PERSONAL
COMPUTER NEWS
50p Jan 7, 1984 No 43 BRITAIN'S BIGGEST WEEKLY

BBC TOUCHLINE
The typing tutor that gets fast with qwerty

SPECTRUM SUITE
Assembler, editor & monitor in one new package

TEST PLAY . . .
. . . new games for the Dragon, 64, Spectrum & Genie

ORIC EXTRA
We pick up the tabs . . .

!FREE INSIDE!
Your guide to the Electron

SHOULD WE WAIT FOR IBM'S JUNIOR?

January 7, 1984 — No 43

Pull-out and keep Micropaedia

First of a three-part in-depth look at Acorn's Electron. This week, inside the machine, electron history and a first look at the Electron's BBC Basic.

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Dragon rumpus

By David Guest

Dragon Data faces a revolt by its users over the terms of its 32 to 64 trade-in.

'Ridiculous' was how one Dragon 32 owner described it. 'I can't see many people being too keen,' said Paul Kennedy, the organiser of a Dragon owners' club. What they are both objecting to is the £85 valuation that Dragon has put on the 32, leaving users to find £140 to move up to the 64.

'At the moment you could probably expect to get £110 or £120 for a 32,' said one owner. 'Not only that, but when you're buying a new system you can normally get a discount somewhere.'

The trade-in deal was unveiled to users just before Christmas; Dragon's Richard Wadman said: 'We have already had some indication that it will be accepted, but we don't expect much feedback until January.'

The Dragon 64 — focus of users' discontent over trade-in terms.

The transition from the 32 to the £225 64 has been a thorny subject ever since the 64 appeared on the horizon. In the last few months of 1983 it became clear that Dragon planned a trade-in rather than an upgrade for people wanting to move to the bigger machine, but at the same time it maintained compatibility in the 64 with many of the 32's features.

Mr Kennedy commented: 'I think that in order to keep compatibility they may have sacrificed a lot of potential customers — it is a missed opportunity to enhance the graphics and sound of the 32.' This echoes a common view.

If Dragon 32 users do choose to ignore the trade-in they could effectively extend the life-expectancy of the machine, which otherwise might have begun to fade from the scene later this year.

Memotech disks due

By Wendie Pearson

Memotech's long-awaited disk drives for the MTX 500 should be released at the end of this month.

Originally planned for release in October, one month after the micro's launch, the drives have apparently been held up because of heavy demand for the MTX 500, priced at £275.

The disk drives come in two versions — a double floppy unit storing 500K per drive on 5¼in disks will be £870, giving a total 1Mb of storage, and enabling the machine to run CP/M.

The second version at £995 consists of a single floppy 500K 5¼in drive, and instead of a second drive you get a 256K silicon disk, which is formatted like a disk, and, according to Memotech, is faster than a Winchester.

The company also plans a Winchester drive with up to 32Mb of storage, due out in about six months. A price is not yet fixed.

Winners score a Spectrum

1984 starts well for 20 readers who have each won a 48K Spectrum in our eight-part Micropaedia competition. Congratulations to:

Brian Battye, of Feltham, Middlesex; G Coombs, of Market Deeping, Peterborough; Anna Smith, of London; Brian Shearer, of West Lothian, Scotland; Duncan Williams, of Abingdon, Oxon; R S Holmes, of Breightmet, Bolton; Anthony Breeds, of Eastbourne, East Sussex; Dorothy Leddy, of Linlithgow, West Lothian, Scotland; M D Goddard, of Dereham, Norfolk; A W A Ewence, of Bradford-on-Avon, Wiltshire; Michael Glickman, of Glasgow; Anthony Wood, of Haslingfield, Cambridge; David Hambly, of Hainault, Ilford, Essex; Nigel Mellor, of Oakes, Huddersfield, W Yorkshire; G A W Storer, of Warmley, Bristol; Hin Keung Ling, of Liverpool, Merseyside; Ian Garner, of Shepshed, Loughborough, Leicestershire; David Parkes, of Warley, W Midlands; John A Bell, of Quarndon, Derbyshire; David Ratcliffe, of Narborough, Leicestershire.

Commiseration to all unlucky entrants, but we'll be publishing many more competitions for you to try again. The correct answers to the Micropaedia competition were: 1, 6502; 2, Beginners' All-purpose Symbolic Instruction Code; 3, Numeric and string; 4, 4960; 5, Charles H Moore; 6, 1976; 7, Wumpus; 8, First In First Out.

Queen's gift to India — Acorn's second processors

By Ralph Bancroft

As 1984 starts there is still no sign of Acorn's promised second processors for the BBC micro. Unless, that is, you happen to be in India.

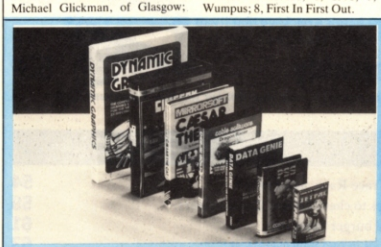
The Queen has made a special gift to the Indian government of six Econet systems. Intended for use in universities and other institutions, the systems have been treated as a showcase for Acorn's products and included with the BBC micros was a number of specially assembled 6502 second processors.

An Acorn spokesman confirmed the second processors were included in the package, and said the company is still not in a position to say when the processors will be generally available in the UK.

'All the production plans have been finalised including the detailed designs,' he said. 'However, the company has yet to announce which company will be doing the assembly of the products.'

One major hurdle to be overcome is the building up of an adequate supply of chips. 'These days you have to place your orders six months ahead,' he said. Several UK micro makers are facing the same difficulty.

Since this is the time for New Year's resolutions, how about it Acorn?



BACK-PACKING — Time was you could cop for a handful of games and put them all in the pockets of your mac. These days, a trip to your local software dealer involves a rucksack and two carrier bags. Where will it all end? Soon you'll have to go accompanied by a porter. Cassette packaging, as you can see, is something of a boom industry, an unexpected spin-off from the growth and profit made over the last few months in software production. Based on the tried-and-true American ideal of bigger is better, publishers are now literally trying to edge each other off the shelves. Presumably this expansion will bring more work to flagging Britain as other associated trades are roped in to help supply the voracious demands of promotion.

TI: prospects improve for '84

By Sandra Grandison

The new year could bring glad tidings for beleaguered TI 99/4A users after the shock late last year of their supplier's withdrawal from the home computer business.

At the moment Texas Instruments is in the throes of deciding whether it will hand over its property rights to let other companies in the UK continue production of hardware and software for the 99/4A — and eventually come out with a new generation of machines.

Clive Scally of the TI-994A UK user group said: 'Since TI has stated it's no longer going to produce home computers and software, user groups have put a lot of pressure on the company, so perhaps something will come out of it.

'To my knowledge, users in the US can buy third party add-ons and software from companies, but this facility is not available here. Hopefully, by January TI will have made a decision as to whether it shall let it happen in the UK.

'With regards to servicing machines, TI says that it will continue to support its range of home micros indefinitely,' Mr Scally said.

Fair play rules...

By Geof Wheelwright

Add-ons were the big movers at the Your Computer Christmas Fair — with keyboards, light pens, light rifles and joysticks heading the list.

The most popular items at the show were probably 'real' keyboards for the Sinclair Spectrum and ZX81. DK'tronics was doing a roaring trade selling its full-travel Spectrum keyboard — a popular number, with paste-on labels for the keys and a £46.25 price-tag.

Even cheaper — and looking somewhat sturdier — was Ricoll Electronics' metal-encased keyboard for the Spectrum. At £37.95, the keyboard includes an all-metal box (not something you'd want to drop on your toe) and a 'proper' full-length space bar. By Friday afternoon — the second day of the four-day show — Ricoll had sold all its keyboards and had to start ordering more. It hopes to have more keyboards in stock by early January, and it anticipates a £5 price-increase combined with a step-up in production to ease the shortage.

Light pens were also shifting well, with new releases for the Spectrum, Vic-20 and BBC micros. They were so popular, in fact, that one manufacturer didn't want to give any details on his light pen for fear more people would order them than he could supply.

The light-pen manufacturers that did want to talk about their wares had a good deal to offer. Add-on Electronics has a light-pen that will work with the Spectrum, BBC, Oric, Dragon and Commodore's 64 and Vic-20 machines.

Stack Computer Services offers its light-pen for the Atari range of micros and Commodore machines as well as the BBC micro. But Stack's best-seller at the show was the light-rifle. For £29.95, it will work with the Commodore machines and Sinclair's Spectrum.

The light rifle connects to the computers by a 12-foot cable and three arcade-style games to use the gun are included with the price. Stack is also encouraging software houses to write programs that will offer the option of using the gun. So far titles include Rats and Cats, Escape from Alcatraz, Big Game Safari and Crow Shoot.

The recent appearance of Sinclair's cartridge software and joystick Interface 1 for the Spectrum seemed to cause prices of joystick interfaces from other manufacturers to plummet. Kempston's interface, for example, sold for £14.99, and was on special for £9.95 for the duration of the show.

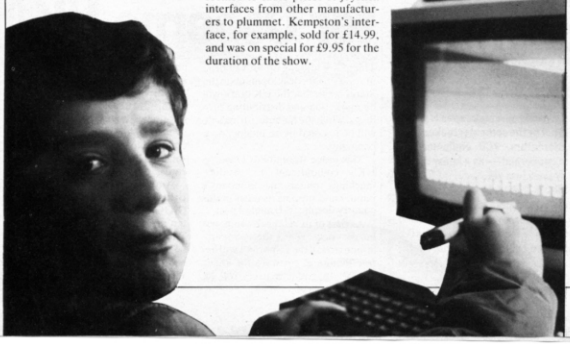
A 'new' old peripheral also found its way to the show. The Mattel Aquarius data recorder and thermal printer were finding their way on to other machines under the brand-name of Manta. The 40-column thermal printer runs at 80 cps and will print upper and lower case letters as well as graphics. Selling for £99, the printer can be used with the Oric, Spectrum, Dragon, Aquarius and BBC micros.

The data recorder can be used with the same set of machines and sells for £30. Add-on Electronics, which is selling the equipment, is also offering free software with both the printer and data recorder: worth £30 with the recorder and £99 with the printer.

Disk drives and software were also on special offer, with a number of drives under £250. Among the more attractive deals was Opus Supplies' £180 disk drive for the BBC. The 5¼in single-sided 40-track drives have a formatted single density capacity of 200K and a double-density formatted capacity of 400K.

The company's dual drives were also relatively cheap — at £380 for the single-box dual disk drive unit. Software prices were also down, with old Atari, Vic-20 and Apple games finding ther way to the bargain barrel.

Third party 3K and 8K memory expansion cartridges for the Vic-20 also joined the bargain bin, at £5 and £10 respectively.



VIEW FROM JAPAN

Shake-down in the Tokyo corral

By Serge Powell

What's the opposite of a shake-out?

Whatever it is, there seems to be a minor one happening here at the moment. Perhaps it's a shake-in; in part it must have something to do with MSX Basic, but it also bears out the old adage that the personal computer business is still full of opportunity for any company or person with an idea. The idea can be new or good, but the best ones are both.

I must admit that I was sceptical when the press hand-out crossed my desk, especially when I came to the line 'A bold step . . . to establish a solid base in the personal computer market based on extensive expertise in consumer audio and video products' — this at a time when some companies with extensive expertise in the PC market are having a hard time making a go of it.

The first reaction is to sit back and sigh: 'Ah yes, another Japanese manufacturer entering the fray.' But this one could have more to recommend it than most. Perhaps JVC is on to a good thing. Learning from its gross marketing mistake when it sponsored the inept England touring team to Australia last year, it has stuck to what it's good at.

The product hinges on a little unit called a Superimposing Adaptor that connects to a not particularly spectacular computer — 16K or 32K of RAM, 32K of ROM, 32 by 24 display, 256 by 192 graphics, 16 colours, and MSX Basic-compatible.

With JVC's well established name for video cassette recorders and VHD laser disks it isn't so much a question of the company entering the personal computer market as adding a natural extension to its existing product line.

Consider, for example, the use a Japanese family might make of the new device (I forgot to mention that for now, the product is destined only for the domestic market so those on holiday abroad will have to wait a while). After video-recording the family's antics on their portable VCR with scenic highlights in the background, Poppa and Momma Tanaka and all the little Tanakas hurry home, connect the family computer to the video system, and lo and behold, they start superimposing titles and integrating graphics with their video tapes just like the professionals.

The possibilities opened up by interfacing with a video disk are even more intriguing when you take account of the vast amount of visual information a laser disk can store; and the direct access capabilities of the laser playback system coupled with the programming possibilities of the ROM packs that slot into the JVC computer; not to mention that the Superimposing Adaptor can be coupled to joysticks.

Imagine caves, adventures, maps and monsters and armies of galaxies all in immediate prospect.

There will be more — you'll be able not only to read about them on screen but see them as (at the very least) still pictures, and possibly motion pictures that will change perspective dramatically as you interact with the game.

On the serious side, the potential for educational programmers is even more impressive, especially in technical fields, all of which helps to answer the never ending question of what the future might possibly be holding in store for chip-heads.

But it still leaves me wondering what the opposite of a shake-out might be.

While the western world worries about a chip shortage Japan is going through a less serious dearth; this is led not by the computer makers but by audio, VCR and television manufacturers. VCR equipment in particular is seen — as far as sales are concerned — as a heavy drain, but JVC won't be cutting its own supply lines just yet.

Oddly enough the demand for VCRs is linked by some industry observers to the Olympic Games next year. If it persists, you probably won't be seeing the Superimposing Adaptor overseas for several months, but Japanese visitors to the Games face an unprecedented possibility; filming everything on their video cameras, they can return home and alter things with the micro so that Japanese competitors win everything.

Soft change

Look out this year for a new direction in micro software. It isn't quite games, and it isn't purely educational — recreational software is on the way.

This is the prediction of Clive Digby-Jones, head of Websters Software, the company that supplies major chains such as Boots, Tesco and Ketts. 'Games are important because kids learn to use the computer through them, and there are probably valid educational reasons why we should encourage this,' he said. 'But software suppliers have got to move beyond games.'

Mr Digby-Jones referred to a computer competition in the area around Websters' former Godalming offices; it was won by a 65-year-old, and 70 per cent of the entries came from women. The image of the alien-zapping juniors obviously needs to be updated, but gardening programs and chest freezer stock control aren't the answer.

Websters' background is in books, and Mr Digby-Jones sees the software industry developing along parallel lines — especially where books and programs are packaged together.

As a distributor, taking programs from software houses and presenting them to retailers, Websters is in a good position to direct trends through its buying power — this starts from purely commercial reasons but should ultimately benefit the user. 'We look for slots in the market: we try to identify early on where there is no software and we will talk to software producers about possible ventures they could join in to fill the gaps,' he said. Some early products of this type of co-operation could be software for the disabled and for children in care.

The benefit isn't confined to the range of software available — a distributor the size of Websters helps to increase the stability of the software supplier, and Mr Digby-Jones pointed out: 'We haven't yet had a case where we've had to take out a product because the supplier is no longer in the market.' By placing its orders with software houses four or eight weeks in advance it also promotes stability, which is good news for software buyers.

Matchmaker takes on an Octopus

Loxton Computers has launched a system to give more power to the estate agent's arm — or in this case, eight arms. Its Matchmaker package is built around the LSI Octopus.

Matchmaker is designed to automate one of an estate agent's most common jobs, matching clients' requirements with the properties on its books. It also takes on the task of arranging and addressing property details. Hardware and software together cost £5,000.

The system comes with a keyboard overlay giving such commands as Property Enquiry, Client Enquiry and others to make it easy to use.

The software design process was helped by a Tunbridge Wells estate agent, and Loxton's marketing manager Chris Roffey said that nobody would need a computer science degree to use the system.

The basic Octopus has a 400K floppy and a 5Mb hard disk that can be expanded to 40Mb. Up to 16 terminals can be supported. If you already own an Octopus, the software alone will cost £1,150.

Loxton is on 0634 243000.

Sunny outlook for Osborne UK

Things are looking up for Osborne users as further developments in the States mean that the UK outfit will be marketing and distributing products, while the manufacturing side will be handled by an independent company.

This move strengthens Osborne UK's commitment to produce machines under the company's banner and support its users in this country despite its troubled past.

As part of its relaunch campaign in the new year, the company intends to sell the Osborne 1 with its free bundle of software for under £1,000. In addition users will be able to upgrade their Osborne 1s and Executives with an 800K floppy disk drive, and if you're in for mass storage, a 10Mb hard disk version for the Executive will also be available. And the long awaited PC compatible Executive which will run IBM PC's software is still on the cards.

Any Osborne user who joins the British Osborne Owners, Group (BOOG) can take advantage of a ten per cent discount on products. The group also offers the possibility of influencing the manufacturer.

Contact Bruce Durie on 0494 445145 for further information.

Elstree hunts ProCalc bugs

By Ralph Bancroft

No sooner has Elstree Computer Centre produced a spreadsheet program for the Newbrain than it runs into complaints from users.

The program, ProCalc, costs around £40 and aims to provide the usual spreadsheet facilities for the recently rescued micro. However, a number of problems with the package have appeared that may limit its usefulness.

The first concerns the maximum size of spreadsheet the program can handle. The manual says up to 10 pages of 30 columns and 250 rows can be used, depending on the memory available. Unfortunately it gives no indication to the user of how to calculate in advance the maximum for an application.

As a result the program crashes without warning when the memory required exceeds what is available.

Alan Fish, Elstree's software manager admitted that this could make life difficult for users. 'It sometimes happens that you do not know a fault exists until a program goes out to users. In this case it is clearly important for us to write a check routine into the program and to warn users that they are running out of memory and giving them options on what they want to do next,' he said.

Another apparent problem is that the program crashes if a calculation uses for input the results of a previous calculation.

PERIPHERAL VISION — Who knows, there may be circumstances under which you'd want to have your peripherals more than 30 metres from your micro. If you do, be warned that the signal at these distances becomes weak and less reliable. Inmac has produced a £103 booster to overcome the problem for any RS232-compatible peripheral, and all you need to install it is a screwdriver. Inmac is on 04427 74296.

Keep your eye on the price

Are the prices published in advertisements sacred?

The question arose when Dr John Gribben of Lewes was charged £22.90 for an item that had been advertised the previous day at £19.95. On querying the price he was told that £22.90 was right, take it or leave it. 'I took it because I did not want to disappoint my son,' he told *PCN*.

We contacted Sonic Foto and Micro Centre, the shop concerned, and it immediately admitted that Dr Gribben had mistakenly been overcharged. A spokesman said that he would contact Dr Gribben to arrange a refund. But he did point out that prices do occasionally change after they have been advertised, and that this possibility is mentioned in the advertisement.

Basic truths

Happy Birthday Basic! Coinciding with the 20th anniversary of the birth of their now widely-used language, Professors Kemeny and Kurtz of Dartmouth College plan to rewrite the enfant terrible.

True Basic Inc, with financing from ex-Dartmouth students and three professional programmers, has been founded to perfect the language. The new version, which promises portability and greater structure, should be available by autumn 1984.

True Basic hopes that the revised version will be adopted as the new standard by personal micro manufacturers. It also hopes prices will be kept low to encourage its use in education — the original intention for Basic.

Basic, as implemented on most micros, leaves a lot to be desired. True Basic may provide some extensions and improvements, but it's doubtful that it will provide a challenge to Microsoft's well-established version.

SOFTWARE

PCN rounds up the software releases.

Games

Spectrum: Sinclair has brought out a new tranch of ROM cartridges for the Interface 2. At the reduced price of £9.95 are Pssst, Cookie, Hungry Horace and Horace and the Spiders. At the higher price of £14.95 are top sellers Jetpac and Tranz-am. Meanwhile on the cassette front Imagine has brought out a war strategy game called Stonkers. Written by the author of Molar Maul and Zoom, the game features elements of arcade action to present a mythical conflict somewhere in Northern Europe. Also from Imagine is Alchemist, a real time graphics adventure that has the hero with the power to turn himself into an eagle flying over the obstructions in the way of his quest to slay the dreaded worlock. Both games are priced at £5.50.

