

P E R S O N A L

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NEWS

JUNE 16-22 1983 Vol 1 No 15

35p

EXCLUSIVE

APPLES WITH EARS
Teach your computer to obey voice commands

GENIE GRAPHICS
Unbottle your Genie's colour capabilities

SOFTWARE: EPSON, COMMODORE
Pro-Tests of new packages for the HX20 and 64

ACE ACTION
We play arcade games on the Jupiter Ace

COMX EXCLUSIVE

Can this £120 Hong Kong computer compete?
Pro-Test, page 46

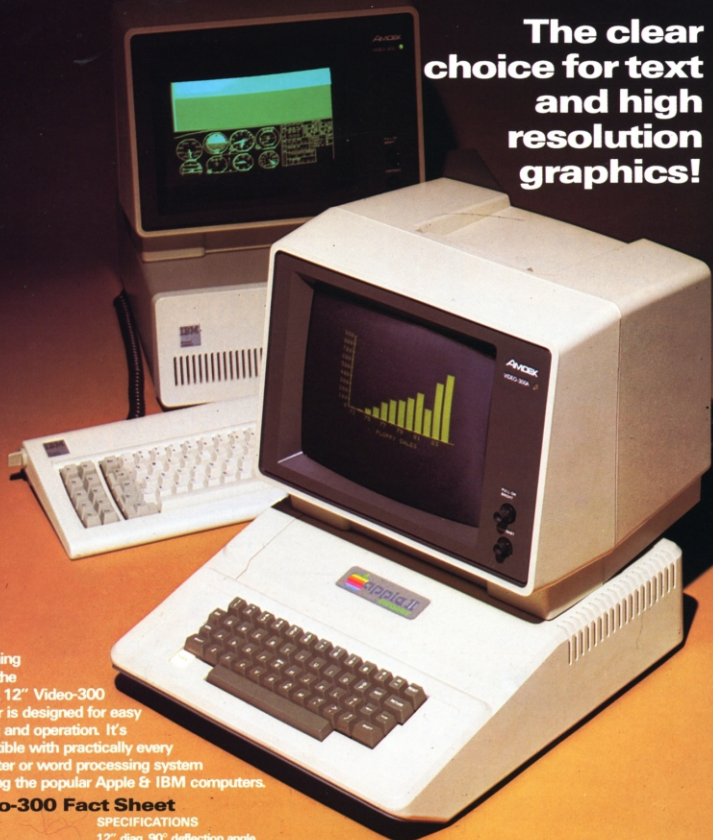


SPECTRUM MICROPAEDIA, PART 2
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AMDEK BY Roland DG

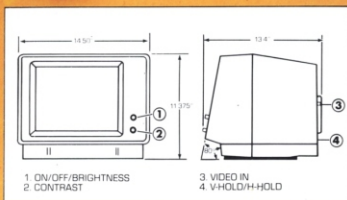
The clear choice for text and high resolution graphics!



Everything about the Amdek 12" Video-300 monitor is designed for easy reading and operation. It's compatible with practically every computer or word processing system including the popular Apple & IBM computers.

Video-300 Fact Sheet

ITEM	SPECIFICATIONS
CTR	12" diag, 90° deflection angle
CTR	Etched non-glare, green or amber
Signal	Composite video input
Input Signal	1.0 Vp-p, sync negative
Input Impedance	75 ohms
Scan Frequencies	Horizontal: 15.75 KHz, Vertical: 50/60 Hz
Display Size	210 (W) x 158 (H) mm
Deflection Linearity	Horizontal: 10% Max. (refer to EIA ball chart and dot pattern). Vertical: 8%
Video Response	18 MHz (±3dB)
Resolution	Centre: 900 lines. Corners: 800 lines
Power Source	120/220 V Convertible 50/60 Hz
Controls	See diagram (focus, sub-brightness, H-size V-linearity and +B adjustment are on PCB)





Micropaedia Spectrum: Part 2

Microdrive revolution. Building a bigger system. Around the keyboard, Organic Spectrum and Hatching a colour plot.

REGULARS

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MENU

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PCN SPECIALS

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The printer connection . . . and into the graphics area, with David Janda.



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Genie Scene 25

Nigel Cross picks out some fascinating patterns in the Colour Genie's 'surprising' graphics.

PCN PRO-TEST: SOFTWARE

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A programmer's aid package which boosts the Commodore's Basic with a further 50 commands. Pete Gerrard rates it.

Address Manager 32

Your Spectrum as an address book.

Epson Filing 35

Records on the run. How does the MST Database work as a portable filing system for the HX-20? Henry Velleman is our roving reporter.

PCN PRO-TEST: PERIPHERALS

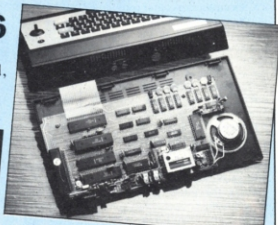
Apple II Speak 36

HAL is here — in the guise of VIM. Nigel Cross lends the Voice Input Module an ear.

PCN PRO-TEST: HARDWARE

Comx 35 46

Max Phillips meets the Comx 35 micro: 32K RAM, colour, sound, good keyboard, joystick, ten bundled programs and a good Basic — all for a miserly £120.



CHARACTER SET EDITORIAL: Editor Cyndy Miles Deputy editor Geoff Wheelwright Production editor Keith Parish Managing editor Peter Worlock Sub editor John Lettice News editor David Guest News writers Ralph Bancroft, Wendie Pearson Software editor Shirley Fawcett Systems editor Max Phillips Hardware editor Richard King Peripherals editor Ian Scales Listings editor Sandra Grandson Editor's assistant Harriet Arnold Art director Jim Dunsie Art editor David Robinson Assistant art editor Floyd Savers Art assistant Dolores Fairman Publisher Fiona Collier Publishing manager Mark Eisen Publishing assistant Jane Green ADVERTISING: Advertisement director John Cade Advertisement manager Nic Jones Assistant advertisement manager Sue Hunter Sales executives Robert Stallibrass, Matthew Parrott, Bettina Williams, Ian Whorley, Sarah Barron, Roxanna Johnston, Christian McCarthy Production manager Eva Wroblewska Advertisement assistant Jenny Dunne Subscription enquiries Simon Maggs Subscription editor 53 Frith Street London W1A 2HG 01-439 4242 Editorial address 62 Oxford Street London W1A 2HG 01-636 6899 Advertising address 62 Oxford Street London W1A 2HG 01-323 3211 Published by VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickest, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper.

Save £1 on your favourite Spectrum games cassette!
See page 10
SPECIAL OFFER
PCN
your favourite!

Coleco Adamant

CP/M compatibility and a built-in daisywheel printer included with your micro for under £300?

Sounds crazy, but that's what Coleco Industries unleashed on the world last week in Chicago. Coleco's Adam computer will sell for \$600 in the US — including a built-in daisywheel printer, a high-speed magnetic tape storage facility, CP/M compatibility, full-travel qwerty keyboard, 80K RAM and compatibility with all the Coleco games machine software.

The machine's Z80A processor allows the use of CP/M business operating system with what Coleco calls an optional '500K mass-memory' drive for storage. Conventional storage with a magnetic cassette tape drive comes as standard with the price of the Adam — and each cassette will store about 25K.

Coleco claims the cassette drives



The daisywheel printer, not the least of the surprises in Coleco's Adam.

will run much faster than ordinary cassette storage devices and hold twice as much information as wafer-tape drives. A second tape drive will be offered for \$125.

Sirius distributor ACT is getting in on the retail act as well.

also sell a cut-down version of the Adam to act as the plug-in computer console for the ColecoVision video game system (*Pre-tested in PCN, issue 2*). The computer console will include the tape drive, printer and full-travel keyboard, but will use the Z80A processor and the cartridge slot of the games machine.

It's expected to sell for between £100 and £200 (\$400 in the US) and will be released in the UK this autumn.

A spokesman for Ideal Toys, which sells the ColecoVision machine in this country, said the computer console will be available before the stand-alone computer.

He added that Ideal expects to build up a big base of ColecoVision game machines users and that many should be interested in buying the Adam add-on unit.

... But Atari counters

The cheapest computer in Atari's new XL range (*reported last week in PCN's View From America*) will be sold with a special \$465 package that includes a letter-quality printer, text editing program and a data-storage attachment.

The package will be offered for Atari's 600XL, which sells for \$150 in the US with 16K (expandable to 64K). It will put the 600XL in direct competition with Coleco's new Adam computer, which will sell for \$600 with a built-in daisywheel printer and tape drive.

Atari claims its printer is twice as fast as Coleco's. The announcement of this printer/software package for the 600XL comes on the heels of Atari's release of four new computers last week, all destined to replace the ageing Atari 400 and 800.

A spokesman for Atari UK declined to name a UK release date for the XL series.

Arise, Sir Clive . . .

Clive Sinclair, the leading force in the British micro revolution, has been rewarded with a knighthood.

Sir Clive started in the electronics business in the Sixties with an assemble-it-yourself hi-fi kit. A pocket calculator, digital watch and pocket TV followed — all of them world firsts, none of them outstanding commercial successes.

When the ZX80 made its appearance from the newly-formed Sinclair Research it represented a quantum leap in terms of cost and performance. Massive sales of the micro led to further refinements and the launch of the second version of the machine, the ZX81.

Under challenge from the Americans and the Japanese, Sinclair Research went on to develop the ZX Spectrum as a colour computer that would sell for around £100.

Not everything in the Sinclair firmament shines bright. Sinclair users are still waiting for their low-cost microfloppy drives, and difficulties in developing the flat screen TV (not helped by recent labour disputes at Timex) could let the Japanese in first.

Sir Clive's contribution to the micro industry is not restricted to technological innovation. He has also encouraged some of the best brains in the country and a number of companies, including Acorn, Jupiter/Cantab and Torch, can trace their origins to Sinclair.

His latest project reflects his prominent membership of MENSAs and abiding interest in stimulating creative ideas. Called Metalab, it will be a technological think-tank committed to opening up new fields ranging from battery technology to robotics.

Now the Beeb gets BOOTed

Look out for price-cuts on the BBC Micro in mid-July as the Boots chain puts the system on its shelves for the first time.

The BBC will be going into Boots' top 30 branches, including Nottingham, Manchester, Newcastle and Leeds. Boots will not say whether there will be introductory bargains on offer but a spokesman said: 'We are always looking to be competitive,' and the Boots chain's pricing has been aggressive over the last two months.

Sirius distributor ACT is getting in on the retail act as well.

It plans to set up a national chain of computer department stores called Computerworld, and the first of them has now opened in Bristol.

ACT is offering its dealers a franchise-style arrangement. It will provide finance as long as the dealer sells mainly ACT products, which will soon include ACT's own micro, the Apricot.

Eventually it expects to have between 100 and 150 stores around the country.

Its target is to have 20 to 30 open by the end of the year.

Micro Marketing

Complaints have reached PCN concerning a former advertiser, Micro Marketing, previously located in Fulham, London SW6.

Anyone wishing to contact the

company should write to director Giles Hacking, c/o C G Hacking, C G Hacking & Sons Ltd, 50 Borough High Street, London SE1. Tel: (01)-407 6451.

Micro Marketing is no longer at its Fulham address.



ON THE BEEB — Storage for your BBC has probably shrunk as far as it can with Advanced Memory Services' release of Hitachi 3in drives. The double-sided floppies hold 200K, and a single drive will cost you £225 — the dual drive version is £399. In either case you get cables, manuals, utilities and EPROM controller with the drive. The Hitachi drives join a growing list of floppy disk units that will run on the BBC Micro. Acorn itself, Mitsubishi, Siemens and Torch all produce storage devices for the BBC, but Control Data's disks still represent the most bytes per pound. Advanced Memory Services is on Warrington (0925) 62682.

Hobbit caps Acorn

One of the biggest holes in the BBC Micro's performance is about to be partially plugged — but not by Acorn.

Ikon Computers, producer of the Hobbit storage system, is designing a 'sideways ROM' to enable you to transfer machine code programs from cassette to the Hobbit. But without a sound knowledge of 6502 machine code and the workings of the BBC you won't have much chance of getting machine code programs to run once you've put them on to disk from a cassette.

If you add a disk drive and interface (DFS) to your BBC it's natural to want to transfer cassette-based programs to disk. With programs written in Basic there is

normally no problem, but machine code software is a different kettle of fish.

Acorn's attitude is unsympathetic. 'Acornsoft software is not designed to be saved on to disk,' a spokesman said. It says you must buy the program on disk in the first place, and it won't offer a trade-in on cassette software. Nor will it consider attaching a relocater to its tape software for users who want to save it to disk.

Saving software is actually no problem — you load it from the tape into the lower end of memory above the DFS and then save it to disk. But when you try to load it from disk and run it, the machine code loads into

the RAM above the DFS and is therefore unlocated. Switching back to the tape filing system does not move everything down into its original starting position, and therefore the program will not run properly.

Ikon's solution is a piece of hardware designed to keep the Hobbit filing system out of the BBC's RAM, thus side-stepping the problem.

It should be available later in the year.

Acorn's lack of sympathy is based not on a cynical desire to sell more disks but on the question of software copyright protection. You buy the right to use the software, not the software itself.

64 carries the day

You could hardly move for new products at the Commodore Show in west London last week.

Some of them won't actually be on sale for three months and some were supposed to have been rolling into the stores by now, but Commodore managed to build a centre of interest around them even before you got round to looking at the other 60 exhibitors' wares.

And there was some flag-waving as well, with UK-designed and written software being destined for users throughout the world.

The portable Commodore 64 and the Teacher's Pet were two of the machines that immediately caught the eye; one that didn't was the Commodore 500, for the simple reason that it wasn't there. The 500 and 700 were recently thought to be on the verge of either being dropped or re-launched (*PCN, issue 14*) but the word now is that stocks of both are on their way to dealers.

The 1701 14in colour monitor for



Star debutante — the portable 64.

the Vic 20 and Commodore 64 performed some class graphics, the 1520 four-colour printer/plotter also brought a splash of colour to the show, and the 8250K disk drive may look unspectacular but it will give you 3Mb for £1,295.

But the SX64 Portable 64, weighing in at about 25lbs, was probably the star of the show. As portables go it has a style all its own, and some felt it wouldn't be out of place in a garage performing wheel-balancing tests. But its spec could justify the anticipation it has created: you get 64K of RAM as standard, a built-in 5in colour monitor, and optional single or dual integral disk drives. It will run any 64 software.

The serial interface will let you hook it up to monitors, printers and others. Prices start at £650 and larger storage models will cost up to £995 when it becomes available in the autumn.

September is the due date for the Teacher's Pet, or as Commodore prefers to call it the Educational 64. This system has the technical spec of the 64, the programming language Logo, and a colour monitor in a Pet housing. Commodore feels that more schoolchildren should benefit from contact with micros — specifi-

cally with Commodore micros — and this system at around £400 with software such as Data Limited's Talking Books will lead its charge into the classroom.

Commodore's 500 and 700 were originally launched in the spring and the 700 was Pro-Tested in *PCN* issue 4. It now runs CP/M, so some progress has been made while the rest of the world wondered what had happened to it. At the show the demo of CP/M had some teething troubles but if Commodore says it runs presumably we can take its word for it.

All the software on the Commodore stands was written in this country and it will be sold around the world. The new pieces on show included business applications such as Future Finance, a financial planning system, and Easy Stock, a control routine, and serious games with such promising titles as Lobster Catcher and Face Ache.

It also had programming tools to demonstrate, including Simon's Basic to whet your appetite for the day when this becomes available in cartridge form for the 64.

If the crop of new products overwhelmed you there were plenty of familiar sights around the Canard Hotel in Hammersmith, the scene of this year's show. The entire lower floor was given over to Vic 20 and 64 demonstrations. There was also an arcade area where you could acquaint yourself with the latest games, and Visoft was there in strength. Despite its mixed feelings about software on cartridges (*PCN, Issue 14*), it had no fewer than 17 ROM-based games making their debut.

Commodore demonstrated new printers for users of its business and



The 700 Series... but no sign of the 500.



Teacher's Pet classroom contender. home computer systems with the usual attractive Commodore price-tags.

The 6400P is a 40cps daisywheel printer which is on sale now for £1,195. It will take a range of print wheels to give you a choice of character styles.

The 4023 and 1526 are both dot matrix units, for the Commodore business range and for the 64/Vic 20



No design award for the 1701.

respectively. They will both print standard alphanumeric characters or Commodore's graphics symbols.

The 4023 costs £450 and the 1526 £345; both are in the stores now.

CP/M for Commodore systems was also represented on a Commodore 64, equipped with a Z80 cartridge.



A wealth of new products, but the Vic 20 keeps its faithful following.

VIEW FROM PARIS



Franc talk in foreign software

From Alan Simpson

It is hardly surprising that the French are getting restless about the invasion of English — or rather American — speaking microelectronic companies and services. The French balance of micro-trade is distinctly one-sided with exports accounting for only five per cent of world micro business and imports representing an equally unhealthy position.

France takes much delight in establishing Five Year Plans but is now discovering to its technological and social cost that in micro matters, even five months could be too long a planning time.

With a sidelong glance at Ken Baker, 1983 has been nominated 'Computer Year' in France and the authorities are actively promoting Paris as 'The World Capital of Data Processing'. To back up this somewhat pretentious claim, the First International Software Package Fair, organised by SICOB and Convention Informatique, has just taken place at La Palais des Congrès in Paris.

The software — or 'progiciel' as the French prefer — being shown at the exhibition represented some of the best, plus some of the not so best, packages available in the UK and the US. Increasingly, the small local business user is now being served with French language versions of standard software packages. International vendors have been investing considerable time and funds in developing products which are not only user friendly but are also local language versions of best selling software packages.

The word made French

MicroPro in fact is marketing its top word processing packages, WordStar, MailMerge, SpellStar and SuperSort in 11 working languages.

Closer to home, Intelligence (UK) announced a French version of its management planning package MicroModeller. According to managing director Ashley Ward, as the products go to non-specialists company users, it has become essential to provide a local language version.

MicroModeller, which is being distributed internationally by Cresta Marketing, has now sold over 6,000 copies — 5,000 in the UK and 1,000 in Australia and Canada, and the company is hoping for a similar response in Europe. Its expectations could well be realised. In France especially, business micro users tend to have more powerful machines than their counterparts in the UK and US, a factor which assists the Intelligence (UK) marketing drive.

Cresta Marketing is also involved in distributing the Supergraf graphics package, from Georgetown Computer Systems, which was featured in PCN, 29th April 1983. The package was attracting considerable attention, as was the associated Victor/Sirius system. Another Cresta International marketing product was Format-80, the Apple word-processing package from Elite Software.

Patrick Whelan, marketing director of Cresta, has been establishing offices in London, Paris, Munich, Geneva, and New York. He is firmly convinced that the current international market for software is highly confusing with far too many suppliers trying to offload their products in unfamiliar environments.

'There are too many machine types, languages, operating systems, and formats competing for business. Europe is being overwhelmed with English language software which has been configured for commercial English and US users,' he says. By liaising closely with users and dealers Cresta will source and adapt standard software packages to meet the needs of specific localities.

Also being introduced to an international market for the first time were the Sound Training Word Processing and CP/M teaching packs from Head-Line Communication of Hereford. However, translations are apparently still in the development stage.

Home computing systems and electronic games were notably absent from the Paris exhibition. But for the small business user, a visit to 'Mini Sicob' could well have been a justifiable business expense.

To the aid of Commodore

An impressive batch of programming aids for the Commodore 64 and 8000 machines has been released by Calco Software.

The packages, at £100 for the 64 and £295 for the larger machines, look pricey but in tests they suggest that you'll get your money's worth. A screen generator, report generator, Basic programming aids and other utilities are brought together in a very 'friendly' package.

The screen generator was previously available in a cartridge for the Vic (called Screen Master). It lets you develop screen management functions in Basic. Screen masks for acquisition of data can be stored in memory and on disks, for rapid recall.

Windows can be declared, with full scrolling capabilities, and commands exist for drawing lines and clearing and reversing areas on the screen. Keyed Access Filing is

catered for, with records of up to 256 bytes. The Indexed Sequential Access Method is used for data retrieval, giving access to records by complete or partial key, using sequential searches. If the index is lost, a utility generates it again. Data can be compressed, to save disk space.

A report generator package makes it simple to design and record a printing mask, into which data is put for filing by the editor program.

A range of Basic programming aids extends Basic by If... Then... Else, Print Using, Hardcopy, Call, Fetch, and other commands.

Multiple precision arithmetic is provided as well as computed GOSUB and GOTO.

Although no less than 85 new commands are added to the 100 in Basic.

Contact Calco on 01-546 7256.

Monarch vs Megafame



UK debut — Dynabyte's Monarch

Two micros from the heavyweight division made their UK debuts last week.

In the blue corner, sporting 1 Mb of RAM, multiple processors and a 50Mb hard disk was Convergent Technologies' Megafame. The only guide to its form is strictly from the US — prices start at \$17,546.

In the red corner from Dynabyte was the Monarch, starting at around £12,000 with an 8086, a Z80, BOS, Os8 8, MPM 11 and MPM-86.

Both contenders plan further systems that may bring them within the range of those of us who don't have major businesses to run — Dynabyte is looking at a 32-bit processor, possibly an NS16032, and Convergent Technologies plans a portable machine.

de Bono lateral linking micro

A quiet and cautious crowd that managed to find its way to the right bits of the Barbican struggled to get to grips with micro networking and multi-micro systems at last week's Office Automation Show.

Apple was there, with the show's biggest crowd on tiptoe to get an eyeball at Lisa, hooked up to give a demonstration of Applenet. But Wang had also hopped aboard the networking gravy train, with its 16-bit Professional micros hooked up to the Wang VS5 minicomputer.

Something different came from a new company, de Bono Multi/Processor Computing — yes indeed, run by a brother of the famous lateral thinking de Bono. Its Home PC is going to sell from £695 for a micro with both 6502 and Z80

processors on board, and it runs Apple DOS, CP/M and CP/M+.

There's a business version, the Executive, with twin floppy disks and a 27 Mb Winchester thrown in for £2,395.

And the de Bono Business System is the company's hope to sell its db² database management system — a piece of software that's designed to be used by networks of micros, irrespective of what micro-processor they are based on.

Hewlett-Packard cleaned up the prizes for the gimmickiest stand, with the tale of two HP-120 desktop micros keeping tabs on the British team in the Americas Cup sailing races. An American company, computing for a British team in an American race...?

IBM bumper bundle

Autumn should be a good season for PC owners. IBM has announced a bumper selection of add-ons for the unstoppable PC, anticipated for September.

Take your pick from an IBM colour display (£520), a full Bisync communications adaptor for playing at 3270 communications and suchlike (£230) or one of those wonderful 8087 maths coprocessors for £214 (PCN, issue 14).

Software doesn't get overlooked either. Basic primer is an on-line

tutor for IBM Basic. At £53, it has the distinction of being available this month. There's an APL interpreter (£165) which will use the 8087 to provide fantastic mathematical power with the minimum of cryptic symbols.

Systems stuff will include a 'professional Editor', (£113) with macro capability and text formatting, so we'll all be able to get rid of EDLIN.

There's runtime support for UCSD p-System version 4.3 (£41) to allow access to p-System applica-

tions written in UCSD-Pascal, Fortran 77 or Basic.

FileCommand (£31) appears to be a welcome utility. It provides an on-screen directory and menu of commands, giving an easy way to keep house and run programs. FileCommand is supplied to work with either the current version 1 of PC-DOS or version 2 when it becomes available.

Last, don't forget this is a personal computer. New games releases will include Strategy games — draughts, Elusion, Reversi and a

surprise package. Battleships! It isn't clear what Elusion will turn out to be. It's played on a 25 or 36 square board and the object is to be the player to make the last move. Strategy games will cost £31.

At the same price is the intriguing '101 Monochrome mazes'. This allegedly attractive game offers '101 unique mazes filled with black pools...'

Presumably you have to make your way from your B&B accommodation to the tower while being chased by the trams.

...but XT late

Not even the mighty IBM is immune to the micro industry's most common disease — its Personal Computer XT is going to be a month or two late.

First deliveries of the hard-disk PC were due this month, but because the Americans are buying more than IBM can build only a trickle will arrive.

The corporation's official statement says: 'Because of exceptionally high demand it is unlikely that IBM will be able to meet all immediate European dealer requirements. We shall do everything we can to reduce delivery delays.'

Exactly how long you will have to wait if you have ordered an XT is a matter of speculation. IBM has already increased its productive capacity in the US 'several times' in the last five months, but even if it starts building XTs at Greenock its preparations could occupy several months.

Unfortunately, the US maker of the IBM-compatible Compaq still has no plans to bring its system to the UK before the end of the year.



IBM Greenock — gearing up for PC production.

Meanwhile, you may console yourself with the thought that even one of the world's largest corporations has attacks of human frailty occasionally.

Less consolatory is the thought that people who ordered IBM's System 38 minicomputer counted the waiting time in years rather than months.

P-System pep talks by TDI

Supporters of the UCSD p-System operating software will soon find that the feeling is mutual — the UK distributor of the p-System is offering a hardware-like support contract with it.

TDI, which sells the p-System on a range of machines including the IBM PC, Sage, Sirius, and Apple, has set up a hot-line maintenance service to give p-System users the kind of response to problems that is more common in the hardware world.

Not that the p-System is particularly accident-prone. TDI is at pains to emphasise. 'People have problems with operating systems,' a spokeswoman said. 'They find that

they can't do this or that and they phone up to ask about it. Frequently it isn't the software that's at fault but their understanding of it.'

TDI's new Customer Support Services section is intended to deal with problems as quickly as possible.

Its aim is to keep the customer satisfied, and with the price of software rising as a proportion of a system's cost it is a logical step.

Other software suppliers could well follow suit.

But software expertise doesn't come cheap. For the first three months you get the support free, and for the rest of the year you pay £50. From then on it will cost £100 a year, about 25 per cent of the original cost of the p-System. Hardware maintenance contracts usually average out around 10 to 15 per cent.

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 one week before publication date (in this case June 16), so these charts tell the story in high streets between May 27 and June 9.

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

Top Twenty up to £1,000

	MODEL	PRICE	DISTRIBUTOR
▶ 1 (1)	Sinclair Spectrum	£99	(SI)
▶ 2 (2)	BBC Model B	£399	(AC)
▶ 3 (3)	Sinclair ZX81	£40	(SI)
▲ 4 (6)	Atari 400	£150	(AT)
▼ 5 (4)	Oric 1	£100	(OR)
▼ 6 (5)	Dragon 32	£200	(DR)
▲ 7 (9)	Vic 20	£170	(CO)
▲ 8 (10)	Atari 800	£300	(AT)
▲ 9 (13)	Texas TI 99	£150	(TE)
▼ 10 (7)	Lynx 48	£225	(CA)
▼ 11 (8)	Newbrain A	£228	(GR)
▼ 12 (11)	Epson HX20	£472	(EP)
▲ 13 (14)	Colour Genie	£224	(LO)
▲ 14 (18)	Jupiter Ace	£90	(JU)
▲ 15 (16)	Commodore 64	£345	(CO)
▼ 16 (12)	Sharp MZ80 A	£549	(SH)
▲ 17 (19)	Apple II E	£969	(AP)
▼ 18 (17)	Sharp PC 1500	£170	(SH)
▲ 19 (—)	Tandy Colour	£240	(TA)
▲ 20 (—)	Sord M5	£218	(SO)

Top Ten over £1,000

▶ 1 (1)	Osborne 1	£1,581	(OS)
▶ 2 (2)	Sirius 1	£2,754	(ACT)
▲ 3 (4)	IBM PC	£2,392	(IBM)
▼ 4 (3)	Apple III	£2,780	(AP)
▲ 5 (8)	HP 86A	£1,541	(HP)
▼ 6 (5)	Commodore 8032	£1,129	(CO)
▲ 7 (9)	Sanyo MBC 1000	£1,195	(SA)
▲ 8 (10)	DEC Rainbow	£2,714	(DEC)
▲ 9 (—)	Televideo TS 800	£1,495	(CCS)
▼ 10 (7)	Superbrain II	£2,070	(IC)

AC Acorn Computers. ACT — ACT Sirius. AP — Apple Computers. AT — Atari International. CA — Computers. CCS — Colt Computer Systems. CO — Commodore. DEC — Digital DR — Dragon Data. EP — Epson. GR — Grundy Business. HP — Hewlett-Packard. IBM — IBM. IC — Icarus Computers. JU — Jupiter Computers. LO — Lucas Electronics. LI — Lucas Logic. OR — Olivetti. OS — Osborne Computers Corporation. SA — Sanyo. SH — Sharp. SI — Sinclair. SO — Sord. TA — Tandy. TE — Texas Instruments.



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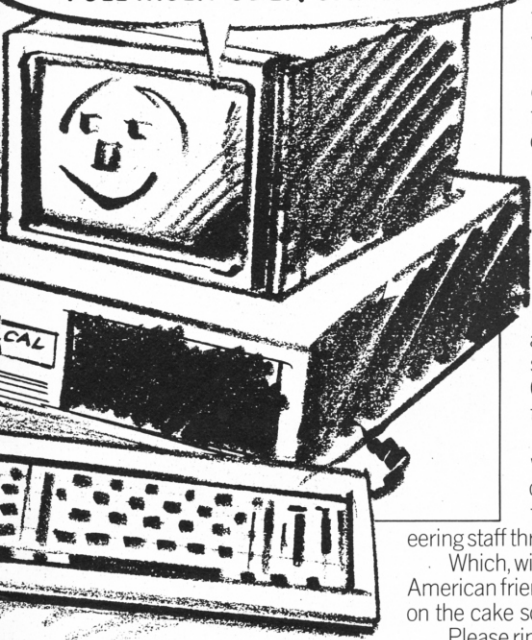
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Rival for Husky

A go-anywhere portable with the promising name of Nomad has been launched for those of you needing a micro in a tough environment.

Made by Immediate Business Systems (IBS), Milton Keynes, it will compete with the Husky, made by DVW Electronics of Coventry. This portable sells at £3,445 for the 144K version and £2,051 for the 32K.

Nomad, however, offers a whopping 256K of memory for £3,600. David Viewing, managing director of DVW, said his company planned an upgrade of the Husky

later this year, but would not elaborate.

Describing the Husky, he said: 'It's designed so that anyone can use it, in any situation or environment.'

It has a better screen display — four lines of 32 characters, as opposed to Nomad's two lines of 40 characters, and is for inexperienced users.

For the Nomad you would need to use the MBasic 80 Programming language to write programs.

David Thomsett, marketing manager of IBS, stressed the robust nature of Nomad: 'You could drop

it in a bucket of water and it would still work.'

Nomad comes in a 64K version for £2,570, but a price for the 128K version is still to be decided. It weighs less than 3lbs, and is the size of a large book, measuring 10.7in wide, 7.5in deep and 2in thick. It runs off a Z80 processor and uses rechargeable batteries.

Its portability is enhanced by bubble memory.

The company is only selling direct at present and can be contacted in Milton Keynes on 0908 568192.

Dual bases

Two new database packages for Commodore users are now in the shops.

Superbase from Precision Software is a £517 database management system for the Commodore 700 Series, and this version will interface with Superscript 11, a word processor which includes a spelling checker and calculator.

The version for the Commodore 64, costing £115, will interface with EasyScript and EasySpell, the Commodore word processor and spelling checker.

Super Office has also appeared this week. It is a database with integrated word processor and spelling checker at £127.50 for use on the Commodore 700 Series only.

Snakes and ladders

The Johnny-come-latelies in the PC business are about to sweep aside some of its pioneers, and it looks like a triumph for business over the home user.

A report from market research company Intelligent Electronics Europe forecasts that IBM, DEC, Hewlett-Packard and Olivetti will take large market shares away from companies such as Apple, Tandy, Commodore and Osborne this year.

Figures are based on the West European market, and Victor, maker of the Sirius, is the only new computer company expected to increase its share.

Apple's present share of 18 per cent is expected to fall to 11 per cent within the year, with Commodore crashing to 9 from 17 per cent. Olivetti meanwhile is expected to jump from 4.5 to 8, and Sirius from 3 to 6 per cent.

Tandy's market share should fall from 12 to 9, and IBM should breeze in with 13 per cent, knocking all its main competitors for six.

The West European market will quadruple to \$3,600m by 1988.

