

PERSONAL COMPUTER

THE COMPLETE COMPUTING WEEKLY

NEWS

MAY 20 - MAY 26 1983 Vol 1 No 11 35p

We put
the finger
on keyboards
in this week's
Micropaedia
supplement

EVERY
35p
WEEK

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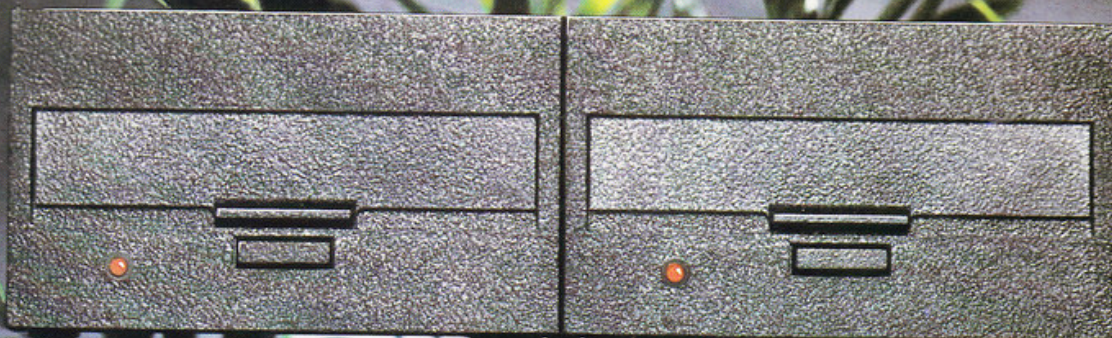
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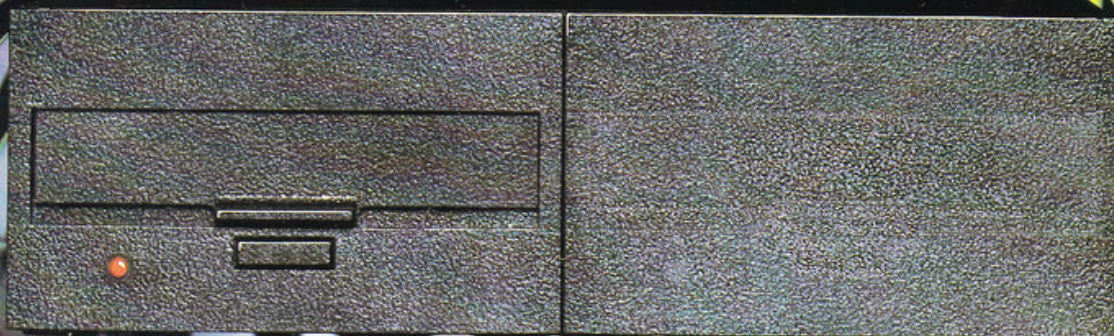
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PCN SPECIALS

ZX81 Graphics: Part 2

More program modules to build into a complete ET-type game on your micro. This week, we put the movement into your routines.

**Sharp Practice**

Geoffrey Childs gets back to Basic on his MZ80, delving into obscure corners and revealing a few bits of trickery.

PCN PRO-TEST: SOFTWARE

BBC filing

Vufile is a best-selling filing system for the Spectrum. Now it has been released for the BBC, Max Phillips makes some comparisons.

IBM database

Pete Galliard samples a simple database package for the IBM and finds it could be just the job for beginners.

Apple Pascal

If you find Basic too basic, or just want to break the language barrier, Ted Ball reports on a teach-yourself Pascal package.

PCN PRO-TEST: PERIPHERALS

Printer power

Ian Scales gives you the low-down on buying printers, and following full reviews in recent PCNs, we present a side-by-side comparison of six medium-priced contenders.

Sinclair control

Free your fingers — Trevor Jones tests a joystick controller for the Spectrum or ZX81.

PCN PRO-TEST: HARDWARE

Treading the boards

With the introduction of cheap systems from Sinclair, Commodore and others, single board computers have become something of a rarity. Francis Monkman gets his hands on a new specimen — the C9E from Adaptors Engineering.



CHARACTER SET

EDITORIAL: Editor Cyndy Miles Deputy editor Geof Wheelwright Production editor Keith Parish Sub-editors Peter Worlock, John Lettice News editor David Guest News writers Ralph Bancroft, Wendie Pearson Software editor Shirley Fawcett Systems editor Max Phillips Hardware editor Richard King
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Sinclair speaking

PCN EXCLUSIVE INTERVIEW

When Mrs Thatcher's government is tested at the polls on June 9, it won't get full marks from at least one of the nation's leading business men — Clive Sinclair.

In an exclusive interview, Mr Sinclair reveals to Geof Wheelwright that he has very definite views on how the government should treat research and development, how Britain can compete with Japan and how a politician should behave.

Here we present that interview — more excerpts will be published in the forthcoming Sinclair Spectrum Micropaedia on June 10.

Q: How do the British and Japanese approaches differ in producing micros and how do you approach competing with Japan?

Sinclair: I think it's very difficult to beat Japanese competition because it's extremely efficient, but I do think it can be done. In order to do it, one must match Japanese excellence in the areas where they are excellent; in terms of the quality of the product, and scale of operation — the Japanese tend to produce for the world market and achieve great economies of scale.

Q: Do you think the recommendations in the government's Alvey report, calling for the injection of £200 million into development of 'fifth generation' computers, will be enough to match the tradition of massive government support for research in Japan?

Sinclair: It's a change, but I'm concerned that it (the government) is not going about it the right way. I do think that 100 per cent funding (for research and development) of the Japanese form is necessary.

Q: Is the recent Spectrum price drop the start of a price war on micros in this country?

Sinclair: The Spectrum price reduction was part of our policy of reducing prices when we're able to. We do this even if the product is doing very well — as it was in the case of the Spectrum. If we failed to reduce the price under those conditions, it would simply attract more competition.

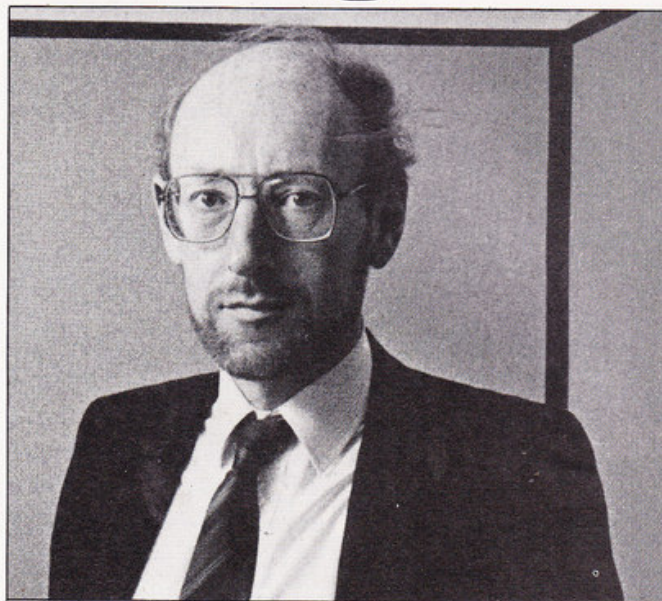
Q: What problems do you foresee in moving upmarket with the introduction of your ZX84 business machine?

Sinclair: There's a strong advantage in going upmarket, particularly with high-volume goods. The point is that the benefits to economies of scale come into effect.

Q: How long do you see the ZX81 being a viable product in this country, given the declining cost of adding colour and extra memory to personal computers?

Sinclair: It's still very much cheaper than anything else around and I think that's perhaps why it has survived so well without any competition at all.

Q: Do you think the ZX81 will have the kind of staying power the



Apple II has, where the machine develops a momentum of its own although reason would suggest that it's obsolete?

Sinclair: Unfortunately no. I don't think it will last like the Apple II. The Apple II goes on even though it's highly priced because when people buy for business they're perhaps not particularly cost conscious. If the 81 was anything but highly competitive, people would cease to buy it.

Q: Do you have any deadline in mind at which the 81 will cease to be competitive?

Sinclair: No.

Q: (Note: this question was asked four days before the government called a General Election for June 9) Given your outspoken nature on government policies regarding research funding and on import duties for computer parts and assembled foreign computers, have you considered entering politics?

Sinclair: There are two things: having political beliefs and wanting to be a politician. I certainly have political beliefs and want to put them across. And I think I'm far more likely to get them across by trying to be successful in life and putting forward my views. Politicians, if they're to be good politicians, don't so much have the ideas themselves and impose them on people as be receptive to ideas around them and decide on those that are best to serve the needs of the people.

Q: So you've got too many of your own ideas to be a good politician?

Sinclair: Yes, I think that's right.

Spectrum cartridge jitters

The exclusive revelation in last week's PCN that Sinclair Research will soon release cartridge software for its Spectrum computer drew a mixed reaction from the country's software houses.

Some software suppliers who phoned both PCN and Sinclair's own London offices were concerned that they wouldn't be able to match the promised under £10 price of Sinclair's cartridge software, but Imagine Software, one of the country's biggest Spectrum software suppliers, isn't phased by the news.

Imagine software director Dave Lawson predicted that cartridge software will have no more than a

'flash-in-the-pan' appeal to Spectrum users, although he admitted his company had already discussed plans to develop such software if the idea catches on. He said Imagine could be producing cartridge software within a month and produce the cartridges cheaply enough to meet Sinclair's under £10 price.

Mr Lawson added that the majority of Sinclair owners already have 48K machines and aren't short of memory, that pirate-proofing doesn't make much difference to the person buying the tape and that cassettes load only a few minutes slower than cartridges — although the cartridges will cost almost twice as much.

Disks in a spin

By Ian Scales

All is not well among disk and drive manufacturers who plan to bring us the next shrunken generation of floppy disk storage systems.

The latest news is that the ANSI committee (American National Standards Institute) has come out with a 26 to 21 vote rejecting Sony's 3.5in rigid shell floppy disk as an industry standard.

A variety of manufacturers are ploughing ahead with a number of physical shapes and sizes. The frontrunner appears to be Sony which scooped Hewlett Packard's 200 series of 16-bit micros. These were released with Sony's 3.5in

drives only a month after the drives' first appearance in the UK. The scene then appeared to be set for a Sony lead.

Earlier this year the company got together with Shugart and a wide variety of disk manufacturers to pledge fealty to the Sony standard. Other major manufacturers, however, have different ideas.

The close decision by ANSI has been interpreted by Shugart as a partial victory.

'We believe that the marketplace will ultimately determine the standard for microfloppy media,' said a Shugart spokesman.

Price wars



Atari: next in line for price cuts?

By Wendie Pearson

Following hard on the heels of Sinclair Research and Commodore, numerous other micro companies are joining the price cuts battle.

Sinclair slashed prices on the Spectrum to £99.95 for the 16K and £129.95 for the 48K on May 2. Meanwhile, Commodore says its Vic 20 'starter pack' (PCN issue 10, May 13-20) was just the start of its cuts.

John Baxter, marketing manager, says: 'We are reducing prices on the whole range of items — hardware, software and peripherals.'

In just three weeks, prices of NCR machines should take a tumble. NCR has cut the costs of the Decision Mate V Series in the US, and Michael Webster, company spokesman says: 'We will be announcing price cuts on the series in about a month. At the same time, we will announce new goodies coming out for the Decision Mate V Series.'

Texas Instruments has also entered the fray with two special offers on the 99/4A.

The first deal gives away a pair of joysticks, a Beginners' Basic tutorial program and a Connect Four games cartridge with the micro. The second special offer gives a speech synthesiser (worth about £49.50) or TI program recorder (worth £44.95) with six of TI's plug-in cartridges.

The micro's price stays at a recommended £159.95.

Sanyo has also joined the trend, bringing the MBC 2000 down to £1,450 from £1,950 and the MBC 3000 down from £3,150 to £2,250.

The MBC 1000 will stay at £1,195 but Logitech, which markets Sanyo micros, plans to cut the prices of its present range.

Oric and Lynx will not immediately be involved in the price battle. Ian Banks, spokesman for Lynx, said: 'We're watching pricing very closely and we will react as is necessary within the market.'

Atari is watching too. According to a dealer, the industry is buzzing with rumours that Atari and Commodore will drop their prices as they get into a major price war.

Is it the end for CP/M86?

By Max Phillips

Victor technology has added its nail to the coffin of CP/M86 by discontinuing it for the Sirius and Victor. Now it will offer only Microsoft's MSDOS, dropping Digital Research's alternative.

ACT, the Sirius' UK distributor, quietly stopped promoting CP/M86 way back in December last year, but continues to support users who want to stick with it.

On a wider scale, the UK looks set to follow the US lead in taking MSDOS to heart. Estimates put MSDOS on 96 per cent of American 16-bit machines. This isn't simply because MSDOS turns out to be an anagram of IBM.

Digital Research has relied on its rival Microsoft to support CP/M86

with languages. Microsoft has been hesitant to implement M-Basic and Basic-86 compiler under CP/M86.

As a belated counter-measure, Digital Research developed its own Personal Basic. But it may be too late to stop the landslide. Notable stragglers are DEC and Future Technology Systems, though it's likely both companies will move to MSDOS soon.

Without CP/M86, Digital Research will be forced to shelter in the 8-bit and 68000 based markets.

CP/M version 3, coupled with its GSX graphics support, looks likely to be the dominant 8-bit operating system. CP/M-68K provides an ideal environment for low-end 68000 systems and avoids the cost of Unix-like operating systems.



ZENITH DISKS — Zenith has added hard disk options to its Z100 range of business micros. Pictured is the 'all-in-one' ZW120, with 10Mb Winchester and 320K floppy. There's also a 'low profile' ZW100 for use with a separate colour or green screen monitor. The new machines come with 192K user RAM plus the usual Z100 specs of 8085, 8088, \$100 bus, CP/M, Z-DOS (MSDOS) and Z-Basic. Prices for the hard disk machines start from a competitive £3,925. Zenith is on Gloucester (0452) 29451.

Big boost for Unix at NCC

From David Guest, Anaheim, USA

No Macintosh from Apple, and not a hint of an IBM portable, but there was plenty to ogle when the National Computer Conference (NCC) opened this week.

A \$2,795 portable with a 10Mb hard disk appeared on the Kaypro stand; Maxtor showed a disk drive that brings the cost of storage down below \$10 a Mb. The Japanese demonstrated what can be done with printer technology and the claims of Unix to be everybody's favourite operating system took a huge step forward.

The Kaypro 10 at 31 pounds isn't the lightest portable, but with 64K of RAM and 10Mb on disk it isn't the puniest either.

Built around a Z80, it runs CP/M2.2 with Basic, Pascal and other languages. These may be superfluous, since the price-tag covers a series of applications, including word processing, spreadsheet, and a spelling checker.

The system has 4K to drive bit graphics on its 9in monochrome screen. The package is rounded off by a full typewriter keyboard, and there are interfaces for a Centronics printer and two serial devices.

Maxtor cleaned up in the storage stakes through sheer volume. Its EXT-4000 family of 5¼in Winchester includes a 380Mb unit costing \$3,695. If 380Mb seems excessive, opt for 75Mb at \$1,295.

Contrast this with, for instance,

the difference a hard disk makes to the price of an IBM PC, and you can see what is happening to storage costs.

It isn't only hard disks that are affected. Tandon crammed 1Mb on to a 3½in floppy to sell for \$228; Amlyn has 3.3Mb on a 5¼in diskette for \$370.

Fujitsu unveiled new dot matrix and daisywheel printers at the NCC, and its emphasis has been on print quality. Mitsubishi offered another view of what could be in store for you: a seven-colour thermal printer costing \$1,500.

A significant feature of the NCC this year could turn out to be ATT's deal with Motorola, Intel and National Semiconductor.

These three protagonists in the microprocessor market have agreed to further the cause of Unix by implementing Unix System V on their chip sets.

Meanwhile Digital Research, developer of CP/M and its spin-offs, has undertaken to support VisiOn as the standard feature of CP/M systems products.

VisiCorp itself demonstrated VisiOn on a Wang Professional computer at the NCC, and it promises to have its Lisa challenger implemented on several more systems before it becomes commercially available in October.

A full report on the NCC will appear in next week's PCN.

VIEW FROM JAPAN



How software drives a hard bargain

From Serge Powell

Bear with me while I tell you a story. Its moral will become obvious.

Something like a year ago I finally broke down and bought a PC. It was an easy decision. My typewriter had given up the ghost and I took it as a sign from whoever dishes out these signs that I couldn't live without a word processor. Subsequent events demonstrate the doubtful wisdom of taking easy decisions and also the shape of the micro world in Japan.

Here, without going into too much detail, is an example of how the mighty have fallen — the mighty being prices of 12 months ago.

The processor I'm using cost £470. At current prices that's a princely sum; about a year ago it bought 16K of RAM, a ten key numeric pad, ten function keys, and colour. The reason it was so attractive to me was that another vendor's cassette gave me word processing on the system for about £27, although that required an extra 16K at a similar price.

If speed had been an issue there was a disk version available for something like three times the price. But that would have involved another £450, for a single-sided, double-density, single-unit drive. I wisely abstained, and dug out an old cassette player.

The cheapest dot-matrix printer then cost £250. The cable was another £14. Since the only people who ever saw my originals were editors, who are paid to damage their eyes deciphering poor quality print, I opted for it.

Besides, a daisywheel would have cost £950.

But Japan is the land of the CRT, so my monitor was relatively affordable. To humour my kids, who wanted to run games, I picked a low resolution monitor for £150.

If I'd needed CP/M at the time, which Heaven forbid, there would have been a further outlay (on top of the disk drive) of £220 for a 32K RAM expansion unit, not to mention the software.

The real heart-breaker was that at my friendly neighbourhood electrical goods shop demand for these devices exceeded supply. The net result was that a strict discount policy was in operation, and there was no way of circumventing it. I got 12 per cent.

Six months later, with the micro boom well under way, every man and his brother had plenty to offer in the way of peripherals. The £450 sum now bought a double-density, double-sided disk drive. The extra 32K RAM expansion pack was down to £140, and the discount on it all was 20 per cent, offered more or less automatically. To sweep the pot, salesmen would even toss in disk Basic and a couple of blank disks.

Two months on, the original CPU had 64K RAM, better graphics, more I/O ports, and was a little more compact for the slightly more compact price of £340. And what originally bought a single-sided, double-density one-disk unit now bought a dual unit with double-density, double-sided disks. Again, the 20 per cent discount was virtually standard.

Today, my printer is listed at about £140 and there's every chance of a small discount on that. A daisywheel now sells for around £420, and a lighter, cheaper model is on the way at £385.

It doesn't take a computer to work out that things are looking up in Japan for anybody who is building up their expertise on a straightforward, workmanlike micro system. There is no VAT here, but we have a plethora of manufacturers who can move equipment from production line to display shelf virtually overnight, at prices that become more reasonable with every passing day.

But it's not so rosy on the software side. It makes me weep to flick through US and UK magazines and see how little you pay for really great software, and the choice you have.

Professional's gift of speech

Texas Instruments has announced a speech recognition board for its recently introduced TI Professional computer. It says it's easier to talk at a computer than to point at things with a mouse.

This new add-on uses the LPC technique (made famous by Speak'n'Spell and used by TI in speech equipment, which allows memory to hold about 30 words.

This is not as small as it sounds, since one of those words can be used to call a new set of words from the disk. A floppy will hold about 16 minutes of speech, and TI said that it hadn't done the sums as to how much a Winchester would hold. Certainly it's hours and hours.

As for what you'll use it for, TI says it's intended for such applications as 'Intelligent telephone answering', meaning that you can call up the computer and ask what messages have been left on it.

The machine (if it has recognised your words) will then give you a synthesised dictation of all it has on file.

It can be connected directly to the phone, will cost 'late hundreds' and should be available in the third quarter of this year, says TI.

An interesting detail is that it is controlled by the TMS320 chip. TI says this is a true 32-bit processor, but the company wasn't able to give more details.

Sanyo micros' software lure

Three new business micros should be available to expand the Sanyo range.

Logitek, which markets Sanyo, is bringing out the 1150 at £1,822, the 1250 at £2,395 and the 4050 at £2,817, and says that dealers should now have the machines in stock.

The first two are 8-bit machines

running the CP/M 2.2 operating system, while the 4050, a 16-bit, runs on CP/M 86.

A wide range of Peachtree software can be used on these micros.

If you buy one of these new models you can get the Peachtree POP series cut-price. This 5-partner consists of word processing, financial modelling, a mailing system, telecommunications and an English Dictionary. Normally selling at £850 the price has been slashed to £425.

Softly, softly learn on IBM

Newcomers to the IBM PC will find two programs from Pete and Pam Computers particularly useful.

The PC Tutor teaches you how to use the micro without the need to wade through pages of the instruction manuals.

All you do is load the disk and follow the instructions on the screen. The program does the rest by taking you through the PC's features. The program costs £68.

Copy II PC helps you get round the habit of some software houses who make their software uncopyable, which prevents you from making back-up copies.

Pete and Pam claims that Copy II PC makes back-up copies of more protected software than any other copy program, does it quicker and, at £46, costs less too.

Pete and Pam Computers is on 01-769 1022.

Forth with 64

Audiogenic is launching three software cartridges for the Commodore 64, including a Forth compiler and a word processor, which should be available next month.

The Forth compiler, which costs £29.95, is, according to Audiogenic, 'for people who are frustrated with the limitations of Basic but are not ready for assembly language.' It uses standard Forth commands with facilities to extend the language by user-defined commands.

Monitor, also cartridge based for the 64, is designed 'to take the misery out of machine code', according to Audiogenic, and is the same price as Forth.

It contains the standard TIM monitor commands plus others

including assembler, disassembler, Centronics interface, printing disassembler, quick trace, fill, hunt, transfer and Step Code.

The Centronics interface command allows the 64 to interface directly via the port to various types of printer by means of a cable.

Wordcraft 64, a word processing package, is written in machine code and available on cartridge. Costing £89.95, it is derived from Wordcraft 20 — the Vic 20 version, and Wordcraft 80, the word processor for the Pet.

When released, these products can be bought from Audiogenic dealers, Commodore dealers or direct from Audiogenic in Reading (0734 586334).

Hold fire on Dragon disks

Dragon users will have to wait for disk drives and 64K upgrades.

Dragon confirmed last week that it will be at least another four weeks before the products are released.

'The hardware is all ready,' a spokesman told PCN. 'All we are waiting for is the operating system to be put into ROM.'

The upgrade to 64K comes not as plug-in chips but as a replacement for the machine's main circuit board, so you'll have to return your machine to Dragon or its service agents, who are still being appointed.

The company plans to sell the 64K board and OS/9 disk operating system in a single package for about £150. The 64K board will cost about £75, including installation costs.

As with the other products, Dragon has yet to fix the price for the disk drive and controller but the company says it will be about £295.

Disks can be used with the 32K Dragon but not with OS/9. Because of the small amount of memory, the company has written its own operating system to work with the Microsoft Basic in ROM.

Another snag is that the Microsoft Basic overwrites the third quarter of the Dragon's memory map which means that if you use the 64K board you will not be able to use the top 32K of RAM for programs. Disk users can get round this problem by using the OS/9 operating system to switch out the Microsoft ROM and load Basic or another language from disk.

British Micro brings Mimi Trojan trio

British Micro has released its first home-grown software for the Mimi. Written for business users, Trojan Sales Ledger and Trojan Purchase Ledger are out now and Trojan Nominal Ledger will join the range in about a month.

All three cost £250, and supplement the Cashfix spreadsheet released last month and costing £120.

The Trojan program generator is due for release when the manual is completed, which should be late summer. Marketing manager Frank Sketch describes the generator as 'a high-level business programming language'. Price for this is as yet undecided.

Trojan is British Micro's own programming language and operating system, and the packages can, therefore, be used only on the Mimi.

You can get the new packages from British Micro's 50 UK dealers or from the company direct on 0923-48222.

Music program

Music Tools is up for grabs for BBC users who are budding composers.

At £5.75 Music Tools has five programs — organ, auto-tune generator, symbol writer, sound envelope explorer and a three-part tune player — with 60 procedures which, by using a mix 'n' match technique, means more complex programs can be created.

Another sound package from Musicsoft is Pieman at £3.75. This serves two purposes — as a fun game and as an ear, eye, hand

co-ordination trainer. The game uses hi-res graphics and is menu-driven.

If you want to enhance the sound of your music packages further, then take a look at the Microvoc.

Microvoc is a sound system built for the BBC micro. At £21 it comes with two spherical speakers, jack socket and volume control which plug into the back of the Beeb's casing.

Further details from Micro-Advent on (0245) 59078.



Beeb wired for sound with the Microvoc system.

UCSD-p peps up Rainbow and NEC APC

More power to the portable UCSD-p operating system as it hops onto the DEC Rainbow and NEC APC machines.

TDI, the p-system's UK champion, has announced versions for these two machines, along with its standard applications packages.

Prices are the standard UCSD-p prices. A development system, including either a Pascal, Basic or Fortran compiler, is £375. The sum of £29 buys a run-time only system, the minimum needed to run a UCSD-p application.

There are a few special features just for the newcomers. Both the Rainbow's Z80 and 8088 processors are supported. On the NEC, there's access to sound and graphics as well as support for a variety of disk formats and a hard disk.

Common to both versions is support for printer spooling, RAM disks and screen dumps as well as the usual p-system features.

The Rainbow and NEC join the ranks of Sage, IBM, Sirius, Apple, Osborne, Xerox and Nascom as p-system possibilities. And the support for DEC's belated Rainbow at least goes to show that all is not lost for the machine. Initial supply problems are now being cleared up and the backlog should be over by the end of May.

TDI can be contacted on (0272) 742796.

PCN Charts

PCN Charts follows the rise and fall of the UK's best-selling micros. This fortnightly top-of-the-shops list tells you what's selling best over the counter; it does not take account of mail order and does not count deposit-only orders. This week's figures show the number of machines sold in the two-week period ending a week before publication date (in this case May 20), so these charts tell the story in high streets between April 29 and May 13.

Machine prices quoted are for the no-frills models and include VAT. Information for the PCN Charts is culled from retailers and dealers throughout the country and compiled by MRIB, London. They will be updated every alternate week . . . so watch for the arrows to follow the ups and downs of the best-sellers.

Top Twenty up to £1,000

	MODEL	PRICE	DISTRIBUTOR
▶ 1 (1)	Sinclair Spectrum	£99	(SI)
▶ 2 (2)	Sinclair ZX81	£40	(SI)
▲ 3 (10)	Oric 1 (48K)	£169	(OR)
▼ 4 (3)	Atari 400	£160	(AT)
▼ 5 (4)	BBC Model B	£399	(AC)
▼ 6 (5)	Commodore Vic 20	£170	(CO)
▲ 7 (12)	Lynx 48	£225	(CA)
▲ 8 (9)	Newbrain A	£228	(GR)
▲ 9 (14)	Atari 800	£400	(AT)
▼ 10 (7)	Dragon 32	£200	(DR)
▲ 11 (13)	Epson HX20	£472	(EP)
▼ 12 (8)	Commodore 64	£345	(CO)
▲ 13 (—)	Sharp MZ80A	£549	(SH)
▼ 14 (6)	Texas TI-99/4A	£150	(TE)
▶ 15 (15)	Jupiter Ace	£90	(JU)
▼ 16 (11)	Sharp PC 1500	£170	(SH)
▼ 17 (16)	Apple IIe	£969	(AP)
▲ 18 (20)	Acorn Atom	£174	(AC)
▼ 19 (18)	Colour Genie	£224	(LO)
▼ 20 (19)	TRS 80 Model 1	£199	(TA)

Top Ten over £1,000

▶ 1 (1)	Sirius 1	£2,754	(ACT)
▲ 2 (3)	Olivetti M20	£2,754	(OL)
▼ 3 (2)	Osborne 1	£1,581	(OS)
▲ 4 (5)	IBM PC	£2,392	(IBM)
▼ 5 (4)	Commodore 8032	£1,129	(CO)
▲ 6 (7)	Apple III	£2,780	(AP)
▲ 7 (—)	Superbrain II	£2,070	(IC)
▼ 8 (5)	HP 86A	£1,541	(HP)
▶ 9 (9)	Xerox 820	£2,415	(RX)
▲ 10 (—)	Epson QX10	£1,995	(EP)

AC Acorn Computers. ACT — ACT Sirius. AP — Apple Computers. AT — Atari International. CA — Computers. CO — Commodore. DR — Dragon Data. EP — Epson. GR — Grundy Business. HP — Hewlett-Packard. IBM — IBM. IC — Icarus Computers. JU — Jupiter Ace. LO — Lowe Electronics. OL — Olivetti. OR — Oric. OS — Osborne Computers Corporation. RX — Rank Xerox. SH — Sharp. SI — Sinclair. TA — Tandy. TE — Texas Instruments.

Dial-a-cure

A maintenance service that will diagnose hardware and software faults over the phone is being offered to users of the new Transtec Krypton Series (PCN, issue 10, May 13-20).

The marriage between Transtec Computers and Telemaintenance Ltd should mean that anyone with a Krypton machine and a telephone can get action immediately.

Roger Day of Telemaintenance said: 'We are offering a service that acts fast. Unlike many maintenance services that normally take a day to diagnose a problem, we have the user up and running the next day.'

Anyone taking out a Telemaintenance contract is given a British Telecom-approved acoustic cou-

pler, a dummy printer and an instruction manual. The user's proportion of the Telemaintenance diagnostic program is supplied by Transtec on the systems disks that come with every machine.

The cost of a system for the bottom-end machine is about £275, which includes the software and a year's maintenance.

When a fault occurs on your system you telephone the Telemaintenance controller, who goes through a list of simple operator errors. If no obvious faults are identified you connect to the master control computer over the telephone network. The remote diagnostic program is then activated. If there's a software fault in one of



the standard packages offered with the Krypton machines, the engineer will either tell you the correct operational procedure or transmit a replacement package back to you.

In the case of hardware faults, the diagnostics run checks the printer, monitor, keyboard and system unit. If necessary a new printer or computer is despatched.

Cifer micros plug in Unix

If you have a Cifer machine you can now have the Unix operating system.

Built around the Motorola MC68000 microprocessor, the Unix 16-bit plug-in board gives 256K of RAM at £995. It can slot into the Cifer Series 1 micros or the new Cifer Club (PCN, issue 8, April 29-May 6).

With the new board fitted into Cifer's 8-bit machines, the two Z80As will be free to handle other operations.

One will act as a floppy disk processor and the other will handle the video screen and keyboard, while the 16-bit board runs the programs.

Cifer will aim the upgrade at people in educational, scientific and engineering areas.

The Unix option will be available from Cifer Systems, Melksham (0025) 706361.



HOWZAT? — The smile belongs to Phil Edmonds, the Middlesex and England cricketer currently organising his benefit year. Benefit years are held for cricketers nearing the end of their working innings so they can retrieve earnings lost while rushing round the world playing cricket. Things can't be too bad in the benefit year business, however, for Phil has been given a Torch micro to keep track of fund-raising activities with software originally written by Microcomputer Products International to handle wine orders for a wine-buying function at Lords Cricket Ground in London.

Reflex takes a tough line on monitors

Monitors are not known for their robust qualities. They are susceptible in more brutal environments where they are moved about, bumped, bashed or otherwise abused.

But now Reflex is selling a pair of monitors claimed to be capable of withstanding the worst treatment in environments such as universities and factories.

The 9in EDM 926X and the 12in EDM 1226X feature an all-metal casing and robust video input/output connectors.

They cost £127 and £145 respectively.

Both versions come with either P4 black and white or P31 green phosphor screens.

Reflex is on Reading (0734) 884611.

Graphics boom

Sophisticated business graphics won't be a plaything of the rich much longer.

California research organisation, Strategic Inc, says that falling memory costs and improved techniques will soon bring fancy graphics within range of many micro users and predicts an annual growth of 200 per cent for business graphics.

The most expensive part of a graphics system is falling in price by 23 per cent a year, it says, while at the same time processors and storage are becoming more advanced.

And all this will lead to a graphics boom, it predicts.

Leading the field will be the GSX and VisiOn packages, say the researchers. Designed to be sys-

tem-independent, they could take off in the way that CP/M has done.

GSX from Digital Research is already available in the UK on the IBMPC, the Televideo 803, and the Xerox 820. Many other companies, including NEC, Texas Instruments, Fujitsu and DEC, are said to be implementing it.

VisiOn, from Visicorp, is due out later this year for 16-bit operating systems.

Much future software development will concentrate on the IBM PC, says the report.

But IBM will wait for the boom before it jumps in, selling a high resolution display only when a large market for it has built up. Then it will move aggressively, predicts this report.



PRINTER/PLODDER — This solid-looking beast is the latest daisywheel printer from X-Data. It costs £695. The EXP550 can print bi-directionally and handles paper up to 17in wide. Standard interfaces are the RS232C and Centronics. Unfortunately the printer is capable of only a meagre 16cps — slow enough for you to take lunch while a substantial document is printed. If you want a cheap typewriter-quality printer for an occasional letter, it could be worth looking at. Tel (0753) 72331.



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RS232 is an industry standard computer interface. That means secretaries can punch Telex tapes use the word processor, without, even leaving their desks. If they have left, to go home or to lunch, the Canon AP400 can still receive computer printout. Completely unattended.

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B.B.C. Airlift	B	Bug Byte	02B007	£5.50
Polaris	32K	Bug Byte	02B008	£5.50
B.B.C. Chess	32K	Bug Byte	02B009	£8.00
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Mazogs	16K Bug Byte	02E175
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Adventure	Bug Byte	02E177
ZXAS Assembler	Bug Byte	02E178
ZXTK Toolkit	Bug Byte	02E179
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Damsel and the Beast	Bug Byte	02E181
Dictator	Bug Byte	02E182
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Constellation	Bug Byte	02E184
Multifile	16K Bug Byte	02E185
Awari	Sinclair	20E186
Games Pack 1	Sinclair	20E187
Games Pack 2	Sinclair	20E188
Asteroids	Sinclair	20E189
Centipede	Sinclair	20E190
Defender	Sinclair	20E191
Space Invaders	Sinclair	20E192
Games 1 10 Games		
Games 2 Starfighter	1K J K Greye	32E001
Artist	1K J K Greye	32E002
Games 3 Catacombs	16K J K Greye	32E003
Games 4 3D Monster Maze	16K J K Greye	32E004
Games 5 3D Defender	16K J K Greye	32E005
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Gobbleman	16K Artic	25E194
Namir Raiders	16K Artic	25E195
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Chess	1K Artic	25E200
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Adventure A	Artic	25E202
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Adventure D	Artic	25E205
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Games	Artic	25E207
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Frogs	Microgen	06E220
Paintmaze	Microgen	06E221
Asteroids	Microgen	06E222
Tempest	Microgen	06E223
Games	1K Microgen	06E224
Debug	Microgen	06E225
Asteroids	Quicksilva	12E226
Croaka Crawla	Quicksilva	12E227
Munchees	Quicksilva	12E228
Trader	Quicksilva	12E229
Starquest	Quicksilva	12E230
Super Nine	Quicksilva	12E231
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Decision Maker	Gemini	63E233

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£3.95		Audiogenic	16V027	£19.95
£3.95	8K	Audiogenic	16V028	£7.95
£3.95	16K	Audiogenic	16V029	£12.95
£10.00		Audiogenic	16V030	£19.95
£4.00	3K	Audiogenic	16V031	£7.95
£8.00		Audiogenic	16V032	£19.95
£5.00	8K	Audiogenic	16V033	£14.95
£6.00		Audiogenic	16V034	£19.95
£6.50		Audiogenic	16V035	£19.95
£6.50		Audiogenic	16V036	£6.95
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£8.00		Audiogenic	16V039	£7.95
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£6.95	3K	Audiogenic	16V041	£6.95
£4.75	3K	Audiogenic	16V042	£7.95
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£4.95		Audiogenic	16V045	£7.95
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£4.95		Audiogenic	16V047	£7.95
£4.95	3 or 8K	Audiogenic	16V048	£7.95
£3.95		Audiogenic	16V049	£7.95
£3.95		Audiogenic	16V050	£7.95
£4.95		Audiogenic	16V051	£19.95
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£3.95	16K	Commodore	04V106	£4.99
£3.95	16K	Commodore	04V107	£19.95
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£3.95	8K	Commodore	04V110	£9.99
£3.95	8K	Commodore	04V111	£9.99
£3.95	8K	Commodore	04V112	£9.99
£3.95	8K	Commodore	04V113	£9.99
£3.95	8K	Commodore	04V114	£9.99
£3.95	8K	Commodore	04V115	£9.99
£9.95	3K	Commodore	04V116	£4.99
£3.95	3K	Commodore	04V117	£4.99
£3.95	3K	Commodore	04V118	£4.99
£9.99	8K	Commodore	04V119	£9.99
£7.95	8K	Commodore	04V120	£9.99
£5.95	8K	Commodore	04V121	£9.99
£5.95	8K	Commodore	04V122	£9.99
£5.95	8K	Commodore	04V123	£9.99
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Business family

◀ 6 A new range of micros for businessmen has arrived in the form of the Prelude series.

