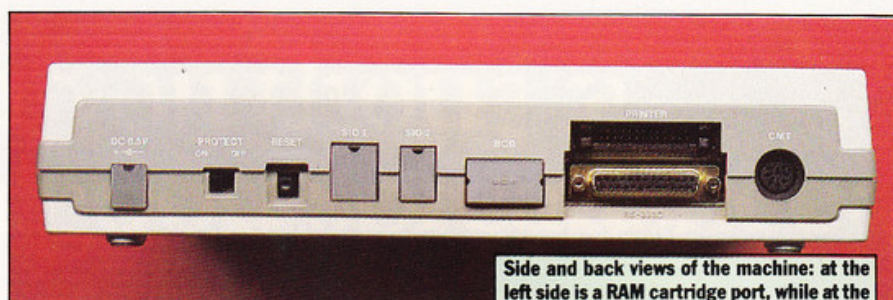
Witness, for example, these gems in the Personal Application Guide: 'Schedule Keeper — SCHDL: This program is for busy person. Program help you make schedule and keep them.'

Or this classic: 'The SOUND instruction of the N82-Basic provide such first parameter for decision for musical intervals that gives much finer decisions than so-called semitone music.'

However, such pécadillos are to be expected whenever a product as complex as the PC-8201A takes a trip halfway round the world. And the mistranslations are few and far enough between that they don't make for more than the odd intriguing aside.

Despite the comprehensive approach there are a few areas which could have done with more explanation. The SIO (Serial Input/Output) interfaces, with their 6-pin and 8-pin BERG modular jacks, are described inscrutably as "available for future expansion of peripherals".

The interface could be designed for use with a disk drive system that NEC has alluded to, but kept safely out of the manual — but even an NEC spokesman wouldn't confirm that. It's unfortunate that since such a lot of work obviously went into the superb design of this machine, NEC couldn't have been sure enough of its future to include details of and plans for the



Side and back views of the machine: at the left side is a RAM cartridge port, while at the back are plug-ins for peripherals.

disk drive.

## Construction

The PC-8201A is a solid machine with a slightly more substantial feel than its Tandy sibling. This is largely due to the way the machine's I/O ports are stacked up at the back of the machine to provide you with a tilted keyboard and screen. This rakish wedge-shaped design improves the readability of the screen.

There are, however, two minor drawbacks to the construction of the NEC. The first is the placement of the battery power supply, which is designed so that it neatly slides out from the back. Perhaps it was my test model, but several times I found the machine sliding away from the power supply when I was carrying it.

The second — and again small — problem with the construction of the machine is the close positioning of the printer and RS-232 ports. If you were using both at once, it could be a tight fit as they sit one above the other.

## Keyboard

The keyboard is a high-quality qwerty job with a good bounce that gives the kind of "feedback" that will make even fans of manual typewriters feel at home. The keyboard layout is sensible, forsaking Tandy's "in-line" key arrangement for a proper cursor keypad, with each key pointing in the direction that it intends to move the cursor. NEC has also dispensed with the "numeric keypad within a keyboard" arrangement that Tandy provides on the Model 100.

There are five function keys, which actually function as ten by having a second set of values when the Shift key is pressed. A Paste key which inserts text from a buffer, and a Delete/Backspace key are incorporated in the main body of the keyboard.

A GRPH key displays user-defined graphics with a value of CHR\$(131) or greater and a CAPS key provides a capitals lock.

## Screen

The PC-8201A (I can never get used to these long-winded numbers as names of computers; why not something catchy, or bland, but easily remembered?) has the same 40-column x 8 line screen display as the Tandy Model 100.

The resolution on this screen is 240x62 dots, giving a quite readable typeface for text and a good resolution for graphics. The dot-resolution is high enough that it allows for development of games to rival

the "Game and Watch" variety of dedicated gadgets.

The NEC doesn't support the range of graphics characters built into the Tandy, but instead allows you to redefine any characters from CHR\$(131) to CHR\$(255). Included in the Personal Application Kit that comes with the machine is a character redefinition program.

## Storage

The machine uses a cassette filing system or non-volatile RAM for storage. But its biggest advantage in this department is the use of bank-switching and plug-in non-volatile memory cartridges.

The PC-8201A can take up to 64K of memory "inside", and an additional 32K through the cartridge port at the side. The bank-switching system is explained in detail in the box below, but summed up in a few words: it gives you the effective equivalent of three RAM-based disk drives.

The expanded machine has three "banks" of memory, each of which can be addressed like a disk drive. Banks 1 and 2 are each 32K sections of memory inside the machine, while Bank 3 is the 32K memory cartridge.

Pressing Shift and function key 5 from the main menu switches you from bank to bank, giving you a new directory for each of them. And there are utilities included on the Personal Application Kit cassette which let you transfer files from one bank to another, copy all the data from one bank to another and write from one bank to another.

This system effectively means that all your day-to-day programs can be stored in one bank of memory (calendar programs, reminders, schedules and utilities), another bank can be used as a scratch "worksheet" for notes, calculations and other work — leaving the exchangeable cartridges to be used for data files.

And since the cartridges are removable, you could have as much "portable" storage as you like — although it would take quite a bit of information to fill up the 96K supplied by the on-board memory and one 32K memory cartridge.

The only drawback to this system which



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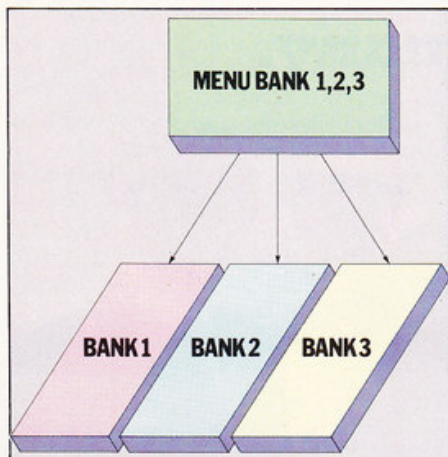
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The PC-8201A uses a unique bank-switching system that treats chunks of memory much like disk drives. As the diagram at left shows, when you log onto the machine a menu is displayed showing that you are logged on to a memory bank #1, #2 or #3.

Each bank of memory can contain up to 32K RAM and allows you to store 21 files. Files can also be copied between banks of memory and backed up from one memory to another.

There are write/read protect switches on both memory banks #2 and #3 so that you can't accidentally overwrite a file in those banks. The switch for protecting memory bank #2 is at the back of the machine, while the switch for memory bank #3 — which is a 32K memory cartridge (shown in picture at right) — is on the outside of the cartridge itself.



4 20

— if it works properly — could make disk drives quite superfluous on book-size portables, is the price of the battery-powered memory. At about £200 per 32K cartridge, the memory cartridges are not likely to replace floppy disks or cassette tape in any great hurry.

And that's a shame, because the cartridges are so nice. If they came down to about £50 or so each, they could mount an effective challenge to the Osbornes And Compaqs of this world — but at their current price, the plug-in RAM disks have too little memory for too high a price.

### Expansion

The major expansion capabilities of the PC-8201A have to do with the memory, although there are vague promises for a disk drive system in the future — as well as even more vague talk of producing a TV modulator to run an 80-column screen. But the back of the machine is already packed with expansion potential for add-on goodies:

- The two previously-mentioned SIO connectors.
- The Bar-Code-Reader connector which can use a bar-code wand to read bar codes.
- A parallel printer interface.
- An RS-232C serial connector.
- A cassette interface.

The cost of the peripherals represent a certain dual-mindedness in NEC's pricing department. While the £85 price tag for the battery-operated/Centronics compatible 40-column printer seems more than reasonable, the £20 cost of a printer cable, £21 for the RS-232 cable and £58 for data cassette recorder all seem a bit high.

### Software

Unlike Tandy's Model 100, NEC has included only two programs in ROM: a text editor and a communications program. They share the names of the Tandy programs: TEXT and TELECOM, and they do exactly the same things.

The telecom program allows you to send and receive data from other micros through the RS-232 port, while the text program is a surprising by powerful in-built word processor. Text allows you to write text, format it, do block moves, block deletes and block inserts — all in glorious 40-column display.

NEC has taken a different approach to Tandy in providing software. It has opted for a much nicer version of Microsoft Basic, fewer built-in programs, more programs on tape and some provision for playing games with the machine. The applications tape, for instance, includes two games: a version of the classic Snake game, and a tank maze game where you try to take territory and men from an enemy force.

The financial world has also been represented in the suite of packages with a calculator, an investment portfolio file organiser and the schedule and address programs that reside in the Tandy machine in ROM.

### Basic

The PC-8201A has a relatively standard extended Microsoft Basic that can be edited quite easily using the cursor keys and many of the editing commands available in TEXT. Unlike many Basic editors (such as the one on the Model 100, where you have to go into a special EDIT mode to edit Basic programs) programs can be edited straight from Basic.

You can also use what is known as an IPL file to create programs that are automatically executed when the machine is turned on. If, for example, you wanted to create a Basic file that would prevent anyone who didn't know your machine password from using your machine you would type the short program:

```
BASIC
CLS: INPUT A$:IF A$<>"YOUR
PASSWORD HERE" THEN POWER
OFF ELSE MENU
```

That would cause the computer to shut itself off every time someone entered a password that didn't match whatever you

had chosen.

The IPL command can also be used to turn the machine into a dedicated word processor by causing it to go straight into the TEXT program every time you power up the machine.

### Verdict

The NEC PC-8201A is a gorgeous machine that I would recommend to anyone were its price not stuck at the current level by the high cost of CMOS RAM.

The NEC is still, however, the cheapest in an expensive field. At £475 for the bottom-line machine with 16K, the NEC represents better value than the Tandy Model 100 and Epson HX-20 machines it's currently competing with. There are two questions that will loom large for NEC in launching the PC-8201A in this country: how well can they support the machine — particularly in view of the number of people who will quickly want to upgrade the 16K memory (which costs £59 per 8K up to a maximum of 64K) and how will they fare against the looming competition?

NEC has made the right decision in leaving the 8201A as an "open" machine with lots of memory, but can it compete in the face of the aforementioned £1300 Sharp PC-5000, replete with flip-up 80-column screen, 16-bit 8088 processor running under MS-DOS, 256K maximum bubble memory and disk drive potential?

In short, NEC has produced a very nice machine that probably would have been unequivocally praised to the skies had it arrived here six months ago. But in the face of what else is available now, and at the price, NEC is going to have to make the machine a little more wonderful if it wants to win the battle of the "lap-held" computer market.

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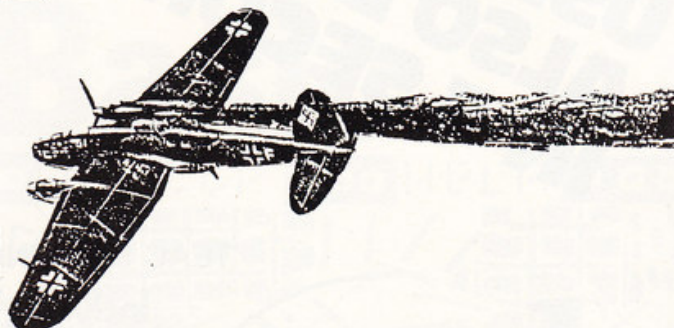
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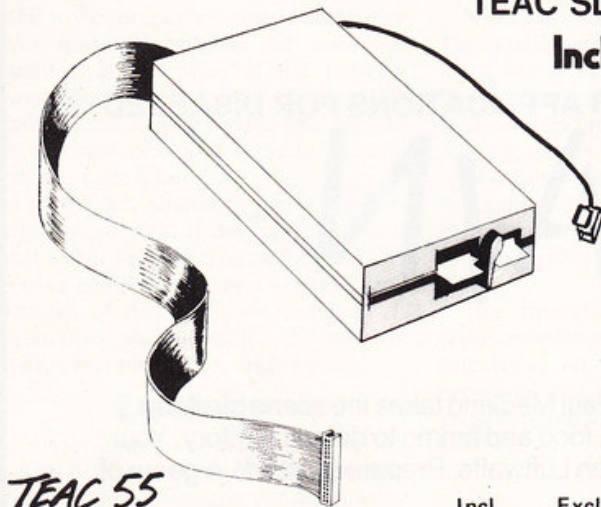


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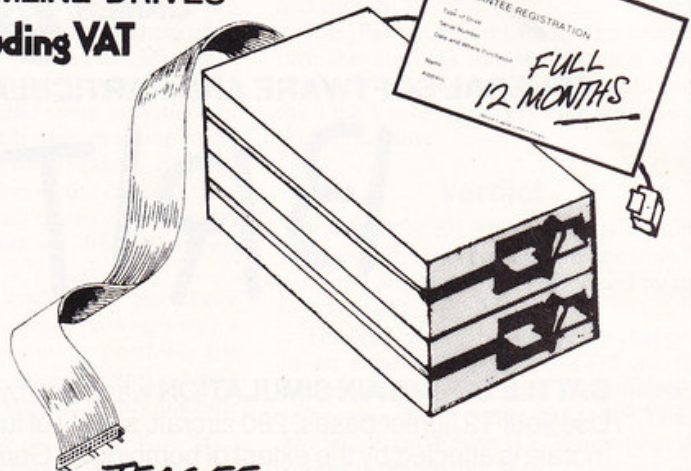
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Look after the bytes, and you'll find that the memory looks after itself, says Gary Williams.

# Token gestures for Oric Basic

In common with a number of other microcomputers, the Oric 1 uses what are known as 'tokens' to allow the interpreter to recognise the Basic instruction. This allows more efficient use of memory space by using only one byte for common instructions, rather than one byte for each letter of the instruction.

For example, take the instruction PRINT. If this was stored as individual letters P-R-I-N-T, then it would take up to 5 bytes of memory. However, the statement PRINT is instruction number 186 decimal, which is saved in memory as one byte, ie an 80% saving of memory space.

Words like RESTORE and EXPLODE result in almost 86% saving. This also helps the interpreter when it is searching through the memory for the next Basic instruction.

The start location for Basic programs is location 1280 (HEX 0500) in RAM. PEEKing this and the following locations will reveal a series of decimal numbers that, at first, bear no resemblance to the normal screen listing.

Starting with a 'clean' computer, ie with the power just applied and the screen displaying ORIC EXTENDED BASIC V1.0, type in the following program exactly as listed. If you make a mistake, and you wish to edit the program, then switch OFF and then ON again to make sure all memory is re-set.

```
10CLS
20FORI=1TO5
30PRINT"HELLO"
40NEXT
50A=1280:B=1290
60FORI=ATOB:PRINTI,PEEK(I)
70NEXT
80LIST-40
```

Run the program. The screen will clear, display HELLO on five consecutive lines then print two columns of numbers before listing itself up to line 40.

In the table below, the left hand column of numbers represents the RAM locations from 1280 to 1290. The right hand column shows the decimal or binary number associated with each location.

1280	0	
1281	7	Pointer to start location of next
1282	5	Basic line. $7+(5 \times 256)=1287$
1283	10	Basic line number
1284	0	$10+(0 \times 256)=10$
1285	148	Token number for CLS
1286	0	End of first BASIC line.
1287	18	Pointer to start location of next
1288	5	Basic line. $18+(5 \times 256)=1298$
1289	20	Basic line number
1290	0	$20+(0 \times 256)=20$



You will note that it takes two bytes to store the Basic line pointers (also known as link addresses) and Basic line numbers. As discussed earlier, you are allowed to use line numbers up to 65535. One byte can only store up to 255 decimals. Therefore, if you wanted a line to be numbered 1000 then the second byte would be a multiplier for 256. The resultant number would be added to the number in the first byte.

The above is simplified on the Oric by giving you an instruction that looks at both bytes and performs the necessary calculation to give the decimal equivalent. The instruction is DEEK(X), where X in example 1 above would be 1283.

PRINT DEEK (1283) Return

1000

READY

If you want to continue looking at the

	Location	Number		
Example 1	1283	232		232
	1284	3	$= 3 \times 256 =$	768 +
				1000
Example 2	1283	255		255
	1284	255	$= 255 \times 256 \times$	65280 +
				65535



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remainder of the short program in RAM then type the following:

A=1291:B=1309:GOTO60 Return

The next block of memory will be displayed, taking you up to the quotation mark at the end of line 30.

A=1310:B=1316:GOTO60 Return

This will take you up to the end of line 40.

## Renumbering

With some knowledge of how commands and characters are stored in RAM, it is possible to create a simple renumber routine that will identify the existing line number RAM locations and change the line numbers to whatever is required.

```
60000 CLS:INPUT"Start to re-number
        at line";S
60010 INPUT"End re-number
        sequence at line";E
60020 INPUT"New start line";L
60030 INPUT"New line
        increments";I:L=L-I
60040 A=1281
60050 B=DEEK(A+2)
        :IFB<STHENA=DEEK(A):
        GOTO60050
60060 IFB>ETHENEND
60070 L=L+I:DOKEA+2,L
60080 A=DEEK(A):
        IFDEEK(A)=OTHENEND
60090 GOTO60050
```

Unfortunately, this simple program will not change any GOTO and GOSUB line numbers in the Basic text. These would require changing, using the normal Basic editing routine, after the above listing had been RUN.

A program to alter all the GOTO and GOSUB flags would first have to identify their position in RAM and store this information, along with the current flag numbers in the following locations, in a temporary buffer. The above routine would then be run concurrently with a comparison routine to note the change in line numbers and substitute the GOTO and GOSUB flags when necessary.

A Basic version of this would probably be so slow that the user would prefer to edit the program in the normal manner. Reference should be made to 6502 machine code textbooks for guidance on developing a fast assembly language program.

The above re-number routine can be merged onto existing programs by first loading it into the computer, then LISTing it on screen. Without clearing the screen, load the main program that you wish to alter. When loading is complete, cursor up the screen and copy each of the program lines 60000 to 60090 by using the CTRL'A' facility in the normal manner. The routine will now be part of your main program. Type RUN60000 Return and you are then able to change program line numbers.

A useful routine to add to any Basic program that has data stored in it is one that gives the equivalent of RESTORE X — where X is a specified line number.

The normal READING of data in a Basic program is sequential. That is, the first READ statement is directed to the first

block of data, wherever that may lie in the listing. Subsequent READ statements are directed to blocks of data after the block read in the previous READ instruction, unless it has been RESTORED, in which case it will start again at the first block of data.

To access a particular block in the Oric 1, you must first RESTORE, then generate a FOR — NEXT loop to READ and discard unwanted data, until you arrive at the data block required. This is both time consuming and uses a fair amount of variable storage area which may then have to be subjected to the 'garbage collection' routine to clear all unwanted variables. Remember, string variables can be anything up to 255 characters in length, so a lot of memory can be used if your data is being transferred into string variables.

RAM addresses 174 and 175 monitor the progress of the READ instructions and store the current program line number. Unfortunately, DOKEing this location with the desired line number does not give the required result. Locations 174 and 175 are updated by other locations within the system variable block.

One of these is 176/177, which monitors the actual RAM location in the program memory block (1280 upwards) and acts as a pointer to the current data statement. Changing this pointer with a DOKE instruction will give the desired result. For example:

```
60000 CLS:INPUT"Restore line
        No.";L
60010 ML=1281
60020 ML=DEEK(ML):
        IFDEEK(ML+2)=
        LTHEN60050
60030 IFDEEK(ML+2)>
        LTHENPRINT"No such line
        line.":GOTO60000
60040 GOTO60020
60050 IFPEEK(ML+4)<>145
        THENPRINT"Not a
        DATA line.":GOTO60000
60060 DOKE176,ML+4:RETURN
```

In a normal program, where the above listing would be a subroutine, line 60000 would be 60000 L=X — where X is the desired line number.

In a properly debugged program, lines 60030 and 60050 will be redundant; we can therefore rewrite the subroutine as follows:

```
60000 ML=1281
60010 REPEAT:ML=DEEK(ML):
        UNTILDEEK(ML+2)=L
60020 DOKE176,ML+4:RETURN
```

'L' should be set to the desired line number before you GOSUB60000. The Basic listing is obviously not as fast as a machine code routine but it does use less memory than READING through unwanted data, and looks only at line numbers rather than every bit of data. It is therefore much faster than the FOR — NEXT loop routine.

Data statements should be stored somewhere near the beginning of the program. As the search routine starts at the first line location in RAM, the sooner it meets a match with the desired line number then

the faster the routine. If it is unavoidable that data statements are near the end of a program (this being the standard procedure used by many people) then the following modification for line 60000 will increase the speed of operation.

6000 ML=X

Here X is the RAM location of the link address LOW byte, which in turn points to the start of the first data line in RAM.

## Keywords

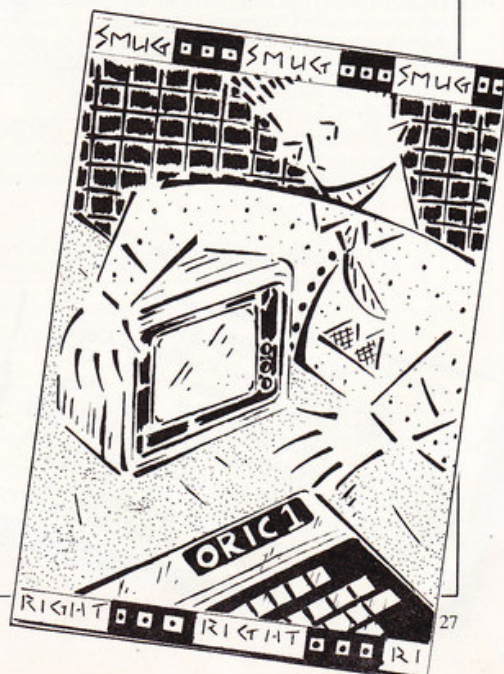
Finally, here are some hidden Basic keywords that are not mentioned in the user's manual. Typing EDIT X, where X is the program line, will list the line on screen with the flashing cursor to the left of the line number. The normal LIST X will list the line, but also prints READY and leaves the flashing cursor at least three lines below the desired position.

The EDIT facility is very useful for changing program lines in HIRES mode. Attempting to LIST when in HIRES results in the required line scrolling up and off the three line TEXT area at the bottom of the screen. You have probably typed TEXT, lost the HIRES screen for comparison and then typed LIST X.

Try typing EDIT X Return while still in HIRES mode. You can now change your program line, using the normal CTRL'A' copy facility, while the HIRES screen is still being displayed — very helpful if you are trying to re-calculate CURSET or CURMOV parameters.

The Basic keywords INVERSE and NORMAL cannot be used. The designers had intended that these facilities be available, and they were included in the glossy brochure that was being sent to prospective customers, but it seems that problems with the ROM meant these keywords were switched off. Attempting to use them will return 'syntax error'.

As you can see, there are many permutations and procedures that can be developed with the knowledge of the Basic storage and system variables locations. There are obviously many other locations that I have not discussed but this article should help you to delve even deeper into the operating system.