Burroughs bends over backwards

Your entry into personal computing if you work for a Burroughs user could be the ET 2000, launched by the US manufacturer last week. But you'll have to persuade somebody to part with a tidy sum to get one.

The ET (Ergonomic Terminal) 2000 is an 8086, MSDOS system with 256K of RAM — prices start at £3,500. You get a choice of disk drives — either the IBM-compatible 160K floppies or the

dual 800K variety. The 2000 supports four drives, giving it a maximum on-line capacity of 3.2Mb.

Burroughs is starting off with two models, the 2100 monochrome machine and the 2200 with eight colours. It has also introduced a graphics processor which, for the colour machine, includes three processors to drive each of the primary colours, with 128K of RAM available to each. The

graphics system slots underneath the base of the main unit.

The ET 2000 also represents Burroughs' first serious attempt to placate the ergonomics lobby. The CRT's luminance conforms with levels of ambient light, the screen swivels and tilts, and the detachable keyboard has sculpted keys with all manner of attention paid to the comfort of the user.

Burroughs is on (01)-750 1287.



The eight-colour ET2200 with primary colours driven by three 128K processors.



TAPE TRAVEL — Portability is a matter of opinion when systems weighing 28lbs or more are sold with handles on them. But for the handheld systems the problem is not so much weight as the equipment that you have to carry around with them. This is where Olympus hopes to make an impression with its microcassette recorder, the PearRecorder C100, which costs about £55. It uses the kind of cassettes executives dictate into — they run for 15 minutes a side, which should be enough for most programs. It weighs just 10oz with batteries, and its phase reverse control makes it usable on most micros. Olympus is on (01)-253 2772.

Smalltalkers

Smalltalk, the mouse-driven operating environment that inspired the Lisa and VisiOn, has been launched on the Basis 200 series. It costs £454.

The Basis is a German-built Z80-based micro that can be expanded to a 16-bit system using plug-in processor cards which offer a choice of 68000, Z8000 or 8086 chips. The machine is distributed in this country by BCD Systems, which has sold the micro mainly to universities and technical institutions.

According to BCD's sales director Douglas Shankland, you would need a minimum of 1Mb of RAM to run Smalltalk. 'This can be done by plugging in four 256K RAM cards.

We hope soon to be able to offer a RAM card with 1Mb on it,' he said.

The company is also re-launching the Basis 108, a twin-processor system that runs CP/M Plus and is compatible with Apple II hardware and software.

It features 6502 and Z80 processors and comes with a minimum of 128K of RAM. It has been available in this country in small numbers but BCD Systems is now setting up a dealer network to sell it retail. It will sell for £1,708 without disks. A twin disk system will cost £2,582.

BCD Systems is on (0892) 45266. ■ Apple systems get their fair share of Smalltalk implementations — Asolo of Basingstoke also has one.

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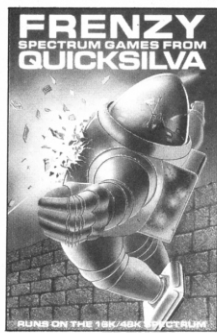
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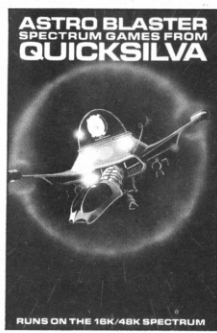
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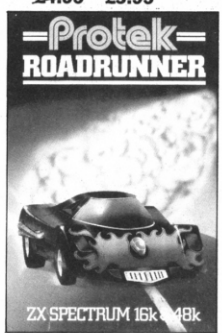


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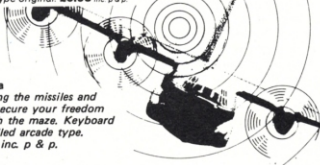
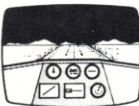
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Jargon for the jaded

I am writing to express sympathy with Mr Furness in his confusion over the meaning of the many abbreviated terms that make up computer and programming jargon (*PCN*, *Random Access*, issue 13).

Until the advent of the more enlightened computer mags such as *PCN*, which endeavours to explain such matters, I could only guess at the meaning of many terms and have ended up

PCN £10 Star Letter



with an alternative glossary which may be of interest.

Some examples are listed below.

Contronics: American method of making money from electronics.

CMOS: Second son of Amos.

ASCII: Son of Arthur.

Serial interface: Adaptor to enable good reception of Crossroads.

Poker: (censored).

Pixie: Very small creature living at the bottom of the garden.

Bus: Noise made by the Sinclair Spectrum.

RAMtop: Sheep's head.

RS232: Inferior version of Ford Escort.

Z80: Japanese motorbike.

LLIST: Name of Welsh composer.

16K: 8K if you're lucky.

48K: 16K Oric.

Baud: State of person after too much computer jargon.

Baud rate: Time it takes to achieve above state.

Floppy disk: Hard disk left in the sun.

Twin floppies: (censored).

Flip-flop: Action of twin floppies.

Basic: Complicated.

CP/M: Confuses People Most.

I'm sure *PCN* readers will add to this list.

John Reynolds,
North Anston, Sheffield.

Soft seduction

It is becoming increasingly apparent that games software is not being bought for the fact that it is good or enjoyable but because it has a pretty front inlay.

I bought two cassettes. One was poor but with a lovely picture on the front and the other was an excellent flicker-free game with sound and colour with a poor drawing on the front inlay.

It is to be that only artists will be able to sell software in the future? I know a lot of people agree with me. So with your reviews print more pictures of the games.

Robert Newton,
Littlehampton, W Sussex.

We print full tests of the software so you're not wrongly influenced by the packaging. We do show pictures of what's on the screen rather than an artistic and possibly unrealistic interpretation of it. Like books, you can't judge the package by its cover, good or bad — Ed.

All aboard the Qwerty

Jan Allan's comments, *PCN*, issue 12, rather hit the nail on the head regarding the qwerty keyboards. What, really, is the advantage of more 'ergonomic' (and I use the word very loosely) keyboards that allow typists to exceed all known records on the qwerty arrangement when such speed is seldom required or even desirable?

My own speed is that of copy typing which is, arguably, the most difficult at which to attain high speeds (no looking down at the keyboard... see?), however my own tested speed at a VDU terminal exceeds 100 words per minute. Do we really want to go so very much faster? I think not.

The keyboard should follow the standard qwerty layout that is known internationally and by millions of keyboard operators throughout the world.

Apart from the standard layout, any idiosyncrasies of the main equipment should be catered for by specialist keys.

Whilst on my soapbox, I would like to say a few words to

all those 'my machine is the best' microcomputer enthusiasts. Yes my friends, your machine is the best, as far as you are concerned. But what about the rest of us?

My previous micro was a Sharp MZ80K. I still feel that it is one of the most flexible systems around. However, being a typist I just could not get on with the keyboard. So I sold it.

When looking for my next micro I thought long and hard about what I really wanted to do and eventually bought an Osborne-1, no colour, limited graphics, a ridiculously small screen, but everything else that I wanted. When I do want to use colour, graphics, sound, joysticks etc. I merely take out my ZX Spectrum.

So you see, I have two machines which are 'the best around', but remember that 'best' is from my viewpoint just as your version of 'best' would be from yours.

So please, can we just stop padding out the letters pages with all this correspondence and let's see something else?

D A Thompson
Dartford, Kent

No padding intended (or needed), but due to popular demand, the 'mine's best' series has been discontinued — Ed.

Software satisfaction from a library

I am writing to tell you about the National Association of Video Owners. It has existed for four months now. We offer members use of software library, software exchange service and we issue a monthly newsletter.

One of our chief aims is to protect Vic20 owners from mail order firms who either sell poor software or who accept money but don't even send on the goods. One of our goals is also to encourage a downward trend in software prices. We consider that cassettes should ideally cost no more than £4 and cartridges no more than £15.

I would like to add to the software libraries debate. The majority of people who join our club do so to use our library. Even if software houses do protect their software by locking programs so that home users cannot copy them, libraries will still proliferate.

There are several reasons for this. One is that many users buy

software from shops without testing them, with the result that many customers are dissatisfied. Since shops refuse to exchange software the user is stuck with a tape which is of no use to anyone.

Having sent out questionnaires to my members asking them about software, I can tell you that 70 per cent of them get fed up with a game after two weeks. It therefore makes great sense to join a software library. *S N Tomanek, Silverdale, Nottingham*

Disk disappointment with my BBC

I have just bought a disk system for my BBC and am disappointed to find that most of my commercial tapes — the long ones that I really need the disk system for — could not be saved as the companies that market them (mainly Acornsoft, Bug Byte and Program Power) have made it extremely difficult to break in to the programs in question.

They do not, as they could, offer an optional service which would allow people to return their copies of the programs on tape and for the company to return them on a disk for a small fee.

I am also disappointed in the lack of commercially available software (apart from adventures) on disk. Surely these big companies can record their programs on disk — they do have turnovers of many billions of pounds, and there are quite a few of us disk system users out here.

Alistair Lindsay,
Frodsham, Warrington

The companies you mention told us they did not want people to copy their software (even for personal use) and would not offer a copying service because it would cost too much time and money. Acornsoft said that its software was designed not to be copied as this would break its copyright. Bug Byte said it tries to make its software as copy-proof as possible, while Program Power said it did not put dongles into its programs to make them uncopyable. You should, with effort, be able to work out how to copy a program onto disk. But the company's not going to tell you how! — Ed.

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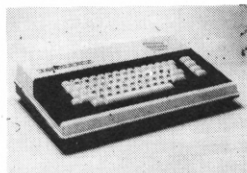
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Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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

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

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

Databases: micros and peripherals.

Issue 4, April 1-8

Pro-Tests: Piel Fiber Communicator, Olympia ESW3000 printer, Namal SuperTalker, Commodore Catecuals, Spectrum Pascal, Cash-book (BBC).

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

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

Databases: peripherals.

Clubset: Clubs and user groups.

Micropaedia: Go Forth, part 1.

Issue 2, March 18-25

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

Features: Colecovision, micro back-gammon, 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.

Databases: full software listings.

Issue 5, April 8-15

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

Features: speech packs, monitors.

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

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

Databases: software.

Clubset: full list of user groups.

Micropaedia: Go Forth, part 2.

Issue 3, March 25-April 1

Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspood-computer, Sirius toolkit, Dragonalc.

Features: Atom upgrade, Lynx programming, Apple music.

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

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

Databases: micros.

Micropaedia: Anatomy of the BBC, part 3.

Issue 6, April 15-22

Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon word 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 Computer Set Up (BBC), Day of Week.

Databases: micros.

Micropaedia: Graphics, part 1.

Issue 11, May 20-26

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

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

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

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

Micropaedia: keyboards.



Issue 7, April 22-29

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

Features: Dealer support, Atari graphics.

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

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

Databases: Peripherals.

Micropaedia: Graphics part 2.

Issue 8, April 29-May 6

Pro-Tests: Atari Home Files Manager, Kobra's Vic Star for the Vic 20, Hazetree's Accounts for the Spectrum, Epon RX80 printer, NCR's Decision Mate V, Future Computer's FX31.

Features: Micronet, Compact programming on the TP9944.

Gameplay: Harvestet (Vic 20), Strategic Command (Dragon 32), A full Book of Micro Rhymes (BBC), Telling the Time-Money (Spectrum).

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

Databases: software.



Issue 9, May 6-13

Pro-Tests: Structured Basic on the Apple, Pael Power on the Vic 20, Star DP110 printer, Dams and Interpod interfaces for Commodore 64, Micro-Professor.

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

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

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

Databases: hardware.

Micropaedia: Graphics, part 4.

Issue 10, May 13-20

Pro-Tests: Infomart on Commodore 64, Dragon Maze, MC202 and CMU800 music synthesizers (Apple), Prim directly coupled modem, Epson QX10.

Features: ZX81 graphics part 1; Atari word-processing part 2.

Gameplay: Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).

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

Databases: peripherals.

Micropaedia: Graphics, part 5.

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Alternate characters banished from Basic

Many Oric owners seem to have had problems with large programs overwriting their alternate character set. In *Microwaves*, PCN issue 12, S W Lucas suggested frequent use of X=FRE(“) to force garbage collection to avoid the problem.

A simpler and more common trick is just to set HIMEM to #97FF at the start of your programs. This puts the alternate character set just off-limits to Basic.

Many thanks to all those who pointed this out.

Disable Spectrum's BREAK Key

One of the most sought-after routines for the Spectrum is a method of disabling the BREAK key. Even though Sinclair announced it was possible to do this at the Spectrum launch, the manuals don't mention any technique.

You can do this with POKE 23613, PEEK 23730-5 to disable BREAK and POKE 23613, PEEK 23730-3 to reenable it. If you're sure that RAMtop is in its usual place (32599 on a 16K machine and 65367 on the 48K model), you can change these POKEs to 82 and 84 respectively.

The POKE works by altering the low byte of ERR-SP, the address to which the stack is reset when an error occurs. Normally this points to a routine that terminates execution of the program, but the POKE forces it to point to a routine that continues execution.

Unfortunately, there are drawbacks to using this method

... probably the reason Sinclair doesn't document it. It will only work 99 per cent of the time. You should really set 23614 also. You must ensure that normal error-trapping is restored before the program ends to avoid the machine resetting itself.

The POKE traps all errors except "Nonsense in Basic". You can pick up the error from location 23610. For example, if you divide by 0, you could check for the error with IF PEEK 23610=5 THEN... If you do this, POKE 23610,255 beforehand so that any previous errors are cleared. And notice that if an error occurs, the Spectrum will skip any more multistatement statements on that line.

Other dangers are a machine crash if a numeric input is answered with STOP or an undefined variable is used in an INPUT. So it's best to use INKEY\$ and INPUT LINE for all your input and check any strings before using VAL\$.

If anyone knows any other side effects, please write.

Robert Baker,
London SW9

Oric line restored

If you try 'Dropping Aliens' in your Oric manual, you'll find it gives you an OUT OF DATA ERROR at line 1020. All that's missing is the line 1045 RESTORE.

Nigel Grace,
Wendover, Bucks

Listings compatibility on upgraded Vics

Once you've expanded your Vic 20 with an 8K or 16K RAMpack, you may have problems using listings designed for the unexpanded machines, or Vic with 3K expansion.

To avoid this, enter the following before typing in or LOADING the program: POKE 44,32:POKE 256*32,0:POKE 36866, 150: POKE 648,30:NEW. Press RETURN then hold down the RUN/STOP key and press RESTORE.

If you're entering a listing, ignore any instructions that POKE any locations from 51 to 56. If you're loading the program from tape, ignore any random characters that appear on the screen as it loads.

A Mardlin,
Aylesbury, Bucks

Dragon/Tandy screen reverse-out

The following machine code routine (below) can be used to reverse the graphics screen on the Dragon. It should also work on the Tandy Color Computer.

As listed, the program inverts the first four pages of hi-res but this can be easily changed. Bytes 2 and 3 are the start address and 13 and 14, the

end address of the area to be inverted.

You could combine this routine with Darren Eteo's Dragon scroll routines in *Microwaves*, issue 12. Incidentally, Mr Eteo's routines can be converted to scroll left and right by POKEing the eight byte in 'down scroll' and the sixth byte in 'up scroll' with 1.

A Edgson,
East Barnet, Herts

```
10 CLEAR 200,32699
20 DATA 142,6,0,134,255,168,132,167,132,
48,1,140,30,9,38,243,126,180,140,246,57
30 FOR A=1 TO 21
40 READ B
50 POKE A+32699,B
60 NEXT A
70 REM DEMO SECTION
80 PMODE 3,1:SCREEN 1,1:PCLS
90 CIRCLE(50,50),40:PAINT(50,50),7,8
100 COLOR 6,7
110 LINE(100,100)-(200,150),PSET,BF
120 FOR A=1 TO 40
130 EXEC 32700
140 NEXT A
150 IF INKEY$="" THEN 150
160 END
```

Keep Dragon in the picture

It's often handy to be able to recall Dragon graphics from tape. You can do this using the CSAVEM and CLOADM and addresses gleaned from the following tables of hi-res pages.

Page	Hex Address
1	600-BFF
2	C00-11FF
3	1200-17FF
4	1800-1DFF
5	1E00-23FF
6	2400-29FF
7	2A00-2FFF
8	3000-35FF

PMODE	number of pages used
0	1
1,2	2
3,4	4

Assuming, you're starting with page 1, some examples would be CSAVEM "NAME",&H600,&HBBF,&H600 for PMODE 0; CSAVEM "NAME",&H600,&H11FF,&H600 for PMODE 1 or 2, and CSAVEM "NAME",&H600 for PMODEs 3 and 4. To get your graphics back use CLOADM.

D G Rendle,
Hythe,
Southampton

Codifying the Ace cursor

Many Ace users will want to use the cursor and editing keys in their own programs. The Ace manual does not list the relevant codes for use with INKEY: All are accessed using the caps shift:

Key	Function	Code
1	Delete line	10
2	Caps lock	2

3	None	51
4	Inverse video	8
5	Cursor left	1
6	Cursor up	7
7	Cursor down	9
8	Cursor right	3
9	Graphics	4
0	Delete	5

The short routine demonstrates the use of these codes by moving an asterisk around using the arrow keys.

Ralph Lorenz,
Henley-in-Arden, Warwickshire

```
@ VARIABLE X @ VARIABLE Y
: POINT X @ Y @ AT 42 EMIT ;
: VERT INKEY 7 = IF X @ 1 - X : THEN
INKEY 9 = IF X @ 1 + X : THEN ;
: HORIZ INKEY 3 = IF Y @ 1 - Y : THEN
INKEY 3 = IF Y @ 1 + Y : THEN ;
: TEST BEGIN 1000 @ DO LOOP X @ Y @
AT SPACE VERT HORIZ POINT
@ UNTIL ;
```

(enter TEST to run the demonstration)

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Soft snags and harder keys

Q I am trying to buy a home computer. I've narrowed my choice down to two — the 48K Spectrum and the 48K Oric. It seems that there is little software available for the Oric and there are problems with **LOADING** what is available. Is this still the case? The only thing I have against the Spectrum is its keyboard.

P Toogood, London E12

A Like most new machines, the Oric has had a bad time with software. It is starting to appear now, but not in the quantity or quality that you can get for the Spectrum.

The fuss over **LOADING** problems seems to be nothing to do with the Oric itself — but to be a problem with early cassettes from Oric suppliers — it should have gone away by now.

In its current state, the Oric is a machine for experienced hobbyists rather than first timers. Besides a software shortage, it has ROM problems and a superficial manual. But it does appear to offer a better hardware spec. Great if you like that sort of thing.

The Spectrum is still the unrivalled first time computer, especially now it's a giveaway £130. The keyboard is objectionable, but have you tried it with its key-beep switched on? Show off: try **POKE 23609, 100** in your local WHSmith. **POKE** is typed by pressing the **O** key. If the keyboard turns out to be a real problem, you could buy a full travel add-on and still come inside the Oric's price.

But think carefully about this. You still have to muck about with one-touch keywords if you're using Sinclair Basic.

Alternative entries

Q I own a 48K Spectrum and I am very pleased with it. The only problem is its keyboard. I know there are lots of add-on

keyboards, but I want one with a proper spacebar, and where I don't have to use the keywords. Is this an impossible thing to ask?

Dieter Lott, Bonn, West Germany

A The current batch of Spectrum keyboards have, at long last, got space bars. The Delux keyboard from Kayde Electronics on Great Yarmouth (0493) 55253 costs £45. Fuller Designs (71 Dale St, Liverpool 2) is about to launch its FDS keyboard for £39.95 plus £2.50 for post and packing.

Unfortunately, it's harder to beat the keyword system. Sinclair Basic expects keywords . . . it can't handle people typing them out character by character. So, unless someone has a big go at the Basic, you're stuck with it.

I can't see why you want to eliminate the keywords. They're not difficult to learn and you don't need them if you are writing machine code programs or word-processing . . . presumably the reasons why you want a better keyboard in the first place.

Lost in the translation

Q Recently, I purchased a Lynx, well aware of the software shortage. Is it possible to purchase cassettes for other micros and read them into the Lynx? I am prepared to modify them if I could get them into the Lynx.

Andy Scarisbrick, Worsley, Manchester

A I've no doubt that it would be possible to read other machines' cassettes on the Lynx. But it would require a neat bit of programming to do it and, as far as I know, nobody has bothered.

It wouldn't be worth the trouble. Lynx Basic is so different from other Basics that the conversion job would be a major task. Like all programming, you'd be much better off working it all out on paper before going near the keyboard.

So if you feel like doing your own conversions, have a go with magazines and books of listings. The older the better, as you'll find simpler programs

and fewer machine-dependent routines. Besides books for mainframe Basics, look at books for the PET and Tandy TRS80 model 1.

Once you've got the basics of the program converted, you can go through and add Lynx specific stuff such as sound and graphics. Apart from the hard work, you've got instant and cheap software.

Epson: a racing certainty

Q Are Epson's FX80 and RX80 as good as they say? Besides the price, what is the main difference between the two?

Arvind S Maini, Wembley, Middlesex

A These machines are certainly good. Most of Epson's products are. But they're not dramatically so . . . there's a surprising fuss surrounding their launch. I didn't think people cared about printers — but it looks as though the end of the MX80 has deprived the micro world of its much loved workhorse.

Like you, I have trouble telling the new beasts apart. Perhaps Epson should adopt more memorable names like the Banana from Gorilla (or vice-versa) that's available in America, and change the case colours.

For the record, the FX80 is the more expensive one at £440. Its main advantage is its faster 160 cps print speed. Remember, the **F** stands for faster. The RX80 is the more homely machine at around £300 and looking reassuringly like an MX80.

If you want more info, see *PCN's* Pre-tests (*PCN* issue 7, *PCN* issue 8) for full reviews of the FX80 and RX80 respectively. If you're looking for a cheap printer, there are now hundreds of cheap alternatives.

Take a PEEK at Spectrum

Q Could you tell me where I can get a complete list of **PEEK** and **POKE** addresses for the 16K Spectrum? Could you explain the **ATTR** function as it is not explained in the manual?

Ian Linwood, Dinwoodie, Lockerbie

A Not in the manual? Most things are in that manual. Try the index . . . **ATTR** is explained in several episodes from page 112, 116, 164 and 219. But if you couldn't understand it, let's try another way.

You'll know that each character square on the Spectrum's screen can have a **PAPER** colour and an **INK** colour. In addition it can be **BRIGHT** or **FLASHING**. These effects or properties are called attributes.

The Spectrum gets its display from two areas of memory. The Display file (locations 16384 to 22528) holds any graphics and the shapes of the characters on the screen. The memory from 22528 to 23296 (the Attributes file) holds the attributes for each character position.

All **ATTR** does is to dive into the Attributes memory and pull out the relevant value for a particular character. This is stored in memory as a byte . . . an eight-bit binary number but, being Basic, what you actually get is a decimal number between 0 and 255.

So **ATTR** lets you find out if a character at a particular position on the screen is flashing, bright and what colour it is. You could do a similar thing with **PEEK** but **ATTR** just simplifies the job.

Once you've got your **ATTR** value, you need to decode it to look for particular attributes. Figure 1 shows a sample **ATTR** value in binary. The first three bits from the right are the **INK** colour, the next the paper colour, and bit 6 is a one if the

```

10 REM attribute demo
20 CLS
40 PRINT AT 10,12; INK 1;"PERS
ONAL"; AT 12,6; INK 2;"C O H P U
T E R"; AT 14,14; INK 3;"NEWS"
50 FOR R=10 TO 15
60 FOR C=8 TO 22
70 LET A=ATTR (R,C)
80 LET A=A+1; IF A>255 THEN LE
T A 0
90 POKE 22528+A*32+C,A
100 NEXT C; NEXT R; GO TO 50
    
```

ZX attributed — see *Take a PEEK at Spectrum*



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character is BRIGHT, bit 7 is a one if it's FLASHing.

You can chop up the decimal number to extract the information you need. For example suppose A = ATTR(row, column). If A is greater than 128, the character at row, column is flashing. Other tests can be derived from other information.

ATTR in itself might not seem that useful. But it's worth understanding since having a separate display and attribute memory allows you to do some fancy effects with the minimum of trouble.

Suppose you use POKE to set particular attributes prior to PRINTing and PLOTing a character. You can have colour changes all set up ready for you to whizz a spaceship across the screen. Or you could alter the colours of existing text. The demo program on page 18 should be of interest. Line 70 reads back the attribute for the current character. After messing it around, the value is POKEd back where it came from.

As for a complete list of PEEKs and POKEs on the Spectrum, I've never seen one. You should do your own. Collect all the bits and pieces in the manual, in magazines and books. Try your local club and so on.

PEEK and POKE are just simple tools. It's what people do with them that turns them into useful PEEKs and POKEs. So although there's a whole pile of standard and useful ones you can find, there will always be new ones being invented. Start collecting now . . .

Evolution of the Oric

Q I've got quite an early Oric and there are some surprising differences between it and a later model bought by a friend. I get a lot of corrupted LOADs at the 2400 baud rate and the screen flickers whenever sound is used. I've read that early Orics had EPROMs rather than ROMs and I don't know if this will be exchanged for a new ROM or not. Can you advise me?

A On one occasion, a corrupted LOAD produced a listing with two words I didn't know existed in Oric Basic . . . INVERSE and NORMAL. INVERSE is also mentioned in the Oric brochure but it's not in the Oric manual.

How do you use these commands?

*M Platts,
Malmesbury, Wilts*

A It's hard to know where to start with this one. Early Orics do seem to have suffered from production problems, blamed on everything from power supply, modulator to the ROMs. If you can't live with faults like bad loading and a flicking picture then I'd have a got at exchanging your Oric.

Try and insist on an exchange for a new machine. This is okay if you're convinced that the faults make the machine faulty but it's likely to be quicker than sending your Oric away for repair.

You're right that early Orics are fitted with EPROMs and not ROMs. In itself this isn't a bad thing. It's just suggestive of preliminary versions of the software. Everybody else does this and switches to ROMs as soon as they're convinced the software is ready and working.

As regards a new version of the ROM (or EPROM), Oric says it has plans to do a new version. There are no details as to when or how they will be available.

INVERSE and NORMAL are harmless oddities in the ROMs. They are in the Basic's command table but appear to have been patched out. As far as I know, they are not usable.

It's easy to see how they got into your listing. A Basic program is saved in a 'tokenised' form. Each keyword is replaced with a particular number. PRINT might be 1, IF might be 2 and so on. This makes programs more compact and quicker to execute.

INVERSE and NORMAL are in the command table. So a corrupted listing might accidentally have their tokens in it. So out they pop when you LIST the program. It's only when you try to execute these instructions that the Oric finds a locked door with the message SYNTAX ERROR written on it.

If you want a quick look at the command table yourself, this short program dumps it to the screen.

```
10 CLS
20 I=49386
30 PRINT CHR$(PEEK(I));
40 IF PEEK(I)>128 THEN
PRINT I
50 I=I+1:IF I<50123 THEN
30
60 END
```

Getting answers on the screen

Q Can you recommend a cheap but good VDU? Can you use a VDU made for a particular computer with another machine?

*J Trotter,
Edinburgh*

A Let's be careful about words here. VDU stands for Visual Display Unit. Many people use it to mean just a display screen . . . either a TV or monitor. Not so long ago, a VDU was a terminal to a computer . . . it had a screen and a keyboard.

If you mean just a monitor, then there are lots of units I could recommend. You get what you pay for. If you're after a bottom end monochrome monitor then anything from the Zenith 121 upwards will do the job. If you are buying a monitor, do get it from a nearby dealer where you can see it working and get it fixed or adjusted if it ever needs it.

The signals used to drive monitors conform to various standards. It's just a question of matching signals and plugs to use one monitor off one computer with another machine.

There are only a couple of snags you might meet. Some monitors for particular computers have fixed leads with odd plugs. The monitor may take its power from the computer through these leads — it's unlikely that you'll be able to use this on other machines.

And you may find that some imported American and Japanese machines come with foreign standard monitors and won't use anything else.

Beating the Oric go-slow

Q I have written a game for the Oric and want to change it to machine code when a compiler comes out. Would I then be able to market it? If I did, would I have to pay royalties to the author of the compiler? Do you know of any compilers that will become available?

*James Eibisch,
Cheltenham, Gloucestershire*

A Basic compilers for 6502 machines are expensive and complex programs. You can get compilers for machines such as the Pet and Apple but they are

very much disk-based products. So don't expect such a serious tool to be available for the Oric for a long while.

What you can expect are 'mock' compilers that will translate a tiny subset of Basic into machine code. Think carefully about buying one of these . . . you'll have to re-write programs in Oric Basic to get them to compile.

Reality aside, suppose you had a Basic compiler on the Oric and were selling a compiled program. Royalty payments or whatever depend solely on the company that produces the compiler. It's a matter of some debate. You've bought a tool . . . why should you have to keep paying the company whenever you use it?

So where does this leave you? With a slow Basic program. If you need speed (or flexibility) then you can't avoid learning either assembly language or possibly Forth. Don't worry, it's not that hard.

Dawning of the micro micro

Q I've got a silly question. Where did you get the little model computer that was pictured next to the Aquarius on the cover of issue 7? I know it's a silly question but I did think it was a cute model.

*S Sham,
Enfield, Middlesex*

A Oh dear . . . silly answer time. I suspect the fact that the model's CPU appears upside down fooled you. It's actually a model of a DEC professional with a built in digital clock. It was given away at the launch of DEC's micros in January.

I suspect DEC had the models made because it's still difficult to get hold of the real thing. It can't have been a ploy to get their name around the place because most of the models I've seen don't keep good time. A trait reflected by the deliveries of the machines themselves.

I was lucky enough to be given a working (but slow) specimen . . . I'm sure it's around my desk somewhere.

But don't be embarrassed about asking. I think it's one of the nicest freebies I've ever been given. There's only one thing I'd like more than a working example. A working specimen of the genuine article.

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David Janda makes designs on the Newbrain — with the aid of screen and printer.

Graphics in print

The Newbrain is designed for expansion. Disk drives, printer, communications modem and ROM cartridges have all been promised, and with their addition the Newbrain should form the core of a powerful system.

Grundy will be releasing a printer for the machine in the near future, but meanwhile you can connect various printers to the machine provided you have the right interface.

The Newbrain interface will be of the RS232C/V24 type, with a device number of 8. So once you have the printer set up, entering OPEN #8,8,"b" enables the printer. Here b stands for the baud rate. If your printer operates at 300 baud, enter OPEN #8,8,"300".

Grundy's machine will operate at 9600 baud, and as this is the default value, OPEN #8,8 will be sufficient for 9600.

To list or print, all that is needed is the stream number. You'll be able to list all or part of a program by entering the stream number after the LIST thus: LIST #8 or LIST #8,10-100.

It won't be possible to use TAB with the printer as TAB will act as the comma separator with zone widths of eight characters. At first this may seem like a letdown, but the print formatting characters are available and spaces can be printed. To see this, look at the following program which prints the number n, COS n, SIN n and TAN n, formatted!

```
10 PRINT "Align next page to printhead
and press N/L"
20 INPUT (" ") Z$
30 OPEN #8,8
40 FOR a=1 TO 100
50 PRINT #8,a [3] ; " " ;
60 PRINT
#8,COS(a) [1.4] ; " " ;
70 PRINT #8,SIN(a) [1.4] ; " " ;
80 PRINT
#8,TAN(a) [2.4] ; " "
90 IF a/20=INT(a/20) THEN PUT #8,12
100 NEXT a
110 CLOSE #8
120 PRINT "Printout complete"
130 END.
```

Lines 30 and 110 open and close the printer stream, while line 90 calculates whether 20 lines have been printed. If this is the case, a form feed is performed, and 20 lines are printed per sheet.

Graphics

The Newbrain has a comprehensive graphics package as standard, with 19 graphics commands in all. The functions range from placing a graphics cursor on a particular area of the screen to drawing axes. Our table lists the machine's graphics commands.

All the commands are preceded by PLOT, and it is possible to have more than one graphics command per line, for example:

```
PLOT RANGE (200, 100), CENTRE
(100, 50)
```

The graphics command PEN allows the user to find out where on the screen the PEN is. This is handy because you cannot draw outside a previously defined graphics area. PEN is used to evaluate where the next pixel is to be drawn, and if it is outside the graphics area, an error trapping routine can be set up. This is very good for debugging graphical programs.

