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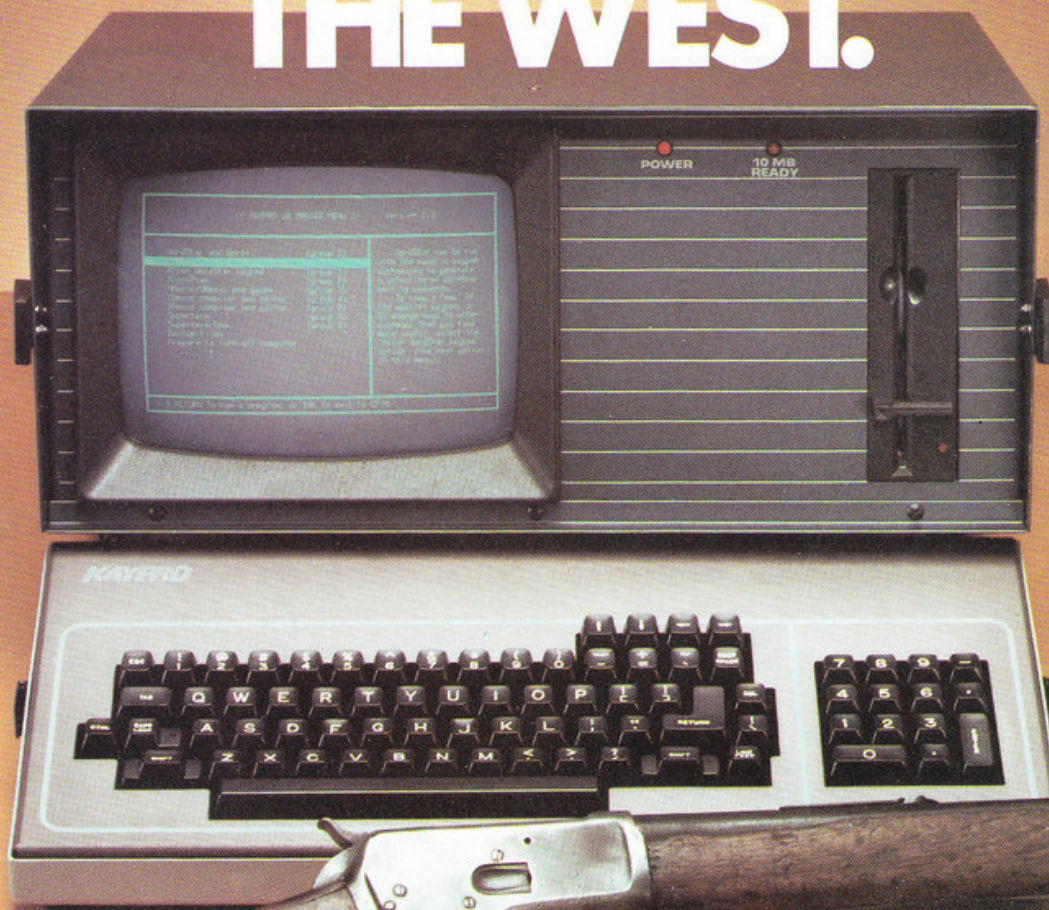
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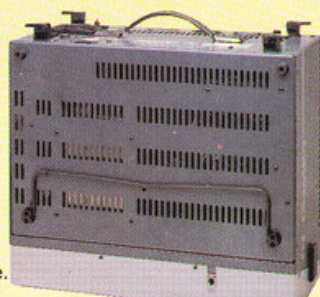


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Cover photo: Howard Kingsnorth. Styling by Lindy Pettitt. Desk: Cabochon Furniture. Lamp: clock tray, pen holder vase: Astrohome Ltd.

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Carry out Kaypro

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Cantab crashes

By Ralph Bancroft

Jupiter Cantab, manufacturer of the Jupiter Ace, has ceased trading and is to go into liquidation.

The company, which has never employed more than five people, is the latest victim in the increasingly cut-throat microcomputer market.

The Jupiter Ace, in its time, was an innovative computer using Forth as the resident language. The trouble was that the time ran out all too quickly.

The micro has been beset by difficulties for most of the year. The late delivery of expansion memory and software by Jupiter Cantab proved to be a major handicap.

The company has also had its internal problems. One of the founders of the company, Richard Altwasser, who designed the hardware for the machine, left in July and resigned as a director. This left the firm in the hands of Steven Vickers, its software expert. He was

joined by Geoffrey Walker as marketing director.

The changes in the management came at a time when sales of the Ace started to falter. The company stopped advertising in micro magazines, and the Ace dropped out of PCN's top 20 hardware chart at the end of June.

While the Forth language has a dedicated following, few software houses produced programs for the Ace.

One such company is Brighton-based Remsoft, run by John Noyce, who also runs the Jupiter Ace Users Group. Commenting on the demise of Jupiter Cantab Mr Noyce said: 'It's been on the cards for some time. The Ace was the only product it had. It was getting old and its design was not as fully thought out as it could be.'

The next step in the winding up of the company will be a creditors' meeting on November 8 when a

liquidator will be appointed.

But the Ace may not disappear. An improved version in a more substantial case, called the 4000, was being made for release in the US. Remsoft is negotiating with Downsway Electronics, which has already manufactured a supply of machines ahead of the launch, to make a limited number of the 4000 for the UK market.

John Noyce said the user group, which has 300 members, will continue in order to help owners of the Ace. He thought that Ace users should not suffer too much by a lack of support for the machine. 'The circuit board of the Ace is well made and not likely to fail. The main problem is the rubber keys wearing out. But many people are already switching over to full travel keyboards,' he said.

There were no immediate signs last week of a Newbrain-style rescue bid.

Home control system faces liquidation

A system that points one possible way forward for home computers faces extinction this week.

Radionic, a West Country firm of electrical engineers, is likely to pass into liquidation and its micro-based home control systems could be lost. According to John Bowring, Radionic's managing director, £65,000 is needed to see that the system survives.

The Radionic CNS system drives exotic peripherals that let you set a micro up as a burglar alarm, a home 'weather centre', a disco lights show controller, and as the heart of other functions around the house.

It is built around a Tandy-compatible system from Hong Kong, the Komtek micro, with a cassette recorder and a monochrome monitor. The micro itself costs £180, the full package about £300. You can use it as a standard home micro, but Radionic's intention with the CNS was to take micros beyond the realms of games and into something closer to DIY.

'We felt that the public had had enough of games,' said Mr Bowring. 'Our *raison d'être* has been to make people do it for themselves. We aim to set up a club to stay close to the kids who buy these systems and they'll suggest functions that we can add.'

At the moment it has about a dozen functions running off the CNS — these span utilitarian, educational and home entertainment.

Some of the 'peripherals' look as though they might have been constructed from Blue Peter designs but that is the whole point, Mr Bowring says. The systems are intended to be cheap to develop and they use very basic components. Radionic plans either to supply them ready-made or provide such detailed documentation that people will easily be able to build their own.

Radionic's background lies in the toy trade, and its present problems stem from a downturn in that business over the last three years. 'We have tried to save it (CNS) with City money,' said Mr Bowring, 'and they have suggested starting again with a clean slate.'

But so far the money has not been forthcoming. Ironically, with Inmos down the road costing the UK taxpayer more than £100 million so far, a product may disappear for want of £65,000.

The product itself seems to reflect what Gary Kildall at Digital Research sees as the way forward for home computers (PCN issue 32) — away from games and into control functions.

If Digital Research wants to do it, it can't be a bad idea.

Econet farce

Schools who have bought BBC micros have found that they cannot get hold of Econet systems to link the machines into a network.

In many cases the dealers who supplied the original machines are not allowed to sell and install Econet systems. As a result schools are being forced into a ludicrous situation where their hardware is serviced by two completely different companies.

The ban on Econet sales has been laid down by Acorn. Apparently, the company considers that Econet is a 'high-tech' product and it is only allowing a small percentage of dealers to install it.

'We need to be satisfied that the dealer has the technical expertise and facilities to install the system properly and provide a full after-sales service,' a spokesman said. As a result Acorn recently introduced a certification scheme.

One school caught in the trap is the High School of Glasgow. It had placed an order for Econet and originally expected delivery in the summer, in time for the start of the autumn term.

The High School had bought its BBC micros from a local dealer, Comscot, which gets its supplies from Acorn distributor Leasalink Viewdata. Because of Acorn's certification scheme Comscot has found it virtually impossible to obtain a supply of Econet hardware and software.

Mr J Simonis, the school's assistant bursar, says that the school gets excellent service from Comscot and would like to have its Econet system installed and serviced by the same company. He is therefore far from happy with the situation the school now finds itself in.

TI axes 99/4A

By Geoff Wheelwright and Brian Power

The Texas Instruments TI 99/4A home computer is dead.

Texas Instruments announced on Friday that it was getting out of the home computer business as of November 1 after recording a loss of \$110.8 million in the third financial quarter this year and a \$119.2 million loss in the previous quarter.

In a statement for the press, the company said: 'The first nine months of 1983 have been the most difficult period in the history of TI. In order to limit further financial strain, we have made the decision to withdraw from the home computer market — we believe that the painful, but correct, decision to withdraw (will mean) that period has now ended.'

The decision also means, of course, that research and development work on the home computer to replace the TI 99/4A will cease

immediately and that TI will not be releasing any more home micros.

TI added, however, that the home computer shutdown will mean the company is free to concentrate on their more up-market business machines. 'These actions do not in any way affect TI's participation in the professional computer market,' it said.

The company still intends to sell portable micros with its CC-40 computer and its line of professional and scientific programmable calculators.

It will offer special prices on remaining stock of TI 99/4A machines in the US, but a spokesman for TI UK said he wasn't sure how the decision would affect the price on remaining UK stocks. He stressed, however, that TI will still support servicing and maintenance of existing TI machines — although software may become scarce.



TI 99/4A — the latest casualty of the US micro war.

Adam die cast

By Brian Power in Vancouver

The video games company Coleco will finally begin delivering its much-publicised Adam computer this week to retail stores across the US, and the customers who have been swamping Coleco with calls will find it performs to spec for the most part.

The Adam is a complete system that includes 80K of RAM, a fast access tape drive, a letter-quality printer, and built-in word processing software, all driven by a Z80A microprocessor.

It will cost \$700 in the US up from the original announced price of \$600. Coleco won't explain why the price has increased but insiders say there were difficulties with the printer, the tape drive, and the

software. The company's earlier forecast that it would ship 500,000 units by the year's end has been trimmed to 400,000, although Coleco boasts that customers have already placed deposits on 100,000.

The fortunes of the video games company have been pegged to the Adam ever since Coleco first showed the machine last June at the Chicago Consumer Electronics Show. The interest it created was spectacular and it didn't abate in the ensuing months.

A review of the Adam shows that the micro lives up to its advanced billing in most particulars. If the Adam faces any problems it will probably be with the printer, which is constructed mainly of hard plastic and has yet to prove it will be able to

stand up to the rigours of constant use.

The word processing program is extremely easy to use and the on-screen prompts make it unnecessary to follow the user's manual. But the Adam takes only 36 characters per line, hardly a number adequate for word processing. An 80 character upgrade is planned for early next year in a \$300 module that will also include a floppy disk drive.

The system currently comes with one high-speed tape drive that Coleco says is eight to 16 times faster than standard tape units, and this element of the system appears to work well in a preview.

■ PCN will carry a full Pro-Test of the Adam in a forthcoming issue.

CW/P unveils £300 printer from Japan

By Wendie Pearson

Cortex-maker CW/P (*Issue 33*) has laid its hands on one of the new wave of very cheap, very slow Japanese daisywheel printers.

It will be selling the Silver Reed EXP 500 with a parallel interface for £299—a serial interface will cost an additional £60.

Compatible with most micros, the printer runs at 11 cps, has one year's free warranty rather than the more usual three months, and can be repaired at 250 Silver Reed service centres throughout the UK if it goes wrong.

CW/P is also selling floppy disk drives for the Apple II for £159, undercutting Apple, whose own units retail for £281.75.



THREE-SCORE — The Alphacom 32 printer, which has been selling like the proverbial hot cakes in the US to users of Timex/Sinclair machines, has had its UK price cut by its distributor Dean Electronics. The new price, £59.95, is down from £99.95 — that's still some way above the price of a ZX printer but the Alphacom unit takes paper that costs only £1 a roll. The printer uses Olivetti's thermal mechanism and is claimed to be maintenance-free throughout its lifetime. You can buy it from stores such as Greens and WH Smith or mail order from Dean Electronics on Winkfield Row (0344) 885661.

Hyperion meets Ajile threat

The Hyperion portable has become the latest system to come down in price. One of its UK distributors, Bytec-Gulfstream, has taken 14 per cent off its price and added free software.

The Hyperion, built by the North American company Bytec, is also sold in the UK by Anderson Jacobson under the name Ajile.

A Hyperion from Bytec-Gulfstream will now cost £2,599, and that will include the Aladin database management system. The Ajile's recommended retail price is £2,995 — but that hasn't stopped it beating the Hyperion into PCN's Charts (it holds the number nine position).

UK monitor maker sorts out problems

Flag-flying has cost UK monitor maker Cabel orders over the summer but the company says that it has overcome its problems and has its

production schedules back on course.

Cabel was reluctant to go overseas for components when a major supplier let it down, and as a result of lost production it lost orders. But it says that it now has its production sorted out, with 1,000 units a month coming out, and that there should be no further problems. Cabel is on Tewkesbury 0684-298840.

Low marks for effort

Griffin and George, well known for its supply of scientific hardware for schools and colleges, has jumped on the educational software bandwagon.

Last week saw the release of four packages for the Spectrum and BBC micros. None of these is brand new; they are revised versions of Griffin's large educational library.

You'll have to wait several weeks to see the really new products. Even

so, if the standard of the launch software is anything to go by, you might be better off shopping around. Although the programs are well presented with nice packaging and parents' pamphlets, they give the distinct impression that they are aimed at parents rather than their children.

Covering the maths and spelling areas the suite lacks innovation and falls short on imaginative approaches to the subjects. They fall in the rote-learning and drill practice school of instruction, and few children will feel motivated to spend more than a few hours on the programs.

Oric ROM near

By Bryan Skinner

The signs pointing to a new ROM from Oric are growing clearer. Following Softek (*Issue 32*) a second software house has revealed a new Basic compiler for the Oric-1.

Oric maintains that no new ROM will be released until all its software suppliers have approved it. 'We don't want to get into the situation Sinclair did with its ULA in the issue 3 machines,' said a spokesman.

Oasis Software has announced the imminent release of two new packages for both the Oric and the Dragon. These are to be a Basic compiler and the structured language Pascal. They will cost in the region of £15.

Oasis said that it actually has a copy of the new ROM and has been using it for the compiler development — the Basic compiler will therefore run on both the old and new ROMs.

Oric International says that some software houses have been supplied with 'EPROM versions of a prototype new ROM' in order to modify existing programs and to develop new software. Oric said that the

new ROM has had all the old bugs ironed out and has several new features 'not included in our brochure'.

A spokesman said that 'most' existing software 'should' run on the new ROM, but refused to go into detailed comparisons of the old and new ROMs. One comment made was that there would 'probably' be an upgrade path (ie from old to new) but that as the new ROM was still in the pre-production phase, no marketing policies had as yet been worked out.

No release dates were given, but following a recent warehouse fire in which some 15,000 old-ROM machines were destroyed, Oric will probably be bringing production of the new ROM forward as fast as possible in order to meet existing orders and gear up for the Christmas rush.

As an interesting aside, it seems that following Oric's fire on the Thursday night, a neighbouring warehouse went up on the Friday. Police are said to suspect that an arsonist got the wrong building the first time round...

VIEW FROM AMERICA



Crackers in Christmas advertising

By Chris Rowley

The seconds tick away towards Christmas. The hardware makers take their places around the blazing Yule log, touting their stocking fillers. Millions of dollars are at stake but what you'll see is an innocent group of cheery Santas in a synthetic chorus of Hark the Herald Salesmen Sing.

But there's a lot of jostling in the back row and some of the Santas' smiles are looking strained. After all, they want to have a job next year and the big fellow who insists on wearing a blue costume keeps threatening to push them all aside.

But Apple has apparently discovered that IBM has placed no Peanut-type advertising for the fourth quarter and in consequence is racing to bring out the Macintosh. According to those who have seen it, the Mac is a Big Step Forward in the \$2,000 range of home personal computers.

Clearly, Apple wants as many II and IIe upgrades as it can hang on to, and if the Mac lives up to the advance billing it will get them. Software compatibility remains the big question mark over the orchards.

There was considerable activity elsewhere, for example Radio Shack (ie Tandy) entered the transportable market with a potential winner in the 9in screen version of the TRS model 4. Dubbed the Model 4B (as in beta) it has 64K RAM expandable to 128 K plus twin double density floppies, and all for just \$1,799. Which is close to competitive with the Kaypro II and can run all the software developed for the Model 4 and Model III.

Hard disk machines in the sub-\$3,000 bracket are beginning to proliferate, thus offering the Kaypro 10 competition. There is the Morrow MD 11 which has 11Mb, runs CP/M, has 128K RAM on a 4Mhz Z80 and has backup double density disks with 400K each plus a parallel port and three serial ports.

This machine is not transportable but it does cost \$2,950. Kaypro meanwhile now feels big enough to enter the advertising fray on TV, its sales having reached \$75 million last fiscal year (1500 per cent increase over 1981/82). Kaypro has budgeted \$4 million to promote itself as the market Volkswagen, half the price of the IBM Mercedes.

Coleco announced the first shipments of the Adam. So, ladies and gentleman, the die is cast and of course a lot of money riding on it. To help things along Coleco has budgeted \$25 million in advertising.

Commodore is said to have a full 30 per cent of the home computer market now, so president Jack Tramiel switched ad agencies again. Myrrdin Jones, vice-president of marketing at Commodore commented 'this shows that Jack Tramiel considers business as a war'.

The reason for the agency switch? 'None of anybody's business,' says Jones. This was the third agency in as many years for Commodore.

However there is one reservation. Tramiel believes senior management must perform very hard every day, and the doors marked 'exec' revolve swiftly as a result. In the view of some analysts this leaves Commodore vulnerable, too dependent on the top.

Meanwhile over at Warner Communications the words V*D**G*M*S have been banned on upper floors. The corporate death squad cut 250 HQ staff after a loss of \$122.4 million in the last quarter.

Atari's fate now seems to be resting on the Alan Alda series of commercials. Warner has budgeted \$50 million for the fourth quarter Alda ad-blast.

Just to show that experienced mainframe computer companies aren't that much better at predicting the ways of micro marketing, DEC announced alarmingly poor results for the quarter. Wall Street immediately shivered and several computer stocks went down a point or two.

Sharing the front pages with such glum stuff was the happy absurdity of the FBI's dawn raid on dozens of youthful hackers in several cities. Naturally, Southern California was the heart of the problem.

From NASA came the word that several pranksters have been reading through the Tele-mail and leaving messages here and there. Intruding persona included 'Mad Bomber', 'Space Shuttle', 'Kilroy XIV' and so on.

A little Husky

The portable Husky computer will get a smaller sibling this week.

Husky Computers (formerly DVW) is set to bring out the Husky Hunter, an aluminum-clad Liquid Crystal Display, CMOS-memory portable about half the size of the Tandy Model 100/NEC 8201A portable computers. The machine will cost about £1,000, include 70K of non-volatile memory and run a CP/M-like operating system.

Memory on the machine is expandable up to 208K, in lots of 64K at a rate of £500 per 64K. The keyboard is Spectrum-style 'squishy', but maintains a tight enough seal with the main body to keep the machine totally waterproof.

Although it admits the price

might seem a bit high for a consumer machine, Husky says it hopes to sell the new machines mainly to companies and professional people. It already has interest from the Ministry of Defence.

The most interesting aspect of the machine, however, is not the size or the memory — but the fact that it supports a CP/M emulation. The emulation means that you can download a CP/M program to the Husky Hunter (license agreements permitting) and then run that CP/M program 'in the field'.

The CP/M emulation will treat the memory like a disk drive, and the 'scroll-across' feature of the Hunter's 40 character by 8 line gives you a simulated 80-column screen.



Husky's Hunter — a tough portable with 70K of non-volatile memory.

Using OS-9

A new user group has been set up for people interested in OS-9, the disk operating system that will be used in the Dragon 64 due out next month.

The group is affiliated to the Kirklees Computer Club and is intended for students and commercial users.

OS-9 is a relatively new operating

system which is designed to work with the Motorola 6809.

Apart from working with the 6809 — a fast and powerful 8-bit chip sometimes referred to as the programmer's chip — OS-9 has many Unix-like features.

For further information contact Mr MR Ellis, Secretary, OS-9 User Group, 1st Floor, 16 New North Parade, Huddersfield, HD1 5JP. Telephone 0484-516179 (daytime) or 0484-864130 (after 6pm).

Rugged Ricoll

If you thought Sinclair add-on keyboards were all pretty much of a muchness, you've got a surprise coming. The metal-cased Ricoll RIKB1 bounces off the obstacles other keyboards find terminal.

For £37.95 Ricoll (Ormskirk 79104) has produced a keyboard radically different in approach from its rivals. It has a space bar and 41 industrial-quality keys, but it doesn't follow the current practice of putting PSU, interfaces and so on inside the case.

A Ricoll spokesman said there were a number of reasons for this, and for the all-metal construction. Plastic keyboards tend to break if

you drop them, and as Ricoll is looking at the educational market, toughness is important.

Keeping the PSU outside the case should also mean that there will be no earthing problems, and electrical noise will be kept down. And apparently the metal case is ideal screening if you happen to use your micro with a CB rig...

You can fit the RIKB1 to your Spectrum or ZX81 easily, but Ricoll also operates a fitting service at no extra charge. Because of Ricoll's design policy, it probably won't be that easy to run it with Interface 1, but the company will be looking into this.

Casio comes of age in Amsterdam show

By Sandra Grandison in Amsterdam

Although it wasn't the season for tulips at Comdex '83 in Amsterdam, it was certainly a blossoming event for the launch of new micros.

The show attracted the biggest names in the computer business from Japan, the US and Europe. For some companies it was the first time their products had had a viewing at a big European exhibition.

At least six machines made their first public appearance and among them Casio put up no fewer than three offerings for people to look at. This is the first time the pocket

standard keyboard, the machine comes with a monitor giving 640 x 200 dot resolution.

The 8086-based FP-6000 running MS-DOS is a 256K RAM machine. Depending on the configuration, it can hold up to 20Mb and offers any eight colours at once from a choice of 16.

On its own soil, Dutch electrical giant Philips showed its answer for the portable market. The P2000C consists of three models—the main difference being the storage capacity.

All machines run the familiar Z80 processor using 64K RAM, and



Spectravideo — jumping the MSX gun with its SV.328.



Attaché — the last pre-Peanut IBM-compatible?

computer expert has moved to home and business computers.

For the home computer user was the Casio PV-2000, alternatively known as Quick-Draw. Using a Z80 processor, 4K of RAM, 16K of ROM and 16 colours — with 28 sprites—you can produce interesting characters using the spongy-type keyboard.

In addition to its normal 68 Ascii key layout, the machine has some function keys for games playing and drawing. There are two attack keys and eight cursor control keys for drawing vertical, horizontal and slanted lines.

Sound effects can be achieved with the three voice chords, four musical octaves and one effects box. Built-in software includes C-83 Basic for background picture creation and animation movement.

On the business side were the FP-1000 Series and FP-6000, an 8-bit and 16-bit respectively. The FP-1000 has 64K RAM for main use and 16K RAM dedicated to the video. And in addition to its

have a low profile keyboard and 9in monochrome monitor. The P2010-1 and P2010-2 have 2 x 160 floppy disk drives and come with a word processing and spreadsheet program. The P2012 has 2 x 640 floppy drives and comes with Basic.

An American company called Otrona displayed an IBM-compatible portable computer called the Attaché. A little on the heavy side at 20lbs, the machine runs dual processors Z80 and 8086.

With 5½in display, 256K RAM and fold-away keyboard, the Attaché comes with two 5¼in disk drives holding 360K each. Running MSDOS 2.0 and CP/M 2.2 the machine will give you a lot of software from which to choose, and for starters two packages are thrown in.

Japanese computers manufacturer Spectravideo had its latest brainchild, the SV.328 personal computer, on view. Pitched at the home user, the machine hopes to join the ranks of 14 other Japanese companies after it clinches a deal

with Microsoft to use MSX.

MSX is a set of standards for 8-bit home computers and means that the SV.328 will be CP/M compatible and run all Microsoft's 8-bit software. Selling at around £299 when it reaches the UK this machine will make an attractive buy, especially with the abundance of software already available.

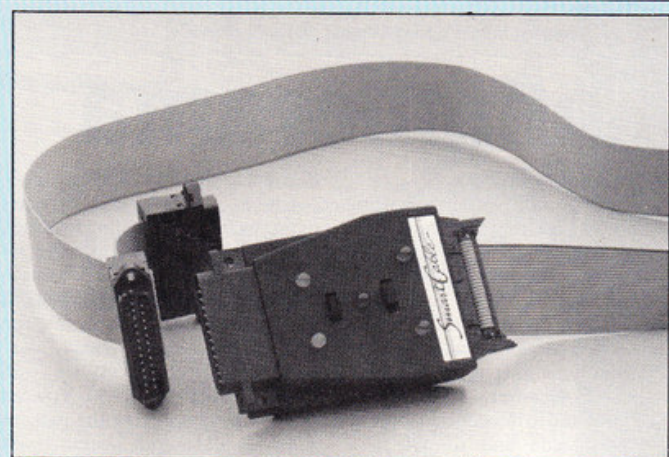
Some of the impressive features of the SV.328 include 80K RAM expandable to 144K, 16 colours, 32 graphics sprites, three sound channels and eight octaves. In addition Spectravideo had its slightly older machine the SV.318 on show.

The Amsterdam event is a spin-off from the Comdex shows that have attracted large crowds in the US — the next takes place in Las Vegas next month. Like many European trade shows (particularly the Hannover Fair in recent years) it proved to be something of a showcase for the Japanese — but

this time they didn't have the field to themselves.

The US companies that have stayed away from Europe in the past, at least as far as any substantial presence at shows is concerned, were there in force. In the portable class there was the Attaché, of course, and also Non-Linear Systems in the guise of the Kaypro systems. The Kaypro is unassumingly taking over the mantle of the Osborne, and it looks as though it could be raising its profile to play the part to the full.

Undoubtedly, the show didn't draw many end users—it was more of a gathering for companies to get a taste of what's happening in the industry and to clinch a few deals. As the manager of a computer company admitted: 'To be quite honest if you've already got a distribution network in Europe for your product then this show wouldn't hold much for you.'



RIGHT CONNECTIONS — A handy little gadget called the Smart Cable 817 appeared at Comdex. It is an intelligent interface that looks at the RS232 signals from the computer and peripheral, and uses its own logic circuitry to make the right connections. All you do is plug in the cable and set two switches. The Smart Cable matches up all the data, handshaking and control lines automatically. Contact IQ Technologies, Inc. 11811 N E First Street, Suite 308 Bellevue, Washington 98005.

Commodore rules

We may be also-rans at world domination, cricket and the Eurovision Song Contest but Britain still leads the world in at least one thing — the computer use.

At the end of last year 5.7 per cent of the UK population owned a computer. Not even the US could match this figure — it had 5.1 per cent.

The numbers come from Dataquest, which also discovered that Commodore has by far the largest proportion of sales in the sub-\$1,000 bracket.

It put the total value of systems sold at \$563 million, of which Commodore had supplied (or

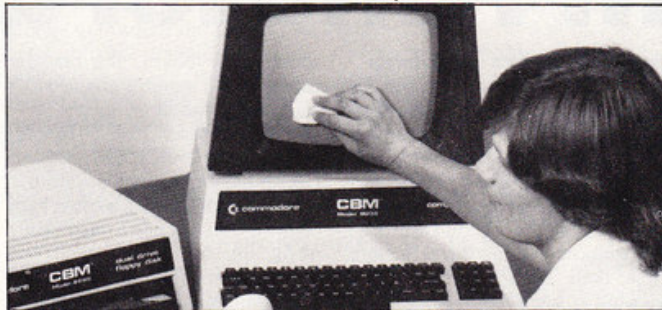
raked in, depending on your point of view) 43 per cent. Reflecting this domination, Commodore has reported profits of \$24.3 million in its most recently completed financial quarter, an increase of almost \$10 million on the same period last year.

Commodore also leads the field, according to Dataquest, in the number of systems sold — of a total estimated at 2.54 million it has contributed 37.9 per cent. The nearest challenger was Texas Instruments with 21 per cent, and Sinclair (by courtesy of Timex) came third with 19.7 per cent.

Atari is fourth and Tandy fifth. Tandy is the only manufacturer in

the list apart from Commodore that doesn't have any serious clouds on the horizon. TI is in serious trouble in this section of the market; Timex

is feeling the pinch in the US price war; and Atari is widely believed to be on the brink of financial collapse.



Commodore — cleaning up in home micros of the sub-\$1,000 class.



VOX POP — Following Fidelity, Solavox has broken the £200 barrier for colour monitors with a 14in model that sells for £169. There are also 20in, and 22in sets, and the larger television can be supplied with remote control and Teletext, taking the price up towards the £350 range. The 14in screen doubles as a portable television, with a fold-away handle and indoor aerial, and eight stations to choose from. It is sold through Comet discount stores.

Compilerama

By Wendie Pearson

Software house Softek is getting firmly behind machine code programming with three new products for the Spectrum.

It has launched a kit called The Complete Machine Code Programmer which contains a machine code monitor-assembler and an editor-assembler together with a booklet. It is intended to introduce people to machine code and to act as a reference guide. The kit consists of a pair of cassettes and costs £12.95.

Suitable for 16K or 48K, the IS compiler and FP compiler will turn Basic into machine code so that you can get the benefit of machine code speed without having to learn it.

The IS compiler won't handle

decimals, but it will produce machine code that is up to 200 times as fast as Basic, according to Softek boss Tim Langdell, while the FP compiler is a 'floating point' compiler that will handle decimals and will produce code that is claimed to run 10 times faster than Basic.

They are both on cassette — IS for £9.95 and FP at £19.95. You can save money by buying the pair for £24.95, and both come with manuals.

You can get the products, as of this week, from Boots, Lasky's or direct from the company in Covent Garden on 01-240 1422.

■ PCN will be reviewing the IS and FP compilers in a forthcoming issue.

Research Machine puts software in Chains

Chain, Research Machines' network system for schools, is about to bring with it the promise of £2,000-worth of software.

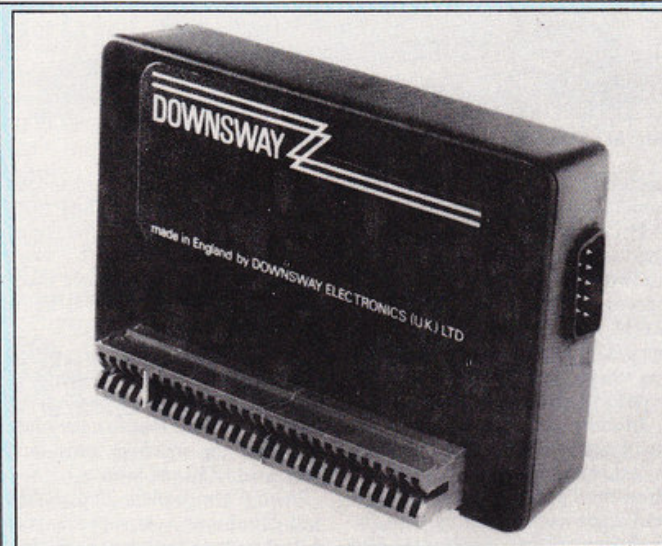
The packages that RML is giving away with Chain include Wordstar, Logo, and Pascal. On top of this, another £395 will buy you Multiplan, CIS Cobol, and Fortran. The presence of Wordstar and Multiplan suggests that RML is looking beyond the educational sphere for its network, and indeed a spokesman confirmed that the company was looking at the possibility of supplying business users as well.

Chain is up to version 2.0 now,

with about 450 installed around the country. The improvements in 2.0 include the spooler system, boot routines, and more flexible disk changing and directory facilities. Version 2.1 should support hard disks.

Further into the future (but probably not more than six months away) RML plans to implement 'silicon' RAM disks on the workstations that populate a Chain network — these are usually 480Z Link systems or upgraded 380Zs. This will enhance the operating speed.

Research Machines is in Oxford on (0865) 249866.



STICKING POINT — Instant response in a video or computer game, says Downsway Electronics, can be a vital factor in a life-and-death situation. This isn't what is normally meant by life and death but you know what they're getting at. And instant response is what Downsway promises with its programmable joystick interface for the Spectrum. The unit plugs directly into the rear expansion port of the machine and a two-way switch gives you 'program' and 'play' modes. Downsway (03727 27222) supplies the interface for £22.95 with instructions, and the device is compatible with such joysticks as the Atari/Commodore, Competition-Pro, Quickshot, Starfighter and Wico. Presumably drawing on its experience of producing add-on memories for the ZX81 Downsway says that it has paid particular attention to ensuring a tight-fitting and stable connection between the interface and the machine. The box is styled to match the finish of the computer.

More WINNING GAMES from LYVERS

LUNAR RESCUE (48K SPECTRUM)

A team of research scientists are trapped on the moon and you have to pilot the rescue pod from the mother ship and ferry them back safely. But you have only space for one scientist at a time.
100% M/C action with super smooth HI-RES GRAPHICS AND JOYSTICK OPTION.

LIBERATOR (16K/48K SPECTRUM)

This game tests your aim and reactions as you command a gunsight on a homeward bound space freighter. Your cargo is the royal treasures of the empire and many people want them.
A machine code presentation that should have you hooked.

THUNDERHAWK (48K SPECTRUM)

Based on the popular arcade game Pheonix. This 100% full colour epic pitches you against the evil Albertrons who are set to destroy your race, five levels of fast action bring you to the command centre of battle fleet, can you finish the job. WITH JOYSTICK OPTION.

GOLF (48K SPECTRUM)

Using M/C graphic routines, a game to absorb the keen novice and the scratch player. Play on a 9 or 18 hole course, with full selection of clubs. Along the greens and fairways hours of addictive sport can be had.

PICTURE PUZZLE (DRAGON 32)

With HI RES graphics and 100% M/C. You are set the problem of putting the picture back together. Test your skill against the dragon 32 computer. A game guaranteed to hold you spell bound for hours.

ANDROID INVADERS (DRAGON 32)

In a change of tactics the beings beyond the stars have developed an android of human form to do their dirty work. And with the aid of sensor jamming they may prove formidable. Using full colour, M/C, hi-re graphics this game can offer up to 21 levels of combat.

VOYAGER (VIC 20 8 OR 16K)

The mission is simple, but its completion is far from being so. As captain of starship you have all the best facilities at your disposal. Unfortunately the klingons oppose you. A great M/C version of this classic computer game.

SPHINX (VIC 20 8 OR 16K)

A riveting, full colour graphic adventure. That pits you against the spells and guardians of the tomb. In your quest to uncover the treasure of the pharaohs. This game will have you enthralled.

BIRD OF PREY (BASIC VIC 20)

Evil baron von fritz is out to kill his cousin, the much loved Prince Rupert. The Baron intends to throw the prince from his plane into the north will make every endeavour to save your friend Prince Rupert. With colour, sound, this M/C game is a must.

