PERSONAL COMPUTER NEWS

THE COMPLETE COMPUTING WEEKLY

JUNE 10-JUNE 15, 1983 Vol 1 No 14 35p

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Micropaedia puts the spotlight on Spectrum.

Pull out part 1 this week

ACORN'S VOICE CHIP
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DRAGON GAMES
Arcade action and family favourites in six new packages

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Last chance to save £100 on a double disk drive subsystem
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PCN SPECIAL OFFERS
Save £1 on your favourite Spectrum games cassette!
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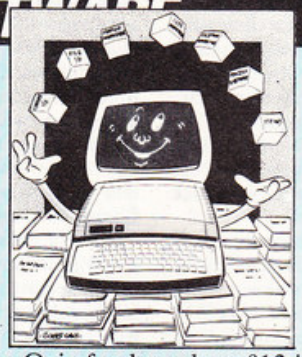

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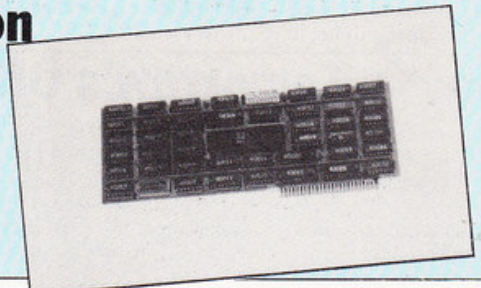

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Outsiders pip Acorn

Torch kindles CP/M on BBC

By Ian Scales

Acorn has been beaten by Torch in the race to provide the much-awaited 'second processor' for the BBC Micro.

The Torch offering of disks and a second Z80 processor running the Torch version of the industry-standard CP/M operating system is now widely available. Ironically, it increases the attractions of the BBC Micro at the Torch's expense.

CP/M operating systems seem to be the coming thing for low-cost micros. They are always coming but rarely arrive.

Besides Grundy (*see story page 3*) Camputer's Lynx is another plodder in the CP/M stakes. Lynx owners were promised a CP/M upgrade as one of the major selling points of the micro.

The BBC Micro was designed as an expandable system, but Acorn has been notoriously slow to come up with the goods.

Torch's own microcomputer uses a BBC board as its I/O handler and runs a version of CP/M (CPN) on a second Z80 processor with a full 64K RAM.

What Torch has done is take the non-BBC part of its Torch micro, minus the communications hardware and software, and package it as an upgrade for the BBC. For £780 plus VAT you get twin 400K disk drives plus a Z80 card with RAM which goes into the BBC under the lid and is cabled to the Tube port.

For around £1,500 you can put together an impressive CP/M system — £399 for a Model B, £200-£300 for a colour monitor, £95 for a disk interface and £780 plus VAT for the Z80 pack.

This seems to compare more than favourably with the Torch itself, which retails at £2,795 plus VAT.

PCN will Pro-Test the Torch Z80 pack in issue 16.

Kenda boosts disk system

A disk filing system that looks streets ahead of Acorn's offering for the BBC Micro will be launched this month in response to the complaints of Acorn users.

And Kenda Software's Disk Management Filing System (DMFS) could mean more than just an improvement in the capabilities of a BBC system with disk drives. A third-party operating system could help ensure the long-term survival of the BBC Micro as Acorn turns its attention to the new Electron, due out in August.

The shortcomings of Acorn's systems software have caused many frustrations — DMFS shows what you can do about it. 'Acorn had nothing to do with it,' said Kenda's Alan Horner. 'Users asked us to develop the system.'

Mr Horner says the system will be cheaper than the BBC's version, which is £109.25.

'DMFS doesn't restrict the number of files you can have on disk, which is a major deficiency of the Acorn offering,' he adds.

The present disk filing system for the BBC gives you a maximum of 31 files, while the DMFS aims to provide efficient use of disk space, also letting you call up files you have erased. Using the BBC system, they are gone for good once erased.

The file structure is CP/M compatible, enabling DMFS to read CP/M standard disks. This fits in neatly with Acorn's plans and Torch's reality in adding CP/M to the BBC system.

DMFS allows file names of up to eight characters plus three qualifiers, and it can be used on its own or alongside the present DFS, allowing transfer of files between the two systems.

Kenda Software is on 0703 869922.

Acorn's Z80 due in August

More power should be available for the BBC Model B in August, when Acorn says it will launch two add-on processors — a Z80 for around £345 and a 6502 for about £230, with applications software thrown in free.

The units will each have 64K RAM. Speed will be 6MHz for the Z80 and 3MHz for the 6502.

These units, when connected to the BBC's built-in 6502 processor using the now legendary Tube, will give very fast I/O and increase memory considerably. The Z80 will enable the BBC to run CP/M.

A unit with 64K RAM would give a total of 96K RAM, but the chances are that Basic would have to be copied into the add-on, reducing the total capacity.

The launch date depends on when the software is ready, and a spokesman said that the launch time of the Electron, also in August, is 'purely coincidental'.

Meanwhile, don't get too excited. Acorn was promising the two add-on processors for August last year.

And the Tube could be the most apt name ever chosen.

Now for a cassette backlash

Dragon Data is bucking a trend by moving away from plug-in cartridge software to more cassette-based programs.

The introduction of a mid-price range of cassettes, it says, will spare you from forking out for the more expensive type of cartridges. Cassette software will be priced at £4.95, £7.95 or £10.95.

A spokeswoman said: 'The fairly hefty programs will still be produced on cartridges. But we felt we had to make this move because the user prefers using cassette software, because it's cheaper.'

Vicsoft too has expressed some doubt about the future of plug-in software. A spokesman said: 'If we're talking about a Vic 20, who is going to invest a third of what he pays for his machine on a software package? We don't believe there'll be a swing towards cartridges.'

On the other hand, Texas Instruments has been moving in the plug-in direction because it says it offers better value for money. Richard Mann of TI said: 'The user gets better graphics — and it's faster and easier to load.'

Both Sinclair and Acorn see cartridges as a good idea and have jumped on the bandwagon. They will produce packages shortly (*PCN, issue 10 & 12*).

Halfway to Tomorrow's Office

Software supplier SoSoft is to put money on the Commodore 64, with the promise of a scaled-down version of its Tomorrow's Office database-cum-application-generator for the 64.

But SoSoft is hedging its bets, with versions for other small micros planned, as well as a new version of the full-blown package for the IBM PC.

The IBM version boasts multiple file-handling and built-in transaction handling, plus the ability to set up command strings which can be run from user menus.

SoSoft says it's hoping to close an agreement with IBM under which the Big Blue Whale will distribute the package. And it's already found itself a US distributor, Professional Software.

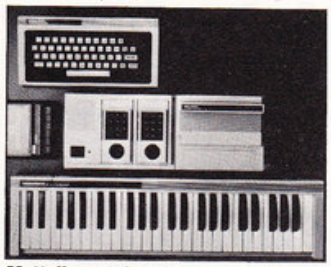
But, of course, none of these will be on offer for the disk-based 64 version, which is to be sold as Micro Filer 64, for around the £60 mark.

'It will be nowhere as powerful as Tomorrow's Office, but the basic principles will be the same,' says SoSoft chairman Neil Hewitt.

GO-BETWEEN — This device could mark the end of futile juggling with the volume control on your cassette recorder as you try to load a program on to a ZX81. Called the ZX Tapeloader, it sits between your cassette deck and your ZX81 and stabilises the signal in both directions. It should also make life easier when you're switching from LOAD to SAVE — with its three-way switch there will be no need to plug and unplug leads from the input and output sockets.

The ZX Tapeloader costs £14.99 from Elinca Products, Sheffield (0742) 339774.

Play it again—on keyboard



Mattel's peripherals

By Geof Wheelwright

The day of the games machine cometh.

Keyboards that will turn both the Intellivision and Coleco games machines into home computers are to be released at the Consumer Electronics Show in Chicago this week.

The long-awaited keyboard for Mattel's Intellivision games unit — code-named 'The Lucky' — has the feel and look of Tandy's Colour Computer and features 49-keys, a space bar and an £89.98 price tag.

The price covers both the keyboard and the Computer Adapter — the adapter plugs into the Intellivision's expansion slot and the keyboard then plugs into the adapter.

Mattel has also released a number of other computer peripherals for the Intellivision.

They include: a program expander to add memory and an Extended Basic to the Intellivision computer, a computer cassette recorder and a music synthesiser.

Meanwhile, the soon-to-be-released Coleco games machine (*Pre-Tested in PCN, Issue 2*) is also to have a computer keyboard.

Its UK distributor is hinting at an 84-key, full travel qwerty keyboard with a built-in dot-matrix printer and 48K RAM for under £100. But Coleco has launched an 80K computer with detachable keyboard and printer for $600 at the CES in Chicago, so its 'keyboard' for the games unit could in fact be a cut-down version.

All change in Tandy revamp

It's all change at Tandy with the launch of three new products, the dropping of two existing ones and price cuts.

June 28 should see the launch of the Model 100 portable, the Model 4 and later the MC-10, a smaller version of the Colour Computer. An expansion unit for the Model III at under £700 is also promised.

The Model 4 will feature a new CPU board, 128K RAM to run CP/M Plus, a new keyboard and an 80×25 screen, but the price is not yet available.

The Model 100 is comparable to the Epson HX20 and comes with up to 32K of RAM, integrated LCD display with eight lines of 40 characters and internal rechargeable batteries. A built-in 300 baud auto-dial modem will give communication over the phone.

But if you want the old TRS80 Model 1 or the TRS80 pocket computer 1, forget it — both have been discontinued. The pocket computer got the elbow in April, while the other was phased out in December. A Tandy spokesman said they had been 'superseded by technological advances'.

Tandy is cutting prices, too. The TRS80 model III has been reduced to £1,699 to £1,299, while the model II is £1,999 as opposed to £2,699 — drops of £400 and £700 respectively.

The TRS pocket computer II is now £129.95, the previous price being £179. You could always use your £50 saving to buy the TRS80 pocket computer IV for £49.95 — this will be in the shops by June 14.

As opposed to Apple, which is heading upstream with Lisa, and Commodore, which seems to be reaching for the lower echelons, Tandy does not appear to be taking any specific direction.

Richard Ford, managing director of consultancy Microsearch, said he felt Tandy was aiming at as large a mass of people as possible.

Russ Nathan, managing director of market research firm Rontech, had different ideas concerning Tandy's aims.

'They see themselves in the business market rather than the home one,' he said.

Micros reprieved

By Ralph Bancroft

The Commodore Computer Show this weekend should finally scotch the rumours that Commodore is dropping the 500 and 700 models.

The company confirmed this week that it had considered withdrawing the 500. 'But there was such a heavy demand for it that we decided to continue with it,' said John Baxter, Commodore's marketing manager. 'Dealers were ringing us up asking for as many machines as we had left because they reckoned they could sell every one.'

Commodore now sees a bright future for the 500, especially in scientific and technical uses, but it is not prepared to discuss what detailed plans it has in mind. 'We are considering upgrades and downgrades for the machine but I am not prepared to say what they will involve,' said Mr Baxter.

He was also keen to dispel suggestions that the company was either scrapping the 700 (*PCN, issue 5*) or planning a relaunch. 'There are no plans to make any changes to the 700,' said Mr Baxter. 'In fact the machine went into production this week.'

While emphatic about the 500 and 700, Mr Baxter was less forthcoming about plans for new machines. The only machine that he confirmed would be coming to the UK is a portable version of the Commodore 64.

Also in the pipeline could be a new teachers' Pet. It will be a repackaged version of the 64 with built in colour monitor and is designed to replace the 4032 in schools.

People who have seen prototypes of the machine have enthused over the colour graphics. Equally attractive is the rumoured selling price of around £400.

■ Don't buy a Commodore 64 . . . well, not this month, anyway. Wait until next month, when its price should drop from the current £345 to somewhere under £200, and there should be more software for it, too.

Commodore is about to go flat out to push its scaled-up Vic to the front of the market, by slashing the price right down. 'We want to sell as many 64s next Christmas as we sold Vics last Christmas,' a spokesman says.

Newbrain CP/M at last

The advance guard of the CP/M Newbrains has appeared in London and you should be able to buy one this summer.

Two London stores were demonstrating hand-built systems last week. Grundy Business Systems' Keith Beverton said there were ten systems in existence. 'Those first two are really investigatory for us,' he said.

Grundy is on course to produce 1,750 systems by early September, he said, but advance orders will account for most of these.

The ten prototypes match what will be the production machine's specification almost completely. But Grundy will make minor adjustments to a ROM chip.

Mr Beverton said this move was to enable the Newbrain to run some CP/M software packages without modification. Some packages that don't conform to the protocol will be adapted.

The system software will also include a 'configure' program which will theoretically provide for any 8-bit CP/M machine's disk format to be read by the Newbrain. 'You will be able to re-configure drive B to read any disk format,' said Mr Beverton.

The minimum Newbrain CP/M system, built around a model A, will cost £603 — for this you get 32K of RAM and 200K on a floppy. A 96K system with twin 200K floppies will cost £998.

COMING OR GOING — This could be the last you'll ever see of the Texas Instruments 99/2. A spokesman for TI said last week that the £80 black and white, soundless, 16-bit computer is currently being test-marketed in the US — and only after the results of those tests will TI in Britain decide whether or not to bring the machine here. Rumour has it that the vicious price war in the US has made colour and sound computers so cheap that the mute and colour-blind machine will never make it.

VIEW FROM AMERICA

Pacman puts the bite on Atari

From Chris Rowley

Pity the poor US micro manufacturers, for they are truly between the rocks and the cheap 64K RAMs. Low-price memory chips, marching Z80s, hordes of Sords and Sinclairs — this market has turned tough.

The competition is so stiff that prices have fallen to the point where the entire American middle class can access 64K RAMs without feeling any pain in the pocket-book.

Consider, for example, an optimum Timex Sinclair layout. The computer itself is $50. From the mail-order people you can put together a $150 RAMpack, a $150 green-screen monitor, a 300 cps dot-matrix printer with cables and interface for $400, a fully-detachable ASCII keyboard for $100, a modem for $140, joysticks for $25, a tape deck for $25, a power-surge isolator for $20. For about $1,000 you have a complete Z80-based micro with all the trimmings.

New machines keep appearing too. The Jupiter Ace is now on sale here for $150. Tandy just announced the $120 junior version of its Colour Computer. Mattel, the giant toy maker, is bringing out the Aquarius (expandable to 56K) for about $300, and Timex Sinclair has released the TS 1500, an $80 16K machine.

The question is how a manufacturer hangs on to a perfect margin in a market like this. By the skin of his teeth, for some. 'Expansion is everything now, profits must come later,' say a few, and 'Pacman take the hindmost' says the stock market.

Just 15 months ago Atari was the jewel in Warner Corporation's crown. Warner, number 92 in the Fortune 500, found that Atari was generating the bulk of its profits. Then that first surge in the video market passed. The bright light in Warner's front window had attracted an army of competitors — video games advertising had taken over network TV, and home computers were down to $100 or less, not much more than a games machine. The ageing Atari 400 and 800 lost their lustre and began to look overpriced. Margins were slashed furiously to hold on to shelf space in stores and profits plunged. Warner fell out of the heavens on Wall St and crashed to an $18.9m loss in the first quarter of 1983.

Warners announced a big shake-up at Atari and manufacturing jobs were hurriedly transferred overseas to South-East Asia. Then the corporate headsmen were sent into the executive suite.

Embattled Atari chairman Raymond Kassar is still in place, despite his being under investigation by the Securities and Exchange Commission for selling Warner stock just before the bad news broke last December and Warner's shares tumbled.

However, despite the smoke wreathing the executive desks, Atari is fighting back with a new range of computers. $150 will buy the Atari 600 XL with 16K of RAM. The 64K machine, the 800 XL, will sell for $300, the 1400 XL with built-in modem and speech chip will be $500, and the top of the line 1450 XL will have all that and a built-in disk drive for $800.

But whether this will plump up Atari's slice-of-the-pie chart remains to be seen. A lot of new machines are being released this autumn including IBM's Baby Blue 64K RAM 'Peanut' for less than $1,000.

By Christmas the competition should rival shark feeding-frenzies, especially with the US economy on the mend, and with everyone capable of reading a magazine article aware that without computer awareness their futures may be humble and tedious. Fully one third of US university graduates this spring face a jobless autumn. Corporations are discovering a new facet of the computer age — five young executives can do the work of ten.

Indeed there are persistent rumours that on Manhattan's psychiatric Gold Coast, where the rent on a shrink's couch can be $250 an hour, there are any number of keyboard-phobic chief executives undergoing rehabilitation.

Their unemployable descendants should do them a favour. For the price of a couple of hours getting rapped by a shrink for their terror of doing 'girl/secretarial' things like touching a keyboard, these guys could be having fun with a new Atari. You're never too old to learn . . . otherwise, let's face it, the Pacman'll get you.

Another spot for Ladybird

A new kind of generation gap is about to open. Those of us who grew up with Ladybird books are going to be succeeded by a generation growing up on Ladybird software.

Ladybird has joined forces with another specialist educational publisher, Longman, to produce a series of cassette-based educational software for primary schools. The programs will run on the BBC Model B and the first four were unveiled last week.

Although the Department of Industry has offered primary schools a 50 per cent subsidy on micro systems, it is widely felt that there is a dearth of good software at this level. Ladybird, which gave you such deathless prose as 'This is Sir Walter Raleigh. He lived a long time ago' intends to step into the breach.

The first offerings try to make learning fun.

Rally I and Rally II offer practical, useful applications in maths, dealing with the kind of problems you might need to solve each day.

Terrible Tales lets you create your own monsters and giants.

In September Junior Maths, Basic Number Help, Other Worlds and Junior English are due out. They are expected to be the same price as the current programs — £11.45, complete with teacher's notes and pupil's work cards.

More programs are due out each Spring and Autumn. For more information contact Ladybird-Longman Micro Software on York (0904) 20801.

Soft on 45

Software on singles has been given a boost by a new release from EMI but the pioneers of the technique are on the point of launching their follow-up.

A two-piece band called Mainframe produced a single called *Radio (Will Bring Me Home)* in February; on the B side was a short Apple text program. Mainframe's follow-up, *Talk to me*, will be backed by software for the Apple and BBC, and in text form for Sinclair machines. It is out next week.

As a source of cheap singles might have a bright future — not many tapes cost less than £1.50. Mainframe record on MC².

Mainframe — John Molloy (left) and Murray Munro — interface with their Apple.

Adding add-on for IBM PC

A maths co-processor could be a future add-on for your IBM PC.

IBM in the US plans to introduce two additional programming languages, various educational/entertainment programs and a maths co-processor for its PC.

The co-processor is an Intel 8087 which you install on an IBM PC system board.

IBM should also implement a programming language to take advantage of the maths co-processor's capabilities.

A spokesman for IBM confirmed that the US announcement was official, but that there was no equivalent announcement in Europe.

But users can take heart, since IBM UK tends to follow US announcements.

Win a micro in Capital competition

If you're 16 or younger and fancy winning a free micro, you'd better hurry. Capital Radio's essay competition closes on June 24.

The essay should start with the words 'Computers will change our lives because . . .' and be no more than 500 words long.

Jilly Clarke, spokeswoman for Capital, stressed that you should live within the 45 mile Capital radius in order to be considered.

The 50 best entrants will receive a two-day computer training course in Basic programming at Capital Radio, and the most promising students will go on to the Imbucon summer school for two weeks to do a further computer course as well as each receiving a free computer.

Details of the competition can be heard on Sunday between 4 and 5pm on 194 around London.

Sinclair packs Palace

By Sandra Grandison

Against the heat of a June summer's day, more than 8,000 people packed into Alexandra Palace for the Seventh ZX Microfair.

It was a good day, drawing 700 people more than last year and Mike Johnstone, organiser of the fair, said: 'People were pleased to have a bit more space at this venue. In the past shows have tended to be a bit too cramped.

'This fair has been so successful that we are planning to hold another one at the Alexandra Palace for August 20.'

The fair attracted novices and boffins who crammed the 288 stalls. It was a Sinclair users' field day with add-ons and software for the asking.

Among the 148 exhibitors simplicity was the name of the game. For £3.95 a company called Softeach was selling a Custom Keypanel Kit for the Spectrum to end keyboard fumbling. Each kit comes with 10 matt black keypanels plus a sheet containing more than 140 self adhesive command labels printed with words and symbols.

Micro-Myte's stand was another crowd puller, displaying the capabilities of an acoustic modem costing £39.60. Using it you can communicate data between compatible users over the normal telephone network. Included with the package is menu-driven software, cables and a 12-month warranty.

On Basicare's stand two new modules for its expansion system were on view — an 80-column dot-matrix printer drive, Pericon at £41.75, and a three-voice music synthesiser, Sonus at £30.15.

Quick-action wrists moved excitedly at stands displaying new joystick interfaces. AGF Hardware was selling a programmable joystick interface at £32.95 which is compatible with all games. And Cambridge Computing was offering a similar product for £26.

On the Fuller stand, against the hustle and bustle, was a new 'printerface' for the Spectrum. For £34.95 and £39.95 you can buy RS232 or Centronics, respectively.

For the kids the main attraction was the bangs, splats and zaps coming from some of the big names in games such as Artic Computing. Romik, JRS and Mikro-Gen.

Apple alive and kicking

By Richard King

The Apple show in Slough was rather a quiet affair on the first day . . . not that it was poorly attended, just that it was 'restricted' to the trade. It's amazing how many 'dealers' are below the age of criminal responsibility, though.

As for the Apple itself, it's not only alive, but kicking lustily. So much for the perennial remarks by the ill-educated that it's 'out of date' or 'long in the tooth'.

Several interesting items were on display, and the most interesting one was actually flown in specially, from California.

This was the Videx Ultraterm, a new item from the company which produced the first 80-column card for the Apple, and thus started a major trend.

Its latest product is carried by Pete & Pam Computers, and P & P went to the expense of having a courier bring one over. It arrived in the middle of Friday afternoon, direct from Heathrow, and was plugged into a waiting machine.

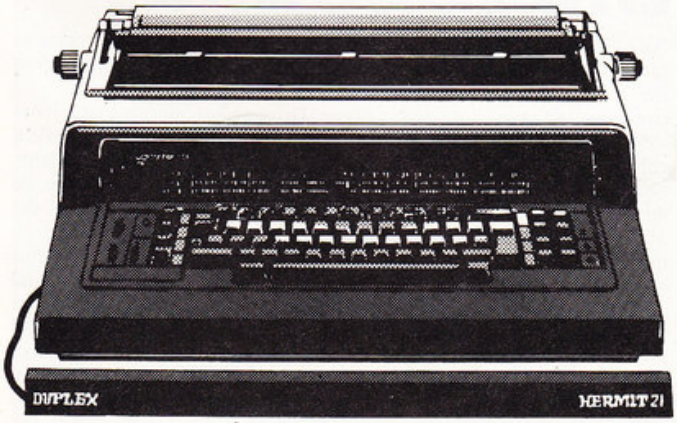
Apple users have become pretty blasé about new add-ons which make their computers do amazing things, but this one looked incredible. Imagine a screen with 24 rows of 160 columns.

Of course, 24 × 160 means pretty small letters, but there are eight other modes, each with inverse and normal as well as high-light and low-light, plus graphics. Definitely an 'ultra' add-on, which we'll be reviewing soon.

Another interesting device was the Genie 5 + 5 hard-disk system. This has a removable 5Mb cartridge which completely solves the backup problem, but the price of £3,885 will have to drop before it gains wide acceptance.

Several companies were plugging networking systems, but rather desperately.

The software front was definitely weak . . . there wasn't much new stuff, and of that, most was American. Where is the British talent for software we hear so much about?



Hermit 21, an interface for the Hermes Toptronic 21 electronic typewriter, converts the Toptronic 21 into a full KSR printer/terminal. It features a 2,000 character print buffer and a 'white space skip' which increases print speed to 45 cps. It also has three modes of operation. Hermit 21, £402.50, is available from Duplex Communications at Dunton Bassett, Leicestershire, (0455) 209131.

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 two weeks before publication date (in this case June 10), so these charts tell the story in high streets between May 13 and May 27.

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 (5)	BBC Model B	£399	(AC)
▼	3 (2)	Sinclair ZX81	£40	(SI)
▼	4 (3)	Oric 1	£100	(OR)
▲	5 (10)	Dragon 32	£200	(DR)
▼	6 (4)	Atari 400	£150	(AT)
►	7 (7)	Lynx 48	£225	(CA)
►	8 (8)	Newbrain A	£228	(GR)
▼	9 (6)	Commodore Vic 20	£130	(CO)
▼	10 (9)	Atari 800	£300	(AT)
►	11 (11)	Epson HX20	£472	(EP)
▲	12 (13)	Sharp MZ80 A	£549	(SH)
▲	13 (14)	Texas TI 99	£150	(TI)
▲	14 (19)	Colour Genie	£224	(LO)
▲	15 (—)	Nascom 3	£549	(LL)
▼	16 (12)	Commodore 64	£345	(CO)
▼	17 (16)	Sharp PC1500	£170	(SH)
▼	18 (15)	Jupiter Ace	£90	(JU)
▼	19 (17)	Apple IIe	£969	(AP)
▼	20 (18)	Acorn Atom	£174	(AC)

Top Ten over £1,000

▲	1 (3)	Osborne 1	£1,581	(OS)
▼	2 (1)	Sirius 1	£2,754	(ACT)
▲	3 (7)	Apple III	£2,780	(AP)
▲	4 (4)	IBM PC	£2,392	(IBM)
▼	5 (5)	Commodore 8032	£1,129	(CO)
▼	6 (2)	Olivetti M20	£2,754	(OL)
►	7 (7)	Superbrain II	£2,070	(IC)
►	8 (8)	HP 86A	£1,541	(HP)
▲	9 (—)	Sanyo MBC 1000	£1,195	(SA)
▲	10 (—)	DEC Rainbow	£2,714	(DEC)

AC Acorn Computers. **ACT** — ACT Sirius. **AP** — Apple Computers. **AT** — Atari International. **CA** — Camputers. **CO** — Commodore. **DEC** — Digital **DR** — Dragon Data. **GR** — Grundy Business. **HP** — Hewlett-Packard. **IBM** — IBM. **IC** — Icarus Computers. **JU** — Jupiter Cantab. **LO** — Lowe Electronics. **LL** — Lucas Logic. **OL** — Olivetti. **OR** — Oric. **OS** — Osborne Computers Corporation. **SA** — Sanyo. **SH** — Sharp. **SI** — Sinclair. **TE** — Texas Instruments.

More micro cuts

Prices are continuing to tumble in the battle of the price-tags, with Oric, Alpha Micro and retailers all joining in.

Sinclair has been selling the ZX81 for £39.95 for about a month, but Greens has cut it to £29.99.

Dixons has turned the Texas Instruments 99/4A into a sub-£100 system with an offer that includes accessories supposed to be worth £56. For £149.99 you get the 99/4A, TI joysticks, Teach yourself Basic and a cartridge carrying four games. Elsewhere on Dixons' shelves you'll find the Dragon 32 at £174.99, the Atari 800 at £299.99, the Vic 20 starter kit at £139.99 and the Commodore 64 at £349.99.

Oric is mounting a summer sale from July 1 to mid-September, offering a software package free with every 48K machine sold. For £169.95, you'll get the micro plus tapes on Home Finance, Teach Yourself Basic, Oric Flight and Multi Games, which the company says are worth £40.

The 16K model, which should at last reach outlets by early July, will also come with a software package, this time valued at £30. It will contain adaptations of the programs produced for the 48K. The 16K deal is £129.95 and both the Oric and ZX81 sell through W H Smith, Dixons, Greens, Laskys, Micro C and Spectrum Centres.

Not to be outdone, Alpha Micro has announced a 33 per cent reduction in the price of the AM-100/L. This 68000 based micro, aimed at business, professional, scientific and educational users, will sell at £3,561 instead of £5,341.

But general sales manager David Ford would not be pressed on the subject of future price reductions. 'We haven't got plans for any further specific reductions at present, but prices are declining in the industry all the time,' he said.

Alpha Micro is based in Slough on (0753) 2821922.

The micro industry's reaction to the prices' helter-skelter has been mixed. One analyst described it last week as 'suicidal' but another said that the business market was not necessarily price sensitive.

Adman natter

The Chatterbox speech synthesizer for the Vic 20 (*Pro-Tested PCN March 18*) has undergone a facelift and price change under its new distributor — Adman Electronics.

The 'Jack-in-the box' logo has gone in favour of a swish new design. The new box is simply called the Adman Speech Synthesiser.

According to Adman, *PCN*'s Pro-Test highlighted design problems in the documentation which have since been rectified.

The best news, however, is that the unit has been reduced to £49.95.

According to Adman spokesman Mick Shorrock there are many applications just waiting to be 'articulated'. He sees a big future in the education field (spelling programs) and in games.

Adman Electronics is on (0423) 62642.

Tri-compatibility means switchable software

Are you and your micro tri-compatible? Don't look for psychiatic guidance yet, it's just a new approach to software packaging that has slipped over from the US.

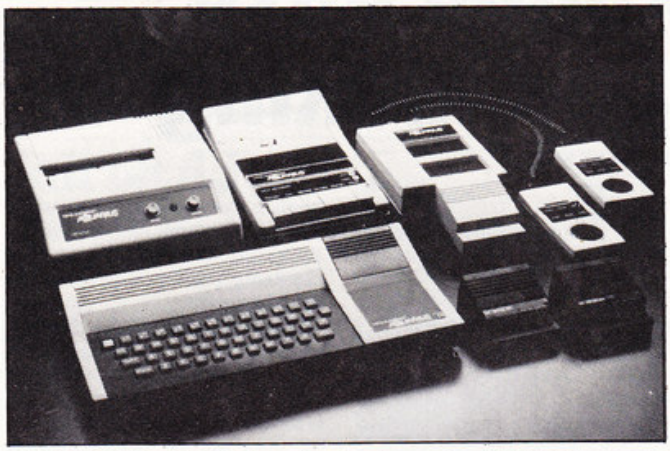
Tri-compatible means that a package can run on three different types of micro — each cassette holds a different program version for each machine. All you have to do is to choose the right program for your machine and load as normal.

For starters the first release of tri-compatible games is called Aztec Challenger at £12.95 for the Atari 400 and 800, Commodore's Vic 20 and the Texas Instruments TI99/4A.

Cosmi, the Californian company that is behind this marketing ploy, also has three new arcade-type games for the Atari machine — Spider Invasion, Meltdown, The E Factor and Plumbous at £11.95 each.

Funware, another US comany, has shipped in some non-violent games for the TI99/4A. They are Rabbit Trail and Henhouse, both at £29.95.

All packages are available from Centresoft, 021-550 8263.



HUNDRED CLUB — Mattel's Aquarius micro has made a little bit of computer history. It must be the first micro to have been reduced in price before its launch. Although it isn't due out until later this month, Mattel has announced that the planned price of £109.95 has now been slashed to £99.95 to bring it in line with the recent price cuts on Sinclair's Spectrum. The basic machine comes with 4K of RAM, has 8K of Basic, uses a 40 × 24 screen and offers 16 colours. But you'll have to pay extra for joystick paddles, the 'mini-expander' to use cartridges and a cassette recorder. This may of course change when the system is actually launched.

Commodore modem is now on show

Commodore 64 users will be able to buy a modem to hook up to Prestel in early autumn.

The modem on a chip works only with the 64 machine and plugs into the cartridge port at the back of the micro. It will operate at split speeds of 1200-75 baud and you don't need a separate power supply.

For about £70 the unit will come with software from Y2 Computing, so you can save Prestel frames and download telesoftware.

The hardwired device, a direct-connect unit, is 'less susceptible to noise', according to a spokeswoman from Commodore. The company is also considering a modem for the 700 machine.

You can get a sneak preview of three prototype modems at the 4th Commodore Computer Show, June 9-11, at the Cunard International Hotel, London. The price of admission is £3.

This Pixy plots pictorially

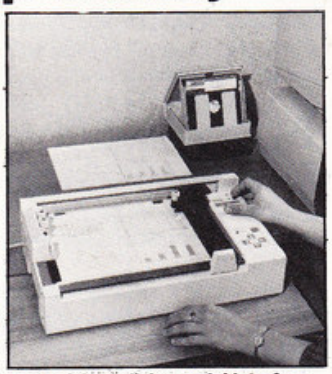
A colour plotter will be unveiled by Mannesmann Tally on June 21.

The Pixy III is intended to give high-quality plotting, and its features include triple pens for multi-colour applications, scientific symbols, 15 character sizes with four directions of rotation, plus line plot and scattergram marks.

A Z80 processor drives the device and gives automatic circles, arcs and curves.

The plotter costs £690 with a parallel interface, or £747.50 with a serial interface.

Contact the company in Wokingham on 0734-7887211.



Choice of parallel or serial interface with the new Pixy II colour plotter.

Old orange on the rebound

An old friend in new clothes and a rare new single-board system are on the way from a south London company.

Microtanic of Dulwich is launching the Microtan 65, which is none other than the Tangerine micro of days gone by, and the Microtutor, a single-board machine-code system that may also strike a few chords in your memory.

The Microtutor, on sale later this month, is something of an oddity at a time when single-board systems seem to be increasingly unfashionable. It will cost £49.95.

The Microtan 65 has come into Microtanic's hands following Tangerine Computer Systems' decision to sell off its interest in the system and its range of add-ons. You may also know the machine as the Micron, another of its past identities.

Driven by a 6502 processor, it has just 1K in its basic form but you can add to this with Tanex cards from the same supplier. Input can be from a keypad or board, and the system can drive either a monochrome or colour monitor with a 128 character set and 'chunky' graphics.

Microtan 65 with a keyboard Tanex expansion, Basic, graphics and power supply will cost you £389. Microtanic is at 16 Upland Road, Dulwich, London SE22, tel: 01-693 1137.

■ *PCN* will look more closely at the system in a future issue, if only for old times sake.

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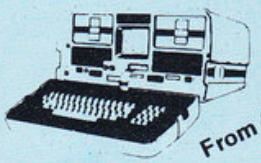

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The June Top Ten in Spectrum software at W.H.Smith.

Flight Simulation
Sinclair
48K **£7.95**

Penetrator
Melbourne House
48K **£6.95**

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

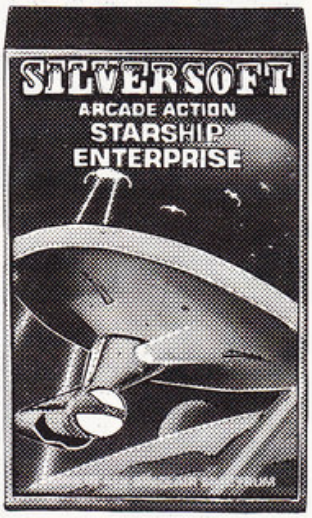
So every month at W. H. Smith, we review the range with particular reference to presentation, challenge, excitement and value for money. And because we're quite severe it's a difficult job finally to arrive at a Top Ten. But as you can see, not impossible.

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

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

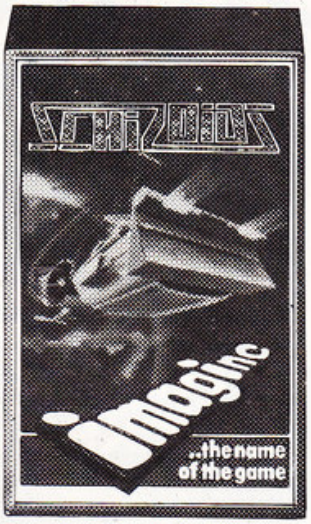
Title	Producer	K RAM	Price
Arcade Games			
Meteor Storm	Quicksilva	16	£4.95
Space Intruders	Quicksilva	16	£4.95
Time Gate	Quicksilva	48	£6.95
Gulpman	Campbell	16	£4.95
Spectral Invaders	Bug-Byte	16	£5.00
Meteoroids	Softek	16	£4.95
Planetoids	Sinclair	16	£4.95
Hungry Horace	Sinclair	16	£5.95
Space Raiders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

Chess
Sinclair
48K **£7.95**

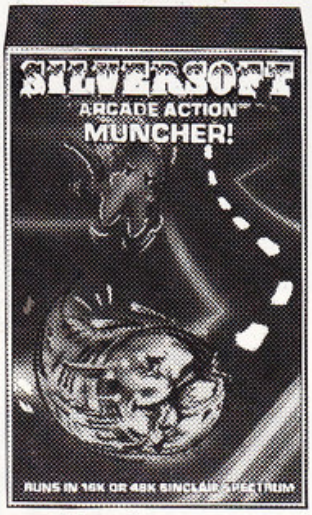


Starship Enterprise
Silversoft
48K **£5.95**

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



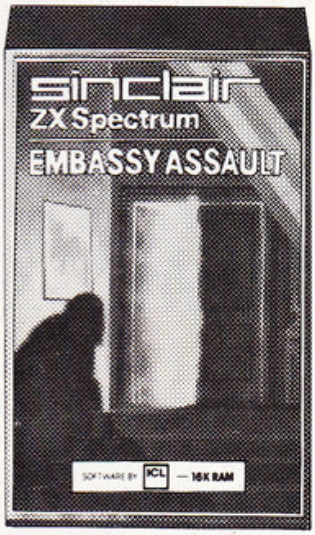
Schizoids
Imagine
16K **£5.50**



Muncher
Silversoft
16K **£5.95**

Mined-Out
Quicksilva
48K **£4.95**

Transylvanian Tower
Shepherd
48K **£6.50**



Embassy Assault
Sinclair
48K **£4.95**

Title	Producer	K RAM	Price
Avenger	Abacus	16	£4.95
Cyber Rats	Silversoft	16	£5.95
Arcadia	Imagine	16	£5.50
Ground Attack	Silversoft	16	£5.95
Orbiter	Silversoft	16	£5.95
Slippery Sid	Silversoft	16	£5.95
Strategy Games			
Battle of Britain	Microgame	48	£5.95
Novotnik Puzzle	Phipps	16	£4.95
Chess	Artic	48	£9.45
Voice Chess	Artic	48	£9.95
Superchess II	C P Software	48	£7.95
Football Manager	Addictive	48	£6.95
Chess-The Turk	Oxford	48	£8.95
Dictator	DK Tronics	48	£4.95
Everest Ascent	Shepherd	48	£6.50
Dallas	CCS	48	£5.95
Adventure			
Labyrinth	Axis	16	£5.95
Planet of Death	Sinclair	16	£6.95
Inca Curse	Sinclair	48	£6.95
The Hobbit	Sinclair	48	£14.95
Ship of Doom	Artic	48	£6.95
Espionage Island	Artic	48	£6.95
Rescue	Computer Rentals	48	£5.95
The Orb	Computer Rentals	48	£5.95
Utility			
M/C Code Test Tool	Oxford	16	£9.95
Editor/Assembler	Oxford	16	£9.95
Compiler	Softek	16	£14.95
Soft Talk II	C P Software	48	£6.95
Spectsound	PDQ	16	£5.95
Family Games			
Reversi	Sinclair	16	£7.95
Othello	CDS	16	£5.95
Golf	R and R	16	£3.75
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Test Match	Computer Rentals	48	£5.95
Backgammon	C P Software	48	£5.95
Draughts	C P Software	48	£6.95
Practical			
Vu-Calc	Sinclair	16	£8.95
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Vu-3D	Sinclair	48	£9.95
Collectors Pack	Sinclair	48	£9.95
Club Record Controller	Sinclair	48	£9.95
Address Manager	Oxford	16	£8.95
Finance Manager	Oxford	16	£8.95
Dietron	Custom Data	16	£4.75
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Over The Spectrum 1	Melbourne House	16	£5.95
Over The Spectrum 2	Melbourne House	16	£5.95
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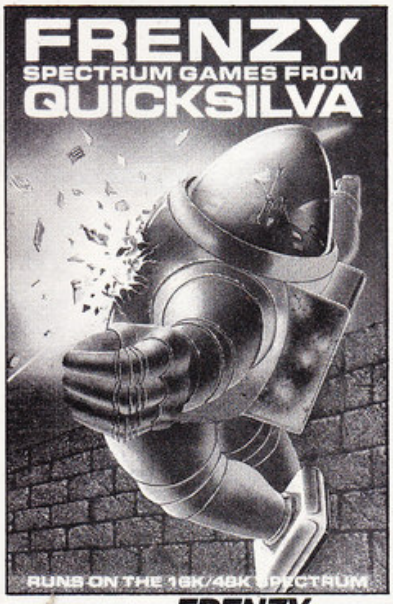

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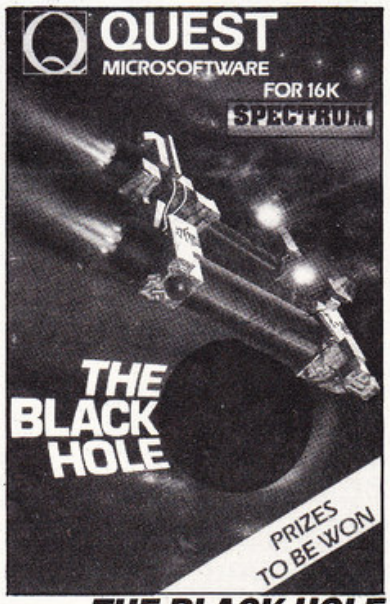

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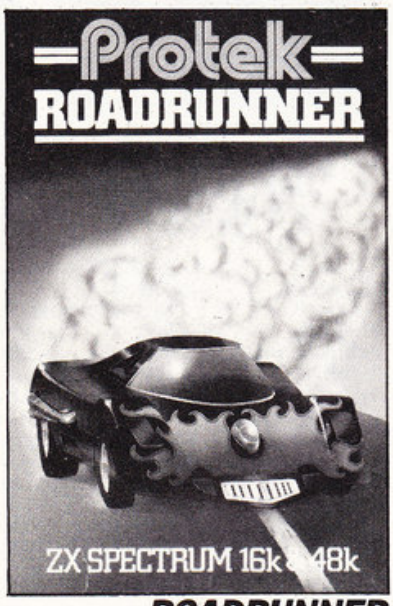

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Offer closes on July 30, 1983

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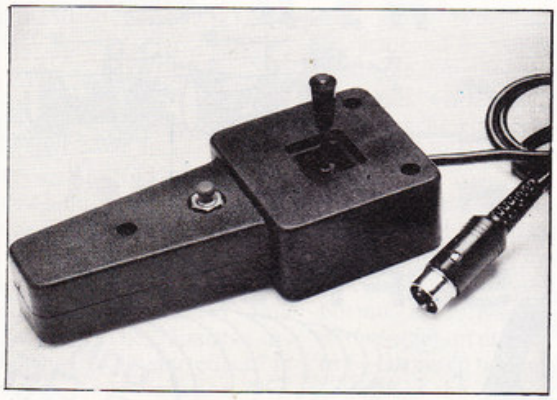

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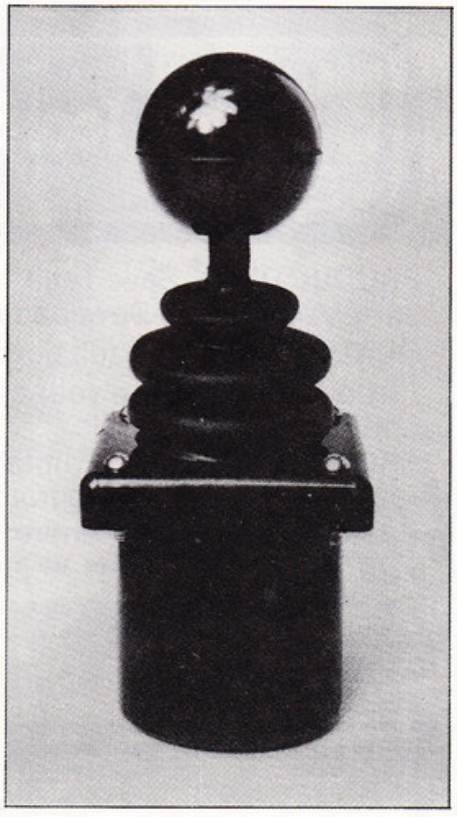

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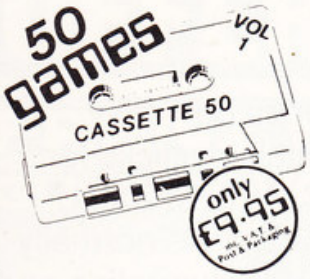

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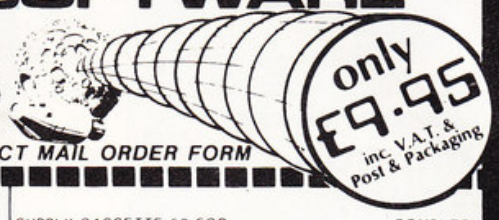

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The whole Sordid story

Oh dear. That old, old chestnut once again, just when I thought it was safe to go back into the computer store. And to what am I referring? Why, the review of the Sord M5 (*PCN May 27-June 2*). The Japanese invasion has finally started, eh? Is this the same invasion that started in 1979 with Sharp, or the 1981 one featuring NEC, or a completely new one?