Look at the following program from the Newbrain beginner's guide. This sets up a narrow (hence 'w') area at the lower end of the screen and draws a cross-hair:

```
6 5 CLOSE 1
10 OPEN 0,0, "100"
20 OPEN 1,11, "n160"
30 PLOT BACKGROUND (1), WIPE
40 PLOT RANGE (200,100)
50 PLOT CENTRE (0,0)
60 PLOT PLACE (0,50), MOVE (200,50)
70 PLOT PLACE (100,100), MOVE
(100,0)
80 END
```

Line 5 closes any streams that were open, 10 reserves some memory and line 20 OPENS a narrow screen 160 high.

Reserving areas of memory to do graphics work is a headache. To define a work area for graphics, a stream has to be opened, and sometimes this can be very complicated.

OPEN #.11,"W200" opens a stream — number 1, for device 11. A wide screen 200 graphic lines high has been selected.

Character set

The Newbrain has four character sets. This does mean that every character is different in each set — the difference is usually in the latter half. Each character set can be obtained by entering control codes directly on the screen, or by a program statement (PUT).

Not all the characters are printed, as the first 31 are control codes, and these can be used for tasks like positioning the cursor. The following program prints every printable character in all the sets:

```
10 LET a=0
20 FOR c=1 TO 8
30 READ a
40 PUT 23,a
50 FOR p=0 TO 255
60 PRINT CHR$(p);
70 NEXT p
80 NEXT c
90 DATA 65,66,67,68,72,73,74,75
100 END
```

Overall, the Newbrain is a good machine. Its processor is used throughout the micro world and it has a 'normal' Basic. The only real disappointment is that, for a compiled Basic, the machine runs slow. But the compiler is designed for saving memory rather than for speed.

When its peripherals become available in the near future, it could well become a micro worth watching.

TABLE OF GRAPHIC COMMANDS

MOVE(x,y)	Moves pen to x,y. Draws as it goes.
MOVEBY(d)	Moves the pen distance d.
DRAW(x,y,c)	Draws line to x,y. Colour c.
DRAWBY(d,c)	Draws line to d.
ARC(d,o)	Used to draw circles.
PLACE(x,y)	Move pen to x,y. No drawing.
TURN(o)	Turn pen angle o.
TURNBY(o)	TURN increase by o.
RADIANS	Angles output in rads.
DEGREES	Angles output in deg.
BACKGROUND (b)	Sets background to colour b.
WIPE	Clears screen.
DOT(x,y,c)	Plot single dot.
AXES(a,b)	Draws axes crossing at current pen position.
COLOUR(c)	Sets the pen colour.
FILL	Colours the area pointed to by pen.
RANGE(a,b)	Sets the coordinate scale.
CENTRE(a,b)	Sets the origin of the coordinates.



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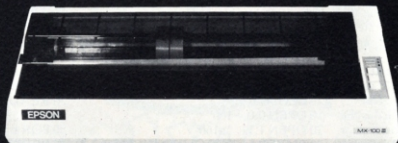
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Open Sesame? Nigel Cross gives Colour Genie owners magic words they've been looking for.

The Genie's graphics in the picture

The Colour Genie is claimed by both the manufacturer and distributor to be a machine capable of 'amazing' graphics facilities. Depending upon your interpretation of the word, this may or may not be the case.

My understanding of it is that it claims to have 'surprising' graphics — this certainly seems to be the case.

Basically, the machine has two graphics modes. One is low resolution with text on a 24 lines by 40 character display. The other is high resolution, with no text, giving access to 160 points in the X direction and 96 points in the Y direction. For those unfamiliar with X, Y designations they refer to horizontal and vertical axes. These two modes are mutually exclusive in both direct and program modes.

Low resolution is the normally available and displayed text screen and is referenced within programs by the LGR command. However, should you use the high resolution screen and your program terminates, you will find the system automatically returns to the low resolution screen. Assuming that you really want to see what is on the high resolution screen then the CTRL and MOD SEL keys must be depressed. To return to low resolution press BREAK.

Low resolution allows the use of the full ASCII code range (0 to 255), selectable by the CHAR n function for one of four active character sets. The full pre-defined character set is shown in the illustration on this page.

User defined characters can be created using an 8 by 8 matrix, and are then POKED into memory. This is similar to many other machines previously described in issues of PCN, and is well explained in the manual, so I shall skip this technique.

Colour

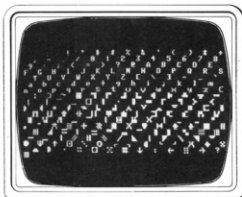
Within this mode eight colours are available referenced by the COLOUR n command, where 'n' refers to the following: 1 — white, 2 — green, 3 — red, 4 — yellow, 5 — orange, 6 — blue, 7 — cyan, 8 — magenta.

Black is, however, the only available background colour in this mode. By deft programming and careful character design it is possible to produce very effective animated graphics.

However, to turn to the high resolution mode, things become somewhat more complex and decidedly 'amazing'. Access to this mode is by the FGR command within your program, or as previously stated through the keyboard. FGR is

supposed to represent Full GRaphics, but on a system such as this with only four character colours and two background colours, I feel that in this day and age it is something of a misnomer.

Starting in the background, BGRD gives an insipid pink and NBGRD returns to black — powerful! In this mode the four foreground colours are selected by the



A display of all pre-defined characters available through access to ASCII codes 0-255.

FCOLOUR n command where 'n' is: 1 — black, 2 — cyan, 3 — orange, 4 — green. The Basic manual suggests that 2 and 3 are blue and red — wrong! Clearing the screen in this mode is accomplished by the FCLS command to the currently set background colour.

However, should you want different background colours then a facility does exist to colour the background with the FILL n command. Here 'n' is the same as above, but do make sure that your foreground colours are not the same as the selected background or they will disappear.

Displays

Simple drawing of pictures or patterns is accomplished by either of two commands. The first is the PLOT X1, Y1 TO X2, Y2 TO Xn, Yn command which allows a line to be drawn from point 1 to 2 to ... n in the current foreground colour. There is an associated command NPLOT ... to draw lines in the current background colour.

The second major command is CIRCLE X,Y,R where X,Y is the centre of the circle to be drawn and R is its radius. The radius can exceed the parameters of the available screen and still function without errors, a technique demonstrated in the first program in lines 20 to 50.

Unfortunately, the same does not apply to plotted lines, thus these should be restricted to the available screen area, as in lines 60 to 100 of the same program.

The second program example shows the capability of generating, rotating and reducing regular geometric shapes. The original intention of this program was to demonstrate the use of another command, the PAINT X,Y,C,B function. This command is supposed to fill a closed shape with a solid colour C, up to a selected border colour B, by defining a point within the shape, X,Y.

But this procedure proved so erratic that the function was omitted. If you would like to try it, then enter the following line in the program and watch the result.
65 PAINT X,Y, (5 - M),M

This should have produced solid rotating squares, but the display turned out to be that of slabs of colour to the right of the pattern with the occasional solid square — not quite the desired result.

I can only assume that this is due to lines of different colours falling within the boundaries of the selected shape to be filled.

Even attempts to PAINT circles with solid colours produced many erroneous displays and on occasions 'hung' the system altogether leaving the power-off as the only exit. Not the world's most efficient technique!

As a way round this problem, the third example shows a somewhat long-winded technique for PAINTING solid colours to produce a multi-hued fish design.

There are four more commands available for use in the high resolution mode pertinent to the creation and display of complex shapes. The shapes concerned have to be created by the long-winded procedure of analysing the shape and colour combinations of the desired result and POKING the binary colour and movement values into the high end of memory such that it can be displayed afterwards.

This technique can only store one shape at a time and is so time-consuming that you should only attempt it as a last resort. Be that as it may, the commands associated with this are SCALE n — for selecting size of displayed shape; SHAPE X,Y — displays shape at X,Y; NSHAPE — undraws the shape; XSHAPE — inverts the colour of the shape drawn.

All in all, I would expect most users of this system to create their graphics using the low resolution mode as, in my opinion, high resolution has so many drawbacks and limitations that only the single-minded and dedicated have the patience, and probably skill, to make the high resolution system work well.

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```

10 FOR: FCLS
15 X = 80: Y = 40
20 FOR R = 1 TO 100
30 FCOLOUR (RND(4))
35 CIRCLE X,Y,R
40 AS = INKEY$: IF AS = "" THEN INPUT AS
50 NEXT R
60 FOR R = 1 TO 47
70 FCOLOUR (RND(4))
80 GOSUB 200
90 PLOT AX,AY TO BX,BY TO CX,CY TO DX,DY TO AX,AY
95 AS = INKEY$: IF AS = "" THEN INPUT AS
100 NEXT R
110 GOTO 20
120 REM END OF MAIN PROGRAM LOOP
200 AX = X1: AY = Y - R
210 BX = X + R1: BY = Y
220 CX = X1: CY = Y + R
230 DX = X - R1: DY = Y
240 RETURN

```



The short program on the left produces a display of partially random colours, as seen in the 'wallpaper' pattern above. The program creates a whole range of pseudo-colours, using a line-overlap technique. It is possible to run the program over and again without repeating patterns, despite the fact that only four colours — black, cyan, orange and green — are used.



The pattern you see above is easy to produce using the short program on the right. It uses variable adjustment of regular geometric shape to give the impression of depth. Notice the difference between the way this program and the first program use colour.

```

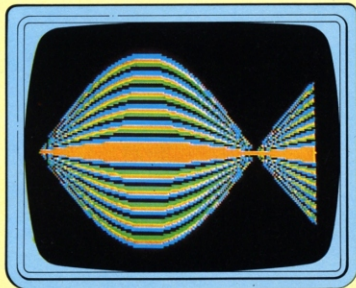
10 FOR: FCLS
20 X = 80: Y = 40: R = 47
25 M = 4
30 FOR TH = 0 TO 3.14159 STEP 0.1571
40 GOSUB 200
50 FCOLOUR M
60 PLOT AX,AY TO BX,BY TO CX,CY TO DX,DY TO AX,AY
70 M = M + 1: IF M = 5 THEN M = 1
80 R = R - 2: AS = INKEY$: IF AS = "" THEN INPUT AS
90 NEXT TH
100 GOTO 20
110 REM END OF MAIN PROGRAM LOOP
200 AX = X + R * SIN(TH): AY = Y - R * COS(TH)
210 BX = X + R * COS(TH): BY = Y + R * SIN(TH)
220 CX = X - R * SIN(TH): CY = Y + R * COS(TH)
230 DX = X - R * COS(TH): DY = Y - R * SIN(TH)
240 RETURN

```

