PERSONAL COMPUTER NEWS

THE COMPLETE COMPUTING WEEKLY

MAY 13 - MAY 20, 1983 Vol 1 No10 35p

!SOFTWARE EXCLUSIVE!

Infomast: A three-in-one package for the Commodore 64.

Check it out, page 26

GAMEPLAY

SPECTRUM STRATEGY

Pit your wits against prowling patrols and pick up a princess

HARDWARE: FIRST HANDS-ON

ESPON'S FANCY CHARACTER

Pro-Test of the QX10, the micro with a fountain of fonts

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SPECTRUM SOFTWARE

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Author: **John Hollis**

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Author: **Martin Wren-Hilton**

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Author: **John Hollis**

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Author: **John Hollis**

EASYSPEAK
Add speech or music to your programs. 48K.
Author: **John Hollis**

MINED-OUT
With 9 levels of minefield. 48K.
Author: **Ian Andrew**

SOFTWARE FOR THE ZX81 WITH 16K RAM

QS ASTEROIDS
"...very good..."
"...addictive game!" (C. & VG.).
Author: **John Hollis**

QS DEFENDA
"...better than any other arcade game I've seen." (Sync.).
Author: **Nick Lambert**

QS SCRAMBLE
"...amazing, fantastic!" (PC.W.).
Author: **Dave Edwards**

QS INVADERS
"...just like the real thing!" (C. & VG.).
Author: **Dave Edwards**

MUNCHEES
Features 1 to 4 Ghosts, 3 Munchees, Power pills
Author: **A. Laird**

GALAXIANS & GLOOPS
Features two types of swooping Galaxian.
Author: **T. Beckwith**

CROAKA-CRAWLA
With Frogs, Lorries, Logs, Crocodiles, Turtles, Flies.
Author: **John Field**

SPECTRUM FRENZY
Arcade action
Features: Full colour hi-res graphics, sound, high score table, hold feature, 5 levels of robots, Evil Orville the minelayer, exploding pods, progressive difficulty, attract mode.
Author: **David Shea**

ASTRO BLASTER
Arcade action
Features: Full attract mode, 5 attack waves, 15 levels of difficulty, rapid fire, meteor storms, changing aliens, plasma bolts, killer bombs, full colour hi-res graphics, full sound.
Author: **John Edwards**
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Menu driven prompts given at all times.
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48K Spectrum

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ZX81 GAMES

OCEAN TRADER
An adventure set in the 19th Century.
You own and captain a vessel, sail between 5 ports and deal in coal and whisky, with storms, pirates, sea mist and vessels adrift.
Author: **A. Morgan**
ZX81 with 16K RAM

COSMIC GUERILLA
Arcade action
Fast m/c action, will drive QS sound and character boards, responsive controls, high score tables.
Author: **C. K. Tame**
ZX81 with 16K RAM

3D BLACK STAR
Arcade action
Features: Fast 3D graphics, fast scoring, four types of target. Eight instrument displays, warp drive, resurging aliens, time limit, 17 levels of progressive difficulty, high score table.
Author: **M. Sudworth**
ZX81 with 16K RAM

DAMPER & GLOOPER
Arcade action
Features: Fast action, 5 dampers increase to 6 on later phases, 3 lives plus bonus lives, ever increasing speed, high score, stall frame features, spiral clear at end of games, bonus phase worth 5000 pts., high score save and display.
Author: **P. Crane**
ZX81 with 16K RAM

PIONEER TRAIL
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Features: 20 levels of play. "Mind Game" plus shooting rifle speed uses all keys and is measured against the players personal average response. This game is based on historical data.
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ZX81 with 16K RAM

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MENU
May 20, 1983 Volume 1 No 10

Micropaedia Graphics Part 5
The pixel extravaganza concludes with more for the **Dragon, Vic 20, Spectrum, Oric,** and **BBC** machines.

REGULARS

Monitor 2
In seven pages of news, Sinclair tells all, *page 2;* Grundy re-organises for CP/M Newbrain, *page 3;* US robots are on the march, *page 4;* Compec Europe report from Brussels, *page 5,* with PCN Charts; Record companies muscle in on software, *page 6;* and more news of the microcomputer world.

Random Access 14
Write to *PCN* and take a chance on winning £10

Routine Inquiries 16
Max Phillips puts you out of your misery in his question and answer page

Microwaves 19
BBC, Oric and **Lynx** program hints; **ZX81** and **Vic20** tips.

Gameplay
Spectrum 48
Full marks for Princess in Waiting . . . don't miss it!
Spectrum 51
Indulge your ruling passions with Dictator and Roman Empire
Vic 20 54
Take to the skies with Choplifter and Skyhawk

Readout 56
Whether you're a micro duffer or database genius, there's a book here for you

ProgramCards
Lynx 57
Colour and sound in a fun demo program
Spectrum 61
Play this game and get the robot back to base
Commodore 63
The CBM Database saga goes a step further
Subroutine 67
New Forth users start here

Clubnet 70
Check out the clubs in your area . . .

Billboard 80
Buy, sell or swop

Quit/Datelines 88

Cover illustration by Robin Harris (with a slight acknowledgement to John Ingledew)

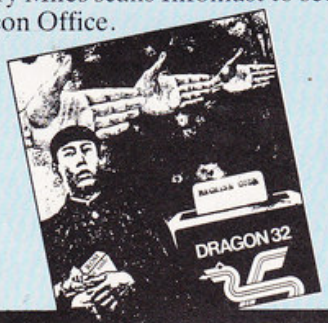
PCN SPECIALS

ZX81 Graphics: Part 1 20
Start here with the stars and skyline and build into a full ET-type adventure with next week's part 2. Adrian Boot gives you the lines.

Atari: Which WP? 24
Stage 2 in Geof Wheelwright's bid to take Atari to the serious side of software.

PCN PRO-TEST: SOFTWARE

Commodore 64 — cover story 26
Barry Miles scans Infomast to see whether it stands up as a scaled down version of Silicon Office.



Dragon: machine code monitor 30
Dragon Mace gets the thumbs up from Ted Ball, who recommends it to people wanting to learn 6809 assembly language, or to write serious programs.

PCN PRO-TEST: PERIPHERALS

Music makers 34
Former Curved Air musician Francis Monkman finds out what happens when low-cost micros meet music in the form of two new synthesisers.

Hard-wired modem 38
We herald a new era in personal computing with the advent of prism's directly coupled modem. Ralph Bancroft studies its virtues.

PCN PRO-TEST: HARDWARE

Epson QX-10 14
Karl Dallas introduces the micro of many faces, the multifont Epson.

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Sinclair looks to the future

Clive Sinclair: an exclusive interview in next week's PCN.

Plug-in power on Spectrum

By Geof Wheelwright

You will be able to buy cartridge software for your Sinclair Spectrum late this summer.

The cartridges will sell for under £10 each and plug in through a less-than-£20 interface box that you must buy in order to use the new software. Sinclair managing director Nigel Searle hailed the move last week as a major breakthrough. He said the cartridges will put an end to the hours of frustration many Spectrum users have experienced in trying to load cassette software, because the cartridges will load the moment you power up your machine.

'We are going to be bringing out later this year a lot of software for the Spectrum in ROM cartridges, and that means you will no longer need to use the internal RAM for program space, and you will be able to run in a 16K Spectrum a lot of programs which weren't available for that machine before,' he said.

The major problem with cartridge software has been the cost — £20 or more for each cartridge. But Mr Searle said the high prices have been the fault of video games manufacturers, rather than any inherent expenses involved in cartridge production.

'I think it's a matter of volume; if you look at games cartridges for video games the manufacturers are obliged to make very high margins on the cartridges because they make very little money off the video games and they have no other source of accessories to sell,' he said.

Modems and microdrives

It's unlikely Sinclair will ever sell a modem for its Spectrum micro.

Mr Searle said last week that Sinclair has scrapped plans for its acoustic modem largely because Micronet and other companies have offered modems at far less than it had planned.

'There's no point in doing it if other companies are willing to operate on lower margins and sell very inexpensively.

'There will be modems for the Spectrum whether they come from us or other parties,' he said.

■ Sinclair will be releasing its Microdrives some time in the last two weeks of this month. And Mr Searle said the low-cost storage devices will *not* be transferable to other popular micros. Despite intense speculation that Sinclair will try to make the Microdrives an industry standard for low cost storage, he said Sinclair is building the drives so they will work only with Sinclair's machines — starting with the Spectrum.

■ Meanwhile, Timex has delayed plans for release of the Spectrum in the US. Timex is Sinclair's licensee in America and had planned to release the Spectrum this month as the TS-2000.

■ Mr Searle denied that the recent price cut on the company's products was simply because Oric was offering its 16K machine for £99. 'We reduced the price, not because the Spectrum had become uncompetitive, but because we want to expand the market and establish a position in the market.'

ZX84 means business

Sinclair Research will launch a new business computer early next year.

Code-named the ZX84, it will sell for slightly more than £1,000 and run on a non-standard operating system of Sinclair's own invention. Sinclair managing director Nigel Searle said last week that the company is counting on software houses to write packages for the machine, even though it's scorning the PC-DOS and MS-DOS operating systems.

Mr Searle said the machine may be a portable, and hinted that it could use Sinclair's flat-screen TV technology. He added that he doesn't expect it to be a business machine in the sense of competing directly with the IBM PC.

Citizen canes print costs

Two low cost printers should arrive from Japan in about a month.

Based on the 505 series, the Citizen 510 will cost £155 and the 520, £165, plus VAT. You can choose from a parallel or serial printer — interfaces are built in, so all you need is connecting cable.

These 40-column printers are said to print at high speed and come in desk top or panel mounted versions.

The two new printers will initially be available from Datac in Altrincham, Cheshire on 061-941 2361.

Datac also manufactures printer interfaces, and distributes Centronics printers.

Pre-packed micros

In the wake of the price war started by Sinclair Research (*PCN, issue 9, May 6-13*) Commodore is to market a Vic20 'starter pack' for £139.99 including VAT.

Aimed to seduce the first-time buyer who isn't sure what to choose, the pack incorporates the Vic20 computer, a cassette deck, Introduction to Basic Part 1 and four cassette games — Blitz, Hoppit, Race and Type-a-Tune.

The current retail price of these items if sold separately is £249.99.

Basic Part 1 consists of a manual and two cassettes which teach you elementary aspects of Basic, example programs, and give questionnaires on topics covered in the manual.

The packs will be available from the usual Vic20 haunts, ie Dixons, Boots, selected branches of Smith, Laskys and smaller outlets, from June 1.

Although the Vic itself would cost about £90 in this deal Commodore says dealers will not be allowed to split the package.

■ Not to be outdone Laskys is offering an Apple package which it says includes a free portable colour television plus £100 worth of software. For £1,398 you get a 64K Apple IIe, disk drive and control adaptor, graphics package, 14in colour TV and software covering games, education, and home finance. But Apple itself offers the Apple IIe Starter Pack at £1,473.

CP/M strains Grundy

By David Guest

The Newbrain with CP/M is imminent, but Grundy Business Systems is going through the mill to get it out.

'We are re-organising to bring CP/M online,' says dealer sales manager Keith Beverton. And finance director Tony Wheeler adds that the company is trying to secure extra finance to carry through a program that has been dogged by embarrassing delays.

According to Mr Beverton pre-production machines running CP/M will be on show to dealers on May 20. Production models will come out at the rate of 250 in June, 500 in July, and 1,000 in August.

Grundy has been promising CP/M since late last year, and its advertising has featured the development. But successive deadlines have slipped as the company struggled with what is understood to have been a bug in the disk controller.

'Although we might be late, there are other people who haven't started the race,' says Mr Beverton.

He describes Grundy Business Systems' re-organisation as 'minor changes — we are looking at the problems we're going to encounter when we launch a system that will multiply out turnover ten-fold.' Mr Beverton assures current Newbrain users: 'From an external point of view nothing is happening.'

Software from Peachtree is one of the blandishments that Sharp is offering businessmen among you with its MZ3541 system. The Peachtree packages it includes are the MBasic range and the Office Productivity Systems — word processing, a spelling checker, mailing list, spreadsheet, and comms manager. With a green screen you pay £1,795, and for colour £2,450.

Alpha boost for VisiCalc

A connection allowing you to upgrade your 64K Apple VisiCalc to 256K IBM VisiCalc power, should be available now from Pete & Pam Computers.

Called the Apple-IBM Connection and made by Alpha Software, of the US, it retails at £139 plus VAT and comes with spoken instructions.

It means your worksheets can be larger and your Apple Wordstar 130K floppy capacity can be increased to the IBM DOS Wordstar 320K capacity.

Designed for non-technical users, the Apple-IBM Connection comes with a disk for the Apple as well as one for the IBM.

Microsoft mouse loose for IBM PC

The IBM Personal Computer has trapped itself a mouse. Chasing the Lisa bandwagon, Microsoft has released a mouse-compatible word processing package.

Microsoft's mouse only works with its new Multiword package, and only on the IBM PC, but the company plans a Mouse Mark Two, which will fit an RS232 interface on any MS/DOS machine.

There will also be a new version of Multiplan, Microsoft's other package in its Multitools range, which the mouse will be able to operate quite happily.

Multiword will sell for $375 in the US, or $475 with the mouse thrown in, while the mouse alone will cost $195. But Microsoft is not saying how much it will be charging in this country, or when shipments will start.

The package will work either with or without the mouse. It's compatible with Multiplan, the Microsoft spreadsheet, so data can be passed between the two. It features on-screen formatting, and the mouse can be used to point to chunks of text, then select the appropriate command from the bottom of the screen to underline, copy, put into bold face, and so forth.

Multiword supports foreground and background processing, and different character fonts can be displayed on screen if the micro has the graphics capability. It also features the window concept beloved of Apple, with the option of having several editing windows on different parts of a single document, or onto another document to copy parts of it.

Microsoft can be contacted on 04427 75091.

Multi-colour print shop

A seven-colour dot-matrix printer is on the way from Seikosha. The GP700A will be distributed here by DRG and the end-user price will be £399 plus VAT.

The printer uses a special multi-coloured cassette ribbon with green, blue, red, yellow, black, magenta, cyan and purple. In addition to these primary colours the printer can produce 30 different shades.

As you would expect colour graphics are its forte.

It comes with pin and friction feed and a Centronics interface. An RS232C is available as an extra. Print speed is either 38 or 40cps and noise is low.

● PCN will be featuring a full Peripherals Pro-Test on the GP700A when it first becomes available in late June.

Gavilan out of the traps

One of the biggest little systems to come out of the US will be in the shops by autumn.

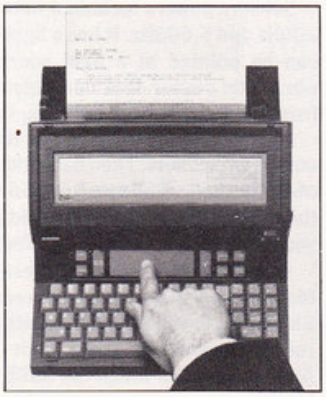
The Gavilan machine demonstrated in London last week looks like the first in what could be a line of very high performance, high capacity micros that is bound to include offerings from such as IBM and Apple.

Based on an 8088 processor it has no less than 1.2Mb of RAM, and in one small unit weighing 9lbs it incorporates a full size keyboard, a 320K microfloppy, and a 66 × 8 Liquid Crystal Display. It runs MS/DOS.

Even with a letter-quality printer attached the Gavilan is genuinely portable at 14lbs, making devices like the Osborne seem obese. Between battery charges you can get eight hours of use from the system.

But probably its chief feature, as far as the shape of things to come is concerned, is the touch-sensitive panel that takes the place of a mouse on systems with similar approaches to the convenience of the user. The panel also allows you to use windows and its software includes context-dependent help screens.

The Gavilan Corporation will be aiming to attract those of you in business. Its system



comes with integrated applications — a spreadsheet, word processing, a diary, and communications facilities that can use a built-in modem.

Its design will allow you to use a full-size monitor and any microfloppy. There is also provision for a cartridge system.

The Gavilan (a Spanish word meaning 'hawk') should be on sale in the UK in October. It will cost around £3,000.

VIEW FROM AMERICA

Iron hand in a velvet glove

From Chris Rowley

At Fujitsu's Fanuc automated robot-building plant in Japan, the union was recently driven to ask that the plant's robots join the union and pay dues to keep the union solvent. There are already robots that build robots and now they are to pay subscriptions for the privilege.

Which is a thought guaranteed to bring a smile to the lips of that growing group of humans that even now is blistering its thumbs while building a whole generation of home robots for $2,000 and less. As they wrestle with soldering irons and fragile pin arrays, you have to wonder if they realise what a giant step forward for humanity they are taking.

The fact is that robots are among us now and they're not likely to go away. They will be a broad spectrum phenomenon. Thus the near future will not only see industrial robots but also a variety of home robots. Something the size of a radio with a phone tie-up for security purposes might add a fresh wrinkle to the old hassle of burglary.

When the burglar is taking the powered metal clippers to your security gate the home robot can not only phone you but allow you to negotiate with the burglar, try to tell him that there's nothing worth stealing (while notifying the police, of course) and in the end the robot can proffer a $1,000 note and say: 'Why not call it quits?'

Suggestions that 'armed, murderous' robots will be on sale soon are nonsensical — there are laws against that sort of thing.

A lot of the hot-eyed enthusiastis with the solder burns on their thumbs are building the same machine, the Heath Hero, a 40 lb wee electronic beastie with three wheels and a carapace that vaguely resembles an R2D2 unit from Star Wars.

But Hero is on sale for $1,495 in kit form or $2,495 fully assembled. Moreover, Heath has set up a users' group to co-ordinate information as it pours in from all those involved in the experiment.

Furthermore, Hero has the right stuff. He gets around for up to an hour on batteries between recharging, uses four 6V 4amp gelled electrolyte re-chargeable cells, and has an arm and a claw that can pick up objects and carry them around. Hero's brain is a processor board and there are add-on slots for 8K more. Hero also talks using a Votrax voice chip and will say things like 'Happy Birthday' and 'I don't do windows'.

Sensory powers include a microphone to pick up sounds between 200Hz and 5,000Hz. It has a light-dependent resistor on its head that can be pointed at a light source to determine direction, and an ultrasonic sensor that can detect objects on the ground. For many frustrated home robot builders, the Heath Hero is the answer.

After all, the robot builders used to be lumped in with the home computer hackers. Then came the Cupertino gang and Mr Sinclair and when the dust settled we had 256K RAMs, $50 micros, and IBM — but the robot builders were still welding Fischer-Technik kits and stepper motors in home-made arrays. And they still weep over Meccano.

And the future? One of these days I expect a new entry in the Manhattan Yellow Pages between Road Service & Towing and Rock Shops. Meanwhile Hero is drawing competition. There are other small robots appearing, some with jokey extensions like Androbot's Androwagons on which the $995 Androbot can hold snacks in the TV lounge.

On a more serious note, at Odetics Corp in Anaheim, California, they are building Functionoids. These are walking, functioning robots such as the Odex-1, which runs on 24V aircraft batteries, stands 6ft high on six articulators (arms or legs) and which can manoeuvre well on rough terrain. It weighs 370lbs and can heft loads of 1,000lbs or more.

Odex-1 doesn't sound like a home robot to me, but somewhere on the curve between him and the little Heroes lies the future home robot. Nor will things stop there. Give tomorrow's robot 256K of RAM and some kind of mass storage system, perhaps from a VCR unit, and then give them new touch sensors being developed at MIT for robot fingers. What you have is the first truly sensuous household robots with silky-smooth fingers for expert stroking of their owners, mixing the martinis, polishing the car, and, or course, joining the union.

Sinclair keyboard swop

Substitutes for the Sinclair keyboards are springing up like mushrooms for those of you who don't like the membrane or tacky rubber styles.

Steatite Insulations has produced a typewriter-style model for the ZX81. It has keys that typists know as full-travel, and inserts we all know as plastic (for longer life).

The keyboard (*pictured*) is fitted with a cable, and it comes with instructions on how to disconnect the incumbent keypad. It costs £30.95 and Steatite is on 021-454 6961.

For the Spectrum, DK'tronics has a cased keyboard due to be released in June. It has 52 keys, 12 of which are set aside in a numeric keypad.

To install the keyboard you have to remove the system from its original case and screw it into the new one. DK'tronics' unit also includes a motherboard, if you want to repackage a ZX81 inside it. The case doesn't forget the usual connections on the back, and it won't stop you using any add-ons.

It will cost £45 and DK'tronics is on Saffron Walden 26350.

●*PCN* has already Pro-Tested two other Sinclair-replacement keyboards, from Fox Electronics and Telford Electronics and Computing (*PCN, issue 9, May 6-13*).

Juki breaks into print

If you're thinking of splashing out on a daisywheel printer to get a bit of typewriter-like text from your micro it might be an idea to have a look at the latest Japanese daisywheel from a company called Juki.

The big selling point of the Juki 6100 is its price. At £399 plus VAT it seems to have broken a significant barrier. There's always a drawback though — speed is rated at a rather modest 18cps.

The Juki is promised in the next couple of months and *PCN* will be doing a Peripheral Pro-Test on it.

User power

By Ralph Bancroft

Micronet has given in to badgering from BBC owners and agreed to release version 4.0 of the Prestel software.

The extra features and compatibility with new telesoftware standards made version 4.0 attractive to BBC users who learnt about it through Prestel's own electronic grapevine.

The new software can be downloaded by Micronet subscribers for free (on *600558#). Other BBC users can download a free copy if they have a Prestel adaptor with downloader software courtesy of Viewfax 258 (on *258200066#).

In addition, the author of version 4.0, Soft Machinery, is selling the package on tape with a manual for £19.95.

Version 4.0 offers improved cursor controls; a failsafe mechanism that stops you leaving Prestel if mailbox messages are waiting; and the ability to cope with the telesoftware standard promoted by the Council for Educational Technology.

Bob Clarke of Soft Machinery said that version 4.0 should have been the version used when Micronet was launched.

He said he was surprised it was held back.

It was completed and delivered to OEL (which makes Micronet's acoustic modems) in time for the March launch date.

Soft Machinery's address is Kiln Cottage, Higham, Colchester.

Brussels sprouts 16 bits

By Ralph Bancroft

Bigger, better, faster was the underlying theme of Compec Europe, with 16-bit machines well to the fore.

Future Computers, for example, had on display the first two FX20 micros to roll off the production line. The machine should be in full production by August and will be supplied complete with CP/M-86 as the operating system and the top rated Spellbinder as the free word processing package.

Future FX20—August production

Future Computers will also supply Concurrent CP/M-86 as a standard feature and MS/DOS 2.0 as a £50 extra.

One UK firm demonstrating Concurrent CP/M up and running was Future Technology Systems (no relation).

At the top end of the scale, Plessey was demonstrating its new System 68 machine. Based on the true 16-bit 68000, with half a megabyte of RAM, Winchester disk and tape streamer back up, it certainly is a gutsy micro. But you will have to save up to buy one as, with Unix included, you won't get much change out of £15,000.

The Europeans are not slow to get in on the 16-bit act. The Tulip from Holland (*PCN, May 13*) was showing-off its high resolution colour graphics, and Olympia used the exhibition to launch its German-made answer to the IBM PC.

Called the People computer, it is based on the Intel 8086 and comes with 128K of RAM (expandable up to 512K), two 5¼in floppies, each with a capacity of 655K, a 10Mb Winchester, 640 by 475 pixel graphics that use 128K of dedicated RAM, and a keyboard with a numeric keypad and 12 programmable function keys.

In Belgium the machine will sell for BFr230,000, which is about £3,000. The price includes not one but three operating systems: CP/M-86, concurrent CP/M-86 and MS/DOS.

The People will be available in the UK in the autumn.

Another stand drawing a crowd was Commodore, with a bevy of Commodore 64s grabbing attention through a demonstration program whose musical sound effects were loudly amplified through the building.

One product that didn't need amplifying was Unix. It seemed to be everywhere, creating the impression that the next generation of micros will all be running this operating system (or some alternatively named lookalike) on a Motorola 68000 CPU plugged into a Multiboard or VME bus.

Real Time Systems, a UK company, is convinced this is the way things will go and was promoting a system called Idris.

Produced in the US, the great claim for it is that unlike other Unix systems it guarantees true portability of software between machines, right down to insisting on a single disk format for all machines it is implemented on.

Linked with this, the company is selling a C-compiler (the language that Idris is written in) that can run on a wide range of machines. The latest microprocessor able to run the language is the 6809. A C-compiler running on a Dragon? The mind boggles.

Lucidata was showing the £2,000 6809-based Concept-09 to demonstrate its Pascal compiler. Elsewhere on the stand was its range of Diplomat protocol converters and modems.

The collection of peripherals at the show was wide, but there appeared to be little new. The most interesting newcomer was a daisywheel printer from Fujitsu. Called the SP830, it runs at an incredible 80cps — that's almost twice as fast as the Diablo 630 for only a marginal increase in the price.

There was one machine at the show that didn't have a price tag on it, and that was the Heathkit Hero 1 robot. It seemed to spend most of its time escaping from the Zenith stand and terrorising visitors.

The Commodore stand—a bevy of 64s

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 May 13), so these charts tell the story in high streets between April 16 and April 30.

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 (3)	Sinclair ZX81	£40	(SI)
▲	3 (5)	Atari 400	£160	(AT)
▼	4 (2)	BBC Model B	£399	(AC)
▲	5 (7)	Commodore Vic 20	£170	(CO)
▲	6 (10)	Texas TI99	£150	(TE)
▼	7 (4)	Dragon 32	£200	(DR)
▲	8 (12)	Commodore 64	£345	(CO)
▲	9 (11)	Newbrain A	£228	(GR)
▼	10 (8)	Oric 1	£100	(OR)
▼	11 (9)	Sharp PC 1500	£170	(SH)
▼	12 (6)	Lynx 48	£225	(CA)
▲	13 (18)	Epson HX20	£472	(EP)
►	14 (14)	Atari 800	£400	(AT)
▲	15 (16)	Jupiter Ace	£90	(JU)
▲	16 (—)	Apple IIE	£969	(AP)
▼	17 (13)	Sharp PC 1251	£80	(SH)
▲	18 (19)	Colour Genie	£224	(LO)
▲	19 (—)	TRS 80 Model 1	£199	(TA)
▼	20 (17)	Acorn Atom	£174	(AC)

Top Ten over £1,000

►	1 (1)	Sirius 1	£2,754	(ACT)
►	2 (2)	Osborne 1	£1,581	(OS)
▲	3 (5)	IBM PC	£2,392	(IBM)
▲	4 (6)	Commodore 8032	£1,029	(CO)
▼	5 (4)	HP 86A	£1,541	(HP)
▼	6 (3)	Olivetti M20	£2,754	(OL)
►	7 (7)	Apple III	£2,780	(AP)
▲	8 (9)	Sanyo MBC 1000	£1,195	(SA)
▲	9 (10)	Xerox 820	£2,415	(RX)
▲	10 (—)	Televideo TS800	£1,495	(COL)

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

Music men cometh

By Sandra Grandison

Buying software could become as easy as picking up a copy of the latest records with giants like Virgin and K-Tel stepping into the market.

From June 14, Virgin Games will be making its debut with a batch of new releases for three popular micros, and K-Tel has taken its first steps in software distribution.

Virgin is opening with games for the Spectrum, BBC and Vic-20. Priced at £7.95 each, titles for the Spectrum include Golf, Yomp, Star Fire and Sheep Walk. For the BBC model B there's Bug Bomb, Landfall and Space Adventure. And for the Vic-20 Mission Mercury.

Nick Alexander, managing director of Virgin Games, said: 'Our target is to sell our software through every shop that sells computers. And as a start we shall be selling them in four of Virgin's record stores.'

Virgin intends to boost the image of the authors of programs by putting a picture and a small autobiography of the author on the cover of the cassette. Mr Alexander said: 'The idea behind this is that people will start to buy a package because they like the author's programs.'

So far the software has been flooding in at a rate of 50 programs a week, of which 50 per cent is usable.

K-Tel has placed an initial order worth £150,000 for Spectrum games from DK'tronics. It will distribute DK'tronics' tapes to stores like WH Smith, Boots and Woolworth, but ordinary record shops may follow.

'Our expertise is in marketing to multiple chains and offering a very fast service,' said K-Tel's director of information services Guy Wood. 'It is definitely possible to sell tapes through hi-fi shops, and I'd guess that in a matter of months we'd see the demand from High Street shops.'

The deal with DK'tronics is K-Tel's opening move in an arena that is increasingly attracting record companies. But K-Tel will simply act as a distributor, where others like CBS are considering using their tape duplication facilities, or like Virgin are signing exclusive distributorships.

K-Tel's first batch from DK'tronics will be 15 games and it hopes to add five new games each month.

Mr Wood said that K-Tel was unlikely to start commissioning games, but he stressed that the deal with DK'tronics was the first of what could be several distributorships.

Etching on the Genie

A program for the Colour Genie that makes it easier to draw pictures and diagrams can be yours for only £5.95.

Called Electric Etch it has 20 single key commands to change colours, leave a trail, draw lines, arcs, circles, triangles and boxes. The shapes are then filled in automatically using points that you have told the computer to remember.

Anything drawn on the screen can be saved as a named file on cassette and recalled for future display or editing. You can also use the program in conjunction with your own programs to put pictures on the high resolution screen, edit them and save the results on tape.

Electric Etch will be available from B P Cooper of Brittain Laboratories Ltd (0232-751549) in about two weeks.

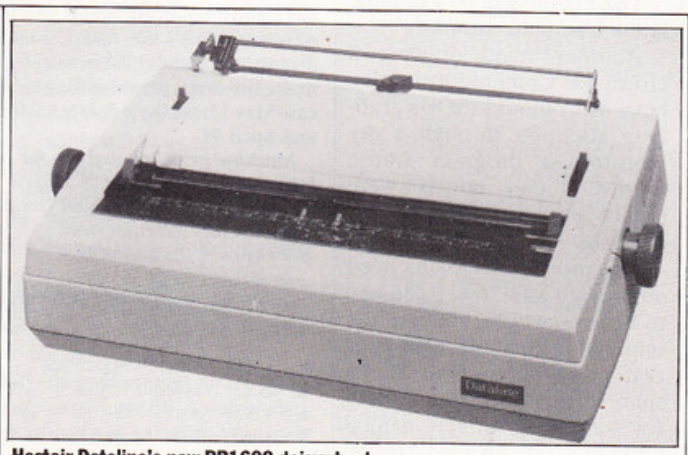
BBC merger

Concurrent printing and sequential file merging are now available in a word processing package for BBC users.

The £15 Wordsworth Mark 2 works on the BBC 0.1 operating system as well as under the two subsequent releases without internal modifications.

It is a new program which will print while you type.

Contact Ian Copesake on Woking (048) 674755.



Hestair Dataline's new RP1600 daisywheel.

Daisywheels from Dataline

For people who like to retain the illusion of typewriter-style text or letters, Hestair Dataline has a pair of new daisywheel printers.

The Dataline RP1300 and RP1600 feature 8K buffers, bi-directional printing and operator control over pitch and line feed.

You can select from Centronics, IEEE or RS232C interfaces for the basic price.

The difference between the two models is speed. The RP1300 is capable of 35cps and costs £1175 plus VAT, while the RP1600 goes at 60cps and costs £1595 plus VAT from Hestair on (0533) 56215.

Base for IBM

The choice of database management systems for the IBM PC grows by the week, Following Qbase (*PCN, May* 13) there is Data Design, from Insoft of Oregon.

Data Design is slightly more expensive than Qbase at £150 and it lacks some of Qbase's verification routines, but according to its UK distributor, it scores on ease of implementation.

Its standard features include command choices held in menus, interactive help manuals built into the software, and interactive 'browse and modify' facility, and even a telephone communications subsystem to help you get information into the appropriate hands quickly if your PC is tied into a network.

Data Design is a multi-key database that structures your data into tables.

Pete and Pam Computers is on 01-769 1022.

Colourful calculation from Zenith

Owners of the Zenith Z100 16-bit micro can now run SuperCalc and Wordstar in living colour.

Zenith has brought out customised packages that take advantage of the machine's colour capabilities. SuperCalc costs £200 and Wordstar £276.

In use, colour SuperCalc shows negative quantities in red, protected entries in yellow and unprotected entries in white. Error messages are also displayed in red.

With colour Wordstar you can select the colours used for the menu display and the colour of the background and foreground of the text area.

Zenith is on 01-837 6332.

● Zenith tell us that the much-loved Z89 series of micros will shortly cease production. In fact, of the four models in the range only the Z90 (without disk drives) is still being made. And even this version is due for demise.

CP/M network

If CP/M has been stopping you hooking your system into a communications network, the Corvus Systems' Omninet local area network can now accommodate you.

For more information on Omninet contact Keen Computers on 01-236 5325.

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B.B.C. MICRO

	Mem Req'd	Supplier	Code No	Price
Space Pirates	16K	Bug Byte	02B001	£8.00
Space Warp	32K	Buy Byte	02B002	£9.00
Golf	32K	Bug Byte	02B003	£5.50
Dragon Quest 1	16K	Bug Byte	02B004	£11.50
Fruit Machine	B	Bug Byte	03B006	£5.50
B.B.C. Airlift	B	Bug Byte	02B007	£5.50
Polaris	32K	Bug Byte	02B008	£5.50
B.B.C. Chess	32K	Bug Byte	02B009	£8.00
B.B.C. Backgammon	A/B	Bug Byte	02B010	£8.00
B.B.C. Multifile	16K	Buy Byte	02B011	£15.00
B.B.C. Micro Derby	A/B	Bug Byte	02B012	£5.50
Swoop B/A	32K	Micropower	24B029	£6.95
Alien Destroyers	32K	Micropower	24B030	£6.95
Galactic Commander	32K	Micropower	24B031	£6.95
Timetrek	32K	Micropower	24B032	£6.95
Laser Command B/A	32K	Micropower	24B033	£6.95
Astro Navigator B/A	32K	Micropower	24B034	£4.95
Chess B/A	32K	Micropower	24B035	£6.95
Footer B/A	32K	Micropower	24B036	£6.95
Adventure		Micropower	24B037	£6.95
Cowboy Shootout	32K	Micropower	24B038	£5.95
Munchyman		Micropower	24B039	£5.95
Seek		Micropower	24B040	£5.95
Eldorado Gold B/A	32K	Micropower	24B041	£5.95
Roulette B/A	32K	Micropower	24B042	£4.95
Reversi 2 B/A	32K	Micropower	24B043	£4.95
Filer		Micropower	24B044	£8.95
Micro Budget		Micropower	24B045	£6.95
Constellation B/A	32K	Micropower	24B046	£5.95
Disassembler		Micropower	24B047	£5.95
World Geography	32K	Micropower	24B048	£5.95
Where B/A	32K	Micropower	24B049	£5.95
Junior Maths Pack	32K	Micropower	24B050	£5.95
Startrek/Candyfloss	A or B	I.J.K. Software	33B001	£6.50
6 Games	A or B	I.J.K. Software	33B002	£4.50
Mutant Inv/Breakout	A or B	I.J.K. Software	33B003	£6.50
Beep Beeb B or A	32K	I.J.K. Software	33B004	£4.50
Beebmunch B or A	32K	I.J.K. Software	33B005	£6.50
Super Hangman B or A	32K	I.J.K. Software	33B006	£4.50
3D Maze B or A	32K	I.J.K. Software	33B007	£4.50
Invaders A		I.J.K. Software	33B008	£5.50
Invaders B or A	32K	I.J.K. Software	33B009	£7.50
Wordpro B or A	32K	I.J.K. Software	33B010	£10.50
Atlantis/Scramble	32K	I.J.K. Software	33B011	£7.50
Flags	32K	I.J.K. Software	33B012	£4.50
Hyperdrive	32K	I.J.K. Software	33B013	£6.50
Strato Bomber	32K	I.J.K. Software	33B014	£7.50
Creative Graphics	A/B	Acornsoft	53B051	£9.95
Arcadians	B	Acornsoft	53B052	£9.95
Sliding Block Puzzles	B	Acornsoft	53B053	£9.95
Snapper	B	Acornsoft	53B054	£9.95
Desk Diary	A/B	Acornsoft	53B055	£9.95

B.B.C. MICRO cont.	Mem Req'd	Supplier	Code No	Price
Cube Master	B	Acornsoft	53B056	£9.95
Tree of Knowledge	B	Acornsoft	53B057	£9.95
Lisp	A/B	Acornsoft	53B058	£16.85
City Defence		Bug Byte	02B059	£7.50
Space Invaders		Bug Byte	02B060	£7.50
Galaxy Wars		Buy Byte	02B061	£7.50
Asteroid Belt		Comp. Concept	60B073	£7.80
Space Hawks		Comp. Concept	60B074	£7.80
Golden Baton		Digit. Fantasia	61B075	£8.95
Time Machine		Digit. Fantasia	61B076	£8.95
Arrow Death 1		Digit. Fantasia	61B077	£8.95
Arrow Death 2		Digit. Fantasia	61B078	£8.95
Pulsar 7	32K	Digit. Fantasia	61B079	£8.95
Circus	32K	Digit. Fantasia	61B080	£8.95
Feasibility Experiment		Digit. Fantasia	61B081	£8.95
Frogger		I.J.K.	33B088	£7.50
Croaker		Micropower	24B108	£7.99
Dragon Rider		Salamander	62B109	£7.95
Tanks		Salamander	62B110	£7.95
Graphics Package		Salamander	62B111	£24.95
Compendium B1		Salamander	62B112	£6.95
Compendium B3		Salamander	62B113	£6.95
Database Management System		Gemini	63B114	£19.50
Invoices & Statements		Gemini	63B115	£19.95
Home Accounts & Budget		Gemini	63B116	£19.95
Decision Maker		Gemini	63B117	£5.95
Stock Control System		Gemini	63B118	£19.95
Selective Mailing List		Gemini	63B119	£19.95
Commercial Accounting		Gemini	63B120	£19.95
BBC Word Processing	32K A or B	Gemini	63B121	£19.95
Beebcalc		Gemini	63B122	£19.95

COMMODORE 64

Monopole		Rabbit	13K002	£9.99
Grave Robbers		Rabbit	13K003	£9.99
Sprite Editor/Graphic Generator		Rabbit	13K004	£9.99
Adventure Pack 1		Rabbit	13K005	£9.99
Attack on Mutant Camels		Llamasoft	52K006	£8.50
Rox 64		Llamasoft	52K007	£4.95
Gridrunner		Llamasoft	52K008	£8.50
Colonels House		Rabbit	13K009	£9.99
Orbis 64		Rabbit	13K010	£9.99
Adventure 2		Rabbit	13K011	£9.99
Grand Master Chess		Audiogenic	16K012	£17.95
Renaissance		Audiogenic	16K013	£8.95
Motor Mania		Audiogenic	16K014	£8.95

DRAGON 32

Ghost Attack (cart)		Dragon Data	17C007	£24.95
Cave Hunter (cart)		Dragon Data	17C008	£24.95
Starship Chameleon (cart)		Dragon Data	17C009	£24.95

NB. Software Centre is not a software library.