ALSO AVAILABLE:

Demon Driver Basic VIC20 — £5.95
Lunar Rescue Basic VIC20 — £5.95
Space Assault 3 or 8 VIC20 — £5.95
Apple Bug/Crazy Climber Basic VIC 20 — £5.95

Nuclear Attack/Grand Prix Basic VIC20 — £5.95
Hearts & Diamonds/Hi-Lo Basic VIC20 — £5.95
Machine Code Monitor VIC20—£14.95

Hangman/Super Docker ZX81-16K £4.95
Bouncing Gorillas ZX81-16K—£4.95

all games
£5.95

VIC-20 Machine Code Monitor @ £14.95 each
Lunar Rescue @ £5.95 each
Demon Driver @ £5.95 each
Applebug/Crazy Climber (2 pack) @ £5.95 each
Nuclear Attack/Grand Prix (2 pack) @ £5.95 each
Hearts & Diamonds/Hi-Lo (2 pack) @ £5.95 each
Space Assault @ £5.95 each-For 3K & 8K VIC-20

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HARDWARE ZX81 PANDA

The famous Panda Expandable Ram Pack. Massive 16K add-on memory which can easily be expanded to 32K with an optional plug-in module. Supplied in no-wobble design, rugged, injection moulded case, contoured to fit the ZX81 snugly. Compatible with other add-ons (printer etc.) LED on/off indicator. No additional power needed just plug in and go. British designed and made from top quality components throughout, guaranteed 12 months.



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- Fully compatible with available motherboards modules.
- Simply plugs into the rear expansion port of computer.
- No re-addressing of existing BASIC programs needed.



From Fox the new FDS for the SPECTRUM, ZX81 as illustrated.

This elegant desk top system, designed for the professional user. In its slimline case, the superior keyboard contains all the graphic characters for the above computers. With the additional function keys and SPACE-BAR, speedy and accurate data entry is made simple. The Fuller FDS is easy to install, based on the very popular FD42 system, it requires no soldering or technical knowledge. For the user who is reluctant to install his computer circuit board inside the FDS a buffer is available (at extra cost) which simply plugs onto the expansion port and connects directly to the keyboard.

£39.95 incl.

ALSO AVAILABLE FOR THE:

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but without space bar **£29.95 incl.**

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but without space bar **£29.95 incl.**
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| STORY A - SPANISH GOLD The first multichoice illustrated story book on screen. (6-11 years) | £7.95 £6.95 | BBC 'B' Spec 48K | <input type="checkbox"/> | Please rush me the tapes I've ticked. |
| PIRATE Simply the best adventure game for young people (7 to adult) illustrated. Compulsive. | £8.25 £8.25 | BBC 'B' Spec 48K | <input type="checkbox"/> | I enclose a cheque for £ or debit my Access no: |
| LETTERS Let your micro teach your child to write! Draws lower-case letters | £14.25 £10.25 | BBC 'B' Spec 48K | <input type="checkbox"/> | Name |
| INKOSI Be an African King! Simulation. Can you look after the tribe and defeat the WITCH DOCTOR? | £6.95 £5.95 | BBC 'B' Spec 48K | <input type="checkbox"/> | Address |

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Introducing Tradecon

Tradecon International, the company that now controls the destiny of the Newbrain, will be an unknown quantity to most UK users. It was previously Newbrain distributor in the Low Countries, Scandinavia, Spain and South Africa, but how will it perform running the show, and what changes can Newbrain fans expect to see? Tradecon director Jack van der Schier has the answers.

Five miles east of the old Dutch university town of Leiden, along the banks of the Old Rhine, is a tiny village with a barely pronounceable name — Koudekerk aan de Rijn. This is the home of Tradecon International, the firm which took over the Newbrain microcomputer two weeks ago (PCN, issue 33). 'It's

now a matter of arranging a few formal details,' says Mr van der Schier. 'Then we can begin with a clean slate.'

The Newbrain takeover fits into Tradecon's vertical marketing strategy. Where price is concerned, the Newbrain is aimed at the lowest market segment.

What will change, now that the Newbrain is in Tradecon's hands? First of all, there will be an about-face in the access to information about the Newbrain's operating system, a subject on which Grundy Business Systems was decidedly coy. 'That will be an open matter,' Mr Van der Schier says, 'to allow the equipment to be used to its full potential.' Getting to know the Newbrain better has given



From Newbury to Teddington to Holland — the Newbrain finds a home.

Tradecon new ideas for better programs and new applications. In this respect, Newbrain user groups can count on full support from the company. Future plans for the Newbrain include extension from 32K to 64K RAM in the standard model and an extension of functions. The development of a possible 'Newbrain Mark II' could follow a parallel path.

For the time being, the Newbrain will continue to be produced in England, where the necessary know-how and technology are available. Until now 18,000 Newbrains have been sold, 4,000 are in the warehouse and parts are ready for the assembly of an additional 2,000. Obviously the Newbrain is no mass-market product; Tradecon doesn't aim at the mass market, but at distinct target groups.

Tradecon began 10 years ago with the development of a data entry system combining the Triumph/Adler electric typewriter with an optical reader. Philips marketed the system with

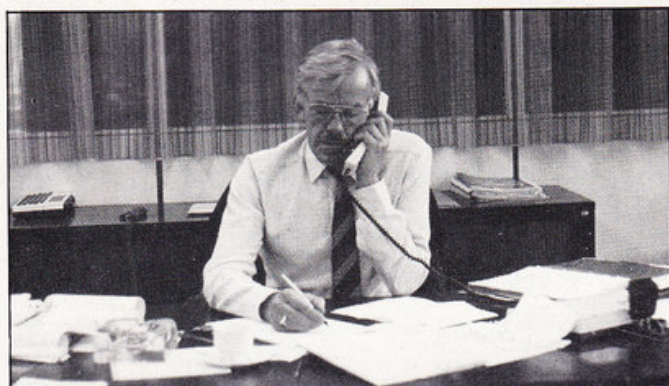
Tradecon handling the technical aspects. The typewriters evolved into terminals and the terminals, in turn, into electronic work stations.

Tradecon grew into a systems-supplier and builder of computer networks. The firm recently completed a coax datacommunications network for the Nederlandse Aardolie Maatschappij, a joint venture of Shell and Exxon. The network is a 'multi-colour' solution, which connects diverse computer systems both inside and outside the company.

It has also developed an advanced network module which allows the link-up of 16 Newbrains; a configuration that lends itself especially to the field of education.

'We're a real technical club', Mr van der Schier says of his 22-man team. 'Up to now, we've even done without a sales representative. Customers flock to us for the service we give.'

But after all the turmoil, van der Schier's first priority is to normalise matters and restore faith in the Newbrain.



Jack van der Schier, Tradecon director: 'We're a real technical club.'



Ferranti Computer Systems hopes to have Concurrent CP/M and MSDOS running on its Pro-Personal Computer by the end of the year, and to make the system multi-user soon after that. The basic £2,800 PPC Model 10 comes with VDU, two 320K floppy disks and F-COS 86 — Ferranti's own version of CP/M which includes Basic. Top of this business range is the £5,845 PPC Model 40 which comes with 20Mb Winchester and 1Mb floppy disk as back-up. Ferranti can be contacted in Manchester on 061-499 3355.

Type a Telex

Prestel users can now send telexes to anywhere in the UK for only 50 pence using their Prestel sets or microcomputers with a Prestel adaptor.

The new service is an extension to the Prestel mailbox service. The sender receives confirmation that

the telex was delivered by a message in their Prestel mailbox.

Unlike the normal telex service the Prestel-telex link is not interactive. You can't have a telex conversation with the person at the other end of the line nor can you receive telex messages yourself.

Further information can be obtained from Prestel page 6018.

Tandy Model 4 gets CP/M

Tandy Model 4 owners can now run the popular CP/M 2.2 operating system on their micro.

Montezuma Micro, which has done the adaptation work on Digital Research's CP/M, has included a number of utilities with the DOS. The first is INTERCHANGE, a utility that allows the reading, writing and copying of 20 different manufacturers' disk formats.

Also included is a utility similar to Memdisk used by TRSDOS/LDOS 6.0. The utility is called Memlink, and you need 64K RAM in your machine before it will be of much use.

Selling at £171.35 CP/M 2.2 on the Tandy 4 supports an 80x24

video, plus inverse video and direct cursor addressing. The function keys on the Model 4 are also utilized.

The format utility allows for a number of disk formats to be constructed and packages like Wordstar and Calstar are now available formatted for the Model 4, using CP/M 2.2.

At £44.85 you can also buy Toolbelt for the Model 4, which is an extensive version of Toolbox already available for the Model I and III.

Montezuma Micro's software is marketed in this country by Molimerx.

Contact them on 0424-220391.

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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 27 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 October 14 and October 27.

GAMES

Top Thirty

| | | GAME TITLE | PUBLISHER | MACHINE | PRICE |
|---|---------|------------------------|-----------------|----------|--------|
| ▲ | 1 (2) | Kong | Ocean | Spectrum | £5.95 |
| ▲ | 2 (6) | Manic Miner | Bug Byte | Spectrum | £5.95 |
| ▼ | 3 (1) | Jet Pac | Ultimate | Spectrum | £5.50 |
| ▶ | 4 (4) | Zoom | Imagine | Spectrum | £5.50 |
| ▲ | 5 (8) | Hobbit | Melbourne | Spectrum | £14.95 |
| ▼ | 6 (5) | Penetrator | Melbourne | Spectrum | £6.95 |
| ▲ | 7 (10) | Harrier Attack | Martech/Durell | Oric | £7.95 |
| ▼ | 8 (3) | Flight | Psion | Spectrum | £5.95 |
| ▲ | 9 (30) | Gridrunner | Llamasoft | CMB64 | £7.95 |
| ▲ | 10 (13) | Arcadia | Imagine | Vic 20 | £5.50 |
| ▲ | 11 (21) | Devil of the Deep | Shepherd | Spectrum | £5.95 |
| ▼ | 12 (11) | Jumbo Jet Pilot | Thorn/EMI | Atari | £29.95 |
| ▼ | 13 (9) | Horace and the Spiders | Psion/Melbourne | Spectrum | £5.95 |
| ▲ | 14 (27) | Hovver/Bovver | Llamasoft | CBM 64 | £7.50 |
| ▲ | 15 (17) | Zip Zap | Imagine | Spectrum | £5.50 |
| ▲ | 16 (—) | Golf | C/Rentals | Spectrum | £5.95 |
| ▲ | 17 (—) | Scrabble | Psion/LG. | Spectrum | £5.95 |
| ▲ | 18 (19) | Football Manager | Addictive | Spectrum | £5.95 |
| ▼ | 19 (16) | Yomp | Virgin | Spectrum | £5.95 |
| ▲ | 20 (23) | Tranz AM | Ultimate | Spectrum | £5.50 |
| ▲ | 21 (—) | 3D Deep Space | Postern | Acorn | £8.00 |
| ▲ | 22 (24) | Monsters in hell | Softtek | Spectrum | £6.00 |
| ▼ | 23 (22) | Xenon 1 | IJK | Oric | £8.50 |
| ▲ | 24 (—) | Xadom | Quicksilver | Spectrum | £6.95 |
| ▼ | 25 (18) | Hall of Things | Crystal | Spectrum | £7.50 |
| ▲ | 26 (—) | Blue Max | Synapse | Atari | £27.95 |
| ▲ | 27 (—) | Cookie | Ultimate | Spectrum | £5.50 |
| ▼ | 28 (20) | Heathrow ATC | Hewson | Spectrum | £5.50 |
| ▼ | 29 (13) | Pool | CDS | Spectrum | £5.95 |
| ▲ | 30 (—) | Hunchback | Superior | Acorn | £7.95 |

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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 (3) CBM 64 | £229 | (CO) |
| ▲ 3 (4) BBC B | £399 | (AC) |
| ▼ 4 (2) Vic 20 | £140 | (CO) |
| ▲ 5 (6) Texas/99/4A | £99 | (TI) |
| ▼ 6 (5) Oric 1 | £99 | (OR) |
| ▶ 7 (7) Dragon 32 | £170 | (DD) |
| ▲ 8 (9) ZX 81 | £45 | (SI) |
| ▲ 9 (12) Atari 400 | £150 | (AT) |
| ▼ 10 (8) Atari 800 | £300 | (AT) |
| ▶ 11 (11) Colour Genie | £168 | (LO) |
| ▼ 12 (10) Sharp MZ80A | £349 | (SH) |
| ▲ 13 (14) Aquarius | £70 | (MA) |
| ▲ 14 (15) Lynx 48/96 | £225 | (CA) |
| ▲ 15 (16) CGLM 5 | £150 | (SO) |
| ▲ 16 (17) Sharp MZ700 | £240 | (SH) |
| ▲ 17 (20) Apple IIe | £969 | (AP) |
| ▶ 18 (18) Epson HX20 | £472 | (EP) |
| ▶ 19 (19) Nascom 3 | £349 | (NA) |
| ▼ 20 (13) Tandy Colour | £240 | (TA) |

Top Ten over £1,000

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

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.



PROGRAMMERS

Softek is continuing its search to the furthest outposts of the galaxy for Superstars of Machine Code Programming to expand its force of Game Masters. (Particularly for Spectrum, CBM 64 and the Acorn Electron)

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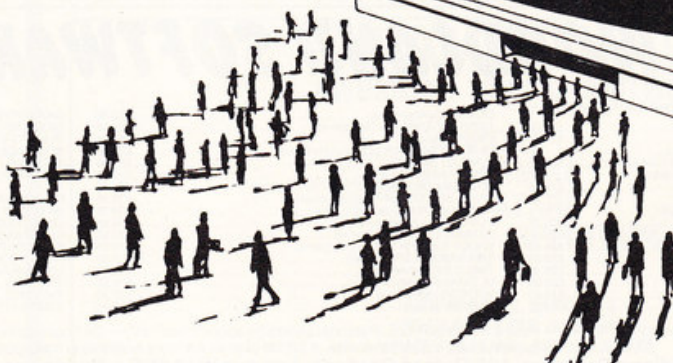
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Ergonomics for micro addicts

I have just come across Mr Charles Hardy's letter in *PCN* No 27, which included a cry for help for relief from micro-headaches. Are these perhaps a symptom of micro-hangovers suffered by microholics?

The answer must lie in micro-Ergonomics. There are two common causes of headaches associated with using micros for any length of time, neither of which has anything to do with radiation from the front of any standard TV or monitor screen, so let's kill that old chestnut here and now.

One cause of headaches is tension in the spinal muscles in the neck region, up to where they are attached to the base of the skull. The main reason for this is poor posture due to incorrect 'workplace' design. If the keyboard is too high, you will find that you are tending to lift your shoulders up in order to get your forearms horizontal (try it!). This in turn induces tension in the neck muscles; consciously lowering the shoulders occasionally will help to relieve it. However, prevention is better than cure, so let's get some ergonomics into your workplace.

PCN £10 Star Letter



If you are sitting comfortably at the right height, thighs more or less level and back leaning backwards by 5° or so, then the keyboard should be positioned so that it can be used with the forearms horizontal (shoulders down).

The second main cause of headaches is associated with the eyes. They do not like flickering displays, nor displays too close to the eyes, nor being focused at a fixed distance for too long. Older eyes find these more of a problem than younger eyes. The points to remember are: try to reduce the flicker if possible by careful tuning; move the TV/monitor further away (from 1m to half-way across the room — leads permitting — is fine if you can still read the display

RANDOM



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

clearly); and every so often try the old cricketers' eye exercise trick — hold a finger a foot in front of the face and focus rapidly between this and something at the far side of the room several times until it is no longer a strain. The general rule is that if any muscles (eye or shoulder/neck) are kept still under tension for too long, they will fatigue and start to ache.

I hope these guidelines will help not just Mr Hardy (who I'm sure isn't a nutcase), but others who may have the same problems and never realised that Ergonomics isn't just a make of keyboard!

Andrew G. McNicholl
Burton-on-Trent, Staffs

Thanks to everyone who wrote with 'cures' for Mr. Hardy's ailment. This one covered the main points made. — Ed.

Deprived Dutch look to the UK

I would like to respond to the letter sent in by L Schultinge (*PCN* issue 30).

The high prices of software here in the Netherlands are a result of the high import prices.

I would also like to comment on the appalling lack of software available here. If I want to buy a software cassette I must travel at least 50 miles to find a shop that sells about one third of the software available in most English computer shops.

Funnily enough, the cheapest way of buying software is by means of mail order companies in the UK.

By the way, if anyone knows of a computer club near me,

please contact me at Anton Mauvestraat 10, 5831 XV, Boxmeer, N Brabant.

S Foster,
The Netherlands.

Poetic plea for accuracy

Dear Ms Editor, what have you done?

You reduced the price of the BBC B and off to STATACOM I run. This was the moment I had long awaited as pennies to me mean so much. What a shock I received on arrival at Sutton when I discovered an error had been done.

So back to my Video Genie I went and fed in my 'Word for Word', as a few lines to the Editor were called for I thought, I decided to take the plunge. If the BBC B was still out of my reach I'd enquire just how long it must be, before programs for my Genie by *PCN* boffins could be printed for us all to see.

Seriously, being an 'oldie' and possessing a bus pass, I would appreciate any help that can be given, particularly with regard to programming, and I am delighted that you should have started a beginner's course on this subject.

E. John Welton,
Sutton, Surrey

Whoops — an outbreak of slipping digits. Sorry to raise your hopes, but how about sending us a Genie program for Program Cards? — Ed.

Communications standards exist

I refer to your note on the fact that three 'big names' in the US micro business hope to establish a standard set of protocols for micro users, and charge \$2,500 for the privilege of using it (*PCN* issue 26).

Your readers may be interested to know there is already a 'de facto industry standard' for the transfer of files between micros. It is based on work by Ward Christiansen and is referred to as the 'CP/M protocols', 'X Modem protocols' and even 'Christensen protocols'. It started with W Christiansen's MODEM.COM series for CP/M systems but has become widely used by others on TRS 80, Apple and Atari.

Details of the protocols can be obtained from bulletin boards which support them for download — CBBS NE, Liverpool Mailbox, London TBBS, Forum 80 Hull etc.

The protocols include handshaking, check sums and automatic repeat and error facilities, and work very well for transferring files between quite different types of micro, either directly or via modems.

Peter Tootill,
Liverpool.

TV aerial sockets can't cope

In reply to Ralph Rapley (*Issue 33*), there is a possibility of damage to a TV set when used with a computer that is often overlooked. That is the fact that TV aerial sockets are not made for constant plugging and unplugging as they are quite flimsy. The solution to this is to make or buy a short extension cable. This has the added advantage that it will no longer be necessary to grope around behind the TV set when changing cables.

R G Daniels,
London

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A symphony of sound on the BBC

QPCN Micropaedia, sound part four in issue 20 showed the oscillogram of a clarinet. I would like to know if you could attach a microphone to the BBC microcomputer to produce the same result on the screen and then be able to take the result and convert it into envelope and sound statements automatically.

R K Reading, Birchington, Kent

AYes, it is possible to attach a microphone to the BBC. The easiest way of doing this is to attach a high impedance microphone (50K ohm) directly into one of the analogue to digital converter (A/D) channels at the back of the machine. This will not give very good quality due to differences in the impedances between the microphone and the A/D. Ignoring this fact, the A/D can then be read with the ADVAL command and some experimenting can be done.

What is coming in through the microphone is a continuously varying voltage. This needs to be sampled at as high a rate as possible. Basically, sampling means taking a series of measurements at a set number of times per second. This sampling rate needs to be as high as possible, in fact at least twice the highest frequency to be sampled.

For audio frequencies this means taking measurements at least 40 thousand times a second. The drawback is that the A/D converter only performs a conversion every 10msec. This gives a maximum sampling frequency of 100 times a second and so the highest frequency that can be monitored accurately, is about 50 Hz. To improve on this it is necessary to use an A/D converter that can convert at a higher rate, and for practical purposes this means a conversion every 20 microsec. This can be done by attaching a separate higher speed A/D through the 1 MHz bus.

Once there is a signal coming

into the computer, it needs to be stored. The best way to do this is to put consecutive samples into an array. For example using the ADVAL command:

```
10DIM V%(1024)
20FOR T%=0 TO 1024
30V%(T%)=ADVAL (1)
40NEXT
50MODE 0
60FORT%=0 TO 1024
70PLOT5, T%, V% (T%)
80NEXT
```

This will plot out the volume or amplitude levels of whatever was coming into the microphone when lines 20 to 40 were executing. This is a bit rough and ready but should work, but only really for frequencies below 50 Hz. To convert this into something more useful, such as a set of frequencies you would need a Fast Fourier Transform (FFT). This algorithm is way beyond the scope of this reply, but various examples of the FFT can be found in the electronics journals.

Imitation of a musical instrument, such as the clarinet referred to in the above letter, can be accomplished in two main ways. The first is to take a set of samples of a note of the instrument, at a high enough frequency, and then just push these out through a Digital to Analogue converter (D/A), this is a device which does exactly the opposite of an A/D and could be fairly easily attached to the user port.

To alter the frequency of the note, the set of samples would need to be played back at a faster or slower rate than the recorded sample, just like slowing down or speeding up a record. This has the drawback that you first of all need a D/A and secondly the faster and slower versions of the original will not be accurate.

The second method requires the computer to simulate the instrument using a set of sound and envelope generators. This is a lot more complicated and requires a great deal of processing from the computer. The other problem with this method is that a musical instrument does not produce one frequency, it produces a whole set combined to produce the required tone. This means that the computer needs to be attached to a very clever set of sound chips.

But don't despair, as there

are a number of add-ons that can be attached to your computer to do the work for you. Remember though that you will pay more for higher quality sound.

Oric acting out of character

QCould you please tell me how to move a character vertically up or down the screen of my 48K Oric in 6502 assembly language. Although this is simple enough in Basic I cannot seem to achieve the same effect in machine code.

M. Y. Sutton, Swansea

AOne way of tackling the problem is to use 2 bytes in the 0 (zero) page of RAM to hold the position of the character you want to move. This will be relative to the screen start and can be found by multiplying the object's row value by its column value. Adding these to the HIRIS screen origin (40960) gives its exact location in RAM.

The reason for using the zero page is that there are a set of 6502 op codes which are especially designed for 'zero page (0-FF) indirect' usage and which make this sort of operation easier. You could use address #0021 and #0022 as these are normally used for DEFUSR related sequences, so are unlikely to be affected by an all machine code program.

To move your character, you'll have to work out the op codes to do the following: load the accumulator with the ASCII value of the character, using an indirect load from the address given in #21 and #22 and replace the character with a blank (ie where the object is). This may be tricky if you have different PAPER colours on the screen. Next, you have to update the contents of #21 and #22 using the following table; the star shows where the object is to be moved from.

| | | |
|-----|-----|-----|
| -41 | -40 | -39 |
| -1 | * | +1 |
| +39 | +40 | +41 |

Here you have to add the appropriate value to #21 and #22, according to the direction in which you want the object to travel. Finally, you simply

dump the contents of the accumulator into the new memory location pointed to by the two bytes #21 and #22.

Of course, you'll have to add in routines to make sure that you don't run off the screen and have your character running wild through RAM, and inevitably causing a crash. Moreover, if you're using the Oric's serial attributes to give your character some colour, you'll have to move these as well to the left and possibly the right of its new location.

Ambivalence about Spectrum add-ons

QI own a Spectrum 48K and wish to fit a joystick interface. Is the new Interface 2 from Sinclair compatible with much cassette based software, and if so which?

I also wish to know if there is an add-on typewriter keyboard available that won't affect the fitting of any peripherals such as Microdrives. If not, are separate keyboards available?

Richard Styles, Dover, Kent.

AThe general answer to your question is, no, Interface 2 will not work with quite a considerable body of cassette based software. Kempston has been making considerable strides towards getting manufacturers to accept its joystick as an industry standard, so there's a large body of software that is Kempston compatible, and currently will not work with Interface 2. A Kempston spokeswoman tells us that there are no current plans to change this situation.

However, it's likely that Interface 2 will become a standard for new manufacturers, and other existing manufacturers are likely to take steps to allow their games and joysticks to work with it. You'll therefore see things improve as time goes by.

Keyboards are also currently in a state of flux. The Fuller keyboards will apparently take Interface 1 inside, so you shouldn't have problems there, apart from delivery dates, and the Mukbus keyboard is being redesigned to accommodate Interface 1. There's currently heavy demand for keyboards, though, so you may have to wait a while.

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Change the Colour Genie cursor

There are several ways of changing the cursor on the Colour Genie. Some of these are done by POKEing the following locations. POKE 16410,71 will change the cursor to a line cursor, the same as on the BBC micro computer. POKE 16410,1 will stop the cursor blinking. POKE 16410,72 will make the cursor disappear.

David Keely,
Hungerford,
Berkshire.

Impractical tip but useful technique

While experimenting with the filespec after the enter command on my Atari 800, I discovered that a filespec of `Kie ENTER"K:"` allowed me to enter data directly into memory, without having it displayed on the VDU (the filespec K bypasses the editor).

So far I can think of no practical use for this, but the technique can be applied to the INPUT command with great benefit.

```
10 DIM A$(10)
20 OPEN #1,4,0,"K:"
30 INPUT #1,A$
```

When the above program is run, on reaching line 30, you can INPUT directly from the keyboard into A\$, with nothing appearing on the screen. This could be very useful for entering Prestel log on codes, or any security lock you may have in your program.

Mr B,
Garston,
Watford, Herts.

If Mr B could send us his full name, he will be able to receive his cheque.

Commodore merger bid is finalised

The simple merger routine described in (*PCN, issue 32*) is not completely correct.

If you decrement the pointer at decimal 45, you have to bear in mind that this pointer really is a hexadecimal address (6502 style) low byte first (45) plus a high byte (46).

All goes well if decimal 45 contains a number greater than one. However, if it contains 1 or 0, you have to decrement the complete hexadecimal address to which the pointer is pointing. In other words you also have to decrement the high byte of the address.

So, if PEEK(45) gives a 1 you have to do this:

```
POKE 43,255:POKE 44,
PEEK(46)-1
```

Similarly, if PEEK(45) gives a 0:

```
POKE 43,254:POKE 44,PEEK
(46)-1
```

For the CBM 64, locations 43 and 44 normally contain 1 and 8. Fer Weber,
Venlo,
Netherlands.

Oric-1 pointer one-liner

For Oric-1 owners who wish to move a pointer around for screen positioning, using the cursor keys, here is a one line routine to do it.

```
K=ASC (KEY$+'0'):POKE
#20E,
```

```
1:P=P+(K=8)-(K=9)+
(K=11)*40-(K=10)*40
```

Note that POKE #20E, 1 reduces the auto-repeat delay down to a minimum.

B Masterson,
Poole,
Dorset.

NOTeworthy function for Dragon 32

The logical function NOT isn't mentioned in the Dragon 32's manual, but it can be used.

Try the following program:

```
10 INPUT A
20 IF A THEN PRINT
"A=TRUE"
30 IF NOT A THEN PRINT
"A=FALSE"
40 GOTO 10
```

You will notice that for every integer value of A besides 0 and -1, A is both true and false simultaneously. But if A=0 then A='false' and if A=-1 then A='true'. Now you can

verify that the statement `B=NOTA` is the same as `B=-(A+1)`. So `B=NOTNOT A` is the same as `B=A`, as it should be.

This means that you can use the function NOT in a very convenient way to set flags in your program.

Ruud Hoekzema,
Utrecht,
Netherlands.

Atari characters walking tall

The following short program enables the Atari to print out characters at normal width and double height. There is one drawback though, and that is the characters are not as clear as they are in modes 0,1 and 2.

```
10DL=PEEK(560)+PEEK
(561)*256+4
20FORI=1 TO 14:POKE DL
+I,5:NEXT I
30SETCOLOR1,8,12:SET
COLOR2,8,12:SET COL
OR 4,8,5:PRINT
CHR$(125)
```

Steven Hurst,
Bolton,
Lancs.

Are you writing copy on your Oric?

On the Oric-1, the copyright symbol does not appear on the keyboard. It is, therefore, theoretically impossible to include it in a REM statement.

This may be overcome by typing out the desired line, and leaving appropriate spaces where the copyright symbol is to appear. By a process of elimination, plot at various points on the screen, CHR\$(96) until the symbol is in the correct space.

Then 'COPY' over it so that when listed, the copyright symbol appears in the line.

A Hutton,
Bromley,
Kent.

Commodore Basic in the NEWed

The following machine code subroutine for the CBM64 will retrieve a Basic program once it has been NEWed.

To use it, type in the Basic program and RUN it. Clear the memory by typing NEW. Now whenever you want to OLD a program you just enter SYS 53200.

This subroutine will not work

if, after NEWing the program, you enter a line of Basic or define a variable.

```
10 DATA 169,1,141,2,8,32,
51,165,165,34,24,105
20 DATA 2,133,45,165,35,
105,0,133,46,76,94,166
30 FOR I=53200 TO 53223:
READ A:POKE
I,A:NEXT I
```

Martin Lightfoot,
Worsley,
Manchester.

Playing your Oric drum kit

I have been exploring the Oric's sound and have at last come up with two basic drum sounds.

The first is: `PLAY 80,23,65,100` which produces a sort of snare drum sound.

The second is: `PLAY 20,40,65,100` which produces a bass drum sound. Using both of these you can try:

```
10 PLAY 20,40,65,100
20 WAIT 40
30 PLAY 80,23,65,100
40 WAIT 20
50 PLAY 20,40,65,100
60 WAIT 20
70 PLAY 20,40,65,100
80 WAIT 40
90 PLAY 80,23,65,100
100 WAIT 40
110 GOTO 10
```

Mr G Hill,
Exeter, Devon.

Cassette Revelations

On the Oric-1, if you record many programs onto a tape but lose or forget their names, then finding them again can be rather slow.

Poke in the following machine code program (remember the numbers are HEX so precede them with a hash) or, if you have one, use an assembler.

| Address | Mcode | Mnemonics |
|---------|--------|-----------|
| 400 | A949 | LDA#49 |
| 402 | A000 | LDY#00 |
| 404 | 20EDCB | JSR CBED |
| 407 | 60 | RTS |

A Basic loader follows:

```
10DATA
A9,49,A0,00,20,ED,CB,60
20FOR T=#400 TO #407
30READ A$
40POKE T,VAL("E"+A$)
50NEXT T
```

Now use `CLOAD""` to load a program.

K L Gillatts,
Woodley,
Reading.

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David Guest explores the intricacies of a 'portable' business micro with a hard disk.

Kaypro computing

Once there was a man called Adam Osborne who made an enviable fortune by producing an unassuming micro that could be carried around.

In the fullness of time others saw the possibility of following in his footsteps (which left a deep imprint, owing to the weight of his machine), and a number of 'portable' micros appeared. One such was the Kaypro II, built by Non-Linear Systems (NLS), whose previous claim to fame has been a digital voltmeter.

Squire Osborne observed the Kaypro and declared it to be a flash in the pan.

And just as the Osborne Computer Corporation sought refuge from its clamouring creditors in the US bankruptcy laws, the Kaypro 10 arrived in Britain looking hale and hearty and unassuming except for its 10Mb Winchester disk. Nobody who carries this system about should ever have sand kicked in their face again.

In some respects NLS has borrowed from Osborne (transportability, conservative technology, bundled business software) and in others it has gone one better. The hard disk is the most obvious example and for the moment is what marks the Kaypro 10 out from all its competitors.

Presentation

The 10 arrives in a Russian doll arrangement of cardboard boxes; the large outer box opens to reveal a smaller of uncomplicated construction. The smaller box contains the machine itself, sheathed in a plastic bag, and the documentation which is unaccountably sheathed in two plastic bags.

Also in the inner box is the mains lead. Ours sported an exotic plug looking as though it's intended for the Albanian national grid. NLS or its UK distributor CK Computers will probably attach a British three-pin plug to later shipments.

Documentation

NLS gives away various items of business software with the 10 in addition to three Basics and CP/M 2.2. This makes for a substantial amount of documentation; if you're planning to carry the machine anywhere you might like to work out on the manuals first.

The main users guide is a pleasantly produced ring-binder that shouldn't give offence to the initiated or discourage the novice. To judge by its illustrations, NLS expects most users of the Kaypro 10 to be young women with frightening finger nails.

The system we reviewed came without the Perfect range of software that is promised to real users. Instead it had Wordstar, Suprterm and Microplan in addition to MBasic, CBasic, SBasic, CP/M, and Word Plus. This may become



Work out on the documentation first.

the standard offering — NLS has yet to decide.

The manuals for these are the software manufacturers' own documentation, which means that in some cases they assume knowledge of English.

NLS has produced a small additional booklet called Introduction to Software which may confuse people with its references to two diskette drives as the 10 has only one, with the hard disk safely out of harm's way.

Construction

As befits the product of a digital voltmeter manufacturer the Kaypro 10 has a steely, angular solidity when closed. The Kaypro logo and some racy stripes relieve the greyness of the box, but the main concession to style doesn't appear until you unclip the keyboard from where it sits flush with the screen. In use the 10 is a very good looking machine; its casing forms a hood above the screen, giving it a strangely malevolent air.

The keyboard is a separate unit and it forms the base when the system is in transportation mode. The backplane has the carrying handle, ports and switches, and also four protrusions that might, given the duplication in the packaging, serve as back-up feet but are more likely to be a provision for rack-mounting.

The box measures 18in by 15in by 8in, and the whole package weighs 31lbs. It has yet more feet which serve the main unit in use and a hinged metal stand that tilts it to an angle for the user. This reviewer, no giant by any means, found the angle too shallow.

Keyboard

Linked to the machine by a cord when in use, and by two clips in transit, the keyboard unit might be the crowning glory of this system if it wasn't for the fact that it is its base.

There's nothing special about the layout of the keys themselves, and they may offer too little resistance to appeal to all tastes, but the banked effect of the higher rows make this an exceptional keyboard to use.

The separate numeric keypad is not sculpted to the same extent but its 14 keys

have the distinction of being programmable. The four cursor control keys that surmount the main body of keys (another 62 in all) are also programmable.

The reset button, thoughtfully provided in red plastic, is well away from wayward fingers at the back on the machine.

Screen

Anybody who has ever peered doggedly at the original Osborne screen for any length of time will appreciate the Kaypro 10's 9in display. There is still a strong temptation to lean into it and at times you feel as though you're looking through the wrong end of a telescope but that has more to do with the size of the fascia than the size of the screen.

It is green on black, 24 lines (plus a status line) of 80 characters, and has inverse video, blinking, underlining, and reduced intensity — unspectacular but functional.

The screen's most endearing feature is its pronounced persistence. The ghosts of characters linger on the screen as though they can't believe that the last refresh cycle has gone. Large graphics constructions disappear with particular reluctance.

As a business graphics system the 10's screen is 100 by 160 pixels. But the manual won't fill you with confidence: 'The Kaypro 10 has graphics capability. However it needs a program to tell it what to do . . . If you are not able to write the programs and want to use the Kaypro 10 graphics capability for business or other purposes, then (Note the if . . . then) it is best to find someone to write a program to do what you want.'

Storage

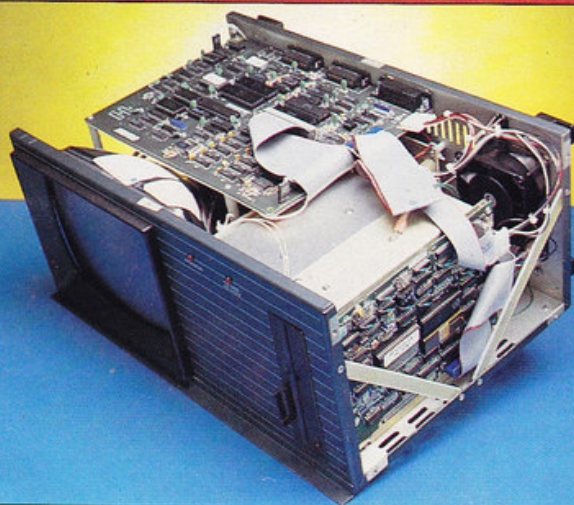
With a Z80A doing the pushing the 10 has 64K of RAM and just 4K of ROM.

Then there's the small matter of a 10Mb Winchester disk. Is this overkill? A sledgehammer to crack a nut? Perhaps there will prove to be an equivalent to Parkinson's Law that will say that data expands to fill the space available to it. 'Equivalent to 50 floppies!' Kaypro exclaims in its brochure, and that sounds like an awful lot of backing up. But the system keeps a sense of proportion by treating the hard disk as two drives, each divided into 16 user areas.