You will gather that I am rather sceptical about such claims, mainly because we've heard them all before. Since the first news of the inevitable a few decidedly non-oriental companies have come and, well, sort of stayed. You may have heard of them: Acorn, Sinclair, even IBM spring to mind. Meanwhile NEC, Japan's largest computer manufacturer, has captured a full 3 per cent of the US micro market.

Perhaps one day the 'storm that's bound to break' will actually do so, but certainly the Sord M5, nice as it is, cannot be described as more than a medium-sized raindrop. I can just imagine the agonising decisions being made by British buyers: Should I buy a 48K Spectrum with a printer for £170? Or should I pay £189 and get a Sord with a full 4K (whew!) of user RAM?

Nice try, Sord. Knock the price in half, shift the reset key away from the return key, add a space-bar and you might generate some interest.

It's not the same M5 that sells for $159 (£100) in the US, is it? It is? Oh . . .
Nick Rushton,
Reading, Berks

You're right . . . we've all heard it before, but in this case powerful marketing and support could well make the Sord M5 the first really successful invader from the Orient. And the price? Inflated as usual, I'm afraid, but that seems to be the price of not being American — Ed.

Give 'mine is best' a rest

Am I alone among your readers in being justly aggrieved at the amount of space taken up in your letters column by contributions from the 'mine is best' lobby? What can possibly be achieved by constantly insulting the intelligence of other computer owners by parading their machine's shortcomings across the pages of your magazine?

Honest micro owners know only too well the areas in which the performance of their machines could be bettered; but most are to busy utilising the strong points of their computers to be bothered by them.

Perhaps the people who resort to this kind of correspondence are the type who can't think up enough uses for their expensive toys and feel they must justify their purchases on the grounds that at least they bought the best available.

I own a Dragon 32; its not the best micro in the world — I wish it had the graphics of a BBC, the sound of a Commodore 64, the speed of a Jupiter Ace, the colours of the Atari and the software support of the Spectrum — but look what it *can* do without them!

There seems something oddly perverse in criticising the minutia of someone else's home computer, when not so many years ago we were all sitting, goggle-eyed, watching James Bond pressing the buttons on his digital watch.
David H Mitchell,
Edinburgh.

Debate about the virtues of various machines can help people new to micro-computing. Nevertheless, you do have a point — Ed.

Tape me back to dear old Dolby

I have heard that a lot of Oric 1 owners have problems CLOADing tape programs.

When I received my Oric, I purchased a small cassette player, labelled 'Suitable for use with personal computers.' I then spent a very frustrating weekend, trying to load a couple of pre-recorded tapes, as well as the demo tape. I tried every variation of volume setting, with no success, I could not even re-load programs which I had CSAVEd off the machine.

I decided to experiment with my stereo cassette deck, and made up a 3-pin DIN to phono lead, using only one of the channels. It occurred to me that the purpose of the tape player is to accurately convert the magnetic information into electronic signals, and an expensive hi-fi unit should do that job much better than a cheap and nasty portable. It also offers the luxury of VU meters for proper level control.

Having switched off the Dolby etc , I gave it a try. Result — 100 per cent perfect loading every time. I can load any of the Oric software first time, including the demo tape, at 300 or 2400 baud.

So if you already have a stereo deck, try using that first, and save your £25.

Just remember to note on which channel you CSAVEd your masterpiece.
P R Strutt,
Norwich, Norfolk

Sympathy for the Devil

I write regarding the subject of software piracy mentioned in J R Mortleman's letter (*PCN, issue 11*).

The problem of software piracy lies with the software companies. Consider it, the vast majority of computer programmers who are likely to pirate programs are aged in their early teens. They probably receive a couple of pounds' pocket money a week, so it takes at least three weeks to save enough money to purchase a cassette containing, usually, one program. Therefore, who can blame them for clubbing together to buy cassettes and copying the original.

However, if the software companies were to reduce their prices to say, £3, many more people would be prepared to buy an original — I know I would.

Surely a minimum of £5 is extortionate for one program, and to my mind this gives the manufacturer a huge profit margin. Alternatively, more programs should be enclosed on the one cassette for £5. It can be done — look at Michael Orwin's game cassettes containing eight games.

To sum up, a message to the software giants, you cut your prices, we'll stop the piracy . . .
Lyndon Martin,
Whitehaven, Cumbria.

Atari *does* pack the cards

In *PCN* issue 9 Geof Wheelwright says he can't find an 80 column card for the Atari 800. Why doesn't he look in the Silica shop catalogue and price list. 'CXP 0880 80 column card — full view 80 (Bit 3) £249.00'.

Too many people seem too lethargic to find things out for themselves, especially about computers, even when the information is in the manuals supplied with them, as can be seen by looking at any letters page in any micro magazine.

As for all the writing about different computers and their proper use — piffle. If a person likes the one they have and it serves their purpose and they can afford it, then it's the best one for them.
Fred Vincent,
Maidenhead, Berks

Well, Geof tells me he didn't say we couldn't find an 80 column card — but that Atari wouldn't say where you could get one. Of course, you're right about Silica Shop and you'll find details of its card within PCN — Ed.

Grundy machine a brainwave

I'd like to reply to Anthony Hodge (*PCN, issue 9*). He may like to know that after Max Phillips' Routine Inquiries reply, I brought a Grundy Newbrain A.

For several years now I have been using a VAX (a DEC 32-bit mini). This meant that screen editing and a good keyboard were essential items.

Often underestimated, the presence of these on the Newbrain make program development infinitely easier (well, compared with the atrocious line editor on the Dragon 32).

Now then, with the machine selling consistently well in *PCN Charts*, 640×250 graphics (with commands to match) and the best built-in 80-column screen editor, when on earth are we going to see an Anatomy of the Newbrain between your worthwhile covers?
I D Walters,
Abertillery, Gwent

It's on our list, Mr Walters . . . but meanwhile if you've programs, tips etc, please send them in. Thanks — Ed.

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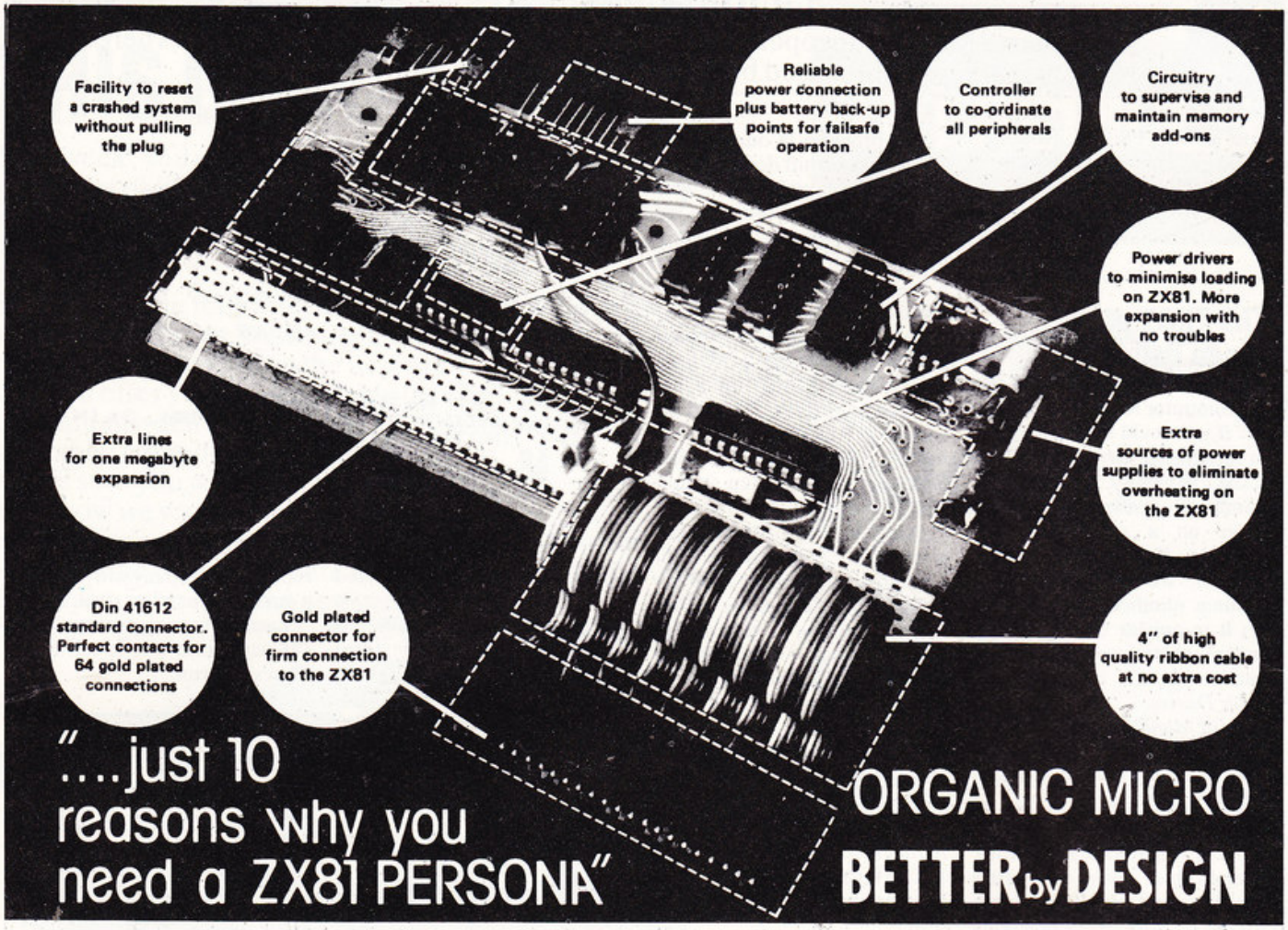

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The ZX81 as Bingo caller

Q I'm a recent convert to the computer scene, and I wonder if you could help me with a programming problem on my ZX81? How do I get a random number to print in the correct space on a set form? For example, if I wrote a bingo progam, when I generated a random number, how could I get it to appear in the correct square corresponding to that number?
Peter Davies,
Salford Manchester

A This is the sort of problem for which it's great fun to come up with your own solutions. If you are working with a complicated form, it's often easiest to use a look up a table for the coordinates of positions on the screen. So, if your tenth random number should be in a box at position 10,20 on the screen, you could have the 10,20 stored in any array X(10) and Y(10) and use PRINT AT Y(10),X(10); followed by the number.

If you've a simple form, it's often possible to use a mathematical formula to convert a number into a set of screen coordinates. As a very simple example, try the table in our illustration. Suppose you wanted to present a blank screen and then display random numbers in the correct positions.

The table has the numbers 0 to 9 on row 0, 10 to 19 on row 2, 20 to 29 on row 4 and so on. So we can get the row number to print on from the tens digit of the number. This is simply 2*INT(N/10). In a similar way, the column to tab to can be squeezed from the units digit of the number, as 3*(N-INT(N/10)*10).

The 3* separates the numbers out across the screen, assuming two character positions for each number and a space between them. Doing it this way means you should remember to put a leading space in front of single digit numbers so the columns align.

The program in our illustration is a makeshift demo of this.

If you thought that was complicated, wait until you try bingo cards. To do a good bingo program you should reproduce a real bingo card exactly, and this isn't easy.

A Mecca definition of bingo card is a nine column by three row matrix. There are five numbers and four 'blanks' on each row. The numbers from 1 to 90 can appear on this. Numbers less than ten should be (in order) in column one. Column two is for 10 to 19, three is for 20 to 29 and so on until column 9, which is for 80 to 90.

To prove it can be done, here's a sample card from my first attempt at it (running on a BBC . . . I'll admit it):

```
** 13 ** 32 ** 52 ** 72 81
 6 16 ** 33 ** 54 ** ** 84
 8 ** ** 34 44 55 ** 75 **
```

Incidentally, my program works on a 9×3 array, marking the blanks first and putting the numbers in afterwards.

The form is displayed simply by printing out the array in order.

Now the fun really starts. Your program shouldn't generate the same card twice in any one game (guess why). In real life around three-quarters of the numbers are the same on all cards, with the last quarter being random. This keeps the tension up and all the players interested.

In short, if you are looking for a good program to write, you've found one. Bingo!

```
 0  1  2  3  4  5  6  7  8  9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49

 10 CLS
 20 LET N=INT (RND*50)
 30 PRINT AT 2*INT (N/10),3*(N-
INT (N/10)*10);
 40 IF N<10 THEN PRINT " ";
 50 PRINT N;
 60 GOTO 20
```

Joysticks for the Spectrum

Q I was interested in the Pickard Joystick controller featured in PCN issue 11, and wondered if anybody can fit it, and will it attach to any Spectrum? Could you give me an address where I could buy one?
Andrew Ackers,
Ormskirk, Lancs

A Anyone can fit the Pickard provided they don't mind a bit of fiddle and tearing up their warranty card. You have to open the Spectrum, pull off its keyboard ribbon, connect the controller and reconnect the keyboard ribbon. There's no reason why the controller should be fussy about the sort of Spectrum that it is connected to.

The joystick controller is available only directly from Success Services at 154 High St, Bloxwich, Walsall, West Midlands. The price is £18.95 plus £1 post and packing. The phone number is (0922) 402403.

Research into RAMtop

Q I'm a long-standing ZX81 owner, but I've decided to upgrade to a 48K Spectrum. I've just a few questions: How do you check RAMtop on a ZX81? Where can I sell my 16K ZX81 with its software and hardware for a good price? Is it possible to load a 16K Spectrum cassette into a 48K Spectrum?
Larry Leung,
Sutton Coldfield, Birmingham

A RAMtop on the ZX81 is stored in locations 16388 and 16389 in memory, and is written about on page 177 of your ZX81 manual. To read its value, you can just use PRINT PEEK 16388 + PEEK 16389*256.

As to selling the ZX81, the choice is up to you. You'll get a good price through classifieds like *PCN*'s Billboard, though selling time can be slow. Ads in local newsagents and so on can frequently bring a surprising response, and there are a number of dealers offering second-hand equipment and part-exchanges.

Some of these are one-off initiatives. Others are existing firms changing specialities, mostly camera shops. These are a bit young to judge at the moment, and camera habits such as book pricing don't put sellers in a good position. But a reputable company will provide a quick and painless deal.

Lastly, of course you can load 16K tapes into 48K Spectrums. They even run.

Cheaper micros? Wait a bit . . .

Q Do you think IBM or DEC will bring the cost of a 16-bit system down to £500, and down to the size of the Newbrain, and If so, when? Tandy seems to be trying in the States, but it doesn't have the marketing in the UK media that is required.
J Gibson,
Romsey, Hants

A If IBM doesn't do it, somebody else will. Already, Advance Products is working on the Advance 86a, a £400 cassette-based version of the IBM.

The Advance is rumoured to use ULAs and such fancy gizmos to reduce the chip count and board size. So you can do an IBM in a small space. Hopefully, Advance can do it for a small price.

Of course, if you want a twin disk machine for £500, you'll have to wait a bit longer, but not a lot longer. IBM compatibles around the £1,400 mark will mean that cheapo CP/M machines will have to be repriced. And of course, the Japanese can't continue to resist temptation.

So as a general trend, prices go down, performance goes up and size goes down. As for the other companies you mention, I wouldn't expect DEC to come down to the rough and tumble end of things, but Tandy is perfectly capable of anything to which it put its mind. Even in this country.

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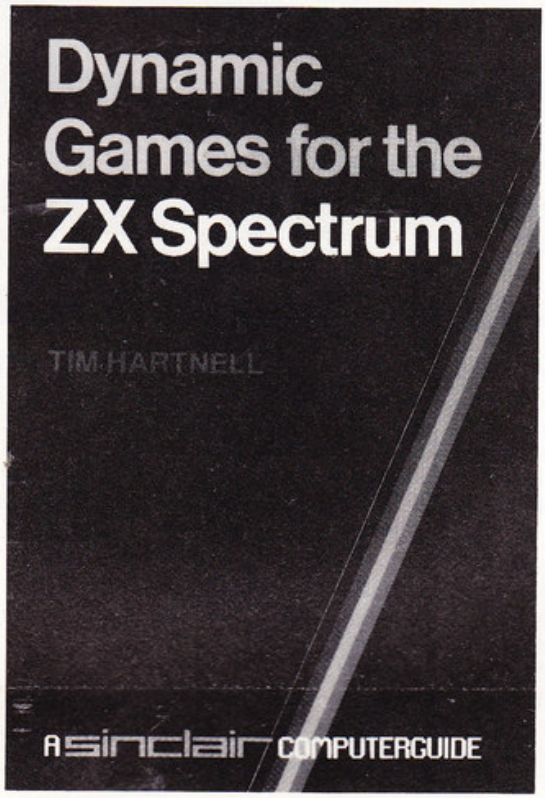
Dynamic Games for the ZX Spectrum



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On location with the Oric

Here are a few tips for Oric owners. The top of Oric's user memory is stored in A6 (166) not 9A as it says in the manual. When you load machine code programs you don't need to specify the start and end addresses as these are stored with the program.

Once you've loaded the programs, DEEK(95) gives the start address and DEEK(97) the end address. These values could be useful if you want to restart or save the machine code.

M R Chambers,
Bury, Lancs

Tandy print diversion

There's an easy way to redirect output on a TRS80 model 1 or 3. To send LPRINTs to the screen rather than printer, POKE 16422,88: POKE 16423,4. To reset this to its normal mode POKE 16422, . 141: POKE 16423,5.

Alternatively, POKE 16414, 141:POKE 16415,5 will send the output of PRINT statements to the printer rather than the screen. Use POKE 16414,88:POKE 16415,4 to put things back to normal.

John Allsopp,
Huddersfield, West Yorks

Improved ZX autostart

Most ZX81 owners know how to create an autostarting program. If you have the lines:

```
9000 SAVE "SELFSTART"
9010 LET START=10
9020 GOTO START
```

then saving the program with GOTO 9000 will mean that it starts running from line 9010 whenever it is loaded.

There is one snag with this. As well as saving the program, the ZX81 saves all its system variables. So if you use RAND before any user input in the program, the same random seed will be loaded from tape and you'll always get the same sequence of random numbers.

To cure this, use the following save routine:

```
9000 SAVE "SELFSTART"
9005 LET START=10
9010 CLS
9015 PRINT AT 10,3; "PRESS
   A KEY TO START"
9020 IF INKEY$="" THEN
   GOTO 9020
9025 CLS
9030 GOTO START
```

M J Plummer,
Redhill, Surrey

Lynx memory on the move

This simple routine will move the start of the Basic program area on the Lynx to the specified address. It can be useful for storing machine code below Basic programs where it cannot be overwritten. You could even use it to hold two or more Basic programs at once.

```
10 INPUT "Start of Basic
   area?";X
20 POKE X-1,13
30 POKE X,128
40 DPOKE 25082,X
50 DPOKE 25084,X
60 DPOKE 25119,X+1
```

25082/3 holds the location of the start of the Basic programming area and 25119/20 holds the end of the array area.

Clive Newton,
Sutton Coldfield, West Midlands

Speed up the Oric editor

Editing Oric programs using CTRL-A can get quite frustrating. You can make life easier by increasing the auto-repeat rate of the keys.

Do this by POKEing 839 with a suitable value . . . 16 is a good place to start. This might upset program execution so reset it with POKE 839,39 before running the program.

P Humphrey,
Harraton, Washington

Dragon dodges and interrupts

There are quite a few undocumented but useful Dragon addresses. 363 and 364 contain the vector for the machine's keyboard interrupts. The interrupts are enabled with POKE 362,126 and disabled with POKE 362,57.

Location 135 contains the ASCII code of the last key pressed.

One problem with the Basic is that only USRO works. To overcome this, you can change the address of USRO or go back to using plain old EXEC.

A Ward,
Gillingham, Kent

Oric reset disabled

All Oric owners know there is a soft reset switch on the underside of their machines. This switch is connected to an interrupt line on the 6502 which fetches the new program counter address from &FFFA. In the Oric, this address is &22B and the routine stored there is:

```
22B JMP F430
22E ORA (00,X)
230 RTI
```

To disable the reset key, all you need to do is put an RTI at the beginning of this routine. Just POKE 555,64.

Gordon Love,
Hamilton, Lanarkshire

Short sort for the Lynx

This short program for the Lynx will sort a list of words. It isn't intended to demonstrate the rather inefficient bubble sort technique but is designed to show a way of comparing strings on the Lynx.

Normally, the Lynx can only compare strings for being = or NOT. The section of program between 210 and 330 compares two strings character by character using the ASC function to extract the ASCII codes of each character.

You could pull this routine out of the program and use it as a PROCedure in your own programs.

John Moulson,
Grimsby, South Humberside

```
  100 CLS
  110 INPUT "HOW MANY WORDS ";A
  120 DIM A$ (20) (A)
  130 DIM T$ (20)
  140 DIM R$ (20)
  150 DIM S$ (20)
  160 FOR B=1 TO A
  170 INPUT A$(B)
  180 NEXT B
  190 FOR F = 1 TO A-1
  200 FOR G = F+1 TO A
  210 IF ASC(A$(F))<>ASC(A$(G)) THEN GOT
O 330
  220 L = LEN (A$(F))
  230 K = LEN (A$(G))
  240 IF L<K THEN LET J=L
  250 ELSE LET J=K
  260 B=0
  270 B=B+1
  280 LET S$= RIGHT$(A$(F),L-B)
  290 LET R$= RIGHT$(A$(G),K-B)
  300 IF ASC(S$)<ASC(R$) THEN GOTO 370
  310 IF ASC(S$)>ASC(R$) THEN GOTO 340
  320 IF B<J THEN GOTO 270
  330 IF ASC(A$(F))<ASC(A$(G)) THEN GOTO
370
  340 T$=A$(G)
  350 A$(G)=A$(F)
  360 A$(F)=T$
  370 NEXT G
  380 NEXT F
  390 CLS
  400 FOR B=1 TO A
  410 PRINT A$(B)
  420 NEXT B
```

String sort routine — see *Short sort for the Lynx*

NEWBRAIN BASIC: PART 1

David Janda explores the mind of a micro with a powerful Basic interpreter and editor.

Probe the NewBrain

The NewBrain microcomputer has been available for some months, but it has received little attention. This is surprising, because it has a very powerful Basic interpreter and editor. The Basic isn't the fastest available, but it's fast enough for most applications. Programs can be written for maximum speed by including LET statements with FOR . . . NEXT loops, for example.

The graphics on the NewBrain are also powerful, with commands enabling the user to set up a 'graphics screen' where lines and circles can be drawn. These graphics screens can take up any part of the screen, and text can be displayed around the screen if the user wishes.

Every NewBrain comes with two manuals, the beginner's guide and the user manual. In this and next week's issue I'll be looking at the various features of NewBrain Basic, and explaining how these can be used to interact with the user.

Unlike many micros available today, the NewBrain's numeric variables can be made up only of the letters A to Z, and the numbers 0 to 9. String variables are much the same, but must end with '$'.

Using long variable names can slow down a program, but it *is* very handy — in long programs in particular, as using short variable names can be confusing.

On the subject of variable assignment, NewBrain Basic allows the programmer to either include or omit the LET statement. The examples in the beginner's guide show the latter, but, after running tests I found that the Basic runs faster if the LET statement is included.

String handling is achieved à la Microsoft Basic, the only major difference being that NewBrain Basic allows unlimited string size. But be careful — you may run out of memory.

All the usual Microsoft string handling commands, such as LEN(n$), MID$(n$,X,Y) LEFT$(n$,X) and RIGHTS$(n$,Y) are in NewBrain Basic. MID$ is also allowed in the form MID$(n$,X) where n is the name of the string. This will return the remainder of the string from character X. The logical AND and OR may be used in IF statements where a string is part of the test, *eg.*

```
IF M$="FEBRUARY" OR
  N$="February" AND D=28 THEN
  GOTO 100
```

Vectors and matrices

The NewBrain will handle one and two dimensional arrays with up to 5,374 elements. The arrays should be declared before working on them, but if this is not done, a default of ten elements will be assigned.

One handy feature when using arrays is the ability to clear the contents of the array as well as cancelling the dimension by using CLEAR n$(). This can be used as a form of garbage collection, and you would most likely use it in very large programs where remaining memory is minimal.

Most applications requiring the use of arrays only need two dimensions, and the NewBrain provides this. But it can be handy to use multidimensional arrays for clarity, especially when dealing with text, and it is a pity that the NewBrain can't handle multidimensional arrays.

Streams of control

The NewBrain provides sophisticated — albeit complicated — control of how information is handled by the computer. For the flow of data between the computer and I/O (including the screen), the OPEN statement is used. On the other hand, control characters can be 'written' to the screen either directly or by writing them with CHR$(n) or PUT x, y.

First the control characters. The PUT statement can be used to place text at a certain place on the screen, or to write control character to the screen. Here is a short list of some of the PUTs:

- PUT 31 — Clear screen
- PUT 30 — Clear a line
- PUT 11 — Move cursor up
- PUT 10 — Move cursor down
- PUT 1 — Insert blank line
- PUT 22 — Place cursor

The writing of control codes can be a powerful tool in designing screen layouts. It can also be used to control the switching of the four character sets that the NewBrain has — more of that later.

OPEN allows the programmer to control the way data is sent to I/O. This is used mainly for defining the high-resolution screens, but can be also used to control the way the data is sent to the cassette recorder and disks.

For example, it is possible to have either a 40 or 80 column screen on the NewBrain. The way to do this is to enter (in a program or direct mode):

- OPEN#0,0, "L" *For 80 characters per line*
- OPEN#0,0, "S" *For 40 characters per line*

The power (and complexity) of OPEN is clear when it is used with the NewBrain's graphic commands.

Before any graphics work can be done with the NewBrain, you have to set up a screen. Again OPEN has to be used to define the size, shape, and position of the screen.

NEXT WEEK A major program to illustrate control of data flow, plus data file programming commands and graphics.

John Dee presents a graphics editor program for use on the Sirius 1 with the Graphics Tool Kit.

GRAFIC CONTROL

Grafic is a simple interactive editor designed to be used in conjunction with the Sirius Graphics Tool Kit and Grafix kernal to design and save screens without the need to write one-off programs for development purposes.

Screens produced with Grafic can be used from applications programs using the Sirius Grafix program. Grafic — as listed on pages 22 and 23 — is written in standard Microsoft Basic and runs under MSDOS on the Sirius. It should give you a high-level interface to the Sirius Grafix kernal software for program and screen development purposes.

An interpretive version of the program will require a 256K machine, but if a compiler is available a compiled version will run on the basic 128K machine.

The command line for Grafic is free format and its only restriction is that parameters are separated from the keyword by at least one space. The command can begin anywhere on the current command line, as leading and trailing spaces are ignored.

The response "?" comes in reply to an incorrectly written or unimplemented command. If parameters are omitted, zero is assumed. Commands may be in upper and lower case. The draw command allows you to use the Sirius cursor keys to draw shapes anywhere on the screen, turn pixels on and off and start and stop drawing.

After using the cursor keys to draw a shape, you can then fill the shapes in with eight different types of patterns. FILL sketches the region surrounding the current cursor position with the currently enabled fill pattern. The pattern command (PATTERN x), where x is the number of pattern type, will be implemented on the FILL command.

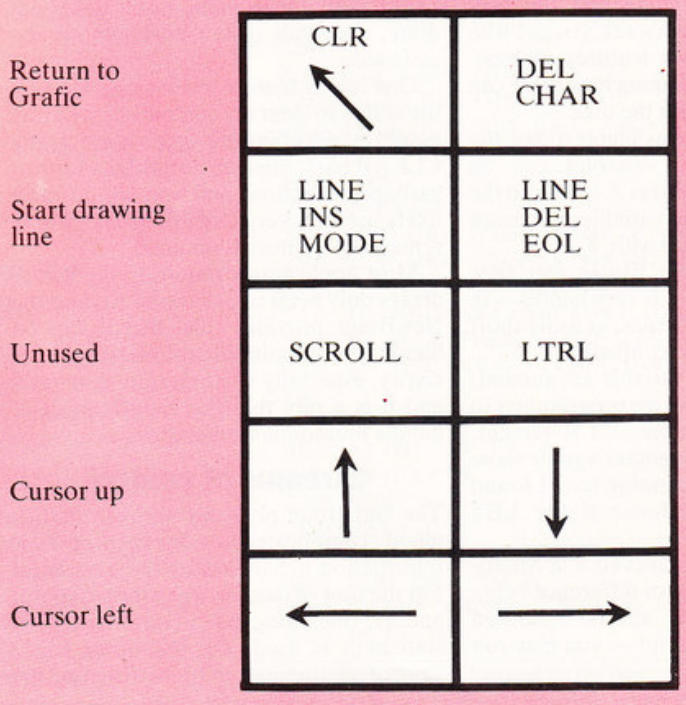
The combination rules are the same as in the Graphics Tool Kit manual, which should be consulted for further details on how they work. The tool kit contains a number of other programs in addition to Grafix:

- Busigraf — A business graphics package that allows you to make and edit pie charts, bar graphs, line plots etc.
- Chargraf — A character graphics system that allows you to create and print graphics using characters instead of high-resolution graphics.
- Efont — A font editor used to define or modify the character set.
- Keygen — A keyboard generator used to define characteristics of individual keys.
- Modcon — A console modification utility that allows you to set and save keyboard tables and character sets.
- GW Basic — An interactive interpreter that supports hi-res graphics and music.

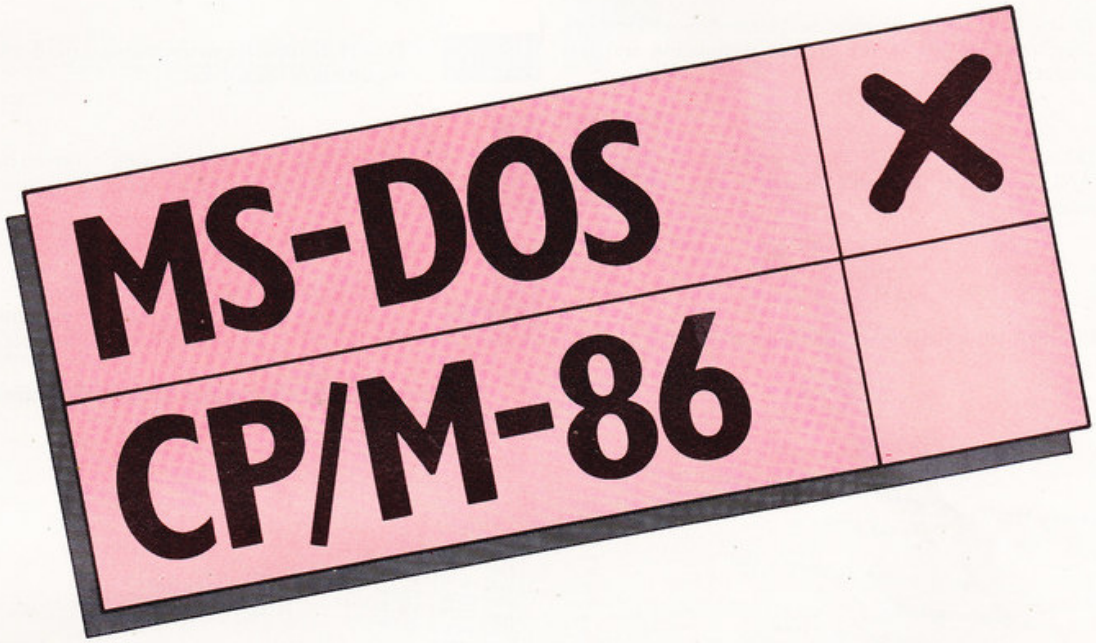
COMMANDS

EXIT	Returns to MS-DOS
CLEAR	Clears graphics screen and returns cursor to 0,0. Other parameters remain unchanged.
MOVETO x y	Moves cursor to screen co-ordinates (x,y).
MOVEBY x y	Moves cursor from the current position by the increments (x,y).
LINETO x y	Draws a line from the current position to the co-ordinates (x,y).
LINEBY x y	Draws a line from the current cursor position by the increment (x,y).
CIRCLE x	Draws a circle of radius x around the current cursor postion.
PATTERN x	Selects a fill pattern, where x is in the range 0-8. The density of the pattern increases as the number does. Pattern 8 is blank.
FILL	Fills the region surrounding the current cursor position with the currently enabled fill pattern.
DUMP	Dumps the graphics screen to the currently enabled dot matrix printer (as specified when Grafix was loaded).
CURSOR ON	Enables cursor.
CURSOR OFF	Disables cursor.
CURSOR SAVE	Saves internally, the position of the cursor on the graphics screen.
CURSOR RETURN	Returns the cursor to the last saved position.
CURSOR FIND	Reports the current cursor position on the screen.
CURSOR TYPE x	Selects a cursor type where x is in the range 0-2: Type 0 = block cursor Type 1 = gun sight Type 2 = arrow
SAVE filename	Saves the current screen window on disk with the name filename SCR. No extension needs to be given, but a drive specifier may be used. Filename can be up to eight characters.
LOAD filename	Loads a screen at the current cursor position (filename details as above).
BAR x y	Fills a bar with sides of size x y from the current cursor position with the currently enabled fill pattern.
ARC r xl yl x2 y2	Draws an arc of radius r from co-ordinates (xl yl) to (x2 y2) which must lie on the circle of a specified radius.
WINDOW FIND	Reports the current window origin and size to the screen.
WINDOW DRAG	Copies the currently defined screen window to the present cursor position.
WINDOW SET x y	Defines the current graphics window, based at the current cursor position with the height and width as specified by x,y.
LINE TYPE x	Sets the line type as follows: type 1 = solid line; type 2 = dashed line, 4 on 4 off; type 3 = dashed line, 8 on 4 off; type 4 = dot dashed, 4 on 2 off 2 on 2 off; type 5 = dot dashed, 8 on 3 off 3 on 3 off;
LINE WIDTH x	Selects the line width (in pixels), either 1,2,4 or 6.
RESET	Resets the system parameters (see Grafix manual, ESC 5d) and sets the step rate for the draw facility to 1.
SCREEN RULE x	Sets the current screen combination rule (see pages 22/23).
STEP x	Sets the step rate for the draw command.
DRAW	See panel below.
WRITE string	Write the string at the current cursor position.

Keyboard layout for the DRAW command



THE BATTLE IS OVER...



"MS-DOS has become the dominant 16-bit operating system . . ."

Computing, 17th February '83

". . . now it is clear that MS-DOS is the runaway winner."

Weekly Micro Bulletin, 21st February '83

"MS-DOS . . . has virtually stopped the runaway success of Digital Research's CP/M in its tracks."

Infomatics Daily Bulletin, 14th January '83

"Digital Research . . . may be too late to stop the landslide."

Personal Computer News, 20th May '83

"In quick succession, more than 50 other computer hardware manufacturers picked Microsoft's operating system. As a result, MS-DOS has virtually shut CP/M out of the market for newer, more powerful microcomputers."

Business Week, 21st February '83

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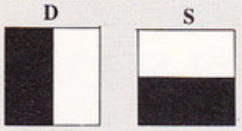

THE COMBINATION RULES

The portion of a screen (or a whole screen) to be moved is called the source and is labelled "S". The portion of the screen (or a whole screen) targeted as the location of the move is called the destination. Before your move, it is labelled "D"; after the move, the destination is labelled "D".

The following rules specify the possible transformations of the destination by the source:

D' = 0: The destination RAM contains all zeroes.

D' = S AND D: The destination is formed by ANDing the corresponding bits in the original destination and the source.

D' = S AND NOT D: The destination is formed by ANDing the complemented original destination with the source.

D' = S: The source is moved to the destination.

D' = NOT S AND D: The destination is formed by ANDing the inverted source with the destination.

D' = D: No operation; no change in the destination results regardless of the source.

D' = S XOR D: The destination is formed by XORing the corresponding bits in the original destination and the source.

D' = S OR D: The destination is formed by ORing the corresponding bits in the original destination and the source. This is the starting combination rule.