DRAGON 32 cont.	Mem Req'd	Supplier	Code No	Price
Chess (cart)		Dragon Data	17C011	£24.95
Dragon Selection One		Dragon Data	17C012	£7.95
Dragon Selection Two		Dragon Data	17C013	£7.95
Personal Finance		Dragon Data	17C016	£7.95
Graphic Animator		Dragon Data	17C017	£7.95
Computa Voice		Dragon Data	17C018	£7.95
Typing Tutor		Dragon Data	17C022	£7.95
Alcatraz		Microdeal	21C028	£8.00
Defense		Microdeal	21C029	£8.00
Dragon Invaders		Microdeal	21C030	£8.00
Escape		Microdeal	21C031	£8.00
Mansion Adventure		Microdeal	21C032	£8.00
Jerusalem Adventure		Microdeal	21C033	£8.00
Williamsburg Adventure		Microdeal	21C034	£8.00
Ultimate Adventure		Microdeal	21C035	£8.00
Phantom Slayer		Microdeal	21C036	£8.00
Planet Invasion		Microdeal	21C037	£8.00
4 Games Pack 1		Microdeal	21C038	£8.00
4 Games Pack 2		Microdeal	21C039	£8.00
4 Games Pack 3		Microdeal	21C040	£8.00
Racer Ball		Microdeal	21C041	£8.00
Scarfman		Microdeal	21C042	£8.00
Space Monopoly		Microdeal	21C043	£8.00
Space War		Microdeal	21C044	£8.00
Storm		Microdeal	21C045	£8.00
Invaders Revenge		Microdeal	21C046	£8.00
Donkey King		Microdeal	21C047	£8.00
Flipper		Microdeal	21C048	£8.00
Katerpillar Attack		Microdeal	21C049	£8.00
Strategic Command		Romik	10C050	£9.99
Adventure 2		Microdeal	21C055	£8.00
Adventure 3		Microdeal	21C056	£8.00
Light Pens		Microdeal	21C060	£8.00
Trek		Salamander	62C061	£9.95
Wizard War		Salamander	62C062	£7.95
Vulcan O's & X's		Salamander	62C063	£7.95
Games Compendium		Salamander	62C064	£7.95
Golf		Salamander	62C065	£7.95
Grand Prix		Salamander	62C066	£7.95
Star Trek		P.S.S.	64C067	£7.95
Tex Star		P.S.S.	64C068	£12.95
Dragbug		P.S.S.	64C069	£12.95
Attack		P.S.S.	64C070	£7.95
Dataplan		P.S.S.	64C071	£12.95
Cosmic Zap		Microdeal	21C072	£8.00
Android Attack		Microdeal	21C073	£8.00
EL Diablero		Dragon Data	17C074	£7.95
Database Management System		Gemini	63C075	£19.50
Home Accounts & Budget		Gemini	63C076	£19.95
Dragon Calc		Gemini	63C077	£19.95

SINCLAIR SPECTRUM	Mem Req'd	Supplier	Code No	Price
Time Gate	48K	Quicksilva	12D047	£6.95
Chess Player	48K	Quicksilva	12D048	£6.95
Space Intruders	16K	Quicksilva	12D049	£4.95
Meteor Storm	16K	Quicksilva	12D050	£4.95
Meteoroids		DK Tronics	09D063	£4.95
3D Tanx		DK Tronics	09D064	£4.95
Centipede		DK Tronics	09D065	£4.95
Ground Force Zero		DK Tronics	09D066	£5.00
Master Chess		Micro Gen	06D067	£6.95
Socerers Castle		Micro Gen	06D068	£5.50
Cosmic Raiders		Micro Gen	06D068	£5.95
Orbiter	16/48K	Silversoft	29D001	£5.95
Ground Attack	16/48K	Silversoft	29D002	£5.95
Starship Enterprise	48K	Silversoft	29D003	£5.95
Football Manager	16K	Addictive	50D070	£6.95
Gobbleman	16/48K	Artic	25D071	£4.95
Invasion Force	16/48K	Artic	25D072	£4.95
Frog/Showdown	16/48K	Artic	25D073	£4.95
Spectrum Assembler	48K	Artic	25D074	£9.95
Voice Chess	48K	Artic	25D075	£9.95
Schizoids		Imagine	05D076	£5.50
Ah Diddums		Imagine	05D077	£5.50
Adventure A		Artic	25D078	£6.95
Adventure B		Artic	25D079	£6.95
Adventure C		Artic	25D080	£6.95
Adventure D		Artic	25D081	£6.95
Invaders		Artic	25D083	£4.95
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Bug 2		Artic	25D086	£7.00
Forth		Artic	25D087	£29.95
Micro Chess		Artic	25D088	£6.95
Chess		Artic	25D089	£9.45
Krakit		Artic	25D090	£9.95
Arcadia		J.K. Greye	32D091	£4.95
Penetrator		Melbourne H.	65D092	£6.95
Hobbit		Melbourne H.	65D093	£14.95
Spectrum 1		Melbourne H.	65D094	£5.95
Spectrum 2		Melbourne H.	65D095	£5.95
Spectrum 3		Melbourne H.	65D096	£5.95
Mined Out		Quicksilva	12D097	£4.95
Ground Force		Titan	22D098	£5.00
Mad Martha		Microgen	06D099	£6.95
Mines of Saturn		Microgen	06D100	£5.95
M Coder		P.S.S.	64D101	£8.95
Ghost Hunt		P.S.S.	64D102	£4.95
Maze Death Race		P.S.S.	64D103	£4.95
Database Management Systems		Gemini	63D104	£19.50
Home Accounts & Budget		Gemini	63D105	£19.95
Decision Maker		Gemini	63D106	£5.95
Stock Control System		Gemini	63D107	£19.95
Selective Mailing List		Gemini	63D108	£19.95
Commercial Accounts		Gemini	63D109	£19.95

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SINCLAIR SPECTRUM

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Inca Curse	48K	Artic	25D002	£6.95
Ship of Doom	48K	Artic	25D003	£6.95
Espionage Island	48K	Artic	25D004	£6.95
Reversi/Othello		Moi	26D005	£7.95
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Portable Televideo

By Richard King

Televideo's first portable machine will be on sale by the autumn, and with hardware and software costing less than £1,500 it should be worth a close look.

The Teletote I is a 25lb machine with a Z80 processor and 64K of RAM, which makes it a pretty standard CP/M configuration, but the memory is expandable to 128K, and there is a single 368K 5¼ inch floppy built in.

As well as two RS232 ports for printer and modem connections, there's a port for the SuperMouse, which is intended to control graphics applications. Vision, where are you?

The TeleTote looks like good value, considering that not only is CP/M included in the price, but so are a 'powerful word processor package' and a spreadsheet, as well as TeleChart, a graph-plotting program which works interactively with the spreadsheet.

This last item is written with the long-awaited GSX-80 graphics systems extension, which Digital Research, publisher of CP/M and GSX, hopes will be recognised as an international standard.

One interesting facet of the new machine is that it is totally compatible with the more upmarket Televideo 803. The intention, according to Phil Hwang, Televideo's president, was to provide a machine which is portable, and can be used as an exact replica of the main office machine, generally the 803, since the disk-format is identical.

If you're accustomed to Televideo terminals, you will know that they are styled (if that's the word) on the lines of a '54 Buick.

Not so the 803. Apparently Televideo has used a new design-house, giving the entire range a facelift. The new styling is much more European and makes more than token bows in the direction of ergonomics.

The actual processor and ancillaries are kept in a strange L-shaped housing, which also acts as a kind of frame to hold the screen in place. This allows the VDU to tilt up and down, but keeps the machine as a single unit.

An advantage of this design is the fact that the circuit boards are mounted vertically, which Televideo says is to provide cooling without fans.

Naturally, in the limited time available, it wasn't possible to do more than run a couple of demo programs, and then try as hard as possible to bomb the machine. I was singularly unsuccessful in this, and the machine obstinately refused to do anything wrong at all.

The standard 803 configuration costs £1,975 from Televideo dealers.

● *PCN* will Pro-Test the Televideo 803 in a future issue.

GLARING OMISSION — If your eyes suffer from screen glare this Polaroid CP-70 Contrast Enhancement Filter may help. Distributed by Cave Tab of Northampton, it is designed to absorb the harsh reflections and ambient reflected glare often produced by VDUs. It costs £76. For more details call Cave Tab on 0604-47238.

Insurance offers extra protection

Another low-cost solution to the problem of insuring your computer has been provided by insurance brokers Graham Brown and Company.

The company is offering a policy for micros under two years old. It gives cover against 'all risks' including internal breakdown and accidental loss or damage, including damage during transit.

The cost of the scheme starts at £7.50 a year for a system worth up to £100. For a £500 system the cost would be £15.

These costs are slightly higher than getting an extension on your existing home contents insurance policy (*PCN, March 25*).

APL means business for Sage users

A version of the programming language APL has been launched for the Sage IV 16-bit micro.

Produced by MicroAPL, APL 68000 is a full implementation, together with enhancements to improve its usefulness in commercial applications. It is designed to run under the Mirage operating system.

MicroAPL is selling the language and OS as a complete system together with a Sage IV with 1 Mb of RAM and a 12 Mb hard disk. It costs £7,800.

APL is something of a cult language with a band of enthusiastic followers. Originally developed as a shorthand notation for scientific equations, it is now used as a high-level language for both scientific and commercial programs. Its advocates claim that APL projects are typically written in 15-20 per cent of the time taken using Cobol, Basic, Fortran or Pascal.

Detroit accent

It may not be up to Olivier's standard but a new speech synthesis unit tries to be easier on the ear than the usual grating monotone.

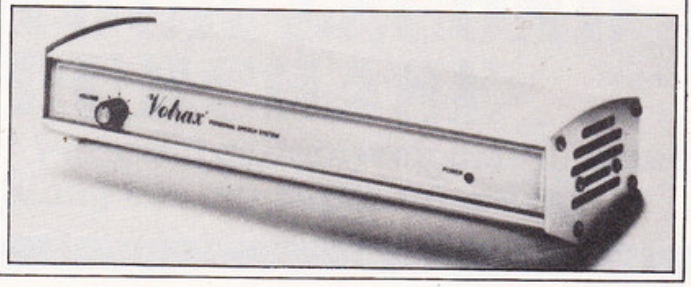
The Personal Speech System (PSS) from Votrax of Detroit has programmable inflection and amplitude — you can play with its oratory to try to produce a more realistic sound.

The PSS can run off most micros with its serial and parallel ports and programmable baud setting, and at £375 it really should be a cut a above run-of-the-mill units. Driven by a Z80 it has a 3.5K input buffer which can be split to give a printer buffer, and the unit can run in parallel with a printer to give hard copy output of its verbal efforts.

According to UK distributor Cyber Robotics, the key feature of the device is its ability to translate 95 per cent of English words from text.

Besides its programmable tendency to lilt, the PSS can function as a music synthesiser with a range of eight octaves. It also includes a clock.

For further information contact Cyber Robotics on Cambridge (0223) 210675.



NSC puts Supercalc on BBC

With a bit of tweaking NSC Computer Shops has adapted Supercalc to run under CPN on your BBC micro with Torch disk drives.

Normally Supercalc is only available on CP/M systems and although it tries to run under CPN it doesn't get far. NSC used Torch drives and a terminal emulator to fool the BBC into behaving like a CP/M machine.

For more information contact NSC on 061-832 9788.

Krypton factor in the office

A new family of business computers — the Krypton Series — will be in the shops soon.

Produced by Transtec Computer, the series consists of four models — the Krypton 800K, 1600K, M5 and M10, differing mainly in storage capacity.

At £1,695 plus VAT, Krypton 800K comes with 64K RAM, two 400K floppies, a green monitor, slimline keyboard and CP/M 2.2 as its operating system. The 1600K costs £1,995 plus VAT.

The hard disk systems come with floppy disk drives for back-up purposes and all models can have UCSD p-system and CP/M Plus operating system at extra cost. The M5 costs £3,107 plus VAT and the M10 £3,750 plus VAT.

In addition, the systems can be hooked up for a multi-user, multi-processor network — with a maximum of 30 users having 64K RAM each.

Transtec is also selling add-ons. The Centurion Colour Graphics system gives you colour — an extra board slots into your computer and gives you up to 1024×1024 graphics resolution. It will cost £795 plus VAT.

And if you want to boost your main memory to 256K, a RAM disk is available for £450 plus VAT.

Transtec is on Bristol (0272) 277462.

Holidays for the disabled

Computing holidays for the disabled will be held at the University of Southampton this summer.

Up to 25 people, aged from nine, will join each week-long course at Clarkson House, the university's purpose-built accommodation for the disabled.

The course costs £160, but organiser Dr Lionel Wardle has asked the Department of Industry to put some cash into the project and cut the price to £60. Talks to achieve this are still going on.

Course participants will spend five days learning about computers leaving two days' free time. BBCs, Ataris, Spectrums and ZX81s will be available and will be adapted for use by disabled people.

Computers in Beds

Government money is helping Bedfordshire people try their hands at micro business systems.

Bedfordshire County Library is equipping some main branches with Sinclair, BBC and IoTech systems. The micros will be available free to anybody who wants to book time on them.

The scheme is funded by a £90,000 Department of Industry grant. Eventually 36 systems will be installed around the county with the emphasis on business software.

The first library to go live with the systems will be Luton Central on May 20.

£5,000 chess challenge

Five thousand pounds is up for grabs in a computer chess championship sponsored by Sinclair Research and Intelligent Software.

The prize will go to anybody whose chess program can beat Intelligent Software's IS Chess, a £9.95 program that runs on the Spectrum. Intelligent Software's chairman, David Levy (no mean player himself) is prepared to stick his neck out: 'We are willing to bet that it can win a match against any other chess program which is currently commercially available for the Sinclair Spectrum.'

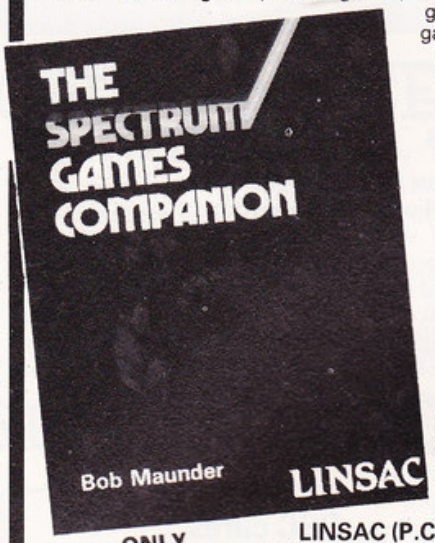
The number of possible contenders is put at 'at least half a dozen' by Sinclair. Battle will commence when they come forward. If you fancy your chances, contact David Levy on 01-636 7016 or Sinclair on 01-235 9649.

Linsac's ZX Companion series has received excellent press reviews:

"Far and away the best" — *Your Computer*

Thoughtfully written, detailed and illustrated with meaningful programs ... outstandingly useful" — *EZUG*

'The Spectrum Games Companion' is the latest addition to the series and is aimed at the games player and programmer alike. Twenty-one games designed specifically for the ZX Spectrum are included, with clear instructions on entry and play. Each program is explained fully with complete details on how it is designed and written. Introductory chapters show how to set up and use the Spectrum and how to create your own games. Later sections cover number games, word games, board games, simulation games, dice games, card games and grid games. If you want to enjoy your ZX Spectrum and learn its secrets at the same time then this is the book for you!



Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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Software piracy — OK among friends

Much has been written in the press recently about ordinary users pirating copies of software house programs, especially games. One survey said that only one copy in 50 of Acornsoft's 'Snapper' was an original. Other articles have talked about 'massive losses of revenue' through such illegal practices.

This is not necessarily as bad as some would have you believe. There are two types of software piracy — one is for fun and the other for profit. I agree that for the latter, *ie* people selling pirated programs as their own, legislation should be introduced to clarify the copyright law and introduce heavier penalties for offenders. On the other hand, 'piracy among friends' is not only harmless but maybe of benefit to the personal computer industry.

Consider the following:

(a) Would computer users buy all the programs which they were not able to obtain free? Would any more original copies of 'Snapper' be bought, for example? I think not. Most people have a limited amount of money to spend on software, so that the interchange of programs between friends means simply that each user has more software for the same cost.

(b) In a group of users, where this 'illegal piracy' takes place, you can be sure that every participant will have to buy their share of programs . . . Who would keep supplying a friend with programs who never returns the favour?

(c) People, in general, are more likely to buy a computer if they know they can obtain a certain amount of software without paying for it. The resulting higher sales of computers can only be of benefit to the industry.

(d) Software houses may moan about piracy, but how many are going out of business? How much profit are Quicksilva, Acornsoft and the like going to make this year with Sinclair and BBC computers topping the sales charts?

Let us hope the industry as a whole will concentrate on stopping those who make a profit on other people's hard work, and cease the endless innuendo about harmless domestic piracy — a practice which, in any case, they are helpless to stop.

Alastair McLeod,
Torrance, Glasgow.

PCN £10 Star Letter

BBC cures while you wait

Over the last few months I have read numerous complaints about the poor service received from computer manufacturers and dealers. I therefore thought that readers (especially in the Midlands area) would be interested to know about the excellent service I have received from my Acorn dealer since purchase of my BBC micro last December.

On power up I discovered that I had a machine with a MOS 0.1 and that several errors occurred while loading programs, so I phoned the dealer, The Daventry Computer Centre, and was told that they would let me know when the MOS 1.2 was available. This they did and my exchange chip was fitted two days after arrival in the shop.

A couple of days later I experienced a loading error: nothing would load at all, so again I gave the shop a call. 'Bring it in,' they said, so I did and the computer was set up on the test bench and checked with an oscilloscope. One of the chips in the cassette interface section of the board had blown so they sorted it out for me, while I waited.

The machine has been fine since then.

Chris Rain,
P H Educational,
Shipston-on-Stour, Warks.

More about WP, please

I think it is a pity that you never cross the barrier you seem to have set up for yourselves between the personal computer and the office machine costing a bit more.

There are surely many people besides myself who are seriously interested in the word processing abilities of microcomputers and would like to see more comparison between the speeds and ease of use and relative virtuosity of the various forms of word processing, from the simplest up to the IBM Displaywriter standard.

We may not be able to afford the latter but we badly want to know what we might be missing and what to look for as each new machine and its software is launched. There must be many self-employed people on the brink of word processing or ready to go up-market who read your magazine.

Surely it is time that somebody who actually *does* word processing for a living could be persuaded to tell us more.

For this is as much of a revolution as any other aspect of computer activity. Besides, I understand that word processing is fun. Please give the games a miss for once and go into it in depth.

Deenagh Goold-Adams,
Bath, Avon.

I'll keep games, but we'll do our best to look at word processing in depth, too (for starters, see page 20) — Ed.

The great micro software con

After having read the latest batch of advertisements in the magazines, I was compelled to write to you about the standard of advertising.

Although the standard in many is good, many advertisements are dishonest, or uninformative. For example, several firms manufacture games for both the ZX Spectrum and the ZX81, many fail to point out that the ZX81 version will not have colour, sound, moving graphics etc.

Also several firms fail to tell the reader how many K is required for a program. Several times I have seen a program advertised, however the advertisement failed to say which computer it was for!

Peter Talks,
Warwick

Cut out the cowboys

I am writing to help draw attention to some of the 'junk' software around. Now that the computer industry has taken off so quickly and strongly there are quite a few 'cowboys' joining in.

Recently I saw an advertisement in a computer magazine for 'The best Maze Chaser game ever!'

Feeling confident that the program was of good quality I mailed a cheque for £5.95. Eight days later I received a poor-quality cassette, photocopied inlay card and a game worth less than the tape it was on.

Surely some official body should be set up to control the quality of software for micros. The public should be made aware of good and bad software companies. Some people are just out to make a fast buck and are spoiling the scene.

They seem more interested in a colourful advert than in the program.

K Meredith,
Cyncoed, Cardiff

We try to sort good from bad in our weekly software and gameplay reviews — this should save some disappointments — Ed. — Ed.

BBC screen test

I am writing in to inform Owen Staley (*Random Access, May 7*) that he has made a mistake, in that the BBC Model A does *not* offer an 80-character screen display as standard. It has to be upgraded with another 16K of memory before an 80CSD is possible, or hi-res graphics.

Also both Newbrain models A and AD offer 80CSD as standard as well as a good full screen editor and 32K of memory, expandable to 2Mb of RAM and 4Mb of ROM, and in my opinion offers far higher quality at a lower price than any of the BBC computers.

D Scott,
Glenrothes, Fife.

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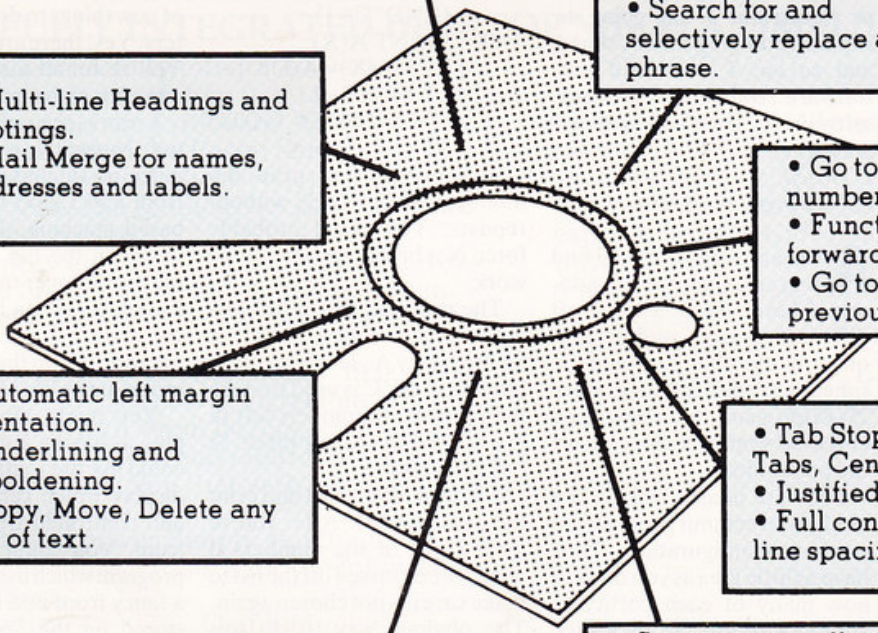

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What's the word on translation?

Q I own a 48K Oric 1 and have recently thought about converting a program for the 380Z. It's quite long and I'd like to know the pros and cons before I attempt it.

Some of the words I don't recognise are ON, GRAPH, DEF, CLEAR and RANDOMIZE.

Jon Watts,
Barnet, Herts

A Unfortunately, it's suck it and see time. It does depend on what the 380Z program does and how. For example, anything that uses CALLs to 380Z HRG is going to be a lot harder than anything that sticks with its text screen.

The basics shouldn't be too difficult. Most 380Zs are now using a 16K Microsoft Basic while the Oric is yet another revival of Ye Olde 8K Microsoft.

So the bulk of the basics are the same. You'll have trouble with some of the 16K extentions, such as INSTR.

The trick is to simulate the commands. Dig the command out of the RML manuals, find out exactly what it does and then write a subroutine to simulate it. Then replace references to the instruction with subroutine calls.

If you make a mistake with the simulated command, you only have to change the subroutine. This technique avoids having to unravel the 380Z program and reprogram it for the Oric. You can just do a verbatim translation into subroutine calls.

Screen handling will cause some problems. But the Oric and the 380Z both have teletext-like screens. Provided there's no high resolution graphics in the 380Z program, you shouldn't have to change much.

Most of the words you list shouldn't be a problem. They are in Oric Basic and they are in the Oric manual. ON is part of ON . . . GOTO or ON . . . GOSUB. DEF is part of DEF FN. CLEAR does the same thing on both machines though 380Z Basics like you to reserve string space with a following number. So CLEAR 3000 would be just CLEAR on the Oric.

GRAPH selects either a full text screen or a graphics window with four lines of text (a bit like Oric HIRES). GRAPH1: GRAPH0 is a common 380Z way of clearing the screen. Use CLS instead. RANDOMIZE reseeds the 380Z's random number generator so that it's not always giving the same sequence of 'random' numbers. The Oric has a similarly weak RND but Oric forgot to put RANDOMIZE in the Basic.

You may find the conversion is difficult at first. But as you come to know both Basics, it will get easier and easier. And once you've done it, you can always do it again.

Expansion can be restrictive

Q I own a ZX81 and am 16 years old. Instead of buying a new machine such as an Oric 1 or Spectrum, I am going to expand by buying colour, sound and so on. I wonder if any software companies produce software for such an expanded ZX81?

D Ansell,
High Wycombe, Bucks.

A It is unlikely that you'll find programs that use the add-ons. There's such a range of different devices and techniques in use that it would be ridiculously difficult to produce ZX81 progams that recognised and used some, let alone all, of the possibilities.

Software houses will also be unlikely to commit programs to particular configurations. They have as little idea as you do as to how many of each particular add-on is in use. So they stick where it's safest . . . with the standard 16K Ram, ZX printer configuration.

So usually the only people you find supporting odd ZX81 hardware are the people who put it out. This tends to mean that programs that work with one particular add-on are easy enough to come by, but it's unlikely you'll find programs to support a full range of expansions.

Now that the Spectrum costs less than £100, you might like to rethink your decision. Spectra have colour, sound, High resolution graphics and so on as standard. So most programs dare to use them.

Will your ZX81's number come up?

Q I want my ZX81 to print random numbers without printing the same number more than once. The problem relates to football pools permutations where no number can be used more than once. I can solve this problem with a megabyte but not in 1K

Carl Richards,
Belle Vale, Liverpool

A I know how to do this. It's a common problem and there's a common solution, even in 1K.

```
10  RAND
20  LET N=35
30  DIM A(N)
40  FOR I=1 TO N
50  LET A(I)=I
60  NEXT I
70  LET C=N
80  LET X=INT
    (RND*C+1)
90  PRINT A(X),
100 LET A(X)=A(C)
110 LET C=C-1
120 IF C>0 THEN GOTO
    80
```

This manages to print the numbers from 1 to 35 without repeats. You could probably force N a bit bigger with some work.

The program works by storing a list of numbers to choose from in array A. This is set up by lines 20 to 60. C is used to store the number of numbers left in the list. So this starts off at 35 (N) in line 70.

Eighty and 90 select and print the next number. After you've picked one of the numbers it needs to be crossed off the list to make sure it's not chosen again. The obvious way to do this would be to shuffle all the numbers up one place in the list to close the gap made by the chosen number. But this takes time.

Line 100 just takes the last number of the list and stuffs it in the gap. This doesn't matter since we don't care about the order the numbers are in anyway. Next, since we've got one less number in the list, we take 1 off C at line 110. Finally, just for demonstration, line 120 loops until all N numbers have been printed.

This approach limits the range of numbers you can generate. A much slower but perhaps more suitable method would be to work the other way around — start with an empty list and add used numbers to it. Each time you pick a new number, you step through the list and check if it has been used. When you're sure you've picked a new number, add it to the list to make sure it doesn't appear again. This takes time but in 1K you should be able to generate 30 different numbers.

Spectrum-Lynx link-up

Q I own a Lynx 48K and a Spectrum 48K. With the imminent arrival of the Spectrum RS232 interface in mind, what would be the advantages of linking these two computers together?

Martin Rocliffe,
Teignmouth, Devon

A You tell me! Nobody gets anywhere unless they think of new things to do with computers. Yes, there are advantages. You've found a solution, now come up with a problem.

I can't see any immediate use. Normally, you link a little machine (including 48K Spectrum and Lynx) to a big disk-based machine. Then you develop on the big machine and move stuff over to the little one to test. So if you had drives on the Lynx or (to be speculative) microdrives on the Spectrum, it might make life easier.

You might also be able to play at having a network. You could use the Lynx as a window display which can be updated and controlled from the Spectrum. You could even have a program which used the Lynx as a fancy front end to a database stored on the Spectrum. The Spectrum could be looking up the next record while the Lynx edited the last one.

Far fetched? Certainly quite hard work. But the link could prove entertaining and educational. If not useful. And there's always time to think of more things.

It will be a while before you can get a Spectrum interface and a working Lynx RS232 port together on the same piece of ribbon cable.

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Position POKEs on the Oric

Here are some more useful locations for the Oric. They work on a 48K machine but should also work on the 16K when it becomes available. 616 and 617 contain the Y and X co-ordinates of the cursor. You can PEEK and POKE them to find where it is and to move around the screen.

Similarly, locations 557 and 538 are the X and Y co-ordinates of the Hires cursor. You can use absolute positions with a statement such as DRAW x — PEEK (537), y — PEEK (538) rather than DRAW's usual relative co-ordinate.

S Bobik,
Preston, Lancs.

Flying upside down

I recently bought the Oric flight simulator from Tansoft. One side of the tape has the program recorded at 300 baud and the other at the normal 200 baud speed.

The instructions say that the fast side is side 1 and the slow side is side 2. On my copy it's the other way round.

Gary Denham,
Little Bookham, Surrey

Program pips the BBC

Here's a short program for a BBC with either 1.0 or 1.2 ROMs. It will make the machine emit a short pip when a key is pressed.

You can turn this on with *FX 13,2 and off with *FX 14,2. Pressing BREAK will not lose the effect.

A Cobley,
Tayport, Fife

Dummies solve Lynx code shortcomings

The CODE statement on the Lynx is very useful. But each line is limited to storing less than 80 bytes of machine code (assuming two digits per byte) because of the fixed length of the input line buffer.

Using single digits only, it is possible to get up to 118 bytes of code into one line. So if the dummy single digits are initially entered, longer machine code can be put into the line by means of the monitor. For example, try the following:

10 CODE0 0 0 0 0 0 0 0 0 . . .

Just carry on typing those zeroes until you've got 79 of them. This will take you up to your limit for the line.

Now print out the location of the first byte with ?#LCTN(10). Enter the monitor with MON, and use the M command to enter your program starting from the address printed out above. Be careful not to overwrite the carriage return character (0DH).

It is possible to enter considerably more than 118 bytes by altering the byte which determines the length of the line.

Greater care will have to be taken if you do this.

Chris Cytera,
Bracknell, Berks

ZX81's sticky problem is solved

I used to have problems with my 'uncrashable' RAM pack wobbling and crashing. I solved my problem by sealing the RAM pack to the ZX81 casing with a few drops of melted candle wax. The hot wax solidifies. It has no effect on the casing and can be cleaned off easily.

Kevin Wright,
Cottingham, Hull.

Some ping new from Sinclair

Many people use Blue-Tak to stop ZX81 RAM packs wobbling. I have found another use for it.

Put a small piece on each key, between the letter, graphic and function. When a key is pressed, you can hear a quiet 'ping'. This can be a great help for typing in programs.

Allan Jarvis,
55 Hill Rd, Benfleet.
PCN specialists have been trying this one out, and it looks like it may take us some time to un-gum them . . . Ed.

Medical diagnosis for Vic 20 keyboard

Sometimes it's useful to discover from within a program what case the Vic 20's keyboard is in. To do this use PEEK (36869) AND 15. This returns the following values:

0 Upper case
1 Upper case and reverse
2 Lower case
3 Lower case and reverse

You'll also find that PRINT CHR$(8); disables case changing from the keyboard. CHR$(9) enables it again. You can set lower case (CHR$(14)) and upper case (CHR$(142)) from within a program.

R S Ladkin,
Frinton-on-Sea, Essex

BBC users' guide passes the ton

I wonder if any readers have trouble with the program on page 61 of the BBC users' guide. It stops on line 100. The solution is to take out the space between RND and (4). My thanks to the Millfield Computer group who helped solve this.

E T Fearon,
Southgate, London

```
   6*KEY10"?&8B=1:?&89=0:?&8A=&F1:?&8B=&FF:?&8C=&C8:?&8D=0:?&8E=1:?&8F=0:?&220=
&70:?&221=01M"
  10?&8B=1:?&89=0:?&8A=&F1:?&8B=&FF:?&8C=&C8:?&8D=0:?&8E=1:?&8F=0
  15REM THE ABOVE SETS UP THE SOUND STATEMENT.SEE PAGE461 OF THE USER GUIDE
  20OSWORD=&FFF1
  30*FX14,2
  31REM ENABLES KEYBOARD EVENT
  40?&220=&70:?&221=0
  41REM POINTS TO THE KEYBOARD INTERUPT EVENT
  50FORT=1TO3 STEP3
  60P%=&70
  61REM PLACES THE MACHINE CODE AT 70 HEX
  70[OPT T
  80SEI:PHA:PHP:TXA:PHA:TYA:PHA
  90LDA£7:LDY£0:LDX£&BB
 100JSR OSWORD
 110PLA:TAY:PLA:TAX:PLP:PLA:CLI
 120RTS
 130]
 140NEXT
```

Making a noise — see *Program pips the BBC*

Do, re, mi, fah, so, la, ti, — BEEP

The Lynx manual isn't very helpful with the BEEP command. This has the format BEEP wavelength, numberof cycles and volumes, but doesn't give you numbers for a musical scale. Here's a table that covers five octaves.

NOTE	FREQ	W/LEN
A	110	909
A#	116.6	857.3
B	123.5	809.7
C	130.8	764.5
C#	138.6	721.5
D	146.8	681.2
D#	155.6	642.7
E	164.8	606.8
F	174.6	572.7
F#	185	540.5
G	196	510.2
G#	207.7	481.5
A	220	454.5
A#	233.3	428.6
B	246.9	405
MID C	261.1	383
C#	277.2	360.7
D	293.7	340.5
D#	311.1	321.5
E	329.6	303.4
F	349.2	286.4
F#	370	270.3
G	392	255
G#	415.3	240.8
A	440	227.3
A#	466.2	214.5
B	493.9	202.5
C	523.2	191
C#	554.4	180.3
D	587.3	170.3
D#	622.3	160.7
E	659.3	151.7
F	698.5	143.2
F#	740	135
G	784	127.5
G#	830.6	120.4
A	880	113.6
A#	932.3	107.3
B	987.8	101.3
C	1046.5	95.5
C#	1108.7	90.2
D	1174.7	85.3
D#	1244.5	80.3
E	1318.5	75.8
F	1396.9	71.6
F#	1480	67.5
G	1568	63.8
G#	1661.2	60.2
A	1760	56.8
A#	1864.6	53.6
B	1975.5	50.6
C	2093	47.8
C#	2217.5	45
D	2349.3	42.6
D#	2489	40.2
E	2637	37.9
F	2793.9	35.8
F#	2959.6	33.8
G	3135.9	31.9
G#	3322.4	30

Dr C D Saffin,
Eltham, London SE9.

A stairway to the stairs, outlined in graphic detail by Adrian Boot. This week: the build-up.

ZX81 calling ET: help is at hand!

A certain extra-terrestrial has been trying to phone home for some time now, but all British Telecom's intergalactic lines are busy. So you and your Z81 will have to help the lonely chap make his way round.

To do this you'll have to write a graphics program on your ZX81. This week we give you a number of graphics routines and examples which you can use next week to build into a game that guides our alien friend around.

We start with PLOT AND UNPLOT, which respectively fill and unfill pixels. The example:

```
10 PLOT 30,20
```

produces a small rectangular block at about the middle of the screen, using PLOT to specify the *x* and *y* co-ordinates of the pixel to be plotted. In order to get the 2709 pixels on-screen, the ZX81 must have 63 *x* co-ordinates (pixel columns) and 43 *y* co-ordinates (pixel lines).

When the ZX81 is using character positions, it can display only 704. The character positions are calculated by multiplying the 22 lines and 32 columns (22 × 32 = 704).

The demonstration program below uses INPUT statements to plot pixels with the *x* and *y* co-ordinates;

```
10 INPUT X
20 INPUT Y
30 PLOT X,Y
40 IF X= OR Y=0 THEN GOTO 60
50 GOTO 10
60 STOP
```

The INPUT statements in Lines 10 and 20 ask for the co-ordinates — they could easily be combined in a single statement. Line 30 is self-explanatory, Line 40 stops the program if it finds any zeroes, and Line 50 cycles the program back to line 10.

Computer art

A better way to use the computer as a machine aid to art is demonstrated with the following program.

```
 5LET X = 20
 7LET Y = 25
10  IF INKEY$="5" THEN LET X=X-1
20  IF INKEY$="8" THEN LET X=X+1
30  IF INKEY$="6" THEN LET Y=Y-1
40  IF INKEY$="7" THEN LET Y=Y+1
50  IF INKEY$="0' THEN GOTO 200
70  IF Y> 40 THEN LET Y=1
80  IF Y< 1 THEN LET Y=40
90  IF X> 60 THEN LET X=1
100 IF INKEY$<>"" THEN PLOT X, Y
120 GOTO 10
200 STOP
```

Lines 10 to 20 all use the INKEY$ function. INKEY$ reads the keyboard and identifies the being pressed.

Line 10 uses the "5" key to decrease the variable X by 1. The "5" key also doubles as the LEFT arrow. This key is used by the program to direct the graphic to the left.

Lines 20, 30 and 40 are similar. They use the RIGHT, UP and DOWN arrows.