The 10 has a 5.25in floppy disk drive for back-up purposes. It takes single or double-sided, double-density disks, and Kaypro II users will be able to carry over data or programs to the larger system. There is a maximum of 390K on the floppy front.

The system generally is very responsive; saving and loading files are impressively fast operations. It may be that the most enduring reservation about the value of hard disks on portable machines will concern their resilience. But if you accept

In use the Kaypro 10's keyboard unclips from the front of the main unit, where the screen glowers beneath its hood. The exploded view (below, left) shows the guts of the system with the floppy and the hard disk drives side by side at the front. The keyboard unit (below, right) is easily stripped and crucial elements are accessible. The keys themselves are swept up in a banked effect.



that a 31lb machine is not likely to be going walkabout very often it could be a minor reservation.

Expansion

Strictly speaking the Kaypro 10 has connections rather than expansion potential. The three ports at the back give it a Centronics interface, a serial printer interface, and one to attach a modem.

The modem port is intended to be used among other things with the Superterm software supplied by NLS. This was designed for the Kaypro line of machines and in one of its manifestations it can turn the 10 into a terminal tied into the Dow Jones system (or so we are assured).

Software

It isn't necessary to say very much about MBasic, CBasic, SBasic, Old Uncle Tom Basic and all except that this surely is going

over the top. One programming language available in three versions (four if you count OBasic, and why not? The more the merrier)? It seems contradictory to say the least.

NLS, at great cost to its profit margins no doubt, is supplying a range of business applications to make life easy for the untutored business user, and it throws in several Basics which will never see the light of day if the Perfect range does the job.

Our system, as noted, was supplied with Wordstar and Microplan; this spreadsheet was so friendly that it was loath to let the reviewer go.

There's also a set of games in the package; these lack polish and demonstrate a juvenile sense of humour that American programmers would be well-advised to disguise. But the Kaypro 10 is a business system; perhaps the games were intended to be trivial.

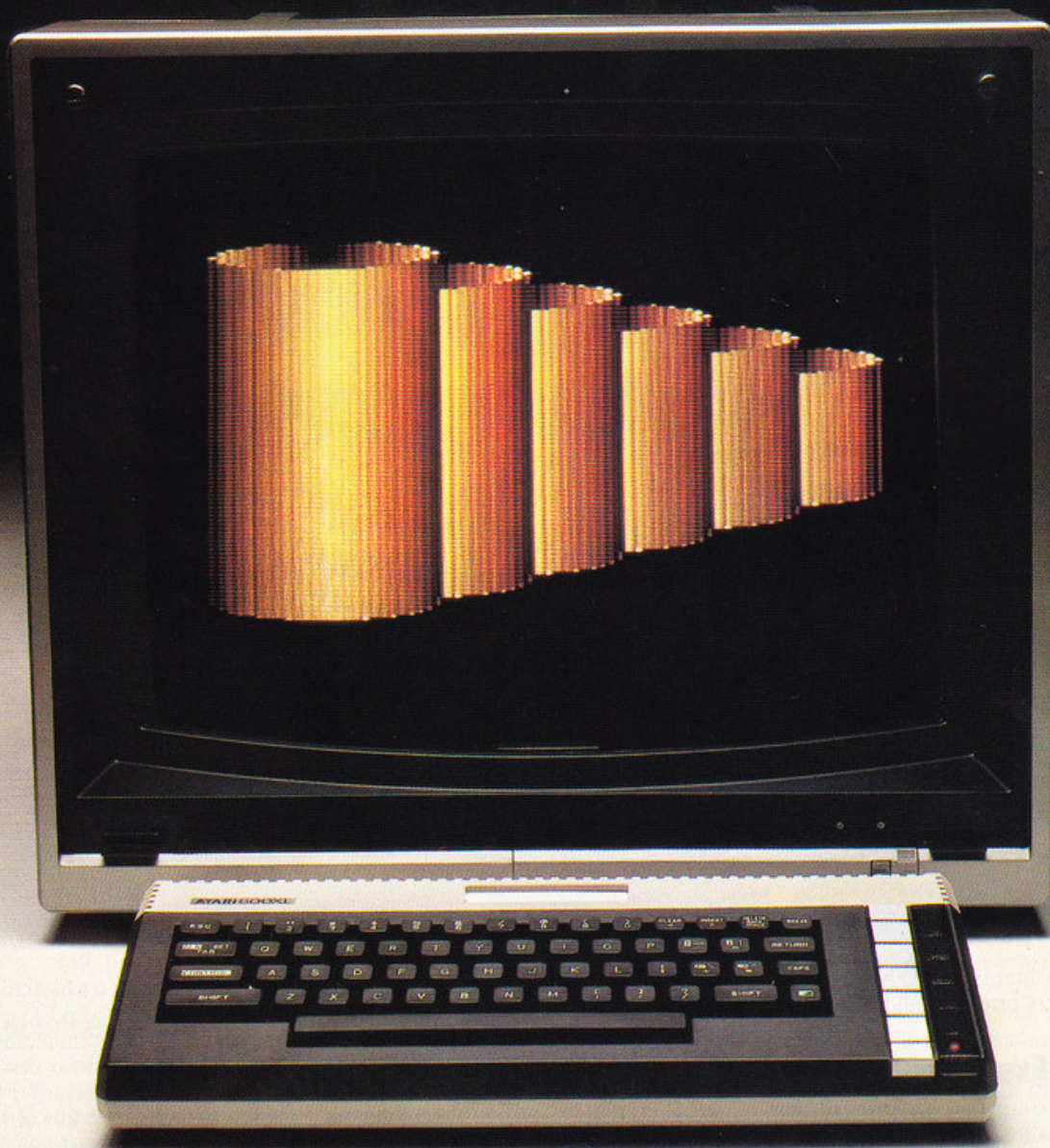
NLS has provided a hierarchy of menus and it isn't difficult to find your way around the system. It is noticeable, though, that it is much easier to move down from the master menu than to return to it as some of the return paths are oddly tortuous.

Verdict

Who was it who said that of all human failings prophesy is the most gratuitous? If the Kaypro 10 succeeds, Adam Osborne may have to eat his words — but if his company collapses completely he may be glad of something to eat.

On the face of it the 10 certainly should succeed — at the price quoted NLS looks almost extravagantly generous. Most of the hardware elements are well tried and tested, and the same goes for the systems and applications software. CP/M and a Z80 may give it a dated air but most users are fairly pragmatic as 32-bit chips and Unix

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ATARI 600XL product specifications.

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Programming features: Built in ATARI

BASIC programming language plus 8 other languages. HELP key will provide additional information and menu screens. Syntax checking on entry.

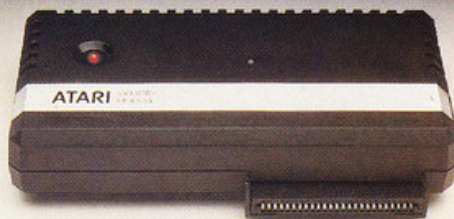
Input/Output: External processor bus for expansion with memory and peripherals. 2 controller ports. Serial I/O connector. Monitor output.

Software: Over 1000 items of software available including self teaching programs with unique voice over. Education. Home management. Programming aids. Atari user written programs (APX). And Atari's famous entertainment software.

Experience grows Atari 600XL.



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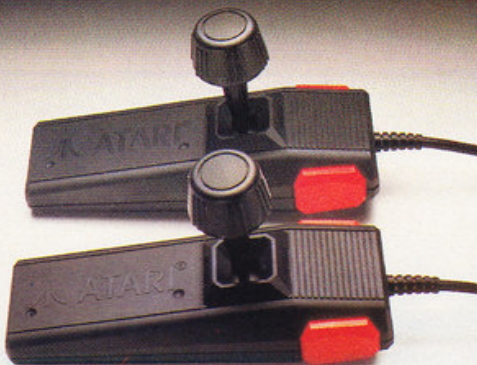
2. 64K Memory Module.



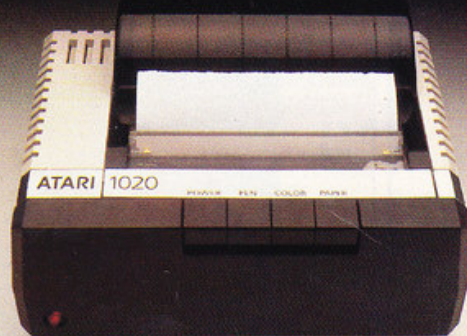
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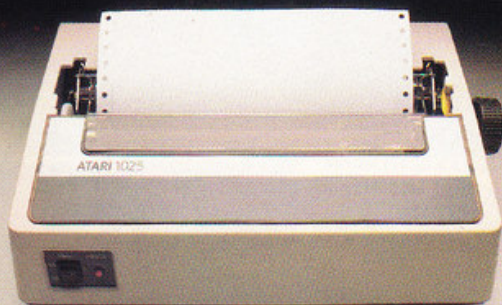
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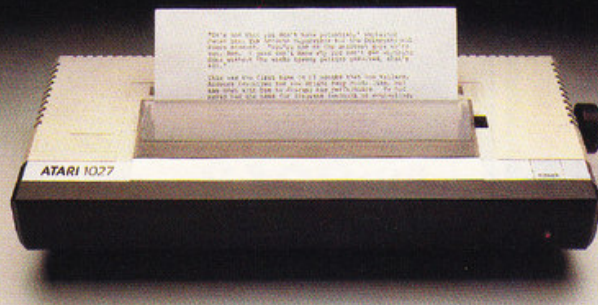
6. Colour Printer.



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8. 80 Column Dot Matrix Printer.



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cursor movement in any direction; adds to the pleasure of Atari games.

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If you'd like to know more about the ATARI 600XL, write to Atari International (UK) Inc., P.O. Box 407, Blackhorse Road, London SE8 5JH and we'll send you all the details.

The new Atari XL home computer system.

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ATARI

419 sound good but what is needed is something that works — and works now.

Any reservations about the reliability of a portable system that includes a Winchester disk, which we've been warned for years are notoriously sensitive, should be considered in context. First, you probably won't be carrying the machine around very much. Second, LNS' power-down procedure includes a routine that tucks the disk up in bed as far as possible. Third, any disk drive can fail and at any moment, with or without being dropped from a great height.

Back-up will be a chore, granted. But to compensate for that there is the eye-opening and almost incredible luxury of having all the software, data files and programs alike, in one place. A Z80 driving a 10 megabyte hard disk may be like kick-starting a jumbo but it does leave you in control of a mobile jumbo.

Computer people are very fond of talking about what they call a learning curve. The Kaypro 10 will introduce you to a variation, the indolence curve. This is how it works: you start your microcomputing career with something that loads

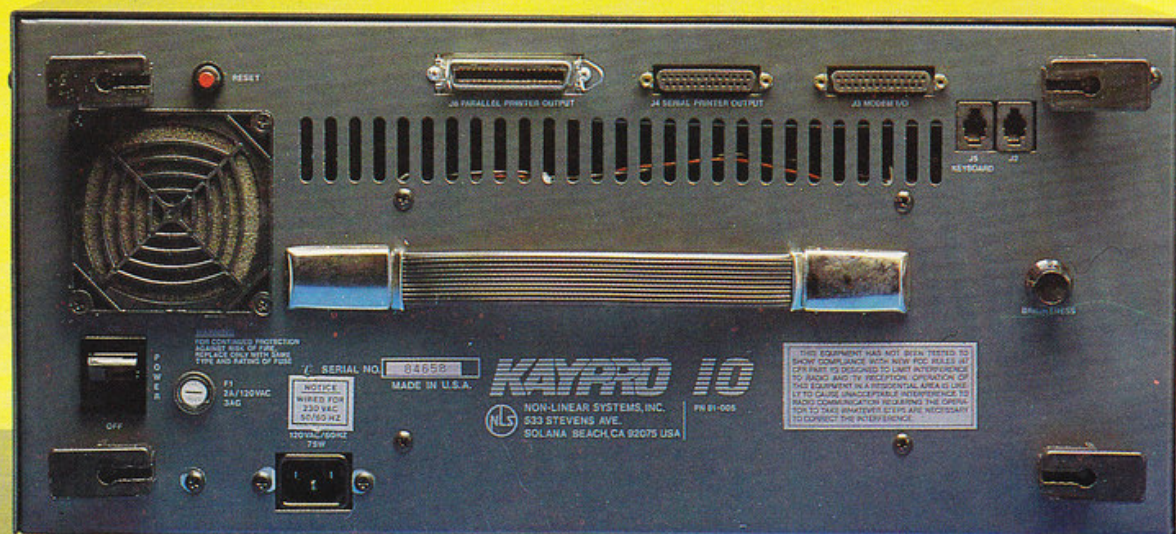
software from a cassette — this is slow, tedious, and unreliable. Later, for an outlay of several hundred pounds, you graduate to a system with floppy disks — these are faster, more reliable, and for a time the last word in data storage. Eventually you may encounter a hard disk system and you'll feel almost self-

indulgent using it. It will rob you of all desire to shuffle floppies ever again.

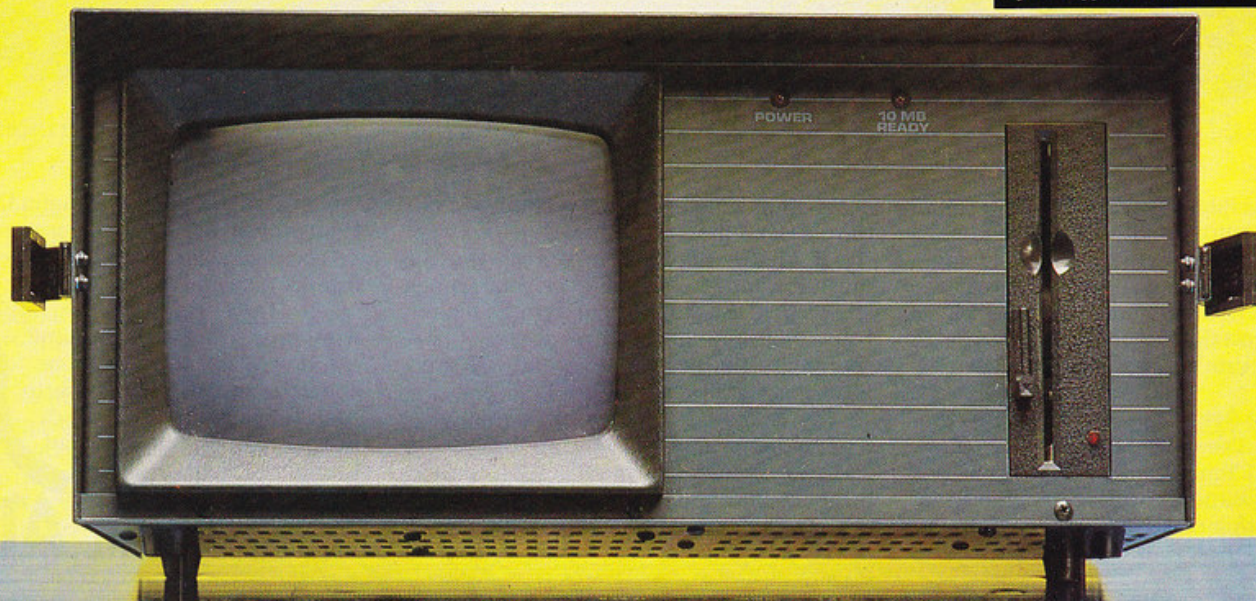
The next step may be foreshadowed in Shugart's announcement of a 1Gb optical disk (for \$7,000) two weeks ago. An outrageous prospect? The Kaypro 10 would have seemed so a couple of years ago.

SPECIFICATION

| | |
|------------------------|---|
| Price | £3,306 inc VAT |
| Processor | Zilog Z80A |
| RAM memory | 64K |
| ROM memory | 4K |
| Text screen | 80×25 |
| Graphics screen | 160×100 pixels |
| Keyboard | 76-key full-travel detachable, numeric keypad, 14 programmable |
| Interfaces | Two RS232, one Centronics |
| Storage | 10Mb Winchester disk, 5.25in floppy up to 390K |
| OS | CP/M2.2 |
| Languages | MBasic, CBasic, SBasic, OBasic |
| Software | A choice of word processing, spreadsheet, spelling checker packages to be determined; Word Plus, Superterm; games |
| Manufacturer | Non-Linear Systems Inc, Solana Beach, California |
| Distributor | CK Computers, Plymouth (0752) 780311. |



The top of the system packed for portability — around the handle are clustered ports, a vent and superfluous feet. Below, the stylish Kaypro 10 dashboard.



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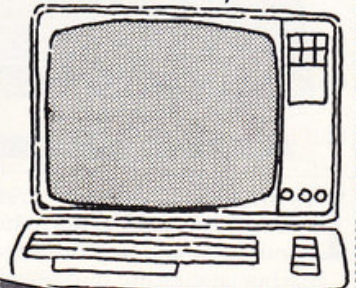


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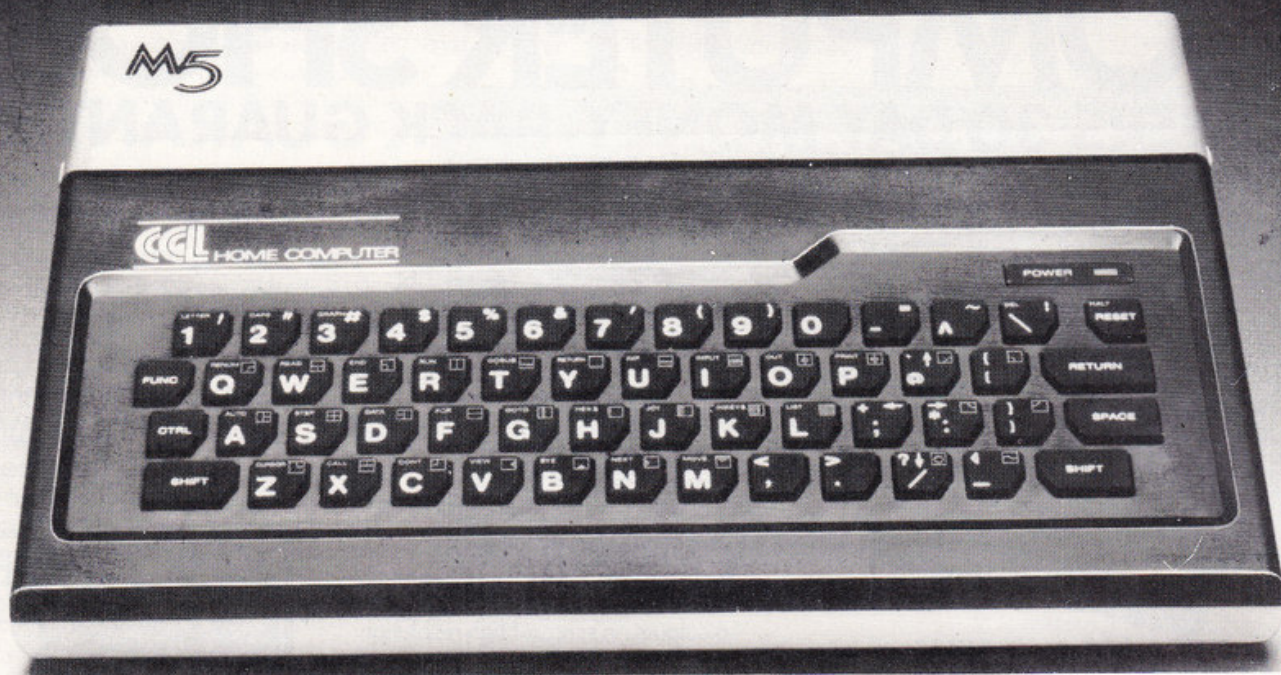
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AT LAST, A HOME COMPUTER THAT IMPROVES WITH AGE.



It's surprising how many first-time relationships with a home computer go sour with age.

You buy an attractive, discounted little machine so that you and the children can learn about computers.

Instead, you learn about its limitations: the dull graphics. The plugs that fall out. The cheap power supply. The unalterable "beginners" language. The stiff, fragile keys. No provision for future developments. If only you'd looked around a bit in the beginning... "Quality costs a little more, but it's usually worth paying for" (Personal Computer News - CGL M5 Review, June '83.)

The CGL M5 is designed and built by Sord, one of Japan's leading computer specialists, with three main ideas in mind.

First, to be easy and fun to learn and operate.

Second, to be rugged enough to last through hours and hours of operation.

And third, to form the basis of a powerful, versatile home computer system that won't need replacing until you're ready for a dedicated business system.

Built to learn

The CGL M5 is designed to be easy for non-genies to use.

"On the M5, most of the work is done for you, and all that is left is the need to work out what to do next, rather than how to do it." (Personal Computer News, June '83.)

If you make a mistake, you can correct it with a simple movement of the cursor. So you only correct that mistake, not a whole line; nor do you have to indulge in complex edit commands.

Budding video game designers and computer artists will love to get their hands on the 16 colour graphics and 32 moveable images called "sprites."

"The M5 makes professional graphic

effects very simple for even the beginner to achieve." (Personal Computer World, Aug. '83.)

Built to last

"It works first time, doesn't need a lot of mollycoddling and jiggery-pokery to persuade it to continue to do so, and what's even better; it continues to work well. You don't have to balance cold cartons of milk on the top, shove matches in the back to keep the plugs in, or press the keys with several pounds force to make them respond." (Personal Computer News, June '83.)

Being able to build things that work and carry on working without endless maintenance is something at which the Japanese seem to excel.

Built to grow

To be truly versatile, a home computer has to understand very different things.

So you need different "languages," which the M5 provides by supplying part of its memory in plug-in cartridges.

"The M5 eliminates the worst limitations on machines at this level, which is that they tend to be stuck with whatever language is provided by the management." (Personal Computer News, June '83.)

The computer is supplied complete with a Basic-I cartridge, a standard integer BASIC language and a simple learning text.

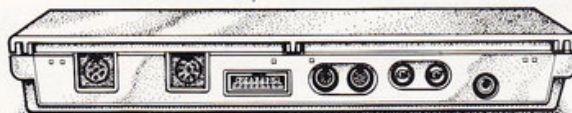
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The graphic arts

Figure 2

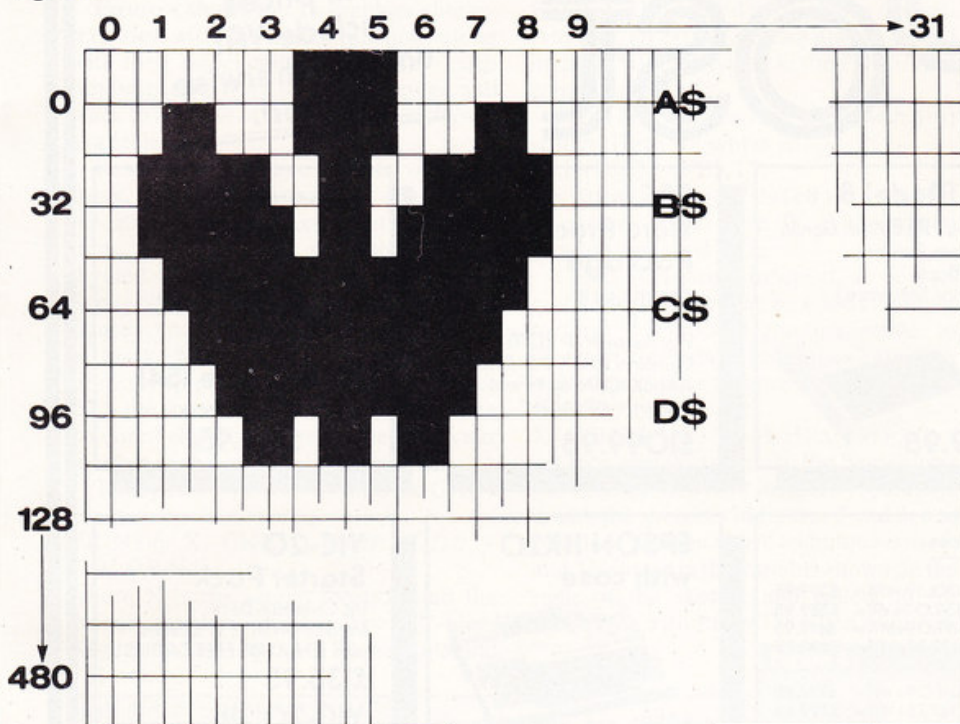


Figure 1

```

70 CLS(5)
80 GOSUB10000
90 CLS(0)
100 **EAGLE STRINGS**
105 A1$=CHR$(143+48)+CHR$(143+48)
110 A$=CHR$(129+48)+CHR$(130+48)+CHR$(128)+CHR$(143+48)+CHR$(143+48)+CHR$(128)+C
HR$(129+48)+CHR$(130+48)
120 B$=A1$+CHR$(139+48)+CHR$(133+48)+CHR$(138+48)+CHR$(135+48)+A1$
130 C$=CHR$(132+48)+A1$+A1$+A1$+CHR$(136+48)
140 D$=CHR$(128)+CHR$(132+48)+CHR$(143+48)+CHR$(141+48)+CHR$(142+48)+CHR$(143+48)
+CHR$(136+48)+CHR$(128)
150 P1$=CHR$(128)+CHR$(128)+CHR$(128)
155 P$=P1$+CHR$(131+48)+CHR$(131+48)+P1$
160 Q$=CHR$(135+48)+CHR$(139+48)+CHR$(130+48)+CHR$(141+48)+CHR$(142+48)+CHR$(129
+48)+CHR$(135+48)+CHR$(139+48)
170 R$=CHR$(141+48)+A1$+CHR$(135+48)+CHR$(139+48)+A1$+CHR$(142+48)
180 S$=CHR$(128)+CHR$(141+48)+A1$+A1$+CHR$(142+48)+CHR$(128)
190 T$=CHR$(128)+CHR$(128)+CHR$(140+48)+CHR$(132+48)+CHR$(136+48)+CHR$(140+48)+C
HR$(128)+CHR$(128)
200 **CASTLE STRINGS**
210 G1$=CHR$(143+32)+CHR$(143+32)
220 G$=CHR$(131+32)+CHR$(129+32)+CHR$(130+32)+CHR$(129+32)+CHR$(130+32)+CHR$(129
+32)+CHR$(130+32)+CHR$(131+32)
230 H$=CHR$(141+32)+CHR$(143+32)+CHR$(141+32)+CHR$(142+32)+CHR$(141+32)+CHR$(142
+32)+CHR$(143+32)+CHR$(142+32)
240 I$=CHR$(128)+CHR$(143+32)+CHR$(135+32)+CHR$(139+32)+CHR$(135+32)+CHR$(139+32)
+CHR$(143+32)+CHR$(128)
250 J$=CHR$(128)+G1$+G1$+G1$
255 K1$=CHR$(140+32)+CHR$(140+32)
260 K$=CHR$(128)+K1$+K1$+K1$
270 L$=CHR$(143+32)+CHR$(135+32)+CHR$(139+32)+CHR$(135+32)+CHR$(139+32)+CHR$(135
+32)+CHR$(139+32)+CHR$(143+32)
280 M$=CHR$(132+32)+CHR$(143+32)+CHR$(133+32)+CHR$(138+32)+CHR$(133+32)+CHR$(138
+32)+CHR$(143+32)+CHR$(136+32)
290 N$=CHR$(128)+G1$+G1$+G1$
300 CLS(0)
310 FOR I=0 TO 31:SET(21,I,1):NEXT
320 FOR J=0 TO 63:SET(J,9,1):NEXT
330 FOR I=0 TO 31:SET(42,I,1):NEXT
340 FOR J=0 TO 63:SET(J,21,1):NEXT
350 PRINT@0,"1";
360 PRINT@11,"2";
370 PRINT@21,"3";
380 PRINT@31,"4";
390 PRINT@41,"5";
400 PRINT@51,"6";
410 PRINT@61,"7";
420 PRINT@71,"8";
430 PRINT@81,"9";
440 P1=PEEK(1024+68)-143
450 P2=PEEK(1024+79)-143
460 P3=PEEK(1024+90)-143
470 P4=PEEK(1024+260)-143
480 P5=PEEK(1024+271)-143

```

High resolution can make a machine seem a really attractive buy, and many of the newer machines on the market really shine in this area. But you can still perform some fairly spectacular feats with low resolution graphics if your micro, like the Tandy Colour Computer, has a PRINT@ facility.

The lowest resolution of the Tandy's 14 modes is the Alphanumeric Mode, which is the mode entered when the beast is first fired up. The screen is divided into 32 parts horizontally, numbered 0 to 31 in single steps, and 16 parts vertically, numbered 0 to 480 in steps of 32. You can get the general idea from figures 2 and 3.

Each rectangle or screen print location so formed corresponds to one text or graphics character position, so by reading across and down and adding the two numbers together, you can read off a unique identifying number for each position. The bottom right hand corner position, for example, would be $480+31=511$.

Each of these screen print locations is represented in memory by one byte, starting at memory location 1024. So screen location 0 is memory location 1024, screen location 1 is memory location 1025, and so on until screen location 511, which is memory location 1535. So it is possible to

```

675 P6=PEEK(1024+282)-143
680 P7=PEEK(1024+452)-143
685 P8=PEEK(1024+463)-143
690 P9=PEEK(1024+474)-143
700 IF P1=32 AND P2=32 AND P3=32 THEN GOSUB2000
705 IF P4=32 AND P5=32 AND P6=32 THEN GOSUB3000
710 IF P7=32 AND P8=32 AND P9=32 THEN GOSUB4000
715 IF P1=32 AND P4=32 AND P7=32 THEN GOSUB5000
720 IF P2=32 AND P5=32 AND P8=32 THEN GOSUB6000
725 IF P3=32 AND P6=32 AND P9=32 THEN GOSUB7000
730 IF P1=32 AND P5=32 AND P9=32 THEN GOSUB8000
735 IF P3=32 AND P5=32 AND P7=32 THEN GOSUB9000
740 IF P1=48 AND P2=48 AND P3=48 THEN GOSUB1000
745 IF P4=48 AND P5=48 AND P6=48 THEN GOSUB1100
750 IF P7=48 AND P8=48 AND P9=48 THEN GOSUB1200
755 IF P1=48 AND P4=48 AND P7=48 THEN GOSUB1300
760 IF P2=48 AND P5=48 AND P8=48 THEN GOSUB1400
765 IF P3=48 AND P6=48 AND P9=48 THEN GOSUB1500
770 IF P1=48 AND P5=48 AND P9=48 THEN GOSUB1600
775 IF P3=48 AND P5=48 AND P7=48 THEN GOSUB1700
780 IF P1=48 AND P4=48 AND P7=48 THEN GOSUB1800
785 IF P3=48 AND P4=48 AND P9=48 THEN GOSUB1900
790 A$=INKEY$: IF A$="" THEN GOTO800
800 B$=INKEY$: IF B$="" THEN GOTO800
810 IF A$=CHR$(69) AND B$=CHR$(49) THEN GOSUB4100:GOTO650
820 IF A$=CHR$(69) AND B$=CHR$(50) THEN GOSUB4200:GOTO650
830 IF A$=CHR$(69) AND B$=CHR$(51) THEN GOSUB4300:GOTO650
840 IF A$=CHR$(69) AND B$=CHR$(52) THEN GOSUB4400:GOTO650
850 IF A$=CHR$(69) AND B$=CHR$(53) THEN GOSUB4500:GOTO650
860 IF A$=CHR$(69) AND B$=CHR$(54) THEN GOSUB4600:GOTO650
870 IF A$=CHR$(69) AND B$=CHR$(55) THEN GOSUB4700:GOTO650
880 IF A$=CHR$(69) AND B$=CHR$(56) THEN GOSUB4800:GOTO650
890 IF A$=CHR$(69) AND B$=CHR$(57) THEN GOSUB4900:GOTO650
900 IF A$=CHR$(67) AND B$=CHR$(49) THEN GOSUB5100:GOTO650
910 IF A$=CHR$(67) AND B$=CHR$(50) THEN GOSUB5200:GOTO650
920 IF A$=CHR$(67) AND B$=CHR$(51) THEN GOSUB5300:GOTO650
930 IF A$=CHR$(67) AND B$=CHR$(52) THEN GOSUB5400:GOTO650
940 IF A$=CHR$(67) AND B$=CHR$(53) THEN GOSUB5500:GOTO650
950 IF A$=CHR$(67) AND B$=CHR$(54) THEN GOSUB5600:GOTO650
960 IF A$=CHR$(67) AND B$=CHR$(55) THEN GOSUB5700:GOTO650
970 IF A$=CHR$(67) AND B$=CHR$(56) THEN GOSUB5800:GOTO650
980 IF A$=CHR$(67) AND B$=CHR$(57) THEN GOSUB5900:GOTO650
990 IF A$=CHR$(67) AND B$=CHR$(57) THEN GOSUB5900:GOTO650
3970 IF A$=CHR$(12) THEN GOTO510
3980 IF A$="" OR B$="" THEN GOTO650
4100 **PRINT EAGLE AT 1**
4110 PRINT@1,A$;
4120 PRINT@33,B$;
4130 PRINT@55,C$;
4140 PRINT@77,D$;
4150 GOSUB6000:RETURN
4200 **PRINT EAGLE AT 2**
4210 PRINT@12,A$;
4220 PRINT@44,B$;
4230 PRINT@76,C$;
4240 PRINT@108,D$;
4250 GOSUB6000:RETURN
4300 **PRINT EAGLE AT 3**
4310 PRINT@23,A$;
4320 PRINT@55,B$;
4330 PRINT@87,C$;

```

Continued p.27

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425 POKE data to a memory location for all character positions.

But Tandy also has PRINT@, a very powerful tool which, together with CHR\$, can make colourful, if somewhat chunky, graphics really easy. PRINT@ places a graphics or text character on screen in any one of 512 positions.

Figure 4 shows the 16 graphics characters used with the CHR\$ function, along with their associated ASCII codes. Each can be altered from its original green and black to any one of the other seven colours available.

Resolution is not as coarse as you might think, although each character can only be black and one other colour at any given time. The character position is really divided into four elements (the 64*32 Semigraphics 4 Mode), as can be seen from figure 4, and if the characters are printed on a black background, then the black portions simply merge. You can, of course, CLS the screen to any colour and get the coloured elements to merge, leaving your martian in sparkling galaxian black!

The syntax for PRINT@ and the CHR\$ function works like this:
PRINT@ X, CHR\$ (ASCII CODE + COLOR No);
where X is the screen location and the colour number is 16-yellow, 32-blue, 48-red, 64-buff, 80-cyan, 96-magenta and 112-orange.

The colour number can be added to the ASCII code beforehand if you are struggling for memory, but personally I cannot see the fun in adding numbers together while sitting in front of a machine designed to do just that. It is also much easier to recognise just which character is being PRINTed and in what colour if the PROGRAM is listed in the above format. Anyway, an extra 1.5K can always be had in this MODE by typing in the PCLEAR 3 command.

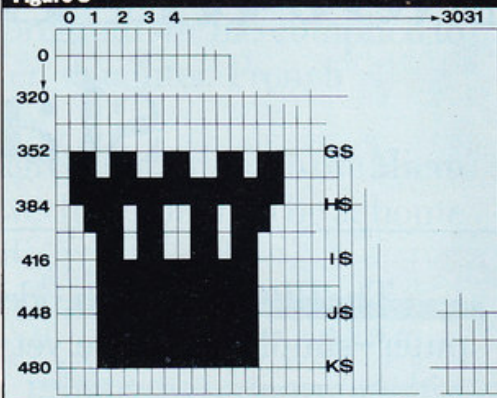
PRINT@ can also be used with text strings. Here the syntax is:
PRINT@ X, "TEXT";
The string is then PRINTed with the first character, in this case 'T' at the screen location specified by X.