The listing for Grafic with the appropriate REM statements to allow easy diagnosis.

```
000 '*************************************************************
010 '*                                                           *
020 '* GRAFIC PROCESSOR          Version 1.0  April 1983         *
030 '*                                                           *
040 '*                          Load GRAFIX in the following way,*
050 '*                                                           *
060 '*                          A)GRAFIX $SIC0Fx                 *
070 '*                                                           *
080 '*                          where x is the printer type,     *
090 '*                          (see later note in DUMP module). *
100 '*                                                           *
110 '*                                                           *
120 '*************************************************************
130 '
140 ' TRAPS
150 '
160 ON ERROR GOTO 1860
170 '
180 ' SET UP ANY CONSTANTS
190 '
200 DEFINT A-Z
210 ESC$=CHR$(27)
220 GRAF$=ESC$+"5"
230 CLS$=ESC$+"E"
240 KEY$=ESC$+"4"
250 '
260 ' RESET THE DISPLAY DRIVER AND RECONFIGURE THE FUNCTION KEYS
270 '
280 PRINT CLS$                          ' CLEAR TEXT WINDOW
290 PRINT ESC$+"y4"                     ' SET UNDERLINE CURSOR
300 PRINT ESC$+"m247"                   ' SET TEXT LINES 21-24
310 PRINT GRAF$+"2"                     ' CLEAR GRAFIX SCREEN
320 STP=1                               ' DRAW STEP IS 1 PIXEL
330 PRINT KEY$+"1"+CHR$(47)+"G"         ' START LINE DRAWING
340 PRINT KEY$+"1"+CHR$(88)+"U"         ' UP ARROW KEY
350 PRINT KEY$+"1"+CHR$(89)+"D"         ' DOWN ARROW KEY
360 PRINT KEY$+"1"+CHR$(98)+"L"         ' LEFT ARROW KEY
370 PRINT KEY$+"1"+CHR$(99)+"R"         ' RIGHT ARROW KEY
380 PRINT KEY$+"1"+CHR$(48)+"S"         ' STOP LINE DRAWING
390 PRINT KEY$+"1"+CHR$(26)+"Q"         ' QUIT THE DRAW FACILITY
400 PRINT KEY$+"1"+CHR$(27)+"-"         ' TURN OFF A PIXEL
410 PRINT KEY$+"1"+CHR$(67)+CHR$(0)     ' NUL KEY VALUE
420 PRINT KEY$+"1"+CHR$(68)+"+"         ' TURN ON A PIXEL
430 PRINT SPC(29) "GRAFIC -- Version 1.0" ' TELL DUMBO WHAT HE'S USING
440 '
450 ' GET THE INSTRUCTION
460 '
470 LINE INPUT "$ ";COM$
480 '
490 ' LOAD THE KEY WORD INTO KEY$, IGNORING LEADING SPACES
500 '
510 GOSUB 3910 : GOSUB 4070 : KEY$=TMP$
520 '
530 ' DECODE INSTRUCTIONS
540 '
550 IF KEY$="EXIT"    THEN 1780
560 IF KEY$="CLEAR"   THEN 2250
570 IF KEY$="MOVETO"  THEN 1910
580 IF KEY$="LINETO"  THEN 1980
590 IF KEY$="MOVEBY"  THEN 2050
600 IF KEY$="LINEBY"  THEN 2120
610 IF KEY$="CIRCLE"  THEN 2190
620 IF KEY$="PATTERN" THEN 2310
630 IF KEY$="FILL"    THEN 2380
640 IF KEY$="CURSOR"  THEN 2430
650 IF KEY$="DUMP"    THEN 2640
660 IF KEY$="SAVE"    THEN 2790
670 IF KEY$="LOAD"    THEN 2800
680 IF KEY$="BAR"     THEN 2940
690 IF KEY$="ARC"     THEN 3010
700 IF KEY$="WINDOW"  THEN 3110
710 IF KEY$="LINE"    THEN 3310
720 IF KEY$="RESET"   THEN 3470
730 IF KEY$="SCREEN"  THEN 3530
740 IF KEY$="DRAW"    THEN 3630
750 IF KEY$="STEP"    THEN 3700
760 IF KEY$="WRITE"   THEN 3840
770 GOTO 1860
780 '
790 ' FINI  -  BACK TO MS-DOS
800 '
810 PRINT GRAF$+"2"     ' CLEAR GRAFIX SCREEN
820 PRINT ESC$+"m2 7"   ' SET TEXT LINES 1-24
830 PRINT ESC$+"x4"     ' SET BLOCK CURSOR
840 PRINT CLS$          ' CLEAR TEXT WINDOW
850 END
860 '
870 ' GRAFIC ERROR TRAP
880 '
890 LINE INPUT "? ";COM$
900 GOTO 480
910 '
920 ' MOVETO MACRO
930 '
940 GOSUB 3910 : PAR1=TMP
950 GOSUB 3910 : PAR2=TMP
960 PRINT GRAF$+"G";PAR1,PAR2
970 GOTO 1440
980 '
990 ' LINETO MACRO
000 '
010 GOSUB 3910 : PAR1=TMP
020 GOSUB 3910 : PAR2=TMP
030 PRINT GRAF$+"U";PAR1,PAR2
040 GOTO 1440
050 '
060 ' MOVEBY MACRO
070 '
080 GOSUB 3910 : PAR1=TMP
090 GOSUB 3910 : PAR2=TMP
100 PRINT GRAF$+"R";PAR1,PAR2
110 GOTO 1440
120 '
130 ' LINEBY MACRO
140 '
150 GOSUB 3910 : PAR1=TMP
160 GOSUB 3910 : PAR2=TMP
170 PRINT GRAF$+"F";PAR1,PAR2
180 GOTO 1440
190 '
200 ' CIRCLE MACRO
210 '
220 GOSUB 3910 : PAR1=TMP
230 PRINT GRAF$+"P";PAR1
240 GOTO 1440
250 '
260 ' CLEAR THE GRAFIX SCREEN AND RETURN CURSOR TO 0,0
270 '
280 PRINT GRAF$+"2";
290 PRINT GRAF$+"R";0;0
300 GOTO 1440
310 '
320 ' PATTERN MACRO
330 '
340 GOSUB 3910 : PAR1=TMP
350 IF PAR1<0 OR PAR1>8 THEN 1860
360 PRINT GRAF$+"L";PAR1
370 GOTO 1440
380 '
390 ' FILL MACRO
400 '
410 PRINT GRAF$+"M"
420 GOTO 1440
430 '
440 ' CURSOR MACRO
450 '
460 GOSUB 3910 : GOSUB 4070 : PAR$=TMP$
470 IF PAR$="ON"     THEN PRINT GRAF$+"q" : GOTO 1440
480 IF PAR$="OFF"    THEN PRINT GRAF$+"r" : GOTO 1440
490 IF PAR$="SAVE"   THEN PRINT GRAF$+"0" : GOTO 1440
500 IF PAR$="RETURN" THEN PRINT GRAF$+"1" : GOTO 1440
510 IF PAR$="TYPE"   THEN 2540
520 IF PAR$="FIND"   THEN 2580
530 GOTO 1860
540 GOSUB 3910 : PAR1=TMP
550 IF PAR1<0 OR PAR1>2 THEN 1860
560 PRINT GRAF$+"x";PAR1
570 GOTO 1440
580 PRINT GRAF$+"U
590 INPUT PAR1
600 INPUT PAR2
610 PRINT CLS$
620 PRINT USING "
630 GOTO 1440
640 '
650 ' DUMP THE GR
660 '
670 ' NOTE - whe
680 '
690 '           $SI
700 '           $SI
710 '           $SI
720 '           $SI
730 '
740 PRINT ESC$+
750 PRINT CLS$
760 PRINT GRAF$
770 PRINT ESC$+
780 GOTO 1440
790 '
800 ' SAVE A W
810 '
820 GOSUB 391
830 PRINT ESC
840 PRINT CLS
850 PRINT GRA
860 PRINT ESC
870 GOTO 144
880 '
890 ' LOAD A
900 '
910 GOSUB 3
920 PRINT G
930 GOTO 14
940 '
950 ' BAR M
960 '
970 GOSUB
980 GOSUB
990 PRINT
000 GOTO 1
010 '
020 ' ARC
030 '
040 GOSUB
050 GOSUB
060 GOSUB
070 GOSUB
080 GOSUB
090 PRIN
100 GOTO
110 '
120 ' WI
130 '
140 GOS
150 IF
160 IF
170 IF
180 GO
190 GO
200 GO
210 PR
220 GO
230 PR
240 I
250 I
260 I
270 I
280 I
290 I
300 I
310 I
320 I
330 I
340 I
350 I
360 I
```

8

D' = NOT S AND NOT D: The destination is formed by ANDing the complemented destination and the complemented source.

9

D' = NOT S XOR D: The destination is formed by XORing the corresponding bits in the original destination and the complemented source.

10

D' = NOT D: The destination is formed by complementing all the bits in the original destination.

11

D' = S OR NOT D: The destination is formed by complementing the original destination and ORing the corresponding bits with the source.

12

D' = NOT S: The complemented source is moved to the destination.

13

D' = NOT S OR D: The destination is formed by O Ring the corresponding bits in the original destination and the complemented source.

14

D' = NOT S OR NOT D: The destination is formed by ORing the complemented original destination and the complemented source.

15

D' = 1: The destination contains all ones.

The combination rules provide flexibility in graphics presentation, including simulating motion on the screen. The diagrams show the results of applying the combination rules to a simple destination and source.

LINE DRAW FUNCTIONS

The 16 combination rules can be summarised in the following four rules for all the Line Draw functions. In this case, the line is the source and all the dots in the source are ON.

> Hard write (or OR-in) the line. (D' = S)
> Erase a line. (D' = NOT S)
> XOR-in the line. (D' = D XOR S)
> No operation. (D' = D)

```
nd at ffff X  ffff Y";PAR1,PAR2

HICS SCREEN TO CURRENTLY ENABLED DOT MATRIX PRINTER

oading the kernal, specify the dot matrix printer in use

"N - NO PRINTER
"C - C.Itoh and ACT printers
"E - Epson printers
"S - Tally printers

"          ' DISABLE THE CURSOR SO THAT IT ISN'T PRINTED
"          ' CLEAR THE TEXT SCREEN

"          ' ENABLE THE CURSOR SO WE CAN SEE IT AGAIN

OW ON DISK

FILE$=TMP$ ' FILENAMES ARE CONVERTED TO UPPER CASE BY GIOS
x5"        ' DISABLE THE CURSOR SO THAT IT DOESN'T SHOW
"S";FILE$  ' CLEAR THE TEXT SCREEN
U5"

NDOW FROM DISK

: FILE$=TMP$ ' FILENAMES ARE CONVERTED TO UPPER CASE BY GIOS
$+"T";FILE$


0
 : PAR1=TMP
 : PAR2=TMP
F$+"N";PAR1,PAR2


ERO
10 : PAR1=TMP
10 : PAR2=TMP
10 : PAR3=TMP
910 : PAR4=TMP
910 : PAR5=TMP
RAF$+"h";PAR1,PAR2,PAR3,PAR4,PAR5
40

W MACRO
3910 : GOSUB 4070 : PAR$=TMP$
$="DRAG" THEN PRINT GRAF$+"U";0 : GOTO 1440
$="SET"  THEN 3190
$="FIND" THEN 3230
1860
3910 : PAR1=TMP
3910 : PAR2=TMP
GRAF$+"I";PAR1,PAR2
1440
 GRAF$+"e"
T PAR1
T PAR2
T PAR3
T PAR4
NT CLS$
NT USING "Window top at ffff X  ffff Y , Width ffff , Height ffff";PAR1,PAR2,PAR3,PAR4
D 1440

EFINE LINE CHARACTERISTICS

UB 3910 : GOSUB 4070 : PAR$=TMP$
 PAR$="TYPE"  THEN 3380
 PAR$="WIDTH" THEN 3420
3370 GOTO 1860
3380 GOSUB 3910 : PAR1=TMP
3390 IF PAR1<1 OR PAR1>5 THEN GOTO 1860
3400 PRINT GRAF$+"Z";PAR1
3410 GOTO 1440
3420 GOSUB 3910 : PAR1=TMP
3430 IF PAR1<1 OR PAR1>6 THEN 1860
3440 IF PAR1=3 OR PAR1=5 THEN 1860 ' NOT SUPPORTED WITH THIS RELEASE
3450 PRINT GRAF$+"Y";PAR1
3460 GOTO 1440
3470 '
3480 ' RESET GRAFIX
3490 '
3500 PRINT GRAF$+"d"
3510 STP=1
3520 GOTO 1440
3530 '
3540 ' SCREEN MACRO
3550 '
3560 GOSUB 3910 : GOSUB 4070 : PAR$=TMP$
3570 IF PAR$="RULE"  THEN 3590
3580 GOTO 1860
3590 GOSUB 3910 : PAR1=TMP
3600 IF PAR1<0 OR PAR1>15 THEN 1860
3610 PRINT GRAF$+"X";PAR1
3620 GOTO 1440
3630 '
3640 ' DRAW MACRO TO USE THE FUNCTION KEYS
3650 '
3660 TYPE$="R"
3670 SCAN$=INKEY$ : IF SCAN$="" THEN 3670
3680 IF SCAN$="U" THEN PRINT GRAF$+TYPE$;0,-STP
3690 IF SCAN$="D" THEN PRINT GRAF$+TYPE$;0,STP
3700 IF SCAN$="L" THEN PRINT GRAF$+TYPE$;-STP,0
3710 IF SCAN$="R" THEN PRINT GRAF$+TYPE$;STP,0
3720 IF SCAN$="+" THEN PRINT GRAF$+"c1"
3730 IF SCAN$="-" THEN PRINT GRAF$+"c0"
3740 IF SCAN$="S" THEN TYPE$="f"
3750 IF SCAN$="R" THEN TYPE$="R"
3760 IF SCAN$="Q" THEN 1440
3770 GOTO 3670
3780 '
3790 ' SET STEP RATE FOR DRAW FACILITY
3800 '
3810 GOSUB 3910 : PAR1=TMP
3820 IF PAR1<1 THEN 1860 ELSE STP=PAR1
3830 GOTO 1440
3840 '
3850 ' HI-RES PRINT FACILITY
3860 '
3870 GOSUB 4010 : PAR$=COM$
3880 IF PAR$="" THEN 1860
3890 PRINT GRAF$+"p";PAR$
3900 GOTO 1440
3910 '
3920 ' FIND A NUMERIC OR STRING PARAMETER
3930 '
3940 GOSUB 4010 ' TO STRIP OFF ANY LEADING SPACES
3950 TEMP$=COM$
3960 IF LEFT$(TEMP$,1)<>" " THEN TEMP$=RIGHT$(TEMP$,LEN(TEMP$)-1) : GOTO 3960
3970 TMP$=LEFT$(COM$,LEN(COM$)-LEN(TEMP$))
3980 TMP=VAL(TMP$)
3990 COM$=RIGHT$(COM$,LEN(COM$)-(LEN(TMP$)+1))
4000 RETURN
4010 '
4020 ' STRIP LEADING SPACES FROM THE COMMAND STRING
4030 '
4040 IF LEFT$(COM$,1)=" " THEN COM$=RIGHT$(COM$,LEN(COM$)-1) : GOTO 4040
4050 COM$=COM$+" "
4060 RETURN
4070 '
4080 ' CONVERT ALL LOWER CASE INPUT INTO UPPER CASE
4090 '
4100 XLEN=LEN(TMP$)
4110 FOR I=1 TO XLEN
4120     X=ASC(MID$(TMP$,I,1))
4130     IF X>96 AND X<123 THEN MID$(TMP$,I,1)=CHR$(X-32)
4140 NEXT I
4150 RETURN
```

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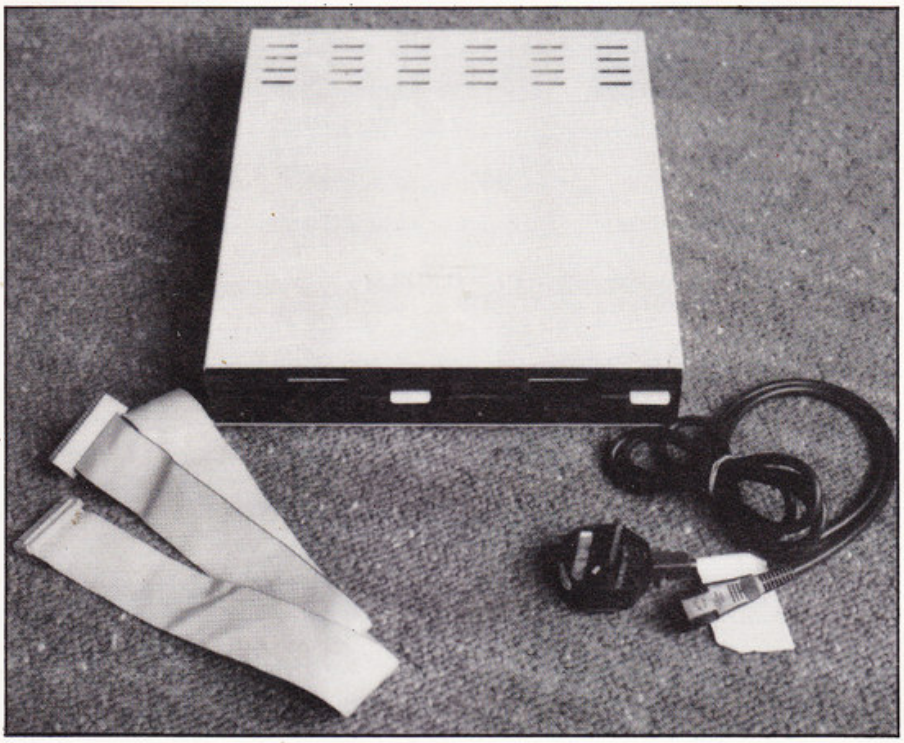

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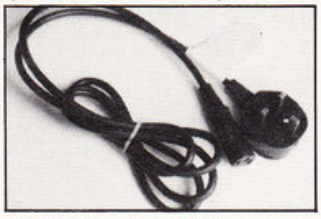

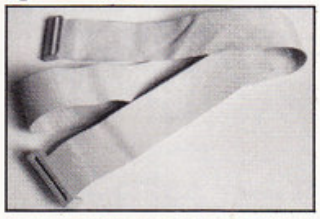

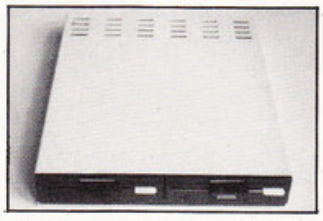

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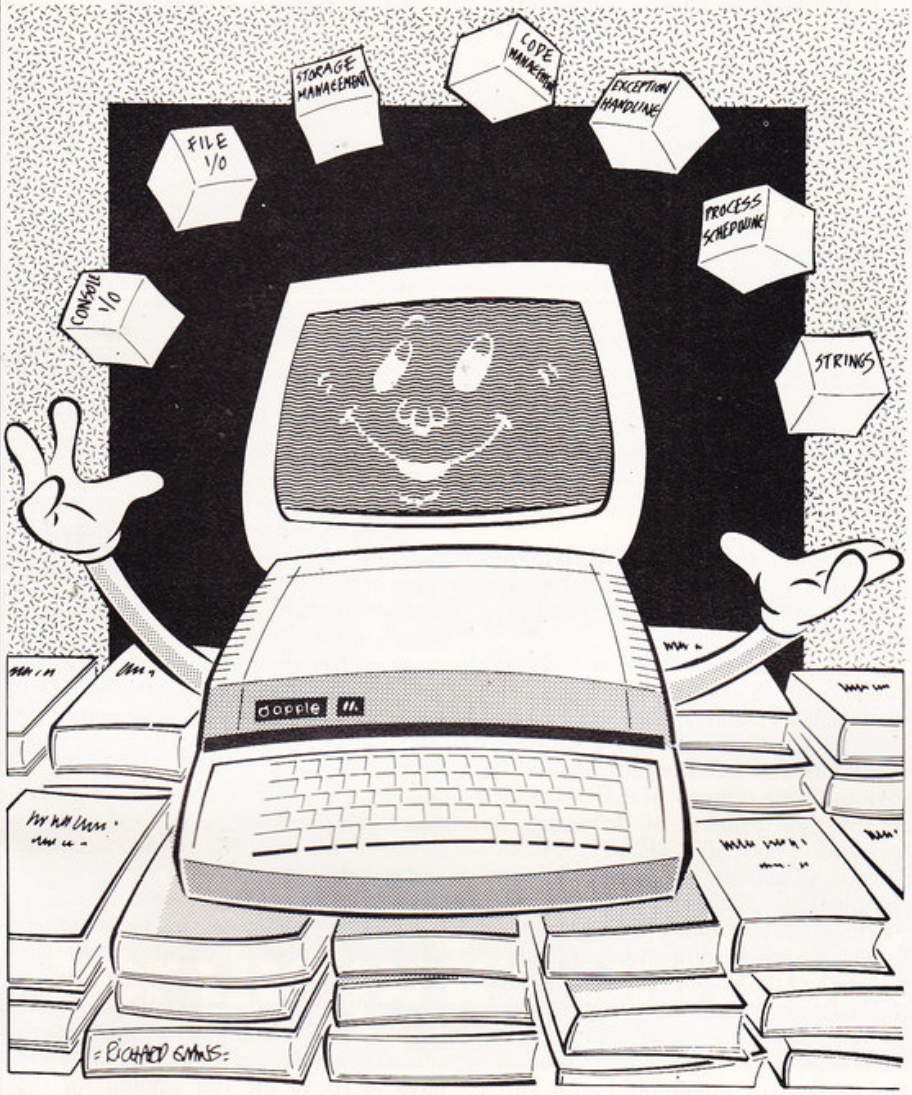
Ted Ball tests the first micro-based version of a new language from the designer of Pascal.

Modula-2: son of Pascal



Richard Evans

Modula-2 is a general-purpose language designed by Niklaus Wirth, and combining his two earlier languages, Pascal and Modula. Pascal was intended as a teaching language, and incorporates the principles of structured programming.

Modula is a stripped-down version of Pascal, and has extensions including independently compilable modules and support for multiprocessing and low-level mainframe access. It was intended for programming small real-time control systems.

Modula-2 adds extra features to Pascal and Modula, and is designed for systems programming, and large-scale programming projects involving a team of programmers.

But a microcomputer implementation of Modula-2 is now available from Triangle Software. It was developed by Volition Systems in the USA, and runs with the UCSD Pascal system. The Apple version was supplied for review.

Features

Modula-2 includes almost the whole of Pascal, but there are many differences in the details, apart from the specific Modula-2 extensions.

The differences include:

■ Unsigned integers of type CARDINAL are included as well as signed integers of type INTEGER, and both types can be given values in decimal, hex, or octal.

■ Structured statements in Modula-2 all have an explicit end and include statement sequences instead of Pascal's compound statements enclosed within BEGIN . . . END. For example, in Modula-2 you write:

```
WHILE condition DO
      statement 1;
        . . .
      statement n;
END
```

instead of

```
WHILE condition DO
    BEGIN
      statement 1;
        . . .
      statement n;
END
```

in Pascal.

GOTO has been omitted from Modula-2 and replaced by HALT, which terminates program execution; RETURN, which transfers control to the end of the current procedure, and LOOP/EXIT, which provides a generalised loop structure allowing multiple exits.

Modula-2 does not have a separate FUNCTION definition, but functions may be implemented with procedures. If the statement 'RETURN expression' is included in a procedure definition, a call to the procedure will return the value of 'expression' in exactly the same way as a Pascal function call returns a value.

The Pascal reserved word FILE is omitted from Modula-2, but there is a file-handling module included in the system library.

The most important differences, however, are the features derived from Modula: modules, processes, and low-level machine access.

There are two types of modules — program modules and library modules, and each module includes its own declarations and procedures, but may also refer to other modules.

Program modules make up the top level of a program and you may use constants, variables, data structures and procedures from lower level modules in them by including names of the objects you want to use in an 'import list'.

Library modules consist of two parts: a definition module and an implementation module. The definition module contains an import list as in a program module, an export list detailing the objects from the module that may be imported by other modules, and the declarations and procedure headers for the implementation module. The implementation module consists of procedure definitions and program text.

A module may import either complete library modules or individual objects from library modules. It is possible to have either qualified or unqualified import. With qualified import, when an identifier is referenced by the importing module the identifier must be preceded by the name of the module it has been imported from. This makes it possible to construct a program from a number of modules that were written independently, without the possibility of confusion between the same name used in different modules.

'Processes' in Modula-2 are designed to allow multiprogramming, or concurrent

26►

◀25

programming. Genuine concurrent programming requires a system with more than one processor, but Modula-2 supports *quasi-concurrency*, where a single processor executes one process at a time, but switches among several processes in a 'time-sharing' fashion, so that the processes appear to be running simultaneously.

Processes communicate through shared variables, which allow the transfer of data, and signals, which allow synchronisation of processes. The library module 'Processes' includes procedures such as WAIT and SEND which allow you to define the way that processes interact.

Processes may be used for handling input/output devices, either by polling or through interrupts, and Modula-2 allows several levels of priority.

As well as the compiler and the p-code interpreter the Modula-2 package includes a standard library of machine dependent modules for input-output, file handling and dynamic storage allocation, and a utility library which includes mathematical functions, string manipulation, and arithmetic operations on 19-digit decimal numbers.

Presentation

The package consists of two 5¼in disks containing the Modula-2 compiler, p-code interpreter and library modules, a user's manual in the usual ring-binder format, and a textbook, *Programming in Modula-2*, by Niklaus Wirth.

The textbook is described as an introduction to programming in general and programming with Modula-2 in particular, and as being suitable as a self-contained tutorial for the beginner. However, although the book does cover the syntax and features of Modula-2 in a very thorough way and explains the ideas involved, it includes some advanced concepts.

It is therefore not possible to understand the book fully or to appreciate the power of Modula-2 without programming experience and a good background in computer science.

The manual is a reference guide, divided into several sections. *Introduction to Modula-2* covers the syntax in detail and includes a section describing the differences between Pascal and Modula-2. *Standard Library* and *Utility Library* give details of the contents of these libraries, *The Modula-2 System* covers the use of the compiler, while *Implementation Guide* covers installation procedures and the use of machine specific features. The manual is well organised and clearly written, and there is a separate index to each section.

Getting started

The manual includes a section on installing Modula-2. This also describes how to incorporate the Apple Pascal library units into the Modula-2 system, and how to set up the interrupt system.

You need to understand something of the Modula-2 system before you start on the installation, but the instructions are clear, so you don't have to know everything before you start.

```
MODULE MainProgram;

  ...

  MODULE RandomNumbers;
    IMPORT TimeOfDay;
    EXPORT Random;
    CONST Modulus   = 2345;
          Increment = 7227;
    VAR Seed: INTEGER;

    PROCEDURE Random(): INTEGER;
    BEGIN
      Seed := (Seed + Increment)
              MOD Modulus;
      RETURN Seed;
    END Random;

  BEGIN
    Seed := TimeOfDay;
  END RandomNumbers;

  ...

BEGIN (* MainProgram *)
  ...

  WriteInt(Random(), 7);
  ...
END MainProgram.
```

```
MODULE MainProgram;

  VAR Seed: INTEGER;

  ...

  PROCEDURE Random(): INTEGER;
    CONST Modulus   = 2345;
          Increment = 7227;
  BEGIN
    Seed := (Seed + Increment)
            MOD Modulus;
    RETURN Seed;
  END Random;

  ...

BEGIN (* MainProgram *)
  Seed := TimeOfDay;
  ...
  WriteInt(Random(), 7);
  ...
END MainProgram.
```

Family resemblance: a random number generator in Modula-2 (on the left) and Pascal.

In use

The compiler is quite complicated to use, as there are a number of directives and options, and conditional compilation is allowed.

Among the directives are STANDARD, which controls the use of the non-standard features of this implementation; $TO, which is used in conjunction with predefined Boolean variables to allow various listing options; $DEBUG, which controls the printing of debugging information, and $IF, $ELSIF, $ELSE, $END, which are used in conditional compilation.

I found the section of the manual on using the compiler rather more difficult to follow than the rest of the manual, but it does contain all the information you need, provided you look hard enough. One advantage of having the library modules, and particularly the Apple Pascal Turtle Graphics package, is that you can write short test programs to use while practising with the compiler.

Part of the difficulty in learning how to use the compiler is picking out the minimum you need to compile simple programs. For large programs you will probably need most of the features of the compiler, but only a small part of it is needed to start with.

Reliability

While testing the compiler I put in innumerable errors, both accidental and deliberate, and I found the error messages generally quite accurate and informative. There are about 150 error messages covering everything from missing punctuation marks and illegal variable names to illegal exports from program modules, and from syntax errors in compiler directives to compiler scope table overflow.

There are some things which are not covered, but warnings are given about these in the textbook and the manual. For example there is 'underflow' of cardinals, where an arithmetic statement would make a cardinal variable take on a negative value, but what actually happens is that the value is taken as a large positive value.

Verdict

Modula-2 is a very interesting language, and it isn't difficult to learn if you are already familiar with Pascal. It is well done and well documented.

With the price taken into consideration, it will appeal only to professionals and to advanced hobbyists, but if you are interested it is worth investigating further. The textbook and the manual are available separately, allowing you to decide if you can make good use of Modula-2 before you have to spend the full amount for the Modula-2 system.

RATING

Features	★★★★★
Documentation	★★★★★
Performance	★★★★★
Usability	★★★★
Reliability	★★★★★
Overall value	★★★★★

Name Modula-2 **Application** Systems programming language **System** Apple II 48K, 2 disk drives, Apple Language Card and Apple Pascal or Apple III with Apple Pascal/SOS **Price** Program Development System, £375 inc VAT; User Manual, separately, £39; Textbook (*Programming in Modula-2* by Niklaus Wirth), separately, £9.50 **Publisher** Triangle Software, 38 Belleville Rd, London SW11 6QT **Format** 5¼in floppy disk **Other versions** 8080/Z80, configurable for CP/M or other operating system

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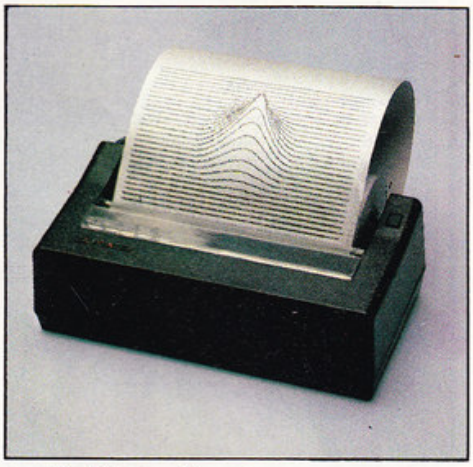

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Want to turn your Oric into a filing clerk? David Janda tests a database that might do the job.

GLOSSARY

Commands to be used on their own:—	
EDIT	**Edit last sentence**
LAST	**Repeat last sentence that was understood**
SAVE	**Save data**
ADD	**Add new record**
SORA	**Sort in ascending order**
SORD	**Sort in descending order**
PON	**Turn on printer**
POFF	**Turn off printer**
DUMP	**Print whole file quickly**
FIELDS	**List defined fields**
ABORT	**Return to Basic**
Macro commands:—	
MACDIR	**List all macros**
MACSAV	**Save last command as a macro**
MACDEL	**Delete a macro**
MACDIS	**Display a macro**
MACRUN	**Run a macro (The Macrun is optional)**
Oricbase sentences:—	
FIND	**Find records**
AND	**Restrict FIND to a further condition**
OR	**Find records, and add to already found list**
PRINT	**Print data**
ADD	
SUBTRACT	**Arithmetic commands**
MULTIPLY	
DIVIDE	
MOVE	**Move data**
DELETE	**Delete record**
BEGIN	**Start of commands to be executed once before all records**
ATRECORD (ATR)	**Commands for each record selected**
END	**Command executed once, at end of records**
IF . . . ENDIF	**Conditional commands**
Operands:—	
#NN	**Register to contain temporary data**
Field Name	**Data from appropriate record**
Literal	**If not a field name, e.g. 4, SINGLE "abc"**
INPUT	**Stop and ask for data**

Oric-Baselines

Oric-Base is a database in cassette form for customer files, and small business and personal records. You don't have to be a big business user to benefit from using a database, because the operations involved in, for example, keeping track of back issues of a magazine are very similar to those used for storing information on the availibility of spare parts for jumbo jets.

I used a 48K Oric 1 to review Oric-Base. A printer can be used for hard-copy output, but this is not essential.

Features

To store your data, it must be organised into records, and they in turn make up a file. Each record is divided into field which can contain alphanumeric or numeric data.

An address field, for example, will contain letters of the alphabet, and may also contain numbers. It is therefore an alphanumeric field. On the other hand, the field for dates of birth will contain only numbers, and therefore is a numeric field, and so on.

Oric-Base, like most other databases, will allow you to define the record — how many fields — and decide on what data you will put into the fields: numeric or alphanumeric. Once you have done this, and decided how many records you wish to have in your file, you're on your way.

The data in the fields can be edited to correct mistakes, records can be deleted, and calculations can be performed such as: 'SUBTRACT TAX FROM GROSS-WAGE MOVE GROSS-WAGE TO NET-PAY.'

You can search and sort, and files can be SAVEd and LOADed. One useful facility is the ability to define macros. If you have a particular sequence of commands you use frequently, you can set them up as a macro — a string of commands — and then execute the macro by simply entering its name. This saves a lot of time and effort.

As Oric-Base is much cheaper than most 'professional' databases, it lacks many of their features.

But there are a number of other things that Oric-Base should really be able to do and cannot, including addition and/or deletion of fields; naming files; merging tape files; and renaming fields. You cannot add records at a later date.

Some of these omissions are more serious than others, and more arithmetic functions, including %, would also have been helpful. I hope the publishers will include them in later versions. It will use more memory, but these are important and useful facilities.

Presentation

A 13 page handbook is supplied with the cassette. This contains the information you will need to get going. The details, however, are very sketchy.

Non 'computerate' people — the majority of those people who use databases — may find the handbook very confusing, and a rewrite would be in order here. There is a help file within the database itself, but this doesn't give you any more information than is already in the handbook.

In use

Setting up Oric-Base is fairly straightforward. Once you have LOADed the main program, you are asked whether you wish to create a new file or LOAD one that has been created already.

You are then asked 'How many records?' At first I assumed this must refer to the number of records I planned to create in the session, but in fact you must decide the maximum number of records the file is going to contain. So you will need to decide in advance how big your file will ever need to be.

I had to make an educated guess. Further information was requested as to number of fields, length of fields and so on. After this I had to enter ADD to add the records. I entered some garbage, then tried to amend it.

The only editing commands available are used to edit commands, not the data in a record, and amending data in records means going through a lengthy procedure. To change the name in a field called NAME it was necessary to do this:

FIND NAME = "NIGLE" ATR MOVE "NIGEL" TO NAME

I found this long-winded and annoying. But long commands to do things like changing names can be incorporated into macros. These macros can be SAVEd with the file, and used again by simply entering MACRUN *n*, where *n* is the name of the macro.

The diagram shows the commands Oric-Base offers. Some of the commands must appear in a particular order; for example, PRINT will give an error message if it is used on its own. The manual is not particularly clear on this.

Reliability

A lot of thought has gone into error-trapping here. You can't do silly things, such as asking to define fields with a length of 0. Trying to place alphanumeric data in a numeric field also brings up an error message, and you are asked to re-enter the data.

Error-trapping in any type of database is very important, and I was glad to see that Oric-Base is well up to scratch in this respect.

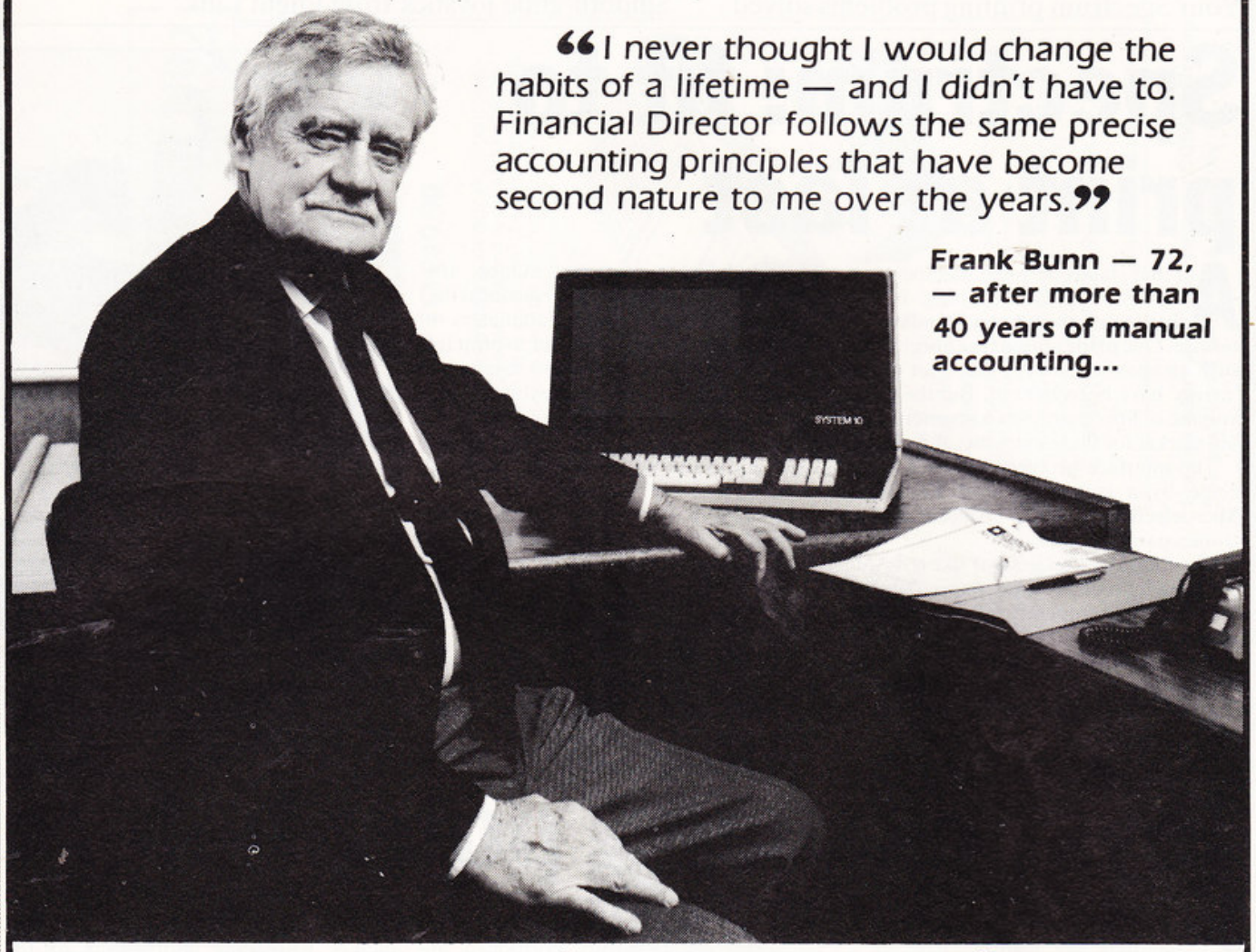
Verdict

There is a limit to what you can expect for £12.95. Many people are selling software at twice the price, but with half the features. Progressing up to a database with more facilities will not present any problem because Oric-Base gives you a good idea as to what database *is*.

The fact that you cannot add records at a later date is a serious weakness, and it would be significantly improved if some of the missing features were incorporated in later versions.

RATING

Name Oric-Base **Application** Database **System** 48K Oric 1 **Price** £12.95 plus 95p P&P **Publisher** Tansoft 0353-2271 **Format** Cassette **Language** Basic **Outlets** Mail order, Oric dealers.



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Spectrum: fit to print at last

All that stands between the Spectrum and good-quality printing is the absence of an industry-standard interface. One of the reasons the Spectrum is such an economic buy is that a lot of the 'extras' have been left out. But the sheer volume of Spectrum sales has generated a big market for these extra bits and pieces.

The interface problem has been overcome by a company called Kempston Microelectronics, which produces a Centronics parallel interface.

The interface looks rather like a RAM-pack and fits onto the edge connector at the back of the computer. The male edge connector is continued at the back of the interface cabinet so that further add-ons can be configured. A ribbon cable runs from the interface to a standard Centronics printer plug.

The software to drive the interface is LOADed from cassette. Once it's LOADed (this takes about 30 seconds) the user can set up the printing parameters — the format he wants the printer to print in. This is done through a menu — a series of questions answered via the keyboard.

The modified program can then be SAVEd onto another tape. This copy can then be LOADed straight in, and the printing done without any further ado.

Changes in format after this operation are still possible. It is also possible to add extra control codes to generate special characters from the printer, although this depends very much on the printer you are using.

PCN has used the interface frequently for work in the magazine — printing out Spectrum game listings for instance. So far it has been reliable, and has added to the versatility of the machine.

Reliable cassette-driven Centronics interface.

Name Kempston Centronics Interface **Machine** Sinclair ZX Spectrum **Price** £45 inc VAT and P&P **Manufacturer** Kempston Microelectronics, 0234 852997.

Joysticks with potential

Flight Link's range of potentiometer joysticks for two of the most popular computers are featured here as a follow-on to the joystick round-up of last week *(PCN Peripherals, issue 13)*.

Potentiometer joysticks use a different method of sending information to the computer.

Normally a spring-loaded stick mechanically closes one of (usually) four circuits to instruct the computer where to move a screen object. You can't execute a move up and left, say, at the same time.

The potentiometer joystick, however, has two potentiometers positioned at right-angles. These are simultaneously manipulated by the stick through a universal joint mechanism. Instead of being spring-loaded, the stick moves smoothly, and the object on-screen goes through exactly the same manoeuvres.

This kind of joystick is capable of instructing a program in true two dimensional movement. You can, for instance, move the stick cross-wise in a north-easterly direction, and both potentiometers will send information to the computer indicating between them the desired movement.

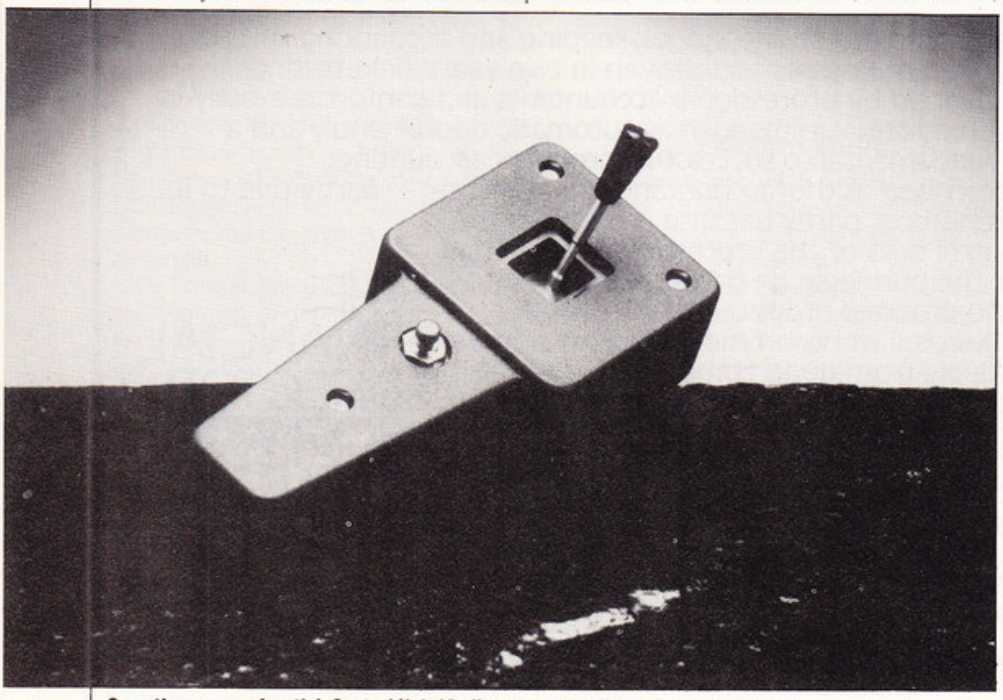
The Flight Link joysticks we tested were for the Dragon and BBC micros. The Dragon set uses a five-pin DIN plug, while the BBC uses the D-plug. Flight Link is also planning the release of versions for the Vic, Atari, ZX81 and Spectrum later this month.