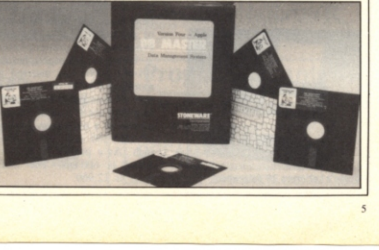
BBC: Papillon Software (01-518 1414) has secured the distribution rights to the highly rated shoot 'em up game Zalaga. Selling at £6.90, it is reckoned to be good enough to outsell Arcadians. Micro Power is keeping up its recent flood of software with five new arcade action games: Nemesis (£7.95), Bumble Bee (£7.95), Cosmic Combat (£6.95), Space Jailer (£6.95) and Positron (£6.95). Other new additions to its catalogue are Intergalactic Trader, a role playing game at £8.95, Draughts (six levels of play for £6.95), and Wizards Challenge, an adventure at £7.95.

Apple: Pete & Pam (0706 212321) is now able to offer Infocom's most recent adventure classic, Suspended. Available on disk for £33.95, the game casts you in the role of the controller of a network of computers and six robots with which you have to maintain the planets' equilibrium. You are awoken from your cryogenic sleep and the nightmare begins . . . Also from Pete & Pam is Quizagon, a game for which you will require a combination of strategy and luck if you are to answer the 6,000 questions correctly. It can handle several players at once and costs £26.95.

Business

Apple: Booksellers can get a custom designed package called Book Order Register and Inventory System from Applitek, (01-995 5446).

BBC: Gemini (0395 265165) has combined some of the more useful business software programs to form five combination packs, each containing a selection of programs and manuals. A BBC user can obtain two of these packs for under £240 containing such programs as payroll and word processing.



Ringing changes in micro sales

If you wake up one morning to find a freezing cold salesman flogging micros on your doorstep, don't be surprised.

Distribution of computer-related products is in trouble and new methods must be found, according to a report out from market research company Strategic Incorporated.

'Microcomputer Distribution — the Key Issues' looks at the changes in distribution that must come about due to the computer market's expected growth. This will mean even more (and perhaps better) ways of selling you a micro.

Strategic expects the number of personal computers shipped throughout the world in 1982 to double to 4·5 million in 1985, and distribution channels must be found to deal with this.

One expected method is the door-to-door approach with salesmen selling micros as they do with double glazing or encyclopaedias, while another channel likely to emerge is the PC supermarket selling a range of micros and related equipment under one roof from various manufacturers, rather like a computer fair.

A more obvious method and already a growing phenomenon is teleshopping, ie ordering products via the communications media from a giant central shopping and distribution mechanism.

Among more conventional methods is the possibility of regional or national broker sales forces, calling on individual users with complementary lines from different manufacturers.

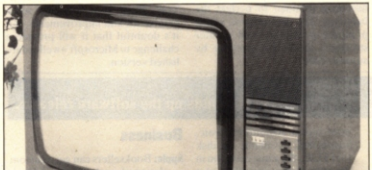
System houses and retailers alike will expand sales forces into horizontal and vertical markets, eg, educational, medical, banking. These areas would demand customised software with sales and support staff familiar with specific markets.

Distribution of low cost home computers is expected to spread to jewellery shops, supermarkets and chemists.

CASH MEMORY — Proving that cash registers with metal casings, cheery bells, and price tickets that pop up in a window belong to the age of white fivers, P&M Data Services (0895 52131) has designed a till with a built-in Epson HX-20. As well as the normal processing of the Epson, P&M's unit lets you adjust stock lists at the point of sale with room for 1,800 items. It calls the system the ED-20, and claims that a shopkeeper can use an unlimited number in a cluster. The one-off price is £950.

PERIPHERALS

PCN rounds up the latest add-ons.



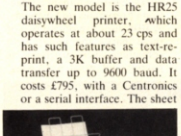
ITT's RL2301 — choice of RGBS or PAL.

Printers: The birth is announced of an addition to the Brother range — if it grows much further they'll have to find seven brides for them.

The new model is the HR25 daisywheel printer, which operates at about 23 cps and has such features as text-reprint, a 3K buffer and data transfer up to 9600 baud. It costs £795, with a Centronics or a serial interface. The sheet feeder is an extra £220 and tractor feed is £85. The distributor is Thame Systems (084421 5471).

Euroelectronics' (0242 582009) ZX Lprint Centronics interface for the Spectrum is now available in a version that will run with Interface 1 and Microdrives. If you already have ZX Lprint I or II a conversion can be carried out for £3.25.

IBM users interested in a spot of plotting can now use the Printronix MVP printer/plotter — Universal Microperipherals (01-683 0060) has inserted a modified PROM to make the unit PC-compatible. Its plotting rates are 8, 16 and 27in per minute at a maximum density of 100×100 dots per square inch. As a printer its highest speed is 600 cps. The base price is £2,960.



Qume's Letterpro 20 daisywheel.

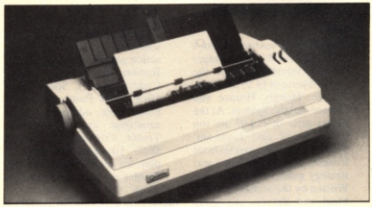
3.2Mb on a 5¼in floppy from Amlyn.

Qume, the originator of the daisywheel, has moved into the personal computer world with its Letterpro 20, a 20 cps daisywheel. Qume will supply the printer with Centronics, serial and Qume parallel. The unit costs £747.

Disk Storage: HAL Computers (0252 517175) is distributing high density Amlyn floppy disk drives that will give you 3.2Mb unformatted. The price to dealers is £342 per unit, which sounds as though the cost per Mb to you will be not far off £125. The drive has its own Intel 8051 processor to handle real-time control functions. Referred to as the 1860, it measures 3.25in by 5.75in by 8in — the floppies themselves are 5.25in disks and the interface is Shugart-compatible. Average access time is 88 milliseconds.

Monitors: ITT Television and Video's contribution to a colourful new year is a pair of 14in monitors. The RL2301/1 takes RGBS input and costs £280; the RL2310/M is for micros that only give PAL signals and it costs £310.

For more information contact 01-930 6711.



The HR25, latest addition to the Brother family of printers.

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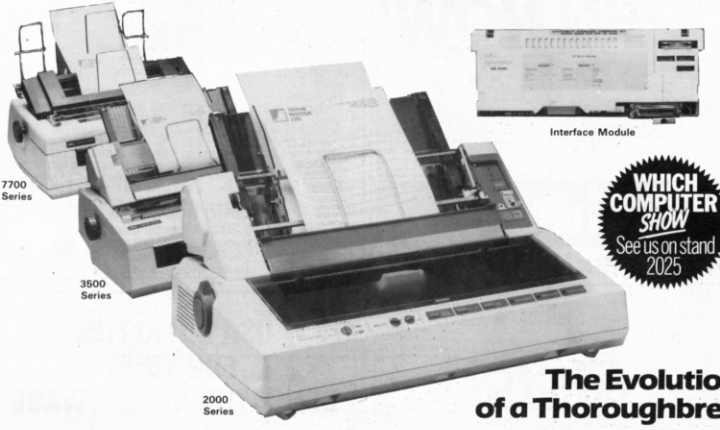

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PCN charts

Hardware Top Twenty up to £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
1	(1)	Spectrum	£99	(SI)
2	(2)	CBM 64	£220	(CO)
3	(3)	BBC B	£399	(AC)
4	(6)	Sinclair ZX/81	£45	(SI)
5	(4)	Vic 20	£140	(CO)
6	(5)	Oric 1	£99	(OR)
7	(7)	Dragon 32	£170	(DD)
8	(16)	Atari 600XL	£160	(AT)
9	(11)	Lynx 48/96	£225	(CA)
10	(10)	Sharp MZ700	£240	(SH)
11	(12)	Apple IIe	£750	(AP)
12	(9)	TI/994a	£90	(TI)
13	(8)	Atari 800	£300	(AT)
14	(13)	Colour Genie	£168	(LO)
15	(15)	Sharp MZ80A	£349	(SH)
16	(18)	Aquarius	£70	(MA)
17	(14)	Tandy Colour	£180	(TA)
18	(17)	Epson HX20	£472	(EP)
19	(–)	CGLM5	£150	(SO)
20	(19)	Newbrain A	£269	(GR)

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to December 20.

Neither mail order nor deposit-only orders are included in these listings. The prices quoted in the hardware charts are for the no-frills models and include VAT. Information for the stop-selling micros is culled from retailers and dealers throughout the country and like the games, is updated every alternate week.

PCN Charts are compiled exclusively for us by MRIB (Computers), London (01) 408 0250.

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
1	(2)	IBM PC	£2,390	(IBM)
2	(1)	ACT Sirius	£2,525	(ACT)
3	(6)	Apricot	£1,719	(ACT)
4	(4)	Commodore 8000 series	£1,200	(CBM)
5	(4)	Apple III	£2,780	(AP)
6	(7)	Kaypro	£1,949	(CKC)
7	(10)	Televideo TS-800 series	£1,495	(MD)
8	(5)	HP86A	£1,570	(HP)
9	(9)	DEC Rainbow	£2,714	(DEC)
10	(8)	Epson QX10	£1,995	(EP)

Games Top Thirty

	GAME TITLE	PUBLISHER	MACHINE COMPATIBLE									PRICE
			SP	AC	64	V20	81	DR	OR	AT	OTHERS	
► 1 (1)	Atic Atac	Ultimate	★									£5.50
▲ 2 (3)	Lunar Jet Man	Ultimate	★									£5.50
▼ 3 (2)	Valhalla	Legend	★									£14.95
▲ 4 (7)	Chequered Flag	Psion	★									£6.95
▲ 5 (10)	Pyramid	Fantasy	★									£5.50
▼ 6 (4)	Ant Attack	Quicksilva	★									£6.95
▼ 7 (5)	Splat!	Incentive	★									£5.50
► 8 (8)	Flight	Psion	★				★					£6.95
▼ 9 (6)	Metagalactic Llamas	Llamasoft				★						£6.00
▼ 10 (9)	Hobbit	Melbourne	★	★	★				★			£14.95
▲ 11 (15)	Hunter Killer	Protek	★									£7.05
▲ 12 (14)	Kong	Ocean	★									£5.90
▲ 13 (17)	Arcadia	Imagine	★		★	★						£5.50
▲ 14 (–)	Mr Wimpey	Ocean	★									£6.90
▲ 15 (23)	Falcon Patrol	Virgin			★							£7.00
▼ 16 (11)	Horace and the Spiders	Psion/Melbourne	★									£6.95
▲ 17 (–)	Snooker	Visions	★									£8.95
▲ 18 (–)	Moonbuggy	Anirog			★							£7.00
► 19 (19)	Hovver Bovver	Llamasoft			★							£7.50
▲ 20 (–)	Dimension Destructors	Artic	★									£5.95
▼ 21 (13)	Manic Miner	Bugbyte	★									£5.95
▼ 22 (20)	Mad Martha II	Mikrogen	★									£6.95
▲ 23 (–)	Cuddly Cuthbert	Interceptor			★	★						£8.00
▲ 24 (–)	Penetrator	Melbourne	★									£6.95
► 25 (25)	Zzoom	Imagine	★			★						£5.50
▲ 26 (–)	Rommel's Revenge	Crystal	★									£5.50
▲ 27 (–)	Siren City	Interceptor			★	★						£8.00
▼ 28 (22)	Gridrunner	Llamasoft	★		★	★		★		★		£5.00
▲ 29 (–)	Twin Kingdom Valley	Bugbyte	★									£5.95
▲ 30 (–)	Death Chase	Micromega	★									£6.95

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

Manic Miner's marathon

Regarding the letter in Issue 39 on unlimited lives for the Spectrum game Manic Miner, I can confirm that when more than 32 lives have been reached, screen distortion does happen, increasing with each extra life received.

I have not used the POKE for unlimited lives, but have played through the stages in a proper game. My score stands at 1,033,993 and I have 33 miners.

I have been taking photographs at various stages which I hope will prove my score.

A Sweeting,
Humbleton,
Hull.

Can someone defend software copyright?

William Dickinson's letter (Issue 20) has raised my ire. Now what's all this about 'software theft'? Has someone pinched someone's software which was meant for a special purpose?

Apparently not. No, it's this old bogie about paying over and over again for another person's work—something I have never quite understood because I, like so many others, perhaps the majority, only get paid once for what I do. Furthermore, I have no control over what the person who pays me does with the product. Not can I relate what proportion of his profit I get, however it might affect me.

So, what price this so-called copyright? It's an artificial barrier to enable some lucky people to go on, perhaps to infinity, reaping rewards for a job that, let's face it, can only be done once. Sorry, but I consider that dishonest.

Another interesting point is that very often your worth as a producer of original material is enhanced by these copiers. After all, to a large extent you're getting free publicity if you play your cards right. So, you have to work to reap the benefits of that publicity. OK, so do the copiers; but it's a lot harder for them because they don't know the product as well as the author does.

A last word on the subject. I think that, despite dire warnings, people will go on copying software, books, music etc. It costs someone money every time a case is brought concerning copyright. I doubt if there is any organisation which could afford to prosecute in all cases, and in any case who is to say what the limits are.

Consider for example that despite local bye-laws, statute law and others, including law on copyright, people still play radios in public places without licence. As long as radios are made with this capability, this will continue, law or no law. You try to eradicate it . . .

L Hipkin,
Stevenage,
Herts.

Problem is, while it may be impossible to eradicate, software piracy is a contributor to the cost of packages. So the consumer pays anyway. —Ed.

Final point for micro purchasing parents

I am studying O-level computer studies at school, and I have another viewpoint on computer studies in school to add to those already offered in Random Access.

I was annoyed at the editor's reply to Mr D Wright (Issue 41) on choosing a micro for children at school. Different manufacturers tend to produce very different versions of the programming language, Basic, making it inadvisable for parents to buy mciros that are incompatible with their children's computers.

My fellow pupils rush out to buy Spectrums, Dragons and Vic-20s, learn their respective Basics thoroughly, and write excellent programs. But on discovering that they will soon need to submit a completed computer program to contribute to their final exam result, they venture into the computer room and head towards the BBCs (all computer programs for exams must be written on the school computers, in our case the BBC.)

They then attempt to program this computer, of which they have very little knowledge, unsuccessfully. Their minds are filled with Sinclair Basic, and they find this unfamiliar programming language difficult.

I think parents should consider this before purchasing a micro for their children. *eg* if the school uses BBCs then the parents could consider purchasing an Electron if the BBC itself is byond their budget.

Or would it be better to wait until a child has finished its computer education before purchasing a micro?

R Pierrepont,
Horsley,
Derbyshire.

You make a good point but surely most people would agree that any computer is better than no computer at all. Also, generally speaking, young people learn computer skills quicker than the oldies, so waiting could be counter-productive. —Ed.

Another editorial policy required

Here is a poem written as a response to the 'Editor' type letters:

I'm talking editors again,
Some people really are insane,
To think that those whose fingers fly,
Across the keys don't curse and cry.
Their programs hold mistakes so grand,
Would take years to re-type by hand.

An editor would save the day,
But theirs does not have easy ways,
Complex commands like Is and Ds,
Useless ones like X and Es
They press RETURN and ENTER too,
Oh, and X is fine I'm told by you.

PCN £10 Star Letter

What I would like and hope to see,
A better editor that seems friendly,
A full screen one so you don't sob,
With cursor keys that do their job,
A standard one that would be fair,
Used by Acorn and Sinclair,
And TIs, ORICs, Apples too,
That is to name just but a few.

Microsoft you are in disgrace,
From four keys you use just backspace,
If it's good like you make it seem,
Then why do some prefer full screen?
Those that try both systems out,
Won't even have the smallest doubt,
About which is best they'll all agree,
That full screen is, believe you me.

So come along, we have to change,
Before the chance is out of range.

Julian Skidmore,
Trowell,
Nottinghamshire.

Share your thoughts in the UK's liveliest micro weekly letters columns. Funny, feisty or fanciful, your letter could win you £10 if it's of star status.

WRITE TO: Random Access, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

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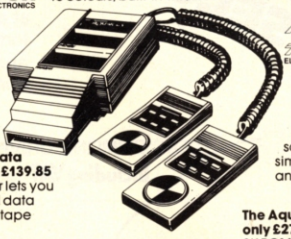
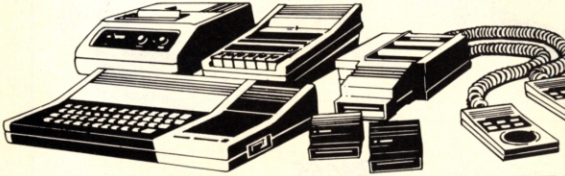


The Aquarius expanded computer – only £89.90
The Mini-expander adds two joy-sticks, two cartridge ports, two extra sound channels and allows simultaneous use of software and memory cartridges.

The Aquarius data computer – only £139.85
The Data Recorder lets you load programs and data from the computer to tape and back again.



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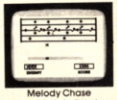

Melody Chase
Hit the notes, dodge the notes – its addictive

Snafu
Little lines that grow – and trap you

Burger Time
Make burgers, avoid hot dogs and pickles

TRON Deadly Discs
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Advanced Dungeon and Dragons
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On the run from robots in the maze.

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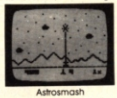
Rob the bank, dodge the cops.



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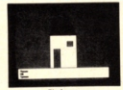

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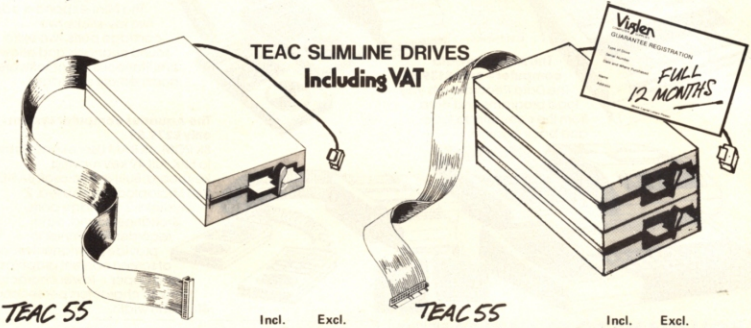

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A printer for the Electron?

Q I would like to connect my Electron to a Texas Instruments Omni 800, 810 RD Terminal Printer. The users manual that came with the micro does not say anything about connecting the micro to anything but a tape recorder. Also, what stops BBC B programs from running on the Electron?
Allan Hardy, Slough, Berks.

A Connecting a TI thermal printer – or any other printer – to your new Electron is theoretically impossible as the machine has no printer interface and Acorn doesn't have plans for bringing one out until at least the spring.

However, there are ways of getting round this problem. A Welsh company – Sir Computers, based in Cardiff – should have a printer interface for the Electron available by now selling for about £45. The interface lets you run a parallel printer and joysticks from the Electron.

However, this doesn't help you much with your TI printer as it uses an RS-232C serial interface rather than a standard Centronics parallel to get information from the computer. There are currently no plans (at least none that we've heard of) to produce an RS232C interface for the Electron in the near future, although Acorn has said in the past that they will eventually offer all the components you need to turn the Electron into a BBC Micro – and that should include an RS232C interface.

In short, unless you are an electronics expert and willing to figure out how to solder some sort of home-built RS232 onto your machine (which is a dodgey proposition anyway), the best you can do is sell your printer and invest in a parallel interface and any one of a number of cheap thermal or dot-matrix printers on the market.

The answer to your second query is perhaps a little more cheery. Although programs will not necessarily run the same way on the Electron as the Beeb.

The major differences are in the SOUND and ENVELOPE commands, and in the lack of a Teletext screen Mode 7 on the Electron. This means that any programs that start in Mode 7 will come out scrambled on the Electron. The differences in the SOUND and ENVELOPE commands mean that the Electron can only play one musical note at a time (so any BBC program that involves playing musical chords won't work properly on the Electron); also, the Electron has no volume control.

But, if your BBC programs don't use Mode 7, rely on volume control or chords in the music or sound effects, they should run on the Electron without any modifications. For more details on this and other Electron questions look in the PCN Electron Micropaedia starting this issue.

Buying a faulty micro from a shop

Q About 6 months ago I bought a Spectrum. After a week it started to overheat and some of the keys wouldn't generate correct characters. My father took it back to the shop but couldn't get a replacement as they'd sold out. This carried on for three weeks, so he asked for his money back. Because the shop would only give a cheque refund, not cash, he took an Oric as a replacement, Now the Oric has broken. We took it back to the shop and it has been sent away to be fixed. I'm really cheesed off with the whole business and want to know if there's any chance of getting my money back from the shop.
Nicky Morris, Dunstable.