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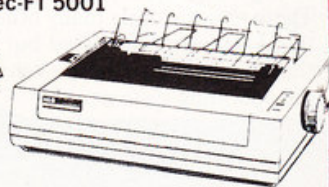
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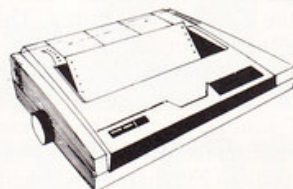
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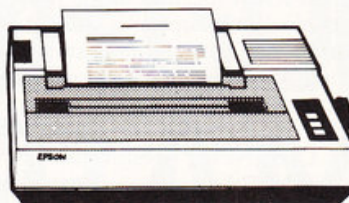
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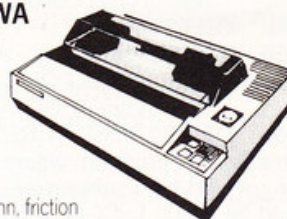
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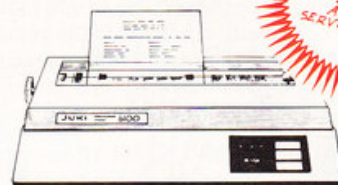
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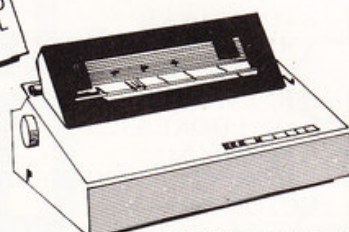
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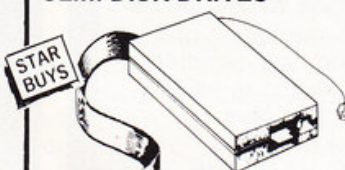
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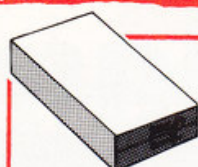
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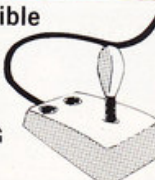
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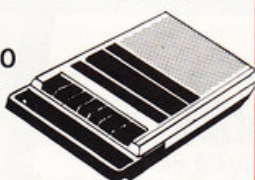
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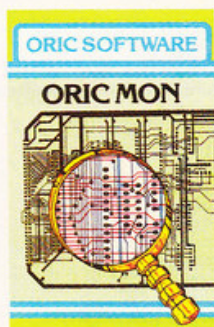
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Shorter records would enable more to be held.

Files can be output in sequential format for use with other systems and the package can cope with a single or dual disk drive and printers using the IEEE, RS232 or Centronics bus.

The system consists of 11 modules, each of which is automatically loaded as required. The modules are written in Basic, with the addition of machine code routines where speed is necessary. The program disk is not protected, the publisher's philosophy apparently being that protection systems are inconvenient to the end user. They prefer to rely on the low price and the goodwill of the buyer to protect the package from piracy. Single disk users can thus copy the most frequently used modules to a work disk, ensuring that as much disk space as possible is available for the data.

## Presentation

A comprehensive 76-page manual is supplied. There is no index, but the material is laid out in a logical fashion so that finding the appropriate reference is not too much trouble. There is a very good introduction which covers a variety of general but relevant aspects, including backing-up programs, terminology, Commodore disk systems, data security, etc.

A generous collection of sample files is included on the program disk. As the manual has plenty of examples which are linked to these specimen files, you can immediately start experimenting. For those wishing to tailor the system to meet their own requirements, advice is given in the manual; it includes a list and explanation of the major variables.

## In use

You always start by creating or reading in an existing database. Each random access file is accompanied by a set of sub-files which hold indices, block maps, report formats, etc.

When creating a file, the program will ask for the number of records the file will contain, and the maximum record size. Each record can contain up to 20 fields, none of which have to be fixed length. It is then just a question of specifying the titles of each field together with the number and name of the key fields. An index is kept for each key field; there is nothing to stop you indexing every field on the file but space availability and speed would be affected.

File maintenance options are shown in a strip across the screen. Records can be added, amended or deleted and the file stepped through, backwards or forwards. A 'browse' facility displays the record number, one key field and one other field of a record.

An individual record can be selected by use of the FIND command. If no match is found, the record nearest a match is displayed. This facility is rather restrictive.

Other options include changing the key field, switching between upper and lower case, replicating the last record, calling up

## 'It represents very good value for money'

a user pre-programmed message, the ability to erase a file and a graceful exit from the program. Most of the options allow you to correct an entry before it is too late. You can transfer to any of the other program modules: re-sort, batch entry, sequential file creation, calculation, sequential file load, mailing labels, and reports.

The mailing label module lets you specify the label format, with up to three labels across a page. If the special field TYPE has been used in the database file, individual groups of records can be selected for printing. If not, all records (from a given starting record number) or just one record can be printed as a label.

One omission is a lining up facility to ensure the labels are properly aligned in the printer. The manual merely tells you to check that the top of the label is under the print head. To be fair, the module allows you to pause or restart while the labels are being printed.

The report is very comprehensive. Headings are automatically centred and column widths allocated. A powerful calculation facility, using very simple steps, allows quite complex arithmetical operations to be carried out on the report fields. In addition, columns can be justified, totalled or averaged. The facilities for setting selection criteria, for records contributing to a report, are impressive.

The format used is extremely simple and the program guides you through each phase of the criteria build-up. This process allows you to set up as complicated a set of criteria as you are likely to need. Criteria operations include equality, less than, greater than, not equal to, alphabetic precedence and antecedence, pattern matching, sliding strings, and record number matching — a generous selection.

The facility to change the contents of files by using the calculation option is equally comprehensive — squares, logs, sines and even random number generation are included.

## Reliability

The package seems reliable, although it lacks some desirable features — for instance, the stop/restore keys are not disabled, not all disk error messages are trapped and reported, and you cannot obtain a directory listing from within the program. The manual gives guidance on what to do in the event of a program crash.

## Verdict

A good all-round information retrieval system whose menu-driven method is particularly easy to use. It has a respectable history and large user base. Although it is a bit weak in the on-screen record retrieval area, and likely to be on the slow side with a large number of records, it more than makes up for these deficiencies with powerful calculation and report generation facilities.

Given the low price of the package and the fact that it includes a built-in mailing list facility, it represents very good value for money.

## RATING

**Features**  
**Documentation**  
**Performance**  
**User interface**  
**Reliability**  
**Overall Value**



**Name** Simply File **System** Commodore 64 **Price** £60 (ex VAT) **Publisher** Simple Software, 15 Havelock Road, Brighton, Sussex BN1 6GL **Tel** (0273) 504879 **Format** Disk **Language** Basic and machine code **Other versions** Pet **Outlets** Mail order and dealers



Bob Chappell takes a crash course in orienteering in the comfort of his own front room.

# Into the Forest

I was sure it had nothing to do with a certain East London soccer team. Maps were involved somewhere along the line, yet more than that I could not say. The ignorance is now resolved and I am a changed man. I have been through *The Forest*.

As you're probably wondering what on earth I'm on about, let me explain in one word — orienteering. The instrument of my education was a program called, unassumingly, *The Forest*. If you know as little about orienteering as I did, then this program is probably the best practical introduction to the sport you could find.

*The Forest* is a simulation of the sport of orienteering. With it you can travel miles through the toughest terrain without ever leaving your fireside chair. Orienteering can most simply be described as car rallying on foot, being a cross-country race over difficult terrain, often forest, with the extra dimension of having to navigate your own course.

Armed with a special marked map and a compass, you have to plot and follow your route between a number of control points from the start to the finish. At each control point, a control card is marked as a verification that all the correct checkpoints have been visited. The art lies in successful map reading as much as being fast on your feet.

The program is intended as a training aid for practising the techniques of orienteering and can be used in teaching the understanding of maps and their relationship to the physical world. It also happens to be a very entertaining and demanding sport simulation in its own right and will undoubtedly appeal to those games-players who like their pleasures to be more cerebral. Tackled as a race, yomp or steady stroll, it offers many interesting challenges during the course and much satisfaction on successful completion.

A detailed map of the course is supplied with the package. The screen views the terrain directly ahead. All visible features (trees, towns, lakes, etc) are shown on the horizon which is six metres away. The view covers a 100 degree sector, 50 degrees to each side of the centre. Movement through the country-

side is controlled by the cursor keys. Pressing the left or right arrow key faces you 11.5 degrees to the left or right respectively. Pressing the down arrow causes a 180 degree about-face. The up arrow sets you moving forward, each step being about 1 metre. To stop running press any key except the up arrow.

The direction you are facing can also be changed by altering your bearings; these can be taken and changed at any time. With every change of direction, the display is updated accordingly. A list of the control point codes and descriptions can be displayed, as can your control card which may be punched at any control point. The time elapsed since you started off is displayed on request.

Assistance can be obtained by calling up a menu and getting your current co-ordinates, enabling you to verify your position against the map. Any part of the terrain can be displayed as terrain type, as contours, as a cross-section, as a three-dimensional view, or can be scanned for point features. These features are not there just to get you out of a jam but are intended to instruct by showing the relationship between the map and the ground in a variety of ways. These features are most impressive and geography teachers could find them invaluable as a teaching aid.

You can give up before you've finished — the display tells you which of the control points marked on your card are correct or missing. There is an option to try out the same course on a more complex forest, which is considerably more difficult.

One might think that having completed the course once or twice the challenge would disappear. Not so, for the author has provided a facility to set out your own course over the mapped area. There are a large number of control points laid out in the terrain, only a few of which are used in the preset course. By following a simple question and answer menu, you may use any of these control points to construct your own course. The only restriction is that the start and finish points must be those used in the preset course.

Being able to design then save these

courses to tape extends the interest value of the program indefinitely. With the additional element of competing against the clock and the various facets of the mapping aids, the program offers vast scope for entertainment and instruction.

## Presentation

The whole package has the hallmarks of quality and professionalism. The program comes on cassette packed in a large video-style case. The program is copied to both sides of the cassette and it loaded first time, every time. Inside the case is the printed map. It is very well produced and the scale and legends are clearly marked, as is the course.

The 32 page book that comes with it provides an introduction to orienteering and covers all the features of the program clearly and concisely. There are helpful diagrams complementing the text which assist in understanding trickier concepts such as map orientation for three-dimensional displays.

Although I knew precious little about orienteering before I picked up this book, I found that I could quickly become proficient in using the program effectively and, more to the point, understand precisely what was going on and why. The book is lacking in two places only — in setting up your own course and in restarting the program. Apart from that, the documentation, like the program, is first-rate.

## Getting started

Although the program is very easy to operate, you are well advised to study the manual before plunging into *The Forest*. Of particular importance is the recommendation to use a protractor for taking bearings on your map. The manual gives invaluable advice on navigational techniques — following boundaries, counting paces, lining up on landmarks, checking bearings, etc. I ignored this expertise to start with and, although I had no problems in using the program and made considerable progress across country, I ended up way off course.

On running the program, you are immediately presented with a colourful view of trees and part of a town. This is





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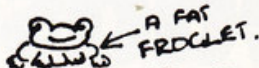


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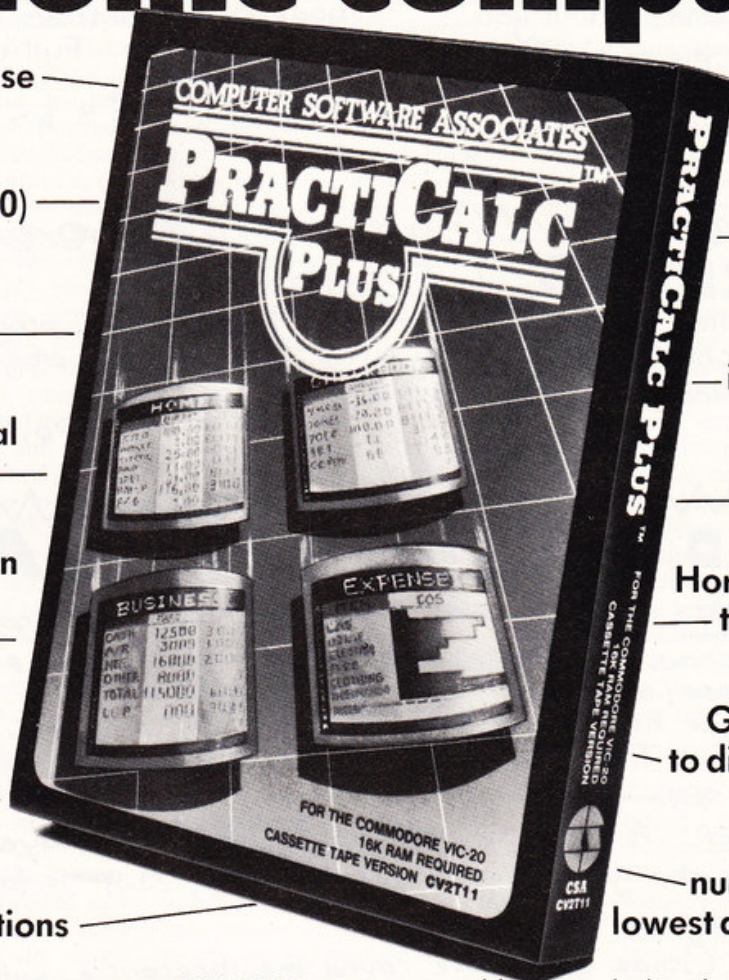
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33 The starting point.

the starting location. Typing shifted B shows your current bearing and invites you to enter a new one. Having done this, pressing the upward arrow sets you off at a steady pace in the direction selected by your bearing. The scene is quickly updated with every step taken.

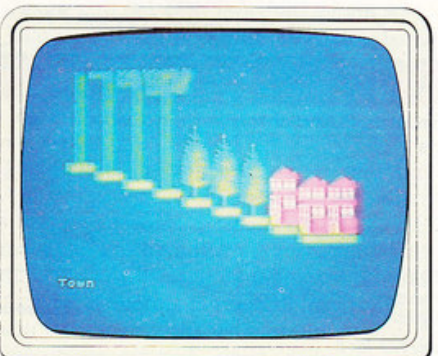
In real life, you would be almost certain to drift slightly from your set course, and since the program emulates this tendency it is worthwhile checking your bearings at regular intervals. Failure to do this had me missing the first control point and having to retrace my steps. Pressing any key other than the upward arrow causes you, and the displayed scene, to remain motionless — but time marches on. Pressing the left or right arrow key while moving has the scene sliding smoothly sideways in the desired direction.

The manual clearly explains the displayed symbols and offers advice on navigating for the control points. With this guidance, I found it very easy to get started and soon had the first three of the 12 control points stamped on my card. It was not long after that that I became hopelessly lost and had to resort to 'cheating' by calling up the assistance menu. This put me back on the right track, although I had wasted a lot of time looking for the control flag in the wrong place.

## In use

The graphic display, with its representations of thicket, houses, moor, grass, lakes and buildings, gives a clear impression of the terrain before you. Eye level is represented by a central square and, as the scene varies in height, it is easy to determine whether you are going uphill or down. Colours are used naturally and effectively.

The contour map option allows you to



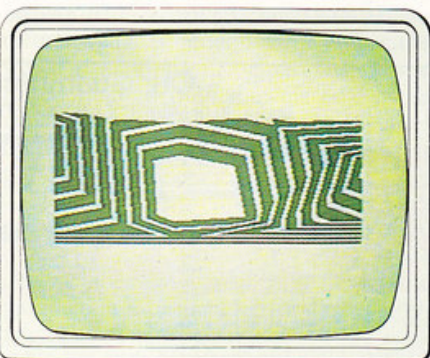
The result of sideways movement.

select a fine or coarse map of an area. If the latter, the contour interval can be chosen and the resulting map coloured and lettered (the higher the letter in the alphabet, the higher the contour). Maps can be scaled or drawn covering a given width and height. The orientation of the map can also be specified.

Mapping the terrain gives a coloured and lettered representation of the area, each letter representing a type of terrain (eg g for grass, m for moor, etc).

The point features option allows the scanning of a particular area. The display is exactly how you see it when in the normal mode of traversing the countryside. The scan runs up and down the area in raster scan fashion, covering a strip at a time, just like a lawn mower. The scan displays the co-ordinates at every step and halts at any section containing any point feature (knolls, depressions, boulders, etc) within it — useful for checking out the names and locations of the control flags.

A cross-sectional view of an area can be taken and a three-dimensional view of a particular area can be obtained. In the



The ordinary contour map.

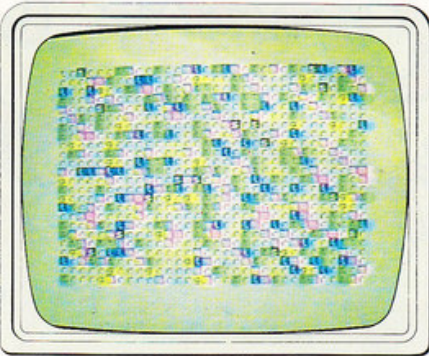
latter, being able to specify the orientation of the view is especially useful.

Setting up one's own course is simple, but you have to know the names and associated descriptions of the control flags you are going to use. Since these can only be found by exploring the terrain (they are not marked on the map or listed in the manual — that would spoil the fun), you need to build up this list yourself. You can't enter new flags or descriptions. Co-ordinates of the control points for your own course do not need to be specified, only the flag codes and associated descriptions. You can have up to 20 control points on your course.

## Reliability

The single key commands and menu of options make the program easy to use. When you have completed a course, your card is displayed along with the time, markings and number of times you cheated. At this point the program is halted by a STOP statement. If you wish to have another race, the manual tells you to type in GOTO 4.

The program loads in two sections — what the manual doesn't say is that you should rewind the tape to the beginning of section two (or even to the beginning of the reel) before executing the GOTO



A full colour map of the terrain.

otherwise the program will hang, not being able to find that section to load. One might just as easily power off and on, and reload from scratch.

Punching your control card with the wrong flag code or against the wrong control point is possible, but then this would be possible if you were really orienteering. It is necessary to use the D option to check the control codes and descriptions before punching your card.

Don't think you can cheat by learning the codes for each of the course points, punching them out on your card and going straight to the finish. The program won't let you punch a control on your card unless you are close by the flag in question.

## Verdict

An exceptionally absorbing program and one that is certain to sustain one's interest over a long period of use. If you are looking out for a program that is original, entertaining, instructive, intellectually satisfying and has an unlimited interest span, then I unreservedly recommend The Forest to you. I just hope that this is but the first in a long series of orienteering programs from Mr Relf and Phipps Associates.

**Name** The Forest **System** Spectrum (48K) **Price** £9.95 **Publisher** Phipps Associates, 172 Kingston Road, Ewell, Surrey KT19 0SD Tel 01-393 0283 **Format** Cassette **Language** Basic and machine code **Other versions** None **Outlets** Mail order and dealers

## RATING

### Features

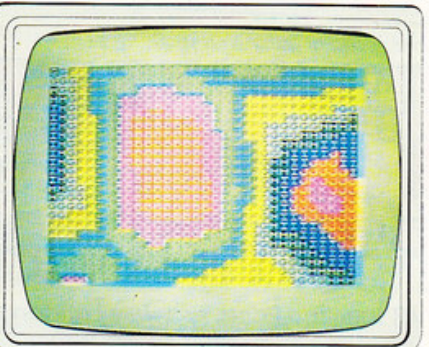
### Documentation

### Performance

### Usability

### Reliability

### Overall value



Contour map showing relative heights.



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Following last week's look at Watford and Acorn DFS chips, Bill Davis checks Amcom's offering.



# A third encounter

**T**he third major selling DFS for the BBC model B comes from Amcom Electronics in Bradford. Like Watford Electronics (*PCN*, issue 33) Amcom cashed in on the fact that the shortcomings, and lack of availability of the Acorn DFS made people who were desperate to expand their BBC machine look elsewhere for the necessary hardware. Unlike Watford, Amcom decided to take a slightly different route.

## First impressions

The DFS comes with a good explanatory manual, a utility disk, a ROM and an eight way dip switch. I was a little confused at first. The inclusion of the dip switch was a little confusing, but a phone call to Bradford and a little more judicious reading of the manual sorted things out — more of that later.

Fitting the ROM proved no problem, assuming you already have a disk interface in place. If you haven't, the entire kit is available (consisting of 11 ICs). You're well advised to get that done by your dealer, unless you really know what you're doing.

The ROM is placed in the first empty socket to the left of the Basic language ROM. The copyright notice appears on screen on switch-on or after BREAK has been pressed.

On switch-on the Amcom defaults to page set at &1500. This means that it gives the user 10 per cent more useable RAM. That's particularly useful if you are using the computer for word processing since the extra is over 1K of space.

## Features

The first thing you find out is that the Amcom system gives you a choice on what system you wish to use. Normally, the machine will default to SYS0 which will make any disks used compatible with the Acorn DFS. This is particularly useful if you exchange disks with friends, since if you have written your disks in the expanded, SYS1 mode they will not be

read by an Acorn DFS.

The expanded mode of the Amcom DFS allows you to write up to 63 files on a disk instead of the Acorn's 31, but it is the layout of the expanded mode sectors and tracks which make for the incompatibility. If you have already written your material on an expanded disk, simply copying the files onto an unexpanded disk will make it perfectly compatible.

There is a built-in formatter on the DFS which allows you to select either 40 or 80 tracks, expanded or normal. The formatter also includes a routine for user-definable parameters to be included for the development of software protection.

Nine new disk commands are contained in the ROM. SYS and FORMAT have already been dealt with. CLEAR is a very powerful extra command which allows you to very quickly clear the whole disk catalogue and sets the system on the disk to the current selected system. Rightly, the manual warns you that this command is irreversible. Think before using!

The other six are extra OPT commands. OPT2 is used to change the number of sectors on a disk. Although the default is set for 5.25in disks some people may want to use 8in disks. An 8in disk normally has 18 sectors per track, so using this command will allow you to use a variety of drives with the DFS. As with OPT2, the OPT3 command allows you to make provision for other drives: this time by changing the number of tracks on the disk. 8in drives have 72 tracks while some drives, such as Tandy, have 35 tracks and, of course, the more normal 40 or 80 tracks.

The start of the DFS buffer is set with OPT5, which used in conjunction with OPT7, sets how long the workspace is to be in 256byte blocks. This allows you to simultaneously COMPACT a disk, and control the amount of workspace. OPT8 allows some 80 track disk drives to read 40 track software. However, some protected 40 track software may be unreadable on 80 track drive units.

I mentioned the dip switch that comes

with the DFS. This is fitted in the two rows of parallel holes that you find to the right of the shift bar on the keyboard. The idea is for certain functions of this, and other DFS's, to be changed. Setting the switches either open or closed, for example, in certain configurations allows the user to make an individual make of disk drive to be totally compatible with the computer.