The micros are produced by Hytec Microsystems of Oxford. Hytec says that you can use them by themselves, in a network, or as terminals connected to a mainframe. The four models in the range are based on the Z80 processor, and a free-standing hard disk drive is also available.

Prelude 10 is the baby of the family with 16K RAM, and like its bigger relatives, it has an integrated 12in screen. Its price, at the foot of the range, is £1,000 — prices of the larger systems grow to £7,000.

Prelude 15 and the two Prelude 20 versions have 6MHz clock frequency, 192K RAM (made up of three banks of 64K), 32K EPROM chip, and they come with the following software included in the price: Hytext word processing, H-base database management, CP/M compatible software and a network interface processor option.

Prelude 15 has one 5¼in floppy



disk with an exchangeable hard disk option with 1Mb capacity, and when connected to the Prelude HDS external hard disk offering up to 50Mb storage, can be used to run a wide range of applications, such as financial and accountancy programs.

The two versions of Prelude 20 differ in that the less powerful model has two floppy drives and the

more powerful model has one hard drive — 50Mb storage as opposed to the smaller model's 2Mb.

Prelude's operating system is CP/M, but the micros have been designed to take future developments for Prelude such as MS-DOS, Unix and 16 or 32-bit processing.

This three-year-old company has two dealers, both in Birmingham.

Artic offers time-limit chess game

Games for the serious player and something for head-bangers are among a batch of releases from Artic Computing.

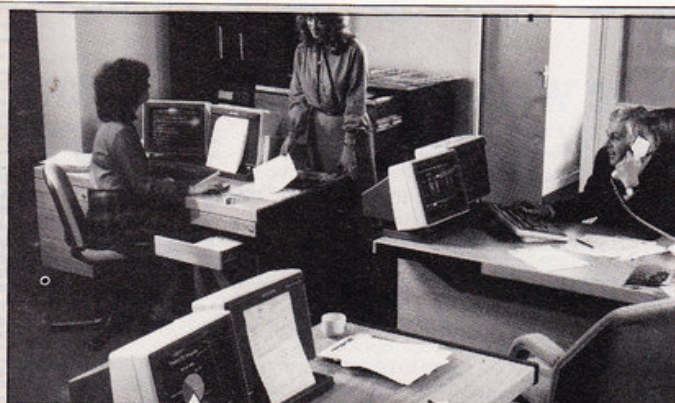
Artic has uprated its chess offering for the 48K Spectrum with Chess II, and for either a 16K or 48K Spectrum, it has produced Chess Tutor. The trainer has three levels of performance, but the game itself uses time limits rather than levels of skill. Chess II costs £9.95 and Chess Tutor £6.95.

Three-D Quadacube is a 3D version of Tic-tac-toe. It runs on a 16K or 48K Spectrum, and costs £4.95.

For the ZX81, Artic has a game for the thinking player, Reversi, a version of Othello (£5.95).

Finally, three arcade games — two for the 48K Spectrum and one for the ZX81 — are among the new releases. Cosmic Debris costs £4.95, 3D Combat Zone £5.95, and Raider £3.95.

Artic is at 396 James Reckitt Avenue, Hull, North Humberside.



BURROUGHS' BOS — Burroughs' B20 (pictured above), Logica's Vitesse, and Canon's AS 100 have been added to the range of micros that can run the UK-designed BOS business software. BOS was written by MP&S, and an average package costs £400 for a one-user system. It includes business and office applications, the programming language MicroCobol, and a number of applications specific to certain industries. MP&S is on 01-831 8811.

Taking stock with a ZX81

Tackling stock control and point-of-sale applications is an unlikely job for the ZX81, but it can be done with software from Micro Sign and Data Systems.

There's a Stock Control program for £27.50 — it needs a printer and 16K of RAM to run. And a Message

Display Program, which costs £4.99 and which gives continuous display by scrolling horizontally, and is pitched as a point-of-sale aid.

Danny Coleman of Micro Sign said: 'We intend to expand the commercial uses of the ZX81, as well as writing software for the Dragon, Vic 20 and Spectrum.'

The packages will be available from May 23, from the company at PO Box 60, Woking, Surrey.

Super-duper VisiCalc

Unable to resist the urge to leave a proven system alone, the Californian outfit Kraft Systems has produced a subroutine that it says enhances VisiCalc.

Kraft's Quick-Vis runs with VisiCalc on the Apple II or II+, and it uses a joystick. You pre-boot the Quick-Vis disk before loading Visi-

Calc, and the subroutine then lets you direct the cursor with your joystick.

Kraft says this is a quicker and easier way of using a spreadsheet program.

Quick-Vis costs £19.95 from Pete & Pam Computers, on Rossendale (0706) 227011.

Till control

Shopkeepers will soon be able to computerise their till systems with an Epson.

P&M Software of Wigan is developing a program that converts an Epson HX20 into a till controller, with the addition of an electronic drawer costing £150.

With the £850 price-tag on the stock program, which is written in MBasic, this brings the cost of the Epson system to about £4,000 for five tills. The program will be available within a couple of weeks.

Out now is a golf handicap program, again for the Epson HX20, for £45 plus VAT. These items are available direct from P&M on Wigan (0942) 497123.

Pre-prescription

Since the Pharmaceutical Society of Great Britain said last autumn that all pill box labels dispensed from chemists must be printed — by January 1984 at the latest — various computer suppliers have been jumping in to woo chemists.

John Richardson Computers of Preston, Lancashire, last week launched its product, in the form of a £1,650 hardware/software package.

This system consists of a 32K BBC micro (Model B) with a 64K

expansion board, bringing its capacity up to 96K, plus an Epson printer, Teac disk drive and AVT screen.

The system can hold data on 2,000 different drugs, and will remember warnings and side-effects. It will print up to 250 labels of exactly the same type at one time.

Two other companies moving into the same field are Orange Computers in Knutsford, Cheshire, and P&M Software in Wigan. Both sell Epson systems.



What the doctor ordered: BBC, Epson, Teac and AVT mixture

RIBA down to micro scale

By Nigel Cross

Although last week's Royal Institute of British Architects (RIBA) show was for the aficionados of the architectural and construction industry with their large bank accounts, there was among the huge computer graphics systems a satisfying trend towards microcomputer use in the business.

The requirements of the architect are said to be so specialised that only expensive equipment is capable of performing the tasks of graphic display. This is not really the case.

Most of the applications shown were of course graphics-oriented and therefore tended to use Apple computers. However, one of the best uses of a micro was demonstrated by Beamscon of Hendon, whose Sinclair ZX Spectrum program for steel beam analysis and calculation shows a company with a real awareness of the computer field.

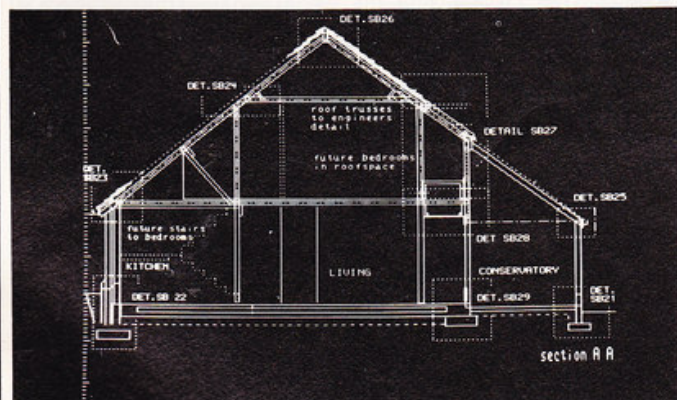
A plethora of accounts and business packages were demonstrated by a variety of companies, invariably using Commodore equipment, the best of which appeared to be that supplied by

ABC Data of Leicester for the whole gamut of architectural work.

Within the range of Apple-based systems three stood out on their own. Robocom of London demonstrated its improved and upgraded CAD system using its unique Bit-stik triple-axis joystick technique with new software (existing Apple owners can get this for a mere £450, others could invest in a full workstation system at £4,500 and upwards).

The Scribe 3D drawing and modelling system from CIC London shows excellent use of graphics (in high resolution) on screen with plotter or printer interface and a multiplicity of easily understood commands and features.

Cascade Graphics Development had probably the most interesting piece of hardware, in that it used a specially designed graphics processor to perform all graphics functions on screen. This unit is a dedicated processor using the Motorola 68000 chip at 12.5MHz and incorporates 220K RAM directly interfaced to the Apple as an I/O device. This system can therefore perform all the graphics functions and display without any discernible delay to the operator.



Detailed sections produced by the Scribe drawing and modelling system (hi-res version) for the Apple.

Sage package Forthcoming

Forth fans will shortly be able to use their language on the Sage IV business micro.

Software house Kuma is putting the finishing touches to what is thought to be the first implementation of Forth on a Sage system available in this country. The Forth implementation will be supplied on disk and should be on sale from June 1, to coincide with first deliveries of the Sage system.

Kuma is also spreading its net in another direction. It plans to release an editor/assembler for the Computers Lynx later this month — the package will sell for £19.50, and more are planned.

Back in its mainstream business Kuma is producing a graphics package for the Epson HX20 for £17.50. For the Commodore 64 it is preparing a database system, likely to cost £24.50, and an accounting package called Easivat, due to cost £39.50 — plus VAT.

For game-players with an Atari or Sharp system Kuma has released Adventure Paragon, a dungeons and dragons game which costs £8.65. This is part of an adventure game series that Kuma is developing for Atari, Sharp and Commodore systems.

Kuma is on Maidenhead (0628) 71778.

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The qwerty question

Regarding P Brown Kenyon's letter (*PCN May 6-May 13*) about keyboard layout, surely the point is that millions of people have been trained to touch-type using the present standard layout.

To change now would eventually create chaos, as has happened so often when other standards have been changed. Having to teach present users another 'standard' keyboard would cause confusion and leave them 'Jack of all trades, master of none'.

New users will always find plenty of courses and books on typing available, and after all, high-speed typing is not essential for the average home computer user. Just typing a program from some of the poorly printed magazine listings is enough to slow the best typist to a crawl.

P V Bamfield
Brighton, East Sussex

Keyboards disentangled

In *PCN (May 6-May 13)*, you printed a letter from P Brown Kenyon which stated that the 'qwerty keyboard was designed . . . to try to slow down the typist.' Unfortunately this is a well reported myth. The qwerty keyboard was actually designed to increase the maximum typing speed. The early typewriters were prone to jamming (that is, if adjacent keys were typed consecutively they often jammed together) so a keyboard layout was designed that would reduce this, in which the most commonly used characters were separated — this was the qwerty keyboard.

P Brown suggests that a new keyboard format should be designed. This would cause several problems, for example what form should the new standard keyboard take, and which of the many companies would design it? If the qwerty

keyboard was abandoned, the result would probably be several different designs competing for the market — in the long run this would not help the complete beginner, it would simply confuse the already confusing maze of micro-computers that are available by adding one more differing feature to the computer.

P Brown stated that teenagers would be able to force manufacturers to alter the keyboard layouts on their machines — I feel that this is very idealistic, and unlikely to occur. And surely it is an advantage for a user to be familiar with the keyboard layout used by most business and home computers.

Janice Raine,
Stoke-on-Trent, Staffs

It's a historical fact that the qwerty keyboard was designed to reduce jamming on early typewriters, as we both say, but we make the point also that this jamming was due to speed as well as key proximity. For detailed information on keyboards past, present and future see this week's Micro-paedia — Ed.

Bingley show stopper

I recently visited the computer show held at Bingley Hall, hoping to gain information which would assist me in buying a suitable micro, but sadly the venture was a waste of time.

The hall was packed to (and beyond) its capacity to such an extent that to scratch one's nose required a carefully compiled program of movement. The reason, of course, was that many stalls were over-run by youngsters playing the various games offered.

Mind you I think it's great to see the kids so engrossed, because eventually they will ascend into the more sophisticated uses of computers, but for future shows I think more thought must be given to allow potential buyers access to the stands. Indeed it would appear that Bingley Hall itself is too small to have an exhibition of this type.

When, after three circuits, I finally managed to contact a representative on one of the very few stands actually selling hardware, I was amazed to find that he knew nothing of the

differences between the Z80 and 6502 processors, particularly with reference to the instruction sets.

I even surprised him by pointing out (from his own brochure) that the five or six micros he was selling were all 6502 based.

It would appear that the only way to buy a machine suited to one's needs is to read a magazine, such as *PCN*, to obtain a general picture, write down the pertinent requirements, go to a dealer who sells an arbitrarily selected machine and run the thing to see if it matches the list of requirements.

R A Bloor,
Birmingham B9 5XY

I hope we are at least some help!
— Ed.

More colours on the Dragon

I have been prompted to write to you by Anthony Asquith's letter (*PCN April 15-22*). He complains about false information being given about the Colour Genie in reviews.

One of the main points he makes is that in comparisons between the Dragon and the Genie, the Dragon is said to have nine colours and the Genie eight. He then claims the Genie has 16 colours (eight foreground, eight background) and therefore the Genie has seven colours more than the Dragon.

Surley he must have realised that the Dragon has both foreground and background colours, giving it 18 colours, meaning that whichever way you look at it the Dragon has more colours.

Paul Griffiths,
Carnforth, Lancs

The brains behind the business

I hope you publish my letter, so I can say thank you to Malthouse Computers of Ormskirk.

I recently purchased a Newbrain from them, and the after-sale service was excellent. I had many niggling little problems due exclusively to my fumbling unfamiliarity with my new machine. However, they nursed me through all my teething troubles without ever losing patience.

I must also add that I have no regrets about choosing the

Newbrain, and have found it an excellent buy. I had roughly £400 to spend so I looked very carefully at the BBC B. But I am not too interested in games so the excellent colour and sound features of the Beeb did not sway me.

However, I do intend my system to grow as money becomes available and my business expands. The Newbrain is ideal, and for the extra £150 I was able to get a monitor and a cassette player. I hope to increase my memory by 64K soon and Malthouse says it will do the installing free.

My main use at the moment is stock-taking, and the battery back-up allows me to wander round the shelves and cellar entering stock levels with no problem.

I have been really pleased with my both my Newbrain and with the support from Mike and Stuart of Malthouse. I wish them well.

Dave Pugh,
Worsley, Manchester

Old Epson exposed

Your review of the Epson RX80 was very interesting. It was also revealing about the previous model: 'the paper is no longer inclined to climb off the sprockets . . .' That has hardly been shouted from the rooftops (until now I thought it was peculiar to mine) in reviews of the MX series. Must we wait for a review of a new model to learn of its predecessors' shortcomings?

John Hamilton,
Edinburgh

I'm glad we uncovered this little gem. Hope it helps — Ed.

Sing praises for Smith

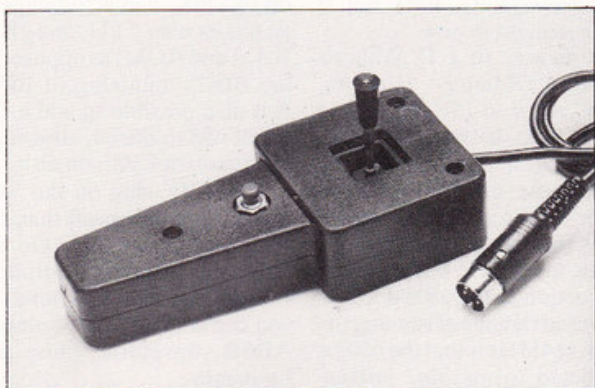
I have always been interested in microcomputers. I did computer studies at school, and I've been thinking about getting one.

The Sinclair ZX81 is a very neat and compact computer and it is very cheap, only £50. When Sinclair introduced the Spectrum, with eight colours and a sound generator, I was keen on purchasing one, but the price did not suit my pocket.

The Sinclair Spectrum software available suits my needs,

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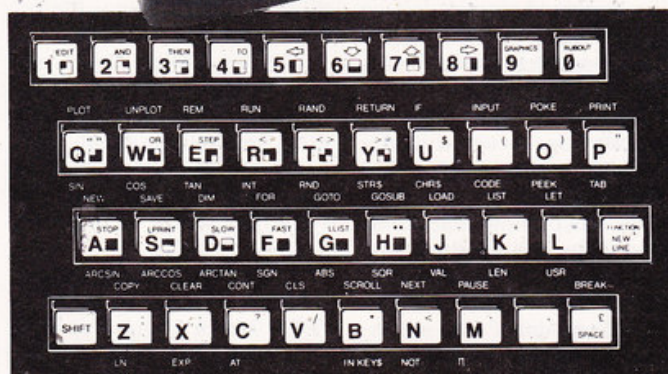
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When I was reading through *PCN* (April 29-May 6 1983), I was interested to read that W H Smith has made a big reduction in prices — to £99.95 from £125 for the 16K, and an even bigger reduction from £175 to £129.95 for the 48K. And I was amazed to learn that W H Smith is to introduce microcomputer shops within shops.

A very big cheer for W H Smith from me. I am pleased to say that I shall now be purchasing a 48K from W H Smith, and all because of your write up in *PCN*. A big thank you as well.

G Darby,
Kings Lynn, Norfolk

Gosh — someone loves us.
Thanks — Ed.

Pirates prevent program profits

I am writing to air my views on an increasing problem in the home computer market — software piracy. There are not many of us who can honestly say that we have never copied a program for a friend or received 'pirate' programs.

Yet this pirating is reaching quite staggering numbers, and the software houses are losing a lot of money because of it. But what can be done?

However much the programmers try to protect their software, you can be sure that the pirates will find a way to copy it. Despite recent government participation, the pirates have not been deterred. And after all, there is not much that can be done to stop them.

The recent popularity of the software libraries has not exactly helped. Some of the advertisements actually encourage copying. Surely the programmers and companies deserve their profits? I would like to hear your readers' views on the subject — it could be a very interesting debate.

J R Mortleman,
London E18 2HL

Well, let's hear from you. This is something that affects all of us — Ed.

Commodore 64 strikes back

Without wishing to get involved in a running argument about home computers, Robert Tizoni (*PCN* April 8-15) might note that a Commodore 64 costs

about twice as much as a Sinclair Spectrum and the IBM and Sirius PCs cost about twelve times as much.

The Commodore 64 is about twice as fast as a Spectrum, while the IBM and Sirius machines are about three times as fast.

The Sinclair Spectrum is on my list of machines worth buying for one reason alone — the remarkable amount of cheap quality software available. It also has a good Basic and graphics system — otherwise it is horrible. The Dragon is no better. The Oric, Lynx, Commodore 64, BBC and Cortex machines are all worth considering. The Atari and TI99/4A are both too slow, as are the Spectrum and the Oric. The Lynx and BBC are both fast.

However as far as animation is concerned the Commodore's sprites win out; and as far as sound is concerned — as Commodore keeps saying — the key adjective is 'the best'.

Gordon J Milne (same column) sounds to me like one of the very small percentage of users he is talking about. They have mainframes for inverting matrices at Aberdeen University. What's wrong with playing games?

I do seem to have upset a number of people by my letter (*PCN* March 25-April 1) but I stand by everything I said. Brian kerslade (*PCN* April 1-May 6) should note that because the Commodore 64 is a 'soft machine' any of its keys can be reprogrammed. M S Pease (same column) completely missed the point about high resolution colour graphics. I am well aware that the BBC machine has a very high resolution mode — I use graphics on the BBC micro regularly — but this mode has only two colours. The most useful mode is 320 × 192 with eight colours in 20K, which is extremely restrictive on user memory.

I find it hard to know quite how I should reply to Ian McAlpine's letter (*PCN* April 22-29). I have never been called a 'flash lecturer' before.

He says that 'the two most popular home computers', namely the Sinclair Spectrum and the BBC computer 'were gunned down.' They most certainly were not. I made one criticism and one compliment (speed) about the BBC. All I said about the Spectrum was that it has the same graphics system as the Commodore 64.

I suspect Ian of belonging to the 'slagging Sinclair' club himself. He says that 'two thirds of (my) letter was just Commodore propaganda.' It was not. It was a straight review.

In answer to I D Walter's inquiry (*Routine Inquiries*, *PCN* April 8-15) about the comparison between a 2MHz 6502 and a 4MHz Z80, the reason the 6502 is so much faster is that a Z80 on average takes four times as many clock cycles to execute one machine instruction as the 6502 does.

The advantage of running the clock at 4MHz is that the 6502 is restricted to machine instructions that take integer numbers of microseconds to execute, whereas Z80 instructions may take 3.25 microseconds or 2.75 microseconds.

Dr Keith Bowden,
Computer Centre, NELP

Expandability is the advantage

I write in defence of Dr K Bowden's letter after I McAlpine's cruel attack on it. As Mr McAlpine says, nobody can say that one particular computer is better than another. But Keith Bowden's recommendations I think most will agree with.

The Oric outperforms the Spectrum and all the other £100 'toys' for just about every application. It has superb Basic, sound and I/O for the price.

Nothing comes near the Computers Lynx in the £200-£250 price range; its fantastic Basic, graphics (512 × 512) and expansion capabilities far exceed those of machines such as the Dragon or Colour Genie.

Now to Mr Bowden's most controversial statement, recommending the Commodore 64 for the £350+ price range. Mr McAlpine states that he wishes to expand his machine. He could expand it in various ways; he may want a second processor, which will set him back £200 for the device to allow him to use his second CPU. However, after a year and a half the 'Tube' is still to appear on the market.

Extra processors for the 64 will plug straight into the back, making it far cheaper to use CP/M etc on the 64. Should Mr Bowden like to add a disk drive he would first need to buy a £100+ disk interface unit (not presently available for reasons known only to Acorn).

A 64 owner could just walk into any Commodore dealer and buy his 1541 disk drive for

£299 (often less), go home and plug it straight into his 64.

The 1541 disk drive is far superior to Acorn's. It can store up to 170K, and is 'intelligent' (it has its own CPU, and 2K of RAM and ROM) as opposed to the BBC's unintelligent 100K. It is also possible to add a £40 IEEE 488 to the 64, allowing a maximum of 22Mb on disk.

The 'SID' chip on the 64 is much more advanced than the Beeb's synthesis chip. On the BBC you can only control pitch, volume and ADSR. On the 64 you can control pitch, volume, ADSR, waveform, pulse and frequency.

On the subject of quality of 64 programs, Wordcraft is a far better WP than View, and on the games side there are superb programs.

Gavin Harris,
Stanmore, Middx

And I think Dr Bowden's reply and Mr Harris's comments will be a fine place to end this long-running debate — Ed.

In search of the perfect price

I refer to the letter from Steven Willingham regarding Commodore RAM prices. Not only are Commodore's prices very expensive, but the contents of the RAM packs are nothing exceptional. The 3K pack contains about £5 of RAM and other components, the 8K about £16 worth of components.

Anyone considering the 3K RAM should buy the Super Expander, as it only costs £5 more for all its added facilities. Anyone who is skilled at soldering and knows about these things can buy the 8K RAM pack and upgrade it to 16K. Kits for this are sold in the US, but cost prohibits importing one. So far most of the independent suppliers have jumped on the bandwagon and charge only a little less than Commodore.

Early this year Boots the chemist was selling packs at reasonable prices, ie 3K £14.95, 8K £22.50 and 16K £34.95.

I have stopped buying RAM cartridges for our Atari video game because while the price was £14.95 it was OK but the new price of £26-£32 is not.

By the way, it's about time we had a national users' group devoted entirely to the Vic 20. Anyone interested in joining/helping should write to me.

B G Bryan,
5 Hertford Road, Clare,
Sudbury, Suffolk



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Apple display by design

Q I am interested in making simple games on my Apple II but I do not know all the locations in ROM and RAM to be able to make my own characters like this:

10 HGR

20 POKE 8192, X

with X being my character.

Luke Richdale,
London, SW7

A I hate to burst your bubble but . . . you can't do user defined characters straight-away on an Apple. The Apple's high resolution screen is bit mapped . . . each dot on the screen corresponds to a bit (either a 0 or 1) in the Apple's memory.

If you like, the screen holds not the codes of the characters but their shapes. But, as you know, you can do it. What you need is a program called a character generator.

When you PRINT characters, the character generator looks at the code, fetches the appropriate character shape from a character table and puts it in the appropriate part of memory. Change the character table and you've got user defined characters.

Of course, the program isn't simple. For a start, it needs to be in machine code, simply for speed but you can buy character generators. Names to look for are programs like Animatrix and HRCG on the DOS tool kit disk and Higher Text from Synergistic Software.

If you're a member of an Apple user group, you may also find they have something in their library. Finally, if you can get hold of some of the American Apple mags, listings are not impossible to find.

A look at the larger Lynx

Q I read with interest about the available user memory on a 48K Lynx. I would be interested to know the available memory with memory expansions. Does the graphics grid of 6x10 remain at 6x10 with expansions? P Myers, Chelmsford, Essex

A Below is a guide to some of the expansions possible. Remember that with bank switching and the ability to suppress certain colours, you can cook up any configuration you like.

A 96K machine with disks will run Computers' own DOS while a 128K disk machine will have CP/M. There is little point in putting CP/M up on the 96K machine as it only has a 40-column screen and most CP/M programs expect 80.

The last column also reflects the increase in graphics resolution with the memory upgrades. The 6x10 you refer to is the matrix on which characters are formed. This doesn't change but it doesn't need to. 6x10 is perfectly adequate to design clear, legible characters.

BBC disk discussions

Q I'm used to using a 'main-frame' (a DEC 10) and am about to take my first steps in microcomputing by buying a BBC Model B and a printer. What are the advantages of a disk drive? I ask this not in terms of just the faster loading but in terms of what can be done while actually running programs. What are the advantages of having two drives instead of just one?

G. Vincent,
Stoke-on-Trent, Staffs.

A You'll find the answer to both these questions just by using a micro. Cassettes are the best way of assuring you of the advantages of a disk drive. And a single disk drive is the best way

in the world to persuade you that you need two.

The most obvious advantage is, as you say, speed. But disks aren't just faster, they're more reliable and more convenient. Disks give you random access; information and programs are stored in separate named files, so you can get the one you want without searching and winding through a heap of tapes.

You can also have random access within any one file. So a program could read just the bits it needed into RAM as it needed them.

This lets you keep bigger files on disk than you can get into the BBC's small RAM so you can have address lists up to the size of a disk, or do word processing on documents that are many pages long.

In other words, a disk drive is needed to get any serious performance out of a computer.

There are other perks to having a two-drive system.

When you're programming, you can have your program disk in one drive and a whole pile of utilities and aids in the other.

If you're going to get serious about computing, get a disk drive. Better still, get two, and unless you're after massive data files, remember that two low capacity drives are worth a lot more than one high capacity drive.

For more information on this and other disk-related topics, don't miss Micropaedia, in next week's PCN.

Don't burn up your Dragon

Q I have problems with my Dragon when I try to use POKE 65495,0. This is supposed to increase the speed of the machine, but on mine it causes a crash.

I have been in touch with Dragon Data who tell me that, due to different tolerances, this will not work on all machines. They say that the Dragon was designed to run at only 0.9 MHz and that they would not use this POKE.

I understand, however, that an increasing amount of commercial software uses this POKE. Therefore I, and anyone else with similar machines, would not be able to run it. I would be grateful for your advice.

John Buckley,
Salford, Manchester.

A Unfortunately, you'll have to believe Dragon Data. If the Dragon could reasonably be guaranteed to run at the higher clock speed, then the tweak would be made to production machines.

You've spotted that this is a problem for commercial software that uses the POKE. But good software houses should be avoiding it rather than using it.

There should be no need to use the POKE. If you can't write a program so that it goes fast enough, you're not going to solve the problem with a little bit of grease from POKE 65495,0.

In other words, if someone tries to sell you a Space Invaders that relies on this POKE don't worry. Have a look at some machine code products instead.

Random events on the Oric

Q I have just bought an Oric and am working on a program that relies rather heavily on random number generation. On my old ZX81, I was able to access the random number list at any point by using RAND(N). On the Oric there is no such function and the list always begins from position 1. This means that everytime I switch on the Oric and run the program, I always get the same sequence of random numbers.

Can you help? Is there a substitute for RAND on the Oric?

Mr C Simmonds,
Birmingham

A I can't find any reference to RAND, RANDOMIZE or whatever in connection with the Oric. So let's program round this, rather than worry about it.

The best way to seed a random number generator is to wait for some unpredictable real time event. If you haven't got one of these handy, just prompt the user to press any key and have the Oric go through the random number list while the user is busy choosing which key to press. Viz:

```
1000 REM Simulate
      RANDOMIZE
1010 PRINT: PRINT
      "PRESS ANY KEY
      TO CONTINUE";
1020 X=RND(1)
1030 IF KEYS= "" THEN
      1020
1040 RETURN
```

Total RAM	User RAM	Display RAM	Display features
48K	16K	32K	40 column, 256x248 graphics
96K	64K	32K	40 column, 256x248 graphics
128K	64K	64K	80 column, 512x248 graphics
192K	128K	64K	80 column, 512x248 graphics

Lynx memory and screen configurations. See *A look at the larger Lynx*.

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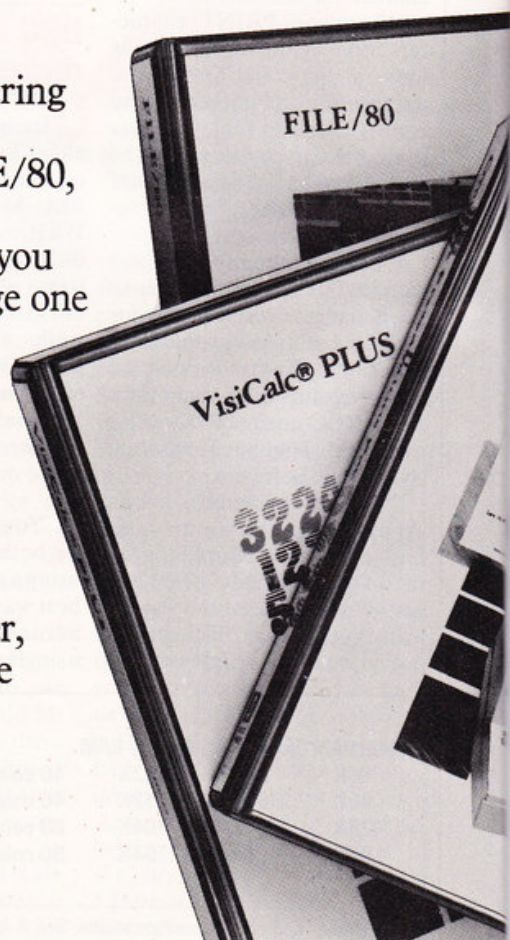
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Vanishing errors on the Atom

Occasionally the Atom reports an error in an apparently error-free line. If you can't find an error, check that the line contains no RETURN statements. If the Atom returns to a line containing an error, it reports the error but gives the line number of the RETURN statement.

So if you get a repeated error in an error-free line, see if it's got a RETURN in it. Then check all the lines it returns to. *Andrew Thompson, Wells, Somerset*

A quick flash for the TRS80

Here's a program for a Level II TRS80 (model 1 or 3) to give it a flashing block cursor. Memory has to be protected to allow the machine code to be stored, so answer 32727 in response to MEMORY SIZE? The machine code is entered and RUN by a Basic program using POKES and USR. After it is run, the Basic can be deleted without hurting the code.

The routine is written for 16K machines but can be relocated for 4K models. Set MEMORY SIZE? to 20439 then change line 10 to FOR X=20440 TO 20479 and line 20 to POKE 16526,216: POKE 16527,79: A=USR(0).

J and D Birdi, Gillingham, Kent

```
10 FOR X=32728 TO 32767: READ A: POKE
X,A: NEXT
20 POKE 16526,216: POKE 16527,127: A=
USR(0)
30 DATA 42,22,64,34,232,127,33,231,12
7,34,22,64,195,25,26,205,0,0,245,58,255,
127,61,50,255,127,40,2,241,201,42,32,64,
126,238,208,119,24,245,179
```

An eyefull on the Lynx

It can be quite difficult to develop long Lynx programs because of the machine's inability to scroll. If you add the following procedures to the end of a program, you can list it in screenfuls, a page at a time.

```
DEFPROC IN
DPOKE HIMEM,10
ENDPROC
DEFPROC PAGE
CLS
TEXT
LET I=DPEEK(HIMEM)
DPOKE HIMEM,I+150
LIST I,I+150
ENDPROC
```

To use the procedures, type PROC IN. Then type PROC PAGE to list the first 150 line numbers. From then on, CTRL-Q, RETURN will list the next screenful. You can list as many times as you like, simply by repeating PROC IN, PROC PAGE. If you like, you can even include the RENUM command in PROC IN to keep the listing tidy.

J C Perrett, Leeds

Tandy tip

Here's a handy way to change all the LPRINTs in a program to PRINT in a TRS80 program. Unfortunately, it does it for the whole of memory rather than just the Basic program. To change PRINTs to LPRINTs, just swap the 178 and 175 over.

```
60000 FOR X=17129 TO
32000
60010 IF PEEK(X)=175
THEN POKE X,178
60020 NEXT X
```

A J Brier, Lytham, Lancashire

Doubling up your programs

Many TRS80 owners will often want to join one program on to the end of another. Here's my method.

CLOAD the program with lower line numbers. Find the end of the first program with

Z=PEEK(16633)+256*PEEK(16634)-2. Now POKE 16548, Z AND 255 and POKE 16549, Z/256. Then CLOAD the second program.

Both programs are now in memory but only the second is accessible. Join the two with POKE 16548,233 and POKE 16549,66.

Darrel Francis, Enfield, Middlesex.

Turn the page on the Apple

Here's a quick way to print to the Apple's text page 2. Just VTAB to the appropriate line and then POKE 41,8 before PRINTing the text.

Before you do this, you need to make sure that the Basic program is moved above the second page. So POKE 104,32: POKE 103,1: POKE 8192,0 before loading the program (or in a boot or calling program). To display page 2, use X=PEEK(-16299) and to clear it use FOR T=2048 TO 3074: POKE T,160: NEXT.

Michael Osborne, Hornchurch, Essex

Go-faster Oric

You can speed up an Oric Basic program by up to 20 per cent. This is the method. Turn the keyboard off — with CALL #E6CA — in the sections that don't require keyboard input. When you need to use the keyboard, turn it back on again with CALL #E804.