Line 50 causes the program to GOTO line 200 and STOP, IF the "0" is pressed.

Lines 70 to 100 make the graphic continue from the opposite side of the screen if the *x* or *y* values get too large.

Line 110 PLOTS only if a key is being pressed.

Line 120 makes the computer GOTO line 10, ready to read the keyboard again and PLOT the next pixel.

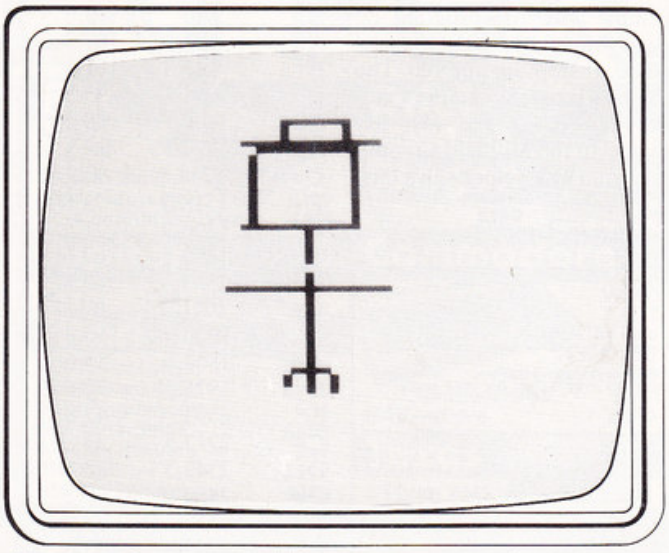
RUN the program. When one of the red arrow keys 5 to 8 is pressed a line is drawn in the direction of the arrow.

Stars

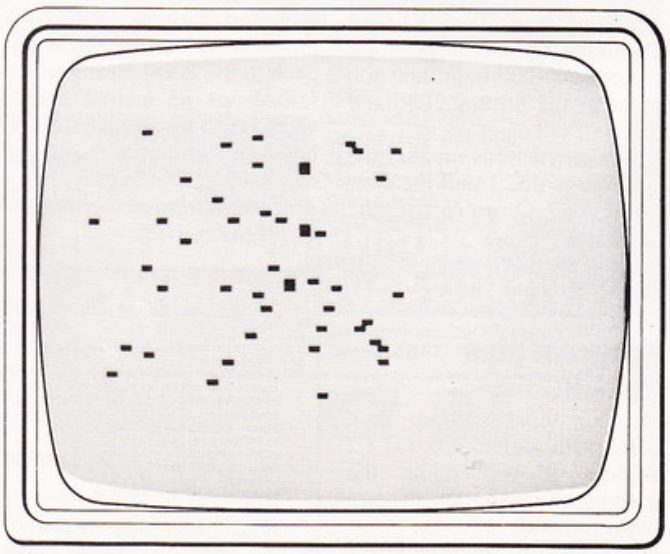
This routine generates an animated graphic of stars twinkling in an alien sky. Leave it running for a few minutes to observe the full twinkling effect.

```
10 LET X=INT (RND*40)
20 LET Y=INT (RND*40)
50 PLOT X, Y
60 UNPLOT Y, X
80 GOTO 10
```

Lines 10 and 20 generate random whole numbers between 1 and 40. The INT



This picture shows the product of the 'Computer art' program, which lets you draw graphics using the ZX81 arrow keys. Here we have drawn a little ET-type figure to get you in the mood for next week's grand finale. Note that you can change the start position of the cursor by modifying the value of X and Y in statements 5 and 7.



You'll get all starry-eyed over the product of the Stars program, pictured here. It takes only five lines to produce and begins your journey to the heavens in black and white. The RND function makes the placement of the stars a random affair, while INT insures that all random numbers generated will be integers.

function gives you a whole number while the RND function generates a random number.

Note line 60. This uses UNPLOT to un-fill the pixel described by the co-ordinates *x* and *y*.

Skyline

The routine below draws a New York-type skyline — with a different vista every time you run it.

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

The outer loop in the program (the I loop) is described by lines in the program (the I loop) is described by lines 10 and 60. The program gives the variable I a value of 1 through 40 as it loops. It loops 40 times, increasing the value of I by 1 on each cycle until a value of 40 is reached.

The inner loop (the J loop) is described by lines 30 and 50. This inner loop gives the variable J values of 0 through R for each cycle of the outer loop.

Line 20 gives the variable R a random whole number value between 0 and 8.

The effect is to produce a skyline of skyscrapers, each a maximum of eight pixels high.

You can change the skyline programme to display taller skyscrapers. Change the number 8 in line 20 for higher values.

The Stars and Skyline programs can be combined to display a rather odd Manhattan-at-night cityscape. Enter the Skyline program first, followed by Stars. You will have to change the line numbers in Stars so that they follow on to give a larger, new program.

```
10 FOR I = 0 TO 40
20 LET R = INT (RND*8)
30 FOR J = 0 TO R
40 PLOT I, J
50 NEXT J
60 NEXT I
70 LET X = INT (RND*40)
80 LET Y = INT (RND*40)
90 PLOT X, Y
100 UNPLOT Y, X
110 GOTO 70
```

It would be nice if you could just stick two smaller programs together and make one larger, more powerful one. Unfortunately, things aren't so simple. If you run this program (it just fits into an unexpanded ZX81 — 1K of memory) you will notice that the stars twinkle below the skyline. Add a couple of lines to confine the stars effect to the sky *above* the skyline.

Here is the corrected *Manhattan at Night* program:

```
10  FOR I=0 TO 40
20  LET R=INT (RND*8)
30  FOR J=0 TO R
40  PLOT I, J
50  NEXT J
60  NEXT I
70  LET X=INT (RND*40)
80  LET Y=INT (RND*40)
85  IF Y< 10 THEN GOTO 95
90  PLOT X, Y
95  IF X< 10 THEN GOTO 110
100 UNPLOT Y, X
110 GOTO 70
```

Lines 85 and 95 confine the stars effect to above the skyline.

Combining small routines to make larger programs is common. Smaller programmes are easier to test but be careful — your combined programs could be larger than your ZX81's memory. If this is the case, you will have to modify the program in some way to get it all in.

But be very careful to change your GOTO statements if you have to change the line number.

Realism

Below is a more convincing way of producing a stars effect on the ZX81, let's call it the Realistic Manhattan at Night programme:

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

70  FOR I=1 TO 15
80  FOR J=1 TO 20
90  LET R=INT (RND*4)
100 IF R< 1 THEN PRINT AT I,J;"."
110 IF R> 1 THEN PRINT AT I,J;""
120 NEXT J
130 NEXT I
140 GOTO 70
```

The program is split into two modules in the above listing for the purpose of clarity. The first module is the Skyline program. The second is a new Stars program that doesn't use the PLOT keyword.

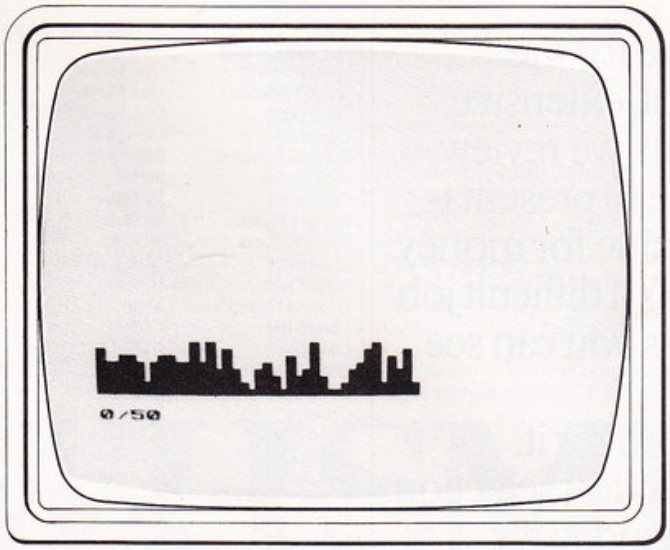
Instead it uses the PRINT AT pair of keywords to print full stops and blank spaces over the screen at random.

The outer FOR NEXT loop (lines 80 and 130) sets the value (I) for the line at which the PRINT AT statements are executed. The inner FOR NEXT loop sets the value (J) for the column.

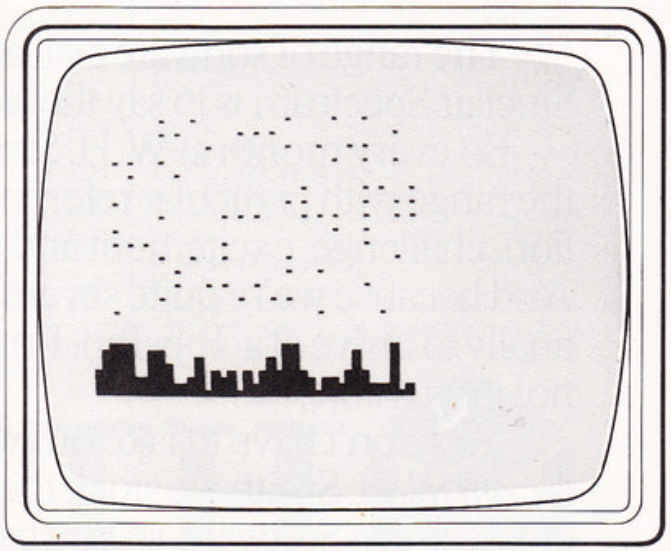
From what you've produced already, you should be able to see some resemblance between your own display and some arcade games. But you should also be able to see the connection between the display and what you key-in.

What your display needs now to turn it into a fully-fledged game, of course, is movement.

Next week: Combine these routines and others to build the ET-type game.



New York, New York . . . all in less than 1K of memory on your ZX81. This picture illustrates the results of the Skyline routine. Again the RND function makes the skyline random so that you could be in New York, Paris, Cambridge or even London, depending on which random numbers are generated by the program.



Here it all comes together — using the routines to draw both Stars and Skyline, we get Manhattan at Night. The programs will still run separately, even after they're combined with lines 10 to 60 generating the skyline and lines 70-140 generating the stars.

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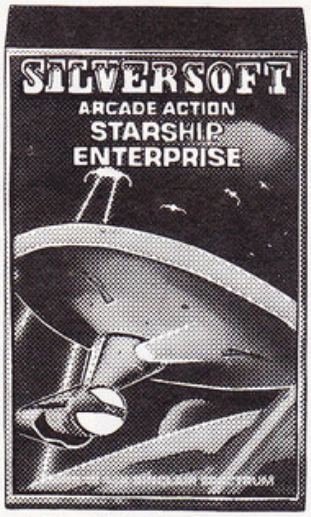

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Having stopped Atari owners in mid-zap last week, Geof Wheelwright spells out the WP choices.

Atari A, B or C?

The Atari 400 and 800 computers can be used for word processing — that much we established last week.

This week we look at three word-processing packages for the Atari: Datasoft's Text Wizard, LJK's Letter Perfect and Atari's Word Processor. They vary in price from £68.95 for Text Wizard up to £109.95 for Letter Perfect — with Word Processor also hovering near the top at £99.95.

A Text Wizard is the cheapest of the three programs in our comparison, and it is therefore no surprise that it also comes in the smallest package and has the slimmest documentation.

But this economy of size is not necessarily a bad thing. The documentation may be slim, but it's also well written and easy to follow. The instruction guide starts by acquainting you with the Atari keyboard as it is used by Text Wizard. The first thing you'll notice is that the System Reset key is disabled by the program, making it more difficult to lose your precious words of wisdom. This feature is also common to Letter Perfect, but noticeably absent from Atari's own Word Processor.

The Ataris have a deservedly high reputation as games machines, but reasonably-priced world-processing is another of their talents.

Text Wizard outlines its needs clearly and understandably — although it perhaps overstates its own case by suggesting that you *must* buy a box of blank diskettes when in fact a few would do to start with. But you can't really fault Datasoft for erring on the side of caution.

You soon arrive at the section on backing up diskettes, and Text Wizard gives some good advice on making back-up copies of disks. It is made all the easier by Text Wizard's use of standard Atari DOS, so you don't have to format disks exclusively for your word processor.

Once you enter Text Wizard, you'll notice it's command-driven rather than menu-driven. You get one menu at the beginning, which instructs you to 'Press Start' — you don't really get much of an on-screen choice after that because all further activities are controlled by your intimate knowledge of the program's commands rather than on-screen instruction.

God help you if you misplace your manual — the commands for using this program won't be spoon-fed to you on-screen. You can take minor solace from the knowledge that major commands such as LOAD, SAVE, PRINT, DELETE and DIRECTORY are all controlled by pressing the Option key and one other.

Once you've pressed the appropriate Option key/single key combination, you begin typing, and soon discover that Text Wizard doesn't turn off the Atari's annoying 'click-click' keypress sound when you hit the keys. This is probably a matter of taste, however, as it can be a help if you're a touch typist who is not used to the Atari keyboard.

Another thing you'll have to get used to is its rather terse deletion commands. Most word processors now have some sort of safety delay that usually takes the form 'are you sure you want to delete x?' before you delete a phrase or file. Not Text Wizard — this little sucker moves right in on your file and wipes it out the moment you give a delete command. There are no second chances either, as the deleted text doesn't get saved to a buffer.

There aren't too many other ways to crash the program — even when you ask it to use a printer and one isn't hooked up, or you hit reset. In the first case, you are just returned to your text, and in the second you are returned to the main menu — but your on-screen file is not deleted.

Text Wizard has all the other word-processing functions you might expect from a package in its price range — Insert, Block moves, Block duplications, Search and Replace — as well as a number of printing commands.

The print commands are actually quite ambitious, including headers, footers, sub- and super-scripted text, underlining, page numbering and CHAINing of files during printing.

All in all, this isn't a bad package for the price — as long as you don't mind learning the commands necessary to run it and make sure you know what you want when you're deleting text.

Although not the most expensive of the three packages, Atari's Word Processor is the most comprehensive. It is the best documented of the three and includes an instructional audio tape, two copies of the master diskette, a training data diskette and two large manuals.

The whole package is bound in a three-ring easel-back notebook that can be stood up to flip through as you go through the training sessions. The training package includes the two audio tapes and a 128-page training manual.

This manual assumes you've never used a word processor before and slowly steps you through disk formatting, text creation, SAVEing, printing, LOADing, editing and screen formatting. The program is entirely menu-driven, so you know exactly what your options are at any time without even laying an eye on the manual. The other useful thing about this menu-driven construction is the ability to move back through different menus just by pressing Escape.

Atari has attempted to overcome the 40-column limitation on its display with the now-traditional 'window' approach. You are shown a 40-character window of an 80-column screen which scrolls across as you type — just like Wordstar on the Osborne I or Magic Window on the Apple II. This is very useful, as it allows you to see exactly how your text will be printed out before it goes to the printer.

In addition to the window, there is a page layout control display that shows you exactly where your text will be printed on

the page and allows you to adjust the position, line spacing, indentations, tabs and page size.

And if you find the scroll-across window annoying, you can always define your page as 40 columns across, and then define the page for 80 columns when you print it out.

After learning how to use the basics of the word processor, you move onto Atari's reference manual, which starts with a chapter on connecting the word-processing system. This is perhaps a little misplaced, since you have to get the system set up in order to run through the training sessions.

The second reference chapter is an alphabetical glossary of all the Word Processor's functions, starting with Alignment and ending with Write-Protect.

You then get a brief chapter on error messages — one page to be exact.

The final chapter discusses system components, including the disk drive, the computer, Atari's printer and interface module.

Although the training manual and glossary of functions are excellent, the idea that there is both a reference manual and a training manual is a bit misleading. The training manual and reference manual would be better integrated into a single volume, although separating them as Atari has is no doubt a good marketing gimmick.

Atari's package also maintains the annoying click-click of keys, but apart from that and the other minor foibles noted earlier, this is one of the best packages you can buy for word-processing on the Atari. Perhaps its only real drawback is that it's so comprehensive you could easily feel intimidated.

Letter Perfect, the most expensive of the three packages on test, is the only one to offer word processing in cartridge form and combine the best features of the other two packages.

Just as Word Processor is completely menu-driven and Text Wizard command driven, Letter Perfect alternates between the two. It begins with an all-too-terse menu asking which printer you want to use — Epson, Atari 825 (or Centronics-type printers), Qume (or Diablo) or a specialised printer requiring the running of Letter Perfect's printer-driver program on diskette.

Unless you have the manual in front of you, the instruction which opens the first menu, 'Select (EADQ):', would be quite incomprehensible. But things soon get better. After asking you which file and database unit you want for primary storage and retrieval (which doesn't matter if you have only one drive), the more meaty menu-driven aspect comes into force.

The main menu has 13 options: Editor; Change Parameters; Load; Save; Merge; Screen Format; Printer; Data Base Merge; Lock; Unlock; Delete; Format Disk, and Quit.

The Editor is obviously where most of the work is done, and offers the usual wrap-around, insert modes, cursor movement and block deletes. It does not offer the scroll-across available on Atari's Word Processor, nor the same kind of preview screen to position text.

There are two nice features to this mode: first it eliminates the ticking on keystrokes that both the other packages retain, and secondly it offers a safety check on block deletes by making you press the hash key whenever you need to effect the delete.

There is also a buffer to which you can SAVE information that you may want to retrieve later. Headers, footers and various formats are supported. And like Atari's package, Letter Perfect allows you to go back to the main menu any time merely by hitting 'Esc'.

The other functions listed in the main menu are quite self-explanatory, and differ little from those on other packages — although it's worth noting the Screen Format selection which shows you on-screen what your document will look like on the printer.

Documentation is good, but not as good as Atari's. The 100 page A4-size manual comes in a three-ring binder and divides up into four sections (not including the introduction and appendix), one each on the editor, disk operation, use of printers and a tutorial.

In summary, Letter Perfect is certainly a good package, although perhaps its name and price may be a little overblown. After all, the reference card that comes with this package is headed 'Letter Pefect' — an intentional error, we hope.

The ratings on this table are awarded out of five. So when Atari's word-processor scores five out of five for documentation, you know you're not likely to find better documentation for an Atari 800 wordpro package from anyone else. Three criteria — unique features, interface with DOS, and price — can't be measured the same way as the rest, so only text or numbers have been included.

Price versus performance is measured by the features included in the packaged, stacked against its price.

	A Text Wizard	B Word Processor	C Letter Perfect
Screen presentation	人人人	人人人人	人人人
Documentation	人人人	人人人人人	人人人
Unique features	can edit Basic	80 col scroll across	cartridge version available
Ease of use	人人人	人人人人	人人人人
Document formatting	人人人	人人人	人人人人
Safety checks	人人	人人人	人人人人
Interface with Dos	Atari	Atari	Non-standard
Price	£68.95	£99.95	£109.95
Performance versus price	人人人人	人人人人	人人人

The Silicon Office scaled down for the Commodore 64? Barry Miles scans Infomast.

Enticing Infomast

Infomast is one of the first of the new breed of programs for the Commodore 64. It has the type of facilities Silicon Office has, but scaled down for the smaller machine. The package consists of a random access filing system, a word processor and a programmable calculator all working together.

Attempting to set up such an ambitious undertaking on a slow disk drive and a slow and noisy printer is a considerable task, and it isn't surprising that perfection has not been achieved.

Features

The filing system has a maximum record length of 255 characters, and a maximum of 30 fields. Access is by full or partial string, multiple fields, or by record number. The calculator allows the use of up to 26 variables, and works to nine significant figures of accuracy.

The word processor has a maximum page width of 80 characters, and a page length of 70 lines. You can have up to 10 tabs, and right justification is available too. The text is formatted as you go.

It's strange to see the text moving about a fixed cursor, and I didn't like this feature, since it led to text scrolling sideways off the screen, even when you restricted the document width to the width of your screen. It's a common approach, however. The similarity to the view you get when using a typewriter is no doubt the reason for this.

Robin Harris

The package reminds me of what Dr Johnson said about a dog standing on its hind legs. 'It is not done well, but you are surprised that it is done at all.' There's little chance of using the Vic 1515 printer for serious business word processing, simply because the font is so primitive that no business person with any sense would dream of sending out the letters it would produce. Similarly the Serial 1541 disk unit is slow, and its capacity is so small that I would hesitate to use it for 'real' applications.

The filing system is also limited: there is no way of deleting a record, and no way of splitting a file when its capacity — 669 records — is approached.

Anyone planning to use the system must seriously consider using a better quality printer, and one of the more advanced faster Commodore disk drives. Versions of these are in the pipeline.

Presentation

The manual starts by dealing with date insertion — you can then use the date automatically. It is a pity, however, that no steps are taken to validate the date of entry time.

The manual is clearly written in a friendly style, with suitable warnings where necessary. It comes in a strong, two-ring A5 size binder. Help screens are always available, however, and this means you won't need the manual much once you are familiar with the program.

The contents are easy to understand, and at the right level of difficulty for the potential users of the package. There is no quick reference index, which is a surprise because the single sheet flier produced for promotional purposes contains the help you need.

The disks are clearly labelled, and the LOADing instructions, important because you have to add an extra parameter to ensure that the program LOADs in the correct area of memory, are printed on the disk itself.

Getting started

The manual takes you through the setting up procedure gently, so the rawest beginner will find this easy. You are taken by the hand and led through the process of setting up a file, stage by stage.

Early on, the manual gives you a heavy warning that the machine may 'hang' and that you'll lose all your work if you don't make sure tha printer and disk drive are switched on and ready to go.

In use

The screen layouts and commands are consistent throughout the package, so you always know that the prompt will appear on the bottom line, and that that is where warnings will flash.

I would have welcomed warning sounds too. When putting data into fields, you are shown, by judicious use of the underline and brackets, how much space you have available for your data.

The commands are consistently two characters, and the help screens are available by 'h1' and 'h2'. These soon become unnecessary, because the mnemonic design of the prompts means you memorise the commands by use. For example 'cs' copies the screen to the printer, partly or completely, and 'ch' changes a record.

It's easy to change your entries on a file, but there is no way to change your mind about using a command when you have hit the first character.

The filing system: Setting up a new file is a long drawn out process, so it's best to plan your layout on squared paper before you produce the mask into which your files will be put.

The reason for this is that you indicate on the screen where you want the prompt for a field to start, and the data will wrap around onto another line if you are starting too far to the right. You cannot change your mind other than by completely repeating the process.

But on the other hand, the user is aided in the definition of fields by good prompts. You are restricted to a maximum of 31 fields, and a maximum field length of 38 characters. As you define your fields, you are told how many characters you have left to play with.

Default values can be defined, and one of these is 'today'. This ensures that whenever you make an entry in a date field, the machine will supply the date you set at the beginning of the day's operations.

You may have password protection, and this is an unusual feature on an inexpensive program.

Once you've set up the mask so that you have defined where all the fields

are to be displayed, the work disk is prepared.

Each file requires two disks, one called 'Work', and one called 'Data'. This is quite expensive, and you will end up with a lot of cash tied-up in disks if you use the program for many applications. A very serious limitation of the software is that no provision is made for backing up the disks, indeed no emphasis is placed upon this. The single drive is a major problem for backing up. The best program so far designed for it requires the disks to be inserted three times each.

There's also no facility for showing you the directory of any disk, and this seems an amazing oversight.

Adding data is simple, and the details from the previous record accessed are available to you if you move from field to field by means of the cursor controls rather than the Return key.

This facility is also available within the change data option.

The most powerful function is the Sort, which sorts the file on the key field. This is quick because the keys are maintained in RAM. In addition, you may change the key field, which enables you to sort consecutively in different ways for different purposes. You can only sort on one field, and partial field sorts are not possible.

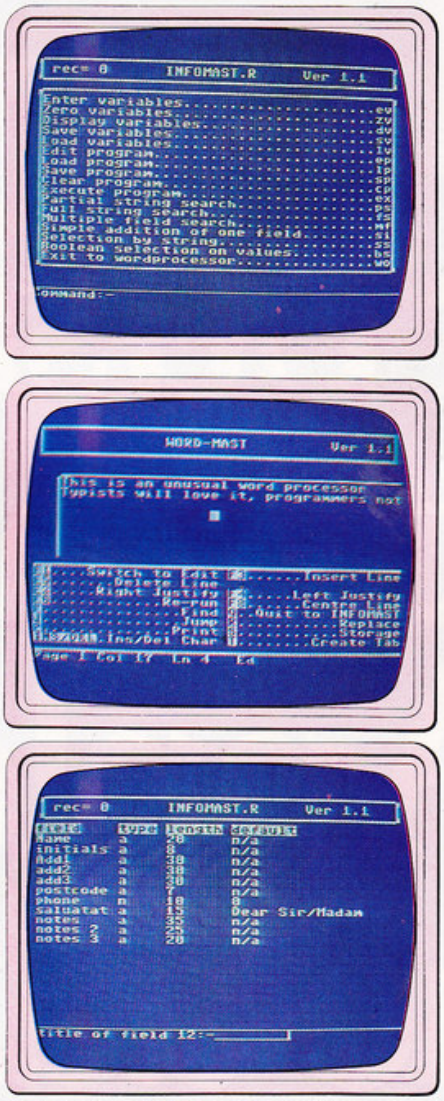
Any command can be used repeatedly by pressing the F1 function key. This aids browsing through a file, backwards and forwards by use of the 'Next Record' and 'Previous Record' commands.

Using the calculator: The calculator is quite powerful, using 26 variables, termed 'Memories', for calculations, which can be displayed at one time. These variables can be SAVEd on you work disk, so they can be modified at a later date.

The calculator works in conjunction with the database, so you can transfer data from fields into variables, perform calculations on them, and store them in a field of the relevant record. Programs can be recorded on disk for repetitive use. They cannot be listed on the printer, but this will change on later versions. The language is like a primitive subset of Basic, and has Goto but no Gosub, so believers in structured programming are in for a hard time.

You can total the contents of a field, with a 'Simple Addition' (SI) command. The computer can search for a record, on a partial string or on a full string. It can also search on multiple fields, with the added opportunity of searching with Boolean comparisons, which aids totalling of a field of records selected by criteria.

Using the word processor: LOADing the word processor is described in considerable detail in the manual because you will need to select the appropriate work disk. This is doubly important, because you have no access to a Directory. Entering the word processor gives you the chance to select page width and length, and you will then be ready to type the document. Information about which column and page you are on is given all the time.



Top to bottom: the help screen, word processor and filing system of Infomast.

The 'Scroll' mode is used to describe the situation in which you are merely typing in the text. The text is formatted slowly, and it is possible that fast typists will lost text by outpacing it. The maximum number of characters available in a document is only one page.

You use the F1 key to switch to 'edit' mode, which is what most word processors call Control mode. You can then create tabs, insert a line, or delete a line. No screen warning is given that the last line will be deleted if you insert one when the text area is full. The right justification allows you to move text to the right hand margin which is convenient for addressing, for instance.

Left justification is also available, as is centring. All these commands are performed by use of the Function keys. Users who make prolific use of the word processor will find it worth using adhesive labels to mark these keys.

'F' will find any string, and 'R' will find and replace, but this is very restricted, as the new string must be the same length as the one it replaces. 'INS/DEL' inserts characters at the cursor, and deletes the character under the cursor. A major disadvantage is that if you insert after the last character on that line reaches the end of the line, it will fall off.

The 'Storage' command SAVES the document to disk. The manual gives a very heavy warning that you must not SAVE the document onto the data disk. That is reserved exclusively for random access files used by the random access filing system.

The Print option is geared to the Vic 1515 printer at present, and includes a limited merge facility for direct access into the random access filing system. You put a '↑' at the point where merging is required, followed by the field number. The merging is manual, so you specify the file, and the record number.

Reliability

The program is reliable enough, although there is the ever-present problem of failing to heed the various warnings about using the right disks and making sure the printer is connected correctly. The major defect is that if you try to call up a non-existent file — easy to do with no directory at your disposal — the machine will hang, permanently!

Verdict

Infomast is difficult to sum up. It is frustrating to use after you've used more expensive, more sophisticated packages which run on more advanced equipment. But bearing in mind that the cost of the hardware for this is below £800 and the software costs £79, it represents very good value for money.

Some of the claims about what it will do are a little fanciful; for instance patient records, client records and the like. But it is the only package of its kind currently available for this machinery, and the price is very low.

RATING

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

Name Infomast. **Application** Integrated filing, word-processing, programmable calculation System Commodore 64, Vic 1515 printer, Vic 1541 disk drive. **Price** £79. **Publisher** Rabbit Software, 01-863 0833. **Format** Disk. **Language** Compiled Basic. **Outlets** Mail order.

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Can Mace make it among the high Motorolas? Ted Ball tests a Dragon machine code monitor.

Monitoring with Mace

The Dragon 32 is built around the Motorola 6809E, the most advanced 8-bit microprocessor so far. Mace is a ROM cartridge containing a machine code monitor, editor and assembler that allow you to produce machine code programs and make full use of the powerful features of the 6809.

Features

The monitor provides only a limited number of commands, and some of them could have been better implemented, but it does have the minimum you need for debugging.

Two of the monitor commands could have been greatly improved without a lot of extra programming. The Shift command moves a block of memory but it always works from low to high memory and cannot be used to move data up in memory if the source and destination blocks overlap.

This is a common fault in machine code monitors, but it is not difficult to write a move routine that always works correctly.

The second command that could have been improved is Calculate. This does addition and subtraction, allowing you to mix hex and decimal numbers in the same expression, and gives the answer in hex.

However, the assembler allows expressions in operands with addition, subtraction, multiplication and division, on a mixture of hex, decimal, binary, octal and ASCII. With a little foresight all this could have been included in the monitor's Calculate command.

The most obvious missing feature is a disassembler. With the assembler in the same package you can manage without a disassembler when working on your own programs, but a disassembler is still useful.

The editor allows you to create, edit and assemble an assembly language source file. It gives a comprehensive set of commands, but you have to remember that it is line oriented, not character oriented like the Dragon's Basic editor.

For example, the *I* command in the Mace editor allows you to insert lines, while in Basic *I* allows you to insert characters.

Mace's *E* command is like the *X* command in Basic, displaying the line with the cursor at the end so you can extend the line or delete and retype part of it.

The *A* command has a number of forms which include allowing you to assemble with or without a listing on the screen, and with a listing to a printer.

The assembler allows all standard Motorola 6809 opcode mnemonics and standard syntax for all the addressing modes.

Mace does not accept the 6800 instructions that are not included in the 6809 instruction set, but the manual gives a list of these, together with equivalent 6809 instructions and some notes on other alterations required when entering 6800 source code.

The assembler directives are not completely standard, but there are no serious differences and you should have no difficulty adapting source code that uses fully standard directives.

Mace's main departure from the Motorola standard is in labels.

Mace allows two types of label, global and local. Global labels are like standard labels but may include a full stop as well as the standard capital letters and digits.

Local labels consist of a colon followed by a decimal number, and are valid only between one global label and the next, allowing the local labels to be reused in other parts of the program. This is not standard, and you would be wise to avoid local labels.

Mace also allows the use of opcode and directive mnemonics, and register names as labels. The source code must be in a fixed format, with a label having to start in column 1 and lines not prefixed by a label having a space in column 1.

Because Mace requires this fixed format the assembler does not get confused by the use of reserved words as labels, but it is not good practice, and most assemblers will not allow it.

Macros and conditional assembly are not allowed, but these features are rarely found in assemblers for small computers.

Presentation

The cartridge comes in a black plastic box, with a printed label on top, and is easy to plug in and remove.

The 80-page manual is nicely printed, and as well as giving instructions for using Mace it includes a reference section giving information about some useful ROM routines in the Dragon, and details of 6809 assembly language.

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I noticed one omission in the documentation, where the Motorola standard requires two assembler source forms for the operand in program counter relative addressing (CONSTANT, PC where the actual value of CONSTANT goes into the object code, and LABEL, PCR where the signed offset from current address to LABEL goes into the object code). Mace does accept both forms and handles them correctly, but only the second form is mentioned in the manual.

EDITOR COMMANDS

(Enter)	Display current line
(Number)	Display line (Number)
↑	Move down the file one line
↓	Move up the file one line
P	Print lines on the display
B	Go to the bottom of the file
N	New. (Erase the file)
I	Insert line(s)
D	Delete line(s)
O	Overlay the current line
E	Edit the current line
=	Replace the current line
C	Change a string
S	Save a file on tape
L	Load a file from tape
?	Display the current file name
M	Go to the system monitor
X	Exit to Basic
A	Assemble the file

MONITOR COMMANDS

V	View memory, in hex and ASCII
M	Memory examine and change
I	Insert (fill block)
S	Shift block
F	Find sequence of bytes
C	Calculate
B	Set a breakpoint
R	Display registers saved by breakpoint
J	Jump to machine code program
G	Go (Continue execution following a breakpoint)
(Break)	Exit to editor

Getting started

The instructions are quite clear, and there is an example program included with a full description of how to enter and run it.

The manual does not teach you to program in 6809 assembly language, but it recommends some textbooks, and is sufficiently easy to use that you should have little difficulty using it as you learn.

Reliability

I could not find any serious bugs, but I did find some minor items that could cause trouble:

1) You must use the assembler directive ">" in order to get a 16-bit offset in program counter relative addressing. The assembler gives an error message if you fail to do so.
2) If a number or expression evaluates outside the range ± 65535 or ± 255 (according to the size of operand required by the instruction) the result is reduced mod 65535 or mod 255, but no warning message is given.
3) If you include more than one ASCII character in an operand the assembler accepts it but ignores all but the first character. For example, the source code line LDD#'AB gives object code CC 0041. There should be an error message in this case.

There is a good selection of error messages, and the manual explains them fully, so you can easily find out where you've gone wrong.

Verdict

The machine code monitor is fairly limited but does include some useful debugging aids, and although the assembler is not completely standard it is near enough for you to have little difficulty adapting programs.

I would recommend Mace to anyone who wants to use the Dragon to learn 6809 assembly language or to write serious assembly language programs.

RATING

Features
Documentation
Performance
Useability
Reliability
Overall values

Name Dragon Mace. **Application** Machine code monitor/editor/assembler. **System** Dragon 32. **Publisher** Windrush Micro Systems, Worstead Laboratories, North Walsham, Norfolk NR28 9SA. **Format** ROM cartridge. **Language** Machine code.

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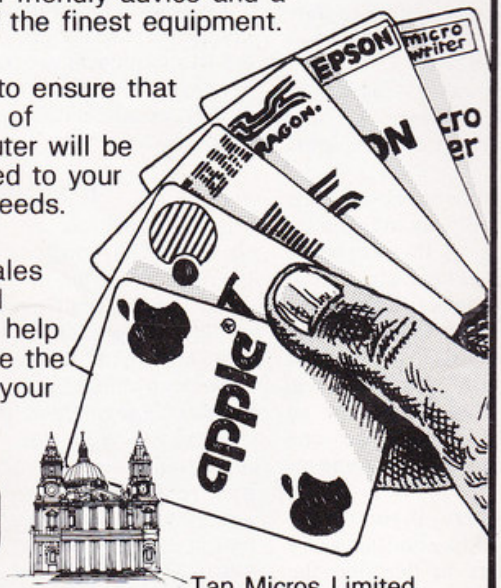

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What happens when cheap micros meet music? Francis Monkman is the man with the notes

Microtechnology going for a song?

Computers aren't the only things that have experienced plummeting prices over the past few years.

The same process is apparent with the digital sythesiser. A synthesiser that used to fill a room in the old analog days can now be condensed to fit a cabinet about the size of a thick bread-board. Little wonder, then, that consumer products sharing such a common background should eventually get together and form an affordable package for the technically-minded musician or the musically-minded microenthusiast.

Francis Monkman is an experienced professional musician — having played in Curved Air and the jazz/rock/classical fusion group Sky. Francis is also a microenthusiast — who better, we thought, to review Roland's latest offerings: the MC202, a digital sythesiser and the CMU-800 driven by an Apple II computer running Roland's Compu-Music software package.

Using the package you can compose 'on-screen' and then run the finished product through the CMU-800.

The software will also be available for the Sharp MZ80 and the NEC 8001 and Roland also has the ZX Spectrum, BBC Micro and Commodore 64 in mind.

Two new products from the Roland stable this week, one from the parent company, the other from one of Roland's subsidiaries, Amdek, with its own brand name, logo, etc.

The Roland machine, the MC202, is primarily conceived as an independent unit, whereas the Amdek CMU-800 is a peripheral device for, in my case, an Apple II.

Roland MC202

Before I looked through the documentation for the MC202 MicroComposer (the MC202 is so new that this was still in the 'upside-down photocopy with blank pages' stage of release) I had fondly assumed that a MicroComposer was a box that not only allowed you to store the tunes you had written, but was also prepared to try a few of its own.

OK, so random melodies are seldom anything other than yawn-provoking, but maybe a company with the resources of Roland might be studying some of the probability-theory algorithms being used with such success by the graphics people. Mightn't it?

Ah well . . . anyway, it turns out that what everybody else calls a sequencer, Roland calls a composer; I wonder what it calls a composer?

In reality the MC202 is a grey plastic box some 13 × 8 × 2 inches in size, with 16 mini-faders, four switches and five knobs to control the synthesizer's functions, 18 buttons to control the sequencer, a calculator-style LCD readout, and a 2½ octave keyboard.

There are sockets at the rear for audio and headphone output, control of/by another synth/drum-box/keyboard, cassette memory storage, and also provisions for synchronising to a tape recorder, so that if you have, for instance, a four-track recorder, you can use one track for the synch pulse, leaving three tracks for recording/bouncing (one track at a time). All in all, this adds up to an impressive spec for such a tiny machine, so what's it like to use?

Keyboard performance

Well, the first thing you will have noticed is that 13 inches is not much room for a 2½ octave keyboard (actually about ten inches wide), so this machine's use as a keyboard performance instrument is effectively precluded, unless you own/buy a suitable add-on.

The keys themselves, outlined in a kind of generalised imitation of the real thing, are small rubber pads identical to those used on the ZX Spectrum — not guaranteed to help evolve a frustration-free keyboard technique.

The keys double as functions, which are printed above and below them, and who knows? a whole new system of tonic sol-fa could spring forth.

The synthesiser is monophonic (one note at a time), mercifully, as any attempt at polyphonic playing on this keyboard could constitute a serious health hazard. It has all the facilities (or lack of them) that seem standard on small synths these days — a waveform oscillator (sawtooth and square/pulse) which can be switched to one of four pitches or 'footages', with an additional 'sub osc' (squarewave one octave down or square/pulse two octaves down).

(A brief digression here; if you understand footage, then skip. Footages are used by organ-builders to describe the pitch of a rank of pipes by their length, *ie* bottom C at piano pitch would be eight feet long, so the pitch became known as 8'. 4' is a octave up, 16' an octave down. Synthesisers with preset footages are easier to tune (and to build) but you can't do things such as sweep the oscillator(s) through their range.)

All three can be mixed together in any proportion, and certainly the 'sub osc' lends a very beefy element to the sound, which would increase its value as a single-line-riff instrument in a band.

Pitch, pulse width and filter contour can be modulated either by the envelope (standard Attack Decay Sustain Release or ADSR) or by the low frequency oscillator (triangle wave at about ·1 Hz to 20 Hz) for swoops, vibrato, etc. In fact, I think the sound quality is the strongest feature of this unit — the oscillators and filter (24db per octave) have a good ring to them (speaking musically rather than electronically), which reminds me of the Arp Odyssey (circa 1972) and would not sound out of place through a 100 watt stack.

The decay was particularly smooth and controlled.

The sequencer, duophonic so you can play one other synth 'voice' from it, is where this machine and I part company. Even when micro-controlled analog synthesisers were quite well established, Roland continued to insist on compatibility with its huge range of analog synthesisers (a philosophy grossly at variance with its motto, 'We design the future') with the usual combersome result.

(We shall see later how, with the computer-based Amdek machine, this has led to a sequencer programming language which is made to look outdated by even the earliest music-making programs for the Apple II).

Readout

On this machine, all readout is via a six-digit LCD, which incidentally displays the name of each note as you play it. Like other analog sequencers, no looping is available, except of the whole piece. Look at it this way: most music, and especially rock/synth music, has lots of repetition, but usually segmented into sections.

So mostly you will want to do some repetitions, do something different, and then repeat the process, perhaps adding new material. If you can't tell the machine to do this kind of thing, it not only means much key-pressing, but also that you risk exceeding your machine's memory capacity surprisingly fast. On which subject, if you are playing direct into memory from the keyboard and the memory gets full, bang! Start again.

37 ▶

Ian McKinnell

Do Roland's new micro-based products fulfill the dreams of musical computer users?

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The MC202 is definitely a toy, but a good one. If it costs around what the ZX Spectrum costs by then, it's good value; I'd rather save up my pocket money for something better.

Amdek CMU-800

The blurb says inscrutably: 'Compu-music is revolutionary. Compu-music consists of 2 parts.'

It is more sturdily constructed than the other and looks like it could handle the occasional knock. Basically, the hardware consists of an interface board (the simplest I've ever seen), the wherewithal to control up to eight external synthsiser voices, plus some internal sound generators (melody, bass, four-part chords and a drum-box — with a very good hi-hat), faders to mix them with, and individual and mixed audio outputs.

The internal oscillators are pretty much pre-programmed, although you can set sustain and decay on Melody and decay on Bass and Chord, the last being a sort of all-purpose rhythm 'jab', not unlike a paper/comb combination.

All very well, but CMU-800's manual's claim for a 'six-voice synthesiser' must be examined in the light of the designer's taste in musical arrangement. Certainly the examples on disk were mainly the kind of thing you find in hotel lifts, although *Good Vibration* was programmed with singular accuracy and faithfulness to the original, similarly the delightful *Maple Leaf Lag*.

Nowhere to be found was Bach, promised in the manual, but then his biographer said he had 'rhythm in every member', so I expect he found a way off the disk.

So, if you don't have those external synths knocking around, don't put too much hope in this as a synthesiser.

Still, as the makers rightly point out, the hardware is only as good as the software that drives it (where have I heard that before?). This, for the Apple II, is CMU106, meaning Compu-Music version 1.06, described by Roland as a 'personality package'.

Evidently, computers acquire personality more easily than they acquire feelings. In fact, Roland means that the Amdek is currently available for, in addition to the Apple, the Sharp MZ-80 and the NEC 8001. Other plans include as possibles the BBC micro, ZX Spectrum and Commodore 64. All this information comes from Roland DG, short for Digital Group, which is spearheading Roland's digital breakthrough.

Well, I must say that their X-Y plotter looks like what I'm looking for, but I feel their music software has come up against a bit of a brick wall. Because Roland, at the risk of repeating myself, has carried analog techniques into its music programming language in order to maintain compatibility with its existing range.

For instance, it is most unhelpful to be forced to define pitches by their absolute number on the keyboard, and the situations where it might be useful, *eg* note pattern creation using maths formulae, are definitely not supported by this language

Rolands' hardware: Compu-Music (top) gets its musical instructions from Apple software; the Micro-Composer stand-alone musical computer (bottom).

You enter note number, step time, and gate time: these represent pitch, note length, and articulation, and could easily be machine-translated into a more easily understood representation.

Pitch numbers start at zero (*ie* middle C = 24), a condition which could usefully have been reserved for a musical rest, here defined as the note of your choice with a gate time of zero. Tempo is not under software control. To speed up you turn the knob.

I can't help feeling that Apple II users have come to expect something better than this. Even the early programs that beeped the speaker did pulse width modulation, and could work out notenames (one line of Basic code), while later, still relatively cheap and unsophisticated products like the Alf (what happened to the Alf?) had a hi-resolution graphics music notation.

Mountain Hardware even gives you a light-pen, and you get 16 fully digital voices (although like many digital synth makers it is a little heavy-handed on the output filters, which can be removed/modified).

Including software the CMU costs £450. For that sort of sum, Apple II users have come to expect a fair deal.

That said, the software seems reliable and easy to use, with commands for copying blocks (much typing saved, much memory used) and inserting loops (not nested, which are useful and easily done in software).

Unless you're already a Jupiter-8 owner (Roland's £4,000 flagship), in which case this is probably just the thing to control it, I would arrange to try it out before you buy it.

My conclusion about both machines is that Roland has built a toy sequencer and put a real synthesiser inside it, while Amdek has built a real sequencer, and put a toy synthesiser inside it.

Product MC202 synthesiser **Price** £365 inc VAT. **Distributor** Roland Tel: 01-568 4578.

Product CMU 800 plus composing software package **Interface** —Apple card included. **Price** £450 inc VAT.

Ralph Bancroft feels the pulse of a hard-wired modem which permits micro-to-micro communication.

Prestel bypassed

Twelve months ago the cheapest way to hook your micro up to the telephone was to buy an acoustic modem costing £300.

Then there came Micronet — as part of its package it offered an acoustic modem at a discounted price of £57, which included software so that micro users could talk to Prestel.

Unfortunately, acoustic modems have their faults. Having the right-sized telephone handset helps (there are five different kinds), but even then you can never be too sure that you will get a perfect acoustic seal.

Background noise can make funny characters appear on the screen, and worse still, data can become corrupted — making your downloaded software unusable.

But from June these problems could become a thing of the past. Prism Microproducts, one of the joint partners in Micronet, is launching a hard-wired modem for £89.95, which includes the cost of the terminal software. Instead of using an acoustic coupler, which acts like a reverse telephone handset with a speaker opposing the microphone in the handset and a mike opposing the speaker, a hard-wired modem sends pulses directly down the telephone line.

PCN was provided with a prototype version to Pro-Test. We think it will open a new era in personal computing.