Other uses for the switches are for 80 or 40 track to be selected on default, normal or extended mode of the DFS to be found on default, and for boot or auto-boot on break.

The utilities disk, which comes with the ROM, has some useful functions on it. Some Acorn disks, for example, have coloured titles on them, which cannot be read by the Amcom DFS. Using this program allows the user to make the disk compatible. A utility program allows you to read single sectors from disk, read them, edit them and resave. There are also screen dump routines for text/graphics for use with NEC and Epson printers, and help pages about the DFS commands. A program for converting an Acorn type disk to an extended mode disk and a utility program for down-loading simple cassette-based programs to disk are also included.

## Verdict

All in all I have found the Amcom DFS to be a welcome addition to the family of DFS's around at present. I found the manual well written and easy to use and was most impressed that it came included with the price of the ROM. Watford and Acorn please note!

**Item Amcom DFS Price £34 inc VAT with manual and utilities disk ROM and dip switch Contact Pace Software 0274 729306.**



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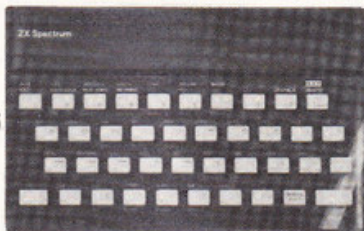
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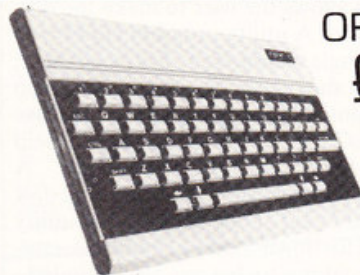
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Now you can teach your Spectrum to speak, as Max Phillips has been discovering.

# Talking Spectrum

**A**fter the Microdrives, Interface 2 and Prism modem you'd have thought it would be difficult to come up with exciting new add-ons for the Spectrum. But Currah thinks not.

Speech synthesis has always been an offbeat sideline, but it is entertaining, and the company's new Microspeech add-on for the Spectrum should prove particularly so. It comes as a single unit that amplifies Spectrum sound, can say almost anything you like, and can voice all the keys on the keyboard. It costs a very reasonable £30.

But what is more important is the fact that Currah has been out of its way to persuade software houses to support the unit. It will take time to see how well it has succeeded, but the list of houses working on Microspeech software already includes Bug-byte, Artic and Romik.

## Presentation

The Microspeech comes in a display box with an 11 page manual and a demonstration cassette. The cassette means you can plug it in and see (sorry, hear) it do something effective. It provides a sort of tutorial on the unit, and a talking version of a crude adventure game called Mystic Tower.

## Documentation

The Microspeech is properly documented in an 18 page booklet. It's straightforward and comprehensive. All the necessary information, such as a complete list of the available allophones and plenty of examples, is there.

Currah sensibly gives memory usage details and explains how to drive the unit from machine code — both these are essential if programmers are going to write compatible software. There are even extra tips, on increasing the size of the speech buffer, for example. Anyone who thought that a speech synthesiser is a difficult beast to get to grips with will be surprised.

## Design

The Microspeech is a compact black box which sits firmly on the expansion port. The works include a ROM with firmware to drive the unit and to provide the keyboard voice facility. A custom ULA does the actual synthesis work.

The Microspeech takes the Spectrum's TV output and modulates the speech onto it. A second input is taken from the MIC socket so that all normal Spectrum sound is amplified and reproduced through the TV speaker.

## Setting up

Plugging Microspeech into the expansion port is straightforward. Its leads then go



into the Spectrum's TV and MIC outputs, and you then connect your TV to the Microspeech.

There are no problems here, as **LOADing** and **SAVEing** on a Spectrum involves pulling plugs in and out anyway. As an alternative you can take the line lead out of MIC and pipe speech through your Hi-Fi or tape recorder.

Switch on the Spectrum and you get the usual copyright message plus a sign-on from the Microspeech across the top of the screen. The unit powers up in its keyboard voice mode. Every key you press will be spoken — letters, punctuation, keywords, cursor controls and all.

The chances are you won't hear this at first, as the Microspeech usually needs to be tuned with a small screwdriver so that the sound is picked up by the TV.

However, the setting does vary greatly from TV to TV, and on one I tried it was extremely difficult to get good sound and

a good picture at the same time. The unit is also susceptible to radio interference — other household electrical equipment and even radio stations spoiled the quality, though neither proved incurable or particularly annoying.

## In use

The first thing you notice is that the speech isn't very wonderful. It's a very mechanical, computerised voice — there's none of the smooth quality of more expensive digitising units.

The Microspeech is based on an allophone system, where words are built by stringing together predefined bits of words. This hasn't the quality of digitised speech but it doesn't need tons and tons of memory, and it has an 'infinite' vocabulary.

Anyway, the mechanical voice only adds to the fun. It sounds exactly how a machine that talks should sound, and

Linda Parry



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taking the mickey out of its voice is a whole new hobby. Incidentally, program it for too long and you really do end up talking like it. . .

The only thing that counts with the quality is that occasionally it is difficult to understand the Microspeech. Mostly, it's the fault of the programmer — either being lazy with his allophones or forcing it to talk too quickly, and 99 per cent of the time there's no problem — particularly since you usually know what it is trying to say.

Programming it is great fun. The first stage is the keyboard voice — a sort of nursery school phase. Microspeech speaks every key and you spend hours looking for keywords or symbols that will beat it. It has a go at most of them although some, such as ?, are a little rough. To spoil the fun, the only thing it chickens out of is ~ (pronounced tilda).

The keyboard voice is a bit of a gimmick. It does actually help with typing — talk about audio feedback — but rapidly becomes annoying. It also gets mixed up with auto-repeats and LOAD and SAVE operations. To turn it off, just enter LET keys = 0.

The Microspeech reserves two Basic variables for its own use. The first is the keys switch (1 for on, 0 for off), and the second is \$\$, used to speak allophone sequences. To get the Microspeech to

Speech is made up from a set number of allophones. These start off simply with the letters a-z (ignoring x and q) and progress through to complex sounds like (eau), (yy), (wh) and so on. Besides these, apostrophe, comma, full stop and space control the timing of the words.

The Microspeech is capable of intonation. A capital A instead of an a is intoned up. By careful selection (and often refinement) of the allophones and intonation, it is possible to produce some very realistic speech.

## The mechanical voice only adds to the fun

There's a reasonable diagnostic facility. After execution, PRINT \$\$ prints the string, with a \* as a first character if the Microspeech finds it syntactically correct, and a question mark if there are problems with it. Illegal characters in the string are marked with a question mark.

The only problem is noticing if a string is wrong. If it finds illegal characters at run time, then Microspeech just clams up. There's no attempt to speak the string and no error message. It's easy enough to debug if you have short programs, but on a serious venture it could take you days to realise that something that should be spoken isn't being spoken.

Besides running your own programs, the Microspeech should gradually become the catalyst for a large amount of software. The games already available aren't particularly wonderful, being hasty adaptations of existing games, and there

is a danger that much talking software will be of this nature. But the potential to develop programs that actually exploit speech, rather than do it as a throwaway addition, is there.

The other nice thing about having a Microspeech is that it amplifies sound from ordinary games. Currah is the first to point out that it can't guarantee compatibility with existing software, but at worst all you have to do is unplug the unit. So don't buy the unit just as an amplifier — it might not always work. When it does, of course, it makes a tremendous difference to games. . .

### Verdict

The Microspeech is a capable little synthesiser in a very presentable form. It's nicely made and well packaged and documented. Whether it's of interest to you or not is very much up to you.

If it does receive a lot of software support (and it's not the convert-me-quick variety) then it will be a very attractive buy. Even if it doesn't, its programmability will let you toy with all the current applications for speech. These range from your own games to serious applications, such as aids for disabled people, and tasks where the user can't see a screen. Verbal diagnostics could also prove a real boon for programmers.

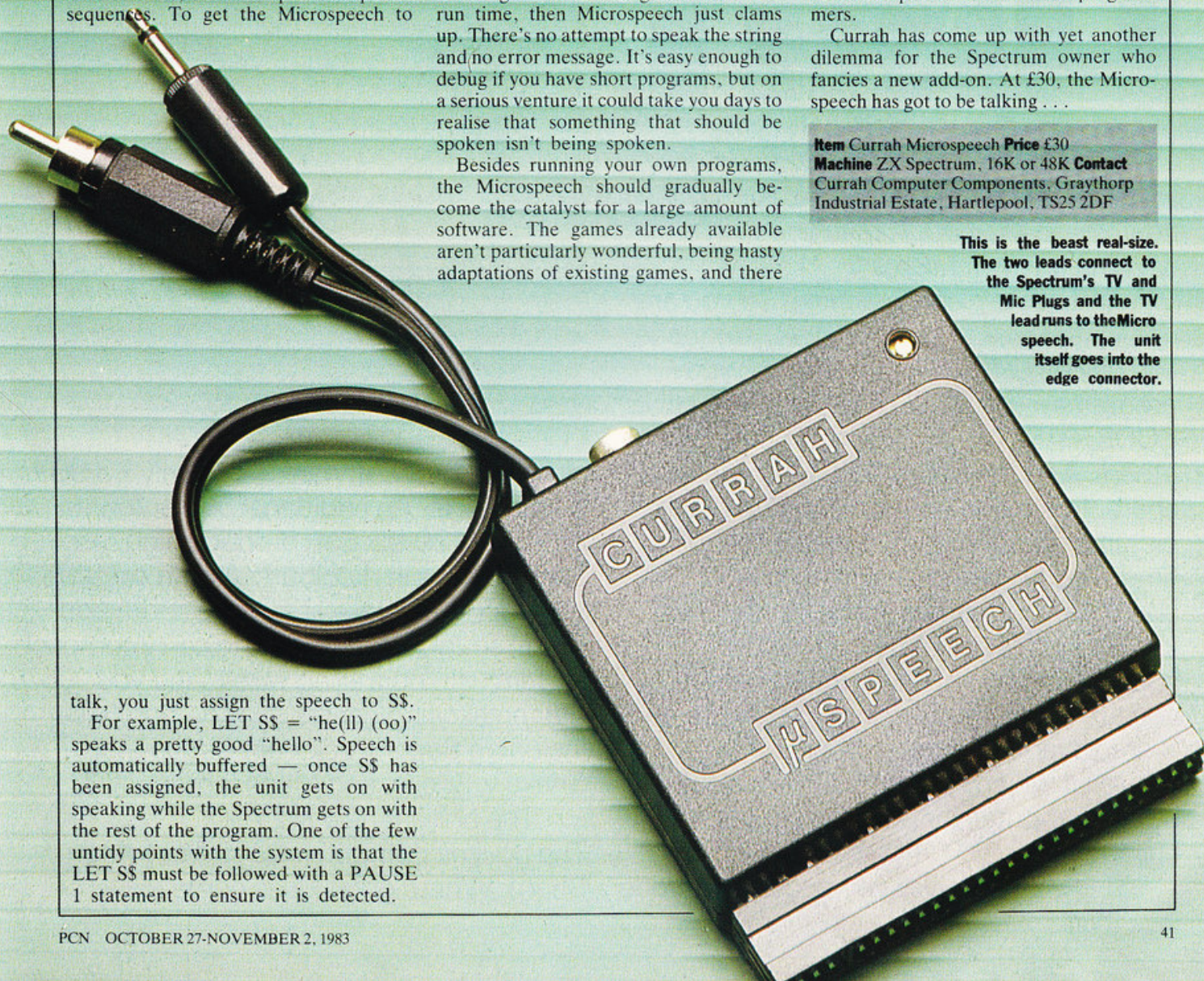
Currah has come up with yet another dilemma for the Spectrum owner who fancies a new add-on. At £30, the Microspeech has got to be talking. . .

**Item** Currah Microspeech **Price** £30  
**Machine** ZX Spectrum, 16K or 48K **Contact**  
Currah Computer Components, Graythorp  
Industrial Estate, Hartlepool, TS25 2DF

This is the beast real-size. The two leads connect to the Spectrum's TV and Mic Plugs and the TV lead runs to the Micro speech. The unit itself goes into the edge connector.

talk, you just assign the speech to \$\$.

For example, LET \$\$ = "he(11) (oo)" speaks a pretty good "hello". Speech is automatically buffered — once \$\$ has been assigned, the unit gets on with speaking while the Spectrum gets on with the rest of the program. One of the few untidy points with the system is that the LET \$\$ must be followed with a PAUSE 1 statement to ensure it is detected.





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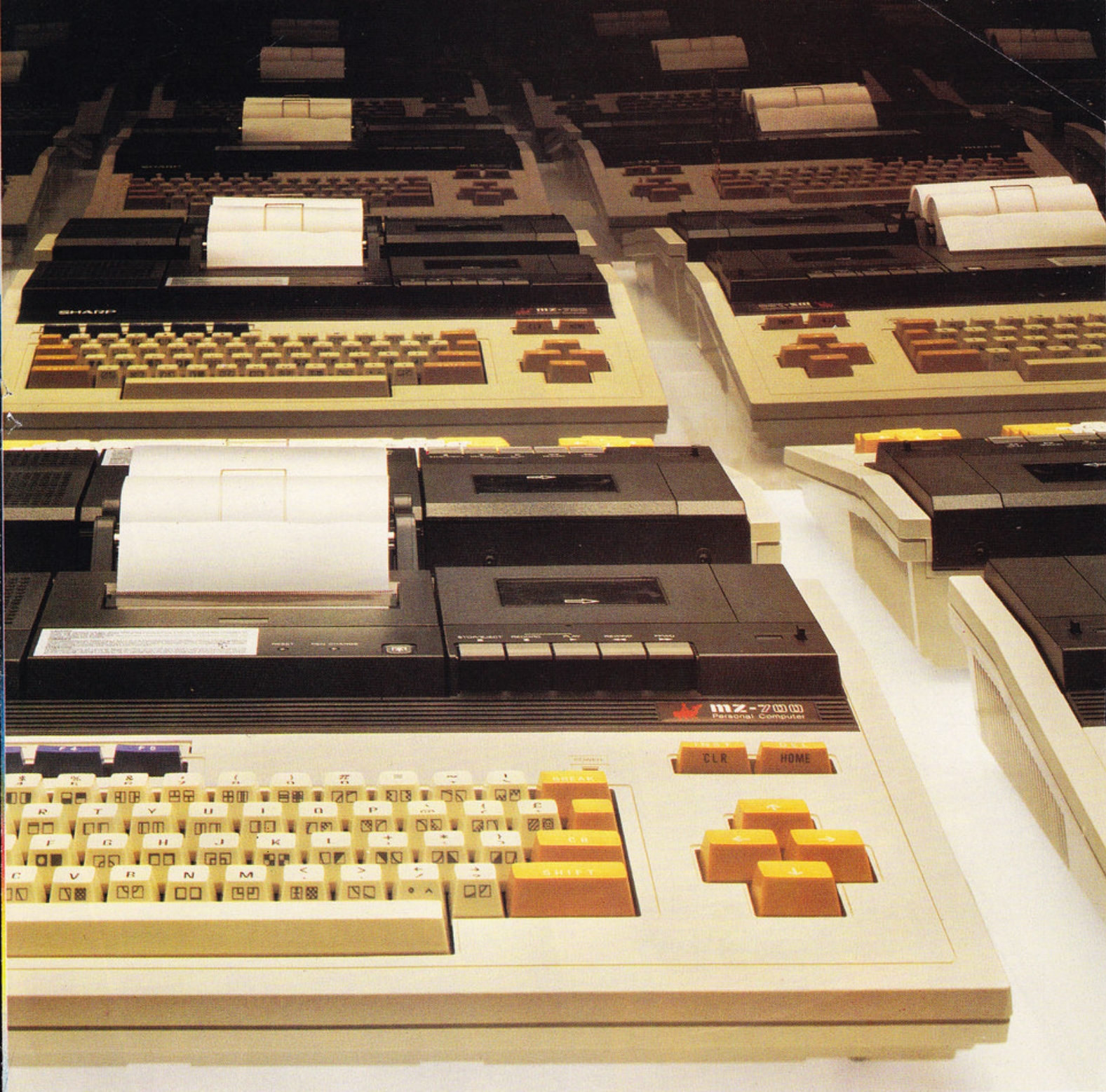
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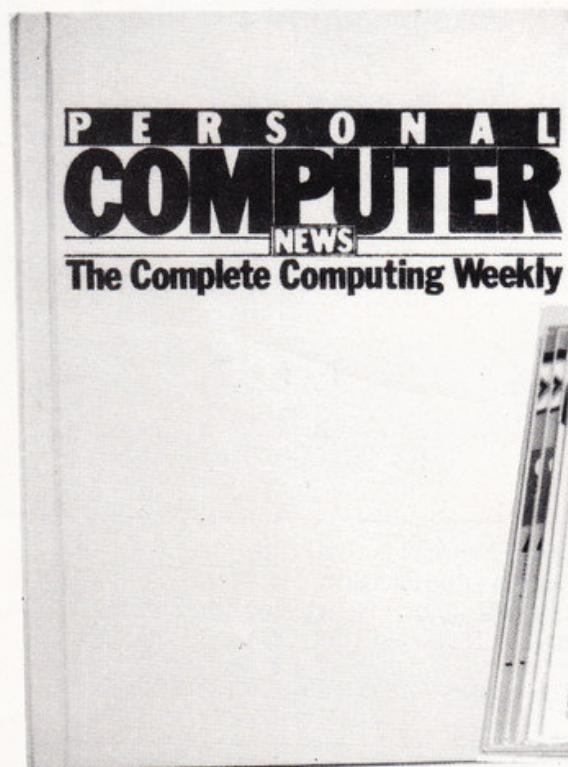
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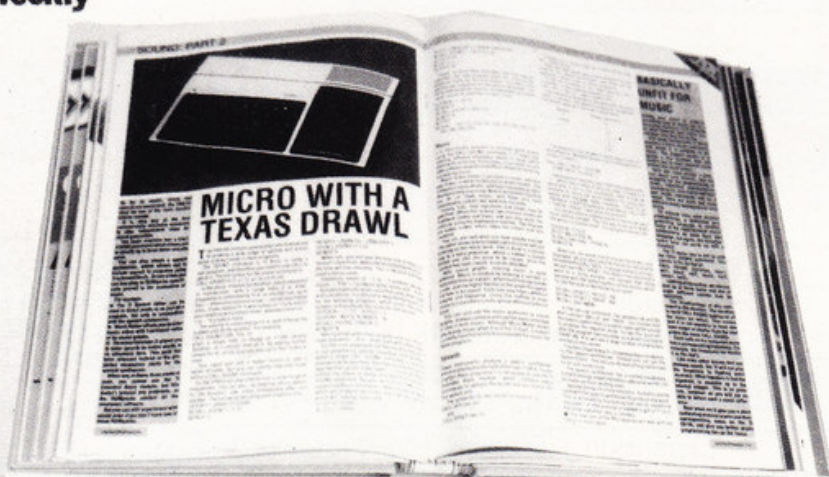
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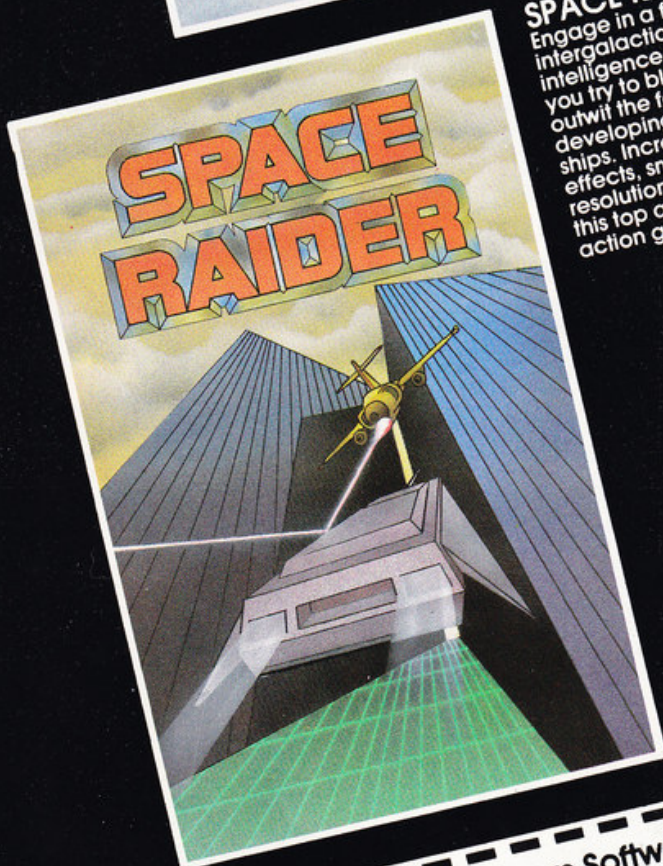
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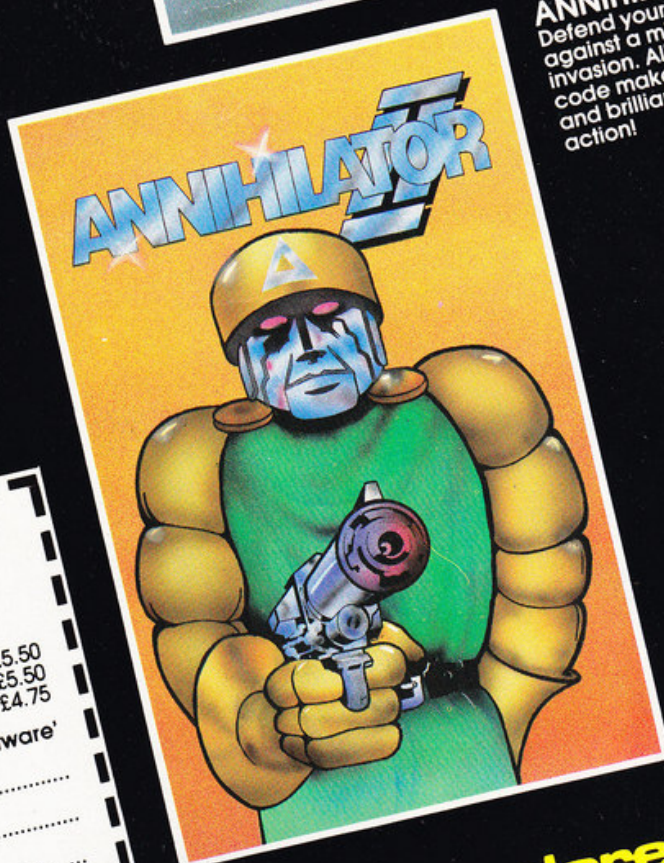
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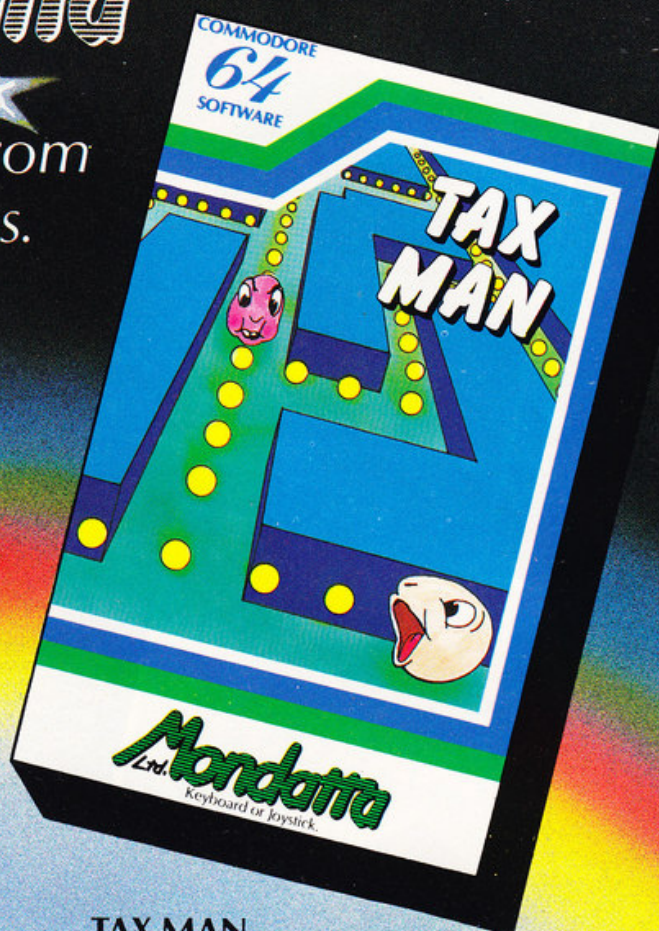
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Piloting a Rocket Copter, your mission is to enter and destroy Fort Apocalypse.