B Bayley, Preston, Lancs

Quicker key function

It's difficult to write games on the Oric using the KEYS function. It takes a while for it to auto repeat and hence slows a game down.

One way round this is to DEEK location 783 in the system variables. Some of the values you will discover are:

```
45310 no keys pressed
48351 left arrow
48255 right arrow
48319 down arrow
48375 up arrow
48382 space bar
```

You can experiment to find any others you need.

Craig Bartliff, Otley, W Yorks

Between the lines on Spectrum

It's possible to GOTO any particular statement in any one line on the Spectrum. To do this, add the line: 9999 POKE 23618, line-256*INT(line/256): POKE 23619,INT(line/256): POKE 23620, state

Then set line and state and GOTO 9999.

Another useful tip is to change the flashing cursor produced by INPUT. You can do this by POKEing 23617. For example POKE 23617,245 produces a full stop when INPUT is executed.

Gavin Monk, Bury St Edmunds, Suffolk

Old and new

Here's a way to rescue a program after you've accidentally NEWed it on a 16K level II TRS80 Model 1. Type POKE 17130,1 followed by SYSTEM. When the *? appears type/11395 followed by LIST.

You can use this if you accidentally type CLOAD instead of CSAVE. CLOAD will clear the memory and try to load the program from tape. Just press the reset button (inside the expansion socket door) and follow the above procedure.

D Armstrong, Underwood, Nottinghamshire

Add to the TAB

A problem in the Oric's ROM stops TAB from working. You can correct this by adding 10 to the TAB required. So PRINT TAB(N+10); will TAB N spaces. As the first two columns are protected, you'll also find that TAB(11) and TAB(12) will give the same result as TAB(13).

K R Amey, Borrowash, Derbyshire.

Magic scroll for the Spectrum

It's a shame that there's no SCROLL command on the ZX Spectrum. There have been some substitutions published involving POKE and PRINT.

A much tidier way is just to use LET A = USR 3280 in your programs.

M Redman, Highbridge, Somerset

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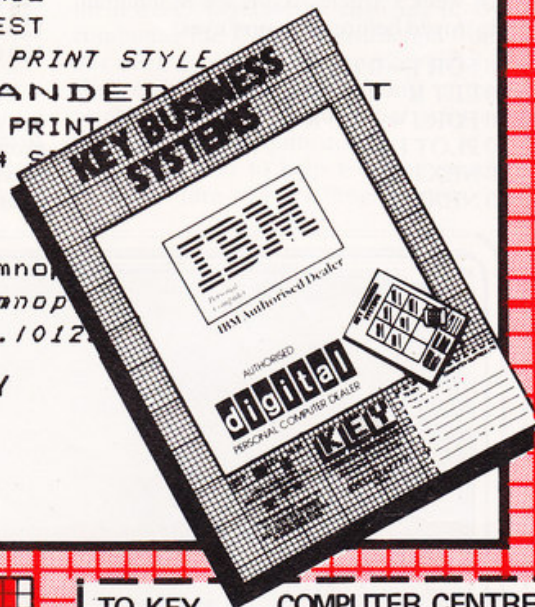


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@ABCDEFGHIJKLMN O P Q R S T U V W X Y Z [\] ^ _ ' a b c d e f g h i j k l m n o p
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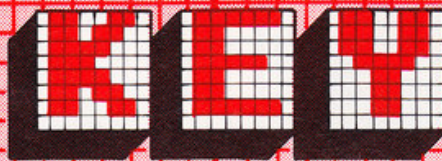
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ZX81 – and now for ET the sequel

Last week we gave you the first set of modules to help build our ZX81 ET-type program. On these pages we present the concluding set of program modules to run the program you'll find in today's PCN Programcards section. These modules are concerned with making the pictures we created last week move on screen.

The first program might be called 'Bombs'. Type in the following lines, and it drops square bombs (who ever heard of a square bomb?) from the top of the screen at random:

```
10 LET R=INT(RND*40)
20 FOR I=42 TO 0 STEP -1
30 PLOT R,I
40 UNPLOT R,(I+1)
50 NEXT I
60 GOTO 10
```

Line 10 starts by defining R as a random integer. Line 20 uses the STEP keyword to step the FOR . . . NEXT loop downwards rather than up (hence the -1). Line 40 UNPLOTS pixels alternately. If you combine it with the Skyline program in last week's article, you'll see Manhattan destroyed before your very eyes:

```
10 FOR I = 0 TO 40
20 LET R = INT(RND*8)
30 FOR J = 0 TO R
40 PLOT I,J
50 NEXT J
60 NEXT I
```

```
70 LET R = INT(RND*40)
80 FOR I = 42 TO 0 STEP -1
90 PLOT R,I
100 UNPLOT R,(I+1)
110 NEXT I
120 GOTO 70
```

The following addition to the program (lines 112-115) provides a useful Explosion effect which you can add without getting involved in the details of ZX81 POKES. Use it whenever you want to make your display shudder and shake:

```
10 FOR I = 0 TO 40
20 LET R = INT(RND*8)
30 FOR J = 0 TO R
40 PLOT I,J
50 NEXT J
60 NEXT I
70 LET R = INT(RND*40)
80 FOR I = 42 TO 0 STEP -1
90 PLOT R,I
100 UNPLOT R,(I+1)
110 NEXT I
112 LET X = 100
113 FOR I = X TO 0 STEP -5
114 POKE 16424, I
115 POKE 16424, (X-I)
116 NEXT I
120 GOTO 70
```

Unless you've given some extra memory to your poor overworked ZX81, this program may not work. If it doesn't, slim it down by altering the width of the display in lines 10 and 70. Just lower the value 40, to

20 for example. Increasing this number increases the display width to a maximum of 63.

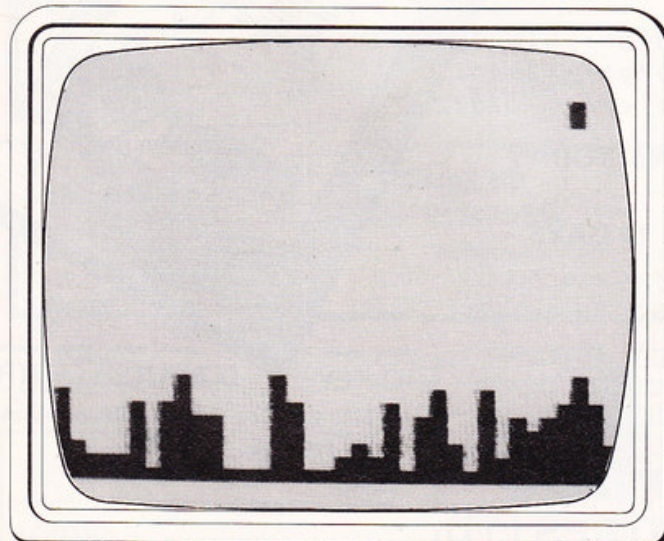
So far, everything we have written has been a display rather than a game. Since most space games require something to be shot down by the player, the next example shows you how to do just that.

First, the computer displays the trace of a cruise missile wandering across the screen at random:

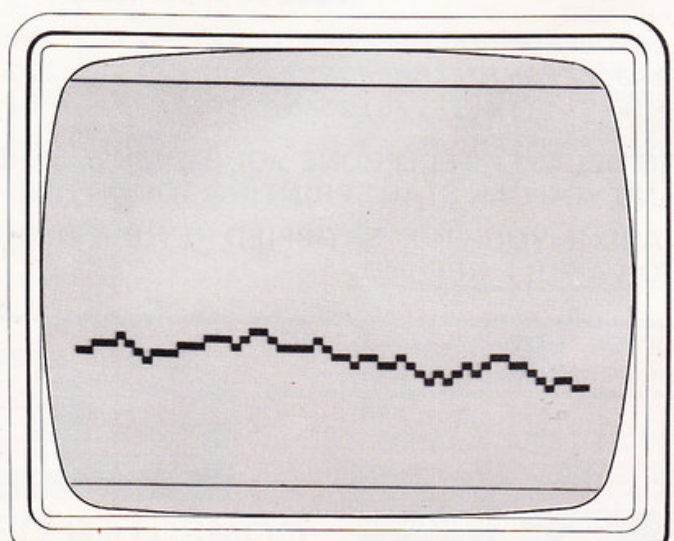
```
10 LET Y = 20
20 FOR X = 60 TO 0 STEP -1
30 LET R = INT(RND*3)
40 IF R = 1 THEN LET Y = Y + 1
50 IF R = 2 THEN LET Y = Y - 1
60 PLOT X,Y
70 NEXT X
```

Lines 40 and 50 alter the course of the missile, moving it up or down at random, according to the value of variable R. Line 20 STEPS across the TV screen right to left. Line 10 sets the launch position 20 pixels up the right hand side of the screen.

You can combine this missile trace display with Skyline and the Explosion insert described above to produce your own World War III scenario. Enter the Skyline module first, followed by the Missile module, with the Explosion tacked on at the end. Remember to change the line numbers as you do so, and to change any GOTO statements this affects.



Here we see a sorry and fearful sight as Manhattan disappears under the first of many bombs brought on by evil ZX81 programmers with a violent bent. The program to develop this carnage is built from last week's Manhattan Skyline routine, which is added to a little bomb-dropping routine to produce the picture.



This, believe it or not, is a cruise missile trace. You may not have had too many opportunities to go chasing cruise missiles about the countryside, but if you had, this is what their trail would look like. If you can successfully stop this cruise missile, you may be able to stop the devastation inflicted upon Manhattan elsewhere on this page.

You're now ready to turn your program into something like a real game. We could generate another missile trace, launched from the bottom of the screen under the control of the player. If the second missile intercepts the enemy cruise missile, the player wins and mankind survives:

```
10 LET Y = 20
11 LET L = 0
12 LET P = 10
13 LET Q = 0
20 FOR X = 60 TO 0 STEP -1
25 IF INKEY$ = "7" THEN LET L = 1
26 IF L = 1 THEN GOSUB 100
30 LET R = INT (RND*3)
40 IF R = 1 THEN LET Y = Y + 1
50 IF R = 2 THEN LET Y = Y - 1
60 PLOT X,Y
70 NEXT X
80 PRINT AT 1,1;"YOU MISSED"
90 STOP
100 LET Q = Q + 1
110 IF INKEY$ = "8" THEN
    LET P = P + 1
120 IF INKEY$ = "5" THEN
    LET P = P - 1
130 PLOT P,Q
140 IF P=X AND Q=Y THEN
    GOTO 200
150 IF P=X+1 AND Q=Y THEN
    GOTO 200
160 IF P=X-1 AND Q=Y THEN
    GOTO 200
170 RETURN
200 PRINT AT 1,1;"ENEMY
    INTERCEPTED-YOU WIN"
```

This program will just fit into an unexpanded ZX81. Lines 10 to 70 provide the missile trace, but with a few extra lines inserted. Compare it with the previous program.

Line 11 sets the interceptor launch variable to 0 (not launched). Lines 12 and 13 set the start co-ordinates for the interceptor, ie the interceptor is launched 10 pixels from the left of the bottom of the screen (P=10 Q=0).

Line 25 changes the launch variable L from 0 (unlaunched) to 1 (launched) if the '7' or 'up arrow' key is pressed.

In line 25, if the launch variable L = 1, then the subroutine which draws the interceptor trace is called (GOSUB 100). The subroutine called by line 26 starts at line 100, and finishes at line 170 with a RETURN statement, which returns the computer to the next line after the subroutine call (line 30).

The subroutine (lines 100 to 170) plots the missile trace using P and Q for the X and Y pixel positions. Line 100 advances the interceptor up the screen, while lines 110 and 120 steer it to the right or left.

Line 140 tests to see if the current interceptor position coincides with the

'The ZX81 has a set of graphics characters which can be printed with normal PRINT and PRINT AT statements'

missile position, and if so, goes to line 200 and declares you the winner.

Lines 150 and 160 are put in to make this rather difficult game easier. They work by testing to see if the missile is directly to the left or right of the interceptor.

If your ZX81 has extra memory you could expand the game considerably. You could add a Skyline at the beginning of the program. Substitute line 80 'YOU MISSED' with the Explosion module described earlier. Change line 10 to allow for input of different values for Y:

```
10 INPUT Y
```

This will allow you to set the position of your interceptor's launch base at the start of the program. If you want to make the

game more difficult, delete lines 150 and 160.

With this and all of your programs it is a good idea to add lots of PRINT and PRINT AT statements in order to make the same 'user friendly'. These could provide instructions and rules of play, as well as comments such as 'YOU MISSED' etc.

So far so good, but we have not looked at everything the ZX81 has to offer in the way of graphics. The ZX81 has a set of graphic characters which can be printed with normal PRINT and PRINT AT statements. These graphic character are switched on in the graphics (shift 9) mode:

```
10 PRINT " "
20 PRINT " "
30 PRINT " "
```

This prints a spaceship on the TV screen. To move the spaceship across the screen, try this program:

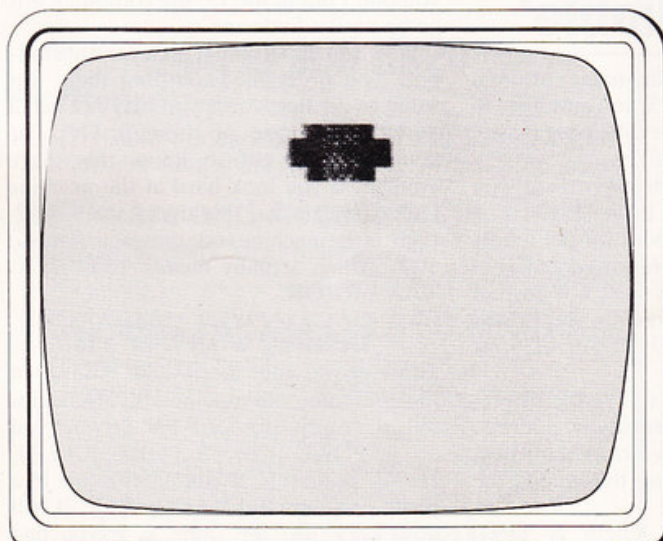
```
5 FOR P=0 TO 26
10 PRINT AT 0,P;" "
1,P;" "
20 FOR D=1 TO 7
30 NEXT D
40 CLS
50 NEXT P
60 GOTO 5
```

By adding to the PRINT AT statement we can print more spaceships. Change Line 10 to:

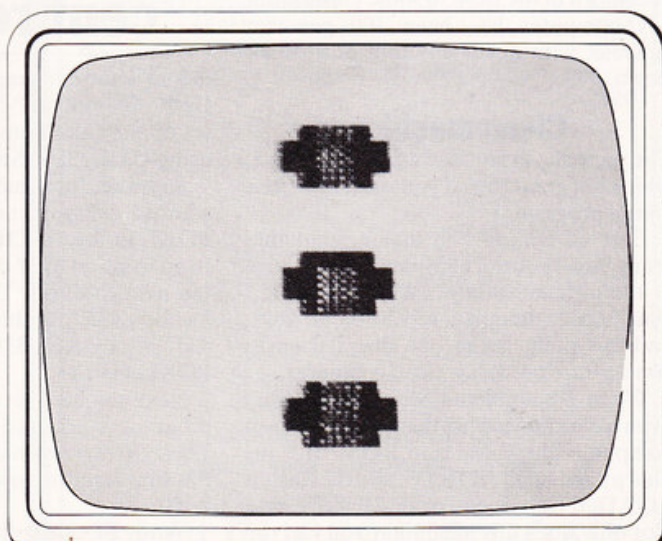
```
10 PRINT AT 0,P;" "
1,P;" "
5,P;" "
9,P;" "
```

The space between spaceships is determined by the first number, so you could get them closer together by changing it. By combining the INKEY\$ instruction from last week's computer art program and the Bombs program at the beginning of this week's, you could put together a Space Invaders program quite quickly.

But we want to help ET, not invade space, so turn to PCN Programcards.



The demonstration shown above moves this little spaceship across the screen in much the same way as the 'Mother Ship' moves in a Space Invaders game. The spaceship is composed of block graphic characters, built up using the ZX81 in the graphics mode. The FOR...NEXT loop and the PRINT...AT statements are the kernel of this program.



The procedure here is much the same as before except in triplicate. By adding a few more PRINT...AT statements to the program, we can easily increase the number of spaceships on screen. Note how the co-ordinates change as the progressive spaceships move down the screen, with the top half of the spaceship being printed one line down from the bottom half.

Hey presto! Geoffrey Childs pulls off a few conjuring tricks on his trusty MZ80K.

Sharpen your Basic

Since I bought my Sharp MZ80K 18 months ago I have never felt, 'If only I had waited I could have bought the XXX computer.'

Some recent models like the Sinclair Spectrum, the Oric, BBC micro or Commodore 64 have features I wish were on my Sharp, but I don't feel any of these would be a better computer for me.

Times move so fast that some people might feel that extolling the virtues of the MZ80K (or even Sharp's new MZ80A, is like a motoring magazine giving a rave review to an Austin 7. But I don't think Sharp users would agree.

If you only want a computer for games playing, there are much more suitable models around, although the Sharp is by no means the worst. The Sharp, however, has no colour, and although the highest resolution graphics at 80×50 were reasonable when the MZ80K first came out, they're not so good these days.

But on the other hand, you can mix graphics and text at this resolution, and the Sharp has probably the largest character set of graphics available.

Sound used to be considered a feature of the Sharp, but other machines have become so sophisticated lately that the only plus point is ease of programming. Some people don't like the keyboard on the K (the A has a very good one), but it's fine for a two-fingered typist like me.

I must admit that what attracted me first was the integral design. Having got the computer out of the box, even a ham-handed idiot like me had it working in a minute.

The integral design means there are never any loading problems, which can be a real thorn in the flesh to some enthusiasts. My computer has been 100 per cent reliable, with never any hint of a breakdown.

Clean machine

The screen locations are consecutive, which is a great help if you want to write a games program.

Ease of editing is a major point that many buyers do not consider, only to curse at the difficulties later. With the Basic I usually use, there is a repeat on all keys, and this point is the one that I want to concentrate on. It is a clean computer.

When I bought the Sharp, I wouldn't even have known what that meant. In most computers the Basic is in ROM. But the Sharp has a small 4K ROM, and the Basic is LOADED from tape (or disk) above this. Not only does this mean that you can run the Sharp on languages like Forth and Pascal for the mere cost of a tape, but that you can obtain improved Basics or even change the Basic yourself.

The Basic I normally use is a slightly

altered version of SP-5060, which can be obtained as well as membership for less than the cost of most games tapes from the Sharp Users Club, Yeovil College (SAE required for enquiries). But for the present I shall work on the assumption that you're using the normal SP-5025.

I have never found anyone who can tell me why Sharp thought that you shouldn't PEEK the Basic. And it's especially annoying if you forget to POKE 10167,1 before running a program that requires this. So when you save a new Basic I suggest you have this modification installed.

It's also helpful to have a computed GOTO or GOSUB that works like the Sinclair one, eg $GOTO 300 + 100 * Z$ is the equivalent of $ON Z GOTO 400,500,600$. Each of these can be done by a couple of simple POKES.

The easiest way to do this is to LOAD the Basic and then — *without* LOADING or writing a program — to POKE in direct mode the following:

POKE 10167,1: POKE 7389,25: POKE 7415,140: POKE 7416,25 and CR (carriage return)

Then again in direct mode (having changed the tape), enter $USR(33)$; $USR(36)$ and CR. Now your new Basic will be SAVED in the normal way.

If you've programmed your alterations

'My Sharp has always been 100 per cent reliable'

in and want to change the name, or use a Basic other than SP-5025, you may have to set up the conditions for SAVING before using $USR(33)$; $USR(36)$.

Suppose, for some obscure reason, you want to call your new Basic 'PIG'. You POKE in the ASCII codes for the letters from location 4337 on, followed by CR at the next location. You must not go past location 4353. In the example you POKE 4337,80: POKE 4338,73: POKE 4339,71: POKE 4340,13.

Next you have to set up the file length, program start and execution address. These are written into two locations in hex, the first one the low and the second the high.

With SP-5025, the length is 12800 (locations 17408-18437 are the Basic work area, and not loaded from tape) and the start and execution addresses are both 4608. These two numbers are $50 * 256 + 0$ and $18 * 256 + 0$ respectively.

POKE4354,0: POKE4355,50 sets the length. It may be best to increase the 50 to 51 in case the end of your SAVE gets corrupted. POKE4356,0: POKE 4357,18: POKE4358,0: POKE4359,18 does the rest.

These monitor locations should be the same on the MZ80A, although the locations in the Basic may be different.

Statement puzzle

Coming out of the monitor and into machine code, consider this little puzzle. There are two statements which call exactly the same machine code routine in Sharp Basic. What are they?

The two statements are REM and DATA. If you are puzzled by this, DATA itself doesn't do anything: it is only activated by READ. In fact, if you are not using any DATA in your program and like being eccentric, you could enter all your REMs as DATA!

Now, as promised, let's dig into Basic. Earlier I POKEd 10167,1 to remove the PEEK protect. There is another way to do this by POKE 10180,195. This actually makes a conditional jump into an unconditional one, and thus allows PEEK(N), locations 10183-10192 for any other uses.

If you want your computer to play a little tune every time it is READY, first you POKE 4684,199: POKE 4685,39. For the machine code minded, this sets register pair DE to a new address, 10183 in decimal. Locations 4686-8 call a monitor subroutine to play music from the address in DE, until it comes to the ASCII code for a CR. All we need to do now is give it a tune to play. POKE 10183-7 with 68, 71, 68, 71, 13 respectively or anything else you choose. If you don't put in the 13, the computer will go on until it finds one.

Now for something a bit more substantial. You probably know that there are some two-letter words you may not call a variable and one of these is FN. The computer has got to know this. Sure enough, if you look hard at the machine code you can find this signal. At 9765-7, there is the machine code message 'jump to 5006' which actually means 'print SYNTAX ERROR'.

Dealing with DEF FN

Suppose you alter the 5006 to 8624, then the computer will assume you are beginning the routine for DEF FN. So what you do is POKE 9766,176: POKE 9767,33. Having done this, if you enter a line in a Basic program $40 FNA(X) = X * X$, it will now work just the same as if you had entered $40 DEF FNA(X) = X * X$.

The point here is that you won't need DEF FN any longer, because you can do it in another, simpler way. Anyway, be fair. Haven't you sometimes forgotten to put in



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04/01/83	400.00	04/01/83	400.00
05/01/83	500.00	05/01/83	500.00
06/01/83	600.00	06/01/83	600.00
07/01/83	700.00	07/01/83	700.00
08/01/83	800.00	08/01/83	800.00
09/01/83	900.00	09/01/83	900.00
10/01/83	1000.00	10/01/83	1000.00
11/01/83	1100.00	11/01/83	1100.00
12/01/83	1200.00	12/01/83	1200.00
13/01/83	1300.00	13/01/83	1300.00
14/01/83	1400.00	14/01/83	1400.00
15/01/83	1500.00	15/01/83	1500.00
16/01/83	1600.00	16/01/83	1600.00
17/01/83	1700.00	17/01/83	1700.00
18/01/83	1800.00	18/01/83	1800.00
19/01/83	1900.00	19/01/83	1900.00
20/01/83	2000.00	20/01/83	2000.00
21/01/83	2100.00	21/01/83	2100.00
22/01/83	2200.00	22/01/83	2200.00
23/01/83	2300.00	23/01/83	2300.00
24/01/83	2400.00	24/01/83	2400.00
25/01/83	2500.00	25/01/83	2500.00
26/01/83	2600.00	26/01/83	2600.00
27/01/83	2700.00	27/01/83	2700.00
28/01/83	2800.00	28/01/83	2800.00
29/01/83	2900.00	29/01/83	2900.00
30/01/83	3000.00	30/01/83	3000.00
31/01/83	3100.00	31/01/83	3100.00
32/01/83	3200.00	32/01/83	3200.00
33/01/83	3300.00	33/01/83	3300.00
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74/01/83	7400.00	74/01/83	7400.00
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79/01/83	7900.00	79/01/83	7900.00
80/01/83	8000.00	80/01/83	8000.00
81/01/83	8100.00	81/01/83	8100.00
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07/02/83	10600.00	07/02/83	10600.00
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05/05/83	19700.00	05/05/83	19700.00
06/05/83	19800.00	06/05/83	19800.00
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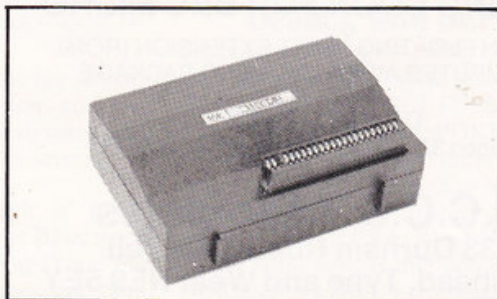
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the DEF and got a syntax error later? Having done this you have a spare token which you can use for a new word in our Basic if you wish.

You may ask whether the new FN works exactly the same as the old DEF FN, and to be strictly honest, there is one minor difference. During its route to 9765, where you diverted it, the computer attempted to evaluate FN. If you enter, for example 40 FNA(X)=6/X, you would probably get a DATA ERROR, since unless the computer is told otherwise it takes X as 0.

However in this occasional (and it isn't usual), case you could insert 39X=1, and everything would be fine. This quirk could even be an advantage in one way. If there

is a syntax error in a DEF FN the computer may be miles away from the original before it is found, and if you have forgotten where you put the DEF FN line, it can be a laborious debugging job. Here the computer will, in fact, crash on the line itself.

This has dealt with the DEF FN all right, but what can you put in its place? Some computers wait for a response after GET, but the Sharp does not. Both types of GET have their advantages. Why not have them both?

The waiting GET, I shall call SEARCH, mainly because it has the same number of letters as DEF FN if you include the space, which the computer does.

However, you will need to find space for the new routine. There is a very long message at locations 15584 onwards, the gist of which is that you have forgotten to turn your printer on. If you replace this with a message which may not have the same inscrutable Japanese manners, but means the same, by POKEing 15584-9 with 80,46,79,70,70,13, you will have 28 locations to spare from 15590.

The method you should use for the SEARCH routine is to copy part of the GET routine starting at 10327 into the new locations. This routine at one stage calls a monitor subroutine which puts the ASCII of any key pressed in the accumulator A and 0 if none pressed. You can therefore divert the routine back if the accumulator is 0 and only revert back to the GET routine if it is not 0.

The copying is easiest to do by entering a single line in direct mode:

```
FOR N=0 TO 14:POKE 15990+N,
PEEK(10327+N):NEXT
```

'Haven't you sometimes forgotten to put in the DEF?'

The rest of the routine is given by POKEing 15605-11 with 254, 0, 40, 249, 195, 102, 40. Of course, you haven't finished yet. First you must make the computer recognise the word SEARCH. We can do this by POKEing out the DEF FN and replacing by SEARCH, POKE 5419-24 with 83, 69, 65, 82, 67, 200. These are the ASCII codes for the letters, except that 128 is always added to the last one. Next you have to make the computer jump to the new routine instead of the DEF FN one. POKE 6731, 230: POKE 6732, 60 is all that is needed for this.

Here's another little puzzle. It is a method I have discovered for reading protected Basic programs, and can also be used for protecting your own programs. If you know enough about computers to find the answer, it is likely you are just the sort of person who will be looking for an ingenious way to protect programs, rather than copying other people's.

Before LOADING a program POKE X,33. The program is almost sure to stop with a syntax error. POKE X!44. The exclamation mark is no joke, and it won't be much of a joke finding X either if you really want to do is to break into a protected program!

MZ80K — Price about £260 secondhand
Processor Z80 RAM memory 48K ROM memory 4K Text screen 40 × 24 Storage cassette
MZ80A — Price £549 Processor Z80 RAM memory 48K ROM memory 6K Text screen 40 × 25 Storage cassette



Both the Sharp MZ80K and MZ80A LOAD their languages from a tape player/recorder which is integrated into the computer's design. The MZ80K (shown here in black and white) is the older and more primitive of the two machines, and has a less-sophisticated keyboard than its newer cousin.



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Can BBC Vufile repeat its Spectrum success? Max Phillips finds it's lost something in the translation.

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Name Vufile **Application** File handler **System** BBC micro Model A or B, 32K RAM **Price** £14.95
Format Cassette or ROM **Language** Machine code **Other versions** Spectrum **Outlets** Dealers or mail order from Psion, 2 Huntsworth Mews, Gloucester Place, London NW1 6DD.

Vufile is yet another of those home-cum-small business computerised card indexes. But this one has a bit more pedigree than most. Psion has already produced a top selling version of Vufile for the Spectrum. And its arrival on the 32K BBC micro will now give the fans of these two incomparable machines even more to argue about.

Features

Vufile lets you look after almost any information that you could keep in a cardbox. You get to design the cards and say where the information will go. Each card has to be less than 40 x 20 characters, and you can have as many fields as you can fit on.

Fields extend from the column you start them off at to the right hand border of the screen, or any text on that line. So the maximum length of the field is 40 characters but you can, unlike the Spectrum version, set limits to length which Vufile rigorously sticks to. Once you've designed a card, you can't go back and modify it.

If you've used the Spectrum version, the first thing you notice is that all that wonderful colour has gone. Vufile works in black and white with only the risqué red 'Searching' message breaking the barrier. The other problem is that you can store less information on a 32K disk based BBC system than you can on a £130 Spectrum.

Don't laugh, but your £750 BBC configuration is limited to 16K in one data base while a 48K Spectrum manages around 34K. Vufile is primarily a cassette based program and databases are kept in RAM.

It's simpler all round, both for Psion and the user, but it does mean that Vufile is

plain weaker than any other package that uses the disk drive. Psion does point out that Vufile uses an optimised data storage system to get the most out of the 16K. It also uses variable length records, but I couldn't detect any sign of any real data compression going on.

Vufile does everything you'd expect with the exception of a command to leap to the last record in the file. You can skip through the file, edit and delete cards and search and sort the file. There's also a very limited printing facility which pulls out selected fields from the cards and prints them in a column format.

But you haven't got the separate print layout of the Spectrum version and you've even got to guess the width of the columns. If they're too narrow, information is just truncated.

Presentation

Vufile is well packaged in a 75% air and cardboard library box, with a carefully labelled cassette and a 13 page manual.

The documentation is perfectly adequate, mainly because the package is so easy to use. It could do with a little bit of reorganisation — how has Psion managed a 13 page book that needs an index, and why hasn't it got one? There's also the odd phrase such as 'MODE 7', 'wholly RAM resident', 'where nnnn is the length of file as displayed by the *LOAD command' and so on, but most BBC users will have no trouble with that little lot.

The presentation is certainly a lot better than the crammed cassette insert the Spectrum version suffered from. The only real sticking point is the repeated assertion that Vufile has been implemented on a variety of similar microcomputers and has enjoyed huge sales. Huge sales maybe, but it's hard to think of the Spectrum as a variety of similar microcomputers.

Getting started

Getting used to Vufile is no trouble

provided you've a little patience. If you've got a disk system, the first thing you do is follow the instructions and copy the program and its demo file off cassette and onto disk.

Another minor stroke of genius is the demo file, a complete world gazetteer. This is a good way to learn about the program. The only drawback is that it's probably more fun to learn about Pshtu, Dari and the Burma Kyat than it is to fiddle with 'Order' and 'Search'.

In use

Vufile has a minefield-type user interface. You have to work to a set of unstated rules that only become clear as you learn about the package. Searching is fiddly, and surprisingly slow, and even after you've selected a bunch of records it can take Vufile a few moments to move back and forwards between cards.

Since the fields aren't typed, Vufile treats numbers like words. So searching (using <, > and so on) and sorting on numeric fields produces some odd results. Vufile also uses the F0 and F9 function keys as a token concession to the fact that the BBC has got them. It's curious to say the least, especially as F9 is frustratingly near to Break.

The program is full of little cul-de-sacs — change your mind about what you're doing and Break is the only way out. This takes you to a main menu where you restart.

Reliability

Vufile does have its rough spots. There are many ways to hang it, from pressing Escape while it is Listing a file to a simple request to go backward to the previous card following some searches. Once you know the package, you can avoid these, and most of the time you can Break and restart the system with your data intact.

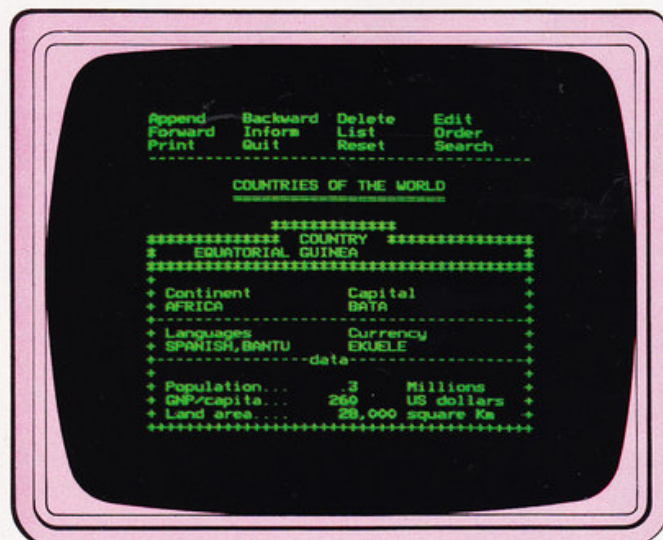
Verdict

Vufile is a competent package that hasn't suffered too much in its transition to the BBC. Since it only looks after 16K files, and it's got such a weak printing ability, it isn't much use for anything more than learning about or demonstrating file handling systems.

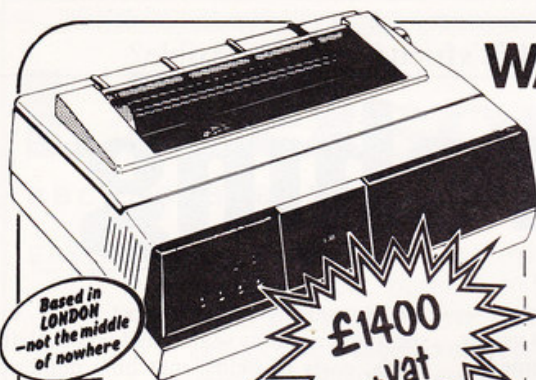
The price, at £14.95, is a bit of a surprise compared to the £8.95 for the more capable Spectrum version, but if you've got a tiny application that needs this sort of electronic cross-reference searching, then Vufile could just work. But don't expect too much from it.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



Vufile's neat teletext display. Commands are selected by pressing the initial letter from a list on the top three lines. Below this, the user-defined cards appear. The picture shows just one record from the Gazetteer demonstration file supplied with the program.

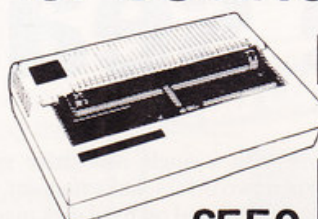


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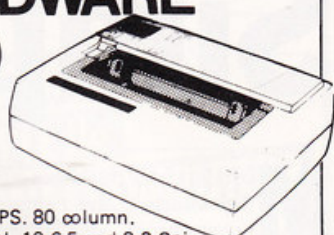
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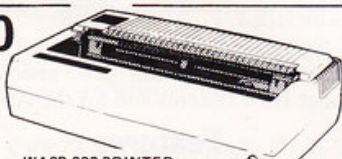
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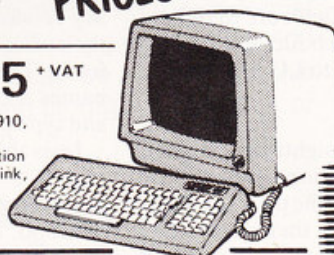
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Pete Galliard flips through the PFS:File package for the IBM. It's friendly but is it flexible?