Prism's is no ordinary Prestel modem. In addition to the usual 1200 receive/75 transmit baud rates it also has settings for 1200 baud rates in a half duplex mode. This opens up the realms of micro-to-micro communication over the telephone network, bypassing Prestel. My only complaint with this option is that since it is half-duplex you will have to switch repeatedly between transmit and receive modes in order to have a conversation with another micro.

In its Prestel mode the modem could not be faulted. Using the standard Micronet terminal software on a BBC micro all you have to do is follow the on-screen instructions, leaving out the one that tells you to put the receiver into acoustic coupler.

The difference compared to using the acoustic coupler was startling. No longer did background noise in the office turn the characters on screen into a load of gibberish. Trial runs of downloading software were all successful.

The first of these chip modems will go to Micronet users, but when volume supplies become available (most probably in September) they will be available from retail outlets such as W H Smiths.

Two versions

Two versions will be on offer. One will be a simple plastic box. The other will be tailor-made to sit under the telephone.

The reason for this second option is to do with the way the device connects up. Connection with the micro will be by way of an RS232 port. Connection with the telephone network will be via a new-style telephone connector (a small rectangular plug compared to the old style round and chunky one). The telephone itself plugs into the back of the modem, again by way of a new-style connector.

The disadvantage of this arrangement is that if you don't have a new-style telephone connection in your house (and very few do) you will have to get one installed.

How much Buzby will charge for this service remains to be seen. But the impression I get is that British Telecom is keen to see all telephones connected this way. Perhaps it would be worth suggesting that you are doing them a great favour by having a modem installed!

The advantages of wiring up this way are, first, you will have full use of the telephone when the modem is not in use. Secondly, especially with the box under the phone version, it leaves everything tidy.

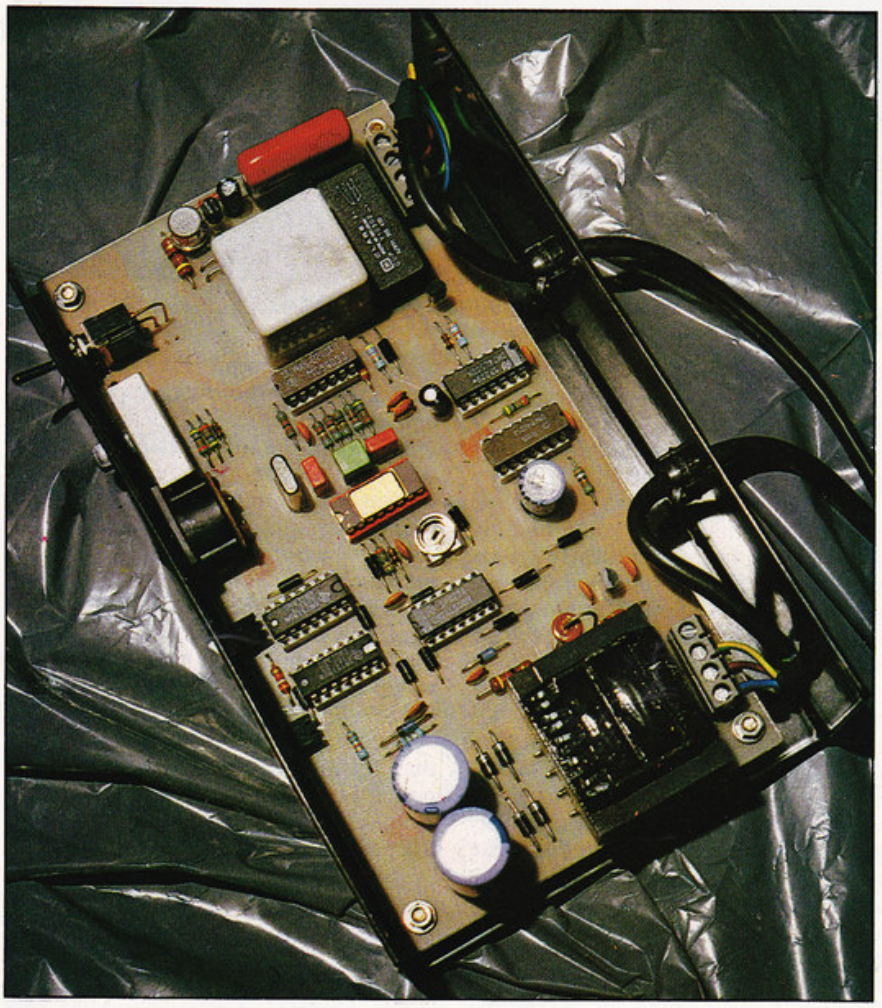
Prism is expecting a heavy demand for the product. The company says it is trying to buy up the entire UK supply of Texas Instruments' 'modem on a chip'.

The company has reason to be optimistic, as the product is competitively priced. But purists may have grounds for suggesting it could have more features. Having used a Torch as a Prestel terminal, I for one appreciate the convenience of having a built-in auto dialler and programmable customer ID.

Prism says that these features could have been included, but only at the expense of another £20 on the purchase price and a delay in bringing the modem on the market.

Another facility that would be attractive is 300 baud full duplex mode, as is used not only by some commercial databases but also by the handful of micro bulletin boards around the country.

Product Prism directly coupled modem **Price** £89.95 **Interface** RS232 **Contact** Micronet (if a Micronet user), 01-837 3699, or Prism Microproducts, 01-359 7481.



Chips with everything: Prism's acoustic coupler alternative revealed.

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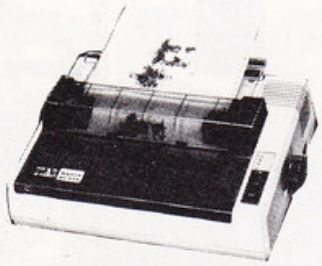

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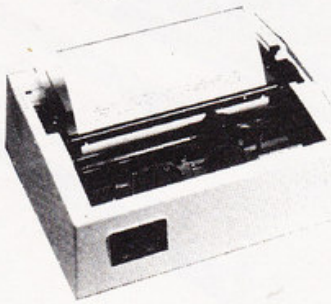

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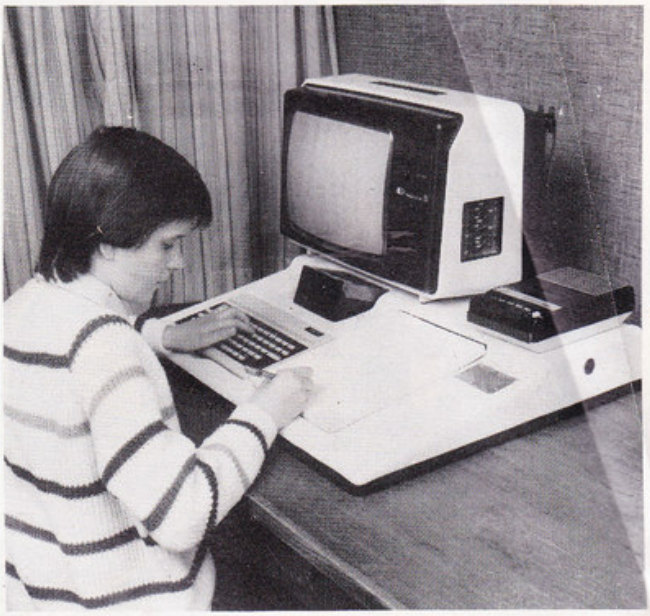

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- Unidirectional unit with facility to daisy chain a disk drive/printer.
- Selectable Baud rates. (Standard 1200 Baud).
- Crystal controlled for stable transmission.
- GENERAL PURPOSE DEVICE; can be used between PET and any RS232 device.

OCTET-AI

- RS232 plug-in PCB.
- Facilitates Apple I and II for RS232 serial connection.
- Simple installation.
- Selective baud rates.
- Allows connection to OCTET-KSR and MSR typewriter interfaces and other RS232 devices.
- Full handshaking capability on buffer-full conditions.

OCTET-PO—Telex tape punch station

- Stand alone table top unit.
- Attractive, modern design: quiet operation.
- Punching speeds up to 75 char/s.
- Plug compatible with OCTET/MSR typewriter interface.

OCTET-PR

As OCTET-PO but facilitates punching and reading of telex tapes.

The Duplex Suss-Box and Adaptor enables the user to make the correct connection between a computer and its peripherals. This is achieved by 'linking' the commonly used signals of RS232C through a 'matrix-block' and connector pins. If the user wishes to connect their computer to the OCTET—MSR or KSR typewriter/printer then please refer to DUPLEX'S SUSS-BOOK for guidance

Full details from sole suppliers: **Duplex Communications Ltd and Duplex Communications (South) Ltd**

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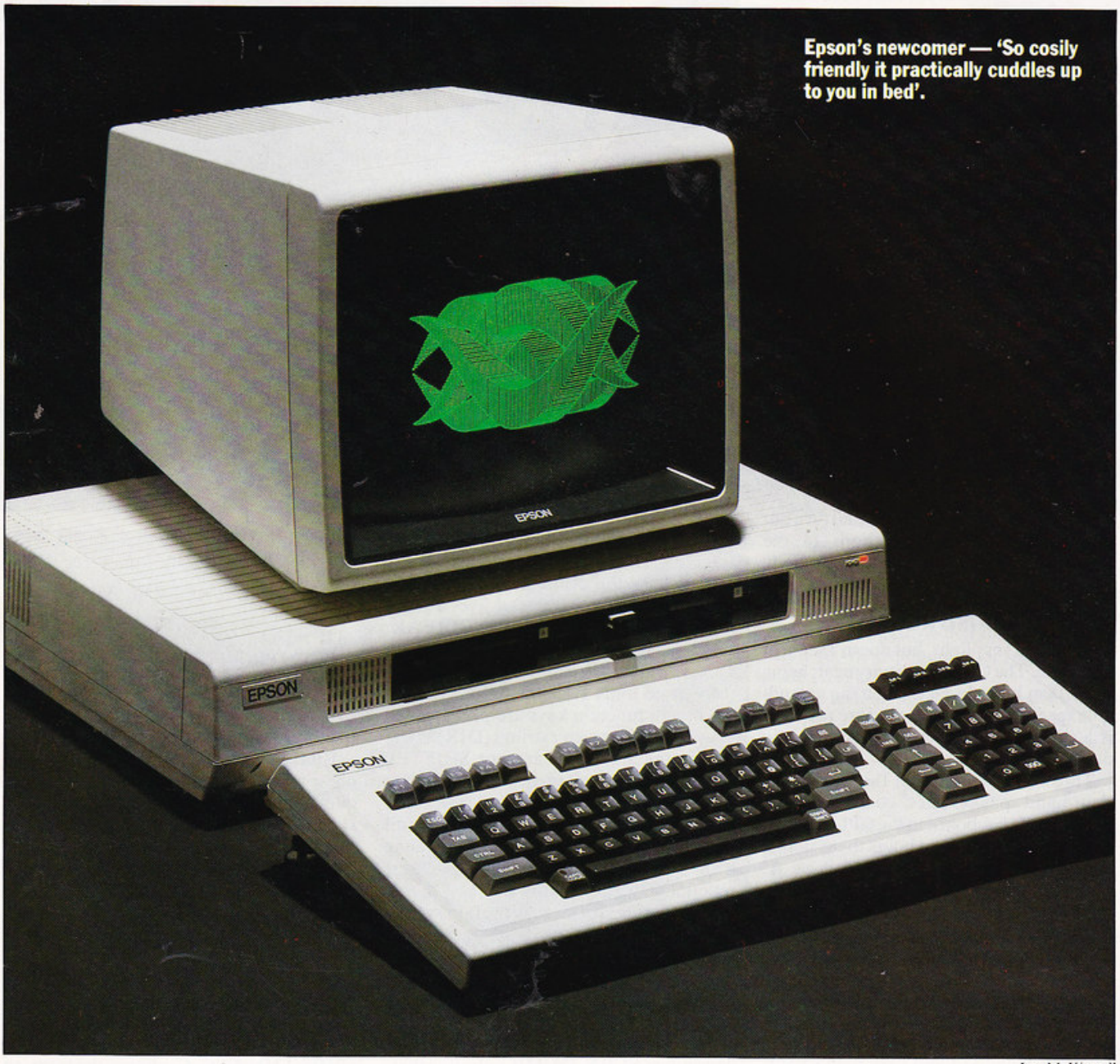
*The OCTET-KSR and MSR typewriter interfaces are sold exclusively by BRITISH OLIVETTI and their distributors. Please contact your local agent for further details.

Introducing a micro of many faces, from Greek to Olde English. Karl Dallas finds it's just his type.

PCN tests the Multifont micro EPSON QX10



Epson's newcomer — 'So cosily friendly it practically cuddles up to you in bed'.

Ian McKinnell

The bad news about Epson's new QX10 computer is that it doesn't come with Valdocs, the ultra-friendly software that caused America's Byte magazine to rhapsodise over the machine as being 'noteworthy for the way in which its software and hardware are integrated.'

The word is that it hasn't worked as well as it should, and Epson UK isn't even willing to hazard a guess as to when we'll see it, if ever. So, the question lots of people are bound to ask themselves is: if an integrated hardware/software system turns up without its software, then what's the point?

The point is that, even without the hyped-up ballyhoo about a system so cosily friendly it practically cuddles up to you in bed, the QX10 is actually a neat and logically designed three-unit computer (keyboard, low-line CPU unit with twin integral disk drives, separate monitor) which performs so well it almost makes me repent of the rude things I've said in the past about CP/M.

Besides 11 extra CP/M commands unique to the QX10, the machine does have one significant plus which will give reviewers and salesmen enough to talk about, even without the missing Valdocs.

42►

◀41

This is 'Multifont', which gives it the ability to display and print (on a dot matrix printer) any of 16 different alphabet sets, ranging from classically-readable Helvetica and Bodoni faces to near unintelligible Olde Englyshe styles — two of them.

So the QX-10 is in fact a rather sophisticated machine whose capabilities I am still exploring as I write.

Documentation

Two fat and clearly-written manuals are supplied — one is an operations manual for the equipment, which includes details of the CP/M commands and how the MFONT Multifont option can be used from within CP/M, while the other is an MFBasic reference manual. The latter makes reference to a Programmer's Guide, which confused Epson UK somewhat, the company denying all knowledge of any such publication.

Not supplied as standard, but loaned to me with the machine, was a very fine Technical Manual *Principles of Hardware Operations*.

None of these is indexed, and far from being 'the first anybody-can-use-it computer', as it is described in the American publicity, the manuals would be harder for a first-time user to penetrate than, say, the widely criticised Commodore documentation.

After assembling and booting the system, you are thrown into the deep end without the step-by-step idiot's guide to programming you usually find next.

It doesn't help your confidence in the manuals, by the way, to find that the first six pages of the operations manual turn out to be tinted paper corrections to the Diskcopy command references in the body of the book.

Construction

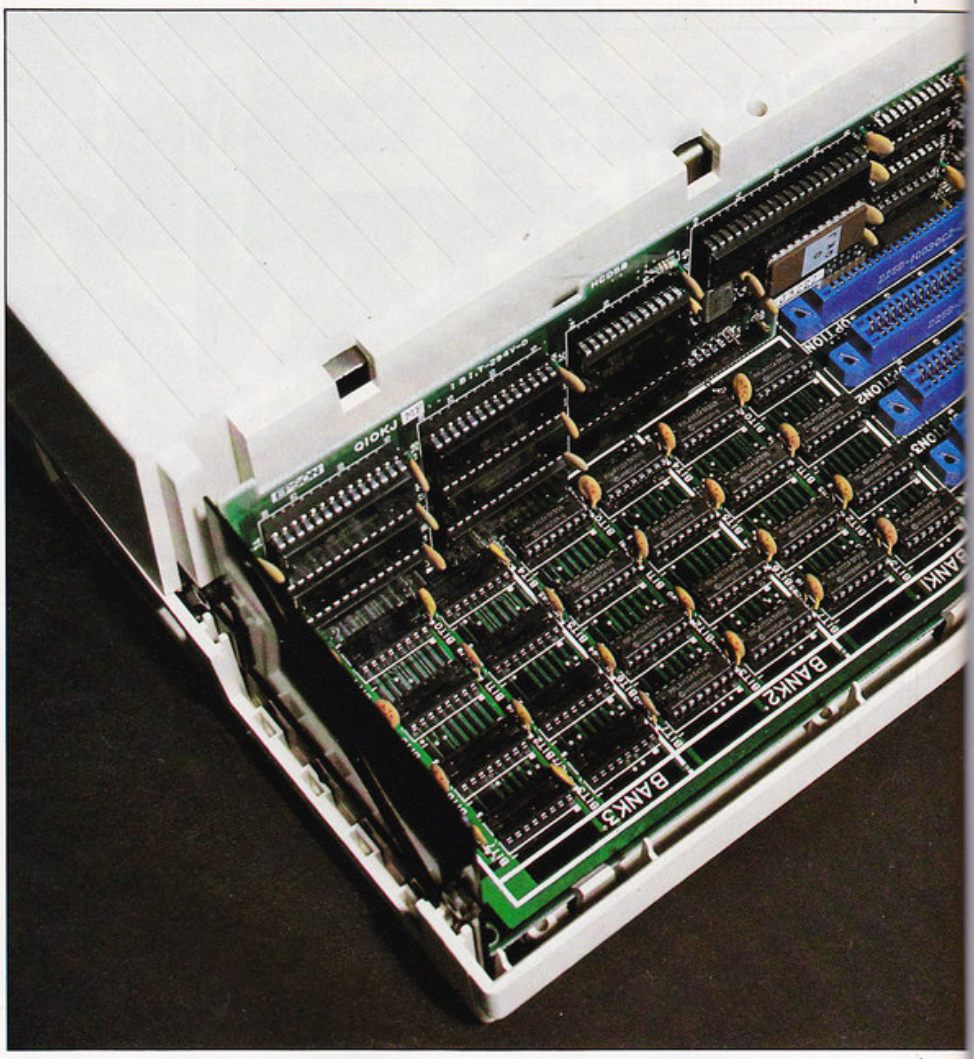
Each unit is very light, but doesn't seem at all fragile. The CPU case is very neat, being only 10cm high. In fact, when the extendable rear feet of the keyboard are raised, it is a slight problem getting disks into the drives.

Throwing the switch at the rear of the right-hand panel after connecting the monitor and keyboard to the CPU turns on the fairly quiet fan, and boots the system if the system disk has been left in drive A. There is a recessed reset button under the right-hand disk drive, easily pushed by a moderately thin finger (or blunt end of a pencil) but impossible to trip by accident, I'd say.

Apart from the low lines of the CPU/disk unit, the other notable things about the system's physical make-up are the specially designed keyboard and very lightweight, clear green-screen monitor. This is powered from the CPU by the single connecting cord, and though it has no tilt facility, if it is stood upon the CPU case it seems to be the ideal height for viewing.

Keyboard

Though the keyboard layout is slightly different from the American, it is clearly still based on Epson's own HASCI (Human Applications Standard Computer Interface, since you ask) standard.



Along the top of the keyboard are ten function keys, in two sets of five, a set of four system control keys (BREAK, PAUSE, SCRN DUMP, HELP), and then four type-style selection keys for accessing the various fonts available.

The ten function keys are pre-assigned to two sets of character strings (DIR, LIST, RUN etc), but these are not SHIFTed/UNSHIFTed as you might assume. One set is available when in MFBasic, the other within CP/M, and this is not explained until you get to the part of the manual dealing with the PFKSET command, for user-redefining the function keys.

The operation of three of the four system keys is fairly obvious. BREAK not only terminates program, LIST or similar operation, but also turns off the AUTO line-numbering mode. PAUSE does just that, with programs or LISTings.

Pressing any key resumes the PAUSEd operation, SCRN DUMP outputs whatever is currently displayed to the printer and HELP doesn't appear to do anything, and the MFBasic Reference Manual says 'This key has no function under MFBasic.'

The operation manual says: 'Pressing this key enters a HELP code (0).' Pressing it under CP/M displays '△@' but nothing else happens, even if you press RETURN.

However, since its ASCII code is zero, as the display of an '@' sign on screen indicates, it could be employed in a programmed 'help' sub-routine, *eg*

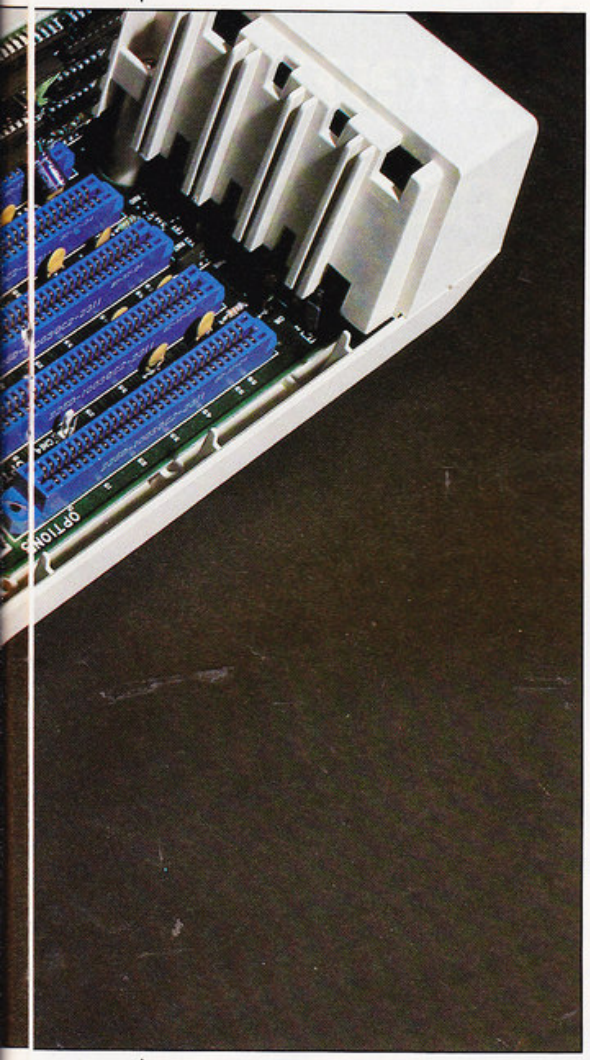
```
10 A$=INKEY$:IF LEN(A$)=0 THEN
   10
20 IF A$="@" [or IF ASC(A$)=0]
   THEN PRINT "(help string)" [or GOTO
   (help subroutine)]
```

It might be just as easy to define 'h' for the same purpose, of course.

BREAK is equal to CTRL C, which is one of ten control codes, many of them duplicating such things as TAB (by CTRL I) and the BS back-space delete (by CTRL H).

Up to 22 escape codes can be programmed in Basic by using CHR$(27) and the appropriate single character string or CHR$ code, or directly under CP/M using ESC and the appropriate key.

One of the more interesting is ESC CHR$(123), which enters the SECRET mode, causing all characters to be displayed as blanks. It is turned off by ESC CHR$(125). ESC C allows the user to select one of eight international character sets, detailed in the appendices in both manuals, by following with the appropriate initial letter (it doesn't matter whether caps or lower case). ESC C U or C u produces US ASCII, ESC C E produces English, and so on for French, German, Danish, Italian, or Spanish. The only odd one out is Swedish, which uses ESC C W to avoid confusion with the Spanish.



The inside of the main board (left) shows five option slots. Design is very clean, shown in the rear view (below) and in the twin slimline disk drives (bottom).

Within MFBasic, OPTION COUNTRY *'country initial'* does the same thing. This reconfigures the keyboard (*eg* so that in German a 'y' is a 'z' and vice versa), but error messages etc remain in English, fortunately.

The system boots in US mode, which is identical to British except that the £ sign is replaced by a hash-mark. There is no SHIFT LOCK, and CAPS LOCK only operates on the alpha keys.

Below the right-hand SHIFT is GRPH SHIFT, which allows the display of 32 graphics symbols by pressing the appropriate alpha keys. These range from fairly basic block graphics to a rather arbitrary selection of special symbols — telephone, little man in a trilby, Model T-type automobile, jet, two kinds of trees, and musical quaver (half-note) sign, but no crotchet (whole note).

They can all be redefined by using the special CP/M command CHARADEF.

There are eight screen-editing keys (four cursors, plus HOME, CLS, INS and DEL, the latter two locking), and a 19-key numeric keypad, which includes a treble zero (000), exponentiation, and a duplicate RETURN/ENTER key.

The four style selection keys above the keypad, numbered SF1, SF2, SF3, SF4, are pressed in various combinations to create the various type-styles available.

Storage

The two integral drives have a specially developed mechanism which seems very positive, as well as taking up minimal depth.

In addition to these two 'real' drives, lettered A and B in the usual CP/M manner, it is also possible to access two sections of memory in the 256K version as if they were disks — though the speed of access is obviously much faster.

These 'disk image RAM' areas are 56K each of virtual memory, and are lettered E and F. Of course, the contents of disk image RAM are lost on power-down, but in addition there is also a battery-backed CMOS chip which can hold up to 2K in its non-volatile memory after power-down.

Expansion

Expansion of the memory and insertion of special cards seems much easier than most other up-market micros. On the left-hand

46►

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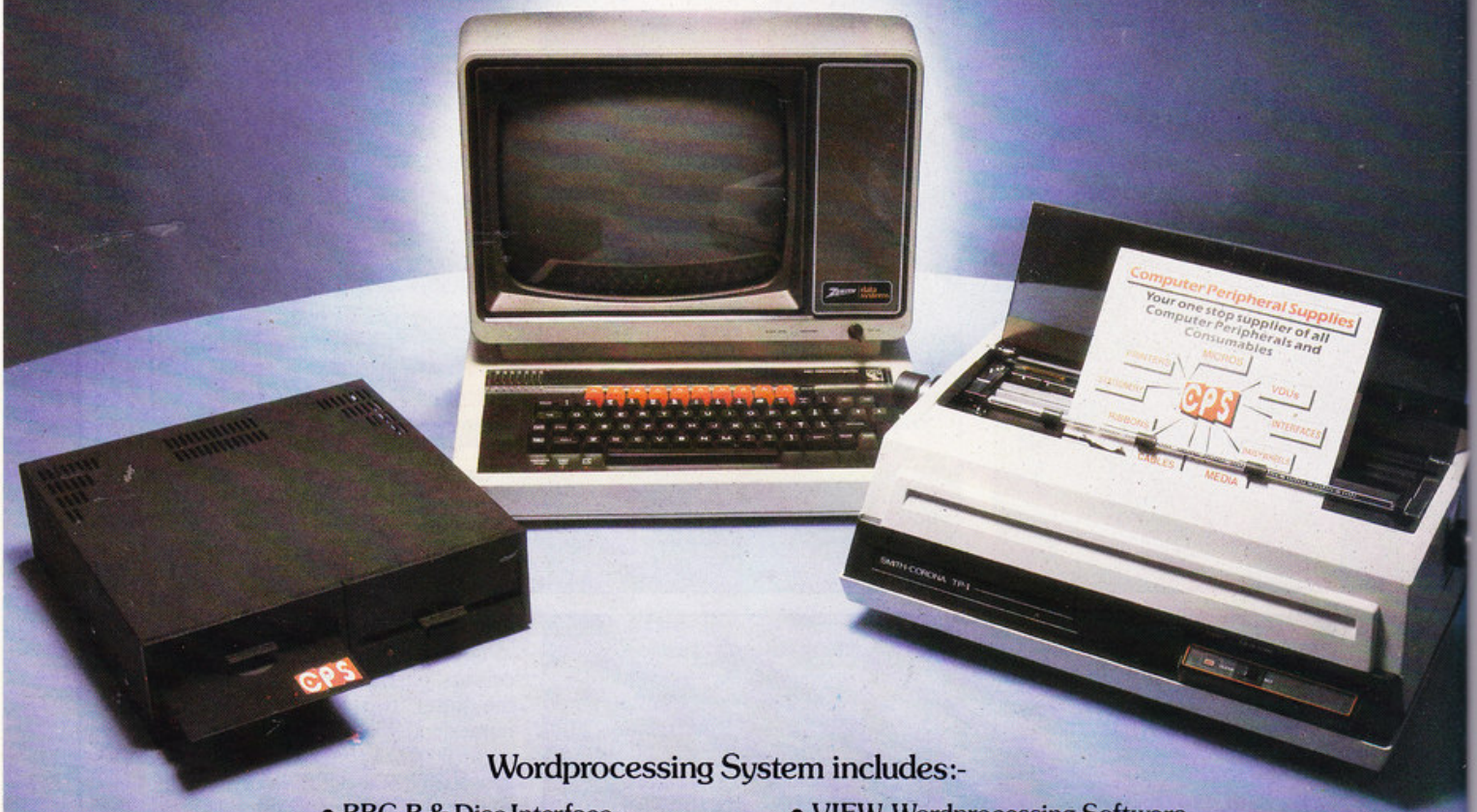

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Two excellent new machines have just been added to our coverage – the Commodore 64 and the Oric. Software for these machines will be in our next Newsletter. Remember, membership is completely free of charge and you are under no obligation to buy anything from the Club unless you really want to. If you use a ZX81 (16k), Spectrum (16k or 48k), BBC (A or B), Dragon 32, Vic (expanded or unexpanded), Commodore 64 or Oric, you should join THE CLUB.

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Left — A selection of the large range of character sets available.

Below — The neat, ergonomical keyboard with triple keypad incorporating a twin set of function keys and the font-selection keys.

top side of the CPU case is an easily removable cover, allowing access to the eight IC sockets for bank 3 of the user memory. In this section, also, is the Multifont Basic card (supplied) and four more slots for other cards, such as a colour display interface or GP-IB interface.

Connections at the rear of the CPU include power, light-pen, display (monitor), Centronics-type parallel printer, and RS232C serial.

Operation

CP/M is CP/M, you might think — but apart from incomprehensible filenames like GAIJI.SYS, dictated by the eight-character name plus three-charactertype limitations, the Epson CP/M is almost human in the way it operates. In addition to the standard built-in commands and 11 transient commands, resident on the system disk, the QX10 has 11 unique transient commands of its own. These are:

- CHARADEF, to define graphics characters
- CONFIG, to reconfigure the system for various printers and RS232C communications formats, to reset the battery back-up calendar/clock, and to select one of the eight international character sets
- DIRINIT, to erase and re-initialise a disk's file directory
- DISKCOPY, to format, copy, or verify a disk (or all three)
- FORMAT, to format a new disk
- MFBASIC, to enter Multifont Basic mode
- MFONT, to allow the 16 possible character fonts to be accessed from within CP/M without LOADing MFBasic
- NORM, to return to normal CP/M from MFONT mode within CP/M
- PFKSET, to assign character strings to any of the programmable function keys
- TERM, allowing the use of the QX10 either as a terminal or host computer for remote operation.
- AUTOST, so that an assigned program on the system disk is run immediately on booting (not to be confused with the MFBasic command AUTO, which turns on auto line-numbering).

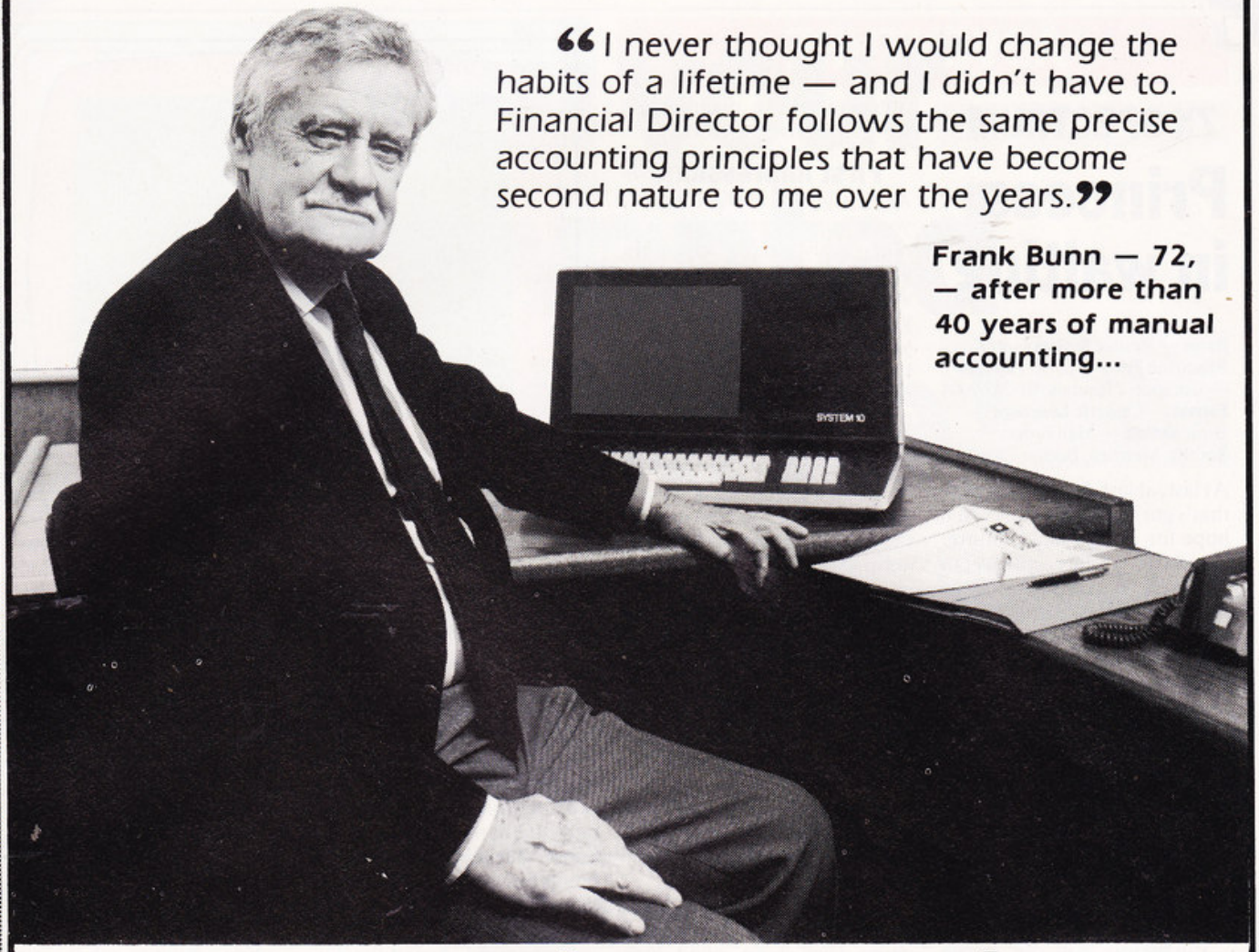
Verdict

Bearing in mind the complexity of options available, I encountered remarkably little difficulty in operating the QX10.

Costing just under £2,000 inc VAT, it's a powerful machine and reasonable value for money, even without considering the plus value of its superb programmable graphics and multifont capability.

SPECIFICATIONS

Price: £1,995.25 inc VAT
Processor: muPD780-1 (Z80A compatible)
RAM memory: 192K expandable to 256K plus 2K non volatile CMOS RAM
Text screen: 25 x 400
Graphics screen: 640 x 400
Keyboard: 103 HASCI inc 10 function keys, 19-key numerics, 4 font keys
Interfaces: parallel (Centronics-compatible) printer, RS-232C serial communications, plus colour display, IEEE488, optical fibre, direct modem
Storage: 2 x 320K double density, double-sided 5.25 floppies, plus 2 x 56K 'disk image RAM'
OS/Language: CP/M 2.2, Multi-Font Basic
Distributor (supplied by): London Computer Centre (01-388 5721)
Software supplied: System disk, Diagnostic disk, Demo
Software available: Most CP/M, plus packages soon from Peachtree and Pearl.



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ADVENTURE

ZX SPECTRUM

Princess in waiting

Name — Rescue **System** — 48K Spectrum **Price** — £5.95 **Publisher** — Computer Rentals, 01-247 9004 **Format** — Cassette **Language** — Basic **Outlets** — Mail order, Smiths, Menzies, Boots

At last, at last, here's one game that's got all the qualities you'd hope for in a good adventure. Graphics, variety, plenty of surprises, a good plot, easy to play—yes folks, Rescue has the lot!

You are an agent of some kind, who has to try to rescue a princess held captive in a castle, and bring her back to your base — alive. You'll need a 48K Spectrum to get you through in one piece . . .

Objective

Yes, the princess is there in the castle, just waiting to be rescued.

But before you can rescue her, you have to break into the castle — and before you can do that, you have to find it. And before you can find it, you have to collect various objects to help you — a torch, a gun, a rope, a uniform, that sort of thing — and of course, you have to find *them*, by hunting in couple of dozen different places where they could be concealed.

Oh, and all this must be done while at the same time avoiding prowling enemy guards and notching up the points you'll need to survive the castle . . .

First impressions

At first glance at the cassette, you'd suppose that this is a remarkably simple adventure game. No instructions at all, apart from how to load it. Then you realise that what it's telling you is that the instructions are there on the tape — and so massive are they that loading them takes almost as long as loading the game itself.

You can choose to read them or go straight on to load the game — but if you vote to read them, you'd better have a pencil and paper at hand, because they go on for over 20 screenfuls. And there's no provision to print them out with the ZX printer, so you'll just have to get scribbling.

I wished heartily that Computer Rentals had produced a separate sheet of printed instructions.

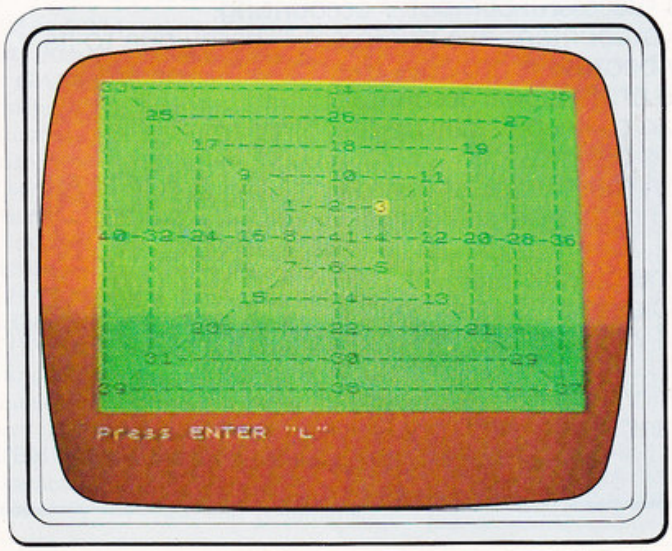
Four levels of play are offered, from 1, that's easy, to 4 — otherwise known as impossible.

I consider myself to be a reasonably smart bloke, so I chose level 1. A good luck message was printed, and the game was underway.

In play

The game is played on a 'board' made up of concentric circles, linked together like a spider's web — and a fresh board is created every time you play.

You start by hunting for a map and radio in the innermost ring, and only then can you move out to search for other objects in the next three rings.



From the outermost ring, you get to cross various obstacles, such as a river, to look for the castle on the other side — but only if you have the right object, for example, a boat, with you to help you cross.

I moved around the middle ring, nine-men's-morris style, since you can only move to an adjacent location or an adjacent one on the ring or rings next to yours. I looked in the house, but all I got was a few points for visiting it, and 'Sorry, there appears to be nothing here'.

Undeterred, I tried the garage where I found the map, and picked it up. Now the Spectrum displayed a map showing the layout of the rings, and my position, and after finding the radio, I was also shown the exact positions of the enemy patrols.

These two guards keep on the move at the same time as you, and if they catch up with you, you are well and truly dead.

And they play pretty intelligently, lurking near locations where you might want to go when you have collected a particular object, and doing a neat pincers movement to try to cut you off.

They certainly kept me on my toes.

You are shown a status panel after every action you make, showing you your location, score, objects you have acquired, patrol locations, and the options open to you — MOVE, PICK, LOOK and so forth.

I finally crossed the river with the boat I'd found, and managed to find the castle. Armed with my chosen entry object, a key, I broke in and started the hunt for the princess. But there are a large number of rooms to be searched, on several floors, and each may hold dangers as well as princesses, and you have only a limited supply of energy. If it runs out — back to the drawing board.

Well, I got wiped out in no uncertain terms, by a large and deadly cobra, so I can't tell you what would have been involved in getting my princess back to home base. Probably I should have saved the game, but although you can in fact do so, this option is not mentioned in the instructions.

You cannot re-run the game at a later date with the same difficulty level, hoping it will be the same — because it certainly will not. It is different every time it is played.

At a guess, I'd say you would need about three hours at level 1 to complete the game successfully — I say 'guess' because I haven't managed to do it!

Verdict

This is the best adventure game I have ever played. It is excellent, for a number of very good reasons. Many adventure games give you a severely limited range of ways to achieve things — to pass a dragon, say, you either kill it or cast a spell. But Rescue has a different philosophy. You decide how to rescue the princess, you decide what tactics to employ, you decide what objects to use and how to use them.

I give my blessing . . .

David Janda

RATING

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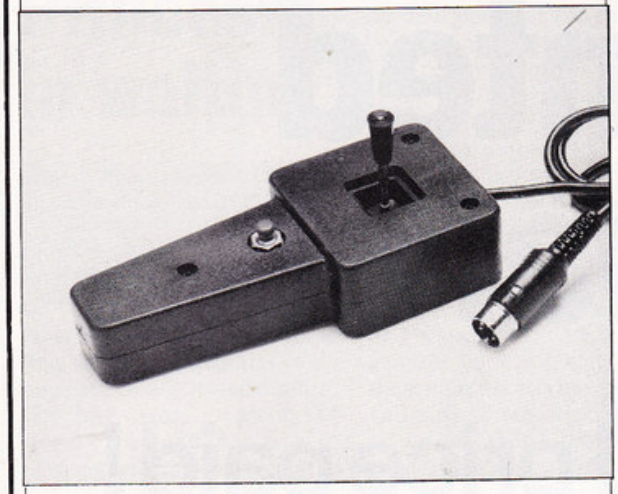

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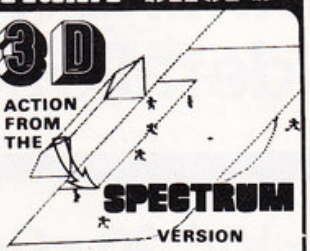

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IF YOU have always wanted to manage a football team,* FOOTBALL MANAGER, *from Addictive Games, is for you — The game is ideal for a football fanatic but the most interesting thing for us was the 3-D graphics used to create the goalmouth action — the game is a winner.
SINCLAIR USER FEBRUARY 1983

Although I'm no great football fan, I really enjoyed playing this game — excellent use is made of colour and user-defined graphics. The game is very logically put together, so that the development of strategy and tactics has a real effect. For example, one of my teams got through to the fourth round of the F.A. Cup where it was beaten by a second division side. This upset morale and meant that our promotion bid failed. Perhaps I should have given up the F.A. Cup run and held some good players back — the possibilities are endless. Brian Clough had better watch out!
* SPECTRUM VERSION ONLY. **ZX COMPUTING FEB/MARCH 1983**

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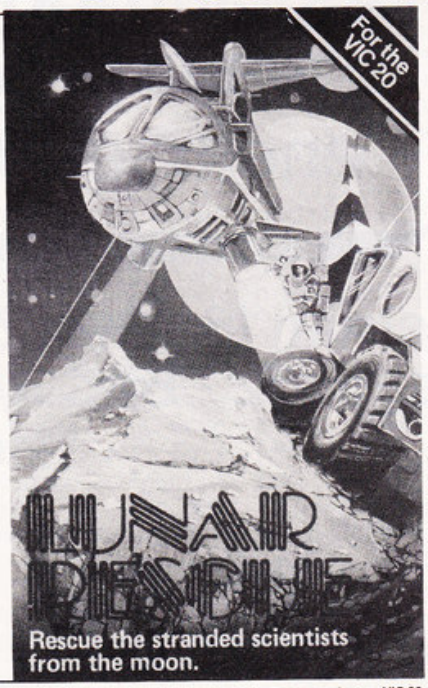

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RULING PASSIONS

SPECTRUM

Banana drama

Name Dictator **System** 48K Spectrum **Price** £4.95 **Publisher** D K Tronics 0799-22359 **Format** Cassette **Language** machine code **Other versions** none **Outlets** mail order, most retail.

Somewhere in the Caribbean — or is it central Africa — lies the tiny, troublesome and fundamentally bankrupt Republic of Ritimba. Its two main industries are bananas and revolution, although nowadays revolutions are often imported from the neighbouring — and hostile — Republic of Leftoto.

El Presidente is a reasonable man, and realising the futility of trying to hold on to the reins of power for any length of time, has decided to divert as much money as possible from the treasury to his pension plan.

Objectives

You are cast as the dictator of Ritimba, and your goals are first, to stay in office for as long as possible, second, to get as much money out to Switzerland as possible, and third, to take yourself out of Ritimba before the Ritimbans take it out of your hide.

In play

No expense has been spared — it looks like the aid budget was paying — to bring you a particularly slick and colourful text game. It starts with the Ritimban national anthem on a loop — 'Press any key when you can't stand it any longer', as the instructions say — and proceeds through gunfire sounds, raspberries from the secret police if you're unpopular with them, to the dead march.

The country's running expenses tick away as the game goes on, and each month one of the interest groups, the army or peasants for example, comes to you with some request.

After the audience you usually get a chance to please a group, strengthen a group, raise cash, or please yourself. The latter can involve increasing your bodyguard, buying an escape helicopter — very bad for your popularity, that one — or moving half the treasury's current funds to Switzerland.

Sooner or later, you face a revolution. You can try to crush it (if you succeed you get to shoot the ringleaders) or run.

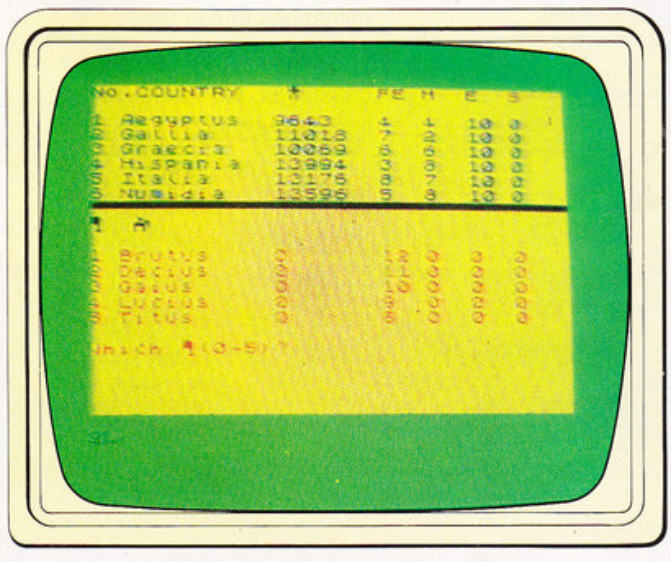
Verdict

Dictator seems fairly simple on the first few plays, but as you get the hang of it you find it actually has hidden depths. I initially thought I'd worked it out when I managed to play-off all the groups against one another, crushing a series of revolutions on the way, but then I ran into a new problem. If everyone's too weak to start a revolution, how do you run away?

It's certainly the Duce of a job being a dictator. **John Lettice**

RATING

Lasting appeal
Playability
Use of machine
Overall value



SPECTRUM

Augustus ascendant

Name Roman Empire **System** 16K Spectrum **Price** £5.50 **Publisher** M C Lothlorien, Dept C20, 4 Granby Road, Cheadle Hulme, Cheadle, Cheshire **Format** Cassette **Language** Basic **Other versions** Atari 400/800, Dragon, Tandy Colour Computer, ZX81 **Outlets** mail order, various dealers

If you're not quite ready to conquer the galaxy in the latest arcade game, why not start small, and conquer the ancient world first? Roman Empire is set in the first century BC — so you're not likely to meet anyone you know — and is a game for the thinking megalomaniac.

Objectives

The game gives you ten legions, six enemies, and sets you the problem of adding them together to come up with the answer, World Domination. You can do it at three levels of difficulty.

In play

If you've any notions of being Julius Caesar and fending-off countless numbers of Gauls with one legion tied behind your back, forget it — your trusty veterans may be twice as efficient as the enemy, but they only get results if there are twice as many of them.

That, unfortunately, is your problem. You need to bring superior numbers to bear on each of your enemies in turn, with the ultimate aim of wiping them all out. Making a desert and calling it civilisation, as Tacitus put it.

You also have to cope with the fact that fighting tires out your legions, and as there are six of the enemy and only one of you, your men tend to get tired six times as fast. You need to manage your resources so you don't end up weeny, weedy and weaky.

On top of this, barbarians breed if you leave them alone, whereas the Romans don't.

Battles take place at the end of every game-turn, and after a period of shilly-shallying and beeping, the computer flashes up the result, thinks for a little longer, and tells you to press a key. It then thinks for even longer — heaven knows what it's up to — then takes you back to the main menu for the next go.

Once you've killed off everyone else, or been killed off yourself, the program gives you a percentage rating for your generalship.

Verdict

Roman Empire doesn't really use the Spectrum's colour capabilities, and has only one 'battle' graphic which is sandwiched between game-turns (the Atari, Dragon and Tandy versions are apparently better from a graphics point of view).

You are also forced to press Enter after keying-in instructions, and this, together with the slowness of the program, is tiresome. But the game is an interesting challenge, and you keep going back to it to try different solutions to the problems. And all this in the comfort of your own Rome. **John Lettice**

RATING

Lasting appeal
Playability
Use of Machine
Overall value

THE FIRST OF THE SECOND GENERATION

Earlier this month *Tomorrow's World* carried its first ever news story about a piece of software. Whilst not of earth shattering importance to the man in the street, this event marks the beginning of a quiet revolution that the experts have been predicting for months. The time has come when standardisation is forcing hardware into the background, leaving the spotlight on software.

Whether you use a micro for playing games, running a business or just learning about computers, the software you buy and use will make or break your relationship with your machine.

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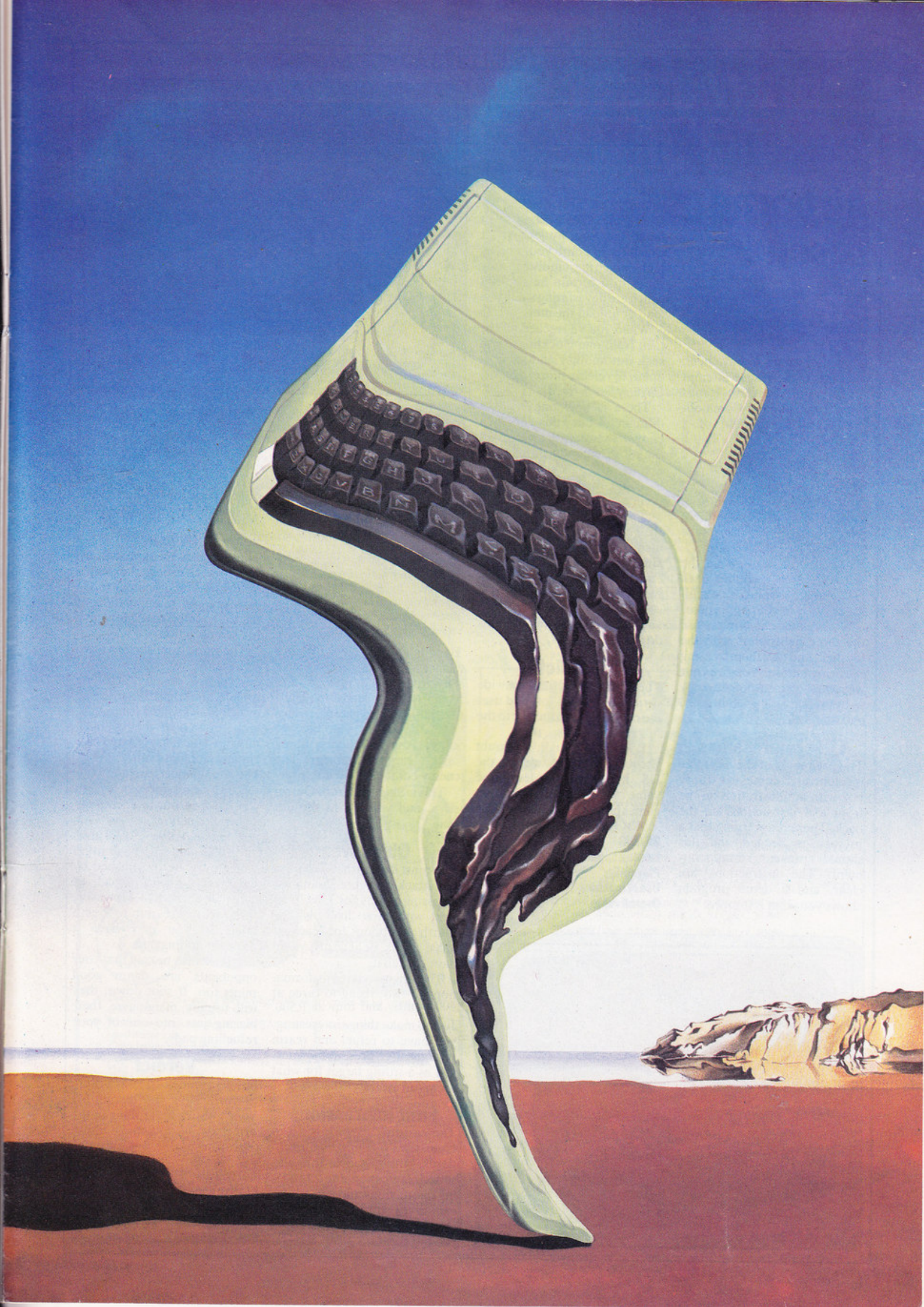


PILOT ERA

VIC 20

Airborne rescue

Name Choplifter **System** Vic 20
Price £24.95 **Format** Cartridge
Language Assembler **Outlets** Mail order and Commodore dealers

Choplifter seems to have been inspired by the rescue attempt for the Iranian hostages. It runs on the unexpanded Commodore Vic with the aid of a joystick.

Objectives

This is a one player game, and more socially acceptable than most. You are using three helicopters to try to rescue hostages in enemy territory. Your score, indicated on the screen, is one point for each hostage rescued and successfully delivered to your home base.

You control the direction of the three helicopters with the joystick, and turn them by using the firing button. You fire your weapons — in self-defence only — by pressing the fire button on and off quickly.

First impressions

The packaging of the cartridge is colourful. It comes in a sturdy box with an illustration on the front and instructions on the back. There is a warning that a joystick is needed and this should prevent disappointment. The instructions are clear, and a demo program shows you what is in store.

In play

This is a very good game, with impressive use of graphics and sound. You are attacked by killer kamikaze satellites which try to ram you, by jet aircraft which try to bomb you, and by tanks which mercifully can only shoot to a certain height, but which are devastating when you load or unload the men.

When you've rescued all the men from one blockhouse you seek out another and shoot it open, to release more. The US Cavalry has arrived!

There is only one level of difficulty, but this is high enough to sustain the interest of the most experienced of players. The waving of the hostages, and the realistic sounds of bombs, helicopter blades, and bullets all add to the fun, as do the lifelike graphics. These include clever high resolution, almost three dimensional, effects, which are very impressive. You can also change the colours by pressing a function key, although the instructions do not tell you this.

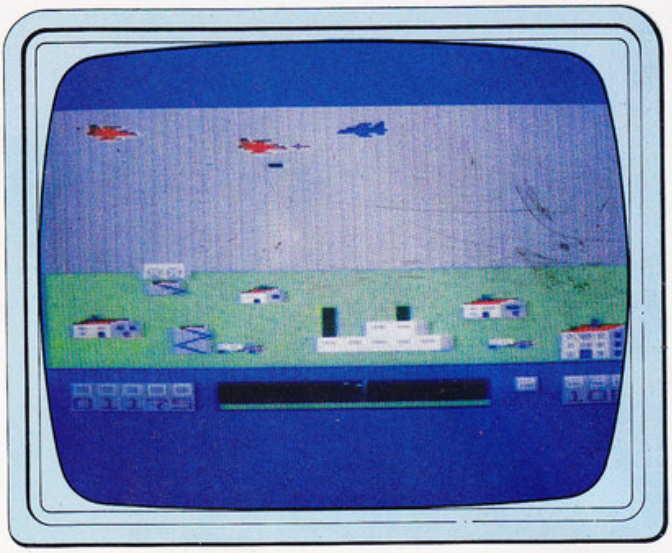
Verdict

The game is good fun for a wide variety of age groups, and uses the capabilities of the Vic to the full.

Priced quite high, no doubt because it is imported from the US, it is none the less good value for the more affluent games player. **Barry Miles**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



VIC 20

Reach for the sky

Name Skyhawk **System** expanded Vic 20 with joystick **Price** £7.95
Publisher Quicksilva 0703-20169
Format Cassette **Language** Basic and machine code **Outlets** Mail order

Bandits at ten o'clock. With a glance at your radar you push forward on the joystick and your jump jet leaps up. Hard left and the townscape rushes beneath you as you race to engage the marauders, lining up the targets on radar. The enemy bombers flash into view.

This is Skyhawk from Quicksilva, and you are in the hot seat.

Objectives

You must defend the town from the attacking fighter bombers, amassing points for kills. You start with three lives, with a fourth as a bonus for reaching 3,000 points. Believe me, you'll have earned it.

The enemy starts in formations of two, rising to three at 400 points, and four at 1,500. Just to make things interesting, you have to refuel and rearm periodically, presenting yourself as a sitting target for what seems an eternity.

First impressions

The cassette artwork is up to Quicksilva's usual high standards, with a double-fold cassette inlay containing LOADing instructions and a (perhaps excessive) story outline. Playing instructions come on a printed sheet.

One side of the tape contains the 6.5K version of the game, while the other plays on the 8K expanded Vic.

The game LOADs in two stages. Press the fire button and it's straight into the action.

In play

The graphics in Skyhawk are superb — an excellent example of the use of multicolour mode graphics and manipulation of the Video Interface Chip to give full screen action.

The game is set above a town represented in effective 3D, and features excellent scrolling to left and right. Everything moves quickly and smoothly, with up to five jets, bombs, missiles and blazing wreckage zipping about simultaneously. The sound effects are good.

The scoring system has been well thought out to encourage aggressive play.

You begin with 900 fuel units and 100 rounds of ammunition which must be replenished by landing on a service pad, of which there are five. However, the enemy are out to bomb these so you may have a problem finding one.

It must also be said that your opponents are damn good pilots too. If shot down, they will usually manoeuvre their blazing jets into one of your refuelling pads.

Verdict

Simply excellent. This is a game that will have you fearing for your joystick and rolling in the armchair as you make those high-G turns **Peter Worlock**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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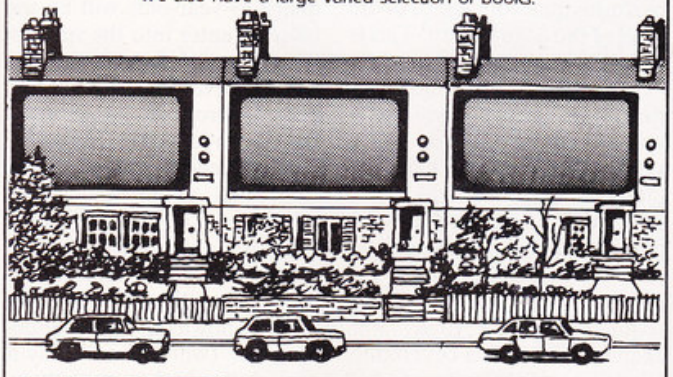

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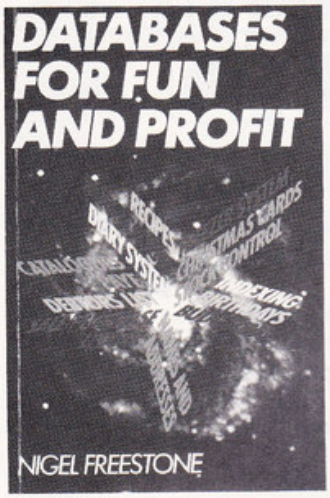


'Databases for Fun and Profit' by Nigel Freestone, published by Granada at £5.95 (paperback, 133 pages)

Picture the scene, a couple of people in a public house, one a publisher, the other a computer buff. The publisher says to the buff: 'How do you feel about writing a book on databases for the uninitiated?'

'No problem! How many pages do you want?'

'About 130'.

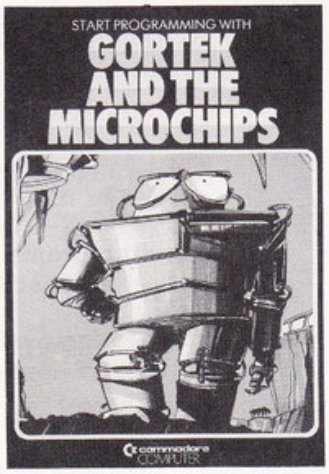
'OK. I'll have it to you next week.'

I hope this book wasn't commissioned in that way but after reading it I can only say that the execution falls way below intention. It seems such a shame that a topic like this is treated so badly and is more likely to turn people off the use of databases as a useful tool on microcomputers.

The woefully poor illustrations and captions look more like page fillers than useful devices to enhance the text. Ah, the text! Well this is better but still weak — it appears to be aimed primarily at 8-year-old computer owners (and even they would find it boring) but performs quantum jumps to the level of the cognoscenti. This is not a good writing technique.

The inference from the title is that your computer will make you money by teaching you a series of database handling methods in a fun way — it doesn't! The best it does is point out the things that databases can be, and are, used for without going into the detail required for the topic. For example, Payroll is covered in all of five and a bit pages, two of which tell you who to contact to find out about tax calculations. Anyone who has had to deal with that sort of program would find this treatment just a little facile.

This book wastes a golden opportunity to increase computer literacy among micro users — and, at the price, forget it! **NC**



'Gortek and the Microchips' by Heather Scott, Stuart Alexander and Gary Bowie, published by Commodore Business Machines (UK) at £15.95 (paperback, 40 pages plus cassette).

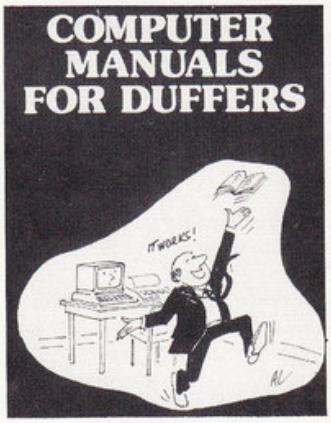
This is a new departure for Commodore, which has decided to back up its new 64 machine with a special learning aid designed for children between the ages of ten and 13.

English graphics designers have been invited to work on the project and the result is a glossy book running to 40 multicoloured pages, dedicated to the idea that the children should couple a space adventure story with elementary lessons in Basic programming.

Two cassettes accompany the course, containing educational games and other programs, notably quizzes for checking progress so far.

The book is the first of a series to be marketed world-wide by Commodore and should be successful, although I think that many 13-year-olds will be too blasé to enter into the spirit of the fantasy. Younger children will, however, find it great fun, and the programs alone are a fair return for the asking price.

By the end of the course the child will understand about INPUT, GOTO, PRINT, LET, IF . . . THEN, and of course END! The point then is not whether there is a sufficiently wide knowledge for programming use (which it certainly is not), but whether enough interest and curiosity has been aroused to encourage further study. Since the idea that computing is fun will have been firmly established, the future is assured. **BM**



'Computer Manuals for Duffers' by D C Mills and G P Guest, published by Mills and Guest at £1.75 (paperback, 32 pages).

The two most striking things about *Computer Manuals for Duffers* are its slimness and the words 'foreword by John Cleese' on the cover. The latter name comes several type-sizes larger than those of the authors.

The booklet sets out to take 'duffers' from their state of total ignorance to the point where they will have the ability and confidence to learn about their computer from the manual.

Alongside this modest aim, the authors give some equally modest — but highly effective — advice on how to buy your first computer. This boils down to advising you to shop around for your computer sales person first, then once you've found the right one, ask. The duffer could certainly do a lot worse.

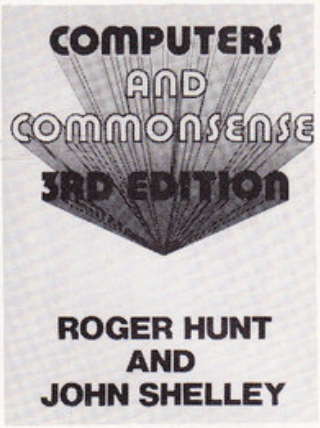
Once you've got your machine, the authors teach you to 'use the computer a little'. This is where the problems start.

The machines dealt with are the Osborne and the Apple. The 'Using the computer' section covers only the Osborne, so the cataclysmic duffer might have difficulty transposing the commands.

Learning how to use the computer involves learning how to perform simple tasks with Wordstar and Supercalc, and once you've completed this 'you can approach the manuals with confidence. They have become your servant.'

Now it's certainly important to get people using software that can help in their business, and it's also important to build up the beginner's confidence — it's quite clear that *Computer Manuals for Duffers* does this — but I'm afraid I can see the join.

All the poor old duffer has to do is blunder into a marginally user-hostile manual, and all that lovely confidence is going to drain away. **JL**



'Computers and Commonsense' (3rd edition) by Roger Hunt & John Shelley, published by Prentice Hall International at £5.50 (paperback, 175 pages).

Introductory books on computing normally come in two types. First, there is the book that covers a particular subject in detail — such as microcomputers. Secondly there is the book that tries to cover the lot — micros, mainframes, data processing and so forth.

Computers and Commonsense is of the second type, and although I found it gives a large amount of information, it falls short in a few places.

Its objective is to give the layman or student a first-level introduction to computing. Three main areas are covered: What is a computer, what can it do, and how does man communicate with it?

At first sight I was surprised at how much the authors managed to cram in, from why the computer was invented, to decision tables. But on reading the book it became plain that the subjects had been covered cursorily, even allowing that it is intended as first-level introduction.

The book is best read sequentially. References are constantly made to other chapters by footnotes, and computer terms explained in one chapter are not explained again.

The history of computing must be a pet subject of the authors as references to what used to be crop up throughout.

Even so, I found *Computers and Commonsense* a good read, and recommend it as an introduction to the subject. The reader should take notice of the bibliography though — you'll need it. **DJ**

PCN ProgramCards

Another bumper crop of goodies, for you to cut out and keep, over the next six pages. Although we have a large stock of your programs to put in this section we still require more for Dragon, Lynx, ZX81, Oric, Atari, Newbrain, TI, Jupiter Ace, Sharp and Colour Genie Tandy so pull your collective digits out and get them to us at the address below.

This week

For those of you who have just acquired a Lynx computer we have a neat little demonstration program from Satnam Singh, of Liverpool, showing the colour and sound capabilities of the machine by drawing a Union Jack then scrolling it on the screen to electronic accompaniment.

Peter Hinton, of Dereham, Norfolk, has obviously put a lot of thought and effort into his game for the Sinclair Spectrum. This program is an easy-to-play game requiring the player to get a robot from a point on the screen to his home through a randomly generated, and increasingly tortuous, block maze that is built as the game progresses.

The CBM Database saga continues this week with yet another three *PCN* ProgramCards from the formidable Cheltenham duo of Ray and Alison Schofield. The final three cards will be published next week to complete this useful package.

How many of you we wonder, are contemplating graduating to Forth but can't get to grips with stack concepts? Well if this is your problem then this week's subroutine and example program from the *PCN* library of subroutines should help you. This pair of cards allows the user to specify a string as a formula and convert it into two stacks of operator data so that these can be analysed.

The price of fame

If you want to see more programs for *your* computer in this section why don't you send examples of *your* expertise to the Programs Editor at the address below so that they can be included in this section.

In addition to seeing your name in print we will send you real money (in cheque form) at our standard rates from our seemingly bottomless budget.

To make life easier all round it would be appreciated if, when submitting programs for inclusion here, you could send it/them on cassette or disk accompanied by a plain white paper listing and a few brief notes about the program(s).

The Programs Editor would like to take this opportunity to thank all of you who have responded to the request for referees for submitted programs and will be writing to each of you with full details in the near future.

As it is we now have a large panel of referees to call upon but if you feel that you have specialist knowledge that should be put to use then please send details to the address below.

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

PCN ProgramCards

Union Jack — Card 1 of 3

8310UJ1/3

A Lynx demonstration program which draws the Union Jack on screen and scrolls it to a musical accompaniment.