The sticks themselves are dainty and feel very precise. They are just over an inch long, and glide smoothly from side to side. This delicacy requires you to adapt your playing style somewhat — you can't be as brutal as you would be with a gear-stick, unless you want to rip your hand open.

Instead you have to use the thumb and index finger. This can take some getting used to, particularly if you play violent action games requiring fast reflexes. A good feature of the controller design is its ability to be used either on the table, one hand holding it steady with finger poised over the single firing button, or aloft, with the thumb of the holding hand doing the firing.

The case has a nice solid feel about it, and should stand maltreatment without getting too upset. The Flight Link joysticks have a quality feel to them and should prove good value.

Name Joystick Control Unit J6 **Machine** Dragon 32 or BBC Micro **Price** £15.95 and £17.95 respectively **Manufacturer** Flight Link Control Ltd on (0420) 87241 **Contact** Clares, 06065 51374.



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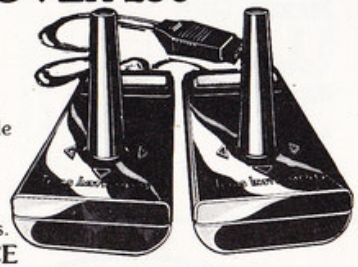

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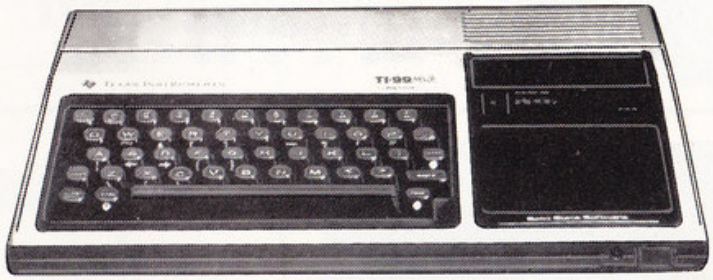

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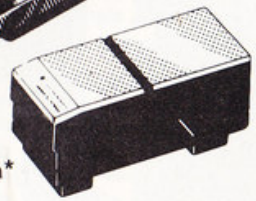

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Kenneth Kendall's silken tones have been siliconised for the Beeb micro. Trevor Jones tunes in.

A word PHROM the BBC

When the BBC micro has a chip-based voice synthesis system designed for it you expect something rather grand. Voice output, after all, is what the micro's namesake is all about.

True to form, the BBC micro has struck a blow for the Queen's English and encoded the vocal tracts of veteran newscaster Kenneth Kendall in a silicon chip. Whether this development is causing concern for job security among the remaining BBC newscasters is doubtful, however.

Speech synthesisers have been around for a while but most of them have an American accent; not really surprising, since most of the development on speech chips has been carried out in the US. Texas Instruments, for instance, has been the leader in the field.

Most of the available speech synthesisers (*PCN, issues 1,2,3 and 4*) come in little boxes which are hooked into their host micros through an interface. In some cases they occupy some of the free memory address space.

The BBC micro was conceived as an expandable computer and has a variety of free socket spaces dotted about inside the cabinet. So the speech system comes as a piece of firmware encapsulated on two 40-pin ROMS.

These have to be fitted by an Acorn dealer due to the fact that on early versions of the printed circuit boards (PCBs) installing the system involves breaking certain tracks and forming wire links. It's not a do-it-yourself job.

Our review machine had an issue four PCB which did not require any board modifications. Fitting the ROMs took 15 minutes, including reassembling the case and dealing with the inevitable unforeseen problems.

Generation levels

Our documentation was a pre-release photocopy — the finished product will undoubtedly be a professional production with much the same content.

According to this the user can generate words on several different levels. Choosing the level really involves a trade-off between time and versatility.

With the system fitted the BBC can produce words and sounds from a vocabulary contained within a word PHROM (Phase Read Only Memory). To encode speech in a binary representation, the speech processor uses a linear predictive coding technique. The speech processor takes serial data provided by the PHROM integrated circuit and converts it into audible 'words' under the control of the main CPU.

You can access and manipulate the 165 words already stored in the PHROM quickly and easily. This can be done in Basic or assembly language.

Existing Basic sound commands are used, but they take a special form: SOUND −1, (word number), 0,0.

The value of the word number determines which of the 165 words are stored in the PHROM. For example, to create the word 'any' type SOUND −1, 168, 0, 0. You can also access ASCII characters by using the sound command in the following format: SOUND −1, ASC "(char)", 0, 0.

Using upper-case characters will produce the letters of the alphabet, and numeric characters will produce numbers. Lower-case letters and the remaining characters will produce words with some kind of association.

You can also make up new words by combining two words that are already supplied in the PHROM. These are known as compound words. Facilities are provided to delineate soft or hard sibilants ('S' sounds).

Silent periods can be generated by using codes 127 and 128, which give 0.125, 0.25 delay between the spoken words.

The basic sound commands require four parameters. The first parameter is treated by the computer as a systems command, while the second parameter determines the word spoken. Parameters three and four do not affect the sound generated. But they are expected by the system, so you have to include them.

Parameter value 1 determines whether

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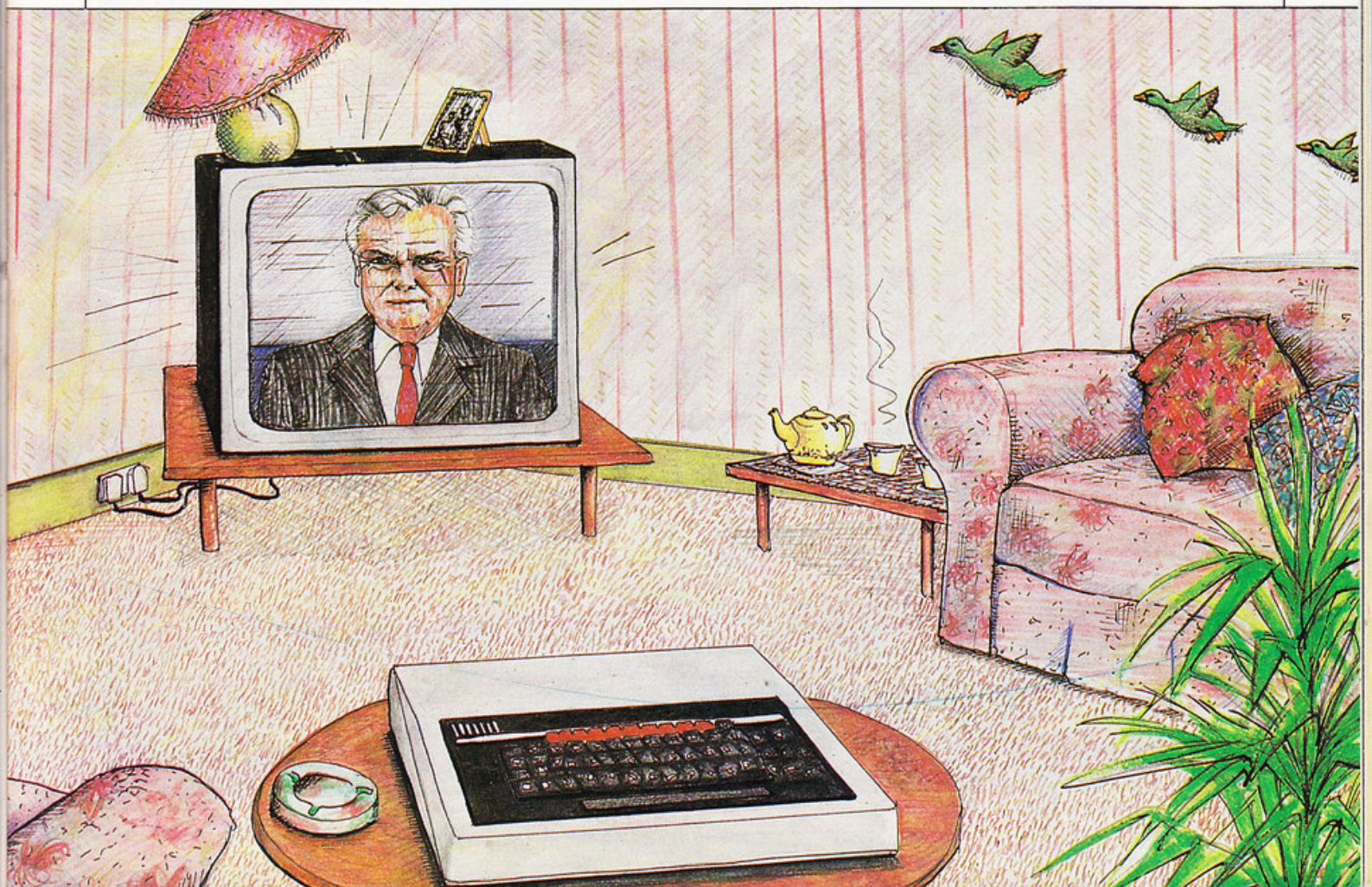

Linda Parry

the computer obtains the word number from the PHROM, RAM or an absolute value in hexadecimal. There are four different ways to produce a word. This makes the system very versatile.

Choosing your language

To use the system in assembly language you have to access OSWORD and OSBYTE. Using the OSWORD call with A=&07 gives you the same facilities as the basic command SOUND, where the X and Y registers are used for sending the store locations containing the values of parameters 1 to 4 to the operating system routine. To actually do this is a little bit tedious, but nevertheless understandable.

The manual provides a good example of using the speech system in assembly language mode where you can write directly to the speech processor. This requires a reasonable grasp of programming, although the manual gives a breakdown of the listing to help you understand what the program is doing.

The advantage of this system for the BBC is that it allows you to incorporate the speech commands into your normal program, thereby enhancing and making it more user-friendly.

Doing this in Basic is fairly straightforward, and it shouldn't be too long before you can write fairly complex programs utilising these facilities.

If, on the other hand, you are after speed of operation you have to revert to the machine code. It's a bit more involved than the Basic mode, but it's equally efficient.

The beauty of the system is that it allows you to customise and form your own special words. However, the amount of raw number typing necessary to achieve this is considerable. To manufacture the word Zero, for instance, you have to type in close to 1,000 individual characters.

If you want to create a number of words for your own use, this much typing — not to mention the considerable amount of RAM gobbled up — presents a bit of a hurdle.

It should be possible to save the words on disk as data files. These can then be called up by the program and used as, say, menu prompts.

The system doesn't depend on any high speed storage, but this would make it a much more attractive tool. It is also possible to load the words onto tape, but the loading speed would obviously preclude the interactive use of a tape recorder with a program.

Instead they would have to be stored in the memory, eating up valuable space — this would make things a little tight for any reasonably complex high-resolution graphics program sharing the memory.

The speech processor responds to a number of commands sent by the CPU. Once set, the speech processor executes the command without involving the CPU. All the commands are explained in the manual, and their names are suggestive of their operations.

The documentation provides some useful examples and hints on the simpler aspects of the system. It also has the foresight to provide a program listing for sending speech data to the speech system.

Verdict

As far as the quality of the voice is concerned, it was recognisable as Kenneth Kendall — though he did sound as though he was talking from the bottom of a deep hole. This sound quality could be attributable in part to the BBC speakers.

Most of the words supplied with the system are useful and easy to get at. Forming sentences from compound words is also easy, once you get the hang of the commands, but some of the words needed careful listening to to understand.

The pitch of the voice is adjustable, but to do this you have to open up your machine and poke around, which is a fiddly operation at best. I haven't seen any similar products equal this system on price and performance.

The range of commands is comprehensive, and when the promised cartridges come onto the market the system should have even wider appeal. It's also available right now.

Item BBC Speech Synthesiser **Computer** BBC Micro **Price** £55 **Contact** Acorn (0223) 245200.

Roger Payling

Here we have an Apple interviewing a BBC. As far as we know, this is the first time one micro, using a voice synthesiser, has held an intelligent conversation with another running a voice input system. The BBC voice chip is here outputting a series of audible commands to the VIM (Voice Input Module). The VIM is an Apple card linked to a microphone, which enables the computer to execute voice commands.

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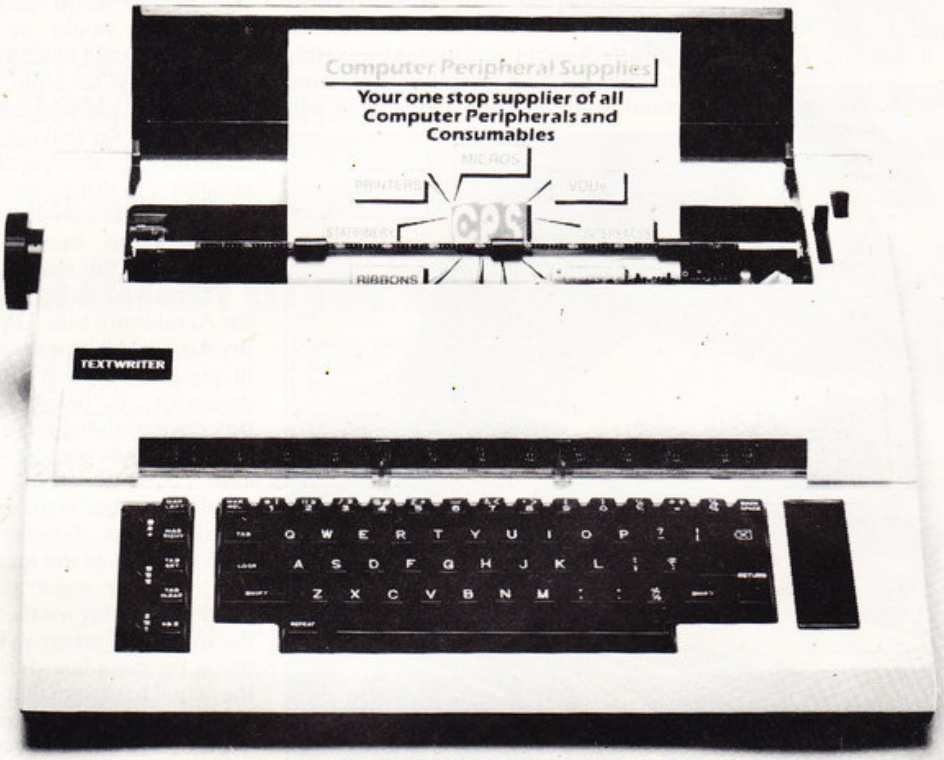

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Richard King holds on to his hat and tests the Accelerator II from Saturn Systems

Turbo-charged Apple

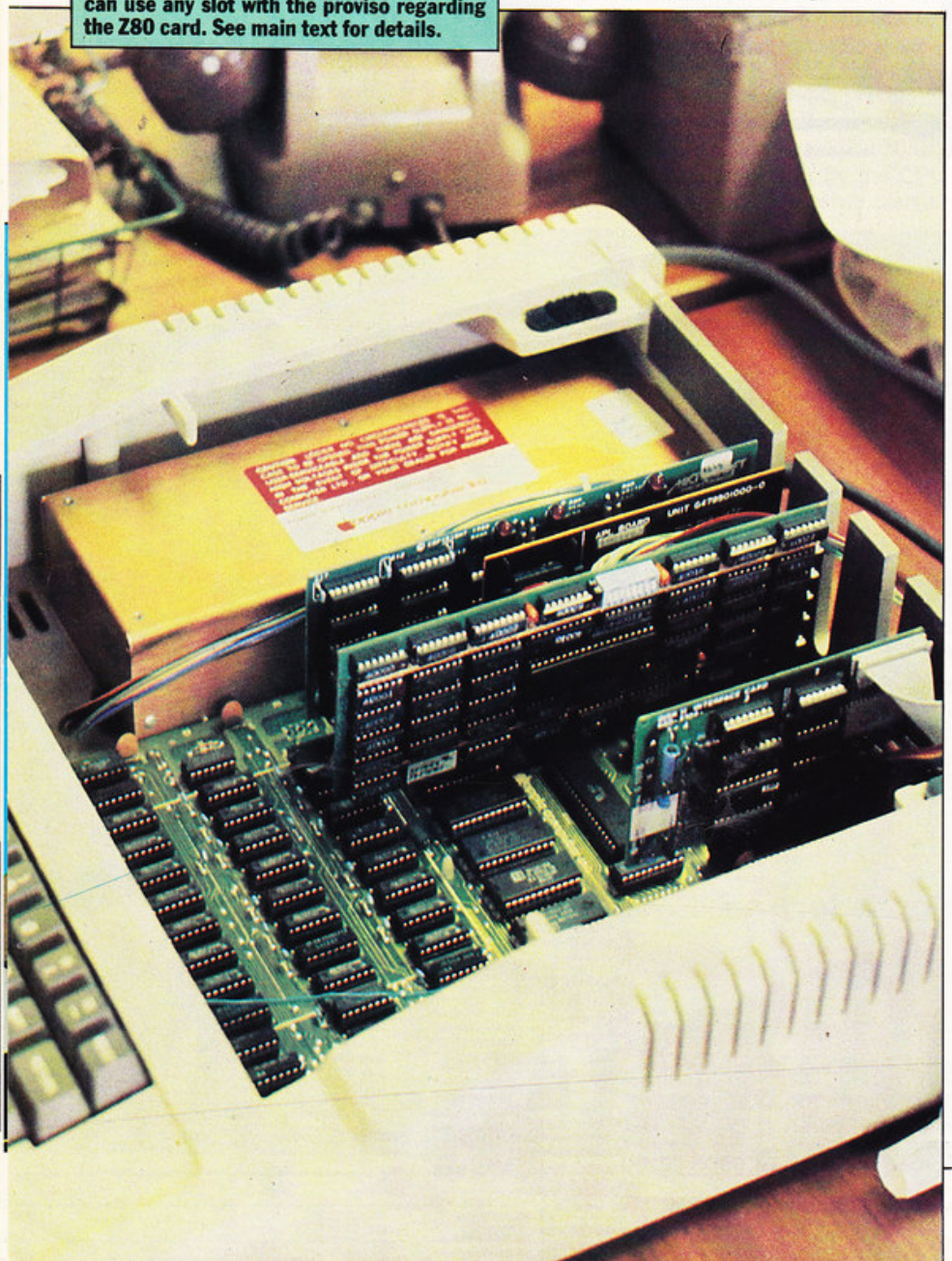
Are you tired of S-L-O-W programs? Does your machine seem less snappy to respond these days? Do you feel nostalgia for the time when your machine was the fastest thing on the block?

Maybe you have a more serious reason for wanting to get stuff through your machine quickly — like money. The 'expert' will tell you to go and get a 'better' language or even a 'more powerful' machine. But this may not be good enough. There's no time to convert and debug, nor to transfer the files, and anyway, you can't afford a new machine.

What you really want is some magical item which makes the machine run more quickly, and does so without requiring any other changes.

The Accelerator II from Saturn Systems is exactly that. It's a plug-in board for the Apple II, which has a 3.6MHz 6502B processor and 64K of fast RAM. Put it in, turn it on, and the Apple works like you've just stuck a turbo-charger on it.

The board is plugged into slot 2, although you can use any slot with the proviso regarding the Z80 card. See main text for details.



Presentation

The packaging is basic. No bright colours or glossy pictures, but since this is not an impulse-buy item, the box is there only to protect the contents. This it does admirably, and I would have no hesitation in consigning it to the slings and hooks of parcel-postage.

The manual is less good. It does the job of explaining how to install the card, and provides several useful lists, but doesn't make any real attempt to give a thorough description of how the Accelerator II board works.

It would appear that Saturn Systems intends that the in-depth details are to remain a dark secret, and in many ways this is no bad thing. Certainly, the actual functioning is far from simple, and will produce some nasty surprises if you don't understand it adequately.

How it works

Thee Accelerator II is billed as a 'co-processor', but this is a misnomer, since a true co-processor is one which works at the same time as the regular processor.

When you activate the Accelerator, it *replaces* the on-board CPU completely, so it should really be called an 'alternative processor'. Not only that, but it comes with its own RAM; you may ask why this is, when there's 48K of perfectly good RAM on the board.

The reason is that the 6502B on the Accelerator can read data from the memory very quickly. So quickly, in fact, that the 'old' RAM can't respond in time. The result would be that the 'new' processor would actually have to wait for the memory to reply, and this would degrade the performance. And since the only reason for making this board in the first place is to squeeze the maximum possible performance from it, that wouldn't make a lot of sense. Not that such considerations usually make a lot of difference in this industry . . .

The manual makes much of the fact that the Accelerator uses 'DMA', Direct Memory Access. All it means is that the memory in question, which actually belongs to one processor, is being used by another processor as though it were its own.

That sounds contradictory, since I said earlier that the 'old' memory on the Apple's motherboard is replaced by an equal amount of faster memory on the card. In most of the memory this is quite true, but for some parts it just isn't possible, notably for the screen-pages and the Input/Output area. These just *have* to be on the main board, since that is where the actual hardware that generates the TV signals and works the slots is located.

There are two ways of reconciling the conflicting needs of the Accelerator, which requires fast RAM, and the external circuitry, which has to have its memory in a certain place. One solution is to fix things so that the 'slow' processor is responsible for the 'fixed' RAM while the 'fast' processor has its own fast RAM. You then pass messages between them, and get a multi-processing system.

The other answer is to deactivate the slower CPU, let the fast processor have control of everything, and use DMA to put stuff into the proper places for the external circuitry.

The second method is the one used by the Accelerator II. There are pros and cons to both methods, the most obvious being that the first requires a complex program to make it work. This uses valuable memory and can easily go wrong.

The Accelerator's method has the

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advantage that the hardware takes care of the necessary switching, but has the disadvantage that you know that there is a perfectly good (albeit slower) processor doing absolutely nothing to earn its keep. I can't help feeling it's a pity Saturn Systems designed the board so one processor was idle, but I acknowledge that it would have been considerably more complicated and perhaps less reliable.

Installation

Power down, open Apple, find empty slot, insert board, shut Apple, power up. That's it — well, almost. There certainly can't be many add-ins to the Apple system that make such a difference in performance with so little fuss.

There are some switches which might have to be set, but since the board arrives with these in the (most probably) correct position, you don't have to do more than check. There are eight of these in a DIL package on the top of the card, and if one is in the 'on' position it tells the Accelerator that the corresponding slot has a 'slow' device in it.

But the term 'slow' device doesn't mean quite what it says. The fact is that certain peripheral cards are heavily time-critical, meaning that signals must be sent to it at specific intervals. If the signals arrive when they aren't expected the device just won't work.

Although modem cards such as the DC Hayes MicroModem and the Novation AppleCat suffer from this constraint, the only device which need concern UK users is the disk-drive card. This is designed to work with a processor running at 1MHz, and so the Accelerator must be slowed down when reading or writing to the disks.

The only thing that *must* be checked is the location of the Z80 card, if one is installed in the system. For some reason (which is not explained in the manual) the Accelerator must be installed in a slot with a lower number than a Z80 card. Something to do with the subtleties of DMA and signal-timing, I believe.

Since a Z80 card also uses DMA, it *cannot* be used when the Accelerator is active, and vice-versa. This may not be obvious, but it's a fact. It isn't sensible to try to access the same piece of memory from two places at once, not to mention the small detail that doing so will quite definitely fry the chip in question.

In use

The card is almost invisible in use, and in many cases it is necessary only to boot the machine normally — for example with VisiCalc or most other pieces of self-starting code. But in some cases the Accelerator must be started correctly in order to gain the maximum advantage from it. This is accomplished by booting with a special piece of code which is provided on disk.

When the boot disk has finished grinding and grunting the screen displays a menu with four options:

- FAST APPLESOFT (or INTEGER if you have an early Apple)
- PHANTOM 0
- DISABLE
- SLOW SPEED

The first option is the one which is most used in Basic programs. In this mode, the Basic is copied from the on-board ROM into the top end of the Accelerator's RAM. This gives the fastest possible execution times, since everything is now in the fast RAM apart from the screens and I/0.

The second option is used for programs which use a RAMcard in slot 0, such as the UCSD p-system. When the Accelerator is in this configuration, it looks as though there is a high-speed version of the RAMcard available.

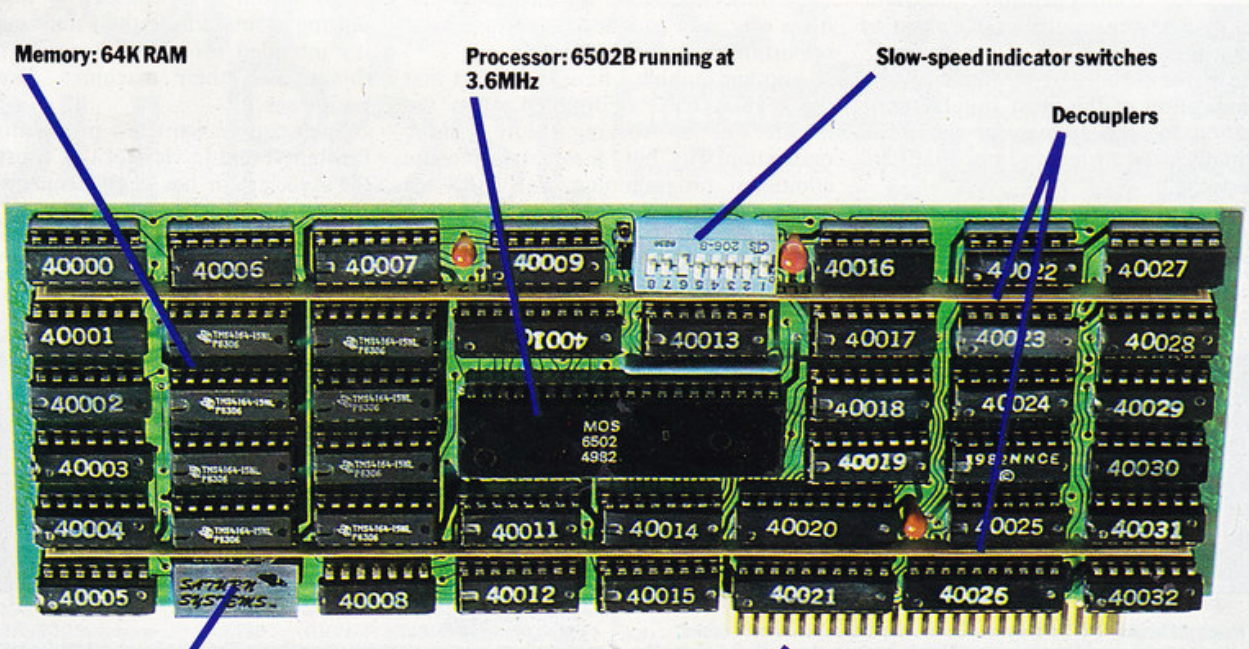
The third option slows down the Accelerator to 'normal' speed, and this is effectively the same as mode 3. This is the one you would choose for running programs which are meant to work at certain speeds. Examples would be games, particularly arcade-type shoot-em-ups. In general these are designed to be pretty hairy at 1MHz, and at 3.6MHz they are terrifying!

What are the constraints in using this card? The most obvious is the difference between the two Basics when the card is up and running. In an un-augmented Apple they run at fairly comparable speeds. Integer Basic is faster, but not enormously so.

With the Accelerator in the system, the version of Basic which is on the card will run an order of magnitude faster than the one which isn't. One minor problem, especially when running several programs in sequence, is forgetting which mode the system is in, but it's fairly easy to find out by pressing Control-G (Bell). When the system is in 'slow' mode, the sound will be normal, but if the Accelerator is active the sound will be very much higher in pitch — more like the sound of the beeper on some digital watches.

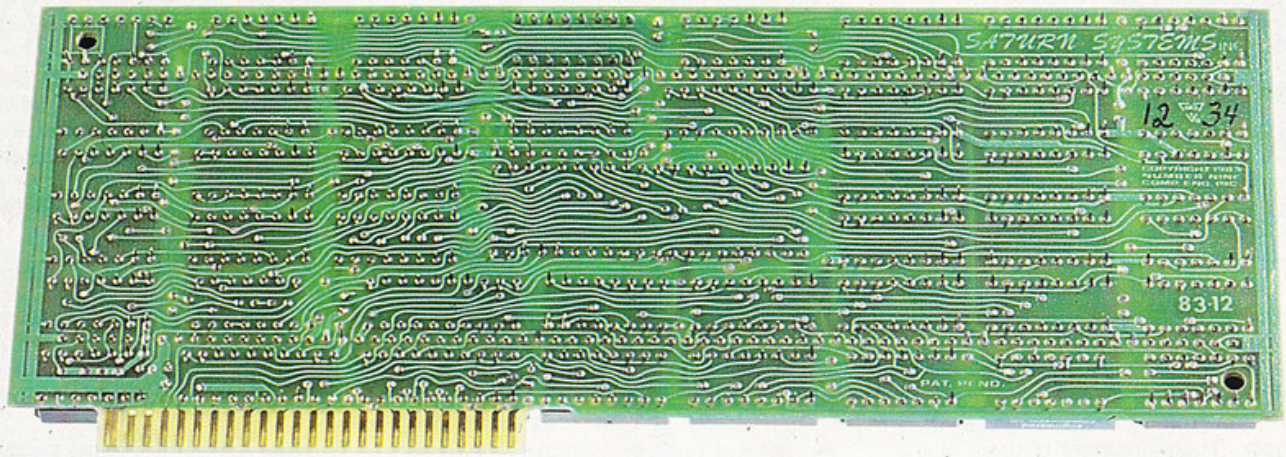
So what don't I like like about the Accelerator II? Not a lot, to be honest. It's simple to install, it's reliable, it's easy to use, and it runs like a bat out of hell.

If I have to pick holes in it, I would say that the system is a little complex to start. There are several options, each of which will bring up a different configuration, but



42 ▶

The back of the board reveals that it was hand-designed but it is neat and tidy for all that.



the names of these aren't particularly helpful.

What does 'PHANTOM 0' really mean? Plenty, if you know plenty about the internals of the Apple . . . not much if you don't. Maybe since the first option is 'FAST whatever is on the main board', the second could be 'FAST the other one'.

This would give 'FAST APPLESOFT' on an Apple II+ as option 1, and 'FAST INTEGER' as option 2. Simple enough, and much more understandable, provided you don't want the p-system.

Well, then, what else could it be called? 'FAST motherboard', perhaps, with 'FAST RAMcard' as the second option. Slightly less comprehensible, but still better than having unattributable ghosties wandering around!

The lists at the back of the manual give a fair indication of the most suitable configuration for the system for the most commonly used programs, but that's its weak point.

The list of programs in the manual is long, but it's far from being an exhaustive compilation of the software actually available on the Apple, and there isn't much help to be found if the program you want isn't on the list. There's plenty that aren't.

The best that Saturn Systems can suggest is that you try the various options and see which works best. Or fastest, if that's what you want.

Another weakness, in my opinion, is the lack of really hard technical detail. This is obviously a deliberate policy on the part of Saturn Systems, which does not intend that pestilential users should start doing funny things with its new toy.

In view of the horrendous complications that could arise if somebody *does* reprogram things so that (for example) the system works as a true co-processor, or perhaps as alternating processors, this is quite understandable, but I still feel that it's a pity, and to some extent a missed opportunity.

Another quibble I have is the fact that the regular 6502 is disabled when the Accelerator is working. Now I fully understand why, but I feel that despite the additional programming and hardware that would be necessary, it would have been worth it.

Perhaps it's some barely remembered childhood injunction against waste, but despite that, the system, though not exactly the slowest thing around even with just one processor working from a less-than-optimal position, would run a sight quicker still with two.

Verdict

The previous section contains a lot of quibbles, but I must make clear that that is exactly what they are . . . quibbles. The Accelerator II makes such a big difference to the operation of the Apple that I wish it did more.

This is, I admit, a slightly unfair comment, since what I, as an incurable TJ, want out of the system is not what this item is intended to do. The Accelerator II is not really meant for people who insist on digging around inside their machines . . . it's intended for users. People who *do* things with their machines, like run businesses.

Such people want fast processing, not flexibility, and in view of this constraint, the Accelerator has been designed quite correctly.

For the real business user who wants a real increase in throughput, I would strongly recommend the product, which costs £299.

TIMINGS FOR ACCELERATOR II

PROGRAM	STANDARD	FAST	SPEED INCREASE
PCN TPT	159.27	47.36	3.362965
PROSE	1606.5	590.5	2.720576

How much difference will putting an Accelerator II into your Apple make?

On the face of it, you'd expect everything to happen at exactly 3.6 times the speed of an unadorned machine. The actual result, as shown in the table, is not quite that much. Due to the need to access certain parts of the memory on the motherboard, the final figures will be slightly lower, and the actual difference will vary depending on what one is doing.

For a purely memory-based program, there will be only a very small loss in speed over the theoretical maximum, mostly due to screen or other main-board accesses. For a program which is heavily dependent on disk-access, the drop will be more noticeable. This is due to the fact that the Accelerator must slow down to read or write the disk.

Two programs were used for these tests. One was Prose, a text-formatter for the UCSD p-system, formatting its own documentation, which consists of about 40K of text, producing some twenty pages of printout. This was spooled to disk, and the time to perform two passes was averaged.

The other program was in Applesoft, and fills an array 12 x 100 with the mathematical tables. It works entirely in memory, and apart from minimal signals to say how far it's got, does no writing to the screen until the tables are complete, so it should be a fair measure of the 'raw' processing-speed of this machine.

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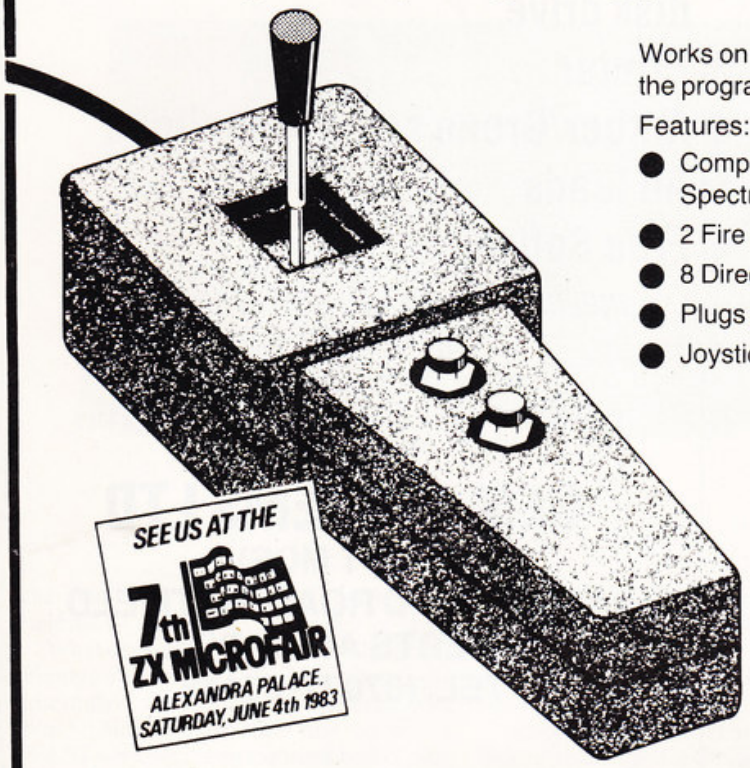

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- 40 or 80 characters to the line – without affecting the 28K bytes of RAM at your disposal;
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- well-formed characters, with true descenders;
- a full European character set;
- normal or reverse video, high resolution graphics on screen of controllable size, 256, 320, 512 or 640 horizontal resolution by 250 vertical lines;
- a facility to set up a "page" of up to 255 lines, with the screen acting as a "window" to display it;
- ability to maintain several such pages simultaneously, and to switch rapidly between them;
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CHARACTER SET

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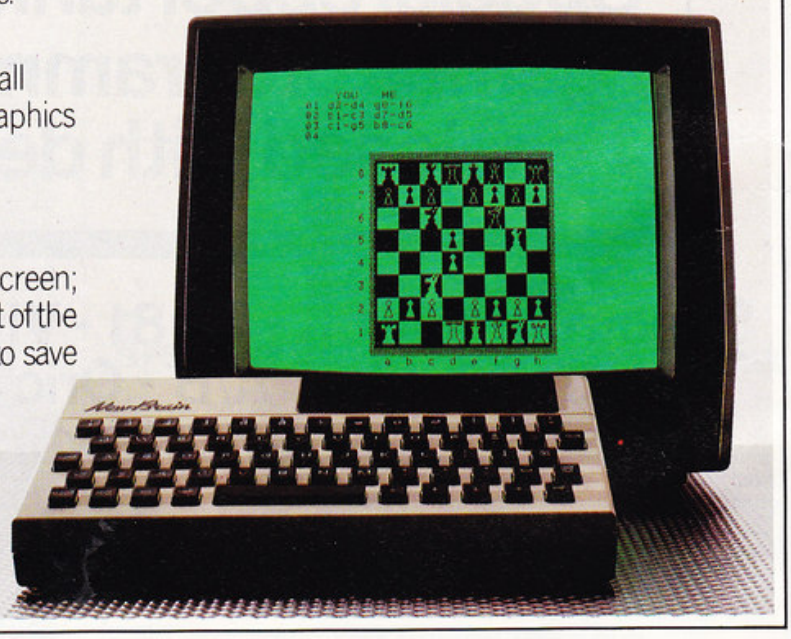

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SPECTRUM

Grin and bear it

Name Ah Diddums **System** ZX-Spectrum, 16K or 48K **Price** £5.50 **Publisher** Imagine Software, Liverpool, (051 236) 6849 **Format** Cassette **Other versions** None **Outlets** Mail Order, Imagine Software, Mason Buildings, 28 Exchange St East, Liverpool 23PN, dealers

Ah Diddums from Imagine Software started as a professional promotion campaign complete with the customary long wait. In the end, Imagine Software turned out not to be imaginary. Now everybody is imitating the promotion, this is one 16K Spectrum game that will have to stand up for itself.

Objectives

Diddums has one of the silliest and most downright complicated scenarios yet invented for a cassette insert. It's done in daddybabyteddy language, presumably to get you in the mood, rather than as a reflection on the documentation department.

You're this teddy. Your baby is crying so you must comfort it, so you try to climb out of the toy box. But if you succeed, Mummy and Daddy will turn out the light and prevent the other toys from playing.

So that's why you're controlling a TB being pursued by numerous toys in an effort to escape from a toy box. Defending you from soldiers, spinning tops, trains and so on is a pea shooter (of course) and a friendly Jack-in-the-box.

You escape by picking up coloured boxes and stacking them in order on a ladder at the top of the screen. Once you've got the boxes right, you escape the toy box only to discover the first really ridiculous loophole in the plot.

Poor old Ted. He's working from inside a set of 99 nested toyboxes. So there's level after level, toybox after toybox to get through.

First impressions

The packaging fits in with the Imagine philosophy. This is how it should be done although it could do with the Fuller ad being removed. People gave this up with books and records a long time ago.

Diddums recognises and uses joysticks. Fuller ones. If you've bought someone else's joysticks there's no need to despair. There's an order form for the Fuller range included.

Now all Imagine has to do is rewrite the instructions so that they are as clear as the copyright notice. For starters, why can no one document which way up to load the cassette? 'Printed side upwards' it says. Fine . . . there are two.

Imagine guarantees the cassette for life, including freebie replacements if it does not load first time. The review copy did load . . . after three attempts. Perhaps I should send it back.

In play

Diddums has no on-line instructions. Just a full-screen coloured toy box, full of flashing toys and shapes. Imagine is proud of the graphics but they're not quite right. Animation is fast enough but everything flashes and jitters.

The Spectrum's two colours per character block rule means that there's a horrible mess when two objects cross. And Diddums isn't without its vanishing and mysterious objects.

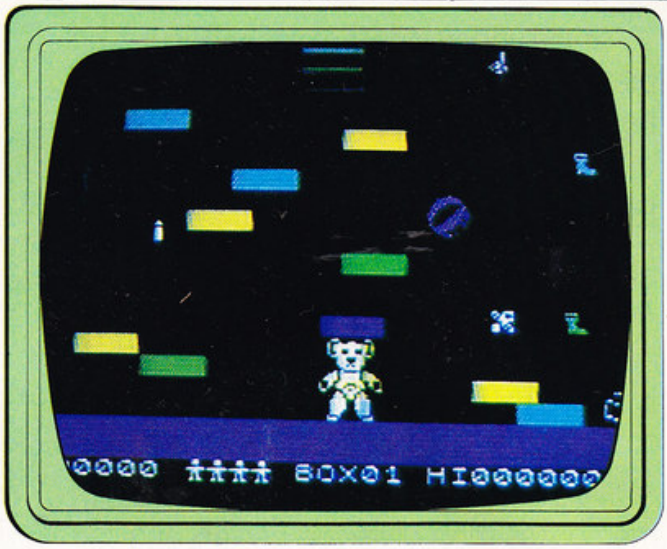
It's such a shame because Diddums is simply over ambitious. It would look great on a true eight-colour display.