Simple searching

Most database packages currently on the market are aimed at the programmer, and are daunting to the less computer-literate user. But PFS:File is one of a new breed which attempts to bridge this gap by making information storage and retrieval more accessible to everyone — computer illiterates included.

I tested it on an IBM PC with 192K of memory, but you can get versions for smaller IBM systems and for the Apple.

Features

PFS:File lets you design files in the shape of forms, enter data into them, and retrieve that information. It is a menu-driven system complete with a very easy-to-use screen design function. Information is retrieved by searching and matching commands, and the data can be displayed on screen, or sent to a printer.

There's also an interface to PFS:Report, the sister report-writing package which has much greater data manipulation abilities. But PFS:File itself will let you print selected records or fields, sorted if you wish on one field.

More experienced users will find that it lacks the kind of features packages like Superfile and dBase II possess. There is no on-line data validation and no ability to link-in your own program routines to do further validation or manipulate files. Its search facilities are also strictly low-key — you can search on strings and numeric ranges, but there's no scope for using complex search algorithms.

Presentation

PFS:File comes on a single diskette stored in the back of the user manual, all packaged in a sturdy cardboard box. A spare copy of the software is included. The user manual is a smallish chunky book, which is well written and easy to follow with plenty of examples and photographs of screen displays. There's no need to have the IBM manuals handy, since there are several useful appendices including one filled with relevant PC-DOS commands, such as detailed step-by-step instructions on how to format diskettes or rename files.

The manual will be particularly attractive to less technical users, since it assumes no computer knowledge. Records are called 'forms' throughout, and the word 'database' never appears.

There is no programmer's manual for more advanced users, but the package has few facilities to offer anyone who might want to carry out such tasks.

In use

PFS:File is straightforward to install. It needs a minimum of 64K memory and can

work with a single disk drive system — though two drives make it easier to use. It can also be used on hard disk machines.

It pays to put a good deal of thought into the design of your files before you start LOADING information into the computer, since changing the design of the file structure at a later stage is slow and cumbersome. It's better to consider what data is to be held on which files from the outset, and how many fields are to be held on each page within each file. Once this is decided, you are ready to LOAD your file design.

File design There is a straightforward menu system, and selecting option 1 puts you into the file design section of the package. Here you name your new file, then design data input screens by moving the cursor about the screen and typing in your chosen field names, followed by a colon, wherever you want.

Each screen can handle up to 100 separate data items, and you can continue on further screens if you wish, up to 32 pages. The PgDn and PgUp keys let you skip between the different pages of your form.

I found it very easy to design these input screens, and produced a large file with 40 fields over three pages in just a few minutes. But there is no distinction made between numeric and alphabetic fields on the forms — this would have been a quick and easy way to validate data as it is entered.

Data entry Option 2 on the main menu takes you into the ADD function, where you enter data into your chosen file. You select the file name, and the blank form you have created for that file appears on the screen. The file is updated record by record, and if you make a mistake on the record you are currently updating, you can correct it immediately.

But if you made your mistake on a previous record you'll have to return to the menu and re-enter the ADD function. If you wish to change the form design after you have added data to the file, you will find it a tedious and time-consuming procedure.

Data entry is fast and friendly to use, but the amount of data you can store on a single diskette is limited to 1,100 one-page forms. Double-sided diskettes raise that figure to 2,200 forms.

It is easy to reach that maximum quickly, and this is a serious limitation if you plan to build large files.

Data retrieval Data is retrieved from the PFS:Files using the same screen you used for input. You can retrieve every record in

the file starting with the most recent, or specific records by searching for complete fields, parts of fields, matching numeric fields, or searching for records containing numbers within a specified range. You can also use the '/' character to perform a 'Not' match to find, say, all data items which do not contain a 5.

I set up a test house sales system, with one file of vendors and one of purchasers. My vendors file listed houses for sale and their prices, number of rooms, town and so forth. The purchasers file listed buyers' names and addresses, price range sought, and type of property wanted.

I was able to search for all houses within a range of prices, or for all houses in a particular town or with a particular number of rooms. I could also search for particular names on the files, but I could not specify a more complex algorithm for seeking out records: say to find houses costing 10 per cent more than a vendor's chosen price range.

Verdict

PFS:File sets out to be simple, and simple it is.

Many of the other database packages available can be used to tailor your system to fit your application exactly, but this is impossible with PFS:File. You are, therefore, constrained by PFS's file structures which will lead to slow and inefficient searches through large files if PFS and your application are ill-matched.

But it's a very good package for the less experienced, or for users who don't want to get involved in complex file system design. It is friendly and easy to use, well documented, and the software seems very reliable.

If your application isn't too large for its restrictions on file size, then this package is well worth looking at.

RATING

Features
Documentation
Performance
User interface
Reliability
Value for money



Name PFS:File **Application** Database management **System** IBM personal computer, 64K **Price** £120.75 **Publisher** Software Publishing Corporation **Format** Disk **Other versions** Apple II and III **Outlets** Personal Computers, 01-377 1200

NEXT WEEK Pete Galliard gives the PCN Pro-Test to PFS: Report, the sister package to PFS: File.

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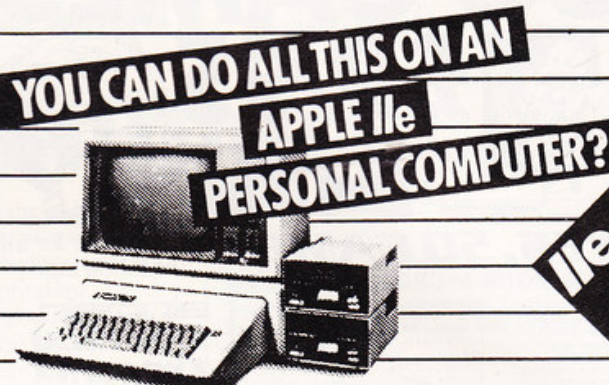
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Practical Pascal for Apple programmers

Pascal For the Apple is a comprehensive self-teaching course which can be used by beginners or more experienced Apple users, and consists of a 500-page textbook and a disk containing a number of example and explanatory programs.

To use the package you need Apple Pascal, and an Apple II or Apple II Plus with a minimum of 48K RAM, one disk drive, and the Apple Language Card.

Features

The main part of the package is the textbook, and although it is written for use with Apple Pascal (which is a form of UCSD Pascal somewhere between versions I.5 and IV.0) it does cover features of Standard Pascal that are not implemented in Apple Pascal, and also mentions the differences between Apple Pascal and UCSD Pascal versions I.5 and IV.0.

Many of the demonstration programs on the disk, and most of the exercises and examples in the early parts of the book use the Turtlegraphics package from the Apple Pascal System Library. This helps to make learning more entertaining, but it also ties the book to Apple Pascal and makes it impossible to use with Pascal on other systems.

The disk includes a number of explanatory programs which step through the demonstration programs, showing what happens at each stage, how the variables change, etc.

These explanatory programs are especially useful if you are studying on your own and have difficulty with any of the features.

Presentation

The book has paper covers but is sturdily bound and can be opened out flat, which is very important as you have to refer to the book continually while you are working at the computer.

The disk comes in a printed folder, and is protected by being laid in a cut-out in a piece of stiff card.

Getting started

The book begins with a section describing the minimum Apple system you need to run Apple Pascal, and how to make back-up copies of the system disks and the MACC: disk provided with the book.

There is a short section on what to do if your Apple cannot read the MACC: disk, and giving a guarantee from the publisher to replace a defective disk free within one month of purchase.

Most of the book consists of alternate practical and theoretical chapters, and the first takes you through a session at the

computer, introducing the UCSD p-system and using one of the programs from the disk to illustrate loading, editing, compiling and running a program.

The first chapter also introduces some of the basic features of Pascal by explaining the statements that appear in two of the demonstration programs.

The theoretical chapters are theoretical only in comparison with the practical chapters. They give a systematic account of Pascal, building on preceding ideas but full of exercises that you should work through to get the full benefit from the book.

In use

Pascal is a large language with many features, and although it is not difficult to get started you do need to put in some hard study to learn it all.

The book covers the whole of the Pascal language, from simple data types and control structures up to file handling and the use of pointers to create your own data structures.

Such esoteric features as passing functions and procedures as parameters (included in Standard Pascal but not in Apple Pascal) are described for the sake of completeness.

The predominantly practical nature of *Pascal For the Apple* helps you through the complexities of Pascal.

You do not need any special knowledge to use the book, but some mathematical background is needed in some later chapters, particularly the last section which is a case study on the minimum path problem.

The MACC: disk is especially useful here as it contains two files giving the distances between 18 and 94 cities respectively.

This allows you to test your program on a problem of realistic size without having to type in masses of data.

Verdict

I consider *Pascal For the Apple* to be an excellent textbook, and very good value for money. The use of Apple Pascal's Turtlegraphics makes it easy and entertaining to get started, without sacrificing any of the rigour you need for a proper understanding of Pascal.

Structured programming is introduced right at the beginning and emphasised throughout the book, so that you learn proper programming habits at the same time as you learn the language.

The book covers the whole of Pascal and includes the standard syntax diagrams, so it will still be a useful reference when you have finished studying it.

One of the exercises in Pascal for the Apple, teaching you how to use the Turtlegraphics routines — here it tells you how to draw four pentagrams.

```
(a) PROGRAM FOURSTARS;
    USES TURTLEGRAPHICS;
    VAR STARNUMBER : INTEGER;
    PROCEDURE DRAWSTAR(S : INTEGER);
        VAR SIDENUMBER : INTEGER;
    BEGIN
        FOR SIDENUMBER := 1 TO 5 DO
            BEGIN
                MOVE(S);
                TURN(144)
            END
        END; (* DRAWSTAR *)
    BEGIN
        INITTURTLE;
        MOVETO(80, 80); PENCOLOR(WHITE);
        DRAWSTAR(25);
        DRAWSTAR(65);
        DRAWSTAR(120);
        DRAWSTAR(160);
        READLN
    END.
```



RATING

Features
Documentation
Performance
Useability
Reliability
Overall value



Name Pascal for The Apple, by Iain MacCallum
Application Self-teaching guide to Apple Pascal
System Apple II or Apple II Plus with Apple Language Card and a minimum of 48K RAM and one disk drive
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If you're looking for hard copy Ian Scales has the answers — and the all-important questions.

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PCN compares the recent contenders



The Apple Dot matrix

Pro-Test PCN, March 18, 1983

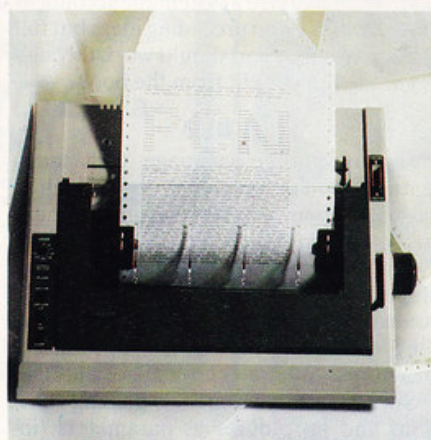
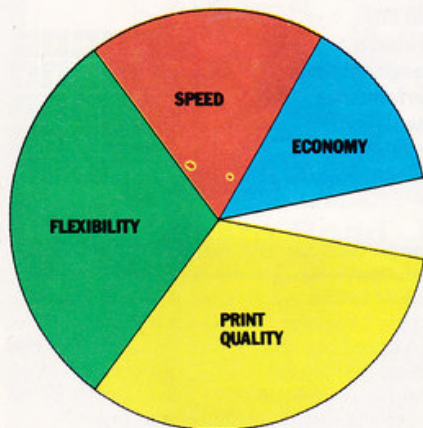
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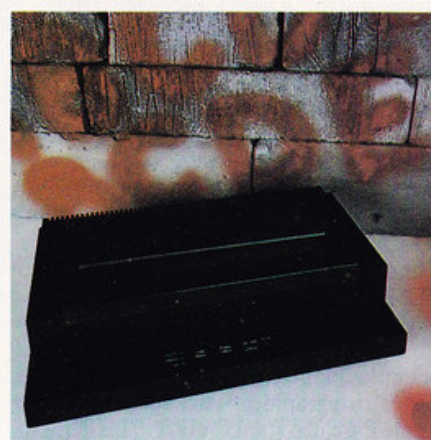
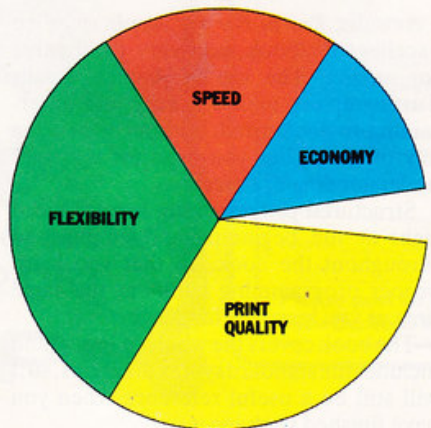
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Interfaces Parallel Centronics. Serial RS232.

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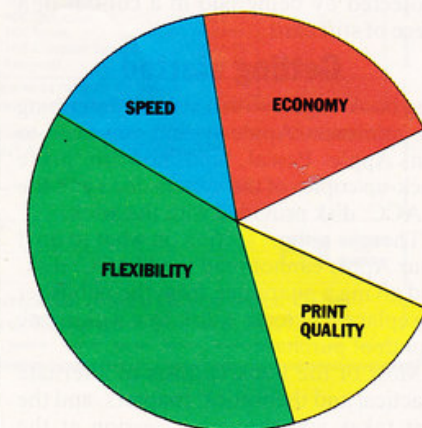
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General features: Uses spark jet. Perhaps its main advantage is almost no noise. Provides ten, 12 or 18 characters per inch. Has full European character sets, and three types of underlining and bit graphics. Its graphics capabilities are extremely good.

Tractor and friction feed is standard. Contact Micro-Peripherals (0256) 3232.



attempts to enhance their products with comparatively priced printer offerings. The ZX Printer remains cheap at the expense of paper width, paper quality and print quality. It is useful only to people who want hard copy listings of programs and this is all it is really designed to provide.

The problem is that printer prices have refused to descend in pace with the computers they serve.

A computer is composed mostly of microchips and the cost of manufacturing them has been steadily coming down over the past ten years. Conventional printers, however, have the handicap of crucial mechanical components and it has not been possible to radically cheapen their

manufacture without making them flimsier and less reliable.

Electrostatic printers introduce technology with fewer moving parts but at present compromise on print quality to such an extent that they suffer severe limitations.

Releases

Although dot matrix printers are stuck with lots of moving parts they do seem to be experiencing benefits from their mass production. As everyone knows, the more you produce of one thing, the cheaper it becomes per unit.

The Japanese manufacturers haven't wasted time in virtually cornering the

low-cost printer market and expansion of this market is starting to have a lowering effect on UK prices.

The past couple of months have seen some notable releases — especially Epson's new and relatively cheap RX80. At under £300, it and its competitors are viable printers for users with micros in the £300 to £450 price range. Even lower priced matrix printers are available at around £200, although these tend to lose points on quality and flexibility.

The dot matrix printer sends a print-head back and forth across the paper. On the head is a row of (usually 7 or 8) pins. The pins are punched through an ink ribbon onto the paper and build up the

Over the past two months PCN Pro-Tested a representative sample of printers. Below we take a look back.

The PCN Printers Pie roughly indicates the trade off between the four major variables. Price is represented by economy so excellent value for money will close up the price/performance gap.



Epson FX80

Dot matrix

PRO-Test PCN, April 29, 1983

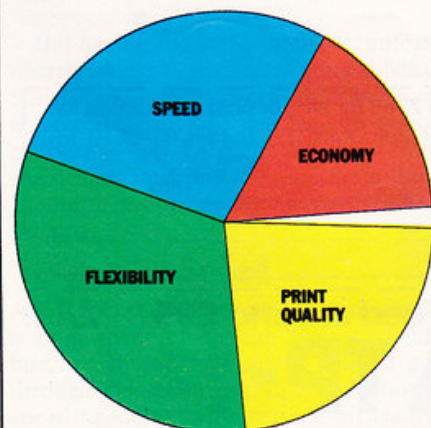
Price £438 inc VAT

Speed 160 cps

Interfaces Parallel Centronics, IEEE optional extra.

General features definable proportional spacing. Subscripts and superscripts are good quality — has double strike giving close to daisywheel quality. Provides normal condensed and double-width characters. You can define your own character set and double and even quadruple density bit graphics are available.

Tractor/pin and friction feed standard. Contact Epson UK (01) 900 0466.



Epson RX80

Dot matrix

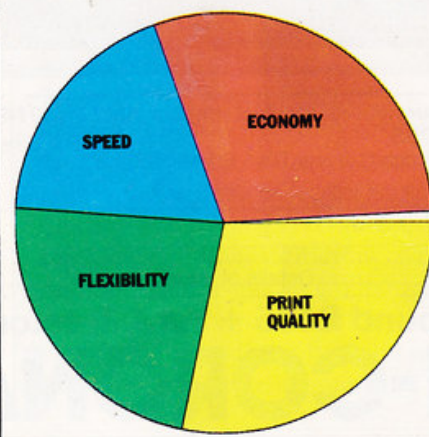
Pro-Test PCN, May 6, 1983

Price £250 to £300 plus VAT (the dealers tend to set their own retail prices — shop around).

Speed 100 cps

Interfaces Parallel Centronics, IEEE and RS232 optional extras.

General features Alternative character set available plus double strike, bold strike and a full range of widths and pitches. Modes may be turned on and off within a line. Bit graphics are available in a wide variety of modes. Tractor feed is standard. Contact Epson UK (01) 900 0466.



Star 510

Dot matrix

Pro-Test PCN May 13, 1983

Price £289 plus VAT

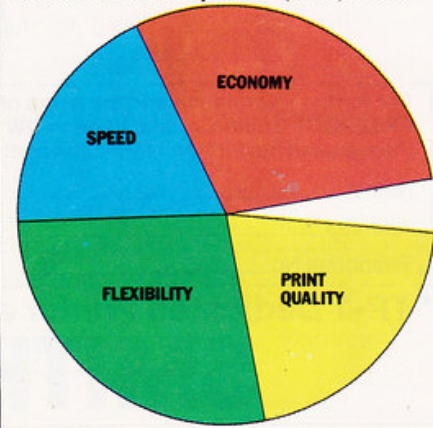
Speed 100 cps

Interfaces Parallel Centronics

General features A 9 × 9 matrix provides either 10, 12 or 17 characters to the inch while the line pitch is programmable. Pitch changes may be made within a line. Subscripts and superscripts are generated in unidirectional mode. Bit graphics come in single or double density in a 480 or 960 dot matrix.

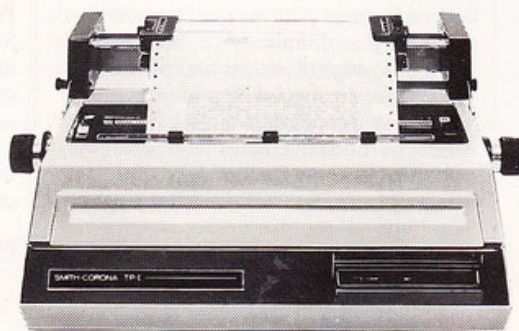
An interesting feature is the printer's use of a normal typewriter ribbon instead of the usual printer cartridge.

Tractor and friction feed is standard. Contact Miro Peripherals (0256) 3232.



NOW THE ONLY LETTER QUALITY PRINTER FOR UNDER £500* IS AVAILABLE THROUGHOUT THE U.K.

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PC/TP-1

* TP-1 Dedicated Printer around £485 + V.A.T. Tractor Feed around £95 + V.A.T.

SMITH-CORONA TP-1

◀ 37 characters as a matrix of dots.

It's a popular method and there is a wide variety of matrix printers on the market in every price bracket, so picking a dot matrix printer is not an easy matter. Potential buyers must arm themselves with a proper understanding of the things before venturing forth with a fistful of notes.

The first thing to work out is interfacing. Most printers could really be described as purpose-built computers in their own right. A printer will usually have a small volatile memory (buffer) and a processor to manipulate it and control the print head as it goes over the paper.

Far from being directly under the control of the micro, they deal as equals — obeying and interpreting text code. This computer to printer communication is carried out through an interface.

Interfaces

An interface is a small group of electronic components which takes the signals from the computer and converts them so they can be sent down a cable to another compatible interface waiting at the other end to convert them back.

There are two main types of interface. The first is known as a serial interface — the most common of which is the RS232. This sends pulses one after the other, rather like a one lane roadway.

Its alternative is a parallel interface and the most popular of these is the Centronics.

The Centronics sends its signals in ranks over a multi-lane roadway rather like tanks in a Russian May-day parade. The advantage here, of course, is speed — you can get more individual bits down in a given time.

So the first thing to work out is what interface your computer has and attempt to match this to interfaces on offer on available printers. It is important to distinguish between interfaces available as standard on a printer and those available as extra cost. Some manufacturers give you a choice — either one or the other — for the basic price.

It may turn out that you have no standard interface on your computer. If so get interface prices before making a purchase, as the expenditure can radically alter the economics of the whole exercise. The Spectrum, for instance, is cheap partly because it has no interfaces. These then have to be added at extra cost before a reasonable printer can be configured. Kempston does a Centronics interface for the Spectrum.

But having the right interface unfortunately doesn't guarantee compatibility. Some computers recognise different character codes and this can lead to major problems — always get an assurance from the dealer or, if possible, see the printer running with your model computer feeding the text.

Speed

Another criterion that must be considered is print speed. Although 100cps sounds fast, it can still take some time to get through a length of text. Like all features, speed is generally a direct trade-off against

price. If you plan to use your printer for business try and work out how much text you are likely to want to put through in a given time in determining your requirements.

Remember too that manufacturers' speed claims tend to err on the optimistic side. It seems to be a convention not to take account of the time involved in carriage return.

As a rough guide it is wise to knock 20 to 30 cps off the claimed speed.

Many users will be interested in graphics capability. This is often very dependent on supporting software — make sure you get all the details sorted out before getting too enthusiastic.

Print flexibility is another quality the importance of which will differ from user to user. Do you really need a full European character set or need to run different typefaces on the one page? (it can often look rather gross anyway). The same applies to different pitches and print positions (the maximum number of characters that can be printed on one line by the smallest character set).

Feeding time

Feed methods are another problem. The dot matrix works best with a tractor feed. The paper is pulled under the print head by a sprocket which marries with a line of perforations on the fan-fold paper. Once the paper is out of the printer the strips of paper down the side of the sheet with the tractor holes can be torn off.

Alternative feed methods — sheet feed for instance — tends to increase the price quite dramatically. Unless you want to use letter-head paper sheets, fanfold tractor feed will probably be quite satisfactory.

Print quality

Perhaps the most important consideration,

however, is print quality. On the face of it, a dot matrix printer is an ideal method of putting what appears on a screen onto paper. It really uses the same method as the cathode ray tube building up characters from a matrix of dots.

The dot matrix printer is conventionally supposed to come underneath the daisy-wheel printers in terms of print quality. Instead of a matrix, the daisywheel uses moulded characters which strike the paper through a ribbon using the same principle as the typewriter.

The daisywheel is really a con-job designed for people who want the convenience of computer-generated text but wish to retain the illusion that every letter sent is the result of half an hour's slave labour on an electric typewriter.

It is interesting to note that the early typewriters sometimes featured a script-type which was supposed to resemble 'joined-up writing'. The idea was the same — it was designed to appease correspondents used to pen and ink.

My guess is that the days of the daisywheel printer are probably numbered. Eventually people will get used to dot-matrix text which they already receive in gas bills, circulars and even, sometimes, books. Good dot matrix printing is just as easy to read as that from a daisywheel and it has been completed faster, quieter and comes from a machine that on average costs half the price. When it's finished doing letters, the printer can output graphics in its spare time.

One alternative to dot matrix is ink jet. The odd man out in this round-up is Olivetti's JP101. This printer uses a spark to fling ink out of a capsule directly onto the paper.

The JP101 does only one line of dots at a time, but does them very fast — this makes it particularly good at graphics.

Questions you need to ask

PCN Checklist — arm yourself with the right set of questions *before* you put yourself on the printer market.

What do I want to print? Think carefully about print quality and graphics.

Will you really print a lot of letters and do you want graphics hard-copy?

How important is time? Is it worth £100 to save the odd minute or so in printing time?

Compatibility Will it run properly with my computer? How much will it cost to make it do so?

Speed What is the *real* speed?

Ribbons How much do they cost and how long will they last?

Feed method Is the standard tractor adequate or is it worth the extra money to buy a sheet feeder?

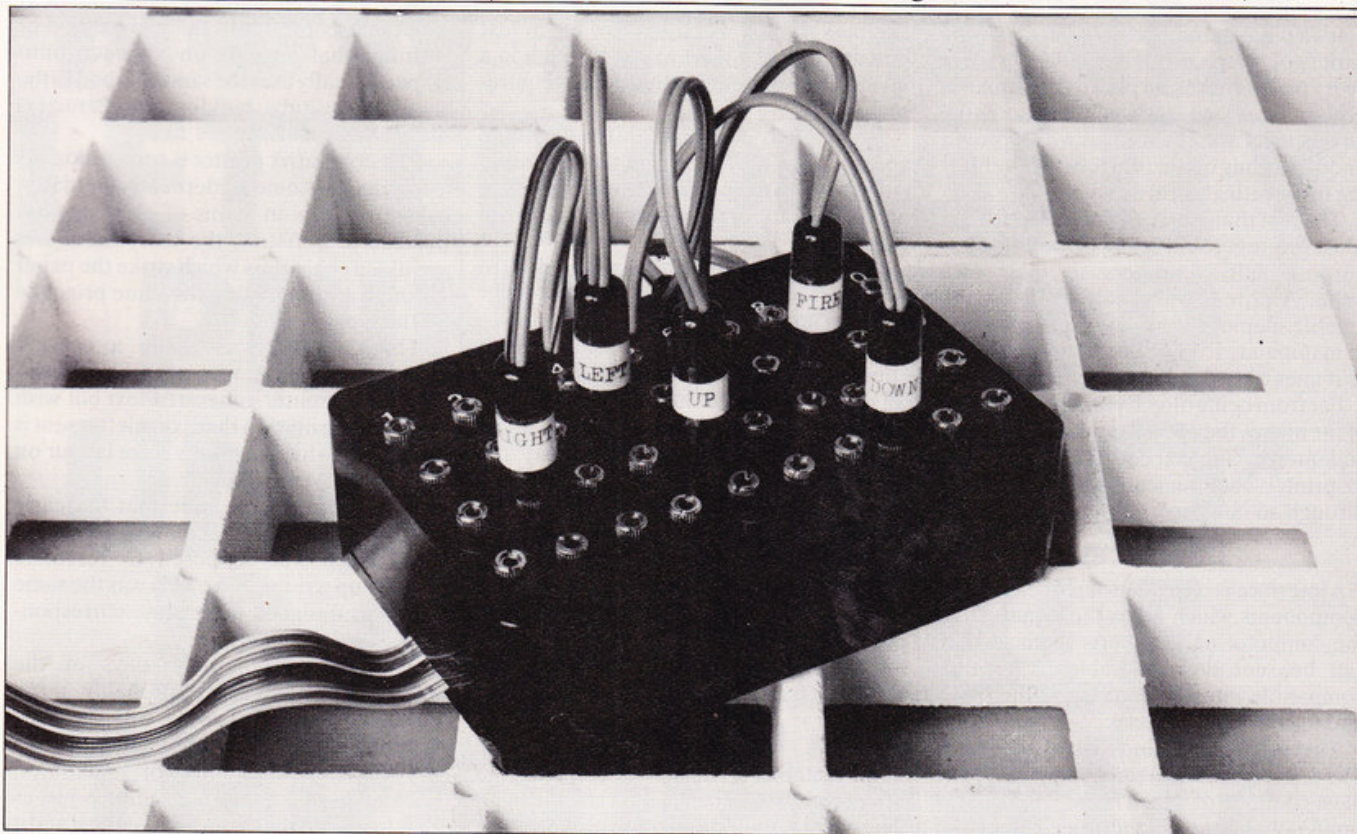
Carriage-width Will it take the paper?

Flexibility How many different character sets and graphics modes are available for the money? What will extra features cost?

Noise Make sure you hear it first.

Support Will the dealer fix it if it breaks and how long will he continue doing so? Are there maintenance schemes available?

If your hands are tied in Spectrum arcade games, Trevor Jones might have the answer in a Pickard.



Rogue Images

Control the action

If you enjoy a fast-action game on your Spectrum or ZX81, you'll know how difficult it is to control four or five keys. Different games use different keys, and they're often placed at awkward positions on the keyboard.

To make matters worse, many games don't have the necessary line to control a joystick controller has solved this problem. It can be configured to the Spectrum

But now Success Services claims its joystick controller has solved this problem. It can be configured to the Spectrum or ZX81, and can convert any key-controlled game regardless of whether joystick routines have been written into it.

The Pickard is the end-result of a simple piece of lateral thinking. The Spectrum version we tested measured 4.5in by 3in by 1.5in and has 40 miniature jack sockets arranged in four rows with ten sockets to each row. Each socket corresponds directly to the key positions on the Spectrum keyboard.

Presentation

Above the first row of sockets are five cables, each with a miniature jack plug. Each cable is labelled either up, down, left, right or fire. The user simply plugs-in the cables, telephone-receptionist style, to the keys dedicated by the program. Simple, huh?

PCN's model was obtained straight from the manufacturer, and therefore gave no clues as to its normal packaging. But I was assured that any joystick controller

ordered would be suitably wrapped to withstand the journey through the post.

The unit comes with an instruction sheet which gives details on connections. More about that later.

Protruding from one end of the box is a 13-way ribbon cable split into two parts. One part has five wires soldered to a seven-way connector and pin assembly. The other part has eight wires soldered to an eight-way connector and pin assembly, so it can be fitted to the Spectrum's printed circuit board.

The other end of the unit contains a standard joystick socket.

Ease of use

The Spectrum power supply plugs into the unit, but gives the Spectrum its rightful share through yet another cable to the computer's 9V socket.

A little work is required before you can use the unit. First you have to open the Spectrum (goodbye warranty?). You then have to remove the two Spectrum ribbon cables. On opening the unit, I found a small circuit board with the electronics mounted on it. The connections could clearly be seen but construction could have been neater.

On the end of the ribbon cables there were a few loose strands of wire where the insulation had been removed. In addition the connections to the terminal were separated by a very small margin, and I found this a bit worrying.

The cabling, by the way, is arranged so

that the keyboard is still operative. I found fitting the keyboard cables to the connector at the end of the controller cable was easy, while trying to fit the cables back into the Spectrum PCB was fiddly. However, having finally got the connectors fitted I reassembled the case and plugged-in an Atari joystick.

I then used the five cables on the top of the controller unit to plug into the sockets that corresponded to the keys I wanted to use. Unfortunately, making stable connections proved troublesome, but after a couple of false starts everything was well connected, screwed back together and primed to obliterate aliens. The beauty of the system is that the keyboard is still usable (crucial really, you still have to LOAD the games).

Verdict

Predictably, the joystick gave a measurable improvement to my maze game. Once fitted, the unit is easy to use with any make of joystick — I tried it out with two different makes and it worked satisfactorily.

Apart from my traumatic experience fitting the controller ribbon cables into the Spectrum's case, I had no problems. At its price the Pickard represents good value for money, and I would quite happily purchase one myself.

Product Pickard Joystick Controller **Price** £18.95 plus £1.00 postage and packing **Manufacturer** Success Services, 0922-40403

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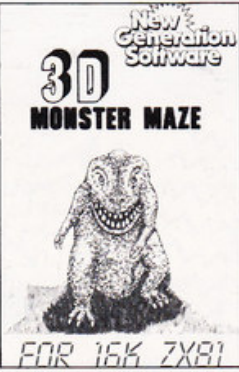
3D TUNNEL - 16K/48K Spectrum
A full action graphics game to test your skill and nerve. What lies in the depths of the tunnel? Flying bats, leaping toads, scurrying rats, crawling spiders all appear in the depths of the moving tunnel. The 48K version also holds a surprise in store! **ONLY £5.95**
Compatible with Kempston and AGF Joysticks. "3D Tunnel contains some of the most impressive graphics you're likely to see on the Spectrum" Computer and Video Games.



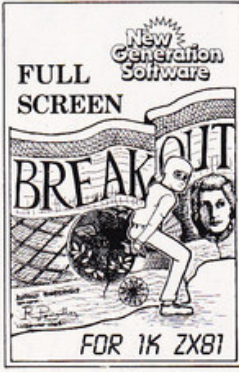
ESCAPE - 16K Spectrum
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*These games have previously been available from J K Greye Software Ltd.



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The single-board C9E comes without trimmings. Francis Monkman finds it something of a mystery.

C9E~

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When Adaptors Engineering found one of its employees was interested in computers, the company decided to open a computer division. The C9E board is its first product, and is aimed at the hobbyist and OEM markets. PCN obtained a pre-release machine for testing.

Presentation

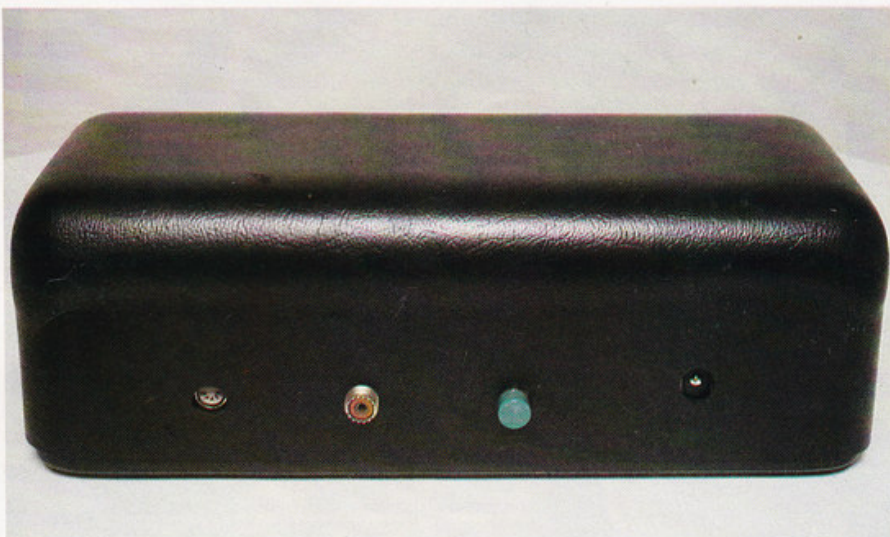
The C9E Computer Board from Adaptors Engineering is a single-board 6809-based unit, and at present resides in a temporary prefab-type casing. It enigmatically refuses to give much away about its intentions, but these must presumably include a visit to the tailor.

Wondering if this could indeed be a sheep in wolf's clothing (rarer than the other) I opened it up, and found a curious blend of ingredients that hinted that the machine might turn out to be a bit of a puzzle.

A circuit board some 12in x 8in holds 18 chips, which include the 68A09 processor (semi-speeded version nominally running at 1.5Mhz), 64K of dynamic RAM (the new chips, so there's only eight of them), and two (presumably 8K) ROMs. One contains a version of Basic, and the other holds an assembler (line-by-line) along with the machine's operating system, intriguingly entitled 'D9E' (remember the hardware is/was called 'C9E').