Descending into the first level of defence, you must rescue eight prisoners scattered around the complex. You'll have to manoeuvre through caves, blast impact shields, navigate hyper chambers and flee from rotating field envelopes. As if that's not enough, the tanks, choppers and mines are hot on your trail, and your fuel running low. Completing the Draconis level allows you access to the Crystal-line Caves and eventually to the main target itself, Fort Apocalypse.

#### In play

Gravity, pilot skill and number of rocket copters (lives) each have three selectable settings so you have a wide range of challenge. At the top of the screen is the Navatron, a miniature view of the immediate terrain. The game starts with your yellow copter hovering over a fuel station which you must land on to refuel. The

copter faces forward, left, or right. Pressing the fire button when facing front releases bombs, missiles if facing left or right. Graphically superb and to the realistic sound of rotating blades, the copter responds smoothly to the joystick's movements.

Flying over mountainous country in search of the cave entrance soon has you encountering floating mines. These can be shot or flown around. More difficult are the blue robo-choppers which are armed with missiles and relentlessly hunt you down. Ground based tanks scurry back and forth, letting fly with drone missiles which pursue you for a short distance before falling away.





Bombing a hole through the portal below, you enter the caverns. Now the game is filled with sound and fury. When you find a landing pad, touch down — the game restarts from this point if you lose a life. The prisoners are in different locations, running about on the ground. To make a rescue you have to swoop low and touch one. All eight must be saved before you can gain entrance to the next level.

#### Verdict

A magnificent game in every respect. For graphics, sound, playability, concept and execution, this program is the tops.

**Bob Chappell**

#### RATING

**Lasting appeal**   
**Playability**   
**Use of machine**   
**Value for money** 



## ATARI 400/800

### This little piggy...

**Name** Pooyan **System** Atari 400/800 (32K) **Price** £27.95 **Publisher** Datasoft USA distributed in UK by Centresoft, Centresoft House, Unit 16, Tipton Trading Estate, Bloomfield Road, Tipton, West Midlands DY4 9AH **Format** Cassette **Other versions** Commodore 64, Vic-20 **Outlet** Centresoft stockists

Are you sitting comfortably? Then I'll begin. Once upon a time, there were three little piggies and a big, bad wolf. That was once upon a time. In this updated version, Wolfie has sensibly recruited a gang of lupine roughs to help with the dirty deed.

#### Objectives

The piglets and wolves confront each other across a chasm too wide to jump. The wolves put Plan X into operation and float down the cliff-face clinging to helium-filled balloons. A quick dash across the valley, a swift shin up the pigs' cliff-ladder then presto — it's bacon sandwich time. The intended lunch has an even daffier idea where one pig sits in a basket which is tied to a rope while the others raise and lower it. Equipped with a bow and arrow, Piggy can now play Robin Hood, thus thwarting the wolves who go crashing to the ground when their balloons are hit.

This calls for plan Y. The wolves start hurling acorns (which look like rocks) as they drift downward. If an acorn hits Piggy square on the snout, Piggy tumbles earthwards

headfirst. If the piglets manage to survive the first attack by 32 wolves, they face Plan Z. The wolves are now grounded, so they use their balloons to float upwards. Some of these balloons have double skins — no fools, these wolves. Any wolf reaching the top helps to push a large boulder towards the edge of the cliff. When seven wolves arrive, the boulder falls. Large rock plus pig in basket = spam.

#### In play

The game is simple to play but requires co-ordination and coolness under pressure. Loosing off wildly with your arrows is not recommended but may achieve some result eg striking a wolf's shield causes the arrow to deflect downwards and, if you're lucky or deliberate enough, pop the balloons of any wolves below. It's best to shoot calmly at each of the helium spheres, taking care all the while to dodge the barrage of acorns. The wolves are just like those in comics — long snouted and splendidly legged, with comically mischievous expressions.





Completing screen two takes you back to the start but naturally everything gets faster and harder.

#### Verdict

Excellent graphics, especially the wolves, and a refreshingly different game. First rate entertainment for you, and a happy ending — for the wolves. The Pooyan should have stuck to their house of bricks.

**Bob Chappell**

#### RATING

**Lasting appeal**   
**Playability**   
**Use of machine**   
**Value for money** 







## DRAGON DIVERSIONS

### DRAGON 32 Terminal Journey

**Name** Death Cruise **System** Dragon 32 **Price** £6.95 **Publisher** Virgin Games, 61-63 Portobello Road, London W11 **Format** Cassette **Language** Basic **Outlets** Mail order, some dealers.

Death Cruise might sound like a disaster movie, but in fact it's opening up a new field in the home micro market: disaster software. However, it purports to be a version of Cluedo on a cruise liner.

#### Objectives

Dr Sinister, disguised as a crew member or passenger on the Pacific 1, has smuggled a bomb on board ship. You have to identify the doctor, discern what the bomb is disguised as, and locate the room where the detonator is hidden.

Death Cruise has a one-player version and a version for two to four players, and comes with four pages of instructions.

#### In play

The ship has five decks and five rooms per deck, with 25 objects and 49 people on board. You can roam from room to room with 50 commands at your disposal. At any point you can type SUSPECT and input your three suspects, as long as all three are there with you.

It seems grossly unfair but if by chance your three suspicions are correct then you lose the game. The procedure is, when

you're sure of your findings you must type ACCUSE and get all three right to win the game.

Commands are kept simple, such as TAKE, PICK, DROP, or GO.

Finding myself on Deck One I explored all five rooms. I moved to Deck Two and typed GO TV ROOM. "No such place," it said. I tried variations such as GO TV ROOM, but the same answer came back despite the TV Room on Deck Two mentioned in the instructions. On Deck three I tried GO COFFEE SHOP. "No such place" I was told, again contradicting the instructions. GO CINEMA then? "You're on the wrong deck." Not according to the instructions, I wasn't. GO DECK FIVE, I tried. "No such deck," I was informed.

I broke into the program to find that the data stored there contradicted completely the information given in the instructions. The program lists four decks, not five, and many of the rooms are located in different places.

#### Verdict

Even without these not considerable drawbacks, the game was proving something of a dodo. I can't imagine why anyone would want to waste money on this, when you could buy the original board game and have much more fun.

Mike Gerrard

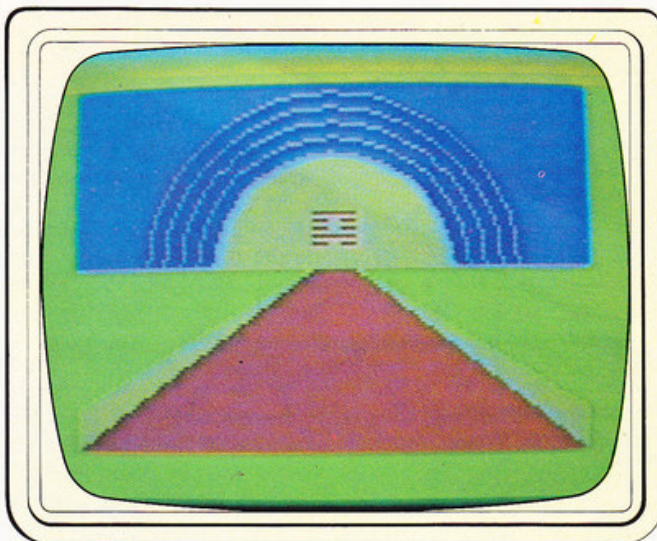
#### RATING

Lasting appeal

Playability

Use of the machine

Value for money



### DRAGON 32 Ancient Wisdom

**Name** I Ching **System** Dragon 32 **Price** £6.95 **Publisher** Virgin Games, 61-63 Portobello road, London W11 **Format** Cassette **Language** Basic **Outlets** Mail order, some dealers

The I Ching is the name given to the ancient Chinese guidelines used not so much to predict the future as to advise people on their best course of action at a particular moment. The thought of this 4000 year old oracle being put onto a home micro seems incongruous to say the least, but I suppose if you're going to do it then it ought to be on the Dragon.

#### Objectives

The I Ching is made up of 64 hexagrams, which in this case means not the usual six-pointed star but a block of six lines, and each of those lines can be either broken or complete, giving the 64 possible permutations. Originally, the hexagrams were built up using a complicated procedure involving 50 yarrow stalks, while thinking of the question which concerns you. The resulting hexagram is then examined in conjunction with a book of interpretations, to guide you as to what to do.

#### In Play

There's an optional introduction explaining the origins of the I Ching, followed by a graphics screen depicting a rising sun at the end of a long road. It is against this sun that you construct your hexagram.

As there isn't a yarrow stalk function, the whole rigmarole is reduced to the more simple formula,  $R = \text{RND}(2)$ . If R happens to be 1 when you press the space bar then your first line will be broken, otherwise complete.

This is repeated six times to give you your hexagram.

The meaning of your hexagram will then appear. My own first attempt produced number 39, which wasn't the egg fried rice but 'Chien: Obstructions. Advantage will be found in the south and west, but not in the north and east. It will be favourable to meet with the great man. Firm persistence brings good fortune.' What can it all mean?

This is then followed by the second section, the Image, a kind of summing up of how the wise person might behave: 'The superior Man examines himself and nurtures his inner virtue.'

That's all there is to it. Think of your question, hit the space bar, read the advice. Next question, please.

#### Verdict

What else could I do but consult the oracle itself for a verdict? The result was number 6, Strife. 'Although sincere he will be opposed and obstructed.' I'm sure the writer of this program is sincere, and I do believe that the philosophy behind the I Ching could teach much to a lot of people. But I'm afraid that as a piece of software this leaves me cold.

Mike Gerrard

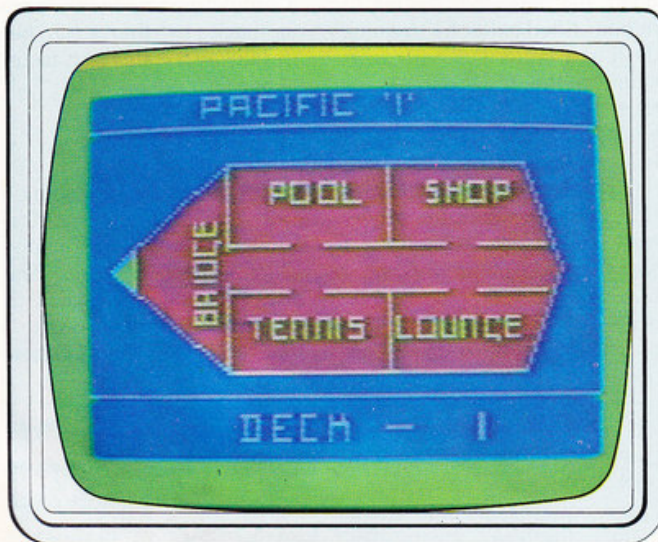
#### RATING

Lasting appeal

Playability

Use of machine

Value for money





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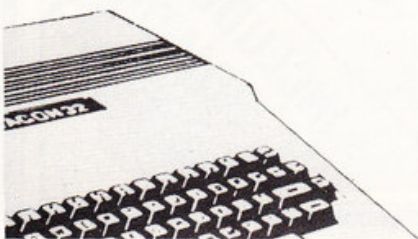
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# ON THE BALL

## SPECTRUM

### Queering your pitch

**Name** Football Manager System  
**Spectrum** 48K **Price** £5.95  
**Publisher** Addictive Games **Format**  
Cassette **Outlets** WH Smiths,  
Menzies, Boots

The start of the season — you sit by the side of the pitch, breathing in the rich fragrance of grass that has been carefully nurtured all summer — apart from the odd carnival and farewell concert by The Who — in preparation for this day.

Then out of the tunnel, with the roar of the crowd building to a crescendo in their ears, come Stalin, Lenin, Thatcher, Reagan and the rest of the lads — because this isn't the real game, just the next best thing, Football Manager.

#### Objectives

You manage a clapped out team somewhere in darkest Division Four. Your goal, if you'll pardon the expression, is to battle your way up to the top of the First Division, winning the FA Cup as many times as you can on your way.

You can pick any team you fancy, and can rename one (along with the players) if the cream of four divisions holds no joys for you.

#### In play

Considering the enormity of the task, even the best of us will take five or six seasons at five to

six hours per season to crack this one, and if you choose the most difficult level you may not crack it at all.

I started out by renaming my team Dundee Utd — Scottish readers would do well to consider a similar course — and ploughed through the player pool, amassing an ill-assorted bunch of history's hard-men.

At the easy level I found it plain sailing. I could manage the team well, snapping up good players when they came on the market, swapping them round so they didn't get too tired, until I had a side that could see off even the First Division giants.

But I forsook the trophies, got over-confident and switched the mode — you can do this in mid-play — to 'genius'. Legs started breaking and groins straining, and my team soon became microcomputing's answer to Tranmere Rovers. Two seasons with no wins and only three goals scored, and I was back on 'easy'. Another feeble season while I paid the bills and repaired the damage.

#### Verdict

You bite your nails as the goal-mouth dramas are played out, you can buy Rasputin, sell Kevin Keagan, and if you ever get good at it, you just have to turn up the skill level for your one-way ticket back to the Isthmian League. **John Lettice**

#### RATING

<b>Lasting appeal</b>	★★★★★
<b>Playability</b>	★★★★★
<b>Use of machine</b>	★★★★★
<b>Overall value</b>	★★★★★



## SPECTRUM

### Pool hustler

**Name** Pool System 16/48K  
**Spectrum** **Price** £5.95 **Publisher**  
CDS Microsystems, PO Box 93,  
Doncaster, South Yorks DN4 5LX  
**Format** Cassette **Language** Basic  
**Other Versions** None **Outlets** Mail  
order, Smiths, Boots, Menzies,  
other dealers

Some companies make the mistake of trying to put an exact replica of a sport or a game onto a micro, which often can't be done. The more successful ones I've seen are programs which accept the micro's limits and produce scaled-down versions. These frequently turn out to be great fun to play, and Pool is in this class.

#### Objectives

The name of the game is aiming, of course, and sinking the pool balls into the pockets. The game offers one-player and two-player options.

#### In Play

The scaling down means that you have just six coloured balls on the table at the start of each frame, three red at 10 points and three blue at 20 points.

After a few bars from *The Sting* you're ready to play. You aim by moving a small white triangular marker round the edges of the table, this being your sight and the direction in which the cue ball will travel. The marker is moved clockwise with the 'S' key and anti-clockwise with the 'A' key.

Once you're happy with the sighting you can then set the

strength of the shot from one to five using the 'L' key. With everything ready you make the shot using ENTER, and of course you miss the pot and the balls click and bounce.

The format of the game is simple in that you have three cue balls and three shots per ball — unless you sink a colour, when you have three more shots. Pot all six colours and you move on to the next frame. Each ball potted scores the value of the ball multiplied by the frame number multiplied by the shots remaining.

Most important, though, is the accuracy and entertainment value of the game, and these seem to be first class. Apart from the odd loss of colour while the balls are moving or passing close to one another, the result of each shot is just what you might expect from the real thing, ie in my case disastrous. They bounce off each other or off the cushions at realistic angles, each time accompanied by the appropriate click or bump, and the whole game has a satisfying authentic feel about it. Each ball potted is stored in a box at the foot of the screen, and there's a high-score record at the top along with the current score.

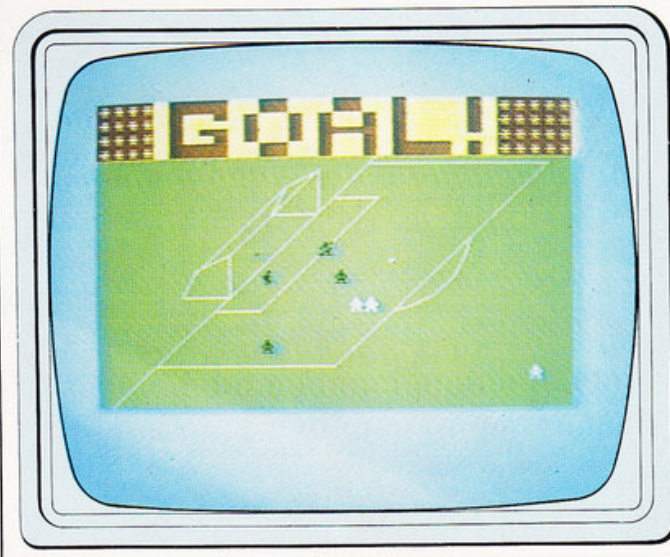
#### Verdict

It may not turn you into a Paul Newman or Steve Davis, but although it's simple Pool is well done and good fun, the kind of game I wanted to continue playing.

**Mike Gerrard**

#### RATING

<b>Lasting appeal</b>	★★★★★
<b>Playability</b>	★★★★★
<b>Use of the machine</b>	★★★★★
<b>Overall value</b>	★★★★★





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# PCN ProgramCards

For the cards this week are four new programs. Two for the Vic-20, one for the Spectrum and one for the BBC model B.

The Spectrum game from Mr J Thurlby, of Farnborough, in Hampshire, is a game that goes by the name of Babyfall. To set the scene: you are standing outside a skyscraper when it catches fire.

Unfortunately there are no megastars about to blow up the ubiquitous water tanks and save the day. So it is left up to you, and the ambulance, to save the occupants of the building. They are jumping out of the windows, hoping that you will catch them. This is easier than it sounds because the inhabitants are babies and therefore very light.

To perform this daredevil act, you have to position yourself at the place where the babies are going to land and let them bounce off you until they land in the ambulance. Be careful, as the game goes on it does get a little harder.

The game itself is written in modular style, that is, each segment is independent

of the others. This method of programming aids debugging and makes the execution of the program easier to follow.

The two Vic programs, from Telstar, are educational. They are quite short and will fit into the expanded machine. They are written from the point of view of being positively competitive, hence the emphasis on timing.

The first program, 'COUNT' displays two dice. The problem is to add the two numbers together and enter the result into the computer as fast as possible. This is a good way of practicing mental arithmetic, but only for two numbers, each between 1 and 6. For more advanced adding, the MEN/ARITH program can be used. This presents you with four numbers, each between 1 and 9. The same rules apply as before, ie you are competing against the clock.

In each of the programs, only two chances are given to get the answer right and for the sake of speed, no answers are given.

The BBC program, from Kevin Edwards, of Didsbury, in Manchester, is a game called Road Hog. The idea of this game is to trap the little hog in a maze, so that he cannot move left, right, up or down. The hog gives the appearance of having great intelligence, especially at higher speeds.

## Don't be bashful

If you have any programs that you would like to see in print, of that you think other people would like to see, send them in to ProgramCards. Your submissions should be accompanied by a listing, if possible, and a set of comments on how the program works.

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62 Oxford Street  
London W1.

## PCN ProgramCards

### French Test Card 4 of 4

8334FT4/4

```

5000 REM ***** READ PEOPLE, INFS & ENDS
5010 REM ***** INTO $S
5020 FOR P = 1 TO 8
5030 READ A$
5040 PF$(P) = A$
5050 READ A$:PE$(P) = A$
5055 NEXT P
5060 FOR UB = 1 TO 6
5070 READ A$
5075 INF$(UB) = A$
5076 NEXT UB
5080 FOR UB = 1 TO 6: FOR PP = 1 TO 8
5090 READ A$
5100 EN$(UB,PP) = A$
5120 NEXT PP: NEXT UB
5130 RETURN
7000 DATA 173,48,192,136,208,5,2      96,225,2,240,9,202,208,245,1
      74,224,2,76,226,2,96
7010 FOR I = 738 TO 758: READ R: POKE I,R: NEXT
7020 RETURN
8000 REM ***** CHECK HOW VERBS GO
8005 INVERSE
8010 HOME
8020 UTAB 5: PRINT "    CHOOSE BETWEEN:": NORMAL
8030 UTAB 10: PRINT "1...SAVOIR"
8040 UTAB 12: PRINT "2...DEVOIR"
8050 UTAB 14: PRINT "3...VOULOIR"
8060 UTAB 16: PRINT "4...POUVOIR"
8070 UTAB 18: PRINT "5...BOIRE"
8080 UTAB 20: PRINT "6...CROIRE"
8085 UTAB 22: PRINT "7...BEGIN A TEST"
8090 GET XX$:XX = VAL(XX$): IF XX < 1 OR XX > 7 THEN 8000
8095 HOME
8100 IF XX = 7 THEN RETURN
8105 INVERSE
8110 UTAB 1: HTAB 15: PRINT INF$(XX)
8120 NORMAL
8150 FOR I = 1 TO 8
8155 PF$ = PF$(I)
8160 UV$ = EN$(XX,I): IF UV$ = "AI" THEN PF$ = "J/"
8170 UTAB 2 * I + 1: HTAB 12: PRINT PF$: HTAB 18: PRINT UV$
8180 NEXT I
8190 GOSUB 3700
8200 GOTO 8000

```

### Apple/Applesoft Basic/Skinner/Continued

5000	Subroutine to read people, infinitives and endings into PE\$ PF\$ INF\$ and EN\$ respectively.
5020-5055	People, English and French.
5060-5076	Verbs.
5080-5120	Endings.
7000	Data for tune.
7010	Do intro tune.
8000	Check how verbs go.
8010-8085	Print menu.
8090	Get reply.
8100	Begin test
8110	Print chosen verb.
8150-8180	Print endings.
8190	Continue prompt.
8200	Return to menu.