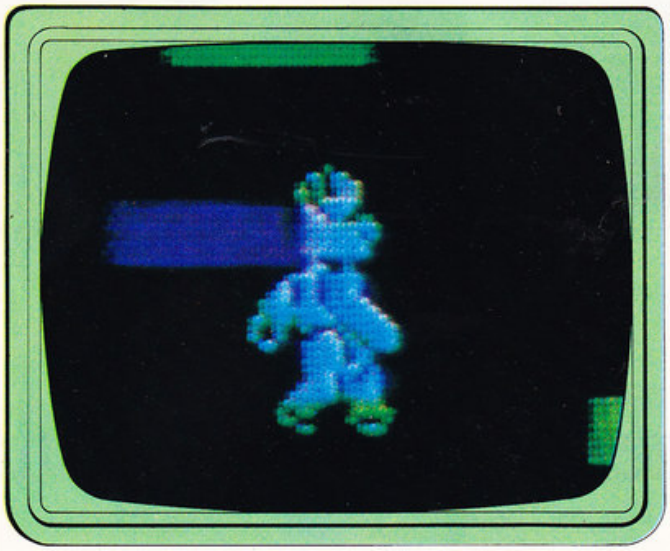
Getting started proved well nigh impossible. It took a while to figure out the controls. Almost all of the keys do something or other though you only need six to play. This is supposed to give you a choice of keys but only results in a confusion of fingers.

It goes something like this. Every alternate character on the bottom row moves left or right. A,D,G,J or L on the second row move down while Q,E,T,U or O on the third row move up. In between these, W,R,Y,I or P picks up or puts down any objects the teddy is touching. S,H,F,K or ENTER is used to throw objects teddy is carrying or fire the infamous pea shooter.

So I rushed Teddy round box one, picked up the blocks and stacked them as instructed. And nothing happened. Climb up ladder. No go. Charge ladder from base of screen. Bangs Teddy's head. Rearrange ladder. No help. Pick up the pea shooter and destroy everything in sight.

Hint: shooting the last baddy on any screen ends in almost certain plasticine. Not nice.





Six people tried and none of us could figure out what you were supposed to do. After 1½ hours I phoned technical support at Imagine. A word of help and I was able to progress to an entertaining and original game.

The blocks may look right but the lower ones can be out of order. So you stand on the ladder and keep pressing 'Pick up' around 10 times to move on to the next level. But putting a block down while you're on the ladder automatically puts it in the right place. End of problem, start of game.

Diddums gets to be great fun and it's quite hard by level 5. Each level brings more toys and more temper. You have to work hard with the pea shooter. Teddy gets five lives per game but each one starts back at the beginning of the current level 1: blocks scattered, pea shooter hidden behind spinning tops, soldiers back. Oh, and that damn train waiting in the corner.

Verdict

Ah Diddums is an original and fun game. It's a shame that Imagine has produced an unhelpful cassette insert and probably the first arcade game that needed hotline support to get going. Maybe I should retreat to the safety of dBase.

Diddums also suffers from the limitations of the Spectrum but I'll bet it will make owners of other machines jealous (Ah Diddums!) It's survived its false start and it's going to be a hit.

Max Phillips

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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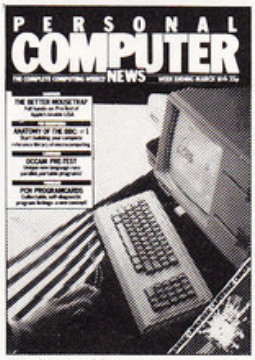
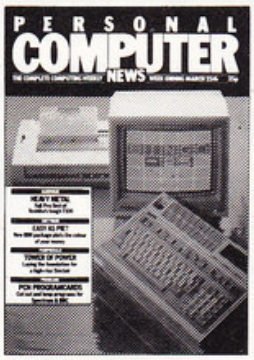
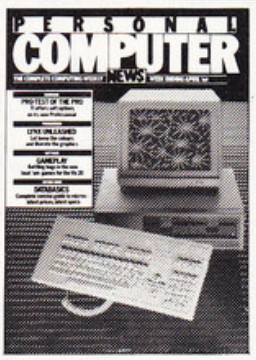


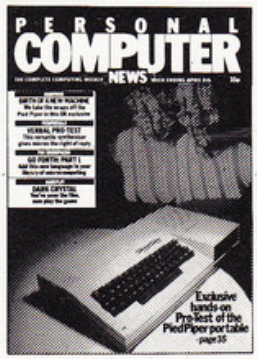
Issue 1, w/e March 18
Pro-Tests: Apple's Lisa, Texet TX8000; Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.
Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).
Databasics: micros and peripherals.



Issue 2, March 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.

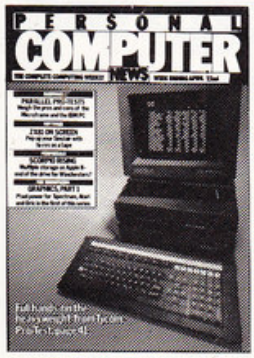


Issue 3, April 1.
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), 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.

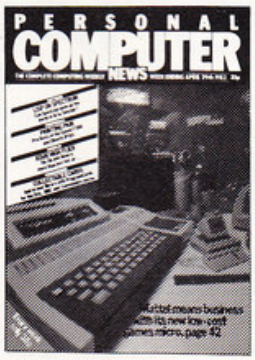


Issue 4, April 8.
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunesmith (Oric), Array Editor.
Databasics: 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 Leeper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databasics: micros.
Micropaedia: Graphics, part 1.



Issue 7, April 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.

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Go Forth

Part 1: Basic and Forth compared; Forth on your micro; assembler language; changing up; the Jupiter Ace.

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CAPITAL GAINS

COMMODORE 64

Micros pass go

Name Monopole **System** Commodore 64 **Price** £9.95 **Publisher** Rabbit Software, 01-863 0833 **Format** Cassette **Language** basic **Outlets** Mail order

The game is a two-player replica of the old family favourite Waddington board game running on the Commodore 64.

Objectives

This is a complete reproduction of the game which, as almost everyone knows, is aimed at budding capitalists who try to amass great wealth while eliminating the opposition by making them go bankrupt. The machine keeps all the records, and no board, dice, or paper money are needed.

First impressions

The packaging of the cassette is the usual Rabbit Software style — a colourful illustrated box, with a single instruction sheet inside which assumes you know all the rules of the game Monopoly.

In play

This is a very good game, with very impressive use of graphics and sound. Two players are relieved of all the tedious work involved in passing money backwards and forwards; the machine keeps a record of both players' cash and the property they own, and charges rents.

The dice are beautifully represented, and the tokens move automatically round the board, with sound accompaniment.

At the start of each move, a Transactions option is given, which is when you build on properties, or mortgage them, or have a look at your list of properties, or those of your opponent. At the end of each move, you are told where each player is, and how much cash they have. You go to jail accompanied by police sirens.

When you land on an unsold property, full details are given about its rental potential, with and without houses, and about whether any others in the set are already sold. You are also told its price, and how much cash you have in hand.

Interesting options are given at the beginning of the game: to tinker with the bonus effect of Free Parking, and to decide whether to auction unbought properties. Community Chest and Chance cards are faithfully represented.

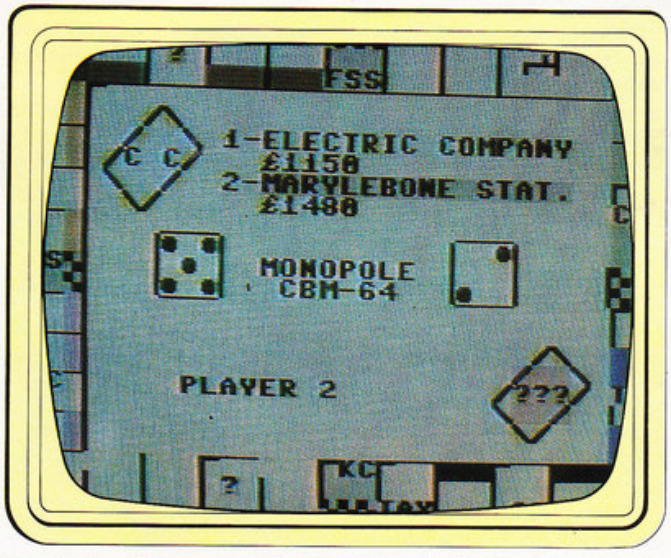
This is one way of speeding up the old game to a point where play will be over fast enough to retain interest for today's kids. The only criticisms are that only two players can play, and that the rules are not given.

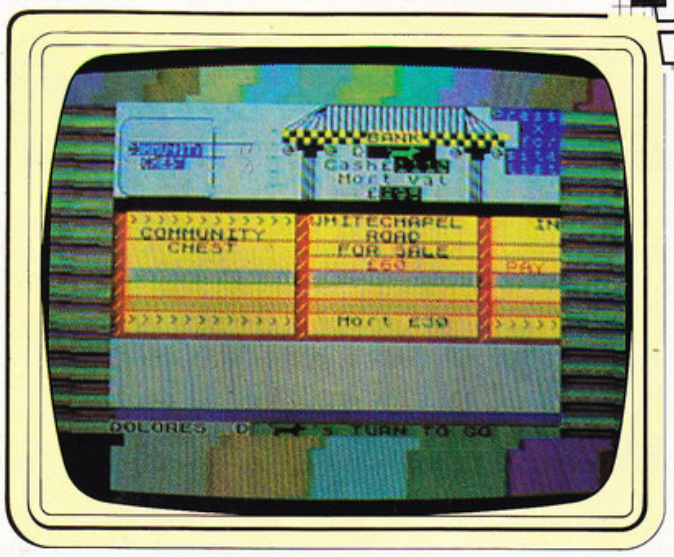
Verdict

The game is very well done, and makes imaginative use of the colour and sound facilities of the 64. Being on cassette, it is low-priced, and very good value for money. **Barry Miles**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





SPECTRUM

Empire building

Name Automonopoli **System** Spectrum, 48K **Price** £6 **Publisher** Automata UK, 65A Osborne Road, Portsmouth, Hants PO5 3LR, (0705) 735242 **Format** Cassette **Outlets** Mail order, various retailers

Those of you who have that empire building streak but not the finances to match can take refuge in Automonopoli — a version of the board game.

The game is similar to its counterpart with between two and five players and five tokens to choose from. And of course, the old familiar streets in London are there for the taking.

The Spectrum can be a competitor and/or banker.

First impressions

Automonopoli comes in the standard cassette casing with a clearly labelled cover on how to load and play the game. It didn't take long to get the hang of the game and before I knew it I was well on my way to beating the Spectrum.

Objectives

Your aim is to monopolise all the sites and property within the field of play through wheeling and dealing. If another player has the misfortune of landing on one of your sites, he then has to cough up the rent.

In play

I opted to play the Spectrum. So after entering my name and selecting my token I was given £1,500 to kick off the game.

The Spectrum made the first move as the dice rolled automatically on the screen. To get the dice rolling for me I had to enter my initials.

On each player's turn his token, amount of cash and mortgage value of his property is shown on the right hand side of the screen. The lower part of the screen is divided into three windows — showing your position and two places after you. When the dice have been rolled the windows scroll to the left.

I landed on the inexpensive Angel and snapped it up immediately. If properties are not bought they are auctioned to the highest bidder. My mistake was to buy property too quickly, thereby ending up with very little cash. On several occasions the Spectrum outsmarted me — knowing I had £50 left, it would offer £51 and snap up a site.

During play a constant rundown of what property you own is available using the X key. In addition, this gives you a menu system enabling you to buy a house, mortgage property, swop property and all the usual transactions needed.

Chance and Community Chest cards are featured to musical accompaniment.

Verdict

The game has to be seen to be appreciated. It certainly gave me a run for my money and was a change from the usual shoot 'em up epics.

With careful planning you can make the right moves and deals to add a bit of flavour to your game. The game can also be saved, giving you a break.

Trevor Jones

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

Mike Gerrard pulls a handful of hot chestnuts out of the Welsh micro's lair.

Dragon dramatics

Dragons are noted for being fiery customers — even the modern microchip variety does have a certain reputation. So this week *PCN* takes a trip through the latest in Dragon games to see if we can find any scorchers.

BONKA

To begin with the best of the bunch, Bonka from J Morrison is a colourful machine code version of the game originating in the arcades where you control a little man (looking like a flour grader here) who runs along platforms and ladders, occasionally stopping to dig holes into which he attempts to lure the Meanies who are chasing him.

A trapped Meanie must be promptly hit on the head, and points are scored depending on how far the creature plummets to its doom.

While inevitably lacking some graphic detail, this is still superior to most games around, giving you a choice of four speeds and between one and nine Meanies, and I defy anyone to stay alive at the highest level with all nine in hot pursuit.

The only drawback is that movement is through the arrow keys, with the space bar for digging and bonking, and it takes a little time and a lot of dead men (amusing graphics here) to master the controls.

All credit to J Morrison for concentrating on a few excellent machine code games for the Dragon, though I do wish its packaging was as good as that from Salamander.

NIGHTFLIGHT

Nightflight, you'll be astonished to hear, is a flight simulation program, the first I've seen, and it proved to be a slight disappointment, though this may or may not have something to do with the fact that I couldn't even get the wretched plane off the ground without crashing.

It certainly wasn't the fault of the instructions, which are detailed and clear, but I expected more from the graphics than two converging white lines and a plain blue block at the top of the screen.

The lower half contains the information panel, with speed, position, heading, distance from runway and so on, while you key in alterations to your direction, power, flaps and undercarriage.

I was obviously the right person to test whether the program was idiot-proof, and it was, but for more experienced pilots the aim is to take off, fly around, perform a few rolls and loops if you can, and then land safely again. Having seen screen photos of other flight simulations, though, I don't think this can be one of the best.

CITY DEFENCE

Even more of a disappointment was City Defence from Shards Software, though I'm always wary of people who describe their own games in glowing terms, like this one: 'A fast moving missile-command arcade game.'

The arcades would soon be empty if they had only games like this Basic one, which didn't get off to the best of starts with the loading instructions being wrong. CLOAD "program name", you are told, whereas you need to CLOAD "Defence".

A minor irritation, but it doesn't inspire confidence in the rest of the product.

The game itself has you in command of a planet full of cities, with the usual hostile aliens who haven't seen E.T. hell-bent on everyone's destruction.

Three traces start to move down the screen, and you must guide your sights to the tips of these traces with your joystick (no keyboard option). There are four speed levels, and while it does make good use of the Dragon's colour and sound, the game would seem to have little long-lasting appeal . . . or even short-lasting appeal, and is scarcely better than some from magazine listings.

HANGMAN

From the latter company comes a very good version of the old favourite, Hangman, and while it's not a game I would play for too long myself, I can imagine young children getting a lot of fun from it, and that's the market at which it's aimed.

Features include a vocabulary of 1,000 words, three levels of difficulty, one or two player options, and the choice of using a timer as well. Words and pictures are all on the high-res black and green screen, new words take only about five seconds to appear, and there's also an automatic skill adjustment if hangings are too frequent or too few.

FAMILY PROGRAMS

An improvement on City Defence, and from the same company, is Family Programs, a collection of 11 varied items, the best being a 'Name That Tune' type of quiz, with over 100 songs in memory — great fun, and very tricky to do — with tunes being played at unusual tempos.

Also good is a Maths quiz in high-res graphics, with three levels of difficulty and an egg-timer running out at the top of the screen.

Other programs include a version of Simon, a slow tank battle, a quiz on various topics, a mortgage and savings calculator, and one or two odds and ends which seem to be there just to make up the numbers.

DARTS

All darts players know that you finish on a double, so I'll finish with Championship Darts, a game for two players. Games like chess transfer readily to the micro, while others might be better left where they are, and darts would appear to be one of the latter.

This version, though, is not an attempt at exact simulation

but more an adaptation within the confines of the computer, and is all the better for that. As a regular darts player myself I enjoyed it, even if the only improvement it will make to your game at the pub is by encouraging you to work out those finishing scores that much quicker.

Using the high-resolution black and green screen, the writer is to be congratulated on his impressive use of graphics, and for a Basic program the responses are very quick indeed.

So how does it work? A cursor moves clockwise round the board, and pressing any key will stop it on the number you want . . . well, you hope it will. Another cursor then moves back and forth across a bar, broken up into sections for single, double, treble, miss, 25 or bull, and again you must try and stop it on the one that you're after.

The game length can be anything from two to 999, and scoring the magical 180 earns you a multi-coloured flashing lights routine . . . and it's about as easy to get as it is in the real game.

Not an addictive game, perhaps, but certainly one I'd return to from time to time for a bit of fun, and done to a very high standard. Second only to Bonka in this little batch.

Bonka, £7.95, J Morrison (Micros), 0532 480987
Super Skill Hangman and Nightflight, £7.95 each, Salamander Software, 0273 771942
Family Programs, £6.95, **City Defence,** £5.75, Shards Software, 10 Park Vale Court, Vine Way, Brentwood, Essex CM14 4UR
Championship Darts, £5.95, Shadow Software, 0709 558676

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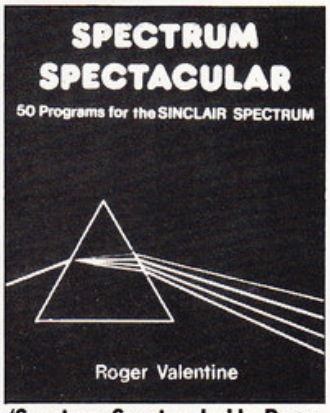


'Spectrum Spectacular' by Roger Valentine, published by V & H Computer Services (Staines 58041) at £4.95 (paperback, 138 pages).

'Spectacular' may be overstating the appeal of this book, but it should make a valuable addition to the library of the enthused Sinclair user.

Fifty program listings and subroutines should provide many happy hours of keying. The book covers the full applications spectrum — from games to business programs. It's also nice to see a British flavour — there is a program for keeping track of the football league table, for instance.

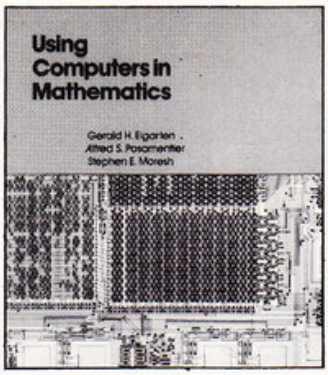
The opening chapter, 'Five easy pieces' is designed to acquaint you with the machine's capabilities and includes short listings for producing large characters and also a clock.

Many people will be interested in the intriguing 'Not just your plaything' chapter. No, nothing like that! This introduces 'serious' applications through word processing and accounting listings.

Another nice touch is a practice game for arcade buffs. This is a 'warm-up at the nets' exercise. Balls are shot out and the player simply attempts to get his electronic bat to them. Because the code is fairly simple the screen movement is fast. The author suggests that arcade players with fragile egos can limber up before exposing themselves to the competitive atmosphere of the games arcade.

There are also a number of games — Firepower, Flying Saucers and so on.

These machine-dedicated books are improving as the competition hots up, but they are still dogged by cheap production. But minor quibbles aside, this book offers some useful listings and the light — one might almost say acid — narrative is refreshing. **IS**



'Using Computers in Mathematics' by Gerald H Elgarten, Alfred S Posamentier and Stephen E Moresh, published by Addison-Wesley at £9.95 (01-631 1636) (hardback, 574 pages).

Using Computers in Mathematics is designed as an introductory text for a computer course, and as a supplement to teach the use of the computer in the traditional study of mathematics.

There are eight chapters, further divided up into sections. The text layout is very good and it makes reading the material more enjoyable.

All the computer ideas are introduced in the context of mathematical concepts, which means that the fundamentals of programming in Basic are learnt while the understanding of mathematics is added to and reinforced.

For example, in chapter 3, which covers geometry concepts, string variables, nested FOR-NEXT loops and logical operators are introduced.

The chapters cover programming concepts, algebra, trigonometry, statistics and end up with approximations for roots and functions.

Each chapter has worked examples followed by an exercise and further problems which enable the reader to test his understanding. Thanks to the sectional nature of the chapters, you can stop halfway through a topic and return to it later without losing continuity.

Listings are a joy to read and the flowcharts are drawn mostly on a separate page, usually accompanied by the corresponding code.

Don't be put off by the maths. *Using Computers in Mathematics* teaches a lot of fundamental programming concepts in a non-trivial way.

Business applications such as preparing invoices, printing charts, and sorting algorithms are also included. **TJ**

'Simple Interfacing Projects' by Owen Bishop, published by Granada at £6.95 (paperback 168 pages).

After you've used your micro to play a few games, manage the household accounts and write a couple of letters what then? It seems a shame to have the machine lying around the house not doing something with its processing power.

Owen Bishop's book would be a good starting point for anyone wanting to explore the possibilities.

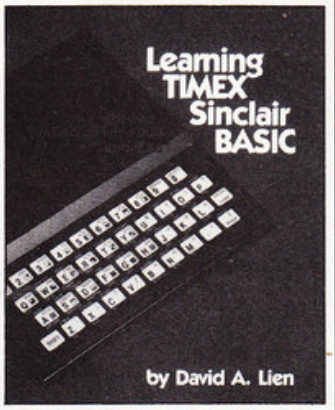
Granted, using your micro as a clock might seem an expensive way to tell the time but Mr Bishop does come up with some other ideas. How about controlling your electric kettle so it comes to the boil just before the start of News at Ten? Or a mains controller to switch lights on and off to confuse burglars into thinking you're in when you're out?

These are just a few examples which, although simple in concept, could spur the imaginative on to greater things. Among the other projects are a graphics tablet, music generator, ROM board, voice-operated controller, sound processor, digitiser pad and telephone modem.

With each project, a description is given of what it does and how it works, together with a circuit diagram. Constructional details are also supplied with a list of the components required.

Layout and presentation in the book are, like the contents, an example of clarity. A reader with some experience of wiring up electronic circuits should have no difficulty in understanding it. Even the uninitiated will quickly grasp the principles involved.

Simple Interfacing Projects is an apt title. It accurately describes both the complexity of the projects and the assumed knowledge of the reader. **RB**



'Learning Timex Sinclair Basic' by David A Lien, published by Compusoft at $14.95 (paperback, 331 pages).

The fact that there seems to be a plethora of books for the Sinclair ZX81 purporting to teach the raw user the ins and outs of Basic programming could be attributed to either the desperate interest of the ZX81 owner, or the shortcomings of the machine's users' guide.

Perhaps it's a combination of the two, but it would be nice if Sinclair's ZX81 manual was as lucid as *Learning Timex Sinclair Basic*. The book is aimed at the beginner with no computer knowledge or training in Basic.

There are eight chapters, starting with one on how to get started, and then the reader is introduced gently to maths operators, relationalship operators, FOR . . . NEXT loops, and how to use the cassette tape recorder.

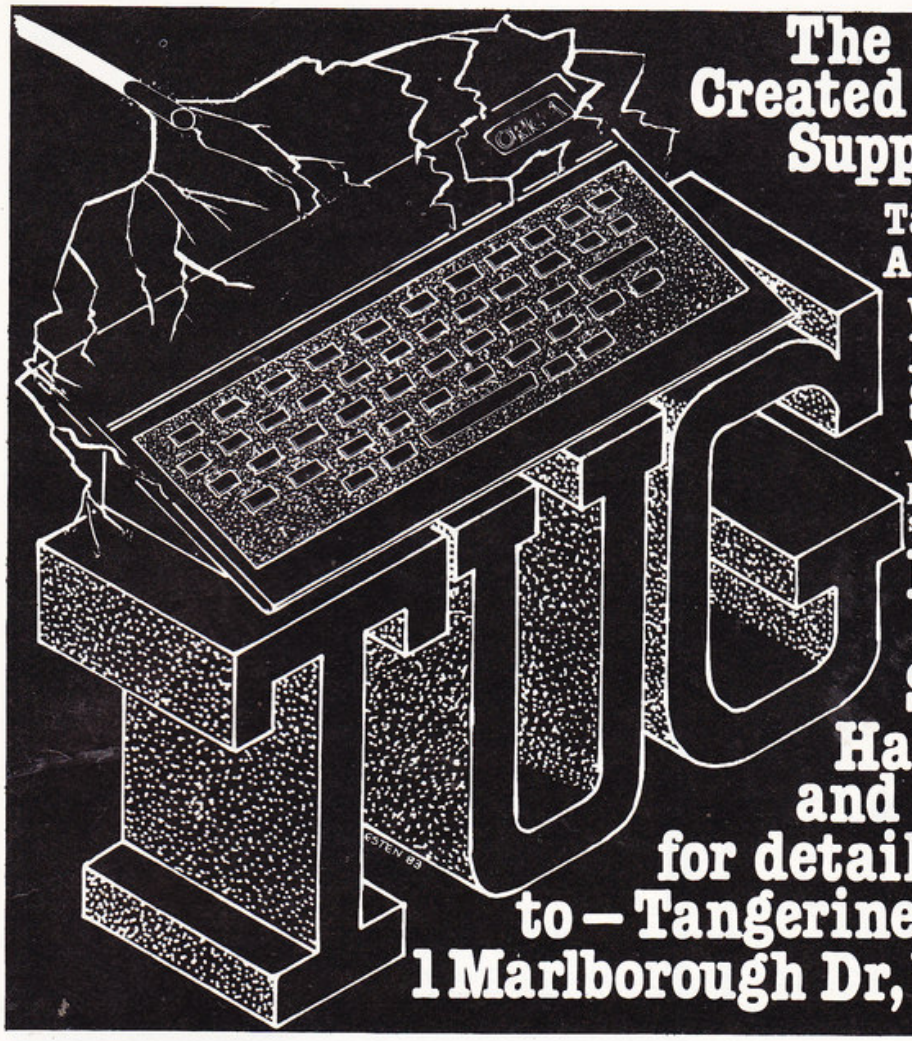
In chapter 3 it's strings, then onto maths function in chapter 5. All the basic topics such as graphics, arrays, PEEK and POKE are covered.

The chapters are well laid out with big clear print. Listings are printed unusually large. Each point is clearly explained and used in a program on the computer.

Most chapters have exercises to test your newly acquired knowledge and conclude with a list of the new commands.

The book has a light, conversational style which should make learning fun. *Learning Timex/Sinclair Basic* is ideal as a self-teaching aid and would be equally useful at home, in the classroom or on a training program.

There's no law that I know of that says a book dealing with a cheap computer must be downmarket itself. I particularly liked the inclusion of a cartoon to wrap up each chapter. This care and attention to detail in a book for the ZX81 makes a nice change. **TJ**



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PCN ProgramCards

Another nine uniquely annotated ProgramCards submitted by you. We do hope you are still cutting them out and filing them away for future reference. You know it makes sense.

Sorry!

Oh dear! It's apologies time again. Two weeks ago (*PCN May 27-June 2*) we published a Spectrum program by Philip Arnold called Munchman. Unfortunately, the program contained a couple of confusing lines. The lines in question were 1000 and 4100, containing references to RND. Most of you no doubt used this as a keyword and therefore found that when running the program it gave up the ghost (*tee-hee!*) with a syntax error in line 4100. The solution to this is as follows:

Line 1000—type in RND as capitals, not as a keyword.

Line 4100—type in RND as capitals for the first and third references, but use the keyword RND for the second reference to it.

This should solve the problems encountered and it will thereafter run OK. Philip and ourselves regret this oversight.

This Week

As promised, we complete P Lister's Time Bomb program for the Atari 400/800. We hope you enjoy this game as much as we did.

Fans of Phil Drabble should quickly don their wellies and have a bash at the program sent to us by Bobby Rao, of Bedford. 'Who is Phil Drabble?' we hear you ask. Well, he's that awfully nice chappie that introduces the BBC-2 programme *One Man and His Dog*, about sheepdog trials.

Does this give you a clue?

Running on the BBC Model B, Bobby's program is a game called Sheep Drive. By controlling your dog (black, of course) you have to round up and pen up to five dirty (yellow) sheep. You can also dip them to make them clean (white), but do not exhaust them or they fall over and lie on their backs — odd behaviour for sheep!

For those of you with disk-based systems there are a couple of things you will have to do to get this game to run. First, type in the program and save to cassette. Second, when successfully saved 'BREAK' the system and type in the following line:

PAGE = 3584 <RETURN>

This sets the machine to accept programs to load at the normal tape configured system. Finally, load the program from cassette and play the game. A bit long-winded but at least it works.

A RUN for our money

Gives us a RUN for our money.

Contributions should be sent on disk or cassette, with a plain paper listing and brief notes to:

Programs Editor, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

All disks and cassettes will be returned, at our expense, after consideration or publication.

PCN ProgramCards

Time Bomb — Card 3 of 5

Continued from last week

8314TB3/5

```
2080 POSITION Z(0),X(0):? £6;"t":RETURN
2100 POSITION Z(0),X(0):? £6;" "
2110 X(0)=X(0)+1:IF X(0)>8 THEN X(0)=0
2120 LOCATE Z(0),X(0),C:IF C=32 THEN X(0)=X(0)-1:RETURN
2130 POSITION Z(0),X(0):? £6;"t":RETURN
2150 POSITION Z(0),X(0):? £6;" "
2160 X(0)=X(0)-1:IF X(0)<0 THEN X(0)=8
2170 LOCATE Z(0),X(0),C:IF C=32 THEN X(0)=X(0)+1:RETURN
2180 POSITION Z(0),X(0):? £6;"t":RETURN
2200 T=20:REM *MOVE PATH FROM RIGHT
2215 T=T-1:IF T=Z(0) THEN POKE 764,255:SOUND 0,0,0,0:RETURN
2218 SOUND 0,65,6,8
2220 LOCATE T,X(0),C:IF C<>32 THEN 2215
2240 POSITION T,X(0):PRINT £6;"Z"
2250 GOTO 2215
2300 T=-1:REM *MOVE PATH FROM LEFT
2310 T=T+1:IF T=Z(0) THEN POKE 764,255:SOUND 0,0,0,0:RETURN
2315 SOUND 0,65,6,8
2320 LOCATE T,X(0),C:IF C<>32 THEN 2310
2330 POSITION T,X(0):? £6;"Z"
2340 GOTO 2310
2400 SOUND 2,0,0,0:SOUND 3,0,0,0:IF F1=1 AND F2=1 AND F3=1 THEN 2500
2420 RB=INT(5*RND(1)+1):FOR A=0 TO RB:Z(0)=Z(0)-RB:IF Z(0)<0 THEN Z(0)=0:NEXT A
2450 SOUND 0,162,10,8:GOSUB 9510:SOUND 0,182,10,8:GOSUB 9510:GOTO 1000
2500 FOR A=1 TO 3:FOR B=59 TO 29 STEP -2:SOUND 0,B,10,8:NEXT B:NEXT A:SOUND 0,0,
0,0
2520 SCORE=SCORE+(BOMB*100):GOSUB 6000:CAT=CAT+1:IF CAT=(ROUND+3) THEN ROUND=ROU
ND+1:GOTO 2800
2530 BX=Z(7+CAT):BY=X(7+CAT):TIME=99:GOTO 1000
2800 BP=ROUND*100:GOSUB 7200:POKE 756,224:POSITION 3,1:? £6;"congratulations":PO
SITION 2,3:? £6;"YOU HAVE COMPLETED"
2810 POSITION 7,4:? £6;"ROUND  ";ROUND:POSITION 3,6:? £6;SCORE:A=1:IF SCORE>9999
 THEN A=2
2820 POSITION A,7:? £6;"+  ";BP;" BONUS PTS":GOSUB 9200:SCORE=SCORE+BP:POSITION
1,9:? £6;"= ";SCORE
2870 GOSUB 9500:GOSUB 9500:GOSUB 7200:GOSUB 6000
2875 POSITION 1,5:? £6;"HERE COMES ROUND ";ROUND+1
2876 POSITION 3,7:? £6;"good luck !!"
2880 GOSUB 9500:GOSUB 9300:GOSUB 9520:GOSUB 7200:GOTO 350
3000 SOUND 1,80,0,11:FOR A=0 TO 90:SETCOLOR 4,0,A:SETCOLOR 1,0,A:NEXT A:SETCOLOR
 1,0,12:SETCOLOR 4,0,0
3010 SOUND 2,0,0,0:SOUND 3,0,0,0:GOSUB 9100:GOTO 4000
```

2080-2180 Routine to move Robot

2200-2250 Routine to move path from right side

2300-2340 Routine to move path from left side

2400-2450 Routine to deal with Robot meeting Bomb

2500-2530 Routine to deal with defused Bomb

2800-2880 Routine to display instructions at end of round

3000-3010 Bang!!!! Bomb explodes

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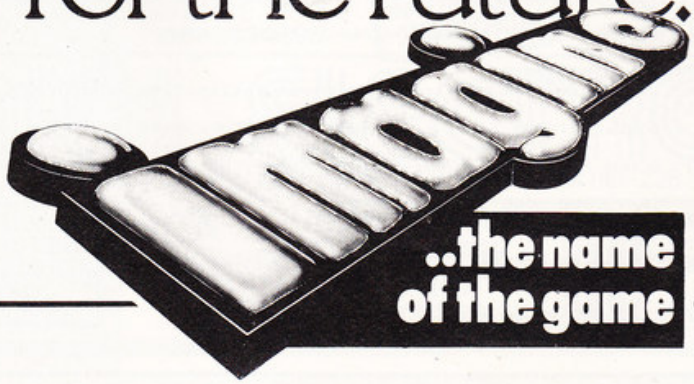

PCNProgramCards

Time Bomb — Card 4 of 5

8314TB4/5

```
4000 SOUND 2,0,0,0:SOUND 3,0,0,0:POSITION Z(0),X(0):? £6;"y":GOSUB 9000:GOSUB 95
10
4010 POSITION Z(0),X(0):? £6;"w":GOSUB 9510:POSITION Z(0),X(0):? £6;"x":GOSUB 95
110
4025 FOR A=X(0) TO 8:POSITION Z(0),A:? £6;"x":GOSUB 9400:POSITION Z(0),A:? £6;"
":SOUND 0,0,0,0:NEXT A
4027 IF Z(0)=LP THEN 4045
4028 IF Z(0)>LP THEN 4030
4029 FOR A=Z(0) TO LP:POSITION A,8:? £6;"x":GOSUB 9400:POSITION A,8:? £6;" ":NEX
T A:GOTO 4045
4030 FOR A=Z(0) TO LP STEP -1:POSITION A,8:? £6;"x":GOSUB 9400:POSITION A,8:? £6
;" ":NEXT A
4045 POSITION LP,9:? £6;"x":GOSUB 9400:GOSUB 9500:LIFE=LIFE-1:LP=LP-2:IF LIFE=0
THEN 4060
4050 GOSUB 7400:GOSUB 9300:GOTO 350
4060 GOSUB 7200:GOSUB 6000:POKE 756,224:POSITION 5,0:? £6;"game over":GOSUB 9200
4070 POSITION 3,2:? £6;"you completed          round  ";ROUND:GOSUB 9200:GOSUB 95
20:GOSUB 6100
4080 POSITION 2,6:? £6;"PRESS OPTION FOR      INSTRUCTIONS.":GOSUB 9200:GOSUB 952
0
4085 IF PEEK(53279)=3 THEN GOSUB 7300:GOSUB 9500:GOSUB 9300:GOSUB 9500:GOTO 340
4090 POSITION 2,6:? £6;"press start to          go again.  ":GOSUB 9200:GOSUB 952
0
4100 IF PEEK(53279)<>6 THEN 4080
4110 GOTO 340
5000 F1=1
5010 FOR A=59 TO 29 STEP -2:SOUND 0,A,10,8:NEXT A:SOUND 0,0,0,0:SCORE=SCORE+100:
GOSUB 6000:RETURN
5050 F2=1:GOTO 5010
5100 F3=1:GOTO 5010
6000 POSITION 1,10:? £6;"SCORE    HIGHSCORE":POSITION 14,11:? £6;HISCORE
6010 SCP=3:IF SCORE>9999 THEN SCP=1
6020 IF SCORE>999 THEN SCP=2
6030 POSITION SCP,11:? £6;SCORE:RETURN
6100 IF SCORE<HISCORE THEN RETURN
6110 HISCORE=SCORE:POSITION 2,6:? £6;"new high score":POSITION 7,7:? £6;HISCORE
6120 FOR C=0 TO 6:SETCOLOR 1,C,10
6130 GOSUB 9200:NEXT C:GOSUB 9300:POSITION 14,11:? £6;HISCORE:RETURN
7000 FOR R=0 TO 19:Z(R)=R:X(R)=R
7005 IF X(R)>8 THEN X(R)=INT(X(R)/3)
7007 NEXT R
7010 FOR R=19 TO 0 STEP -1:RX=INT(R*RND(1)):P=Z(RX):Z(RX)=Z(R):Z(R)=P:T=X(RX):X(
RX)=X(R):X(R)=T:NEXT R:RETURN
7200 GRAPHICS 17:GRAPHICS 18:RETURN
```

4000-4050 What a shame — Robot is destroyed

4060-4110 Routine to display end of game instructions

5000-5100 Routine to check flags

6000-6030 Routine to check scores and display

6100-6130 Routine to deal with new high score

7000-7010 Routine to generate 20 unique Z, X positions

7200 Routine to wipe out screen

PCNProgramCards

Time Bomb — Card 5 of 5

8314TB5/5

```
7300 GRAPHICS 17:POSITION 5,0:? £6;"time bomb":POSITION 1,3:? £6;"USE JOYSTICK T
O     MOVE REPAIR ROBOT.":GOSUB 9200
7310 POSITION 1,6:? £6;"USE CURSOR CONTROLS TO ADD MORE PATHS.":GOSUB 9200
7330 POSITION 1,9:? £6;"AVOID BOOBY TRAPS.          (SKULLS!)":GOSUB 9200
7340 POSITION 1,12:? £6;"COLLECT ALL THREE   FLAGS, AND THEN     DE-FUSE BOMB/S.
":GOSUB 9200
7350 POSITION 1,16:? £6;"MORE BOMBS WILL     BE SET EACH ROUND.":GOSUB 9200
7360 POSITION 1,19:? £6;"BONUS POINTS FOR    EACH BOMB DE-FUSED,":GOSUB 9200
7370 POSITION 1,22:? £6;"AND FOR EACH ROUND  COMPLETED.":GOSUB 9200
7399 RETURN
7400 GRAPHICS 17:POSITION 1,3:? £6;"your repair robot   has been destroyed.":GOS
UB 9200:GOSUB 9500
7410 POSITION 1,8:? £6;"YOU STILL HAVE ";LIFE;"    REPAIR ROBOTS LEFT.":GOSUB 92
00
7420 POSITION 1,13:? £6;"THE GAME WILL START AGAIN AT ROUND ";ROUND+1:GOSUB 9200
:GOSUB 9500:GOSUB 9500:RETURN
8000 FOR A=0 TO 1023:POKE 56*256+A,PEEK(224*256+A):NEXT A
8010 FOR A=0 TO 55:READ BYTE:POKE 14752+A,BYTE:NEXT A
8020 DATA 153,153,255,24,24,60,36,231,65,62,42,62,20,28,42,65,64,92,92,92,64,64,
64,64,0,200,136,139,255,255,0,0
8030 DATA 0,0,0,196,132,156,255,0,255,153,153,255,102,102,60,24,127,85,127,85,12
7,85,127,0
8099 RETURN
8999 END
9000 FOR A=35 TO 245 STEP 5:SOUND 1,A,10,12:SOUND 1,0,0,0:NEXT A:RETURN
9100 FOR A=100 TO 1 STEP -1:SOUND 1,A/10,0,A/14:NEXT A:SOUND 1,0,0,0:RETURN
9200 FOR A=1 TO 3:FOR B=1 TO 4:SOUND 0,29,10,8:SOUND 1,35,10,8:NEXT B:SOUND 0,0,
0,0:SOUND 1,0,0,0:NEXT A:RETURN
9300 TT=60:YY=47:GOSUB 9340:TT=53:YY=45:GOSUB 9340:TT=47:YY=40:GOSUB 9340:TT=45:
YY=37:GOSUB 9340
9310 TT=60:YY=47:GOSUB 9340:TT=60:YY=47:GOSUB 9350
9339 RETURN
9340 FOR A=0 TO 3:SOUND 0,TT,10,8:SOUND 1,YY,10,8:FOR B=1 TO 5:NEXT B:SOUND 0,0,
0,0:SOUND 1,0,0,0:NEXT A
9350 SOUND 0,TT,10,8:SOUND 1,YY,10,8:FOR A=0 TO 20:NEXT A:SOUND 0,0,0,0:SOUND 1,
0,0,0:RETURN
9400 FOR B=10 TO 30 STEP 5:SOUND 0,70+B,10,8:NEXT B:SOUND 0,0,0,0:RETURN
9500 FOR A=0 TO 300:NEXT A:RETURN
9510 FOR A=0 TO 25:NEXT A:RETURN
9520 FOR A=0 TO 100:NEXT A:RETURN
```

7300-7399 Routine to display full instructions

7400-7420 Routine to display instructions after Robot destroyed

8000-8099 Routine to create user defined graphic characters

9000-9400 A series of routines to perform sound functions

9500-9520 Routines for variable time delay functions

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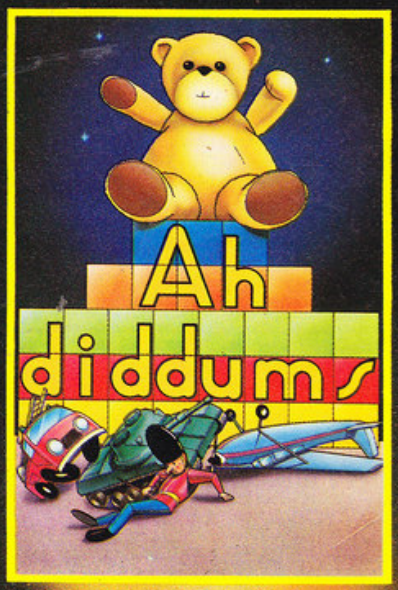