```

10 FOR: FCLS
20 Y = 40
30 R = 47
40 M = 2
50 FCOLOUR M
60 FOR X = 0 TO 159
70 DY = R * SIN(X/40)
80 PLOT X,Y - DY TO X,Y + DY
90 AS = INKEY$: IF AS = "" THEN INPUT AS
100 NEXT X
110 M = M + 1: IF M = 5 THEN M = 1
120 R = R - 2
130 IF R < 1 THEN GOTO 50
140 INPUT AS
150 GOTO 10

```



Simplicity itself — this program uses large areas of solid colour together with trigonometric functions to create . . . a fission reaction?



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Sysres gives a micro about 50 extra commands. Pete Gerrard uses it to boss around his 64.

The Commodore at your command

Sysres is a programmer's aid package for the Commodore 64, and adds a very valuable 50 or so commands to the existing Basic built into the machine. As it is aimed at programmers, it is competing directly with a similar package called Power 64.

Both sets of programs are designed to enhance the computing capabilities of your machine, and the comparison table at the end of this review will give you some idea of which one would suit you best. I tested the package on a Commodore 64 with a 1541 disk drive.

Features

There are around three dozen commands to soup-up the 64's own text editor and help you edit both text and basic files easily. They work in much the same way as the standard Basic commands, but insist on being the first command on any line. They allow you to DELETE a range of lines, define a KEY as a special function, MERGE a file from disk into your program or RENUMBER a program.

There are also 11 DOS support commands which allow you to format diskettes, duplicate and validate them; copy, scratch or rename files and list files and the directory. These commands cannot be used from within a Basic program in the normal way, but this does not detract from their overall usefulness.

Sysres operates by taking out a chunk of memory from the 64, but as it sits below the area normally used for RAM this is of little concern to the user. All you'll lose is 256 bytes, and this is hardly a major disaster.

Presentation

There is only one program disk, which comes in an attractive binding, together with a user registration card, for use in the event of your disk malfunctioning.

The usual sort of security devices are missing, but instead you are given a rather peculiar master disk, which allows you to create up to three copies of what they refer to as a 'boot disk'. You get three to cover the occasional error on your part, and to prevent you from giving too many away.

The manual tells 64 owners with a single disk drive to get someone with a double disk drive to make copies for them, as making copies on a single drive is tedious and prone to error.

As well as giving this sound advice, the manual does its job well, describing each command in detail (with a useful index), and giving examples of it in use. But there



Karen Phelps

are annoying discrepancies which detract from the overall appeal of the product. Commodore 64 owners are presented with just half a dozen pages which are different from the original Commodore Pet version. The other 100 or so pages have a number of references to the Pet which do not apply to the 64. And not all the differences are trivial.

Getting started

There are no security devices to install; you simply insert the master disk into the drive, and away you go. But be prepared to be driven to the limit of your patience while the computer slowly and painfully makes the boot disk from your original master.

On using the package for the first time, you are required to make at least one boot disk before proceeding. This is tedious if you just want to start playing around with it straight away, and downright aggravating if you don't happen to have any blank disks to hand.

Beyond that, the manual and the instruction file on the master disk are all you'll need to begin driving the system. It's that easy to use.

In use

There have been utility programs available for computer users for a number of years, and such commands as AUTO (for line numbering), RENUMBER (for line renumbering) and DUMP (for dumping out

the contents of active variables) have become required statements for this kind of utility.

Sysres has all the standard commands you'd look for — old favourites like FIND and CHANGE, which search through your program and replace all occurrences of a given set of characters with another set, as well as some powerful additions to existing Basic commands.

The most useful, and the most apparent, is the ability to scroll a Basic program listing bi-directionally. Move the cursor to the top of the screen and the program listing will continue to decrement until you reach the start of the listing. Similarly, moving to the bottom of the screen scrolls the listing in the other direction.

A number of existing commands — such as RUN, which now ignores all screen garbage — have been upgraded but all of them are fairly common. Besides these facilities Sysres has a few aces up its sleeve. You can view sequential files on the screen with a three keystroke sequence, or do the same with relative files. You can also dump the contents of the screen to the printer.

You can define any key to be a whole sequence of other keystrokes, or even make a key into a whole program subroutine. Almost as an afterthought, Sysres gives you an internal monitor for your Commodore 64, with the same bi-directional scrolling facilities, even in assembly language.

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Reliability

I made a number of attempts to crash the program. Pressing RUN/STOP twice on the initial screen display plunged it into terrible chaos.

Apart from that, the program seems uncrashable.

Verdict

I consider Sysres to be the best package of its kind currently available for the 64. It is also the cheapest. As well as adding more commands than its rivals, the ones it has are particularly useful. You'll get so used to scrolling program listings merrily up and down the screen that you'll never want to be without the package again.

Apart from a couple of mistakes in the manual, the documentation is more than adequate, and certainly any experienced (or even not-so-experienced) programmer will find this a delight to use.

RATING

Features

Documentation

Performance

Usability

Reliability

Overall value



Name Sysres 64 **Application** Programmer's aid **System** Commodore 64 **Price** £59 **Publisher** Solidus IC (UK), Wandle Road, Beddington, Croydon 01-688 5164 **Format** Diskette **Language** Machine code **Other versions** Commodore Pet series, Apple **Outlets** Mail order.

	ORIGINAL TOOLKIT	POWER 64	SYSRES
Machines	All Pets	Pets/64s	Pets, 64s, Apples
Number of commands	9	15	50+
Disk commands	1	1	11
Monitor commands	No	Yes	Yes
Screen dump	No	No	Yes
Scroll listings	No	Yes	Yes
List files from disk	No	Yes	Yes
Ability to add commands	No	Yes	No
DOS support	No	No	Yes
Price	£29	£69	£59

The number of commands given applies to the command in its most basic form. Most have a number of variants on the original form. We've tried to give a balanced comparison between Power 64 and Sysres. The original Toolkit utility chip? It just goes to show how times change ...

ZX compresses addresses

Address Manager is primarily for home use, allowing you to keep your address book on cassette and use your Spectrum to find and update addresses.

Features

The program is menu-driven, the menu coming up on the screen when you load the tape and after you have finished each operation. The options available are Locate Entry, Add Entry, Amend Entry, Delete Entry, Select Entries, Display Entries, Print Entries, and Maintain File.

The Select Entries option is a multiple indexing facility. When you enter a name and address into a file you can specify three index keys, of three characters each, and you can ask the program to search for combinations of index keys and print out the entries that match.

As well as the program there is a simple file of names and addresses on the tape, which you can use to learn the controls and editing methods.

Presentation

Address Manager comes in a colourfully printed box which contains the program cassette and instruction leaflet, and there is

space provided in the box for you to keep your address file tape.

The leaflet is nicely printed, with explanations and examples of the program's features, and illustrations to show the screen layout for all of the menu options.

In use

Address Manager is generally quite easy to use, allowing you to select options and move around the different fields of an entry by pressing the cursor control keys.

There are, however, some features that are a little more complicated and confusing than they need to be. The editor, which you use when entering or altering names and addresses, can work in several different modes, where you have different ways of getting upper and lower case letters, or numbers and cursor movement.

As you will probably use the editor only occasionally, having all these different modes is more likely to be confusing than helpful.

I was unable to crash the program, even when it was loading, saving, and printing, and the program performed correctly, doing everything exactly as described in the instructions.

The only problem I had was with the tape, which has the program on both sides, but one side would not load correctly. Faulty tapes may not be common, but it is important, and if anything goes wrong with the tape you will not be able to get at your address file until you can get another copy.

Verdict

Address Manager is a well-designed program, and the multiple indexing facility is a sufficient advantage to compensate for the extra trouble involved in loading a tape instead of using an old-fashioned address book.

RATING

Features

Documentation

Performance

Usability

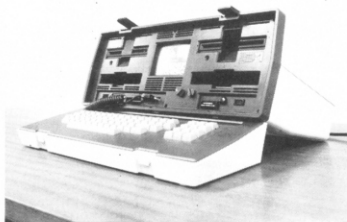
Reliability

Overall value



Name Address Manager **Application** Computerised address book **System** ZX **Spectrum Price** £8.95 **Publisher** OCP, PO Box 99, Oxford **Format** Cassette **Language** Machine code.

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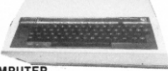
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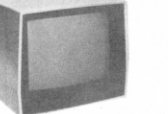
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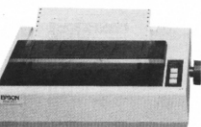


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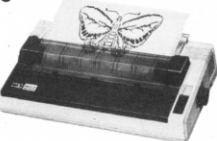
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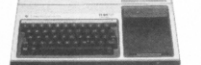
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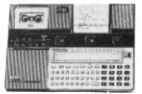
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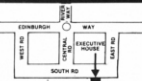
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Henry Velleman checks out an underarm filing system for the Epson HX-20 portable micro.

Rambling records

Ever wished you could carry a filing system around with you? The MST Database program is an attempt, although on a less ambitious scale, to do just that on Epson's HX-20.

Features

The Epson HX-20 is a very portable, battery powered microcomputer complete with a built-in 24-column dot matrix printer and 20-column by 4-line LCD display. As standard it costs £402 with 16K RAM.

The MST Database costs £25 and provides all the basic facilities necessary to build and maintain a simple filing system on the HX-20.

At the above prices (not much more than a good quality filing cabinet) you won't find all the facilities which are to be found on the latest office micros with sophisticated packages such as dBase II. However, in addition to the essential facilities of add, amend, delete and list records, the MST program has flexible search, sort and total routines which can be used on any field — something uncommon on many of the expensive packages and machines.

The instruction leaflet with MST Database claims that the package is 'designed to replace any reasonably sized card index system'. This is a meaningless comment as no indication is given as to the actual capacity of the system.

Unfortunately I found that the instruction leaflet was definitely the weak link of the system, leaving too many points to be discovered by trial and error, and relying heavily on the fact that the program is 'user-friendly and should guide you through.'

Presentation

The MST package as reviewed consists of a C60 microcassette on which the 6KBasic program is recorded, plus a plainpaper photocopy as the instruction leaflet. I cannot believe that this is how the package is to be sold, unless it is purely mail order, as it has no consumer appeal whatsoever.

The instruction leaflet leaves a lot to be

desired. It would be greatly improved by an introduction to the concepts and planning of a computerised database and examples would make it so much easier to plan the transfer of your existing system onto the computer.

Worse, you are given no guide as to the number of records you are likely to be able to fit on the system and there is no hint that the maximum field length is only 18 characters. By experimentation I found that a database of records consisting of four alphanumeric fields totalling 60 characters plus one numeric field gave 54 records on a 16K machine or 234 records with 32K RAM.

Records may contain up to nine fields, so if you use the maximum field size, your record has a limit of 152 characters and this produces 113 records on the 32K machine.

You would be wise to experiment with different file configurations before finally committing yourself by entering a lot of data.

The paragraph on 'Getting Started' gives terse instructions on loading the program into the computer, referring you to the Epson manual for the tricky bit of clearing the memory and setting the time and date.

Unfortunately Epson has rather hidden this information in its manual and it would be easy to search for hours for this essential piece of advice (page 4.1.2).

In use

The seasoned user will be familiar with the next hurdle; the program does not do what the leaflet says it will do when you type RUN. Instead of asking a series of questions, a title page is displayed with no indication of how to proceed. Fortunately, press any key and away the program goes.

With the instruction leaflet is a loose sheet of sample printouts of the main menu and some of the other options. Using this sheet as a guide to the excellent 'step through' facility which the program has, you soon become at home with the program. To step through simply press the '>' key to progress forward, the '<' key to move backwards and the '@' key to accept or reject any option. The program remembers the path you have taken and it is possible to move back several steps, alter your response, and then move forward again. I found this a very powerful facility which easily makes up for the restriction imposed by the small screen on the amount of information displayed at any one time.

Very strangely the program will not allow lower case characters even though the HX-20 has a full upper and lower case set on both the display and the printer. The input is otherwise well controlled, and the program ignores irrelevant keys so it is difficult to crash the system. The BREAK key is not disabled, but this is unlikely to cause

a problem unless pressed during a sort.

When adding data the program steps you through field by field, prompting for the appropriate input and restricting you to the maximum field length set.

There is also a search facility you can use to find a record you wish to amend or delete. The search is powerful but slow, allowing searching on any of the fields and displaying all records where a possible match exists. Searching for 'TOM' will match with not only TOM but also TOMATO, ATOM, etc if they exist in the searched field. Matches can be displayed on the screen or the printer.

The sort facility also works on any of the fields which means that you do not need to worry too much about having a key or master field restricting the layout of your database.

The sort can be into either numeric or alphabetic order. The instruction leaflet warns you to be prepared for a lengthy delay if you have a lot of records and it is a pity that the HX-20's built-in sound is not used to signal the completion of lengthy processes such as sorting or searching.

Reliability

The program performed reliably and should not crash under normal use but there is too little emphasis in the instructions on the importance of backing-up your database to tape in case of catastrophe.

Also, the data saving routine does not allow a name to be given to the tape file. This can make it very difficult to find the right tape.

The only major problem you are likely to experience is if more than one database is planned for the same HX-20. This is due to a hardware design oversight in that there is no way of clearing memory without totally resetting the machine. You then have to reset the system time and date, reload the program from the microcassette, followed by the data also from cassette.

Verdict

The MST Database is a very fair package for the price and should provide a ready replacement for most reasonably compact manual filing systems providing that the data will fit into a maximum of nine fields with up to 18 characters each.

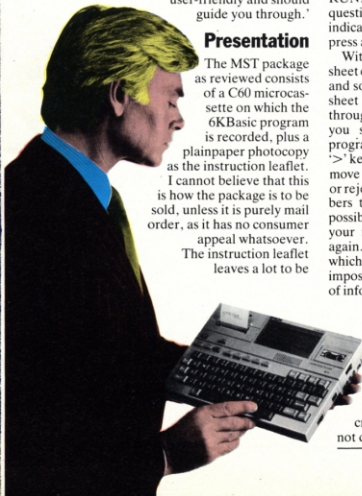
I feel that with a revamped user manual the package would be excellent value for money, but it may be worth looking at Epson's own database program, Card Index, which sells for £25 on cassette.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall Value



Name MST Database Application Database System Epson HX-20 Price £25 Publisher MST Consultants Format Cassette Language Basic Outlets Mail order



Nigel Cross talks to his micro, courtesy of VIM from Voice Machine Communications.

An Apple with ears on

About 15 years ago Stanley Kubrick and Arthur C Clarke combined their talents to produce a classic science fiction film. The product, *2001 — A Space Odyssey*, was hailed as a major step forward in the realistic portrayal of the future.

One of the most memorable features of the film was the voice activated and responsive computer HAL — a science fiction writer's invention. It's worth pointing out that when that film was released there were no microcomputers—and even if there were they would have cost an arm

and a leg. But today we have a glut of small and powerful machines, with ever-increasing capabilities at low cost.

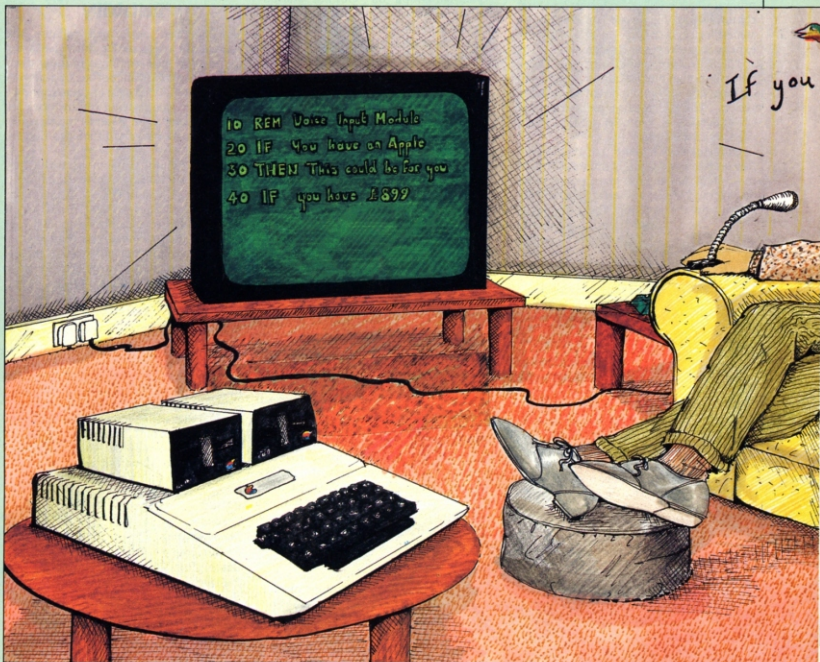
Among those capabilities are a whole range of voice output units (or speech chips). They vary in efficiency and cost, but until now there has been no voice input facility outside the research laboratory environment. VIM (Voice Input Module), from Voice Machine Communications of California, has changed all that. At relatively low cost you can talk to your computer and your micro can respond accordingly.

Presentation

The system PCN reviewed is the VIM-2 for the Apple II range of computers. It consists of one large PCB (VMC 2020C), Shure noise-cancelling goose-neck microphone, foot-operated switch, disk-based software and a comprehensive user manual.

The PCB is somewhat longer than the normal I/O board often seen in Apples, as it contains its own processor (68B03), 4K EPROM and 8K RAM plus keyboard interface. Due to its length the top leading edge is cut away so that the board can fit under the sloping part of the Apple keyboard.

The manual claims that the installation of the board is a simple ten-minute job that can be done with a Phillips screwdriver. The instructions for installation are as idiot-proof as possible without being too 'down-market' for the average Apple user. But they must be read thoroughly before taking the plunge. Once you're acquainted with the instructions and illustrations, all you have to do is arm yourself with your trusty tool and dismantle the Apple.



Instead of the normal technique of just lifting off the cover and putting the PCB into one of the available I/O slots, this board requires the whole of the upper part of the Apple to be disconnected from the baseplate. The next part is the most tricky and potentially dangerous operation. What you have to do is remove the keyboard connector from the mother-

too easy to bend the legs trying to remove it from its tight-fitting socket. I did this, but managed to retrieve the situation. The UK distributors, CGD, Ltd, told me it will be including a chip-puller in the versions that it supplies to alleviate this problem. Once you've got this far it's easy to put the PCB into any available I/O slot (the software uses slot 4 as its default value, but this can be adjusted to your requirements).

All you need to do then is put the machine back together again, connect the foot-operated switch to the board and plug the microphone into the switch. You are now in a position to use the system, but it has probably taken about 30 minutes and left you suffering from terminal apoplexy!

In use

Use of the system is simplicity itself. Put the supplied software disk into the drive and turn on the Apple. Hey Presto! The Voice Utility Program (VUP) is loaded and allows you to perform all the necessary actions through menu-driven selections. But before continuing with the operation of the system it would be best to fill in a bit of background and put VIM into perspective.

At about the time 2001 hit the world's cinemas, Ron Runge (now of VMC) was working on the problems of optical recognition of shapes and patterns by computer. To do this he analysed various eyes of the animal kingdom and produced a simplistic model eye which interfaced directly to a computer. This was capable of recognition of simple shapes — triangles, squares and circles — but beyond this, technology and the complexity of the problem left him no alternative but to abandon this line of research.

Not wishing to waste all his experience gained in pattern recognition techniques, he turned to the problems of speech. Again he took the empirical route, analysing various types of ear until he produced a computer compatible model guinea-pig ear with which to further his research. But even this simpler line of research posed many problems.

For example, if you were to go into any high street hi-fi shop and just look at amplifiers, you'd find a whole range of equipment covering a wide spread of performance. The cheaper units typically have an active low distortion range covering frequencies from 20Hz to 15kHz, whereas the top quality units spread from 5Hz to 20kHz. This means that for the expensive amplifiers the reproductive capability allows for a greater band-width response within the human limits of audio frequencies.

Similarly, sounds uttered by the human larynx (voice box) tend to be within the wider band-width, giving more distinctive and unique timbre of each word or phrase spoken by the individual. However, if you used a cheap amplifier to reproduce the spoken word then it is possible for you to lose the distinctive qualities of each individual's speech pattern by not having the full range available for amplification. This therefore highlights the first part of

the problem in speech pattern recognition — that of the wide range of frequencies to be sampled for distinctive response.

The second — and greater — problem is that human speech tends to be an amalgam of many different frequencies generated simultaneously. This means that any device designed to analyse human speech patterns must be capable of not only covering the frequency range, but also sampling many frequencies at the same time. There is also the problem of repetition. It is seldom possible for individuals to reproduce the same word or phrase exactly, so any sampling technique must also have the capability of being able to average the frequencies used in any single utterance. These changes in frequency generation are usually caused by small variations in volume, stress and health plus other factors too numerous to document here.

The problems so far mentioned pale into insignificance when compared to the fact that words and phrases are not just one sound but a concentrated string of sounds. The sounds that make up our words have been the subject of many years of research and investigation by speech therapists, primarily to teach deaf people how to communicate with those of us who hear normally.

It has been found that there are 64 discrete sound units that make up all of our words, and this refers only to English language. For other languages there are other aspects — gutturals, for example — to be taken into consideration. The individual sound units are collectively referred to as phonemes (a Greek derived word meaning sound units).

It was first thought that phoneme recognition would be the solution to the problems, but again the infinitely variable human body managed to put the mockers on this line of investigation.

The drawback to the use of phonemes for speech pattern recognition is that each

At relatively low cost you can talk to your computer

board and plug it into the VIM board, while plugging a matching connector into the now vacant keyboard socket. Extreme caution is required to do this.

The keyboard connector is one of those dreadful long-pinned devices, and it's far



Sounds that make up words have been subject to years of research

phoneme as uttered by any person can still be a variable. This variation is usually caused by the fact that although in normal speech each phoneme is used, in many words they vary in reproduction according to the length of time taken to utter one, or to apply inflexion, stress, accent, etc.

Runge's answer to these seemingly insurmountable problems was to treat all speech in one way. The technique he employed was to sample speech input at specific points in time over a number of discrete frequencies. He used an audio frequency spectrum analyser for this.

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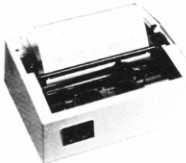
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These sample selection points, in fact, turn out to be at periods of five milliseconds (1/200th of a second). Unfortunately, the frequencies used for the discrete sampling are unavailable to us, but it is assumed that they would be selected according to a normal distribution graph—bell-shaped—as used in statistical analysis. The majority would be grouped about the mid-frequency range of human speech, and less at the band width extremities.

Although this method of sampling covers the whole range of normal speech, there is yet another problem—word or phrase completion, and plosives. Plosives are the result of the complete closure of the oral passage followed by the sudden release of breath or utterance. Examples of these are the sounds produced by 'B', 'D', 'P', 'K', 'T' and the hard 'G'. In these cases there is a silence during the build up of the power required to force the sound out of the larynx. Obviously, this silence has to be allowed for in the sampling technique and not cause the analyser to assume that it is the end of an utterance.

The method employed to distinguish between plosives and termination is the simple task of allowing a 32 sample wait during comparative silences. If the silence continues past this selective wait then termination is assumed and comparison with a stored vocabulary is instigated.

This historical and technical background should show you the enormous amount of effort required to produce an efficient recognition unit. The fact that this unit is available for such small machines as are around at the moment, and is relatively cheap, demonstrates the single-minded dedication of Ron Runge to improvements

in the human/computer interface, and he should be given a hearty pat on the back.

But to return to the operation of VIM, we got as far as loading the VUP, a menu-driven utility program. This program allows the facilities of BUILDING and EDITING, TRAINING the VOCABULARY, RECOGNISEing the VOCA-

Playing Blackjack by talking to your computer is an experience

BULARY, IDLEING AVIM (Apple Voice Input Module) and QUITting the VOICE UTILITY. Within these menu selections are further sub-menus to allow the operator to deal with all the requirements of voice input, storage of vocabularies, loading of vocabularies, loading and saving of voice patterns etc.

In operation, VIM proved to be a robust product with stable, easy-to-use software. The user manual leads you very simply through a series of exercises to familiarise you with the operation of the system. These use a set of pre-defined vocabularies for interface to standard Apple software such as Visicalc, Wordstar, Apple Pie and Basic plus a vocabulary for a Blackjack game (also supplied on disk). Playing Blackjack by talking to your computer is an experience all of its own—but, unfortu-

nately, our resident card-sharp managed to lose all his money by chewing on a Callard and Bowser and trying to talk to the machine, which managed to misinterpret his instructions. Mind you, even I couldn't manage to understand him!

By studying the manual in depth you'll find many tips on getting the best results. eg use longish discrete words or phrases, avoid possible homonyms (bear, bare etc). I followed the advice in the manual, and found that the manufacturer's claims of high accuracy were valid.

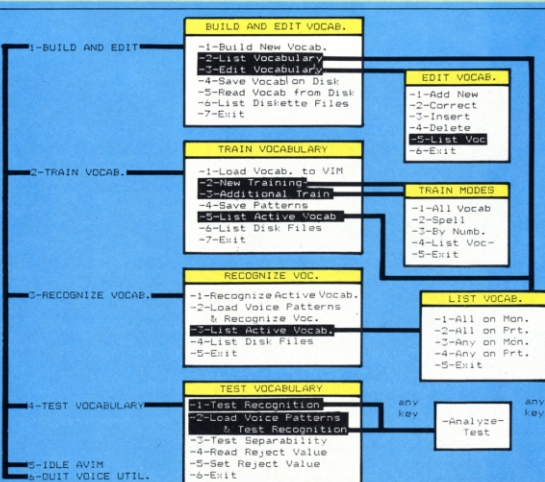
In fact, as a bit of a joke, we even tried to interface a BBC Model B microcomputer fitted with the Kenneth Kendall voice chip (see PCN issue 4 for a review of this) to the Apple through VIM. It worked! Is this the first demonstration of non-bit oriented inter-computer communication? Could it catch on? We wait to hear!

Verdict

All in all I have got to admit that this system is most impressive. The manufacturer also mentions a whole range of extra options available for VIM. These include head-worn close-talking microphones, a programmer's reference manual and a cordless microphone system.

Thank you Ron Runge and CGD for giving me the opportunity to enjoy myself so much with such a professional and forward-thinking product. My only hope is that it is put to use correctly.

Item VIM (Voice Input Module) Computer
Apple II Price £899 inc VAT Contact CGD Ltd, (01) 878 4072.



Learning to listen

These are the four slabs of menu you encounter when using the system. The idea is to choose commands which are both easy to remember and distinguishable for the machine.

Once you've saved the vocabulary you train the system to recognise the way you're likely to say the words.

The program clears the screen and prompts you, one word at a time, to say each word. It 'remembers' the way you say the words and then works its way through the list twice more. In this way it has a good sample of your pronunciation of the word—every time you say it, you say it slightly differently.

You then save the vocabulary to disk and tell the program to recognise the vocabulary. The program turns the VIM on and drops you into Basic, where you can load the program you wish to control with the system.

The AVIM program has options for testing your vocabulary for separability—to make sure that no two words will sound too much alike to the system.

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Max Phillips falls for the Comx 35 — a full-featured colour micro for a miserly £120.

Beauty from the Orient

You don't launch a £120 home computer anymore unless you know exactly what you're doing. Fortunately, the Hong Kong-based Comx World Operations seems to have the market sussed. Its existing companies who should watch out.

The Comx 35 is a conservative little computer. It's beautifully built, well designed and it offers 32K Ram, colour graphics, sound, a usable keyboard, a joystick, ten bundled programs and a good Basic. For a miserly £120.

Presentation

The review machine was one of the first in the country. Its packaging is going through a cosmetic redesign. But functionally, its compact and strong enough. The Comx has a very consumer goodie feel to it, ideal for today's computer.

You find everything you need in the box. One pretty computer, TV lead, cassette leads, manual, freebie cassette and a plug/power pack. It really is child's play to get started.

Documentation

Documentation is the customary spiral bound Basic tutorial. It looks less glossy than some of its rivals . . . it's off a daisywheel with a single spot colour and a handful of diagrams. But who needs fatuous filler cartoons anyway?

Manuals are about communicating information and the Comx book is hard to beat. It's in English, it's thorough, accurate, well organised and not the slightest bit patronising. There's plenty of examples and programs and tables where you need them. In short, as an example of its genre it's spot on.

But, and it's a megabit, there's one omission — gut level technical information. The Comx is based on the antediluvian 1802, a weird, wonderful but little known environment. A complete 'Comx 35 peeled' guide is essential.

Memory maps, I/O ports, entry points, schematics, ROM listings, CPU architecture. Every bit, byte and jumper should be documented. The Comx 35 will fail miserably unless UK and American companies can produce software and add ons for it. It needs the support that make Sinclair and Apple tops.

Comx says it will consider handing out technical information. It has a choice of confessing all or committing suicide.

Construction

For £120, it's quite a shock. The Comx is well styled (a definite selling point) and well made. The main unit has a moving keyboard and built in four-way joystick and there's also a welcome on/off switch at the back.

Prising the Comx open involves just two screws and a small fight with its snap-on top. Inside, it's a beautifully made and laid out board, all push connectors and apparently kludges.

The big surprise is the 1802 processor. This takes its name from the year it was last seen in a commercial product. Normally, nobody could care less what processor was in a machine. As long as it was a 6502, Z80, 6809, 8080 . . .

The 1802 is a CMOS 8-bit chip, equipped with a neat instruction set and piles of 16-bit registers. Last well known products to use it were the Elf, Cosmac VIP and Quest. Well . . . they were well known once.

No matter how good a design the 1802 is (the Dodo was a good design), its rareness is a fault. How many 1802 programmers are there left? How quickly will software houses train their latest ten-year-old folk heroes to program it? Having an 1802 introduces a dangerous unadaptability among software houses and add on firms.

Following the 1802 overture, there's a set of three RCA support chips . . . the 1869, 1870 and 1871. The rest of the computer seems to be a bank of 32K RAM and a second block, presumably video RAM, of 3K. Hence the 35K in Comx 35.

Keyboard

Super selling point, especially in photographs, is the Comx's 55 key keyboard. This is similar to the Oric's feel but a little cramped. All decoding seems to be done in software so you can do what you like with it.

The layout is QWERTY at heart but the rest is original thinking. Punctuation marks are all moved round and DEL has ended up bottom left. But it's perfectly usable . . . most Basic characters don't require shifting, so tots should find it a delight.

There's a reset key, labelled RT, carefully positioned right next to the 1. Sensibly, Comx has locked it. You must hold down the space bar and hit reset at the same time to actually reset the machine.

But not to make a glaring failure of

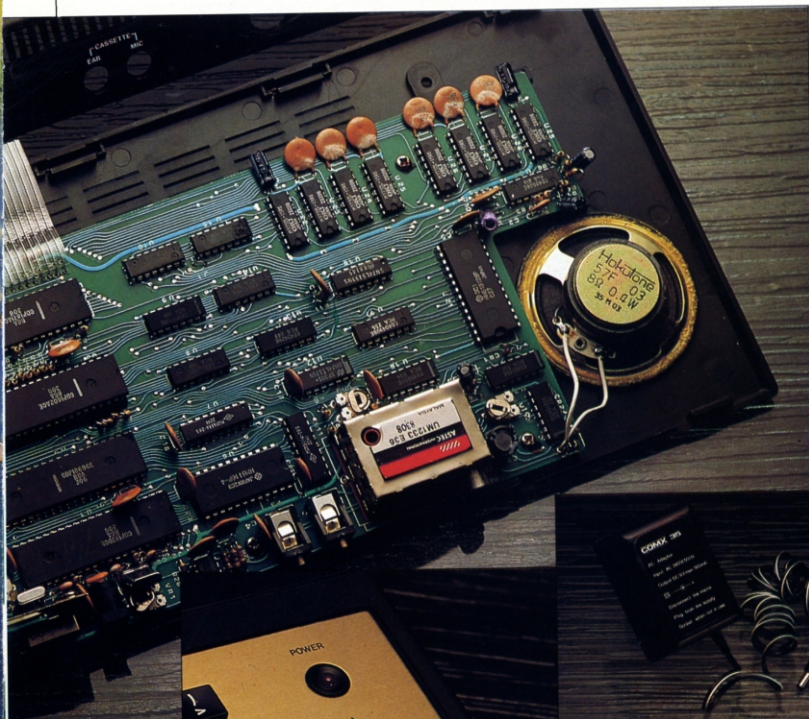
including a sensible reset, the RT button is destructive. Hit it and it blows away all your programs and data. The ESCape key interrupts Basic programs . . . most of the time. I managed to hang myself several times.

But the real genius in the keyboard is the little joystick. Think about a built in joystick. Commercial programs can use it without having to worry about half their market not having bought one. Everyone knows there is a joystick and how it works.

It's a simple but sturdy device, and it's a little strange. All it does is generate key presses (136-139 for up, right, down and left). So you can read it with the KEY function in Basic.

It's an auto-repeat joystick (what am I saying?) so you can work it like a normal joystick but most of the time, the action is to flick it once with the tip of the finger rather than bend it Atari style with the fist and forearm.





Top: The Comx lid snaps off after removing two screws. Inside is a neat and well made board. The larger chips are the 1802 and display generator, user RAM is in the upper right with the video RAM to the left of the silver modulator.

Right: The built in joystick provides for up, down, left and right

Far right: The Comx has a separate power supply cum plug. There's an on/off switch on the computer



Screen

The Comx plugs straight into a TV. There will be American NTSC versions but there's no monitor output which may be fine for a home computer but it can be difficult to develop on.

Unless, of course, the picture is as good as the Comx's. It produces a stable 40x24 eight-colour display, with clear characters and bright colours. The review

machine had some form of loose connection that caused the display to go pop on several occasions. Nothing that a smart tap on the table didn't cure!

The Comx is, at a cursory glance, a sort of colour ZX81. There a 40x24 line display with 128 different characters. Lower case isn't standard... it's replaced by more of the bizarre shapes and signs that inhabit the rest of the set.

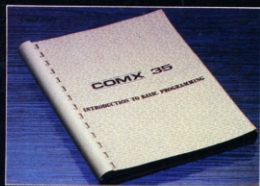
But the entire set is redefinable using the

gloriously easy **SHAPE** command. So you could put lower case in if you wanted it. This is the full extent of Comx graphics as far as the Basic system goes. No pixel graphics, no bit mapped high resolution.

You could do a 64x90-odd bit-mapped fudge but it's hardly hires graphics and it wouldn't fill the screen. You could define yourself a set of pixel characters... 80x48 wouldn't be difficult. Don't let it put you off. PET owners never let it stop them. And they didn't have colour.

But Comx colour is cryptic to say the least. It goes something like this. The 128 characters (normally white) repeat with codes 128 to 255 in a second colour (normally cyan). At a simple level, Comx Basic puts your typing up in the first colour and its responses in the second. Coupled with a pink cursor, it's a surprisingly helpful use of colour.

You can set the background colour to any of the eight available with **SCREEN**. And you can select the two character colours from a palette of 12 choices using



The Comx 35, the home colour computer at a take away price. There's 35K Ram, colour and sound for £120. Top: The Comx manual . . . spot on for its genre

47 COLOR. There's also a CTONE command that brightens text against the background by fiddling with luminances.

Sounds like there's only four colours on screen at once (background, two text and cursor). The rest of the colour involves the actual character definitions themselves. Comx characters are on a crammed 6x8 matrix. The high two bits of any of the eight bytes in the definition select from four colour pairs to be used like cyan and white in the default set.

So, in reality, you've got access to

multicoloured characters, with each line of six dots being a combination of two colours. That's a similar colour resolution to the Oric.

What does this make Comx graphics besides a considerable strain on the mind? Good enough. You can use the definable characters to produce fast, multicoloured arcade style displays, particularly if you can program the 1802.

The Comx misses out on normal graphics. There's no PLOT command, no CIRCLE, PAINT, LINE and so on. The

best you've got is CPOS(Y,X) to position the cursor for PRINT. But it doesn't really need them. Commercial programmers, at least, can do great things with multicoloured character graphics.

A last word on graphics. COLOR has the audacity to reset all your character definitions. So any thoughts of cycling quickly through the colour palette like the BBC's VDU 19 should be careful thoughts.

The Comx 35 has sound. Plenty of it. It comes through the built-in, innocent

looking speaker but can be so loud that an external on/off/volume control would be a real blessing.

Not that it's fancy sound. There's a single note channel, opened at any of eight octaves with MUSIC or TONE, and a Gaussian white noise thingy controlled with NOISE. There's also a VOLUME command but it's helpless against the others.

The great thing about the sound is that it's simple. You can do explosions, phasers, invaders and so on with the minimum of parameters and the maximum effect (usually deafness).

The sound is all done in software. On most machines your program would have to stop to do a really juicy effect. But the timed interrupts in Comx Basic, using TIME and TIMEOUT, lessen the problem. The demo programs included with the Comx make the point that sound is often neglected. In the loudest possible way.

Storage

The Comx plugs into an ordinary cassette recorder using its supplied EAR and MIC cables. Comx at least isn't babbling incoherently about microdrives but says it hopes to have disk drives this year.

There is a command DOS in the Basic which comes back with the reassuring error code 62. A 62 turns out to be 'ROM or ROM card not installed'. Bingo!

The cassette itself actually works well. You get a quiet replay through the built in Public Address system. It sounds like it's around 300 baud and there's long leaders and short blocks.

It worked fine. There are no named files and programs are saved with PSAVE and PLOAD. Apart from the playback, you've got no indication of how things are progressing.

The only other discernable bit of COS is DLOAD and DSAVE which load and save Basic's data tables. Simple and effective as it goes.

Expansion

Well, there's room for it. There's a single expansion socket, for you-name-its. Comx is planning a printer, disk drives and so on this year. But it's a shame there isn't a plain ordinary Centronics printer socket on the back. It would make a usable teeny word processor. And where are the pin outs for the socket?

Basic

Comx Basic is very impressive. 1802 Basics aren't easy to come by and Comx had to write its own (fear!). It bears the dreaded Version 1.00 label but seems to be a tremendous success. Perhaps Comx has cornered the world market in 1802 programmers.

Comx Basic feels like an 8K Basic like Microsoft's or Sinclair's. It's got its share of fabulous goodies and disastrous deficiencies. But it's not the same mess as some other home grown Basics.

Good bits first? Try and believe some of this. A RUN+ statement that converts

literal GOTO destinations into absolute addresses. It produces a marked increase in speed in an already reasonably fast Basic.

TIME starts an internal interrupt timer. When it reaches zero, the Basic GOSUBs to the routine specified by TIMEOUT (line number). Try that in your event-driven IBM Basic.

Timed interrupts let you do amazing tricks, like playing tunes under program control continuously with a game under way at the same time.

There's FORMAT and FIXED for printing numbers. FVAL evaluates an expression in a string. CHR\$ will take a list of ASCII codes instead of just one. EXIT even lets you change your mind about FOR/NEXT loops. Yuk.

There are fewer bad bits. Strings are limited to 127 characters and string arrays to 255 elements. There's no ON...GOTO and ON...GOSUB. So you're stuck with GOTO 100*20-4.7+NT... etcetera. AND, OR, XOR and NOT are byte sized, bitwise operators. They can't be used as operators in IF statements.

For debugging, there's TRACE and RENUMBER. Editing is an old fashioned serial line editor invoked by EDIT. You position the cursor under the point you want to change and type, I,D or C for insert, delete or change, followed by the character. Control S then implements the change.

This pedestrian antique is workable as well as laughable. Perhaps Comx's 1802 development system runs on a serial terminal. A throwaway touch is Control R which retypes the last command. It's great to see another micro with this 5 minutes' worth of programming that puts years on user's lives.

And sin of sins, the Basic doesn't have an error messages. There's a total of 73 different error codes, thankfully listed on page 133 onwards. There's only one reason to forgive this... this list offers an insight into future developments. Files not opened for I/O. Unacceptable character in BINARY number. Even WORD not in LIBRARY. The mind boggles.

Comx Basic is one of the best 1802 Basics around. 1802 jokes aside, it's a great home computer Basic, perfectly adaptable for most jobs. It commands over 30K of usable memory, allowing newcomers a good stab at learning programming.

Included with every Comx is a cassette of ten programs. The review machine came with a preliminary but mostly working

copy. There's five games and five more 'serious' programs.

If this is a sample of the software you can expect, you need not worry about independent suppliers.

Verdict

The Comx 35 is a great little machine for £120. Everyone knows that prices go down and performance goes up. The Comx is just right in many ways but not dramatically so.

Competition has to be the unstoppable and so-far unrivalled ZX Spectrum. It costs a mere extra £10 to go to the 48K wonder machine. The Comx's little advantages... keyboard, quality display, solid construction... will have to work hard to detract from the Spectrum market for cheap quality software.

It's wait-and-see time for the Comx. It has to get add-ons, software, technical information to make it. When the flies start falling, Comx will be well placed. It should be able to play chase-the-price-tag with Sinclair itself... a game few others dare to risk.

You've also got to wait for the arrival of the Comx. Don't buy it mail order until you've seen dealers' windows full of them. Few computers ever go from review to end users in a matter of weeks. Initial shipments should already be here. Let's hope that the Comx doesn't do a disappearing Textet.

The Comx 35 is a fun little machine and it offers great value for money. It's aimed at the first-time buyer who starts off with games and goes on to programming and it hits that target spot on. All Comx has to do is deliver it and any number of British and American companies will have to think hard.

In short, like it or not, the Comx 35 is a winner.

COLOURS SET BY COLOR(X)

	Colour 1	Colour 2
1	Black	Green
2	Red	Yellow
3	Blue	Cyan
4	Magenta	White
5	Black	Blue
6	Red	Magenta
7	Green	Cyan
8	Yellow	White
9	Black	Red
10	Blue	Magenta
11	Green	Yellow
12	Cyan	White

Colour combination 12 is the default value.

SPECIFICATION

Price £120

Processor 1802

Ram 32K

Text screen 40x24

Graphics screen 40x24, 8 colours

Keyboard 55 key moving keyboard with joystick

Storage Cassette tape

Interfaces Expansion port

Language Basic

Distributor Asley Computers, Unit 133, Hartlebury Trading Estate, Hartlebury, Worcs, DY10 7JB.

Software supplied Demo tape of ten programs

Now that software for the Ace has gone Forth and multiplied, Max Phillips tries his hand.

Playing the Ace

Speed is not one of the qualities of the 'fastest microcomputer in the universe'. It's taken ages for software and RAMpacks to emerge for the eccentric Jupiter Ace.

But now they're here, the claim that Forth makes for fast, value-for-money programs is easily tested. And you'd be surprised what can be done.

GOBBLEDEGOOK

To start the Pacman rolling, there's Gobbledegook from old Jupiter itself. It runs on a 19K Ace and comes with the minimum of paperwork. Sparse cassettes with slightly smutty covers characterise Ace software.

Congratulations to the brain that thought of the name Gobbledegook; it's the best imitation Pacman name in the business. It's a shame it's a touch too long for the Ace's filing system and the program actually goes by the name of Gobblegook.

But it's a fun program and it plays well. Everything's there... you eat the pills, and the gooks chase you. Eat a power pill and the gooks shrivel a bit.

My only quibble is that it isn't easy to spot the change from a violent gook to a shrivelled one.

Gobbledegook looks more randomly—they don't have the comin'-to-get-you mentality of most Pacmen. You can select between two chase algorithms using Logic A or Logic B. So it's a different game from the one you're used to.

Program luxuries include an ingenious automatic score ladder and provision for two players to take turns and compete. There's screenful after screenful of pills, but there are no proper progressive playing levels. So apart from eating your friends into the ground, Gobbledegook won't provide eternal fun.

HOPPER

Hopper is, of course, Frogger. Discount Software's version for the 19K Ace should be famous for its

cassette cover. A heroic attempt to reproduce the unfortunate frog has come out looking like a demented four-legged acorn with measles. Well worth the money.

It is a bit of a disappointment to find that the joyous object does not turn up in the program itself. Still, there's plenty of graphics and music to make up for it.

The game is rather simple. You've got to cross a wide motorway, divided by two streams of traffic. This is much easier to deal with than versions where the directions of traffic are mixed together.

Your controls are simply left and right arrow to move left and right and up arrow to hop forward.

Hopper isn't too hard to master, but there are a few rough edges. There's no play-again option, and the frog can frequently be persuaded to fly over the backs of lorries. Fun for the minutes it lasts.

FROGGER

Frogger take two came from Remsoft, the Bright-on-based software house that's also the Jupiter Ace user group and vice-versa.

Remsoft's 19K Frogger has a busy road with alternating traffic followed by a fast-moving river for you to cross. There's plenty of noise but it lacks the odd trimming — a high-score feature, for example.

The controls are 0 for right, 1 for left and 9 for forward. You can't move left or right once you're past the road.

It doesn't take long to be nothing up free frogs like they grew on trees. But miss on the road and you turn into a small heap of frog. The same splat also appears if you drown.

If you can't get off a log quick enough, you are swept away off the left of the screen. But curiously, the frog wraps round to reappear on a new log at the right of the screen. You can hop it to safety only to discover that it turns into a splat the moment it reaches home.

Frogger is nicely program-

med and reasonable fun. But more work wouldn't go amiss.

OTHELLO



Othello is more than a touch fashionable at the moment. Jupiter Cantab's 19K version is competent-ly done and has the advantage that it plays a reasonable speed.

Ace Othello will play against you or act as a board for two human players. There's a welcome user interface, far ahead of the nasty old co-ordinates, commas and returns that ruin most Basic versions.

You pick your move by positioning a cursor over the relevant square, using the four arrow keys. Once you've decided where you want to go, you press 0 to place your counter.

The display presents a neat board with slightly square pieces. But it updates quickly and pieces are turned over with reassuring speed.

Positioning the * involves a series of musical tones. Great fun... it's as interesting to play tunes on the cursor as it is to play Othello.

If you can't go, you can press 1 to skip your go. Unfortunately, you can do this at any time during the game, allowing for some sophisticated cheating.

But the proof of the pudding is in the beating. And Ace Othello managed to lose several times.

GREEDY GOBBLER

Time to hang up my RAM-pack and go back to the days of the 3K RAM. Greedy Gobbler comes with Blowing up the World, and is one of a vast number of tapes designed to keep people amused while they save up for the RAM-pack.

The cassette is produced by Jupiter, and offers an amazing fun-per-byte-penny ratio. Program one is a complete but rather tiny Pacman. It's controlled by a sensible cross-shaped key cluster and makes more noise than you'd have thought possible on an Ace.

You are randomly followed by four baddies plus a dead one in the middle that never seems to move until you walk near it. Eat a power pill and they turn into edible top hats for seven seconds.

Greedy Gobbler is great fun — an addictive.

Program two raises the odd political issue. You are a satellite that flies over a map of the world. The idea is to completely erase everything within a count of 3,000 by dropping bombs. You just sit there and press 1-8 depending on the distance at which you want the bomb to explode.

It could be a sedate pastime for retired megalomaniacs. The world puts up very little resistance... kind of satisfying.

Now if the world fired back at you and your satellite got lower and lower you'd have a competitive game. It's called Bomber! But Blowing up the World is an earth-shattering experience with a charm all its own.

FISH AND FLUTTERER

I tried another 3K tape to see if Jupiter could do it again, and Fish has much the same qualities. You control a beautifully animated fish in a strong right-to-left current.

The only object is to eat as much of the strange-looking food and debris as possible without getting swept off the screen. There's a counter of how many things you've eaten and that's it.

Flutterer is another non-competitive game. A strangely menacing fly wobbles its way down the screen while you fire your inexhaustible supply of jerky rockets at it. Hit a flutterer and you score one point. That's the sum total of its 3K wonder.

Jupiter Cantab Cheshunt Building, Bateman St, Cambridge, CB2 1LL (0223) 313479 — Gobbledegook £7.95, Othello £7.95, Greedy Gobbler & Blowing up the World £5.95, Fish & Flutterer £5.95, Remsoft 18 George St, Brighton (0273) 602354 — Frogger £6.50.

What's your game? Find out with PCN's weekly freeze-frame of the action.

FLIGHT SIMULATOR

APPLE

Skyline computing

Name Cleared for Landing System
Apple II, 48K, DOS3.3 Price £49
Publisher Programmers Software, Arkansas
Format Diskette,
Language Machine Code/Basic
Outlets Beattie-Edwards Aviation, 20 Normanhurst Close, Three Bridges, Crawley, Sussex, (0293) 20565.

IFR Simulator from Programmers Software is a hi-res simulation of flying an aircraft on instruments. It has been around in various guises for some years, but this is the latest and most sophisticated version.

It's aimed (according to the manual) at those who want to understand the workings of aircraft instruments and navigation, not at training real pilots.

Quite why anyone would choose to learn about such a rarefied subject without at least wanting to become a pilot, though, I can't imagine.

Don't think that this is an alternative to the classic flight-simulator, A2-3D1 from Sublogic, though. It isn't the same thing at all.

Objectives

IFR Simulator is intended to train you in the complexities of blind-flying. For this purpose the 'basic six' instruments must be available. These are altimeter, airspeed indicator, artificial horizon, turn and

bank indicators and rate of climb or descent indicator.

Also included is a set of radio-navigation instruments, namely two OMNIs and an automatic direction finder. These are the real reason for the program, and it is intended to train you in their correct use.

Training is done by 'flying' a series of problems, which range from simple to very difficult. The task is to orientate yourself by using the OMNI and ADF, then to fly to a given position. If this is done successfully it is assumed that you could have made a successful landing from that point.

Whenever your altitude drops below a minimum, the session is over, and a plot of your flight-path is shown, since you have effectively landed. Naturally, doing so anywhere but on the runway is a crash, but the program doesn't take any notice if you do.

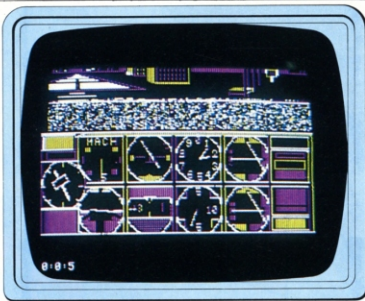
First impressions

The documentation would be good if it were better organised. It has all the information required, but it's in such a mess that it's not a lot of use.

The manual is OK if you know a bit about instrument or radio-flying, but rather confusing otherwise.

Getting into the pilot's seat is a matter of menu-driven teleportation. You boot the disk and are presented with a menu of problems. Selecting one of them immediately transports you to the starting position.

The problem is shown on the bottom of the screen in the typical terse, cryptic style of the



airways. For example:
LR NDB RWY 4. Direct to NDB
344 Out Procedure trn.
164 inbound to runway
FAF is bottom OMNI

From there on in, you're on your own. Happy landings... mind you, it isn't easy.

In play

The actual flight characteristics of the plane are noticeably different from the Sublogic simulator. It seems much less jumpy but rather less stable, and if left unattended in level flight, has a habit of wandering without any noticeable tendency to correct.

The speed of response is quite adequate, because most of the real work is done in machine code.

The use of the Apple's facilities is excellent. The instruments, both conventional and electronic, are beautiful, and their response is uncannily accurate. But my main criticism is against the 'out-the-window' view. This is a picture of an airport runway, stretching away into the distance, with several large buildings on either side.

When the plane turns, the view scrolls sideways. It's beautifully done, but utterly pointless since it doesn't respond as a real horizon.

The main trick when you're flying this thing is not to worry about the apparent lack of response from the OMNIs, as you barrel along waiting for something to happen.

As long as you're flying towards the beacon, not away from it, the OMNI will suddenly swing over as you cross the beam. Only then do you get some idea of where you are.

The joystick or paddles are used to fly the plane. P adds 3 per cent more power each time it is pressed, L subtracts the same amount.

The only other valid Key-press is ESCAPE, which gives an X-Y plot of your course so far.

The authors don't approve of doing this, so for some time after looking at the plot, the compass is dead. Pendency.

To build new problems, you need to use the Seed program, which contains the actual flying problem. Installing a new flying exercise consists of making some minor changes to the Basic code. This, the authors suggest, is not something you would want to do yourself, so they advise you to send them the details of your approach-problem together with \$100, and they'll do it for you.

I bet they will, but I can't figure out why they didn't put all the relevant details into a file, and add a little file-manager to take care of it.

Verdict

After making a thorough mess of the first few problems, I began to get the hang of it, and apart from the irritating display, found it quite fun.

It isn't strictly a game... it's a real simulation, and as such is instructive. Certainly there is nothing like it on the market.

Overall, I would say that my feelings were of modified rapture. It's a good solid program which is interesting and different.

Richard King

RATING
Lasting appeal
Playability
Use of machine
Value for money





Games

A name to PLAY with



GOLF (Spectrum 16A & 48C)
CHAMPIONSHIP GOLF IN YOUR OWN HOME by David Thomson VGA 1004



MISSION MERCURY (VIC 20 UNDEP)
LAND YOUR CRAFT AND RESCUE THE SCIENTISTS...
BUT BEWARE THE ASTEROID BIRDS by Steve Lee VGA 3004





SHEEPWALK (Spectrum 48K) A SHEEPDOG TRIAL IN YOUR LIVING ROOM! IT'S A ONE-MAN SHEEPDOG TRIAL by Gregory Trzeise
VGA 1003



STARFIRE (Spectrum 48K) RID THE GALAXY OF THE XYANDAN BATTLE CRUISERS - A GAME OF STRATEGY AND SKILL by Martyn Davies
VGA 1003



YOMP (Spectrum 16K & 48K) COMMAND THE PARAS AND TAKE ON THE IMPOSSIBLE by T. Murray & R. Poole
VGA 1001



LANDFALL (BBC B) AN EXCITING AND REALISTIC SPACE SHIP LANDING SIMULATOR by Gregory Trzeise
VGA 3003



BUG BOMB (BBC B) A SKIN-TINGLING NEW ARCADE GAME by Simon Small
VGA 3001



SPACE ADVENTURE (BBC B) A GRAPHIC ADVENTURE SET ON A SEEMINGLY ABANDONED SHIP DRIFTING THROUGH SPACE by R. Thomas & A. Thomas
VGA 3002

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DRAGON ACTION

DRAGON 32 Vindictive vultures

Name Vultures **System** Dragon 32, joystick **Price** £6.95 **Publisher** J Morrison (Micros), 0532-480987
Format Cassette **Language** Machine code **Other versions** None **Outlets** Mail order and some dealers

Just when you thought you'd killed your last invader, and you'd never want to see another row of aliens, galaxians, or anything else lined up at the top of your screen, someone comes along with a new variation and you're addicted once more — or I was, at least.

Objectives

In this single-player game you're being attacked by vultures who are attempting to drop — well, use your imagination about that. The joystick helps you keep down your cleaning bill, and the only aim is to wipe out the waves of increasingly fast-moving vultures as you head for that high-score that's recorded at the top of the screen.

This early review copy came without a cassette insert, though J Morrison's packaging has never been of the most professional. This does tend to detract a little from the programs, which are usually very good.

In play

The program is auto-run, and offers you slow, medium and fast speeds. The blue and yellow vultures line up at the top before peeling off indi-

vidually to zig-zag down the screen in what is initially at least a reasonably slow and predictable manner. But that doesn't last long, and while you only have to contend with the birds one at a time, a nasty trick is that on reaching the bottom they come back up (obviously eating that seed that makes birds bounce with health) in a faster more erratic manner.





They flap about till you can pick them off, a flying vulture netting you 200 points while one still in the holding pattern earns you half that amount. There are no mother vultures gliding randomly across the top, but once you've managed to wipe out the flying birds a row of eggs will hatch out one at a time to present you with — yes, super-vultures, which move even faster.

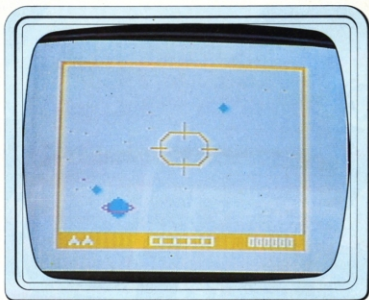
As with Galaxians, the best technique is to glide under the birds and shoot them as they move, being careful to keep out of corners, though when they do eventually get you, one way or another, and you lose one of your three lives, you'll be subjected to a burst of derisory chirruping . . . or whatever noise vultures make.

Verdict

Vultures is an amusing and addictive variation on an old favourite. It is reasonably priced, and as it is written in machine code, is fast. It should provide a messy challenge to most people.

Mike Gerrard

LASTING appeal 
Playability 
Use of machine 
Overall value 



DRAGON 32 Violence in 3D

Name Star Jammer **System** Dragon 32, joystick **Price** £7.95 **Publisher** Salamander Software, 0273-771942 **Format** Cassette **Language** Basic **Other versions** None **Outlets** Boots, Spectrum and mail order (+ 50p)

Three-dimensional games just don't seem to have caught on as well as some others. Most people apparently prefer to see their targets moving down or across the screen, rather than hurtling towards them in increasing size as they do in this new battle game from Salamander.

Objectives

The aim of the game is to stop the alien ships from a distant galaxy reaching the colonised planets of your own federation . . . or to put it another way, zapping and high-scoring.

Star Jammer is the name of your ship. The game itself comes in Salamander's usual sturdy plastic wallet, complete with instruction leaflet, though this is scarcely needed as the game is as easy as falling off the proverbial log. My copy LOADED first time every time.

In play

Your sights are fixed in the centre of the high-resolution screen. Stars and space debris float towards and around you. From time to time you'll see a green or purple object in the distance. By using the joystick you must steer this into your sights and blast it with your cannon ('the very latest type', it

says, so Salamander obviously spares no expense.)

As the alien ships approach, they turn into one of several varieties, from the common 50-point 'H'-wing to the infrequent 1,000-point Commander, but they all have to suffer the same fate as you head for the targets of 10,000 and 50,000 points and your reward of an extra life. I'll have to take that on trust, I'm afraid, as my entries in the high-score top ten at the end are strictly between me and my Dragon.

Occasionally you'll approach a Stargate, and be drawn through the whirlpool-like phenomenon into the next quadrant of the galaxy, while having your energy replenished at the same time.






You have three lives, and if the enemy ship gets close enough to fill the screen you're going to lose one of them. Sound was a little disappointing, with unexciting little shrills and beeps, and only a siren when your ship is wiped out.

The game is pleasing on the eye in colour, but it is set against a pale rather than the usual black background, so I wouldn't recommend it to those with just a black-and-white set. They'd find it tricky to pick out the aliens.

Verdict

This isn't a game to set the world alight, and it lacks the simple 'Clear the screen' challenge of most games, but it is reasonably fast for Basic, and requires a fair amount of dexterity with the joystick. It shouldn't disappoint buyers.

Mike Gerrard

RATING 
Lasting appeal 
Playability 
Use of machine 
Overall value 



PCN ProgramCards

What a load of goodies we've got for you this week! Eleven annotated ProgramCards for your ever-increasing library of programs. You are keeping these, aren't you?

This week

For those of you with disk-based BBC machines we have a good routine to recapture the lost disk work area (3584-6400) in memory for use by large programs. This procedure was sent to us by C R Tanner of Ickenham, Hillingdon, and can be used in your own program loading utilities.

Following hard on the heels of the Colour Genie articles in this and last week's issues we have a small *Mastermind*-type program.

John Tompkins of Leicester sent us his Micro-mind game. It shows how simply this type of game can be programmed, yet still be effective and entertaining.

Allan Tennent of Glasgow was pressu-

red by his younger brother to write some games on his new Dragon 32 machine. One of the fruits of this persuasiveness is this version of the perennial Breakout game which uses the machine's low-resolution mode to give better speed—he has not yet mastered the art of machine code programming to use high resolution with any reasonable speed. This may not be the best example of the game, but as an early attempt at inter-active games programming it was deemed worthy of inclusion.

How many of you with machines capable of sprite graphics have managed to fathom the intricacies of using them? Well, Andy Holmes of Coventry thinks he has got it right with his interesting version of a 24-hour clock using the sprite graphics facility of his Commodore 64.

Will it prompt others of you to show us your sprite techniques? We hope so!

Adventure games addicts will no doubt be pleased to see *Pirate Island* by 14-year-old Philip Green of St Helens, Lancashire,

starting this week. His game is not complex but demonstrates the ideas behind adventure games programming in an easy-to-follow way. It is for the Atari 400/800 range of machines but with little effort can be converted to a whole host of other computers.

Are any more of you working on adventures? If so, then let us know when you have them completed so that others may learn how to develop their own games.

A RUN for our money

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Contributions should be sent on disk or cassette, with a plain paper listing and brief notes to: Programs Editor, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

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

PCN ProgramCards

Mover

Card 1 of 1

8315M

A fully documented procedure to allow recapture of the disk workspace (3584-6400)