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## Babyfall Card 1 of 3

8334BA1/3

### ZX81

### ZX Basic

Application: Game

Author: J Thurlby

```
1999 REM main program
2000 CLS : GO SUB 9500: GO SUB 6
2010 GO SUB 9000: GO SUB 3010
2020 IF sc<50 THEN LET k$="1": G
O SUB 5000: GO SUB 6000
2030 IF sc>=50 AND sc<150 THEN L
ET k$="1": BEEP .01,10: GO SUB 5
000: GO SUB 6000: LET k$="2": G
O SUB 5000: GO SUB 6000
2040 IF sc>=150 AND sc<300 THEN
LET k$="1": BEEP .01,10: GO SUB
5000: GO SUB 6000: LET k$="2": G
O SUB 5000: GO SUB 6000: LET k$=
"3": GO SUB 5000: GO SUB 6000
2050 IF sc>=300 THEN LET k$="1":
GO SUB 5000: GO SUB 6000: LET k
$="2": GO SUB 5000: GO SUB 6000:
LET k$="3": GO SUB 5000: GO SUB
```

```
5000: LET k$="4": GO SUB 5000:
GO SUB 6000
2060 GO TO 2020
2999 REM dropped baby
3000 PRINT AT a,b;" ";AT 21,b;"G
": FOR f=16 TO 4 STEP -2: BEEP .
2,f: NEXT f
3010 PRINT AT 0,26;" "
3020 LET live=live-1
3030 LET f=27: FOR l=1 TO live:
PRINT AT 0,f;"C ": LET f=f+2: NE
XT l
3040 PAUSE 20: PRINT AT 21,b;" "
3050 IF live<0 THEN GO SUB 7000
3060 PRINT AT 21,5;" "
3070 RETURN
4999 REM movement of babies
```

2000	Call routines to set up user defined graphics and to display instructions.	2050	move 3 babies.	3020	number of lives left. Decrement the number of lives left.
2010	Call initialisation and screen display routines.	2060	If score greater than 300 move 4 babies.	3030	Display the number of lives left. Type 'graphic G' for the UDG.
2020	If score less than 50 then move 1 baby.	3000	Repeat from line 2020	3040	Short wait, remove headstone.
2030	If score between 50 and 150 move 2 babies.		Rub out current position of dropped baby and put a grave headstone (graphics G) at the place where the baby fell. A short tune is played.	3050	Check for end of game.
2040	If score between 150 and 300	3010	Clear space for update of the	3060	Clear the bottom line of the screen.
				3070	Return to the main program.

# PCNProgramCards

## Babyfall Card 2 of 3

8334BA2/3

```
5000 IF k$="2" AND INT (RND*5)+1
=3 THEN RETURN
5005 LET a=P (VAL k$,1): LET b=P (
VAL k$,2): LET c=P (VAL k$,3)
5010 PRINT AT a,b;" ": LET c=c+4
: LET a=VAL s$(c TO c+1)
5020 LET b=VAL s$(c+2 TO c+3): B
EEP .01,10: PRINT AT a,b;CHR$ (1
43+INT (RND*5)+2)
5030 IF a=18 AND b=26 THEN LET s
c=sc+5: PRINT AT a,b;" ";AT 0,6;
sc: LET c=5
5040 IF a=20 AND cp=b THEN BEEP
.05,3
5050 IF a=20 AND cp<>b THEN GO S
UB 3000: LET c=5
5060 LET p (VAL k$,1)=a: LET p (VA
L k$,2)=b: LET p (VAL k$,3)=c
5090 RETURN
5999 REM movement of catcher
6000 LET cp=cp+4*(INKEY$="8" AND
cp<23)-4*(INKEY$="5" AND cp>4)
6010 PRINT AT 21,c1;" ";AT 21,cp
;"A"
6020 LET c1=cp
6030 RETURN
7000 REM end of game
```

```
7010 CLS
7020 PRINT AT 0,3;"End of game..
";AT 5,3;"You saved ";sc/5;" b
abies in a score o
f ";sc
7030 INPUT "play again ? (y/n) "
: LINE a$
7040 IF a$="y" THEN RIN 2010
7050 GO TO 9999
8000 REM intro
8010 PRINT AT 0,6;"BABY FALL."
8020 PRINT AT 3,0;"The idea of t
his game is to catch the bab
ies as they fall out of the bu
rning tower block, and carry the
m to the safety of a nearby ambu
lance."
8030 PRINT ""If you drop three
babies the game ends."
8040 PRINT ""Use the arrow keys
""5"" and ""8"" to move left
and right."
8050 PRINT "" You = A Bab
y = C"
8060 INPUT "Press ENTER to start
."; LINE a$
8990 RETURN
```

5000	Cause second baby to pause at random intervals.	5040	Check for baby hitting catcher.	6030	Return.
5005	Setup temporary variables for use in calculations.	5050	Check for baby dropped.	7000-7050	End of game display, show score and ask for another game.
5010	Remove baby from old position. Increment c to find the next coordinates. Redefine a.	5080	Redefine the array p for baby specified by R\$.	8000	Introduction and playing instructions.
5020	Redefine b. BEEP to indicate movement. Print new baby (one of six variations in pose).	5090	Return.	8050	First UDG is graphics A second UDG is graphics C.
5030	Check for baby reaching ambulance safely.	6000	Move catcher to the left if key 5 is pressed or to the right if key 8 is pressed. Rub out old catcher position.	8060	Return.
		6010	Display catcher in new position. Type graphics 'A' for UDG.		
		6020	Keep note of current position of		



# PCNProgramCards

Babyfall

Card 3 of 3

8334BA3/3

```

9000 REM initialise
9010 LET S$="0402040304040507060
80809111015112012151311140815061
60517041805190620082111221523202
415251826"
9030 BORDER 5: CLS
9040 PLOT 0,135: DRAW 27,0: DRAW
0,-135
9050 FOR f=6 TO 21 STEP 2: PRINT
AT f,0;"■": NEXT f
9060 RESTORE 9080: FOR g=1 TO 2:
READ a,b: PLOT a,b: FOR f=1 TO
4: READ a,b: DRAW a,b: NEXT f: N
EXT g
9070 PLOT 245,15: DRAW 0,-5: DRA
W 6,0: CIRCLE 220,3,3: CIRCLE 24
4,3,3: PLOT 225,14: FOR f=1 TO 1
2: READ a,b: DRAW a,b: NEXT f
9080 DATA 212,22,27,0,0,-19,-27,
0,0,19,242,15,10,0,0,-12,-10,0,0
,12,0,4,2,0,0,-4,4,0,0,-2,-4,0,0
,-4,-2,0,0,4,-4,0,0,2,4,0
9090 LET live=3
9110 LET sc=0

```

```

9120 LET c1=21: LET cp=4
9140 DIM p(4,3)
9150 LET p(1,3)=1: LET p(2,3)=1:
LET p(3,3)=1: LET p(4,3)=1
9160 FOR f=1 TO 4: LET p(f,1)=VA
L$(p(f,3) TO p(f,3)+1): LET p(
f,2)=VAL$(p(f,3)+2 TO p(f,3)+3
): NEXT f
9470 PRINT AT 0,0;"score";AT 0,6
:sc
9480 RETURN
9500 RESTORE 9170: FOR f=1 TO 7:
READ a$: FOR g=0 TO 7: READ a:
POKE USA a$+9,a: NEXT g: NEXT f
9510 DATA "A",186,186,146,254,16
,16,40,108,"B",206,136,203,255,2
03,136,206,0,"C",56,56,146,254,1
6,16,186,254,"D",8,22,37,88,154,
103,78,36,"E",36,114,230,89,26,1
64,104,16,"F",27,9,107,127,107,9
,27,0,"G",24,24,126,126,24,24,24
,24
9520 RETURN

```

9000 Start of initialisation routine.  
9010 String containing coordinates of  
baby's flight positions.  
9030 Define colour border.  
9040 Draw outline of tower block.  
9050 Draw windows on tower block.  
9060 Read data for drawing outline of  
ambulance.  
9070 Draw window, red cross, and

9080 wheels, of ambulance.  
9090 Data for ambulance drawing.  
9110 Define number of lines.  
9120 Set the score to zero.  
9140 Set initial position of catcher.  
9150 Set up array p.  
9160 Define points s\$.  
Define coordinates for starting  
positions of babies.

9470 Display score.  
9480 Return.  
9500 Read a character. Read value  
and poke it into UDG section of  
memory. Repeat for all the  
seven UDG characters.  
9510 The characters in quotes are  
typed as graphics 'A' to 'B'.  
9520 Return

# PCNProgramCards

Count

Card 1 of 3

8334CO1/3

```

1 SC=0
2 TI$="000000"
3 PRINTTAB(8);"TWO MAIN DICE"
4 N=N+1
5 D=INT(6*RND(1))+1)
6 PRINT"    "
7 IFD=1THEN14

```

8 IFD=2THEN12

```

9 IFD=3THEN12
10 PRINT"    "
11 GOTO15
12 PRINT"    "
13 GOTO15
14 PRINT"    "
15 IFD=2THEN20
16 IFD=4THEN20
17 IFD=6THEN22

```

```

10 01
12 01
14 11

```

## Vic-20 3.5K Commodore Basic

Application: Educational  
Author: Telstar

1 Set the score to zero.  
2 Set the time to zero.  
3 Print title.  
4 Increment N.  
5 Get a random dice face.  
6 Print top of dice.  
7 If the number of dots is one then  
print blank line.

8 If two then put a dot in the top  
left hand corner.

9 If three then do the TLHC.  
10 Two dots for 6,5,4 dice.  
11 Select next dots.  
12 Dot the TLHC.  
13 Select next dots.  
14 Blank line.  
15 If two then blank line.  
16 If four then blank line.  
17 If six then two dots on middle  
line.





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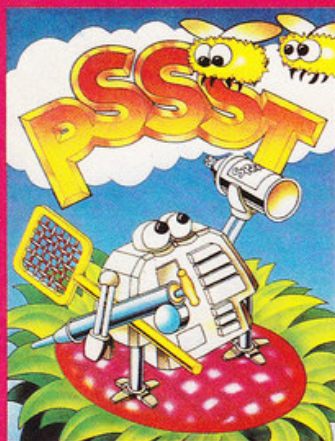
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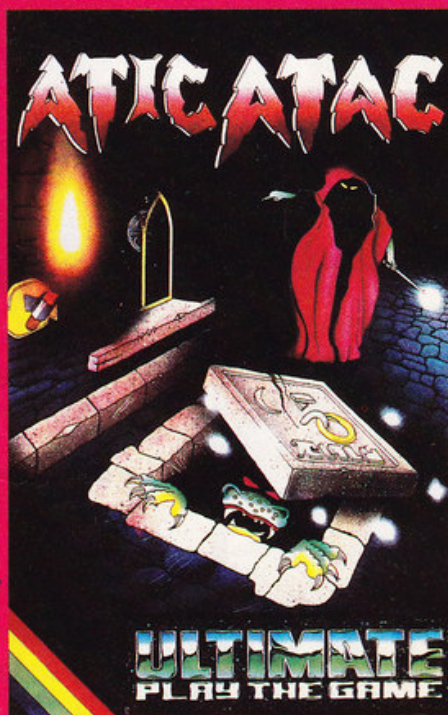


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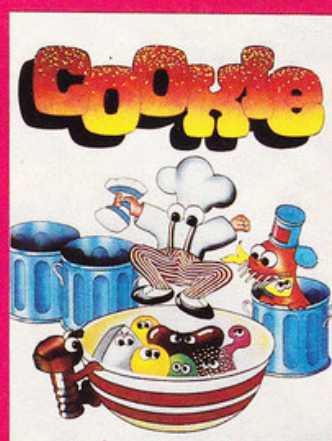
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# PCNProgramCards

Count

Card 2 of 3

8334CO2/3

```

18 PRINT"          | * |"
19 GOTO23
20 PRINT"          |   |"
21 GOTO23
22 PRINT"          | * * |"
23 IFD=1THEN30
24 IFD=2THEN28
25 IFD=3THEN28
26 PRINT"          | * * |"
27 GOTO31
28 PRINT"          | * |"
29 GOTO31
30 PRINT"          |   |"
31 PRINT"          |   |"
32 PRINT"          |   |"
33 IFN=2THEN36
34 PRINT"          + "
35 PRINT"
36 A=D
37 GOTO4
38 T=D+A
39 PRINT"          = ";
40 INPUTT1
41 IFT1=TTHENPRINT"X CORRECT " : SC=SC+1
42 IFT1<>TTHEN44
43 PRINT"          " : GOTO54

```

18 Centre dot for 1, 3 or 5.  
19 Select next dots.  
20 Blank line.  
21 Select next dots.  
22 Two dots.  
23 If one then print bottom blank.  
24 If two dot bottom right hand corner.  
25 If three then dot BRHC.  
26 Bottom two dots.  
27 Print bottom of dice.  
28 Print BRHC dot.  
29 Print bottom of dice.  
30 Bottom line blank.  
31 Bottom of dice.  
33 If two dice have been printed then continue program.  
34 Print plus.  
36 Set A to the number of dots.  
37 Next dice.  
38 Evaluate the total.  
39 Print equals.  
40 Get answer.  
41 If the answer is correct then increment the score.  
42 If wrong then try again.

# PCNProgramCards

Count

Card 3 of 3

8334CO3/3

```

44 PRINT"NO, COUNT THE SPOTS AND GIVE ANOTHER ANSWER."
45 SC=SC-1
46 PRINT"X          = ";
47 INPUT T2
48 IFT2=TTHEN54
49 PRINT"X NO, THE ANSWER IS"; T
50 PRINT"          "
51 FOR T=1 TO 2000 : NEXT
52 GOTO55
53 PRINT"          "
54 GOSUB62
55 PRINT"
56 PRINT"TIME = "; T1$; " SECONDS
57 PRINT"YOUR SCORE = "; SC
58 N=0
59 IFT1$>"000055" THEN GOTO64
60 GOTO4
61 END
62 FOR T=1 TO 1000 : NEXT
63 RETURN
64 PRINT"X WELL DONE"
65 PRINT"X YOU HAVE SCORED "; SC; "X IN "; T1$; " SECONDS
66 PRINT"X PRESS [ Y ] TO GO AGAIN
67 GETA$: IFA$="" THEN 67
68 IFA$<>"Y" THEN 68
69 IFA$="Y" THEN 1

```

43 Underline.  
44 Print the retry prompt.  
45 Decrement the score.  
46-47 Get second try.  
48 Check answer.  
49 Print wrong.  
50 Underline.  
51 Delay.  
53 Line.  
54 Goto end section.  
55-57 Print time and score.  
58 Set dice counter to zero.  
59 Check time.  
60 Restart.  
61 End.  
62-63 Delay subroutine.  
64-66 Final score.  
67 Get answer.  
68-69 Check reply and act on it.



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# PCNProgramCards

Men/Arith

Card 1 of 2

8334MA1/2

```

1 GOSUB51
2 TI$="000000"
3 POKE36869,240

4 SC=0
5 N=3
6 PRINT"Q"
7 A=INT(RND(1)*9)+1
8 B=INT(RND(1)*9)+1
9 C=INT(RND(1)*9)+1
10 D=INT(RND(1)*9)+1
11 POKE36879,25
12 PRINT"SC"
13 PRINT"ADD ALL FOUR NUMBERS"
14 PRINT"SUMS DONE ="N
15 PRINT"
16 PRINT"  [ ] [ ] "POINT" TIME"
17 PRINT"  [A] [B]"
18 PRINT"  [ ] [ ] ":PRINTTI$
19 PRINT"
20 PRINT"
21 PRINT"  [ ] [ ] ":PRINT" SCORE"
22 PRINT"  [C] [D]"
23 PRINT"  [ ] [ ] ="SC
24 PRINT"
25 T=E
26 E=A+B+C+D

27 N=N+1
28 PRINT"YOUR ANSWER=":INPUTT1
    
```

## Vic-20 3.5K Commodore Basic

Application: Educational  
Author: Telstar

1	Gosub and print instructions.
2	Set the time to zero.
3	Change character memory pointer.
4	Set the score to zero.
5	Set the number of goes to zero
6	Clear the screen.
7-10	Select the four random numbers.
11	Set the screen colour.
12	Position cursor.
13-24	Print the quiz screen.
25	Set T equal to the last solution.
26	Set E equal to the present solution.
27	Increment go number.
28	Get answer.

# PCNProgramCards

Men/Arith

Card 2 of 2

8334MA2/2

```

29 IFT1=ETHE NSC=SC+1:GOTO35

30 PRINT"NO,COUNT AGAIN"
31 PRINT"SCEOND ANSWER ="
32 INPUTT2
33 IFT2=ETHE NS35

34 PRINT" INCORRECT"

35 IFSO<20THEN38
36 IFSO>19THEN42
37 IFTI$<"000200"THEN42
38 IFTI$<"000200"THEN45
39 PRINT"YOU TOOK MORE THAN 2 MINUTES TO SCORE";SC;" OUT OF ";N;" SUMS"
40 PRINT"THIS ="INT((SC*80)/N);"%";"ACCURACY":GOTO46
41 GOTO43
42 PRINT"YOU TOOK ONLY ";T1$;" MIN/SEC TO SCORE";SC;" OF ";N
43 PRINT"
44 PRINT"THIS ="INT((SC*100)/N);"%";
45 PRINT"ACCURACY"
46 PRINT"ANOTHER GO ?"
47 PRINT"PRESS Y FOR YES N FOR NO
48 GETA$:IFA$=""THEN48
49 IFA$<"Y"THENEND
50 IFA$="Y"THEN2
51 POKE36869,242
52 PRINT"THIS IS TO TEST YOUR ABILITY TO ADD FOUR NUMBERS, NONE OF"
53 PRINT"WHICH EXCEEDS NINE."
54 PRINT"DO AS NOT TO WASTE TIME AND TO PROVIDE THE LARGEST NUMBER";
55 PRINT"DOF EXAMPLES POSSIBLE."
56 PRINT"1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20"
57 PRINT"INCORRECT ANSWER REPEATS TIME."
58 PRINT"IF YOU TAKE MORE THAN 2 MINS 20% IS DEDUCTED"
59 PRINT"TRY TO COMPLETE AT LEAST 20 SUMS!"
60 PRINT"PRESS 1 TO 10"
61 GETA$:IFA$=""THEN61
62 IFA$="Y"THENRETURN
    
```

29	If the answer is correct then increment the score.
30	Incorrect.
31	Prompt for second try.
32	Get second try.
33	If this is correct then continue the program.
34	Tell the users that this is incorrect.
35-36	Check the score.
37-38	Check the time.
39	Print the overtime score.
40	Print the accuracy.
42	Print undertime score.
43	Underline.
44-45	Print accuracy.
46-47	Prompt for another go.
48	Get reply.
49-50	Validate reply and act upon it.
51	Change character pointer.
52-62	Subroutine to print the title page.





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## ZX 81

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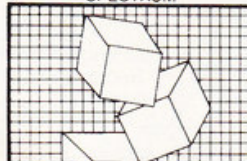
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# PCNProgramCards

**Road Hog**  
8334RH1/2

**Card 1 of 2**

**BBCB**  
**BBC Basic**

Application: Game  
Author: Kevin Edward

```
10 ON ERROR RUN
20 *FX12,0
30 *FX15,1
40 C$=CHR$(133):M=&7F30:T=&7F40
50 MODE7:VDU23;8202;0;0;0;0:PRINT'TAB(
7)CHR$(131)"** Instructions **":PRINT'
C$"You Guide Your 'o' Round The Maze"
60 PRINT'C$"Trying To Trap The Evil L
ittle '*'
70 PRINT'C$"So He Can Not Move Up,Dow
n,Left Or"
80 PRINT'C$"Right Using The Following
Controls"
90 PRINT'TAB(12)CHR$(134)"Up ':'":PR
INT'TAB(7)CHR$(134)"Left 'Z' 'X' Righ
t"
```

```
100 PRINT'TAB(10)CHR$(134)"Down '/'"
110 INPUT"Enter Speed 1-40 INCLUSIVE 1
=FAST",SPEED
120 IF SPEED<1 OR SPEED>40 THEN RUN
130 PRINT'TAB(8)CHR$(130)"Press Key To
Start":*FX15,1
140 A$=GET$:*FX11,8
150 *FX12,7
160 CLS:FORL=&7C28T0&7C4F:?L=255:L?920
=255:NEXT
170 FORL=&7C50T0&7FC0STEP40:?L=255:L?3
9=255:NEXT
180 TIME=0:GOSUB490
190 FORL=1T0200
200 PP=INT(920*RND(1)+1)+&7C28:IF ?PP<
>32 THEN 200 ELSE ?PP=255:NEXT
```

10	Error trap for escape key to rerun the game.	50	Select mode and set a window, print title.	150	Set auto repeat period.
20	Set auto repeat period.	60-110	Print instructions and get speed.	160-170	Set up playing screen.
30	Clear keyboard buffer.		Check speed.	180	Set time to zero and print time on screen.
40	Set C\$ to alpha magenta, set up pointers to mode 7 screen memory.	120	Prompt start.	190-200	Place random blocks (char 255) on the playing screen.
		130	Get key and set auto repeat delay.		
		140			

# PCNProgramCards

**Road Hog**  
8334RH2/2

**Card 2 of 2**

```
210 ?T=42:?M=111
220 X=RND(4)
230 GOSUB490:ON X GOTO 240,250,260,270
240 F=1:GOTO280
250 F=-1:GOTO280
260 F=40:GOTO280
270 F=-40
280 IF ?(F+T)<>32 THEN 220
290 FORL=1TOSPEED:NEXT
300 ?T=32:T=T+F:?T=42:SOUND1,-9,RND(20
)+200,1
310R=0
320IF INKEY(-73) THEN R=-40
330IF INKEY(-105) THEN R=40
340IF INKEY(-67) THEN R=1
350IF INKEY(-98) THEN R=-1
360 IF R=0 THEN 230
370 IF ?(R+M)<>32 THEN 470
380 ?M=32:M=M+R:?M=111
```

```
390 IF ?(T+1)=32 OR ?(T-1)=32 OR ?(T+4
0)=32 OR ?(T-40)=32 THEN 230
400 FT=TIME:FOR L=1T025:SOUND1,-15,L,1
:NEXT
410 CLS:PRINT'C$CHR$(141)"YOU CAUGHT
HIM !!!":PRINTC$CHR$(141)"YOU CAUGHT HIM
!!"
420 PRINT'C$CHR$(131)"It Took You Only
";FT/100" Seconds."
430 *FX12,0
440 *FX15,1
450 PRINT'CHR$133"Another Game "':INPU
T AN$:IF LEFT$(AN$,1)="Y" THEN RUN
460 PRINT'"B Y E !!!":END
470 *FX15,1
480 GOTO230
490 PRINTTAB(8,0)CHR$(131)"Time = ";I
NT(TIME/100):RETURN
```

210	Place you and the hog on the road.	310-350	Get player's key press and alter R accordingly.	400	Note the final time (FT): play the end of game tune.
220	Set X.	360	If player hasn't moved then go back and move the hog again.	410	Print double height catch.
230	Print time onto the screen.	370	If the player is trying to nut a wall then don't move.	420	Tell player how long it took.
240-270	Move the hog absolute position.	380	Move the player.	430	Set repeat period to 0.
280	Check that hog is not running into a wall.	390	If the hog has any spaces around it then continue the game.	440	Clear the keyboard buffer.
300	Put the hog onto the screen after rubbing out the old one.			450	Prompt for another game.
	Make random pitch sound.			460	Bye.
				470	Clear keyboard buffer.
				480	Continue game.
				490	Subroutine to print the time on the screen.