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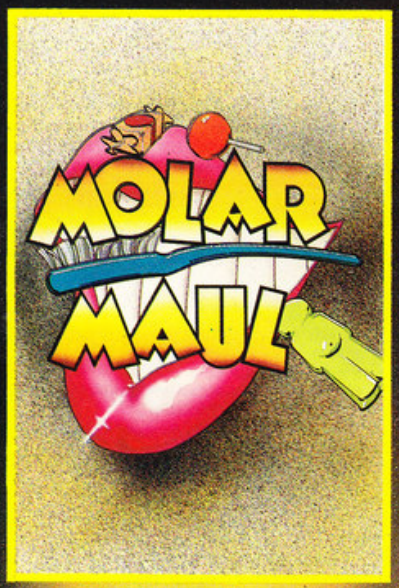

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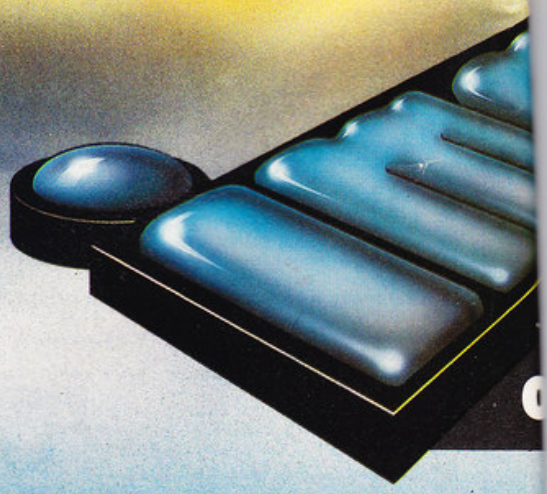

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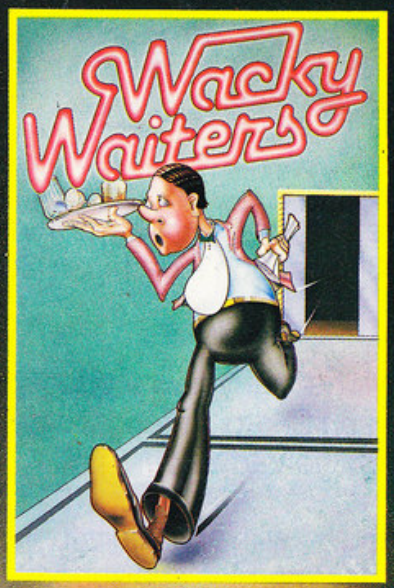

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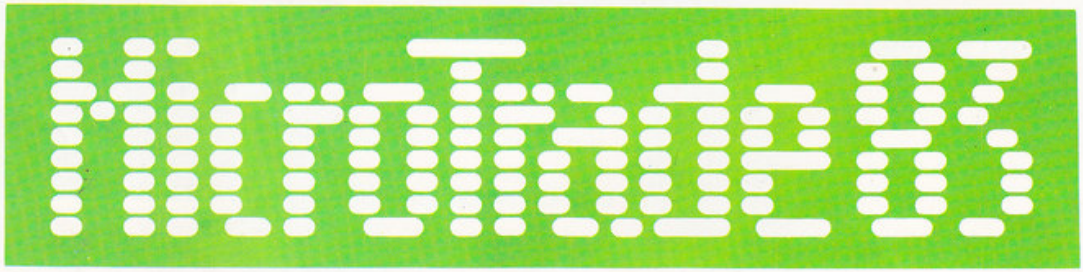

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PCNProgramCards

Sheep Drive Card 1 of 6

8314SD1/6

A different all action entertainment. NB Read the instructions in the introduction if you have a disk system

```
  10REM******************
  20REM***SHEEP DRIVE***
  30REM******************
  40ONERRORRUN

  50MODE7:PROCTITLE

  60?&25A=&20

  70ENVELOPE1,2,50,-70,50,30,30,30,120,0,0,-1,126,126
  80SOUND&11,1,0,50
  90REPEAT:PRINTTAB(2,23);SPC(37):PRINTTAB(2,22):INPUT"Do you want instructions
(Y or N)? " A$:UNTIL MID$(A$,1,1)="Y" ORMID$(A$,1,1)="N":IFMID$(A$,1,1)="Y" MODE
7:PROCINST
  100REPEAT PRINTTAB(2,23);SPC(37):PRINTTAB(2,22):INPUT"No. of sheep (1-5)? "SH%
:UNTIL SH%>0 ANDSH%<6:SH%=SH%-1
  110REPEAT PRINTTAB(2,23);SPC(37);:PRINTTAB(2,22):INPUT"Time limit (secs) " LIM
%:UNTIL LIM%>0:LIM%=LIM%*100
  120TIX=15/LIM%:TIY=255/LIM%
  130*FX15,0
  140MODE2:VDU5
  150VDU19,15,2;0;
  160VDU19,14,6;0;
  170VDU19,13,7;0;
  180VDU19,12,5;0;
  190VDU19,2,3;0;
  200VDU19,6,7;0;
  210VDU19,1,0;0;
  220PROCCHRS
  230PROCSCREEN
  240A%=900:B%=460:A0%=A%:B0%=B%:C%=0:D%=1
  250E%=226:E0%=E%:F%=0:GT%=1:GCOL3,15
  260MOVEA%,B%:VDUE%
  270TIME=0:REPEAT
  280GCOL3,15

  290MOVEA0%,B0%:VDUE0%
  300MOVEA%,B%:VDUE%
  310A0%=A%:B0%=B%:E0%=E%
```

BBC Model B
BBC Basic

Application: Game
Author: Bobby Rao

40	Error trap. If actioned then program reruns
50	Set screen mode and display title page
60	Set "CAPS LOCK" on and "SHIFT LOCK" off
70-80	Play opening theme music!
90-120	Routine to select instructions or not, accept number of sheep (1-5) and accept time limit (in seconds)
130-210	Set screen attributes and redefine colours
220-260	Set up initial values and displays
270	Reset time and start of main program loop
290-310	First part of routine to move dog

PCNProgramCards

Sheep Drive Card 2 of 6

8314SD2/6

```
  320IFINKEY(-74) PROCGATE
  330IFINKEY(-98) ANDA%>8 A%=A%-32:D%=1:GOTO350
  340IFINKEY(-67) ANDA%<1216 A%=A%+32:D%=-1
  350IFINKEY(-73) ANDB%<988 B%=B%+16:GOTO370
  360IFINKEY(-105) ANDB%>32 B%=B%-16
  370C%=C% EOR1:E%=225+C%+SGND%
  380FORN%=0 TOSH%:IFS%(N%,2)<>0 AND S%(N%,2)<>5 GOTO520
  390GCOL3,S%(N%,7)
  400DS%=12-FNDST/150:IFA%>S%(N%,0) S%(N%,3)=-DS% ELSES%(N%,3)=DS%
  410DS%=DS%/2:IFB%>S%(N%,1) S%(N%,4)=-DS% ELSES%(N%,4)=DS%
  420PROCSHEEP
  430IFFNSCRPK=0 GOTO460
  440SOUND0,-15,6,3
  450IFFNHIT=1 GOTO510 ELSEGOTO480
  460S%(N%,6)=S%(N%,6) EOR1:S%(N%,5)=231-SGNS%(N%,3)+S%(N%,6)
  470S%(N%,0)=S%(N%,0)+S%(N%,3):S%(N%,1)=S%(N%,1)+S%(N%,4)
  480IFFNINDIP=1 PROCDIP
  490IFFNOUT=1 S%(N%,2)=S%(N%,2)-10:F%=F%+1
  500IFFNPEN=1 ANDGT%=1 PROCIN
  510PROCSHEEP
  520IFFNPEN=1 ANDS%(N%,2)>5 ANDGT%=0 S%(N%,2)=S%(N%,2)-10:F%=F%-1:S%(N%,3)=-6:S
%(N%,4)=6
  530NEXT
  540TI%=TIME
  550VDU4:PRINTTAB(12,0);INT((LIM%-TI%)/100);"secs  ":VDU5
  560SOUND&13,-TI%*TIX,TI%*TIY,1
  570UNTILF%=SH%+1 ORTI%>LIM%

  580MODE7
  590IFFNSCORE=SH%*15+15 PROCCHAMP:GOTO620
  600IF TI%>LIM% PROCTIMUP:GOTO620
  610IFSH%*15+15-FNSCORE<SH%*7.5+7.5 PROCSUCCESS ELSE PROCFAILED
  620REPEAT:PRINTTAB(2,23);SPC(37):PRINTTAB(2,22):*FX15,1
  630INPUT"Another go (Y or N)?" A$:UNTIL MID$(A$,1,1)="Y" ORMID$(A$,1,1)="N":IF
MID$(A$,1,1)="Y" RUN
  640END
```

320-370	Final part of routine to move dog and open/close gate
380-530	Routine to move sheep about the field. Includes tests for dipping, penning and exhaustion
540-560	Time left display and associated sound functions
570	End of main program loop. Repeats until out of time or no sheep left
580-610	Routine to report on score and highlight success or failure
620-640	Routine to allow another attempt or end program

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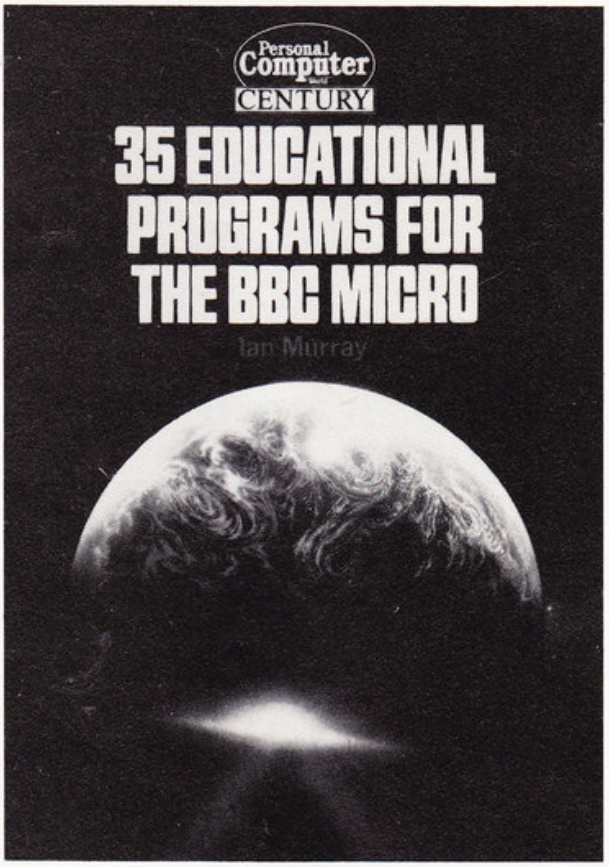

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CENTURY

PCNProgramCards

Sheep Drive Card 3 of 6

8314SD3/6

```
650DEFPROCCHRS

660VDU23,224,0,6,7,4,252,60,36,66
670VDU23,225,0,6,7,132,124,60,36,36
680VDU23,226,0,96,224,32,63,60,36,66
690VDU23,227,0,96,224,33,62,60,36,36
700VDU23,230,0,0,6,62,124,124,36,36
710VDU23,231,0,0,6,62,124,124,36,66
720VDU23,232,0,0,96,124,62,62,36,36
730VDU23,233,0,0,96,124,62,62,36,66
740VDU23,235,0,0,66,36,62,62,124,96
750VDU23,237,0,0,66,36,124,124,62,6
760VDU23,240,0,8,74,126,127,254,126,60
770DIMS%(SH%,8)
780FORN%=0 TOSH%
790REM N%,0=X N%,1=Y N%,2=IN/OUT
800S%(N%,0)=RND(200)+450:S%(N%,1)=RND(200)+450:S%(N%,2)=0
810REMN%,3=XDIS N%<4=YDIS N%,6=LEGS N%.5=CHR
820S%(N%,3)=RND(2)-1:S%(N%,4)=RND(2)-1
830S%(N%,6)=INT(RND(0)+.5):S%(N%,5)=231+SGNS%(N%,3)+S%(N%,6)
840S%(N%,7)=12:S%(N%,8)=0
850NEXT
860ENDPROC
870DEFPROCGATE
880GT%=GT% EOR1
890GCOL3,12:MOVE960,384:DRAW960,572:ENDPROC
900DEFFNDST
910=SQR((A%-S%(N%,0))^2+(B%-S%(N%,1))^2)

920DEFPROCDOUB(X%,Y%,A$)
930LOCALN%
940FORN%=0 TO1:PRINTTAB(X%,Y%+N%);CHR$141;CHR$136;A$:NEXT
950ENDPROC
960DEFPROCBKGND(A%)
970LOCALN%
980FORN%=0 TO24:PRINTTAB(0,N%);CHR$A%;CHR$157:NEXT
990ENDPROC
1000DEFPROCSHEEP
1010MOVES%(N%,0),S%(N%,1):VDUS%(N%,5)
1020ENDPROC
1030DEFPROCDELAY(DLY%)
1040LOCALT%:T%=TIME
1050REPEAT UNTIL T%>DLY%
1060ENDPROC
```

650	Procedure to define initial variables
660-760	Define all characters used in the game
770-850	Define and initialise array for sheep data
860	Return to main line program
870-890	Procedure to open or close the gate
900-910	Function to calculate distance between dog and a sheep using Pythagoras's theorum
920-950	Procedure to display double-height characters in mode 7
960-990	Procedure to perform background colour selection
1000-1020	Procedure to display sheep or not
1030-1060	Procedure to perform delay loop

PCNProgramCards

Sheep Drive Card 4 of 6

8314SD4/6

```
1070DEFFNSCORE
1080LOCALSC%:SC%=0
1090FORN%=0TOSH%:SC%=SC%+S%(N%,2)
1100NEXT
1110=SC%
1120DEFFNLOST
1130LOCALL%:L%=0
1140FORN%=0 TOSH%:IFS%(N%,2)<1 L%=L%+1
1150NEXT
1160=L%
1170DEFPROCSCREEN
1180VDU23;8202;0;0;0;:GCOL0,143:CLG:COLOUR143:COLOUR13
1190VDU4:PRINTTAB(2,0);"Time left:":VDU5
1200GCOL0,0:MOVE960,580:DRAW1150,580:DRAW1150,376:DRAW960,376:PROCGATE:GCOL0,0:
MOVE968,576:DRAW1142,576:DRAW1142,380:DRAW968,380
1210GCOL0,142:MOVE320,732:VDU32,32,127,127,10,32,32,127,127
1220GCOL0,12:MOVE312,740:DRAW448,740:DRAW448,668:DRAW312,668:DRAW312,740
1230MOVE312,744:DRAW448,744:MOVE312,664:DRAW448,664
1240GCOL3,11
1250FORN%=1 TO5:MOVERND(600)+200,RND(600)+50:VDU240:NEXT
1260GCOL3,12
1270FORN%=0 TOSH%
1280MOVES%(N%,0),S%(N%,1):VDUS%(N%,5)
1290NEXT
1300ENDPROC
1310DEFFNPEN
1320IFS%(N%,0)>959 ANDS%(N%,0)<1087 ANDS%(N%,1)>415 ANDS%(N%,1)<585 =1 ELSE =0
1330DEFFNINDIP
1340IFS%(N%,7)=12 ANDS%(N%,0)>312 ANDS%(N%,0)<392 ANDS%(N%,1)>700 ANDS%(N%,1)<7
44 =1 ELSE=0
1350DEFPROCDIP
1360S%(N%,7)=8:GCOL3,0:PROCSHEEP:GCOL3,8:S%(N%,2)=S%(N%,2)+5
1370ENDPROC
1380DEFFNOUT
1390IFS%(N%,0)<-64 ORS%(N%,0)>1280 ORS%(N%,1)<0 ORS%(N%,1)>1056 =1 ELSE=0
1400DEFPROCIN
1410S%(N%,2)=S%(N%,2)+10:F%=F%+1:S%(N%,0)=1008:S%(N%,1)=416+N%*32
1420ENDPROC
1430DEFFNSCRPK
1440LOCALF%,G%,H%:H%=0
1450F%=S%(N%,0)+S%(N%,3):G%=S%(N%,1)+S%(N%,4)
1460IFF%<0 ORF%>1216 ORG%<32 ORG%>992 GOTO1470 ELSEIFPOINT(F%,G%)<12 ORPOINT(F%
+64,G%)<12 ORPOINT(F%,G%-32)<12 ORPOINT(F%+64,G%-32)<12 H%=1
1470=H%
```

1070-1110	Function to calculate final score
1120-1160	Function to calculate how many sheep lost
1170-1300	Procedure to set up initial screen with pen, dip, bushes and sheep
1310-1320	Function to ascertain sheep in pen or not
1330-1340	Function to ascertain sheep in dip or not
1350-1370	Procedure to change colour of sheep to white if in dip
1380-1390	Function to determine if sheep off screen
1400-1420	Procedure to deal with sheep in pen
1430-1470	Function to detect sheep hitting something

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PCNProgramCards

Sheep Drive Card 5 of 6

8314SD5/6

```
1480DEFFNHIT
1490S%(N%,8)=S%(N%,8)+1
1500IF S%(N%,8)<10 =0 ELSE IF S%(N%,8)>10 =1
1510S%(N%,2)=S%(N%,2)-10:F%=F%+1
1520S%(N%,5)=236+SGNS%(N%,3)
1530ENVELOPE1,7,123,0,-10,1,1,12,125,0,0,-125,125,125
1540SOUND1,1,0,15
1550=1
1560DEFPROCCHAMP
1570ENVELOPE3,1,100,60,20,127,50,127,12,0,0,-12,120,120
1580SOUND1,3,0,120
1590PROCBKGND(135)
1600PROCDOUB(14,10,CHR$130+"Champion!")
1610PRINTTAB(2,20);CHR$129;"You have managed a perfect score of";TAB(2,21);CHR$
129;CHR$136;FNSCORE;CHR$137;"points!"
1620PRINTTAB(2,22);CHR$129;"You are champion of the minute!"
1630ENDPROC
1640DEFPROCTIMUP
1650ENVELOPE1,10,30,30,30,2,2,2,127,0,0,-127,126,126
1660SOUND1,1,0,47
1670PROCBKGND(132)
1680PROCDOUB(14,10,CHR$129+"Time up!")
1690PRINTTAB(2,20);CHR$135;"You ran out of time and managed to";TAB(2,21);CHR$1
35;"score ";FNSCORE;" points."
1700ENDPROC
1710DEFPROCSUCCESS
1720ENVELOPE1,1,45,30,15,10,30,40,127,-7,0,-120,126,120
1730SOUND1,1,0,50
1740PROCBKGND(131)
1750PROCDOUB(14,10,CHR$129+"Hooray!")
1760PRINTTAB(2,19);CHR$132;"You were successful in your mission";TAB(2,20);CHR$
132;"and scored";CHR$136;FNSCORE;CHR$137;"points,"
1770PRINTTAB(2,21);CHR$132;"losing ";FNLOST;" sheep on the way."
1780ENDPROC
1790DEFPROCFAILED
1800ENVELOPE3,70,-50,-50,-50,1,1,1,127,-100,0,-27,127,127
1810SOUND1,3,150,100
1820PROCDOUB(14,10,CHR$131+"Failure!")
1830PRINTTAB(2,20);CHR$130;"You failed miserably losing ";FNLOST;" sheep";TAB(2
,21);CHR$130;"and scoring ";FNSCORE;" points."
1840ENDPROC
1850DEFPROCTITLE
1860PROCBKGND(135)
1870PRINTTAB(11,1);CHR$133;"***************"
1880PROCDOUB(9,2,CHR$131+CHR$157+CHR$133+"Sheep Drive "+CHR$135+CHR$157)
1890PRINTTAB(11,4);CHR$133;"***************"
1900ENDPROC
```

1480-1550	Function to determine if sheep exhausted. Takes appropriate action
1560-1630	Procedure to deal with perfect score
1640-1700	Procedure to deal with 'out of time' condition
1710-1780	Procedure to deal with successful result
1790-1840	Procedure to deal with unsuccessful result
1850-1900	Procedure to display title page

PCNProgramCards

Sheep Drive Card 6 of 6

8314SD6/6

```
1910DEFPROCINST
1920PROCTITLE
1930PRINTTAB(3,6);CHR$132;"You control your sheepdog which must";TAB(2,7);CHR$1
32;"round up,dip and pen a flock of"
1940PRINTTAB(2,8);CHR$132;"sheep before your time runs out."
1950PRINTTAB(3,10);CHR$132;"The sheep are dirty and 5 points are";TAB(2,11);CHR
$132;"gained for each one you run through"TAB(2,12);CHR$132;"the blue dip (dirty
 sheep are yellow"
1960PRINTTAB(2,13);CHR$132;"and clean ones are white)."
1970PRINTTAB(3,15);CHR$132;"You gain 10 points for each sheep";TAB(2,16);CHR$13
2;"you pen. To pen a sheep you must open"
1980PRINTTAB(2,17);CHR$132;"the pen's gate,guide the sheep in and";TAB(2,18);CH
R$132;"close the gate.While the gate is open"
1990PRINTTAB(2,19);CHR$132;"any sheep in the pen begin to move so";TAB(2,20);CH
R$132;"only open the gate when essential."
2000PRINTTAB(6,23);CHR$129;CHR$136;"Hit SPACE BAR to continue"
2010REPEAT A$=GET$:UNTIL A$=" "
2020CLS:PROCTITLE
2030PRINTTAB(3,6);CHR$132;"You lose 10 points for each sheep";TAB(2,7);CHR$132;
"you allow to wander off the screen."
2040PRINTTAB(3,9);CHR$132;"You also lose 10 points when you";TAB(2,10);CHR$132;
"exhaust a sheep by either jumping on";TAB(2,11);CHR$132;"its back or allowing i
t to run into"
2050PRINTTAB(3,12);CHR$132;"something solid for too long (sheep";TAB(2,13);CHR$
132;"cannot jump over walls,bushes,gates";TAB(2,14);CHR$132;"or other sheep alth
ough the dog may)."
2060PRINTTAB(2,15);CHR$132;"Exhausted sheep lie on their backs."
2070PRINTTAB(3,17);CHR$132;"The sheep move away from the dog,the";TAB(2,18);CHR
$132;"closer it is to them the quicker they";TAB(2,19);CHR$132;"run away."
2080PRINTTAB(2,21);CHR$132;"ALWAYS TRY TO KEEP THE SHEEP TOGETHER"
2090PRINTTAB(6,23);CHR$129;CHR$136;"Hit SPACE BAR to continue"
2100REPEAT A$=GET$:UNTIL A$=" "
2110CLS:PROCTITLE
2120PRINTTAB(3,5);CHR$132;"Move the dog with the following keys"
2130PRINTTAB(7,8);CHR$129;"RIGHT-'Z'      LEFT-'X'"
2140PRINTTAB(10,10);CHR$129;"UP-';'      DOWN-'/'"
2150PRINTTAB(3,12);CHR$129;"Open and close the gate with SPACE"
2160PRINTTAB(5,14);CHR$129;"To move diagonally press two";TAB(5,15);CHR$129;"di
rection keys simultaneously."
2170PRINTTAB(3,17);CHR$132;"If you dip and pen all your sheep";TAB(2,18);CHR$13
2;"you become shepherd of the minute!"
2180PROCDOUB(11,20,CHR$130+"Good luck!")
2190ENDPROC
```

1910-2190	Procedure to display the instructions

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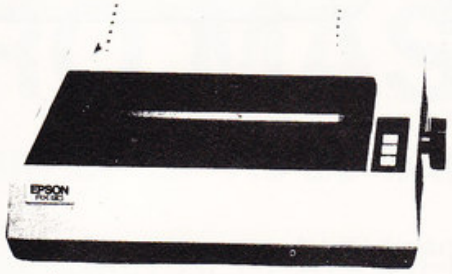

EPSON FX80: 80 column, 160 CPS, normal, italic and elite characters, 256 user definable characters, superscript, subscript, 11 × 9 matrix, bidirectional logic seeking, hi-res bit image printing (960 × 8 dots/line), friction and pinfeed, 9 international character sets, Centronic parallel interface.
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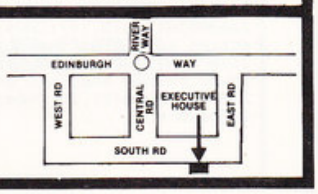

Social Spectrum of the Chiltern Club

In the back room of the Five Bells pub, club secretary Steve Betts demonstrates how fast Pascal runs on the Spectrum (top). After the talk the younger members get tapping on their Lynx, Spectrum and Dragon machines (above).

Running Pascal on the Spectrum was the topic of the night at the Chiltern Computer Club, in Eaton Bray.

About 30 members packed into the back room of the Five Bells pub armed with their micros, portable TVs and cassette recorders for the evening's play.

Against the background beat of pop music Steve Betts, general secretary of the club, delivered a talk on Pascal to an engrossed audience. To show the speed at which Pascal runs on the Spectrum, he contrasted it with a basic program on the same machine. The younger members in the room were amazed at Pascal's pace.

Sean Sullivan, one of the youngsters, told me: 'I've been coming to the club for about a month now. If I get stuck with a program on my Spectrum I can always get help from the club.'

Giving advice and help to members is one of the club's main functions — but to someone like Simon Cox, 15, using his Spectrum has become second nature. So far he has written 20 programs and sold some of them, and he has even used his own micro to check the answers to his homework.

Brian Jones, one of the founder-members of the club, and an electronics engineer for ICI, told me about some of his ventures: a 16-bit micro which took him a year to build, and a sound output for the BBC machine.

The club celebrates its first anniversary next month. Steve Betts said: 'We encourage people to bring their own machines along to meetings. Until recently we used to have a free-for-all where people would swop ideas, programs and so on. But now we split the meetings into two halves. The first half is a lecture and the rest of the evening is left open for members to do what they want.'

Mr Betts is also trying to persuade local companies to get involved with the club, and has invited several to give a talk. Subjects on the agenda include connecting the Spectrum to a teletype through an RS232 interface and Spectrum graphics.

Sandra Grandison

Name: Chiltern Computer Club. **Venue:** Five Bells, Eaton Bray, near Dunstable, Beds. **Meetings:** Second and fourth Mondays of the month. **Contact:** Steve Betts, 0525 220922.

NEXT WEEK We take up the invitation of the Watford ICPUG.

CLUBS

Clubnet keeps you in touch with the microcosm of personal computer enthusiasts throughout the UK. It is divided into two sections — clubs and user groups.

We publish a list of these two groups on alternate weeks. This week it is the turn of clubs, which are listed alphabetically by county and then by town.

Each issue also focuses on the activities of an individual club or group with a fly-on-the-wall report.

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HS.

AVON

Multi-User Club produces bi-monthly magazine, subs: £7.50. Contact Valerie Boyde-Shaw, Nailsea 851337.

Worle Computer Club. Meets at Woodspring Inn Functions Rooms on alternate Mondays at 7-10.30pm (annual subs: £12). Contact S W Rabone, 18 Castle Road, Worle, Weston-super-Mare, Avon, tel: 0934-513068

BEDFORDSHIRE

Bedford Amateur Computer Club. Meets at Star Rowing Club, Bedford, on the first and third Tuesday of each month at 8pm (annual subs: £3). Contact Rowan Bird, 74 High Street, Great Barford, Beds MK44 3LB, tel: 0234-870763.

Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month (annual subs: £2 senior members, £1 under-14s). Contact Steve Betts, 42 Wallace Road, Eaton Bray, Bedfordshire OU6 2DF, tel: 0525-220922.

Luton College Computer Club. Contact John Rodger, tel: 0582-3411.

Luton Computer Club. Contact J P Fletcher, 1 Trowbridge Gardens, Luton, Beds LU2 7JY, tel: 0582-450687.

BERKSHIRE

Easthampstead Computer Club. Meets at Easthampstead Park School, Easthampstead Park Mansions, Bracknell, on the first Wednesday in month at 8pm. Contact Brian Poulton, tel: 0344-84423.

BIRMINGHAM

Birmingham Amateur Computer Club. Meets at CBS Consultants, Watery Lane, Small Heath, Birmingham 10, on the first and third Wednesday of each month at 7pm (annual subs: £4.20 adults, £1.50 juniors). Contact Dr M Bayliss, 125 Berryfield Road, Sheldon, Birmingham B26 3UU, tel: 021-743 7197.

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm (annual subs: £5). Members also meet at Mandsville County Secondary School the first Thursday of each month at 7pm. Contact Ken Knight, 22 Mount Street, Aylesbury, tel: 0296-5181.

Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month (annual subs: £4 for six months). Contact Mrs W Tibbitts at Ellwood, Deanway, Chalfont St Giles. Buckinghamshire, tel: 024-07 4906.

Iver Computer Club. Contact P A Seal at 1 Ormonde Flats, Church Road, Iver Heath, tel: 0753-652792.

Iver Computer Society meets at Huntsmoor room, Iver Village Hall on the second and fourth Thursday every month at 7.30. Contact John Haigh, 141 Leas Drive, Iver Bucks, SL0 9RP.

CAMBRIDGE

Cambridge Microcomputer Club, meets on the third Wednesday of each month. Contact Derek Tripp at 3 Spurgeons Avenue, Waterbeach, tel: 0223-315662.

Haverhill Microcomputer Club, meets at St Marys' Church Hall, Camps Road, Haverhill, on the second, third and fourth Wednesday of each month at 7.30 to 10.30pm (annual subs: £3 adult: £1 OAP and students: meetings 25p). Contact Andrew Holliman, at 5 Trinity Close, Balsham, Cambridge CB1 6DW, tel: 022 029-583.

Peterborough Personal Computer Club meets at Crosfield Electronics Social Club, fortnightly on Mondays. Contact Andrew Pike, tel: 0733-44342 after 5pm.

CHESHIRE

Altrincham Computer Club. Meets at N. Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Contact Martin Hickling at 39 Barrington Road, Altrincham, Cheshire WA14 1H2, tel: 061-941 4547.

Brunel Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Contact Mr R Simpson at 4 The Coots, Stockwood, Cheshire.

Cheshire Computer Club. Contact W Collins at 37 Garden Lane, Chester, Cheshire.

Crewe Computer Users Club meets at Buffaloes Club, Earl Street, Crewe, Cheshire, on the third Thursday of each month at 8pm. Contact Bram Knight on 0270-623375.

Holmes Chapel Micro Club meets at Liesure Centre, Holmes Chapel at 7.30 to 9.30pm on the first and third Tuesday of each month (annual subs: £5 adults: £2.50 children, OAP and students. Or weekly subs: 30p adults, 20p children). Contact Margaret Baker, at 1 Helton Close, Crewe, Cheshire, tel: 0477-34238.

Kinder Peek Computer Club meets at Bew Mills School every Monday, sub: £2 per quarter, £1 members under 11. Contact John Eary, New Mills 43870.

New Mills & District PCC meets at New Mills School, fortnightly on Fridays at 7 to 9.30pm, meetings 35p. Contact Mr G M Flanagan at 11 Sundown Close, New Mills, Stockport, Cheshire SK12 3DH, tel: 0663-44051.

Northwest Computer Club meets fortnightly, meetings 25p. Contact John Lightfoot at 13 Aston Drive, Frodsham, Warrington, Cheshire WA6 7PU, tel: 0728 31519.

Northwest Computer Club, weekly meetings. Annual subs: £1; meetings 30p (vistors 50p). Contact Tom Wyatt at 29 Summer Lane, Halton, Runcorn Cheshire WA7 5PG, tel: Runcorn 77545.

Mid-Cheshire Computer Club meets at Winsford Library on the second Friday every month at 7.30pm contact Dave Clare, Winsford 51374.

CLEVELAND

Cleveland Micro Club meets on the second and third Tuesday of each month, under 18s on second of the month, over 21s on third Tuesday of the month. Contact J Telford at 13 Weston Crescent, Norton.

Stockton Amateur Computer Club meets at YMCA, Stockton, each alternate week at 7-9pm. Subs: adults £4, families £6, juniors £2, meetings 30p. First week: programmer's evening, second week: workshop/games evening. Contact Peter Cheshire, 60 Croft Road, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0DY.

CORNWALL

Cornish Radio Amateur Club — Computing Section. Contact Bob Reason at 24 Mitchell Road, Camborne, Cornwall.

Cornwall Area Computer Club. Contact M F Grove at 35 Causeway Heard, Penzance.

St Austell Computer Club and Computer Town meets at ECIP Labs, Penpewan Road, St Austell, fortnightly on Mondays at 7.30pm. Contact N G Day at 2 Cilendale Close, St Austell, Cornwall PL25 3DD.

DERBYSHIRE

Derby Micro Society meets at Littleover Church Hall, Sheperd Street, on every other Thursday at 7pm. Annual subs: £5, £2.50 children, £7.50 for families, 50p entrance non-members. Contact Mike Riordan, tel: 0332-769440.

Glossop Computer Club. Contact John

70 ▶

Dearn, 2 Spinney Close, Glossop, Derbyshire.

DEVON

Exter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month. Annual subs: £7.50 adults, £2.00 for students. Technical library. Contact Ian Hodgeson, 21 Dean Street, Exeter, tel: 0392-50812.
Exeter & District Amateur Computer Club meets second Tuesday every month. Annual subs: £7.50. Contact Doug Bates, Fortescue House, Stoke Cannon, Exeter. Specialist meetings on third and fourth Tuesday.
Torbay Users Computer Club meets at Devon Computer Services, 96 Dartmouth Road, Paignton on Mondays fortnightly. Annual subs: £2.00 juniors, £5.00 adults, meetings 20p, children welcome. Technical library available.

DORSET

Bournemouth Area Computer Club meets at Kinson Community Centre on the third Wednesday every month. Annual Sub: £5 adults; £2.50 juniors. Contact Peter Hibbs, 54 Runnymede Avenue, Bournemouth, Dorset BH11 9SE, tel: 0202 576547.
TOPIC meets at Canteen English Truck Centre on the second and fourth Wednesday every month at 7pm. Annual subs: £5, reduced fees for students. Contact David Washford, 1 Alexander Road, Bournemouth, Dorset BH6 5JA.
Purbeck Computer Club, contact 31 North Street, Wareham, Dorset BH20 1AD.

DURHAM

Darlington Computer Club, weekly meetings and informal discussion. Technical library available. Contact L Boxell, 8 Vane Terrace, Darlington DL3 7AT, tel: 0325-67766.

ESSEX

Genius Computer Club, subs: £1 ZX81 members, £1.50 Spectrum members. Contact 30 Webber House, North Street, Barking, Essex.
Brentwood Amateur Computer club, proposed new club. Contact R Sadler, 18 Wanescot Road, Brentwood, Essex CM15 9HD.
Springfield Computer Club meets on the first Friday of every month. Contact Stephen Cousines, 1 Aldeburgh Way, Springfield, Chelmford, Essex CM1 5PB, tel: 0245 50155.
Colchester Microprocessor Group meets at University of Essex on the second and fourth Wednesday of every month at 7.30pm. Annual subs: £5. Contact Information Centre, University of Essex, near Colchester.
Stanway School Computing Club, only school members at present. Contact G Floyd, c/o Physics Department, Stanway School, Stanway, Colchester, Essex.
Dragon Independent Owners Association, produces newsletter, gives discount on software, subs: £8. Contact Doug Bourne, School House, Nevern Road, Rayleigh, Essex.
Romford Club, a new club. Contact Mr D Norden, 138c Church Road, Romford, Essex.
South East Essex Computer Society meets at Hockey Club at Roots Hall, near Southend Football Stadium on Wednesday at 7.30pm. Open to members over 14. Contact Robin Knight, 128 Little Wakering Road, Little Wakering, Southend-on-Sea, Essex, tel: 0702-218456.

GLOUCESTERSHIRE

British Amateur Electronics Club. Independent club with newsletter, beginner's section, library, annual exhibition catering for all ages. Contact Mr J Margetts, 3 Bishopstone Close, Golden Valley, Cheltenham.
Cheltenham Amateur Computer Club meets on the third Tuesday of each month at 7.30pm. Contact Mike Pullin on 0242-25617 or Robin Phelps on 0242-584343.
GCHQ. Contact D W Adam, 16 Court Road, Prestbury, Cheltenham.
Cheltenham Amateur Computer Club meets at Prestbury Scout Headquarters, on the third Tuesday of every month at 7.30pm. Annual subs: £3. Contact M Hughes, 36 Riverviews Way, Cheltenham, Gloucs.

HAMPSHIRE

Commodore Computer Club. This new club meets on the first Friday of every month at Bury House, Bury Road, Gosport at 7.30pm. For further information contact Brian Cox, Fareham 280530.
Fareham and Portsmouth Amateur Computer Club. Contact Alan Smith, c/o Francis Close, Lee-on-the-Solent, Gosport, Hants PO13 8HB, tel: 0705-550907.
RAF Odiham Computer Club. Contact c/o Officer i/c, Royal Air Force, Odiham, Nr Basingstoke, Hants.
Southampton Amateur Computer Club meets at Medical Science Building, Bassett Crescent, East Southampton, on the second Wednesday of every month at 7.30pm. Annual subs £5, £3.50 students & OAPs. Contact P Maddison, 'Gardenways', Chilworth Towers, Chilworth, Southampton SO17 7JH.

HEREFORD

Hereford Amateur Computer Club, proposed new club. Contact Stuart Edinborough, 2 Warwick Walk, Bobblestock, Hereford HR4 9TG, tel: 0432-269700.

HERTFORDSHIRE

Harpenden Microcomputer Club meets at Silver Cap, Harpenden on alternate Mondays. Annual subs £2.50. Contact David James, 5 Ox Lane, Harpenden, Hertfordshire AL5 4HH.

HUMBERSIDE

Grimsby Computer Club meets at Grimsby Central Library fortnightly on Mondays at 7.30pm. Contact Jenson Lee, 29 Park View, Cleethorpes, tel: 0472-4259.
Scunthorpe & District Microprocessor Society meets at Community Centre, Lindun Street, Scunthorpe, every Tiesdau at 7.30pm. Annual subs £2, families £5. Contact G Hinch, 21 Old Crosby, Scunthorpe, South Humberside DN15 8PU.

KENT

Canterbury ACC proposed new club. Contact L Fisher, 21 Manwood Avenue, St Stephens, Canterbury, Kent CT2 7AH.
Medway Amateur Computer & Robotics Organisation meets on the first Tuesday and third Wednesday of every month. Annual subs £5. Contact Paul Cameron. Small Community Centre, Lordwood Lane, Lordwood, Chatham, Kent, tel: 0634-63036.
North Kent Amateur Computer Club meets at Lecture Theatre, Charles Darwin School, Jail Lane, Biggin Hill, Kent, on the first Thursday of every month at 7.30pm. Annual sub £3, £1 students. Contact Iain House, 28 Canadian Avenue, Catford SE6 3AS, tel: 01-690 5441.
Orpington Computer Club meets at The Large Hall, Christ Church, Chaterhouse Road, Orpington, Kent, every Friday at 8pm-10.30pm. Insurance cover for all members' equipment while on club premises. Contact Mr R Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF, tel: Orpington 20281.
Amateur Computer Club, annual subs: £4.50 (£2 for under 18s, OAPs). Contact Rupert Steele, St John's College, Oxford OX1 3JP.
National Personal Computer User Association, annual subs £12. Contact Eric Keeley, 11 Spratling Street, Manston, Ramsgate, Kent.
Sevenoaks School Computer Club. Contact G Sommerhoff, Technical Centre, Sevenoaks School, Sevenoaks, Kent, tel: 0732-456340.
Tonbridge & Tunbridge Wells ACC. Contact Ray Szatkowski, 1 Cromer Street, Tonbridge, Kent, tel: 0732-355960.

LANCASHIRE

Blackburn Micro Computer Club. Contact Roger Longworth, 12 Sharp Close, Accrington, Lancs.
Bolton Computer Club meets at E4/24 Bolton Institute of Higher Education, Deane Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Asherton, Manchester M29 9FB, tel: 0942-876210.
Burnley Computer Club meets at Carleton Hotel, Standish Street, on Tuesdays 7.30-11pm. Contact Clive Tallon, 27 Basnett Street, Burnley, Lancs BB10 3EQ.
Chorley Computer Club meets at Townley Arms, Chorley, every other Tuesday at 8pm. Contact Chris Hicks, 131 Market Street, Chorley, Lancashire.
Ribble Valley Computer Club meets at Staff Canteen, Pendle Carpets Ltd, West Bradford, on the second and fourth Monday of every month at 7-9pm. Contact Ian Thornton-Bryar, 25 Southfield Drive, West Bradford, Clitheroe, Lancs BB7 4TU.
Lancaster & Morecambe Computer Club. Contact Sarah Blackler, tel: 0524-33553.
South Chadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton, on Thursdays at 7-9.30pm. Contact Mr Jakeman, 26 Marble Street, Derker, Oldham, Lancs. Tel: 061-678 0547.

LEICESTERSHIRE

East Leake Computer club. Contact Andrew Jones, 59 Bateman Road, East Leake, Loughborough, Leicestershire LE12 6NN.

LINCOLNSHIRE

Lincoln Computer Club, meets at Blandings Public House, High Street, Lincoln on the frist and third Wednesday of every month. Contact John Clifford, 448 Newark Road, Lincoln LN6 8RX, tel: 0522 2168.
Skegness Computer Club, meets at County Hotel every other Monday, 7-9.30pm. Contact Reg Potter, 118 Beresford Avenue, Skegness, tel: 0754 3594.

LIVERPOOL

BBC Microgroup Liverpool meets at Old Swan Technical College, Liverpool, on the first Wednesday of every month. Contact Nick Kelly, 56 Queens Drive, Walton, Liverpool L4 6SH.