```
10REM THE USER MUST LOAD ALL PARTS OF THE PROGRAM FROM DISK BEFORE
20REM THE PROCEDURE IS USED AS IT WILL TURN THE DISC OFF WITH *TAPE. THIS
30REM PROCEDURE IS DESIGNED TO BE USED IN THE USERS OWN *DISK INDEX PROGRAM*
40REM WHICH SHOULD FOLLOW THE FOLLOWING FORMAT
50REM
60REM 1. LIST ALL PROGRAMS ON THE DISC AND CHOOSE ONE TO BE SELECTED.
70REM 2. LOAD ALL PARTS OF THE PROGRAM INTO MEMORY BETWEEN 51500 AND 57000
80REM 3. CALL THE PROCEDURE TO MOVE THE PROGRAM DOWN IN MEMORY TO ITS CORRECT
POSITION AND THEN RUN IT.
90REM
100REM TO USE THE PROCEDURE YOU MUST PASS IT SOME INFORMATION
110REM
120REM PROCMOVE (LENGTH, START ADDRESS, RELOCATE ADDRESS, PAGE OR CALL ADDRESS
130REM -----
140REM @ INSTRUCTIONS)
150REM -----
160REM
170REM WHERE THE INSTRUCTIONS ARE..
180REM
190REM B=RELOCATE PROGRAM AND THEN SET PAGE VALUE AND RUN
200REM R=RELOCATE AND CALL RUN ADDRESS
210REM R=ONLY RELOCATE PROGRAM THEN ENDPROC
220REM E=ONLY SET PAGE VALUE AND RUN PROGRAM
230REM
240DEFPROCMOVE (CL, AS, BS, DS, AS)
250%70=CMD0256:7871=C3D1V256
260%72=40R0256:7875=40D1V256
270%74=80R0256:7879=80D1V256
280IFAR=B THENPROCIM:PROCBAS
290IFAR=R THENPROCIC:CALLBAS
300IFAR=R THENPROCIM
310IFAR=E THENPROCIBAS ELSE ENDFPROC
320DEFPROCIBAS AF21,0
330RESTORE450:FORA=1TOB:READY:AS=130
340%5=D=USR(MFFA):NEXT PAGE=D+1:END
350DEFPROCIM:PD=DP+520:FORP=0TO2STEP2
360(CDPF),ST LDA(140):LDX(0):LDX0
370R0RFFFA:CL:CLDAS:70:ADCR72:STAS70
380DAS71:ADCS75:STAS71:CLC
390%LDA75:SBCS75:STAS76:L1 LDA872
400%TAS74:CLC:LDA875:SBCS76:STAS75
410%LDY(0):CLC:LDA(872):STAS(874):Y1CLC
420%LDA72:ADCE1:STAS72:LDA875:ADCE0
430%TAS75:CP#571:BNEL:LDA872:CP#570
440%BNEL:RTB:BNEXT:CALLST:ENDFPROC
450DATA79,76,69,13,02,85,78,13
```

BBC Model B BBC Basic and assembler

Application: utility
Author: C R Tanner
Where E occurs, replace with (shift-3)

240	Start of procedure
250-270	Set absolute program values
280-310	Analyse instruction and act accordingly
320-340	Procedure to set PAGE values etc, and terminate
350-440	Procedure to perform relocation function using embedded assembler code
450	Data statements for use in 330-340

QUESTION

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PCNProgramCards

Sprite Clock Card 1 of 5

8315SC1/5

A novel 24-hour clock using eight coloured sprites. Runs in 6K. Refer to ProgramCard 8307CC for explanation of Commodore Control code symbols.

```

5 PRINT"
10 REM *****
20 REM **
30 REM *      A 24 - HOUR CLOCK      *
40 REM *      USING COLOURED SPRITES  *
50 REM *      *
60 REM **
70 REM *****
80 REM
90 REM
100 REM JUST ENTER THE TIME OF DAY IN
110 REM 24 HOUR MODE. IF YOU HAVE
120 REM TYPED IN AN OUT OF RANGE NUMBER
130 REM THEN THE PROGRAM WILL RESPOND
140 REM BY MAKING YOU RETYPE THE ENTRY.
150 REM
160 REM ONCE YOU HAVE TYPED IN THE
170 REM PROGRAM YOU MAY WANT TO TAKE
180 REM OUT THE <REM> STATEMENTS.
190 REM THESE ARE ONLY HERE TO EXPLAIN
200 REM WHAT THE PROGRAM IS DOING, AND
210 REM IF THEY ARE REMOVED WILL NOT
220 REM AFFECT ANY JUMPS IN THE PROGRAM
230 REM
300 REM**++ VARIABLES **
310 SP=53248:PO=2040:CH=192
320 REM**++ RESERVE MEMORY **
330 POKES2,48:POKES6,48
340 REM**++ SPRITE DATA INPUT **
350 FOR I=12288 TO 12990:READ
360 POKI,R:NEXT
370 REM**++ SET SCREEN COLOUR **
380 POKESP+32,0:POKESP+33,0
390 REM**++ COLOUR SPRITES 0 & 1 BLUE **
400 POKESP+39,14:POKESP+40,14
    
```

Commodore 64 Commodore Basic

Application: general interest
Author: Andy Holmes

300-400 Initialise program variables, load character data, set sprite colours

PCNProgramCards

Sprite Clock Card 2 of 5

8315SC2/5

```

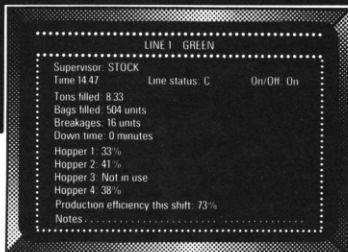
410 REM**++ COLOUR SPRITES 3 & 4 RED **
415 POKESP+42,2:POKESP+43,2
420 REM**++ COLOUR SPRITES 2 & 5 YEL**
430 POKESP+41,7:POKESP+44,7
432 REM**++ COLOUR SPRITES 6 & 7 GREEN**
435 POKESP+45,5:POKESP+46,5
440 REM**++ TURN OFF ALL SPRITES **
450 POKESP+21,0
460 REM**++ DOUBLE SPRITE SIZE **
470 POKESP+23,255:POKESP+29,255
480 REM**++ SET SPRITE Y COORDINATES **
490 FOR I=1 TO 15:STEP2
500 POKESP+1,125:NEXT
510 REM**++ SET HSB FOR SPRITES 6 & 7 **
520 POKESP+16,192
530 REM**++ SET SPRITE X COORDINATES **
540 POKESP,17:POKESP+2,60:POKESP+4,97
550 POKESP+6,136:POKESP+8,179
560 POKESP+10,219:POKESP+12,3
570 POKESP+14,46
580 REM**++ SET ALL SPRITE POINTERS **
590 FOR I=0 TO 7
600 POKEPO+1,192:NEXT
610 REM**++ SET SPRITE POINTERS 2 & 4 **
620 POKEPO+2,202:POKEPO+5,202
630 REM**++ REAL TIME INPUT **
640 PRINT"
650 PRINT" [X] REAL-TIME , 24 HOUR SPRITE CLOCK [Y]"
660 PRINT" [Z]"
670 PRINT"
680 PRINT"***** PLEASE ENTER THE CORRECT TIME"
690 INPUT"***** HERE >>> *****";TH#
700 IF LEN(TH#)<6 THEN GOTO 690
710 IF LEN(TH#)>6 THEN GOTO 690
720 IF VAL(LEFT$(TH#,2))>24 THEN GOTO 690
730 IF VAL(MID$(TH#,3,2))>59 THEN GOTO 690
740 IF VAL(RIGHT$(TH#,2))>59 THEN GOTO 690
750 T1$=TH#
760 PRINT"*****"
770 PRINT"*****"
    
```

410-435 Final part of sprite colour set up

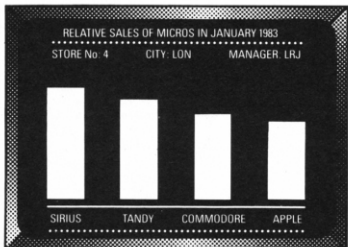
440-620 Initialise all sprite data

630-770 Time input routine. Time *must* be entered as full six digits (HHMMSS) in 24-hour form

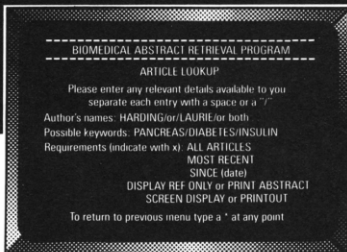
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PCNProgramCards**Sprite Clock Card 3 of 5**

8315SC3/5

```

780 REM**  CLOCK UPDATE ROUTINE  **
785 POKESP+21,255
790 FOR I=1 TO 6: T=VAL(MID$(TI#,I,1))
800 IF I=1 THEN POKEP0+0,CH+T:REM SPRITE 0
810 IF I=2 THEN POKEP0+1,CH+T:REM SPRITE 1
820 IF I=3 THEN POKEP0+3,CH+T:REM SPRITE 3
830 IF I=4 THEN POKEP0+4,CH+T:REM SPRITE 4
840 IF I=5 THEN POKEP0+6,CH+T:REM SPRITE 6
850 IF I=6 THEN POKEP0+7,CH+T:REM SPRITE 7
860 NEXT:GOTO 790
1000 REM**  DATA FOR CHARACTER 0  **
1010 DATA 7,255,224,14,15,240,12,7
1020 DATA 240,8,3,240,8,3,240,8
1030 DATA 3,240,8,3,240,8,3,240
1040 DATA 8,3,240,8,3,240,8,3
1050 DATA 240,8,3,240,8,3,240,8
1060 DATA 3,240,8,3,240,8,3,240
1070 DATA 8,3,240,8,3,240,12,7
1080 DATA 240,14,15,240,7,255,224,0
1090 REM
1100 REM**  DATA FOR CHARACTER 1  **
1110 DATA 0,254,0,0,127,0,0,63
1120 DATA 0,63,0,0,63,0,0
1130 DATA 63,0,0,63,0,0,63,0
1140 DATA 0,63,0,0,63,0,0,63
1150 DATA 0,63,0,0,63,0,0
1160 DATA 63,0,0,63,0,0,63,0
1170 DATA 0,63,0,0,63,0,0,63
1180 DATA 0,63,0,0,30,0,0
1190 REM
1200 REM**  DATA FOR CHARACTER 2  **
1210 DATA 7,255,224,14,15,240,12,7
1220 DATA 240,8,3,240,8,3,240,0
1230 DATA 3,240,8,3,240,0,3,240
1240 DATA 0,3,240,0,3,240,9,7
1250 DATA 240,0,15,240,7,255,224,14
1260 DATA 0,12,0,0,8,0,0
1270 DATA 0,1,224,0,3,240,12,7
1280 DATA 240,14,15,240,7,255,224,0
1290 REM

```

780-860 Routine to perform correct clock display

1000-1290 Data statements for digit display format. Characters 0,1,2

PCNProgramCards**Sprite Clock Card 4 of 5**

8315SC4/5

```

1300 REM**  DATA FOR CHARACTER 3  **
1310 DATA 7,255,224,14,15,240,12,7
1320 DATA 240,8,3,240,0,3,240,0
1330 DATA 3,240,0,7,240,0,15,240
1340 DATA 1,255,240,0,15,240,0,7
1350 DATA 240,0,3,240,0,3,240,0
1360 DATA 3,240,0,3,240,8,3,240
1370 DATA 8,3,240,8,3,240,12,7
1380 DATA 240,15,15,240,7,255,224,0
1390 REM
1400 REM**  DATA FOR CHARACTER 4  **
1410 DATA 7,255,224,14,15,240,12,7
1420 DATA 240,8,3,240,8,3,240,8
1430 DATA 3,240,8,3,240,8,3,240
1440 DATA 8,3,240,8,3,240,8,3
1450 DATA 240,8,3,240,12,7,240,14
1460 DATA 15,240,7,255,252,0,15,240
1470 DATA 0,7,240,0,3,240,0,3
1480 DATA 240,0,3,240,0,1,224,0
1490 REM
1500 REM**  DATA FOR CHARACTER 5  **
1510 DATA 7,255,224,14,7,240,12,3
1520 DATA 240,8,3,240,8,1,224,8
1530 DATA 0,12,0,0,14,0,0
1540 DATA 7,255,224,0,15,240,0,7
1550 DATA 240,0,3,240,0,3,240,0
1560 DATA 3,240,0,3,240,0,3,240
1570 DATA 8,3,240,8,3,240,12,7
1580 DATA 240,14,15,240,7,255,224,0
1590 REM
1600 REM**  DATA FOR CHARACTER 6  **
1610 DATA 7,255,224,14,7,240,12,3
1620 DATA 240,8,3,240,8,1,224,8
1630 DATA 0,12,0,0,14,0,0
1640 DATA 15,255,224,14,15,240,12,7
1650 DATA 240,8,3,240,8,3,240,8
1660 DATA 3,240,8,3,240,8,3,240
1670 DATA 8,3,240,8,3,240,12,7
1680 DATA 240,14,15,240,7,255,224,0
1690 REM

```

Data statements for digit display format. Characters 3,4,5 and 6

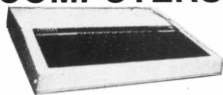
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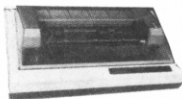
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PCNProgramCards

Sprite Clock Card 5 of 5

8315SC5/5

```
1700 REM** DATA FOR CHARACTER 7 **
1710 DATA7,255,224,14,15,240,12,7
1720 DATA240,8,3,240,8,3,240,8
1730 DATA3,240,8,3,240,8,3,240
1740 DATA0,3,240,8,7,240,8,15
1750 DATA24,8,31,192,8,63,128,8
1760 DATA127,8,8,254,8,1,252,8
1770 DATA3,248,8,7,240,8,15,224
1780 DATA0,31,192,8,31,128,8,0
1790 REM
1800 REM** DATA FOR CHARACTER 8 **
1810 DATA7,255,224,15,240,112,15,224
1820 DATA48,15,192,16,15,192,16,15
1830 DATA192,16,15,192,16,15,224,16
1840 DATA15,240,48,6,58,96,12,15
1850 DATA240,8,7,240,8,3,240,8
1860 DATA3,240,8,3,240,8,3,240
1870 DATA8,3,240,8,3,240,12,7
1880 DATA240,14,15,240,7,255,224,8
1890 REM
1900 REM** DATA FOR CHARACTER 9 **
1910 DATA7,255,224,14,15,240,12,7
1920 DATA240,8,3,240,8,3,240,8
1930 DATA3,240,8,3,240,8,3,240
1940 DATA8,3,240,8,3,240,12,7
1950 DATA240,14,15,240,7,255,240,8
1960 DATA15,240,8,7,240,8,3,240
1970 DATA8,3,240,8,3,240,12,7
1980 DATA240,14,15,240,7,255,224,8
1990 REM
2000 REM** DATA FOR CHARACTER 10 **
2010 DATA0,0,0,0,0,0,0,62
2020 DATA0,0,127,0,0,127,0,0
2030 DATA127,0,0,127,0,0,62,0
2040 DATA0,0,0,0,0,0,62,0
2050 DATA0,0,127,0,0,127,0,0
2060 DATA127,0,0,127,0,0,62,0
2070 DATA0,0,0,0,0,0,0,0
2080 DATA0,0,0,0,0,0,0,0
```

Data statements for digit display format.
Characters 7,8,9 and 10

PCNProgramCards

Pirate Island Card 1 of 9

8315PI1/9

An easy to follow adventure. This can be easily modified to run on many machines.
"?" is heavily used throughout the program for PRINT.

```
1 DIM V$(12)
5 PRINT "?"
10 PRINT "*****"
20 PRINT "PIRATE ISLAND:"
50 PRINT "*****"
60 PRINT "*****"
70 FOR I=1 TO 1000:NEXT I:?"
80 ? "In this adventure, your task is to find and restore all treasures by choosi
ng numbers from 1-4."
81 ?
82 ? "Each room has a choice of 1-4 things that you can do."
83 ?
84 ? "But in some rooms you may see a sign saying please type in order."
85 ?
86 ? "So when you see this sign type the numbers in order, to help you understan
d what is going on."
87 PRINT
90 ? "GOOD LUCK"
95 FOR I=1 TO 7000:NEXT I:?"
100 ? "You are in a large room, to the north is a corridor."
105 PRINT
110 ? "VISIBLE ITEMS:swarm glowing fire,rug,large sleeping cat."
115 PRINT
120 ? "WHAT DO YOU WANT TO DO ????"
130 ? "1.WHILE CAT"
140 ? "2.LIFT RUG"
150 ? "3.GO FIRE"
160 ? "4.LOOK FIRE"
161 ?
165 ? "PLEASE TYPE IN ORDER"
167 ?
170 ? "TYPE IN NUMBER REQUIRED":INPUT A
180 IF A=1 THEN ? "":GOTO 230
190 IF A=2 THEN ? "":GOTO 240
200 IF A=3 THEN ? "":GOTO 240
210 IF A=4 THEN ? "":GOTO 360
220 GOTO 130
```

Atari 400/800

Atari Basic

Application: game
Author: Philip Green

1 Assign array for occasional input
5 Clear screen. "?" is the printed version
of "clear screen" symbol (ESC, CTRL
and CLEAR or ESC, SHIFT and
CLEAR)
70 Pause
80-90 Opening instructions

95 Pause
100 Start of adventure! Location
105-167 Prompts

170-220 Response and action

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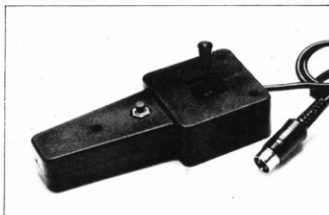
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PCN 16/83

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Pirate Island Card 2 of 9

8315PI2/9

230 ? "CAT AWAKES AND VANISHES"
 231 PRINT
 235 GOTO 140
 240 ? "THE RUB VANISHES TO REVEAL A GOLDEN KEY"
 245 PRINT
 250 ? "1.TAKE KEY"
 260 ? "2.GO FIRE"
 270 ? "3.LOOK FIRE"
 271 ?
 272 ? "PLEASE TYPE IN ORDER":INPUT B
 280 IF B=1 THEN ? "":GOTO 320
 290 IF B=2 THEN ? "":GOTO 340
 300 IF B=3 THEN ? "":GOTO 360
 310 GOTO 250
 320 ? "YOU ARE NOW CARRYING THE GOLDEN KEY"
 325 PRINT
 330 GOTO 260
 340 ? "YOU ARE NOW AT THE FIRE,YOU MANAGE TO SEE A SILVER SWORD IN IT"
 345 PRINT
 350 GOTO 270
 360 ? "YOU SEE NOTHING SPECIAL,EXCEPT AN OLD MAP"
 365 PRINT
 370 PRINT "1.TAKE MAP"
 380 PRINT "2.TAKE SWORD"
 390 PRINT "3.GO NORTH"
 395 ?
 397 ? "PLEASE TYPE IN ORDER":INPUT C
 400 IF C=1 THEN ? "":GOTO 440
 410 IF C=2 THEN ? "":GOTO 460
 420 IF C=3 THEN ? "":GOTO 490
 430 GOTO 370
 440 PRINT "YOU NOW HOLD THE MAP , LEAVE THIS ROOM,YOU MAY NEED IT AGAIN SOMETIME"
 445 PRINT
 450 GOTO 380
 460 ? "YOU NOW HOLD THE SILVER SWORD,IN SOME CASES A SWORD IS GOOD,IN OTHERS MAY BE NOT."
 465 PRINT
 470 GOTO 390
 480 ? "You are in a long corridor:VISIBLE ITEMS large door with sign saying NO ENTRY"
 485 PRINT
 490 ? "1.GO EAST"

230-235 Action to response

240-310 Action to response

320-330 Action to response

340-350 Action to response

360-430 Action to response

440-450 Action to response

460-470 Action to response

480 New location

485-550 Action to response

Pirate Island Card 3 of 9

8315PI3/9

500 ? "2.GO WEST"
 510 ? "3.OPEN DOOR":INPUT D
 520 IF D=3 THEN ? "":GOTO 560
 530 IF D=1 THEN ? "":GOTO 600
 540 IF D=2 THEN ? "":GOTO 620
 550 GOTO 490
 560 ? "YOU MAY HAVE OPENED THE DOOR,BUT SOMETHING HAS FALLEN FROM THE CEILING AND YOU ARE DEAD"
 567 PRINT
 570 ? "HIT Y FOR ANOTHER TURN":INPUT Y\$
 580 IF Y\$="Y" THEN 5
 585 GOTO 570
 600 ? "SORRY IT'S A DEAD END"
 605 PRINT
 610 GOTO 490
 620 ? "You are in a small box room:VISIBLE ITEMS bottles of rum,weird looking box"
 625 PRINT
 630 ? "1.TAKE RUM"
 640 ? "2.GO BOX"
 645 ?
 647 ? "PLEASE TYPE IN ORDER":INPUT E
 650 IF E=1 THEN ? "":GOTO 670
 660 IF E=2 THEN ? "":GOTO 700
 670 PRINT "YOU NOW HAVE THE RUM TO TRADE"
 680 PRINT
 690 GOTO 640
 695 PRINT
 700 ? "YOU HAVE ENTERED THE BOX,AND THE FLOOR HAS GIVEN WAY"
 705 FOR I=1 TO 50:NEXT I
 706 PRINT
 707 ? "YOU ARE FALLING THROUGH MID AIR"
 710 FOR I=1 TO 1000:NEXT I: ? " "
 715 PRINT
 720 ? " S P L A S H "
 725 PRINT
 730 ? "BOY! YOU WERE LUCKY! YOU HAVE LANDED RIGHT IN THE SEA"
 731 ?
 740 ? "You are in the sea:VISIBLE ITEMS sandy beach ahead of you in the distance"
 745 PRINT

560-585 Oh dear! Try again?

600-610 Ah well!

620 Location

625-660 Prompts and response

670-690 Action to response

695-731 Argh! . . . You've fallen in the water!

740-745 New location

Micro-mind Card 1 of 1

8315MM

A very simple version of the classic Mastermind game.

```

5 COUNT = 0
10 CLS
20 A = RND(4)
30 B = RND(4)
40 C = RND(4)
50 D = RND(4)
60 PRINT "-----MICRO MIND-----"
70 PRINT
80 PRINT "CHOOSE FOUR NUMBERS BETWEEN 1 & 4"
90 PRINT "BEWARE NUMBERS CAN BE DUPLICATED"
100 PRINT "IF YOU ARE CORRECT X WILL APPEAR"
110 PRINT "IF YOU ARE WRONG X WILL APPEAR"
120 COUNT = COUNT + 1
130 INPUT E: INPUT F: INPUT G: INPUT H
140 IF E <> A THEN PRINT "X": T = -1
150 IF F <> B THEN PRINT "X": T = -1
160 IF G <> C THEN PRINT "X": T = -1
170 IF H <> D THEN PRINT "X": T = -1
180 IF E = A THEN PRINT "+": T = 1
190 IF F = B THEN PRINT "+": T = T + 1
200 IF G = C THEN PRINT "+": T = T + 1
210 IF H = D THEN PRINT "+": T = T + 1
220 IF T = 4 THEN GOTO 250
230 IF COUNT = 10 THEN GOTO 300
240 GOTO 80
250 PRINT "WELL DONE! YOU WIN!": GOTO 310
300 PRINT "YOU LOSE!!"
310 PRINT "THE NUMBERS WERE"
320 PRINT A: PRINT B: PRINT C: PRINT D
330 PRINT "ANOTHER GAME?"
340 INPUT A$
350 IF A$ = "Y" THEN GOTO 5
360 END

```

Colour Genie
Colour Genie BasicApplication: game
Author: John Tompkins

5 Initialise limit of attempts
10 Clear screen
20-50 Generate numbers

60-110 Instructions NB: replace "+" with
"●" (Graphic A) in line 110

120 Increment attempt count
130 Inputs for each number
140-170 Wrong

180-210 Correct. NB: replace "+" as line 110

220 Clever dick! All correct
230 Only 10 attempts
240 Next attempt
250 Yippe!
300 Gloom and despondency
310-320 Just to let you know

330-350 Again? Y = Yes

360 Any other response ends program

Brickbat Card 1 of 1

8315B

A short implementation of a Breakout-type game using the low resolution mode.