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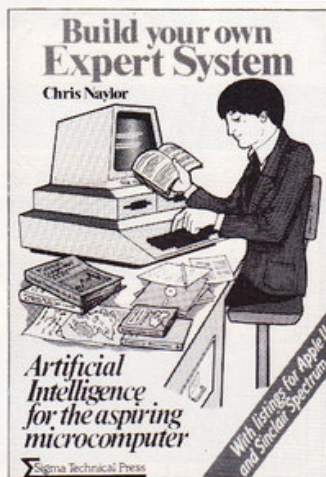
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## READOUT

Which book would your micro want you to buy?



**Build Your Own Expert System** by Chris Naylor, published by Sigma Technical Press at £6.95 (paperback, 250 pages).

Somewhere else, some time ago, Mr Naylor delivered his verdict on computers. 'High speed morons', he wrote, and this book represents one result of his efforts to turn his own micro, an Apple II, into something with a glimmer of intelligence.

He quickly defines his subject: 'There are two major faults possessed by most existing expert systems . . . that you, personally, don't understand how they work, and that you, personally, haven't got one . . . You become an outcast and a despised person in your own eyes.'

'Expert systems' calls to mind long-winded boffins giving interminable seminars in glorious technobabble. Mr Naylor is no long-winded boffin; at times his book gives the impression that he was anxious to finish it so that he could get out to the pub.

If you have a Spectrum or an Apple system or just a taste for dry humour it should appeal to you. The listings of programs from which your micro might gain wisdom and expertise are given for these two systems, but since they are Basic programs you may be able to adapt them for other machines.

Programs, conducted tours of statistics, whimsical observations and plenty of logic are sustained from the introduction up to the crescendo in chapter 7, 'An Expert on Everything in the Entire Known World'. The idea is that you develop your own expert system as you go along. Thereafter you are shown some of the things you might do with it, and some of the things that people do with existing expert systems. The

book's final contribution is a summary of the steps taken in the construction of the system it proposes.

This is an excellent book on a forbidding subject. Even if you don't build an expert system from it, your money won't have been wasted. **DG**

**Z80 Machine Code for Humans** by Alan Toothill and David Barrow, published by Granada, price £7.95 (paperback, 152 pages).

This book prepares you for the worst by stressing, at the outset, the importance of exercising one's mind with hard mental effort.

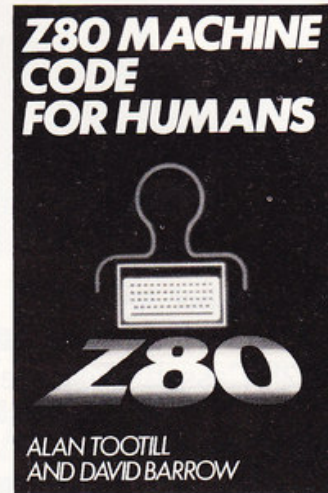
But true to its title, it succeeds in taking the nightmares out of machine code, progressing through explanations and exercises in orderly fashion.

The authors explain how to control the speed of machine code and emphasise the usefulness of compilers, interpreters and assemblers when writing your own applications, complete with advice and ideas. Even the chapter on arithmetic and conversion is clearly explained and encouraging in outlook.

Particularly interesting, too, is a chapter labelled 'Relocatable Code', and there is much detail on graphics, giving the routines that form a graphics system. Pixel graphics are dealt with separately.

Collected at the back of the book are various recommended ways of doing repetitive tasks which often trouble the machine code novice. Explanations of binary and hexadecimal number systems follows, as well as an enlightening comparison between Basic and machine code.

And at the end of it all you feel spurred to action. Definitely an encouraging book. **WP**



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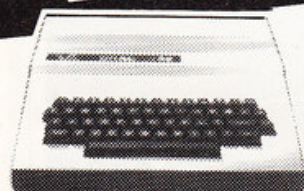
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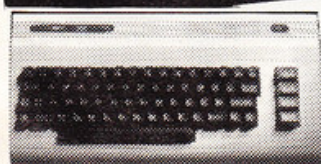
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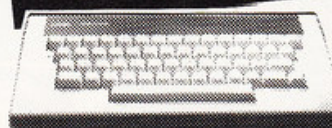
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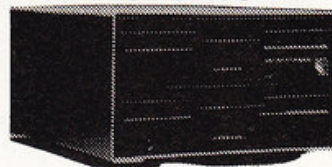
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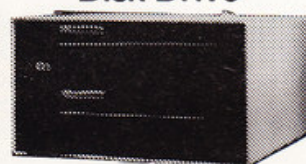
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1. 747 Flight Simulator	£7.95	£7.16
2. Killer Gorilla	£7.95	£7.16
3. Cylon Attack	£7.00	£6.30
4. The Hobbit	£14.95	£13.46
5. Felix & the Fruit Monsters	£7.95	£7.16
6. Felix in the Factory	£7.95	£7.16
7. Sphinx Adventure	£9.95	£8.96
8. Danger UXB	£7.95	£7.16
9. 3D Bomb Alley	£7.95	£7.16
10. Snapper	£9.95	£8.96
11. Number Balance	£11.90	£10.71
12. Demon Decorator	£7.95	£7.16
13. Bandits at 3 o'clock	£7.95	£7.16
14. Philosopher's quest	£9.95	£8.96
15. Starship Command	£9.95	£8.96
16. Galactic Commander	£7.95	£7.16
17. Painter	£8.00	£7.20
18. Bug Byte Oblivion	£7.50	£6.75
19. Bug Byte Old Father Time	£7.50	£6.75
20. Forth	£14.65	£13.19

### DRAGON TOP 20

1. Everest	£7.95	£7.16
2. Defence	£8.00	£7.20
3. Katerpillar Attack	£8.00	£7.20
4. Morocco Grand Prix	£8.00	£7.20
5. The King	£8.00	£7.20
6. Wizard War	£7.95	£7.16
7. Samurai Warrior	£6.95	£6.26
8. Night Flite	£7.95	£7.16
9. Space Monopoly	£8.00	£7.20
10. Ultimate Adventure	£8.00	£7.20
11. Invader Revenge	£8.00	£7.20
12. Dragbugrunner	£8.75	£7.88
13. Dragbug	£12.95	£11.66
14. Don't Panic	£5.95	£5.36
15. Champions	£5.95	£5.36
16. Flipper	£8.00	£7.20
17. Golf	£7.95	£7.16
18. Escape	£8.00	£7.20
19. Dragon Invaders	£8.00	£7.20
20. Jungle Search	£7.00	£6.30

### COMMODORE 64 TOP 20

1. Hover Bower	£7.50	£6.75
2. Frogger 64	£7.00	£6.30
3. Laser Zone	£7.50	£6.75
4. Damsel In Distress	£7.95	£7.16
5. Gridrunner	£7.95	£7.16
6. Galaxians	£7.95	£7.16
7. Scramble 64	£7.00	£6.30
8. Hobbit	£14.95	£13.46
9. Simon's Basic	£50.00	£45.00
10. Token of Ghall	£6.95	£6.26
11. Motor Mania	£8.75	£7.88
12. Crazy Kong	£7.00	£6.30
13. Exterminator 64	£5.99	£5.40
14. Alien Panic 64	£3.99	£3.60
15. Introduction to Basic	£14.85	£13.37
16. Jumpman (import)	£33.10	£29.79
17. Trog (import)	£14.85	£13.37
18. Protector (import)	£36.70	£33.03
19. Repton (import)	£33.10	£29.79
20. Serpentine (import)	£33.35	£30.02

### COMMODORE VIC 20 TOP 20

1. Arcadia	£5.50	£4.95
2. Bewitched	£5.50	£4.95
3. Gridtrap	£7.95	£7.16
4. Astro Fighters	£6.95	£6.26
5. Gun Fighters	£6.95	£6.26
6. Chopper	£6.95	£6.26
7. Get Lost	£5.95	£5.36
8. Choplifter	£21.55	£19.40
9. Space Rescue	£6.95	£6.26
10. Shark Trap	£16.50	£14.85
11. Gridrunner	£33.35	£30.02
12. Lazer Zone	£29.00	£26.10
13. AE	£33.35	£30.02
14. Astro Patrol	£28.98	£26.08
15. Shadowfax	£7.95	£7.16
16. Fourth Encounter	£25.00	£22.50
17. Barrel Jumper	£8.95	£8.06
18. Conqueror	£15.95	£14.36
19. Alien	£9.99	£9.00
20. Omega Race	£9.99	£9.00

### ATARI TOP 20

1. Zepelin (import)	£28.95	£26.06
2. Planet Fall	£41.35	£37.22
3. Blue Max	£27.80	£25.02
4. Zaxxon	£25.95	£23.36
5. Necromancer	£24.95	£22.46
6. Choplifter	£29.95	£26.96
7. FT. Apocalypse	£29.95	£26.96
8. Soft Porn	£21.95	£19.76
9. Strip Poker	£21.95	£19.76
10. Sargon 2	£28.95	£26.06
11. Blade Blackpoole	£33.10	£29.79
12. Gorf	£29.95	£26.96
13. Miner 2049ER	£21.95	£19.76
14. Wizard & the Princess	£24.95	£22.46
15. Wizard of War WR	£21.95	£19.76
16. Shamus	£21.95	£19.76
17. Drelbs	£28.95	£26.06
18. Preppie	£21.95	£19.76
19. Preppie 2	£25.49	£22.95
20. Frogger	£24.95	£22.46

### SPECTRUM TOP 20

1. Valhalla	£14.95	£13.46
2. Hobbit	£14.50	£13.05
3. Black Crystal	£7.50	£6.75
4. Jungle Fever	£6.90	£6.21
5. Penetrator	£6.95	£6.26
6. Halls of Things	£7.50	£6.75
7. The Train Game	£5.95	£5.36
8. Cookie	£5.50	£4.95
9. Jungle Trouble	£5.50	£4.95
10. Pssst	£5.50	£4.95
11. Terror-Daktal 4D	£6.04	£5.44
12. Chucky Egg	£6.90	£6.21
13. 3D Combat Zone	£5.95	£5.36
14. Styx	£5.95	£5.36
15. Transam	£5.50	£4.95
16. Zip Zap	£5.50	£4.95
17. Z Zoom	£5.50	£4.95
18. Digger Dan	£5.95	£5.36
19. Xadom	£6.95	£6.26
20. Dungeon Master	£7.50	£6.75

### ORIC TOP 10

1. Road Frog	£6.90	£6.21
2. Centerpede	£6.95	£6.26
3. Galaxians	£6.95	£6.26
4. Candy Floss + Hangman	£7.50	£6.75
5. Invaders	£7.50	£6.75
6. Light Cycle	£6.95	£6.26
7. Star Fighter	£6.95	£6.26
8. Harrier Attack	£6.95	£6.26
9. Killer Cavens	£5.95	£5.36
10. Reverse	£6.50	£5.85

### ZX TOP 10

1. 3D Defender	£4.95	£4.46
2. Starfighter	£3.95	£3.56
3. Black Crystal	£7.50	£6.75
4. Invaders	£4.95	£4.46
5. M Coder	£8.95	£8.06
6. Zombies	£5.95	£5.36
7. Jumping Jack	£4.95	£4.46
8. Inca Curse	£5.95	£5.36
9. Maze Death Race	£3.95	£3.56
10. Zok's Kingdom	£5.95	£5.36

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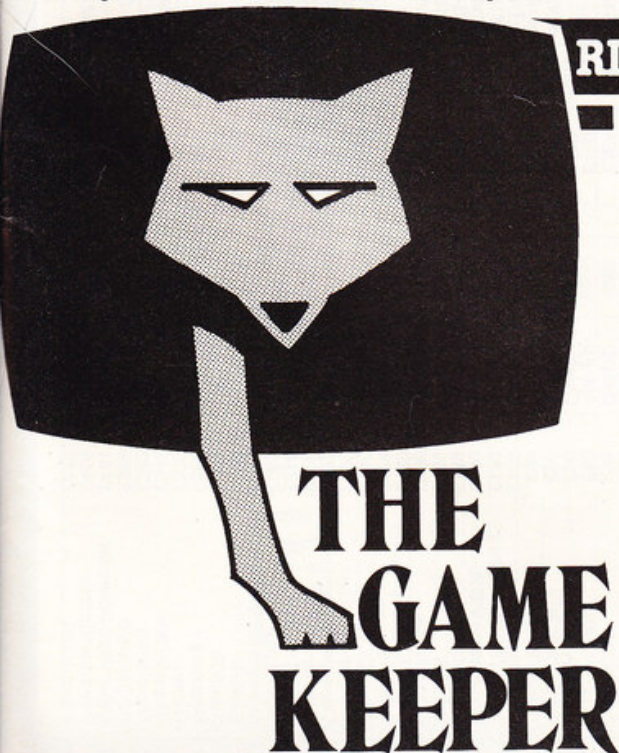
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# DATABASICS

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** 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, 5 1/4" 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	£45	Tandy TRS-80 Model 100	£499	Microsolution Brit. Genius	£1,840	North Star Horizon	£2,294	Cromemco System 2	£3,560	Sord M243	£5,842
Casio PB100	£50	Nascom 3	£549	Globe 101	£1,850	Sanyo MBC 1250	£2,294	Digital Microsystems 3	£3,576	Archives IV	£5,905
TRS-80 PC4	£50	Commodore 4016	£632	Grundy 8200	£1,850	Casumi C2	£2,300	Decision-1 Computer 012	£3,674	Sage IV	£5,962
Aquarius	£68	Research Machine 4802	£684	Genie III	£1,897	Seed System I	£2,300	Televideo TS-1602-C	£3,714	ICL PC Model 32	£6,037
Laser 200	£70	DAIPC	£684	Toshiba T-100	£1,900	Sharp PC3201	£2,300	Advis Multivision	£3,795	Rair Business Computer	£6,037
Sharp PC1251	£80	Apple II	£776	Sord M23	£1,932	HP 85	£2,360	Clenio Pronto	£3,795	Digital Microsystems 4	£6,210
Commodore 500	£799	Commodore 500	£799	Kaypro II	£1,949	HP Series 100, 120	£2,369	Panasonic JD800M	£3,795	Superstar	£6,296
Jupiter Ace	£861	Tandy Model 4	£861	Krypton 800 range	£1,949	Sord M23P	£2,386	Kemitron K3000	£3,850	Racal 6000	£6,327
Casio FX702P	£90	Tandy Model 4	£861	Kenilworth 83G	£1,953	TIP Pro. Computer	£2,386	DEC PC350	£3,850	Eagle 1600	£6,497
Sinclair Spectrum	£99	Sharp MZ80B	£900	Epson QX10	£1,983	IBM PC	£2,415	Victor 4	£3,852	TISystem 200-250	£6,695
T199/4A	£100	Franklin Ace	£914	IDS Datamachine	£1,995	Xerox 820 Model II	£2,439	Cifer Club	£3,904	CompuCorp 675	£6,780
Tandy TRS-80 Pocket 2	£100	Apple IIe	£972	Tandy TRS-80 Model II	£1,999	Haywood 3000	£2,472	Sage II	£4,019	Wicat 150	£6,846
Commodore VIC 20	£140	Commodore 8032	£1,129	Kenilworth 83N	£2,012	LSM4	£2,472	Eagle IV	£4,190	Pascal Mod. Microengine	£7,003
Atari 400	£149	Cromemco C10	£1,350	Caltext Micro	£2,019	Canon CX-1	£2,500	Tandy TRS-80 Model 16	£4,199	Diablo 3000	£7,250
Sord M5	£150	Microdecision	£1,144	LSIM3	£2,059	Sinuis 1	£2,525	Hytech H4500	£4,310	Onyx 5001 MU	£7,607
Colour Genie	£168	Fujitsu FM8	£1,144	Haywood 9000 Composite	£2,064	IO Tech Iona	£2,539	BMCOK 11 F800, Model 20	£4,360	Apple Lisa	£7,653
Sharp PC1500	£169	Microdecision	£1,144	LSIM3	£2,064	HP 87XM	£2,571	ADS 42	£4,500	Sundance II	£8,205
Dragon 32	£174	Sanyo MBC 1000	£1,195	Positron 9000	£2,070	Quantum 2000	£2,587	Televideo TS-80ZH	£4,533	Haywood Hinet	£9,550
Texas CC40	£180	Pied Piper	£1,226	Research Machines 380Z	£2,147	Canon AS100	£2,639	Country Com'ers C1000	£4,542	Altos 856-10	£9,631
Electron	£199	Positron 900	£1,259	Superbrain JR	£2,150	CP1100	£2,639	ICL PC Model 31	£4,939	Micro Five 3000	£10,350
Computers Lynx	£225	Tandy TRS-80 Model III	£1,299	Future Computers FX-20	£2,156	Seed System 19	£2,600	Cromemco System 3	£5,170	Sundance 16	£10,480
Commodore 64	£229	Commodore 8096	£1,374	CWP Cortex	£2,179	Enterprise 1000	£2,645	Fortune 32:16 System 2	£5,204	Spectrum	£11,442
Tandy TRS-80 Colour	£240	Pasca 640	£1,437	Comart Communicator	£2,180	Facit 6520	£2,645	Zeus 4	£5,400		
NewBrain A	£269	NEC PC8000	£1,454	Adler Alphatronic P3	£2,197	Olympia Boss Model A	£2,657	Hawk Model 2110	£5,400		
Multitech MPS II	£269	Signal 2	£1,483	Eagle II	£2,242	Britannia Baby	£2,696	Molecular M200	£5,462		
Genie II	£299	Magnum	£1,483	Country Com'ers C3000	£2,242	Adler Alphatronic P3	£2,702	Almos 800/15	£5,663		
Atari 800	£300	Televideo TS-800 Series	£1,495	Kemitron K2000E	£2,242	Almarc 801	£2,708	Durango F85	£5,744		
Nascom 2	£327	HP 86A	£1,541	Rair Black Box 320S	£2,242	DEC Rainbow 100	£2,714	Triton 4	£5,744		
Genie I	£330	Osborne I	£1,581	Sanyo MBC 2000	£2,242	ICL PC Model 10	£2,754	Marm Chip M9900	£5,750		
Sharp MZ80A	£347	Signal 10025	£1,599	Toshiba T-200	£2,242	Millbank SX10	£2,754	SWTech Products S09	£5,750		
Microtan 65	£389	APL Signal	£1,610	TMK 332	£2,242	Olivetti M20D	£2,754	BASF 7100	£5,805		
Datasc Micro Controller	£399	Basis 108	£1,683	Bonsai SM 3000	£2,294	Sinuis I	£2,754	CompuStar	£5,837		
Powertran Cortex	£431	Commodore Spr. Pet 9000	£1,719	CAL PC	£2,294	Victor 9000	£2,754				
Epson HX20	£472	Gemini Galaxy 2	£1,719								

## ABBREVIATIONS

Ap: APL  
As: Assembly  
Ba: Basic  
Co: Cobol  
Cm: Comal  
Fr: Fortran  
Pa: Pascal



Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM — normally at extra cost	Display		Graphics	Keyboard				Interfaces built-in				Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters columns x lines	Method (at extra cost)		Colour capability	Max dot resolution	Type of keyboard	No of function keys	Numeric pad	No of RS232	No of Centronics	No of IEEE 488	No of others	No of expansion slots					
<b>HARDWARE</b>																							
Adds Multivision	£3,795	8085A	5	64K	256K	80x25	M	640x240	W 28		1		1				1x350K5¼F	CP/M 2.2, Muon	Ba	●	A2	Multi user system	
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80x24	M		W 6	●	2		1	3			2x320K5¼F	CP/M	Ba	●	T1	£327 buys extra storage	
Adler Alphatronic P3	£2,696	8085A	3	64K		80x24	M		W 6	●	2		1	3			2x790K5¼F	CP/M		●	T1	16 bit option-promised	
Ajile	£3,400	8088	4	256K		80x25	M	640x250	W 10	●	1	1	2				2x320K5¼F	MS-DOS	BaAs	●	A9	PCN issue 13	
Almarc 801	£2,708	Z80	4	64K	512K	80x25	(M+)	●	W		2						2x800K5¼F	CP/M		●	A4	8-bit range goes to 20Mb	
Almarc 1601	£3,445	8086	8	128K	1Mb	80x25	(M+)	●	W		2						2x800K5¼F	CP/M86		●	A4	Pseudo 16-bits go to 20Mb	
Aquarius	£68	Z80A	4	4K	52K	40x24	TV	●	C				1	●				Cassette	Ba		M7	PCN issue 7	
Altos 800/15	£5,663	Z80	4	192K	208K	80x24	M		W 8	●		1					1x450K5¼F	MP/M		●	L1	Multi user business machine	
Altos 856-10	£9,631	8086	10	512K	1Mb	80x24	M		W 16	●	6						2x500K5¼F	Xenix	Xenix	●	L1	The 16-bit version	
APL Signet	£1,610	Z80A	4	64K		80x25	Tv(M+)	●	*		2						2x188K5¼F	APL, CP/M	Ap	●	M1	*APL terminal recommended	
Apple II	£776	6502	1	48K	128K	80x24	Tv(M+)	●	W									CP/M, DOS 3.3, UCSD-P	Ba	●	A8	Plenty of software and extras	
Apple IIe	£972	6502	1	64K	128K	80x24	(M+)	●	W			1		8				DOS	Ba	●	A8	Updated Apple II	
Apple III	£2,780	6502	2	128K	256K	80x24	(M+)	●	W								1x140K5¼F	SOS, DOS		●	A8	Will emulate Apple II	
Apple Lisa	£9,775	68000	8	1Mb		120x30	M	792x360	W	●	2	1	3				2x860K5¼F	Lisa		●	A8	PCN issue 1	
Archives I	£3,003	Z80	4	64K		80x25	M	240x100	W 23	●	2	1	1	5			2x386K5¼F	CP/M		●	S1	Standard CP/M + graphics	
Archives IV	£5,905	Z80	4	512K		80x25	M	240x100	W 23	●	1						1x10Mb5¼H+1x7445¼F	CP/M, MP/M		●	S1	Hard disk version	
Atari 400	£150	6502B	1.79	16K		40x24	Tv	●	T 3				7	●				Cassette	Ba	●	A5	Games computer	
Atari 800	£300	6502	1.8	48K		40x24	Tv(M+)	●	W 3				7	4	●			Cassette	Ba	●	A5	Versatile, good graphics	
Barcellos AMT 100	£3,450	Z80A	4	64K	256K	80x24	TvM	820x168	W 8	●	1	1	2	3			2x500K8F	CP/M	BaCo	●	B1	Up to four users	
BASF 7100	£5,805	Z80A	4	64K		80x24	M		W 26	●	1	1					3x163K5¼F	BOS	Ba	●	C1	Hard disk promised	
Basis 108	£1,683	6502	1	64K	126K	80x24	TvM	●	W 15	●	1	1		6	●					●	C12	Apple bus, Z80, 80 columns	
BBC Micro Model B	£399	6502	2	32K		80x30	Tv(M+)	●	W 10		1		5	3	●			MOS	BaAs	●	A1	PCN issue 3	
BMC OKI 800, Model 20	£4,360	Z80B	5	64K	256K	80x25	M	640x200	W 15	●	1						2x340K5¼F	CP/M	Ba	●	E1	Built-in printer	
Bonsai SM 3000	£2,294	Z80	2	64K		80x24	M	80x24	W 14	●	1	1					2x350K5¼F	CP/M		●	B2	CP/M business machine	
Bonsai SM 4000	£2,842	8088	5	128K	256K	80x24	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		80x25	Tv(M+)	80x25	W 11	●	2	1					2x500K5¼F	CP/M	AsBaCo		B3	Cobol language included	
British Micro Mini 803	£1,490	Z80A	4	64K		80x25	(M+)	512x256	W 17	●	1	1	1				2x400K5¼F	OS/M		●	B4	This is CP/M compatible	
CAL PC	£2,294	8088	5	128K	256K	80x25	TvM	●	W	●	2	1	1	5			2x400K5¼F	CP/M	Ba	●	C3	Also Z80B Processor	
C-Base 64A	£401	6502	1	64K	192K	40x24	Tv(M+)	●	W 51	●								CP/M, DOS 3.3, UCSD-P	Ba	●	W3	Apple II compatible	
Caltext Micro	£2,019	Z80A	4	64K	256K	80x24	TvM	●	W 36	●	1	1					2x400K5¼F	CP/M		●	C3	Range of software included	
Computers Lynx	£225	Z80A	4	48K	192K	40x24	Tv(M+)	●	W		1	1						CP/M	Ba	●	C5	Also 128K with CP/M	
Canon AS100	£2,633	8088	4	128K	512K	80x25	M	640x400	W 12	●			4				2x640K5¼F	CP/M		●	C4	Choice of CP/M86 or MS-DOS	
Canon CX-1	£2,500	6809	4	128K	256K	80x24	M	80x25	W 15	●	3	1	1	2			2x320K5¼F	MCX	BaAs	●	C4	Pascal, Fortran as extras	
Casio FX 702P	£90	Cust.		2K		20x1	LCD		C									Cassette	Ba		C6	Pocket computer	
Casio PB100	£50	Cust.		0.7K	1.7K	60x1	LCD		C				1	●				Cassette	Ba		C6	Business pocket computer	
Casu Mini C Mark 2	£2,300	Z80A	4	64K		*	(M+)	*	*		4	1		6			2x1Mb8F			●	C7	*Choose your own terminal	
Cifer Series 1	£3,214	Z80	4	128K	320K	132x32	TvM		W 40	●	3	1					2x800K5¼F	CP/M		●	C17	Other models available	
Cifer Club	£3,904	Z80A	4	64K	256K	80x24	M	1024x300 opt	W 20	●	3	1	1				1x800K 5¼F	CP/M, MP/M opt, UNIX opt		●	C17	Optional 68000 processor	
Clenio Pronto	£3,795	Z80A	4	64K	1Mb	*	Tv(M+)	*	*		2	2		18			2x600K8F	CP/M	Ba	●	C8	*Choice of terminal	
Clenio Table-Top 925	£3,105	Z80A	4	64K	128K	80x25	M		W 11	●	2	2					2x600K8F	CP/M		●	C8	Watch out for the weight	
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80x24	M	640x200	W 10	●	2	1		8			2x320K5¼F	CP/M, MS-DOS	Ba	●	I1	An IBM lookalike	
Commodore VIC 20	£140	6502	1	5K	32K	22x23	Tv(M+)	●	W 8				3	1	●			Kernal	Ba	●	C9	Very popular home micro	
Commodore 64	£229	6510	1	64K		40x25	Tv(M+)	●	W 8									Kernal	Ba	●	C9	Good value for money	
Commodore 4016	£632	6502	1	16K	32K	40x25	TvM		W				1	1	3	●		Cassette, PETDOS	Ba	●	C9	The original PET	
Commodore 700	£1,144	6509	2	128K	896K	80x25	TvM		W 10	●	1			1	2	1		Kernal	Ba	●	C9	Might be a long wait	



[illegible]



Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM — normally at extra cost	Display			Graphics	Keyboard			Interfaces built-in					Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters columns x lines	Method (at extra cost)	Colour capability		Type of keyboard	No. of function keys	Numeric pad	No. of RS232	No. of Centronics	No. of IEEE 488	No. of others	No. of expansion slots	Cassette facility	Capacity per disk and disk size					
HP 86A	£1,541	Cust.	N/A	64K	512K	80x24	M		544x240	W			1	1	2	4			HP	Ba		H2	CP/M optional	
HP 87XM	£2,571	Cust.	N/A	128K	640K	80x24	M		544x240	W	14		1	1	3	4			HP DOS	Ba		H2	Special technical uses	
HP Series 100, 120	£2,362	Z80A	3.68	64K		80x24	M		80x24	W	8		2		1				CP/M	Ba		H2	Top end HP business system	
HP Series 200 Model 16A	£3,212	68000	8	128K	750K	80x25	M			W	5		1	1	2				HP			H2	Genuine 16-bit	
Hyperion	£3,100	8088	4.7	256K		80x25	M		320x200	W	10		1	1	1				MS, DOS, CP/M 86	BaAs		G5	Same as Ajille	
Hytech H4500	£4,310	Z80	4	64K	208K	80x25	M		80x25	W	26		1		3				CP/M	Ba		H3	Standard CP/M micro	
IBM PC	£2,392	8088	4.7	64K	576K	80x25	(M+)		640x200	W	10		1		5				MS-DOS	Ba		I9	Slow but reliable	
ICL PC Model 10	£2,754	8085	3	64K	256K	80x24	Tv(M+)			W	11		2		8				CP/M	Ba		I4	Repackaged Rair Black Box	
ICL PC Model 31	£4,939	8085	3	128K	256K	80x24	(M+)		80x24	W	11		4		8				CP/M, MP/M	Ba		I4	Multi user Black box	
ICL PC Model 32	£6,037	8085	3	256K		80x24	(M+)		80x24	W	11		8		8				CP/M, MP/M	Ba		I4	Top of ICL range	
IDS Datamachine	£1,995	Z80	4	64K	1Mb	*	Tv(M+)		*				2		15				CP/M	Ba		I8	*Depends on terminal	
IO Tech Iona	£2,539	Z80	4	69K	960K	80x24	M		160x75	W	12		1	1	8				CP/M			I5	Good colour versatility	
ITT 3030	£3,105	Z80A	4	64K	256K	80x24	Tv(M+)		80x24	W	8		1		1				CP/M, BOS			I7	Top end business system	
Jupiter Ace	£90	Z80	3.25	3K	51K	32x24	Tv(M+)		64x46	C					1					Fr		J1	Native Forth machine	
Kalamazoo 1050	£3,450	8085	6	64K		80x24	Tv(M+)		80x24	W	10		1						Kalamazoo			K3	Only Kabol language	
Kaypro II	£1,949	Z80	4	64K		80x24	M		80x24	W			1	1					CP/M	Ba		C15	A portable business machine	
Kemilton K2000E	£2,242	Z80	4	64K		80x24	(M+)		80x24	W			2	1	11				CP/M			K4	Scientific Keyboard	
Kemilton K3000	£3,795	Z80	4	64K	256K	80x24	(M+)		80x24	W			2		14				CP/M, MP/M			K4	For scientific use	
Kenilworth 83G	£1,953	Z80A	4	64K		80x25	TvM		160x75	W	10		1	1	5				CP/M			K5	British portable	
Kontron RSI 80	£3,306	Z80	4	64K	128K	80x25	M		256x512	W	16		2	1	8				Kontron	Ba		K6	O/S CP/M based	
Krypton 800 range	£1,949	Z80A	4	64K	256K	80x24	M		80x24	W	13		2	1	8				CP/M			T8	Fully definable characters	
Laser 200	£70	Z80A	3.6	4K	64K	32x16	TV		32x16	C			1		1					Ba		C14	Cheap colour computer	
LSI M3	£2,064	Z80	2.5	64K		80x24	M		80x24	W	31		1	1					CP/M			L3	Big, British and CP/M	
LSI M4	£2,472	8088	5	128K	256K	80x24	M		160x72	W	31		2	1	1				CP/M 86, CP/M 80			L3	Z80 for 8-bit software	
Logica VTS Vitesse	£2,863	8086	5	64K	256K	80x24	M		640x288	W	12		1	1	4				CP/M, MS-DOS	Ba		L4	High-res colour graphics	
Magnum	£1,489	Z80	4	64K		80x25	M			W			2						CP/M			I6	Inexpensive CP/M machine	
Marin Chip M9900	£5,750	9900	3	64K	1.6Mb	24x80	M		24x80	W	8		4		12				MOS, MDEX	Ba		M2	Genuine 16-bit	
Micro Five 1000	£5,175	8088	8	128K	512K	25x80	TvM		512x512	W	20		10		2				*			F2	*Choose your own O/S	
Micro Five 3000	£10,350	8086	5	128K	1Mb	25x80	TvM		512x512	W	20		5		3				*			F2	*Choose your own O/S	
Microdecision	£1,144	Z80	4	64K		80x24	(M+)			*			2						CP/M	Ba, Pilot		M9	*Terminal extra	
Microsolution British Genius	£1,840	Z80	4	64K		80x24	TvM		80x24	W	21		1	1					CP/M			M4	'Genius' by nature?	
Microtan 65	£389	6502	1	8K	48K	25x64	(TvM+)			W			1	2					Tanbug	Ba		M8	Expandable in many ways	
Millbank SX10	£2,754	Z80A	4	65K	256K	80x25	M		80x25	W	10		2		1				CP/M	As		M5	Scientific applications	
Minstel	£2,059	Z80	4	64K	352K								2	1					CP/M opt			H4	Choose your terminal	
Molecular M200	£5,462	Z80	4	64K	320K		(M+)*			*			2		1	16			CP/M	BaAs		G2	*Terminal required	
Monroe EC8800	£2,990	Z80A	3	128K		40x24	M		240x240	W	32		3		3				Monroe	BaPaPilot		F3	Only 40-character screen	
Monroe OC8810	£3,162	Z80A	3	128K		80x24	M		80x24	W	32		3		2	1			1x320K5 1/4F	BaPa		F3	Bigger model available	
Multitech MPFII	£269	6502	1.2	64K		40x24	Tv(M+)		280x192	C			1	1	1				Cassette	Ba		S8	Apple soft compatible	
Nascom 2/3	£327	Z80A	4	2K	64K	16x48	Tv(M+)		48x96	W			1		4				NAS, SYS	BaAs		L5	Old reliable	
NEC PC8000	£1,454	Z80	4	32K	64K	80x25	M		160x100	W	10		2	1					CP/M, NEC, DOS	Ba		N1	Superb colour graphics	
New Brain A	£269	Z80A	4	32K	512K	80x30	Tv(M+)		640x220	C			2		1				Cassette	Ba		G3	A lot of promise	
North Star Advantage	£2,766	Z80	4	64K		80x24	M		640x240	W	15		1		6				CP/M			T9	16-bit option	
North Star Horizon	£2,294	Z80	4	64K	512K		*		*				2	1	1	9			2x360K5 1/4F	Ba		T9	*Choose your own terminal	
OEM Orion	£3,392	8086	8	128K	896K	80x25	TvM		800x400	W	13		11		6				CP/M 86	BaCo		O5	*Full communications machine	
Olivetti M20	£2,754	Z8000	3	160K	512K	80x25	M		512x256	W			1	1	5				PCOS	Ba		B6	Real 16-bitter	

# HARDWARE



Olympia Boss Model A	£2,645	Z80A	4	64K	256K	80x28	M	●	80x28	W 10	●	1					2x140K5¼F	CP/M	●	O1	Useful 28 lines on screen
Onyx 5001 MU	£7,607	Z80A	4	128K		*			*	*		5	1			●	1x7Mb5¼H	CP/M	●	T2	*Terminal extra; other models
Oric 1	£100	6502A	1	16K	48K	40x28	Tv(M+)	●	240x200	C			1	1		●		Cassette		O2	4-colour printer opt
Osborne 1	£1,581	Z80	4	64K		104x24	M		104x24	W 10	●	1		1			2x185K5¼F	CP/M	●	O3	Portable, includes software
Panasonic JD 800M	£3,795	8085A	4	60K		80x24	M		80x24	W 21	●	3					2x250K8F	CP/M	●	P1	Larger model costs £5,002
Pasca 640	£1,437	Z80A	4	64K		80x24	M		*	*		●	1	1			2x250K8F	CP/M	●	W1	Regular CP/M micro
Pascal Modular Microengine	£7,003	WD9000	2	128K		*	*		*	*		4			8		2x1.2Mb8F	UCSD-P	●	P2	*Terminal extra
Pied Piper	£1,226	Z80A	4	64K		80x24	Tv(M+)			W 36			1		1		1x780K5¼F	CP/M	●	S11	PCN issue 4
Philips P3500	£3,000	Z80A	4	64K	320K	80x25	M			W 11	●	2					2x0.6Mb5¼F	Turbo-DOS	●	P3	Fast O/S as standard
Positron 900	£1,259	6809	1	64K	256K	*	(M+)		*	*		4	1	3				O/S 9	●	P4	*You choose your terminal
Positron 9000	£2,134	6809	1	64K	256K	80x24	TvM	●	480x240	W 12	●	4	1	3				O/S 9	●	P4	Multi-user version
Powertran Cortex	£454	9995	12	64K	1Mb	40x24	Tv(M+)	●	256x192	W 12	●	1			●					M2	Mainly sold as £340 kit
Quantum 2000	£2,587	Z80A	4	64K	192K	80x25	M		160x75	W 18	●	1			5	●	3x860K5¼F	CP/M	●	Q1	Mono, low-res graphics
Rair Black Box Model 3/20S	£2,242	8085	5	64K	256K	80x24	(M+)			*		2		8			2x1Mb5¼F	CP/M	●	R1	*VDU extra; many versions
Rair Business Computer	£6,037	8088	5	256K	1Mb	80x25	M			W 10	●	2		4	8		1x19Mb5¼H+1x1Mb5¼F	CP/M, PCDOS	●	R1	Hybrid 8/16 bit
Racal 6000	£6,327	Z80	5	64K	256K	80x26	M		80x26	W 21	●	1	1				1x600K8F	CP/M	●	R2	CP/M languages available
Research Machines 380Z	£2,147	Z80A	4	32K	56K	40x24	Tv(M+)			W		1	1				2x144K5¼F	CP/M	●	R3	Widely used in schools
Research Machines Link 480Z	£650	Z80A	4	32K	256K	40x24	Tv(M+)		*	W 4		2	1	1	2	●		Cassette		R3	CP/Net version available
Sage II	£4,019	68000	8	128K	512K	*	(M+)	●		*		2	1	1			2x640K5¼F	UCSD-P System	●	T10	*Terminal extra
Sage IV	£5,962	68000	8	128K	1Mb		(M+)			*		6	1	1			2x640K5F+1x6MbH5¼	UCSD-P System	●	T10	*Terminal own choice
Samurai	£2,754	8086	4.6	128K	768K	80x25	M	●	720x400	W 12	●	3	1	3			2x1.2Mb8F	MS DOS, CP/M 86	●	M6	High-res colour graphics
Sanyo MBC 1000	£1,195	Z80A	4	64K		80x25	M		80x25	W 17	●	1	1				1x320K5¼F	CP/M	●	L1	Standard CP/M model
Sanyo MBC 1250	£2,294	Z80	4	64K		80x40	M		640x400	W	●	1	1				2x640K5¼F	CP/M	●	L1	High-res graphics
Sanyo MBC 2000	£2,242	8085A	5	64K		80x24	M		80x24	W 24	●	2	1	2			2x328K5¼F	CP/M	●	L1	Big disk model costs £3,622
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80x24	M		80x24	W		1	1				2x640K5¼F	CP/M 86	●	L1	Pseudo 16-bit
Seed System 1	£2,300	6800	2	32K	64K	80x24	M		80x24	W 3	●	2		8			2x160K5¼F	DOS 68 Flex	●	S3	Ageing business machine
Seed System 19	£2,600	6809	2	48K	1Mb	80x24	M		80x24	W 3	●	2		8			2x160K5¼F	OS-9	●	S3	Latest from Seed
Sharp MZ80A	£347	Z80	2	48K		40x25	M		80x50	W	●				●			Sharp Basic		S4	CP/M facility extra
Sharp MZ80B	£900	Z80A	4	64K		80x25	M		320x200	C 10	●				●			Sharp Basic		S4	Unusual keyboard
Sharp PC1251	£79.95	Cust.	.58	4.2K		LCD			24x1	C 18				1	●			Sharp Basic		S4	Pocket computer
Sharp PC1500	£169	Cust.	1.3	3.5K	11.5K	LCD			156x7	C 6	●	1	1	2	●			Cassette		S4	Optional 4-pen plotter
Sharp PC3201	£2,300	Z80A	2.6	64K	112K	80x25	M		160x50	W 10	●			5			2x500K5¼F	Sharp Basic	●	S4	Powerful Sharp Basic
Signet 10025	£1,599	Z80B	6	64K		80x24	M	●	512x512	W	●	2	1	1			2x200K5¼F	CP/M, Macnos	●	S9	Choice of keyboards
Signet 2	£1,483	Z80	4	64K		80x24	(M+)	●	512x256	W 18	●	2					2x200K5¼F	CP/M		S9	Multi-user system
Sinclair ZX81	£45	Z80A		16K	16K	32x24	Tv		64x44	C				1	●			Cassette		S5	Sold a million
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32x24	Tv	●	256x192	C				1	●		2x600K5¼F	Cassette	●	S5	PCN issue 14
Sirius I	£2,525	8088	5	128K	896K	80x25	M		800x400	W 7	●	2	1	4				CP/M 86, MS/DOS	●	A7	IBM style
Sord M5	£150	Z80A	4	4K	16K	40x24	Tv(M+)	●	256x196	C			1	2	●			Cassette		S6	PCN issue 12
Sord M23	£1,932	Z80A	4	128K		80x25	M	●		W 14	●	2	1	2	3		2x330K5¼F	Sord O/S, SB80	●	S6	CP/M compatible
Sord M23P	£2,369	Z80A	4	128K		80x25	Tv(M+)	●	640x200	W 14	●	2	1	2	2		2x290K3½F	Sord O/S, SB80	●	S6	Complete with suitcase
Sord M223	£3,277	Z80	4	64K		80x25	M			W	●	2		4			2x350K5¼F	Sord O/S, SB80	●	S6	Standard business machine
Sord M243	£5,842	Z80	4	192K		80x25	M	●	640x400	W 15	●	4	1	4			2x1Mb8F	Sord O/S, SB80	●	S6	Large and powerful
SWTP SO9	£5,750	6809	2	256K	1.2Mb	80x24	M			W 15	●	1	1				2x1.5Mb5¼F	Flex, Uniflex	●	S7	Top end SWTP
Spectrum	£11,442	68000	8	256K	4Mb	*	(M+)		*	*		4		16			2x720K5¼F	Mirage	●	M1	*As terminal
Sundance I	£6,969	Z80A	4	64K	256K	132x24	M			W 4	●	1	1		●		1x7Mb5¼H	CP/M	●	T2	Ordinary CP/M machine
Sundance II	£8,205	Z80A	4	128K	256K	132x24	M			W 4	●	1	1		●		1x7Mb5¼H	CP/M	●	T2	Middle-range Sundance
Sundance 16	£10,480	Z8001	6	256K	1Mb	80x24	M			W	●	5	1		●		1x14Mb5¼H	BOS	●	T2	Tape backup for hard disk
Superbrain JR	£2,127	Z80A	4	64K		80x24	M		560x240	W	●	2		1			2x160K5¼F	CP/M	●	I10	Bigger models available
Superstar	£6,296	Z80	4	64K		80x24	Tv(M+)		80x24			1	1	8			1x10Mb5¼H+1x400K5¼F	CP/M 80	●	B7	Includes hard disk
Tandberg EC10	£3,000	8080A	2	64K		80x25	M			W	●	7					1x250K8F	CP/M, TOS	●	T3	Very early machine
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80x24	M		80x24	W 2	●	2	1				1x500K8F	TRS-DOS	●	T4	Big business machine
Tandy TRS-80 Model III	£1,299	Z80A	2	48K		64x16	M		128x48	W	●	1	1	1	●		2x184K5¼F	TRS-DOS	●	T4	Standard TRS 80
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80x24	M			W 2	●	2	1				2x1.2Mb8F	TRS-DOS	●	T4	True 16-bit
Tandy TRS-80 Colour Computer	£240	6809E	1	16K	32K	32x16	Tv	●	256x192	W	●	1			●			Cassette		T4	Related to Dragon 32
Tandy TRS-80 PC4	£50	Cust.	N/A	½K	1½K	12x1	LCD		12x1	C 9	●			1	1			Cassette		T4	Low-cost pocket computer