CHR\$ is a string function, so several graphics characters can be added together to form a composite graphics image, as shown in the examples in figures 2 and 3. A good approach is to store them in a string variable, as in:

X\$=CHR\$(129+32)+CHR\$(130+32)

Once you've typed in the Supercross game, presented here in figure 1, compare it with the sketches in figures 2 and 3, and you'll see that the above technique is used, and 3 is stored in the variable shown on the right of the sketch, and called up for PRINTing with PRINT@ when required.

Figure 3

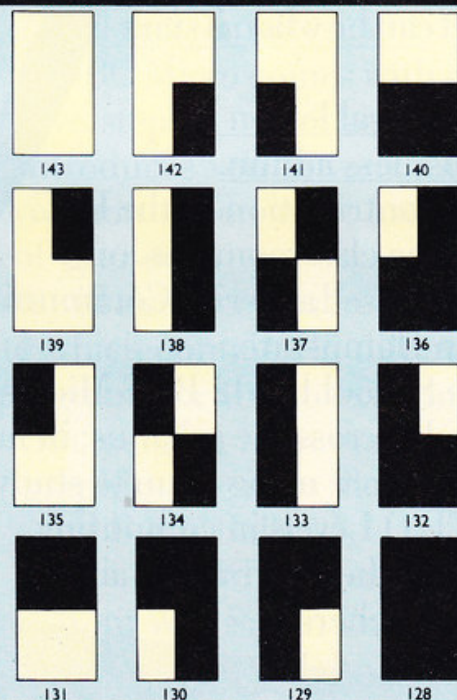


Program lines 100 to 270 show this string building procedure.

In this instance the method used to show all required strings on screen at the same time is to use one PRINT@ statement for each string variable, and to locate each set of statements in its own subroutine. Program lines 4100 to 4150 and 5700 to 5760 illustrate this point. The subroutine is called in this case by the use of the INKEY\$ function, so that by a single keystroke the complete graphics figure can be sited anywhere on screen instantaneously. There is positively no waiting with PRINT@.

Figure 3 shows how the Tandy's screen is divided in the alphanumeric mode, while figure 4 gives the ASCII codes of the micro's graphics characters.

Figure 4



```
10010 PRINT@9,"SUPERCROSS III";
10020 PRINT@66,"THIS GAME IS FOR TWO PLAYERS";
10030 PRINT@97,"EACH PLAYER HAS A SYMBOL - THE";
10040 PRINT@129,"EAGLE OR THE CASTLE - AND TAKE";
10050 PRINT@161,"TURNS TO PLACE THEIR SYMBOL ON";
10060 PRINT@193,"SCREEN IN THEIR CHOSEN SQUARE";
10070 PRINT@237,"PRESS";
10080 PRINT@256,"<E> FOR EAGLE <C> FOR CASTLE";
10090 PRINT@289,"FOLLOWED BY THE SQUARE NUMBER";
10100 PRINT@329,"PRESS<CLEAR>";
10110 PRINT@365,"TWICE";
10120 PRINT@399,"TO START A NEW GAME";
10130 PRINT@419,"IF THE WRONG LETTER KEY IS";
10140 PRINT@448,"PRESSED SIMPLY PRESS THE CORRECT";
10150 PRINT@491,"KEY TWICE";
10160 FOR T=1 TO 30000:NEXT T:RETURN
```

```
4340 PRINT@119,D$;
4350 GOSUB6000:RETURN
4400 **PRINT EAGLE AT 4**
4410 PRINT@161,P$;
4420 PRINT@193,Q$;
4430 PRINT@225,R$;
4440 PRINT@257,S$;
4450 PRINT@289,T$;
4460 GOSUB6000:RETURN
4500 **PRINT EAGLE AT 5**
4510 PRINT@172,P$;
4520 PRINT@204,Q$;
4530 PRINT@236,R$;
4540 PRINT@268,S$;
4550 PRINT@300,T$;
4560 GOSUB6000:RETURN
4600 **PRINT EAGLE AT 6**
4610 PRINT@183,P$;
4620 PRINT@215,Q$;
4630 PRINT@247,R$;
4640 PRINT@279,S$;
4650 PRINT@311,T$;
4660 GOSUB6000:RETURN
4700 **PRINT EAGLE AT 7**
4710 PRINT@353,P$;
4720 PRINT@385,Q$;
4730 PRINT@417,R$;
4740 PRINT@449,S$;
4750 PRINT@481,T$;
4760 GOSUB6000:RETURN
4800 **PRINT EAGLE AT 8**
4810 PRINT@364,P$;
4820 PRINT@396,Q$;
4830 PRINT@428,R$;
4840 PRINT@460,S$;
4850 PRINT@492,T$;
4860 GOSUB6000:RETURN
4900 **PRINT EAGLE AT 9**
4910 PRINT@375,P$;
4920 PRINT@407,Q$;
4930 PRINT@439,R$;
4940 PRINT@471,S$;
4950 PRINT@503,T$;
4960 GOSUB6000:RETURN
5000 **PRINT CASTLE AT 1**
5100 PRINT@1,L$;
5120 PRINT@23,M$;
5130 PRINT@65,N$;
5140 PRINT@97,O$;
5150 GOSUB7000:RETURN
5200 **PRINT CASTLE AT 2**
5210 PRINT@12,L$;
5220 PRINT@44,M$;
5230 PRINT@76,N$;
5240 PRINT@108,O$;
5250 GOSUB7000:RETURN
5300 **PRINT CASTLE AT 3**
5310 PRINT@23,L$;
```

```
5320 PRINT@55,M$;
5330 PRINT@87,N$;
5340 PRINT@119,O$;
5350 GOSUB7000:RETURN
5400 **PRINT CASTLE AT 4**
5410 PRINT@161,G$;
5420 PRINT@193,H$;
5430 PRINT@225,I$;
5440 PRINT@257,J$;
5450 PRINT@289,K$;
5460 GOSUB7000:RETURN
5500 **PRINT CASTLE AT 5**
5510 PRINT@172,G$;
5520 PRINT@204,H$;
5530 PRINT@236,I$;
5540 PRINT@268,J$;
5550 PRINT@300,K$;
5560 GOSUB7000:RETURN
5600 **PRINT CASTLE AT 6**
5610 PRINT@183,G$;
5620 PRINT@215,H$;
5630 PRINT@247,I$;
5640 PRINT@279,J$;
5650 PRINT@311,K$;
5660 GOSUB7000:RETURN
5700 **PRINT CASTLE AT 7**
5710 PRINT@353,G$;
5720 PRINT@385,H$;
5730 PRINT@417,I$;
5740 PRINT@449,J$;
5750 PRINT@481,K$;
5760 GOSUB7000:RETURN
5800 **PRINT CASTLE AT 8**
5810 PRINT@364,G$;
5820 PRINT@396,H$;
5830 PRINT@428,I$;
5840 PRINT@460,J$;
5850 PRINT@492,K$;
5860 GOSUB7000:RETURN
5900 **PRINT CASTLE AT 9**
5910 PRINT@375,G$;
5920 PRINT@407,H$;
5930 PRINT@439,I$;
5940 PRINT@471,J$;
5950 PRINT@503,K$;
5960 GOSUB7000:RETURN
6000 SOUND210,1:SOUND200,1:SOUND190,1:SOUND210,1:SOUND200,4:SOUND200,4:RETURN
7000 SOUND150,1:SOUND140,1:SOUND130,1:SOUND150,1:SOUND140,4:SOUND140,4:RETURN
8000 SOUND230,3:SOUND230,3:SOUND230,2:RETURN
10000 **PRINT INSTRUCTIONS**
```


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Here are a few stories to illustrate how the BBC Micro gets out and about. And one to remind you how helpful it can be when it stays at home.

A practical lesson in business admin.

The contribution of the BBC Micro in the classroom has long been recognised at Perins Community School in Hampshire.

The School has 12 BBC Micros used extensively across the syllabus: in fact some pupils are using them to study for their GCE O Levels in computing.

One of the programs available to Perins teachers

such as David Beck, pictured below with his class, is "Newsagent."

This program contains all the necessary information for the class to run a newsagent's shop; allowing them to organise daily deliveries, make up bills and keep an eye on stock control and ordering.

It's a nice example of how the BBC Micro can be used not only to acquaint a class with the language of computers, but also with some of the realities of the community in which they live.

Correcting Jodrell Bank.

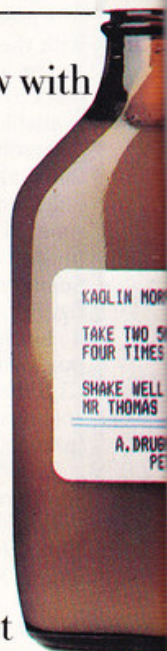
The BBC Micro is a familiar worker around Jodrell Bank.

You'll find it in the reception area explaining the workings of a radio telescope to visitors, for example.

But it's also been helping in a more testing task: to improve the performance of the Defford telescope.

In this application it has been used to make calculations necessary to determine the precise parabolic shape of the dish.

Theodolites are used to do the measuring—then the BBC Micro works out the necessary corrections.



The end of the scrawl.

If any of you have noticed how much easier it is to read and understand labels on drugs and medicines these days, then you can most probably thank the BBC Micro. John Richardson, a Preston pharmacist, was first to realise how a micro with a suitable printer could produce labels that were accurate and legible and which could include, automatically, such information as drug reaction warnings.

At the same time it could record drug usage for better stock control.

He chose the BBC Micro for its versatility and potential for expansion.

John Richardson believes that this system will be recognised as standard in the profession and be used in hospitals, health centres and pharmacies throughout the UK.

Meanwhile back at home.

Dr. & Mrs. Yarwood bought a BBC Micro as a birthday present for their 12 year old daughter.

programs. Mrs. Yarwood is particularly proud of one program she has compiled to help teach her daughter French vocabulary.

They all agree that although the Micro is fast and powerful enough to be at home in Jodrell Bank, it is also the ideal computer at the Yarwood home: simple to set up (virtually any TV set and cassette player is all you need) and simple to use.

All this for only £399.

The BBC Micro comes with a comprehensive, step-by-step User Guide which introduces you to your micro and shows you how to construct useful programs of your own.

You will also receive a free "Welcome" cassette which contains 15 different programs for you to experiment with, ranging from music and graphics to games like Kingdom and Bat 'n' Ball.

The BBC Micro is available from WH Smith Computer Shops, Boots, John Lewis and local Acorn stockists.

Alternatively if you would like to order one with your credit card or if you want the address of your nearest supplier just phone 01-200 0200 or 0933-79300.

However, it quite quickly became common property.

All three can now write their own

The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.



Paul Giblett explains the uses of the Machine Operating System in your own programs.

Beeb special FX

One of the BBC's biggest advantages is that it has a complete Machine Operating System (MOS) separate from its Basic. This provides facilities for other programs and languages, but the MOS can also be accessed directly by prefixing commands with an asterisk.

Over the next two issues PCN will be providing a guide to some of the more useful of these commands.

In BBC Basic an asterisk indicates that the line which follows is intended for processing by the MOS, not the language interpreter. The language accepts the 'command line' and removes the asterisk as well as any leading spaces before storing the line in the language workspace (&700-7FF).



The language then passes control to the Command Line Interpreter (CLI), and the Y register of the processor containing an offset which, when combined with a pointer at &F2, gives the address of the first character in the line to be processed.

The CLI offers the command line first to the MOS for processing. At issue 1.20 the MOS will recognise, though not necessarily act upon, the following commands:

| | | | |
|-------|-------|--------|-------|
| *CAT | *EXEC | *LOAD | *RUN |
| *CODE | *FX | *MOTOR | *SAVE |
| *DISC | *KEY | *OPT | *TAPE |
| *DISK | *LINE | *ROM | *TV |

The special command *HELP is also recognised.

If the MOS does not recognise the command line it is offered to each of the Service ROMs in turn, starting with the highest priority ROM. If this process also fails to produce a recognition of the line, it is finally offered to the current filing system.

If the Cassette Filing System (CFS) is active it will automatically generate the

'Bad command' error message and return control to the language. If, however, the Disk Filing System (DFS) is active an additional avenue for recognising the command is explored.

The DFS will search the current disk for a machine code file whose name matches the command line, one example of this being the *FORMAT command in Acorn's DFS. If the DFS fails to find a suitable file the 'Bad command' error is generated. Thus it is relatively easy to add commands to the BBC's repertoire by placing them on disk or into a Sideways ROM.

Of the commands which are already implemented, by far the most versatile are the *FX commands. These provide access to the MOS's OSBYTE routine. OSBYTE is a very powerful facility and is accessible fully only from machine code. It is capable of providing information on the machine's current status, and of altering that status. From machine code OSBYTE is accessed by placing the call number into the processor's accumulator, any necessary parameters into the X and Y registers and then jumping to OSBYTE's entry address at &FFF4.

OSBYTE calls may be used to send or to receive information, and in the latter case the information is returned in the X and Y registers. For example:

Send Call

Assembler Mnemonic

LDA#138
LDX#0
LDY#65
JSR&FFF4
RTS

Effect

Places the character whose ASCII code is 65 into buffer 0 (the keyboard buffer)

Receive Call

Assembler Mnemonic

LDA#131
JSR&FFF4
STX#70
STY#71
RTS

Effect

Returns the value of OSHWM — this is the top of the operating system RAM and is used to set PAGE.

The first of the above examples is far more simply achieved by the command *FX138,0,65. FX is an abbreviation of 'effects', and this group of commands can be used to achieve some very useful effects from a high level language, such as Basic. However, we are not able to get at the returned values of the OSBYTE calls that the *FX commands call.

Thus *FX commands will not return a value, with *FX0 being an exception to this. For example, try *FX131 to achieve the second of the above examples. So it tends to be pointless to list receive FX commands without noting that you will need to use the equivalent OSBYTE call from machine code or write further Basic

around the FX command. Yet despite the limitations of being send only calls, the *FX commands still provide an easy way to control many of the BBC's most powerful features.

Below is the first part of a list of send only *FX commands I have compiled. The list will be completed next week. I would welcome ideas from anyone who has any details to add to the list, which seems to grow daily.

The command format is *FXx,n,y, where x is the call number, and n and y are parameters.

*FX0 Prints the operating system version number eg 'OS 1.20'.

2,n Selects input stream for future input, n = 0-keyboard, 1-RS423, 2-keyboard with RS423 enabled.

3,n Selects output stream for future output. The user guide explanation of this facility is very simplified and the call is most easily explained at the bit level. There are four control bits:

| Bit | Effect when set | Effect when not set |
|-----|------------------|---------------------|
| 0 | RS423 enabled | RS423 disabled |
| 1 | Screen disabled | Screen enabled |
| 2 | Printer disabled | Printer enabled |
| 3 | Force Printer* | |

*Printer is activated, as long as bit 2 is set, even without VDU2. This provides the facility to have the output go to printer with the screen disabled (since this would otherwise stop VDU2 from being sent).

4,n Controls the action of the cursor control keys, with the order of the keys being COPY, ←, →, ↓, ↑, n = 0-normal cursor action, 1-produces ASCII codes 135-139, 2-acts as function keys 11-15.

5,n Selects printer driver, n = 0-sets a printer sink, 1-selects Centronics printer driver, 2-selects RS423 driver, 3-selects user supplied printer driver. Address of routine must be placed at &222.

6,n Sets printer ignore character to n. This





call is usually used to suppress the line feeds which the BBC sends automatically after a carriage return, as many printers do the same. Thus *FX16,10 avoids double line spacing on such printers (since 10 is the ASCII code for line feed).

7,n Selects RS423 receive rate in Baud (bits per second).

8,n Selects RS423 transmit rate in Baud, for both these calls, n = 0-Disabled, 1-75, 2-150, 3-300, 4-1200, 5-2400, 6-4800, 7-9600, 8-19200.

9,n and 10,n These two calls are used to control the flash duration for flashing colours. *FX9 sets the flash duration for the named colour, while *FX10 sets the duration for its complement, with n being set in 1/50ths seconds. If either duration is set to zero the complement colour will be permanently displayed.

11,n Sets the delay before a depressed key is auto-repeated, within being set in 1/100ths seconds. If n = 0 auto-repeat is disabled.

12,n Sets the repeat period for auto-repeat, with n being set in 1/100ths seconds. If n = 0 the auto-repeat delay and period are reset to their default values.

13,n and 14,n The BBC's MOS is described as interrupt driven. Put simply, it continually interrupts its current operation in response to one of a number of 'Events'. It will then deal with the event before proceeding with its current operation. These two calls allow the user to alter the MOS's response by enabling or disabling selected events. *FX13,n disables event n, *FX14,n enables event n. n = 0-output buffer empty, 1-input buffer full, 2-code entering input buffer, 3-ADC cycle complete, 4-start of vertical synch pulse, 5-interval timer at zero, 6-escape key pressed, 7-RS423 receive error, 8-service/network error.

15,n Flushes (that is, empties) buffers, n = 0-all buffers, 1-current output buffer.

16,n Selects how many ADC channels are active. If more channels are active than needed a program will run slower than necessary. This is due to the fact that conversion at each channel occurs sequentially, not concurrently, with each cycle taking 10ms. Thus if you are only sampling at one channel you can obtain about four

times as many samples in a given period if the other three channels are disabled, although there will also be a very minor slowing of the processor due to the extra number of interrupts.

Here, n = 0-disables ADC, 1-enables channel 1, 2-enables channels 1 & 2, 3-enables channels 1, 2 & 3, 4-enables all four channels.

17,n Forces ADC at channel n (channels are numbered 1-4, just to confuse you since the sound channels are 0-3).

18 Clears function keys of stored strings, ie wipes the key buffer at &B00-&BFF.

19 Waits for next TV frame synch pulse — useful to avoid screen shudder in animation.

20,n,y Controls the character set definition in modes other than 7. Normally the character set is said to be 'imploded', and one page of memory is set aside for redefinitions at &C00-&CFF. It is possible to store 32 character definitions per page, and Acorn says that characters &80-&9F may be defined here. In fact any character may be defined here, but if you wish to redefine more than 32 characters it is necessary to allocate more memory. The additional memory is allocated by the y parameter and is set aside just above OSHWM (better known as PAGE). Where n = 0-character set imploded, n = 1-character set exploded.

| Memory | Characters officially stored |
|---------------|------------------------------|
| y Used | |
| 0 OSHWM | &A0-&BF |
| 1 (OSHW+&100) | &C0-&DF |
| 2 (OSHW+&200) | &E0-&FF |
| 2 (OSHW+&300) | &20-&3F |
| 4 (OSHW+&400) | &40-&5F |
| 5 (OSHW+&500) | &60-&7F |

It is not possible to redefine the control codes.

21,n Allows the flushing of selected systems buffers, n being the buffer number, n = 0-keyboard, 1-RS423 input, 2-RS423 output, 3-printer output, 4-sound channel 0, 5-sound channel 1, 6-sound channel 2, 7-sound channel 3, 8-speech output.

123 A user supplied printer driver must send this call to indicate to the MOS that it has completed its task.

124 Reset Escape flag pointer to &FF — the no escape condition.

125 Set Escape flag pointer — this will force an escape event.

126 This call must be sent to acknowledge an escape event.

137,n Controls the tape motor relay in a similar manner to *MOTOR, N = 0-motor off, n = 1-motor on.

138,n,y Places the character whose ASCII code is y into buffer number n, buffers are numbered as given in FX21.

139,n,y Selects filing system options in an equivalent manner to *OPT. If n = 1 and y = 0-no messages, 1-short messages, 2-detailed messages. If n = 2 and y = 0-ignore errors, 1-prompt for retry on error, 2-abort operation on error. With n = 3 the Interblock gap is given in y, in 1/10ths second.

140,n Selects the Baud rate for the CFS and is equivalent to *TAPE, n = 3-300 baud, n = 12-1200 baud.

141 Selects the ROM cartridge system, equivalent to *ROM.

142,n Passes control to the Sideways ROM in socket n. On the unexpanded BBC there are four Sideways ROM (SWR) sockets—the full complement is sixteen. The ROM is selected by placing a number between 0 and 15 into location &FE30. If the four sockets are present the links on the board force them to be addressed as if they were all sixteen.

Thus SWRO, SWR4, SWR8 and SWR12 are all the same ROM. SWR15 is assigned the highest priority and is entered on power-up or a hard reset. This call forces the selection of another ROM language without having to make a service call, eg *EXMON.

144,n,y Addresses the 6845 video controller in the same manner as *TV, y controls the field interlace, y = 0-interlace on, 1-interlace off. n controls the horizontal position of the picture, ie n = 1-move picture up one line, 2-move up 2 lines etc, n = 255-move picture down one line, 254 down 2 lines, etc.

These changes are only effected at the



next mode change and it is not possible to remove interlace in mode 7.

147,n,y Write to Fred Input/Output area, n = offset from &FC00, y = data byte.

149,n,y Write to Jim Input/Output area, n = offset from &FD00, y = data byte.

151,n,y Write to Sheila Input/Output area, n = offset from &FE00, y = data byte. eg to alter the format of the RS423 transmit sequence, the offset of the 6580 control register is 8. Thus *FX151,8,y will produce:

| y | No data bits | Parity | No stop bits |
|----|--------------|--------|--------------|
| 2 | 7 | Even | 2 |
| 6 | 7 | Odd | 1 |
| 10 | 7 | Even | 1 |
| 14 | 7 | No | 1 |
| 18 | 8 | No | 2 |
| 22 | 8 | No | 1 |
| 26 | 8 | Even | 1 |
| 30 | 8 | Odd | 1 |

This could be used to configure the printer interface to non standard printers.

The next issue of PCN will conclude our current list of *FX commands.

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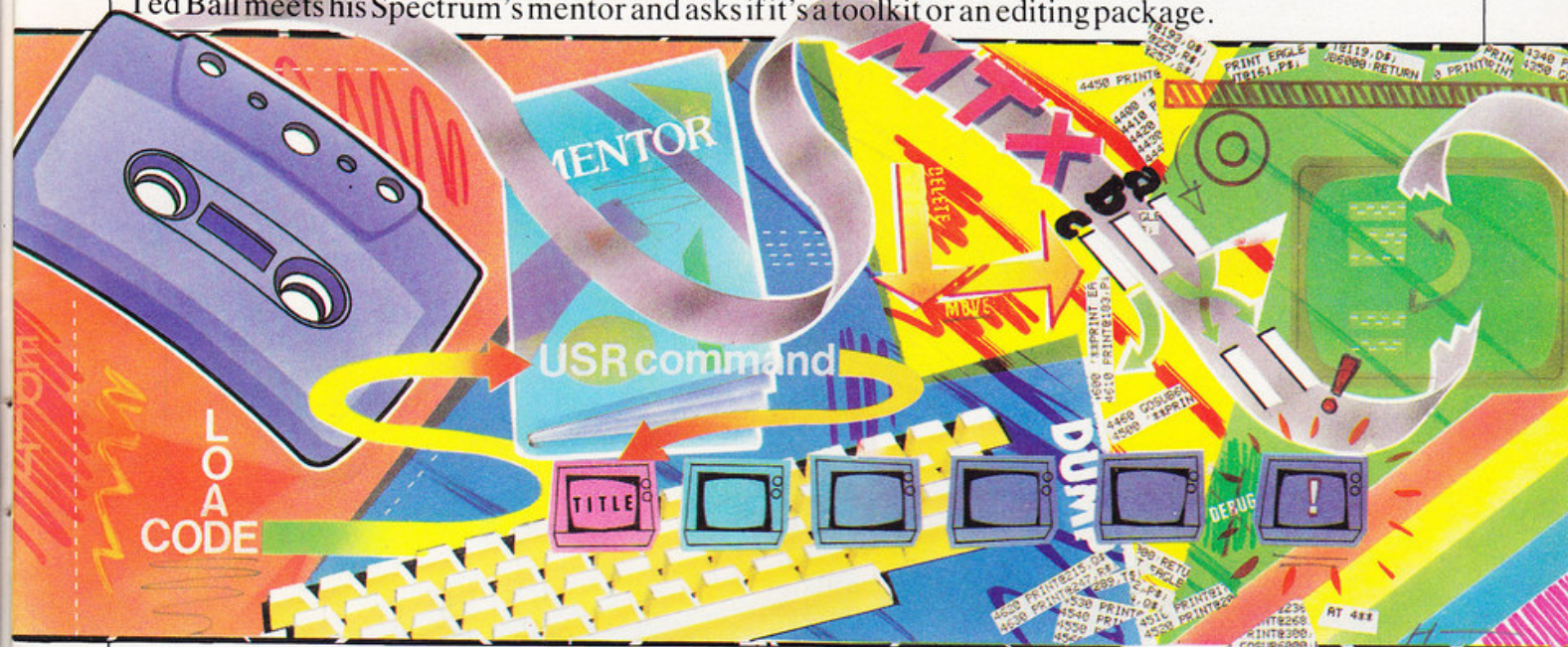
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Ted Ball meets his Spectrum's mentor and asks if it's a toolkit or an editing package.



What's my line?

When you are writing a Basic program you often want better editing facilities than are provided in your computer. Mentor, for the 16K or 48K ZX Spectrum, gives you a number of block and global editing commands to supplement the Spectrum's built-in line editor.

Features

The editing functions provided in Mentor are:

Renumber This changes the line numbers so that they are in a neat sequence, and also changes the line numbers in GOTO and GOSUB statements. However it will not change the GOTOs and GOSUBs if the line number referred to does not exist or if the line number is specified by an expression.

Block text operations These functions allow you to move a block of lines to a different part of the program, copy a block of lines to a different part of the program, or delete a block of lines. The operations are normally followed by an automatic renumber, but you can suppress this if you wish.

Search operations With these functions you may search the program for any string, which can include Basic keywords; search for GOTO and GOSUB statements that contain a line number; or search for GOTO and GOSUB statements that contain an expression. If the search is successful the line is displayed, and you can continue to search the rest of the program.

String substitution This allows you to specify target string and a replacement string. Also, Mentor will search the program, displaying the lines containing the target string and give you the option of substituting the replacement string at each occurrence.

Variable dump This allows you to display the program variables in the form they are

stored in the Spectrum (as explained in Chapter 24 of the Spectrum manual). The variable name is displayed in ASCII characters but the rest of the data is displayed as the hexadecimal values of individual bytes.

Presentation

The cassette is clearly labelled and has two copies of the Mentor program recorded on one side.

The documentation consists of three pages copied from a typed original. Although it describes all the functions included in Mentor and gives the syntax for the commands, it is not easy to follow.

Getting started

Getting Mentor up and running is rather a tedious job that could have been made easier. First you have to load the machine code, then run it by typing in a USR command. Then you have to work through a title screen and five screens of instructions. It's the fifth screen that contains the instructions for actually getting Mentor relocated and running.

In use

Once you have Mentor loaded and running you can type in or load your program from tape, and use the Mentor functions for editing. However, it takes a little time to get used to the commands, as they are not clearly explained in the documentation and you have to experiment to find out exactly how the commands operate.

For example, to move a block of text you have to type in "MTX a,b,c" and the documentation says that 'This moves the text between lines b,c to line a location'. However, it is not until you have tried it that you find that the block that is moved includes line b, does not include line c, and that the block ends up immediately in front of line a.

Most of the functions operate almost instantaneously, but the renumbering takes an appreciable time. Mentor took 2 minutes 10 seconds to renumber the 370 line program I used to test it on. That may not be much slower than most renumber programs, but it's a long wait when it happens after every move, copy and delete.

Reliability

I could not find any bugs in Mentor. It gives an error message if you type in invalid commands such as trying to move non-existent lines. It also gives error messages if renumbering would give a line number greater than 9999 or if there is not enough memory left to carry out a block copy operation.

Verdict

The documentation describes Mentor as a 'toolkit', but it is really an editing package. You could reasonably expect a toolkit to include debugging aids as well as the editing functions, but the only debugging aid in Mentor is the variable dump and this does not display the variables in a suitable form to help you debug a Basic program.

The editing functions are useful, but you have to specify a block of lines by giving the numbers of the first line in the block and the line following the last line of the block. And that certainly doesn't make for ease of use.

RATINGS

Features
Documentation
Performance
Usability
Reliability
Overall value



Name Mentor **Application** Basic program editor
System ZX Spectrum, 16K, or 48K **Price** 8.95
Publisher JK Gosden Software, Timeslip, 13
Ashted Common, Ashted, Surrey KT21
2ED Format Cassette **Outlets** Mail order

● This is an entirely new computer system. It was designed with both eyes fixed firmly on the future. So that whatever shape the future takes, we'll be able to fit it into the system. Just as simply as the peripherals and software already available fit into the system. That way, the system will grow with you. And you'll never get left behind.

● Based around the Z80A microprocessor, and utilising Microsoft™ BASIC, Aquarius™ has 8K ROM and 4K RAM resident within its console. It is able to provide up to 16 colours and resolution of 320x192, and generates its sound directly through the television's speakers.

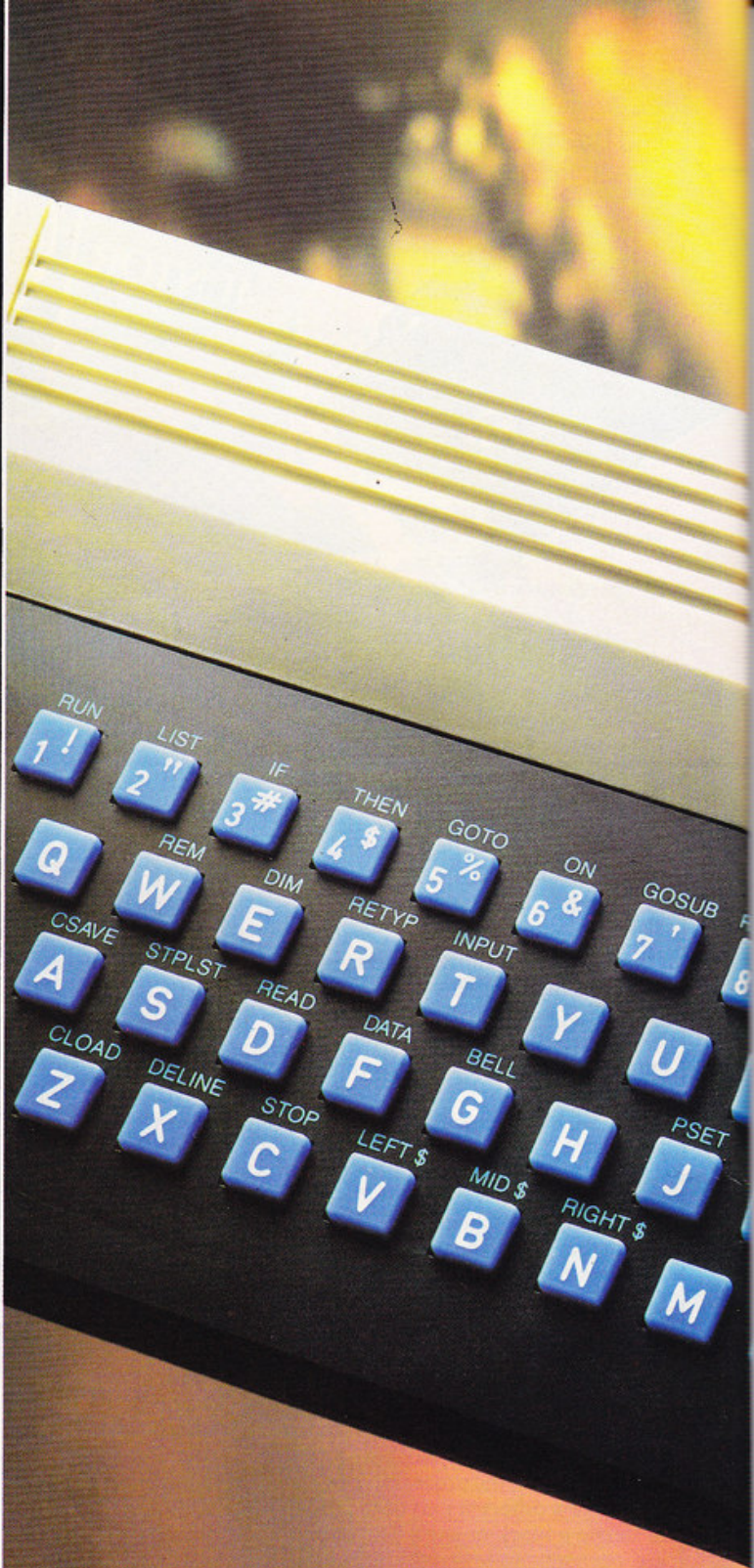
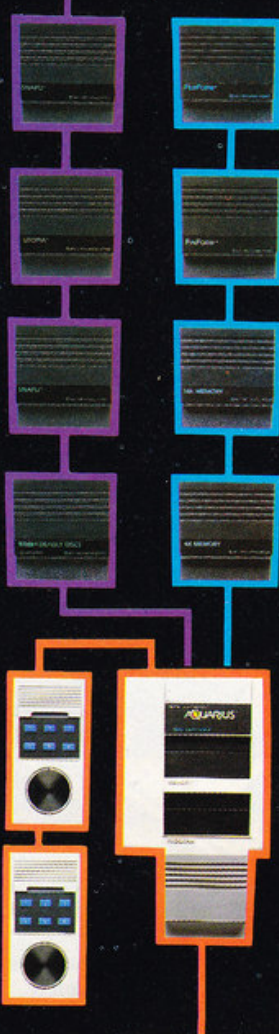
● With twin cartridge ports, the mini-expander allows simultaneous use of additional RAM and software cartridges. Twin disc game hand controls are included and the unit provides two additional sound channels. The 16K RAM cartridge plugs into either the console or the mini-expander, increasing Aquarius™'s RAM capacity to 20K.

● With the ability to reproduce the entire graphic and character set of Aquarius™ at 80 characters a second, the printer's 40 column output allows transcription of the complete monitor image.

● Using standard audio cassettes, the data recorder provides storage for programs and information, and allows the use of cassette based software. Incorporating a digital tape counter and transmission indicator, it operates sequential searching.

● A large number of games, designed to take advantage of Aquarius™'s sophisticated colour and sound capabilities, are available on cartridges that plug into the console either direct, or through the mini-expander. Cassette based games can be used via the data-recorder.

● A wide range of preprogrammed cartridges is available, including the LOGO teaching program and practical home data systems like FILEFORM™ and the spreadsheet calculator package, FINFORM™.



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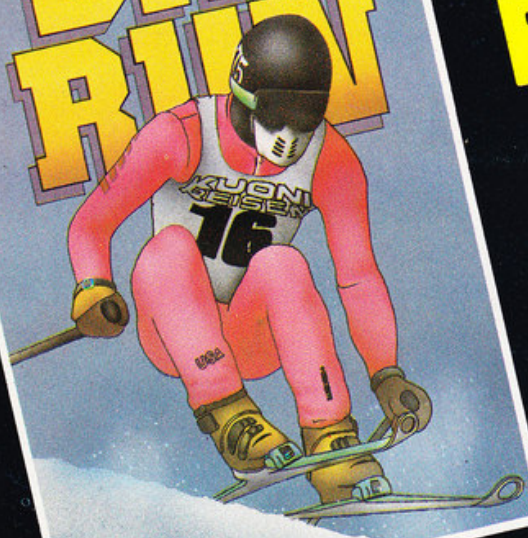
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Does Stock Control really tally with running a small business? Bill Quentin loads it up.

The program provides a basic stock control system for the small business. It is a stand-alone system and cannot be linked to other Kemp products, such as the Sales Ledger. This means that all the records must be entered on a daily or weekly basis, increasing yet again the book-keeping requirements of the business.

Features

Stock Control is like a card index file in that every stock item has a *page* in the program. These pages can be *created, deleted, corrected or displayed* according to the wishes of the operator. Here are the print-outs that are available:

STOCK LISTING Stock number
Stock description
Stock level
Reorder flag
Stock value
(for all individual stock items)

STOCK VALUE Total stock value
(for the whole stock)

REORDER LIST All items to be reordered
Stock numbers
Stock description Cost
(for the whole stock)

The reorder list can only be reproduced on the printer. Records of stock changes, deletions etc can also be printed.