```

10 REM SET UP WALL
20 CLEAR
30 CLS: FOR I = 1056 TO 1151: POKE I, 175: NEXT I
40 REM PLACE BAT
50 BP = 1517: IX = RND(2): IY = -1: IF IX = 2 THEN IX = -1
60 REM PLACE BALL
70 POKE BP, 159: POKE BP+1, 159: POKE BP+2, 159
80 PX = RND(29)+1: PY = 151: IF PEEK(32+PY+PX+1023) <> 96 THEN 80
90 REM CHECK POSITION AHEAD. IF CLEAR MOVE BALL
110 NX = PX+IX: NY = PY+IY: IF NX < 1 OR NX > 31 THEN IX = IX*-1: GOTO 110
120 IF NY > 15 THEN 290
130 IF NY < 0 THEN IY = IY*-1: NY = NY+1
140 IF PEEK(32+NY+NX+1023) <> 96 THEN 320 ELSE 170
150 IY = IY*-1: NY = NY+IY: IF PEEK(32+NY+NX+1023) = 96 THEN 170
160 IX = IX*-1: NX = PX+IX
170 POKE 32+PY+PX+1023, 96: POKE 32+NY+NX+1023, 79: PX = NX: PY = NY
180 REM MOVE BAT
190 A$ = INKEY$: IF A$ = CHR$(8) OR A$ = CHR$(9) OR A$ = CHR$(32) THEN P$ = A$
200 IF P$ = CHR$(32) THEN 270
210 IF P$ = CHR$(9) THEN 250
220 IF BP > 1505 THEN POKE BP, 96: POKE BP+1, 96: POKE BP+2, 96: BP = BP-2: GOTO 270
230 IF BP > 1504 THEN POKE BP, 96: POKE BP+1, 96: POKE BP+2, 96: BP = BP-1: GOTO 270
240 IF BP < 1532 THEN POKE BP, 96: POKE BP+1, 96: POKE BP+2, 96: BP = BP+2: GOTO 270
250 IF BP < 1533 THEN POKE BP, 96: POKE BP+1, 96: POKE BP+2, 96: BP = BP+1: GOTO 270
260 IF BP < 1591 THEN POKE BP+1, 96: POKE BP+2, 96: GOTO 110
270 IF T = 2 THEN PRINT "SCORE = " S: INPUT "ANOTHER GAME "; B$: IF B$ = "YES" THEN 20 ELSE END
300 POKE BP, 96: POKE BP+1, 96: POKE BP+2, 96
310 POKE PY+32+PX+1023, 96: T = T+1: GOTO 50
320 REM IF POSITION AHEAD IS PART OF WALL THEN DELETE IT
330 IF PEEK(NY+32+NX+1023) = 175 THEN POKE NY+32+NX+1023, 96: SC = SC+1: SOUND 150,1
340 SOUND 200,1
350 GOTO 150

```

Dragon 32
Dragon BasicApplication: game
Author: Allan Tennent

20 Initialise variables
30 Clear screen then set up wall
50 Set bat in start position. Select movement vectors
70 Draw bat
80-90 Ball position

110-170 Check ball movement allowed and action

190-280 Move bat according to left/right arrows or halt movement with space bar, then round again

290 Balls all used (3). Show score and prompt for another game
300-310 Lost ball

330 Bonk. Take brick from wall

340 Beep
350 Continue to play

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

We publish a list of these two groups on alternate weeks. This week it is the turn of user groups, which are listed alphabetically by machine and special interest.

Each issue will also focus on the activities of an individual club or

group with a fly-on-the-wall report. This week we feature the Watford ICPUg.

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

The user group listing is based on that of the Amateur Computer Club.

WICUPUG plugs into Micronet

It was a full house at the Watford Independent Commodore Products Users Group meeting which offered tips on getting hooked up to Micronet 800.

It's not unusual for WICUPUG to have some of the big names from the Commodore headquarters in Slough drop in. And on this night John Collins from the company's technical department stepped in to bring members news from the Commodore front, until the Micronet presenter made his appearance.

Mr Collins talked about a modem for the 64 machine (See *PCN issue 14*) and other products in the pipeline.

WICUPUG has been going for a couple of years now, and from the start it had a bias towards professional users rather than games players. Stephen Rabagliati, one of the founder members of the club, said: 'Normally we have a guest speaker.

'We sometimes get visits from major

software houses, and when we get the chance we like to look at other micros to see what they have got to offer. Some of our members meet privately and quite a few of them have written software for the main ICPUg library.'

At this gathering more than 50 people poured into a room of the Institute of Grocery Distribution, in Letchmore Heath, where meetings are normally held.

Rod Eva (left), David Babski, Micronet's Editor (centre) and Stephen Rabagliati demonstrate Micronet on Commodore machines.



Members gather to see demonstrations on hardware, software and add-ons.

Mr Rabagliati and Rod Eva, chairman of WICUPUG, have formed their own company called Y2 Computing. They wrote the Prestel software for the Commodore Pet machines and have recently written the package to be used with the Commodore 64 Prestel interface.

Micronet's editor David Babski eventually arrived and showed a Kenny Everett video on Micronet, and followed it with a talk on connecting the system through an acoustic modem. After some teething problems in setting it up, members watched the system running — and the evening was rounded off with questions from the floor.

Sandra Grandison

Name: WICUPUG **Venue:** Institute of Grocery Distribution, Grange Lane, Letchmore Heath, Watford **Meetings:** Second Monday of the month **Contact:** Stephen Rabagliati, 01-779 7141.

USER GROUPS

Acorn

Coventry Acorn Atom User Group. Subs: £4. No meetings but quarterly newsletter. Contact Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Session at 9pm Thursday at the F/O and H/O, Chatham. Contact Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (eve).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crusall, Manchester 8 on Tuesday except school holidays. fees: £1. Contact John Ashurst, 192 Vendure Close, Failsworth, Manchester, 061-681 4962.

Apple

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Newsletter. Contact Eva Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Contact Steve Profit, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062 84 73074.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Subs: £5. £10 commercial members. Contact Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

Hertfordshire British Apple Systems User Group. Meets at Old School, Branch Road, Park Street, St Albans, Hertfordshire, on first Tuesday and Thursday each month. Tuesday and third Sunday each month. Annual subs: £12.50, joining fee: £2.50. Publishes magazine. Contact John Sharp, 09273 7562.

London Apple Music Synthesis Group. Contact Dr Davis Ellis, 22 Lennox Gardens, London SW1.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Bull Ring Contact Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham Atari User Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Subs: £5. Meetings: 25p members, 50p non-members. Contact Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carlshall Atari User Club. Contact Paul Deegan on 01-642 5232.

Hull Atari Users Local Group. Proposed new user group. Contact Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094. New club. Library planned, newsletter. Contact Richard Hawes on 01-301 1111.

Norwich Atari User Group. Proposed new club. Contact Ken Ward, 45 Colchburn Road, Lakenham, Norfolk.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merrion House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Subs: £5. Contact Roger Taylor, 0253 738192.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Contact Nick Kelly, 051-525 2934 (evenings).

BBC

Leamington is an international user group for the BBC micro. Produce monthly magazine. Subs: £12 for one year, £6 for six months. Contact Paul Atkinson, 10 Dawley Ride, Colnbrook, Slough, Berks. 0252 20614.

Beebug. Ten magazines with programs. Discount deals, library and query service. Contact Sheridan Williams or

David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR. **Bournemouth** BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Contact Norman Carey on 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Subs £3. Newsletter. Contact Joseph Fox, 4 Harman Close, London NW2 2EA.

North London BBC Micro Users Group. Meets at the Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Wide range of skills and expertise. Contact Dr Leo McLaughlin, Department of Chemistry, Westfield College, University of London, Kilderpore Avenue, London NW3 7ST, 01-435 0109.

Preston Area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Subs: £5. Contact Duncan Coulter, Membership Secretary, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

Widham BBC Micro User Group meets at comprehensive school, Witham on second Thursday each month at 7.30pm. Contact Dave Watts after 7pm, 0245 358127.

Comal

London Comal User Group. Meets at Polytechnic of North London, Holloway, second Wednesday of month, term time. Subs: £7.50. Contact John Collins, 75 74111.

Commodore ICPUg

Barnsley. Subs: £7.50. Contact Bob Wool, 13 Ward Green, Barnsley, South Yorkshire, 0228 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. Contact David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY3 3ST.

Canterbury SE. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. Subs: £7 adults, £3.50 juniors. Contact R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.

Cardiff. Contact David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788. **Cheltenham.** Meets at The Cheltenham Ladies College on last Thursday of month at 7.30. Contact Alan Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789. **Clyde.** Contact John Poole, 062 Ridgeway Close, Cornhill Quay, Clyde City GL2 4LZ.

Corby. Contact Peter Ashby, 215 Wincovin Way, Corby, Northamptonshire, 05363 4442. **Coventry.** Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Subs: £2.50. Contact Will Light, 22 Ivybridge Road, Sycchale, Coventry, Warwickshire.

Derby. Meets at Derby Professional College every other Tuesday at 7pm. Contact Robert Watts, 03322 72569. **Durham.** North-East Pet and ICPUg.

Meets at Leazes School, Riccarton Way at 7pm second and third Mondays of month. Contact Jim Coallands, 20 Worcester Road, Newton Hall Estate, Durham.

Essex. No meetings, software library. Contact Simon Kniveton, 097 086 303. **Hainault.** Meets at Grace Remedial Centre, Woodman Path, Hainault.

Contact Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex. **Glasgow.** Contact Dr Jim MacBrayne, 27 Daidnyrie Street, Newton Mearns, Glasgow, 061-539 6666. **Gloucester and Bristol Area.** Meets at 23 Sheppard Lane, Wotton-under-Edge, Gloucester, on last Friday of month.

Meets at Leazes School, Riccarton Way, Farnborough, on third Wednesday of month. Contact Ron Reeger, 109 York Road, Farnborough, Hants, 0252 542923.

Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. Contact B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 729226.

Kilmarnock. Meets at Symington Primary School on first and third Thursdays of month at 7pm. Software library. Contact John Smith, 19 Bremlands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.

Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Software exchange. Contact Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.

London. Contact Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.

London North. Contact Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Subs, London N7, 01-467 2789.

Norfolk. Contact Peter Petts, Bramley Hall, Wretton, King's Lynn, Norfolk PE33 9X5, 0366 508692.

Northumberland. Proposed new club. Contact Graham Saunders, 22 Front Street, Guide Post, Northumberland.

Slough. Meets at Slough College on second Thursday of month at 7.30pm, visitors — 65p adults, 40p students. Contact Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 2DF, 0734 661494.

South-East Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Contact 01892 400000.

South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. Help available with business programming problems. Contact M J Merriman at above address.

Staffordshire. Annual subs: £6.50. Group newsletter. Contact at 57 Clough Hall Road, Kidsgrove, Stoke-on-Trent.

Teddington. Contact G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.

Wattford. Meets on second Monday of month. Contact Stephen Rahagiaty, c/o Institute of Grocery Diet, Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.

Commodore West Blackpool. Pest Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. Contact D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 3ST.

Southern Users of Pets Association. Contact Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.

Pet User Group Crawley. Contact Richard Dyer, 33 Farham Road, Hiffeld, Crawley.

Pet Users Education Group. Produces newsletter. Contact Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.

UK Pet Users Club. Annual subs: £10, newsletter. Contact 360 Euston Road, London NW1 3BL.

Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 30. On alternate Tuesdays, 6pm. Meets at Barry Miles on 01-607 2789.

Pet User Club. Contact Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.

Independent Pet Users Group. Contact 57 Clough Hall Road, Kidsgrove, Stoke-on-Trent, Staffordshire.

Commodore Vic Burnley. Proposed club. Contact John Ingham, 72 Ardwick Street, Burnley, Lancashire.

London. Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Contact Robin Bardber.

Norfolk. Proposed club. Contact J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Subs £15. Contacts with USA, Australia and Canada. Newsletter, program library. Contact Peter Hiner, 111 Pennycoff, Harpenden, Hertfordshire, 05827 64872.

CP/M Irish CP/M Users Group. Subs: £5, meets monthly in Dublin area. Newsletter. Contact Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411. **UK CP/M Users Group.** £7. Software library. Contact Lesley Spier, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC COSMAC Users Group. Contact James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 429394.

Digital Equipment Digital Equipment Users Society. Program library. Contact The Secretary, PO Box 53, Reading, Berkshire, 0734 387725.

Dragon Brisham Dragon Owners Club meets at Computer Systems (Torbay), Pump Street, Brisham, every Saturday at 7.30pm. Contact 01392 436662. **Bristol.** Contact 01274 599999. **Brookside Court, Brisham, Devon.** Brisham 59224.

Education Birmingham. Education ZX80/1 User Subs: £2.50. Contact Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.

Birmingham. MUSE. Subs: £10, student fee £6.50. National body for co-ordinating activity in schools, colleges. Contact Loraine Hoyce, MUSE Information Office, Westhill College, Woolley Park Road, Birmingham, 021-471 3723.

Dublin. Computer Education Society of Ireland. Subs: £3. Contact Dairmaid McCarthy, 7 St Kevin's Park, Kilmacall, Blackrock, Co. Dublin.

Middlesex. Educational Users Group. Offshoot of national TRS-80 Users Group. Contact Dave Fletcher, Head of Tech, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.

Worcestershire. Mini and Commodore computer Users in Education. National organisation. Contact R Trigger, 48 Chadoute Way, Catshill, Bromsgrove, Worcestershire B61 0FT.

Forth Forth Users Group. Produces newsletters and covers a variety of machines. Subs £7.50. Contact David Husband, 2 Gosleston Road, Branksome, Poole, Dorset BH12 1NW, 0202 764724.

Forth Interest Group UK. Meets at Room 408, South Bank Polytechnic on the first Thursday of month. Subs: £7. Newsletter. Contact K Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH, 01-937 3231.

Forum Forum 80 Users Group. Contact Frederick Brown, 421 Endike Lane, Hill HU6 6AG.

FX-500-P FX-500-P Users Association. Contact Max Francis, 38 Grysmdyke, Great Missenden, Buckinghamshire HP16 0LP.

Genealogists Society of Genealogists Computer Interest Group. Subs: £3. Newsletter. Contact Anthony Camp, 01-773 7054.

Intel MDS UK Intel MDS User Group. Newsletter. Contact Leeds Hard, c/o S.P.A.C.E., The Old Coach House, Courst Row, Lynton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100 Ithaca Audio S100 Users Group. Software exchange—discount. Contact Dave Weaver, 41 Dore Avenue, North Hykeham, Lincoln LN6 8LN.

Jupiter Ace Jupiter Ace Users Group. Subs: £7. Newsletter, add-ons. Contact John

Noyce, Remsoff, 18 George Street, Brighton BN2 1RH.

Mattel Mattel Intellivision TV Game Group. Proposed group to organise games competitions. Contact Warrington 62215 after 4pm.

Medical Durham. Primary Health Care Group. Contact Dr Alastair Malcolm, British Computer Society, Chevelay Park Medical Centre, Belmont, Durham, 0385 64282.

London. Medical Micro Users Group. Newsletter. Contact Medicom, 1-2 Hanover Street, London W1.

Middlesex. TRS-80 Medical and Laboratory Users. Newsletter. Contact Dr Robinson, The Presidency, 200 Northwick Park Hospital, Harrow, Middlesex.

Nascom Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Newsletter. Contact Mike Rothery, 37 Eaton Wick Road, Woking, Windsor, Berkshire, Windsor SP6 106.

Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Contact Martin Sidebotham, 021-744 3093.

International Nascom Microcomputer Club. Subs: £5. Newsletter, program library. Contact 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP8 5EQ.

Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Contact Mr T Searle, 051-526 2526.

Newbrain Wakefield Independent Newbrain User Group. Contact Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.

Ohio Ohio Scientific User Group. Subs: £5. Newsletter. Contact Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric Oric Owners Group. Subs: £10. Communicates through bi-monthly newsletter. Contact Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Osborne British Osborne Owners Group. Subs: £18. Newsletter. Contact A Anglesa, Flat 19, Rowan House, Milton Road, Handsworth, Birmingham B20 2JR.

OSI OSI UK User Group. Contact Richard Ely, 12 Bencherley Road, London SW11 6DS.

Pascal Pascal User Group. Subs: £9. Contact Nick Hughes, 01-532 32, Pinner, Middlesex HA5 3FE.

PDP Buckinghamshire. PDP8 User Group. Newsletter. Contact David E. High, Campson Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.

Hertfordshire. PDP11 User Group. Information service only. Contact Peter Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot UK Pilot User Group. Contact Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside L63 3AQ.

Prestel ACC National Prestel Committee. Administrates Club Sport 800 (hobbyists on request). Contact secretary, Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines Birmingham. Research Machines 380Z. Contact Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AK.

Leamington Spa. West Midlands RML User Group. Contact Spencer Instone, c/o 59 Avenue Road, Leamington Spa, Newcastle. NERML 380Z User Group. Meets monthly at 8pm. Electronics Education Centre of the Polytechnic Coach Lane Campus. Subs: £5.

Computer Unit. Northumberland Building. Newcastle Polytechnic. 0632 326002.

Oxford. Research Machines National User Group. Contact RML, Mill Street, Osney, Oxford OX2 0BW, 0865 49866.

Oxford. Research Machines Ltd National User Group. Contact M D Fisher, PO Box 75, Oxford OX4 1EY.

Sharp MZ80 Aberdeen. International Sharp Users Group. Subs: £3. Newsletter. Contact Graham Knight, c/o Knight's Computers, 108 Rossmount Place, Aberdeen, 0224 630526.

Essex. Sharp MZ80K User Group. Contact Joe Street, 16 Elmhurst Drive, Hersonnett, Essex. 0206 220000.

Leeds. Sharp PC1211 Users Club. Subs: £5. Newsletter. Contact Jonathan Dakayne, 281 Liddgett Lane, Leeds LS17 3AT.

Somerset. Sharp MZ80 Users Club. Contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair Brighton. ZX Users Group. Contact J Ireland, 141 345 Goswin Road, Hove, Brighton.

Aylesbury. Sinclair ZX Computer Club. General monthly meeting, newsletter. Equipment for hire, specialist computer services, library. Contact secretary, Ken Knight, 0296 5181.

Colchester. Sinclair User Group. Meets fortnightly. Contact Richard Lawn, 102 Prattsyate Road, Colchester, Essex.

Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Subs: £5. Telephone homebased software library. Contact Mike Hayes, 54 Oakley Place, Grangefield, Cardiff, 0222 37732.

Edinburgh. ZX. Meets at Clarendon Hotel, Clarendon Crescent, Edinburgh on second and fourth Wednesdays every month, 7.30pm. Subs: £5 adults, £3 juniors, students, OAP and unemployed. Newsletter. Contact John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.

Glasgow. ZX80/1 User Group. Contact Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.

Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Contact Keith Archer, 051-260 4950.

London. National ZX User Club. Monthly magazine 'Interface'. Contact Jim Hartnell, Intiface, 44-48 Ears Court, London W8.

London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block, Monday, 6.30pm. Contact Irving Brand, Polytechnic of North London, Holloway Road, London.

ZX Spectrum Club. Proposed new club for teachers. Contact D Beatrice, 63 Kingleys Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Staffordshire. ZX80 National Software Association. Software available on cassette. Contact 15 Woodlands Road, Wombourne, Staffordshire WVS 01Z.

Suffolk. ZX Amateur Radio User Group. Newsletter. Contact Paul Newman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone enquiries.

Surrey. Guildford ZX81/80 Users Group. Meets Fridays, club magazine. Contact A Bond, 54 Farmham Road, Guildford, Surrey GU2 5PE, 0483 63035.

Surrey. ZX80/1 User Club. Newsletter. Contact David Bigden, PO Box 159.

Kingston-upon-Thames, Surrey KT2 5JG.
West Sussex. Hassocks ZX Micro User Club. Contact Paul King, 25 Fir Tree Way, Hassocks, West Sussex.
Sirius
Sirius User Group. Newsletter, program library. Contact Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-7/1 Gordon Street, London, 0852 412215.

68XX
68XX Special Interest Group. Contact Tim Turner, 63 Millars Road, London E11 4HB, 01-558 3681.

Software
London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Contact Mike Duck at Polytechnic of North London, Holloway, London N7. Oxford. Program of the Month Club. Defunct programs, newsletter. Contact Mr Purrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer
Liverpool European Sorcerer Club. Monthly meetings. Subs: £7.50, newsletter. Contact Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3UJ, 070-48 72137. Surrey. Exidy Sorcerer User Group. Newsletter, program exchange. Contact Andy Marshall, 44 Arthurs Bridge

Road, Woking, Surrey GU21 4NT.
Spreadsheet
International Electronic Spreadsheet Users Group. Newsletter. Contact UK Alpha House, 7th Floor, Rowlandway, Michaelston M22 5RG.
Tangerine
Avon. Tangerine Users Group. Hardware/software suppliers for Oric 1 and Microtan. Monthly newsletter. Contact Bob Green, 1 Marlborough Drive, Worle, Avon, 0934 21315.

Bristol. Tangerine Homebrew. Contact A Coales, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.
Texas Instruments
Leeds. TI99/44 User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. Subs: £6. Contact 1 Youlden, 0532 401408.
Manchester. TI User Group. Proposed new club. Contact T Grimshaw, 21 Allingham Street, Longsight, Manchester.
Manchester. TI9900 User Group. Software, data libraries. Contact Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Triton
Triton User Group. Subs: £4. Newsletter, software exchange. Contact Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.
TRIS-80
Birmingham. National TRIS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Subs: £2.50. Newsletter, software library. Contact Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.
Chelmsford. TRS-80 User Group. Contact Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.
Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. Subs: £5. Newsletter. Contact J Dunn, 8 Eitrich Terrace, North Gateshead, County Durham.
Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month, 7.30pm. Contact Dick Mackie, 3 Warrander Park Crescent, Edinburgh EH9 1DX, 031-229 6032.
Isle of Wight. TRS-80 User Club. Meets at Light Hotel, Ryde on last Friday of month, 7.30pm. Contact Sean Coulson, 0903 614589.
Kent. TRS-80 User Group. Contact Alan Reid, 22 Woodleys Road, Rainham, Kent, 0654 367012.
Bolton. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Subs: £8. Sub-group meets at Crown Hotel, Blackfriars Street, on first and third Monday of month. Newsletter, software library. Contact Melvin Franklin, 40 Cowles, Westhoughton, Bolton, Lancashire.
Liverpool. UK DOSPLUS User Group. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.
Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month, 7.15pm. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL, 051-220 9733.
London, SW. TRS-80 User Group. Contact Ron Everett on 01-394 2123.
Merseyside. TRS-80 User Group. Subs: £5. Software library, newsletter. Contact N Rushton, 123 Roughwood

Drive, Northwood, Kirby, Merseyside.
Milton Keynes. National TRS-80 and Genie User Group. Fee £7 for six months, newsletter. Contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.
London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Contact Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital.
Northants. TRS-80 Users Group. Meets at Welwyn Park Community Centre on alternate Thursday at 7pm. Subs: £12. Saturday workshop. Contact Neil Griffiths, 0858 6718.
Nottingham. East Midlands TRS-80 Users Group. Newsletter. Contact Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.

Colour Genie
National Colour Genie User Group. Subs: £10. Products monthly newsletter, has software library and prepares national workshops. Contact Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.
UCSD
Hants. UCSD System Users Society. Contact John Ash, Diecill Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.
Oxford. UCSD Pascal UK Users Group. Contact Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.
CUA
CUA User Group. Contact Adrian Waters, 9 Moss Lane, Romford, Essex.
6502
Bedfordshire. 6502 User Group. Contact Walter Wallenborn, 21 Argyll Avenue, Luton, Bedfordshire LU3 1EG, 0582 20927.
Hants. 6502 Users Club (Southern Region). Contact Steve Cole, 70 Sydney Road, Gosport, Hants.

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.

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'IBM Basic for Business and Home' by Robert Funkhouser, published by Reston and distributed by Prentice-Hall (0442 58531) at £12.70 (paperback, 204 pages).

This is a remarkable book. Long after Mr Funkhouser's contribution to IBM Basic has been forgotten his bold assault on the English language will live on.

His preface gives the game away — this book may appear to be about IBM Basic but its primary purpose is to demonstrate that we are all mistaken in believing that we can use language to communicate. 'Using a computer,' he asserts, 'is not difficult. It is not difficult, that is, once you know how to use it.'

Even a skilled Logical Positivist would have difficulty sorting that out, but Mr Funkhouser has made his point and he goes on to show that language, when handled with the care of a man wearing asbestos gauntlets, can indeed be used to convey information.

'Input,' he says later, 'is data . . . Data that is input to a program is often referred to as "input data".' What could be clearer? Armed with a solid understanding of input data you can look forward to complete mastery of your IBM PC.

It may be unfair to concentrate on Mr Funkhouser's eccentric style, but we are not quibbling about minutiae such as split infinitives (although he can dish those out as well). A book that addresses you as though you were two years old is likely to be more irritating than useful.

As to content, Mr Funkhouser aims to give a comprehensive treatment. From the rationale of computing to the intricacies of DOS he doesn't overlook very much. He concentrates on business programming and his

reassuring comment 'No prior computer experience is needed' is possibly the understatement of the year. **DG**



'Using Your IBM Personal Computer' by Lon Poole, published by Prentice-Hall (0442 58531) at £14.40 (paperback, 326 pages).

Presentation is just as important as content in computer manuals. It improves readability and comprehension. Having an eye for these things, my heart sank when I first picked up this book. I could tell without reading it that it was written and printed in America.

I don't want to appear xenophobic but I find American (both language and presentation) jarring on the mind and eye. However, if you can put up with words like 'colour' being spelt 'color' you may well be rewarded.

Lon Poole is no newcomer to this kind of book. Previous efforts have included *Apple II User's Guide* and *your Atari Computer*. The result is a well-polished approach to the subject that takes the reader in stages through the anatomy of the machine.