It's almost as if Steve Wozniak had burst in on Steven Jobs one day shouting 'Great idea — we'll call it Bpple'.

But on with the plot; 18 chips plus analog bits and pieces will fit happily on a board half the size of this one, so investors in glass-fibre could be on to a good thing here. There are expansion sockets *à la* Apple on the board — five of them, 50-way, minus one for a 'right way round' cutout. They're also single-sided, which is a good idea as



The sockets on the back of the casing are for tape recorder, monitor and power, with a large green reset button.

double-sided prototyping boards are hard to find and expensive.

But with all that board space, couldn't they be more than 0.6in apart? Socketed chips plus the width of a PCB amount to at least half an inch, leaving not much room for the odd solder-blob — and if you want wire-wrap (many a prototyper's favourite), forget it!

I had originally thought 'industrial controller' when I heard about this one, and was then assured that, whatever the maker's plans for it, that was not among them. Then I thought that perhaps this was the kind of board (like the Kim, Sym. Aim and many others) that served as an excellent intro to computing at the machine code/hardware level — just like in the days before Sinclair and others proved that attractive packaging and aggressive

marketing are more powerful lures than technical specs.

But if this board is designed for a market at present not too well catered for, then the general layout, especially the placement of those expansion slots, is going to make hardware buffs wonder what else has been overlooked: maybe the size was agreed before the circuit design was done.

Construction

The system I saw has been put together for the benefit of this review, and any comment on, or criticism of the keyboard, connections — apart from the integral expansion slots — and PSU would be irrelevant. But I wasn't entirely impressed with the way the system was put together.

The video connector socket was of the sort more frequently seen on old oscillo-

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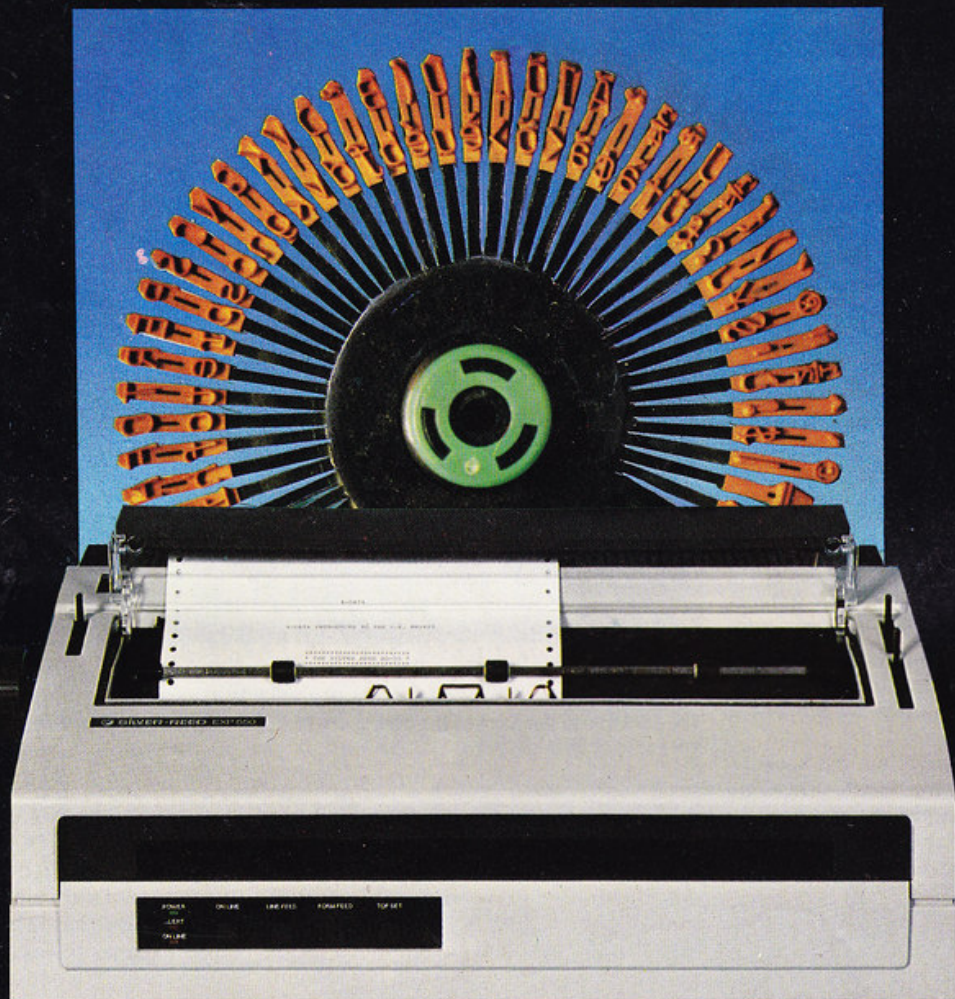
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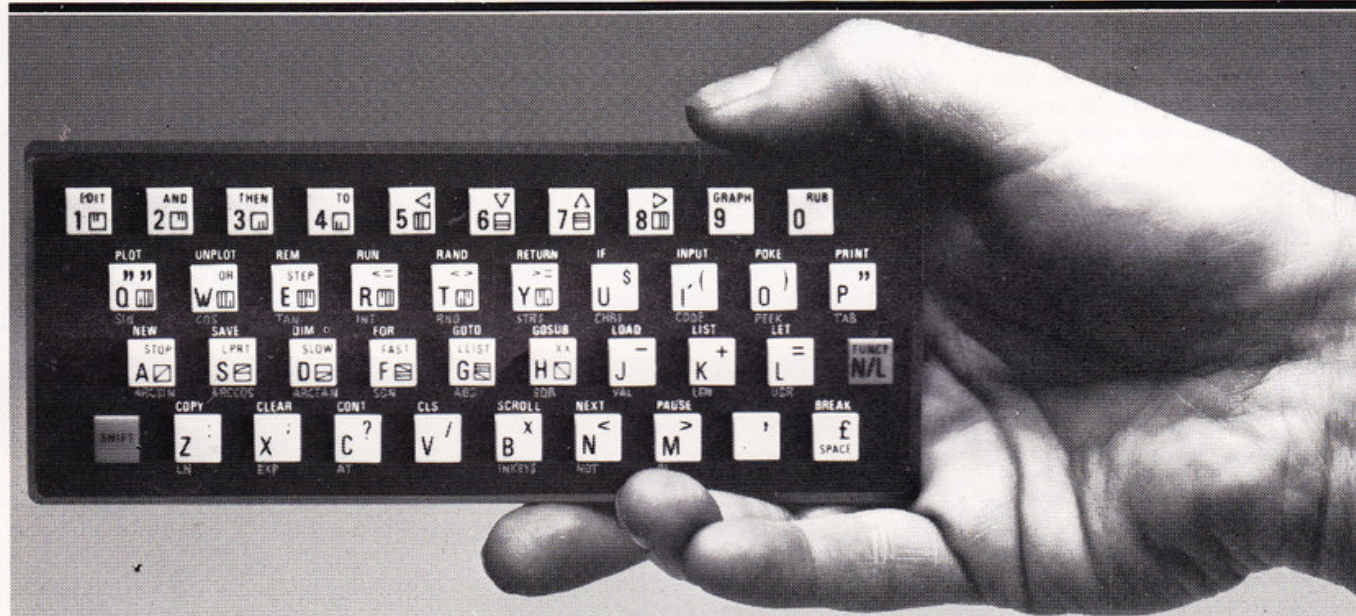
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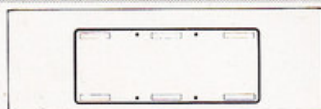
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PCN JUNE

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scopes. No modulated TV output was available, although this would be a must for the home market, and the very provisional keyboard I saw had no Break key — surely the final version will have one.

Operation

Powering up I had some trouble getting a stable display on my BMC monitor. I then found that the character intensity was too low to allow a snow-free background (which incidentally gave some interesting random graphics displays while the processor was busy).

Given a 32 × 16 text window, a few block graphics characters, and a character set (upper case only) that looked as if it had been designed on a subway wall, with a spray can, by a committee, this machine doesn't look set to score too highly with VDU aesthetes — '*' for example, turns out to be a diamond.

If you're going to spend time redesigning character sets, then it's probably worth spending the time and effort where it matters, *ie* on getting the character set to look consistent. If this is a ready-made character set, then I advise Adaptors to look for a better one.

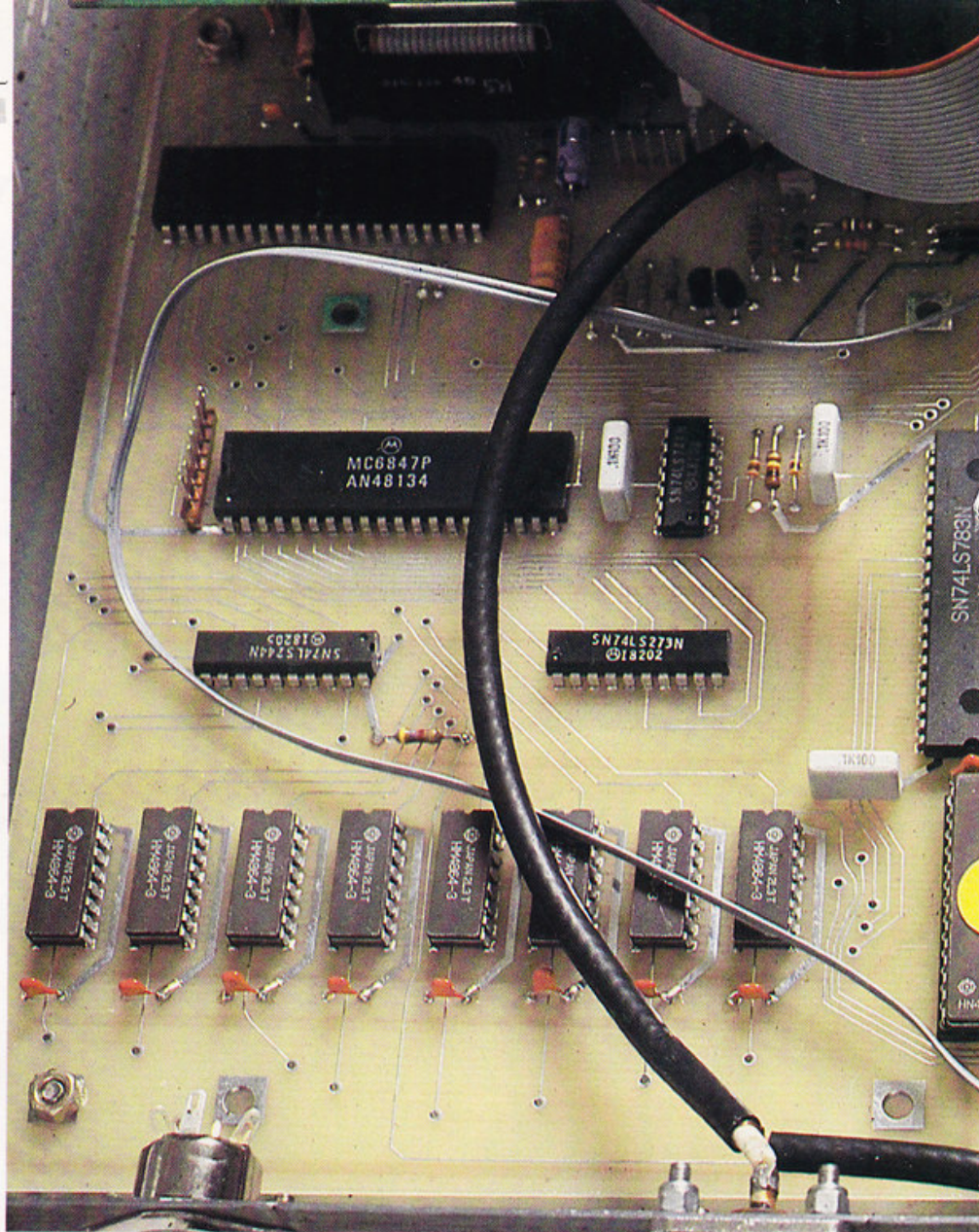
But apart from this, everything seemed to be working — D9E came up with its screenful of menu options (16 lines isn't much) which allow you to enter Basic, Assembler, Edit (not what most people mean by an Editor) and do various things with memory at a machine code monitor level.

DOS and Print are also there — although 'unavailable', according to the message the machine outputs — plus cassette LOAD and SAVE. I didn't have a cassette recorder/din plug combination handy, but selecting either simply returned me to the D9E menu — either the C9E can detect presence/absence of a cassette player, or these are also 'unavailable'.

A word about printers — while examining the character set via a FOR X=0 TO 255: PRINT CHR\$(X):: NEXT X type of routine, I found that printing the ASCII code for ESCAPE (27) caused a jump out of Basic back to D9E. As most printers recognise ESCAPE as a code which precedes command strings (for tab stops, line length, type size, graphics, you name it) watch out for problems when PRINT does become available.

The Basic itself seemed OK, and was fast enough to hold its own with just about any PC on the market. In the absence of a Break key, exit from endless loops was via a reset button wired to the back panel. No editing seemed possible without a 'cursor up' function, and typing EDIT, ED, E and E. caused no magic wands to wave.

So, back to D9E to find out what EDIT means. It turns out to mean 'edit memory' *ie* display a screenful of hex dump, with a cursor to move round and change things. First you enter 'Start address' and 'Final address' (apparently ignored if final address < start address + 128). Start addresses below 400 hex came up OK until I pressed RETURN, which returned



me, for some reason, always to 400 hex, which appears to be screen memory, and does not respond to being written to directly.

The assembler is single-pass, single-line, which is fine for short programs, debugging, and trying out ideas, but you have to calculate forward-references yourself, and you wind up with no source file. There appears to be no disassembly, and the 'Trace' function is misleadingly named to the point of absurdity — it consists of a single breakpoint insertion with register content display.

Documentation

The manual, which seems very much in a 'provisional' state, is terse in content if not in style. At first I thought the Basic was tiny, but having spotted the 8K ROM I discovered in quick succession first, that variable arrays may be multi-dimensional; second, that string arrays are permitted, and may be multi-dimensional; third, that variables are floating point, and fourth, that maths functions are supported.

None of these is mentioned in the manual, and it's perfectly possible that others exist. Granted the manual must be regarded as being in its development stage, but it *had* been typeset and printed. Even what there is not too clear in places. Basic

LET, for example, is implied to be obligatory rather than optional.

Verdict

I like the 6809, although processors designed to be compatible with earlier architectures, in this case the 6800, often have instruction set anomalies as a result. I liked it less on acquaintance, discovering the slowness of the index registers, and its nasty habit of setting status bits during a 'store to memory' instruction.

It's still better than most chips as a beginner's guide to machine code, as it has few of the Z80's annoying inconsistencies, and I like 64K DRAMs, because you get lots of memory and few chips.

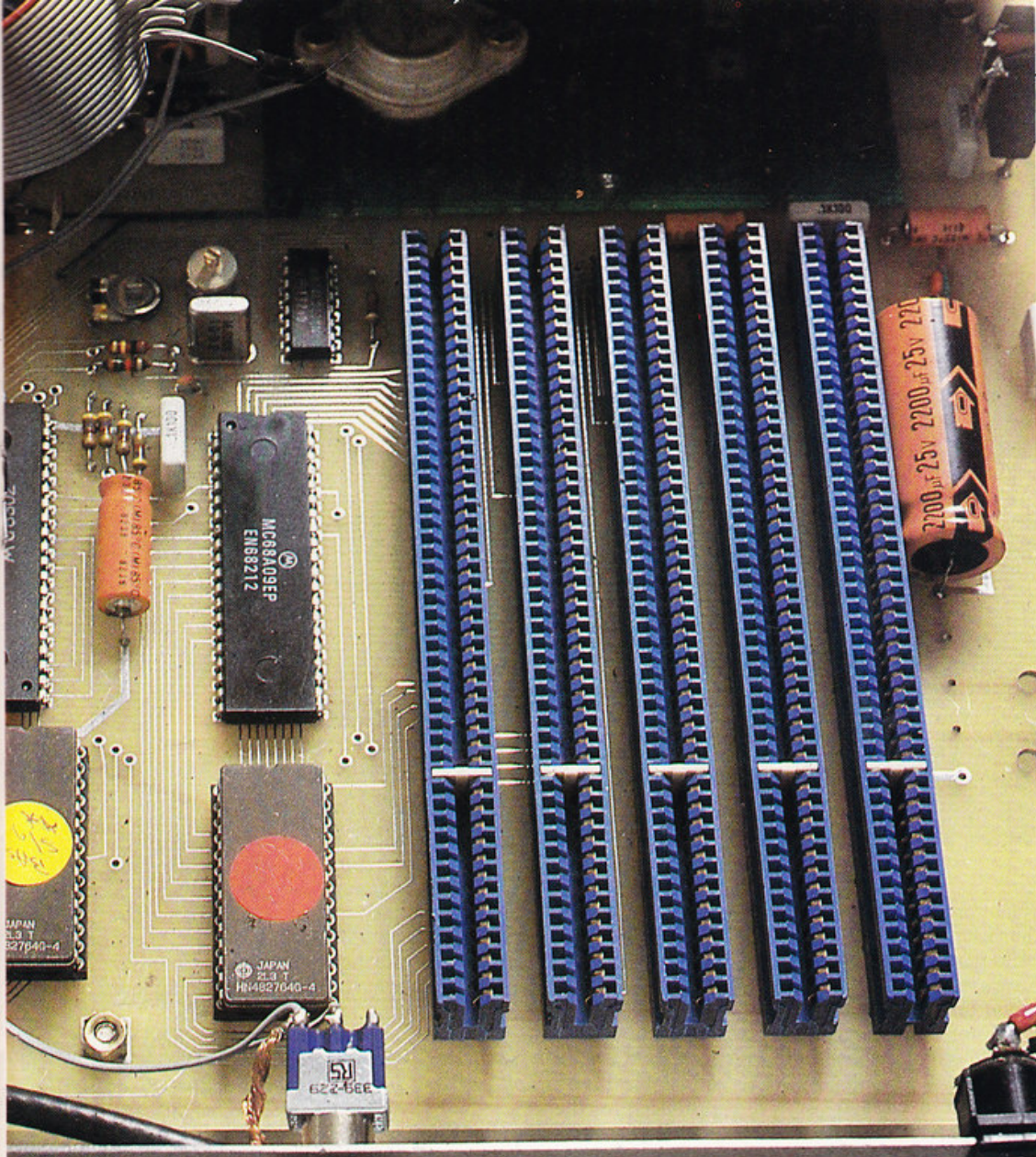
So ideally I would say, great, just what you need to start on. But too much seems to have been ill-conceived (or just forgotten), from the hardware to the video circuitry to the O/S to the documentation, preliminary or not.

If Adaptors Engineering has a lot of pre-release improvements up its sleeve, then I wish the company luck and I'll be quite ready to revise my opinion, but my feeling is that most of this should have been settled at a much earlier stage in the machine's history.

The C9E board will be sold assembled and tested for £185 plus VAT, excluding

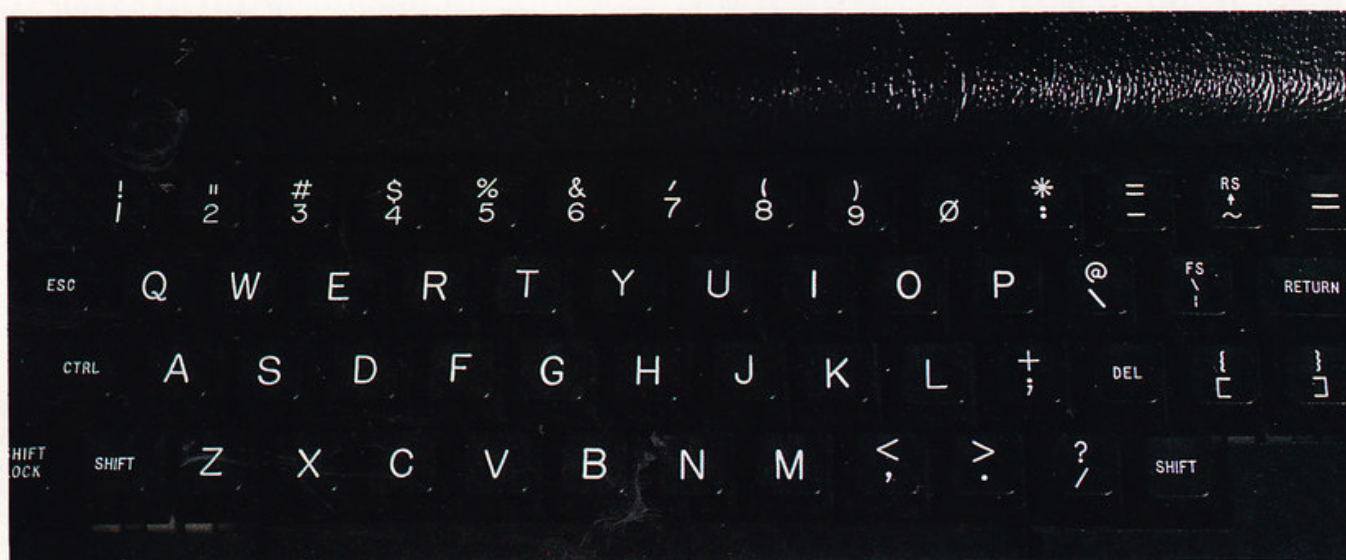
PCN PRO-TEST HARDWARE

The simplicity of the board is evident in this picture. The 6809 requires little in the way of supporting logic, and the big chips do most of the work. The five SS-50 connectors have polarising pegs inserted.



The keyboard is of standard layout and features no extra keypads, but it was supplied solely for review purposes and you can add one of your own choice.

Ian McKinnell



keyboard and power-supply. The choice will be up to the buyer, but Adaptors will have its own models. The PSU will cost £10.70 plus VAT, and the keyboard £40 plus VAT.

There are also plans to produce a range of expansion boards, including a colour encoder, a disk-controller, a 128K memory expansion board and a CP/M adaptor card.

SPECIFICATIONS

Processor	68A09 running at a nominal 1.5MHz
ROM memory	32K containing D9E operating system and Basic
RAM memory	two pages of 32K expandable to 2Mb
Screen	32 by 16 or 256 by 192 pixels
Keyboard	None. User must supply
Interfaces	Five SS-50 expansion slots, tape interface, video output
Storage	Tape
Software supplied	None
O/S language	D9E and Basic
Distributor	Mail order from: Adaptors (Engineering), London E7.

TRAVEL SPECIAL

COMMODORE 64

Tracks of my tyres

Name Motor Mania **System** Commodore 64 **Price** £8.95
Publisher Audiogenic, PO Box 88, Reading, Berks **Format** Cassette
Language Basic **Other versions** None
Outlets Mail order, dealers

The Commodore 64 is very strong on sound, high resolution graphics, and colour, and deserves to have programs written which exploit these qualities.

Arcade games are a natural choice and car driving games, in particular, are sufficiently testing to be a challenge while not being as frustrating as aircraft simulations, for example.

Objectives

Choosing one of nine levels of difficulty, you pilot your car around a track which includes motorway sections, ordinary roads and dirt track tests.

You will meet a number of hazards on the way, including slick patches and avalanches of boulders. In addition you have to pass other road users, and the local ambulance crosses your path.

In play

Throughout the game there are realistic engine noises as you drive, and a constantly changing speedometer is just one of the dashboard instruments.

You also have to keep an eye on a gauge which tells you if you are driving too slowly to keep your battery charged, and a fuel gauge that warns you to call in at a garage.

Other hazards include logs in the road — hitting one will cause your engine to overheat, signified by a flashing light, followed by an oil warning light. If you fail to get to a garage in time, your engine stops dead.

Potholes will make your steering go haywire.

Each map section completed earns an extra thousand miles, and for clocking up 5000 miles you get an extra car to add to the five you start off with.

If you still have four cars in the garage at this time, you score a massive 10,000 miles.

Verdict

The program is sufficiently absorbing for blasé users (me) who generally take no interest in games to have a thoroughly good time.

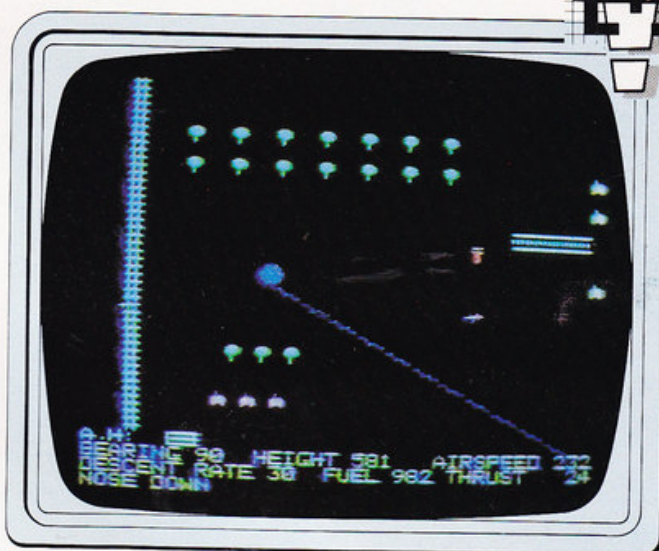
Motor Mania is a first-class arcade game of absorbing interest, and requiring considerable skill to succeed.

It is a pity that it comes on cassette — although a cartridge would undoubtedly be more expensive — because this is a game likely to be in great demand in the home, and waiting for the cassette to load will prove frustrating.

Barry Miles

RATING

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



ORIC 1

Flying tonight

Name Oric Flight **System** 48K Oric
Price £7.95 **Publisher** Tansoft 0353-2271 Products International
Format Cassette **Language** Basic/
machine code **Outlets** Mail order or Oric dealers

Flight simulators seem to be in fashion these days so it was inevitable that one would be produced for the Oric.

A flight simulator puts you in control of some aircraft or another — generally a Boeing 747 — which you have to fly around and land safely, overcoming everyday hazards of air travel such as mountains, crosswinds, lack of fuel.

Objectives

You have to control speed, climb, descent and direction of the plane and put it down safely on a very short runway to win the game. Should you fail, points are deducted from a fixed score.

Throughout the game a bird's eye view of the plane and surrounding terrain is displayed. There are also several digital readouts to show direction, speed, and the like.

As you try to land, the colour of the runway changes to indicate where you are.

In play

Setting up the game proved to be a little difficult — surprising, because the instructions were clear enough. One side of the cassette was labelled "F" and the other "S". I took this to mean fast and slow

recordings but after much vain trying, I discovered the labels had been switched.

The game takes about 30 seconds to load, displaying messages like 'Fasten your seatbelts' and 'Extinguish all cigarettes' before take-off.

Then you get a view of the scenery with the runway on the far right of the screen. You have to steer your aircraft on to the runway through crosswinds, over the mountains, and past other hazards.

Once the plane is lined up with the runway, a 3D view of it is displayed (although it suddenly becomes night) and you have to land. I never achieved this.

If you crash you get a 3D action replay showing the plane hitting the ground and a parachute floating gently to earth, accompanied by a few bars from *Colonel Bogey*.

A post mortem is then conducted telling you what went wrong, your score and an invitation to play again.

Throughout there are sarcastic messages to keep you on your toes.

Verdict

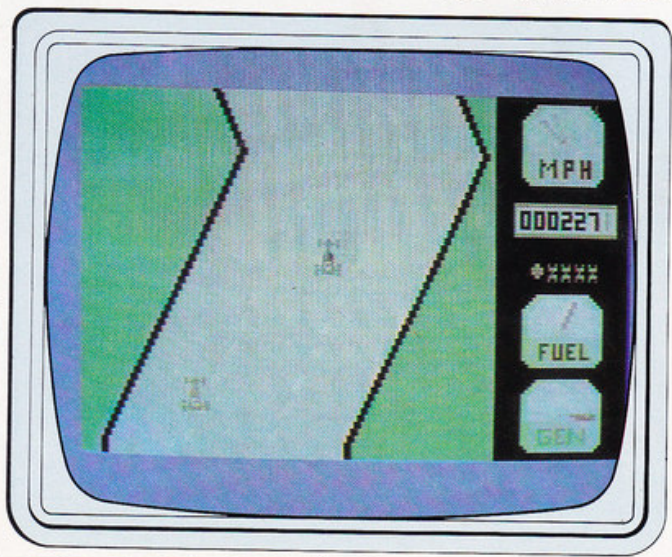
As flight simulators go Oric Flight is refreshingly different with plenty of comment and things going on. Excellent use is made of the Oric's graphics and sound and on the whole, the game is great — which is to say, addictive.

My only grumble is that at the easiest level, it is still well nigh impossible to get the plane down in one piece.

David Janda

RATING

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



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MICRO MUSIC

BBC MICRO

Called to the bars

Name BBC Music Synthesiser
Application Music synthesiser
System 32K BBC micro **Price** £9.50
Publisher Bug-Byte Software
051-227 2642 **Format** Cassette
Outlets Boots, Smiths, mail order.

Have you ever toyed with the idea that inside you lies a dormant Mozart, Gershwin or McCartney?

Well, now here's your chance to see if they do.

First impressions

The program comes in a standard cassette casing with a colourful cover. Inside the cover are lengthy instructions on how to LOAD and RUN the program. It takes a little while to get to grips with it, and you need to read the instructions carefully in conjunction with the sound section in the BBC user manual.

Objectives

The aim of the program is to use the menu driven system to shape the various envelopes to produce the type of sounds you want.

The composition created can then be played back all at once, or as sections, with the facility to play back previous renditions. And if you like, you can save your masterpiece on disk or cassette.

In play

With my fingers itching to

create some wonderful sounds, I typed yes in response to the question displayed in the middle of the screen asking if 600 notes was sufficient.

Four options appeared at the top of the screen in a lilac hue — D(isplay), E(dit), P(lay), L(oad) and S(ave).

To program the envelopes I selected the E(dit) function by typing E(RTN). Immediately the screen was filled with another menu — E(nvelope), C(hannel), A(ll) and S(ection).

The sound parameters are changed by typing in the number of parameters you want to alter, eg 1 followed by RTN alters pitch.

Eventually, I programmed and named five envelopes, namely — guitar, bass, piano, drum and flute.

I entered some notes in the sound channel and from the main menu opted for my piece to be played. Then, fingers crossed, I pressed RTN and out spilled a cheerful performance of 'I am Sailing'.

Verdict

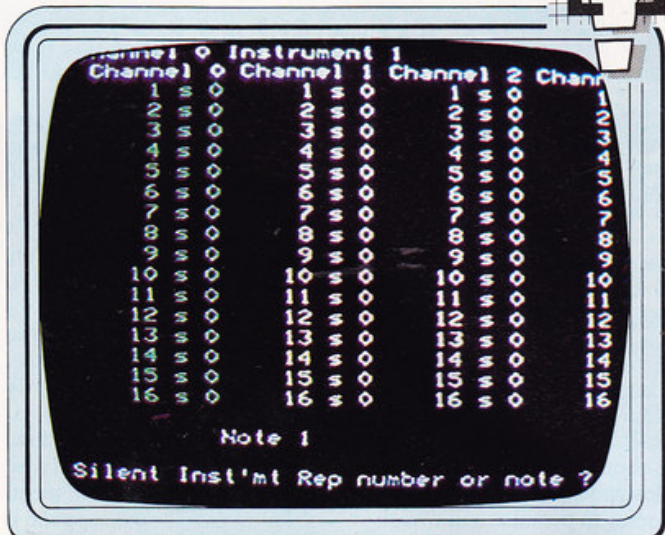
BBC Music Synthesiser takes a little while to get used to. There are a lot of options provided to create versatile sound effects, but the emphasis is on experimentation to get the required sound.

Good use is made of the excellent sound capabilities of the BBC, and overall it's a good program which should provide endless hours of entertainment.

Trevor Jones

RATING

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



SPECTRUM

A sound purchase

Name Music Maker **Application** Music composition program
System 48K Spectrum **Price** £5.75
Publisher Bellflower Software 01-903 1816 **Format** Cassette **Outlets** mail order

Many recent software releases have tried to make the most of home computers as music making machines. So, being somewhat musically inclined, I was interested to find out what Music Maker had to offer.

Objectives

The aim of the exercise is to choose a musical key — and by using the notes within that key, create your own melody, which can be played back at various tempos.

First impressions

The program came in cassette form, with a fairly bland cover. Instructions on LOADING and how to use the program were on the reverse side.

The program proved easy to use, and I became familiar with it fairly quickly.

In play

After LOADING the tape the central area of the screen displays the range of musical keys available from C to D flat. Next to each key is the number of sharp and flats.

I chose Eb by using the K key, which moved sequentially through the list of keys.

Next on the musical agenda was a selection of time signa-

ture. The number of beats per bar — 2, 3, 4 or 6 — is selected by using the B key. The value of the note — 2, 4, and 8 — is selected with the V key.

The next step is simplicity itself. After pressing the obligatory K key to continue, you selected the tempo, which varies from 38 to 188 beats per bar, by using the keys 0-9.

Then things really began to take shape. After I hit the K key, the screen greeted me with a colourful display of all the notes in Eb.

Rest can be entered simply by pressing R instead of selecting a note.

A maximum of 200 notes can be stored and there's a counter to display the number of notes used. And when a bar is filled a new bar line is drawn automatically.

There's also a nice facility provided to either shorten or lengthen a note's duration by using the right and left arrow keys.

Selected notes are played back as they appear on the screen. The screen then displays a menu option to replay the melody, change its speed, add more notes to the melody, SAVE it on tape or create a new practice.

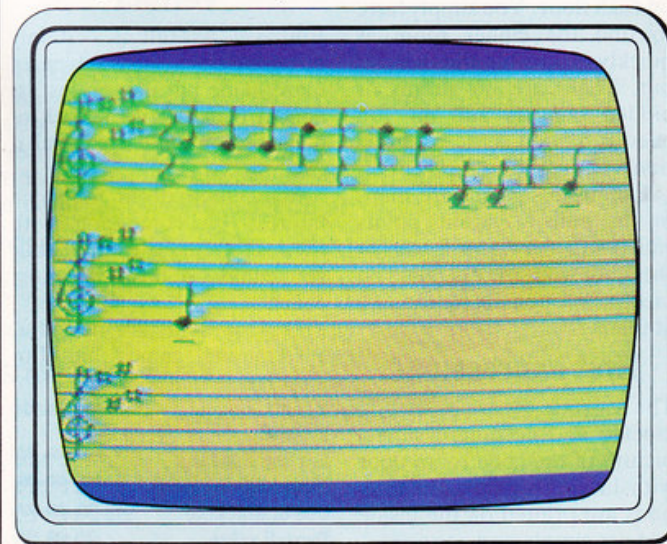
Verdict

I found Music Maker both entertaining and instructive. There is no provision to produce chords, because the Spectrum doesn't have a three-channel sound chip. But overall, it's a good program that is well worth a listen.

Trevor Jones

RATING

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





SPECTRUM MAZES

SPECTRUM
Raging
robotics

Name Embassy Assault **System** ZX Spectrum **Price** £4.95 **Publisher** ICL Software **Format** Cassette **Language** Machine code/Basic **Other versions** None **Outlets** WH Smith

Tobor comes in slick, well-designed packaging which seems to promise a new high in Spectrum thrills, arcade action par excellence. As for what you get when you load it up... well, that's another story.

Objectives

On a mission to discover new life (sounds a bit familiar?) you develop trouble with your propulsion and navigation systems. You land on the planet Kalanium to look for grittian stones to repair your ship.

But (surprise!) the planet just happens to be ruled by a race of vicious robots whose only aim in life is to destroy invaders.