Stock Control's search facilities are primitive, allowing a match of only the first four letters of either the stock description or supplier's name. In most cases it's considerably easier to perform a full stock listing and grab the information as it scrolls up the screen.

The program provides the following information on each stock item:

| | |
|----------------------|-----------------------|
| Stock number | 4 characters |
| Stock description | 20 characters |
| Supplier description | 4 characters |
| Unit cost | 000 000.00 |
| Reorder level | 7 figures |
| Present stock | calculated by program |
| Value | calculated by program |

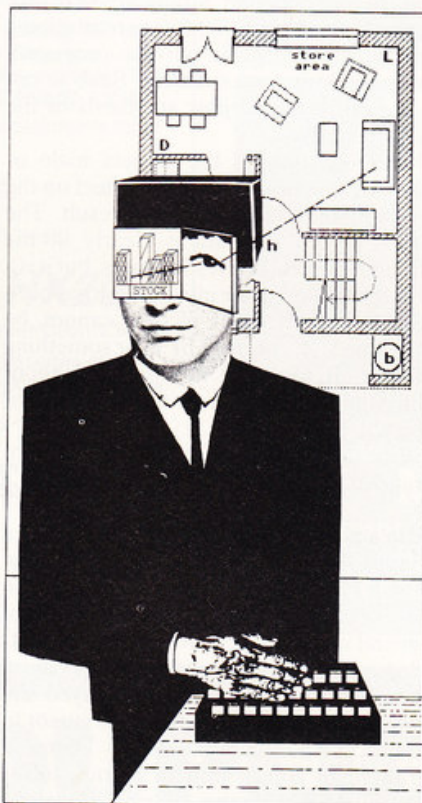
Presentation

Stock Control, like the other programs from the Kemp stable, comes in a very attractive box with a beautifully printed leaflet.

Kemp should put far more material into its manuals, as 8 pages of A6 is scarcely enough space to describe the operation of the program, never mind detailed information about operating a stock control system. It is important that programs designed to introduce the user to business systems, such as stock control, should not assume prior knowledge of operating such a system.

The manual is an adequate reference for general operation for the program, although there is neither an index nor a list of contents. The text is succinct and when read in conjunction with the on-screen

The stock answer on Spectrum?



comments allows the user to get the program flying without undue fuss.

It is a pity that more use wasn't made of the Spectrum's considerable graphics capabilities.

Getting started

The program takes about ten minutes to load-verify and save-verify, which are the minimum operations required for any transaction. This limits its use to end of the week summaries rather than a real-time system to be used in a store-room.

On entry into the program you are asked for the date, then confronted with the main menu. This is a list of all the various functions which can be performed by Stock Control. Option number 6 gives a complete listing of the stock, number 4 allows you to create a new record, and so on. It would be helpful if the selected option was described on the resulting display screen by more than its function number. Several screens are identical and it is easy to enter the wrong mode by mistake.

Only a cursory knowledge of the Spectrum is required to operate the program. The main area likely to cause problems is the saving, loading and verification of the program and data on cassette. A mistake by the operator, or a tape loading error, will require a BREAK

and GOTO instruction.

Ease of operation

Stock Control can be learnt in under an hour, but it might take weeks to fully understand the stock-control techniques necessary to integrate this package into a practical business.

The cassette contains a demonstration program followed by a working copy. The demonstration copy has a set of figures already installed and is therefore a useful training aid. The manual tells you to verify the program after loading it from cassette.

Reliability

A sample stock of 30 items was entered into the program for testing purposes. All the functions of the program were checked without encountering a software error. The data was saved-verified and then load-verified a total of 20 times without dropping any data.

The program uses the standard Spectrum routines for checking and verifying, data being dumped to and from memory, and therefore has some protection against data corruption.

Kemp supports all its software during normal office hours which makes for rapid problem solving should any untoward occurrences happen during program installation or operation.

Verdict

The program is easy to use and will find a ready market with small businesses needing more information about their stock. Stock Control will not, however, reduce the amount of book-keeping required to operate effective stock control.

It is unfortunate that the search facilities are so limited as surely the main advantage of a computer is to reduce the time taken to find stock records. Equally, I was disappointed to find that this program couldn't be linked with other Kemp programs so as to allow a sales ledger entry to automatically alter the stock levels.

The program is most definitely not designed to be operated in real-time. It would be most difficult to keep an up-to-date stock record by using this program to record each 'nut and bolt' being removed from the stock room. The problem with attempting this sort of application is the length of time necessary to load and save from a cassette. Kemp is presently developing a Microdrive version of Stock Control which may go some way towards alleviating this problem.

RATING

| | |
|---------------|------|
| Features | ☆☆☆☆ |
| Documentation | ☆☆☆☆ |
| Performance | ☆☆☆☆ |
| Usability | ☆☆☆☆ |
| Reliability | ☆☆☆☆ |
| Overall value | ☆☆☆☆ |

Name Stock Control **Application** Accounting
System Spectrum 48K **Price** £14.95 **Publisher**
Kemp Ltd, 43 Muswell Hill, London N10 3PN,
01-444 5499 **Format** Cassette **Other versions** none
Outlets Mail order (soon to be distributed nationally)

Colin Cohen looks at five educational games for home or school use on the BBC Model B.

Learning as you play

Even though you might find it far-fetched, it's nevertheless possible for a four-year old (or younger) to manipulate a computer providing that a suitable program is run. So program quality has to be judged not only on its originality, usefulness and technical competence, but also its kid-proofness. This means that all the keys not needed for control are disabled and that pressing a legal, but incorrect, key is not too disruptive. For the supervising adult this can be a little difficult as the Escape and Break should be disabled — Escape often to take you back to a menu and break only usable in conjunction with SHIFT/CTRL.

It goes without saying that the program should also load first time round, and it's often a help if the RETURN key does not need to be used after entering a choice to exit a menu.

Visual and memory skills

Facemaker (age range 5-12). As with all the programs in this series it starts with an attractive title page while the program loads in six stages. The packaging and documentation are good. The latter is perhaps over-cautious in starting with the instruction *TAPE, presumably in case you are using a disc system. Each tape is marked with the loading time, repeated on the screen.

Before drawing a face the child enters their name and the subjects: the software automatically inserts a capital for the first letter before the drawing starts. The compilation of the drawing is on an indentikit basis whereby the child is asked a series of questions about the person being drawn and the appropriate features are displayed each time 'return' is used.

The speed with which a child can work this program will depend on the ability of the child to read the choice of words offering the different features. As with the other programs in the series a couple of neat graphic symbols are used — a finger pointing at the space-bar appears when the next stage of the program is needed and a smiling face in a question mark if the computer does not expect the answer given. Sometimes the latter is replaced by

just a beep.

At stages throughout the program the child is given the chance to go back over the last stage and redraw if the face being drawn does not come up to expectations. It has to be said that although there are apparently about 1,000,000 permutations, faithfulness to life is not the program's strongest suit, and even the Beeb is not quite up to the graphic standards of the documentation.

The question 'is the subject male or female?' seems to have more effect on the prompts than on the finished result. The value of the program is clearly in the thought process that it stimulates, but it is a pity that although the information has been asked for, the final picture cannot be captioned 'X's portrait of Y' or something similar. It took my five-year old about thirty minutes to draw and revise her first face.

It's also a pity that BREAK is not trapped as the program can't be OLDed.

Hide and Seek (age ranges 5-12). This is a Happy Families/Hide and Seek type game which certainly has better graphics than earlier ones I've seen. There's a choice of several variants, the first of which (Find it) places objects in six boxes and then covers them. One of them is then displayed and the space bar is used to move the cursor to the corresponding location. There is gratifyingly good sound for a 'find', and as with all ASK programs, the sound level can be varied with CTRL/S.

Seek uses a three by three grid. There are four variants, some of which require the child to place the pictures in the boxes and some of which do it for you. One version blanks out each picture the moment it is in position. Finally, the What's Missing version involves spelling ability, with a lexicon of 36 words.

Numerical skills

The programs in the series are counting aids, starting with *Let's Count* which is genuinely for children from three upwards. Only the numbers 1-9 are used and the cursor is moved with the space bar. If you overshoot the cursor starts to backtrack to

allow a second or third attempt. In two of the games (Treasure Island and Space Stations) matching numbers of objects have to be grouped, with a sea shanty or a rocket launch as a reward.

In *Which Way*, equal or unequal numbers of red and blue 'objects' are displayed and the child has a choice of two or three alleys to send them down, depending on which there are more of. It's only on this last one that the documentation is less than satisfactory.

Number Gulper (age range 5-12). This may be the only program in this series too difficult for the youngest of the group for which it is intended, or even their parents. There are many different levels (numbers from 1-9999 can be selected) and the whole exercise takes place against a clock. Choose a make number and the computer chooses a made number. Gulper has to be steered round the board gulping the numbers which produce the make number when added or subtracted from the made number.

I found the gulper difficult to control and the program not quite crash-proof: the space bar should pick up the number and add/subtract it to/from the made number. I found it could pick it up without doing the maths.

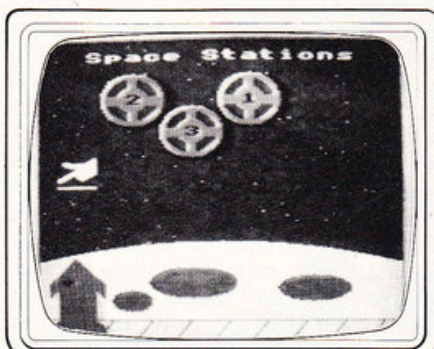
Number Puzzler (age range 4-12). This is the most difficult game in terms of the number of different levels available and in the mixing of addition and subtraction. You can play against a friend or the computer, but the latter tends to be too fast for a child to see what is happening.

The first games are a sort of musical noughts and crosses and easy enough to grasp, though much more difficult to play against the Beeb than ordinary noughts and crosses. Magic square is even more difficult and requires a very good understanding of numbers.

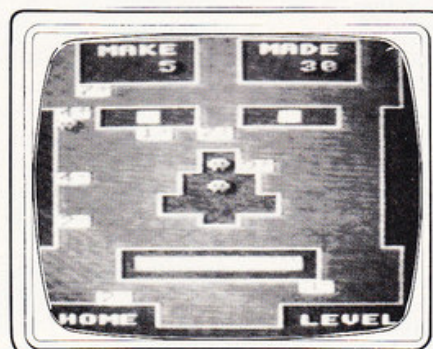
Price £9.95 each **Publisher** ASK Ltd, London House, 68 Upper Richmond Road, London SW15 2RP, tel 01-874 6046 **Format** Cassette (disk soon) **Language** Basic and machine code **Other versions** Vic 20 **Outlets** Acornsoft and retail.



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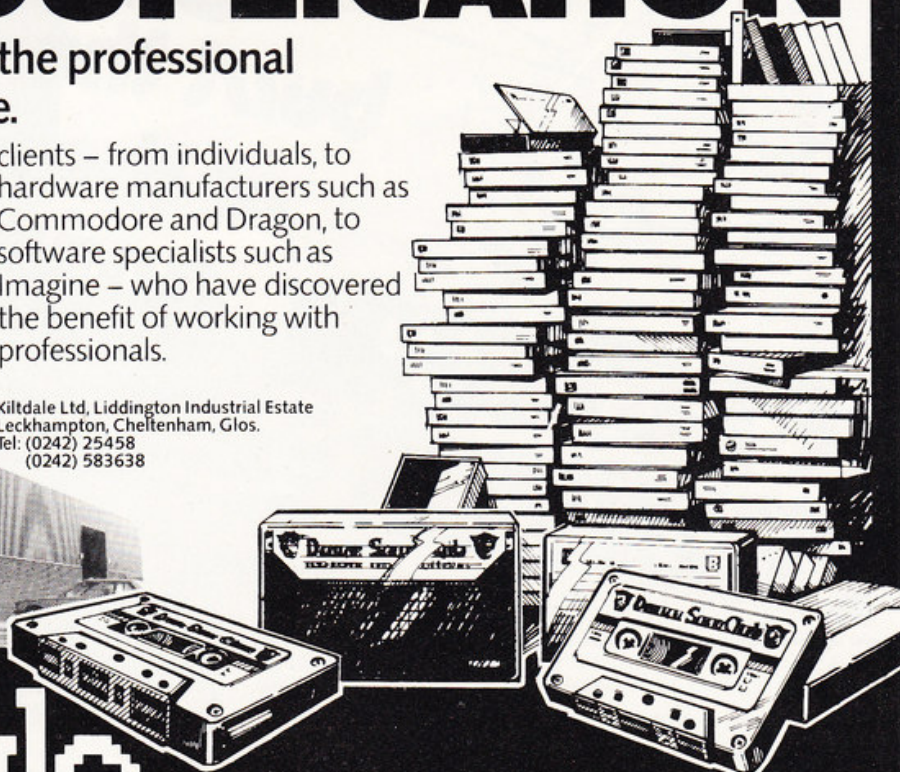
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John Lettice reveals a low-end micro printer lurking inside a cheap, portable typewriter

Oh Brother!

The Brother EP-22 is claimed to be the world's smallest electronic typewriter, but it's a lot more than that. It's battery/mains, and a built-in RS232 interface means that, for under £170, you can get a reasonable quality printer for your micro. The entire set-up costs you less than some of the interfaces you can get for the pricier electronic typewriters, and — initially at least — the RS232 screams Interface 1 at you loud and long.

The EP-22 in this sense could provide a toe-hold in word processing for many an owner of a low-end micro.

Presentation

The machine comes in a fairly durable box, with a couple of wedges of polystyrene inside. The packing seems firm enough, and inside this you find the Brother tidied away in its carry case, so it's not likely to come to a great deal of harm in transit.

The case itself is something else. It's around 31cm x 23cm x 5.5cm, with all the bits you're liable to need securely clipped into place. There's a fold out carrying handle, and a plastic cover for the RS232. The latter has a special place inside the lid where you can clip it when you're using it as a printer.

The inside of the lid also has clipping space for two spare carbon ribbons, and a plastic band to hold a couple of sheets of paper or documents in place. The base of the machine doubles as the bottom of the case. Ergonomically speaking it's all very pretty.

Features

The EP-22 is a plain paper, thermal printer/typewriter that will take standard A4 sheets, and will give you anything up to 75-column printing, although at this width your margins will be non-existent. Practi-

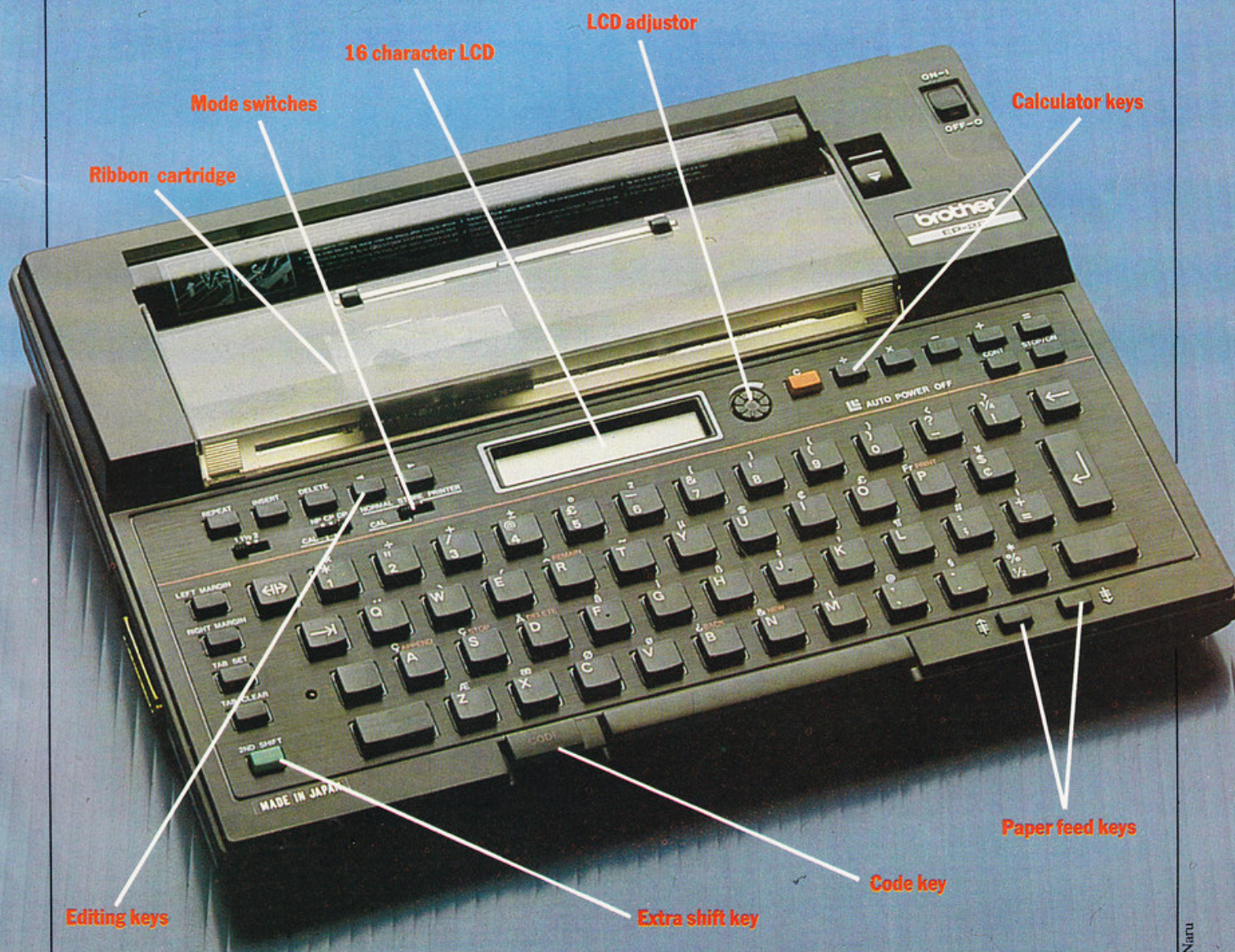
cally, you're therefore talking about 64 columns. It has a standard qwerty keyboard, but with a second shift that allows you three characters from most keys, plus a calculator mode that gives you a few basic arithmetic functions.

It has three basic printing modes — non-printing (where you can store up to 2,015 characters, or about a page of A4, in memory for printing out later, corrected printing (where it prints out 16 characters behind the ones you're typing, allowing you to correct as you go) and direct printing (where it acts as a normal typewriter). It has no descenders but is much more legible than some other printers.

It's difficult to see what you're typing through the smoked plastic cover, but there's a 16 character LCD that shows what you're typing as you type it in, whatever mode you're in. Carriage return is not automatic, even when you're typing into memory, so you have to hit return every time you hear the beep.

When used as a printer, the EP-22 has a transfer rate of 300 and 75 baud, with a 78-byte buffer. The information given on using the machine as a printer is fairly

► 43



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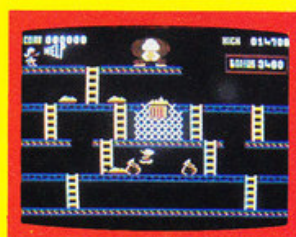
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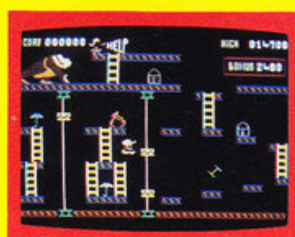
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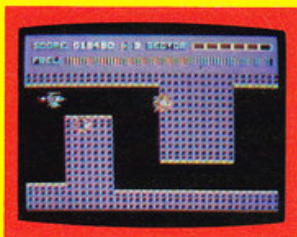
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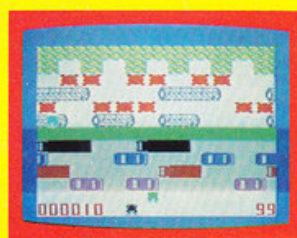
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41 sketchy, although the codes are better presented than in the manuals of some considerably more expensive printers.

In use

Getting going in typewriter mode is easy enough. You slip a sheet of paper behind the roller, press the index key, and watch the roller pull in the paper. You then lift the dust cover, press paper release and adjust to your taste, close the cover, close paper release and you're off.

You're now ready to type away; the size of the unit means that the angle of the keys isn't all it might be, and the keys are relatively small, but I found I soon got used to them. One peculiarity about the keyboard is that I found it considerably easier to type with the thing on my lap than on a desk — if you think about it, this is an advantage in a portable.

But if you're typing away direct, you'll run into Tippex troubles when you try to correct. Pouring correction fluid into the works of this one doesn't seem such a smart idea. The corrected printing mode is obviously the answer here.

Printing quality is nothing to write home about, but is good enough to serve its purpose. When you're using the carbon ribbon you get a relatively grey overall look, but photocopying experiments showed that the density of the little black dots was great enough to produce adequate copies.

You get into thermal printing by taking out the carbon ribbon and using thermal paper (the stuff supplied was white and standard A4 size). The manual doesn't tell you this, so you could spend a fruitless hour or so looking for the relevant — and non-existent — mode switch.

Thermal printing is in a tasteful blue, and is very easy on the eye — this, however, doesn't photocopy as well as the carbon ribbon. You can't take carbon copies — the Brother is a bit fussy about the thickness and texture of paper you use — and this is where the 2K memory comes in. The theory is that you type your page, store it, then print out the number of copies you require.

Using the machine as a word processor will take a little getting used to, if only because the people most likely to buy it won't have much experience of them. They'll either be owners of cheap micros, or they'll be businessmen who normally have someone else doing their typing. One idiosyncrasy is that you seem to have to do all your editing on page — you can't add copy in the middle of a file stored in memory.

The most obvious goof to make is to forget to tell the machine when you want to store text, as it doesn't tell you when you're wasting your time. The way you store is to switch the mode switch to Store, press the code button (left of the space bar) and 'a', and respond 'y' to the question 'New text?' You can then be in no-print, corrected print or direct print, and still store what you're typing.

Once you've finished typing, press the stop key, and 'Store stop' appears in the

LCD. The text is then in the memory, even if you switch off the machine.

You can use a number of methods to insert or delete. You can use the keys marked as such for the odd character, while code/b deletes the last 16 characters, and code/n deletes the lot. The manual has a nice little picture showing the question 'Delete text?' at this point, and says that no deletion is made if a key other than 'y' is pressed. I was initially unable to achieve this happy state, but I later discovered that it was just saying 'New text?' and although it looked like all was lost, it wasn't.

Insert is a lot safer, and you're given fairly clear instructions as to how you prepare form letters and the like, with plenty of examples of use.

Using it as a printer is another matter. The manual is user friendly up to this point, with lots of little pictures showing you what to do, but here you're just told how to switch it into printer mode and change the baud rate. You're then given a couple of

Top right: The EP-22 is slightly smaller than a briefcase, complete with fold-flat handle. Right: The 16-character LCD display.

tables showing you what the technical details are, but apart from that you're on your own.

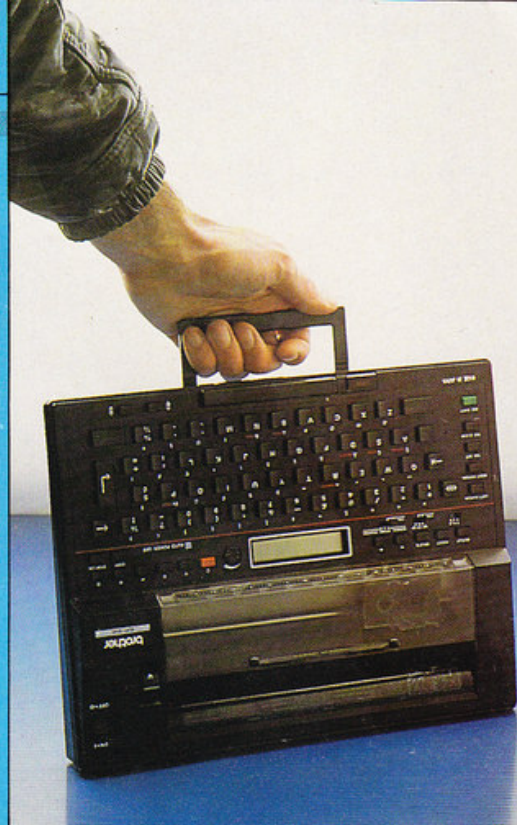
In order to be able to use it as a printer, you need the correct cable between the Brother and your micro. Lowe Computers, the main distributor for the EP-22, is currently making up cables for the Colour Genie and the BBC, but has no plans to produce them for other micros. So if you do buy an EP-22, it would make sense to get your dealer to make up a cable at the same time, and make sure it works with your machine.

After an hour or so of wrestling with the Brother as well as one another — a team of PCN specialists managed to get it working with a Tandy Model 100. It didn't work at all at 300 baud, and we put this down to slight variations between what the Tandy thought was 300 and what the Brother thought was. After a little tinkering, 75 baud did the trick, so it is possible, and this duo would produce you a very nice portable system.

There should be less trouble linking up the Brother to the BBC or the Genie, but you'll almost certainly run into a few brain-bending problems with other micros. It can be done, and you'll be able to get it done, but it's a pity, considering the effect the EP-22 could have on the printer market, that you won't get more help.

As regards formatting, it seems that you'll have to do most of this through software. The line spacing key on the printer is operative when you're on-line, but the margins are not. So things like word wrap-round and justification need to be handled by your micro.

Standard continuous stationery will fit, although you'll have to rip off the tractor



feed holes first, and you'll again have to handle page breaks through software.

The machine is powered either by four U2 type batteries, or by a 6V DC power source. Brother has a standard PSU which will operate with it, but even if you are using it with a mains supply it uses the batteries to retain memory when it's switched off.

The PCN test machine ran quite happily on batteries alone during the test.

Verdict

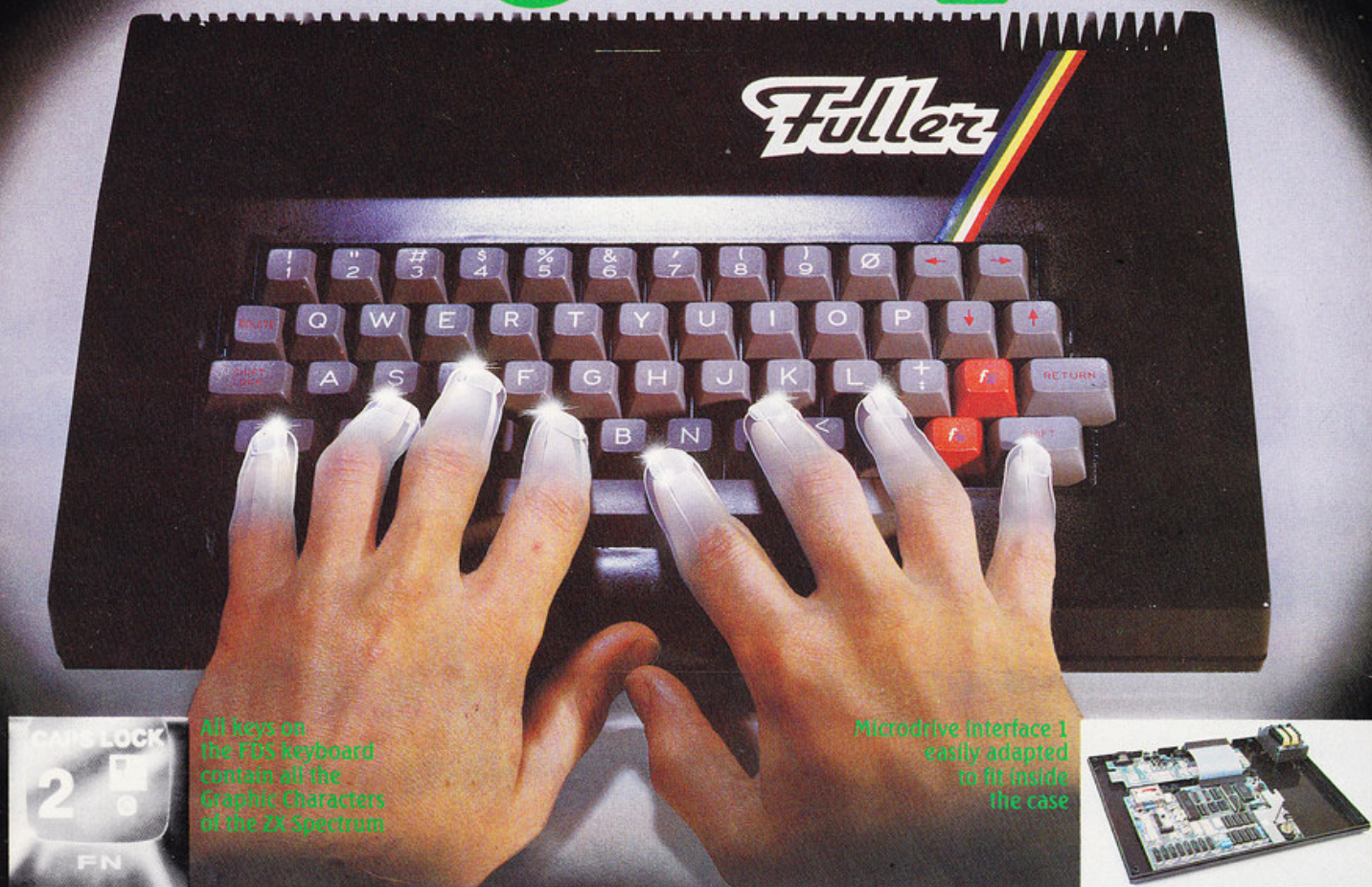
At £170 the EP-22 just has to be a good deal. It's worth the money as a typewriter, never mind a portable typewriter, and for a word processor — albeit an idiosyncratic word processor — and printer it's nothing less than a bargain.

Granted, you may have interfacing problems, the print isn't daisywheel quality, and you don't get descenders, but you get all these problems with printers at double the price. And the machine is so quiet that you could use it as a portable typewriter in situations you'd otherwise never have dreamed of.

Of course, there are limitations. You can't — I think — do anything other than text output, and although the print output is perfectly acceptable, it isn't what you'd expect from the high powered business person Brother would no doubt like to buy it. But at this price you have to sacrifice some flexibility, and as it is it's well worth the cash. Roll on the EP-23...

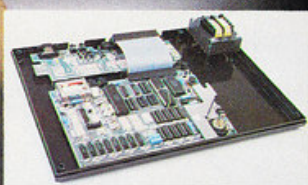
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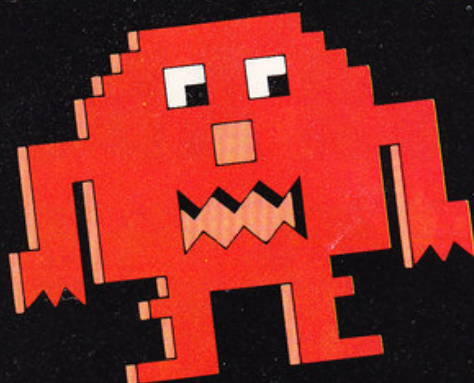
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John Lettice welcomes a Centronics interface for the Jupiter Ace and Sinclair Spectrum.

It all ADS up now

Just a few months ago the Sinclair Spectrum and the Jupiter Ace were pretty lonely machines. It was difficult to link them to a wide range of peripherals because of the dearth of interfaces. While there were some interfaces available for the Spectrum, Ace owners must certainly have been feeling aggrieved at the lack of support their machine was getting.

The Spectrum, of course, has had a run of excellent interfacing devices recently, courtesy of Sinclair Research. The launch of the ADS Centronics Interface also means that the Ace, if not coming in from the cold, has at least been thrown a pair of gloves.

The ADS comes in two versions, the straight interface for the Spectrum, which plugs firmly into the edge connector and will drive any Centronics printer, and the slightly more complicated version for the Ace. Here you first fit an adaptor card to your Ace, then connect the interface and your RAMpack to the card.

A tape with the necessary driver software — Spectrum on one side, Ace on the other — comes with the ADS. In the case of the Spectrum, this is a piece of re-locatable

machine code. This means that it can be shifted around in RAM, and will therefore work with all but the fussiest of programs.

However, it is unlikely to work with software that moves RAMtop.

In the event of your having any difficulty with a particular program, clear instructions are given on moving the code's location.

Things proceed just as smoothly with the Ace, although Ace users are much more likely to be using the ADS to take advantage of the ZX Printer, rather than testing the joys of 80 columns. Using the command PRTON will send all output via the interface to the printer, while PRTOFF switches this off. COPY will get you a screen dump.

In use

It can't be often that a single device can have (apparently) two such widely differing applications. For the Spectrum, the obvious thing to do was to run micro, printer and Tasword2 as a word processing system, and the three seemed to get on very well together.

Considering the dearth of software for

the Ace, the most likely use for the ADS will be to provide a hard copy output for program listings, and again it does this well. It probably wouldn't make sense to run it with anything more expensive than the ZX printer, unless you already had a larger one, but this set up should provide all the budding Forth programmer is likely to need.

Of course there are hazards with any interfacing project of this kind. The Spectrum's tokenised keywords are a particularly obvious problem. As the letters of the commands are stored as single tokens rather than as separate ASCII codes, just sending them to the printer wouldn't work.

The ADS therefore decodes the tokens and translates them into the ASCII codes that will be understood by the printer. The software assumes that codes above the value of 164 are tokens, but should you need to send data bytes above this value you can.

Using the Spectrum's Basic COPY command also causes problems, so if you wish to use this command you must use a routine (provided on the driver software cassette) which emulates this. You call it by using RANDOMISE USR 23310, which dumps the screen contents to the printer.

The code provided drives a Seikosha GP-250X, but information is provided to allow you to alter it for other graphics printers.

As far as the Ace is concerned, things are rather more DIY. Once you've got over the initial shock of being able to use word processor class printers and graphics plotters, you'll probably start wondering where you're going to get the word processor class software to run with it.

Verdict

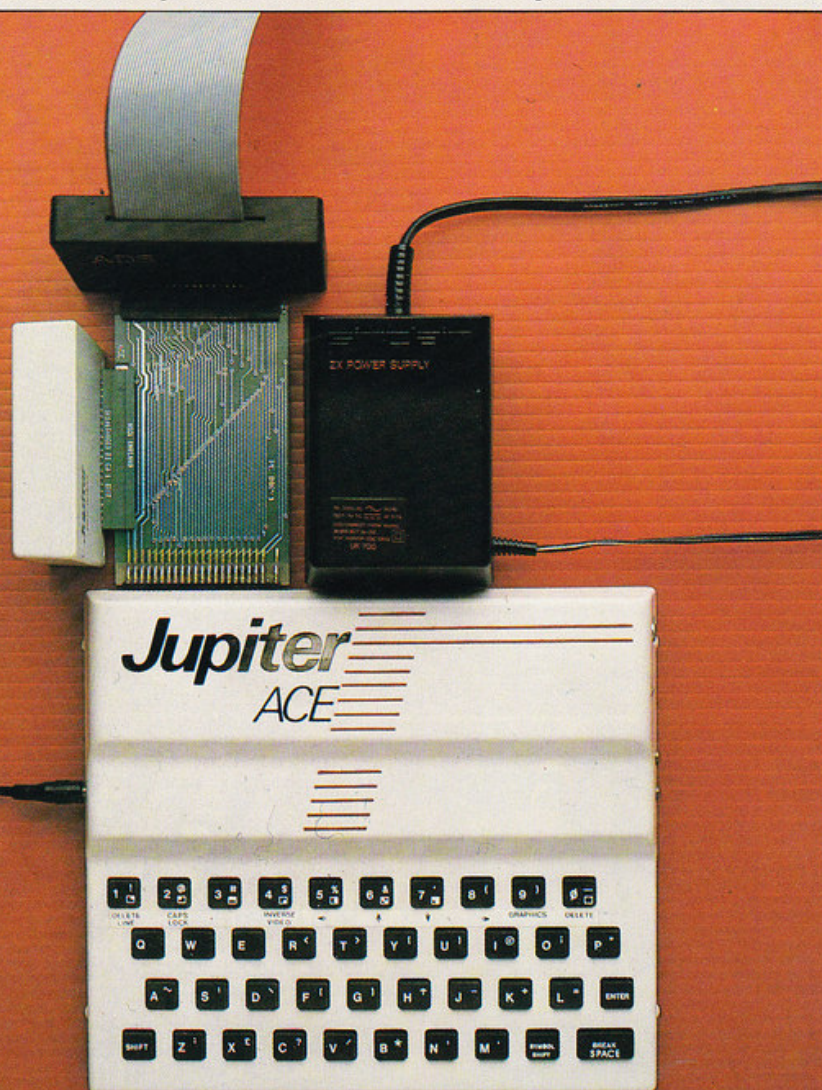
From the point of view of the Ace owner, the ADS interface is undoubtedly a winner. At £34.50 it's a reasonably cheap way to use the ZX Printer to produce hard copy listings, and although it's clearly something of an uphill task, it at least means the hardware for more complicated text and graphics handling is there.