Make and model	Price inc VAT	Processor type	Speed in Mhz	Standard RAM	Max RAM — normally at extra cost	Display		Graphics	Keyboard		Interfaces built-in				Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
						Max characters columns x lines	Method (at extra cost)		Colour capability	Max dot resolution	Type of keyboard	No of function keys	Numeric pad	No of RS232	No of Centronics	No of IEEE 488					
HARDWARE																					
Tandy Model 4	£861	Z80A	2	16K	128K	80x24	M	80x24	W	10	1	1			●	1x187K5¼F	TRS DOS	Ba	●	T4	Floppies versions available
Tandy Model 100	£499	8085	2.4	8K	32K	40x8	LCD	240x62	W		1				●			Ba		T4	Software built in
Tandy TRS-80 PC2	£130	Cust.	1.3	2.6K	16K	26x1	LCD	156x7	C	6					●		Cassette	Ba		T4	Plotter available
Televideo TS-802H	£4,533	Z80	4	64K		80x24	M	80x24	W	15	2	1				1x256K5¼F + 1x7Mb5¼H	CP/M	●	C11	Recently upgraded	
Televideo TS-800 Series	£1,495	Z80A	4	64K		80x24	M	80x24	W	15	2	1					CP/M	●	C11	Standard CP/M machine	
Televideo TS 1602-C	£1,323	8088	5	128K	256K	80x24	M	576x424	W	15	2	1				2x256K5¼F	CP/M-86	●	C11	Graphics, but no colour	
TI Professional Computer	£2,386	8088	5	64K	256K	80x25	M		W	12	●	1				1x320K5¼F		●	T5	PCN issue 3	
Texas CC40	£180	Cust.		6K	18K	31x1	LCD	31x1	C	4					●			Ba	●	T5	Cartridge software available
Texas Instruments TI-99/4A	£100	9900	3.5	16K	52K	32x24	Tv(M+)	●	256x192	W			2		●		DOS	Ba	●	T5	This has sprite graphics
TI System 200-250	£6,695	9900	4	64K		80x24	M	80x24	W	12	●	1				1x5Mb5¼H	UCSD-P, PX10	Ba	●	T5	Bigger version available
TMK 332	£2,242	8085A	5	64K		80x24	M	190x96	W	22	●	2	1			2x320K5¼F	CP/M	Ba	●	P5	*6502 I/O processor
Torch	£3,214	Z80*	4/2	96K		80x30	TvM	●	640x256	W	15	●	1	4	●	2x400K5¼F	CPN	Ba	●	T6	CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80x25	TvM	●	640x200	W	8	●	1	1	2	2x256K5¼F	CP/M	Ba	●	O4	Pro test March 18
Toshiba T-200	£2,242	8085	2.6	64K		80x24	M		80x24	W	15	●	1			2x256K5¼F	CP/M	Ba	●	O4	Standard CP/M machine
Transam Truscan	£1,983	Z80A	4	64K		80x24	TvM		640x288	W	●	2	1	1	5	2x190K5¼F	CP/M	●	T7	S-100 machine	
Triton 4	£5,744	Z80A	4	64K	160K	80x24	M			W	8	●	1	1	3	2x1.2Mb8F	MPSL-BOS	●	T11	Upgradable to Winchester disk	
Vector 4	£3,852	8088	5	128K	256K	80x24	M	●	640x312	W	15	●	1	1	2	2x630K5¼F	CP/M, CP/M 86	Ba	●	A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80x25	M		800x400	W	7	●	2	1	4	2x600K5¼F	CP/M 86, MS-DOS	Ba	●	D8	Same as Sirius 1
Wang Professional	£3,076	8086	8	128K	256K	80x25	M		800x300	W	16	●	1			2x360K5¼F	MSDOS, CP/M80, USCDP	Ba	●	W4	8087 co-processor optional
Wicat 150	£6,846	68000	8	256K	1.5Mb	80x25	M		400x300	W	20	●	2	1	1	2x616K5F	MCS	Ba	●	S10	Upgradable to 32 user system
Wilkes YD8110	£4,025	8086	5	128K	896K	80x24	M	●	960x624	W	21	●	1			2x1.2Mb8F	CP/M 86	Ba	●	W2	Standard CP/M machine
Xerox 820 Model II	£2,415	Z80A	4	64K		80x24	M		1024x512	W	●	2	2	2		2x160K5¼F	CP/M	●	R4	Powerful graphics	
Zenith ZF-120-22	£2,978	8088	5	128K	192K	80x25	M		640x225	W	18	●	2	1	1	2x320K5¼F	CP/M, MS-DOS, Z Basic	●	Z1	PCN issue 28	
Zeus 4	£5,400	Z80	4	64K	320K	80x25	(M+)		80x25	W	11	●	10			1x6Mb5¼H + 1x250K5¼F	CP/M, Muse	As	●	M5	Designed as multi-user

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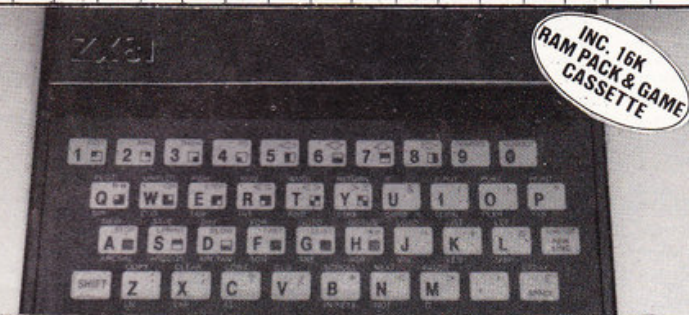
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# BACK ISSUES

## Issue 1, March 11-18.

**Pro-Tests:** Apple's Lisa, Text 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 Braham (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).

**Databases:** 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 extractor/replace.

**Databases:** 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).

**Databases:** micros.

**Micropaedia:** Anatomy of the BBC, part 3.

## Issue 4, April 1-8.

**Pro-Tests:** Pled Piper Communicator, Olympia ESW3000 printer, Namal Supertalk, Commodore Calcsult, Spectrum Pascal, Cashbook (BBC).

**Gameplay:** Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).

**ProgramCards:** Fruit Machine (C64), Tunesmith (Oric), Array Editor.

**Databases:** 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.

**Databases:** 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 Lopper (Apple II), Evolution (Apple II).

**ProgramCards:** Wacky Racers (Oric), Mortgage Comparison

(Sharp MZ80K), Computer Set Up (BBC), Day of Week.

**Databases:** 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.

**Databases:** 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.

**Databases:** 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).

**Databases:** hardware.

**Micropaedia:** Graphics, part 4.

## Issue 10, May 13-20.

**Pro-Tests:** Infomast on Commodore 64, Dragon Maze; 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).

**Databases:** 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 I 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).

**Databases:** Hardware.

**Clubnet:** clubs (Cambridge Micro-computer 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).

**Databases:** peripherals.

## Issue 14, June 10-June 15.

**Pro-Tests:** Apple Accelerator II board, Modula-2 (Apple II), Oric-Basic, Joystick Control Unit J6, Kempston Centronics Interface, BBC Speech Synthesiser.

**Features:** Newbrain Basic part 1, Sirius designing.

**Gameplay:** Ah Diddums (Spectrum), Monopole (Commodore 64), Automonopol (Spectrum), Dragon dramatics.

**ProgramCards:** Time Bomb (Atari, cont), Sheep Drive (BBC B).

**Databases:** Software.

**Micropaedia:** Spectrum, Part 1

## Issue 15, June 16-June 22.

**Pro-Test:** Comx 35, Address Manager (Spectrum), Sysres (Commodore 64), MST Database (Epson HX-20), Voice Input Module (Apple II).

**Features:** Newbrain Basic part 2, Genie scene.

**Gameplay:** Cleared for Landing, Playing the Ace (Apple II), Vultures, Star Jammer (Dragon 32).

**ProgramCards:** Mover (BBC B), Sprite Clock (Commodore 64), Pirate Island (Atari, 3 of 9), Micro-mind (Colour Genie), Brickbat (Dragon 32).

**Databases:** Hardware.

**Micropaedia:** Spectrum, part 2.

## Issue 16, June 23-June 29.

**Pro-Tests:** Atari v Acorn, word processing for the Commodore 64, Simplifile (CP/M), MPF-II printer, Z80 Pack for BBC.

**Features:** ZX81 Maths, US mail order, Atari graphics.

**Gameplay:** Computer Scrabble (Spectrum), Education (BBC), Horace and Spiders (Spectrum), Catcha Snatcha (Vic 20).

**ProgramCards:** Video Titrer (TI99/4A 3 of 6), Bowling (Spectrum), Pirate Island (Atari cont).

**Micropaedia:** Spectrum, part 3.

## Issue 17, June 30-July 6.

**Pro-Tests:** Duet-16, The Organizer (CP/M), Trace and ZX Text (Spectrum), Juki 6100 daisywheel, Videx Ultra Term (Apple II).

**Features:** Leasing part 1, Atari screen action.

**Gameplay:** Oric chess, Grand Master (Commodore 64), Escape from Orion (BBC), Jet Pac (Spectrum), The Ring of Darkness (Dragon 32), Spectrum spectacle.

**ProgramCards:** Video Titrer (TI99/4A cont), Pirate Island (Atari cont) Word processor (BBC).

**Micropaedia:** Sound, part 1.

## Issue 18, July 7-July 13.

**Pro-Tests:** Tandy 100, RS232 interface (ZX81), ROM pager (Commodore), Interface printer buffer, IBM Personal Basic, Spectrum assembler, Newbrain WP.

**Features:** Leasing Part 2, Lynx music.

**Gameplay:** Spectrum Backgammon, BBC Snooker, Commodore 64 round-up, Serpentine (Vic 20), Psst (Spectrum), Spectrum Safari.

**ProgramCards:** Word Processor (BBC), Fruit Machine (Spectrum).

**Micropaedia:** Sound Part 2.

## Issue 19, July 14-July 20.

**Pro-Tests:** 16-bit chips, Stock control (Epson HX20), Mailplus (Torch), Smith-Corona daisywheel, ZX81 word processing.

**Features:** Insurance, buying secondhand.

**Gameplay:** Escape MCP (C64), Escape from Perilous (Atari), Apple round-up, Temple of Apsai (C64), Airline (Spectrum), Heathrow (Spectrum).

**ProgramCards:** Colour Code (Atari), Wreck (Dragon).

**Micropaedia:** Sound, part 3.



## Issue 20, July 21-July 27.

**Pro-Tests:** Rade bareboard, Vic digital tape drive, Seikosha colour printer, Toolkit (Spectrum), Bonus (Pet payroll), Newbrain monitor.

**Features:** Computer art, Dragon scrolling.

**Gameplay:** Rabbit Trail (TI99/4A), Aztec Challenge (Atari, Vic 20, TI99/4A), BBC round-up, Joust (Spectrum), Molar Maul (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).

**ProgramCards:** Tumbler (Oric), Wreck (Dragon), Atari Errors, Speed Race (Vic 20).

**Micropaedia:** Sound, part 4.

## Issue 21, July 28-August 3.

**Pro-Tests:** BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.

**Gameplay:** Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).

**ProgramCards:** Collection (Vic), Bomber (64), Definer (BBC).

**Micropaedia:** Sound, part 5.

## Issue 22, August 4-August 10.

**Pro-Tests:** Spectrum Forth, BBC graphics, Music synthesisers, IBM plotter, Brother daisywheel, Maltron keyboard, Mupid.

**Features:** Genie assembler, Dragon machine code.

**Gameplay:** River Rescue, Oric Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Moria (Oric), Velnor's Lair (Spectrum).

**Micropaedia:** CP/M part 1.

## Issue 23, August 11-August 17.

**Pro-Tests:** Sord Basic-G, Tasword, BBC microfloppies, Microdrive, Tandy Model 4.

**Features:** Dragon machine code, Atari controllers.

**Gameplay:** Bridge Master, Styx, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (Oric), Everest (Dragon).

**Micropaedia:** CP/M, part 2.

## Issue 24, August 18-August 24.

**Pro-Tests:** T-Maker III, Spectrum Fifth, daisywheels surveyed, Spectrum digital tracer, Laser.

**Features:** Videotex, Dragon machine code.

**Gameplay:** Oric roundup, Cookie, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (64).

**Micropaedia:** Commodore 64, part 1.

## Issue 25, August 25-August 31.

**Pro-Tests:** Electron, Simons Basic, Oric monitors, Microdrive.

**Features:** Newbrain map, Acorn Atom, Dragon machine code.

**Gameplay:** Suspended (64), Terror Daktils, Tranz AM (Spectrum), Dragon roundup, Jogger (Oric), Frogger (IBM).

**Micropaedia:** Commodore 64.

## Issue 26, September 1-September 7.

**Pro-Tests:** Microtan 65, BCPL, BBC tracer, 80 column Pet, Oric interfaces.

**Gameplay:** Magic Mountain, Smugglers Cove (Spectrum), Ninja roundup, Matrix (64), Ninja Warrior (Dragon), Dallas, (Oric), Call to Arms (IBM).

**Micropaedia:** Commodore 64.

## Issue 27, September 8-September 14.

**Pro-Tests:** Sharp MZ700, BBC Lisp, Apple editor, IBM mice, ZX81 surgery.

**Gameplay:** Zip-Zap, Zzoom (Spectrum), Spectrum roundup, Hover Bover, Benji-Space Rescue (64).

**Micropaedia:** Dragon, part 1.

## Issue 28, September 15-September 21.

**Pro-Tests:** Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM mice.

**Gameplay:** The Witness, Super Scramble, Stix (64), Harrier Attack (Oric), Morocco Grand Prix (Dragon), Pharaoh's Tomb (Spectrum).

**Micropaedia:** Dragon, part 2.

## Issue 29, September 22-September 28.

**Pro-Tests:** Portico Miracle, Dragon editor, BBC toolkit, Dragon drives, Apple light pen.

**Features:** HX20 disassembles, TI transformations.

**Gameplay:** Griddler, Gloopt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Splat, General Election (Spectrum).

**Micropaedia:** Dragon, part 3.

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# PCN Billboard

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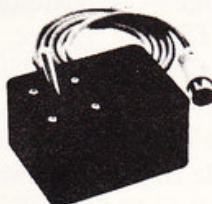
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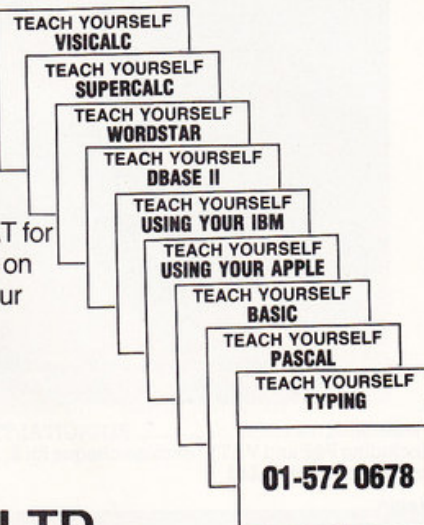
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The RD DIGITAL TRACER is available from computer shops or direct from RD Laboratories. The direct (UK only) price of £55.50 includes Postage, Packing and full VAT. Send a cheque (payable to RD Laboratories Ltd.) with order for delivery within 28 days, or ask your local dealer for details.



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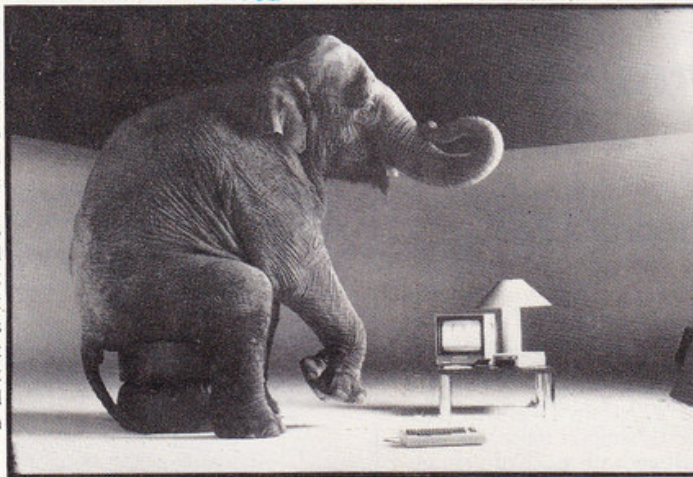
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## Jumbo jive

What you see here is a still from Commodore's current £2m TV advertising campaign designed to 'demonstrate the speed, agility and memory size of the Commodore 64.'

Is Commodore really telling us that the 64 has all the speed and agility of Nellie the elephant? Not exactly — speed and agility is dealt with by a mouse which, unless it's that thing under the table, couldn't make the photo call. We can see it now: 'Commodore users are dead cheesed by delays in the production of a mouse for the 64...'



## SANTAX ERRORS

### Sensible pricing

Apologies for a price error in last week's *PCN Monitor*. The price of the Sensible Solution applications generator should have read £799.25, not £764.50.

### Crabs in Basic?

In our review of Luna Crabs (issue 33), we gave the language used as Basic. This should, of course, have been machine code.

### Lost lines

Part of the amazing *PCN* game got itself shuffled in issue 33 Program Cards, and four lines were lost. The missing lines are 2810 to 2840; fortunately they aren't vitally important as all they do is print: 'Roll up Roll up, win an Acorn Electron, Get the highest score of the show.'

### Bubble on the brain

Someone was blowing bubbles in *Micropaedia* (issue 33) and got CMOS technology and bubble memory mixed up.

CMOS uses small amounts of electric current to maintain the memory in a non-volatile RAM chip, while bubble memory has electromagnetically-generated bubbles which spin around a disk-shaped magnetic recording layer.

## NEXT WEEK

10 — *PCN* looks at the hard disk Kaypro portable.

64 Varieties — a round-up of games for

the Commodore 64.

*BBC calling* — FX calls on the BBC micro explained in a new series.

*Rainbow Bridge* — to Valhalla; a look at the most teasing software release of the year.

*Little Brother* — the promise of portable printing with Brother's EP22. Plus part 6 of our pull-out Programming Guide and the regular weekly look at news, tips, ProgramCards and other features.

PAL 2000

by Mollusc



## PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

## UK EVENTS

Event	Dates	Venue	Organisers
Lancaster & Morecambe Computer Club Open Day	October 29	Lower Town Hall, Lancaster	Brian Sheldon, 0524 61831
Computertown UK	October 31-November 18	Nailsea Library, Avon	Byte Micro Computing Centre, 0272 851337
Brainwave (Home Computing, Video & Electronics Family Show)	November 4-6	NEC, Birmingham	Clapp & Poliak Europe, 01-747 3131
Software Expo	November 8-10	Wembley Conference Centre, London	Interco, 01-948 3111
Home Computer Exhibition	November 9-13	Dublin	SDL Exhibitions, Dublin 763871
Personal Computers & Leisure Technology Exhibition — HOMTECH	November 11-13	Bristol Exhibition Centre	Tomorrow's World Exhibitions Ltd, 0272 292156/7
Malvern Micro Fair	November 12	Malvern Winter Gardens, Worcestershire	Personal Computer Fairs, Worcester 22659
Manchester Apple Village	November 13-16	Belle Vue, Manchester	Database Publications, 061-456 8383
COMPEC	November 15-18	London Olympia	Reed Exhibitions, 01-643 8040
Computer Aided Design for the Building Professional	November 16	RIBA, 66 Portland Place, London W1	Helen Carpenter, 01-637 8991
Humberside Computer Fair	November 20	Winter Gardens, Cleethorpes	Jenson Lee, 0472 42559

## OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Computer Malaysia	October 25-28	Kuala Lumpur	Conference & Exhibition Management Services, 9A Jalan SS24/8, Taman Megah, Petaling, Jaya, Selangor.
Gulf Computer Exhibition	November 21-24	Dubai	Trade Centre Management, 01-930 3881
Computer Indonesia	November 22-25	Jakarta	Overseas Exhibition Services Ltd, 01-486 1951



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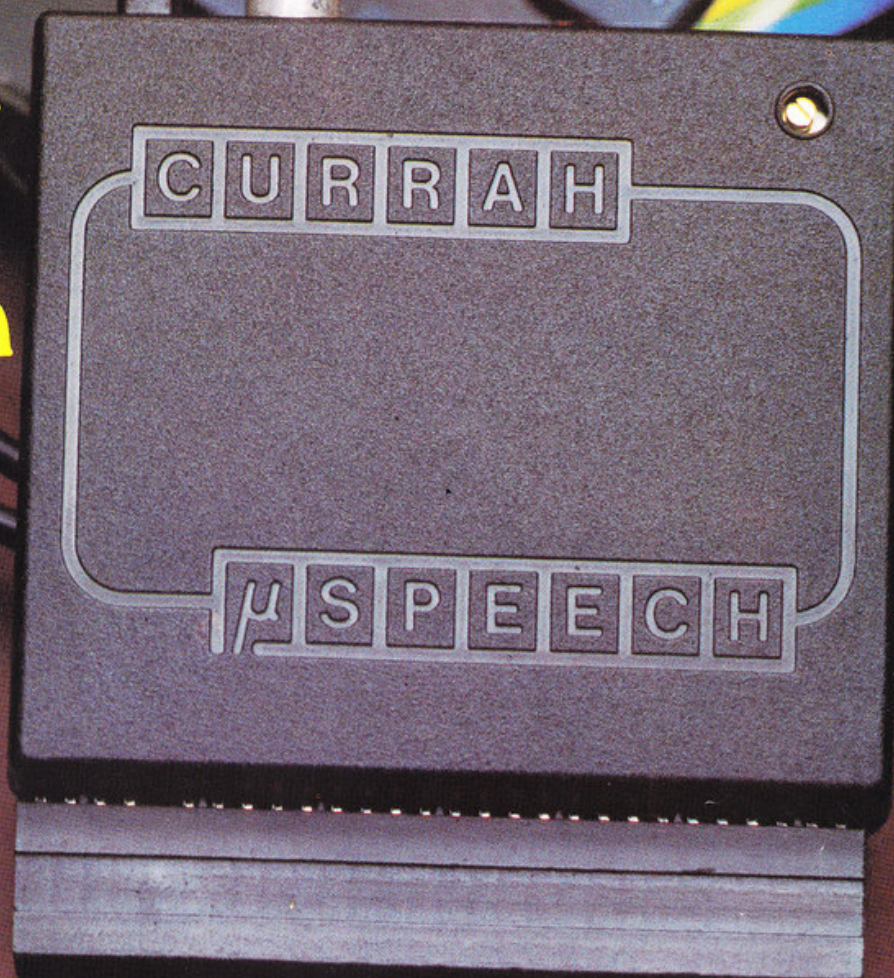
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- μ Mysterious Adventures Part 1 - 4 (*Digital Fantasia*)
- μ The Birds and the Bees (*Bug Byte*)
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