A You seem to have had a run of bad luck. We don't understand why, if the shop has sent off your Oric for repairs, it didn't do the same in the first instance with your Spectrum. But, it would have been prudent to have taken the cheque offered: we don't think the shop has any obligation to refund cash. The faults in the machines are not entirely the shop's responsibility, and the management would appear to be acting in good faith so you'll just have to be patient waiting for the return of you Oric.

Atari vs BBC – an old chestnut

Q Considering all aspects of computers – graphics, colour, sound, memory etc – could you tell me which is the best computer out of the BBC Model B and the Atari 800?

Also, is there a modem built for the Atari, and if so how much is it?
Paul Edwards, Camberwell, London SE5.

A If we were playing cricket rather than talking about micros this would be a full toss. Not because it's easy to answer – 'which is the best?' questions never are – but because much of the answer has already been written in *PCN*.

Instead of referring you to the back issues department to have a look at Issue 16, where Andrew Tollyfield compared the BBC with the Atari 800, let's see what he had to say.

Unfortunately you don't say what your main use of the micro will be. Considering all aspects, a Cray 1 might be a better computer than a Beeb or an Atari.

The Atari, according to Andrew's review, has the edge in graphics, sound and colour. The BBC, he says, has a superior Basic and is also faster. In theory it has the greater potential for expansion. The Atari 800, with 48K RAM, has more memory for you to use.

More to the point, perhaps, the Atari 800 is now considerably cheaper than the BBC but there are reasons for this that might be relevant to your choice. Atari is concentrating more now on the recent XL systems; nobody would suggest that the 800 is going to be left high and dry but your prospects of continued software, in terms of quantity and diversity, look better with a BBC.

On the subject of modems, the answer is unequivocally yes. You can get an expansion interface with an RS232 port through which you can attach a modem – the cheapest would probably be the Prism 1000, at £69.95. If you are particularly interested in modems keep an eye open for Issue 46 with a PCN Micropaedia devoted to them.

Oric objects to colour collision

Q I have an Oric and am puzzled by two aspects. Firstly, what is the ESC key for? It doesn't stop a program and I can't seem to use it to send escape sequences to change colours etc.

Secondly, as far as I can work out, using serial attributes for the colours means that you can't have a character move too close to a wall if the colours of the character and the wall are different colours.
M J Bryant, Knutsford, Cheshire.

A The ESC key on the Oric is mostly for show. If you collect it in KEY$, then take its ASCII code, you'll find it has the value 27. You could use this in a program to provide a user with a means of 'escaping' to a previous menu, *eg*.

```
1000 A$=KEY$: IF A$='' THEN 1000
1010 IF A$=CHR$(27) THEN POP:RETURN
```

This assumes that you're in a subroutine called from within a previous subroutine and POP will RETURN control to the level of GOSUBs above the calling routine. This looks something like this:

```
MAIN MENU
(GOSUB)
SECOND MENU
(GOSUB)
THIRD MENU
(POP:RETURN)
```

This takes you back to the end of the main menu, rather than to the end of the second menu, which is where RETURN alone would lead.

As for your second query, you're quite right. To set the colour for a character locally you have to place an attribute to its left. This means that a character cannot get nearer than 1 byte to left and right walls of a different colour.

For the right-hand side it would overwrite the attribute of the wall, setting the wall colour to the same colour as the character.

If it were next to the left-hand wall it would overwrite the pattern of the wall itself with its own colour attribute, making a hole in the wall.

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Make your micro go Beep bleep

When the following program is run, it will enable the BBC to respond to a key being pressed, with a bleep.

```
10CODE%=&70
20P%=CODE%
30?&220=CODE% MOD 256
40?&221=CODE% DIV 256
50[
60    LDA #7
70    JSR &FFEE
80    RTS
90]
```

To switch the bleep on use *FX 14,2 and switch off with *FX13,2

If you have a more recent operating system than OS 1.2 then you will be able to vary the type of bleep you get using the following FX calls:

*FX 211,X	Where X is the channel number
*FX 212,X	Where X is an envelope number (0 to 127 in step so of four)
*FX 213,X	Where X is the pitch (0-255)
*FX 214,X	Where X is the duration (0-255)

Anwar Ali and Gary Woolridge, Handsworth, Birmingham.

Basically breaking in a Lynx

With modification, D P Akerman's hint *(Issue 38)* on determining whether the break key has been pressed, can be used to stop a Basic program while it is executing. The following four lines of Basic, when inserted at the top of your program, will allow you to do this. On executing your program once, lines 2 to 4 can be deleted (but not line 1).

```
1 CODE OB ED 56 FB 76 AF ED 4F
FB 76 ED 5F FE 08 20 03 C3 42 1E
08 C9
2 DPOKE &6297,&4DED
3 DPOKE &622B,&6954
4 POKE &622A,&C3
```

Clive Newton, Cwmbran, Gwent.

Setting your Spectrum FREE

As the Spectrum does not have a FREE command as other micros do, here is a short program to overcome it.

It gives the amount of spare memory in bytes available for your Basic program.

```
9999LETS=(PEEK23730+(256*
PEEK23731))-(PEEK23653+(2
56*PEEK23654)):
PRINT"SPARE" MEMORY =
";S;" BYTES"
```

Mr M Groll, Rugeley, Staffs.

Is this how to get a tip in Microwaves?

The following routine, used on the Spectrum (16/48K) is a neat liitle trick to print out text on the screen. It does not use the print statement to its usual effect.

```
10 BORDER 0: PAPER 0: INK 0:
CLS
20 PRINT "This is a routine
written to flatter Personal
Computer News so that my
program gets printed in Micro-
waves"
30 FOR X=22528 TO 22657:
POKE X,7: PAUSE 5: NEXT X
```

Note that the x value determines the amount of text to be displayed. POKE x,7 sets the memory address (x) for the screen text and 7 denotes the INK colour.

Also, try this:

```
10 BORDER 0
15 FOR N=0 TO 24
20 LET L=USR 3582: PAUSE 1
:NEXT N
30 PAPER 7
40 FOR X=0 TO 24
50 LET L=USR 3582:PAUSE 1:
BEEP .008,X: NEXT X
```

Darren Virgo, Wickham, Newcastle upon Tyne.

Unlocking Sinclair Forth's potential

After buying the Sinclair Forth cassette, I realised that there was no INKEY$ function other than KEY which returns the ASCII value of the key pressed to the stack.

The problem is that this waits for a key to be pressed, unlike INKEY$ which does not.

To remedy this I set about using Forth's ability to redefine words and re-wrote KEY as follows:

```
: KEY 23560 C@ ;
```

so that it no longer waits.

It uses the system variable LAST K and typing KEY. (ENTER) should make the computer respond with KEY . 13 OK, thirteen being the code for (ENTER). If KEY is used to detect a letter being pressed, the letter can be printed onto the screen using EMIT.

Michael Perris, Great Bookham, Surrey.

Why not give your BBC a break?

Here is a way of turning all the keys (except BREAK and ESCAPE) on a BBC micro, into a kind of piano.

It's not exactly Beethoven but it does produce an intriguing effect. Try:

```
?&FE40=0
```

Another good trick is

```
*FX 254,7
```

which tells the computer that all the expansion slots are empty.

After you have typed this in, push CTRL and BREAK and then read the top of the screen.

Nicholas Booth Edgerton, Huddersfield, W Yorks.

Does your BBC deserve decorating?

The following little routine might appeal to those BBC owners who like to see their name in lights.

```
*KEY 10|LIBBC computer ¦_¦
cyour name¦_¦@!EBASIC¦_¦
@¦G>¦J¦U¦_¦A¦G
```

Then each press of the BREAK key gives:

```
BBC COMPUTER
your name
BASIC
>_
```

This works by programming the VDU codes directly into the break key.

- ¦L¦J clears the text area and moves the cursor down one line.
- ¦_ moves the cursor to X, Y (VDU 31)
- ¦@¦C gives X=0, Y=3
- ¦@¦E gives X=0, Y=5
- ¦@¦G gives X=0, Y=7
- ¦J¦U moves the text cursor down one line and delete back to the '>' symbol.
- ¦_¦A¦G positions the cursor at X=1, Y=7 *ie* after the '>' symbol.

These additions do not affect the function of the BREAK key, they merely give a little personal adornment to the following display.

David Abbot, Horsham, Sussex.

Would the author of the Microwave on the left please send us his/her name and address.

Keeping fine time

Most Commodore 64 users will be well aware of the TI$ function which allows access to the inbuilt clock for use in programs. However you are limited to hours, minutes and seconds. It is often the case that a timing system is required that will operate in tenths of a second. Well, it is possible to go one better than that and program in 100ths of a second.

The secret lies in the TI function which reads the interval clock in 'jiffies', or 1/60th second. This value is set to zero on power up and continually increments itself, except when the tape input/output routine is called. Try PRINT TI and RETURN followed almost immediately by another PRINT TI and RETURN. You will have two numbers giving the jiffy count at the moment of pressing RETURN.

The use in programs, refer to the following subroutine:-

```
1000 PRINT "{CLS}"
1020 T1=TI:REM**SET T1 AT START OF LOOP
1030 GET A$:REM**INITIATE ACTION TO BE TIMED
1040 T2=TI:REM**SET T2 TO FINISHING OR UPDATED TIME
1050 T=INT((T2-T1)/60)*100+.5)/100:REM**CALCULATE TIME INTERVAL AND
     ROUND TO 2 DECIMAL PLACES
1060 PRINT"{HOME}"T+"{CU}{7CR}SECS"
1070 IF A$=""GOTO 1030:REM**RETURN FOR NEXT ACTION
```

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PCN5/1

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

'Graphic Art for the BBC Computer — Turtle Graphics And Art' by Boris Allan, published by Sunshine Books at £5.95 (paperback, 112 pages)

At first sight this seems quite interesting, but delving deeper I found little more than a rather elaborate game with pretensions to grandeur.

That this introduces similar ideas to those propounded by Seymour Pappert in his book 'Mindstorms' is a tribute of sorts, and certainly Mr Allan takes a more practical line than Mr Pappert did, or possibly could considering the development of microcomputing at the time of writing.

The book is quite short, and academically interesting. But it's lack of origination left me dissatisfied.

PL

'Using VisiCalc' by Carol Klitzner and Matthew Plociak Jr, published by John Wiley at £13.95 (paperback, 269 pages)

This is yet another third-party tutorial on using the world's most popular program, (and one which was unfortunately not available to me). One of its most unusual features is that the worksheets used as examples in this book, as in others of its' type, are published on disk.

This is highly desirable, because although the complete models are listed at the back of the book, they are in several cases very large with many repetitive sequences, so copying them out would be excessively error-prone, albeit possible.

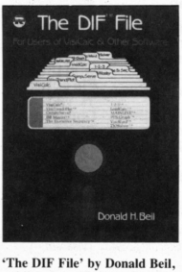
As models, they are quite good, if a bit unimaginative. On the one hand their very simplicity makes them relatively easy to understand, on the other they don't give much idea of the subtleties of VisiCalc.

The tutorial section of the book doesn't suffer the same fault as it's little more than a paraphrase of the VisiCalc documentation, which is itself particularly good.

Overall, I would suggest that the disk versions of the spreadsheets are rather more useful than the book, though at US$39.95, it could be rather extravagant. Of course, you could type in the listings, but since the authors list them complete, with no attempt to develop some convention for using the /REPLICATE function, this is tedious.

It's a pity that a little more thought wasn't applied to the development of the idea before the authors rushed into manuscript.

RK



'The DIF File' by Donald Beil, published by Prentice/Hall at £13.55 (paperback, 233 pages)

There are some books which really should be on the shelves of any systems or application-programmer, and this is one of them.

Though the Data Interchange Format isn't formally accepted as a standard by any major bodies, it has proved popular in the US, and at least over there, is considered to be a 'de facto' standard. However, it hasn't received the attention it should, at least not in Britain. It's obvious that the situation is different in the States, where a large number of programs either use DIF as an external utility or as a means of internal communication.

Part of the reason may be the (relative) lack of availability of the DIF Technical Specification in this country, which has meant that most information has to be gleaned at second or third-hand. Since the matter of interchanging data between different programs is a complex one, and involves many considerations not immediately apparent from examination of Basic listings, further obstacles have been put in its path.

This book, however, explains the whole subject lucidly with plenty of good examples, many of which have clearly been developed in real use. As a bonus the book gives some very useful hints and tips about how to use the DIF file-saving features of VisiCalc to overcome some of the limitations of the program.

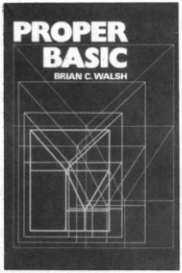
One case which often comes up, particularly in the early stages of developing a worksheet, is that a formula or value is incorrectly placed, resulting in circular or back-referencing calculations. Moving it is a problem, but by saving the worksheet in parts as DIF and VisiCalc-files, it can be dismantled and correctly reassembled.

Though DIF is often associated with numeric data, largely as a result of VisiCalc, it also has provision for string-data, which makes it ideal for use with data-base and card-index programs, and this is also well covered.

The most interesting section is on the Special Data Values and User-Definable Items, which allow considerable expansion to the DIF, and suggest some interesting experimental ideas.

A very good book, which makes an important but neglected idea much more approachable. I can heartily recommend this treatise on DIF to any professional or serious amateur programmers.

RK



'Proper Basic' by Brian Walsh, published by John Wiley at £12.50 (hardback, 397 pages)

The title attracted me, and I hoped for a good meaty book on making Basic work reliably, but I was disappointed.

The book doesn't teach Basic 'properly' (whatever that means), since the only aspects covered are the 'legitimate' uses of the language.

For example, it describes Sinclair ZX-81 Basic as well as the use of WHILE . . . WEND and such-like in GWBasic, however the author makes little attempt to show how you can synthesise such structures perfectly adequately in dialects which don't have them.

As a result, much of the code is clumsy and has many GOTOs and other constructs for which Basic has often, and justifiably, been criticised. It's the sort of book which unfortunate Computer Science students will be instructed to read, and in my opinion exemplifies the reasons why academic instruction in this subject is not the best way to learn.

The problem is that 'real' programming as opposed to the 'theoretical' variety is as much a question of bending and creative abuse of the rules as it is of strict adherence to them, and books such as *Proper Basic* refuse to recognise this.

All is not lost, however, since the book does have some redeeming uses as a reference book concerning the differences between the many dialects of the language. Like many academic works it is extremely thorough and covers the full spectrum ranging from ZX-81 Basic through Pet and Microsoft Basics to Vax and ICL 2900 Basic.

RK

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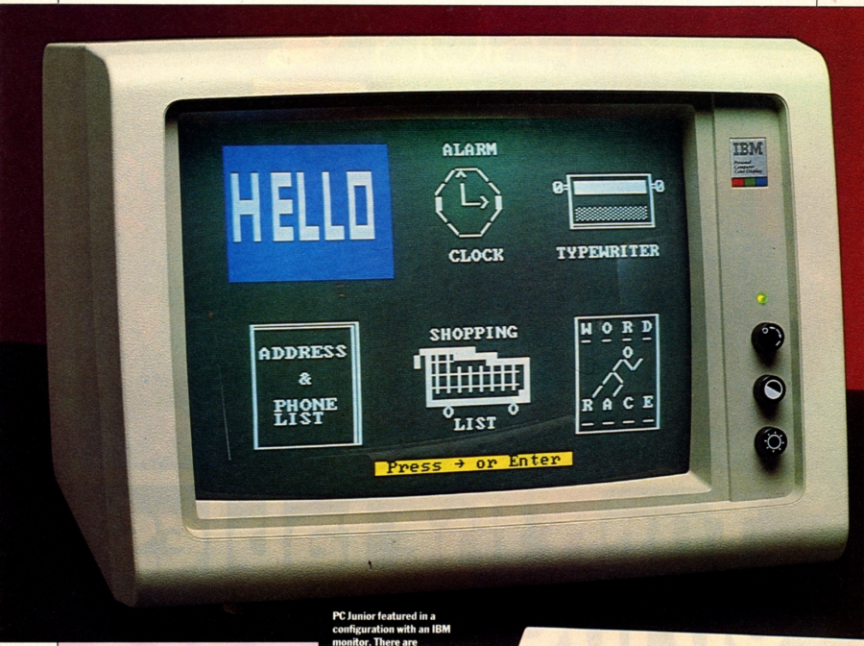


PC Junior featured in a configuration with an IBM monitor. There are questions surrounding the reliability of the cordless keyboard when working with a remote control TV.

At last IBM has released details of its PC Junior, the home computer version of the IBM PC, and allowed selected North American journalists a quick hands-on experience.

However the Junior, also dubbed the IBM Peanut, doesn't seem all it's cracked up to be. If it takes the home computer market by storm, it will be through its family connections, not because it possesses any outstanding qualities of its own. In the flesh, the Junior is rather dull, and horrendously over-priced.

The PC Junior looks rather like the IBM PC. The good news is that it does use the 16-bit 8088 Intel Processor and it does run the PC's operating system, PC-DOS although it is a revamped version called 2.1. The operating system comes 'bundled' with the machine. In the US it can also be bought as an extra for the IBM PC so that machine can run the Junior's applications programs.

Some of the bad news involves the Junior's keyboard which has been described as 'rather inadequate' by our North American correspondent. It is laid out a bit like the PC's except that it lacks the IBM's 10 special function keys. By way of recompense, IBM has colour-coded the remaining 62 keys so special functions can be performed through a 'shift' operation.

The keys themselves are rubber domed arrangements rather than full-moving. This seems anomolous as it rules out effective word-processing (always a feature noticed by journalists, perhaps). But IBM does expect this to be a popular application and has already announced its Home Word package for the machine.

The costs, presumably cut by downgrading the keyboard, have been reintroduced in the form of an infra-red remote control system (the same technology that magically changes the channels on a TV remote control unit).

The keyboard can be used up to 20 feet away 'in line of sight' without a connecting cable. The system uses batteries to achieve the effect and turns itself off when the keys aren't being pressed. The batteries are supposed to last up to three months.

There are a few question-marks

Ian Scales inspects the features of IBM's latest progeny and is not impressed.

Peanut power

surrounding the reliability of the remote keyboard when competing with home-appliances on the same frequency. The fact that IBM also offers a conventional cable arrangement (costing US$20) should tell us something, though it's always possible that users will want to manipulate the keyboard 'out of sight' of the receiver. Then again IBM expects that many of the Juniors will end up in classrooms where their IR signals would clash — cables here would be a necessity.

None of this explains why IBM bothered with an infra-red keyboard at all — we think it's an obvious gimmick but judge for yourselves.

There's more bad news surrounding upgradability. IBM naturally doesn't want the Junior to take sales away from the PC. This is a possibility if a clear upgrade path, (free of expensive obstructions) is opened up to the potential purchaser.

The Entry Model has 64K and runs cartridge software. It can display forty characters across a line and has variety of screen modes. 160×200 pixels are available in 16 colours, 320 by 200 in 4 colour mode and 640×200 in two colours.

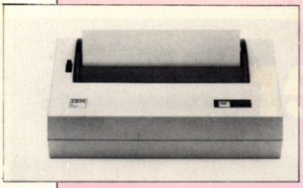
The Expanded model comes with one 360K disk drive and 128K. Users can upgrade from Entry to Expanded — a 64K RAM cartridge and 80 column display costs $140 and the disk drive costs $480. If you really want to you can apparently expand the Junior to 640K of RAM though the dollars might all tot up to send shudders down the spine.

Monitors, of course, are an additional expense. Users of the Entry Model will obviously use a TV set to display their 40 columns of text, but the Expanded model can utilise IBM's colour monitor.

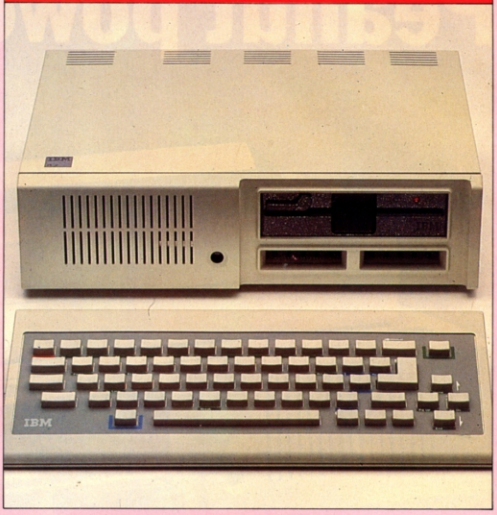
IBM has the software base off the ground already. There is a special Basic language, PCJr Basic, a Home Budget program, a Personal Communications Manager, the Home Word package, a range of games and a 'sampler' disk for the extended model which shows the users how to make the most of the system. An additional 'exploring' diskette shows them how the system works.