Part 1 deals with the essentials of how to use the PC. Setting up the system and working with the operating system are well covered. Part 2 dives into the complexities of how to program in Basic and is as comprehensive as you would expect from a book with more than 300 pages.

Appendixes — sorry, appendices — cover easy reference guides to Basic commands, PC DOS commands, error messages and keyboard codes. Inside the back cover you'll find a glossy tear-out card for use as a quick-reference guide.

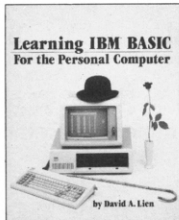
The text is supplemented with charts, diagrams and program listings of good legibility and clarity — which is more than can be said of the photographs. **RB**

'Learning IBM Basic for the Personal Computer' by David A Lien, published by CompuSoft at US\$19.95 + \$2.50 p&p surface mail (paperback 425 pages).

CompuSoft Publishing, PO Box 19669-12, San Diego, CA 92119. Do you have an IBM PC about the house? Do you yearn to get to know it better? Ache to learn Basic? Do you enjoy reading American? Do you grin at cute cartoons of rabbits illustrating multiplication? Do you believe learning should be Fun, Fun, Fun?

Here's the book for you. It's a hefty paperback and entire pages are given up to cartoons or three- or four-line exercises — in the interests of user-cuddliness, one presumes.

Dr Lien, the man behind more than a million technical book sales and proud author of such classics as the Epson MX Printer Manuals, proclaims his



latest opus as 'Light and non-threatening, since we have no insecurities to pass along'.

Your journey starts gently enough, with instructions about switching on, which way up to insert the system disk, and how to enter the date, list the directory and format a disk.

Then it's down to Basic, and plenty of hands-on exercises spelt out in minute detail, right down to 'Remember to use the ↑ key to get parentheses.' There's a chapter for each new concept, from relational operators and FOR-NEXT loops to PEEK and POKE, flowcharting and debugging. And most chapters have their own exercises to sweat over.

There are plenty of appendices, full of ASCII codes and error messages and IBM-reserved words. And a stack of ready-to-type-in sample programs.

It's all there, and all explained with exemplary clarity. But a few British business persons might find its jokey

style beneath their corporate dignities. **SF**



'IBM Personal Computer — An Introduction to Programming and Applications' by Larry Joel Goldstein and Martin Goldstein, published by Prentice-Hall (0442 58531) at £13.55 (book only), £30.97 with disk (paperback and disk 310 pages).

The Goldsteins have done it properly this time.

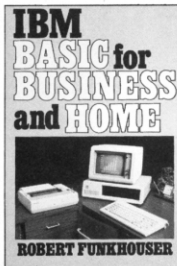
In their last book for the Apple II (*PCN April 15*) they spent too much time playing with numbers and little maths problems. But in their new book for the IBM PC there's a good mix of explanations about Basic for the novice, enough programs to keep most hobbyists happy and a meaty section on applications.

Because the IBM PC is seen more as a business machine in the UK, punters could be excused for expecting the book to concentrate on business applications. In the US, however, the PC is seen as a little more down-market, and the book reflects this in its coverage.

There's a discussion on computer graphics, word processing and business simulation, but also a section on computer games, programming for scientists and tips on using colour.

The chapters on applications are made all the more vivid by the inclusion of many short demonstration programs and exercises. For example, in the word-processing chapter a rudimentary 32-line program gives the first-time user an idea of what world processors can accomplish. Similarly, a bar chart program is included on the graphics sections and a program demonstrating the operation of a dry-cleaning business is listed in the business simulations chapter.

An extra is the 5 1/4 in floppy disk containing many of the programs listed. **GW**



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DATABASICS

This five-page guide lists as many of the micros on the market for under £12,000 as possible. In Databasics you'll find all the specifications for the machines, add-ons and software necessary to make your buying decisions.

PCN keeps you up to date in three-week cycles, starting with hardware, then peripherals and finally software.

PRICE Specifications listed for each machine indicate what you get for the basic price quoted, which includes VAT.

PROCESSOR TYPE a microprocessor is the heart of the computer. The 280 and 6502 are popular 8-bit chips. The 8088 and 68000 are common 16-bit chips. If a machine has an 8-bit and a 16-bit processor we have listed the 16-bit only. Cust. means custom-built.

SPEED in Mhz means the clock used to drive the microprocessor, measured in MegaHertz (million cycles per second).

STANDARD RAM Amount of main memory used on the system. The capacity is expressed in kilobytes.

MAX RAM normally at extra cost Amount of memory to which the system can be expanded.

MAX CHARACTERS columns × lines The number of characters that can be displayed across the screen and the number of lines down.

METHOD (at extra cost) This indicates the way the computer displays information. **M** on its own means that a monitor is included in the basic price.

Tv indicates that you can plug the computer into a television set (**M+**) indicates that the monitor costs extra. **LCD** = Liquid crystal display.

COLOUR CAPABILITY tells you whether the machine can give colour at the basic price quoted.

MAX DOT RESOLUTION gives the maximum number of points across the screen by the number of points down the screen that are available for graphics.

KEYBOARD This tells you the type of keyboard that comes with the machine. **W** = word processing, **C** = calculator and **T** = touch-sensitive. **No of FUNCTION KEYS** refers to the number of keys that can be used for different jobs by different programs.

NUMERIC PAD indicates whether the machine has a separate calculator-style group of number keys to enter data quickly.

INTERFACES BUILT-IN shows the number of standard connections built into the machine.

CASSETTE FACILITY gives a yes or no as to whether or not the machine can use a cassette to store data.

CAPACITY PER DISK AND DISK SIZE tells you how many disk drives come with the machine, and the amount of data in kilobytes (K) or megabytes (Mb) that can be stored on each drive. There are two sizes for disks, 5¼" or 8", and they can be floppy (F) or hard (H).

OPERATING SYSTEM gives the program that looks after the general running of a computer.

LANGUAGES INC is a column which lists the programming languages that come with the machine at the basic price.

OTHER LANGUAGES AVAILABLE indicates whether or not other programming languages are available for the machine.

DISTRIBUTOR To find which company distributes the machine refer to the distributor table from the code listed in this column. The table is at the end of the listings, and gives the distributor's name and telephone number.

All details given are the latest available. We ask distributors to let us know as soon as machine specifications change so Databasics can be kept right up to date. This guide has been meticulously researched and the information collected from individual distributors listed.

PRICE GUIDE

Sinclair ZX81	£40	Research Machine 480Z	£650	Transam Truscan	£1,983	LSM4	£2,472	DECPC325	£3,080	Corvus Concept	£4,887	ABBREVIATIONS Ap: APL As: Assembly Ba: Basic Co: Cobol Cm: Comcal Fr: Fortran Pa: Pascal
TRS-80 PC4	£50	DAIPC	£684	IDS Datamachine	£1,995	Canon CX-1	£2,500	Inter 1000	£3,093	ICL PC Model 31	£4,939	
Sharp PC1251	£80	Apple II	£776	Tandy TRS-80 Model II	£1,999	Adler Alphatron P2U	£2,524	Equator	£3,099	Cromemo System 3	£5,170	
Jupiter Ace	£90	Commodore 500	£799	Kenilworth 83N	£2,012	IO Technona	£2,539	Clenio Table-Tops 925	£3,105	Fortune Five 1000	£5,175	
Casio FX702P	£90	HP 75C	£863	Caltext Micro	£2,019	HP 87XK	£2,571	ITT 3030	£3,162	Fortune 32-16 System 2	£5,204	
Sinclair Spectrum	£99	Sharp MZ80B	£900	LSIM3	£2,064	Quantum 2000	£2,587	Monroe OC 8810	£3,162	Zeus 4	£5,400	
Tandy TRS-80 Pocket 2	£130	Commodore 8032	£1,129	Haywood 9000 Composite	£2,064	Seed System 19	£2,600	HP Series 200 Model 16A	£3,211	Hawk Model 2110	£5,405	
Atari 400	£150	Commodore 710	£1,144	Hawk Model 1110	£2,070	Enterprise 1000	£2,645	Samurai	£3,214	Molecular M200	£5,462	
TI-99-4A	£150	Microdecision	£1,144	Postron 9000	£2,134	Facit 6520	£2,645	Torch	£3,214	Altos 800 15	£5,663	
Commodore VIC 20	£170	Fujitsu FM8	£1,150	Research Machines 380Z	£2,147	Olympia Boss Model A	£2,645	Sord M223	£3,277	Durango F85	£5,744	
Sharp PC1500	£170	Sanyo MBC 1000	£1,195	Superbrain JR	£2,150	Future Computers FX-20	£2,156	Kontron RS180	£3,306	Marin Chip M9900	£5,750	
Acorn Atom	£174	Positron 900	£1,259	Comart Communicator	£2,180	Comart Communicator	£2,180	Columbia FC 1600-1	£3,392	SW Tech. Products S0/9	£5,805	
Colour Gene	£194	Tandy TRS-80 Model III	£1,299	Eagle II	£2,197	Almarc 801	£2,242	Digico Prince	£3,392	BaSF 7100	£5,842	
Dragon 32	£200	Commodore 8096	£1,374	Adler Alphatron P2	£2,242	DEC Rainbow 100	£2,242	Barcellos AMT 100	£3,450	Sord M243	£5,842	
Sord M5	£218	Pasca 640	£1,437	Kemtron K2000E	£2,242	Rair Black Box 3205	£2,242	Kalamazoo 1050	£3,450	Archives IV	£5,905	
Computers Lynx	£225	NEC PB8000	£1,454	Rair Black Box 3205	£2,242	ICL PC Model 10	£2,754	Cromemo System 2	£3,560	ICL PC Model 32	£6,037	
Tandy TRS-80 Colour	£240	Irvine Business Systems	£1,489	Toshiba T-2000	£2,242	Milbank SX10	£2,754	Digital Microsystems 3	£3,576	Rair Business Computer	£6,207	
New Brain A	£269	Televideo TS-800 Series	£1,495	TKM 332	£2,242	Olivetti M200D	£2,754	Decision-1 Computer 012	£3,576	Digital Microsystems 4	£6,210	
Multitech MPS II	£269	HP 86A	£1,541	Bonsai SM 3000	£2,242	Sirius I	£2,754	Televideo TS 1602-C	£3,714	Superstar	£6,296	
BBC Micro Model A	£299	Osborne I	£1,581	CAL PC	£2,294	Victor 9000	£2,754	Adds Multivision	£3,795	Rascal 6000	£6,327	
Genie II	£299	Signet 10025	£1,599	North Star Horizon	£2,294	North Star Advantage	£2,766	Vector 4	£3,795	Eagle 1600	£6,497	
Atari 800	£300	AFL Signet	£1,610	Sanyo MBC 1250	£2,294	Apple III	£2,780	Panasonic JD800M	£3,795	TI System 200-250	£6,695	
Nascom 2	£327	Zenith Z89-81	£1,668	Casu Mini C2	£2,300	Sanyo MBC 4050	£2,817	Kemtron K3000	£3,795	Compucorp 675	£6,780	
Genie I	£330	Basis 108	£1,683	Logic System I	£2,300	Bonsai SM 4000	£2,842	DECPC 350	£3,850	Sundance I	£6,969	
Commodore 64	£345	Commodore Spr. Pet 9000E	£1,719	Sharp PC3201	£2,360	Logica VTS V15esse	£2,863	Vector 4	£4,019	Pascal Mod. Microengine	£7,003	
BBC Micro Model B	£399	Garni Galaxy 2	£1,719	HP Series 100, 120	£2,362	Decision-1 Computer 011	£2,869	Sage II	£4,190	Diablo 3000	£7,250	
Datasc Micro Controller	£431	British Micro Mini 803	£1,720	Sord M23P	£2,369	Eagle III	£2,950	Eagle IV	£4,190	Onyx 5001 MU	£7,607	
Cortex	£454	Microsolution Brit. Genius	£1,840	TI Prof. Computer	£2,386	Zenith Z89-81	£2,978	C-1010	£4,197	Sundance II	£8,205	
Epson HX20	£472	Genie III	£1,897	IBM PC	£2,392	Monroe EC 8800	£2,990	Tandy TRS-80 Model 16	£4,199	Haywood Hinet	£8,500	
Nascom 3	£549	Toshiba T-100	£1,900	Xerox 820 Model II	£2,415	Philips P8500	£3,000	Hytech H4500	£4,310	Altos 856-10	£9,631	
Sharp MZ80A	£549	Sord M23	£1,932	Haywood 3000	£2,439	Tanberg EC10	£3,000	BMC OC 11F800, Model 2054, 360	£4,310	Fortune Five 3000	£10,530	
Commodore 4016	£632	Transtec BC2	£1,949	Kenilworth 83G	£1,953	Archives I	£3,003	ADS 42	£4,500	Sundance 16	£10,480	
		Kenilworth 83G	£1,953			Cromemo System 1	£3,025	Televideo TS-80ZH	£4,533	Spectrum	£11,442	

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM - normally at extra cost	Max characters columns x lines	Display		Graphics	Max dot resolution	Keyboard		Interfaces built-in					Storage		Operating system	Languages inc	Other languages available	Distributor	Comments
							Method (at extra cost)	Colour capability			Type of keyboard	No. of function keys	numeric pad	No. of RS232	No. of Centronics	No. of IEEE 488	No. of other	No. of expansion slots	Cassette facility					

HARDWARE

Acorn Atom	£174	6502	1	2K	40K	32x16	Tv(M++)	●	256x192	W										Cassette	BaAs	●	A1	Hobbyist micro			
Adds Multivision	£3,795	8085A	5	64K	256K	80x25	M		640x240	W	28	1								1x350K5¼F	CP/M2.2, Muon	Ba	●	A2	Multi user system		
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80x24	M			W	6	●	2		1	3				2x160K5¼F	CP/M	Ba	●	T1	Good software choice		
Adler Alphatronic P2U	£2,524	8085A	3	64K		80x24	M			W	6	●	2		1	3				2x320K5¼F	CP/M	Ba	●	T1	£327 buys extra storage		
Adler Alphatronic P3	£2,696	8085A	3	64K		80x24	M			W	6	●	2		1	3				2x790K5¼F	CP/M	Ba	●	T1	16 bit option-promised		
ADS 42	£4,500	8085A	4	32K		40x8	M		40x8	W	●	3								1x82K5¼F	Holland Automation	Ba	●	A3	Intelligent cash register		
Almarc 801	£2,708	Z80	4	64K	512K	80x25	(M++)	●		W	●	2				11				2x800K5¼F	CP/M	Ba	●	A4	8-bit range goes to 20Mb		
Almarc 1601	£3,445	8086	8	128K	1Mb	80x25	(M++)	●		W	●	2				11				2x800K5¼F	CP/M86	Ba	●	A4	Pseudo 16-bits go to 20Mb		
Altos 800/15	£5,663	Z80	4	192K	208K	80x24	M			W	8	●			1					1x450K5¼F	MP/M	Ba	●	L1	Multi user business machine		
Altos 856-10	£9,631	8086	10	512K	1Mb	80x24	M			W	16	●	6							2x500K5¼F	Xenix	Xenix	●	L1	The 16-bit version		
APL Signet	£1,610	Z80A	4	64K		80x25	Tv(M++)	●			●	2								2x188K5¼F	APL, CP/M	Ap	●	M1	*APL terminal recommended		
Apple II	£776	6502	1	48K	128K	40x24	Tv(M++)	●	256x192	W										8	●	Ba	●	A8	Plenty of software and extras		
Apple III	£2,780	6502	2	128K	256K	80x24	(M++)	●	560x192	W	●	1								1x140K5¼F	SOS, DOS	Ba	●	A8	Will emulate Apple II		
Archives I	£3,003	Z80	4	64K		80x25	M	●	240x100	W	23	●	2		1	5				2x386K5¼F	CP/M	Ba	●	S1	Standard CP/M + graphics		
Archives IV	£5,905	Z80	4	512K		80x25	M	●	240x100	W	23	●	1		1	3				1x10Mb5¼H+1x7445¼F	CP/M, MP/M	Ba	●	S1	Hard disk version		
Atari 400	£150	6502B	1.79	16K		40x24	Tv	●	320x192	T	3									7	●	Ba	●	A5	Games computer, Basic extra		
Atari 800	£300	6502	1.8	48K		40x24	Tv(M++)	●	320x192	W	3									7	4	●	Ba	●	A5	Versatile, good graphics	
Barcelona AMT 100	£3,450	Z80A	4	64K	256K	80x24	TvM			W	8	●	1			2	3			2x500K8F	CP/M	BaCo	●	B1	Up to four users		
BASF 7100	£5,805	Z80A	4	64K		80x24	M			W	26	●	1							3x163K5¼F	BOS	Ba	●	C1	Hard disc promised		
Basis 108	£1,683	6502	1	64K	126K	80x24	TvM	●	820x168	W	15	●	1							6	●	Ba	●	C12	Apple bus, Z80, 80 columns		
BBC Micro Model A	£299	6502	1.8	16K	32K	40x30	Tv(M++)	●	320x256	W	10									1	●	BaAs	●	A1	Upgradable to Model B		
BBC Micro Model B	£399	6502	2	32K		80x30	Tv(M++)	●	640x256	W	10									5	3	●	BaAs	●	A1	Versatile and expandable	
BMC Oki # 800, Model 20	£4,360	Z80B	5	64K	256K	80x25	M	●	640x200	W	15	●	1							●	2x340K5¼F	CP/M	Ba	●	E1	Built-in printer	
Bonsai SM 3000	£2,294	Z80	2	64K		80x24	M	●	80x24	W	14	●	1							●	2x350K5¼F	CP/M	Ba	●	B2	CP/M business machine	
Bonsai SM 4000	£2,842	8088	5	128K	256K	80x24	M			W	14	●	1							●	CP/M, MP/M, MS-DOS	Ba	●	B2	Z80 for 8 bit software		
Britannia Baby	£2,657	8085	6.14	64K		80x25	Tv(M++)	●	80x25	W	11	●	2							●	2x500K5¼F	CP/M	AsBaCo	●	B3	Cobol language included	
British Micro Mimi 803	£1,720	Z80A	4	64K		80x25	(M++)	●	512x256	W	17	●	1							●	2x400K5¼F	OS/M	Ba	●	B4	This is CP/M compatible	
C-1010	£4,197	6502	1	64K	128K	80x24	TvM	●	256x192	W	12	●	1							●	1x1405¼F+1x10MbH	CP/M, DOS, UCSD-P	Ba	●	C2	Apple II compatible	
CAL PC	£2,294	8088	5	128K	256K	80x25	TvM	●	256x512	W	●	2				1	5			●	2x400K5¼F	CP/M	Ba	●	C3	Also Z80B Processor	
Caltech Micro	£2,019	Z80A	4	64K	256K	80x24	TvM			W	36	●	1				3			●	2x400K5¼F	CP/M	Ba	●	C3	Range of software included	
Computers Lynx	£225	Z80A	4	48K	192K	40x24	Tv(M++)	●	248x256	W	●	1								●	Cassette	Ba	●	C5	Unusual — promise of CP/M		
Canon CX-1	£2,500	6809	4	128K	256K	80x24	M	●	80x25	W	15	●	3		1	2				●	2x320K5¼F	MCX	BaAs	●	C4	Pascal, Fortran as extras	
Casio FX 702P	£90	Cust.		2K		20x1	LCD			C										●	Cassette	Ba	●	C6	Pocket computer		
Casu Mini C2	£2,300	Z80A	4	64K			(M++)							4						6	●	2x1Mb8F	Ba	●	C7	*Choose your own terminal	
Clenio Pronto	£3,795	Z80A	4	64K	1Mb	80x24	M	●						2		2				18	●	2x600K8F	CP/M	Ba	●	C8	'Choice of terminal
Clenio Table-Top 925	£3,105	Z80A	4	64K	128K	80x25	M			W	11	●	2							●	2x600K8F	CP/M	Ba	●	C8	Watch out for the weight	
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80x24	M	●	640x200	W	10	●	2							●	2x320K5¼F	CP/M, MS-DOS	Ba	●	I1	An IBM lookalike	
Commodore VIC 20	£170	6502	1	5K	32K	22x23	Tv(M++)	●	176x158	W	8	●								3	1	●	Ba	●	C9	Very popular home micro	
Commodore 64	£345	6510	1	64K		40x25	Tv(M++)	●	320x200	W	8	●								3	●	Ba	●	C9	Good value for money		
Commodore 500	£799	6509	1	128K	896K	40x25	Tv(M++)	●	320x200	W	10	●	1							3	1	●	Ba	●	C9	Available by summer?	
Commodore 4016	£632	6502	1	16K	32K	40x25	TvM			W	●	1								1	3	●	Ba	●	C9	The original PET	
Commodore 710	£1,144	6509	2	128K	896K	80x25	TvM			W	10	●	1							1	2	1	●	Ba	●	C9	Might be a long wait
Commodore 8032	£1,129	6502	1	32K	96K	80x25	TvM			W	●	1								1	1	●	Ba	●	C9	The 80-column PET	
Commodore 8096	£1,374	6502	1	96K		80x25	TvM			W	●	1								1	1	●	Ba	●	C9	Fully expanded PET	
Commodore Super Pet 9000	£1,719	6502	2	96K		80x25	TvM			W	●	1								1	1	2	●	Ba	●	C9	Top of the range
Compucorp 675	£6,780	Z80	4	64K	256K	80x20	M			W	20	●	1							4	●	2x655K5¼F	Compucorp	Ba	●	C10	Unusual O/S

Comart Communicator CP-100	£2,190	Z80	4	64K	512K	80x24	M	W	12	1	10	2x390K5/4F	CPM	BaAs	Business CP/M micro
Cortex	£454	9995	12	64K	1M6	40x24	Tv(M+)	256x192	W 12	1	1	●	Merlin	Pa	Mainly sold as £340 kit
Corvus Concept	£4,887	68000	8	256K	1M6	120x60	M	720x500	W 10	2	1	●			A4 shaped screen
Cromacom System 1	£3,025	Z80	4	64K	80x25	(M+)		450x735	W 20	1	8	2x390K5/4F	CDOS, Crom		Designed for business
Cromacom System 2	£3,560	Z80	4	64K	80x25	(M+)			W 20	1	21	2x390K5/4F	CDOS, Crom		Large business machine
Cromacom System 3	£5,170	Z80	4	64K	80x25	(M+)			W 20	1	21	2x1.2MbitF	CDOS, Crom		Top end Cromac
DALC PC	£664	8090	2	48K	60x24	Tv(M+)		255x335	W 20	1	1	●	Cassette	Ba	Optional maths chip
Daltec Micro Controller	£431	Z80	2	16K	40x24	Tv(M+)		80x60	W 1	1	1	●	CPM	Ba	Mainly used in labs
DEC Rainbow 100	£2,714	8088	N/A	64K	192K	132x24	M	960x240	W 20	2	3	2x400K5/4F	CPM		Competitor for IBM PC
DEC PC 325	£3,080	90P1123	N/A	256K		132x24	M	960x240	W 20	2	2	2x400K5/4F	PDS		Mini in micro clothing
DEC PC 350	£3,850	90P1123	N/A	256K		132x24	M	960x240	W 20	2	4	2x400K5/4F	CPM		Mini in micro clothing
Decision-1 Computer MDC-011	£2,869	Z80A	4	64K	192K		(M+)*		W 8	1	4	1x400K5/4F+1x3Mbit5/4H	DACL		"Buy your own terminal"
Decision-1 Computer MDC-012	£7,250	Z80A	4	64K	192K		(M+)*		W 8	1	4	2x1.8MbitF	DACL		"You choose the terminal"
Diablo 3000	£7,590	8095	3	32K	64K	80x25	M		W 50	2	7	2x400K5/4F	CPM		Unusual keyboard
Digital Microsystems DMS-3	£3,392	Z80A	4	64K		80x25	M		W 50	2	7	2x400K5/4F	CPM		"Choice of terminal"
Digital Microsystems DMS-4	£3,576	Z80A	4	64K		80x25	M		W 50	2	7	2x400K5/4F	CPM		"Depends on terminal chosen"
Digital Microsystems DMS-5	£6,210	Z80A	4	128K	1/2Mb		(M+)*		W 50	2	7	2x512KbitF	MP/M		Standard CP/M machine
Direc 100	£3,093	Z80	4	64K		80x25	M	132x192	W 20	1	4	2x390K5/4F	CPM		Standard CP/M machine
Direc 320	£2,000	6809E	1	32K	64K	32x16	Tv(M+)	256x288	W 2	1	4	1	Cassette	Ba	Tandy colour looklike
Dureango F85	£5,744	8095A	5	64K	196K	80x64	Tv(M+)		W 4	1	12	2x1Mbit5/4F	StarBasic	Ba/Co	Includes WP/SS software
Elite II	£2,702	Z80A	4	64K		80x24	M	80x24	W 8	2	1	2x500K5/4F	CP/M	Ba	Includes WP/SS software
Elite III	£2,950	Z80A	4	64K		80x24	M	80x24	W 8	2	1	2x1Mbit5/4F	CP/M	Ba	Includes WP/SS software
Elite IV	£4,190	Z80A	4	64K		80x24	M	80x24	W 8	2	1	1x1Mbit5/4F+1x1.2Mbit5/4H	CP/M	Ba	Includes WP/SS software
Elite V	£6,497	8096	8	128K	512K	80x25	M	720x352	W 24	2	1	1x1Mbit5/4F+1x1.2Mbit5/4H	MS-DOS, CP/M 86	Ba	High speed IBM copy
Elite 1600	£2,445	8	64K	64K					W 10	2	2	2x358K5/4F	Cassette	Ba	Micro Nova 16-bit
Enterprise 1000	£4,72	6301	1	16K	32K	20x4	LCD	120x32	W 13	2	2	●	Enterprise	Ba	Powerful portable
Epson HX20	£6,842	Z80A	4	64K	448K	80x24	M	255x560	W 14	7	1	1x5Mbit5/4F+1x750K5/4F	CP/M, MP/M, Turbo DOS	Ba	2 bigger models available
Equator	£6,845	Z80	4	64K	128K	80x24	M	80x24	W 8	2	1	2x320K5/4F	CP/M, Fact DOS	Ba	Concurrent printing
Facit 6520	£5,204	68000	6	256K	1Mb	80x24	M	1024x1024	W 16	1	20	2x800K5/4F	Unix	Ba	Good for business graphics
Fortune 32/16 System 2	£5,204	68000	6	256K	1Mb	80x24	M	1024x1024	W 16	1	20	2x800K5/4F	Unix	Ba	Good for business graphics
Fujitsu FMB	£1,150	6809	1	64K	1Mb	80x25	(M+)	800x400	W 20	2	1	2x800K5/4F	Flex	Ba	Good for business graphics
Future Computers FX-20	£2,156	8098	8	128K	1Mb	80x25	(M+)	128x468	W 4	1	1	2x800K5/4F	CP/M 86, MS-DOS	Ba	Good for business graphics
Genie I	£2,990	Z80	2	16K	48K	54x16	Tv(M+)	128x468	W 4	1	1	●	Cassette	Ba	Still on a promise
Genie II	£1,997	Z80A	3,2	64K	48K	64x16	Tv(M+)	160x72	W 8	1	1	●	Cassette	Ba	Compatible with TRS 80 I
Genie III	£1,997	Z80A	3,2	64K	48K	64x16	Tv(M+)	160x72	W 8	1	1	●	Cassette	Ba	Speeded-up Genie I
Genie IV	£1,719	Z80A	4	64K	512K	80x25	M	160x96	W 8	1	1	●	Cassette	Ba	CP/M costs extra
Genie V	£2,070	Z80A	4	64K	256K	80x25	(M+)*	160x75	W 10	1	1	●	Cassette	Ba	Home games machine
Genie VI	£5,405	Z80A	4	64K	256K	80x25	(M+)*	160x75	W 10	1	1	●	Cassette	Ba	Low cost British system
Genie VII	£2,064	Z80A	4	64K	192K	80x24	(M+)*	160x75	W 10	1	1	●	CP/M, MP/M2	Ba	"Choose your terminal"
Genie VIII	£10,982	Z80	4	64K	128K	80x24	(M+)	160x75	W 10	1	1	●	CP/M, MP/M2	Ba	"Choose your terminal"
Genie IX	£2,360	Qurl	N/A	16K	24K	32x1	(M+)	64x255	W 34	2	3	1x390K5/4F+1x2.1MbitH	CP/M	As	Designed for network
Genie X	£2,541	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XIV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XVI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XVII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XVIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XIX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXIV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXVI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXVII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXVIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXIX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXIV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXVI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXVII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXVIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XXXIX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XL	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLIV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLV	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLVI	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLVII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLVIII	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie XLIX	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large network machine
Genie L	£2,571	Qurl	N/A	16K	32K	32x1	(M+)	64x255	W 34	3	1	●	CP/M	Ba	Large

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard ROM	Max RAM - normally at extra cost	Display		Graphics	Keyboard	Interfaces built-in					Storage	Operating system	Languages inc	Other languages available	Distributor	Comments
						Max character count - in lines	Method (if extra cost)			Colour capability	Max dot resolution	Type of keyboard	No. of function keys	Numeric pad						

HARDWARE

Jupiter Ace	£90	Z80	3.25	3K	51K	32×24	Tv(M+)	64×46	C	●							Fr	J1	Native Forth machine			
Kalamazoo 1050	£3,450	8085	6	64K		80×24	Tv(M+)	80×24	W	10	1			2×250K5¼F			Kalamazoo	●	K3	Only Kabol language		
Kemtron K2000E	£2,242	Z80	4	64K		80×24	(M+)	80×24	W					1×300K5¼F	CP/M			●	K4	Scientific Keyboard		
Kemtron K3000	£3,795	Z80	4	64K	256K	80×24	(M+)	80×24	W	●	2	1		2×1Mb8F	CP/M, MP/M			●	K4	For scientific use		
Kenilworth 83G	£1,953	Z80A	4	64K		80×25	TvM	160×75	W	10	●	1	1	2×350K5¼F	CP/M			●	K5	British portable		
Kenilworth 83N	£2,012	Z80	4	64K		80×25	TvM	160×75	W	10	●	1	1	2×350K5¼F	CP/M		Ba	●	K5	Includes Basic		
Kontron R510	£3,306	Z80	4	64K	128K	80×25	M	256×512	W	16	●	2	1	2×300K5¼F	Kontron	Ba	●	K6	O/S CP/M based			
LSI M3	£2,064	Z80	2.5	64K		80×24	M	80×24	W	31	●	1	1	2×200K5¼F	CP/M			●	L3	Big, British and CP/M		
LSI M4	£2,472	8088	5	128K	256K	80×24	M	160×72	W	31	●	2	1	2×400K5¼F	CP/M 86, CP/M80			●	L3	Z80 for 8-bit software		
Logica VTS Vitesse	£2,863	8086	5	64K	256K	80×24	M	640×288	W	12	●	1	4	2×1Mb5¼F	CP/M, MS-DOS	Ba	●	L4	High-res colour graphics			
Marin Chip M9900	£5,750	9900	3	64K	1.6Mb	24×80	M	24×80	W	8	●	4	4	2×1.2Mb8F	MOS, MDEX	Ba	●	M2	Genuine 16-bit			
Micro Five 1000	£5,175	8088	8	128K	512K	25×80	TvM	512×512	W	20	●	10	2	2×1Mb5¼F + 2×3.6Mb5¼H				●	F2	*Choose your own O/S		
Micro Five 3000	£10,350	8086	5	128K	1Mb	25×80	TvM	512×512	W	20	●	5	3	1×10Mb8F				●	F2	*Choose your own O/S		
Microdecision	£1,144	Z80	4	64K		80×24	(M+)		*				2	1×200K5¼F	CP/M		Ba, Pilot	●	I2	*Terminal extra		
Microsolution British Genius	£1,840	Z80	4	64K		80×24	TvM	80×24	W	21	●	1	1	2×160K5¼F	CP/M			●	M4	Genius by nature?		
Millbank SX10	£2,754	Z80A	4	65K	256K	80×25	M	80×25	W	10	●	2	1	2×350K5¼F	CP/M		As	●	M5	Scientific applications		
Molecular M200	£5,462	Z80	4	64K	320K		(M+)*		*				2	1×10Mb8H + 1×500K8F	CP/M		BaAs	●	G2	*Terminal required		
Monroe EC8800	£2,990	Z80A	3	128K		40×24	M	240×240	W	32	●	3	3	1×320K5¼F	Monroe	BaPaPilot	●	F3	Only 40-character screen			
Monroe OC8810	£3,162	Z80A	3	128K		80×24	M	80×24	W	32	●	3	2	1×320K5¼F	Monroe	BaPa	●	F3	Bigger model available			
Multitech MPF11	£269	6502	1.2	64K		40×24	Tv(M+)	●	280×192	C			1	1	1	●	Cassette	Ba	●	S8	Apple soft compatible	
Nascom 2	£327	Z80A	4	2K	64K	16×48	Tv(M+)	48×96	W	1	4	●	●	NAS, SYS	NAS, SYS	BaAs	●	L5	Old reliable			
Nascom 3	£549	Z80	4	48K		16×48	Tv(M+)	48×96	W	1	4	●	●	NAS, SYS	NAS, SYS	BaAs	●	L5	Fully expanded Nascom			
NEC PC8000	£1,454	Z80	4	32K	64K	80×25	M	●	160×100	W	10	●	2	1	●	2×300K5¼F	CP/M, NEC, DOS	Ba	●	N1	Superb colour graphics	
New Brain A	£269	Z80A	4	32K	512K	80×30	Tv(M+)	●	640×220	C			2	1	●		Cassette	Ba	●	G3	A lot of promise	
North Star Advantage	£2,766	Z80	4	64K		80×24	M	640×240	W	15	1			2×360K5¼F	CP/M			●	T9	16-bit option		
North Star Horizon	£2,294	Z80	4	64K	512K		*	*	*				2	1	1	9	2×360K5¼F	North Star DOS	Ba	●	T9	*Choose your own terminal
Olivetti M200	£2,754	28000	3	160K	512K	80×25	M	●	512×256	W	●	1	1	5	CPDS			●	B6	Real 16-bitter		
Olympia Boss Model A	£2,645	Z80A	4	64K		80×28	M	●	80×28	W	10	●	1	4	2×140K5¼F	CP/M		●	O1	Useful 2B lines on screen		
Omyx 5001 MU	£7,607	Z80A	4	128K	256K		*	*	*				5	1	●	1×7Mb5¼H	CP/M	Ba	●	T2	*Terminal extra; other models	
Oric 1	£169	6502A	1	48K		40×28	Tv(M+)	●	240×200	C			1	1	●		Cassette	Ba	●	O2	16K promised	
Osborne 1	£1,581	Z80	4	64K		52×24	M	128×32	W	10	●	1	1	2	2×185K5¼F	CP/M	Ba	●	O3	Portable, includes software		
Panasonic JD 800M	£3,795	8085A	4	60K		80×24	M	80×24	W	21	●	3		2×250K8F	CP/M	Ba	●	●	P1	Larger model costs £5,002		
Pasca 640	£1,437	Z80A	4	64K		80×24	M		W	●	1	1		2×250K8F	CP/M			●	W1	Regular CP/M micro		
Pascal Modular Microengine	£7,003	WD9000	2	128K		*	*	*	*				4	8	2×1.2Mb8F	UCSD-P	Pa	●	P2	*Terminal extra		
Philips P3500	£3,000	Z80A	4	64K	320K	80×25	M		W	11	●	2		2×0.6Mb5¼F	Turbo-DOS	Co	●	P3	Fast O/S as standard			
Positron 900	£1,259	6809	1	64K	256K		(M+)	*	*				4	1	3	O/S 9	Ba	●	P4	*You choose your terminal		
Positron 9000	£2,134	6809	1	64K	256K	80×24	TvM	●	480×240	W	12	●	4	1	3	O/S 9	Ba	●	P4	Multi user version		
Quantum 2000	£2,587	Z80A	4	64K	192K	80×25	M	160×75	W	18	●	1	1	5	●	3×860K5¼F	CP/M		●	Q1	Mono, low-res graphics	
Rair Black Box Model 3/20S	£2,242	8085	5	64K	512K	80×24	(M+)		*				2	8	2×1Mb5¼F	CP/M	Ba	●	R1	*VDU extra; many versions		
Rair Business Computer	£6,037	8088	5	256K	1Mb	80×25	M		W	10	●	2	4	8	1×19Mb5¼H + 1×1Mb5¼F	CP/M, PCDOS	Ba	●	R1	Hybrid 8/16 bit		
Rascal 6000	£6,327	Z80	5	64K	256K	80×26	M	80×26	W	21	●	1	1	1	●	1×600K8F	CP/M		●	R2	CP/M languages available	
Research Machines 380Z	£2,147	Z80A	4	32K	56K	40×24	Tv(M+)		W	1	1		4	●	2×144K5¼F	CP/M	Ba	●	R3	Widely used in schools		
Research Machines Link 480Z	£650	280A	4	32K	256K	40×24	Tv(M+)		W	4	2	1	1	2	●		Cassette	Ba	●	R3	CP Net version available	
Sage II	£4,019	68000	8	128K	512K	*	(M+)	*	*				2	1	1	●	2×640K5¼F	UCSD-P System	BaAsPafn	●	T10	*Terminal extra
Samurai	£3,214	8086	4.6	128K	768K	80×25	M	●	720×400	W	●	3	1	3	2×1.2Mb8F	MS DOS, CP/M 86			●	M6	High-res colour graphics	

Sanyo MBC 1000	£1,195	Z80A	4	64K		80×25	M	80×25	W	17	1	1			1×320K5¼F	CP/M	Ba	●	L1	Standard CP/M model	
Sanyo MBC 1250	£2,294	Z80A	4	64K		80×40	M	640×400	W	●	1	1			2×640K5¼F	CP/M	Ba	●	L1	High-res graphics	