LONDON

Croydon Micro-Computer Club meets on the first and fourth Tuesday of every month. Contact Vernon Gifford, 111 Selhurst Road, Selhurst SE25 6LH, tel: 01-653 3207.
Computer Users Club. Contact Tony Latham on 01-304 3910.
East London Amateur Computer Club meets at Harrow Green Library, Cathall Road, E11, on the second and fourth Tuesday of every month at 7-10pm. Annual subs: £5. Contact Fred Linger on 01-554 3288.
Forum-80 London, contact Leon Jay on 01-286 6207.
Forum-80 Wembley, contact Victor Saleh on 01-902 2546.
Harrow Computer Group meets at Harrow College of Higher Education, Room W24, Northwick Park, on alternate Wednesday at 7pm. Contact Bazyle Butcher on 01-950 7068.
Imperial College Microcomputer Club meets at room 145, level 1, on Tuesdays at 7.30pm. Contact Tim Panton, c/o I.C. Union Office, Prince Consort Road, London SW7 2BB.
London School Computer Club. Contact Burlington Danes School, Dane Building, DuCane Road, Hammersmith, London.
Metropolitan Police Amateur Computing Club meets on the first Thursday of every month at 7pm. Contact S Farley on 01-725 2428.
North London Hobby Computer Club meets at the Polytechnic of North London, Holloway, London N7 8DB, on every Monday, Tuesday, Wednesday and Thursday during term time and one evening a week during holidays. Annual subs: adults £25, family £40, jobless, pensioners, poly students £5. Contact Robin Bradbeer 01-607 2789.
Paddington Computer Club meets at Paddington College, 25 Paddington Green, London W2 1NB. Contact Peter Hill on 01-723 5762.
Post Office HQ Microcomputer Club meets at room B145, River Plate House, 12-13 South Place, off Moorgate, on the second Thursday of every month. Contact Vernon Quaintance, British Telecom Enterprises, Cheapside House, 138 Cheapside EC2U 6JH, tel: 01-726 4716.
Richmond Computer Club meets at Richmond Community Centre, Sheen Road, Richmond, on the second Monday of every month at 8pm. Contact Bob Forster, 18a The Barons, St6 Margarets, Twickenham, Middlesex, tel: 01-892 1873.
The SOBAT Computer Club meets once a fortnight. Subs: £4. Produces monthly letter. Contact Mr T Kayani, Berridge House, Hillfield Road, London Nw6.
South East London Microcomputer Club meets at Thames Polytechnic, Greens Ends, Woolwich SE18, on alternate Wednesdays at 7pm. Annual subs: £5. Contact Peter Phillipps, 61 Graigerne Road, SE3, tel: 01-853 5829.
Southgate Computer Club, annual subs: £2.50. Contact Panos Koumi, 33 Chandos Avenue, London N14.
Southgate Technical College Computer Club meets at Room W102 Southgate Tech, fortnightly on Thursdays at 7.30pm. Annual subs: £5. Contact Kevin Pretorius on 01-882 2282.
West London Personal Computer Club meets at Back room, Fox & Goose pub, Hanger Lane, Alperton, on the first Tuesday of every month at 7.45pm. Annual subs: £5 adults, £2.50 under 16s & pensioners. Contact Graham Brain on 01-997 8986.

MANCHESTER

Manchester Computer Club meets at the Department of Computer Science, Manchester University, Oxford Road, Manchester, on the first and third Thursday of every month at 7.30pm. Contact David Wade, 061-941 2486.
Small Business Computer Users Club. Proposed new club to meet the last Tuesday every month, subs: £7.50. Contact K Wadsworth on 061-740 7232 after 5pm.

MERSEYSIDE

Bolton Computer Club meets Room E4/E24 Bolton Institute of Higher Education, Deene Road, Bolton, on Thursdays. Annual subs: £1. Contact David Atherton, 16 Douglas Street, Atherton, Manchester M29 9FB.
Merseyside Microcomputer Group meets at Merchant Taylor's School, Crosby, on second Thursday every month. Contact Mr F Shaw, 14 Albany Avenue, Eccleston Park, Prescot, tel: 051-426 5536.
Southport Computer Club meets weekly. Contact Ian Bristone, 28 Weld Road, Southport, Merseyside PR8 2DL, tel: 0704-64524.
Wirral Microcomputer Users Group meets at Birkenhead Technical College every Monday. Contact J Phillips, 14 Helton Close, Birkenhead, Merseyside L43 9HP.

MIDDLESEX

68 Microgroup meets at Regents Park

Remember

Let us know about your micro club or user group so we can be sure the information printed here is up to date. Drop a card to Sandra Grandison, Listings Editor, at *Personal Computer News*, 62 Oxford Street, London W1A 2HG, or give her a call on 01-636 6890.

Library, Robert Street, NW1, on the third Tuesday of every month at 7.30pm. Annual subs: £5. Contact Jim Anderson, 41 Pebworth Road, Harrow, Middlesex.
Richmond Computer Club meets at Richmond Community Centre, Sheen Road, on the second Monday of every month at 8pm. Contact Bob Fisher, 18a The Barons St Margarets, Twickenham, Middlesex, tel: 01-892 1873.
Sunbury Computer Club meets at St Benedicts Hall, Napier Road, Ashford, on the last Tuesday of every month at 8pm. Contact Simon Taylor, 8 Priory Close, Sunbury-on-Thames, Middlesex. Contact Simon Clark, 83 Watling Street, Towcester, Northants NW12 7AG.

NOTTINGHAMSHIRE

Ashfield Computer Club meets at Carsic Junior School, St Mary's Road, Sutton in Ashfield on the first and third Thursday every month. Annual subs £3. Contact Derick Daines, c/o Cuttings Avenue, Sutton in Ashfield, Notts.
Eastwood Town Micro Computer Club meets at Devonshire Drive Junior School every Wednesday at 5.45pm. Annual subs: £5.50 adults, £2.75 juniors, £4.50 OAPs. Contact Ted Ryan, 15 Queens Square, Eastwood, Nottingham NQ16 3BJ.
Nottingham Microcomputer Club meets at Friends Meeting House, Clarendon Street, Nottingham, on the first Tuesday of every month. Annual subs: £5.50 adults, £2.50 juniors, OAPs. Contact Mr E Harvey, 68 Roseleigh Avenue, Nottingham NG3 6FH, tel: Nottingham 608491.
Worksop Computer Group. New club, first meeting June 14 in Worksop library lecture room. Contact Mr Andrews, Worksop 487327.

NORFOLK

Anglia Computer User Group. Contact Jan Rejzl, 128 Templemere, Sprowton Road, Norwich, tel: 0603-29652.
East Anglian Computer User's Group meets at Crome Community Centre, Telegraph Lane, Norwich. Contact Gill Rijzi, 88 St Benedicts, Norwich.
South Northants Computer Group meets at Anchor House, Moat Lane, Towcester, on Wednesdays at 7.30pm.

OXFORDSHIRE

Association of Computer Clubs. Annual subs: £5, £2.50 under 18s and OAPs. Contact Rupert Steele, St John's College, Oxford OX1 3JP.
Microsoc meets at Clarendon Lab, Parks Road, Oxford, every week during term. Contact Rupert Steele, St John's College, Oxford OX1 3JP.
Oxford Personal Computer Club. Annual subs: £8. Contact Len Phelps, Southport Cottage, Sutton Courtenay, Nr Abingdon, Oxon OX14 4AU.
Ridgeway Computing Club meets at Swan Hotel, East Ilsley, on the second Tueday every month. Contact Mike Magney, Beavers, South Street, Blubury, Didcot, Oxon OX11 0JU.

SHROPSHIRE

Ludlow & District Microcomputer Club meets at Diocesan Education Centre, Lower Galdeford, Ludlow, on the second Monday of every month at 7.30pm. Annual subs £7.50 family, £5 adult, £2.50 student.
Shrewsbury Micro Club meets at Shrewsbury Shirehall once a month. Beginners' Basic course and many machines on display. Contact Mr V Ives, 6 Bramley Close, Severn Meadows, Shrewsbury SY1 2TP.
Telford Computer club meets at Telford ITEC on every Monday 6-9pm. Annual subs: £3.50, £1.50 unemployed. Contact John Murphy, 10 Brichmore, Brookside, Telford TF3 1TF, tel: 0952-595959.

SOMERSET

Sharp MZ80 Club, contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset.
Yeovil Computer Club. Contact D G Carrington, 2 Romsey Road, Yeovil, Somerset BA21 5XN.

STAFFORDSHIRE

Alsager Computer Club, meets at Alsager Comprehensive School, Stoke-on-Trent, Staffs, fortnightly on Tuesday. Contact Rex Charlesworth on 09363-77270.
The Amateur Computer Club of North Staffs meets on the third Wednesday every month. Annual subs £3. Contact J Roll, 16 Hill Street, Hednesford, Staffordshire WS12 5DS.
ICL Birmingham Branch Micro Club, c/o WBA Ecclestone, 26 Browns Lane, Tamworth, Staffs.
Tame Valley Computer club, contact Tim Marshall, 32 Milton Avenue, Leyfields, Tamworth, Staffordshire B79 8JG.

SUFFOLK

Suffolk Microcomputer Club meets monthly. Annual subs £5. Contact Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich, Suffolk.

SURREY

Ashtead Computer Club meets on the last Thursday of every month. Contact P Palmer, 8 Corfe Close, Ashtead, Surrey.
Thames Valley Computer Club meets in Griffin Pub, Caversham. Annual subs £1, 50p a meeting. Contact Phil Warn, Reading 594874.
Thames Valley Amateur Computer Club meets at Griffon, Caversham, on the first Tuesday every month. Contact Brian Quarm, 25 Roundway, Camberley, Surrey GU15 1NR, tel: Camberley 22186.
Ewell Micro Club, contact Dave De Silva, 316 Kingston Road, Ewell, Surrey KT19 0SU.
Farnham Computer Club, meets at Farnham 6th Form College, Morley Road, Farnham, Surrey on the second Wednesday every month. Annual subs: £2. Contact Adam Sharp, 14 Thorn Road, Boundstone, Farnham, Surrey.
West Surrey Computer Club meets at Paddock Room, Green Man Public House, Burpham, Guildford, the first Thursday of every month. Annual subs £5. Contact Chris Karney on 0483-68121.
ITN Computer Club meets on Fridays. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, tel: 0485 62035.
TI Home Group, annual subs: £12. Contact P Dicks, 157 Bishopsford Road, Morden, Surrey.
CBBS London meets on Sundays 4-10pm. Contact P Goldman, PO Box 100a, Surbiton, Surrey KT5 8HY.
Sutton Library Computer Club meets at Central Library, St Nicholas Way, Sutton, Surrey, on the first Friday of every month at 6pm and second and third Tuesday of every month. Annual subs: £6, £4 OAPs, £2 family. Contact Dave Wilkins on 01-642 3102.
Atari Computer Enthusiasts meets at 8 Cosdach Avenue, Wallington, Surrey SM6 9RA, subs: £20. Contact Adrian Miles, tel: 01-647 1713.
Association of London Computer Clubs, contact Len Stuart, 89 Mayfair Avenue, Worcester Park, Surrey KT4 7SJ.
Worthing & District Microcomputer Club meets at Rose Wilmot Youth Centre, Littlehampton Road, Worthing, on alternate Sundays 11am-1pm. Annual subs £4 adults, £2 students, £5 family. Contact B. Thomas, 11 Gannon Road, Worthing, W. Sussex, BN11 2DT, tel: 0903 36785.

SUSSEX

West Sussex Microcomputer Club meets at Room RO6, Robinson Road Annexe, Crawley, on the first and third Monday every month. Annual subs: £6 adults, £3 students. Contact J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, W Sussex, tel: 0293-884207
Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hillary Close, East Grinstead, W Sussex RH19 3XQ.
Micro Enthusiasts, new club proposed. Contact G Diannage, 16 Malvern Street, Hove, Sussex BN3 3YR.
Arun Microcomputer Club meet at Wick Amenity Centre, Wick Farm Road, Littlehampton, W Sussex, on the first Monday of every month at 8pm, and third Sunday of every month at 6pm. Fees: £3 six months, £1 joining fee. Contact P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL

TYNE & WEAR

Newcastle upon Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. Anual subs £6. Contact Pete Scargill, 21 Percy Park, Tynemouth, tel: 0632-573905.

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Annual subs: £3 adults, £1 students. Contact Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.
Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday every month 6.45-9.45pm. Annual subs £5 adults, £3.50 students. Contact Alison Hunt, 58 Princes Avenue, Walsall, W Midlands, WS1 2DH, tel: 0922-23875.
National Westminster Personal Computer Society. Contact P Moore 021-236 6176, ext 382.
Central Program Exchange, annual subs: full membership £25 Europe, small users service £10 Europe. Contact Mrs Judith, tel: Wolverhampton 28521.
West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday every month. Annual subs £4, £3 full-time students. Contact John Tracey, 100 Booth Close, Brierley Hill, Kingswingford, W Midlands, tel: 0384-70097.

WILTSHIRE

Chippenham and Calne, proposed new club. Contact Matthew Jones, Pinhills, Calne SN11 0LY.

WORCESTER

Worcester & District Computer Club meets at Old Pheasant Inn, New Street, Worcester, on the second Monday every month at 8pm. Contact D Stanton, 55 Vauxhall Street, Rainbow hill, Worcester WR3 8PA.

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday every month at 7.30pm. Annual subs £1. Contact James Bridson, c/o 39 Kereforth Hall Road, Barnsley, South Yorks S70 6NF, tel: 0226-41753.
Doncaster Amateur Computer Society meets in YMCA, Wood Street, on the first Wednesday every month. Contact John Wilkinson, 316 Bawtry Road, Doncaster, S. Yorkshire, tel: 0302-868379.
Greenhead Grammar School Computer Club. Contact Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, tel: 0535-62828.
Huddersfield Computer Club meets every Monday. Contact Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, tel: 0484-657299.
Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. Contact David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.
Program Power, contact R Simpson, 5 Wemsley Road, Leeds Ls7 2BX, tel: 0532-683186.
Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Contact Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, tel: 0535-43007.
Shipley College Computer Group meets on Tuesdays. Contact Paul Channell, tel: 0274-595731.
South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday every month at 7.30pm. Annual subs: £4. Contact Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.
Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, every Wednesday at 7.30pm during school term. Contact Mr James Davis, 62 Tudor Street, Thurnscoe East, tel: 0709-893880.
West Yorkshire Microcomputer Group meets on Tuesdays. Contact Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, tel: 0532-632532.
York Computer Club meets at the Enterprise Club every Monday at 8pm. Contact K Thomas, Green Lea, Ripon Road, Harrogate, North Yorkshire HG1 2BY, tel: 0904-38239.

SCOTLAND

Bishopton Computer Club meets at 'Cwa Ben', Sachelcourt Avenue, Bishopton, Renfrewshire, on Sunday once a month (next meeting May 22 at 2.30pm). Contact Alasdair Law, 10 Dunglass Road, Bishopton, Renfrewshire PA7 5EF.
Edinburgh Home Computing Club meets at Claremont Hotel, Edinburgh, on the 2nd, 3rd and 4th Wednesday of the month, produces bi-monthly newsletter. Contact I. Robertson, 031-441 2361.
Scottish Amateur Computer Society, contact Mike Anthony, 46 Moredun Park Gardens, Edinburgh EH17 7JR.
Central Scotland Computer Club meets at Falkirk College of Technology, Grangemouth Road, Falkirk, on the first and third Thursday every month. Contact James Lyon, 78 Slamannan Road, Falkirk FK1 5NF.
Fife Computer Users Club meets fortnightly. Annual subs: adults, £5; under 18s, £3. Contact Murray Simpson, 31 Tom Steward Lane, St Andrews, Fife, Scotland KY16 8YB.
Grampian Amateur Computer Society meets at 35 Thistle Lane, Aberdeen, on the second and fourth Monday every month at 7.30pm. Annual subs: £12, £5 student, £2.50 junior. Contact Alan Morrison, 21 Beech Road, Westhill, Skene, Aberdeenshire AB36 WR.
Kemnay Computer Club meets weekly. Contact S Stubbs, 15 The Glebe, Kemnay, Inverurie, Aberdeenshire.
Inverness Personal Computing Club meets every second Tuesday at 7.30pm. Subs: adults £5, juniors £2.50. Contact Gyl Mackenzie, 38 Ardconnel Street, Inverness IV2 3EX, tel: 0463-220922.
Perth & District Amateur Computer Society meets at Hunters Lodge Motel, Bankfoot, on the third Tuesday of every month at 7.30pm. Annual subs £5. Contact Alastair McPherson, 154 Oakbank Road, Perth PH1 1HA.
Skye and Lockalsh Computer Society, proposed new club. Contact C Manvell, 25 Breacais Isol, Isle of Skye IV42 8QA.
Strathclyde Computer Club meets at Wolfson Centre, 106 Rottenrow, Glasgow, on the third Wednesday of every month. Contact B Duffy, 24 Lomand Drive, Condorrat, Cumbernauld G4 8NW.

WALES

Abergele Computer Club meets at Abergele CI Offices every Thursday at 7.30-10pm. Annual subs: £5 adults, £2.50 juniors. Contact W Jones, 77 Millbank Road, Rhyl, Clwyd, North Wales.
Colwyn Computer club meets at the Greens Hotel, Colwyn Bay, at 7pm. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.
81 Club annual subs: £30 + vat. Contact Mike Hayes, tel: 0222-371732.
Gwent Amateur Computer Club meets at St Mary's Institute, Stow Hill, every Thursday at 7.30pm. Annual subs: £3.50. Contact Rothery Harris, 16 Alanbrook Avenue, Newport, Gwent, Wales NPT 6QJ.
Pencoed Amateur Computer Club meets fortnightly on Saturdays at Pencoed Library. Subs: adults, £5; OAP's and students, £3.50. Contact Philip Williams, 38 Bryn Rhedyn, Pencoed, Bridgend, Mid-Glamorgan CF35 6TL, tel: 05473 287.
Pontypool Computer Club meets at The Settlement, Roackhill Road, Pontypool, Gwent, on every Friday. Contact Graham Loveridge, on Pontypool 2827.
Swansea & Southwest Wales Amateur Computer Club meets on the last Friday every month. Contact Paul Griffiths, 1 Prescelli Road, Penlan, Swansea SA5 8AF.

NORTHERN IRELAND

Bangor Computer Club (N Ireland). New club. Contact Derek Blanc, c/o Queen's University, Belfast, Northern Ireland.

EIRE

Cork Amateur Computer Club. Talks and demonstrations. Hardware, programming and games. Contact T Moriarty, Tiger Bay, Rochestown, Douglas, Cork, Eire.

QUESTION

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DATABASICS

PCN Databasics is presented in three-week cycles. This week it's the turn of software packages, next week hardware, and two weeks from now, peripherals.. We can't fit all software packages in, so we've compiled a selection, giving best sellers from 100 publishers and distributors.

We confined coverage to five main types of applications: business, education, games, home and utility. All details published are the latest available.

Companies wanting to add their best-selling packages to Databasics, or wanting to update information already here, should send details to: Databasics, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

APPLICATION Each software package is listed alphabetically by its application.

PRICE includes VAT.

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OTHER VERSIONS indicates whether or not the package runs on a different machine or operating system.

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

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Mail order avail.	Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge		Disk drive	Joystick	Other		
BUSINESS														
Accounting	£3,320	Apple II	●	Financial Controller	48K		●			●			S1	Also on Apple IIE. 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		Payroll	48K		●		●	●			C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Purchase Accounting & Cost Control	64K		●			●		●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Accounting System	64K		●			●			J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£339.25	Apple II		Sales Ledger	48K		●		●	●			C1	Supports 700 + accounts. Direct posting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Auditman	32K		●		●				C4	Also on Commodore 4000. Complete accounts production system.
	£1,552.25	Commodore 8000	●	Businessman	32K		●		●				C4	Also on Commodore 4000. Can be used with Auditman. 5 modules.
	£2,052.75	Commodore 8000		Data-Lex	32K		●		●	●			D1	Designed for solicitors + others who need to separate office & client's accounts.
	£2,070	Commodore 8000	●	Microfacts	32K		●			●			M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Micro-simplex	32K		●			●		●	M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Pegasus Integrated Accounting Suite	32K		●			●			P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£1,437.50	CP/M		Aurora Integrated Accounting Package	64K		●		●	●			G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M		Boss	64K		●		●				F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	Cash Book Accounting	64K		●		●	●			S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,300.00	CP/M		dBFlex	48K		●		●	●			E1	Open item six module accounting system, (£575.00) per module. Works with dBase II.
	£402.50	CP/M	●	Exact	64K		●		●	●			S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£373.75	CP/M	●	Fast Nominal	60K		●		●	●		●	T1	Also on MS-DOS. Needs 132 character printer. Can define up to 99 report layouts.
	£3,059	CP/M		ISBS-W	64K		●		●	●			G2	Comes on hard disk. Contains ISBS functions plus job costing and purchase control.
	£1,840	CP/M	●	ISBS-S	48K		●		●	●			G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Multi-Index	64K		●		●	●			B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£569.25	CP/M	●	Nucleus	64K		●		●	●			C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M		Padmede Business Control System	64K		●		●	●			P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Motor Dealers Part Distribution	64K		●		●	●			S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●	Peachtree Basic Accounting Systems	48K		●		●	●			P1	Also on MP/M & MZ-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Mail order avail.	Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge		Disk drive	Joystick	Other		
	£287.50	CP/M	●	Sales Ledger	64K		●		●	●			S2	Also on CP/M 86 and MS-DOS. Flexible ledger system.
	£45.42	Sharp MZ80A	●	Easy VAT	48K	●			●	●			K1	Also on Sharp MZ80B & M200K. VAT record system.
Agriculture	£1,150	Apple II		Dairy Package	64K		●			●			F2	Available on floppy or hard disk. Files individual cow production, with herd summaries.
	£1,725	Apple II		Financial Management Program	64K		●			●			F2	Available on floppy or hard disk. Accounts for farm/estate management.
	£1,150	Apple II		Management Program	64K		●			●			F2	Available on floppy or hard disk. Monitors individual field activities, budgets, etc.
Bill of Materials	£373.75	CP/M	●	Fastbill	60K		●		●	●			T2	Also on MS-DOS & TRS-DOS. Will give parts explosion at 10 levels, 99 items/level.
Bookeeper	£56.35	Apple II		Apple Bookeeper	48K		●		●	●		●	H1	Needs printer. Keeps petty cash, sales, other business books, sorts, analysis etc.
Building Specifications	£460	Commodore 8000	●	National Building Specifications	32K		●		●	●			C3	Also on Commodore 4000. Used with Wordcraft. Produces building specifications.
Business Graphics	£471.50	16-bit machines		Micro-Graphpower	128		●		●	●		●	I2	Needs plotter. Business graphics which plots business data.
	£120.75	Apple III	●	Business Graphics	48K		●			●			P6	Also on Apple II (£125.35). Supports range of plotters & pie-charts, etc.
	£149.50	IBM PC	●	Graph Magic	96K		●		●	●			F1	Also on Apple II, III. Displays files graphically. Reviewed 18.3.83.
Business Management	£569.25	Commodore 8000	●	The Administrator	96K		●		●	●			S11	Complete applications generator. No programming required.
	£4,140	CP/M		Peachtree Business Management System	48K		●		●	●			P1	Also on MP/M & Unix. Available on hard disk (£6,900). Six modules for single user.
	£684.25	IBM PC	●	Tomorrow's Office	128K		●		●	●			S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
Cash Book	£224.25	Commodore 4000	●	Electronic Cash Book	32K		●		●	●			D1	Also on Commodore 8000 & 64. For small business or add-on products.
Cataloguing	£46.00	Apple II		Floppy Cat	48K		●		●	●			P4	Enables user to catalogue & store all information.
Estate Agents	£1,092.50	Apple II		Commercial Agency Systems	48K		●		●	●			C7	Matches in both directions with lists, labels and letters.
	£977.50	Apple II	●	Cyderpress Clients Recoverable Costs	48K		●		●	●			C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cyderpress Residential System	48K		●		●	●			C7	Also on Rair Black Box. An applicant & property matching system.
	£419.75	CP/M		Estate Agents Match & Mail	56K		●		●	●			S4	Matches & prints out potential customers for every property.
Financial Accounting	£1,926.25	CP/M	●	Fast Range	60K		●		●	●		●	T1	Also on MS-DOS & TRS-DOS. Needs 132 character printer. 5 modules.
	£569.25	Commodore 8000	●	Finplan	32K		●			●			M3	Also on Commodore 3, 4, & 8000, Vic-20 and Commodore 64. £46.57 on floppy disk.
	£287.50	Commodore 8096		The Financial Director	96K		●			●			D1	Designed to handle large & complex planning & financial applications.
Financial Planning	£44.85	Commodore Pet		Busicalc	16K	●			●				S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K		●		●	●		●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M		Bottom-Line Strategist	48K		●		●	●			P4	A business/project forecasting program. Allows user to test business assumptions.
	£454.25	CP/M		Fastplan	64K		●		●	●			C5	Needs double density disks. A file based modelling system for business planners.
	£281.75	CP/M	●	Master Planner	64K		●		●	●			C5	Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£396.75	CP/M	●	Micro Plan	64K		●		●	●			B1	Also on MP/M. Spreadsheet financial planner.
	£343.85	CP/M		Minimodel Financial Modelling	48K		●		●	●		●	G1	Needs 80 column screen. Model consolidation facility, colour option.
	£182.85	CP/M	●	Multi-Plan	48K		●		●	●			P4	Also on PC-DOS, Cromix, Fortune, Corvus & Sirius. Second generation spreadsheet.
	£44.85	CP/M		Plannercalc	64K		●		●	●		●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£218.50	CP/M		SP2020	48K		●		●	●			G2	Forecast effects of proposed actions. Aid to management decision-making.
	£172.50	CP/M		Supercalc	128K		●			●			A1	Electronic worksheet, representing a large flexible accounting work pad.
	£212.75	CP/M		Super Calculator	48K		●		●	●			E1	Spreadsheet calculator.
	£178.25	CP/M		T-Maker	48K		●		●	●			L1	Utility for analysis & presentation of numerical data & test material.
	£224.25	MS-DOS		Pulsar Business System	128K		●			●			A1	Consists of eight integrated packages & provides commercial accounting functions.
	£339.25	Osborne	●	PADA/C	64K		●		●	●			P2	Also on CP/M. Two systems. Incomplete records accounting, time/cost recording.
	£632.50	UCSD-P System		Microfinesse	128K		●		●	●			P5	Financial modelling program for businessmen.
	£741.75	UCSD-P System	●	Micro-Modeller	48K		●			●		●	I2	Also on CP/M & MS-DOS. Designed for large corporations.
Industrial Costing	£747.50	Apple II	●	Stock & Production Costing	48K		●		●	●		●	A2	Also on Apple IIE & III & Sirius. Available on hard disk. Needs Pascal system.
Insurance Accounting	£1,380	Commodore 4000	●	Insurance Man	32K		●			●			C4	Also in Commodore 8000, provides insurance broker with sales ledger.
Insurance Broking	£5,462.50	ICL DRS20		HS-100	64K		●		●	●		●	H2	Requires 16 or 27 Mb hard disk to run off. Maintains client & policy records.
Integrated Software	£569.25	IBM PC		Context MBA	256K		●			●			B2	Also on Sirius & Victor. Comprises word processor database management system.
	£908.50	Commodore 8000	●	Silicon Office	256K		●			●			F1	Integrated spreadsheet modelling, graphics, WP, database & communications.
Invoicing	£323.75	CP/M	●	Fast Invoicing	60K		●		●	●			T1	Also on MS-DOS & TRS-DOS. Can link into Fast Sales & Fast Stock.
Linear Programming	£373.75	CP/M	●	Optimiser	48K		●		●	●			C6	Also on Apple. Management tool for optimizing the deployment of scarce resources.
Local Authority	£862.50	Commodore 8000	●	P.U.S.W.A.	96K		●			●			M3	Also on Hytec. Monitors road holes under Public Utilities Street Work Act (1950).
	£569.25	Commodore 8000		Road Register	96K		●			●			M3	D-base network based on road names. Modules (£373.75) on street, lighting etc.

Mailing	£86.25	CP/M		Mailing List	56K		●		●	●			S4	Works with Super file. Prints labels, files, names & addresses. Mail merge facility.
Management	£226.16	CP/M	●	Scratch Pad 3.0	48K		●		●	●			M4	Also on CP/M 86, MS-DOS & PC-DOS. Spreadsheet using virtual memory.
Mathematics	£28.75	Commodore Pet	●	Infinite Arithmetic	16K	●			●				S5	Also on Commodore 3000, 4000 & 8000. Available on floppy disk.
Medical	£517.50	Apple II	●	Medical System	48K		●		●	●			A2	Also on Apple IIE, III & Sirius (£573.85). On hard disk. Age/sex register.
Office Information	£402.50	Apple II	●	Prophet II	48K		●		●	●			A4	Also on IBM PC & Corvus Concept. Information system which acts as a noticeboard.
Payroll	£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 CP/M & MS-DOS (64K). Up to 2000 employees, nine pay schemes.
	£977.50	CP/M	●	Powerday	48K		●			●			O2	Also on MP/M and MS-DOS. Integrates with Omicrons nominal ledger. Handles SSP.
Project Management	£747.00	IBM PL	●	Micronet	48K		●			●			T2	Also on ICL PC, Sirius, Superbrain, Apple II, & others. Critical path analysis.
Project Planning	£1,150.00	Commodore 8000		Hornet	32K		●			●			C3	Has eight optional variants (all eight £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.
Purchase Ledger	£287.50	Apple II	●	Tabs Purchase Ledger	48K		●		●	●			T3	Also on CP/M & 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 CP/M & 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.
	£325	DEC Rainbow 100	●	Sales Ledger System	64K		●		●	●			D2	Also on DEC Mate II. Invoicing & monthly statement generating system.
Sales Order Processing	£805.00	CP/M	●	Compact Sales Order Processing	64K		●		●	●			C2	Also on CP/M 80, 86 & MS-DOS. Comes on hard disk. Control, stock, ledgers.
Sales, Purchase, Nominal Ledger	£1,207.50	CP/M	●	Compact Sales, Purchase & Nominal Ledger	64K		●		●	●			C2	Also on CP/M 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.
Statistics	£172.50	Apple II	●	Inter-Stat	48K		●		●	●		●	G1	Also on Basis 108 & ITT 3030. Needs printer.
	£287.50	Commodore 8000	●	Statistical Package for Personal Computers	32K		●		●	●			P7	Also on Commodore 64 & Sirius. Fully interactive, (two modules at £99 each).
	£9.20	Sharp MZ80A	●	Statistical Analysis	48K	●			●				K3	Also on MZ80K. Calculates mean & standard deviation for up to 100 items.
	£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.
Stock Control	£373.75	CP/M	●	Fast Stock	60K		●		●	●		●	T1	Also on MS-DOS & TRS DOS. Needs 132 character printer.
	£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 fwd/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, IBM PC & CBM 64. Routine correspondence, mailing, etc.
	£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 Visi 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.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied: Cassette	Media Supplied: Disk	Media Supplied: Cartridge	Mail order avail.	Hardware Required: Disk drive	Hardware Required: Joystick	Hardware Required: Other	Publisher/ Distributor	Comments
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	●	Inkosi	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.
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.
	£5.25	Spectrum		Alphabet	48K	●			●				W2	'Picture for each letter of the alphabet. Option for lower case.' Aimed at ages 2-6.
Classroom Monitor	£322.00	UCSD-P	●	Classroom Monitor	64K		●		●	●			K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
Economics	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●			●				W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
French	£14.38	Research Machine 380Z	●	Repondez	31K		●		●	●			H4	Also on Apple II. Practising French verb formation (present tense).
	£9.20	Sharp MZ80A	●	French Conjugate	48K	●			●				K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
	£9.20	Sharp MZ80A	●	French Verbs	48K	●			●				K1	Also on MZ80K. Allows user to impart up to 20 verbs & eight tenses at a time.
Graphics	£8.00	BBC Model B	●	Painter	32K	●			●				A5	Also on Spectrum (£5.75), Atom (£6.90) & on disk.
	£9.95	BBC Model B		Creative Graphics	16K	●			●				A9	Book available (£7.50). Designed to illustrate BBC graphics.
History	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●			●				K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
Languages	£7.95	Sharp MZ80A	●	Multilinguist	3K	●			●				S8	Also on MZ80K. A language tutor to suit all European languages.
Mathematics	£8.95	BBC Model B		Angle	32K	●			●				C9	Also on Spectrum. Includes four programes designed to teach simple geometry.
	£9.95	BBC Model A	●	Algerbraic 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.
	£5.25	Spectrum		Counting	16K	●			●				W2	Graded programs. 'Good as a first introduction to numbers.' Aimed at ages 3-6.
Meteorology	£23.00	Research Machines 380Z	●	Weather	31K		●		●	●			H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
Morse Code	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●			●				K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
Physics	£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.
Typing	£28.75	CP/M	●	Touch'n'Go	48K		●		●	●			C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
	£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',
	£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.
	£6.90	Oric	●	Zodiac	16K	●			●				A5	Also runs on Atom. 'A thinking persons adventure game'.
	£12.07	Sharp MZ80A	●	Adventure	48K	●			●				K1	Also runs on Sharp MZ80B and MZ80K. 'An interactive adventure game'.
	£12.07	Sharp MZ80A	●	Quest	48K	●			●				K1	Also runs on Sharp MZ80B and MZ80K. 'Dungeons & Dragons type game'.
	£7.95	Sharp MZ80K	●	Nightmare Park	48K	●			●				S8	Also runs on MZ80A. 'Cross Nightmare Park. Every few steps play game or task'.
	£7.95	Sharp MZ80K	●	Tombs of Karnak	48K	●			●				S8	Also runs on MZ80A. 'Bargain for items required before entering tombs'.
	£5.95	Spectrum		Faust Folly	16K	●			●				A6	'A 16K adventure with the same traps, magic, fiends, treasure as the 48K game'.
	£14.95	Spectrum		The Hobbit	48K	●			●				M8	'Object is to get treasure. For one player. Can instruct computer in ordinary English'.
	£5.00	Spectrum	●	Orb	16K	●			●				I5	Also runs on Dragon 32 and Commodore Vic-20. 'Explore labyrinth and destroy Orb'.
	£10.00	Spectrum	●	Pimania	48K	●			●				A7	Also runs on Sinclair ZX81, BBC 13, Dragon 32. Reviewed 18.3.83.
	£5.00	Spectrum	●	The Quest	48K	●			●				I5	Also runs on Dragon 32. 'Fighting adventure game'.
	£5.00	Spectrum	●	Star Trek	48K	●			●	●			I5	Also runs on Dragon 32 and Commodore Vic-20. 'Hunt down the Klingon in space'.
	£5.95	Spectrum		Slippery Sid	16K	●			●		●	●	S9	Needs joystic and keyboard to use. 'Snake type game'.
	£10.06	Tandy TRS-80 I	●	Mysterious Adventurer	16K	●			●				M6	Also runs on Tandy TRS-80 III, Genie I, II, Colour Genie and BBC B.
	£4.95	Texas Instruments 99/4A		Forbidden City	16K	●			●				A8	'You have to explore a deserted alien city with many hazards on the way'.
	£3.95	Texas Instruments 99/4A		Sorcerers' Castle	16K	●			●				A8	'You are trying to rescue the captured princess'.
	£7.50	BBC Model B		Atlantis	32K	●			●				I4	'Guide submarine through caverns & destroy enemy'.
Arcade type	£9.99	Commodore Vic-20		Night Crawler	5K	●			●				R2	'A Centipede style game. Fast action, graphics and sound effects'.
	£5.50	Spectrum	●	Arcadia	16K	●			●				I6	Also on Commodore Vic-20. '12 levels of aliens attacking in different ways'.
	£5.95	Spectrum		Ground Attack	16K	●			●				S9	'Variable speeds allows this game to be played by everyone'.
	£3.95	Texas Instruments 99/4A		Bomber	16K	●			●				A8	'Must land plane & bomb skyscrapers'.
	£5.95	Spectrum		Cyber Rats	16K	●			●		●	●	S9	Needs joystick and keyboard to run.
Asteroids type	£4.95	Spectrum		Meteor Storm	16K	●							Q1	'Progressive difficulty, variety of controls'.
	£6.95	Spectrum		Time-Gate	48K	●			●				Q1	'Time travel, 3D graphics, colour, cockpit view and instrument display'.
	£4.95	ZX81		Asteroids	4K	●			●				S9	'Fast moving, suitable for all ages'.
Ballooning	£14.95	Atari 400	●	Up Up Away	16K	●			●				S13	Reviewed in *PCN* week ending April 29. Also on Atari 800. Available on disk.
Centipede type	£7.99	Dragon 32		Caterpillar	32K	●			●		●		M12	'A new generation munching game'.
Chess type	£7.99	BBC Model B		Chess	16K	●			●				M7	'Machine code, high resolution graphics with many play options'.
	£24.95	Dragon 32		Cyrus Chess	32K			●					D3	'Won European microcomputer chess championship 1981. Nine levels of difficulty'.
	£14.50	Sharp MZ80A	●	Chess	48K		●	●					K1	Also on Sharp MZ80B & MZ80K. '14 levels of difficulty'.
	£42.95	Texas Instruments 99/4A		Chess	16K		●	●					T5	'Different difficulty levels. Will solve problems. Can teach chess'.
Darts	£19.99	Atari 400	●	Darts	8K	●					●		T4	Also on 800. 'Aim & throw — the computer does the arithmetic'.
Defender type	£22.80	Atari 400/800	●	Submarine Commander	16K			●		●			T4	'One player. Nine levels of difficulty. Destroy shipping. Oxygen levels, fuel etc'.
	£9.95	BBC Model B		Planetoid	32K	●			●				A9	'A game of speed & skill'. Available on floppy disk (£11.50).
	£7.95	Commodore Vic-20		Alien Blitz	5K	●			●		●		A3	Needs joystick to run. 'Difficulty levels, colour & sound'.
	£9.99	Commodore Vic-20		Annihilator	3K	●			●		●		R2	'Based on Defender'.
	£6.95	Spectrum		Penetrator	48K	●			●				M8	'Two levels of difficulty difficulty'.
	£21.95	TI 99/4A		Parsec	16K			●	●				T5	'Increasingly difficult. After four onslaughts pass through to next stage'.
Flight Simulator	£22.80	Atari 400	●	Jumbo Jet Pilot	16K	●					●		T4	Also Atari 800. 'Ten difficulty levels. View through cockpit with flight instrumentation'.
	£7.95	Spectrum	●	Flight Simulation	48K	●			●				S10	Also on ZX81 (£5.95). 'Shows control panel & control view'.
	£17.20	Tandy TRS-80	●	Jumbo	16K	●			●				M6	Also on Genie I, II & BBC Model B. 'Simulation of piloting a Jumbo'.
Football	£29.99	Atari 400	●	Kick Back	8K			●			●		T4	Also available on Atari 800. Needs joystick to run. 'Beat the high score'.
	£19.55	Atari 400	●	Soccer	8K			●					T4	Also on Atari 800. 'Aerial view of field.' Reviewed 11.3.83.
Frogger type	£5.50	Commodore Vic-20		Wacky Waiters	3.5K	●			●				I6	'Waiter serving drinks in hotel. Has to hop from lift to lift'.
	£9.99	Commodore Vic-20		Hopper	3K	●			●		●		R2	'A version of Frogger'.
	£5.95	Spectrum		Horace Goes Ski-ing	16K	●			●				S10	'Sequel to Hungry Horace. He must cross busy road, fetch skis & ski down slope'.
Golf	£7.95	Dragon 32		Golf	32K	●			●				S7	'For one or two players. Full handicapping system'.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Mail order avail.	Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge		Disk drive	Joystick	Other		
	£3.75	Spectrum		Golf	16K	●			●		●		R3	'For one or two players. Choice of nine or 13 holes'.
	£3.75	Sinclair ZX81		Golf	16K	●			●		●		R3	'Similar to other golf games, in black and white'.
Helicopter	£24.95	Commodore Vic-20	●	Chop Lifter	8K			●	●		●		A3	Also on Commodore 64. Needs joystick to run. 'Vic version of USA's best-seller'.
Jigsaw	£14.99	Atari 400	●	British Heritage Jigsaw Puzzle	8K	●							T4	Also on Atari 800. 'Educational game with selective difficulty'.
Kong type	£7.95	Commodore Vic-20		Bonzo	8K	●			●		●		A3	'Workman dodges robots on split-level. Sound & full graphics.
	£8.00	Dragon 32		Donkey King	32K	●			●		●		M12	'Popular arcade game'.
	£9.95	BBC Model B		Monsters	32K			●					W1	'The player has to run up & down ladders & along walls, pursued by monsters'.
Maze type	£24.95	Dragon 32		Ghost Attack	N/A			●			●		D3	'The aim is to avoid & eliminate ghosts which roam a maze'.
	£8.00	Dragon 32		Jerusalem Adventure	32K	●			●				M12	'Aim is to get treasure & avoid being eaten'.
	£5.95	Spectrum		Hungry Horace	16K	●			●				S10	'Animated maze game with sound & full graphics'.
	£4.95	Spectrum	●	Mined-Out	48K	●			●				Q1	Reviewed in *PCN* week ending April 22. Also on Dragon 32.
	£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'.
Science Fiction	£19.95	Apple II		Lunar Leeper	16K		●			●			S12	Reviewed in *PCN* week ending April 22.
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'.
	£19.95	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'.
Strategy	£7.95	Dragon 32		Wizard War	32K	●			●				S7	Reviewed in *PCN* week ending April 8.
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	●	Tabs Golf Package	48K		●		●	●		T3	Alsom 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/M86 (£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	64K	●			●			S5	Also Commodore Vic-20. Also on floppy (£92.00). Adds 50 commands to Basic.
Card Index System	£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 24×80 VDU & 100K disk storage.
Communications	£102.35	Apple II		ASCII Express — The Professional	48K		●		●	●	●	P4	Needs RS232. Asynchronous serial communications package.
	£448.50	Apple II		Editel	48K		●		●	●	●	O1	Needs modem. A Viewdata frame word processor designed to aid data editing.
	£626.75	Apple II		Owlsync 3780	48K		●		●	●		O1	A full IBM 3780 emulator package allowing communication up to 2400 Baud.
	£454.25	Apple II		Owltel	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 of up to 9600 BPS.
	£57.50	CP/M		Xcopy 1.0	64K		●		●	●		X1	Disk copy utility for Cromemco machines. Copies 8" or 5¼" single/double sided.
	£454.25	CP/M	●	Micro-Linkline	64K		●		●	●		I2	Also on UCSD-P. Teletype comms for transferring datafiles.
	£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 asyncs comms terminal.
	£117.30	IBM PC		IBM 3101 Emulation Program	64K		●			●		I3	Makes PC act as 3101 terminal provides 3270 emulations 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.
	£115.00	IBM PC	●	Interlink	48K		●			●		T2	Also on Sirius, Apple II, Xerox, Osborne etc. Connects processors for downloading.
Database	£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 & Corvus 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).
	£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	●	Dataflow 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
	£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 I16	64K		●		●	●		M10	A sort utility for handling various forms of data files. Mainframe-like additions.
	£1,840	CP/M	●	MDBS II	64K		●					T2	Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£569.25	Commodore 800		The Administrator	96K		●		●	●		S11	Applications generator. No programming involved.
	£68.42	Newbrain		Invoice & Credit Program	32K	●			●			E2	The invoice program allows you to put in your own information and design invoice.
	£29.32	Newbrain		Database 40/S	32K	●			●			E2	Information gatherer, stores large quantity of information & can be interrogated at will.
	£684.25	Sirius	●	Tomorrow's Office	128K		●		●	●		S11	Complete applications generator. No programming involved.