Its position *vis-a-vis* the Spectrum is a little more problematical. Granted, it's a cheap and effective Centronics interface, but with Sinclair Research plunging into interfaces in a big way, Spectrum owners may be thinking more in terms of going RS232 with Interface 1.

That said, there will be Spectrum owners who'll want a Centronics interface, and in terms of efficiency and value for money, the ADS is certainly highly competitive.

Item ADS Centronics Interface **Machine** ZX Spectrum and Jupiter Ace **Price** £34.50 **Contact** Advanced Digital Systems, 9 Bonchurch Road, Portsmouth, Hants PO4 8RY, tel 0705-823825.

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ADVENTURE

48K SPECTRUM

Viking
voyage

Name Valhalla **System** Spectrum
48K Price £14.95 **Publisher** Legend
Format Cassette **Language** Machine
code **Other versions** None **Outlets**
 Some retail, mail order from
 Legend, Freepost, 1 Milton Road,
 Cambridge CB4 1UY.

If you've always fancied yourself as a flaxen haired nordic demigod, but you've found Burton's doesn't stock your size in winged helmets, help is at hand. Valhalla is half epic, half cartoon strip, and its Norse setting is ideal for those with the fjords in their bloodstream.

The graphics screen features a sort of strip cartoon, where the characters actually act out the 'screenplay' seen in the text window below. So, if Thor attacks Loki, you'll see Thor stride across the screen towards Loki, and start beating him about the head with an axe. You'll find you tend to sit back and watch this happen, and the other characters are perfectly capable of carrying on without you, but should you feel inclined to actually do something, there are six quests you can be getting on with.

Objectives

You have to wend your way through Asgard, Midgard and Hell to pick up a key, a ring, a shield, a sword, an axe and a helmet. In order to do this you'll probably have to pick up a key,

a ring, a sword, etc . . . but you must understand that the quests' objects are actually special versions of the above artefacts.

The quests must be performed in order, and are increasingly difficult. They should easily fill in the odd spots of tedium you run into in those long arctic nights.

In play

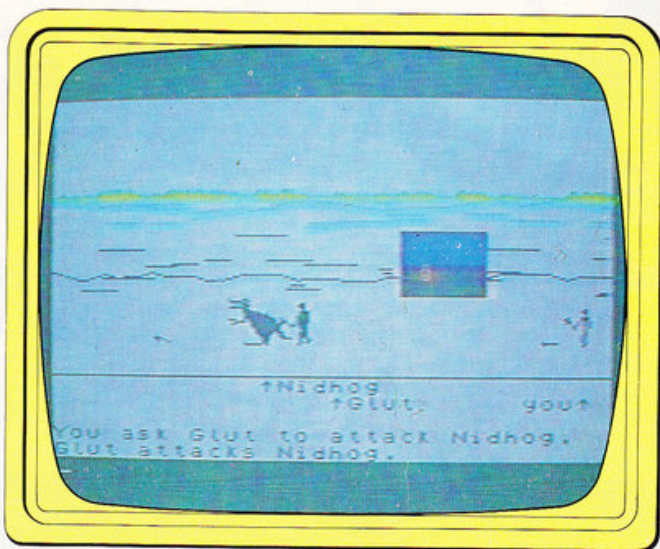
You start off with 200 crowns and your brains. If you want to keep the latter inside your skull it's advisable to get yourself arms and armour fairly sharpish. You can buy these from various other characters, but you can also find them lying around.

You'll also need food and drink, which is there in abundance to start with, but disappears fairly rapidly as you and the rest of the cast munch through it. You can sometimes induce characters to give you things, particularly if the character in question — Thor, for example — suffers from total eclipse of the brain.

Thor in fact found himself on the receiving end of one of my earlier wheezes. First induce Thor to give you the axe, then use the axe to kill an unarmed Thor. I regarded it as a lesson in life for the lad . . .

As far as the condition of your soul is concerned, you start off about half way between good and evil. Your goodness rating changes depending on whether you attack the good characters or the bad characters.

Working on the assumption that being good would probably



mean not being sneaky, I decided to join the blackguards. It might also have had something to do with an encounter I had with arch goodie Odin, who first extracted 50 crowns out of me for a ring he apparently didn't have, then took a ring from one of his henchgoddesses in order to complete the transaction.

Thinking dark thoughts about gods, landlords and pawn-brokers, and feeling practically ruined, I hobbled off in search of a bargain basement sword. Fortunately, shield and helmet were to be found just lying around.

Rings were also to be found in abundance, and I got this recurring vision of Odin sitting behind a large leather-topped desk smoking a fat cigar. However, the 50 crown wonder did serve its purpose well enough.

Rings — except for Drapnir, which is one of the quest objects and about as useful as a lead hula hoop — give you access to Ringways, which act as teleports/bypasses. So in addition to the usual NORTH, SOUTH type commands you can use 'JUMP', which takes you Club Class to the relevant location.

After a bit of hopping around like this, I was well and truly lost. I asked for help, and was told the ringway nearest me led to . . . El Vinos? Surely not the El Vinos? Could I get a sandwich there? Would they let my editor buy a drink at the bar? Naturally I had to investigate.

When I finally got out, I'd drunk all the wine and eaten all the food I'd had with me when I arrived, and had had my wallet lightened considerably by one Alvin, billed in the manual as a dwarf, but clearly some kind of profiteer.

I won't tell you about my other attempts at the game, about my attempt to lock away all the food and wine in the universe and sell it to the other characters for huge sums, or about my attempt to sell an axe to a wolf.

Nor will I tell you how you finally solve the quest — matter of fact, I'd be grateful if you'd tell me. What I will tell you is that Valhalla is well worth the rather substantial cost.

Verdict

I have very little that even approaches a complaint about Valhalla. The graphics are good and varied, and although the responses can be slow, this is because the machine is processing the moves for a number of characters, not just you.

Even this minor problem is dealt with by the way the program allows you to stack instructions. For example, you can type in get food, eat food, go north in quick succession, then see your character do all these. It's a good idea to do this, as it lets you get the drop on other characters.

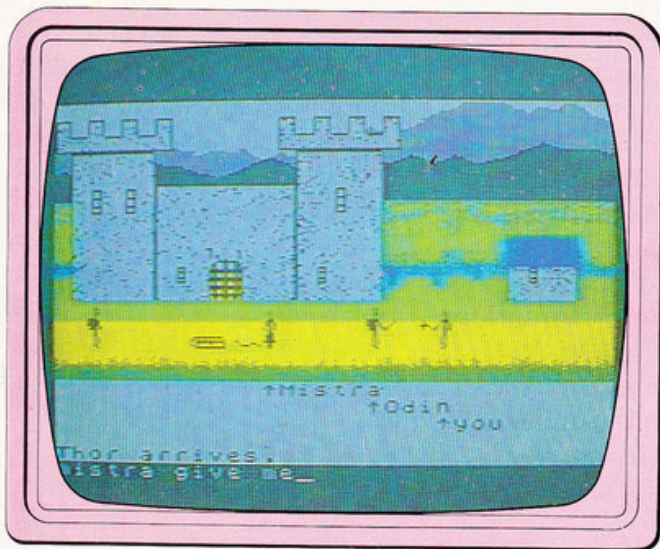
Another departure from the traditional format is the way the manual is actually designed to help you win. You get a detailed guide to the characters, a couple of clues, and a list of common words and their accepted syntax.

This means you'll get into it straight away, so it's less frustrating than most games, although no less difficult.

John Lettice

RATING

| | |
|----------------|-------|
| Lasting appeal | ★★★★★ |
| Playability | ★★★★★ |
| Use of machine | ★★★★★ |
| Overall value | ★★★★★ |



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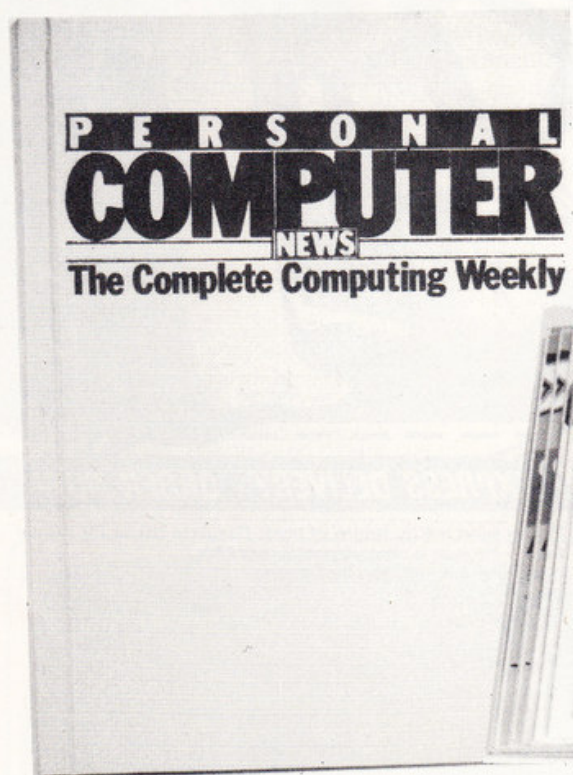
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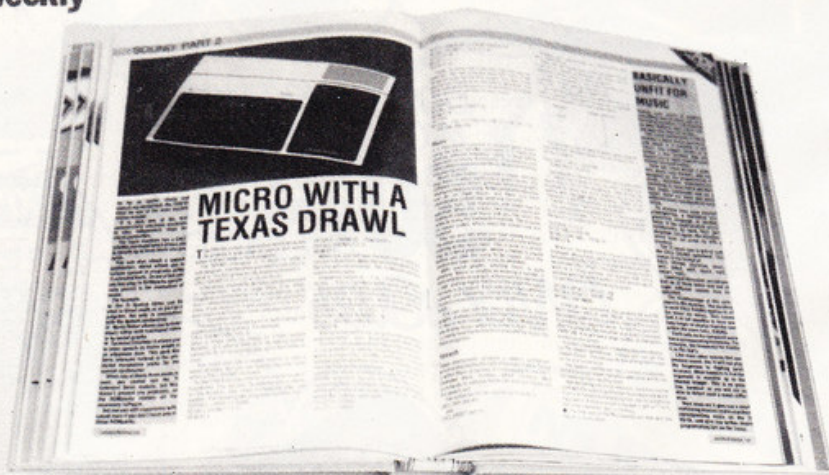
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GAMEPLAY

Peter Worlock battles enemies alien, avian and electromagnetic on the colourful Commodore.

Six-pack for the 64

It is only a few short weeks since Commodore 64 owners were facing a dire shortage of software for their micros. Now the opposite is the case: some excellent games are being shipped in from the US while the British software houses have finally cranked up their programmers and are now merrily churning out cassettes.

PCN had a look at half a dozen of the recent releases.

SUPER DOGFIGHT

To start off on a high note, a classic in more than one sense.

This was one of the very first arcade games and Terminal Software has produced a marvellous implementation.

It's also something of a rarity in that it is for two players. Each controls a World War I biplane in a dogfight to the death. Control is by joystick only.

At the start you look down on a blue sky ringed by a clever graphic impression of billowing white clouds. The two combatants appear flying side by side before wheeling away to start the game.

The screen features full wrap-round so it quickly becomes a tactical contest to get on your opponent's tail, or make a swooping attack out of the cloud.

The planes themselves are neat little sprites with a simple 3D effect that gives a sense of perspective as they loop and dive around. The sound effects are excellent.

The only minor criticisms of Super Dogfight are that you need two joysticks and two people. Terminal could have produced a game with a wider appeal had there been the option of using the keyboard and playing against the computer.

Still, provided you have the joysticks and a playing partner, this is highly recommended.

VULTURES

Unfortunately, I can't lavish such praise on this one from J Morrison Mic-



ros. But there are no real grounds on which to criticise the game. The graphics are splendid multicolour sprites with very smooth animation and good sound effects.

So what's the problem? Simply that it is all such old hat now. It's been said before in PCN Gameplay and merits a repeat: there really is little point in games writers turning out variations on Pacman and Space Invaders *et al.*

Vultures falls into the category of pale imitation. It's fun and fast and colourful but most people will already have something similar. If you don't then here's what you get: you play a humanoid at the foot of the screen, shooting down laser-spitting vultures descending from the top.

If you clear the sheet two eggs hatch open and three faster, more vicious birds appear. If they don't shoot you first they may pick you up and carry you aloft to an unspeakable end. Shooting them down merely moves you to a faster level.

Not very original, not very addictive.

KONG

No prizes for guessing the plot of this one, another copy of the arcade original. This, from Anirog, is the second version I've seen for the 64 and though a closer copy of the original, loses something in playability.

There are only three floors of girders (I seem to recall the

arcade version having four) but everything else will be familiar. Kong even throws the barrels, instead of them magically appearing from off screen somewhere.

Again, the graphics are well done but given the graphics facilities on the 64, there can be no excuse for boring displays or jerky animation.

One common fault with 64 sprites is that collision detection can be tricky to handle and this seems to be a fault here. The upshot is that timing your jumps is even more crucial than arcade addicts will be used to. However, if you want a version of Kong, you could do worse.

BITMANIA

The lowpoint of this round-up. Virgin Games' usual high standard of packaging credits one Kieron Brennan with the creation of Bitmania. He is, apparently, 16 years old and prefers games that are 'fast, colourful and visually exciting'.

Bitmania fulfils these conditions but fails in one department: it's a boring game to play.

Master Brennan is a wizard in the graphics department and this game is one of the most beautiful I have seen. The title screen is colourful with a clever script display. The game itself features user-defined graphics, swooshing sprites and a multitude of shapes whizzing about in all directions.

Sadly, it is marred by a lack of balance. If half the effort invested in the graphics depart-

ment had been spent on improving the actual playability of the game, it would have been a masterpiece.

After the first moments of blind panic in the face of the screen pyrotechnics, it becomes apparent that you can position your gun in one of several relatively safe spots and, with only a few corrections, knock out the enemy with impunity.

The scenario is also a little bizarre. You are apparently in the data bus of the 64 attempting to reach the 'central core'. You do this by blasting the bits dispatched against you by the CPU.

By far the best thing about Bitmania is the introduction sequence. If, instead of going straight into the action, you wait a bit, you will be rewarded by a superb piece of musical programming that sounds very much like Vivaldi. I quickly gave up playing and left this musical accompaniment running for a while.

MOON BUGGY

Another one from Anirog and much the better of the two. You control the vehicle of the title, speeding across the lunar terrain facing a multitude of perils from an enemy attack force.

There are many ways to lose here, zapped from above, blasted from the front, driving over a mine or simply crashing in a crater. You have forward and vertical lasers to defend yourself and control over the

GAMEPLAY

speed of your buggy. By accelerating and jumping you can avoid the mines and craters but it really is a test of hand-eye coordination.

The graphics are simple but cutely effective. Your buggy has independent six-wheel suspension as you move across the rough surface and when you lose a life the tyres pop off in a manner guaranteed to raise a smile.

SUPER COPTER

Helicopters do seem to be in on the 64 this season. Following hot on the rotor blades of Choplifter and Fort Apocalypse comes this title from newcomer Mondatta.

I felt the adrenalin surge as I read the inlay; it sounds like a combination of 3D arcade action and flight simulator. And so it is, but a little disappointing in the implementation.

You have two screen displays in the first section, starting with the view from the cockpit. Displays include speed, RPM, pitch, fuel and other necessities of flight control. You can switch to radar which gives you a pictorial image of the playfield and shows your position, barrage balloons, ground to air missiles and your target — the enemy island.

The hazards in this first section include 4,000ft high mountains which you must fly over or round, and a radar screen at 1,500 feet which you must fly under.

Having reached the island in less than 5mins 30secs, you can refuel and set about blowing things up. Unfortunately I was never able to get to this exciting bit, being in the habit of hitting mountains, lasers or missiles, or avoiding these and running out of time.

The graphics are adequate, the sound is disappointing and, so far as I was able to tell, there's little excitement. However, it does make a change from the Invaders/Pac-man clones.

Moon Buggy, Kong (£7.95), Anirog, 8 High Street, Horley, Surrey.
Vultures (£6.95), J. Morrison Micros, 2 Gleasdale Street, Leeds.
Super Dogfight (£9.95), Terminal Software, 28 Church Lane, Prestwich, Manchester.
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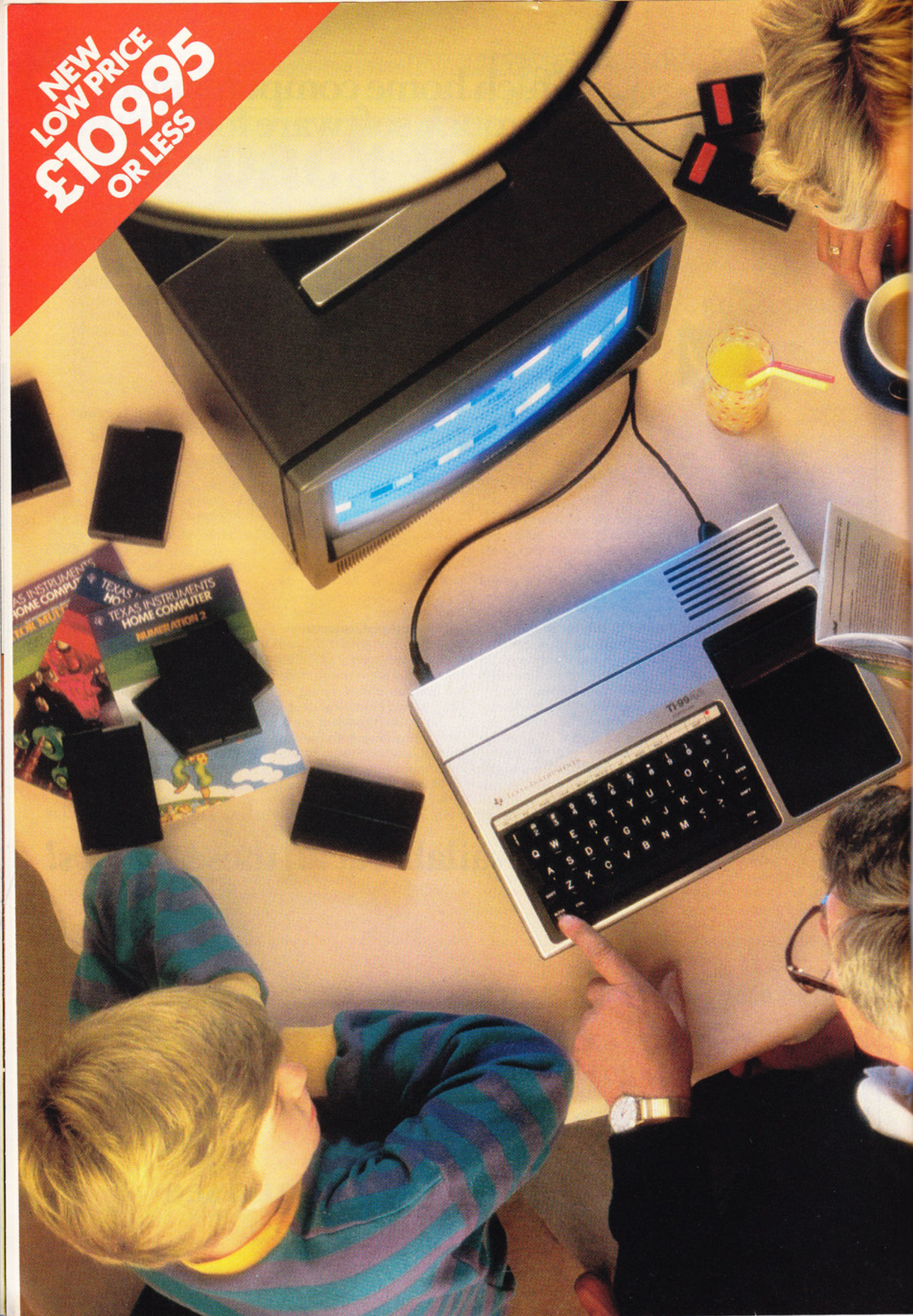
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Memory: Total 114K bytes; 26K bytes ROM internal; up to 36K ROM cartridges external; 16K built-in RAM expandable to 52K bytes.

Keyboard: 48 Key QWERTY, alpha lock, function key auto repeat.

Sound: 5 octaves, 3 simultaneous tones, noise tone.

Colour: 16 foreground and background. High resolution.

Interfaces: Cassette, TV, 2 joysticks, main peripheral port.

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The standard programming language, TI BASIC, is built into your TI Home Computer so you can begin programming right away. But there's an expanded range of optional languages like Extended BASIC, TI Logo, USCD-Pascal, TIFORTH and Assembler.

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CUBIC CAPERS

ATARI 400/800

Spring to action

Name Slinky System **Atari 400/800**
Price £14.95 **Publisher** Cosmi
Format Cassette **Other Versions** Vic-20, TI 99/4 **Outlet** Home Computers, 234 Church St, Blackpool FY1 3PX Tel 0253 22340.

If you've ever owned one of those spring-like toys known as a Slinky, then the hero in this game should be familiar to you. Similarly, if you're an arcade fan, the game itself will not be unknown.

Objectives

Controlling Slinky, you must bounce around a Pyramid of cubes, turning each one to the same colour as you go. You start with 25,000 points and lose points with each move — the aim is to lose as few as possible. Several objects help or hinder your progress — a magnet, raindrop, dustcloud, face and chameleon. These can drop you off the edge, speed you up, slow you down, wipe you out or just generally get in the way. Hyperspace holes and bonus blocks add to the complications, as do the 99 different levels of play.

In play

Slinky, a golden spring, is perched on the top left of a pile of 52 three-dimensional white cubes. He can only hop diagonally and moving the joystick in

the wrong direction when he's near the edge has Slinky springing to his doom. On the first level, Slinky merely has to land on each hexagon, turning it to blue. If he leaps down a black hyperspace block, he ends back up at top left.

All the hazards have names, a feature that is probably right for the youngest players but a trifle treacley for older hands. Do Marge the magnet and Ralph the raindrop make you smile or grimace? Marge has a nasty habit of flying along a row at irregular times and if there, Slinky will be picked up and dropped off the edge. On the other hand Slinky might be lucky and drop down a hyperspace hole.

Slinky turns blue when hit by Ralph and moves at double speed. If hit by Dusty the dustcloud, Slinky turns brown and loses more points per move. If struck by Ralph and Dusty, he rusts and Oil-Can Charlie rushes on to cart him off for scrap metal to the tune of Raindrops Keep Fallin' On My Head!

Verdict

Highly addictive, much more so than the original arcade version. The colourful graphics, particularly Slinky itself are excellent. Despite the twee names, this is a first class game of skill and strategy for all ages.

Bob Chappell

RATING

Lasting

Playability

Use of machine

Overall value



COMMODORE 64

Bert likes bounce

Name Hexpert System **Commodore 64** **Price** £7.95 **Publisher** Anirog Software, 8 High St, Horley, Surrey **Format** Cassette **Other versions** None **Outlet** Mial order & retailers.

Another arcade original comes to the personal computer. Bert, forsaking his old heap of hexagons, has taken up residence on a new pile of blocks. Although he can now be found bouncing around on the Commodore 64, he still hasn't shaken off his pursuers.

Objectives

An odd, furry creature, Bert has been abducted by Zoga-naar, a wicked witch and forced to play on her fiendish Pyramid of hexagons. Bert must leap from block to block, avoiding two massive rubber balls which are bouncing around after him. Not only that, the witch's pet snake Coily, has also decided to yomp round the Pyramid.

Bert must change the colour of every hexagon by jumping on each one. If he is touched by a ball or the snake, he loses one of his five lives. If he inadvertently leaps off the edge, bye bye Bert for good.

Bert has some help. He can jump on one of two spinning disks which will transport him to the top of the pyramids.

In play

No introductory music, just a simple title page with the title slowly moving from the bottom to the top of the screen. You

can't start until it reaches the top. Unfortunately, this pause occurs every time you start a new game and slows down the pace. The pyramid of 21 three-dimensional blue hexagons appears, with a chocolate-coloured spinning disk on both sides.

A spinning barrel descends from on high, depositing Bert part way down the pyramid. The game is afoot, and that's quite an apt phrase since Bert needs to be very fleet of foot.

He's hardly started leaping when two giant Maltesers start bouncing down the pyramid, immediately followed by the coiled snake. If he's leapt upon, Bert loses a life. Fair enough. What's not quite so sporting is that if, in leaping, he just touches any of these creatures in passing, he still loses a life. Even worse, if he should jump off the pyramid altogether, he loses all his lives and that makes it a bit frustrating. If Bert can turn all the hexagons yellow by landing on them, he gains bonus points and has to start again, with the action faster.

Sound effects are minimal. The graphics are pleasant if lacking in animation. However, I was impressed by the bounce of the rubber balls, and the 3-D effect is a saving grace.

Verdict

The graphics and sound could have been livelier and there's not enough variety to hold the attention for long. Nevertheless, it is a challenging little game and worth a spin.

Bob Chappell

RATING

Lasting appeal

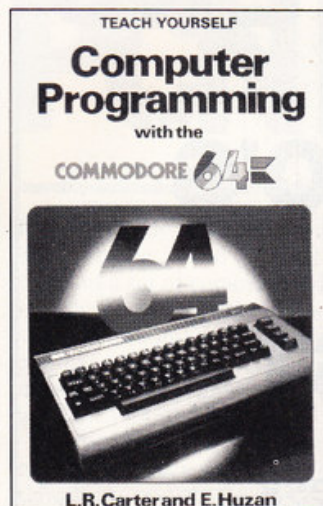
Playability

Use of machine

Value for money



Which book would your micro want you to buy? PCN's review page helps you choose.



'Teach Yourself Computer Programming with the Commodore 64', by L. Carter and E. Huzan, published by Hodder & Stoughton at £2.75 (paperback, 206 pages).

Anyone familiar with the Teach Yourself range of titles will know what to expect from this offering: well thought out, professionally produced, clearly presented. If there is a criticism it can only be that it is rather dry stuff.

However, perseverance has its own rewards and this is a book well worth studying. Beginning with a straightforward, no-nonsense guide to computers, it works its way through the by now well tried and tested route of input/output routines, program development, branches, and the other unexciting but necessary prerequisites to getting your micro to do what you want.

Then follows what many will find the more interesting and exciting section on graphics and sprites, sound and bigger applications.

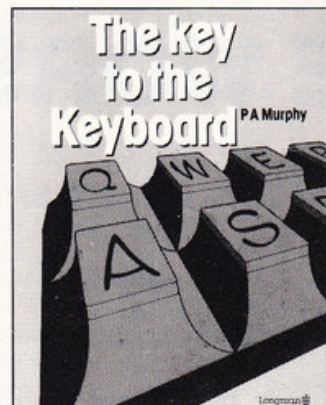
All of this is thoughtfully illustrated with diagrams, flowcharts, printouts and program listings.

It is perhaps the choice of program examples that gives the book its serious feel. There are no frivolous (or particularly exciting) examples and a look at the list reveals all: a program to calculate linear regression, a mortgage calculator, one to calculate the roots of quadratic equations. However, it must be said that the selection admirably illustrates the points under discussion.

If all this sounds off-putting to those of you with dreams of inter-galactic, multi-coloured megadeath on your 64, the

book will fulfill the promise of its title: it will teach you to program your 64.

Indeed, of the many books that have appeared for this machine, this is undoubtedly the best I have seen if you really want to learn to program and are not just toying with a powerful micro. **PW**



'The Key to the Keyboard' by P.A. Murphy, published by Longman at £2.95 (paperback, 64 pages).

Even though you can talk computer-speak, beat the aliens and keep your home accounts on line, chances are you are still a two-fingered typist. And what makes that tedious is you still have to look at the keyboard rather than at the screen.

With this teach-yourself paperback Murphy aims to train you through the typing barrier, even if you've never touched the keys before.

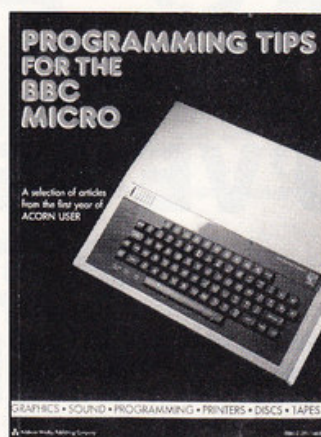
Clear, well-presented instructions take you easily through the course, starting with an explanation of how to position your hands over the board and finishing with copying exercises. There are plenty of diagrams, revision tests and practice routines, allowing you to master the keys at your own speed.

Though designed more for the typewriter user, this would do equally well for qwerty keyboard tappers. **NR**

'Programming Tips for the BBC Micro' (Acorn User Annual), published by Addison-Wesley at £6.95 (paperback, 143 pages).

Here's a good book that does what it claims to do. On the cover we're told it contains articles on 'graphics, sound, programming, printers, disks, tapes' and it does, in considerable detail.

This Acorn User annual is designed as a series of articles



which go from the various fixes needed for the OS0.1 operating system, to the BBC DFS and how printers work. They look the same as they did when published in the magazine and include programs.

With all this the book is a must if you've just bought a BBC Micro and want to know what it can do and how to do it. In the programming section, there are hints and tips on speeding up programs, garbage collection and various procedures and functions.

The next chapter is on graphics, and includes articles on moving pictures, colours, and how to install a light-pen and how it works.

There's a chapter on sound with sections on the sound and envelope commands, finishing with programs on how to compose with the BBC. An excellent chapter on the disk system follows this and the book concludes with a section on tapes and multiple programs, and a game.

All in all this is an excellent book and useful for reference. **KG**

'Outstanding Programs for your Apple' by Michael Orphanides, published by Interface Publications at £5.95 (paperback, 181 pages).

The title of this book fills you with great expectations which for me at least were not fulfilled.

After a brief foreword, the first chapter plunges straight into the first program. Each program has an introduction covering about a page. There are brief explanations of the program structure for the early programs, but as the book progresses less information is given.

The book is divided into sections on utility programs,

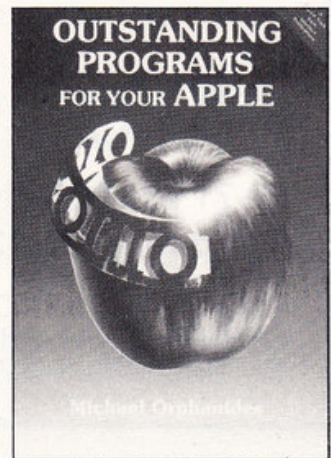
graphics, games, general education, language skills and number skills. The utility programs are quite straightforward but also rather limited. For example, the Bank Account program only records debits and credits without a facility to add comments on each transaction.

The graphics programs enable you to draw pictures of the space shuttle or a Lamborghini sports car in a variety of colours, in a similar fashion to the sample program given on the Apple system master disk. The shape plotter is the longest and probably one of the few outstanding programs. This uses equations to draw straight lines, circles, hyperbolas and exponential graphs.

The games section contains the predictable version of blackjack plus two other gambling games as well as a version of Mastermind called Applemind. An up-to-date wargame entitled Attack from the USSR, complete with SS20 missiles, brings the film Wargames to your own computer. Vell is the name of the space program in which you have discovered a new planet and, just like the intrepid colonist of the past, proceed to annihilate the natives one by one so that it is safe for humans to live there.

The educational programs teach useful things like the capitals of the world, famous people, geometry and mental arithmetic. Of course, you have to know all the answers to program the computer. The final program is that old University computer programming course favourite, the roots of a quadratic equation.