IBM has other options as well. In the US

20 ▶



The IBM thermal printer does seem to be priced reasonably at $175. It's capable of a respectable 50 cps. Likewise the $199 modem seems reasonable as it has auto-dial and auto-answer as standard features. The keyboard however is a disappointment being more calculator-like than full-moving.



◀ 19

there is to be a 300-baud hardwired modem with auto-dial and auto-answer, costing $199, plus a $175 50cps thermal printer with a $40 adaptor.

The PC Junior is not expected to appear in this country for some time yet. The IBM PC took over a year to cross the Atlantic and although IBM always plays its cards very close to its chest, the odds are that the Junior will also take a leisurely passage.

The important thing is that the machine has finally surfaced. If you are wondering whether it was worth the wait the answer could well be no, but the PC Junior is an important machine simply because it has the initials of the world's largest computer company stamped on it.

The rumours that IBM was about to launch a home computer made the other US home computer manufacturers quake in their boots. Since the release of IBM's PC, the business/personal microcomputer market in the US has been transformed and many experts expected the same process to occur with the Peanut.

The PC has become the 16-bit micro standard there, and a host of IBM compatibles from both the US and Japan have sprung up to collect IBM's crumbs — some of the crumbs have been rather substantial, espcially in the portable or luggable market. At the upper end of the micro market, if it's not IBM-compatible, it's at a very severe disadvantage.

By only releasing selected details of the Junior, IBM managed to ruin its competitors' Christmases. The stock exchange was already jittery about the future of the micro industry in the wake of Osborne's difficulties, Texas Instruments pulling out of the home micro market and losses reported by Atari, to name just a few reversals.

When IBM spent months being mysterious over a new release, investors wisely remained wary of investing in any of its competitors. According to some US spokesmen, Christmas buyers were also put off buying alternatives by IBM's decision not to start making the Jr available until early this year.

As far as users in the UK are concerned, the IBM PC Jr is bound to have some sort of impact. If things go the usual IBM way, the Junior and its compatibles will arrive on these shores eventually. The Jr will become a standard that can't be ignored by users simply because the software and expansion facilities will be huge. The pity is, the Peanut will be at least 40 per cent more expensive than it need be to prevent it from competing with the fully-blown PC.

Once Peanut owners reach the end of the Peanut's potential they will have to buy a new product to get any further — 'bait and switch' is the industry jargon for this marketing technique.

Such is IBM's status and power that it can actually afford to see the market in these terms. The possibility that users might opt for neither the PC nor the Jr doesn't seem to figure in the strategy. The annoying thing is that IBM is probably right.

Even if the Peanut is a lemon and does get a raspberry, the familiar scene seems set to unfold again. The overpriced Peanut will sell in huge quantities. Dozens of US software and 'third party' add-on manufacturers will produce supporting products. This trend will be encouraged as Peanut-compatibles arrive on the scene. IBM will sell even more Peanuts . . . and so it goes on.

If, by some miracle, this doesn't happen, IBM will hardly notice the difference — to IBM, home computers *are* Peanuts.

If the Junior fails to sell, IBM will simply lick its slight scratch . . . and come back with something better.

For example the company recently decided that a $100 million-plus research program into advanced, high-speed processors was a blind alley. It simply announced that it wasn't interested anymore, wrote off 15 years development effort and reassigned over 100 scientists — Peanuts indeed!

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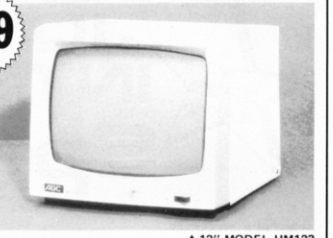

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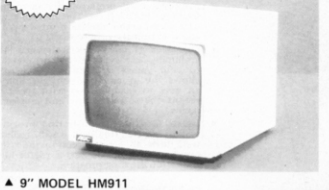

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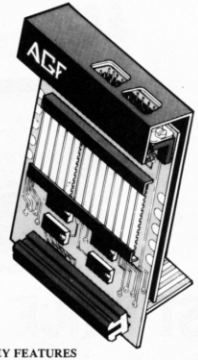

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Has language taken the path predicted for 1984? John Lettice says Orwell's that ends well.

Turning the tide

Welcome to 1984, the celebrated year of Newspeak.

And take a bow, all you owners of personal micros. You may not realise it but you are a bulwark against one form of Newspeak — computer jargon. This is the year by which English is supposed to have been distorted beyond recognition, but one of the most threatening distorting influences of recent decades, computerese, is making its last stand and looks like being overwhelmed.

The jargon that was once a form of gibberish spoken and understood only by a small elite is on its way out. English is making a comeback. You can all take some credit for this, but it's a back-handed compliment — it is the very popularity of micros that has undermined the jargon. We have taken what we need from its peculiar vocabulary and thrown the rest away.

There was a time, to be sure, when an understanding of core or binary digits would have qualified you for membership of a very exclusive club. This was when computer jargon was a creative art, finding names for new things. The BBC hardly had television in those days, let alone an overpriced micro; Sir Clive Sinclair had more hair.

As the years rolled by the jargon thrived and grew around computing like an impenetrable thicket. Acronyms sprang up everywhere, many of them with intimidating, science-fiction overtones — Cobol, for example, which may sound innocuous now but which can still send a shiver up the spines of those who knew it when it was all they had.

Some of the early machine names were acronyms as well — Leo, Eniac and so on — but in the Sixties names were dropped and numbers came into vogue, leaving people in no doubt that here was a subject best left to the experts.

The experts prospered. But where the Sleeping Beauty was content to lie around for years waiting for Mr Right to hack his way through the thicket, the computer industry found that the thicket was keeping it from Mr Right. Mr Right in this context was identifiable by his theoretical ability to afford a computer.

So it set about the thicket, made a few gaps, and fought its way out. The Seventies became the decade of the minicomputer, which carried computing to many more people than had been able to lay their trembling hands on it before.

The jargon wasn't laid waste during this period; if anything, a second protective layer was added. The original jargon had been baffling, but the second layer sounded as though it might be English. The expression 'man-machine interface' was rarely off people's lips, virtual memory became concrete fact, but above all, this was the decade of the solution.

It could almost have been the chemical industry, there were so many solutions flying around in the late seventies. Integrated solutions, single-vendor solutions, vertical solutions, nothing was insoluble. The computer industry looked at businesses everywhere, and eyewhere it saw problems — it would have been negligent not to offer solutions.

When it said 'problem' what it meant, of course, was 'job', and what a job needs is not a solution but simply a spot of elbow grease. But elbow grease is far too earthy a term to sell computers, so jobs became problems. This particular corruption of English still struggles on, especially in advertising, but bear in mind that when people talk about a solution looking for a problem what they mean is that it will take somebody with more money than sense to buy it.

Appropriately enough, it was a man by the name of Jobs who was largely responsible for exposing the pervasive lie of the 'problem'.

With microcomputers beginning to sell in thousands, then in hundreds of thousands, then in millions, it becomes obvious: surely not all of these people can have problems? Not all of them have jobs either, but that is by the by.

The Eighties is the decade of the micro. At first micros went only to hobbyists and universities, where people understood the jargon and wore their understanding like an old school tie. But the trouble with something that sells for, say, $500, as opposed to a $500,000 mainframe, is that you have to find hundreds of people willing to buy them to make the same profit. If incomprehensible jargon has left you facing a hostile and anxious market which worries that computers are bent on world domination, something has to be done about the jargon. Something was. The Californian garage proprietors were not about to let a misapprehension stop them from spreading the manifold benefits of computing to all humanity.

The jargon was not so much ditched as side-stepped. Computers acquired names again — fresh fruit proved especially popular — and the mysterious things they contained acquired one name — the chip. The difference between memory, processors, and logic gates became irrelevant. Software became 'user friendly', an impressive, though vaguely bogus, way of saying straightforward. The jargon grew in a new and fruitful direction; it became homely, which was no surprise since the micros themselves were heading in the same direction.

You can still see this process at work — take for example the latest development in the user friendly man-machine interface, the windows/mouse combination.

In the bad old days the mouse would have been given some more or less meaningless acronym — Cursor Orientation Device (Cod) perhaps. Even so, there would have been die-hards muttering darkly about the dangers of using a name that ordinary folk could understand. To a 1984 businessman it will be a matter of complete indifference whether he's pushing a mouse or a cod across his desk, but the mouse, furry and warm-blooded, scores over the cod in the homeliness stakes.

Windows are a different kettle of fish. For some reason software has never lent itself to acronyms as readily as hardware. Windows would have been called something like SSSS (Screen Segmentation Software System) in the days when men were men and mice scuttled about behind the wainscotting. SSSS would not have meant anything to anybody, but when used in conversation it could have indicated the scorn in which the speaker held the uninitiated. Nowadays, windows are perfect. All homes have them.

The phase we're entering now might be described as the Twilight of the Cods. The pace of computer development hasn't slackened but the old jargon is dying out faster than it can be replaced. Technology becomes obsolete so quickly that jargon sounds dated sometimes within a day or two of being invented. New technology, on the other hand, tends more and more to use recognisably English words.

Certainly the words it borrows are usually given a different meaning, but the point is that the flow has been reversed — technology now relies more on English to make itself understood, instead of concocting drivel to make itself unintelligible. Jargon that survives has found its way into dictionaries and gained respectability as part of the language. English is a broad church able to accommodate all sorts of heresies. God Save the Queen's English.

Put weight on your characters with Kevin Ball's routine for double-width letters.

Spectrum s-t-r-e-t-c-h

This routine shown in the disassembly listing enables the Spectrum to display double width characters. These characters make very effective titles, screen headings, and also input prompts; being larger the user's attention is drawn to them quicker.

The method of implementing the double width characters is as follows: the coordinates of a particular screen location are POKEd into two buffers, and then the machine code routine is called. This routine examines the bytes of the character in the character square and expands them horizontally to stretch out the character.

NB: Care must be taken when planning displays with double width characters as each expanded character takes up two character blocks horizontally next to each other. This means that when printing a string of characters, they must be printed in every other character position. The easiest way is to use a FOR..NEXT loop thus:

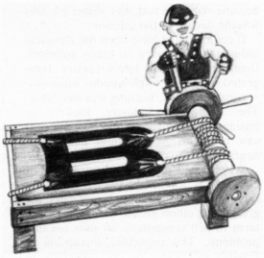
```
10 LET a$="STRING"
20 POKE 23729,5
30 FOR f=1 TO LEN a$
40 POKE 23728,f*2
50 PRINT AT 5,f*2;a$(f)
60 RANDOMIZE USR double width
70 NEXT f
```

It should also be noted that as there are 32 columns in the Spectrum's display only 16 double width characters can be fitted onto each row. The short program above illustrates the point made earlier: to display a double width character it is first necessary to print the character in the normal way and then to call the machine code routine. This means that you can expand anything that you care to put into a character block.

The alternative would be for the routine copy bytes from the character set in ROM to the display file in RAM. This method limits you however to ROM based characters which are the space (code 32) through to the copyright symbol (code 127).

The machine code routine preserves the attributes of the printed character and uses them for the new expanded character. The routine also includes range checking for the character position that is POKEd into the buffers. The routine has been written so that it is totally relocatable ie it doesn't matter where you put it in RAM, it will still work. For integration into a Basic program you may find it most convenient to POKE the codes into a REM statement at the start of your program. The locations of the buffers used to accept the print position remain unchanged wherever the routine is placed.

If you enter the mnemonics into an assembler then you will find it easier to modify the routine and adapt it to your own needs. It is possible to use this routine in the same demonstration program as shown last week for the double height characters. All you have to do is replace the old data lines with the new bytes for the double width characters. No other alterations are necessary.



Enlarged characters

It is possible to use the double width characters routine shown here with the double height characters routine shown last week to produce extra large characters which take up four character positions. Both routines have to be present in memory, and one has to be called twice for each character printed. To produce the enlarged characters, add this extra line to the program shown above:

65 RANDOMIZE USR double height: POKE 23728,f*2+1: RANDOMIZE USR double height and

(making sure *both* routines are present in memory) run it again.

```
        LD BC,          237 75 176 92
        LD A, C         121
        CP 31           254 31
        JR C, cont a    56 1
        RET             201
cont a:LD A, B          120
        CP 22           254 22
        JR C, cont b    56 1
        RET             201
cont b:CALL CL-ADDR     205 158 14
        LD B, 0         6 0
        ADD HL, BC      9
        PUSH HL         229
        LD C,8          14 8
bgloop:LD A,(HL)        126
        INC HL          35
        LD (HL), 0      54 0
        LD B, 4         6 4
loop a:RRCA             15
        JR C, one       56 6
        RRC (HL)        203 14
        RRC (HL)        203 14
        SET 7, (HL)     203 254
        SET 6, (HL)     203 246
next a:DJNZ loop a      16 237
        DEC HL          43
        LD (HL), 0      54 0
        LD B, 4         6 4
loop b:RRCA             15
        JR C, two       56 6
        RRC (HL)        203 14
        RRC (HL)        203 14
        SET 7, (HL)     203 254
        SET 6, (HL)     203 246
next b:DJNZ loop b      16 237
        INC H           36
        DEC C           13
        JR NZ, bgloop   32 203
        POP HL          225
        LD A, H         124
        RRCA            15
        RRCA            15
        RRCA            15
        AND 3           230 3
        OR 88           246 88
        LD H, A         103
        LD A, (HL)      126
        INC HL          35
        LD (HL), A      119
        RET             201
                        999
```

```
10 REM at least 92 characters (3 lines)
20 LET a=5+PEEK 23635+256*PEEK 23636: LET aa=a
30 READ z: IF z<>999 THEN POKE a,z:LET
   a=a+1: GO TO 30
40 DATA 237,75,176,92,121,254,31,56
50 DATA 1,201,120,254,22,56,1,201
60 DATA 205,158,14,6,0,9,229,14
70 DATA 8,126,35,54,0,6,4,15
80 DATA 56,6,203,14,203,14,24,8
90 DATA 203,14,203,14,203,254,203,246
100 DATA 16,237,43,54,0,6,4,15
110 DATA 56,6,203,14,203,14,24,8
120 DATA 203,14,203,14,203,254,203,246
130 DATA 16,237,36,13,32,203,225,124
140 DATA 15,15,15,230,3,246,88,103
150 DATA 126,35,119,201
160 DATA 999
170 INPUT "Character? ";a$
180 INPUT "Row: ";r
190 INPUT "Column: ";c
200 POKE 23729,r: POKE 23728,c
210 PRINT AT r,c;FLASH 1;a$(1)
120 RANDOMIZE USR aa
130 GO TO 70
```

To the left is the Basic loader and demonstration program. Above is the disassembled machine code listing.

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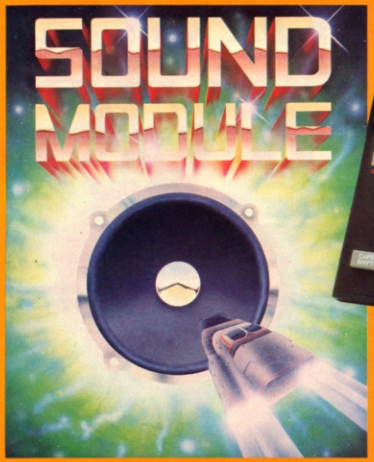

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Mind your Xs and Ys

The Oric's TAB problem is well known. TAB(N) is actually TAB(N-13) for available columns on one line, so that TAB(17) = TAB(4), and anyway it does not TAB but SPACE. That is, it does not jump the cursor but prints blanks on the way to the PRINT position, so that TAB(17) = SPC(4).

Finally, it forgets where the left hand margin start is, Oric's TAB is SPC(N)-13).

That's the situation on my June 1983 Oric. Try Listing 1 to check out how TAB works on your Oric.

A true TAB function following a PRINT command is a way of presenting a command PRINT AT x on a given line and is a very useful tool in storing and number presentation format. So the Oric does not have a true TAB, but it has facilities which let you provide alternatives.

In this article the x coordinates/printing column numbers are those of the Oric, shown below, unless specified differently.

(Column sequence) 1 2 3 4 5 6 . . . 40

Oric number N/A 0 1 2 3 4 . . . 38

(See manual p154). Thus SPC(4) would cause printing to commence in column 5, as would a true TAB(4), in the apparent seventh column along.

One TAB replacement function has been suggested by C Thompson (*PCN* issue 13, page 16) in the form of SPC(N-POS(∅)) to replace TAB(N). Here are four other methods, each with their particular features and advantages, so that with the five techniques one should be able to cope.

An important criterion for a replacement TAB is that the cursor should subsequently behave as after a PRINT command — so the PLOT command is not regarded as a true alternative, although of course it is extremely valuable in its own right. I also wish to stay in fundamental Basic operations for a replacement function, so I am not including the Oric PRINT AT function which may be constructed in code from the manual (page 128), although again this is an extremely valuable function, behaving as a PLOT + cursor retention command.

SPC (N-POS(∅))

Listing 2 provides a demonstration of the function and illustrates the importance of getting the numbers correct.

POS(∅) is a function that returns the current x position at the cursor and is thus related to PEEK (617) (see later for PEEK/POKE 616 and 617.) In the function POS(∅) the brackets are required (amend the manual P141), but the argument is a dummy, any true alphanumeric character will do, changing the number does not change the datum column ∅. So SPC (N — current cursor position) gives the function SPC(x) to print x spaces further to the right — providing the numbers are right.

Note that POS(∅) uses the left most numbered columns as datum, Oric's ∅ column. Thus, if the cursor rests at position 10 following a string of length 9, then POS(∅) will return 11. This is illustrated in the demonstration program.

Since the printing and POS(∅) are one

30 ▶

PROGRAM 1

```
0 REM SAVED AS'ORICTABDEMO'
1 REM  ILLUSTRATES ORIC'TAB'FUNCTION
2 REM  B JAQUES 1983
5 CLS
9 REM  FILL SCREEN WITH X,THEN'HOME'
10 GOSUB15ø
20 FORR=1TO2ø:R$=STR$(R)
25 PRINTTAB(R)"TAB("R$")"TAB(R+5)"OO"
30 IFSCRN(1,R)=32THENGOSUB2ø⁄ø
35 NEXT
40 PRINT:GOSUB25ø
45 PRINT:PRINT"'TAB(R)' IS PRINTED BY'?TAB(R)'"
50 PRINT"'OO' IS PRINTED BY'?TAB(R+5)'"
55 PLOT12,6,CHR$(1)+"PRESS A KEY TO CONTINUE"+CHR$(ø)
60 GETC$
65 GOSUB15ø:GOSUB25ø
70 H$="HELLO":H=LEN(H$)
75 T$="THERE":T=LEN(T$)
80 P$="FCN":P=LEN(P$)
85 PRINTSPC(1)H$SPC(H+2)T$SPC(T+2)P$+"  L85"
90 PRINTTAB(13+1)H$TAB(13+H+2)T$TAB(13+1+H+2+T)P$
95 PRINTSPC(1)H$SPC(H+2)T$:PRINTSPC(T+2)P$
100 PRINTTAB(13+1)H$TAB(13+H+2)T$:PRINTTAB(13+T+2)P$+"  L1ø⁄ø"
105 GOSUB25ø
120 END
150 FORR=1TO1ø⁄25:PRINT"X";:NEXT
155 PRINTCHR$(3ø):RETURN
200 IFC>1THEN N=1-R
210 PRINTTAB(13+12+R+N)CHR$(11)"TAB("R$") IS TAB("STR$(R+N)")"
220 F=1
230 RETURN
250 PLOTø,PEEK(616)-1,CHR$(1)
252 PRINT"12345678ø⁄12345678ø⁄12345678ø⁄12345678ø⁄1345678"
260 RETURN
```

PROGRAM 2

```
ø REM  SAVED AS TABREP1DEMO
1 REM  B JAQUES 1983
2 REM  SPC(N-POS(ø)) IDEA BY C THOMPSON
3 REM  FCN,JUNE 3'83 P16
5 CLS
10 A$="THIS IS A":A=LEN(A$)
15 B$=CHR$(129)+"DEMONSTRATION"
20 PRINT"POS(ø) FR(617) R(LOOP) A+R+'POS'"
25 FORR=5TO15STEP-1
30 GOSUB1ø⁄ø
33 PLOTø,PEEK(616)-1,4
35 PRINTA+1;P=POS(ø):FR=PEEK(617)
40 PRINTSPC(A+R-P)B$
45 PRINT,,FR,,R,,A+R-P
50 NEXT
55 GOSUB1ø⁄ø
60 END
100 PLOTø,PEEK(616)-1,1
110 PRINT"12345678ø⁄12345678ø⁄12345678ø⁄12345678ø⁄12345678"
120 RETURN
```

PROGRAM 3

```
1 REM  SAVED AS'TABREP2DEMO1'
2 REM  DEMO 1 FOR ERSATZ TAB FUNCTION
3 REM  B JAQUES 1983
4 REM  USE OF CHR$(11) TO'TAB'FROM ONE LINE BELOW
5 REM  'TAB'S *'S TO B$,TO A$
10 CLS:B$="IS QUITE NICE":B=LEN(B$)
20 FORR=11TO5
25 READA$:A=LEN(A$):PRINTA$
28 REM  'SPC' ALONG UNDERNEATH A$,THEN COME UP WITH B$
29 REM  FOR DEMO PURPOSE LINES 30 & 40 ARE'SEPARATED'
30 PRINTSPC(A+1)CHR$(11)+B$
39 REM  'SPC' LONG UNDERNEATH A$+B$ THEN UP CURSOR,PRINT COLOUR COD
E
40 PRINTSPC(A+B+1)CHR$(11)+CHR$(129)
48 REM  PRINT * TO A RIGHT MARGIN
49 REM  COULD USE A SLICED STRING INSTEAD OF LOOP
50 FORT=(A+B+2) TO 35
60 PRINTSPC(T-CHR$(11)+"*"
70 NEXTI
75 NEXTR
80 DATA JOHN,BETTY,ELIZABETH,IAN,BARTHOLOMEW
```

◀ 29

column 'out' the minimum spacing, zero, between two printings is SPC(N+1−POS(∅)) where N columns have already been used. Anything less than N+1, however derived, will result in a negative spacing which is not allowed — look for the error message.