```
100 REM * * * *  UNION  JACK.  * * * *
110 REM *                              *
120 REM *  DEMO  FOR  THE  LYNX 48K    *
130 REM *                              *
140 REM ********************************
150 REM
160 REM
170 PROTECT BLACK
180 CLS
190 PAPER BLUE

200 LET Z=40


210 CLS
220 INK BLACK
230 FOR X = 250 TO 255
240     MOVE X,0
250     DRAW X,251
260 NEXT X
270 FOR X = 201 + Z TO 255 + Z
280     MOVE 0,X
290     DRAW 254,X
300 NEXT X
310 MOVE 0,251
320 DRAW 0,0
330 DRAW 255,0
340 INK WHITE
```

Lynx 48K
Lynx Basic

Application: demonstration
Author: Satnam Singh

170	Unprotect all screen colours
180	Clear screen
190	Set PAPER (background) colour to blue
200	*Z* holds constant to determine how far down screen the flag will be drawn
210	Clear screen
220	Set INK to black (rubout)
230-330	Rubout unwanted area of screen leaving blue area on which to add white and red stripes of flag.
340	Set INK to white to paint diagonal stripes

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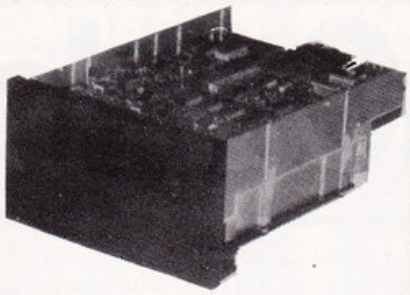

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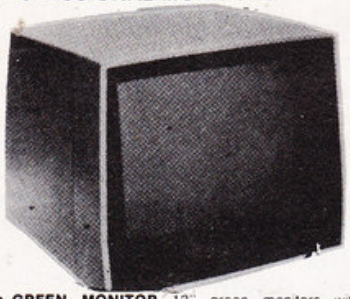

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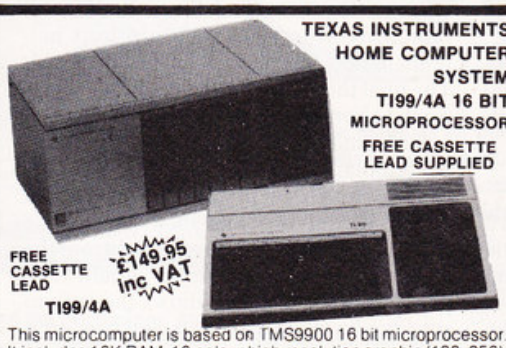

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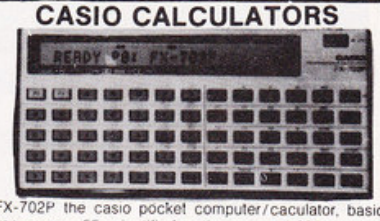

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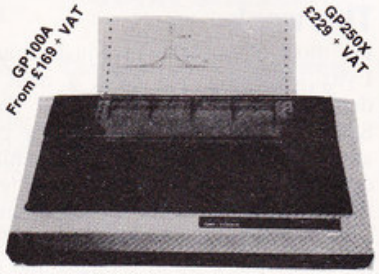

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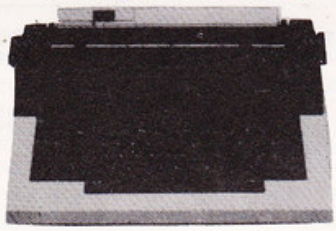

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PCN ProgramCards

Union Jack — Card 2 of 3

8310UJ2/3

```
350 FOR X = 0 TO 20
360     MOVE X,1+Z
370     DRAW X+90,80+Z
380     MOVE 1,X+Z
390     DRAW 90,X+80+Z
400     MOVE X,200+Z
410     DRAW X+90,120+Z
420     MOVE 1,200-X+Z
430     DRAW 90,120-X+Z
440     MOVE 250-X,1+Z
450     DRAW 160-X,80+Z
460     MOVE 250,X+Z
470     DRAW 160,X+80+Z
480     MOVE 250-X,200+Z
490     DRAW 160-X,120+Z
500     MOVE 250,200-X+Z
510     DRAW 160,120-X+Z
520 NEXT X
530 INK RED
540 FOR X = 1 TO 10
550     MOVE 1,X+Z
560     DRAW 90,X+80+Z
570     MOVE X,200+Z
580     DRAW X+90,120+Z
590     MOVE 250-X,1+Z
600     DRAW 160-X,80+Z
610     MOVE 250,200-X+Z
620     DRAW 160,120-X+Z
630 NEXT X
```

350-520	Paint white diagonals on blue background
530	Set INK to red
540-630	Paint red diagonals

PCN ProgramCards

Union Jack — Card 3 of 3

8310UJ3/3

```
640 INK WHITE
650 FOR X = 55 TO 80
660     MOVE 1,X+Z
670     DRAW 250,X+Z
680     MOVE 1,X+65+Z
690     DRAW 250,X+65+Z
700 NEXT X
710 FOR X = 81 TO 105
720     MOVE X,1+Z
730     DRAW X,200+Z
740     MOVE X+64,1+Z
750     DRAW X+64,200+Z
760 NEXT X
770 INK RED
780 FOR X = 77 TO 123
790     MOVE 1,X+Z
800     DRAW 250,X+Z
810     MOVE X+25,1+Z
820     DRAW X+25,200+Z
830 NEXT X
840 PAUSE 50000
850 OUT&0086,13
860 LET P=19
870 FOR X = 1 TO 63
880     BEEP X,P,63
890     BEEP 63-X,P,63
900     LET Z = X BNAND 15
910     IF Z < 8 THEN OUT&0087,( X BNAND 7 )*32
920     ELSE OUT&0087,( 15 - Z )*32
930     BEEP X+62,P,63
940     BEEP 125-X,P,63
950 NEXT X
960 GOTO 870
```

640	Set INK to white to paint horizontal and vertical stripes
650-760	Paint white stripes
770	Set INK to red
780-830	Paint red vertical and horizontal stripes
840	Pause for five seconds
850-950	Routine to move flag and play music simultaneously
960	Repeat lines 870-950 indefinitely

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Escape — Card 1 of 3

8310E1/3

An easy-to-play game involving random block maze generation.

```
  5 POKE 23658,8: REM CAPS LOCK ON
 10 DATA BIN 00011000,BIN 00111100,BIN 01100110,BIN 11000011,BIN 01111110,BIN 0
0111100,BIN 11100111,BIN 01100110
 15 LET a=BIN 01111110
 20 DATA 0,a,a,a,a,a,a,0

 30 FOR b=146 TO 147
 40 FOR c=0 TO 7
 50 READ d: POKE USR CHR$ b+c,d
 60 NEXT c
 70 NEXT b
100 REM "ESCAPE"
110 FLASH 1: PRINT AT 10,10;"STOP THE TAPE": FLASH 0: PAUSE 200
120 PRINT AT 0,3;"The object of this game is     to get the ROBOT,to the point
       marked,H."
130 PRINT AT 4,4;"To move him you use the        arrows above the figures:
      5,6,7 and 8."
140 PRINT AT 8,2;"Unfortunatly he has little     protection from the blocks tha
t    appear to block his way so       he has PLASTERS, to weld          on to
his wounds."
150 PRINT AT 15,10;"IMPORTANT."
160 PRINT AT 17,4;"He can only survive 20 such impacts,after that he becomes
      useless."
170 PRINT AT 21,3;"PRESS ANY KEY TO CONTINUE."
180 PAUSE 0
190 CLS
200 PRINT AT 10,1;"If it becomes impossible for     the robot to reach HOME,the
n       button 1 will abort and you        will ,START AGAIN."
210 PRINT AT 18,7;"PRESS ANY KEY.": PAUSE 0
```

Sinclair Spectrum Spectrum Basic

Application: Game
Author: Peter Hinton

5	Set "Caps Lock" on
10	Data statements for Robot character in binary
15	Define block character
20	Data statements for block character
30-70	Loop to read and create the appropriate characters for Robot and block
110-210	Game introduction and instructions

Escape — Card 2 of 3

8310E2/3

```
220 LET E=3: LET F=20

230 LET L=0
240 BORDER 6: PAPER 6: INK 0: CLS

250 LET A=20: LET B=30.
260 PRINT AT 21,2;"FRAME NO. ";E-2
270 PRINT AT 21,16;"PLASTERS=";F;"   "
280 PRINT AT 0,0;"H"
290 PRINT AT A,B;"c": REM GRAPHIC C

300 FOR D=1 TO E
310 PAPER 2
320 PRINT AT INT (RND*21),INT (RND*32);"d": REM GRAPHIC D
330 NEXT D
340 PAPER 6
350 PRINT AT INT (RND*3),INT (RND*3);" "
360 IF INKEY$="1" THEN  GO TO 710
370 IF INKEY$="5" THEN  PRINT AT A,B;" ": LET B=B-1: LET L=1
380 IF INKEY$="6" THEN  PRINT AT A,B;" ": LET A=A+1: LET L=2
390 IF INKEY$="7" THEN  PRINT AT A,B;" ": LET A=A-1: LET L=3
400 IF INKEY$="8" THEN  PRINT AT A,B;" ": LET B=B+1: LET L=4
410 IF A<0 THEN  LET A=0
420 IF A>20 THEN  LET A=20
430 IF B<0 THEN  LET B=0
440 IF B>31 THEN  LET B=31
450 IF ATTR (A,B)=16 THEN  GO SUB 480

460 IF A=0 AND B=0 THEN  GO TO 550
470 GO TO 260
480 LET F=F-1
490 IF L=1 THEN  LET B=B+1
500 IF L=2 THEN  LET A=A-1
510 IF L=3 THEN  LET A=A+1
```

220	*E* is counter for block generation. *F* is counter for "PLASTERS"
230	*L* is Robot movement indicator
240	Set screen attributes. Clear screen
250	Start position of Robot
260-270	Score line
280	Target of Home
290	Draw Robot at start point. "*c*" is Graphic C character
300-330	Loop to generate blocks randomly
320	"*d*" is Graphic D character
340-350	Ensure 3 * 3 area around Home is clear
360-400	Check for keyboard entry for Robot movement "1" — Abort game: "5" — Left: "6" — Down: "7" — Up: "8" — Right
410-440	Keep Robot on screen
450	Oopsidaisy!! Robot collides with block
460	At last Robot made it home!
470	Round again
480-540	Routine to deal with injured Robot. When no "PLASTERS" left then game ends

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PCNProgramCards

Escape — Card 3 of 3

8310E3/3

```
 520 IF L=4 THEN  LET B=B-1
 530 IF F=0 THEN  PRINT AT 21,25;"0": PRINT AT A,B;"c": PRINT AT 10,10;"THE END.
": PAUSE 200: GO TO 720
 540 RETURN
 550 BORDER 5: INK 1: PAPER 5: CLS
 560 FOR B=1 TO 5
 570 INK 5
 580 FOR A=0 TO 1
 590 PRINT AT 10,10;"WELL DONE."
 600 PAUSE 10
 610 INK 1
 620 NEXT A
 630 NEXT B
 640 INK 1
 650 CLS
 660 PRINT AT 12,5;"CAN YOU DO IT AGAIN."
 670 PRINT AT 14,7;"PRESS SPACE  KEY TO TRY."
 680 IF INKEY$=" " THEN  GO TO 690

 685 GO TO 680
 690 LET E=E+1
 700 GO TO 240
 710 PRINT AT 10,7;"You have aborted."
 720 PRINT AT 12,2;"PRESS SPACE KEY TO TRY AGAIN."
 725 PRINT AT 14,10;"PRESS N TO  STOP "
 730 IF INKEY$=" " THEN  CLS : PAUSE 50: GO TO 120
 735 IF INKEY$="N" THEN  GO TO 1000
 740 GO TO 730
 750 GO TO 240
1000 CLS : PRINT AT 10,0;"PRESSING ANY KEY WILL CLEAR        THE MEMORY": PAUSE
0: NEW
```

530	"c" is Graphic C character
550-630	Loop to flash "WELL DONE."
450-670	Prompt for next frame
680	Single key response — space continues game
685	Get it right!!!
690-700	Increment frame and block speed counter then play again
710-1000	Routine to deal with aborted game.
Note:	At the end the program will be deleted from memory

PCNProgramCards

CBM Database — Card 7 of 12

8310CD7/12

```
5400 PRINT:PRINT "X=8.2 - SORT ROUTINE"
5402 PRINT "VALUE OF P TO INPUT IS ";(A-1);"   -   INPUT P"
5405 INPUT P
5410 RESTORE
5415 FOR I=1 TO (P)
5420 READ A$(I),B(I),C(I),D(I)
5430 NEXT I
5431 PRINT "DO YOU WANT A SECOND SORT ON SUBJECT ? Y OR N ":INPUT V$
5432 IF V$="Y" THEN PRINT "SECOND SORT WILL BE BY SUBJECT"
5433 IF V$="N" THEN PRINT "SECOND SORT WILL BE BY DATE"
5440 FOR I=1 TO (P-1)
5450 FOR J=1 TO (P-I)
5455 IF B(I) < B(I+J) THEN GO TO 5520
5460 IF B(I) > B(I+J) THEN GO TO 5470
5462 IF V$="Y" THEN GO TO 6100
5464 IF V$="N" THEN GO TO 6150
5470 LET M=B(I):L$=A$(I):N=C(I):O=D(I)
5480 LET B(I)=B(I+J):A$(I)=A$(I+J):C(I)=C(I+J):D(I)=D(I+J)
5490 LET B(I+J)=M:A$(I+J)=L$:C(I+J)=N:D(I+J)=O
5520 NEXT J:PRINT I,J:PRINT "INCREMENT I"
5550 NEXT I:PRINT I,J:PRINT "INCREMENT ENDED"
5552 PRINT"DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT Q2$
5554 IF Q2$="" THEN GOTO 5554
5556 IF Q2$="Y" THEN GOTO7200
5560 FOR I=1 TO P
5570 PRINT B(I),C(I),TAB(30) A$(I),TAB(50)D(I)
5580 NEXT I
5590 RETURN
5600 PRINT:PRINT "X=8.3 - SORT ROUTINE"
5602 PRINT "VALUE OF P TO INPUT IS ";(A-1);"   -   INPUT P"
5605 INPUT P
5610 RESTORE
5615 FOR I=1 TO (P)
5620 READ A$(I),B(I),C(I),D(I)
5630 NEXT I
```

5400	Prompt
5402	Prompt
5405	Response
5410	Set read pointer to one
5415-5430	Loop to read data to array
5431-5433	Sub-field sort prompts and response
5440-5550	Loop to perform sort routine according to input
5552-5556	Printer option prompts and response
5560-5590	Display sorted array on screen
5600-5602	Prompts
5605	Response
5610	Set read pointer to one
5615-5630	Loop to read data to array

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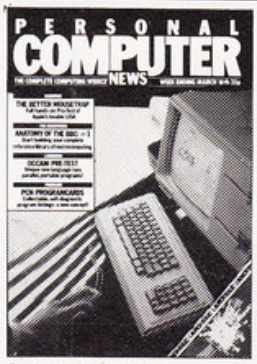
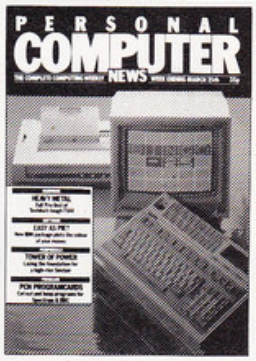
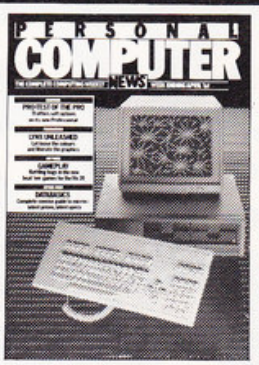


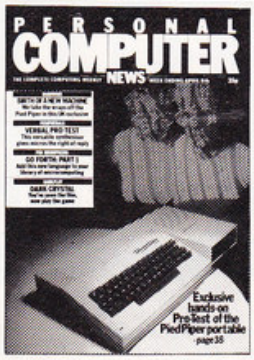
Issue 1, w/e March 18
Pro-Tests: Apple's Lisa, Texet TX8000; Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.
Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers 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.

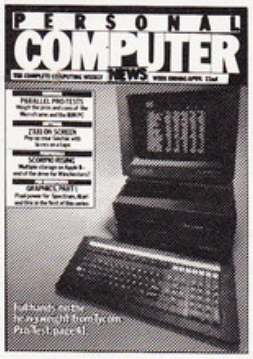


Issue 3, April 1.
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum),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

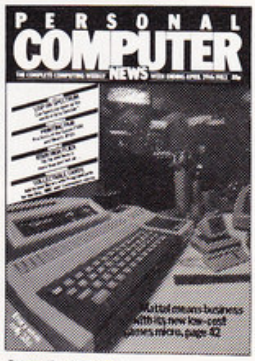


Issue 4, April 8.
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunesmith (Oric), Array Editor.
Databasics: 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

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Part 2: Jupiter Ace software; guide to Forth; Forth on Apple, IBM and ZX81; more implementations; Forth 79 v FIG-Forth; books.

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Part 1: Colour co-ordinated; Spectrum, Oric, Atari.

Part 2: Graphics on the Vic 20; the Video Interface Chip explained; Dragon displays; video easel on Atari 800.

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PCNProgramCards

CBM Database Card 8 of 12

8310CD8/12

```
5631 PRINT "DO YOU WANT A SECOND SORT ON SUBJECT ? Y OR N ":INPUT V$
5632 IF V$="Y" THEN PRINT "SECOND SORT WILL BE BY SUBJECT"
5633 IF V$="N" THEN PRINT "SECOND SORT WILL BE BY SUM"
5640 FOR I=1 TO (P-1)
5650 FOR J=1 TO (P-I)
5655 IF C(I) < C(I+J) THEN GO TO 5720
5660 IF C(I) > C(I+J) THEN GO TO 5670
5662 IF V$="Y" THEN GO TO 6200
5664 IF V$="N" THEN GO TO 6250
5670 LET N=C(I):L$=A$(I):M=B(I):O=D(I)
5680 LET C(I)=C(I+J):A$(I)=A$(I+J):B(I)=B(I+J):D(I)=D(I+J)
5690 LET C(I+J)=N:A$(I+J)=L$:B(I+J)=M:D(I+J)=O
5720 NEXT J:PRINT I,J:PRINT "INCREMENT I"
5750 NEXT I:PRINT I,J:PRINT "INCREMENT ENDED"
5752 PRINT"DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT 03$
5754 IF 03$="" THEN GOTO 5754
5756 IF 03$="Y" GOTO7400
5760 FOR I=1 TO P
5770 PRINT C(I),TAB(20)A$(I),TAB(40)B(I),D(I)
5780 NEXT I
5790 RETURN
5800 PRINT:PRINT "X=8,4 - SORT ROUTINE"
5802 PRINT "VALUE OF P TO INPUT IS ";(A-1);"   -   INPUT P"
5805 INPUT P
5810 RESTORE
5815 FOR I=1 TO (P)
5820 READ A$(I),B(I),C(I),D(I)
5830 NEXT I
5831 PRINT "DO YOU WANT A SECOND SORT ON SUBJECT ? Y OR N ":INPUT V$
5832 IF V$="Y" THEN PRINT "SECOND SORT WILL BE BY SUBJECT"
5833 IF V$="N" THEN PRINT "SECOND SORT WILL BE BY SUM"
5840 FOR I=1 TO (P-1)
5850 FOR J=1 TO (P-I)
5855 IF D(I) < D(I+J) THEN GO TO 5920
5860 IF D(I) > D(I+J) THEN GO TO 5870
5862 IF V$="Y" THEN GO TO 6200
5864 IF V$="N" THEN GO TO 6350
5870 LET O=D(I):L$=A$(I):N=C(I):M=B(I)
5880 LET D(I)=D(I+J):A$(I)=A$(I+J):C(I)=C(I+J):B(I)=B(I+J)
5890 LET D(I+J)=O:A$(I+J)=L$:C(I+J)=N:B(I+J)=M
5920 NEXT J:PRINT I,J:PRINT "INCREMENT I"
5950 NEXT I:PRINT I,J:PRINT "INCREMENT ENDED"
```

5631 Prompt for secondary sort
5632-5633 Response answers
5640-5750 Loop to perform dual sort

5752-5756 Printer prompt and responses

5760-5780 Loop to display sorted array

5790 Return to main line
5800-5805 Prompts and response for fourth sort routine
5810 Set read pointer to 1
5815-5830 Loop to load data array

5831-5833 Prompts and responses for secondary sort

5840-5950 Loop to perform dual sort

PCNProgramCards

CBM Database Card 9 of 12

8310CD9/12

```
5952 PRINT"DO YOU WANT OUTPUT TO PRINTER Y/N ":INPUT 04$
5954 IF 04$="" THEN GOTO 5954
5960 FOR I=1 TO P
5966 IF 04$="Y" GOTO7500
5970 PRINT D(I),TAB(20)A$(I),TAB(40)B(I),C(I)
5980 NEXT I
5990 RETURN
6000 IF B(I)<=B(I+J) THEN GO TO 5320
6010 GO TO 5270
6020 RETURN
6050 IF C(I)<=C(I+J) THEN GO TO 5320
6060 GO TO 5270
6070 RETURN
6100 IF A$(I)<=A$(I+J) THEN GO TO 5520
6110 GO TO 5470
6120 RETURN
6150 IF C(I)<=C(I+J) THEN GO TO 5520
6160 GO TO 5470
6170 RETURN
6200 IF A$(I)<=A$(I+J) THEN GO TO 5720
6210 GO TO 5670
6220 RETURN
6250 IF B(I)<=B(I+J) THEN GO TO 5720
6260 GO TO 5670
6270 RETURN
6300 IF A$(I)<=A$(I+J) THEN GO TO 5920
6310 GO TO 5870
6320 RETURN
6350 IF B(I)<=B(I+J) THEN GO TO 5920
6360 GO TO 5870
6370 RETURN
7000 PRINT"MAKE SURE THE PRINTER IS ON":FOR M=1TO2000:NEXTM
7005 OPEN7,4,2:CMD7
7010 OPEN8,4,1:CMD8
7030 PRINT#7,"AAAAAAAAAAA     9999.99       999999      999999"
7100 FOR I=1TOP
7150 PRINT#8,A$(I)CHR$(29),B(I),C(I),D(I)
7180 NEXT I
7185 PRINT#8:CLOSE8
7190 PRINT#7:CLOSE7
7195 GOTO5390
```

5952-5954 Printer prompt and response

5960-5980 Loop to display sorted array

5990 Return to main line
6000-6370 Independent tests for previous sort routines

7000-7195 Routine to print data array on printer

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PCN ProgramCards

Evaluate Card 1 of 1

8310SubE

This subroutine demonstrates the facilities of formula evaluation using simple input. This is compared against a user defined set of operators. Currently, for instruction purposes, the routine is limited to the most simple of formulae but will be enhanced in future issues.

```
2000REM A SUBROUTINE TO EXAMINE A FORMULA AND RETURN A RPN/FORTH STRING
2010SI = 0: SO = 0

2020FOR N = 0 TO SS: S$(N) = "": O$(N) = "": L(N) = 0: NEXT N

2030FOR N = 1 TO LEN(I$)

2040C$ = MID$(I$,N,1)
2050IF C$ >= "A" AND C$ <= "Z" THEN S$(SI) = C$: SI = SI + 1

2060FOR M = 2 TO LEN(OS$) STEP 2

2070IF C$ = MID$(OS$,M,1) THEN O$(SO) = C$: SO = SO + 1: L(SO) = ASC(MID$(OS$,M
-1,1))
2080NEXT M

2090IF SI > SS OR SO > SS THEN I$ = ""
2100NEXT N
2110IF I$ = "" THEN RETURN
2120SI = 2: I$ = S$(0) + S$(1)
2130I$ = I$ + O$(0)
2140 RETURN
```

Written in Microsoft Basic it can be modified to work on all machines

2010	*SI, SO* are the indices to the operator and operand stacks.
2020	*SS* must be defined to the maximum number of operands. *S$(*), O$(*), L(*)* must be DIMensioned in the user program and are the operator and operand stacks
2030	Start of loop to analyse the input string
2040	Character being compared to
2050	If character is a valid alphabetic value then store in stack and update index
2060	Loop to examine the operator values for a match
2070	If a match is found then store in stack and also store the precedence level of the operator in the stack
2090	Do not exceed size of stack
2110	Bad formula
2120-2130	Sets *I$* to return string. N.B. This section will be enhanced to allow complex formulae in future issues.

PCN ProgramCards

Formula Card 1 of 1

8310F1/1

A very simple program to demonstrate the use of the subroutine EVALUATE to help those with difficulty in understanding Forth or Reverse Polish Notation. By restricting the input to the simplest of formulae understanding should be gained here prior to moving on to the full program which will feature in future issues

```
1000REM A PROGRAM TO DEMONSTRATE SIMPLE RPN/FORTH ARITHMETIC/STACK HANDLING
1010SS = 2: DIM S$(SS),O$(SS),L(SS)

1020OS$ = "1^2*2/3+3-"