I would not call the programs in this book outstanding; some of them are good, but others are only fair. **MB**



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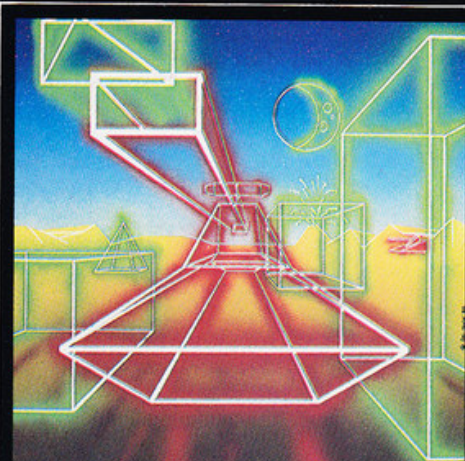


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Mini Math

Card 2 of 10

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110 IF POSUC=0 THEN GO TO 150
111 LET d=d+1: LET e=a-3
112 IF POSUC=0 THEN GO TO 23
113 GO TO 10
140 PRINT INK 2: AT d+10,10: "X"
141 AT d+11,10: "X" GO
TO 100
150 BEEP .1,2+1: PRINT INK 2: AT
d+10,10: "NNNNNN": AT d+11,10: "
151 IF d>10 THEN GO TO 160
161 PRINT PAPER 10: AT d+10,10: "
: GO TO 100
160 LET e=a+0: LET d=d-1
161 IF d<0 THEN LET d=0
162 GO TO 110
163 FOR k=1 TO 15: PRINT AT 5,5
INK 0: "A.J. Moran ©1983": FO
C=0 TO 3: PRINT AT 3,5: INK 1:
"JUNIOR MATHEMATICIAN": BEEP .05
RAND*40: NEXT k: IF INKEY="" T
HEN NEXT k:
164 PRINT "
165 IF POSUC=1 THEN CLS: FOR a
=1 TO 10: FOR k=0 TO 7: PRINT IN
K 7: AT 10,10: "GOODBYE!": BEEP .
.05: RAND*40: NEXT k: NEXT a: CLS
166 RESTORE 2010: DIM d$(15,55):
FOR e=1 TO 5: READ d$(e): NEXT
e
167 REM Instructions
168 FOR e=1 TO 5: PRINT "
169 PRINT INK 7: "INSTU
CTIONS"

```

```

250 BORDER 0: PRINT PAPER 0: IN
K 0: BRIGHT 1: "In a moment you w
ill be shown a Menu, from whic
h you can select your choic
e of operation. You will then be
given questions on that
operation. If you get it
right on your first att
empt you will score 5 and 1 poi
nt if you get it right on your
second attempt. At the end of
you will be given your score on the
t section. You may do as
many sections in any combinatio
n you like. Your total score
so far will be shown with the re
su. When you wish
to stop you will be presented
with your total score and p
ercentage on the whole test pl
us a few surprises."
253 PRINT INK 7: TAB 7: FLASH 1:
"PRESS ANY KEY"
255 IF INKEY="" THEN GO TO 255
256 GO SUB 3000
257 IF level=1 THEN GO TO 302
258 IF k$="0" THEN LET smallnum
b=INT (RAND*999)+100
259 IF k$>"0" THEN LET smallnu
b=INT (RAND*4000)+1000
260 LET bignumb=INT (RAND*5000)+
5000
261 GO TO 305
262 LET bignumb=INT (RAND*500)+5
00

```

190-192 Print, in varying colours, the title
199 Check for the end of the program
200 Restore data for large number characters
210-252 Instructions

253 Prompt for a key
255 Get it
256 Gosub and do menu
290 Check level
292-295 Select number

PCNProgramCards

Mini Math

Card 3 of 10

8335MM3/10

```

304 IF k$="0" THEN LET smallnum
b=INT (RAND*99)+10
305 IF k$>"0" THEN LET smallnu
mb=INT (RAND*400)+100
306 IF k$>"0" THEN GO TO 400
310 BORDER 7: PAPER 7: INK 2: C
LS
315 PRINT "
316 PRINT TAB 4;d$(a) (51 TO 55):
NEXT a
320 LET answer=bignumb*smallnum
b
330 GO TO 410
340 IF k$="2" THEN GO TO 405
341 BORDER 6: INK 0: PAPER 6: C
LS
342 PRINT "
343 PRINT TAB 4;d$(a) (41 TO 45):
NEXT a
344 LET answer=bignumb+smallnumb
345 IF k$>"2" THEN GO TO 410
346 BORDER 4: INK 7: PAPER 4: C
LS
347 PRINT "
348 PRINT TAB 4;d$(a) (46 TO 50):
NEXT a
349 LET answer=bignumb-smallnum
b
350 PRINT AT 14,3: "
: LET k=2: LET
r=0: LET z=1: LET c=1: LET d=4:
LET t=10: LET a$=STR$ bignumb: G
O TO 3933

```

```

400 IF a$=STR$ smallnumb THEN G
O TO 400
401 LET w=0: LET c=0: LET t=1:
LET c=1: LET d=4: LET t=10: LET
a$=STR$ smallnumb: GO TO 3933
402 GO TO 3933
403 INPUT z$
404 IF z$="stop" THEN GO TO 381
405 IF LEN z$=LEN STR$ answer T
HEN GO TO 440
406 GO TO 430
407 IF VAL z$=answer THEN GO TO
442
408 IF for1=1 THEN LET for1=2
409 IF for1=2 THEN PRINT AT 16,
10: FLASH 1: "INCORRECT DATA": BE
EP .5: -20: PAUSE 15: GO TO 500
410 IF VAL z$<>answer THEN PRIN
T AT 16,10: "ERROR": AT 17,10:
"TRY AGAIN": BEEP .5: -10: PAUS
E 15
411 PRINT AT 16,10: "
: AT 17,10: "
412 LET for1=1
413 GO TO 430
414 PRINT INVERSE 1: AT 16,10: "C
ORRECT"
415 BEEP .25,5: BEEP .4,10: PAU
SE 15
416 IF for1=0 THEN LET sc=sc+5
417 IF for1=1 THEN LET sc=sc+1

```

302-305 Select easy numbers
308-330 If selection three was made from the menu, then do multiplication
400-404 If selection two then do addition
405-408 Else do subtraction
410-427 Print the sum in large numbers
430 Get answer
431 Check for stop

432 Check that the answer is fairly close (same order)
435 Get the answer again
441 Check for the correct answer
442-451 Put question again
480 Correct
481 Wait
482-484 Check the number of goes and update the score as appropriate

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8335MM4/11

| | |
|-----------|--|
| 1040-1050 | Set up user-defined graphics for Fool on the Hill and teacher. |
| 1070 | Check total score. |
| 1100 | Check percentage. |
| 1150 | Start of teacher routine. |

| | |
|-----------|-------------------------------------|
| 1162 | Set up screen colours. |
| 1165 | Read congratulations data. |
| 1175-1180 | Draw the school and home. |
| 1220-1230 | Read data for movement of teachers. |
| 1240-1300 | Move teacher. |

8335MM5/11

| | |
|------|--|
| 1340 | Print percentage score. |
| 1350 | Wait. |
| 1450 | Jump to hall of fame. |
| 1500 | Begin the routine used if the score is less than 50 per cent select colours. |

| | |
|-----------|-----------------------------|
| 1520-1533 | Fool on the Hill. |
| 1600-1800 | Move the Fool on the Hill. |
| 1850-2000 | Final score. |
| 3000 | Dimension it and set it up. |
| 3011-3930 | Sort the high score table. |

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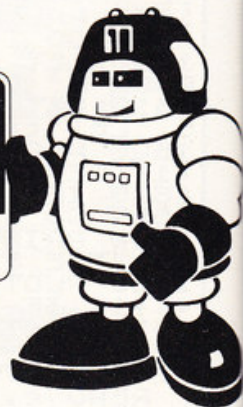
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...BEFORE THEY DO!

PCNProgramCards

Mini Math Card 6 of 11

8335MM6/11

```

3955 LET U=U+1: GO TO 3920
3960 GO TO 4000
3965 LET U$(U)=S$: LET U(U)=TSC:
LET V(U)=TCOUNT
3970 IF U=10 THEN GO TO 4100
3975 LET U=U+1: LET U$(U)=C$(U-1)
V: LET U(U)=S(U-1): LET V(U)=V(U-1)
3980 IF U>9 THEN GO TO 4100
3985 GO TO 3965
4000 BORDER 0: INK 7: PAPER 0: C
LS: IF INT (TSC/TCOUNT*100+.5) >
=50 THEN PRINT INK 7: PAPER 0:
"WELL DONE, CLEVER 'UN,
YOU'VE SCORED AMONG THE
BEST OF 'EM."

```

PLEASE NOW ENTER YOUR NAME,
FOR THE WORLD TO STARE IN
AWE AT IN THE ": PRINT INK 5:
5: "HALL OF FAME."

```

4020 IF INT (TSC/TCOUNT*100+.5) <
50 THEN GO TO 4050
4030 GO TO 4075
4050 BORDER 0: INK 7: PAPER 0: C
LS: IF INT (TSC/TCOUNT*100+.5) <
=50 THEN PRINT INK 7: PAPER 0:
"EVEN THOUGH YOU SCORED LESS
THAN 50 PERCENT,
I BEAR NO GRUDGE AND GIVE
MY CONSENT."

```

FOR YOU TO ENTER YOUR NAME,
SO IT MAY BE DISPLAYED

```

IN THE ": PRINT INK 5: "HALL
OF FAME"
4075 INPUT INVERSE 1: "ENTER NAME
(max 5 letters)": S$
4077 IF LEN S$>5 THEN GO TO 4075
4080 GO TO 3960
4090 REM Hall Of Fame
4210 PAPER 0: INK 5: BORDER 0: C
LS
4230 PRINT INK 5: BRIGHT 1: "
H A L L O F F A M E
4240 FOR a=1 TO 10: PRINT BRIGHT
1: a: " ": U$(a): IF U(a)=0 OR V
(a)=0 THEN PRINT BRIGHT 1: " "
"X ("U(a): " OUT OF "V(a): "
4242 IF U(a)=0 OR V(a)=0 THEN GO
TO 4250
4245 PRINT BRIGHT 1: " ": INT (U
(a)/V(a)*100+.5): "X ("U(a): " O
UT OF "V(a): " ": GO TO 4250
4250 NEXT a
4500 PRINT INK 7: "DO YOU WANT
TO GO BACK TO THE
RT?"
4505 LET a=0
4510 BEEP .500,RND*20: POKE 2262
9,a: POKE 2263,1,a: POKE 2263,3,a:
POKE 2263,5,a: POKE 2263,8,a: POK
E 2264,0,a: POKE 2264,0,a: POKE 22
64,5,a: POKE 2264,7,a: POKE 2264,9,a:
a: IF INKEY$<>"n" OR INKEY$<>"s"
THEN LET a=a+1
4511 IF a>7 THEN LET a=0
4512 IF INKEY$="n" OR INKEY$="s"
THEN GO TO 4520

```

4000 Print rhyme.
4020 Check for 50 per cent.
4075 Get name.
4077 Check length.

4080 Put the name into the high score table.
4200-4250 Print the hall of fame.
4500 Back to beginning ? prompt.
4505-4700 Get answer and act upon it.

PCNProgramCards

Mini Math Card 7 of 11

8335MM7/11

```

4510 GO TO 4510
4520 IF INKEY$="n" THEN GO TO 98
98
4530 IF INKEY$<>"n" AND INKEY$<>
"y" THEN GO TO 4510
4700 LET TSC=1: GO TO 2
5000 IF S<12.5 THEN GO TO 5500
5010 CLS: PRINT "INVERSE 1:
"WELL DONE YOU MANAGED TO GET
OVER HALF THE ANSWERS RIGHT ON
SECTION "K$." "I'VE GOT A
SURPRISE FOR YOU!": PRINT "TAB
2: FLASH 1: "DO YOU WANT IT? (Y O
r N)
5011 IF INKEY$="" THEN GO TO 501
5013 IF INKEY$="n" THEN GO TO 85
5015 IF INKEY$="y" THEN GO TO 50
50+VAL K$*100
5017 IF INKEY$<>"n" AND INKEY$<>
"y" THEN GO TO 5011
5100 CLS: PRINT "
FOR ELISE"
5110 RESTORE 9000: FOR a=1 TO 9:
READ C,d: BORDER INT (RND*7): B
EEP C,d: NEXT a
5120 GO TO 5010
5200 CLS: PRINT "
YESTERDAY"
5210 RESTORE 9000: FOR a=1 TO 25
: READ C,d: BORDER INT (RND*7):
BEEP C,d: NEXT a
5220 GO TO 5010

```

```

5300 CLS: PRINT "
E SOUND OF SILENCE"
5310 RESTORE 9040: FOR a=1 TO 55
: READ C,d: BORDER INT (RND*7):
BEEP C/1.2,d: NEXT a
5320 GO TO 5010
5400 CLS: PRINT "
THE ENTERTAINER"
5410 RESTORE 9050: FOR a=1 TO 79
: READ C,d: BORDER INT (RND*7):
BEEP C/1.2,d: NEXT a
5420 GO TO 5010
5500 CLS: PRINT "
I AM VERY
DISAPPOINTED IN YOU! "YOU GOT
LESS THAN HALF RIGHT."
5510 RESTORE 9060: FOR a=1 TO 11
: READ C,d: BEEP C,d: NEXT a
5530 GO TO 5010
5600 IF level=1 THEN GO TO 5050
5610 LET a=INT (RND*9)+1: LET an
swer=INT (RND*500)+500
5615 GO TO 5055
5650 LET a=INT (RND*9)+1: LET an
swer=INT (RND*90)+10
5655 LET boxnum=a*answer
5660 INK 5: PAPER 0: BORDER 0: C
LS
5665 PRINT AT 6,8: "
"AT 9,8: "AT 7,8: "AT 8,8: "
8: "AT 10,8: "AT 11,8: "
5670 LET C=1: LET d=4: LET z=1:
LET r=8: LET t=0: LET a$=STR$ a:
GO TO 7550

```

5000 Check score.
5010-5017 Surprise ?
5100-5120 Music for Für Elise.
5200-5220 Music for Yesterday.
5300-5320 Music for Sound of Silence.
5400-5420 Music for The Entertainer.

5500 Disappointed.
5510 Funeral March.
6000 Get new answers for level one division.
6065 Print division on the screen.
6070-6120 Set up variables.

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8335MM8/11