In the demo program, B$ has a 'printed' invisible colour character as its first unit; remember this when studying the screen presentation.

CHR$(11), 'cursor up'

This is useful for normal printing in the descending manner providing that there is no important material in the line below that which is to be tabbed. A further valuable use is to insert a variably TABed PRINT between two or more fixed position 'prints' or borders.

One uses SPC(N) but on the line below that required. The cursor is then brought up with the non-printed code CHR$(11) to print on the particular line. If a subsequent line feed is allowed then the procedure can be repeated along the line up to the right hand limit. If the spacings permit one can introduce and cancel/change central codes and attributes along the way as in normal printing.

The technique is illustrated in the demonstration listings 3 and 4. Listing 3 is deliberately complex to demonstrate the method, it is well appreciated that the result could be achieved in a simpler way. The stock B$ is TABed after a DATA produced A$ of variable length, subsequently red stars are TABbed to a constant right hand margin.

Listing 4 shows the technique used in a way that has been useful, in a game situation, amongst others. Here, fixed vertical borders of varying colour blocks are printed first, then two strings are TABed, separately for demonstration purposes, between the borders.

CHR$ (30) in columnation TABing

Especially suitable for columnation of material is the use of CHR$(30), which is Oric's reasonably well hidden non-printing code for HOME. This returns the cursor to ∅,∅ with line feed (unless suppressed), effectively putting the cursor at 1,1.

To produce columns Oric is made to produce one whole column at a time, from top to bottom, with the first set on the *right-hand side* using an appropriate SPC(N). The cursor is then brought HOME, line feed adjusted and SPC computed to produce the next column to the left and clear of the first one — and so on.

If the rows of the columns need to be identified by sequence numbers (1,2,3 — n) then you will realise that a problem occurs at 10 and at 100 because of the increase in length of the number. One simple way round this problem, a form of TABing after a numbers is to use INT(LOG)n)). The integer part of log (base 10) of ∅ to <10 is ∅, 10-<100 is 1, and so on so that SPC(1-INT(LOG(n))) will give you 2 apparent spaces after units and 1 space after tens (allowing for the apparent space used by the invisible decimal point).

If you expect to go up into the hundreds then the standard form would be SPC(2-INT(LOG(n))) for consistent columnation. Thus the general function is SPC(S-1-INT(LOG(n)) function Listing 5 uses five runs of generated random numbers (<1), numbers.

As a demonstration of method 2 and the INT(LOG(n)) function listing 5 uses five runs of generated random numbers (<1), truncated to 4 decimal places, in columns of 20. The printing sequence of columns is from right to left to avoid deletion of previous material since normal SPCing is used. If you wish to title columns then strictly speaking column 1 or run 1 is on the right.

Since CHR$(30) is followed by line feed, preliminary alignment is achieved by a PRINT in line 10. When using titles further line feed alignment is required after HOME.

Note that HOME has to be avoided after the final column, otherwise further printing will be over the columns.

PROGRAM 4

```
1 REM  SAVED AS'TABREP2DEMO2'
2 REM  DEMO 2 FOR ERSATZ TAB FUNCTION 2
3 REM  B JAQUE~ 1983
4 REM  FIXED VERTICAL BORDERS & VARIABLE PRINTING BETWEEN
10 CLS:PAPER0:INK6
20 A$="HELLO":B$="THERE"
30 FORR=1TO20
39 REM  PRINT COLOURED BORDER UNITS
40 C=RND(1)*7+129
50 PRINTCHR$(C)+CHR$(126)SPC(32)CHR$(C)+CHR$(126)
59 REM  PRINT STRINGS IN 2,FOR DEMO,'TAB'STAGES
60 A=RND(1)*15+4
70 PRINTSPC(A)CHR$(11)+CHR$(129)+A$
80 PRINTSPC(A+LEN(A$)+1)CHR$(11)+CHR$(132)+B$
90 NEXT
```

PROGRAM 5

```
1 REM  SAVED AS 'TABREP3DEMO'
2 REM  B JAQUES 1983
3 REM  ERSATZ'TAB'SYSTEM FOR COLUMNATION
4 REM  USES CHR$(30)'HOME',COMPUTED SPACING AND INT(LOG(N)) SPACING
5 REM  NOTE SPACING FUNCTIONS SEPARATEDFROM'PRINT'LINES,USE';'
10 CLS:PRINT
19 REM  LOOP FOR COLUMNS,BACKWARDS
20 FORR=4TO0STEP-1
22 T=7*R+2
23 PRINTSPC(T)"RUN"5-R
24 REM  COLUMN DEPTH
25 FORN=1TO20
29 REM  4 PLACE RANDOM NUMBER FOR COLUMNATION
30 X=INT(RND(1)*10000)/10000
34 REM  FOR LEFTMOST COLUMN FIRST  PRINT SEQUENCE NUMBER THEN RELEV
ANT SPACE
35 IFR=0THENPRINTNSPC(1-INT(LOG(N)));:GOTO45
39 REM  OTHERWISE COMPUTE INTERCOLUMN SPACING
40 PRINTSPC(T);
44 REM  PRINT NUMBER,SEE200-210FOR TRAILING ZEROS
45 PRINTX
50 NEXT N
54 REM  WHEN FINISHED AVOID'HOME'
55 IFR=0THEN70
59 REM 'HOME'CURSOR,LOOP TO NEXT COLUMN
60 PRINTCHR$(30)
65 NEXT R
70 PRINT:PRINT:PRINT"NOW WHAT?"
100 REM  FOR TRAILING ZEROS INSERT AT  32 THE LINE AS IN 110-REM
110 REM  X$=STR$(X):IFLEN(X$)<6THENREPEAT:X$=X$+"0":UNTILLEN(X$)=6
120 REM  AND REPLACE 45 BY ?X$
```

CHR$(9), 'cursor right'

Methods 1 and 2 have been very useful, but since they rely on SPC fundamentally they do not possess the 'leaping over' quality of a true TAB function. When the screen is blank except for the material that is currently being printed this difference may not be noticeable or of importance. However, method 3 is a technique that 'drops' your material into the chosen slot without disturbing anything else — and it keeps control of the cursor. It is not a PLOT!

Create a string of non-printing cursor-right characters, CHR$(9), in the initialisation section of a proper program. When TAB is required, call up the string and take and print as much of it as you need to TAB by using the LEFT$ function, and add on the material you want to PRINT. If you expect to require 2 or more TABs in a line, extend the system by incorporating a subroutine which calculates the string slice required using POS(∅), since Oric knows where the cursor is on the line in question.

35 ▶

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PROGRAM 6

```
◀ 30
 0 REM  SAVED AS'TABREP4DEMO'
 1 REM  ERSATZ'TAB'FUNCTION 4
 2 REM  B JAQUES/M LEACH 1983
 3 REM  USES CHR$(9),CURSOR RIGHT,IN     STRING SLICES
 4 REM  DOES NOT CAUSE BLANK OVERPRINTING
 5 CLS:PAPER7:INK0
 9 REM FILL SCREEN WITH X,THEN'HOME'
 10 FORR=1TO1026:PRINT"X";:NEXT
 12 PRINTCHR$(30):PRINT:PRINT:PRINT
 14 REM SET UP STRING OF CHR$(9)'S
 15 FORR=1TO39:CR$=CR$+CHR$(9):NEXT
 19 REM  DEMONSTRATION STRINGS
 20 A$="CAN YOU":B$="FIND US?"
 22 GOSUB95
 24 REM  SPECIFY'TAB'AS'T',GO TO S/R
 25 T=12:GOSUB100
 30 PRINTA$;
 35 T=20:GOSUB100
 40 PRINTB$:PRINT
 44 REM FURTHER DEMO
 45 FORL=1TO5
 50 T=RND(1)*10+2:GOSUB100
 55 PRINTA$;
 60 T=T+RND(1)*5+1+LEN(A$):GOSUB100
 65 PRINTB$;INT(T)
 74 REM PRINT COMPUTED'T'AT'TB'POSITION
 75 T=T+1+LEN(B$):GOSUB100
 80 PRINT CHR$(132)TCHR$(128)
 85 NEXT
 86 GOSUB95:PRINT
 89 REM  DEMO OF EXISTING TAB FUNCTION
 90 PRINTTAB(25)A$+" "+B$
 92 END
 94 REM  COLUMN LABELLING STRING
 95 PLOT0,PEEK(616)-1,1
 96 PRINT"12345678901234567890123456789012345678"
 97 RETURN
 99 REM  TAB BY STRING SLICING CR$
 100 TB=T-POS(0)+2
 110 PRINTLEFT$(CR$,TB);
 120 RETURN
```

PROGRAM 7

```
0 REM  SAVED AS'TABREP5DEMO'
1 REM  ERSATZ'TAB'FUNCTION 5
2 REM  B JAQUES 1983
3 REM  USES PEEK,POKE 617 FOR X POSITON OF CURSOR
4 REM  DOES NOT CAUSE BLA^K OVERPRINTING
5 CLS
9 REM FILL SCREEN WITH X,THEN'HOME'
10 FORR=1TO1026:PRINT"X";:NEXT
12 PRINTCHR$(30):PRINT:PRINT:PRINT
19 REM  DEMONSTRATION STRINGS
20 A$="CAN YOU":B$="FIND US?"
22 GOSUB150
24 REM  SPECIFY'TAB'AS'T',GO TO S/R
25 T=12:GOSUB100
30 PRINTA$;
35 T=20:GOSUB100
40 PRINTB$:PRINT
44 REM FURTHER DEMO
45 FORL=1TO5
48 GOSUB150
50 T=RND(1)*10+2:GOSUB100
55 PRINTA$;
60 T=T+RND(1)*5+1+LEN(A$):GOSUB100
65 PRINTB$;
74 REM PRINT COMPUTED'T'^T'T'POSITION
75 T=T+1+LEN(B$):GOSUB100
79 REM  'T-2'BECAUSE OF'T+2"IN 100
80 PRINT T-2
82 NEXT
85 REM  DEMO OF IMPROPER(LOW) VALUE FOR'T',16 AFTER 14
86 PRINT"TAB 14/16";:T=14:GOSUB100:PRINTA$;
87 REM SEE L 79
88 T=16:GOSUB100:PRINT" "+B$+"2ND TAB"T-2
89 REM  DEMO OF EXISTING TAB FUNCTION
90 PRINTTAB(25)A$+" "+B$+" L 90"
96 END
98 REM  ALTERS CURSOR POSITION TO'TAB'WITH A POKE
99 REM  100 CHECKS FOR AN OVERPRINTING TAB VALUE,ALTERS TO MINIMUM
VALUE
100 T=T+2
102 IFT<PEEK(617)THENREPEAT:T=T+1:UNTILT=PEEK(617)
104 REM  TURN OFF CURSOR,115 TURNS IT ON
105 PRINTCHR$(17);
110 POKE617,T
115 PRINTCHR$(17);
120 RETURN
149 REM  COLUMN LABELLING STRING
150 PLOT0,PEEK(616)-1,1:PRINT"12345678901234567890123456789012345678
"
155 RETURN
```

Listing 6 demonstrates the full method. It is important to note that since CHR$(9) is a non-printing character it really is put at x = (-1) — the N/A column, on a line by a PRINT command, so the string slices also begin at x = (-1). Since observed printing begins at x = (-1) you will have to add 2 to the apparent TAB required (SPC(∅) puts the cursor at 1).

The central section of the demo-program computes a TAB value and prints that value. Note that here, as in several other instances where non-integers are unrealistic operators, the Oric subjects the number to an automatic INT(N) function. Particularly note where printing starts, using the printed column guide. As programmed the printing starts one column after the TAB value. This is readily altered if required. The last printed string in the demonstration shows/checks the overprinting effect of the existing TAB function (even when adjusted from -13).

POKE(617), the 'x' position address

This also drops the material to be printed into the allotted position without over-printing blanks on its way, and keeps control of the cursor.

Memory locations 617 and 616 hold the current x,y positions of the cursor in TEXT, LORES-∅ and -1 modes and the text window (from y = 1 to 3) in HIRES mode. Thus you can PEEK and POKE here. For the purpose of TABing, it is likely that the cursor is already at or can be line fed to the required y position so only x need be considered.

POKE 617 with required TAB spacing, again noting that the number should be 2 more than the equivalent SPCing. As before one can incorporate a subroutine to have succeeding TABs on one line.

To avoid overprinting one needs to check that the proposed TAB is not less than the present cursor position. The program contains a 'wrong' set of TABs in lines 87, 88, and hopefully line 100 will give a minimum clearance. Put REM in front of line 100 to temporarily remove it and RUN again. Note that there is a space 'positively' printed between the two strings.

On my Oric the first POKE produces a cursor block that can be avoided by switching off the cursor symbol with CHR$(17). If required it can be restored with a succeeding CHR$(17). Listing 7 illustrates these features.

It is apparent that method 5 is a semi-PRINT AT function (given y, PRINT AT x). If you require a full PRINT AT (x,y) command, then details for the machine code program necessary are in the Oric manual (page 128, chapter 13). It seems that you could knock up a version by extending the POKE in method 4 to the y position at location 616.

In a sense the valuable PLOT command is a PRINT AT (ignoring all the details of different character handling) command that subsequently loses the cursor to HOME. Well, one could always put the cursor back where required by POKE 617, 'x'; POKE 616, 'y'.

Richard Gold looks at a new graphics pad for the BBC Micro user.

Finer artists

Graphics pads have joined the tumbling price phenomenon. The latest of the new low-priced products is the British Micro Grafpad at under £150. It brings the price into a range where home users can enjoy screen art, and is available now for the BBC. Versions are promised for the Spectrum and Commodore 64.

The model reviewed included pre-release copies of the software and manual. Designed for educational use as well as for computer aided design, and in many ways similar to the Watford Beebplotter (Issue 26), the Grafpad provides an escape for the BBC user from the long-winded MOVE, PLOT and DRAW commands.

The graphics pad, and its accompanying software cassette, allow you to draw your own designs or trace the outlines of maps and pictures. These can be saved to disk or tape, and copied through a printer.

First impressions

Once you have waded through the excessive protective polystyrene which, as well as surviving the British postal system would presumably keep both device and user afloat in the roughest of seas, you come across a piece of hardware that looks not only well made, but also rather attractive.

The Grafpad consists of a tablet and detachable pen. The tablet has a grid for drawing which has a size of 320 by 256 pixels and a green menu area, the use of which is not specified; both are protected by perspex. The pen has a microswitch nib, looks like a dentist's drill, and is tough and reasonably durable.

Documentation

The user manual is little more than an introductory booklet. It looks cheap (or, if you prefer, functional) and does not even give the full range of commands available in the introductory software. A definite plus is the program listings at the back of the manual, which let you write programs that use the Grafpad.

However, the manual seems little more than a single clue in a puzzle, the object of which is to discover how the Grafpad works, rather than a complete operational guide.

In use

Perhaps the most important point to be made is that you need a disk drive in order to operate the functions with any speed. This is because when saving a screen, the whole of the screen memory, a massive 20K in MODE 1 high resolution graphics, is stored. This, of course, is very tedious using cassette, though not when using disk.

However, the Grafpad is easy to install: all you need is a BBC with 32K and a user port. The software package, which is included in the price of £148.75 (inc post, packing and VAT), effectively turns the Grafpad into nothing more than a sophisticated sketch pad — an expensive toy.

Nevertheless the range of functions is impressive. The program operates in Mode 1 only, but though only four colours can appear on the screen at a time, the full BBC palette of 16 colours is available. Furthermore, they can be swapped to try different colour schemes.

It is disappointing that the keyboard must be used in selecting commands, especially since the menu area on the tablet is not used. However, using the keyboard, and the pen on the grid, you can draw rectangles, triangles and lines quickly and easily, with rubber-banding.

Circles are drawn by fixing the centre and tracing a radius — the computer does the rest, though the circles are not as round as they could be. The freehand drawing function is good for tracing pictures, though a little jittery and therefore slightly inaccurate. You can add text to your design with the WRIGHT function which works better than it is spelt.

There is also a clever erase function which draws the background colour over the part you want to delete. This gives much more control than most other programs.

A serious fault in the Grafpad is the lack of error trapping, particularly as the key to choose a brush colour is next to that used to clear the screen. This means a slip of the hand can destroy your masterpiece.

The FILL command lets you colour in parts of the picture. Sometimes during testing the colour leaked out of what should have been an enclosed area and filled much of the screen.

British Micro sells, for an extra £20.70, a CAD program to use with the Grafpad. The ability of this program to create multicoloured and high resolution characters hides the fact that this is not really a computer aided design package at all. You can create only very small characters, and the only other creative functions are line drawing routines. Furthermore, on the review copy the SAVE and LOAD functions did not work.

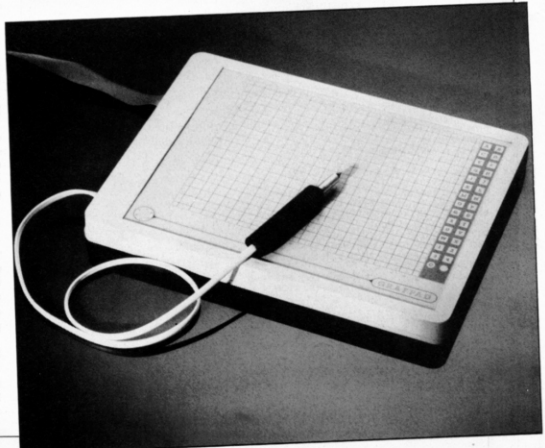
Perhaps the faults of the software should not be overstressed. Indeed, given these faults, the Grafpad itself performed extremely well. Certainly, there are inexplicable features to it. The grid itself is odd as it has no relation to the grid provided in the CAD program. Also there seems no good explanation why the pen is detachable.

Despite the perspex cover the designs can be reasonably, though not completely, accurate. And if you lack space, the Grafpad is big enough, and solid enough, to sit quite comfortably on your lap.

Verdict

The Grafpad is well made but rather expensive. It is certainly not up to the standard required by a design studio, and probably too expensive for the home market. If a school were to consider a product like this, it would probably get better value for money with one of the keyboard-based programs.