Sanyo MBC 2000	£2,242	8085A	5	64K		80×24	M	80×24	W	24	●	2	1	2	2×328K5¼F	CP/M	Ba	●	L1	Big disc model costs £3,622	
Sanyo MBC 4050	£2,817	8086	5	128K		80×24	M	80×24	W	●	1	1	1		2×640K5¼F	CP/M 86	Ba	●	L1	Pseudo 16-bit	
Seed System 1	£2,300	6800	2	32K	64K	80×24	M	80×24	W	3	●	2		8	2×160K5¼F	DOS 68 Flex	Ba	●	S3	Ageing business machine	
Seed System 19	£2,600	6809	2	48K	1Mb	80×24	M		W	3	●	2		8	2×160K5¼F	OS-9	●	S3	Latest from Seed		
Sharp MZ80A	£549	Z80	2	48K		40×25	M	80×50	W	●							●	S4	CP/M facility extra		
Sharp MZ80B	£900	Z80A	4	64K		80×25	M	320×200	C	10	●						●	S4	Unusual keyboard		
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD	24×1	C	18	●						●	S4	Pocket computer		
Sharp PC1500	£170	Cust.	1.3	3.5K	11.5K	26×1	LCD	156×7	C	6	●	1	1	2			●	S4	Optional 4-pen plotter		
Sharp PC3201	£2,300	Z80A	2.6	64K	112K	80×25	M	160×50	W	10	●			5	2×500K5¼F	Sharp Basic	Ba	●	S4	Powerful Sharp Basic	
Signet 10025	£1,599	Z80B	6	64K		80×24	M	512×512	W	●	2	1	1		2×200K5¼F	CP-M, Macnos	●	A6	Choice of keyboards		
Sinclair ZX81	£40	Z80A	3.5	1K	16K	32×24	Tv	64×44	C	●				1			●	S5	Sold a million		
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32×24	Tv	256×192	C	●				1			●	S5	Very popular home micro		
Sirius I	£2,754	8088	5	128K	896K	80×25	M	800×400	W	7	●	2	1	4	2×600K5¼F	CP/M 86, MS DOS	Ba	●	A7	IBM style	
Sord M5	£218	Z80A	4	4K	16K	40×24	Tv(M+)	256×196	C	●		1	2	2			●	S6	Japanese home computer		
Sord M23	£1,932	Z80A	4	128K		80×25	M		W	14	●	2	1	2	3	2×330K5¼F	Sord O.S., SB80	BaPips	●	S6	CP/M compatible
Sord M23P	£2,369	Z80A	4	128K		80×25	Tv(M+)	640×200	W	14	●	2	1	2	2	2×290K3¼F	Sord O.S., SB80	BaPips	●	S6	Complete with suitcase
Sord M23Z	£3,277	Z80	4	64K		80×25	M		W	●	2			4	2×350K5¼F	Sord O.S., SB80	BaPips	●	S6	Standard business machine	
Sord M243	£5,842	Z80	4	192K		80×25	M	640×400	W	15	●	4	1	4	2×1Mb8F	Sord O.S., SB80	BaPips	●	S6	Large and powerful	
SW Technical Products SO-9	£5,750	6809	2	256K	1.2Mb	80×24	M		W	15	●	1	1		2×1.5Mb5¼F	Flex, Inflex	●	S7	Top end SWTP		
Spectrum	£11,442	68000	8	256K	4Mb		(M+)		W	●	4			16	2×720K5¼F	Mirage	Ap	●	M1	*As terminal	
Sundance I	£6,969	Z80A	4	64K	256K	132×24	M		W	4	●	1	1		1×7Mb5¼H	CP/M	Ba	●	T2	Ordinary CP-M machine	
Sundance II	£8,205	Z80A	4	128K	256K	132×24	M		W	4	●	1	1		1×7Mb5¼H	CP/M	Ba	●	T2	Middle-range Sundance	
Sundance 16	£10,480	Z8001	6	256K	1Mb	80×24	M		W	●	5	1			1×14Mb5¼H	BOS	●	T2	Tape backup for hard disc		
Superbrain JR	£2,150	Z80	4	64K		80×24	M	560×240	W	●	2			1	2×160K5¼F	CP/M	Ba	●	110	Bigger models available	

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MICRO BULLETIN

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Address _____

Postcode _____

Telephone _____

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM - normally at extra cost	Max characters columns x lines	Method of extra cost	Display	Graphics	Keyboard	Interfaces built-in		Storage	Operating system	Languages inc	Other languages available	Distributor	Comments
								Model (at extra cost)	Colour capability	Max dot resolution	Type of keyboard	No. of function keys	Numeric pad					

HARDWARE

Superstar	£6,296	Z80	4	64K		80x24	Tv(M+)		80x24		1	1	8	1x10Mb5¼H+1x400K5¼F	CP/M 80	Ba	●	B7	Includes hard disk		
Tandberg EC10	£3,000	8080A	2	64K		80x25	M			W	●	7		1x250K8F	CP/M, TOS	Ba	●	T3	Very early machine		
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80x24	M		80x24	W	2	●	2	1x500K8F	TRS-DOS	Ba	●	T4	Big business machine		
Tandy TRS-80 Model III	£1,299	Z80A	2	48K		64x16	M		128x48	W	●	1	1	●	2x184K5¼F	TRS-DOS	Ba	●	T4	Latest TRS80	
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80x24	M			W	2	●	2	2x1.2Mb8F	TRS-DOS	BaAs	●	T4	True 16-bit		
Tandy TRS-80 Colour Computer	£240	6809E	1	16K	32K	32x16	Tv	●	256x192	W	●	1		●		Cassette	Ba	●	T4	Very popular	
Tandy TRS-80 PC4	£50	Cust.	N/A	¼K	1¼K	12x1	LCD		12x1	C	9	●	1	1	●	Cassette	Ba	●	T4	Low-cost pocket computer	
Tandy TRS-80 Pocket Computer 2	£130	Cust.	1.3	2.6K	16K	26x1	LCD		156x7	C	6	●	1	●		Cassette	Ba	●	T4	Plotted available	
Televideo TS-80ZH	£4,533	Z80	4	64K		80x24	M		80x24	W	15	●	2	1	1x256K5¼F+1x7Mb5¼H	CP/M	●	C11	Recently upgraded		
Televideo TS-800 Series	£1,495	Z80A	4	64K		80x24	M		80x24	W	15	●	2	1		CP/M	●	C11	Standard CP/M machine		
Televideo TS 1602-C	£3,714	8088	5	128K	256K	80x24	M		576x424	W	15	●	2	1	2x256K5¼F	CP/M-86	●	C11	Graphics, but no colour		
TI Professional Computer	£2,386	8088	5	64K	256K	80x25	M			W	12	●		1	1x320K5¼F		●	T5	Choice of operating systems		
Texas Instruments TI-99/4A	£150	9900	3.5	16K	52K	32x24	Tv(M+)	●	256x192	W	12	●	1	2		DOS	Ba	●	T5	This has sprite graphics	
TI System 200-250	£6,695	9900	4	64K		80x24	M		80x24	W	12	●	1		1x5Mb5¼H	UCSD-P, PX10	●	T5	Bigger version available		
TMK 332	£2,242	8085A	5	64K		80x24	M		190x96	W	22	●	1		2x320K5¼F	CP/M	Ba	●	P5	'6502 I/O processor	
Torch	£3,214	Z80*	4/2	96K		80x30	TvM	●	840x256	W	15	●	1	4	●	2x400K5¼F	CPN	Ba	●	T6	CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80x25	TvM	●	640x200	W	15	●	1	1	2	2x256K5¼F	CP/M	Ba	●	O4	Pro test March 18
Toshiba T-200	£2,242	8085	2.6	64K		80x24	M		80x24	W	15	●	1	1		2x256K5¼F	CP/M	Ba	●	O4	Standard CP/M machine
Transam Truscan	£1,983	Z80A	4	64K		80x24	TvM		640x288	W	●	2	1	1	5	2x190K5¼F	CP/M	●	T7	S-100 machine	
Transtec BC2	£1,949	Z80A	4	64K	256K	80x24	M		80x24	W	13	●	2	1	8	2x386K5¼F	CP/M	●	T8	Fully definable characters	
Vector 4	£3,852	8088	5	128K	256K	80x24	M		640x312	W	15	●	1	1	2	2x630K5¼F	CP/M, CP/M 86	Ba	●	A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80x25	M		800x400	W	7	●	2	1	4	2x600K5¼F	CP/M 86, MS-DOS	Ba	●	D8	Same as Sirius 1
Wilkes YDB110	£4,025	8086	5	128K	896K	80x24	M		960x624	W	21	●	1	6	2x1.2Mb8F	CP/M 86	●	W2	Standard CP/M machine		
Xerox 820 Model II	£2,415	Z80A	4	64K		80x24	M		1024x512	W	●	2	2	2	2x160K5¼F	CP/M	●	R4	Powerful graphics		
Zenith 120-22	£2,978	8088	5	128K	192K	80x25	M		640x225	W	18	●	2	1	1	5	2x320K5¼F	CP/M, MS-DOS, Z Basic	●	Z1	Graphics includes turtle
Zenith Z89-81	£1,668	Z80	2.5	48K	64K	80x24	M			W	●	2	1		1	1x100K5¼F	CP/M	Ba	●	Z1	Elderly CP/M machine
Zeus 4	£5,400	Z80	4	64K	320K	80x25	(M+)		80x25	W	11	●	10		1x6Mb5¼H+1x250K5¼F	CP/M, Muse	As	●	M5	Designed as multi-user	

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Vi-20, plus cassette joystick, machine code monitor, 3K RAM + Programmers Aid cart, chess cart, super loader cart Programmers reference and Vi Re-vealed, £70 software. Tel Skelmersdale 25652. £190 ono.

Atari program recorder, brand new, boxed + 10 games, worth £300. Preppie Shamus Zaxxon, Airstrike Darts + more. Bargain at £110, call Tel 01-203 4545.

Apple II 48K Europlus, complete with instruction manuals, TV modulator, leads and software. Excellent condition. For quick sale £375 ono. Tel 021-430 3759.

Ohio and pooton for Texas TI99-4A (16K) or Sharp MZ-80K, £5 for both. Stephen Godfrey, 73 Southwood road, Hayling Island, Hampshire, PO11 9PT.

Atari 400/800; EMI Submarine Commander cartridge only £20. Tel Elgin (0343) 44695.

Mattel Intelligence cartridges £12 each or will sell 13 for £130. titles include Night Star, Star Strike, Space Hawk, Tel Lambert (0234) 562051 weekdays after 5 pm or anytime weekends.

Newbrain writer text editing program. Files loaded/saved on tape. Menu driven print options. Cassette, manual, £99. Also cash budget £6.95. P Murray, Ashley House, Elmhurst, Lichfield, Staffs.

Atari VCS + 4 cartridges Space Invaders, Asteroids, Combat, Olympics. Joysticks, paddles etc. New condition, still boxed, £95. Tel Southend on Sea 546277.

ZX81, perfect condition, tape with over 35 programs including machine code Maze Chase Pinball Bomb run, etc, plus mags £30, small Sanyo radio cassette recorder suitable for above DIM 9½x5½x2in. VGC £28 Tel 594 2281.

Korg MS10 synthesizer, excellent condition, with manual. £175 ono. Tel Glasgow 423 5765 after 6 o'clock, ask for Gerry or Shuggy.

Pet 200 keyboard type with expansion to 32K, will separate, best offer secures, also Acutab 735P and addressable IEEE to parallel port decoder interface for IBM typewriter. Tel 01-950 4209.

Apple II 48K Europlus, complete with manuals, TV modulator, leads and software. Excellent condition, bargain at £375 or offers. Tel 021 430 3759.

Atari 400 16K, cassette recorder, Basic, joystick, games software, manuals £200. Tel Clacton 430277 evenings.

Wanted ZX81 printer will pay £30 to £40 also wanted workable pools program for 16K or 48K Spectrum. Tel N/Sheilds 0632 580199 anytime.

Atari VCS with 7 cartridges including Space Invaders Casino and Break-out. Will accept £120 ono. Tel 01-910 9880.

ZX81 16K plus work station cassette recorder, books, many games on tapes, including 3D Monster Maze, Startrek, Defender, worth £130. Sell £50. Tel 0634 40174 Medway, Kent.

Sharp 16K RAM for ZX81, £20. Frank Dunn, 32 Gateacre Park Drive, Woolton, Liverpool, L25 1PA. Tel: 01-051 722 7915.

ZX81 Memotech 16K, £23 worth of software and £9 worth of books, worth £130 will sell for £100. Tel Amblew 01633 67030 after 6pm.

VIC20 wanted in exchange for my two 40ch FM CB rigs and aerials, powerpack homebase or mobile, cost over £270. Tel Reading Whitley, (0734) 867670 (after 4pm) ask for Mark.

Jupiter Ace for sale £60, ZX81 plus 16K RAM pack and six games cassettes, £50. Tel Chesterfield 7030 after 6pm.

Games tapes for 16K ZX81, 100% machine code Lcaprog £5.95. Scavenger 15 sheets, 4 Mazes 2/chasers fruit all characters fully animated, not Pacman £5.95. 19 Denmark Drive, Sedbury, Wexford.

Wanted BBC06, must be in good condition. Tel (0427 84) 294 (evenings).

Billboard

Commodore 8K2001, integral green screen monitor and cassette, software includes Microchess, Backgammon, Dodgems and Invaders. Full set of TIS manuals, real bargain at £190. Anstruther (Fife) 311181 evenings.

ZX81 + Memotech 16K expandable RAM pack and Filexity keyboard, all with leads etc, two game tapes, £8 worth of magazines etc. £660no. Tel Bursledon 2073.

Speech synthesizer, works with any computer, leads, manual in cabinet, perfect condition one month old, unlimited vocabulary built in P50. Tel 0652 648074.

ZX81 games for sale, including Pacman, Breakout, Asteroids and Basic compiler, £2.25 each, also for sale brand new Sinclair 16K RAM packs £24 ono each. Tel E. Horsley 2864 for more details.

ZX81 plus 16K RAM plus manuals, software, also 14in portable mains B/W television ideal starter pack £85. Tel Andover 0264 65136.

months' guarantee games inc Krazy Kong Football manager etc total value £35 against £15. Tel Dewes 0924 451912.

Cartex 16 bit colour computer 64K, as featured in ETI magazine, cost £450 + but buying house hence £375 ono. Tel Guildford (0483) 31949.

Atari Video game system, with six cartridges, Missile Command, Maze Graze, Combat, Dodge 'em Space Invaders, Cosmic Adventure £250, will accept £150. Tel Freddie on 01-624 2074.

Atari VCS extra paddles and 23 cartridges (including Parker and Activision). Invaders Chess Backgammon, Superman, Starmaster etc, over £650 to buy today badge £275 ono. Southend (0702) 352505.

For BBC Acornsoft Planetoid and book called 30 + programs for the BBC, £12 for one for both, will separate. Tel 061-428 9707 after 5pm, ask for Dave.

Oric 1 48K used twice, full manual, cassette lead, software, boxed £150, also cassette recorder. Tel 01-892 9787.

The overwhelming response to PCN's Billboard service is causing delay in publication of some advertisements. To solve this growing backlog and to cover some of the publication costs we are now charging £1.50 for each ad. Every form received at PCN's offices, 62 Oxford Street, London W1A 2HG, must be accompanied by a postal order or cheque for £1.50 made payable to VNU Business Publications.

Spectrum software, mint condition. Kopykat machine code program copier £4, machine code test tool £7, tape header reader £2, Meteoroids £3, Nigel Barker, 61 Arden Road, Doncaster DN2 5ER.

Apple II professional software unwanted prize on one disk £10 for Taxman, Frogger, Space Panic, Flywars, Serpentine, Cannonball Blitz, Choplifter, s.a.e. to JRC Stevens, Elmfield, Harrow-on-the-Hill, Middx.

Newbrain Model A, green monitor, special compatible cassette recorder, six months old, £50 worth of software, guide handbook, power pack, £325. Tel 011-866 9148 evenings, 01-995 1400 ext 303 days. Godber, Pinner, Middx.

VIC 20 software, spewspelt Star Battle cartridge, Panic, Amok cassettes, issues Vol 1, 16 to Vol 2.5 V + G. Offers, I Carpenter, 43 Cradocks Close, Bradwell Milton Keynes.

Atari Video computer games with cartridges, Frogger, Invaders, Casino and Combat £85. 14 Derby Avenue, Skegness, 0754 5579 office hours 0754 5557 after 6pm.

48K TRS80, lowercase, VDU Edtasm + tiny Pascal, excellent 280 development (34K source/code, macros, symbolic debug, in-memory assembler), £175, will split, nearly complete PCW, PC offers. Tel 0202 576681.

VIC20 16K RAM, 20 cartridges including Choplifter, Adventures, Mutant Herd and Super Expander, some cassettes, joystick, books, all excellent condition, £300 ono. Tel (0632) 899602 afternoons 8pm only.

Sharp MZ80K, 48K, complete with manual, reference books, Chess game, good condition, bought £400, sell £200. Write to Tony S, 9 Thorncliffe Road, Summertown Oxford, for further details.

ZX81 + 16K RAM + games, can buy separate ZX81 + 16K RAM £60 + 7

Sinclair built ZX81 + JRS 16K RAM, 6 month guarantee remains, £20 worth of magazines + software, accept £70. Tel York (0904) 52368 (after 6pm).

Philips G7000 video games machine, excellent condition £80 ono, computer cartridge, Munchkin, Air Sea Battle, Laser Action and Space Monster. Tel Jason, Swanscombe, £6.50 pm.

Atari VCS, 48K RAM, Basic, P10, Supermum with SA-PSU, Cotts Blandford cassette interface, programs, magazines (Inmc, Microwep), £270 cassette recorder, works at 5000 baud with above. £30. Jackson, Tel Stevenage 66355.

Games (Sci-Fi or brain teasers) for Vic20. Tel Steve Christie on 051-733 1586 for list of titles (after 6.30 pm).

Commodore 64, plus C2N cassette software, joystick, magazines £340 ono. Tel 01-251 3769 after 5.30pm.

For Sale or will swap 120CH am-fm CB with 2 aerials and transformer worth £190 or Spectrum 48K or Dragon. Will sell for £130, all boxed. Tel: 0207 50228 weekdays only.

BBC Model B wanted with software and books willing to pay up to £325 in Lancashire area. Tel Poulton Le Fylde (0253) 883929 after 4pm.

BBC compatible 160K disk drive £175, write Harshad Patel, 76 Fairlands Avenue, Thornton Heath, Croydon CR4 6HE.

Attention Atari owners, cartridges for sale, Phoenix £20, Pacman £20, Yar's Revenge £20, Raiders/Ark £22, Haunted House £20, Super Breakout £20, Planet Patrol £18. Most unopened. £12. Tel 0727 23358.

Atari VCS, joysticks, paddles + Invaders cartridges, hardly used, will sell for only £75, contact Max, Tel Bristol (0272) 28672 after 5pm.

Atari shopping list generator, nineteen commodity groups, totalling over 350 items, menu driven, file update facility, requires 32K, disk drive, £7.50. Lees, 1 London Place, Castle Donington, Derby.

Wanted ZX81 good condition under £60. Tel Atherton 876903 after 5pm weekdays, or anytime weekends.

Sharp MZ80-PS printer as new £210, Sharp MZ80B FDOS, Pascal and Double Precision £50, J Parish, 2 Collyers Close, Harworth, Darlington, Co Durham DL2 2ES letters only please.

VIC 20 with Elementary manual and three games cartridges, Chess, Avenger, and Jelly Monsters, normal 3K memory, shop price £212, will ask £180 ono. Tel 01-607 4398 evenings and weekends.

VIC 20 Jelly Monsters £110, Boss 8K £5, Harwards Heath 542485 ask for Paul (after 5pm).

Acorn Atom 12K RAM, 18K ROM with disc pack (96K storage), ROMs include Workpack, Atomatic and Toolbox, much software, printer interface all for £299. Tel (Pinn Bucks) 3355, printer available.

Atari VCS console with joysticks etc plus Combat cartridge, £45 only, Missile Command £10, Asteroids £10, War Lords £15, Haunted House £6. Tel: 01-686 9423 Croydon.

Sharp MZ80K £399, excellent condition with Basic, Pascal, machine language Turbo Pascal program (Assembly) plus many games inc. Star Trek. Tel: (0742) 681144 (evenings only).

Apple II Goodies clearout! Grappler and interface, £69, Epson type II interface, £75, 280 card with CP/M, £149, Magic Window word processor, £59. Frank. Tel: 01-207 3411 (evenings).

Atari VCS console with 48K RAM, Eprom board, Cotts Blandford cassette interface, cased with combined VDU. Offers around £160. Elwyn, Tel: Reuben 821863 (day).

Pet CBM Voluntary community project for unemployed wishes to buy at reasonable cost. Prepared to collect. Tel: 0742 25569, (10am-4pm).

Sharp MZ80K £350. With high resolution graphics board, 48K RAM, books and software including Sharp Software Technician and Zen Editor, Assembly Debugger, Janish, 5 Redmad Road, Hayes, Middx.

Will swap my brand new, hardly used ZX Spectrum with lots of software, for Vic20 (preferably with cassette recorder). Also, 16K ZX81 complete with professional keyboard and case, £80 one. Tel: Mansfield 0623 29380.

Revealed, £6. Introduction to Basic Part 119, Rabbit Base £9, Rabbit Writer £12, Vicat £5, available separately, all £35, cost £60 + McKenzie, 13 Gravesend Avenue, Barnet, Herts.

TI 994/4 stand alone 32K memory expansion unit (does not require peripheral expansion system). Tel: 01-206 0796 (evenings or weekends).

Spectrum 48K, 1 month old, boxed, as new, includes over 40 software: Penetrator, Spectre, Galaxians, Meteoroids, Horace, Spookymann, + many more, £110. Contact B. Doyle, 19 Church Road, Urmoston, Manchester. Tel: 061-76533 (after 6pm).

Omegas OM10 F.1.8 lens, for swap with 40 or 80 track disk drive for BBC computer, want to view it running. Graham, 10 Leadhall Road, Harrogate, Cant. travel.

30 hour Basic £2.75 or swap software BBC, also teletypewriter with Nascom interfacing, details of software print-out £20 or offers, 215 Colwell Drive, north or midlands. Tel: Harrogate 872045.

Newbrain AD, Beginners' Guide and tape, technical notes, all immaculate, offers around £270. Tel: Worthing 207201 (anytime).

Wanted new condition home computer, swap for over £120 of fantasy and family games, with software + books, not ZX81. Cannot collect. Tel: Richard after 5pm 051-733 0900 Liverpool.

Wanted 48K Oric and computer, swap for over £120 fantasy, family games or combination with cash, must sell. Call Richard. Tel: 051-733 0900 after 5pm. Quick sale, buyer collects. Liverpool.

ZX81 software: Startrek, Defenda, Asteroids, Scramble, Invaders, ZX-Gulp, 3D Monster, 3D Defender, Adventure, A. Mazos, Pilot, Chess, Bugbyte 6, ICL 5, ZXDB, Z-aid, Backgammon, Flight. All for £40, £2.50 each. Tel: Preston 27316.

ZX81 16K manual, cassette recorder, software, ie Flight Simulator adventure tapes etc. in excellent condition, three months old. Tel: 21829 after 6.30pm. £80 for the lot.

Wanted Sharp PC1251 pocket computer with or without CE125 cassette drive printer. B. C. Green, 15 Clifton Gardens, London, N5.

16K ZX81 leads manual, Flexisty keyboard and software, as new, also hand-held Invaders, game-watcher. Bargain at £100, worth over £125. Tel: Downpatrick, Northern Ireland 3359, request David.

Swap a set of Spectrum manuals + tape dump of ROM for Ace manual + tape dump ROM. Sinclair software is similar it is possible to transfer files. P. Crawley, Bedstone College, Bucknell, Salop. SY7 0BG.

Microtan 65 Fip-Forth in Eprom 8K RAM Tanex Xbug Assembler, upper/lower case, graphics in mini system rack, Cherry keyboard, £150 one. Tel: 021-445 5439.

Wanted BBC Model B, offering Honda 250 Superdram immaculate condition, new K181 tyres fitted, top box, fairing, little used bike, over 70mpg. Tel: Vic. 061-366 5645.

For sale, Dragon 32 including joystick, 2 books, manual, with Ghost Attack cartridge, Donkey Kong, Computer-voice cassette, leads, 2 months old, £180. Tel: Wakefield 365237.

Silrus 1 computer with 280 card and 2.4

meg disk storage, as new, £2,400, with software MBasic etc, total 192K RAM. Tel: Newcastle upon Tyne 573905 (after 6pm).

Vic20 + 16K RAM + £100 software inc: 2 game cartridges + 5 cassettes + compiled Programs Reference Guide, £155, will sell separately. Tel: 061-790 5874.

BBC adventures to swap, Arrow of Death, Time Machine, Golden Baton and Dragon Quest, will swap for similar good condition originals. Tel: Saltford 3302 after 5pm, ask for Steve.

Spectrum 48K plus 40-word software, £100. Sinclair printer with paper, £40. ZX81 with 16K and software, £40 one. All little used. Write, 97 Windfield, Leatherhead, Surrey.

Philips G7000 computer game plus 8 cartridges, including Munchkins, Freedom Fighters, Computer Programmer, over £200 in value, 5 months old, £125. Tel: (North Humberidge) 0405 69699.

Commodore 64 wanted cassettes and cartridges, also two joysticks wanted. Call Nigel, Newmarket Park, Suffolk 721926 (day). Stodham, Suffolk 613739 (anytime).

Spectrum Jackpot (48K) as new, swap for Spectrum games or sell for £4, game features gamble, hold, nudie facilities. Tel: Kwong Lee 0272 558321 (evenings only).

Sharp MZ-80K bought for business but never used, several game tapes included, private sale, price £325. Tel: Lincoln 722292.

Atom 16K ROM, 12K RAM, monitor utility floating point ROM 6522 V.I.A. printer socket, manuals PSU and lots of software worth £60, must sell! £200 one. Tel: Dave, (0788) 812940 (evenings only).

Vic20 + cassette, Introduction to Basic Part 1, Super Expander, motherboard, printer (links connects Sinclair printer to Vic 20), joystick, games, books, all under 7 months old, £195 including postage. Tel: 0283 35415.

Software for ZX81 16K, includes 3D Monster Maze, Tomb of Dracula, Chess, Invaders and Black Crystal, over £45 worth, selling for £30. Tel: 061-790 3561, will post.

Commodore 64 manual, graphics, Sprite Editor cassette, must sell, getting marvellous. £300. A. McMillan, 3 Bramley Place, Trent Vale, Stoke on Trent, ST4 6NG.

ZX81 16K, hardly used, all leads and manual, booked, only £25. Tel: 01-467 8220 Steve.

ZX80, ZX81, books, magazines and software including Sinc. interface and Sinclair User for sale, offers or details. G. D. Potter, 7 Oxford Road, Birstall, West Yorkshire WF17 9JR.

BBC Model B development aids. Linker allows subroutine libraries to be linked-in, generating complete programs, supplied with useful text-editor, tape-based, £4.50 both. Tel: Basildon (0268) 280979 after 6pm, weekends, Chris.

Vic 20, tape deck, introduction to Basic Part 1, games book, lots of cassette games, joystick, dust cover, five months old, fully boxed, £150. Tel: Johnstone 26463.

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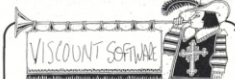
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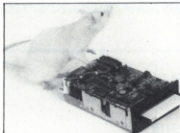
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Ratified

We'd like to say that after our story about the company I/O Devices and its chinchillas two weeks ago we sent out an ace reporter with instructions not to come back until the chinchillas were immortalised on film.

But no. Besides, not every-body would recognise a chinchilla but most of you would know a rat when you see one. You'd see through our deception in seconds.

So what is this cuddly little fellow doing with a floppy disk drive? It is posing, no doubt for £60 an hour, for ITL Kathmill which has just produced the RAT 305S drive.

ITL Kathmill claims 'shirt pocket media portability' for its drive, and that's all very well but where does the rat go? Up your trouser-leg to fight it out with the ferrets?

Thumble

Burroughs' descent into the PC world has been marked by all sorts of features intended to make life easier for anybody using its new ET2200 (see report page 8). These it refers to as ergonomics — swivelling screen, sculpted keys etc.

But one feature seems exclusive to Burroughs. Its hardware requires no tools to install. Presenting this remarkable breakthrough Burroughs' Geoff Druitt draws attention to the cabling. Even the plug needs no tools to apply — it is fitted with 'thumb screws'.

Burroughs should find another name for them before it makes ergonomics disreputable.

SIANTAX ERRORS

Still game . . .

You may have been confused, after reading Max Phillips' enthusiastic review of Ah Diddums in Issue 14, to find that the package rated nothing for Lasting Appeal. Its Playability, Use of machine, and Overall value all had their ratings in green space invaders, but Lasting Appeal had none. This was a case of 'many a slip', because Max swears that after a week of solid playing he hadn't tired of the program. It should have scored four for lasting appeal. Sorry, Imagine.

Spectrum specs

In last week's Micropaedia, we got a little lost inside the Spectrum

(pages 108 and 109). Thus, we could be forgiven (please!) for saying that the 16K RAM was a combination of 2K chips in rows of eight — actually it's a simple 1 × 16 configuration. Similarly, the 32K RAM is not eight 4K chips, but a 1 × 32 arrangement.

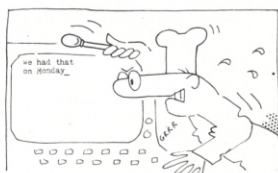
You might have noticed a mistake in the section on basic control statements. The article on page 110 refers to 'IF condition THEN action 1 ELSE action 2'.

As everyone knows, there is no ELSE condition in Spectrum Basic (blush, blush).

SUM total

The Mattel Pro-Test (Issue 8, April 29) grumbled about Finplan's ROMpack spreadsheet program, because it lacked some essential functions. But it doesn't. SUM, AVG MIN and MAX are available in this program. It's just that we got the machine so early (thanks, Mattel!) that it came without final documentation.

PC-DAT 2000
by Mollusc



PCN DATELINES

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

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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
Computer Fair	June 16-19	Earls Court, London	Roy Bratt, Reed Exhibitions, 01-643 8040
Computer Open Day Exhibition	June 16	Holiday Inn, London	Tony Kaminiski, Couchmead Communications, 01-778 1101
Fylde Computer Show	June 17-19	Winter Gardens, Blackpool	Northern Exhibitions, 0706 877687
Compec North '83	June 21-23	Belle Vue, Manchester	Roy Bratt, Reed Exhibitions, 01-643 8040
Leeds Software Fair	June 21	John Taylor Teacher's Centre, Leeds	Graham Creighton 0532 782181
BBC Micro User Show	June 24-26	Renold Building, UMIST Manchester	Database Publications, 061-456 8500
Dexpo Europe '83	June 29-July 1	West Centre Hotel, London	Expo Consul Inc, 01-948 3111
Malvern Microcomputer Fair	July 2	Winter Gardens, Malvern, Worcestershire	Personal Computer Fairs, Worcester 22659
Micro Trade '83	July 6-8	Barbican Centre, London	Timothy Collins, Montbuhl Ltd, 01-486 1951
IBM Users Conference & Exhibition	July 12-14	Wembley Conference Centre	Online Conferences Ltd, 09274 28211
Acorn User Exhibition	August 25-28	Cunard International Hotel, London	Computer Marketplace Ltd, 01-930 1612

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Mini Computer Show for Office, Home, Hobby	June 23-26	Exhibition Hall, Cologne	German Chamber of Industry and Commerce, 01-930 7251
International Micro Computer Exhibition	Aug 2-5	Kuala Lumpur, Malaysia	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8 Taman Megah, Petaling Jaya, Selangor
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085

A two-minute operation turns your BBC Micro into the heart of a word processor.

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View is supplied as a Rom chip that can easily be fitted to your BBC Micro by your local dealer, in a painless two-minute operation.

Then, once installed, you only have to switch on and View is operating immediately. (You can easily switch back to normal computing with a single command.)

Also included in the View package are two special books: 'Into View', that takes you by easy stages through all the word processing commands and explains the



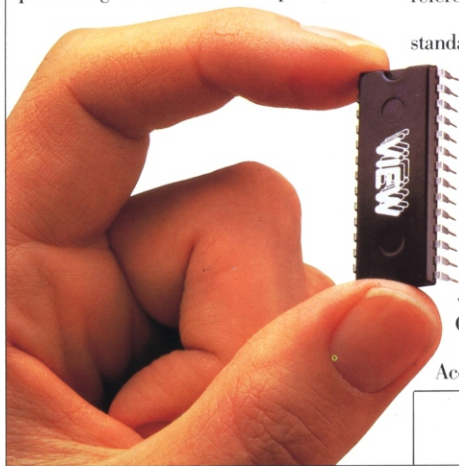
many ways in which View can help you, and the 'View Guide', which provides a quick reference to all View facilities.

You'll find that View is, by any standards, a thoroughly professional system, yet still surprisingly simple for the beginner to master.

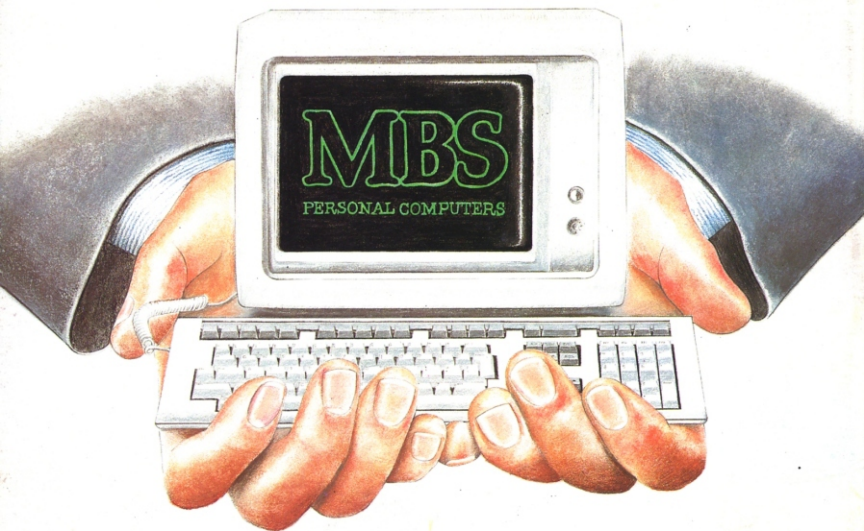
The 'Spark-Jet Printer' shown in the photograph is the ideal choice of printer for your word processing application. Extremely quiet, it offers high resolution graphics from monitor or TV screen and is available now from dealers.

If you'd like more information, write to Acornsoft, 4a Market Hill, Cambridge CB2 3NJ.

Or, for details of your local Acornsoft dealer, phone 01-200 0200.



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