But watch out: the robots will disintegrate — well, that's what the instructions say — if they collide, but green robots are indestructible.

In play

Oh, what a lovely bore. After a very promising title screen with some tasty-looking graphics built up during loading, the game opens with a very basic maze indeed. Then a door at the top left corner of the screen opens to admit the little man you control. He strolls — very, very slowly — to the bottom

right corner of the screen, where he simply stands and waits for a pack of five robots to move into position.

The whole process takes a good twenty seconds, during which all you can do is sit and watch.

When at last you are set free of your time warp, you can start to move, once again pretty slowly, and shoot at the robots.

The robots can also bowl balls at you — again, these don't exactly move at the speed of light, and they disappear if they hit the edge of the screen. But you can come a cropper if you take a potshot at a robot which has just turned green.

If you manage to get yourself killed, you'll get a jolly little tombstone, and the tune you can probably guess. If, on the other hand, you zap all the robots, you get a snatch of Land of Hope and Glory, and a new maze. This time, the robots and you move just a shade faster.

Verdict

Give me Pacman any day of the week. This game is just too predictable for my tastes — the robots don't even take up random positions in the maze, but trundle to the same spot every time.

Wiping them out is so easy, at the lower levels it's guaranteed to give you a guilt complex. You'll never be able to open a can of beans with an easy conscience again...

Shirley Fawcett

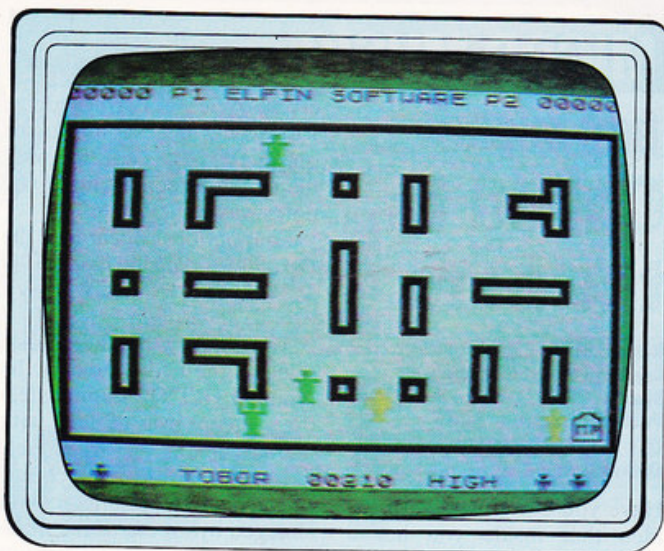
RATING

Lasting appeal

Playability

Use of machine

Value for money



SPECTRUM

Corridors
of power

Name Tobor **System** 48K Spectrum **Price** £7.95 **Publisher** Elfin Software, 0493-53170 **Format** Cassette **Language** Machine code **Outlets** Mail order.

You are a top secret agent who must enter a foreign embassy, find the code room, steal the classified ciphers and escape. If that sounds boringly familiar the difference in Embassy Assault is that you get a 3D view of the building as you travel along its corridors.

Nine levels of difficulty are offered although the game is not very complex. I played it on a 48K Spectrum but it will run on 16K.

Objectives

There is a four-storey embassy to explore with several rooms on each floor. You simply have to find the cipher room as quickly as possible and then get out. There are no guards or hidden dangers and all you need is a good sense of direction.

Failing this, there are maps on the walls at various points which will show you a plan of the floor you are on, but you incur a time penalty for looking at them.

First impressions

The cassette sleeve is clearly labeled and decorated with a picture of the code room door with lurking shadow. Instructions are printed on the inside and are simple and concise.

The game loaded without trouble and offers the use of joysticks or keyboard.

In play

The game kicks off by asking you to wait while it generates the embassy and for the absent-minded it displays a compass, the floor number, and the time elapsed.

The display is quite dazzling with green/blue walls, yellow floor and light blue ceiling and clearly a lot of thought has gone into this.

You use the four cursor keys to move left, right, forward and half turn, each step taking you about five metres in the desired direction.

But the response to your fevered button-pushing is very sluggish with the program taking about five to seven seconds to redraw the display after every move.

Once you have found these precious ciphers you simply waltz in and take them — no guards, no booby traps. Nothing.

Verdict

Embassy Assault is certainly different to the usual type of maze game but it soon lost its appeal because of the lack of danger. You could hardly call it exciting.

You could drum up some interest by competing with friends for the fastest time, but you could do this with most games.

This may be ICL's idea of an entertaining game, but I'm afraid it isn't mine.

David Janda

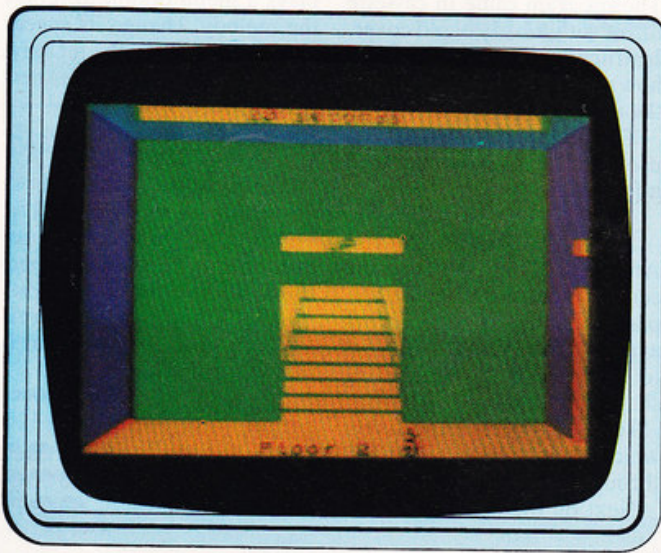
RATING

Lasting appeal

Playability

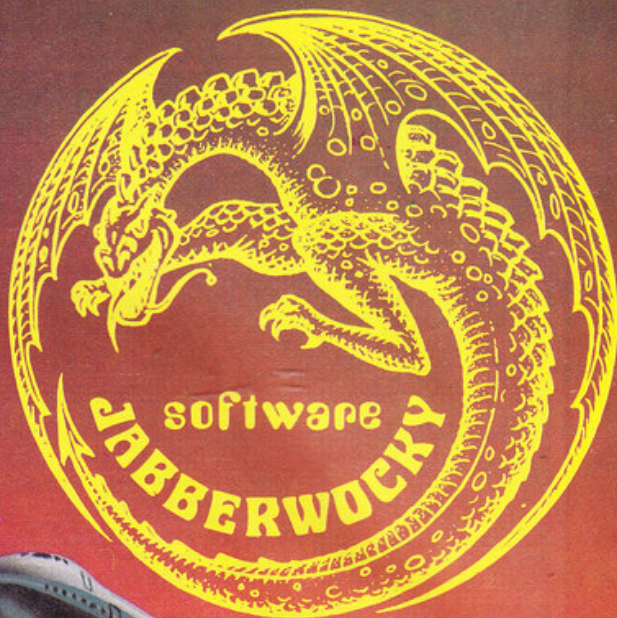
Use of Machine

Overall value



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The Working Dragon 32

David Lawrence



A library of practical subroutines and programs

'The Working Dragon' by David Lawrence, published by Sunshine Books (01-839 6835) at £5.95 (paperback, 158 pages).

The Dragon 32 has been privileged with a deluge of books claiming to advance the programming prowess of its user.

This lucrative market has probably been saturated to such an extent that more fertile fields of endeavour for the Dragon user must be found and exploited.

The Working Dragon has been written to put the Dragon to work on 'serious tasks' like 'managing your money'.

The author claims the book is designed to be used, not read. It illustrates a modular approach to programming — progressing through a series of subroutines which can be fabricated into 'serious' application programs.

Contents include subroutines for running databases, keeping financial records and displaying accounts.

It's a good one, but you'd be well advised to learn Basic programming first. **IS**

DYNAMIC GAMES FOR YOUR DRAGON 32

Robert Young
Roger Bush
Robert Shrimpton

Edited:
Tim Hartnell

'Dynamic Games for your Dragon 32' by Robert Young, Roger Bush and Robert Shrimpton, edited by Tim Hartnell, published by

Interface (01-794 4495) at £4.95 (paperback, 180 pages)

Yet another paperback for Dragon users packed with games.

With six chapters and 29 games, it's inevitable the usual arcade, space and adventure games will crop up. But brain twisters and board games are thrown in as well.

Tim Hartnell, the editor, claims the authors spent much time making this an instructive book — illustrated by the variety of programs. However, I couldn't help feeling nervous when I read 'the publishers cannot be held responsible for running mistakes that may occur'.

All programs have a general introduction preceding the listings, but not all the listings have a short explanation to indicate what happens between certain lines.

And when explanations do appear they tend to be thin. Few of them have screen shots of the game, although some have a drawing of a television with a sketch in it.

If you're looking for a cheap way to get lots of games — and you don't mind typing in long listings — then this is a book for you. Apart from that, it has little instructional value. **TJ**

Making the Most of your Atari

Paul Bunn



'Making the Most of your Atari' by Paul Bunn, published by Interface Publications (01-794 4495) at £8.95 (paperback, 178 pages).

If you've mastered Atari's Basic and want to sharpen your programming skills, then 'Making the Most of your Atari' may be the shot in the arm you need.

The book claims to contain all the techniques you need to know to get the best from your machine, and is primarily aimed at newcomers with a month or more micro experience.

The 14 chapters, covering

topics from graphics to program protection, explain certain command words and how they're used. Occasionally a small program (less than 200 lines) is used to illustrate use of the command. And there's a useful listing where the redefinition of a character is given.

The usual games crop up in chapter 13 — with a version of Frogger and Smashout (a version of Breakout). The reader is encouraged to adopt the programs and incorporate the ideas in them into his own program, which is commendable since this facilitates learning by doing rather than by reading alone.

There's a lot of information in this book and it should be useful for aspiring games programmers. **TJ**

CHOOSING A MICROCOMPUTER



FRANCIS SAMISH

'Choosing a Microcomputer' by Francis Samish, published by Granada (0727 72727) at £4.95 (paperback, 140 pages).

Shopping around for a micro can be a big headache. That's where a book like 'Choosing a Microcomputer' is supposed to help.

Francis Samish gives the home and business user ground work to go on before he reaches for his cheque book.

To the prospective home computer buyer he says 'try before you buy' and 'don't buy any micro through mail order unless you have been able to inspect the machine beforehand'. Tips for hunters of business machines include 'analyse how your business works before starting to look for a micro', and 'get qualified advice to help you make a choice'.

In all, 13 chapters skim over a wide span of subjects giving a general feel of the micro market, dealing with hardware, software, technology, programming and so on. And to

round it all up there's a glossary of computer jargon.

Although supposed to be aimed at both home and business, this book tends to bend towards business.

For instance, in chapter 13, the home user loses out when a list of business packages is given.

Another problem with books like this is that the information in them can get out-of-date quickly.

However, as a general book to get rough guidelines, this isn't bad for the money. **SG**

BASIC Programming on the BBC Microcomputer



'Basic Programming on the BBC Microcomputer' by Neil and Pat Cryer, published by Prentice Hall International (0442-58531) at £5.95 (paperback, 195 pages).

Three cheers. These authors have spotted that using variables like X, Y and Z only complicates the issue when you could easily replace 'oil filter' for X, 'oil' for Y, 'labour' for Z and so on.

This book stops Basic looking like a mathematical mess and puts in good, plain English instead. It takes you from scratch, and must surely be the toddlers' guide to learning Basic.

Chapter 9, Animation for Games, had me glued to the spot, learning how to create animated snakes and bouncing balls, and made me wish I'd had these facilities when I was a kid.

This very readable book goes on to explain mathematical functions and string handling, file handling, programmable characters and sound.

The cherry on the top (or should I say the cheesecake on the screen) is the mine of information contained in the glossary and index. This book is well worth the £5.95 investment. **WP**

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PCN ProgramCards

Another delve into our readers' programs for you to cut out and keep. The observant among you will notice the absence of the subroutine section this week. This is not an oversight, but a result of the wealth of readers' programs that are now queuing up to be published.

We feel that you would rather get going on the programs so we will print the subroutine section on an occasional basis in future.

Most of the programs and subroutines included each week are capable of being modified for use on a variety of machines so it would be nice to hear from any of you who have done this for computers other than the one for which they were written. The address is given in column three.

This week

The universal appeal of a little lost alien continues, and now you can lend a helping hand on your expanded ZX81. In a close encounter with British Telecom, it's 'ZX phone home.'

This program and its structure is explained in depth in last week's and this week's issues by Adrian Boot, of London, who is a photographer and has taught various computer-related subjects professionally.

A W Smart, of Newport-on-Tay, is obviously one of those canny Scots as he has provided a program for the Dragon 32 to play Connect Four. This game featured heavily in pre-Christmas advertising campaigns on TV and normally uses a plastic playing frame and counters, but transposition to the Dragon provides an equally good result.

CMB owners can at last breathe a sigh of relief as the Database program from Ray and Alison Schofield, of Cheltenham, is completed this week with the last three of the ProgramCards in this well-received series.

We heard through the grapevine that Ray, in fact, did not write much of this program as he is more attuned to writing music programs. We plan to print one of his

efforts in future so that you can evaluate his technique.

Make thousands happy

Keep'em coming! The programs editor will not be happy until his desk is absolutely covered in your programs. So make thousands happy — send in *your* program. But don't forget to include a plain paper listing with your cassette/disk and a few brief notes to help decode it.

If your program is printed we'll reciprocate with a cheque at our standard rates.

Contributions should be sent to: Programs Editor, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

NEXT WEEK PCN's uniquely annotated program listings include a memory utility for the BBC featuring memory tabulation, memory modify, hex to decimal and decimal to hex conversion, written in a well-structured manner, plus a Pacman-type game for the **Spectrum** called Munchman.

PCN ProgramCards

Homeward Bound Card 1 of 3

8311HB1/3

This clever little E.T.-type game is made of modules introduced in PCN. See pages 20-21, issue 10, and pages 22-23 this issue.

10 RAND

```
20 LET C = 1
25 LET E# = "0"
30 LET S = 2
40 LET W = 40
50 LET Z = 20
```

```
60 PRINT "HELP Z.X. PHONE HOME"
65 PRINT
70 PRINT "ENTER SKILL 1 = VERY HARD"
75 PRINT "                2 = HARD"
80 PRINT "                3 = EASY"
85 INPUT K
90 CLS
```

```
100 FOR I = 10 TO 60
110 LET R = INT ( RND * 8 )
120 FOR J = 0 TO R
130 PLOT I, J
140 NEXT J
150 NEXT I
```

200 GOSUB 1000

```
210 FOR I = 1 TO 7
220 FOR J = 13 TO 3 STEP -1
230 PLOT I, J
240 NEXT J
250 NEXT I
```

```
260 UNPLOT 4, 13
270 UNPLOT 2, 12
280 UNPLOT 6, 12
290 UNPLOT 1, 10
300 UNPLOT 7, 10
```

ZX81 16K ZX81 BASIC

Author: Adrian Boot

10 Seeds random number
20 Time limit variable
25 Stops aerial tracking
30 Spaceship line position
40-50 Aerial pixel co-ordinates

70-85 Set skill level

100-150 Skyline module

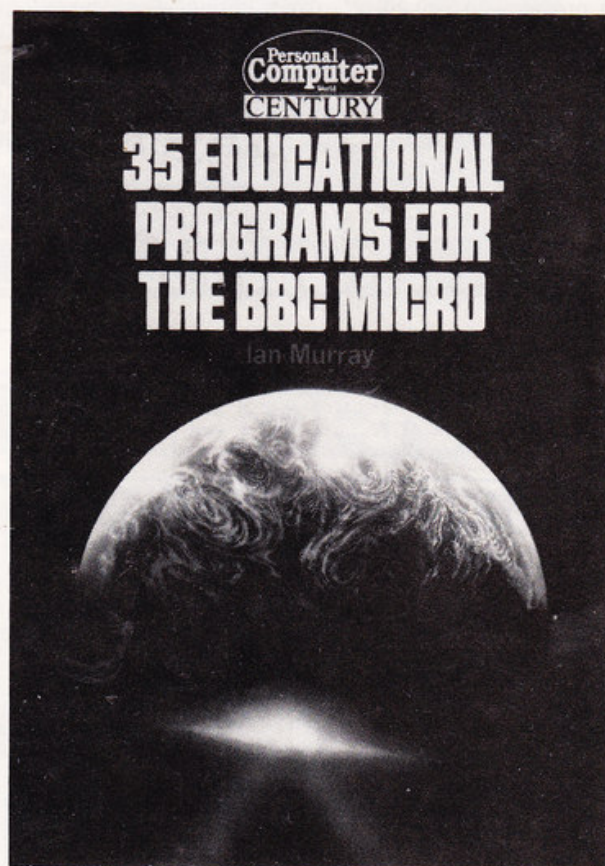
200 Select home position

210-250 Draw Z.X. block

260-300 Draw Z.X.'s head



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CENTURY

PCNProgramCards

Homeward Bound Card 2 of 3

8311HB2/3

```
310 FOR I = 1 TO 7
320 UNPLOT I,3
330 UNPLOT I,8
340 NEXT I
```

```
350 PLOT 4,9
360 PLOT 4,8
370 PLOT 5,2
380 PLOT 5,2
390 PLOT 2,1
400 PLOT 3,1
410 PLOT 5,1
420 PLOT 6,1
```

```
500 LET I = INT ( RND * 15 )
510 LET J = INT ( RND * 30 )
520 IF J < 6 THEN GOTO 510
530 LET R = INT ( RND * 3 )
540 IF R < 2 THEN PRINT AT I,J,"."
```

```
560 IF INKEY$ = "" THEN LET E$ = INKEY$
565 IF E$ = "0" THEN GOTO 610
570 IF E$ = "5" THEN LET W = W - 1
575 IF E$ = "8" THEN LET W = W + 1
580 IF E$ = "6" THEN LET Z = Z - 1
585 IF E$ = "7" THEN LET Z = Z + 1
```

```
590 IF Z < 40 THEN LET Z = 15
592 IF Z < 15 THEN LET Z = 40
594 IF W < 60 THEN LET W = 15
596 IF W < 15 THEN LET W = 60
```

```
610 PLOT W,Z
```

```
614 PRINT AT 0,20: 200 - C : " "
```

```
640 IF P = W THEN GOSUB 700
650 IF P < W THEN GOSUB 800
```

```
655 IF P < W THEN PRINT AT 2,0:"WEST"
```

```
657 IF P > W THEN PRINT AT 2,0:"EAST"
```

```
660 IF P = W AND D = Z THEN GOSUB 900
670 IF P = W AND D = Z THEN STOP
```

```
673 UNPLOT W,Z
```

```
675 PLOT 5,6
```

```
680 LET C = C + 1
```

```
685 LET D = D + 1
```

```
687 IF D = K + 10 THEN GOSUB 1000
```

```
690 IF C > 200 THEN GOTO 1500
```

310-340 Draw Z.X.'s body

350-420 Draw Z.X.'s feet

500-540 Draw a star

560-585 Change aerial tracking direction

590-596 Aerial off screen?

610 Plot aerial

614 Print time left

640 Display spaceship

650 Erase spaceship

655 Relative position

657 Home to aerial

660-670 Win game

673 Flash aerial

675 Z.X.'s heartbeat

680 Game time counter

685 Skill counter

687 Move home position

690 Lose game

PCNProgramCards

Homeward Bound Card 3 of 3

8311HB3/3

```
693 UNPLOT 5,6
695 GOTO 500
```

```
700 PRINT AT S-1,0: " "
710 PRINT AT S,0: " "
720 PRINT AT S+1,0: " "
730 PRINT AT S+2,0: " "
740 RETURN
```

```
800 PRINT AT S,0: " "
810 PRINT AT S+1,0: " "
820 PRINT AT S+2,0: " "
830 RETURN
```

```
900 FOR S = 1 TO 18
910 GOSUB 700
920 NEXT S
932 FOR J = 1 TO 10
933 FOR I = 1 TO 6
934 UNPLOT I,3
935 PLOT I,3
936 NEXT I
937 NEXT J
940 FOR S = 18 TO 1 STEP -1
950 PRINT AT S+3,0: " "
960 GOSUB 700
960 NEXT S
981 LET S = 1
985 GOSUB 800
990 PRINT AT 0,0: "Z.X. HOME"
995 RETURN
```

```
1000 LET D = 1
1005 LET P = INT ( RND * 60 )
1005 IF P < 15 THEN GOTO 1000
1005 LET D = INT ( RND * 40 )
1005 IF D < 15 THEN GOTO 1005
1005 RETURN
```

```
1500 GOSUB 800
1510 PRINT AT 0,0: "TOO LATE"
1520 FOR V = 1 TO 200
1530 LET I = INT ( RND * 8 )
1540 LET J = INT ( RND * 14 )
1542 IF J < 1 THEN LET J = 1
1550 UNPLOT I,J
1560 NEXT V
1570 STOP
```

700-760 Subroutine to draw spaceship
710 Graphic QAAW
720 Graphic FFFF
730 Graphic 3RE4
800-830 Subroutine to erase spaceship


900-930 Subroutine to move spaceship down
932-937 Space landing display

940-985 Spaceship moves up

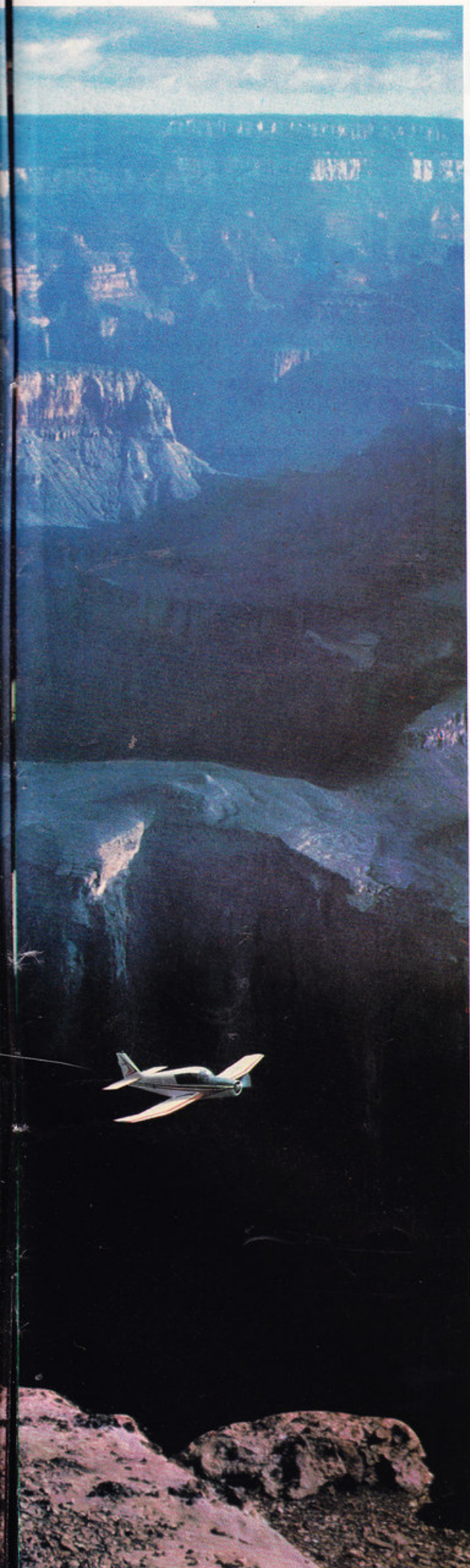
990-995 Win display

1000-1095 Subroutine selects random home position

1500-1570 Lose game subroutine, remove Z.X.

A vintage personal computer setup, including a CRT monitor and a keyboard, is placed on a rocky ledge. The background is a vast, deep canyon with layered rock formations, likely the Grand Canyon, under a blue sky with some clouds. The scene is dramatically lit, with the sun low on the horizon, creating long shadows and highlighting the textures of the rock and the computer hardware.

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PCNProgramCards

Connect Four

Card 1 of 3

8311CF1/3

A program to simulate the playing surface of Connect Four for use by two players. Win lines in each direction are checked by the program.

```

10 CLS6
20 DIM A(9,9)
30 FOR I=1 TO 7
40 COL(I)=6
50 NEXT I
54 M$="O3L8CEG04CC03GEC"
56 PLAY M$
60 PRINT@11,"CONNECT FOUR";
70 FOR I=0 TO 6:PRINT@69+4*I,CHR$(49+I);:NEXT I
80 FOR Y=6 TO 26 STEP 4:FOR X=8 TO 56 STEP 8
90 FOR I=0 TO 4
100 SET(X+I,Y,6)
110 RESET(X+I,Y+1)
120 NEXT I,X,Y
130 C1=0
140 C1=C1+1
150 IF C1<43 THEN 170
160 PRINT@420,"GAME DRAWN-PLAY AGAIN?";:GOTO 520
170 IF C1/2>INT(C1/2) THEN C=0 ELSE C=2
180 IF C=0 THEN NAME$="PLAYER1" ELSE NAME$="PLAYER2"
190 PRINT@36,NAME$;
200 A$=CHR$(172+8*C)
210 PRINT@44,A$;
220 A$=INKEY$;IF A$=" " THEN 220
225 FOR I=1 TO 7
230 IF PEEK(338+I)=254 THEN N=I
235 NEXT I

```

Dragon 32 Dragon Basic

Author: A W Smart

10	Clear screen to cyan
20	Array A(*,*) is used for win line checking
30-50	Initialise array COL(*) to value of 6. This is column status indicator.
54	Define music string
56	Play the music
60	Title
70	Display column numbers 1 - 7
80-120	Loop to display 6 blocks in each column
130	Initialise counter for total number of moves made
140	Increment counter
150	Check that game is not drawn
160	Drawn game
170	Set player indicator
180-190	Routine to display which player's turn
200-210	Routine to display appropriate coloured stone (red/blue)
220	Wait for key depression (not space)
225-235	Check column not full

PCNProgramCards

Connect Four

Card 2 of 3

8311CF2/3

```

240 PRINT@46,"WHICH COLUMN?";N;
250 IF N<1 OR N>7 THEN 180
254 FOR D=5 TO 60:NEXT D
256 PRINT@46,STRING$(16,32);
260 FOR I=1 TO 8
270 IF COL(N)<0 THEN 180
280 IF N=I THEN LN=COL(I):COL(I)=COL(I)-1:A(LN,N)=1-C
285 IF LN<0 THEN LN=0
290 NEXT I
300 S=4*(1-C)
310 REM PLACE COUNTER IN CHOSEN COLUMN
320 FOR J=1 TO LN
330 FOR I=0 TO 4
340 SET(8*N+I,2+4*J,3+C/2)
350 M$="GAB03C"
360 PLAY"TI00"+M$
370 SET(8*N+I,2+4*J,6)
380 NEXT I,J
390 FOR I=0 TO 4
400 SET(8*N+I,2+4*LN,3+C/2)
410 NEXT I
420 FOR I=0 TO 2
430 FOR J=1 TO 4
440 Z=I+J
450 IF A(Z,N)+A(Z+1,N)+A(Z+2,N)+A(Z+3,N)=S THEN P=1:GOTO 510
460 IF A(LN,Z)+A(LN,Z+1)+A(LN,Z+2)+A(LN,Z+3)=S THEN P=2:GOTO 510
470 IF A(6-I,J)+A(5-I,1+J)+A(4-I,2+J)+A(3-I,3+J)=S THEN P=3:GOTO 510
480 IF A(1+I,J)+A(2+I,1+J)+A(3+I,2+J)+A(4+I,3+J)=S THEN P=4:GOTO 510
490 NEXT J,I

```

240	Prompt
250	Get it right!
254	A wait loop
256	Wipe out prompt
260-290	Loop to calculate stone position
300	Set value for win line checking
320-380	Loop to place stone in column to musical accompaniment
390-410	Loop to complete full stone display
420-490	Loop to perform the win line checking

BACK ISSUES SERVICE

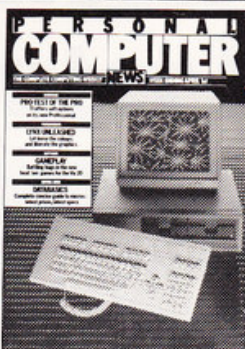
FILL THE GAPS IN YOUR PCN COLLECTION



Issue 1, March 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 Braham (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari), Castle of Riddles (BBC Model B), Pimania (Spectrum), Flight Simulator (IBM PC).
Databasics: micros and peripherals.



Issue 2, March 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.



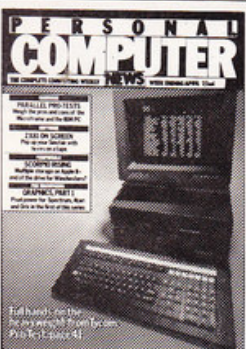
Issue 3, April 1
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).
ProgramCards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).
Databasics: micros.
Micropaedia: Anatomy of the BBC, part 3.



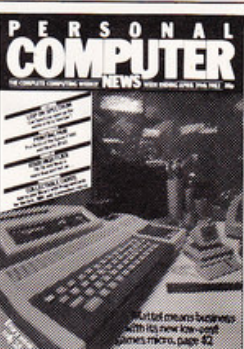
Issue 4, April 8
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunemith (Oric), Array Editor.
Databasics: peripherals.
Clubnet Micropaedia: Go Forth, part 1.



Issue 5, April 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 22
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.
Features: IBM PC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Lopper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databasics: micros.
Micropaedia: Graphics, part 1.



Issue 7, April 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.

MICROPAEDIA LIST

Anatomy of the BBC micro

Part 1: Tune into the BBC — an exploded view; Tube map; blossoming into colour; second opinion — a first timer's look; maths and science on the Beeb; programming the function keys; learning with Logo; BBC Basic; User Guide extra; alternative languages.

Part 2: Introduction to peripherals; playing games — reviews and programs; word processing on chip and cassette; history.

Part 3: Networking; interview with Acorn's Herman Hauser; faults and servicing; video recorder link-up; turtle graphics; Beeb books.

Go Forth

Part 1: Basic and Forth compared; Forth on your micro; assembler language; changing up; the Jupiter Ace.

Part 2: Jupiter Ace software; guide to Forth; Forth on Apple, IBM and ZX81; more implementations; Forth 79 v FIG-Forth; books.

Graphics

Part 1: Colour co-ordinated; Spectrum, Oric, Atari.

Part 2: Graphics on the Vic 20; the Video Interface Chip explained; Dragon displays; video easel on Atari 800.