Product Grafpad **Manufacturer** British Micro, Watford, 0923-48222 **Price** Grafpad: £143.75 inc VAT; CAD software: £20.70 inc VAT **System** BBC Micro (Commodore 64 and Spectrum versions promised)



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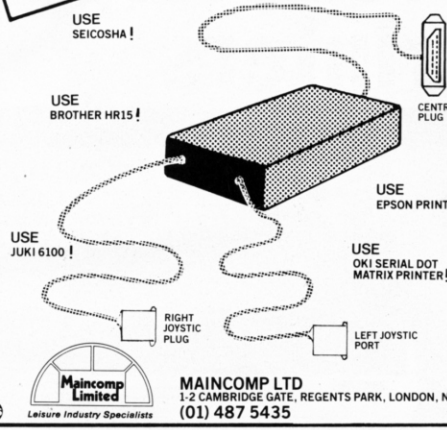

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This printer has features hitherto only available for well over its £240, says Roger Howorth.

Less pricey printers

The Walters WM80 is the cheapest printer in its class, at £240. Introduced as a direct competitor for printers like the Epson RX80 and the CTI CP80, the WM80 shows how quickly the price of printers is falling.

First impressions

The Walters WM80 comes in a plain cardboard box just too large to tuck under your arm. However, the printer itself is compact, measuring 377mm × 295mm by 125mm overall, and is pleasingly designed. It comes with lots of polystyrene packing, a paper feeding rack and even a black carbon ribbon cartridge but, alas, no plug.

There are the usual three lights, signalling Power, Ready and Paper Out, and three push buttons to control On Line, Form Feed and Line Feed. A paper feed roller, Centronics port and an on/off button complete the surface features.

Under the dark tinted perspex cover, the carbon ribbon, print head, and tractor feeds can be seen.

Setting up

It is simple enough to load paper, and this can be single sheet, including up to triple carbons, or tractor feed. The tractor feed is adjustable to give any width between four and ten inches.

The carbon ribbon is easy to fit, and stays firmly in place. Once the plug is fitted, and the cable plugged into the Centronics port the printer is ready for use. This assumes that your computer or interface provides the necessary software. You should check whether operating software is available before buying.

For this review, a ZX Spectrum and the ZX Lprint interface were used successfully, and after only an hour, screen dumps were produced.

Documentation

Although the printer is sold by Walters, which sounds English, the documentation seems to be the result of a bad translation, *eg*: 'Carefully lift front of printer unit and make it stands as the bottom of case be vartically face to you and hold the unit by the one of your hand on the soft surface'.

If you're familiar with hardware, you could make some sense of the 48-page booklet, but newcomers will probably be bemused and spend an inordinate amount of time altering the print format. Parts of the manual are well done, but certain chapters turn English inside out and programming examples use only a Basic interpreter and include no conversion hints.

Features

The WM80 boasts many features that have only been available up to now on much more expensive printers. There are 228 ASCII characters in the character set, and these have true descenders. The printer runs at 80cps, and facilities include both double-width and compressed print, and a combination of the two. Superscripts and subscripts are printable, and seven international character sets can be selected using internal dip switches. Graphics dumps can also be obtained.

In use

The print quality is good, and the characters themselves are well formed, with the possible exception of the 'g' which is printed too high on the line for my liking. The graphics dumps are particularly good for a printer in this price range.

The speed advertised is slightly ambiguous, since it can print at 80cps, but it takes another second to feed a blank line through, bringing the average speed down to 40cps. This might, however, be of only minor concern in a printer of this price.

Opening the printer to change the dip switch settings is a simple task, as long as you follow the pictorial guide in the manual. In this section, the manual's words are particularly difficult to understand, but the pictures tell the story. The dip switches are easy to change, and can be moved with fingernail or screwdriver. The optional settings for these are clearly laid out in an appendix to the manual.

The printer appears to be quite sturdy, and has the feel of one much more expensive. It is relatively quiet, and works at about the same volume as an Epson, *ie* quieter than a same-price Seikosha.

One problem is occasional paper jams. To remove the jammed paper it is necessary to remove the carbon ribbon cartridge, and unscrew the metal guard running across the top of the carriage. Fortunately, paper doesn't seem to jam often.

Walters offers the standard 90-day guarantee, and also promises to do warranty work at the factory. A spokesman said that this work is normally done within 48 hours of receipt of a faulty machine.

Verdict

At this price, the printer seems almost unbeatable, even though closer inspection reveals some disadvantages in particular the quality of the manual. This lets down the whole product, and after five days of effort neither subscript nor italic printing had been coaxed out of it.

I'm sure it's possible, but the whole operation should take only minutes.

Although you may not want to do all your correspondence on it, the Walters is well worth considering for most general purpose uses.

Product Walters WM80 **Manufacturer** Walters Microsystems International Ltd, High Wycombe, (0494) 32751 **Price** £240.35 inc VAT and delivery **Interfaces** Centronics, RS232 optional **Outlets** Mail order or dealers.

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PCN micropaedia

Vol 15 Part 1

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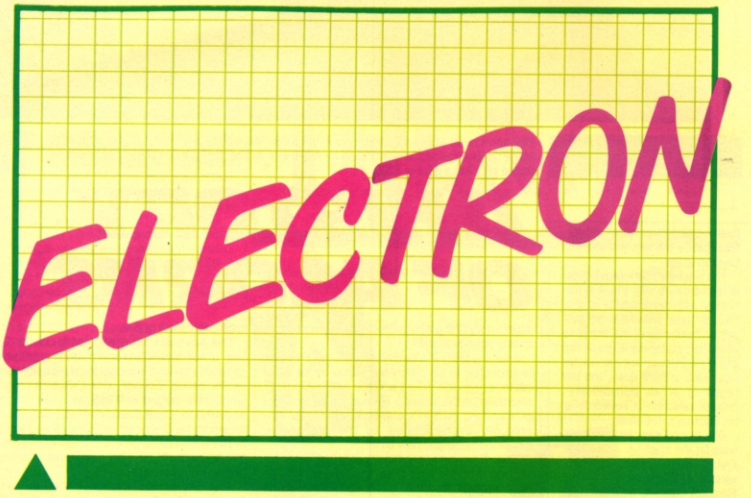
Looking at the



- // Acorn history
- ● Keyword corner
- Inside the machine

Although it bears a passing similarity to Acorn's BBC Micro and Atom machines (see pictures at right), the Electron breaks new ground for Acorn with its size, the inclusion of Basic keywords on shifted keys and a price of £200.

A HISTORY OF ACORNS

Over the next three weeks, *PCN*'s Micropaedia will take you into the Electron-ic age.

This week we'll take an overview of the hardware with a look at the history and development of the Electron (see elsewhere on this page), the inside of the machine with labels explaining where all the bits of the Electron are and exactly what each of them does, and the beginning of an alphabetically-ordered selection of keywords in the Electron's BBC Basic.

The second week features software for the machine, with a look first at Electron games (and conversion of BBC games to run on the Electron), then a discussion of business software and applications for the Electron — including spreadsheets and word-processing, and finally the second part of our look at a selection of Electron keywords.

The final week of the Electron Micropaedia will focus on peripherals (or add-ons) for the Electron. Although such peripherals are currently few and far betweeen, we'll look at what is and will be available — including printer interfaces, attachments for ROM software and plug-ins for joysticks.

The history of the Acorn Electron resembles that of any youngest child.

Like any baby in a family of three, the Electron is expected to do much the same as its older siblings, the BBC Micro and the Acorn Atom. Its shortfalls (*ie* the lack of a Teletext mode and a lot of standard built-in expansion interfaces) are probably overshadowed by the enthusiasm accompanying any new birth.

The Electron's creation could, in fact, be likened to be the birth of an African elephant, as they appear to both have about the same gestation period. Acorn announced the Electron in the wake of Sinclair's 1982 launch of the ZX Spectrum colour computer, but the machine didn't emerge until Summer 1983.

It was well worth the wait. It has the benefit of much of the technology incorporated in Acorn's now-famous BBC Micro, but at less cost: no history of the Electron would be complete without a look at its BBC Micro heritage.

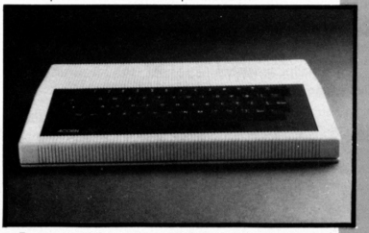
Acorn Computers was founded by Chris Curry and Herman Hauser in 1978 and didn't produce its first microcomputer until 1979 when they introduced the Acorn Atom. The Atom was a modest micro by modern standards with between 2 and 12K of RAM, a 6502-based processor and an idiosyncratic (but quick) implementation of Basic.

The Atom did, however, sell for under £200, use a full-travel keyboard and promise the capability to run a low-cost local area networking facility called 'Econet'. Chris Curry's career in computers began in 1966 as a development engineer for Clive Sinclair's Radionics concern, for whom he designed the Executive Calculator in 1971. The calculator was small enough to run off a normal hearing aid and marked a breakthrough in size.

This tiny number-cruncher fitted in with the Sinclair style of product miniaturization. Curry stayed with Radionics till 1976 when he and Sinclair set up Science of Cambridge to sell component kits for computers and wristwatch calculators. The computer kit, dubbed the MK 14-Microprocessor Kit, had 14 chips and used a ZX81-type membrane keyboard, but it required the user to program entirely in machine code.

The kit uncovered a large number of would-be programmers wanting to know more about the machine than Curry had time to explain. He hired Cambridge University Ph.D student Herman Hauser to help cope. The result of Hauser's research into the needs of home computer users and Curry's own desire to develop a home computer around Basic was the Cambridge

The Atom (below) was introduced in 1980 and for £174 offered between 2 and 12K of RAM, ROM-based software and a printer interface on the expanded version.



Processor Unit — which later became Acorn, and shortly afterwards the Atom was born.

Acorn is an enterprising company, and was soon hard at work on a new prototype computer — the Proton. This was around the time the British Broadcasting Corporation was searching fairly desperately for a benchtest micro for its then-upcoming 'Making the Most of the Micro' TV show.

Curry and Hauser were quite sure their new machine could fit the bill and began making moves to turn it into the BBC Micro. The Proton was to have been a twin-processor replacement for the Atom, but the opportunity of the BBC contract and a feeling that the Proton had perhaps more commercial posibilities than Acorn had originally thought, led to the design of The Tube — an interface that would allow the second processor to be built as a stand-alone add-on. By February 1981, the BBC was sold on the Proton and they signed an agreement with Acorn.

In March, the BBC began circulating pictures of a prototype BBC machine along with its other literature about the Computer Literacy Project.

In December, the long-awaited BBC Micro was finally launched and received high praise from even the sterner critics.

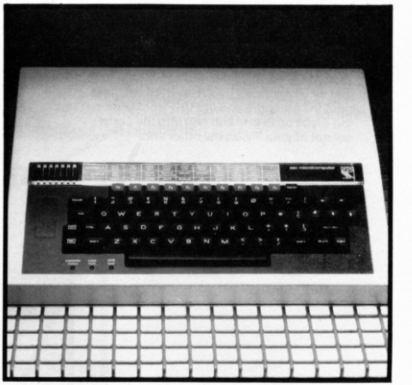
Some six months later, Clive Sinclair cracked the £200 barrier with his ZX Spectrum colour computer and Acorn, feeling truly challenged to bring in a new low-cost colour computer of their own, promptly announced the Electron was 'coming soon.'

'Soon' turned out to be about 18 months — which, by the standards of any other industry is a very quick product development time — but in the computer industry it is an aeon.

Once again, it was worth the wait. A small machine with 32K of RAM, good colour and sound and an ability to run most BBC Micro programs.

Others were soon echoing this sentiment as the Electron continued to receive rave after rave review — establishing it as one of the most popular under-£200 colour computers in the UK.

Max Phillips, reviewing the machine in *PCN* (Issue 25) said 'Acorn has an undoubted winner. The Electron isn't quite as simple as a half-priced BBC, but it does bring you amazing graphics and one of the fastest and most capable Basics in the business. It's easy to use and easy to learn.'



The BBC Micro (above) was introduced in early 1982 to a torrent of rave reviews. It has been widely taken up by schools and was the star of the BBC's Computer Programme.

Geof Wheelwright, writing in the same issue, said 'In short, the Electron has as much (if not more) in common with the phased out Atom as it does with the BBC . . . Some of the facilities now on offer for the Electron and BBC were first tried on the Electron . . . The prices of the two machines are similar, they use the same processors, have the same (type of) keyboards and offer much the same standard facilities.'

But like the Atom and BBC, the Electron will not realize its full potential until a good supply of software and peripherals is available. On the software side, the Electron is in pretty good shape as it can use much of the vast supply of BBC Micro software already on the market. (Its only great limitation is that it doesn't support the Mode 7 Teletext mode, but it shouldn't take much for software companies to modify Mode 7 — based programs for the Electron).

Peripherals are a slightly different story as Acorn has traditionally been slow to bring out add-ons for their own machines. The company has promised expansions for plug-in cartridge software, a printer interface, joystick interface, Teletext display adaptor and disk drives — but at the time of writing none of those add-ons were looming on the horizon.

The good news is that third-party peripheral development companies are racing to fill the 'Acorn gap' with their own Electron add-ons. The most popular extras seem to be printer and joystick interfaces and ROM boards that allow you to use BBC Micro ROM software.

The next two issues take an in-depth look at this machine with a discussion of applications for the Electron (and some of the software available) and a look at peripherals the next week.

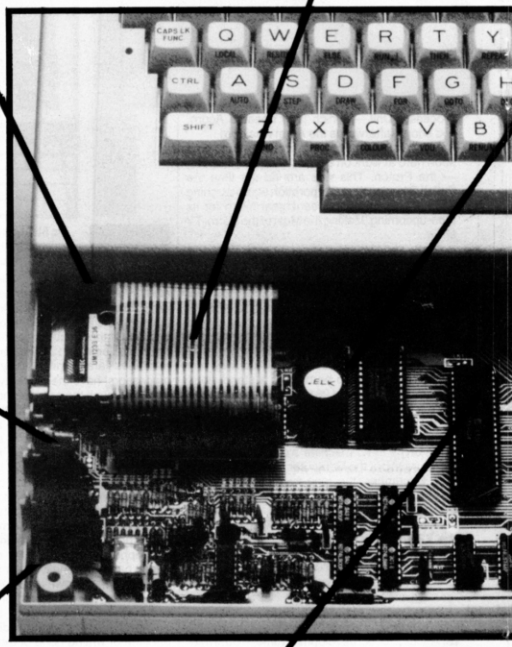
In the rest of this week's issue, you'll find a detailed look inside the Electron in the centre pages and an examination of the Electron's BBC Basic in the last three pages.

The photo above features Acorn's first release: co-managing director Chris Curry — who founded the company with Herman Hauser in the dark days when less than a million people had computers in their homes. The Electron isn't just a case of third-time lucky for Acorn — but third time lucky . . . Again.

Mr Curry is now making plans for Acorn's next machine — a business micro planned for later this year.

The UHF modulator — converts the Electron's video signal into something that can be understood by a television set. Just plug the machine into the UHF socket on the Electron at one end and into the aerial socket of your TV on the other end.

The speaker — The Electron speaker is positioned at the back of the machine, facing away from you. Unlike some computers — which have the speaker facing down and therefore muffling the sound — the Electron produces sound clearly and distinctly.



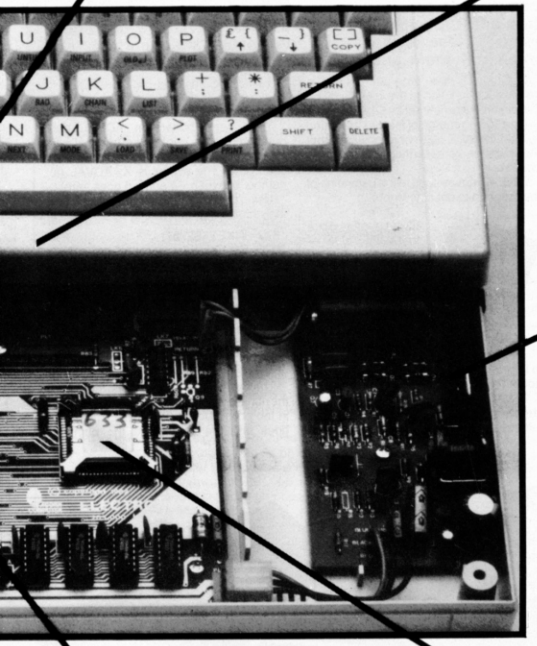
The Composite Video socket — allows you to plug the Electron directly into a professional video monitor. The signal output from this socket is in only black and white, but it can produce quite high resolution even in the 80-column mode when used with a good 'green screen' monitor.

The RGB video monitor socket gives you the opportunity of running the Electron with a professional high-resolution Red-Green-Blue monitor. Direct connection to an RGB monitor also eliminates the need to fiddle with tuning of colour and TV signals.

The 6502 processor — The heart of the Electron, this processor is the same as the one used on the BBC Micro, the Apple II computer and the Atari range of computers. The 6502, along with the Z-80, is the most popular of processors for home computers — so there should be no problem with people writing software for the machine.

The Machine Operating System and Basic chip — in early models of the Electron, the operating system and Basic language are on two different chips. In later models, however, Acorn has promised to put both functions on the same chip.

The edge connector — The Electron has bowed to current micro design conventions and included an 'edged connector' for expansion purposes at the back of the Electron. This edge connector will be the joining up-point for interfaces to run printers, disk drives, joysticks and other peripherals.



The power circuitry — To make it lighter than machines like the BBC — which use internal power supplies — the Electron uses an external power supply which transforms the mains 220 volts to 19 volts. The power is 'stepped down' again to 18 volts at the expansion port and +5, −5 and 0 volt lines to the Printed Circuit Board.

32K RAM — The Electron has the same memory size as its larger and more expensive sibling, the BBC Micro — but it uses far fewer chips to accomplish that task. Only four 64K bit RAM chips comprise the 32K.

The Uncommitted Logis Array — Probably the biggest custom chip you're likely to see in a home micro this year. This 64-pin chip does a lot of the legwork done by a combination of several chips on the BBC Micro. In addition to all the regular duties of the ULA, the Electron's custom chip has to handle all the different Modes in the Electron's display.

A DICTIONARY OF BBC BASIC

The Electron's BBC Basic programming language is largely made up of 'keywords' or instructions that ask the computer to carry out various tasks. Just looking at the first few keywords in the Electron's BBC Basic will give you an idea of what the machine is capable of. Below are some of those keywords and some explanantions which show you how to get the most from them, and build on what you might already know.

ABS — Absolute value — This function ensures that a positive numeric value is always returned for a numeric variable. In simple English, that means that if you're using an equation which might at some point return an unwanted negative value, you can always ensure the value is positive.

In the example below, the ABS function is used to turn the Electron into a small musical instrument.

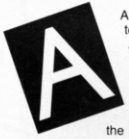
```
 5 Q=INKEY (32767)
20 X=Q-100
30 SOUND 1,-15,ABS (X),5
40 GOTO 5
```

In Line 5, the program sets a value that tells you how long the computer should wait for you to press a key before making sure it moves on to the next line.

In Line 20, the program defines a variable X in relation to the key you hit on the Electron (as defined by Q).

Line 30 is in charge of making the sound — with the ABS statement ensuring that the number representing the pitch is positive.

LINE 40 moves back to the beginning of the program to get a new note.



ADVAL — Analogue to Digital value — Although this command can do a good deal more on the BBC Micro than the Electron because the Electron doesn't come standard with an Analogue to Digital converter, it's still worth knowing about.

The ADVAL command on the Electron is largely concerned with the amount of memory space in the buffers set aside for SOUND functions. There are four SOUND channels on the Electron and they correspond to the four buffers on the Electron.

The sound buffers in ADVAL are numbered in the negative, starting at -5 for channel 0 and moving up to -8 for channel 3. The syntax is X=ADVAL (a number between -5 and -8 goes here).

Using this command in a program would look something like this:

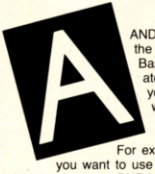
```
 5 Q=INKEY (32767)
20 X=Q-100
30 SOUND 1,-15,ABS(X),5
35 X=ADVAL (-6):PRINT X
40 GOTO 5
```

Note this looks almost identical to our first music demonstration program. By adding Line 35 to the program, you get something telling you how quickly the data (notes) are entered on the keyboard.

The faster you press the keys, the lower the number on the screen — data that's put in too quickly for the computer to handle goes into the buffer and the number

The keyword sequence IF . . AND . . THEN allows you to test for the simultaneous occurrence of two conditions. Using the keywords in a statement such as: IF X=1 AND Y=10 THEN PRINT 'correct' the program would print the word 'correct' if, and only if, the variable X holds a value of 1 *and* the variable Y holds a value of 10. If X=1 and y=7 the programe would proceed to the next instruction and ignore the words after THEN. Similarly, if X=3 and y=10 the program would also 'drop through' and print the ignore the PRINT 'correct' instruction. Only if both conditions are held to be true will the program proceed.

represented by ADVAL is the amount of room still left in that buffer.