Debugger	£258.75	CP/M	●	Animator	64K		●		●	●		M11	Also on Unix & MS100S, interactive source level debugging tool for CIS-Cobol.
File Transfer	£132.25	CP/M		BSTAM	16K		●		●	●	●	L1	Needs common interface ports or modem access. Utility for transfering CP/M files.
Graphics	£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.
	£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.
Language	£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.
	£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.
	£114.43	Commodore 64	●	DTL-Basic Compiler	32K		●		●			D1	Also on Commodore 8000, 4000 & 3000. Also tape version on CBM 64 (£39.90).
	£16.85	BBC Model A	●	Lisp on the BBC	16K	●			●			W1	Also on BBC Model B. Book available £7.50. Lisp is artifical intelligence language.
	£253.00	CP/M	●	ProPascal	56K		●		●	●		E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	●	Forth	48K	●			●			K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£25	Spectrum		Hisoft Pascal	48K	●						H5	Reviewed in *PCN* week ending April 8. Pascal compiler and screen editor.
	£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.
	£350.75	IBM PC	●	Lattice-C	64K		●		●	●		L1	Also on MS/DOS. C' Compiler for 16 bit machines — full implementation & execution.
Linker	£224.25	CP/M		Plink 2	48K		●		●	●		L1	Up to 8 megabytes.
Operations	£59.80	CP/M		Operating Guide	48K		●		●	●		E1	Works by putting CP/M to sleep & replacing it with operating environment.
Operating system	£22.94	Apple II		Fasdos	48K	●			●			P4	Disk operating system for Apples which speeds up location of binary & Applesoft files.
	£277	8086 micro		Concurrent CP/M-86	48K		●			●		T2	Enables four separate tasks to run in a single user station.
	£295.20	Any 8-bit micro		CP/M+	128K		●			●		D4	Upward compatible from CP/M enhanced 8-bit micro. O/S.
	£126.50	Any 8-bit micro		CP/M 2.2	64K		●			●		D4	O/S for 8-bit micros with over 1.5 million users.
	£379.50	Any 8-bit micro		MP/M	64K		●			●		D4	Multiuser, multitasking. Features record & file locking, date & time stamping etc.
	£210.80	Any 16-bit micro		CP/M-86	64K		●			●		D4	Manages up to one megabyte of RAM & allows up to 128 megabytes of on-line storage.
	£548.20	Any 16-bit micro		MP/M-86	64K		●			●		D4	Multi-user. Multi-tasking. Multi-user capability with multi-programming for each user.
	£168.70	Any 8 or 16 bit machine		CP/Net	64K		●			●		D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000		CP/M 68K	64K		●			●		D4	Extends CP/M to Motorola MC6800/microprocessors. Single user, single tasking.
Program Generator	£228.85	Apple II	●	Quickcode	64K		●		●	●		P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	●	Forms-2	64K		●		●	●		M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	●	Last One	64K		●		●	●		S3	Also on MS-DOS and Apple DOS.
Programming Tool	£2,500	Apple II	●	Pascal Isam/Pascal Form	48K		●		●	●		A4	Also on IBM PC & Corvus Concept. Needs Corvus hard disk. Pascal prog tool.
	£287.50	CP/M	●	Fileshare	48K		●		●	●		M11	Also on MP/M. Bank-switched memory or CP/M network.
	£7.95	Dragon 32		Dragon Selection 2	32K	●						D3	Four utility programs which can be listed to see how the program works.
Telex	£2,113.70	Superbrain	●	Micro Telex	64K		●		●	●		E1	Also on Televideo 802. Enables automatic sending-receiving or telex by micro.
Testing Tool	£95.82	CP/M 80	●	Diagnostics II	32K		●		●	●		M4	Also on CP/M-86 and MS/DOS. Tests systems.
Time Recording	£862.50	Commodore 8000	●	Minuteman	32K		●			●		C4	Also on Commodore 4000. Time recording system. Can produce range or reports.
	£402.50	CP/M-86	●	Time Recording System	64K		●		●	●		D2	Also on CP/M 80. Control over man/hour expenditure by job or account number.
Utilities	£23.00	Apple II	●	Computech Utilities Disk II	48K		●		●	●		C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
	£115.00	IBM PC		C-Food Smorgasbord	64K		●		●	●		L1	Decimal arithmetic, low level & terminal independent input & output.

A1 ACT Pulsar, 021-454 8585 **A2** Advanced Quality Software, Norwich 21117 **A3** Audiogenic, Reading 595647 **A4** Atlantic Software, Nottingham 412777 **A5** A & F Software, 061-223 6206 **A6** Abbex Electronics, 01-203 1465 **A7** Automata UK, Portsmouth 735242 **A8** Apex Trading, Brighton 36894 **A9** Acornsoft, Cambridge 316039
B1 Bonsai, 01-580 0902 **B2** Bristol Software Factory, Bristol 23430 **B3** Bug-Byte, 051-227 2299
C1 Computech Systems, 01-794 0202 **C2** Compact Accounting, Dorking 887373 **C3** Claremont Controls, Rothbury 21081 **C4** Computer Services Midlands, 021-382 4171 **C5** Comshare, 01-222 5665 **C6** Caxton Software, 01-379 6502 **C7** Cyderpress, Wallingford 37769 **C8** Channel 8 Software, Preston 53057 **C9** Chalksoft, Wellington 7117
D1 Dataview, Colchester 869414 **D2** DEC, Basingstoke 59200 **D3** Dragon Data, Kenfig Hill 744700 **D4** Digital Research, Newbury 35304
E1 Encotel Systems, 01-686 9687 **E2** Elstree Computer Centre, 01-953 6921
F1 Ferrari, 01-751 5791 **F2** Farmplan Computer Systems, Ross-on-Wye 64321
G1 Great Northern, Leeds 589980 **G2** Graffcom Systems, 01-727 5561
H1 Hilderbey, 01-485 1059 **H2** Hartford Software Northwich, 781156 **H3** H & H Software, Runcorn 65566 **H4** Heinemann, 01-637 3311 **H5** Hisoft, Swindon 26616
I1 Informex, 01-318 4213 **I2** Intelligence (UK), 01-543 3711 **I3** IBM UK Product Services, Basingstoke 56144 **I4** IJK Software, Blackpool 21555 **I5** Impact Software, 031-441 4257 **I6** Imagine Software, 051-236 6849
J1 Jarman Systems, Tring 6841
K1 Kuma Computers, Maidenhead 71778 **K2** Kansas City Systems, Chesterfield 850357 **K3** Knights, Aberdeen 630526 **K4** Keen Computers, Nottingham 412777 **K5** Kobra Micro Marketing, Henley-on-Thames 2512
L1 Lifeboat, 01-836 9028
M1 MMS, Bedford 40601 **M2** Microsimplex, Macclesfield 615000 **M3** McDowell Knaggs & Associates, Worcester 612261 **M4** Micro Technology, Tunbridge Wells 45433 **M5** Micromedia, 01-843 9457 **M6** Molimerx, Bexhill-on-Sea 223636 **M7** Micro Power, Leeds 683186 **M8** Melbourne House, 01-977 9160 **M9** Mercury Software, Darwen 776677 **M10** MicroPro, 01-499 5777 **M11** MicroFocus, Swindon 695891 **M12** Microdeal, St Austell 67676
O1 Owl Microcommunications, Bishops Stortford 723848 **O2** Omicron, 01-636 6575
P1 Peachtree Software International, Maidenhead 32711 **P2** Padmede, Fleet 21892 **P3** Pegasus, Kettering 522822 **P4** Pete & Pam Computers, 01-769 1022 **P5** PE Consulting Group, Egham 34411 **P6** Personal Computers, 01-377 1200 **P7** PTRC, 01-836 2208
Q1 Quicksilva, Southampton 20169
R1 Rapid Terminals, High Wycombe 26271 **R2** Rabbit Software, 01-863 0833 **R3** R & R Software, Gloucester 502819
S1 Systematics International Microsystems, Haverhill 61121 **S2** SGS Software Products, 01-486 7498 **S3** Silicon Valley Trade, 01-242 2807 **S4** Southdata, 01-994 6477 **S5** Supersoft, 01-861 1166 **S6** Seed, Brownhills 378151 **S7** Salamander, Brighton 771942 **S8** Solo Software, Worcester 424152 **S9** Silversoft, 01-748 4125 **S10** Sinclair Research, Cambridge 353204 **S11** Stage One Software, Poole 735656 **S12** SBD Software, 01-870 9275 **S13** Starcade, 051-236 6628
T1 Tridata Micros, 021-622 6085 **T2** Tamsys, Windsor 56747 **T3** Tabs, Andover 5893 **T4** Thorn EMI, 01-836 2444 **T5** Texas Instruments, Bedford 63211
W1 John Wiley & Sons, Chichester 784531 **W2** Widgit Software, 01-444 5285
X1 Xitan Systems, Southampton 334711

PCN Billboard

Atari VCS with joysticks and paddles plus five cartridges. Offers around £120. Tel: 061-653 6063 for details, might separate. Also want to swop BBC micro games? Tel: 061-339 4086.

Acorn User issue one wanted, will pay £5 for mint condition copy. Atari games console plus five cartridges will swop for 48K Spectrum. Tel: Yeovil (0935) 21669.

Atari VCS, 12 cartridges including Berzerk, Defender, Demon Attack and Missile Command. New joysticks and adaptor. Cost £380, will sell for £240 or swop for BBC B. Tel: 0536 523295.

Mattel Intellivision plus ten cartridges including Space Battle, Night Stalker, Space Hawk as new. £150. 9 Berry Leys, Luton, Beds.

PET 2001-8K integral cassette and monitor plus sound box and dustcover. Manuals and books, lots of software including Cosmiads, Super Glooper and Microchess. £275 ono. Tel: Doncaster 841131.

Atari video console, with Asteroids, Missile Command, Pacman, Tennis, Laser Blast, Street Racer, all for £120 ono. Tel: Nottm 620638.

Dragon cartridge for sale, Cave Hunter. 3 months old, cost £20, will sell for £12. It needs one joystick. Tel: Highcliffe 77515.

Acorn Atom 12K + 12K, leads, manual, PSU, VIA, Floating Point. Getting Acquainted, loads of professional software including Invaders, Defender, Pacman, Space Panic, Painter and more. £180. Tel: Chelmsford 68238.

Dragon 32 microcomputer plus Tandy Joysticks, ITT tape recorder, Graphic Animator, Cave Hunter, all leads and six months guarantee. £180. Tel: Chelmsford 68238.

ZX 81 16K RAM. Printer work station (case), Green screen £50 of software. Nearly new. Cost £230, bargain at £100. Tel: Andover 61322 after 4.30 pm any time during weekends.

ZX 81 + 16K RAM + tape recorder, cassettes include, Invaders, Scramble, Chess, 3D Monster Maze. Books with over 80 programs, worth £150, sell for £70 ono. Tel: 01-561 7782.

16K Spectrum plus games software. £90 ono. Tel: Reading 692977 (eves).

Will swop table tennis table with equipment worth £100 for 16K Spectrum or £70 worth of Vic equipment. Tel: Pype Hayes 350-3491 after five.

Dragon 32 with joysticks, £60 worth of software, all as new. £200 ono. Tel: Rotherham (0709) 525913.

Vic-20 and cassette unit still under guarantee, Super Expander, books, joystick, worth £250, accept £150, free cassettes with games. Tel: 01-451 1197 after 7 pm ask for Anthony.

Commodore 64 brand new £300 ono or exchange for plus £100 BBC B. Will haggle over software. G Dutton, 40 Grafton Road, Harwich, Essex CO 123 BD.

Atari 400-800 Star Raiders cartridge, very good condition, instruction manual included. £20 ono. Tel: 01-204 9679.

Swop ZX-16K RAMpack for a Vic-20 16K RAMpack, also ZX software for sale. Real bargains! Tel: Stonehenge 42324 evenings and weekends only.

Atari computer TV game plus four cartridges - Combat, Defenders, Pele Soccer and Haunted House all new. £100 ono. Tel: Wolverhampton 762633.

For sale Sinclair 16K RAM pack, boxed and guaranteed till December with three games cassettes, a bargain at £35. Tel: James Main, Gains (0427) 880116 after 5 pm.

48K Spectrum, D'Ktronics professional keyboard, ZX printer, books and assorted software including Planetoids, Star Trail, VU-Calc etc. £230. Tel: 01-249 5225 after 7.30 pm or at weekend. London N16.

Atari 16K cassettes, Shamus, Preppie, Ghost Hunter, Baja-Buggies, Caverns of Mars. £12 each. Cassettes Ghost Encounters, Galactic Chase, Ricochet. £10 each, new. Tel: 031-229 6794.

Atari VCS, perfect condition, joysticks, paddles, cartridges, Space Invaders, Superman and Combat. All boxed. Sell for £90. Phone Crawley (0293) 36187. Please phone after 4pm.

TRS-80 16K Level II, green screen monitor, CTR-80 casette recorder, massses of Molimerx and other great software. Sell for only £275. Tel 01-485 6218, 9 Regent's Park Terrace, London NW1 7EE.

Atari VCS 8 mths warranty left. Includes Defender, Raiders of the Lost Ark cartridges. £130 the lot. Tel 01-731 0435 after 6pm.

Acorn Atom 14KRAM with BBC compatible Basic in excellent condition. Manuals, leads, power pack, and tapes included. Good buy at £200. Tel Mike George, 01-946 3512 after 6.30pm.

Wanted for Apple II + 48K. Integer Basic card, TV modulator, colour card, word-processing package reasonable prices only. Tel 01-311 7681 after 5pm.

ZX81+ 16K mother board, Sound Generator, Gauntlet Chess, Avenger, 3D Defender, Monster Maze, lots more, 4 months old, excellent condition. New £140, now, £80. Tel Southend (0702) 232258.

Swap Bush mono + stereo cassette recorder radio VGC, cash value £50, swop for ZX81 and 16K or just Vic-20, good condition. Tel Steeple Aston 47758 (Oxfordshire) 4.30-9.30.

ZX81 + 16K RAM-pack and 15 cassettes, including Frogger, Defender, Catacombs, Galaxians, Chess, Flight Simulation, Scramble, Monster Maze, Centipede. Lots of magazines, 2 books, £120. Tel Graeme, Leeds 569906 (evenings).

Wanted, Spectrum software, Pascal, Ahdidums, Molar Maul, Master Key, etc. Also wanted is a machine code book for a beginner. Tel Basildon (0268) 21465, after 5pm.

Apple software 16 packages (maker's original disks, manuals), Applewriter, Bag o Tricks, Sargon, Snoggle, Decathlon, Write-on, Lexicom etc. List price over £400. £90 for the lot. (Owner upgraded to IBM PC). Tel Portsmouth (0705) 820663.

Colour monitor Skantic/Portatel 14in US/UK TV monitor. (Apple, Atari, Texas colour without colour card). Hires colour graphics and text. £190 (list £325 + VAT). Portsmouth 820663.

Vic-20, cassette unit, 3K RAM, Alien, Adventureland, Starmaster, Combat, Missile Command, Chess + Super Lander + books. Sell for £230 or swap for 48K Spectrum + printer + paper + software. Tel Coppull 792131 after 6pm.

Wanted Pet 2001 in exchange for Spectrum 16K, cassette deck. (Both new) and games book. Tel Paul on Southampton 556823 (Eves).

ZX81 + 16K, mother board, sound generator, 3D Defender, Monster Maze, Asteroids, Centipede, Gauntlet, Chess, Pilot and more, 5 months old, new £135 now £75. Tel Southend (072) 232258.

ZX81K, manuals, leads, print + plotter products, + over £50 of games incl. Flight Simulation, M Okwin tape 4 and many more. Still under guarantee, £55 ono. Tel York 51887 after 4pm and ask for Chris.

Wanted BBC model B, with tape deck and leads. C Merritt Dunstable 606220. After 5.30pm.

Hewlett Packard HP-85-32K personal computer, thermal printer 5in CRT, all in integral one top quality keyboard and case including cassette drive + cover and documents £1,250 ono. Northampton (0604) 26156.

TI 99/4A 16K 16 colours pixels, all leads, including Texas cassettes lead, user book + Basic beginners? book, plus superb chess plug in command module hardly used. Worth £200 plus, £150 ono. Tel 0602 871432.

Wanted C2N cassette recorder for Vic-20. Tel Skenfrith 689 after 5pm or write to Andrew Leonard, 2 New Houses, Crossways, Monmouth, Gwent NP5 4NP.

Pet 4016 £350. As new, ex development machine 16K, professionl keyboard, Tel 051-708 7100.

Atari VCS plus 7 best-selling cartridges, includes Fantastic Atari carry-tray with cartridge rack and dust cover. Mint condition. Cost over £300, will sell £150. Tel 366 7826.

ZX81 for sale includes software games, Dk'Tronic keyboard, 16K RAM and accessories. Will accept £75.00 ono. Tel Cardiff 691260. Paul Hinchly, 2 Gelli Deg, Rhiwbiwa, Cardiff.

BBC Model B with 1.2 ROM. Little used and complete with lots of Arconsoft software. £365 ono. Tel 0227 750600 evenings and weekends. Selling for financial reasons.

Nascom 2 32K graphics, Nas-Sys 3, cased, Basic, Zeap, Nas-Dis, Naspen, Nascom hardware mods, monitor, lots of software, digital cassette available, offers Tamworth (0827) 56547.

Printer ICL terminet KSR RS 232 interface, baud rate selectable 110—300, adjustable tractor feed, full ASC II set, upper and lower case, typewriter quality print, ideal for word processing. £175. Tel 0252 877174.

ZX81 All leads, £75 worth of software including high Res. Many mags as new still boxed, cost £125, sell for £50 ono weekdays after 4pm. Tel 061-624 9096.

Swop 1936 Francis Barnett 250cc cruiser for Commodore 64+ disk drive and printer or similar. Contact Mr Thompson, Norwich 0603 52579.

Apple II Europlus 48K. Disk drive with controller, TV modulator, 12in B/WTV, complete set of manuals, 40+ games programs, bit copier, Visicalc, £750 ono. Tel Reading (0734) 29058.

TRS-80 Level 2 16K model 1, excellent condition, still in original box, some software and books, also magazines. £195. Tel 021-449 8699, ask for Abid after 4.30pm.

Texas Instruments TI/59 calculator (magnetic card) and PC100C printer unit for sale. Tel Iver (0753) 655624, ask for Keith. Offers around £160 considered, might sell printer unit separately.

Jupiter Ace educational software, 3 Lander type programs (plus, minus, multiply) all on one cassette £1.50 + 17p sae to Mr J D Kidd, 10 Craigfield Ave, GT Clacton Essex.

Sharp P6 printer. Friction/tractor feed, with MZ-80B interface, cable, plug, manual, dust cover. Boxed, good condition, £360. Tel Reading 584497.

Will swop Premier Snare Drum + stand, worth £100 plus metal detector TR Discriminator, worth £80 for any Lynx or Dragon computer Interested, Tel 06845 5640 & ask for Rob.

American PC magazines for sale or exchange. Sae list. Smith, 84 Edenfield Gardens, Worcester Park, Surrey, KT4 7DY.

Sharp PC 3201 business/personal computer, 112K RAM. VDU, dual disk drive, printer, instruction manuals and software with about 20 diskettes. Worth over £3,000, accept £1,700. Tel Leamington 30553.

Vic-20 computer & C2N cassette unit, 16K RAM, joystick, Asteroids, only three months old. Excellent condition. Cost in shops £272.50, will except £220, saving of £52.50. Tel 061-881 8171 after 5pm.

Spectrum 16K 5 months old, 2 tapes all manuals will swap for Atari console system, with some cartridges, £80 for Spectrum. Tel Bath 834583 evenings.

BBC Rocket raid. Duplicated gift still shrink-wrapped. Offers, Tel 0632 463987.

UK 101 8K RAM cased 1-2 MHz, new monitor, chromasonic sound board, manuals, many games, tape recorder with counter, joystick sockets £115 ono. Tel Norwich (0603) 810442.

Six Atari VCS cartridges, including Missile Command £34.95, Space Invaders £29.95 Indy 500 £34.95 Wardords £24.95. plus driving paddles all six cartridges £70 ono. Tel 767 7341.

Dragon 32 software on cassette. General purpose filing program, features include clock, 95-year calendar and inter-active

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The overwhelming response to PCN's Billboard service is causing delay in publication of some advertisements. To solve this growing backlog and to cover some of the publication costs we will charge £1.50 for each ad. Every form received at PCN's offices, 62 Oxford Street, London W1A 2HG, after Friday, June 10 must be accompanied by a postal order or cheque for £1.50 made payable to VNU Business Publications.

Free software advice for Dragon 32 by an expert. Tel Richard on Gloucester (0452) 720814 (also advice on 6809E machine code) after 7pm please.

Wanted urgently Colour RGB monitor for use with BBC B. Must be perfect condition. Prestel and disk software also wanted. Please ring 0926 881507, cash waiting.

Swap Intellivision cartridges, including Maze-A-Tron and Advanced Dungeons Intellivison cartridges. Tel (0983) 296472 after 5pm or at weekends.

Atari VCS console complete with 6 cartridges. Pac-man, Maze Craze, Boxing, Tennis, Combat, Casino bought at Christmas £100. Tel 0524 412725 Morecambe, Lancs.

Hitachi stereo music centre and or Praktica SLR camera MTL 3 (both mint) plus cash if necessary for best BBC Spectrum WHY. 01-858 3808.

Ingersoll Battle Command television game, 2 cartridges, power adaptor and joysticks, £35. Tel Gloucester 421982.

Atari 410 program recorder, unused with appropriate leads and manual. Under guarantee sell for £30-£40. Tel 01-843 1709, ask for Asheem. 32 Grosvenor Rd, Southall Middx. 4B2 4BP.

Epson printer TX80B 100 cps, 80 column tractor feed Pet-type grahics £140. Hempstead 51809 after 7pm.

Wanted ZX Spectrum I. Will swop for Atari VCS in good condition with three cartridges. If interested write to 10 Park Lane, Sandbach, Cheshire CW11 9EQ or ring Sandbach 3962 evenings.

Wanted Spectrum 48K. All leads, tape(s) and manual. In north London area, buyer will collect. 01-445 1327 Sundays, or between 8pm and 10pm evenings. Will pay £90.

file editing, only £2. Sue Johnson, 76 Kings Hedges Road, Cambridge CB4 2PA.

Atari VCS plus 7 best-selling cartridges. Includes fantastic Atari carry tray with cartridge rack and dust cover. Mint condition. Cost over £300 will sell £150. Tel 366-7826.

Wanted, a Vic-20 owner as a penfriend. Contact Mark Dobson, 73 Chester Road, Talke, Stoke-on-Trent ST7 1SB.

Pet 32K new ROM, large keyboard, toolkit, Micro Assembler, Basic 4, Eprom prog, Papermate, games and books. £400 ono. Tel 01-543 1890 after 5pm.

48K Spectrum plus £200's worth of games, utilities, adventures and books, for BBC Micro B and cash or sell for £150. Contact Mark Roberts, Cardiff (0222) 60022.

Genie I 16K, sound lower case, excellent condition. complete with £80+ worth of software including asteroids Invaders, Scramble, Defender, etc. For sale at £180 ono Tel 021 706 8640.

Vic-20 16K, C2N cassette, joystick, software and Jelly monsters cartridge worth over £200, will sell for £160. Tel 028-686 304 or write to Paul Wood, Bwlcyn, Trefor, Caernarfon, Gwynedd, LL54 5HG.

ZX81+16K+cased, keyboard+Hi-Res graphics+lots of good software+manual+second manual+users notes-4 months old, excellent condition, worth £170, will accept £70. Tel Leeds 692288 anytime.

UK101 8K, 1-2MHz, cased, new monitor, RS 232, Forth. £80. Tel Letchworth (046-26) 74224 after 7pm or weekends.

Swop Spectrum tapes for any 16K adventure games. Games include games 1, games 4, Space Intruders, 3D Tanks, Planetoids and Gulpman, Tel Colchester 46633 for details. Ask for Ian.

Atari VCS plus 3 cartridges, will sell for £75 ono or will swap for 16K Spectrum or 48K ZX 81. If interested write to 10 Park Lane, Sandbach, Cheshire CW11 9EQ. Tel 3962.

Wanted Vic-20 up to £100 offered or ZX81. £25 offered. Tel 051-430 7321 Liverpool.

Wanted ZX Spectrum. Will exchange Vic-20, 1 cartridge game plus two cassettes, cassette recorder and joystick. Will sell Vic-20 Tel 01-689 9320 after five o'clock, (ask for David).

ZX81 16K 20 cassettes Arcade adventure games, including, Invaders, Galaxians, Scramble, Winged Avenger, Counter Attack, Centipede, 3D Defender Black Crystal, UFO, Catacombs Avenger, plus more. Cost owner £100 will accept £55. Bletchley Tel 74480 evenings.

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Vic-20 The Count cartridge to be swopped for Vooodoo Castle or Pirate Cove adventure cartridges Tel Enfield 01-440 5621 (cartridge in good condition), ask for Richard.

Vic 20 games, Skramble, Myriad, Tankwar, Arcadia, Alienwars, Starquest, Subspace Striker, Encounter, Spacestorm, Nightcrawler, Cascade 50, also Avenger cartridge, cash offers or exchange. WHY Yateley Tel 872310 after 6pm also Abacus compiler offers.

Yatzee!! The popular dice game for any Spectrum for up to 6 players, cheaper than competition, only £63.50 from Martin Dolphin 8a The Handbridge, Highgate Park Fulwood Preston, Lancashire.

Dragon 32, Boxed, 2 joysticks, dustcover, £50 software inc. Computavoice, Star Trek, Graphic animator. Will accept £190.Tel 01-254 1221 (evenings).

Spectrum software, all originals in perfect condition. Ground Attack £3, Arcadia £3. Schizoids £3. Planet of Death £3.50, Hungry Horace £3, Space Intruders £2.50. Tel Rugby 73594 evenings.

Pet 2001 8K Integral cassette. Software includes Invaders, Golf, Xmon etc, £250. Tel Weston-super-Mare (0934) 24856. Would consider exchange for printer.

Atari 400/800 games, Canyon Climber, Moonbase I.Q, Galactic Chase, Ghost Hunter, cassettes £10 each. Jumbo Jet Pilot, Rom £20, Le stick £15. Wanted, Miner 2049'er ROM. Tel 01-341 0464 (evenings).

ZX81 + 16KRAM + keyboard + clearing lab, ideal for the beginner, plus £40 of software and books, including 3D Monster Maze. Worth £200, will accept £125 ono. Tel P Tyson (Leeds) 532184.

Sirius I 2.4Mb total disk storage plus Z80 CP/M card with 64K RAM (128K for 8088) plus software, must sell, as new, full documentation. Tel Newcastle upon Tyne 573905.

Printer ICL 7700 Termiprinter excellent condition band printer £75. Tel Farnworth 0204 74873.

Colour Atom 8K ROM 12K RAM complete with manual, PSU, leads, software and books in perfect working order £95 ono. Tel 0222 757682 weekday evenings.

TRS80 books, Basic Computer Language £2. Programming in style £3, Computer Games £2, good condition, excellent value. will swop for BBC software. Tel 031-449 3471 (after 6pm).

ZX81 plus 16K RAM pack, vgc, manual, leads, and software, games include Mazogs and Flight. Only £50, for quick sale. Canford Heath Poole. Tel Broadstone 695320 after 5pm.

ZX81 plus 16K RAM, and manual, plus 12 cassettes including Centipede, Gulp 3D, Monster Maze etc. Very good condition, £70 ono. Tel 01-472 7409 (evenings).

Swop Vic 3K RAM, joystick + Space Storm (cassette) for Vic Super Expander or £30. Tel 01-502 1400.

Unwanted TRS80 16K machine code software Caterpillar, Attack Force, Defense Command and Talking Robot Attack, all with sound through cassette port. Tel Fleetwood (87) 5348 after 6pm.

Atari VCS as new £70, cartridges £13 each, sold separately or together. Tel 01-648 0530 anytime.

Atari video TV game (good condition) with joystick etc and 6 cartridges, Asteroids, Space Invaders, Night Driver, Combat, Superman and Adventure, cartridges with box and instructions. The lot £95. Tel Accrington 34963.

Sharp MZ80K 48K Basic, extended Basic, Fortran, Forth, Pascal, Service manual, very good condition, £250 ono. Delivery possible over reasonable distance, or Securicor arranged. Tel St Mary's Bay 2185.

Texas TI99/4A Extended Basic wanted. Tel (0970) 3488 evenings and ask for Neil Sherwood.

ZX81-16K + DKtronics graphics, ROM + DK keyboard (VG) + motherboard + numeric pad, £57 of software, Scramble, Invaders, 2 Galaxians, Defender, Graphics Asteroids, Gulp, Intruders, Dodgems, 3D-Monster Maze, Gunfight + more, leads, manuals, good-as-new, cost £237 accept £125 ono Tel (0284) 62508.

VIC20 C2N cassette unit, Omega Race, Super Lander, River Rescue, cartridges, Introduction to Basic Part 1, 6 cassettes, £175. Tel Prestatyn 7669.

Super fast! Jupiter Ace for sale, unused present, cost £89.95, will sell for £75, includes manual, leads and power supply. Tel Wing 797 daytime only.

Apple II Europlus (48K) with disk drive, joystick, manuals 8 months old, perfect condition with VHF modulator—use with monitor or TV £750. Tel Berkhamsted (04427) 5570.

48K Oric 3 weeks old, unwanted gift, quick sale £140 inc. p&p. J Breffni, 37 Parkhead Crescent, Newry N. Ireland.

Microtan 65 System, includes full Tanex, Hi-res graphics, Mousepacket, VDU board, mother board, Tangerine ASCII keyboard with case, plus many extras, £350 ono for full details please Tel 0842 89516.

Atari video games system still boxed, including Pacman and Combat cartridges, is worth £111, will sell for £85, absolute bargain. Tel Wythenshaw 061-436 5683, also still under guarantee.

Spectrum programs selling, Space Intruders, Meteor Storm, Star Trek and the Great Graphics of 3D Tunnel and Planetoids, £3 each.Tel anytime after 4pm, anyday, 01-941 2359 (K Hejazi).

Sharp MZ80K 25K Star Trek game, Battle against powerful Klingons and time to save the galaxy! Only £4.99 (+plus free mystery game!) Tel (0742) 681144 (evenings only).

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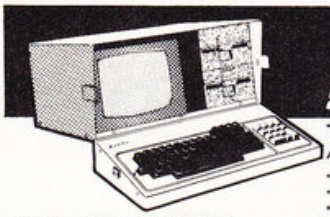

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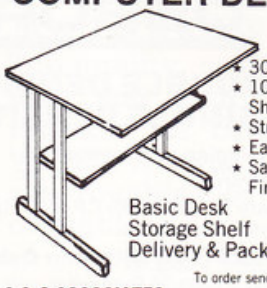

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● **Micro Professor II** £269, Dragon 32 £175, Dragon Disk complete £275, inc VAT, accessories POA, carriage £3.50. Jay Dee Communications, 182a Water Street, Port Talbot, S Wales. Access, AM exp, 24 hr order line. Tel: 0639 895738.

● **Put Your Programming to Use** in your spare time. People required for producing simple but long education programmes, from flow charts provided. Commission paid. Tel: (0283) 35170 details.

● **Discount Computers and Software** wide range of computers peripherals and software at prices hard to beat. Contact SM Software. Tel: Rotherham (0709) 530549 or Freepost Rotherham S660BR.

● **Vic-20 Tapes** and cartridges for hire, large selection. Send large SAE for details to: Vic-20 Users Software Library (Dept PCN) II, Newark Road, Breadsall Estate, Derby DE2 4DJ.

● **Missile** defend your cities from the deadly onslaught. Graphics game for the BBC Microcomputer (32K). Only £5 inc to Paul Stevens, 11 Woodhurst Close, Cuxton, Rochester, Kent ME2 1LU.

● **Spectrum Turtle Graphics:** full feature 48K version, 16K version, plus two turtle games. Tested in school, cassette with instructions £4. From C.P. Hicks, 41 Teddington Park, Teddington, Middlesex TW11 8DB.

● **Software and Hardware** for most micros, Sinclair to Superbrain including Commodore 64. Write or phone for full details. Patons Computer Services, 176 Todmorden Road, Burnley, Lancs. Tel: (0282) 53241.

● **VIC 20 Software and Hardware** stock clearance. Save up to 60%. Send large SAE to Kobra Micro Marketing, PO Box 28, Henley on Thames, RG6 1PF.

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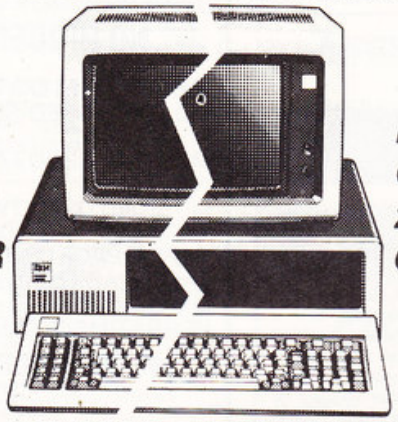

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The Beeb boobs

If you want to sell your BBC micro, don't try foreign markets. Unless, like Acorn, you are prepared to pay to relabel it.

BBC as a name is as much part of the British establishment as HMG, yet in Europe the initials have a different meaning. They are used as a trading identity by Swiss multinational Brown Boveri.

So Acorn discovered after producing hundreds of BBCs bearing the BBC logos for export. BBC (the Swiss one) took great exception to this and warned the Beeb not to market micros bearing these initials in West Germany.

Now the BBC (ours, that is) was far from happy with BBC's reaction. It effectively brought its marketing operation — television programmes and all — to a grinding halt.

Marketing boffins were put to work to dream up a solution to the impasse. Back they came with the ingenious, if uninspiring, solution: 'Let's call the machine the British Broadcasting Corporation Microcomputer.'

And with these Reithian tones ringing in their ears Acorn's production staff were sent off to relabel the hundreds of machines already assembled.

Any suggestions as to how they squeeze this lengthy title onto the name-plate of the micro should be sent to Acorn.

SYNTAX ERRORS

Disk located

When labelling parts of a disk drive, captions get mixed up. So it was in Micropaedia, page 101. The part labelled The Magnetic Coil (*part 13, issue 13* — no wonder) is the motor which moves the wheel pictured under the disk drive at 11. And 14 should read The Head Motor — which moves the head in and out. Sorry about that folks . . . but we're still not superstitious.

Sharp POKE

You had to be Sharp to pick up the mistake in issue 11's story on the MZ80 — and most Sharp owners are. In the first series of POKEs one POKE was omitted — POKE 7388,140.

It should be obvious, but could lead to a crash if you don't expect it.

Graph supplier

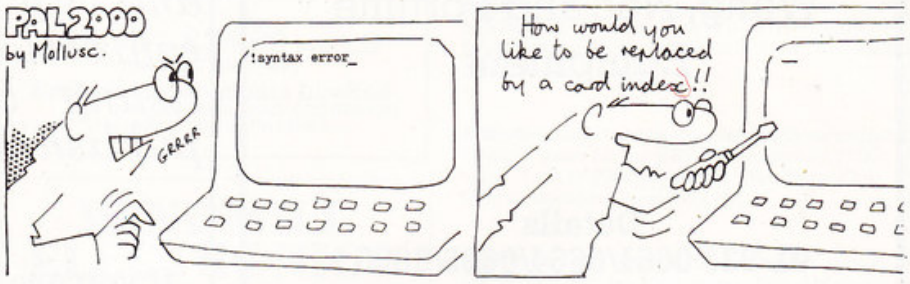
In response to reader's requests, the address of Keyboard, which manufactures the Spectrum graph sheets featured in Micropaedia Graphics Part V, is Keyboard Word Processing & Advanced Office Systems, 28 Forest View Road, Walthamstow, London E17.

Address mode

Letters sent to Elliot Right Way Books could go the wrong way if you follow the address we gave. The publisher is at Kingswood Buildings, Lower Kingswood, Tadworth, Surrey KT20 6TD, not Kingsway.

Laugh line

SUSPENSE OVER — This one taxed you all. Lots of 'testing the air brakes' and 'computerised route planners', and one 'systems crash' line. But best of the lot — better, we thought, than the cartoonist's 'Some of these video games are very realistic' — was Tim Fox with 'Hey, isn't that Silicon Valley down there?' Tim, of Shirehampton, Bristol, wins £20.



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
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 1101
Fylde Computer Show	June 17-19	Winter Gardens, Blackpool	Northern Exhibitions, 0706 877687
Compec North '83	June 21-23	Belle Vue, Manchester	Roy Bratt, Reed Exhibitions, 01-643 8040
Leeds Software Fair	June 21	John Taylor Teacher's Centre, Leeds	Graham Creighton 0532 782181
BBC Micro User Show	June 24-26	Renold Building, UMIST Manchester	Database Publications, 061-456 8500
Dexpo Europe '83	June 29-July 1	West Centre Hotel, London	Expo Consul Inc, 01-948 3111
Micro Trade '83	July 6-8	Barbican Centre, London	Timothy Collins, Montbuild Ltd, 01-486 1951

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Mini Computer Show for Office, Home, Hobby	June 23-26	Exhibition Hall, Cologne	German Chamber of Industry and Commerce, 01-930 7251
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
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic. 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085

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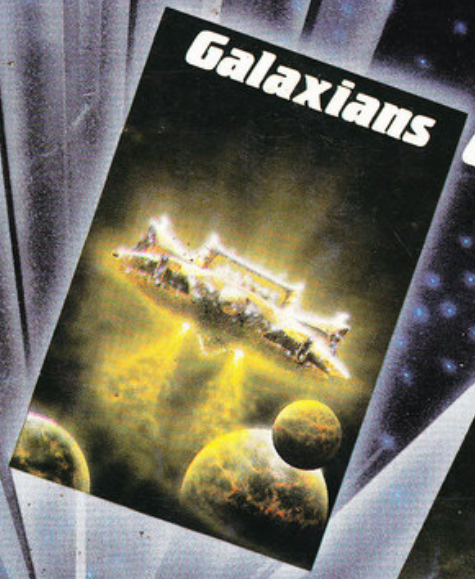

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GALAXIANS The first 'arcade perfect' version of the popular game, written in machine code for super-smooth fast action play. Hi-res movement and superb sound effects make this the game other Oric games will be compared with. £6.95/48K Oric; 16k version soon. Realisation: Gordon Russell.

MONSTERS Don't PANIC! Alone in the maze of platforms and ladders on Saldon III you must find power-modules in the system guarded by the Monster-Robots. But you have your Laz-Gun to blast through levels and send them crashing to their fate. One of the best 100% machine code games yet for the Dragon 32. £7.99.

ROBON Quite simply a quantum leap better than other versions of 'Berserk' for the Spectrum. Nine levels of play, and full feature action including Robon chases, laser guns, and if you dally too long the Rabok will get you! Any ZX Spectrum. £5.95 Realisation: Andrew Beale.

JOUST You, White Knight do fly upon your Ostron and do battle with the Dark Lords upon their Buzzards. The most amazing hi-resolution graphics and movement ever on the ZX Spectrum. 16 or 48K RAM. £5.95 Realisation: Andrew Glaister.

FIREBIRDS Wave after wave of Firebirds and their cohorts the Blue Weavers and the White Bombers; ever chasing the Firebirds' Motherships. Unlimited waves and specially crafted machine coded super-smooth action and sounds sets a new standard in shoot-em-up games. Runs on any ZX Spectrum. £5.95 Realisation: Graeme Devine.

REPULSAR The last outposts of Mankind are under almost constant attack and you alone have control of the defense system. Fast and furious version of the arcade game Missile Command. Works with Joysticks. Any ZX Spectrum. £5.95 Realisation: Andrew Beale.