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PCNProgramCards

Connect Four

Card 3 of 3

8311CF3/3

```

495 N=0
500 GOTO 140
510 PRINT@33,NAME$;" WINS!PLAY AGAIN?(Y/N)";
512 GOSUB 800
515 GOSUB 700
520 PRINT@ 46,"PLAY AGAIN?(Y/N)";
525 INPUT X$
530 IF X$<>"Y" THEN 590
540 CLS
550 FOR I=1 TO 6:FOR J=1 TO 7
560 A(I,J)=0
570 NEXT J,I
580 GOTO 30
590 CLS
600 END
700 RP$="03L8BBB04C03B"
710 M$="T4XRP$;P6;XRP$;P6;P12;AAG;P12;F&F&EEP&GGGF&EP12GF&EP12GBF&F&EP6F&F"
720 PLAY M$
730 N=0
740 RETURN
800 FOR M=0 TO 3
810 ON P GOTO 820,830,840,850
820 B1=2+4*(Z+M):A=16*B1+4*N:GOTO 860
830 B1=2+4*LN:A1=4*(Z+M):A=16*B1+A1:GOTO 860
840 B1=26-4*(I+M):A1=4*(J+M):A=16*B1+A1:GOTO 860
850 B1=4*(1.5+I+M):A1=4*(J+M):A=16*B1+A1
860 PRINT@A,CHR$(49+M);
870 NEXT M
880 RETURN

```

495 Set column indicator to zero
500 Next player's turn
510 Display the winner
512 Perform routine to indicate win line
515 Perform routine to play the winning theme music
520-530 Routine to display prompt and receive response
540-580 Set up for next game
590-600 Game over. Clear screen and halt.
700-740 Routine to play winning theme music
800-880 Routine to indicate winning line

PCNProgramCards

CBM Database Card 10 of 12

8311CD10/12

```

7200 PRINT"MAKE SURE THE PRINTER IS ON!";FOR M=1TO2000:NEXTM
7205 OPEN5,4,2:CMD5
7210 OPEN6,4,1:CMD6
7220 PRINT#5,"9999.99          999999          999999"
7300 FOR I=1TOP
7350 PRINT#5,B(I),A$(I) CHR$(29),C(I),D(I)
7380 NEXT I
7385 PRINT#5:CLOSE6
7390 PRINT#5:CLOSE5
7395 GOTO5590
7400 PRINT"MAKE SURE THE PRINTER IS ON!";FOR M=1TO2000:NEXTM
7405 OPEN3,4,2:CMD3
7410 OPEN4,4,1:CMD4
7420 PRINT#3,"999999          9999.99          999999"
7500 FOR I=1TOP
7550 PRINT#4,C(I),A$(I) CHR$(29),B(I),D(I)
7580 NEXT I
7585 PRINT#4:CLOSE4
7590 PRINT#3:CLOSE3
7595 GOTO5790
7600 PRINT"MAKE SURE THE PRINTER IS ON!";FOR M=1TO2000:NEXTM
7605 OPEN1,4,2:CMD1
7610 OPEN2,4,1:CMD2
7620 PRINT#1,"999999          9999.99          999999"
7700 FOR I=1TOP
7750 PRINT#2,D(I),A$(I) CHR$(29),B(I),C(I)
7780 NEXT I
7785 PRINT#2:CLOSE2
7790 PRINT#1:CLOSE1
7795 GOTO5990
8000 PRINT"THE 'DIMENSION SIZE' FOR DATA LINES IS SET AT 100"
8010 PRINT"DO YOU WISH TO ALTER IT ?"
8020 PRINT"BE CAREFUL THAT YOUR COMPUTER CAN COPE WITH THE VALUE YOU SELECT."
8025 PRINT"INPUT Y OR N":INPUT NN$
8030 IF NN$=""THEN GOTO8040
8040 IF NN$="N"THEN GOTO 8190
8050 IF NN$<>"Y"THEN GOTO8010
8060 PRINT "INPUT YOUR VALUE FOR 'DIMENSION SIZE':INPUT N
8170 PRINT"LINE5 500 TO 1997 CAN HOLD DATA"
8180 PRINT"1998 MUST READ 'DATA #,0,0,0'"
8190 FOR I=1TO2000: NEXT I
8199 RETURN

```

7200 Prompt and pause
7205-7210 Enable printer
7220 Heading for list in 'Sum' order
7300-7380 Loop to print list
7385-7390 Disable printer
7395 Return to main line
7400-7595 As above but in 'Date' order
7600-7795 As above but in 'Cheque' order
8000-8199 Routine to allow change of array DIMension



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HU8 0JA.**

PCNProgramCards**CBM Database Card 11 of 12**

8311CD11/12

```

8500 PRINT"MAKE SURE THE PRINTER IS SWITCHED ON"
8505 PRINT"PRESS ANY KEY TO CONTINUE":INPUT Q7$
8510 IF Q7$="" THEN GOTO 8510
8515 OPEN 1,4,2:CMD1
8520 OPEN 2,4,1:CMD2
8525 PRINT#1,"AAAAAAAAAAAA      9999.99      999999      999999"
8530 FOR I= 1 TO N
8540 READ A$,B,C,D
8550 IF A$="" THEN PRINT "END OF DATA"
8555 IF A$="" THEN PRINT#2:CLOSE2:PRINT#1:CLOSE1
8560 IF A$="" GOTO4090
8570 IF(LEFT$(A$,S1)<S$(1))OR LEFT$(A$,S2)>S$(2))THEN GO TO 8580
8575 PRINT#2,A$ CHR$(29),B,C,D
8580 NEXT I
8585 PRINT#2:CLOSE2
8590 PRINT#1:CLOSE1
8595 GO TO 4190
8600 PRINT"MAKE SURE THE PRINTER IS SWITCHED ON"
8605 PRINT"PRESS ANY KEY TO CONTINUE":INPUT Q8$
8610 IF Q8$="" THEN GOTO 8610
8615 OPEN 3,4,2:CMD3
8620 OPEN 4,4,1:CMD4
8625 PRINT#3,"9999.99      AAAAAAAAAA      999999      999999"
8630 FOR I= 1 TO N
8640 READ A$,B,C,D
8650 IF A$="" THEN PRINT "END OF DATA"
8655 IF A$="" THEN PRINT#4:CLOSE4:PRINT#3:CLOSE3
8660 IF A$="" GOTO4090
8670 IF(B<F(1) OR B>F(2))THEN GOTO 8680
8675 PRINT#4,B,A$ CHR$(29),C,D
8680 NEXT I
8685 PRINT#4:CLOSE4
8690 PRINT#3:CLOSE3
8695 GO TO 4290
8700 PRINT"MAKE SURE THE PRINTER IS SWITCHED ON"
8705 PRINT"PRESS ANY KEY TO CONTINUE":INPUT Q9$
8710 IF Q9$="" THEN GOTO 8710
8715 OPEN 5,4,2:CMD5
8720 OPEN 6,4,1:CMD6
8725 PRINT#5,"999999      AAAAAAAAAA      9999.99      999999"
8730 FOR I= 1 TO N
8740 READ A$,B,C,D
8750 IF A$="" THEN PRINT "END OF DATA"
8755 IF A$="" THEN PRINT#6:CLOSE6:PRINT#5:CLOSE5
8760 IF A$="" GOTO4090

```

8500-8595 Routine to list data on printer in 'Subject' order

8600-8695 As above but in 'Sum' order

8700-8760 As above in 'Date' order — (first part of routine)

PCNProgramCards**CBM Database Card 12 of 12**

8311CD12/12

```

8770 IF(C<T(1) OR C>T(2))THEN GOTO 8780
8775 PRINT#6,C,A$ CHR$(29),B,D
8780 NEXT I
8785 PRINT#6:CLOSE6
8790 PRINT#5:CLOSE5
8795 GO TO 4390
8800 PRINT"MAKE SURE THE PRINTER IS SWITCHED ON"
8805 PRINT"PRESS ANY KEY TO CONTINUE":INPUT Q6$
8810 IF Q6$="" THEN GOTO 8810
8815 OPEN 7,4,2:CMD7
8820 OPEN 8,4,1:CMD8
8825 PRINT#7,"999999      AAAAAAAAAA      9999.99      999999"
8830 FOR I= 1 TO N
8840 READ A$,B,C,D
8850 IF A$="" THEN PRINT "END OF DATA"
8855 IF A$="" THEN PRINT#8:CLOSE8:PRINT#7:CLOSE7
8860 IF A$="" GOTO4090
8870 IF(D<H(1) OR D>H(2))THEN GOTO 8880
8875 PRINT#8,D,A$ CHR$(29),B,C
8880 NEXT I
8885 PRINT#8:CLOSE8
8890 PRINT#7:CLOSE7
8895 GO TO 4490
8900 PRINT"MAKE SURE THE PRINTER IS SWITCHED ON"
8905 PRINT"PRESS ANY KEY TO CONTINUE":INPUT Q6$
8910 IF Q6$="" THEN GOTO 9010
8915 OPEN 9,4,2:CMD9
8920 OPEN 10,4,1:CMD10
8925 PRINT#9,"AAAAAAAAAAAA      9999.99      999999      999999"
8930 FOR I= 1 TO N
8940 READ A$,B,C,D
8950 IF A$="" THEN PRINT "END OF DATA"
8955 IF A$="" THEN PRINT#10:CLOSE10:PRINT#9:CLOSE9
8960 IF A$="" GOTO 3499
8975 PRINT#10,A$ CHR$(29),B,C,D
8980 NEXT I
8985 PRINT#10:CLOSE10
8990 PRINT#9:CLOSE9
8995 GO TO 3499
9998 PRINT " END OF LISTING"
9999 END

```

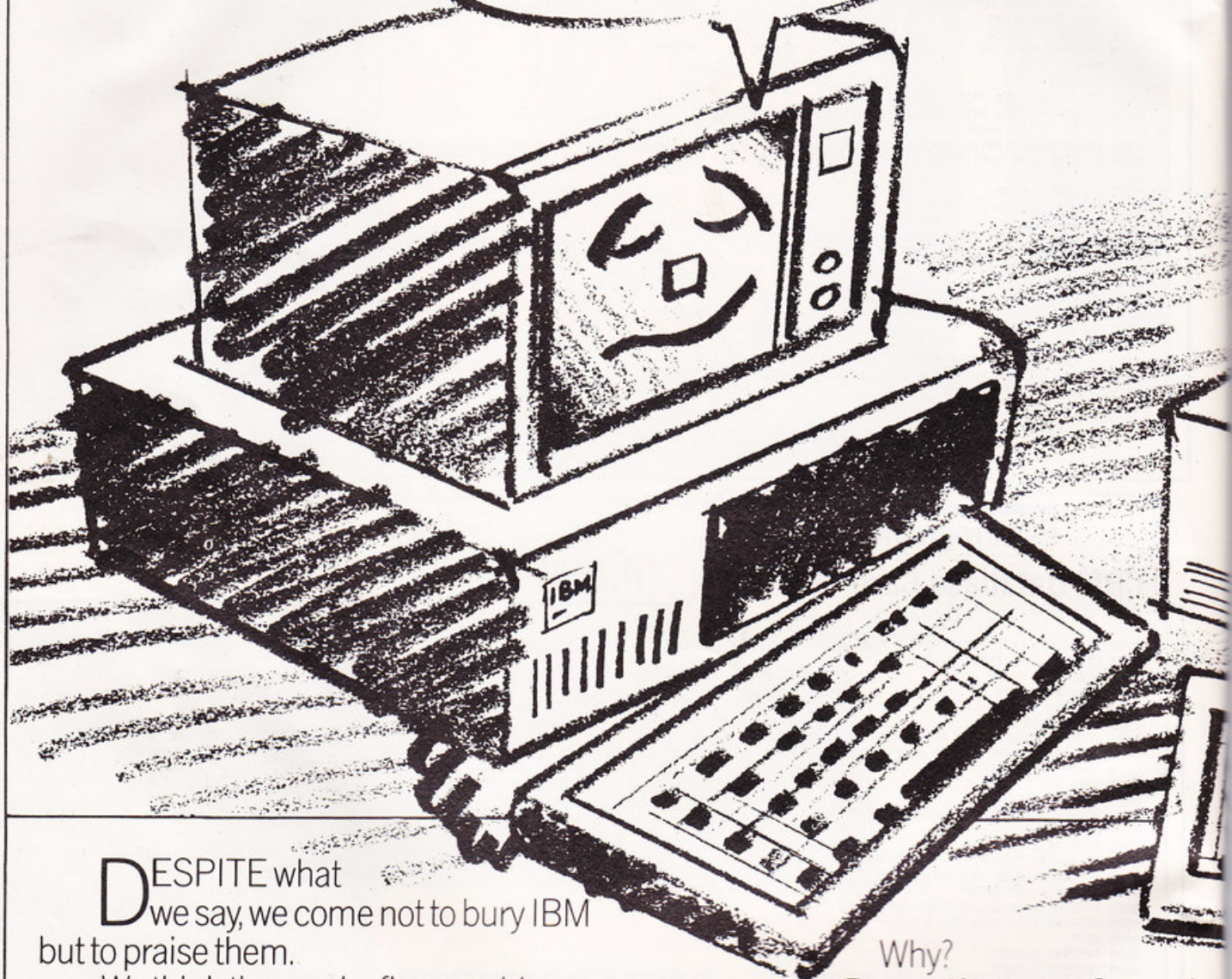
8770-8795 Final part of current routine

8800-8895 Routine to list data on printer in 'Cheque' order

9000-9095 As above but in 'Subject' order

9998-9999 The End

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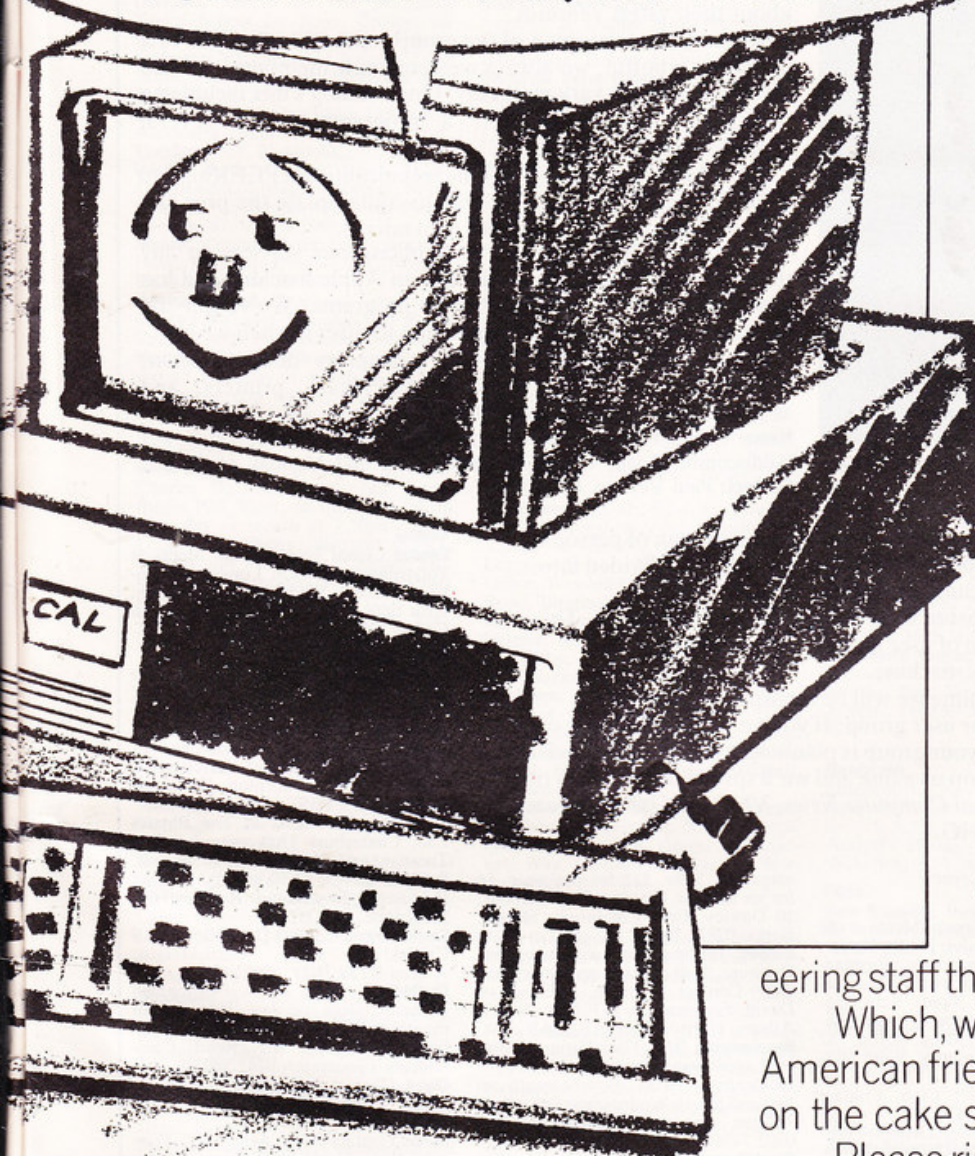
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From this issue Clubnet brings you a weekly fly-on-the-wall report of the activities of individual groups, alternating between clubs and user groups. Sandra Grandison puts the new series on the road with a report from the Apple buffs of



Croydon Apple Users warm up before the machine coding lecture at Vega Computers offices.

Croydon. Next week: Cambridge Microcomputer Club. If your club or group has something special on the agenda, contact *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HS.

Apple workshop

Only a year ago the Croydon Apple User Group started life with just 15 members, now its membership has doubled. Meetings usually take two forms — a formal lecture, or a workshop evening, where members use the equipment made available by Vega Computers, who distribute Apple.

The workshop evenings feature discussions on the latest hardware, software and add-ons. And, of course, members talk about their latest ventures.

Roger Caws, chairman of the group, said: 'Whether you're a novice or a boffin, we always welcome new members.' Indeed members' jobs do vary markedly. One evening's mix included a designer, a cost controller, a programmer and several businessmen.

After Mr Caws' lively talk on the technicalities of PEEKing and POKEing, members took a break to contemplate the pros and cons of machine coding on their own micros.

Mr Caws said: 'We want to publicise our services to any disabled person in the area who has an Apple machine and has a problem with their computer or programs. We've got the expertise among us and we would like to offer it when we can.'

Future talks planned include a graphics demonstration, organisation of Apple disks, Why Pascal?, printers, and sequential and random access files.

Name: Croydon Apple User Group. **Venue:** Sidda House, 350 Lower Addiscombe Road, Croydon. **Meetings:** Second Monday of month. **Contact:** Paul Vernon, 01-777 5478.

USER GROUPS

Acorn

Coventry Acorn Atom User Group. Subs: £4. No meetings but quarterly newsletter. Contact Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Session at 9pm Thursday at the Fox and Hound, Chatham. Contact Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (eve).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crupsall, Manchester 8 on Tuesday except school holidays, fees: £1. Contact John Ashurst, 192 Vendure Close, Fails-worth, Manchester, 061-681 4962.

Apple

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Newsletter. Contact Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Contact Steve Proffitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062 84 73074.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Subs: £5, £10 commercial members. Contact Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

Hertfordshire British Apple Systems User Group. Meets at Old School, Branch Road, Park Street, St Albans, Hertfordshire, on first Tuesday and third Sunday each month. Tuesday and third Sunday each month. Annual subs: £12.50, joining fee: £2.50. Publishes magazine. Contact John Sharp, 09273 75093.

London Apple Music Synthesis Group. Contact Dr Davis Ellis, 22 Lennox Gardens, London SW1.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Contact Brian Pain, Sir Frank Markham School, Woughton Centre, Chaf-

Clubnet keeps you in touch with the microcosm of personal computer enthusiasts throughout the UK. It is divided into two sections — clubs and user groups.

We publish a list of each section on alternate weeks. This week it's the turn of user groups, which are listed alphabetically by machine.

From time to time we will be focusing a feature on an individual club or user group. If you've just started your own user group or if your group is planning something of special interest, then drop us a line and we'll spread the word. Write to Clubnet, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

fron Way, Milton Keynes.

Atari

Birmingham Usara Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Subs: £5. Meetings: 25p members, 50p non-members. Contact Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carshalton Atari User Club. Contact Paul Deegan on 01-642 5232.

Hull Atari Users Local Group. Proposed new user group. Contact Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094.

London Silica Atari 400/800 User Club. New club, library planned, newsletter. Contact Richard Hawes on 01-301 1111.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merriem House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Subs: £5. Contact Roger Taylor, 0253 738192.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Contact Nick Kelly, 051-525 2934 (evenings).

BBC

Laserbug is an international user group for the BBC micro. Produce monthly

magazine. Subs: £12 for one year, £6 for six months. Contact Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks. 02812 30614.

Beebug. Ten magazines with programs. Discount deals, library and query service. Contact Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Contact Norman Carey on 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Subs £3. Newsletter. Contact Joseph Fox, 4 Harman Close, London NW2 2EA.

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Wide range of skills and expertise. Contact Dr Leo McLaughlin, Department of Chemistry, Westfield College, University of London, Kidder-pore Avenue, London NW3 7ST, 01-435 0109.

Preston Area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Subs: £5. Contact Duncan Coulter, Membership Secretary, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

Witham BBC Micro User Group meets at comprehensive school, Witham on second Thursday each month at 7.30pm. Contact Dave Watts after 7pm, 0245 358127.

Comal

London Comal User Group. Meets at Polytechnic of North London, Holloway, second Wednesday of month, term time. Subs: £7.50. Contact John Collins, 75 74111.

Commodore ICPUG

Barnsley. Subs: £7.50. Contact Bob Wool, 13 Word Green, Barnsley, South Yorkshire, 0226 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. Contact David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.

Canterbury SE. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. Subs: £7 adults, £3.50 juniors. Contact R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.

Carrickfergus. Contact David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.

Cheltenham. Meets at The Cheltenham Ladies College on last Thursday of month at 7.30. Contact Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.

Clwyd. Contact John Poole, 6 Ridgway Close, Connah's Quay, Clwyd CH5 4LZ.

Corby. Contact Peter Ashby, 215 Win-cohn Way, Corby, Northamptonshire, 05363 4442.

Coventry. Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Subs: £2.50. Contact Will Light, 22 Ivybridge Road, Styvechal, Coventry, Warwickshire.

Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Contact Robert Watts, 03322 72569.

Durham. North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays of month. Contact Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham.

Essex. No meetings, software library. Contact Simon Kniveton, 097 086 303.

Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault. Contact Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.

Glasgow. Contact Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton

Mearns, Glasgow, 041-639 5696.

Gloucester and Bristol Area. Meets at 23 Sheppard Leaze, Wotton-under-Edge, Gloucester, on last Friday of month.

Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Contact Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.

Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. Contact B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.

Kilmarnock. Meets at Symington Primary School on first and third Thursdays of month at 7pm. Software library. Contact John Smith, 19 Brewlands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.

Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Software exchange. Contact Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.

London. Contact Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.

London North. Contact Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.

Norfolk. Contact Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.

Northumberland. Proposed new club. Contact Graham Saunders, 22 Front Street, Guide Post, Northumberland.

Slough. Meets at Slough College on second Thursday of month at 7.30pm, visitors — 65p adults, 40p students. Contact Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.

South-East. Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Subs: £7.50. Free library, discount service, courses and newsletter. Contact Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.

South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. Help available with business programming problems. Contact M J Merriman at above address.

Staffordshire. Annual subs: £6.50. Group newsletter. Contact at 57 Clough Hall Road, Kilsgrave, Stoke-on-Trent.

Teddington. Contact G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.

Watford. Meets on second Monday of month. Contact Stephen Rabagliati, c/o Institute of Grocery Dist. Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.

Commodore Pet

Blackpool. West Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. Contact D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 3ST.

Southern Users of Pets Association. Contact Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.

Pet User Group Crawley. Contact Richard Dyer, 33 Parham Road, Ilfield, Crawley.

Pet Users Education Group. Produces newsletter. Contact Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.

UK Pet Users Club. Annual subs: £10, newsletter. Contact 360 Euston Road, London NW1 3BL.

Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Meets at Barry Miles on 01-607 2789.

Pet User Club. Contact Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.

Independent Pet Users Group. Contact 57 Clough Hall Road, Kilsgrave, Stoke-on-Trent, Staffordshire.

Commodore Vic

Burnley. Proposed club. Contact John Ingham, 72 Ardwick Street, Burnley,

Lancashire.

London. Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Contact Robin Barber.

Norfolk. Proposed club. Contact J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Subs £15. Contacts with USA, Australia and Canada. Newsletter, program library. Contact Peter Hiner, 11 Pennyroft, Harpenden, Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Subs: £5, meets monthly in Dublin area. Newsletter. Contact Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411.

UK CP/M Users Group. Subs: £7. Software library, newsletter, help service. Contact Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC

COSMAC Users Group. Contact James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 423934.

Digital Equipment

Digital Equipment Users Society. Program library. Contact The Secretary, PO Box 53, Reading, Berkshire, 0734 387725.

Education

Birmingham. Education ZX80/81 User Group. Subs: £2.50. Contact Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.

Birmingham. MUSE. Subs: £10, student £6.50. National body for co-ordinating activity in schools, colleges. Contact Lorraine Boyce, MUSE Information Office, Westhill College, Weoley Park Road, Birmingham, 021-471 3723.

Dublin. Computer Education Society of Ireland. Subs: £3. Contact Dairmuid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.

Middlesex. Educational Users Group. Offshoot of national TRS-80 Users Group. Contact Dave Fletcher, Head Teach, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.

Worcestershire. Mini and Microcomputer Users in Education. National organisation. Contact R Trigger, 48 Chadcote Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forth

Forth Users Group. Produces newsletters and covers a variety of machines. Subs £7.50. Contact David Husband, 2 Gorseston Road, Branksome, Poole, Dorset BH12 1NW, 0202 764724.

Forth Interest Group UK. Meets at Room 408, South Bank Polytechnic on the first Thursday of month. Subs: £7. Newsletter. Contact K Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH, 01-937 3231.

Forum

Forum 80 Users Group. Contact Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

FX-500-P

FX-500-P Users Association. Contact Max Francis, 38 Grymsdyke, Great Missenden, Buckinghamshire HP16 0LP.

Genealogists

Society of Genealogists Computer Interest Group. Subs: £3. Newsletter. Contact Anthony Camp, 01-373 7054.

ICI

ICI Micro Users Group. Meets fortnightly. Contact Keith Heron, 32 Norfolk Road, Congleton, Cheshire.

Intel MDS

UK Intel MDS Users Group. Newsletter.

Contact Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

Ithaca Audio S100 Users Group. Software exchange, discount. Contact Dave Weaver, 41 Dore Avenue, North Hykeham, Lincoln LN6 8LN.

Jupiter Ace

Jupiter Ace Users Group. Subs: £7. Newsletter, add-ons. Contact John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Mattel

Mattel Intellivision TV Game Group. Proposed group to organise games, competitions. Contact Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Contact Dr Alastair Malcolm, British Computer Society, Cheveley Park Medical Centre, Belmont, 0385 64282.

London. Medical Micro Users Group. Newsletter. Contact Medicom, 1-2 Hanover Street, London W1.

Middlesex. TRS-80 Medical and Laboratory Users. Newsletter. Contact Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Nascom

Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Newsletter. Contact Mike Rottery, 37 Wick Road, Eton Wick, Windsor, Windsor 6106.

Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Contact Martin Sidebotham, 021-744 3093.

International Nascom Microcomputer Club. Subs: £5. Newsletter, program library. Contact 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.

Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Contact Mr T Scarle, 051-526 5256.

Newbrain

Independent Newbrain User Group. Subs: £8.50. Produce monthly newsletter. S.A.E. for queries. Contact Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.

Ohio

Ohio Scientific User Group. Subs: £5. Newsletter. Contact Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric

Oric Owners Group. Subs: £10. Communicates through bi-monthly newsletter. Contact Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Osborne

British Osborne Owners Group. Subs: £18. Newsletter. Contact J Anglesea, Flat 19, Rowan House, Milton Road, Handsworth, Birmingham B20 2JR.

OSI

OSI UK User Group. Contact Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal

Pascal User Group. Subs: £9. Contact Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP

Buckinghamshire. PDP8 User Group. Newsletter. Contact Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.

Hertfordshire. PDP11 User Group. Information service only. Contact Pete Harris, 119 Carpenter Way, Potters

Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot

UK Pilot User Group. Contact Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel

ACC National Prestel Committee. Administers Club Spot 800 (hobbyists on Prestel). Contact secretary, Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines

Birmingham. Research Machines 380Z. Contact Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.

Leamington Spa. West Midland RML User Group. Contact Spencer Instone, c/o 59 Avenue Road, Leamington Spa.

Newcastle. NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Subs: £5. Contact Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic, 0632 326002.

Oxford. Research Machines National User Group. Contact RML, Mill Street, Osney, Oxford OX2 0BW, 0865 249866.

Oxford. Research Machines Ltd National User Group. Contact M D Fisher, PO Box 75, Oxford OX4 1EY.

Sharp MZ80

Postal MZ80K User Group. Contact Noel Williams, 07425 88058.

Aberdeen. International Sharp Users Group. Subs: £3. Newsletter. Contact Graham Knight, c/o Knights Computers, 108 Rossmount Place, Aberdeen, 0224 630526.

Essex. Sharp MZ80K User Group. Contact Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.

Leeds. Sharp PC1211 Users' Club. Subs: £5. Newsletter. Contact Jonathan Dayne, 281 Lidgett Lane, Leeds LS17 3AQ.

Somerset. Sharp MZ80 Users Club. Contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair

Brighton. ZX Users Group. Contact J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.

Aylesbury. Sinclair ZX Computer Club. General monthly meeting, newsletter. Equipment for hire, specialist meetings, library. Contact secretary, Ken Knight, 0296 5181.

Colchester. Sinclair User Group. Meets fortnightly. Contact Richard Lawn, 102 Prettygate Road, Colchester, Essex.

Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Subs: £5. Telephone service, software library. Contact Mike Hayes, 54 Oakley Place, Grange Town, Cardiff, 0222 371732.

Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh on second and fourth Wednesdays every month, 7.30pm. Subs: £5 adults, £3 juniors, students, OAP and unemployed. Newsletter. Contact John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.

Glasgow. ZX80/81 User Group. Contact Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.

Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Contact Keith Archer, 051-260 4950.

London. National ZX User Club. Monthly magazine 'Interface'. Contact Tim Hartnell, Interface, 44-48 Earls Court, London W8.

London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block, Monday, 6.30pm. Contact Irving Brand, Polytechnic of North London, Holloway Road, London.

Sinclair

ZX Spectrum Club. Proposed new club for teenagers. Contact D Beattie, 63

Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Staffordshire. ZX80 National Software Association. Subs: £6. Newsletter, software available on cassette. Contact 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.

Suffolk. ZX Amateur Radio User Group. Newsletter. Contact Paul Newsman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone enquiries.

Surrey. Guildford ZX81/80 Users Group. Meets Fridays, club magazine. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.

Surrey. ZX80/81 User Club. Newsletter. Contact David Bigden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.

Solihull. Sinclair Club. Contact J Edwards, 296 Blossomfield Road, Solihull, West Midlands, 021-705 1647.

West Sussex. Hassocks ZX Micro User Club. Contact Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius

Sirius User Group. Newsletter, program library. Contact Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton. 0582 412215.

68XX

68XX Special Interest Group. Contact Tim Turner, 63 Millais Road, London E11 4HB, 01-558 3681.

Software

London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Contact Mike Duck at Polytechnic of North London, Holloway, London N7.

Oxford. Program of the Month Club. Discount programs, newsletter. Contact Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer

Liverpool European Sorcerer Club. Monthly meetings. Subs: £7.50, newsletter. Contact Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 070 48 72137.

Surrey. Exidy Sorcerer User Group. Newsletter, program exchange. Contact Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet

International Electronic Spreadsheet Users Group. Newsletter. Contact UK Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG.

Tangerine

Bristol. Tangerine Homebrew. Contact A Coates, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.

Bournemouth. Tangerine Users Group. Hardware and software suppliers. Contact Bob Green, 16 Idlesleigh Road, Charminster, Bournemouth.

Texas Instruments

Leeds. TI99/44 User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. Subs: £6. Contact I Youlden, 0532 401408.

Manchester. TI User Group. Proposed new club. Contact T Grimshaw, 21 Allingham Street, Longsight, Manchester.

Manchester TI9900 User Group. Software, data libraries. Contact Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Triton

Triton User Group. Subs: £4. Newsletter, software exchange. Contact Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80

Birmingham. National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on

last Friday of month. Subs: £2.50. Newsletter, software library. Contact Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.

Chelmsford. TRS-80 User Group. Contact Michael Dean, 22 Roughtons, Galleyswood, Chelmsford, Essex.

Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. Subs: £5. Newsletter. Contact J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.

Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month, 7.30pm. Contact Dick Mackie, 3 Warrender Park Crescent, Edinburgh EH9 1DX, 031-229 6032.

Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month, 7.30pm. Contact Sean Coulson, 0903 614589.

Kent. TRS-80 User Group. Contact Alan Reid, 22 Wooddeys Road, Rainham, Kent, 0634 367012.

Bolton. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm Subs: £8. Sub-group meets at Crown Hotel, Blackfriars Street, on first and third Monday of month. Newsletter, software library. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancashire.

Liverpool. UK DOSPLUS User Group. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.

Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month, 7.15pm. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL, 051-220 9733.

London, SW. TRS-80 User Group. Contact Ron Everitt on 01-394 2123.

Merseyside. TRS-80 User Group. Subs: £5. Software library, newsletter. Contact N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.

Milton Keynes. National TRS-80 and Genie User Group. Fee £7 for six months, newsletter. Contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.

London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Contact Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital.

Northants. TRS-80 Users Group. Meets at Welwyn Park Community Centre on alternate Thursday at 7pm. Subs: £12. Saturday workshop. Contact Neil Griffiths, 0858 65718.

Nottingham. East Midlands TRS-80 Users Group. Newsletter. Contact Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham, 0602 751753.

Colour Genie

National Colour Genie User Group. Subs: £10. Products monthly newsletter, has software library and prepares national workshops. Contact Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.

UCSD

Hants. UCSD System Users Society. Contact John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.

Oxford. UCSD Pascal UK Users Group. Contact Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA

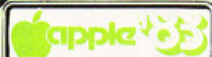
CUA User Group. Contact Adrian Waters, 9 Moss Lane, Romford, Essex.

6502

Bedfordshire. 6502 User Group. Contact Walter Wallenborn, 21 Argyl Avenue, Luton, Bedfordshire. 0582 26927.

Hants. 6502 Users Club (Southern Region). Contact Steve Cole, 70 Sydney Road, Gosport, Hants.

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Computer News, VNU, 62 Oxford Street, London W1A 2HG.

APPLICATION Each software package is listed alphabetically by its application.

PRICE includes VAT.

MACHINE/OPERATING SYSTEM on which the best selling packages runs.

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MEDIA SUPPLIED indicates in what format the package comes — either cassette, disk, or cartridge.

MAIL ORDER AVAILABLE tells you whether or not the package is available by mail order.

HARDWARE REQUIRED shows the need for special hardware, such as disk drive, joystick or printer.

PUBLISHER/DISTRIBUTOR This code refers to the distributor code table at the end of the listings, which will give the name and telephone number of the publisher/distributor.

COMMENTS — any other points of interest.

SOFTWARE

BUSINESS

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/ Distributor	Comments
Accounting	£3,320	Apple II	●	Financial Controller	48K	●	●	●	S1	Also on Apple IIIE. 8 modules (£402.50 each) — sales, purchase, invoicing, etc.
	£339.25	Apple II		General Ledger	48K	●	●	●	C1	Supports 1000 accounts and 100 analyses. Self-balancing, full audit trail.
	£552	Apple II		Informex Integrated Accounting System	48K	●	●	●	I1	Contains nominal, sales, purchase ledger + VAT. Can handle 800 accounts.
	£1,147.70	Apple II		Informex Integrated Business System	48K	●	●	●	I1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K	●	●	●	G1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
	£402.50	Apple II	●	Nominal Ledger	64K	●	●	●	J1	Also on Sirius, IBM PC, Apple III + UCSD. Requires 132 column printer.
	£431.25	Apple II	●	Purchase Accounting & Cost Control Payroll	48K	●	●	●	C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Sales Accounting System	64K	●	●	●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Ledger	64K	●	●	●	J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£339.25	Apple II	●	Auditman	48K	●	●	●	C1	Supports 700 + accounts. Directposting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Businessman	32K	●	●	●	C4	Also on Commodore 4000. Complete accounts production system.
	£1,552.25	Commodore 8000	●	Data Lex	32K	●	●	●	C4	Also on Commodore 4000. Can be used with Auditman. 5 modules.
	£2,025.75	Commodore 8000	●	Microfacts	32K	●	●	●	D1	Designed for solicitors + others who need to separate office & client's accounts.
	£2,070	Commodore 8000	●	Micro-simplex	32K	●	●	●	M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Pegasus Integrated Accounting Suite	32K	●	●	●	M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Aurora Integrated Accounting Package	32K	●	●	●	P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£1,437.50	CP/M	●	Boss	64K	●	●	●	G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M	●	Cash Book Accounting	64K	●	●	●	F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	dBflex	48K	●	●	●	S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,300.00	CP/M	●	Exact	48K	●	●	●	E1	Open item six module accounting system, (£575.00) per module. Works with dBase II.
	£402.50	CP/M	●	Fast Nominal	60K	●	●	●	S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£373.75	CP/M	●	ISBS-W	64K	●	●	●	T1	Also on MS-DOS. Needs 132 character printer. Can define up to 99 report layouts.
	£3,059	CP/M	●	ISBS-S	48K	●	●	●	G2	Comes on hard disk. Contains ISBS functions plus job costing and purchase control.
	£1,840	CP/M	●	Multi-Index	48K	●	●	●	G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Nucleus	64K	●	●	●	B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£569.25	CP/M	●	Padmede Business Control System	64K	●	●	●	C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M	●	Motor Dealers Part Distribution	64K	●	●	●	P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Peachtree Basic Accounting Systems	48K	●	●	●	S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●		48K	●	●	●	P1	Also on MP/M & MS-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.