AND — This is one of the most powerful Basic 'logical operators' that allows you to test whether or not certain conditions are true. For example, perhaps you want to use a Randomizing function (more on RND later) to generate values for Colour in Mode 4, but realise there are only 16 'colours' available in that mode, and you have to make sure the value of the appropriate number is not less than 0 or greater than 16.

To make sure that condition is tested, you might use the AND statement like this:

```
40 IF C>0 AND C<16 THEN COLOUR C
ELSE GOTO 40
```

To put that to an even greater test, look at the following listing:

```
10 MODE 2:C=INT (RND(18))
20 S=INT(RND(255))
30 IF C>16 AND S< THEN GOTO 10
40 SOUND 1,-1,S,12
50 COLOUR C
60 IF C>10 THEN PRINT
   TAB(C-10,C);"COLOUR    ";C:GOTO
80
70 PRINT TAB(C,C);"COLOUR ";C
80 FOR N=1 TO 1000;NEXT N:CLS:GO-
TO 10
```

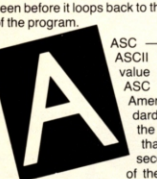
In Lines 10 and 20 the program defines two variables that generate integer values; those variables are called C and S. The third line uses the AND statement to test that C (the variable for Colour) is less than 16, and that S (the variable for pitch in the SOUND statement) is less than 0.

Lines 40 and 50 actually carry out the job of making a sound and defining a colour.

In Lines 60 and 70, the program tests to make sure that the word "Colour" is going to be printed in the right place on screen and go about the business of printing it.

And finally, in Line 80, there's a delay FOR . . . NEXT loop to make sure that our image stays on-screen long enough to be seen before it loops back to the beginning of the program.

IF..... AND..... THEN.....



ASC — Gives the ASCII character value of a string. ASC stands for American Standard Code and the II denotes that it's the second version of the standard.

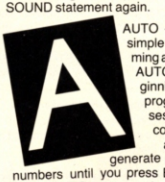
One use for this function is to get the Electron's keyboard to generate unique numeric values for each key. In the music example given in the discussion of ABS, you could easily have used the ASC function to generate music. Look at the program below:

```
 5 INPUT A$:Q=ASC(A$)
20 X=Q-100
30 SOUND 1,-15,ABS(X),5
35 X=ADVAL(-6):PRINT X
40 GOTO 5
```

The program combines some of what you've learnt already about ADVAL with the music program example used to explain ABS. In this case, however, focus your attention on Line 5.

Here the INPUT function is used to set a value for the string variable A$, and then use good old ASC to figure out what the ASCII value of the A$ variable is.

To set the value using INPUT, you have to hit the RETURN key once you've put in your character string or 'note'. Once you've done that, ASC will do the work of figuring out the ASCII value. When that value has been set, the numeric variable Q runs through and puts itself into the SOUND statement again.



AUTO — This is a simple programming aid. If you type AUTO at the beginning of every programming session, the command will automatically generate program line numbers until you press ESCAPE key.

The AUTO command automatically increases the line numbers by 10 after each RETURN starting at Line 10, unless you specify otherwise. For example, the statement:

AUTO 100, 8

will increase the line number by 8 each time you hit RETURN, and will start the program at Line 100.

CHR$ — Performs the opposite function to ASC. It takes a number and generates the character string that represents that number. It can be very helpful in complex tasks like sending control codes to printers, but since the Electron (at least at the time of writing) doesn't have a printer interface, this discussion will be confined to the command's more simple applications.

In the example program the CHR$ command and a FOR. . .NEXT loop are used to print the Electron's full character set on-screen. (A character set is composed of the letters and symbols computer is capable of spitting out).

```
10 FOR X=32 TO 126
20 PRINT CHR$(X);
30 NEXT X
40 PRINT CHR$(27)
```

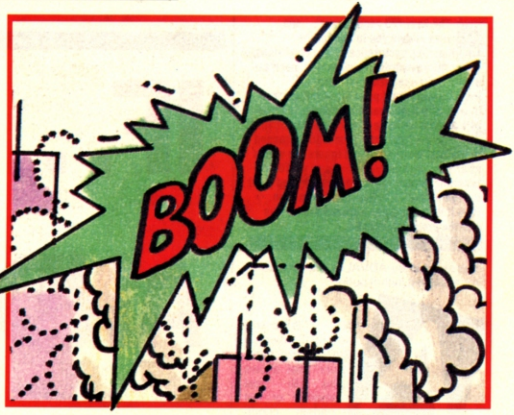
Line 10 starts the FOR. . .NEXT loop by identifying that you are concerned with the value of X between 32 and 126. Line 20 uses CHR$ to PRINT out the ASCII value of X.

Line 30 gets the next value for X, and Line 40 uses the known CHR$ value of 27 as the carriage return character in order to bring the cursor back to the left-hand side of the screen once the program has run.

CLG and CLS — both these functions clear screens. CLG clears the graphics screen with current graphics background while CLS fills the text screen with the current background colour. The example program below allows you to try both commands and see the difference between them for yourself. It draws a rectangle and then moves the rectangle across the screen, either by slowing drawing and undrawing the rectangle in new places on the screen (in the case of CLG) or by simply flashing the rectangle on and off and advancing the position of the rectangle each time it moves.

To try the CLS function, simply exchange the CLG at Line 70 in the following listing for a CLS.

```
 5 MODE 4
10 FOR X=1 TO 10
20 MOVE X*100,100
30 PLOT1,100,0
40 PLOT1,0,700
50 PLOT1,-100,0
60 PLOT1,0,-700
70 CLG
80 NEXT X
90 GOTO 5
```



COLOUR — One of the primary methods of getting colours up on the screen. The listing seen below is a modified version of the one used to show how the CLEAR function works. But to give you a better idea of what the Electron's range of colours are, the CLS statements are omitted at Lines 80 and 180.

```
 5 MODE 2:FOR X= 1 TO 10
 10 C=INT (RND(18))
 20 S=INT (RND(255))
 30 IF C>16 AND S<0 THEN GOTO 10
 40 SOUND 1,-1,S,12
 50 COLOUR C
 60 IF C>10 THEN PRINT
TAB(C-10,C);"COLOUR ";C:GOTO 80
 70 PRINT TAB(C,C);"COLOUR ";C
 80 FOR N=1 TO 1000:NEXT N
 90 NEXT X
100 CLEAR
105 FOR X= 1 TO 10
110 C=INT (RND(12))
120 S=INT (RND(235))
130 IF C>16 AND S<0 THEN GOTO 10
140 SOUND 1,-1,S,12
150 COLOUR C
160 IF C>10 THEN PRINT TAB
(C-10,C);"COLOUR ";C:GOTO 80
170 PRINT TAB(C,C);"COLOUR ";C
180 FOR N=1 TO 1000:NEXT N
190 NEXT X
```

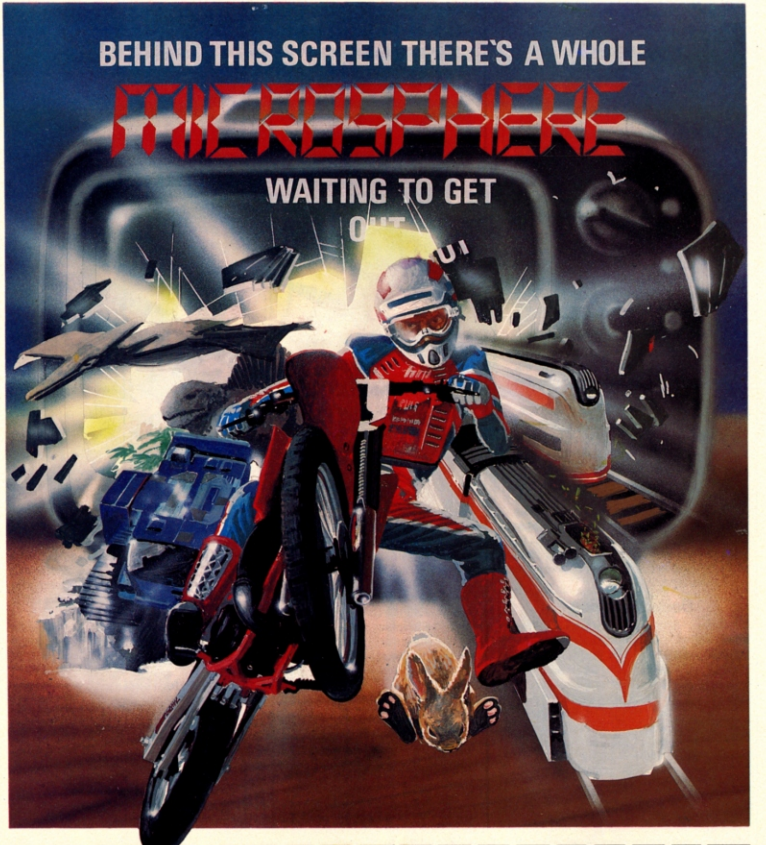
A complete summary of what the available colours are in any screen mode is given on Page 141 of the User Guide — for both foreground and background colour (a background colour is always represented by a logical number exactly 128 more than its corresponding foreground colour).

Micropaedia Editor: Geof Wheelwright.
Design: Nigel Wingrove.
Credits: Some portions of this Micropaedia are extracted from a forthcoming PAN/PCN book on the Electron.

NEXT WEEK

A look at software for the Electron with a focus on word-processing, spreadsheets and graphics — as well as our continuing sample of Electron Basic keywords.

And in two week's time, we'll turn out attention to electron periphals and finish up our look at keywords.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Learn to type right

Jan Marshall

There are good programs and bad programs. The good programs can be further divided into good programs and good programs. I shall explain. Many of the good commercial (non-games) programs reviewed in these pages are perfectly competent and no doubt are well structured and use the computer's facilities to their full. However, if they had never been produced, computer owners would not be noticeably worse off. I know this all too well as I've had a BBC micro from the days when even the Welcome cassette seemed magic, and anything that came on the market was welcome.

In the rush to fill the gap there has been a deluge of software and much of it has been clever stuff. Even if the program was not especially useful there was no complaint as long as it did whatever it did adequately.

The computer manufacturers and conventional publishers have felt a desire to get in on the software act because others were — but they often lacked the inspiration needed when it came to the basic ideas.

If ever there was an exception to this rule it is Vu-Type from the BBC. It is a typing tutor produced in conjunction with Pitman Books — which should know all about it. Vu-Type seems an absolutely first class program — both in terms of content and implementation.

Documentation

Of course, in common with all the 'big name' software it is over-packaged, but it includes one of the best pieces of documentation I have yet seen. Its 50 A5 pages have to fulfil several different functions: instructions for LOADing and RUNning the program, very full instructions for its use which are intended to be understood by users who know nothing of computers whose only interest is learning to type. Finally, there are eight pages devoted to typing principles.

If there are any criticisms of the documentation it is that the section on hand and body positioning should come earlier — an explanation of what touch typing is all about should probably come before the LOADing instructions.

There are remarkably few ambiguities and only one minor error that I found — the program is also largely self documenting. There is space in the manual for cataloguing the program and your results.

Setting up

The program loaded first time (side B is blank) and took its time as the intro is &1C blocks and the main program which it loads is another &3C blocks. This is followed by 23 Pitman exercises. Even the screen displays are reassuringly given in the documentation.

During the loading you are asked whether you have motor control, a colour monitor and your operating system version. Part of the complexity of the program is that so much of it can be changed by the user. Almost anything can be redefined: you can alter all the colours in the display and even the graphics mode used, though the colours chosen are probably as good as any, but it's fun to experiment and worth choosing all the variables *before* you get stuck into the training.

You may find, if you choose four-colour graphics, that you will type ahead of the display. You can also decide which sound each key will make or whether to have them silent.

On the display the 'target' key is highlighted, but you can also choose to make the key you hit flash. This is particularly useful at the start as you are meant to look at the screen rather than the keyboard and this feature tells you straight away if you miss the target. Having the keys with sound was a help as my machine has had a bug on the space bar for as long as I can remember. The function keys are fully used — with different functions depending on the menu in use.

It was a little irritating that having chosen from a sub-menu you have to go back to the main menu before starting to type.

After loading, you are instructed to turn off the recorder (this is not an error, it's just that you are unlikely to need it for a long time). The subsequent display is divided into a map of the keyboard (you can delete the keytop lettering) over which there is a text window for the display of exercises. These can be generated by the main program, or you can use the menu to load one of the Pitman exercises which vary from simple words to freestyle text. The 'copy' scrolls across the screen from left to right.

The exercises start with simple letter combinations — such as F and J which come directly under the first-finger home keys.

As you go on you can get reports on your progress, initially a percentage accuracy with a word of criticism or encouragement and, later on, full reports. This goes as far as recording the number of strikes on each key, and your performance on every key used.

The program distinguishes between caps and lower case — so you'll need to keep a careful watch on the caps/shift lock settings.

Verdict

In its initial stages I've found Vu-Type very easy to use. I once went on a course for several weeks and it simply didn't 'take'. As a journalist using the advanced search-and-peck technique with two fingers at 25 wpm, I can't wait to see if it will change my bad habits as much as I believe it will. The program costs £16.10 which must compare very favourably to any commercial course available.

Name Vu-Type **Application** Extended Typing Tutor **Price** £16.10 **Publisher** BBC Publications Ltd. (01-580 5577) **Language** Basic **Other versions** None **Format** Cassette **Outlets** Retail.

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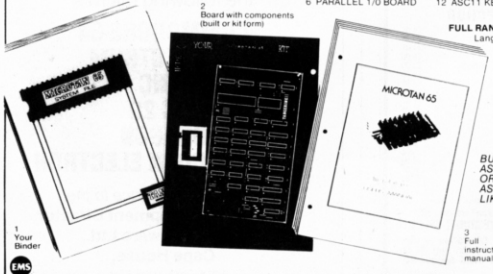

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Ted Ball reviews an impressive assembler and machine code monitor for the 48K Spectrum.

Assembly pac

Devpac is an assembler and machine code monitor for the 48K Spectrum, providing extensive and powerful facilities to help you develop and debug machine code programs. Devpac includes many features intended to appeal to experienced programmers working on large programs but can also be used by beginners.

Features

Devpac consists of two separate programs, the assembler/editor GENS3 and the machine code monitor MONS3. These can be loaded into any part of the memory and automatically relocate themselves to run at the loading address, making it easy to work with object code anywhere in the Spectrum's memory.

The assembler is very close to the Zilog standard, with standard opcode mnemonics, operand syntax, labels, and the directives ORG, EQU, DEFB, DEFW, DEFS, DEFM. Operands may include decimal, hex, binary and character constants; labels, "$" to represent the location counter; expressions involving addition, subtraction, multiplication, division and modulus (remainder) and the logical operations AND, OR, XOR.

The main difference from standard syntax is the notation for binary and hex numbers: GENS3 requires you to precede binary and hex numbers with % and # instead of the Zilog form where the numbers must end with B or H.

There is also a large number of assembly options and commands, most of them concerned with specifying the format and amount of detail in assembly listings.

GENS3 includes two very powerful features — conditional assembly and the ability to assemble source code from tape as well as from memory — these make it particularly suitable for developing large programs. Being able to assemble from tape allows you to assemble very large programs without having to split them into sections that can be assembled separately and the two features together allow you to keep a file of commonly used subroutines on tape and incorporate the routines you need at assembly time instead of having to retype them whenever you write a new program.

The machine code monitor, MONS3, includes all the usual monitor features, allowing you to inspect and alter the computer's memory and the processor's registers, run machine code programs, set breakpoints, etc. There are two other noteworthy features: first is the disassembler, which includes the option of disassembling into a labelled text file that can be edited and reassembled by GENS3. The other is the single step function which allows you to run a machine code program one instruction at a time, with full 'front panel' display, and works on programs in RAM and in ROM.

Presentation

The cassette contains two copies of GENS3 on one side and two copies of MONS3 on the other, but the labelling does not distinguish between the two sides.

The documentation consists of a 45 page booklet, with separate sections on GENS3 and MONS3. The features and the syntax for the assembler, editor and monitor commands are all explained clearly, although a beginner may have difficulty with the descriptions of some of the more advanced features. However, there are fully worked examples that you can follow through step by step and which help you understand how to use the package.

In use

Devpac includes a great many features, so there are a lot of different types of commands. Most require a single key, or a shift key and another key to specify what is to be done, and some have to be followed by parameters. This kind of system is never easy to use when there are many non-mnemonic commands, and it is particularly difficult in Devpac where there are three sections, the editor, the assembler, and the monitor, with similar commands used to do different things.

If you use Devpac regularly you will eventually learn the commands you use most often, but you will inevitably have to do a lot of searching through the manual for the less common commands.

The assembler is reasonably fast when using a source code file in memory — with no listing it took about 4 seconds to assemble 150 lines. It is, of course, much slower when assembling from tape, but the loss of speed is a small price to pay for being able to assemble a source file that is much too big to fit in memory.

The MONS3 'front panel' displays a great deal of information; a disassembly of the instruction starting at the current memory pointer; the contents of all the registers and, for each 16-bit register or register pair, the contents of the 7 bytes starting from the address pointed to by the register as well as the contents of 24 bytes centred on the memory pointer. Nevertheless, the display is clearly laid out and easy to interpret.

Debugging a program with the aid of breakpoints and the single step can be tedious, but the manual gives a great deal of help on how to go about it.

Reliability

The assembler performs extensive error checking and will find almost all errors in the source code. The only bug that I found in the error checking was that it will assemble the incorrect instruction "LD (HL),(HL) and the corresponding forms with the index registers IX and IY. There also seems to be a bug involving the conditional assembly, where the object code is not displayed in the assembler listing. Conditional assembly does, however, generate the object code even though it is not displayed.

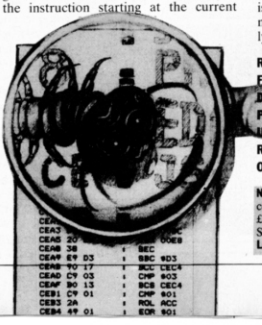
The monitor checks that commands are valid, and the manual gives many warnings about commands that could cause trouble or crash the machine. There is one case where I think that the warning in the manual should be replaced by additional error trapping in the program — when you single step, the program counter and the memory pointer must have the same value otherwise the consequences are unpredictable.

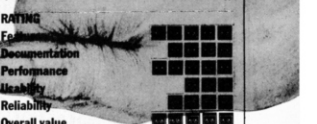
MONS3 and GENS3 are, however, quite reliable in normal use and should not give any trouble with reasonable care.

Verdict

The assembler is closer to the Zilog standard and includes more features than any of the numerous other assemblers available for the Spectrum. The monitor is also very good and includes many advanced features. Although Devpac is not very easy to use — partly because there is so much in it — it is very powerful and this far outweighs the difficulties in using it, and the few minor bugs.

Devpac is also very reasonably priced. Although it gives you much more the price is still about the same as other assembler/monitor packages for the Spectrum. Highly recommended.





Name Devpac **Application** Assembler & machine code monitor **System** 48K ZX Spectrum **Price** £14.00 **Publisher** Hisoft, 60 Hallam Moor, Liden, Swindon, Wilts, SN3 6LS **Format** Cassette **Language** Machine code **Outlets** Mail order.

DRAGON 32

Gateway getaways

Name Trace Race **System** Dragon 32, joysticks **Price** £8.75 **Publisher** Cable Software, 52 Limbury Road, Luton LU3 2PL **Format** Cassette **Language** Basic & M/code **Other versions** None **Outlets** Mail order.

Trace Race is a follow-up to Cable's other successes with games based on Walt Disney's Tron. It's another fast action game, mostly in machine code, with speech built into the program. Admittedly, I only came across one word, but it's still impressive.

Objectives

Two versions are open to you, either a solo game or a two-player option. Solo is you against the computer. You fly along a drawn grid, avoiding the trace gates the computer will put in your path.

Crashing into the grid walls, your own trace line (swift U-turns are out) or a gate ends your life. After your run is over, the time is displayed, allowing you to brush up on your skills before challenging friends and enemies to a duel.

The two player option has no trace gates, but the rules are the same.

The throttles on both bikes are jammed wide open (naturally) so your joystick only allows left/right and up/down movement.