```

      TO STOP PRESS 'S'"
8815 LET tsc=tsc+sc: LET tcount=
tcount+count
8820 IF tcount>0 THEN PRINT "":
TAB 2: INVERSE 1: INK 6:"YOUR TO
TAL SCORE SO FAR IS": PRINT TAB
10: INVERSE 1: INK 6:tsc:" OUT O
F ":tcount

```

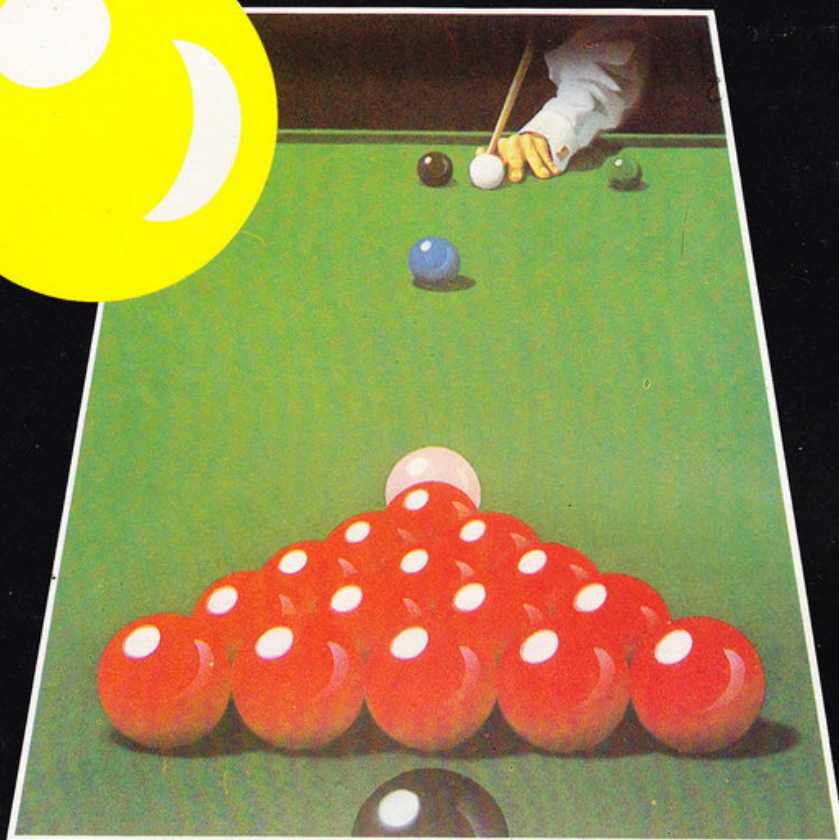
| | |
|------|--------------------|
| 8810 | Print titles. |
| 8815 | Update the scores. |

8335MM9/11

[illegible]

| | |
|------|--|
| 9000 | Data for user-defined graphics for rocket. |
| 9010 | Data for chunky numbers. |
| 9022 | Data for music of <i>Für Elise</i> . |

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BACK ISSUES

Issue 1, March 11-18.

Pro-Tests: Apple's Lisa, Textet TX8000: Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.

Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.

ProgramCards: Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).

Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).

Databasics: micros and peripherals.



Issue 2, March 18-25.

Pro-Tests: Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrum spreadsheet, IBM graphics, BBC word processing.

Features: Colecovision, micro backgammon, nursery computing.

Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).

ProgramCards: String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extract/replace.

Databasics: full software listings.

Issue 3, March 25-April 1.

Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Pedspeed compiler, Sirius toolkit, Dragoncalc.

Features: Atom upgrade, Lynx programming, Apple music.

Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).

ProgramCards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).

Databasics: micros.

Micropaedia: Anatomy of the BBC, part 3.

Issue 4, April 1-8.

Pro-Tests: Pled Piser Communicator, Olympia ESW3000 printer, Nalmer Supertalker, Commodore Caleresult, Spectrum Pascal, Cashbook (BBC).

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

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

Databasics: peripherals.

Clubnet: Clubs and user groups.

Micropaedia: Go Forth, part 1.

Issue 5, April 8-15.

Pro-Tests: Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.

Features: speech packs, monitors.

Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).

ProgramCards: Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.

Databasics: Software.

Clubnet: full list of user groups.

Micropaedia: Go Forth, part 2.

Issue 6, April 15-22.

Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CPM), 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.

Databasics: micros.

Micropaedia: Graphics, part 1.

Issue 7, April 22-29.

Pro-Tests: Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergraf on Victor/Sirius.

Features: Dealer support, Atari graphics.

Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).

ProgramCards: CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.

Databasics: peripherals.

Micropaedia: Graphics part 2.

Issue 8, April 29-May 6.

Pro-Tests: Atari Home Files Manager, Kobra's Vic Stat for the Vic 20, Hestacrest's Accounts for the Spectrum, Epson RX80 printer, NCR's Decision Mate V, Future Computer's FX20.

Features: Micronet, Compact programming on the TI99/4A.

Gameplay: Harvester (Vic 20), Strategic Command (Dragon 32), A first Book of Micro Rhymes (BBC), Telling the Time/Money (Spectrum).

ProgramCards: Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.

Databasics: software.

Issue 9, May 6-13.

Pro-Tests: Structured Basic on the Apple, Pixel Power on the Vic 20, Star DP510 printer, Dams and Interpod interfaces for Commodore 64; Micro-Professor.

Features: BBC function keys, Atari word-processing part 1.

Gameplay: Dungeons of Intrigue (Oric), The Castle (Oric), Starship Command (BBC B), Dragon Trek, Nowotnik Puzzle (Spectrum).

ProgramCards: Lower case (Dragon 32), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MBasic).

Databasics: hardware.

Micropaedia: Graphics, part 4.

Issue 10, May 13-20.

Pro-Tests: Infomast on Commodore 64, Dragon 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), Choplifer (Vic 20), Skyhawk (Vic 20).

ProgramCards: Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).

Databasics: peripherals.

Micropaedia: Graphics, part 5.

Issue 11, May 20-26.

Pro-Tests: BBC Vufile, PFS:File for IBM, Apple Pascal; printer comparison, Pickard Joystick Controller for ZX81 and Spectrum; C9E Computer Board.

Features: ZX81 graphics part 2, Basic on the Sharp MZ80K.

Gameplay: Motor Mania (Commodore 64), Oric Flight, BBC Music Synthesiser, Music Maker (Spectrum), Embassy Assault (Spectrum), Tobor (Spectrum).

ProgramCards: Homeward Bound (ZX81), Connect Four (Dragon 32), CBM Database, cards 10 — end.

Micropaedia: Keyboards.

Issue 12, May 27-June 2.

Pro-Tests: Spectrum word processor, PFS:Report on IBM, File Handling for Colour Genie; CTI CP80 type 1 printer, TG Trackball; Sord M5.

Features: Epson Basic, Oric sound part 1, Tandy Colour graphics.

Gameplay: Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.

ProgramCards: Election Barchart (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).

Databasics: Hardware.

Clubnet: clubs (Cambridge 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).

Databasics: 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).

Databasics: 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).

Databasics: 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), Ninja 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, Orc 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), Spectrum 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, Gloopert, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Splat, General Election (Spectrum).

Micropaedia: Dragon, part 3.

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DATABASICS

This week PCN Databasics lists a selection of add-ons for your micro. PCN keeps you up to date in three-week cycles, listing peripherals, then software, followed by micros.

Printers are best categorised by print-head type. The two most common methods of transferring type to paper are the **Dot matrix** and **Daisywheel** techniques.

A dot matrix printer uses a row of pins which are programmed to strike the paper through a ribbon and form the character as a pattern of dots.

The daisywheel acts more like a conventional typewriter, the character set being pre-formed on a wheel with each character on a separate spoke. As the interchangeable wheel rotates it is struck by a hammer to form the character impression.

Dot matrix printers tend to be faster than daisywheel but offer lower print quality.

In selecting a printer make sure the **interface** on your computer is compatible with those available as standard or at extra cost on the printer.

The **●** sign means the interface is included in the price; **O** means you have a choice of interfaces included in the price; **+** means the interface will cost extra.

Max Baud rate indicates the approximate characters-per-second rate as they are fed into the printer.

The **buffer** stores characters sent by the computer. The printer can take characters in chunks, at a rate quicker than they are able to be printed, sometimes allowing the computer to be freed for further use.

Lines per inch indicates the maximum number of lines printed in a vertical inch. **Characters per inch** can be varied on some printers as the typesizes themselves can be adjusted.

Maximum print speed as indicated by the manufacturer tends to be a little optimistic. **Maximum print positions** tells you the optimum number of characters that can be printed in one line by the smallest character size on the printer. **Maximum paper width** is the widest paper the printer can take.

Size represents the space the printer takes up on a desk top. **The weight** of the printer is given in kilograms.

Maximum copies indicates the number of carbon copies that can realistically be produced at one time.

Underlining puts a line under characters while **bold type** thickens the characters to make them stand out. **True descenders** indicates that the print method allows for fully formed tails on letters such as p, g or q.

Proportional spacing puts the same space between characters whether they are a long 'm' or a short 'i'. **Block graphics** builds up pictures using rectangular blocks, while **High Resolution Graphics** uses smaller dots.

Bi-directional means the printer can save time by printing left to right and then doing the next line backwards right to left. Similarly, **Logic Seeking** enables the machine to save more time by printing the short lines without sweeping over the whole width of the page.

Feed methods comprise **fanfold** which uses continuous stationery sheets folded road-map style drawn into the printer by a tractor mechanism. The tractor cog fits into holes in the fanfold paper and takes the paper past the printer mechanism. **Roll** is a roll of paper that feeds into the printer, usually using **friction feed** where the paper is gripped between two rollers, typewriter-style. **Cut sheet** indicates the printer uses single sheets like a typewriter.

Distributor: to find which company distributes a particular add-on, use the code listed in this column to refer to the distributor table.

The table is at the end of the listings, and gives the distributor's name and telephone number.

PERIPHERALS

| Make & Model | Price inc VAT | Printhead type (M = matrix) | INTERFACES | | | | Max baud rate | Buffer Memory Size (in characters) | Lines per inch | Characters per inch | Max print Speed (CPS) | Max print positions | Max paper width in inches | Size (base area in cms) | Weight (in kilos) | Max Copies | Underlining | Bold Type | True Descenders | Proportional Spacing | Block Graphics | High Resolution Graphics | Bi Directional | Logic Seeking | Feed Method | | | | | Distributor |
|------------------|------------------|--------------------------------|------------|------------|------|-------|---------------|---------------------------------------|----------------|---------------------|--------------------------|------------------------|------------------------------|----------------------------|----------------------|------------|-------------|-----------|-----------------|----------------------|----------------|--------------------------|----------------|---------------|-------------|------|-----------|---------|------------|-------------|
| | | | IEEE | Centronics | 20ma | RS232 | Others ● | Others (+) | | | | | | | | | | | | | | | | | Fan Fold | Roll | Cut Sheet | Tractor | Frictional | |
| Adler TRD 170 | £833 | Daisywheel | ● | ● | | ● | | | 9600 | 256 | 6.8 | 10,12,15 | 17 | 198 | 15.5 | 56×37 | 13 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | T2 |
| Anadex DP 9000A | £1,397 | M 7×9, 9×9 | ● | ● | ● | ● | ● | | 9600 | 2700 | 6.8 | 10,12,5,15,16,7 | 200 | 106 | 9.5 | 40.9×57 | 13.6 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9001A | £1,397 | M 7×9, 11×9 | ● | ● | ● | ● | ● | | 9600 | 2700 | 6.8 | 10,12,5,15,16,7 | 200 | 132 | 9.5 | 40.9×57 | 13.6 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9500 | £1,397 | M 9×9 | ● | ● | ● | ● | ● | | 9600 | 700 | 6.8 | 10,12,13,3 | 200 | 176 | 15.5 | 39×59.9 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9500A | £1,397 | M 7×9, 9×9, 13×9 | ● | ● | ● | ● | ● | | 9600 | 2700 | 6.8 | 10,12,13,3 | 200 | 176 | 15.5 | 40.9×70.3 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9500L | £1,295 | M 7×9, 9×9 | ● | ● | ● | ● | ● | | 9600 | 700 | 6.8 | 10 | 150 | 132 | 15.5 | 39×59.9 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9501 | £1,397 | M 7×9, 11×9 | ● | ● | ● | ● | ● | | 9600 | 700 | 6.8 | 10,12,5,15,16,7 | 200 | 220 | 15.5 | 39×59.9 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9501A | £1,397 | M 7×9, 11×9 | ● | ● | ● | ● | ● | | 9600 | 2700 | 6.8 | 10,12,5,15,16,7 | 200 | 220 | 15.5 | 40.9×70.3 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex DP 9620A | £1,489 | M 7×9, 9×9, 13×9 | ● | ● | ● | ● | ● | | 9600 | 1500 | 6.8 | 10,12,15,16,4 | 200 | 216 | 15.5 | 40.9×70.3 | 16 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| Anadex WP 6000 | £2,616 | M up to 18×20 | ● | ● | ● | ● | ● | | 19200 | 4500 | 6.8,12,16 | 10,12,16,7 | 285 | 220 | 15.5 | 46.7×74.9 | 25 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | I1 |
| ASP 3500 | £977 | M 9×7, 9×9 | ○ | ○ | ○ | ○ | ○ | | 9600 | 80 | 6.8 | 10,12,16,5 | 180 | 217 | 14 | 61.5×40.5 | 19 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | M1 |
| Brother HRI | £747 | Daisywheel | ○ | ○ | ○ | ○ | ○ | | 9600 | 2000 | 4,5,6 | 10,12,15 | 35 | 198 | 16.5 | 38.1×71.2 | 16 | 8 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | J1 |
| Canon AP400 | £1,140 | Daisywheel | ● | ● | ● | ● | ● | 1 | 19200 | 4000 | 4,6,8 | 10,12,15 | 25 | 197 | 15.5 | 50.8×48.2 | 18.5 | 6 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | D1 |
| Centronics 159/4 | £962 | M 9×7 | ● | ● | ● | ● | ● | | 9600 | 768 | 6 | 5.8,18,10,16,36 | 150 | 80 | 10 | 38×35.6 | 10 | 5 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | B1 |
| Centronics 150/4 | £682 | M 9×7 | ● | ● | ● | ● | ● | 1 | 9600 | 768 | 6.8 | 10,12,16,36 | 150 | 132 | 9.5 | 38.1×35.5 | 9.1 | 3 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | R1 |
| Centronics 152/4 | £788 | M 9×7 | ● | ● | ● | ● | ● | 1 | 9600 | 708 | 6.8 | 10,12,16,5 | 150 | 217 | 9.5 | 38.1×35.5 | 9.1 | 3 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | R1 |

PRINTERS

[illegible]

PRINTERS

| | | M9×7 | ● + + | 9600 | 220 | 3,4,6,8,12 | 10,12,5,16,6 | 400 | 220 | 16 | 66×45,7 | 36 | 5 | ● | ● | ● | ● | M3 |
|------------------------|------------------------|-------------|---------|-------|--------------|---------------------------|------------------|-----|------|-----------|----------------|------|---|---|---|---|----|-----|
| MT440 I | MT440 L | M9×7 | ● + + | 9600 | 220 | 3,4,6,8,12 | 10,12,5,16,6 | 400 | 220 | 16 | 66×45,7 | 36 | 5 | ● | ● | ● | ● | M3 |
| | MT440 L | M9×7 | ● + + | 9600 | 220 | 3,4,6,8,12 | 10,12,5,16,6 | 400 | 220 | 16 | 66×45,7 | 36 | 5 | ● | ● | ● | ● | M3 |
| | MT420 I | M9×7 | ● + + | 9600 | 220 | 3,4,6,8,12 | 10,12,5,16,7 | 200 | 220 | 16 | 66×45,7 | 36 | 5 | ● | ● | ● | ● | M3 |
| | MT420 L | M9×7 | ● + + | 9600 | 220 | 3,4,6,8,12 | 10,12,5,16,7 | 200 | 220 | 16 | 66×45,7 | 36 | 5 | ● | ● | ● | ● | M3 |
| MT140 I | MT140 I | M9×7 | + ● + + | 9600 | 218 | 6,8 | 10,12,5,16,6,20 | 160 | 218 | 16 | 48,3×24,1 | 7,5 | 4 | ● | ● | ● | ● | M3 |
| | MT140 L | M9×7 | + ● + + | 9600 | 218 | 6,8 | 10,12,5,16,6,20 | 160 | 218 | 16 | 48,3×24,1 | 7,5 | 4 | ● | ● | ● | ● | M3 |
| | Newbury Labs 1550 | M9×7 | ○ ○ ○ | 9600 | 2000 | 6,8 | 5,6,8,5,10,12,17 | 120 | 230 | 15,5 | 55,9×30,5 | 11 | 3 | ● | ● | ● | ● | N1 |
| | Newbury Labs 8510A | M9×7 | ○ ○ ○ | 9600 | 3000 | 6,8 | 5,6,8,5,10,12,17 | 120 | 132 | 10 | 55,9×28,6 | 8,5 | 3 | ● | ● | ● | ● | N1 |
| Newbury Labs NL40 | Daisywheel | M9×7 | ○ ○ ○ | 2400 | 2000 | 6,8 | 10,12 | 40 | 163 | 15,5 | 55,9×43,2 | 14 | 2 | ● | ● | ● | ● | N1 |
| | OKI Microline 80 | M5×7 | ● ● + | 9600 | 256 | 6,8 | 5,10,16,5 | 80 | 132 | 9,5 | 34,2×24,5 | 6,5 | 4 | ● | ● | ● | ● | X1 |
| | OKI Microline 82A | M9×7 | ● ● + | 1200 | 132 | 6,8 | 5,8,3,10,16,5 | 120 | 132 | 9,5 | 36,1×32,8 | 8,9 | 4 | ● | ● | ● | ● | X1 |
| | OKI Microline 83A | M9×7 | ● ● + | 1200 | 132 | 6,8 | 5,8,3,10,16,5 | 120 | 132 | 15 | 51×32,8 | 14 | 3 | ● | ● | ● | ● | X1 |
| OKI Microline 84 | M | M9×7 | ○ ○ ○ | 4800 | 132 | 6,8 | 5,8,3,10,12,17 | 200 | 231 | 15 | 51×32,8 | 14 | 3 | ● | ● | ● | ● | X1 |
| | Olivetti DM5050 | M7×9 | ● + + | 4 | 9600 | 1000 | 10,12,5,16,5 | 100 | 132 | 9 | 11,6×30 | 7,5 | 2 | ● | ● | ● | ● | B2 |
| | Olivetti DM5100 | M7×9 | ○ ○ ○ | 9600 | 256 | 6 | 10,12,16,5 | 140 | 220 | 14,75 | 59,2×40,1 | 17 | 4 | ● | ● | ● | ● | B2 |
| | Olivetti DM5200 | M7×9 | ● + + | 9600 | 256 | 6 | 10,12,16,5 | 200 | 220 | 19,75 | 59,2×40,1 | 17 | 4 | ● | ● | ● | ● | B2 |
| Olivetti DY-211 | Daisywheel | M9×7 | ● ● + | 9600 | 1000 | 6 | 10,12,15 | 29 | 198 | 17 | 54,1×32,8 | 16,3 | 4 | ● | ● | ● | ● | B2 |
| | Daisywheel | M9×7 | + ○ ○ | 9600 | 1000 | 6 | 10,12,15 | 39 | 225 | 17,25 | 60×50 | 17 | 4 | ● | ● | ● | ● | B2 |
| | Olivetti DY-311 | M | ● + + | 9600 | 1000 | 6,8 | 10,12,18 | 50 | 147 | 9 | 39×26,8 | 5,2 | 1 | ● | ● | ● | ● | B2 |
| | Olivetti JP101 | Thermal 5×7 | + ● + | 9600 | 1000 | 6 | 10 | 240 | 80 | 8,75 | 40,1×34 | 7,5 | 1 | ● | ● | ● | ● | B2 |
| Olympia ESW102RO | Daisywheel | M9×7 | + + + | 19200 | 4000 | 6 | 10,12,15 | 24 | 141 | 17 | 52,8×37 | 13 | 6 | ● | ● | ● | ● | I5 |
| | Daisywheel | M9×7 | + + + | 19200 | 4000 | 6 | 10,12,15 | 24 | 212 | 17 | 52,8×43,1 | 14,5 | 6 | ● | ● | ● | ● | I5 |
| | Daisywheel | M9×7 | ○ ○ ○ | 19200 | 4000 | 3,4,6 | 10,12,15 | 50 | 225 | 17 | 60,4×40,8 | 19,5 | 6 | ● | ● | ● | ● | I5 |
| | Phillips Mullard GP300 | M | + ● | 19200 | 512 | 3,4,6,8,12 | 10,12,15 | 300 | 180 | 14,4 | 64,5×52,3 | 24 | 6 | ● | ● | ● | ● | R2 |
| Printex 920 | M | + ● | 9600 | 1792 | 6,8,12,16 | 10,12,13,3,16,7 | 340 | 227 | 16 | 59×42,5 | 20 | 4 | ● | ● | ● | ● | T3 | |
| | Qume Sprint 9/35 | Daisywheel | + 1 | 9600 | 500 | 6,8 | 10,12,15 | 35 | 198 | 15 | 61,3×49,9 | 19 | 3 | ● | ● | ● | ● | Q1 |
| | Qume Sprint 9/45 | Daisywheel | + 1 | 9600 | 500 | 3,6,8 | 10,12,15 | 45 | 198 | 15 | 61,7×42,5 | 20,4 | 3 | ● | ● | ● | ● | Q1 |
| | Qume Sprint 9/55 | Daisywheel | + ● | 9600 | 500 | 3,6,8 | 10,12,15 | 55 | 198 | 15 | 61,7×42,5 | 20,4 | 3 | ● | ● | ● | ● | Q1 |
| Rair Decwriter III | M7×7 | + ● | 9600 | 1000 | 2,3,4,6,8,12 | 5,6,6,6,8,25,10,13,2,16,5 | 180 | 132 | 15 | 69,9×60,9 | 46,4 | 3 | ● | ● | ● | ● | R1 | |
| | M7×9 | + ● | 300 | 256 | 2,3,4,6,8,12 | 5,6,6,6,8,25,10,13,2,16,5 | 30 | 127 | 15 | 57,1×39,4 | 11,3 | 3 | ● | ● | ● | ● | R1 | |
| | Daisywheel | + ● | 9600 | 768 | 6,8 | 10,16,5 | 40 | 196 | 15 | 59,9×46,4 | 27,2 | 2 | ● | ● | ● | ● | R1 | |
| | M9×7 | + ● | 9600 | 1280 | 6,8 | 10,16,5 | 150 | 132 | 15 | 66×53,4 | 18,2 | 6 | ● | ● | ● | ● | R1 | |
| Rair Centronics 150/4 | M9×7 | + ● | 9600 | N/A | 6 | 10 | 10 | 150 | 132 | 10 | 38,1×35,6 | 9 | 2 | ● | ● | ● | ● | R1 |
| | Thermal | ● ● | 300 | N/A | 6 | 10 | 10 | 30 | 80 | 8,5 | 39,1×40,6 | 6,1 | 1 | ● | ● | ● | ● | R1 |
| | Daisywheel | ○ ○ ○ | 9600 | 200 | 8 | 10,12,15 | 37 | 163 | 15 | 59,3×33,2 | 14 | 7 | ● | ● | ● | ● | A1 | |
| | Ricoh RP1300 Flowriter | Daisywheel | ○ ○ ○ | 9600 | 2000 | 8 | 10,12,15 | 60 | 163 | 15 | 62,5×35,5 | 22 | 7 | ● | ● | ● | ● | A1 |
| Ricoh RP1600 Flowriter | Daisywheel | + ● | 9600 | 4000 | 6,8 | 10,12,15 | 65 | 204 | 13,5 | 63,5×36,2 | 27 | 7 | ● | ● | ● | ● | M4 | |
| | Daisywheel | + ● | 9600 | 2000 | 6,8 | 6,12 | 10,12,15,17,18 | 450 | 234 | 14,5 | 47×56,9 | 23,6 | 5 | ● | ● | ● | ● | A2 |
| | M | + ● | 9600 | 256 | 6 | 6,12 | 6,12 | 50 | 80 | 10 | 42,7×23,8 | 4,5 | 3 | ● | ● | ● | ● | D4 |
| | M5×7 | + ● | 9600 | 256 | 6 | 6,12 | 6,12 | 50 | 80 | 10 | 42,7×23,8 | 4,5 | 3 | ● | ● | ● | ● | D4 |
| Shinwa-CTI CP80 | M9×13 | ● ● + | 9600 | 132 | 6 | 11 | 11 | 80 | 142 | 10 | 295,5×37,7×125 | 5,3 | 4 | ● | ● | ● | ● | M7 |
| | Daisywheel | ○ ○ ○ | 19200 | N/A | 3,4,5,6 | 10,12 | 10,12 | 120 | 126 | 13 | 49,5×31,5 | 8,4 | 5 | ● | ● | ● | ● | D1 |
| | M | ● ● | 9600 | 136 | 6,8,9 | 6,8,9 | 10,12 | 120 | 136 | 15 | 51×36 | 13 | 5 | ● | ● | ● | ● | S12 |
| | Sord SLP160 | Daisywheel | ● ● + | 9600 | 2000 | 6,8 | 10,12,15 | 16 | 132 | 15 | 66×44,7 | 22 | 5 | ● | ● | ● | ● | S2 |
| Sord SWP20 | Daisywheel | ● ● + | 2400 | 132 | 6,12 | 10,12,16,7 | 100 | 132 | 10,5 | 39,4×32,4 | 8,5 | 2 | ● | ● | ● | ● | S3 | |
| | M | + ● | 9600 | 2,300 | 6,8 | 10,12,17 | 10,12,17 | 100 | 132 | 10 | 315,5×39,2×136 | 7 | 3 | ● | ● | ● | ● | M7 |
| | M9×9 | + ● | 9600 | 2,300 | 6,8 | 10,12,17 | 10,12,17 | 100 | 233 | 15 | 515,5×42,5×136 | 10 | 3 | ● | ● | ● | ● | M7 |
| | M9×9 | + ● | 9600 | 256 | 6,8 | 6,8 | 10,12,17 | 120 | 132 | 16 | 71,7×61 | 53 | 6 | ● | ● | ● | ● | S4 |
| Systeme System | M | ● | 9600 | 256 | 6,8 | 6,8 | 10 | 120 | 132 | 16 | 71,7×61 | 53 | 6 | ● | ● | ● | ● | S4 |

[illegible]

MONITORS

These have been split into colour and monochrome.

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals to which the monitor can respond in Megahertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture. **Dimensions** indicates the area the unit occupies on the desktop.

| Make & Model | Price inc VAT | Screen size (in inches) | Signal | | | | | Audio channel | Anti-glare filter | Band width (in MHz) | Dot resolution | Dimensions (cms) | Weight (kilos) | Distributor |
|------------------------|---------------|----------------------------|---------------|-----------------|---------|---------------|------------------|---------------|-------------------|------------------------|----------------|------------------|----------------|-------------|
| | | | Signal | | | | | | | | | | | |
| | | | Modulated PAL | Unmodulated PAL | TTL RGB | 75 Ohm linear | 32 bit 4 bit TTL | | | | | | | |
| COLOUR MONITORS | | | | | | | | | | | | | | |
| Crofton C1401 | £300 | 14 | | | | | | | | 10 | 600 | 37×42 | 10 | C4 |
| HM 2713 | £3,120 | 13 | | | | | | | | 25 | 720 | 54×40 | 36 | B1 |
| HM 2719B | £2,553 | 19 | | | | | | | | 25 | 960 | 50×49 | 46 | B1 |
| HM 2719C | £3,042 | 19 | | | | | | | | 25 | 960 | 50×49 | 46 | B1 |
| HM 3619 | £3,548 | 19 | | | | | | | | 45 | 1280 | 50×44 | 48 | B1 |
| Kaga Vision II | £327.75 | 12 | | | | | | | | 15 | 510 | 32×30.3 | 12.5 | D6 |
| Lion Cub 1431-TTL | £286 | 14 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1436 | £316 | 14 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1439 | £339 | 14 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1441-TTL | £546 | 14 | | | | | | | | 15 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1445 | £633 | 14 | | | | | | | | 15 | 895 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1449 | £604 | 14 | | | | | | | | 15 | 895 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1451-TTL | £430 | 14 | | | | | | | | 10 | 653 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1455 | £483 | 14 | | | | | | | | 10 | 653 | 65×57.5 | 11.5 | S6 |
| Lion Cub 1459 | £459 | 14 | | | | | | | | 10 | 653 | 65×57.5 | 11.5 | S6 |
| Lion Cub 2031-TTL | £344 | 20 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 2035 | £431 | 20 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 2036 | £390 | 20 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 2039 | £371 | 20 | | | | | | | | 7 | 585 | 65×57.5 | 11.5 | S6 |
| Lion Cub 2051-TTL | £646 | 20 | | | | | | | | 10 | 940 | 65×57.5 | 11.5 | S6 |

| Make & Model | Price inc VAT | Screen size (in inches) | Signal | | | | | Audio channel | Band width (in MHz) | Dot resolution | Dimensions (cms) | Weight (kilos) | Distributor |
|-------------------|---------------|-------------------------|---------------|-----------------|---------|---------------|------------------|---------------|---------------------|----------------|------------------|----------------|-------------|
| | | | Modulated PAL | Unmodulated PAL | TTL RGB | 75 Ohm linear | 32 bit 4 bit TTL | | | | | | |
| Luxor Digital | £574 | 14 | | | ● | | ● | ● | 25 | 800 | N/A | 15.7 | P1 |
| Luxor Linear I | £597 | 14 | | | | ● | | ● | 25 | 800 | N/A | 15.7 | P1 |
| Luxor Linear II | £643 | 14 | | | | ● | | ● | 25 | 800 | N/A | 15.7 | P1 |
| Microtech 14 | £402 | 14 | | ● | ● | ● | ● | ● | 18 | 585 | 33.7 × 40.8 | 12.6 | M6 |
| TM 22 | £329 | 6 | | | | ● | ● | ● | 5.5 | N/A | 22×34.5 | 4.1 | J3 |
| VM 14 PSN | £378 | 14 | | | | ● | ● | ● | 5.5 | 300 | 47×40 | 13.6 | J3 |
| Wolf Cub 1435-TTL | £358 | 14 | | | ● | ● | | | 7 | 653 | 65×57.5 | 11.5 | S6 |
| Wolf Cub 1446-TTL | £587 | 14 | | | | | ● | ● | 15 | 895 | 65×57.5 | 11.5 | S6 |
| Wolf Cub 1456 | £454 | 14 | | | | | ● | ● | 10 | 653 | 65×57.5 | 11.5 | S6 |

MONOCHROME MONITORS

| | | | | | | | | | | |
|---------------|------|----|---|--------|---|-------|-----|----------------|-----|----|
| AVT DM 210G | £138 | 12 | ● | Green | ● | 12 | 750 | 30.8×29.6 | 9.5 | L1 |
| EG 100 | £77 | 12 | ● | Green | ● | 8 | 700 | 37.5×29 | 8 | L1 |
| EG 101 | £91 | 12 | ● | Green | ● | 12 | 700 | 37.5×29 | 8 | L1 |
| LED M 091D | £99 | 9 | ● | B&W | ● | 12 | 750 | 22×24 | 5.4 | L1 |
| LED M 0910 | £121 | 9 | ● | Green | ● | 12 | 750 | 22×24 | 5.4 | L1 |
| Luxor 10 | £212 | 10 | ● | Orange | ● | 22 | 625 | N/A | 8 | P1 |
| Luxor 15 | £283 | 15 | ● | Orange | ● | 22 | 625 | N/A | 13 | P1 |
| M9 | £131 | 9 | ● | Green | ● | 15-22 | 650 | 22.4×25.7 | 5.7 | P1 |
| M12 | £144 | 12 | ● | Green | ● | 15-22 | 800 | 29.3×30 | 9.3 | P1 |
| Novex | £114 | 12 | ● | Green | ● | 12 | 750 | N/A | N/A | P1 |
| N12 1003 | £112 | 12 | ● | Green | ● | 24 | 800 | 23×26.5 | 7 | P1 |
| Prince | £126 | 12 | ● | Green | ● | 24 | 800 | 33×50 | 7 | C4 |
| PM 102 | £126 | 9 | ● | Green | ● | 24 | 800 | 22×28 | 7 | C4 |
| PM 1201 | £138 | 12 | ● | Green | ● | 24 | 800 | 33×50 | 7 | C4 |
| Zenith ZVM121 | £99 | 12 | ● | Green | ● | 15 | N/A | 29×29 | 6.5 | P2 |
| U300 | £149 | 12 | ● | Green | ● | 18 | N/A | 34.8×36.8×29.2 | 7.7 | R4 |
| U300A | £153 | 12 | ● | Amber | ● | 18 | N/A | 34.8×36.8×29.2 | 7.7 | R4 |

DISK DRIVES

This section is divided into categories covering 5¼in and 8in floppy disks.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single or double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single or double** (data) **density**. **BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect to** column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

| Make and Model | Price inc VAT | Capacity | No. of disks | Tracks | Sectoring | Sides and density | Connects to | Distributor |
|---------------------|---------------|----------|--------------|--------|-----------|-------------------|-----------------------------------|-------------|
| | | | | | | | Apple II BBC RS232 I-EEF | Others |
| Apple II | £399 | 143K | 1 | 35 | 16 | SS,SD | ● | P2 |
| Atari | £299 | 90K | 1 | 40 | Soft | SS,SD | | A4 |
| BASF 6106 | £195 | 500K | 1 | 48 | Both | SS,SD | | B6 |
| BASF 6108 | £240 | 500K | 1 | 48 | Both | DS,SD | | B6 |
| BASF 6118 | £279 | 1Mb | 1 | 96 | Both | DS,SD | | B6 |
| Canon X8300 | £600 | 640K | 2 | 80 | Soft | DS,SD | | C5 |
| CD 40 | £679 | 400K | 2 | 40 | Both | SS,SD | | C6 |
| CD 50A | £424 | 500K | 2 | 40 | Both | SS,SD | | C6 |
| CD 50E | £569 | 1Mb | 2 | 80 | Both | SS,SD | | C6 |
| CD 50F | £712 | 2Mb | 2 | 80 | Both | DS,SD | | C6 |
| CD 80 | £765 | 800K | 2 | 80 | Both | SS,SD | | C6 |
| CD 80D | £949 | 1.6Mb | 2 | 80 | Both | DS,SD | | C6 |
| Commodore 2031 | £454 | 171K | 1 | 35 | Soft | SS,SD | ● | C2 |
| Commodore 4040 | £799 | 343K | 2 | 35 | Soft | SS,SD | ● | C2 |
| Commodore 8050 | £1,029 | 1Mb | 2 | 77 | Soft | SS,SD | ● | C2 |
| Commodore 8250 | £1,489 | 2Mb | 2 | 154 | Soft | DS,SD | ● | C2 |
| Commodore VIC 1541 | £229 | 171K | 1 | 35 | Soft | SS,SD | | C2 |
| Control Data 9408 | £221 | 250K | 1 | 40 | Both | SS,SD | ● | C7 |
| Control Data 9409 | £272 | 500K | 1 | 40 | Both | DS,SD | ● | C7 |
| Control Data 9409T | £420 | 1Mb | 1 | 80 | Both | DS,SD | ● | C7 |
| Control Data ZL141 | £225 | 250K | 1 | 40 | Both | SS,SD | | M5 |
| Control Data ZL141B | £175 | 250K | 1 | 40 | Both | SS,SD | ● | M5 |
| Control Data ZL142 | £360 | 500K | 2 | 40 | Both | SS,SD | ● | M5 |
| Control Data ZL241B | £240 | 500K | 1 | 40 | Both | DS,SD | ● | M5 |
| Control Data ZL291 | £380 | 1Mb | 1 | 80 | Both | DS,SD | ● | M5 |
| Control Data ZL291* | £405 | 500/1Mb | 1 | 40/80 | Both | DS,SD | ● | M5 |
| Control Data ZL291B | £320 | 1Mb | 1 | 80 | Both | DS,SD | ● | M5 |
| Control Data ZL292 | £640 | 2Mb | 2 | 80 | Both | DS,SD | ● | M5 |
| CS 40 | £482 | 200K | 1 | 40 | Both | SS,SD | | C6 |
| CS 50A | £229 | 250K | 1 | 40 | Both | SS,SD | ● | C6 |
| CS 50E | £305 | 500K | 1 | 80 | Both | SS,SD | ● | C6 |
| CS 50F | £397 | 1Mb | 1 | 80 | Both | DS,SD | ● | C6 |
| CS 80 | £523 | 400K | 1 | 80 | Both | SS,SD | | C6 |
| CS 80D | £627 | 800K | 1 | 80 | Both | DS,SD | | C6 |
| Cumana AS100 | £252 | 200K | 1 | 35 | Soft | SS,SD | ● | C6 |
| Cumana DA8035 | £857 | 655K | 2 | 80 | Soft | SS,SD | ● | C6 |

5¼" DISK DRIVES

| Make and Model | Price inc VAT | Capacity | No. of disks | Tracks | Sectoring | Sides and density | Connects to | Distributor |
|--------------------|---------------|----------|--------------|--------|-----------|-------------------|-----------------------------------|-------------|
| | | | | | | | Apple II BBC RS232 I-EEF | Others |
| EG 401AT | £370 | 102K | 2 | 40 | Soft | SS,SD | ● | L1 |
| Gemini 825 | £403 | 400K | 1 | 80 | Soft | SS,SD | | G2 |
| Gemini 825 | £518 | 800K | 1 | 160 | Soft | DS,SD | ● | G2 |
| Gemini 825 | £661 | 800K | 2 | 80 | Soft | SS,SD | ● | G2 |
| Gemini 825 | £776 | 1.6Mb | 2 | 160 | Soft | DS,SD | ● | G2 |
| Lowe EG 400AT | £426 | 200K | 2 | 40 | Soft | SS,SD | ● | L1 |
| Lowe EG 400T | £253 | 102K | 1 | 40 | Soft | SS,SD | ● | L1 |
| M 4853 | £311 | 1Mb | 1 | 80 | Soft | DS,SD | ● | A3 |
| M 4854 | £368 | 1.6Mb | 1 | 77 | Soft | DS,SD | ● | A3 |
| Megastore MIOS | £1,034 | 1.2Mb | 2 | 80 | Soft | DS,SD | ● | V1 |
| Multi Floppy Drive | £592 | 8Mb | 5 | 770 | Soft | SS,SD | ● | H1 |
| RM MDS-1 | £1,950 | 144K | 1 | 40 | Soft | DS,SD | ● | R3 |
| RM MDS-2 | £2,147 | 288K | 2 | 40 | Soft | DS,SD | ● | R3 |
| Scorpio 8 | £863 | 8Mb | 5 | 770 | Soft | SS,SD | ● | H1 |
| Sharp MZ80 FB | £856 | 560K | 2 | 70 | Soft | DS,SD | | S7 |
| Tandy Colour | £449 | 175K | 1 | 40 | Soft | SS,SD | | T1 |
| Tandy 26-1160 | £299 | 75K | 4 | 40 | Soft | SS,SD | ● | T1 |
| Tandy 26-3023 | £299 | 156K | 4 | 35 | Soft | SS,SD | ● | T1 |
| Tandy Model 1 | £389 | 90K | 1 | 35 | Soft | SS,SD | ● | T1 |
| Tandy Model 111 | £369 | 175K | 2 | 40 | Soft | SS,SD | | T1 |
| TM 101-4 | £282 | 1Mb | 1 | 160 | Soft | SS,SD | ● | H1 |
| TM 102-2 | £393 | 2Mb | 1 | 160 | Soft | SS,SD | ● | H1 |
| TM 848-1 | £389 | 800K | 1 | 77 | Soft | SS,SD | ● | H1 |
| TM 50-1 | £147 | 250K | 1 | 40 | Soft | SS,SD | ● | H1 |
| TM 100-1 | £158 | 250K | 1 | 40 | Soft | SS,SD | ● | H1 |
| TM 100-2 | £221 | 500K | 1 | 80 | Soft | DS,SD | ● | H1 |
| TM 100-4/4M | £247 | 1Mb | 1 | 160 | Soft | DS,SD | ● | H1 |
| Tracker 1 | £373 | 1Mb | 2 | 80 | Soft | SS,SD | ● | D7 |
| Tracker 2 | £497 | 2Mb | 2 | 80 | Soft | DS,SD | ● | D7 |

8" DISK DRIVES

| Make and Model | Price inc VAT | Capacity | No. of disks | Tracks | Sectoring | Sides and density | Connects to | Distributor |
|---------------------|---------------|----------|--------------|--------|-----------|-------------------|-----------------------------------|-------------|
| | | | | | | | Apple II BBC RS232 I-EEF | Others |
| ACP 700 (AC) | £293 | 1Mb | 1 | 77 | Soft | DS,SD | | E2 |
| ACP 750 (DC) | £316 | 1Mb | 1 | 77 | Soft | DS,SD | | E2 |
| ACP 1500 (DC) | £403 | 2Mb | 1 | 77 | Soft | DS,SD | | E2 |
| Caldisk 142M | £465 | 500K | 1 | 77 | Both | SS,SD | | E2 |
| Caldisk 143M | £522 | 1.2Mb | 1 | 77 | Both | DS,SD | ● | F1 |
| Caldisk 143M-1 | £465 | 500K | 1 | 77 | Both | SS,SD | ● | F3 |
| Commodore 8280 | £2,760 | 987K | 2 | 77 | Soft | DS,SD | ● | C2 |
| Canon X 8330 | £1,200 | 2Mb | 2 | 153 | Soft | DS,SD | | C5 |
| Control Data 9404B | £684 | 800K | 1 | 77 | Both | SS,SD | ● | M5 |
| Control Data 9406-4 | £1,144 | 1.6Mb | 1 | 77 | Both | DS,SD | ● | M5 |
| Eicon FD8/1D/DD | £1,438 | 1Mb | 1 | 77 | Soft | SS,SD | ● | E3 |
| Eicon FD8/1D/SD | £1,397 | 500K | 1 | 77 | Soft | BS,SD | ● | E3 |
| Eicon FD8/2D/FBR | £1,740 | 1Mb | 2 | 77 | Soft | DS,SD | ● | E3 |
| Eicon FD8/2D/DD | £2,013 | 2Mb | 2 | 77 | Soft | SS,SD | ● | E3 |
| Eicon FD8/2D/SD | £1,972 | 1Mb | 2 | 77 | Soft | SS,SD | ● | E3 |
| Eicon FD8/1D/FBR | £1,240 | 500K | 1 | 77 | Soft | DS,SD | | E3 |
| F 311 | £1,725 | 1.2Mb | 2 | 76 | Soft | DS,SD | | B15 |

| Make and Model | Price inc VAT | Capacity | No. of disks | Tracks | Sectioning | Sides and density | Connects to | Distributor |
|-----------------------|---------------|----------|--------------|--------|------------|-------------------|-----------------------------------|--|
| | | | | | | | Apple II BBC RS232 I-EEE | Others 20ma Gemini Nasbus St Shugart |
| 8" DISK DRIVES | | | | | | | | |
| F 320 | £2,300 | 2.4Mb | 2 | 76 | Soft | DS,DD | | B5 |
| M 2894 | £499 | 1.6Mb | 1 | 77 | Soft | DS,DD | | A3 |
| M 2896 | £493 | 1.6Mb | 1 | 77 | Soft | DS,DD | | A3 |
| Megastor 11 DD | £1,133 | 2Mb | 2 | 77 | Soft | DS,DD | | V1 |
| Megastor 11SD | £1,018 | 1Mb | 2 | 77 | Soft | DS,DD | | V1 |
| Megastor 111 | £1,121 | 2Mb | 2 | 77 | Soft | DS,DD | | V1 |
| R.M. FDS-2 | £3,789 | 1Mb | 2 | 77 | Soft | DS,DD | | R3 |
| Tandy Model 11 | £999 | 486K | 1 | 77 | Soft | DS,DD | | T1 |
| Tandy Model 16 | £949 | 1.2Mb | 1 | 77 | Soft | DS,DD | | T1 |
| Tandy Model 16 | £1,549 | 2.5Mb | 2 | 77 | Soft | DS,DD | | T1 |

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A D in the connection column represents direct link, while A indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A B in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The interface column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once. Some modems can originate a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

| Make and Model | Price inc VAT | Connection | Data Rates (baud) | Interface | Others | Capabilities | Distributor Code |
|----------------|---------------|------------|-------------------|-----------|--------|--|------------------|
| | | | | | | Asynchronous Simplex Half Duplex Full Duplex Originate Answer | |
| AD 1223 | £287.50 | D | 1200 | RS232 | | | A6 |
| AJ 311 | £320 | B | 300 | RS232 | | | A5 |
| AJ 1222 | £736 | D | 1200 | RS232 | | | A5 |
| AJ A211 | £263 | A | 300 | RS232 | | | A5 |
| AJ 1234 | £684 | A | 1200 | RS232 | | | A5 |
| AJ 1256 | £684 | B | 1200 | RS232 | | | A5 |
| AM 211 | £387 | B | 300 | RS232 | | | A5 |

DISTRIBUITORS

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B1 Bitech, Reading 61031 B2 British Olivetti, 01-785 6666 B3 Barron McCann, Biggleswade 316286 B4 Bencom Sendata (UK), 01-940 1386 B5 Baydel Ltd, Leatherhead 378811 B6 BASF, 01-388 4200
C1 Centronics, 01-581 1011 C2 Commodore Business Machines, Slough 79292 C3 Calcomp Ltd, Bracknell 50211 C4 Crofton Electronics, 01-891 1923 C5 Canon (UK) Ltd, 01-680 7700 C6 Cumana, Guildford 503121 C7 CBL, Reading 792097
D1 Discorn, Evesham 3591 D2 Datatrade Ltd, Northampton 22289 D3 DNCs Ltd, 061-643 0016 D4 DRG, Weston-super-Mare 415398 D5 Data Systems Division, Bedford 223889 D6 Data Efficiency, Hemel Hempstead 63561 D7 Data Track Technology, New Milton 619650 D8 Dacom Systems, Milton Keynes 676797
E1 Epson (UK), 01-900 0466 E2 Elecomatic, 041-881 5825 E3 Eicon, Barhill 81825 E4 Environmental Equipments Northern Ltd, Nantwich 625115
F1 Fastcol, Reading 791557
G1 Geveke Electronics, Woking 26331 G2 Gemini Micros, Amersham 28321
H1 HAL Computers Ltd, Farnborough 517175 H2 Haywood Electronic Assoc. Ltd, 01-428 0111
I1 Informex Ltd, 01-318 4213 I2 Iniac Data Systems, Rotherham 547170 I3 ITT Business Systems, Brighton 507111 I4 ITT Consumer Products, Basildon 3040 I5 Intelligent Interfaces, Stratford-upon-Avon 296879

| Make and Model | Price inc VAT | Capacity | No. of disks | Tracks | Sectioning | Sides and density | Connects to | Distributor |
|-----------------------|---------------|----------|--------------|-------------|------------|-------------------|-----------------------------------|--|
| | | | | | | | Apple II BBC RS232 I-EEE | Others 20ma Gemini Nasbus St Shugart |
| Bermac 1200/1 Model A | £414 | D | 1800 | RS232 | | | | B3 |
| Bermac 1200/1 Model B | £460 | D | 1800 | RS232 | | | | B3 |
| CITT CAT | £228 | A | 300 | RS232/V24 | | | | D8 |
| CCSV22 | £719 | D | 1200 | RS232/V24 | | | | D8 |
| DSL2123 | £329 | D | 300/1200 | RS232/V24 | | | | D8 |
| Sendata 700 Series A | £253 | A | 300 | RS232, 20ma | 1 | | | B4 |
| Sendata 700 Series B | £224 | A | 300 | RS232, 20ma | 1 | | | B4 |
| Sendata 700 Series C | £309 | A | 600-1200 | RS232, 20ma | 1 | | | B4 |
| Sendata 700 Series D | £309 | A | 75-1200 | RS232, 20ma | 1 | | | B4 |
| Sendata 700 Series E | £149 | A | 300-1200 | RS232, 20ma | 1 | | | B4 |
| Racal 126 LS1 | £782 | D | 2400 | V24 | | | | R2 |
| Racal MPS 3021 | £295 | D | 300 | V24 | | | | R2 |
| Racal MPS 1222 | £678 | D | 1200 | V24 | | | | R2 |

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types—flatbed or drum. A flatbed holds the paper flat while the pen draws on it in two dimensions. A drum plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size**. **Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

| Make and Model | Price inc VAT | Type | Max Pens | Paper Size | Maximum Plotting Speed in secs. | Interface (+ at extra cost) | Distribution |
|--------------------|---------------|------|----------|------------|---------------------------------|-----------------------------|--------------|
| Calcomp 81 | £3,392 | Flat | 8 | A3 | 30cm | RS232 or IEEE Centronics | C3 |
| DXV 100 | £699 | Flat | 1 | A3 | 7 | Centronics | R4 |
| HP 7470A | £1,317 | Drum | 2 | A4 | 38.1cm | RS232 (IEEE+) | H2 |
| PD4 | £585 | Flat | 1 | A4 | 700mm | (IEEE+) | J2 |
| RY-21 | £747.50 | Flat | 1 | A4 | 200mm | Centronics, (RS232+) | R5 |
| RY-10MZ | £1,865 | Flat | 8 | A3 | 400mm | Centronics, (RS232, IEEE+) | R5 |
| Strobe 100 | £662 | Drum | 1 | A4 | 7.6cm | (RS232, Parallel+) | D6 |
| TRS-80 Pen Plotter | £1,399 | Flat | 6 | A4 | 6.8cm | RS232 | T1 |
| Watanabe WX 4634 | £2,515 | Flat | 2 | A3 | 250mm | (Centronics, RS232, IEEE+) | E4 |
| Watanabe WX 4635 | £2,301 | Flat | 1 | A3 | 250mm | (Centronics, RS232, IEEE+) | E4 |
| Watanabe 4637 | £2,862 | Flat | 2 | A3 | 400mm | (Centronics, RS232, IEEE+) | E4 |
| Watanabe 4638 | £2,635 | Flat | 1 | A3 | 400mm | (Centronics, RS232, IEEE+) | E4 |
| Watanabe WX 4671 | £1,129 | Flat | 1 | A3 | 50mm | Parallel (RS232, IEEE+) | E4 |
| Watanabe 4675 | £1,638 | Flat | 6 | A3 | 50mm | Parallel (RS232, IEEE+) | E4 |
| Watanabe 4731 | £1,761 | Drum | 4 | A3 | 200mm | (Centronics, RS232, IEEE+) | E4 |

J1 Jones & Brother, 061-330 6531 J2 J J Lloyd Instruments, Lockshead 4221 J3 JVC, 01-450 2621
L1 Lowe Electronics, Malco 4995
M1 Mitsui & Co Ltd, 01-600 1777 M2 Modata, Tunbridge Wells 41555 M3 Mannesmann Tally Ltd, Reading 788711 M4 Microputle, Macclesfield 615384 M5 Microware, 01-272 6237 M6 Microtech Leeds, Leeds 679964 M7 Micro Peripherals Ltd, Basingstoke 3232
N1 Newbury Data Recording, Newbury 48864
O1 Phoenix Technology, 01-737 3333 P2 Pete & Pam Computers, Rossendale 227011
Q1 Qume (UK) Ltd, Reading 584646
R1 Rair Ltd, 01-836 6921 R2 Riva Terminals, Woking 71001 R3 Research Machines Ltd, Oxford 249866 R4 Roland (UK) Ltd., 01-563 4578 R5 Rikadenki Mitsui Electronics, 01-397 5111
S1 Sintorn Electronics, Reading 875454 S2 Sord, 01-930 4214 S3 Stotiron, Coventry 613521 S4 Systime, Leeds 702211
S5 Sinclair Research, Camberley 681666 S6 Silicon Express, Leicester 374917 S7 Sharp Electronics, 061-205 2333
T1 Tandy Company, Walsall 648181 T2 Triumph Adler, 01-250 1717 T3 Technology For Business, 01-837 1271 T4 Toshiba Office International, Sunbury-on-Thames 85666
V1 Vlasak, High Wycombe 448633
W1 Walters Microsystems Int Ltd, High Wycombe 445175
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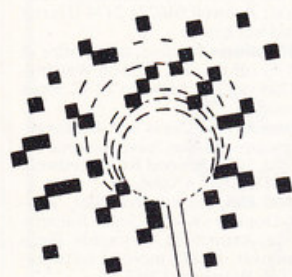
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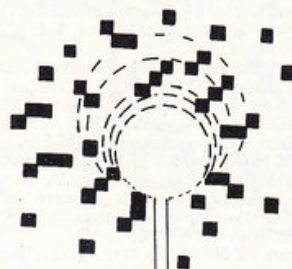
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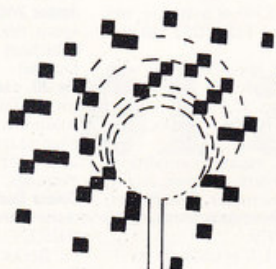
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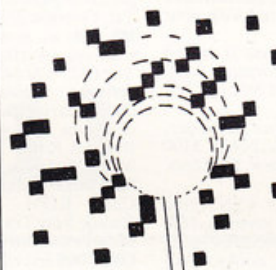
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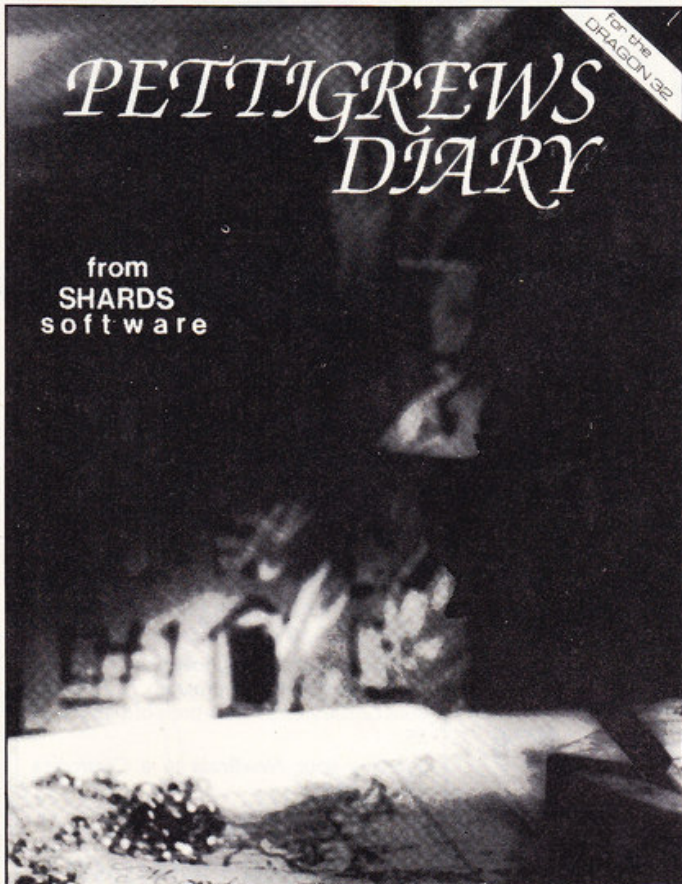
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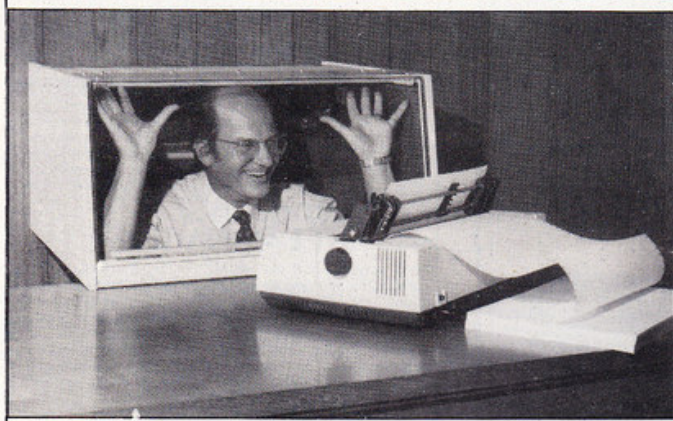
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Laughline result

Another Laughline contest has reached the stage where we name the winner.

It's been another full postbag and the number of things you can read into a man inside a printersilencer leaves us lost for words. So here are some of yours. 'PC 'N quiet at last,' was the suggestion from David North of Durham. Simon Williams, of Sheepwash, Devon, wrote: 'And in next week's "Indoor Naturalist" I shall be

using this easily-constructed hide as part of my study of the Private Life of the Matrix Printer.'

There were many others but after a lengthy deliberation we decided to award the £20 prize to Chris Bailey, of Cleveland: 'Our printers are top class but there's room for improvement in our elevators.' Congratulations, Chris — you'll also win a £30 voucher from Action Computer Supplies.

Softek news

This could be the programming competition of the year — £1,000 up for grabs and you don't even have to finish the program.

'The entry can be a complete

product or something only half completed, but the entrant must demonstrate that they're presenting something new, original and innovative that isn't on the market already,' said Tim Langdell, managing director of the organiser Softek.

The contest closes on December 31, and entries should go to Softek at 12-13 Henrietta St, Covent Garden, London WC2. Mr Langdell wins the PCN prize (value £0) for finding four ways of saying 'new' in a single sentence.

NEXT WEEK

Burning bright: On the cover and inside we look at the HH Tiger.

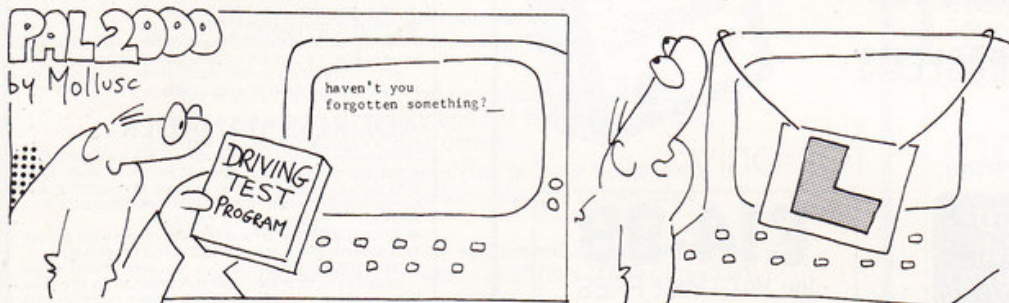
Good health: Three packages that will turn your Spectrum into a consulting room.

Personal FX: The second of our two-part series on BBC FX calls.

Forth division: An implementation of Forth for the ZX81.

Games: For the Commodore 64, Vic 20, and Spectrum and adventure on the Dragon.

Plus all the regular weekly items: news, letters, tips and hints, and the pull-out programming section.



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 |
|---|----------------------------|--|---|
| 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 — HOMETECH | 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 |
| Northern Computer Fair | November 24-26 | Belle Vue, Manchester | Reed Exhibitions, 01-643 8040 |

OVERSEAS EVENTS

| Event | Dates | Venue | Organisers |
|-----------------------------|-------------------|----------------|--|
| 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 |
| Computer Dealers Exhibition | November 28-Dec 2 | Las Vegas, USA | Interface Group Conference & Exposition Management, 160 Speen St., Framingham, MA 01701, USA |

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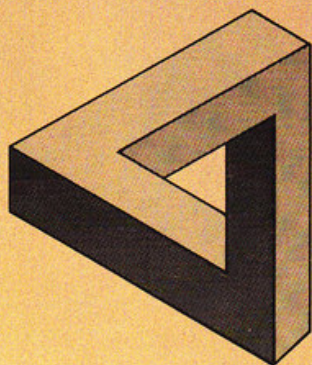
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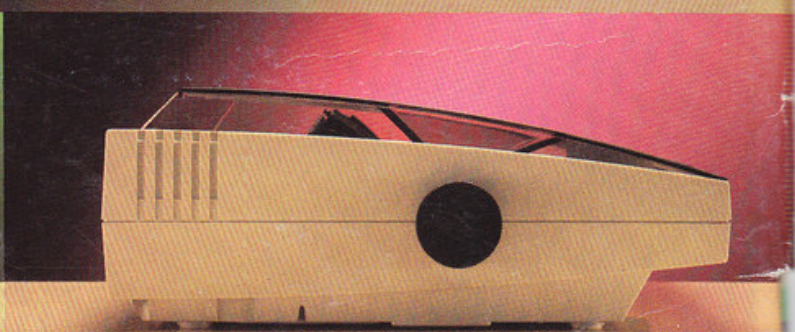
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