1030REPEAT
1040PRINT "ENTER FORMULA USING ^ * / + - AS OPERATORS"
1050INPUT "FORMULA IS ",I$

1060GOSUB 2010
1070IF I$ = "" THEN PRINT "FORMULA CANNOT BE EVALUATED - RETRY": GOTO 1090

1080PRINT "TRANSLATION IS "
1090PRINT "FIRST STACK ENTRY IS :  "; LEFT$(I$,1)
1100PRINT "SECOND STACK ENTRY IS : "; MID$(I$,2,1)
1110PRINT "OPERATOR IS :           "; RIGHT$(I$,1)
1120UNTIL FALSE
```

BBC Model B
BBC Basic

Application: Demonstration

1010	*SS* defines the maximum number of operators/operands *S$(*), D$(*), L(*)* are the stacks used in the subroutine to hold the decoded formula
1020	*S$* holds the user defined operators and their appropriate precedence levels for operation and must be defined as: *LEVEL* (numeric 1-99), *OPERATOR* (all must be of the same length)
1030	Loop to take user input start
1040	Prompt
1050	Prompt and input of formula to evaluate
1060	Perform the subroutine *EVALUATE*
1070	If formula too long or complex then *I$* is returned empty
1080	Prompt
1090	First operand is displayed
1100	Second operand is displayed
1110	Operator used is displayed
1120	Perform this loop forever

Note: Future issues will contain enhanced versions of this program to eventually perform complex and lengthy formulae

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

We publish a list of each section on alternate weeks. This week it's the turn of clubs, which are listed alphabetically by county then by town.

From time to time we will be reporting on the activities of an individual club or user group. If you've just started a micro club or if your club is planning something special, then drop us a line and we'll spread the word.

Write to Clubnet, Personal Computer News, VNU, 62 Oxford Street, London W1A 2HG.

The listings are based on information supplied by the Amateur Computer Club.

CLUBS

AVON

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

Worle Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm (annual subs: £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 OU62DF, tel: 0525-220922.

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

Luton Computer Club. Contact P Fletcher, 1 Trowbridge Gardens, Luton, Beds LU2 7JY, tel: 0582-45068.

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, SL09RP.

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 New Mills School every other Monday, sub: Adults £2 per quarter, £1 members under 11. Contact John Eary, New Mills 43870.

Northwest Computer Club meets fortnightly, meetings 25p. Contact John Lightfoot at 13 Aston Drive, Frodsham, Warrington, Cheshire WA6 7PU, tel: 072 831519.

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 Dearn, 2 Spinney Close, Glossop, Derbyshire.

DEVON

Exeter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month, 7.30pm. Annual subs: £7.50 adults, £2.00 for students. Technical library. Contact T.G. Holden, 14 Greenville Avenue, Teignmouth, Devon TQ14 9NJ.

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 Tuesday of every month during school term at 7.30pm. Annual subs: £1. 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, Glouc s.

HAMPSHIRE

Commodore Computer Club, inaugural meeting at Bury House, Bury Road, Gosport on May 6 at 7.30pm. Contact Brian Cox, Fairham 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 SO1 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

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.

Crosby, Scunthorpe, South Humberside DN158PU.

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 Mardle Street, Dorker, Oldham, Lancs, tel: 061-682 120.

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: 07543594.

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 the first week of every month. Annual subs: £1. Contact T Kayari, 12 Calderon Road, London E11 4EU.

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 Micro Computer Club meets at Room B106 Southgate Tech, fortnightly on Thursdays at 7.30pm. Annual subs: £5. See Prestel page 25820645 for programs. 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.

Wandsworth Computer Club meets at York Gardens Community Centre, Battersea, London SW11 for all ages and all machines. Contact C Verrier, Earlsfield Library, Magdalen Road, London SW18.

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.

The Hardware Exchange. Contact D. Edwards, PO Box 13, Birkenhead, Merseyside L42 4RL.

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 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.

Amateur Radio Special Interest Group proposed group for those interested in Computers and Amateur Radio. Contact Peter Whittle, 49 Barlemas Road, Oxford OX4 1WX.

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.

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: 048 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.

APEX (Astrocomputing Program Exchange). Subs: £2, Overseas £3. Produces 3/4 magazines a year. Contact c/o M Gavin, 79 Ardrossan Gardens, Worcester Park, Surrey.

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,

72 ▶

CLUBNET

Crawley, on the first and third Monday every month. Annual subs: £6 adults, £3 students. Contact J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, W Sussex, tel: 0293-884207

Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hillary Close, East Grinstead, W Sussex RH19 3XQ.

Micro Enthusiasts, new club proposed. Contact G Diannage, 16 Malvern Street, Hove, Sussex BN3 3YR.

Arun Microcomputer Club meet at Wick Amenity Centre, Wick Farm Road, Littlehampton, W Sussex, on the first Monday of every month at 8pm, and third Sunday of every month at 6pm. Fees: £3 six months, £1 joining fee. Contact P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL

TYNE & WEAR

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

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Annual subs: £3 adults, £1 students. Contact Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.

Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday every month 6.45-9.45pm. Annual subs £5 adults, £3.50 students. Contact Alison Hunt, 58 Princes Avenue, Walsall, W Midlands, WS1 2DH, tel: 0922-23875.

National Westminster Personal Computer Society. Contact P Moore 021-2366176, ext 382.

Central Program Exchange, annual subs: full membership £25 Europe, small users service £10 Europe. Contact Mrs Judith, tel: Wolverhampton 28521.

West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday every month. Annual subs £4, £3 full-time students. Contact John Tracey, 100 Booth Close, Brierley Hill, Kingswingford, W Midlands, tel: 0384-70097.

WILTSHIRE

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

WORCESTER

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

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday every month at 7.30pm. Annual subs £1. Contact James Bridson, c/o 39 Kereforth Hall Road, Barnsley, South Yorks S70 6NF, tel: 0226-41753.

Doncaster Amateur Computer Society meets in YMCA, Wood Street, on the first Wednesday every month. Contact John Wilkinson, 316 Bawtry Road, Doncaster, S. Yorkshire, tel: 0302-868379.

Greenhead Grammar School Computer Club. Contact Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, tel: 0535-62828.

Huddersfield Computer Club meets every Monday. Contact Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, tel: 0484-657299.

Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. Contact David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.

Program Power, contact R Simpson, 5 Wemsley Road, Leeds Ls7 2BX, tel: 0532-683186.

Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Contact Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, tel: 0535-43007.

Shipley College Computer Group meets on Tuesdays. Contact Paul Channell, tel: 0274-595731.

South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday every month at 7.30pm. Annual subs: £4. Contact Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.

Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, every Wednesday at 7.30pm during school term. Contact Mr James Davis, 62 Tudor Street, Thurnscoe East, tel: 0709-893880.

West Yorkshire Microcomputer Group meets on Tuesdays. Contact Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, tel: 0532-632532.

York Computer Club meets at the Enterprise Club every Monday at 8pm. Contact K Thomas, Green Lea, Ripon Road, Harrogate, North Yorkshire HG1 2BY, tel: 0904-38239.

SCOTLAND

Bishopton Computer Club meets at 'Cwa Ben', Sachelcourt Avenue, Bishopton, Renfrewshire, on Sunday once a month (next meeting May 22 at 2.30pm). Contact Alasdair Law, 10 Dunglass Road, Bishopton, Renfrewshire PA7 5EF.

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. 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 G68 9NW.

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.

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.

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DATABASICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PERIPHERALS

PRINTERS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
Adler TRD 170	£833	Daisywheel		●		●			9600	256	6,8	10,12,15	17	198	15.5	56×37	13	6	●	●	●	●			●	●	●	●		●	●	T2
Anadex DP 9000A	£1,397	M 7×9, 9×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	106	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9001A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	132	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500	£1,397	M 9×9		●	●	●			9600	700	6,8	10,12,13.3	200	176	15.5	39×59.9	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9		●	●	●			9600	2700	6,8	10,12,13.3	200	176	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500L	£1,295	M 7×9, 9×9		●	●	●			9600	700	6,8	10	150	132	15.5	39×59.9	16	6			●				●	●	●			●		I1
Anadex DP 9501	£1,397	M 7×9, 11×9		●	●	●			9600	700	6,8	10,12.5,15,16.7	200	220	15.5	39×59.9	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9501A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	220	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9620A	£1,489	M 7×9, 9×9, 13×9		●		●			9600	1500	6,8	10,12,15,16.4	200	216	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex WP 6000	£2,616	M up to 18×20		●		●			19200	4500	6,8,12,16	10,12,16.7	285	220	15.5	46.7×74.9	25	6	●	●	●	●		●	●	●	●		●	●	●	I1
ASP 3500	£977	M 9×7, 9×9		○		○			9600	80	6,8	10,12,16.5	180	217	14	61.5×40.5	19	6	●	●	●		●	●	●	●						M1
Brother HRI	£747	Daisywheel		○		○	○		9600	2000	4,5,6	10,12,15	35	198	16.5	38.1×71.2	16	8			●				●	●			●		●	J1
Canon AP400	£1,140	Daisywheel	●			●		1	19200	4000	4,6,8	10,12,15	25	197	15.5	50.8×48.2	18.5	6	●	●	●	●	●		●	●	●	●	●	●	●	D1
Centronics 159/4	£962	M 9×7				●			9600	768	6	5,8.18,10,16.36	150	80	10	38×35.6	10	5							●	●	●	●		●	●	B1
Centronics 150/4	£682	M 9×7				●		1	9600	768	6,8	10,12,16.36	150	132	9.5	38.1×35.5	9.1	3	●		●	●			●	●	●	●		●	●	R1
Centronics 152/4	£788	M 9×7				●		1	9600	708	6,8	10,12,16.5	150	217	9.5	38.1×35.5	9.1	3	●		●	●			●	●	●	●		●	●	R1

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
Centronics 154	£869	M 11×8		●		●			9600	2000	6,9,12,18	5,10,16.5	120	132	15	52.6×37.1	13	5	●		●			●	●	●	●			●		C1
Centronics 159/2	£881	M 9×7		●					N/A	768	6	5,8.18,10,16.36	150	132	10	38.1×35.6	10	5							●	●	●			●	●	B1
Centronics 351	£1,891	M 7×9		●	+	●			19200	2000	6,8	5,6,8.25,10,12,16.5	200	192	15	45.7×55.9	18	6	●	●	●		●		●	●	●	●	●	●	●	B1
Centronics 352	£1,966	M 7×8		●	+	●			19200	2000	6,8	5,6,7.5,8.25,13.2,15,16.5	200	218	14.5	55.9×45.7	18.1	6	●					●	●	●	●		●	●	C1
Centronics 353	£2,420	M 7×8			+	●			19200	4000	3,4,6,8,12	10,12,13.2,15,16.5	200	218	15	55.9×45.7	18.1	6	●		●			●	●	●	●		●	●	C1
Centronics 739/2	£710	M 11×9		●					2200	132	6	5,8.3,10,16.7	100	132	9	36.8×27.9	5.4	5	●			●		●			●	●	●		●	C1
Centronics 739/4	£786	M 11×9				●			9600	512	6	5,8.3,10,16.7	100	132	9	36.8×40.6	7.2	5	●			●		●			●	●	●		●	C1
Commodore 4022P	£454	M 6×7	●						N/A	N/A	2	5,10	40	80	10	36.8×33	9.9	3					●	●	●	●	●	●		●		C2
Commodore 8023	£1,029	M 5×8	●						N/A	N/A	2	5,10	150	250	15	51.4×36.8	11.6	3		●			●	●	●	●	●	●	●	●		C2
Data Products DP55	£1,687	Daisywheel				●		2	9600	1000	6,8	10,12,15	55	198	15	44.4×60.4	24	6	●	●	●	●		●	●	●	●	●		●	S1
Data Products M100	£1,790	M 9×9		+		+	1		N/A	N/A	6,8	5,8,10,16.5	140	218	16	67.5×59.4	27	6	●	●	●	●	●	●	●	●	●			●		S1
Data Products M120	£1,741	M 7×7		+		+	1		N/A	N/A	6,8	5,10,16.7	180	220	16	67.5×59.4	27	6							●	●	●			●		S1
Data Products M200	£1,979	M 7×7		+		+	1		N/A	N/A	6,8	5,10.8,16.7	340	340	16	67.5×59.4	27	6							●	●	●			●		S1
Data South DS180	£1,604	M 9×7	+	●	+	●		1	9600	2000	6,8	5,6,8.25,10,12,16.5	180	217	15.5	60.9×40.6	16	6	●	●	●		●	●	●	●	●			●		D2
Diablo SP1/P11	£2,127	Daisywheel				●			9600	256	6,8	10,15	40	198	16	56.9×46.3	27.2	6	●	●	●	●			●	●			●		●	M2
Diablo 630	£2,127	Daisywheel				●			9600	768	6,8,12	10,12,15	40	198	16.5	56.9×46.3	27	6	●	●	●	●			●	●	●			●	●	M2
DMP 100	£249	M 5×7		●		●			1200	2000	6,8	10.5	50	80	9.5	40.6×20.9	3.9	1	●	●	●		●	●		●	●			●	●	T1
DMP 200	£499	M 9×23		●		●			1200	2000	6,8	10	120	120	9.5	41.9×34.3	7.5	3	●	●	●	●	●	●	●	●	●	●		●	●	T1
DMP 400	£699	M 7×9, 9×9		●		●			1200	2000	6,8	10,12,16.7	140	220	15	61.9×40.4	19	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 500	£1,099	M 23×9		●					9600	2000	6,8	10,12,16.7	220	220	15	58.4×33	12.7	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 2100	£1,399	M		●		●			1200	2000	6,8,12	10,12,16.6	160	232	15	55.2×38.1	20	8	●	●	●	●	●	●	●	●	●			●		T1
DRE 8820	£895	M 9×7		○		○			9600	500	6,8	10,12.5,15,16.7	150	266	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8830	£1,300	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	180	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8840	£1,370	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	240	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8910	£1,585	M 9×7, 9×11		○		○			9600	500	6,8	10,12,13.3,15,17	160	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8925	£1,660	M 12×8, 12×20		○		○			9600	500	6,8	10,12,15,16.7	120	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRH 80	£621	M 7×9		○		○			9600	256	6,8	10,12.5,15,17.5	80	140	8	41.5×30	7.5	4	●	●	●		●		●	●	●	●	●	●	●	T1
DRH 136	£776	M 7×9		○		○			9600	2000	6,8	10,12,15,16.5	120	224	15.5	48.6×30.3	10.5	3	●	●	●		●	●	●	●	●	●		●	●	T1
DRS 250	£1,431	M 7×9		○		○			19200	512	6,8	10,12,15	250	198	6	61×45	25	5	●	●	●		●	●	●	●	●			●		T1
DWP 410	£995	Daisywheel		●					9600	2000	6,8	10,12	25	160	16	60.3×19.6	16	5	●	●	●	●			●	●	●		●	●	●	T1
Epson MX80	£401	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	5.5	3	●	●	●		●	●	●	●	●			●		E1
Epson MX80 FTT/3	£447	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	7.7	3	●	●	●		●	●	●	●	●			●		E1
Epson MX82	£470	M 9×9		●	+	+		1	19200	256	8	17.2	80	159	10	40.6×38.1	7.7	3	●	●	●	●	●	●	●	●	●	●	●	●	●	E1
Epson MX100FT/3	£574	M		●	+	+		1	19200	256	8	16.5	100	233	15.5	59.7×40	10	3	●	●	●		●	●	●	●	●	●	●	●	●	E1
Facit 4510	£672	M 9×7		○	○	○			9600	712	6,8	6,12,16,17.5	100	132	11.5	42.5×34.8	9	5	●	●	●	●		●	●	●	●	●		●	●	A2
Facit 4525	£1,150	M 9×9		○	○	○			9600	512	6,8	5,8.5,10,17	280	132	11.5	46.5×35.6	13.5	5	●	●	●				●	●	●			●		A2
Facit 4542	£2,300	M 9×14		●	+	+			9600	800	6,8	10,12,15	250	232	18	64×45.7	40	5	●	●	●	●	●	●	●	●	●			●		A2
Fujitsu 830	£2,179	Daisywheel		+	●	●			1200	256	3,6,8	10,12,15	80	204	15	59.7×44.9	18	6	●	●	●	●		●	●	●	●		●	●	●	Z1
General Electric 2030	£961	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	60	218	15.5	54.6×47.6	9.9	2	●					●	●	●	●	●		●	●	Z1
General Electric 2120	£1,751	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	150	218	15.5	54.6×47.6	9.9	2	●					●	●	●	●	●		●	●	Z1
General Printer GP300	£2,287	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	120	13.5	52×44.5	20	5	●	●	●	●	●	●	●	●	●		●		●	I2
General Printer GP300L	£2,490	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	132	13.5	63.5×51.5	24	5	●	●	●	●	●	●	●	●	●		●		●	I2
Integrex	£914	M 7×5, 9×6	+	●		+			N/A	37	6,8	10	125	80	10	38.7×32.5	9.6	1					●	●			●			●		D3
ITT Swift 3342	£1,719	M 9×7			○	○			1200	640	2,3,4,6,8,12	10,13,16.5	150	240	15.5	56×47	10.4	6	●		●				●	●	●	●		●	●	I3
ITT Swallow	£914	M 9×7		○	○	○			1200	640	2,4,6,8,12	10,13,16.5	60	240	15.5	56×47	10	6	●		●				●	●	●	●			●	I3
Lear Siegler	£1,667	M 9×9		○	○	○			19200	2000	6,8	10,12	180	218	16	68.6×50.2	22.7	5	●		●	●	●		●	●	●			●		I4
Logabax LX213	£1,840	M 9×9		+		●			9600	4000	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●				●	●	●			●		T3

Logabax LX217	£2,242	M 9×9		+		●			9600	400	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●				●	●	●		●	●						T3
Micro Peripherals 99G	£517	M 9×7, 11×9		●		●			9600	2048	6,8	10,12,16.5	100	136	9.5	41.1×27.3	6.7	2	●	●	●			●	●	●	●	●	●	●	●						T3
Micro Peripherals 150G	£918	M 9×7, 11×9		●		●			9600	8192	6,8	10,12,16.5	150	226	15	58.4×39.9	11.2	2	●	●	●		●	●	●	●	●			●						T3
MT120 I	£600	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	●						M3
MT120 L	£765	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	●						M3
MT1802 I	£1,845	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●				●	●	●			●						M3
MT1802 L	£2,205	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●				●	●	●			●						M3
MT440 I	£1,966	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.6	400	220	16	66×45.7	36	5			●				●	●	●			●						M3
MT440 L	£2,185	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.6	400	220	16	66×45.7	36	5			●				●	●	●			●						M3
MT420 I	£882	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●		●	●	●	●			●						M3
MT420 L	£954	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●		●	●	●	●			●						M3
MT140 I	£1,593	M 9×7	+	●	+	+			9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●		●	●	●						M3
MT140 L	£1,869	M 9×7	+	●	+	+			9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●		●	●	●						M3
Newbury Labs 1550	£747	M 9×7		○		○			9600	2000	6,8	5,6,8.5,10,12,17	120	230	15.5	55.9×30.5	11	3	●	●	●	●	●	●	●	●	●	●	●		●						N1
Newbury Labs 8510A	£552	M 9×7		○		○			9600	3000	6,8	5,6,8.5,10,12,17	120	132	10	55.9×28.6	8.5	3	●	●	●	●	●	●	●	●	●	●	●		●						N1
Newbury Labs NL40	£1,478	Daisywheel		○	○	○			2400	2000	6,8	10,12	40	163	15.5	55.9×43.2	14	2	●	●	●	●			●	●	●	●	●	●	●						N1
OKI Microline 80	£242	M 5×7		●		+			9600	256	6,8	5,10,16.5	80	132	9.5	34.2×24.5	6.5	4					●			●	●			●	●						X1
OKI Microline 82A	£425	M 9×7		●	●	+			1200	132	6,8	5,8.3,10,16.5	120	132	9.5	36.1×32.8	8.9	4	●		●		●		●	●	●	●		●	●						X1
OKI Microline 83A	£608	M 9×7		●	●	+			1200	132	6,8	5,8.3,10,16.5	120	132	15	51×32.8	14	3	●		●		●		●	●	●	●		●	●						X1
OKI Microline 84	£975	M		○	○	●			4800	132	6,8	5,8.3,10,12,17	200	231	15	51×32.8	14	3	●	●	●	●		●	●	●	●		●	●	●						X1
Olivetti DM5050	£575	M 7×9		●	+	+		4	9600	1000	6	10,12.5,16.5	100	132	9	11.6×30	7.5	2	●	●	●			●		●	●	●		●	●						B2
Olivetti DM5100	£1,033	M 7×9	○	○	○	○			9600	256	6	10,12,16.5	140	220	14.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●						B2
Olivetti DM5200	£1,351	M 7×9	●	+	+	+			9600	256	6	10,12,16.5	200	220	19.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●						B2
Olivetti DY-211	£862	Daisywheel	+	●	+	●			9600	1000	6	10,12,15	29	198	17	54.1×32.8	16.3	4	●	●	●	●			●	●	●	●	●	●						B2
Olivetti DY-311	£1,322	Daisywheel	+	○		○			9600	1000	6	10,12,15	39	225	17.25	60×50	17	4	●	●	●	●			●	●	●	●	●		●						B2
Olivetti JP101	£420	Dry Ink Jet		●	+	+			9600	1000	6,8	10,12,18	50	147	9	39×26.8	5.2	1	●				●	●	●	●	●	●			●						B2
Olivetti TH240	£661	Thermal 5×7			+	●			9600	1000	6	10	240	80	8.75	40.1×34	7.5	1	●	●				●		●		●			●						B2
Olympia ESW102RO	£1,917	Daisywheel	+	+	+	●			19200	4000	6	10,12,15	24	141	17	52.8×37	13	6	●	●	●	●	●		●	●	●		●	●	●						I5
Olympia ESW103KSR	£1,263	Daisywheel	+	+	+	●			19200	4000	6	10,12,15	24	212	17	52.8×43.1	14.5	6	●	●	●	●	●		●	●	●		●	●	●						I5
Olympia ESW3000RO	£1,306	Daisywheel	○	○		○			19200	4000	3,4,6	10,12,15	50	225	17	60.4×40.8	19.5	6	●	●	●	●	●		●	●	●		●	●	●						I5
Phillips Mullard GP300	£2,287	M		+		●			19200	512	3,4,6,8,12	10,12,15	300	180	14.4	64.5×52.3	24	6	●	●	●	●	●	●	●	●	●	●	●	●	●						R2
Printex 920	£2,012	M		+		●			9600	1792	6,8,12,16	10,12,13.3,16.7	340	227	16	59×42.5	20	4	●	●	●		●	●	●	●	●				●						T3
Qume Sprint 9/35	£1,892	Daisywheel				+	1		9600	500	6,8	10,12,15	35	198	15	61.3×49.9	19	3	●	●	●	●	●		●	●	●	●	●			●						Q1
Qume Sprint 9/45	£1,966	Daisywheel				+	1		9600	500	3,6,8	10,12,15	45	198	15	61.7×42.5	20.4	3	●	●	●	●	●	●	●	●	●	●	●			●						Q1
Qume Sprint 9/55	£2,403	Daisywheel				+	1		9600	500	3,6,8	10,12,15	55	198	15	61.7×42.5	20.4	3	●	●	●	●	●		●	●	●	●	●			●						Q1
Rair Decwriter III	£2,261	M 7×7			+	●			9600	1000	2,3,4,6,8,12	5,6,6.6,8.25,10,13.2,16.5	180	132	15	69.9×60.9	46.4	3	●							●	●	●		●						R1
Rair Decwriter IV AA	£1,200	M 7×9			+	●			300	256	2,3,4,6,8,12	5,6,6.6,8.25,10,13.2,16.5	30	127	15	57.1×39.4	11.3	3				●				●	●				●						R1
Rair 630	£1,940	Daisywheel			+	●			9600	768	6,8	10,16.5	40	196	15	59.9×46.4	27.2	2	●		●	●			●	●	●	●	●	●	●						R1
Rair 820	£1,529	M 9×7			+	●			9600	1280	6,8	10,16.5	150	132	15	66×53.4	18.2	6	●		●				●	●	●	●		●	●						R1
Rair Centronics 150/4	£722	M 9×7		+		●			9600	N/A	6	10	150	132	10	38.1×35.6	9	2		●					●	●	●	●	●	●	●						R1
Rair/Texas Instruments 743	£1,437	Thermal				●			300	N/A	6	10	30	80	8.5	39.1×40.6	6.1	1	●									●		●						R1
Ricoh RP1300 Flowriter	£1,144	Daisywheel	○	○		○			9600	200	8	10,12,15	37	163	15	59.3×33.2	14	7	●	●	●	●	●	●	●	●	●	●	●	●	●						A1
Ricoh RP1600 Flowriter	£1,782	Daisywheel	○	○		○			9600	2000	8	10,12,15	60	163	15	62.5×35.5	22	7	●	●	●	●	●	●	●	●	●	●	●	●	●						A1
Ricoh RP1600S	£1,667	Daisywheel	+	+		●			9600	4000	6,8	10,12,15	65	204	13.5	63.5×36.2	27	7	●	●	●	●		●	●	●	●				●						M4
Sanders S700	£2,875	M		●		●			9600	2000	6,8	6,10,12,15,17,18	450	234	14.5	47×56.9	23.6	5	●	●	●	●	●	●	●	●		●			●						A2
Seikosha GP100A	£247	M 5×7	+	●	+	+			9600	256	6	6,12	50	80	10	42.7×23.8	4.5	3		●				●			●									D4
Smith Corona TP1	£557	Daisywheel		○		○			19200	N/A	3,4.5,6	10,12	120	126	13	49.5×31.5	8.4	5	●	●	●					●	●	●			●						D1
Sord SLP160	£724	M		●					9600	136	6,8,9	10,12	120	136	15	51×36	13	5	●	●	●		●	●	●	●				●	●						S12
Sord SWP20	£1,444	Daisywheel		●		+			9600	2000	6,8	10,12,15	16	132	15	66×44.7	22	5	●	●	●	●		●	●	●	●			●	●						S2
Star DP-8480	£251	M		●		+			2400	132	6,12	10,12,16.7	100	132	10.5	39.4×32.4	8.5	2	●			●		●	●	●	●			●	●						S3
Systime Systerm	£1,909	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●			●						S4
Systime Sysprint-P	£1,714	M		●					9600	256	6,8	10	150	132	16	71.7×61	50	6			●		●		●	●	●			●						S4
Systime Sysprint-S	£1,599	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●			●						S4
Tandy TRS 80 DW2	£1,299	Daisywheel		●					9600	2000	6	10,12	43	163	16.5	62.4×20.4	27	4	●	●	●	●				●	●		●	●	●						T1
Texas Instruments 743	£1,271	Thermal 7×5			●	●			300	N/A	6	10,17	30	80	8.5	39.1×40.6	6	1									●				●						D5
Texas Instruments 745	£1,470	Thermal				●			300	256	6	10,17	30	80	8.5	39.1×40.6	13.5	1									●									R1

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PRINTERS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+) I-EEE	Centronics	20ma	RS232	Others ●	Others (+)	Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method: Fan Fold	Roll	Cut Sheet	Tractor	Frictional	Distributor
Texas Instruments 781	£1,259	Thermal 7×5			●	●			9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1							●	●		●			●	D5
Texas Instruments 810	£1,369	M 9×7		+	+	●			9600	256	6,8	5,8,10,16.5	150	132	15.5	65.4×50.8	25	9							●	●	●			●		D5
Texas Instruments 820	£1,438	M 9×7			○	○			9600	2000	6,8	5,8,10,16.5	150	218	15.5	64×45.7	40	5							●	●	●			●		D5
Texas Instruments 840	£847	M 9×9			+	●			9600	256	6,8	10,16.5	75	220	15	57.6×43.2	11.3	3							●	●	●	●		●	●	R1
TRD 170S	£834	Daisywheel		○		○			19200	256	6	10,12,15	17	132	15.5	50.8×33	13	6	●	●	●	●			●	●	●				●	T2
Toshiba T1350	£1,898	M		○		○			9600	256	6	10,12	192	192	15	55×38	19.9	3	●	●	●	●	●	●	●	●	●	●	●	●	●	T4
Walters WM2000	£477	M 9×9	+	●	+	+			19200	750	6,8,12	5,6,6,8,3,10,13,3,16,6	128	132	10	43.9×33.5	12	4	●	●	●		●	●	●	●	●			●		W1
Walters WM4000	£713	M 9×9	+	●	+	+			19200	1500	6,8,12	5,6,6,8,3,10,13,3,16,6	150	220	15	63×39	13	5	●	●	●		●	●	●	●	●			●		W1
ZX Printer	£60	Electrical						1	N/A	N/A	9	32	50	32	4	14×4.6	N/A	1			●		●	●				●			●	S5

MONITORS

These have been split into **colour** and **monochrome.**

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals to which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture.

Dimensions indicates the area the unit occupies on the desktop.

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Crofton C1401	£300	14			●					10	600	37×42	10	C4
HM 2713	£3,120	13			●					25	720	54×40	36	B1
HM 2719B	£2,553	19			●					25	960	50×49	46	B1
HM 2719C	£3,042	19			●					25	960	50×49	46	B1
HM 3619	£3,548	19			●					45	1280	50×44	48	B1
Lion Cub 1431-TTL	£286	14			●					7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14					●			7	585	65×57.5	11.5	S6
Lion Cub 1439	£339	14				●				7	585	65×57.5	11.5	S6
Lion Cub 1441-TTL	£546	14			●					15	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14				●	●			15	895	65×57.5	11.5	S6
Lion Cub 1449	£604	14				●				15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14			●					10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14				●	●			10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14				●				10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20			●					7	585	65×57.5	11.5	S6
Lion Cub 2035	£431	20				●	●			7	585	65×57.5	11.5	S6
Lion Cub 2036	£390	20					●			7	585	65×57.5	11.5	S6
Lion Cub 2039	£371	20				●				7	585	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Lion Cub 2051-TTL	£646	20			●					10	940	65×57.5	11.5	S6
Luxor Digital	£574	14			●			●	●	25	800	N/A	15.7	P1
Luxor Linear I	£597	14				●		●	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14			●			●	●	25	800	N/A	15.7	P1
Microtech 14	£402	14		●	●	●		●		18	585	33.7 × 40.8	12.6	M6
TM 22	£329	6				●		●		5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14				●		●		5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14				●	●			7	653	65×57.5	11.5	S6
Wolf Cub 1446-TTL	£587	14					●			15	895	65×57.5	11.5	S6
Wolf Cub 1456	£454	14					●			10	653	65×57.5	11.5	S6

MONOCHROME MONITORS

Make & Model	Price inc. VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
AVT DM 210G	£138	12	●		Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●		Green		8	700	37.5×29	8	L1
EG 101	£91	12	●		Green		12	700	37.5×29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
Luxor 15	£283	15	●		Orange	●	22	625	N/A	13	P1
M9	£131	9	●		Green		15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●		Green		15-22	800	29.3×30	9.3	P1
Novex	£114	12	●		Green		12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green		24	800	23×26.5	7	P1
Prince	£126	12	●		Green		24	800	33×50	7	C4
PM 102	£126	9	●		Green	●	24	800	22×28	7	C4
PM 1201	£138	12	●		Green		24	800	33×50	7	C4
Zenith ZVM121	£99	12	●	●	Green	●	15	N/A	29×29	6.5	P2

Continued page 78 ▼

DISK DRIVES

This section is divided into categories covering 5¼in and 8in floppy disks.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single or double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single or double** (data) **density. BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect to** column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

5¼" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
Atari	£299	90K	1	40	Soft	SS.SD									●	A4
BASF 6106	£195	500K	1	48	Both	SS.BD					●					B6
BASF 6108	£240	500K	1	48	Both	DS.BD					●					B6
BASF 6118	£279	1Mb	1	96	Both	DS.BD					●					B6
Canon X8300	£600	640K	2	80	Soft	DS.DD									●	C5
CD 40	£679	400K	2	40	Both	SS.BD									●	C6
CD 50A	£424	500K	2	40	Both	SS.BD					●					C6
CD 50E	£569	1Mb	2	80	Both	SS.BD					●					C6
CD 50F	£712	2Mb	2	80	Both	DS.BD					●					C6
CD 80	£765	800K	2	80	Both	SS.BD									●	C6
CD 80D	£949	1.6Mb	2	80	Both	DS.BD									●	C6
Commodore 2031	£454	171K	1	35	Soft	SS.DD	●									C2
Commodore 4040	£799	343K	2	35	Soft	SS.DD	●									C2
Commodore 8050	£1,029	1Mb	2	77	Soft	SS.DD	●									C2
Commodore 8250	£1,489	2Mb	2	154	Soft	DS.DD	●									C2
Commodore VIC 1541	£345	171K	1	35	Soft	SS.DD									●	C2
Control Data 9408	£221	250K	1	40	Both	SS.BD					●					C7
Control Data 9409	£272	500K	1	40	Both	DS.BD					●					C7
Control Data 9409T	£420	1Mb	1	80	Both	DS.BD					●					C7
Control Data ZL141	£225	250K	1	40	Both	SS.DD			●							M5
Control Data ZL141B	£175	250K	1	40	Both	SS.DD			●							M5
Control Data ZL142	£360	500K	2	40	Both	SS.DD			●							M5
Control Data ZL241B	£240	500K	1	40	Both	DS.DD			●							M5
Control Data ZL291	£380	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL291*	£405	500/1Mb	1	40/80	Both	DS.DD			●							M5
Control Data ZL291B	£320	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL292	£640	2Mb	2	80	Both	DS.DD			●							M5
CS 40	£482	200K	1	40	Both	SS.BD									●	C6
CS 50A	£229	250K	1	40	Both	SS.BD					●					C6
CS 50E	£305	500K	1	80	Both	SS.BD					●					C6
CS 50F	£397	1Mb	1	80	Both	DS.BD					●					C6
CS 80	£523	400K	1	80	Both	SS.BD									●	C6
CS 80D	£627	800K	1	80	Both	DS.BD									●	C6
Cumana AS100	£252	200K	1	35	Soft	SS.BD				●						C6
Cumana DA8035	£857	655K	2	80	Soft	SS.BD				●						C6
EG 401AT	£370	102K	2	40	Soft	SS.BD					●					L1
Gemini 825	£403	400K	1	80	Soft	SS.DD						●				G2
Gemini 825	£518	800K	1	160	Soft	DS.DD						●				G2
Gemini 825	£661	800K	2	80	Soft	SS.DD						●				G2
Gemini 825	£776	1.6Mb	2	160	Soft	DS.DD						●				G2
Lowe EG 400AT	£426	200K	2	40	Soft	SS.BD					●					L1
Lowe EG 400T	£253	102K	1	40	Soft	SS.BD					●					L1
M 4853	£311	1Mb	1	80	Soft	DS.DD					●					A3
M 4854	£368	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastore MIOS	£1,034	1.2Mb	2	80	Soft	DS.DD				●					●	V1
Multi Floppy Drive	£592	8Mb	5	770	Soft	SS.DD	●									H1
RM MDS-1	£1,950	144K	1	40	Soft	DS.SD		●							●	R3
RM MDS-2	£2,147	288K	2	40	Soft	DS.SD		●							●	R3
Scorpio 8	£863	8Mb	5	770	Soft	SS.DD	●									H1
Sharp MZ80 FB	£856	560K	2	70	Soft	DS.DD									●	S7
Tandy Colour	£449	175K	1	40	Soft	SS.DD									●	T1
Tandy 26-1160	£299	75K	4	40	Soft	SS.SD					●					T1
Tandy 26-3023	£299	156K	4	35	Soft	SS.DD					●					T1
Tandy Model 1	£389	90K	1	35	Soft	SS.SD									●	T1
Tandy Model 111	£369	175K	2	40	Soft	SS.DD									●	T1
TM 101-4	£282	1Mb	1	160	Soft	SS.DD	●									H1
TM 102-2	£393	2Mb	1	160	Soft	SS.DD	●									H1
TM 848-1	£389	800K	1	77	Soft	SS.DD	●									H1
TM 50-1	£147	250K	1	40	Soft	SS.DD	●									H1
TM 100-1	£158	250K	1	40	Soft	SS.DD	●									H1
TM 100-2	£221	500K	1	80	Soft	DS.DD	●									H1
TM 100-4/4M	£247	1Mb	1	160	Soft	DS.DD	●									H1
Tracker 1	£373	1Mb	2	80	Soft	SS.DD					●					D7
Tracker 2	£497	2Mb	2	80	Soft	DS.DD					●					D7

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of discs	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
ACP 700 (AC)	£293	1Mb	1	77	Soft	DS.DD									●	E2
ACP 750 (DC)	£316	1Mb	1	77	Soft	DS.DD									●	E2
ACP 1500 (DC)	£403	2Mb	1	77	Soft	DS.DD									●	E2
Caldisk 142M	£465	500K	1	77	Both	SS.BD									●	E2
Caldisk 143M	£522	1.2Mb	1	77	Both	DS.BD					●					F1
Caldisk 143M-1	£465	500K	1	77	Both	SS.BD					●					F3
Commodore 8280	£2,760	987K	2	77	Soft	DS.DD	●									C2
Canon X 8330	£1,200	2Mb	2	153	Soft	DS.DD									●	C5
Control Data 9404B	£684	800K	1	77	Both	SS.BD					●					M5
Control Data 9406-4	£1,144	1.6Mb	1	77	Both	DS.BD					●					M5
Eicon FD8/1D/DD	£1,438	1Mb	1	77	Soft	SS.DD				●						E3
Eicon FD8/1D/SD	£1,397	500K	1	77	Soft	BS.SD				●						E3
Eicon FD8/2D/FBR	£1,740	1Mb	2	77	Soft	DS.SD									●	E3
Eicon FD8/2D/DD	£2,013	2Mb	2	77	Soft	SS.DD				●						E3
Eicon FD8/2D/SD	£1,972	1Mb	2	77	Soft	SS.SD				●						E3
Eicon FD8/1D/FBR	£1,240	500K	1	77	Soft	DS.SD									●	E3
F 311	£1,725	1.2Mb	2	76	Soft	DS.SD									●	B5

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
F 320	£2,300	2.4Mb	2	76	Soft	DS.DD									●	B5
M 2894	£499	1.6Mb	1	77	Soft	DS.DD					●					A3
M 2896	£493	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS.DD				●						V1
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS.SD				●					●	V1
Megastor 111	£1,121	2Mb	2	77	Soft	DS.DD				●					●	V1
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS.SD	●								●	R3
Tandy Model 11	£999	486K	1	77	Soft	DS.SD.									●	T1
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS.DD									●	T1
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS.DD									●	T1

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A **D** in the **connection** column represents direct link, while **A** indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A **B** in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The **interface** column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once.

Some modems can **originate** a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Others	Capabilities: Asynchronous	Synchronous	Simplex	Half Duplex	Full Duplex	Originate	Answer	Distributor Code
AJ 311	£320	B	300	RS232		●			●	●	●	●	A5
AJ 1222	£736	D	1200	RS232		●	●			●	●	●	A5
AJ A211	£263	A	300	RS232		●			●	●	●		A5
AJ 1234	£684	A	1200	RS232		●	●			●	●		A5
AJ 1256	£684	B	1200	RS232		●	●			●	●	●	A5
AM 211	£387	B	300	RS232		●			●	●	●		A5
Bermac 1200/1 Model A	£414	D	1800	RS232		●			●		●		B3
Bermac 1200/1 Model B	£460	D	1800	RS232		●			●		●	●	B3
CCITT CAT	£228	A	300	RS232/V24		●			●	●	●	●	D8
CDSV22	£719	D	1200	RS232/V24		●	●			●	●	●	D8
DSL2123	£329	D	300/1200	RS232/V24		●			●	●	●	●	D8
Sendata 700 Series A	£253	A	300	RS232, 20ma	1	●				●	●	●	B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1	●				●	●		B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1	●			●		●	●	B4
Sendata 700 Series D	£309	A	75-1200	RS232, 20ma	1	●				●	●	●	B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1	●		●			●		B4
Racal 126 LS1	£782	D	2400	V24			●			●	●	●	R2
Racal MPS 3021	£295	D	300	V24		●				●	●	●	R2
Racal MPS 1222	£678	D	1200	V24		●	●			●	●	●	R2

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types—flatbed or drum. A **flatbed** holds the paper flat while the pen draws on it in two dimensions. A **drum** plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size. Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in secs.	Interface (+ at extra cost)	Distribution
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
Strobe 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4633	£2,772	Flat	10	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4634	£2,515	Flat	2	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4636	£3,074	Flat	10	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Altex Microcomputers Ltd, Reading 791579 **A4** Atari International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, Slough 25172
B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200
C1 Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Calcomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-891 1923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097
D1 Discom, Evesham 3591 **D2** Datatrade Ltd, Northampton 22289 **D3** DNCS Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650 **D8** Dacom Systems, Milton Keynes 676797
E1 Epson (UK), 01-900 0466 **E2** Elecomatic, 041-881 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115
F1 Fastcol, Reading 791557
G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321
H1 HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Asoc. Ltd, 01-428 0111
I1 Informex Ltd, 01-318 4213 **I2** Intac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Interfaces, Stratford-upon-Avon 296879
J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Locksheath 4221 **J3** JVC, 01-450 2621
L1 Lowe Electronics, Matlock 4995
M1 Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macclesfield 615384 **M5** Microware, 01-272 6237 **M6** Microtech Leeds, Leeds 679964
N1 Newbury Data Recording, Newbury 48864
P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011
Q1 Qume (UK) Ltd, Reading 584646
R1 Rair Ltd, 01-836 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866
S1 Sintron Electronics, Reading 875464 **S2** Sord, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Systime, Leeds 702211
S5 Sinclair Research, Camberley 681666 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics, 061-205 2333
T1 Tandy Company, Walsall 648181 **T2** Triumph Adler, 01-250 1717 **T3** Technology For Business, 01-837 1271 **T4** Toshiba Office International, Sunbury-on-Thames 85666
V1 Vlasak, High Wycombe 448633
W1 Walters Microsystems Int Ltd, High Wycombe 445175
X1 X-Data Ltd, Slough 723331
Z1 Zygal Dynamics, Bicester 3361

PCN Billboard

Vic 20 tape deck, 16K + 3K Super Expander, Intro Basic 1 & 2, covers, joysticks, software inc. Gorf, Omega Race, physics and maths O-level revision and books. Worth over £650. Take £350 ono. Tel Swanley 67514 (Andrew)

Newbrain Test Paper. Multiple choice database creates own test questions. Excellent performance, recording, value. Great revision aid. £4. B. A. Elvy, 69 The Bowls, Vicarage Lane, Chigwell, Essex.

48K Spectrum and printer, 10 rolls paper. Unwanted gift, original packing plus software including Hobbit, Pimania, Spectral Invaders, Orbiter and many other books, games. £215. Tel Bournemouth 0202-767989.

Acorn Atom 12K, PSU, manuals, software, all in good condition, £100.. Also Atari software. Star Raiders, £20. Temple of Apshai, £20. £35 for both. Tel Purfleet 6625 evenings.

Wanted BBC Computer, Model A or B. Will pay up to £250. Call Keith on 01-777 4714 preferably in evenings.

48K Spectrum used twice, plenty of software and books including Arcadia, Intruders, Mined-Out and more. £200 complete, (still boxed). Tel Newton Hill 30457 after 4.30pm, ask for Stuart.

ZX 81 and 16K improved keyboard, £45. Some software. Tel 01-992 9019 evenings.

Epson MX80FTIII, perfect condition, rarely used, six months old, £299 ono.Tel 01-654 4054 after 5pm. Ask for Alan.

TI-99/4A, speech synthesizer, cassette recorder, cassette cables, joysticks, over £120 of cartridges, plus some cassettes, manuals, magazines. New £600+, bargain at £450 ono. Tel 051-342 2256 (Ian) after 5pm. Buyer collects.