Office Information	£402.50	Apple II	●	Prophet II	48K	●	●	●	●	●	●	A4	Also on IBM PC & Corvus Concept. Information system which acts as a noticeboard.	
	£69.00	Apple II	●	Payroll	48K	●	●	●	●	●	●	H1		Also available as cassette for Spectrum ZX81 (£25.00). Needs printer.
	£287.50	Apple II	●	Tabs Payroll	48K	●	●	●	●	●	●	T3		Also on CPM & MS-DOS (64K). Up to 2000 employees, nine pay schemes.
Project Management	£977.50	CP/M	●	Powday	48K	●	●	●	●	●	●	O2	Also on MP/M and MS-DOS. Integrates with Omicrons nominal ledger. Handles SSP.	
	£747.00	IBM PL	●	Micronet	48K	●	●	●	●	●	●	T2	Also on ICL PC, Sirius, Superbrain, Apple II, & others. Critical path analysis.	
	£1,150.00	Commodore 8000	●	Hornet	32K	●	●	●	●	●	●	C3	Has eight optional variants (allegit £4,025). Network logic & variety of screen display.	
Property Management	£517.50	Apple II	●	Property Management System	48K	●	●	●	●	●	●	A2	Also on Apple III, Apple IIe & Sirius. Prints rent reminders, demands etc.	
	£287.50	Apple II	●	Tabs Purchase Ledger	48K	●	●	●	●	●	●	T3	Also on CPM & MS-DOS (64K). Open item ledger — automatic payment facility, etc	
	£805.00	CP/M	●	Powerbought	48K	●	●	●	●	●	●	O2	Also on MP/M & MS-DOS. Integrates with Omicron's Nominal Ledger System.	
Sales Ledger	£287.50	Apple II	●	Tabs Sales Ledger	48K	●	●	●	●	●	●	T3	Also on CPM & MS-DOS. Part of integrated system. 300 analysis codes.	
	£373.75	CP/M	●	Fast Sales	60K	●	●	●	●	●	●	T1	Also on MS-DOS & TRS-DOS. Needs 132 character printer. Part of Fast Range.	
	£805.00	CP/M	●	Powersales	48K	●	●	●	●	●	●	O2	Also on MP/M & MS-DOS. Multi-user system based on mainframe software.	
Sales Order Processing	£325	DEC Rainbow 100	●	Sales Ledger System	64K	●	●	●	●	●	●	D2	Also on DEC Mate II. Invoicing & monthly statement generating system.	
	£805.00	CP/M	●	Compact Sales Order Processing	64K	●	●	●	●	●	●	C2	Also on CPM 80, 86 & MS-DOS. Cortes on hard disk. Control, stock, ledgers.	
	£1,207.50	CP/M	●	Compact Sales, Purchase & Nominal Ledger	64K	●	●	●	●	●	●	C2	Also on CPM 80, 86 & MS-DOS. Follows standard accounting procedures.	
Sick Pay	£80.50	Apple II	●	Statutory Sick Pay (SSP)	48K	●	●	●	●	●	●	H1	Also on Spectrum. Does all SSP calculations.	
	£172.50	Apple II	●	Inter-Slat	48K	●	●	●	●	●	●	G1	Also on Basis 108 & ITT 3030. Needs printer.	
	£9.20	Sharp MZ80A	●	Statistical Analysis	48K	●	●	●	●	●	●	K3	Also on MZ80K. Calculates mean & standard deviation for up to 100 items.	
Statistics	£15.00	Sinclair ZX81	●	Critical Path Analysis (CPA)	8K	●	●	●	●	●	●	H1	Also on Spectrum (16K). Activities entered from arrow diagram. Finds critical path.	
	£977.50	UCSD-P System	●	Trend Plot	128K	●	●	●	●	●	●	P5	Needs Hewlett Packard plotter. Developed to analyse historical time series data.	
	£373.75	CP/M	●	Fast Stock	60K	●	●	●	●	●	●	T1	Also on MS-DOS & TRS DOS. Needs 132 character printer.	
Stock Control	£3.289	CP/M	●	M-SIS	48K	●	●	●	●	●	●	T2	Stock control system for manufacturing industry.	
	£33.92	Newbrain	●	Stock Control 40/4	32K	●	●	●	●	●	●	E2	Stores large quantities of stock, accumulates new stock levels & checks stock level	
	£25.00	Sinclair Spectrum	●	Stock Control	48K	●	●	●	●	●	●	H1	Also ZX81. Fast twd/add/delete item. Prints complete or selective lists & total value.	
Word Processing	£228.85	Apple II	●	Format 80	48K	●	●	●	●	●	●	P6	Also Apple IIe. Needs 80 column card. Storage/retrieval of names & addresses.	
	£92.00	Apple II	●	Piewriter	48K	●	●	●	●	●	●	M5	Needs 80 column card. Allows entry, editing & print formatting of any text type.	
	£125.35	Apple II	●	Wordhandler	48K	●	●	●	●	●	●	P4	Word processor for the non-professional — minimum Apple system.	
	£152.95	Apple III	●	Apple Writer 2	48K	●	●	●	●	●	●	P6	Also Apple II. Has word wrap, glossary & word processing language.	
	£28.50	BBC Model B	●	Alphabeta	32K	●	●	●	●	●	●	H3	Also available on disk. Suitable for home & business.	
	£10.50	BBC Model B	●	Word Pro	32K	●	●	●	●	●	●	I4	Includes DELETE, INSERT, SAVE, Date etc.	
	£90.85	Commodore 64	●	Infomast	64K	●	●	●	●	●	●	R2	Combined programmable word processor, Database and calculator.	
	£89.00	Commodore 64	●	Paperclip	64K	●	●	●	●	●	●	A3	Also Commodore 8000. Compatible with WordPro & SpellPro.	
	£488.75	Commodore 8000	●	Wordcraft	32K	●	●	●	●	●	●	D1	Also on SuperPet & Sirius 1. Routine correspondence, mailing, proposals, contracts.	
	£51.75	Commodore Pet	●	Papermate +	16K	●	●	●	●	●	●	S5	Also on Commodore 64, 3, 4, & 8000. Available on floppy (£53.49).	
	£125.00	Commodore BK-20	●	Wordcraft 20	8K	●	●	●	●	●	●	A3	Also Commodore 64 — needs printer. Comprehensive word processor.	
	£145.00	CP/M	●	Mail Merge	64K	●	●	●	●	●	●	X1	Also on CP/M 86 and PC-DOS. An optional MERGE, PRINT, extra for Wordstar.	
	287.50	CP/M	●	Peachtext	48K	●	●	●	●	●	●	P1	Also MP/M & MS-DOS. Needs high quality printer. Contains proof reader.	
	£339.00	CP/M	●	Perfect Writer/Speller	64K	●	●	●	●	●	●	S3	Also MS-DOS & Apple DOS. Contains quick reference card.	
	£431.25	CP/M	●	Select Word Processing System	64K	●	●	●	●	●	●	B1	Also MP/M & PC/DOS. Screen-oriented system.	
	£316.25	CP/M	●	Spellbinder	48K	●	●	●	●	●	●	E1	Also on Oasis. Word processing & office management system.	
	£333.50	CP/M	●	WP2020	48K	●	●	●	●	●	●	G2	Menu-driven, machine independent. Set of key-tops provided.	
	£225.00	IBM PC	●	Easywriter II	64K	●	●	●	●	●	●	X1	Bold face & underscoring on screen. 80,000 word spell checker extra (£43.15).	
	£340.40	IBM PC	●	VisiWord	64K	●	●	●	●	●	●	R6	Mail merge facility with Vist file.	
	£339.25	MS-DOS	●	WordStar	128K	●	●	●	●	●	●	A1	Also on CP/M. Needs printer. Complete screen-based WP.	
	£40.25	Newbrain	●	Word Processor 40/12	32K	●	●	●	●	●	●	E2	Automatic word wrap. editing, saving paragraphs, deleting.	
	£325.00	OS9	●	Stylograph	32K	●	●	●	●	●	●	S6	Expandable system with modular design.	
	£45.42	Sharp MZ804	●	Wordpro	48K	●	●	●	●	●	●	K1	Also on MZ80B + K. Available on disk (£91.94). One of few WP packages for Sharp.	
	£49.95	Tandy TRS 80 I	●	AJ Edit	32K	●	●	●	●	●	●	M6	Also-on Genie I & II. Needs printer.	

EDUCATION

Basic Course	£9.95	Texas Instruments 99/4A	Beginners Basic Tutor	16K	●	●	●	T5	Gives explanations and examples of TI Basic — lets the user try.
	£13.95	Texas Instruments 99/4A	Teach Yourself Extended Basic	16K	●	●	●	T5	Needs extended Basic module.
Business Game	£9.95	BBC Model A	Business Game	16K	●	●	●	W1	Also on Model B. Two games for economics, business & general studies, teaching.
	£5.95	BBC Model B	Inkasi	32K	●	●	●	C9	Also on Vic-20. Rule for ten years, overcoming obstacles, e.g. famines.
Chemistry	£14.38	Research Machine 380Z	Symbols To Moles	31K	●	●	●	H4	Also on Apple II. Practise using chemical symbols, writing & mole concept.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/ Distributor	Comments
Children	£37.89	Apple II		Bumble Plot	48K	●	●	●	P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
	£29.84	Apple II	●	Face Hanger	48K	●	●	●	P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	£37.89	Apple II		Gertrude's Secret	48K	●	●	●	P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●	●	●	T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	£9.95	BBC Model B		Letters	32K	●	●	●	C9	Designed for children aged 4-6 & for dyslexic & remedial children.
	£9.95	BBC Model B	●	Metrics	32K	●	●	●	C9	Also on Vic-20 + Spectrum. Structure of metric system, for children aged 10-15.
	£5.95	BBC Model B	●	Pascal	32K	●	●	●	C9	Also on Vic-20. Shows construction of Pascal Triangle and tests on it.
	£5.95	BBC Model B	●	Sequences	32K	●	●	●	C9	Also on Vic-20. Demonstrates number patterns.
	£6.50	BBC Model B	●	The Early Stages	32K	●	●	●	H3	Reading aid. Plays nursery rhymes. Available on disk.
	£4.50	BBC Model B	●	Super Hangman	32K	●	●	●	I4	Version of famous game. High resolution graphics. 800 words or enter own choice.
	£9.95	BBC Model B	●	Tree of Knowledge	32K	●	●	●	A9	Interactive program teaching categorisation. Simplified information retrieval.
	£4.95	Sharp MZ80A	●	Giant Maths	32K	●	●	●	S8	Also on MZ80K. Big screen figures & humorous error messages. 5 to 11 years.
	£4.95	Sharp MZ80A	●	Rocket	3K	●	●	●	S8	Also on MZ80A. Four difficulty levels. For five to 11 year olds.
	£9.20	Sharp MZ80A	●	Teach Tables	48K	●	●	●	K3	Also on MZ80K. Plays like game but motivates children to improve their ability.
	£4.95	Sharp MZ80K	●	Master Builder	48K	●	●	●	S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	£322.00	UCSD-P	●	Classroom Monitor	64K	●	●	●	K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●	●	●	W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
	£14.38	Research Machine 380Z	●	Repondez	31K	●	●	●	H4	Also on Apple II. Practising French verb formation (present tense).
	£9.20	Sharp MZ80A	●	French Verbs	48K	●	●	●	K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
	£8.00	BBC Model B	●	Painter	32K	●	●	●	A5	Also on Spectrum (£5.75). Atom (£6.90) & on disk.
Classroom Monitor	£9.95	BBC Model B	●	Creative Graphics	16K	●	●	●	A9	Book available (£7.50). Designed to illustrate BBC graphics.
	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●	●	●	K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
	£7.95	Sharp MZ80A	●	Multilingual	3K	●	●	●	S8	Also on MZ80K. A language tutor to suit all European languages.
	£8.95	BBC Model B	●	Angle	32K	●	●	●	C9	Also on Spectrum. Includes four programs designed to teach simple geometry.
	£9.95	BBC Model A	●	Algebraic Manipulations	16K	●	●	●	W1	Also on Model B. Includes four programs designed for use in maths teaching.
	£82.80	IBM PC	●	Fact Track	64K	●	●	●	I3	Learning basic arithmetic. Presents simple two-line sums in random order.
	£46.00	Sharp MZ80A	●	Curve Fitting	48K	●	●	●	K3	Also on MZ80K. Calculates, intercepts & plots power curve.
	£9.20	Sharp MZ80A	●	Directed Numbers	48K	●	●	●	K3	Also on MZ80K. Teaches difficult mathematical functions.
	£9.20	Sharp MZ80A	●	Divisor Advisor	48K	●	●	●	K3	Also on MZ80K. Teaches division at a variety of skill levels.
	£27.60	Sharp MZ80A	●	Numerical Integration	48K	●	●	●	K3	Also on MZ80K & B. Teaches Simpson's Rule.
Meteorology	£23.00	Research Machines 380Z	●	Weather	31K	●	●	●	H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●	●	●	K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
	£14.38	Research Machines 380Z	●	Lenses	31K	●	●	●	H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
	£9.20	Sharp MZ80A	●	Casino Chips	48K	●	●	●	K3	Also on MZ80K. Uses radioactive chips to teach half-life concept.
	£28.75	CPM	●	Touch n' Go	48K	●	●	●	C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
Typing	£31.05	IBM PC	●	Typing Tutor	64K	●	●	●	I3	Presents exercises for learning touch typing or for improving existing skills.

GAMES

Adventure	£17.95	Atari	●	Arrow of Death	16K	●	●	●	C8	Also runs on TRS-80, BBC, Vic-20. A 'classic text adventure'.
	£7.99	BBC Model B	●	Adventure	16K	●	●	●	M7	Also runs on Atom. Many rooms to explore and many hazards to overcome.
	£9.95	BBC Model B		Philosopher's Quest	16K	●	●	●	W1	'Progress through a world of fiendish puzzles.'
	£9.95	BBC Model B		Sphinx	16K	●	●	●	W1	'A classic adventure, moving through caves avoiding hazards to collect treasure'.
	£13.80	Commodore Pet	●	Hitch-Hikers Guide to the Galaxy	32K	●	●	●	S5	Also runs on Commodore 64, Vic-20, 3000, 4000, 8000. 'Involved, textual game'.
	£18.40	Commodore Pet		Pythonesque	32K	●	●	●	S5	'Increasingly difficult textual game based on Monty Python'. Disk available (£20.12).
	£24.99	Commodore Vic-20		River Rescue	8K	●	●	●	T4	Needs joystick. 'Captain boat through treacherous rivers to rescue explorers'.
	£8.00	Dragon 32		Escape	32K	●	●	●	M12	Needs joystick. A 3D maze game. Get clues from 15 rooms for code of elevator.
	£8.00	Dragon 32		Flipper	32K	●	●	●	M12	'A game of intrigue and strategy. Requires an agile mind and a lot of fore-thought'.
	£8.00	Dragon 32		Mansion Adventure	32K	●	●	●	M12	'Wind your way through an old mansion picking up clues to find the diamond'.
Dragon 32	£7.95	Dragon 32		Wizard War	32K	●	●	●	S7	Needs joystick. 'Magical combat for two to nine players; interactive duel'.
	£35.00	IBM PC		Adventure in Serema	64K	●	●	●	I3	Needs colour graphics adaptor and direct drive colour monitor for use.

	Price	Machine/Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/Distributor	Comments
	£5.95	Spectrum		Muncher	16K	●		●	S9	'A monster munching marathon'.
	£8.00	Spectrum		Spectres	16K	●		●	B3	'An increasingly difficult maze game. The object is to fit light bulbs & destroy ghosts'.
	£10.00	Sinclair ZX81		Mazogs	16K	●		●	B3	'Three levels. Find & collect treasure in a maze & escape'.
Pacman Type	£9.95	BBC Model B		Snapper	16K	●	●	●	W1	'Based on Pacman'.
	£9.50	Colour Genie		Chomper	16K	●		●	K2	'Based on Pacman'.
	£8.00	Dragon 32		Scarfman	32K	●	●	●	M12	'Based on Pacman'.
	£4.95	Spectrum		Gnasher	16K	●	●	●	R3	Joystick optional. 'Based on Pacman using Beano characters'.
Pool	£8.50	BBC Model B		Billiards	32K	●	●	●	H3	Available on disk. 'A game for all ages'.
Racing	£7.95	Dragon 32		Grand Prix	32K	●	●	●	S7	'For one or two players, features eight Grand Prix tracks & 10 levels of difficulty'.
	£21.95	Ti 99/4A		Car Wars	16K	●	●	●	T5	'Race through maze whilst avoiding computer controlled car'.
Shooting	£29.95	Atari 400	●	Claim Jumper	16K	●	●	●	C8	Also on Atari 800. 'A two player shoot-out over gold nuggets & cash'.
	£29.95	Atari 400		Shamus	16K	●	●	●	C8	'Player has to move through lair avoiding hazards'.
	£5.95	BBC Model B	●	Invisible Man	32K	●	●	●	C9	Also on Commodore Vic-20. 'Aim is to shoot man who keeps disappearing'.
	£9.99	Commodore Vic-20		Quacker	3K	●	●	●	R2	'Aim is to shoot down ducks & rabbits on shooting gallery'.
	£15.95	Commodore Vic-20	●	Spiders of Mars	N/A	●	●	●	A3	'Popular game for the Vic-20'. Also on Commodore 64.
	£5.95	Spectrum		High Noon	16K	●	●	●	A6	'Clean up chaos & disorder in town'.
Space	£9.95	Dragon 32		Dragon Trek	32K	●	●	●	S7	'A version of Star Trek with ten levels of difficulty'.
	£5.95	Spectrum		Android Run	16K	●	●	●	A6	'Control android to shoot walls, kill mutants & reach central complex'.
	£5.95	Spectrum		Cosmos	16K	●	●	●	A6	'Defend space convoy from aliens & asteroids'.
	£5.50	Spectrum		Schizoids	16K	●	●	●	I6	'Space bull-dozer nudges shapes into black hole'.
	£5.95	Spectrum		Starship Enterprise	48K	●	●	●	S9	'Based on the classic Star Trek. Includes arcade action'.
	£4.95	Spectrum	●	Star Trek	48K	●	●	●	R3	Also on ZX81 (£3.95). 'One player, sound & full colour graphics strategy game'.
Space Invader type	£7.99	BBC Model B		Swoop	32K	●	●	●	M7	'Written in machine code with full colour & high resolution graphics'.
	£7.50	BBC Model B		Model B Invaders	32K	●	●	●	I4	'A Space Invaders game with high resolution & colour graphics'.
	£9.99	Commodore Vic-20		Orbis	3K	●	●	●	R2	'Based on Missile Command. Fast & colour'.
	£19.95	Dragon 32		Cosmic Invaders	N/A	●	●	●	D3	Joystick optional. '15 levels of difficulty'.
	£6.50	Spectrum		Destroyer	16K	●	●	●	I5	'Destroy the varying alien invaders'.
	£4.95	Spectrum		Intruders	16K	●	●	●	Q1	'Includes mutants, random saucers, bonus base & 14 different aliens. Sound & colour'.
	£5.00	Spectrum		Spectral Invaders	16K	●	●	●	B3	'For one or two players. Increasingly difficult. high resolution colour graphics'.
	£21.95	Ti 99/4A		Invaders	16K	●	●	●	T5	'Based on Space Invaders. After every two screens a new character appears'.
	£3.95	Sinclair ZX81		Invaders	4K	●	●	●	S9	'Based on Space Invaders'.
Sport	£33.35	IBM PC		Decathlon	64K	●	●	●	I3	Needs colour graphics adaptor & direct drive colour monitor. 'For up to six players'.
Variety	£5.95	Commodore Vic-20		Innovation Cassette	48K	●	●	●	M8	'One tape containing seven games'.
	£5.95	Spectrum		Over the Spectrum	16K	●	●	●	M8	'One tape with 10 games. Defender to geometry, beginners to advanced'.
Various	£29.95	Atari 400	●	Picnic Paranoia	16K	●	●	●	C8	Also on Atari 800. Needs joystick to run. 'A graphics game based on picnic site'.
	£4.95	Colour Genie		Breakout	16K	●	●	●	M9	'Different levels of skill'.
	£6.95	Commodore Vic-20		Amok	5K	●	●	●	A3	'Chased by robots in enclosed room. Different levels of difficulty'.
	£9.95	Commodore Vic-20		Black Squid	3K	●	●	●	C8	'Get men to shore in shortest time'.
	£24.95	Commodore Vic-20		Mutant Herd	8K	●	●	●	T4	'Protect a powerhouse from mutants. Enter their burrows & destroy eggs'.
	£6.90	Dragon 32		Dead Wood	32K	●	●	●	A5	'A game for all the family'.
	£3.95	Texas Instruments 99/4A		Chalice of Kalmar	16K	●	●	●	A8	'The aim is to retrieve a chalice from a temple'.

HOME

Clubs and Sports	£78.00	Sharp MZ80A		Clubman	48K	●	●	●	S8	Golf handicapping and competition results system complying with 1983 regulations
	£575.00	Apple II	●	Tab's Golf Package	48K	●	●	●	T3	Also on MS-DOS (64K). Maintains members handicaps including 1983 regulations
	£28.18	Epson HX20	●	Horse Race Forecast	48K	●	●	●	K1	Also on Newbrain and Sharp. A punters aid to betting.
	£28.69	Sharp MZ80A	●	Navex	48K	●	●	●	K1	Also on MZ80K. Simulations of navigating a yacht on the English Channel.
Diary	£9.95	BBC Model A	●	Desk Diary	16K	●	●	●	W1	Also on BBC Model B. Consists of address book & diary planner (plus instructions).
Home budget	£19.99	Atari 400	●	Home Financial Management	8K	●	●	●	T4	Also on Atari 800. Needs Atari Basic cartridge. Aids money management.
	£19.95	Epson HX20	●	Home Budget	16K	●	●	●	K1	Also on Sharp, MZ80 & Osborne. Keeps records of home finances with graphics.
	£14.95	Sharp MZ80A	●	Sam Analysis	3K	●	●	●	S8	Designed for balancing home debits & credits.
Music composition	£24.99	Commodore Vic-20		Vic Music Composer	8K	●	●	●	T4	Aids to aspiring composer. Also for entertainment and education.

Stock control	£10.00	Spectrum	Spec File	48K					A5	Stock control program useful in home, e.g. record collection, etc.
Various	£12.95	Commodore Vic-20	Home Office	5K					A3	Comprises VicPro (word processor) & VicData (A database program).
UTILITIES										
Basic	£201.25	CP/M	Basic 80	48K					L1	Industry standard Basic.
	£235.70	CP/M	Basic Compiler	48K					L1	Companion to Basic 80. Allows programs to run faster.
	£80.50	CP/M	BDS C Compiler	48K					L1	A subset of 'C' that enables its implementation. Includes symbolic debuggers.
	£121.90	CP/M	C Basic	64K					X1	Commercial Basic. Also on CP/M-86 (£265.65).
	£213	Any Z80	X-Basic	48K					X1	Built-in matrix functions. Supports MP/M record locking. Graphics option.
Basic Upgrader	74.75	Commodore 64	VicTree	48K					S5	Also Commodore Vic-20. Also on floppy (£92.00). Adds 50 commands to Basic.
	£215.05	Apple II	VisiDex	48K					R1	Also on IBM PC. Needs printer. One record/screen designed for cross-referencing.
	£178.25	CP/M	Cardbox	48K					C6	Also on MS-DOS. Needs 24 x 80 VDU & 100K disk storage.
	£102.35	Apple II	ASCII Express — The Professional	48K					P4	Needs RS232. Asynchronous serial communications package.
	£448.50	Apple II	Ediel	48K					O1	Needs modem. A Viewdata frame word processor designed to aid data editing.
Communications	£626.75	Apple II	Owlsync 3780	48K					O1	A full IBM 3780 emulator package allowing communication up to 2400 baud.
	£454.25	Apple II	Owitel	48K					O1	Needs modem. Allows access to Prestel & private viewdata systems.
	£149.50	Apple II	Terminal Utilities	48K					C1	Also on Apple IIe. Converts Apple II to intelligent terminal. Speeds up to 9600 BPS.
	£57.50	CP/M	Xcopy 1.0	64K					X1	Disk copy utility for Cromemco machines. Copies 8" or 5 1/4" single/double sided.
	£454.25	CP/M	Micro-Linkline	64K					I2	Also on UCSD-P. Teletype comms for transferring datafiles.
Database	£575	CP/M	Bisync AC-3780	64K					E1	Also on MP/M & CP/M86. Micro to mainframe comms through IBM terminal emulation.
	£41.40	IBM PC	Asynchronous Communications	64K					I3	Needs asynchronous comms adaptor. Makes PC act as async comms terminal.
	£117.30	IBM PC	IBM 3101 Emulation Program	64K					I3	Makes PC act as 3101 terminal provides 3270 emulations as when connected to host.
	£638.25	IBM PC	PC SNA 3270 Emulation	128K					I3	Needs SDLL adaptor card makes PC act as IBM 3270 terminal.
	£22.43	Sharp MZ80A	Zen	48K					K1	Also MZ80K & B. Full Z80 editor/assembler.
Database	£115.00	IBM PC	Interlink	48K					T2	Also on Sirius, Apple II, Xerox, Osborne etc. Connects processors for downloading.
	£132.25	Apple II	DB Master	48K					M5	Available on hard disk. Allows 1K records over 100 fields. Report generation, etc.
	£224.25	Apple II	Informex Database System	48K					I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	Mailist	48K					A4	Also for IBM PC & Convus Concept. Requires hard disk. A networking product.
	£96.60	Apple III	PFS: File	48K					P6	Also for Apple II (£135.70). Used in tandem with PFS (£96.60).
Apple IIe	£215.05	Apple II	VisiFile	48K					R1	Also on IBM PC (£273.70; 64K). A database program suitable for up to 500 entries.
	£217.35	Apple IIe	VisiTrend + VisiPlot	64K					R6	Also for CP/M. Graphic representation of data. Compatible with VisiCalc.
	£10.30	BBC Model B	Filer	16K					M7	Allows searching, sorting, saving & recovery of data.
	£201.25	CP/M	Datalfow II	56K					G1	Also on CP/M-86. Needs 160K disk space. Extract files to link with other systems.
	£201.25	CP/M	Datastaff	64K					X1	Data entry & retrieval system. Interfaces with WordStar.
CP/M	£499.74	CP/M	dBase II	48K					E1	Micro DBMS. Can be used for high level programming for a range of applications.
	£557.50	CP/M	Superfile	56K					S4	Multi-file database giving application package information.
	£166.75	CP/M	Supersort II	64K					M10	A sort utility for handling various forms of data files. Mainframe-like facilities.
	£1.840	CP/M	MDBS II	64K					T2	Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£68.42	Newbrain	Invoice & Credit Program	32K					E2	The invoice program allows you to put in your own information and design invoice.
Debugger	£29.32	Newbrain	Database 40 S	32K					E2	Information gatherer. stores large quantity of information & can be interrogated at will.
	£258.75	CP/M	Animator	64K					M11	Also on Unix & MS 100S, interactive source level debugging tool for CIS-Cobol.
	£132.25	CP/M	BSTAM	16K					L1	Needs common interface ports or modem access. Utility for transferring CP/M files.
	£34.50	Apple II	Graphic Utilities	48K					C1	Also for Apple IIe. Parameter driven machine code programs' high res graphics.
	£24.95	Atari	Constructor	48K					C8	Less experienced & new programmers can design animated sequences.
File Transfer	£9.95	BBC Model A	Creative Graphics	16K					W1	Also for BBC model B.30 programs on cassette produce range of pictures & patterns.
	£24.95	BBC Model B	EDG Graphics Package	32K					S7	Computer aided design package. Reviewed 11.3.83.
	£50.60	CP/M	CP/M Graphics	64K					D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
	£488.75	CP/M	CIS Cobol	64K					M11	Also on Unix. Compact, interactive ANSI 74 standard implementation of Cobol.
	£1,109.75	CP/M	Level II Cobol	96K					M11	Also on Unix & MS-DOS. High level ANSI 74. Compiler, mainframe-compat code.
Graphics	£396.00	CP/M	Fortran 80	48K					T2	Useful for scientific applications, where Pascal is inefficient.
	£285.20	CP/M	Pascal — MT +	64K					X1	ANSI standard Pascal for Z80 processors. Also on CP/M-86 (£484-90).
	£210	CP/M	Supersoft C Compiler	48K					M4	Also on CP/M-86, MS-DOS, PC. DOS. Fast implementation of C.
	£16.85	BBC Model A	Lisp on the BBC	16K					W1	Also on BBC Model B. Book available £7.50. Lisp is artificial intelligence language.
	£253.00	CP/M	ProPascal	56K					E1	Also on CDOS. Needs two disk drives. Native code Pascal.
Language	£40.19	Sharp MZ80A	Forth	48K					K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£421.70	Any 8 or 16 bit machine	PL/1	48K					D4	A compact implementation based on ANSI standard general purpose subset of PL/1.

	Price Inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/Distributor	Comments
						Cassette		Disk drive	Other	
Linker	£350.75	IBM PC	●	Lattice-C	64K	●	●	●	L1	Also on MS/DOS. C Compiler for 16 bit machines — full implementation & execution Up to 8 megabytes.
Operations	£224.25	CP/M		Plink 2	48K	●	●	●	L1	
Operating system	£59.80	CP/M		Operating Guide	48K	●	●	●	E1	Works by putting CPM to sleep & replacing it with operating environment.
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Crystal football

Newspapers and micros make an unbeatable team. Or so football fanatics in Burton-on-Trent have proved.

Software house, Peaksoft, accepted a challenge to predict, by computer programming, who was going to win the Bass Challenge Cup final between Burton Albion and Maccles-

field Town.

Peaksoft rose to the challenge. It put together its football program Champions, and added information from local sports reporters. Then top writer Rex Page ran the program on a Dragon 32.

It predicted Burton Albion would win — which it did.

It predicted the match would be decided by one goal — which it was.

It predicted Burton goalscorers would be Dolby, Fisher and Gauden — and it was right on the first two.

It said the winning goal would come in the 82nd minute — it came in the 84th.

Finally, it said the likely final score would be 3-2. This it got slightly wrong as the winning score was 2-1. Not bad, though.

Wayout west

It's Wayout, man... well, what else could take top position in laid-back California?

Actually, Wayout is a video game from Sirius Software which took the 1983 Golden Joystick award for best graphics of the year. Sirius comes from Sacramento and Wayout, no doubt, comes from West Coast living.

It's a rare game that combines graphic excellence, playability and fun, to capture the hearts of the players, say those in the know.

The game is available for Apple, Atari and Commodore. So just get in touch with the Californian dreamers...

Syntax Errors

Graphics put straight

In part four of the Graphics Micropaedia (PCN No 9) the ones couldn't tell themselves apart from the zeroes. On page 69 the first series of numbers should read:

111111

100001

and the series of numbers below them should read:

111111=63

100001=33

In Figure 1, page 68, the words 'Decimal representation of byte' should read 'Binary representation of byte.'

Gremlins continued to muddle us in Figure 2 as the words 'Bit 7' should read 'Bit 5' and

the words '8x8 grid' should read '6x8 grid.' Finally, the word GHAB in our memory map diagram of the Oric should, of course, read GRAB. Sorry!

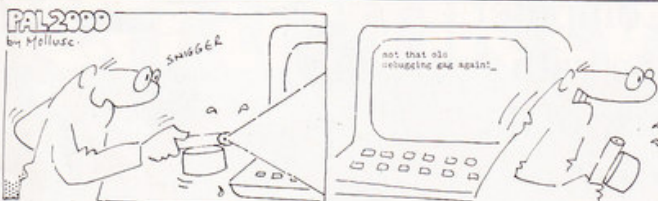
Poke point

S C Bickle's microwave for turning your Atari screen grey in our April 22 issue lost a POKE. There should be a POKE 1539,96 between the POKE 1538,2 and POKE 2,0.

Disk slips

In the review of the Comart 1522, the demon gremlins struck and the size of the disks shrank alarmingly. In fact, the Winchester has a capacity of 20Mb, not 5, as we said.

Disks were also a problem in the review of the Multitech MPF II. We said the Multitech drives would not be the same format as the Apple drives. In fact, they will be, so all Apple software will be accessible.



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
International Word Processing Exhibition	May 24-27	Wembley Conference Centre, Wembley	Philip Le Masurier, BETA, 01-405 6233
Computers in the City	May 24-26	Barbican, London	Mario Meoli, Online Conferences, 09274 28211
Computers Open Day	May 26	Strathmore Kotel, Luton	Tony Kaminiski, Couchmead Communications, 01-778 1102
Micro '83	June 1	Conway Hotel, Dunmurry, Belfast	Micro 1, 0232 664391/2
Apple '83	June 3-5	Fulcrum Centre, Slough	John Riding, Database Publications, 061-456 8500
ZX Microfair	June 4	Alexandra Palace, London	Mike Jonstone, 01-801 9172
Office Automation Show & Conference	June 7-9	Barbican Centre, London	Clapp & Polliak, 01-747 3131
4th Commodore Computer Show	June 9-11	Cunard International Hotel, London	Commodore Business Machines UK, 75 74111, Ext 220
Blackburn Computer Fair	June 11	King George's Hall, Blackburn	Bradley Enterprises, 0772 312677
South of England Personal Computer Fair	June 12	Exhibition Hall, Wood Green School, Witney	Julian Wilde, 0993 2355
Computer Fair	June 16-19	Earls Court, London	Roy Bratt, Reed Exhibitions, 01-643 8040
Computer Open Day Exhibition	June 16	Holiday Inn, London	Tony Kaminiski, Couchmead Communications, 01-778 1102

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Computers, Communications & Electronic Technology Exhibition & Conference	May 31-June 3	Melbourne, Australia	CETIA, PO Box 259, Roseville, Sydney, N S W 2069
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707
International Micro Computer Exhibition	Aug 2-5	Kuala Lumpur, Malaysia	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8 Taman Megah, Petaling Jaya, Selangor
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland

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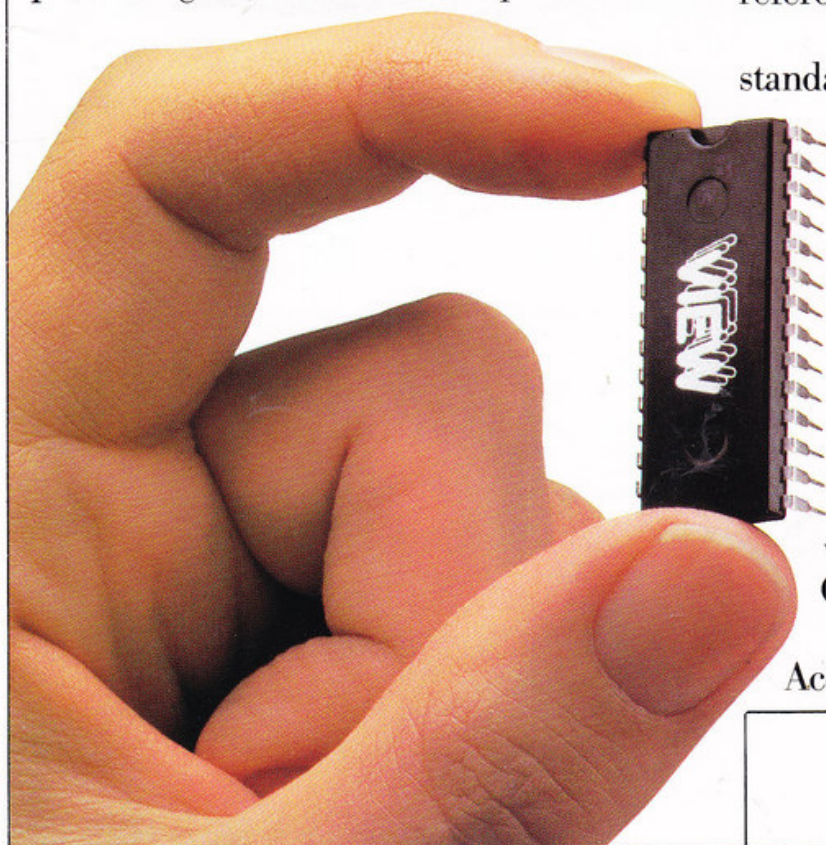
many ways in which View can help you, and the 'View Guide,' which provides a quick reference to all View facilities.

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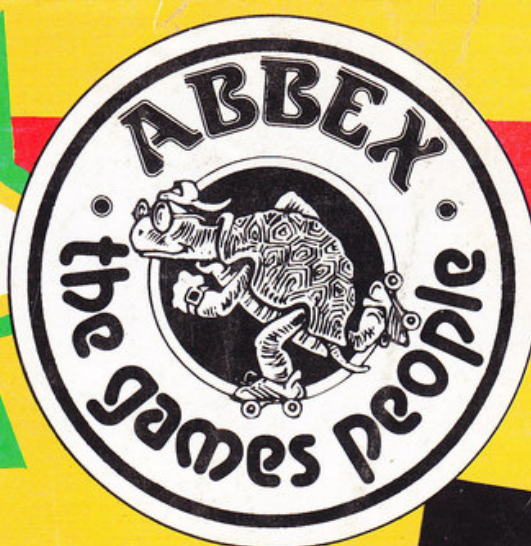
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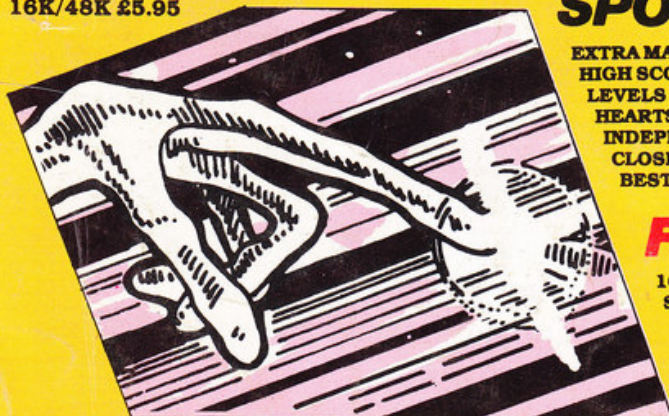
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