Apple Silentype printer, including interface and manual, as new £120. Tel 0902 334106 (Wolverhampton).

MZ80A 5 months old, plus software, books etc. As new £400 or exchange other system. Tel 01-908 1460.

Atari VCS game £70, with Combat, Jedi, Arena £20, Star Raiders £18, Berserk £15, Chopper Command £15, Empire Strikes Back £17, Atlantis £15, Riddle of The Sphinx £15. Mint Condition. Tel Bristol 838152.

Sharp PC1500 pocket computer, as new, only 30 hours' use. Paid £160, will sell for £110 ono. Not needed as upgraded to bigger machine. Tel Ramsey 842325 evenings.

48K SPECTRUM and printer £200. Over £120 of best software and books £60 ono. Tel 0734 783563.

Vic 20 C2N cassette unit, extra memory, Super Expander cartridge, joystick, games and programmers' reference guide. Five months old, still under guarantee. Cost £230, accept £165. Tel Brighton 37652 (Sussex).

Video Genie EG3003 with sound, RS232 interface, programs including T-Bug, Renumber, user defined keys, games. As new with all manuals and TRS80 books. £250 ono. Tel Gravesend 63331.

Will exchange physiology apparatus-Washington 2 channel oscillograph, biopreamp, couplers, stimulator, etc., cost £1,500 new, for newish commodore 64, disk drive, colour monitor/TV. Will sell also for £950 ono. Tel Biggin Hill 71798.

Sinclair Spectrum 16K as new plus software, inc. Invaders, utility programs. £115. Tel Reading 692977 after 5.30pm.

Vic 20, C2N cassette drive, two cartridges (Jelly Monsters and Star Battle). Two books and joystick. Only four months old and in mint condition. £160 ono. Tel 0732 355710.

Screen dumping for cassette systems, saves contents of the screen on paper, compatable with Research Machines 380Z and other micros using the point command when in conjunction with Epson printers. Tel 021-773 3389.

Superb 3-D strategy game which runs on Spectrum (16K and 48K). Full machine code, really tests your skill and wits. £5 ono. Tel 01-531 2892 (Freddy) evenings or weekends.

UK101 16K, Cegmon, ROM Toolkit, cased, sound board plus software and other extras. £100 ono.Tel Medway 576561.

Vic-20 Super Expander, Forth Language cartridge, games cartridges: Rat Race, Star Battle, C2N. Cassette deck, joystick and stand, magazines, Vic Revealed. Very good condition. Will accept £190. Tel 061 4852477.

ZX81 plus 16K, proper keyboard, games controller, numeric keypad, joystick interface, £30 of software, all worth £150. Selling for £100 ono. As new. Apply to D. Salt, 23 Fore Street, Polruan, Fowey, Cornwall.

Sharp PC-1500 with printer and cassette interface, instructions, colour pens, cassette leads and 8K RAM, £190.Tel Norwich 610338 after 5.30pm.

Exchange Commodore 64 single disk drive (1541), as new, for any Commodore twin disks. Tel Erith 41018 evenings.

Learning to use the V-20 computer by Ron Geere, new condition £3 p.p. John Wright, 16 Grosvenor West, Baldock, Herts SG7 6NZ.

Sharp MZ-80A 48K RAM, 6 months old.Comes with original software package (worth £75), Forth and Assembler. First offer over £414 accepted. All in original packaging. Tel 01-642 5785 (Chris) after 6pm.

Atari 400, program recorder, Basic cartridge, joysticks, manuals, over £350 of software: Star Raiders, Seadragon, Choplifter etc. Excellent condition. In original packaging, still under guarantee, only £400. Tel Leic 0533 64980 between 5-7pm.

Videomaster database video game cartridges: Boxing, Four in a Row, Maze, Air Sea Battle, Bat and Ball, Shooting Gallery, Space Wars and Horse Racing. All boxed. £5 each. Tel 01-689 8420.

Sinclair printer with three rolls of paper and instructions. Excellent condition. £35. Tel Leeds 0532 671856 evenings only.

Genie EG3003 32K loud speaker plus games including Chess, Space Invaders, also three user books, programming book. £250 or £275 with extra tape recorder and lead. Tel Mkt. Harborough 62665, ask for Peter.

NEWBRAIN AD 32K. Beginner's Guide, Database, Startrek. £180. Philips amber screen 12in Hi-Res monitor £80 or £250 for both. Tel Uckfield 0825 4742.

ZX81 + 16K RAM, Kayde Graphics ROM, data 2000 console case, plus cassette programs. Worth £125, will sell at £70 ono. Tel Stalybridge 303 8530 day or night.

Microtan 65, Tanex. 8K RAM, basic toolkit and X bug, ROM, many games, word processor, full K/B, £390 ono. Epson MX80 FT1 printer and connectors, £270 ono. Tel Hollington 088 926 221 (Staffs).

Sold all my toys, raised £90, need 16K Spectrum or Dragon 32. If you can help Tel Bolton 0204 389498.

ZON X-81 sound pack £20 ono. Sinclair 16K RAM £20 ono. Portable cassette recorder (suitable for ZX81) £10. QS Asteroids, Invaders, £2 each. Tel 0532 602706.

Vic 20 games to swop or sell. Great cassettes including, Traxx, Defender, Abductor, Shadowfax. Plus Gorf to swap for other cartridge or good 8K-16K software. Tel 031-661 7477 evenings or weekends.

ZX81 16K manual, books, leads etc. Kayde keyboard, software worth over £50: adventures, arcades, 3D Monster: Maze etc. Books worth up to £30. Asking £70 overall. Tel Liphook 723338 after 6pm. preferred.

Printer £50. Tandy quick printer-2 for less than a Sinclair ZX printer! New, unused, purchased from Tandy, complete with TRS80 I/F cable and four rolls paper. Tel Mike 01-836 8000 (work).

VIC20 + 3K, Datassette, joystick, Super Expander, Avengers, Rat Race, Starbattle, Omegarace cartridges. 15 cassettes including Vicmen, Frogger, Myriad. Many books and magazines. Worth £450, fully boxed. Sell for £270. Tel Tatsfield 656.

BBC software, 32K Chess (program power), £4. Castle of Riddles (Acornsoft) £5 or swop for other games. Tel 021-430 4394.

BBC disks manual wanted, to borrow or swop software or maybe buy. Also disK interface chips with fitting details. Tel 0423 872045 evenings/weekends.

Open University Hektor with complete set of course manuals: Microprocessors and Product Design, A Course for Engineers. Covers 8085 Machine Code. (Cost £399), £225. Tel Godalming 04868 22699.

Wanted: Commodore Vic-20 Super Expander, motherboard (switchable), Commodore O level cassettes, good condition please. Will swop for Gorf and plenty of brilliant cassettes, including Traxx, Defender, Wacky Waiters, Skramble! Tel 031-661 7477.

Black and White monitor, composite video input in metal case, £45. Tel East Grinstead 24220 (Sussex).

76K Spectrum, ZX printer, both two months old, 5 rolls printer paper, two blank tapes, two books and some magazines, £190. Tel 0933 315575 Kieron Brogan, Higham Ferrers after 5pm.

Nascom 2 40K RAM 8K Basic built into a fan-cooled case and mains filter, £185. Tel: East Grinstead 24220 (Sussex).

Prestel Ace telecom adapter in perfect condition and never been opened. Comes complete with all connecting leads. Requires only Post Office jack socket. Only £70. Was purchased at £160. Tel Mr Girdlestone 0226-43340.

Dragon 32K with two cartridges, Ghost Attack and Meteoroids. Also including four games cassettes and two joysticks, excellent condition, £250, worth £300. Tel Horsham 62953 after 8pm.

Video Genie EG3003 48K RAM, sound, manuals, books, leads, software, (approx. £700 worth). All worth over £1,000, bargain at £250 ono as need the money. Tel Gt. Yarmouth 0493 662102 after 5pm.

Acorn Atom 8K + 12K. Good PSU. B & W TV. Atom Magic book, Invaders, assorted tapes and listings, £110 the lot. Tel 01-852 7879 evenings or weekends.

WANTED: very cheap Acorn Atom, any size memory and ROM, must have PSU manual and leads. Offers around £70. Tel Blyth 61096.

48K Spectrum one month old, boxed and complete. Plus software including Timegate, Meteor Storm, White Noise and Graphics, Chess, VU-3D, plus books and magazines. Cost me over £210. Bargain at £180. Tel 01-427 7809.

Acorn Atom 12K + 12K. Full colour graphics, input output socket, joystick, software inc. 20 games, Defender, Packman, 747 Flight Simulation, etc. Cost £320, selling at only £180 ono. Tel 01-456 3383.

Atom Acornsoft Word Pack (ROM) £20.Utility Pack 1 (tape) £7. Apple II/TRS 80 (I or III) adventures 1, 2, and 3 by Scott Adams (one disk) £20. Apple II CRAE program editor (disk) £10. Tel Folkestone 51248 (Dougal).

Vic 20 C2N cassette unit 16K RAM pack, software included, only 9 months old, condition as new, 15 months guarantee left, only £195 ono. Tel Epping 76377 ask for Courtney.

Vic 20, C2N, 8K RAM, Super Expander and 'Boss' chess. Bought in November 1982. As new and boxed. Lifetime offer for £150. Contact Abidin, tel 01-205 6390 (London) after 8pm.

UK101 joysticks, Atari type fully fitted, £15 for one, £25 for two. Also available, some software. Contact M. Leslie, tel Welwyn Garden City 35949 anytime.

Wanted ZX81 with the leads and manuals. First offer of £25 or under accepted. Tel 01-994 51421.

Sharp MZ80K, 48K, 19 months old, excellent condition, four languages, Knight Commandor, Copy file, plus approx. 185 programs, dust cover, £430 or will swop for BBC B. Tel 0264-58454 evenings.

Vic-20, cassette unit, tapes, joystick, reference guide, Vic Revealed, 3K-RAM, hi-res cartridge, more books, manuals. £179 ono or Spectrum and printer. Tel 051-526 3775.

ZX Spectrum tape of four games and four useful programs, eg Gorilla, Frogga, Histogram and Language, only £3. Worth at least £12. Nick Pounder, 59 Hadrian Way, Sandiway, Cheshire, CW8 2JT. S.A.E. please!

American 80-micro and 80US mags wanted. Also stringy floppy for TRS80. G. O'Reilly, 96 Boulevard North, Bayside, Dublin 13.

TI58C programmable calculator for sale. Good condition with many scientific and games programs. £50 ono. Tel 0425 55511 evenings, ask for Philip.

Vic 20, C2N cassette player, carrying case, three ROMS, an assortment of cassettes, magazines, manuals and a range of other items, worth £400 ono. Tel 01-764 1501 after 4.30pm.

ZX81 16K, all Sinclair built. Monster Maze, Trader, Donkey Kong, Black Crystal, plus Arcade Game cassette. Cost £134, will accept £75. Tel 0533-783136 after 5pm. please.

Pet 4016 16K RAM + programmer's tool-kit. Very good condition, original packaging, some games including Asteroids, Pacman, Invaders. £350 ono. Tel 01-267 5035 evenings, or write: David Korn, 51 Lady Margaret Road, London, NW5 2NH.

Video Genie EG3003 16K RAM. Integral cassette, manuals leads, monitor and some games. Offers around £100. Tel Crayford 528119. (Items may be sold separately).

ZX81 16K with leads and manual, over fifty program listings, lots of cassette software including 3D Defender, Chess, QS Scramble, Muncher, also lots of magazines, excellent condition, £100 ono. Tel 0740-53635.

Exidy Sorcerer 32K, boxed, Basic ROM pack, UHF modulator, manuals, £250. New orange monitor, £120. New Microline 82A dot matrix printer, £300. The lot £600. User group magazines. Tel 01-573 7372 day, Camberley 31963 evenings.

Acorn Atom 16K ROM, 12K RAM, PSU, 8225, loads of games and 2 databases. Over £50 of software. Can deliver anywhere. Worth over £350, will accept £150. Tel 061-681 2875 evenings.

ZX 81 16K RAM complete with manuals, power supply, leads, software, etc.

PCN Billboard

Cost over £125. Bargain for £85. Tel Coventry 664420 after 5pm. Ask for Sundip.

ZX Spectrum wanted in exchange for Philips G7000 Video Game plus cartridges and cash. Will also accept other computers like Vic-20 etc. Total value of Video Game £155. Tel 051-426 8238 (David Clarke).

Osborne-1 plus 12in monitor and Epson MX-80 F/T-3. Standard software, will separate. Emigrating. Offers, Peter Clark, 67 Flockton Court, Rockingham Street, Sheffield, S1 4EB.

Wanted: Sinclair ZX81 16K RAM complete with manual, power supply, leads, software, books etc. Printer not required. Please write to:Mr. L. Fairbairn, 8 Darcy House, Spendells Close, Walton-on-Naze, Essex.

ZX 81-16K less than year old plus Sinclair Bank Account, Compucalc £65. ZX 81 M'code book £3, cost £7. Halfacre, 53 Silvester Close, Basingstoke, Hants RG21 2HX. Tel 0256 24635 after 6pm.

Atari VCS for sale, as new, complete with 5 game cartridges, Combat, Asteroids, Space Invaders, Missile Command, Defender, £130 ono. Tel 01-648 0530.

ZX 81, nine months old (boxed). Offers around £40. Also fuller keyboard (separate) £15, hardly used, with games cassettes and listings. Everything together for £52. Tel 01-571 1964 evenings.

TRS-80 LII 16K mint condition plus V.D.U. cassette line printer with full graphic facility, all leads. Manuals £190. Software, books, Assembler, £450. Tel 0502 511926 after 6pm. Ask for Colin.

Vic-20 cartridges to swop for your cassette software, or sell. Tel 01-574 4122 after 6pm.

Video Genie EG3003 16K RAM. Modified keyboard. Bionic ROM. Lower case, sound etc. Lots of software and books, £195 ono. EG 100 B & W 12in monitor, £50 ono. Tel I. D. Green, Ruislip 08956 76012.

Vic 20 £100 worth of software, cassette recorder, books, joystick, 3K RAM pack. £250 ono. or part exchange for Apple II. Tel 0602 326049.

ZX 81 with printer and 16K RAM pack plus power supply, leads and manual. Only seven months old. £75. Tel Medway 404437.

Unwanted ZX 81 (16K) software, ZXAS, ZXDB, Vu-File, 3D Monster Maze, 3D Defender, Breakout, ZX Gulp, Orwin's 4 Music. Offers. Tel Hull 836894 (Mike).

Only £300! Sharp MZ-80K 48K. Perfect. £600+. Software including 18 versions of 6 languages, many games, utilities, adventures, etc. Tel 01-834 3800 ext. Frobisher 805 evenings/weekends. May split if you ask nicely!

ZX81, 16K, cased keyboard, printer, lots of software including Hi Resolution Tool Box, manual, peek poke byte and ram. 3 months old, excellent condition, worth £220 will accept £150 ono. Tel Leeds 692288.

Spectrum tapes. Spectral Invaders £2. Hungry Horace £3. Planetoids £3. Star Trek (ICL) (48K) £3. Centipede £3. Time Gate (48K) £4.50. Tel 02313 5857 anytime. (Robert).

ZX81 16K, 40 games, excellent condition, £65 ono. Atari VCS, 4 cartridges, Space Invaders, Pacman, Adventure, excellent condition, £95 ono. Tel Stanton St. John 805.

Vic 20 computer, cassette recorder, 16K RAM cartridge, 3K Super Expander, joystick, Introduction to Basic Part 2, Rat Race cartridge, £40+ software. Only £275. Tel 0227-79 3486.

Printer Microline 80, plus RS232 interface plus forms tractor. Current new price £330, yours for £230. Tel 01-450 2543 before 8.30am.

ZX printer + 5 rolls paper. As new, boxed, manual, PSU, £45. Tel 0782-615568 evenings.

ZX81 Machine Code book, as good as new. True value £8.50, will accept £5. Tel Freshwater 752909.

If you have any programs for the Atari 400/800 and would like to swop them then tel Canvey 696601 or write to Sean Morais, 14 Wilmslowe, Canvey Island, Essex, SS8 8HU.

Home/Business computer system, Sharp MZ80K (48K), MZ80 P3 dot matrix printer, interface unit and cables. Hundreds of programs, lots of literature. All manuals under year old. Worth £1,000, sell for £750. Tel 01-891 3413 after 6pm.

Sinclair ZX 81 five months old, with cassettes, £40. Tel 0302-885855.

CBM 4016 16K 12in screen plus cassette, 18 months old, also included are manuals and books. Must sell £400 ono. Tel Hungerford 0488 84233 7-10pm.

Forth UK 101/Superboard. Fast version for cassette, 30 pages documentation, sample programs, Assembler, etc. £12. (State width 24/48). W. A. Powell, 16 Vantorts Road, Sawbridgeworth, Herts.

Latest BBC data recorder. As new with lead, £25. R. W. Darlington, Worsley, Manchester. Tel 061 799 8945 evenings.

Video Genie with expander, printer interface, joystick, light pen, sound plus software, £410. Tel 021-357 5700 after 5pm.

Atari VCS with four cartridges, Adventure, Space Invaders, Circus and Combat. Joystick and paddle controllers. Only £80 for quick sale. Tel High Wycombe 0494 35484 evenings or weekends.

Oric games. Choose from these four. SAS (action game), 6 action games, 6 mind games/graphics. £5 each from B. Johnson, 61 Highfield Road, Saxilby, Lincoln LN1 2QJ.

Spectrum 48K cassettes. Artic Spectrum Voice Chess and Psion VU-3D. Unused, unwanted gifts. Offers. Write: M. G. Boot, 29 Long Lane, Clayton West, Huddersfield HD8 9PR.

Wanted Sharp M2 80B. Urgent. Cash waiting. Good price paid. DisK drive and printer also considered. Tel Watford 46955.

Acorn Atom for sale. 12K ROM inc. FP, 32K RAM, ROM word processor, manuals, £200 ono. Tel Llanelli 3208 after 6pm. (Davies).

Spectrum software disposed of at bargain prices! Superb 3-D Intelligent Strategy game (16K/48K Spectrum) for only £4.95! Send to Freddy Vachha, 91 Manor Road, London, E17 5RY.

Acorn Atom 12K + 12K, floating point ROM, PSU, instruction manual, extra book, software worth £40, including Atom Chess, £150. Tel 01-450 5841 after 6pm. and weekends.

Atari video computer system complete with Combat game, paddles and joysticks, still boxed and under guarantee, £55. Tel Stevenage 51465 anytime.

Swop Planetoids, Avenger, Planet of Death, Fausts Folly, Roman Empire, Airplane, Hungry Horace, Horace Goes Skiing, Niteflight for other Spectrum 16K games. Tel Barnsley 710119 after 6pm. Anyone local want to swop?

First 14 issues of Popular Computing Weekly for sale. Mint condition, collectors items, only £2. Apply 96 Welbeck Avenue, Highfield, Southampton SO2 1SN Evenings.

Wanted cheap Sinclair ZX81 16K or 1K. Please write to L. Wilkinson, 33 Newtown Road, Woolston, Southampton, SO2 9HX. Also any software accepted for suitable price.

Swop half set golf clubs, bag and size 8 shoes for Vic 20 Expansion 16K or 8K plus 3K or Motherboard, or other add-ons at similiar price. Tel 0253 868314.

Books BBC Micro Revealed (Ruston), £5. Let Your BBC Micro Teach . . . £5. First 17 issues of Computer and Video Games magazine, £5 plus postage. Tel Blyth Bridge 078-18 8423.

Transam Triton L5.2 personal computer. 8080A based system. Fully enclosed keyboard with separate enclosed power supply. In working order, but needs some attention. Bargain at £65. Tel Crawley 545578.

UK101 Cegmon 32 x 48 16K. Side pad. Cased. Monitor, green screen. Manuals, software, both units fan-cooled, £260. Tel Reading 584206 (office) 22410 (home). P. R. Border, 73 Hawkesbury Drive, Calcot, Reading RG3 5ZR.

Sinclair ZX81 + 64K RAM board and DK'Tronics keyboard with numeric pad, plus ZX printer, two rolls paper, also £130 worth of software, books, magazines, etc. Accept £220 ono. Tel Thanet 63687.

Spectrum wanted, interface to receive Teletext. Also RTTY Tranceive program for amateur radio. Please help. Tel West Drayton 08954 43972 and put Richard out of his misery.

Wanted. Sinclair ZX printer needed urgently. Working or non-working. State price. Tel Bristol 567193 after 4pm.

Atari VCS plus 5 cartridges, Space Invaders, Demon Attack, Golf, Pele's Soccer, Combat. Cost owner £205, accept £105. Also Basic programming plus keyboard controls, £20. Tel Preston (Lancashire) 34279 after 4pm.

Wanted urgently, manuals for dBase II and BSTAM. Cash waiting for original or good copy. Also looking for exchange of Osborne CP/M software as have a large collection for OCC1. Tel Dover 211362.

ZX81 with 16K RAM with joystick and interface plus four books of programs, full instruction manual. Three cassettes, Fl Simulation, Puckman, Video Graffitti £100 ono. 64 Orrery Road, Gurranabraher, Cork, Ireland.

Sharp MZ80K (48K) 10 months old, integral screen and tape, complete with instructions, £300 or swop for BBC Model B. Tel 01-527 7091 or 01-520 3930 (John), Walthamstow, London, anytime.

Colour television, 14in Panasonic, works well with ZX Spectrum, £75. ZX printer with six rolls of paper, as new, £50. Tel (Farnborough, Hants.) 0252 540633.

Vic 20 Commodore 3K expansion RAM pack, £17. Commodore new style joystick, £5. Rabbit, Myriad (needs 3K), £6. Llamasoft Gridrunner, £6. All are boxed, £30 ono the lot. Tel 01-274 2694 after 4.30pm.

Sharp PC-1211 pocket computer with printer, cassette interface, leads and manuals. Cost £140. Yours for £70! ono. Mr. S. Gorton, HMS Daedalus, Lee-on-Solent, Hants. PO13 9NY.

Games for Sharp MZ 80K. Brickblast £1.50, Snake £1.50, Aladins Cave £2, Bomber £1.50, Pothole £1.50, Head-on £3. Tel 0789 205198.

ZX Spectrum used software spectral Invaders, Voice Chess, Football Manager, Super Spy, Galaxians, Speakeasy, Autosonics, Arcadia. All eight for £25 or £4 each. N. Pounder, 59 Hadrian Way, Sandiway, Cheshire CW8 2JT. Please do send SAE.

ZX81 16K RAM, magazines, manual, leads, software, worth over £50. Including 3D Defender, Monster Maze, Mazogs, Invasion, and many others. Worth £150. Will sell for £75. Tel Stockport 061 428 5271 after 4pm.

Atari 400 16K, Atari recorder, one joystick, Atari games including Jumbo Jet Pilot, technical manuals, magazines. Cost over £300, only £250. Tel Brighton 739047 after 5pm. Ask for Mike.

Vic 20 + 8K, cassette deck, Omega Race cartridge, Gorf, Jelly Monsters and Programmer's Aid. Plus cassettes including Bonzo, Skramble, Space Phreeks, Traxx. As new, 4 months old. Worth £300+, only £199. Tel 01-249 0207 evenings.

ZX printer suitable for ZX81 or Spectrum. Also £18-£20 worth of printing paper, cost nearly £80. Accept £55, as new still in box. Tel Thanet 0843 42637 Margate area.

32K ZX81 manual, leads, etc. Software including Gulp, Mazogs, Flight Simulation. Machine code book and two 30 program books. £100 ono. Will sell in parts. Tel 01-908 0492 (Kenn) Wembley, London. Evenings only.

16K ZX81 with fuller keyboard, cassette recorder and £50 worth of software. Worth £180, sell for £130 ono. Tel 061-748 0494 evenings only.

Colour cartridge T.V. game, 4 cartridges, pair joysticks, £35 ono. Tel 041-423 8440 early evening.

Early computer magazines, some bound. *PCW, C.T., Pract.* Tel 0703 811760 (Portsmouth).

Interton VC 4000 plus twelve cartridges, cost £280. Bargain at £120. Tel Letchworth 71741.

ZX81 fun to learn series, both English tapes, Geography, History and Inventions, valued at £35 in Personal Computer. Will sell for £16 inc. postage. Tel Bournemouth 578148.

MZ80K 48K RAM M2 interface + P3 printer with Fortran, Pascal, Basic, Forth, small data base and word processor, also games like Minitor Valley, Quest, Colditz and More, £550. Tel 0429 65468 (Hartlepool) after 6.30pm.

Tandy TRS80 Model 1 computer, 16K, unwanted Christmas present for a handicapped boy. Mint condition, will accept £210 ono. (Bought at £300). Tel Manchester 061 205 8720 after 9.30am.

Acorn Atom 12K + 12K, Toolbox, 6522 VIA, 2 Books, PSU and leads, £120 ono. Tel 04862-66144 afte 6.30pm.

Vic-20 cartridges, Alien and Jelly Monsters, worth £39.90 — save £13.30, only £26. Will separate at £13 each. Tel S. Benfleet 58634.

Atari software. Eastern Front £15. Lords of Karma £7.50. Protector £15. Golden Voyage £10. Le Stick joystick, £15. Compute 1st book £7. Tel 0702 559455 after 5pm. (Chris).

Vic 20 C2N cassette drive, two cartridges, Jelly Monster and Star Battle, two books and joystick. Only four months old and in mint condition. Price £160 ono. Tel Ton 0732 355710.

Swop F.M.B.C. for any computer. Leave address or telephone number. Tel 0495 774 118 or write Tony, 124 Manor Road, Abersychaw, Gwent.

Vic 20 cassette unit, games tape, data base, Vic Programmer's reference guide. One issue *Vic Computing* and piles of listings. Bought February 1983. Guaranteed £125, worth £195! Tel Gravesend 0474 67326 evenings, (Steve).

Vic 20 plus cassette unit plus 16K and 3K RAM, joystick, £50 of software, £250 ono. Also Atari VCS, 7 cartridges inc. Defender, Asteroids, etc., £110 ono. Tel Erith 49750 anytime.

Commodore 64 games. Othello, Pontoon, Backgammon, Draughts, Polysynth, M.C. Side Scroll, Superb

PCN Billboard

graphics and sound. Prices from £2.95 to £4.95. All cassette. Tel 01-768 8178 after 5pm. or anytime weekends: Also many Vic games.

48K Spectrum with cassette player plus £30 worth software, inc. books still boxed, £180. Tel 01-993 0275.

48K Spectrum with £200 worth of books and games, only 5 months old. Total cost new £375, sell for £150. Require quick sale. Mark. Tel 0222 60022.

Wanted Atom Chess cassette with graphics pieces. Tel 0793-812625 after 5.30pm.

Wanted ZX81 1K, no parts. Tel Bristol 566033.

SharpMZ80A plus manual and many programs, 6 months old, excellent condition, £450 ono. Tel Nantwich 0270 780084.

TI99-4/A Extended Basic or mini memory module or 99'er magazines wanted, Any condition considered. Tel Bolton 46268 after 5pm.

Spectrum 16K, plus lots of software, including Meteor Storm, Invaders, Centipede, Orbitor and Skramble, £115. Tel Ascot 22510 after 5pm.

Voodoo Castle adventure cartridge for Vic 20. Sell or swop for another Vic cartridge adventure game, £20. Tel Byfleet 48494.

16K ZX81 good condition with various games. Psion Chess, Fun-to-Learn, Test your Knowledge and more, 16K made by Memotech, £65. Tel Cardiff 0222 490452.

Texas TI58 programmable calculator, 25 programs built in. Rechargeable batteries. Mains adaptor/charger. Month old with guarantee. Worth over £60. Bargain at £35. Tel 0789 205198.

Help! Can anyone please help? I would very much like the free use of someone's computer for my A-level studies. Personal references available. Please Tel (Littleborough) 79113. Thank you.

Dragon 32K, one month old, hardly used, still boxed, joysticks and £45 worth of books and software. Cost £290 will sell for £230. Tel Leicester 0533 783854 after 7pm.

Atari VCS 4 months old, excellent condition, joysticks, paddles etc., with Combat, Berzerk, Defender, Vanguard and Yars' Revenge, cartridges. Cost £215, sell for £145. Tel Bishop Auckland 764089.

Video Genie 16K. Original manuals, leads. Button cassette. Price includes software (Invaders, 2 Star Trek, Mission Impossible, Defeud, plus original demo tape). Price £190. For further information tel Telford 460010 between 6.30-8pm.

Atari VCS and seven cartridges including Asteroids, Warlords, Yars Revenge and Star Wars etc. Original box. Bargain £135. Tel Leatherhead 0372 376883.

Spectrum software for sale. Horace Goes Skiing £3. Planetoids £2.50. Muncher £2.50. Tel Sheffield 26484 day, ext 2447 or Sheffield 666867 evenings, (Steve Gold).

Spectrum software. Anybody interested in starting a software exchange club for the Spectrum (16K/48K) please contact Paul Ockenden, 61 Albourne Close, Brighton. Enclose SAE and a list of progs.

Spectrum software. Unused Artic Spectrum Voice Chess and Psion VU-3D. Offers. Write M. G. Boot, 29 Long Lane, Clayton West, Huddersfield, HD8 9PR.

Sharp M280A six months old, boxed with dust cover, several books and around £220 of software including Data Base, Golf. Excellent condition, offers around £465. Tel Manchester 061-223 2089 evenings.

Acorn Atom 12K 12K, BBC board, Floating Point manuals, power pack, only 6 months old, plus Snapper, Snooker, Invaders. £200 ono. Tel Luton 0582 67560.

WantedBBC Mod B. Have for exchange Canon A1, plus wide angle lens, motor drive and flash, or may sell separately. Tel Marshalls Cross 819453. (John).

Acorn Atom, 8K + 12K, 4K utility ROM, 8V 1.8A P.S.U., leads, manuals, magazines, games: the Valley, Invaders, Galaxian, Chess, Omega, Mission and lots more. Excellent condition, boxed, tape recorder included £200. Tel Andover 53118 after 5pm.

Arfon/Tcrch AM VIC20 7 slot expansion unit with lid, £80. Super Expander cartridge, £25. Vic Revealed, £5. Tel 061 439-7776 between 5-7pm. Ask for Simon. Buyer collects.

Acorn Atom 12K RAM 16K ROM P.S.U., manual, 30 cassettes. Worth £150. Games include Space Invaders Galaxians, Asteroids, Pac-man etc. Magazines, all leads supplied. Sell £190. Tel 061-483 8451 evenings only.

Vic 20 and cassette unit, four months old, 16K extra RAM, intro to Basic PT I, dust cover, 12in mono T.V., Vic computing magazines, £200. Tel 0935 872501.

Wanted 2 x 81 printer and paper, also Sharp MZ80B circuit diagram manual. Please send quotations to Paul O'Neil, c/o B42, BBC Engineering Training Department, Evesham, Worcs. WR11.

Atari 400 plus cassette, Basic manuals and games including Pacman, Preppie, Star Raiders, Clowns and Balloons and Rear Guard, three books and more, 6 months old, £260. Excellent condition. Tel Barnsley 83100.

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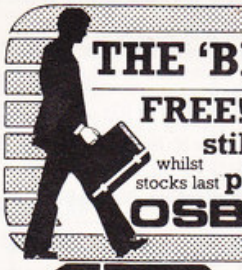

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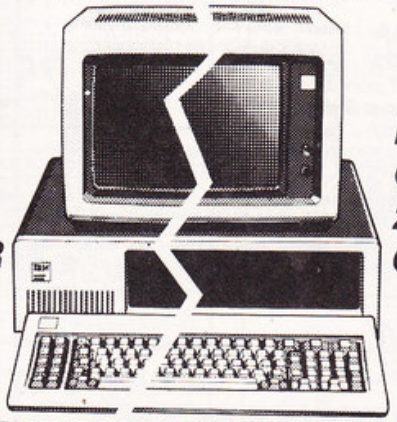

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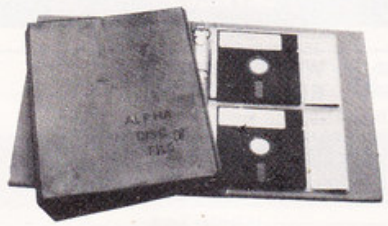

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62 Oxford Street, London W1A 2HG

Please find enclosed my cheque/PO for £10 for the following ad.

Micro-computer Workshop for Physically Handicapped People

Southwark is setting up an exciting new venture for training physically handicapped people — a Workshop fully equipped with a range of New Technology to give physically handicapped people a new medium for learning and communicating. It will be a community project linking with voluntary organisations and local employers.

The Workshop will be part of an existing Day Centre for physically handicapped people which offers social, recreational, educational and therapeutic activities, and the new posts will be included in the Day Centre's staff group.

The Workshop will provide all the necessary aids and support to enable the participants, however handicapped, to operate the equipment.

Where appropriate, the participants will be taught to use simple software packages which can be used in an office setting so as to open up opportunities for employment.

Micro-computer Workshop Co-ordinator

(Deputy Centre Manager)

(£10,638–£11,205) Reference PCN/13/3748

The aim of this challenging and demanding job is to set up the Workshop and establish it as a going concern. The successful person will be managing a staff team who will develop and carry out a training programme in the use of micro-computers, aimed at teaching communication and work skills. Individual assessments of the needs of each participant will be an important part of the task.

The postholder will be responsible for the daily management and development of the Workshop in all its aspects and will act as Joint Deputy to the Day Centre Manager.

Previous experience of micro-computers and their applications is required, as is a real interest of experience of the problem of physically handicapped people.

Flair and innovation are essential requirements of the post.

Day Care Officer

(2 posts)

(£8,007–£8,679) Reference PCN/13/3749

These two posts will be specifically engaged in the Micro-Computer Workshop and will be responsible to the Workshop Co-ordinator.

The posts will involve assessment and training of physically handicapped people in work skills, micro-computer applications, and various aspects of New Technology.

We are looking for people who have a developed knowledge and interest in the use of micro-computers and are sensitive, caring and able to motivate and communicate with the physically handicapped participants.

Experience of teaching, or working with handicapped people on a paid or voluntary basis is desirable.

For an informal talk, please phone Jim Armstrong, Group Manager, on 01-703 6363, Ext 234, or Debbie Brenner, Senior Research Officer, on 01-703 6363, Ext 325.

Telephone 01-701 2870 (24 hour answering service) any time for an application form, or write, on a postcard to: The Personnel Officer, London Borough of Southwark, 25 Commercial Way, London SE15 6DG.

Please quote appropriate reference number and job title. Last date for receipt of completed Application Forms: 27.5.83.

Southwark is an equal opportunity employer. Applications are welcome from candidates regardless of sex or ethnic origin and from registered disabled persons.

Southwark
a London borough

Laughline

After sharpening your wits on the Laughline cartoon you should have a field day with this one. What is Neil Hooper of Micromega thinking? Give this a caption and you could win £20. The winner will be nominated by the *PCN* team and entries must be in by May 27. Send them to *PCN* Laughline, 62 Oxford Street, London W1

Tint tack

Any of you who have ever seen several makes of micros in one place will have noticed the unexciting conformity of their cream of grey casings.

On the whole, they aren't very colourful.

But Future Technology Systems has decided to strike a blow for those whose lives lack lustre. It will 'clothe' a machine in your house colours in 60 to 90 days. FTS will make it blend with wallpaper or be enhanced by the potted plants.

But can it really take three months to customise a micro?

This is style in bulk. Sadly the offer is to companies that take large numbers of FTS systems, and 60 to 90 days is the normal delivery schedule for such orders.

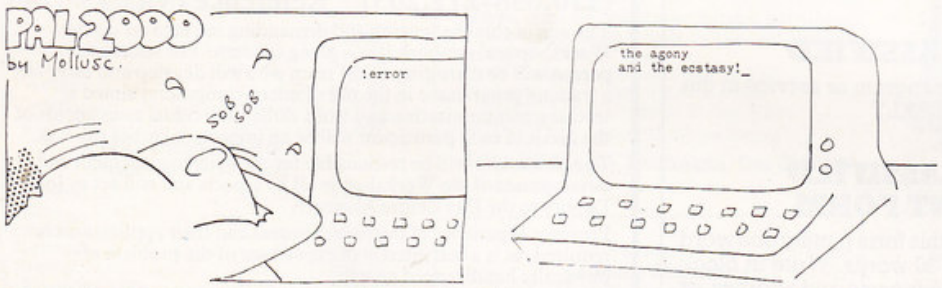
Back to the cream and grey for the rest of us.

DK disko?

Buoyed up by his company's £150,000 order from record giant K-Tel, Peter Brownlie of DK'tronics looks to a Golden Age for software buyers. Or at least, a Golden Hour.

With his tongue firmly in his cheek (it was obvious even over the telephone) Mr Brownlie enthused: 'Who knows?

'When Uncle Clive comes out with his Microdrive, we could see the release of DK'tronics Golden Oldies.'



SYNTAX ERRORS

Close to the EDG

Back in *PCN*'s launch issue we reviewed EDG Graphics for the BBC machine. Our reviewer, as light in his touch as the next man, had trouble with program crashes — but he tells us he's had no problem with a fresh copy Salamandar sent him, so he reckons his copy was at fault. And he has now found the 'guidelines' referred to in the manual, so his comment that they never appear again is incorrect. Sorry!

Poor loser

Despite our reviewer's sterling efforts to win at 'Knight's Quest' in Gameplay (*PCN* No 8) we must confess he was a bit hasty in blaming his failure on program bugs. Alas, he forgot to draw his sword before attacking the elves! Apologies to Phipps Associates for blaming non-existent bugs.

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
Compec Scotland	May 17-19	Kelvin Hall, Glasgow	Tracey Cannon, Reed Exhibitions, 01-643 8040
International Word Processing Exhibition	May 24-27	Wembley Conference Centre, Wembley	Philip Le Masurier, BETA, 01-405 6233
Computers In The City	May 24-26	Barbican, London	Mario Meoli, Online Conferences, 09274 28211
Computer Open Day	May 26	Strathmore Kotel, Luton	Tony Kaminiski, Couchmead Communications, 01-778 1101
Micro '83	June 1	Conway Hotel, Dunmury, Belfast	Micro 1, 0232 664391/2
Apple '83	June 3-5	Fulcrum Centre, Slough	John Riding, Database Publications, 061-456 8500
ZX Microfair	June 4	Alexandra Palace, London	Mike Jonstone, 01-801 9172
Office Automation Show & Conference	June 7-9	Barbican Centre, London	Clapp & Polliak, 01-747 3131
4th Commodore Computer Show	June 9-11	Cunard International Hotel, London	Commodore Business Machines UK, 75 74111, Ext 220
Blackburn Computer Fair	June 11	King George's Hall, Blackburn	Bradley Enterprises, 0772 312677
South of England Personal Computer Fair	June 12	Exhibition Hall, Wood Green School, Witney	Julian Wilde, 0993 2355
Computer Fair	June 16-19	Earls Court, London	Roy Bratt, Reed Exhibitions, 01-643 8040

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
National Computer Conference & Exhibition	May 16-19	Anaheim, USA	American Federation of Information Processing Societies, 1815 N Lynn Street, Arlington, VA 22209
Europe Software Exhibition	May 17-19	Utrecht, Holland	Noelle Brown, 01-486 1951
Computers, Communications & Electronic Technology Exhibition & Conference	May 31-June 3	Melbourne, Australia	CETIA, PO Box 259, Roseville, Sydney, N S W 2069
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707

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PROGRESS REPORT

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Reviewed PCN PRO-TEST HARDWARE April 8th
Write to us and we'll send you a copy

New Range Additions The Communicator range has broadened to add a new 20 Megabyte 5" Winchester Hard Disk Drive System to the already well established 5 Megabyte and floppy diskette models. Another new system offers 8" floppy disk drives for compatibility of data transfer. With the associated tape and additional Winchester back up systems that adds up to eight basic models – all in the same neat, stackable, casing – all based on S100 bus construction to keep future options in memory, users, peripherals and interface requirements wide open.

New System Additions Communicator operating systems continue to broaden both in options and facilities. An improved CP/M offers enhanced diagnostics, for example, and auto boot from Hard Disk. These basic improvements are reflected in the now tried and tested Communicator multi-user MP/MII™, which also provides for full CP/M™ compatibility.

New Communications Options Communicator now offers CP/Net™ and RBTE communications protocols. Individual Communicator Systems can now operate as intelligent information terminals, integrated with either existing mainframe or mini computer installations, or be part of a shared resource or communications network.

New Range of Terminals Find out more about Comart's new smart VDU. It's a new advanced ergonomically designed unit. It has a 105 keyset detached keyboard, soft green phosphor tilt screen, and a low profile foot. Its a perfect complement to the Communicator in both styling and performance.

Some things don't change Communicator still has Comart's established dealer network and nationwide after sales service back up, supporting thousands of Communicators already at work throughout the UK.

And in the Future? Behind all these innovations are advanced programmes of research and development. Soon Comart will be bringing you 16 bit, multi processor and distributed processing systems. This is your guarantee that Communicator will continue to keep pace as microcomputer technology progresses.

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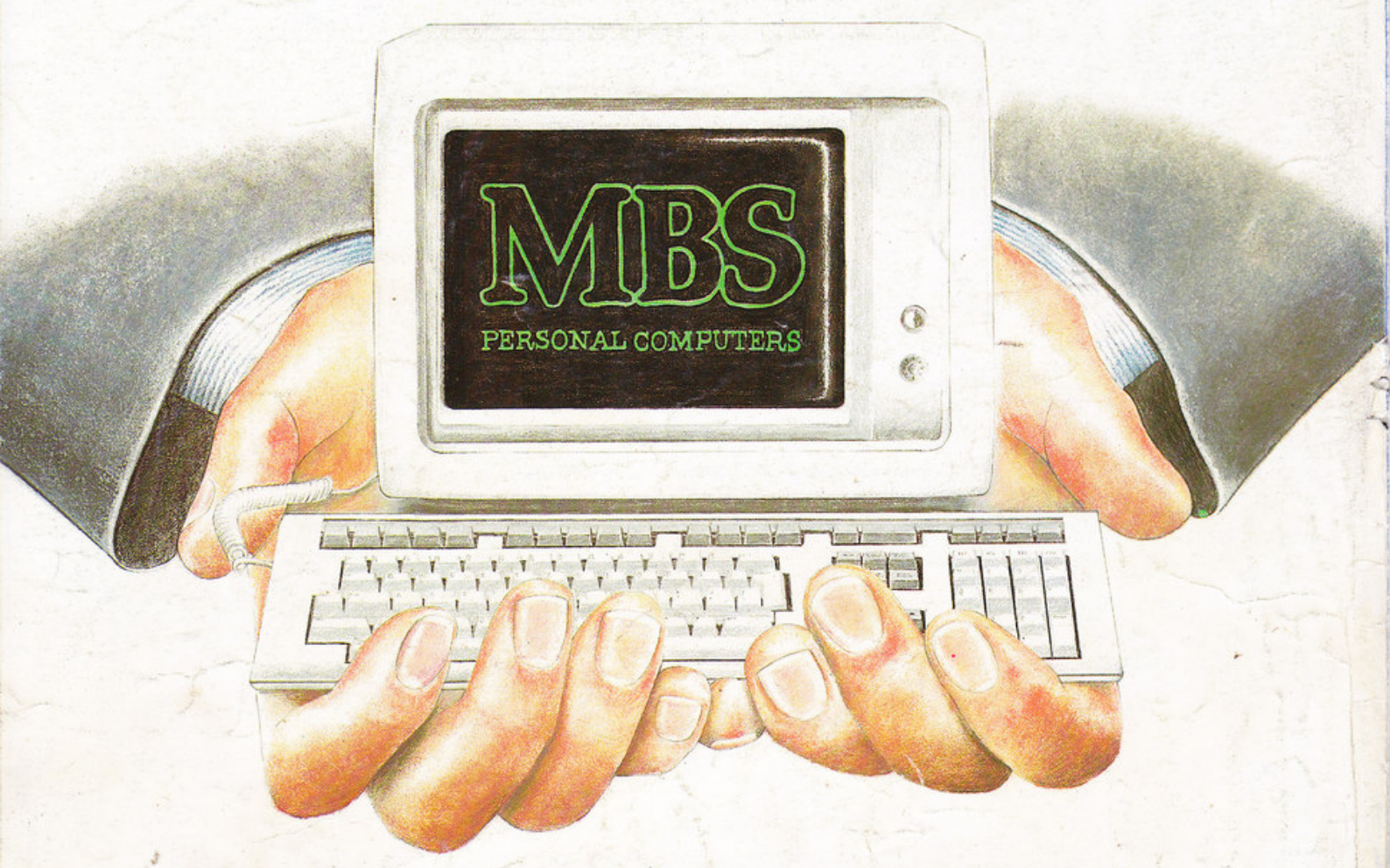

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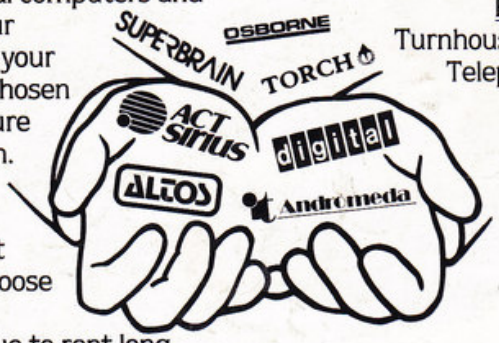

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