Of the two bikes, red always appeared to go faster, so it's not the one to pick to stay alive.

In play

The program is in Cable's standard video box packaging, *ie* sturdy and smart. A short Basic program is loaded first, which on running loads the machine code.

The instruction sheet is clear, brief and simple. A nice touch at the start of the game is the choice of a fast or normal game. As a Dragon owner who suffered with a machine that crashed at the higher speed of 1.8 Hz, there was nothing more infuriating than having to find the POKE that doubles the speed, delete it then start a game. At least with this alternative you don't get an instant crash. Running at the normal speed still gives a fast game in either solo or duo versions.

The graphics are very good in both games, as is the sound. The noise made when the trace gates are drawn on didn't really fit in though. They made a kind of squelchy noise, which I didn't think was very suitable, it needed a more metallic sound.

This is only nitpicking though. If you want an enjoyable, straightforward, and instantly playable game for Christmas, then this is the one.

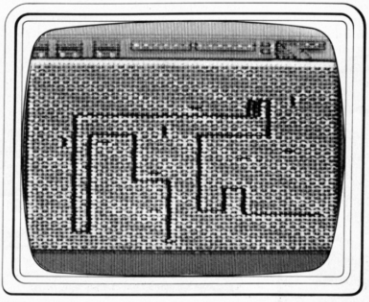
Verdict

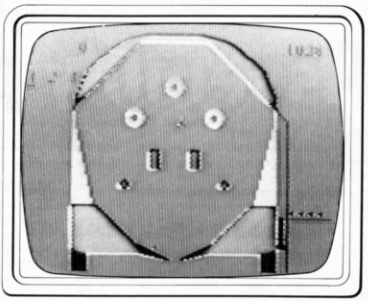
By far the best of Cable's releases so far. But be warned, the only thing you can't do on bikes is stand still.

Jim Ballard

RATING

Lasting appeal	
Playability	
Use of machine	
Value for money	





Pins and needles

Name Pinball **System** Dragon 32 **Price** £8 **Publisher** Microdeal, 41 Truro Road, St Austell, Cornwall **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Mail order, most retail.

It must be at least thirty years that pinball machines have been around and they're still going strong despite the Invaders invasion.

Objectives

The aim is to flip the ball around the table and score unbelievably high scores, which are recorded for you at top left of the screen, with current score at top right.

In play

There are three different table layouts to choose from, the first having seven bumpers and the second and third nine bumpers each. On each screen there is a whirling cross which appears from time to time and which will gain you 1000 points if you hit it. There's a choice of three background colours, and you can use either joystick or keyboard; this is not very strenuous as the '7' key is the only one you'll need. This chooses the table layout, fires the ball onto the table, and operates the flippers.

To fire the ball, of which you get five with a bonus every 10,000 points, you press the fire-button or '7' key down to pull the plunger back, then release it to fire. The ball bounces around with realistic sounds, and the speed of movement seems fairly authentic with it shooting off as it hits a bumper or crawling slowly up the screen when gently flipped.

The problem with Pinball, though, is the graphics. These are decidedly fuzzy on even the clearest screen, and the green background I found almost unusable. As the ball bounces around, it also disappears briefly where the whirling cross appears and around the flippers. When this happens you can dig it out with a bout of frantic flipping.

Despite the dastardly disappearing ball, though, I did enjoy Pinball but felt guilty for doing so. It seemed that with complex adventures to be waded through, and multi-screened fast-moving arcade games to master, I ought not to be sitting there having fun with a game which only required you to lift one finger. But, as in the arcades, you become almost mesmerised by the bouncing ball, your flipper-finger itching, and all that matters is beating that high-score put up there by you or somebody else.

Verdict

At the standard Microdeal price of £8, this doesn't compare well with some of its other offerings, and its appeal may be limited to those occasional sessions when you realise you haven't played the game for a while, just as you can pass dozens of Pinball machines and ignore them then one day you simply have to play. So, although I enjoyed it, it might not be everyone's cup of tea.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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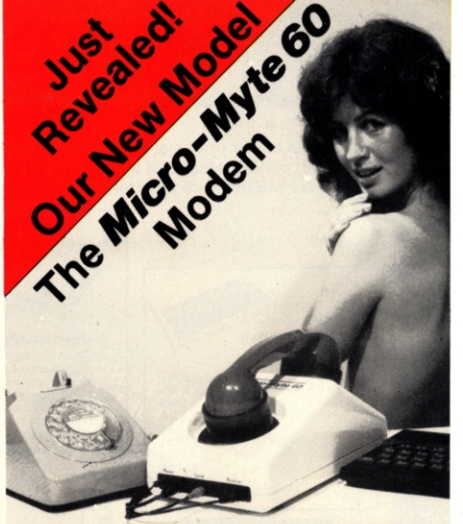

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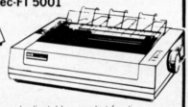

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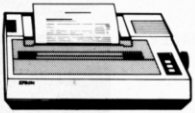

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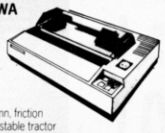

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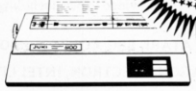

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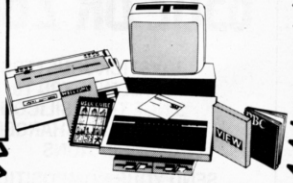

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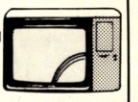

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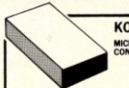

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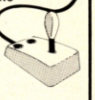

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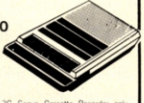

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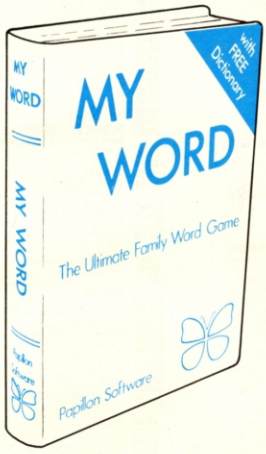

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John Fairbairn revels in the delights of games to cheer the half-starved Colour Genie owners.

Games of the Genie genus generally

Most people's reaction to the Colour Genie has been, 'Nice computer, shame about the software.' Only recently has the number of titles on offer topped 100, and some of those have been dreadful.

But despair not CG owners. At least one company has brought a touch of class to Genie software: JD Tronics of London.

The J is for Justin Barrington, the D for Daniel Brown, a duo who had many years' experience with the TRS-80. They are justifiably proud of their first offerings for the Genie — Micronopoly and Puckman.

Micronopoly

I was tickled pink when this easy-to-load program first ran. Unlike most computer Monopolies (for that is what it is of course) it is superbly designed — simple but elegant. Instead of the pure-text versions you mostly see this keeps the text on the right-hand side of the screen and shows the board moving down the left, like a slow-moving cine film — an effect reinforced by the sprocket-hole kind of sound as it moves. I loved it.

But I had one nasty shock. The cassette inlay gives no instructions on how to play but just says, 'All standard rules.' Rubbish!

It doesn't charge double rent when a person owns all the properties of a set, and I was even more disconcerted when the Genie (it plays against 1-4 humans) bought three houses for Piccadilly when it had only one on Coventry Street and none on Leicester Square.

This is definitely not sanctioned by my 1972 copy of the rules of Monopoly or by Maxine Brady's *The Monopoly Book*, but friends have assured me lots of people play this way to speed the game up. It's reasonable enough, but I would have preferred it as an option. However, as the program occupies a full 32K, YJD tell me nothing else could be squeezed in.

The Genie itself plays a good game, very aggressive and verging on the reckless, but fortune often favours the brave.

Although it is in Basic, the game is fast. It can seem slow but actually is faster than the real game — at least as played by my family where half the time is spent looking for the dice on the floor. The Genie handles the dice for you, and all the money, and you handle the Genie by a very simple menu system that offers a wide range of options (roll the dice, buy property or houses, mortgage, check list of properties, etc.)

There are a couple of bugs to do with user input that don't seem to affect the actual game but cause a little irritation, and I would have liked longer delay loops in some cases. I would also like a 'who's got how much' option on the menu, and why

Passing go in Micronopoly.

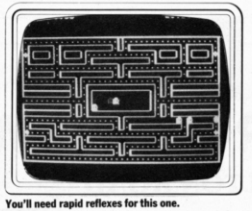
does Genie always go first?

Good family game, very good value for money if you accept the quirks.

Puckman

Yes, JD, it is another Pacman (tney asked me not to say that), but this is the proper arcade version and another superb offering. It hardly needs describing except to confirm that it has the full maze, power pills and ghosts, and is smooth and fast (all machine code). Good sound, good graphics, easy loading, but no joystick control (use the arrow keys).

The title set me to musing about what ever happened to Puck matches, which shows my age and may explain why I'll never get the £100 prize for top score JD is



You'll need rapid reflexes for this one.

offering all purchasers. My kids, 6 and 12, won't win the prize either — I suspect you have to be around 14-15 to really get the best out of this game, the programmers' top score is 24,300 and the best by a purchaser so far is 13,200.

Incidentally, JD Tronics is set to issue a cassette-based word processor in the New Year. I can't wait.

A. G. Kneeus Games

A rather different approach is taken by Ipswich's A.G. Kneeus, a very pseudonym but a very honest chap who is trying to offer reliable programs at a decent price, while at the same time making them all listable so that owners can re-work them or use them for study.

The programs are all in Basic and easy to load. Sound is usually very good, graphics are cute rather than brilliant (but easy for

Watch the birdie in Buzz-Bee-Ball.

the beginner to follow and change).

Best of the range seems to be *Video Paint Pot*. It grabbed my kids' attention, but the instructions are so awful they drifted away, frustrated, very quickly. I had to persevere, and eventually discovered the program will do a lot (draw solid or dotted lines in eight directions or circles in a variety of sizes and colours, and paint inside them) but I was still hazy about several things.

Ask for full instructions — get them and you'll get good value for money.

Draughts is another game I think many people could be satisfied with. Not the connoisseurs, that is, but it'll give most people a decent game.

Buzz-Bee-Ball was my favourite. It's football between a little bird (good on the wing) and a man. Using the arrow keys you can play against Genie or a partner. Utterly simple, but it fascinated simple me.

E. T. Aulie is a passable variety of Pacman, but if that's really what you want I'd go for JD Tronics' version any day.

Bust-a-Dam is an uninspired version of Breakourt and *Retaliation*, which is a type of Space Invaders.

JD Tronics 42 Crediton Hill, London NW6 1HR. Micronopoly £8.00 (needs 32K), Puckman £8.00.
A. G. Kneeus 97 Burrell Road, Ipswich IP2 8AD. All titles £6.50.

BIG JOHN'S CROSSWORD

14 15

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SPECTRUM 48K

Undersea search

Name Hunter Killer **System** 48K Spectrum **Price** £7.95 **Publisher** Protek, 1a Young Square, Brucefield Industrial Estate, Livingston, West Lothian (0506-415353) **Format** Cassette **Language** Basic **Other versions** None **Outlets** Mail order, Menzies, other dealers

As the software skies are now so full of flight simulators that Protek has decided to come down from out of the clouds with a splash and offer something different, a submarine simulator.

Objectives

They have made you Commander of an "S" type submarine lurking off the coast of Holland and Germany during World War Two, your mission to locate and sink an enemy submarine in the same patch of water. Another nice, friendly game designed to increase international understanding.

First impressions

The cassette is certainly well presented, coming in a large box complete with 12-page manual and two additional instruction manuals because one of the interesting features of Hunter Killer is that it can be played in a dual game linking two machines with the networking lead provided with Interface 1, both machines needing an Interface with their own TV screens.

In play

The solo game offers five difficulty levels, and after choosing your level you're given the option of seeing a practice torpedo fired. You're only likely to choose this option once as the torpedo makes painfully slow progress through the water towards the enemy sub seen through your periscope. To be fair, this is the only part of the game which was slow, the rest responding pretty briskly to the keyboard or a Protek joystick.

There are three screens giving you the information you need; the Control Room and Chart Room down below, both with excellent graphics.

The first tasks to master are how to dive and surface successfully, which involves adjusting your ballast tanks and hydroplanes. You cannot stay underwater too long as the electric motors can only be recharged from the diesel engines on the surface. But stay on the surface too long and you risk the enemy submarine getting you first, or being spotted by a passing aircraft (this doesn't apply in the dual game.)

You scroll from the Control Room to the Chart Room using the 'C' and 'X' keys, and these keyboard controls are sensibly laid out, using adjacent keys where possible, with a summary of the controls printed on the back of the instruction booklet.

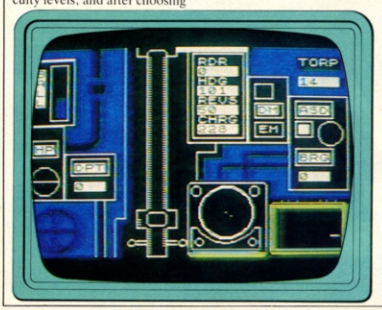
Verdict

An excellent simulation, and definitely not sub-standard.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



A real bun fight

Name Mr Wimpy **System** Spectrum 48K **Price** £5.90 **Publisher** Ocean Software, Ralli Building, Stanley Street, Manchester M3 5FD **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Sinclair dealers

In a novel marketing approach, Ocean Software has joined forces with the Wimpy fast food chain to bring us Mr Wimpy, a game of burger building and sausage survival.

Objectives

The game divides into two sections. Part 1 has Mr Wimpy collecting three ingredients while avoiding manhole covers, and Waldo the burger thief. Part two has him galloping up and down ladders and across platforms in an attempt to assemble four hamburgers. Trying to thwart him at different levels of the game are Sid Sos, Sam Spoon, Ogy Egg and Pam Pickle.

In play

Mr Wimpy resembles the Wimpy logo, a small chubby chap dressed in Beefeater costume. Starting with five lives, Mr Wimpy appears in a recess, stage left. As he moves out of his cubby hole, his little legs pumping away, out pops a tray which then obligingly follows in his footsteps. Over at stage right are three burger ingredients which have to be brought back to the left-hand hideyhole, one by one.

Floating up and down in the central portion of the screen are three golden doughnut-like manholes which Mr Wimpy must dodge. A further hazard is the roly-poly blue meanie Waldo who charts a fast and erratic course around the screen. If he hits Mr Wimpy's tray, the tray (and the ingredient, if one is in tow) return to the starting grid.

Having successfully captured the ingredients, Mr Wimpy now faces a daunting screen where four hamburgers await his attention. The four constituents of each burger have been stacked vertically, one part per platform. Mr Wimpy has access to each of the platforms by means of ladders. When he runs over the top of one of the constituents, it becomes dislodged and falls down a level, with subsequent knock-on effects.

Quite simple, really, or it would be were it not for two beautifully animated mischief-makers: Sid Sos, a twitching frankfurter on legs, and Sam Spoon, a perambulating piece of cutlery. These relentlessly pursue Mr Wimpey who loses a life if caught. He can stop them temporarily by dropping a piece of burger on them or by shaking his pepperpot.

Later, a ferocious fried egg and a precocious pickle add to his problems.

Verdict

Excellent joystick/keyboard response, humourous graphics, smooth animation, and a zany plot — this one is a real giggle and for my money the best all-round family game to date.

Bob Chappell

RATING

Lasting Appeal	
Playability	
Use of Machine	
Overall Value	

fantasy SOFTWARE

DOOMSDAY CASTLE

is an arcade style game with the feel of a real adventure

Doomsday Castle consists of a labyrinth of 76 complexly inter-connected Halls and Passages where you will meet a whole host of adversaries serving the infinitely evil Scarthax, the Garthrogs, the Orphacs, the phenomenally nasty Googly Bird and the Urks which manifest themselves in over fifty unbelievably weird and wonderful guises.

Scarthax has scoured the Universe to bring together the six ancient stones of lifeforce. United in Doomsday Castle they are being used to wield an irresistable power over the cosmos, emanating waves of corruption through every galaxy.

To save the Universe, you must battle your way through the Castle to find and collect the six stones and use their force against Scarthax to destroy Doomsday Castle, hopefully escaping yourself before the final cataclysmic explosion. The task is not easy (saving the Universe never is!) and it will take youmany games to unfold the structure of Doomsday Castle and discover the locations of the ancient stones. The addictive arcade style action will keep you coming back to play but the overall challenge should still keep you occupied for months.

You take on the role of our super hero ZIGGY shown here above in his exploratory capsule in combat with an Urk disguised as a pangalactic gargleblaster (!!) This is a true representation of the on-screen graphics.

FANTASY SOFTWARE
is available from W.H.SMITHS, JOHN MENZIES, LASKYS, GREENS, RUMBELOWS, SPECTRUM GROUP, COMPUTERS FOR ALL and all other good software retailers.

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COMMODORE 64

Rocks and lizards

Name Crazy Caveman **System** Commodore 64 **Price** £6.50 **Publisher** Merlin Software, Business and Technology Centre, Bessemer Drive, Stevenage, Herts. SG1 2DX **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Retail.

It's a refreshing change not having to blast away at mutants or invaders from some far-distant galaxy. The setting for this game is prehistoric times. You are a Neanderthal battling it out with an axe against dinosaurs, dodos and other early beasts.

Objectives

You are the Crazy Caveman of the title, armed only with an axe. You have become separated from your hunting party and you're trying to make it back home alone. In the process you come up against some prehistoric problems.

In play

Initially you encounter rolling rocks. These move across the screen from left to right and the only way to avoid them is to jump over the top of them. They usually come in groups of four with very little random variation in timing or separation and it soon becomes very easy to judge the jumping.

Not only do you have to hop, skip and jump over the rocks, but in order to progres to the next level you have to move the left to break new ground. Trying to dodge the issue by moving to the right is of no use; you're limited to just a few steps.

Following the rocks comes a gang of dinosaurs. You have to be quick and accurate with your axe to kill them. Of course, if you don't you'll end up as their luncheon. They looked deceptively like herbivores to me.

If you manage to negotiate the dinosaurs, your next hazard is the dodos. Dodos, according to the instructions, never accomplished the art of flying. They only manage short hops and bounce around the screen in fairly large numbers.

It can get extremely difficult to avoid them. I never managed to kill one and I'm not even sure you're supposed to.

The fourth hazard is some different types of prehistoric birds (pterodactyls?) which fly above you dropping rocks on your head.

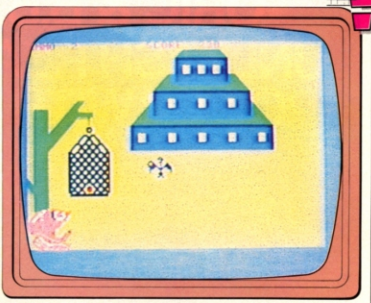
I'm afraid that my history books must be out of date as I could find no reference to rock-dropping birds.

Verdict

This was an enjoyable game which will test even the most ardent games player. The graphics are fairly well-done and the screen scrolling is exceptionally smooth. The sound, however, leaves a lot to be desired. If you are fed up with the usual space destructive games then you should give this one a second glance.

Nigel Farrier

RATING	
Playability	
Use of machine	
Value for money	
Overall Value	



Fire eater

Name Goodness Gracious **System** Commodore 64 **Price** £6.95 **Publisher** Beyond, Competition House, Farndon Road, Market Harborough, Leics **Format** Cassette **Language** Basic **Other Versions** None **Outlet** Mail order and most dealers.

Ever fancied controlling a dinosaur? Well now's your chance, as you travel back in time to a world ruled by dinosaurs. Being somewhat smarter than the average Tyrannosaurus Rex, these dinosaurs hurl fireballs from their mouths, and keep all the other nasties at bay.

Objectives

These prehistoric beasts get their power from a magical red gem, which everything else in this strange world is trying to get hold of.

You control the dinosaur, and make it spit fireballs at appropriate moments to eliminate every other life-form that appears on the screen. Should the magical gem come under attack three times in the same location, it is moved off to a new hiding place and must defend it all over again.

Initially you have to spit fireballs at a devil-like figure that approaches from the right — subsequent devils come at you at slightly faster speeds. The next level has you at the top left of a flight of stairs, another leads up from the middle of the screen to the right. Down this hop aliens at which you have to spit.

There's a little competition being run in conjunction with this game. If you manage to survive five attacks from little monsters bent on taking the gem and running, you can write in to the Beyond team and tell them how the attacks begin on level 6.

In play

You might be forgiven for concluding this is a good, unusual game.

Unusual it may be, but good it certainly isn't.

I doubt whether many will enter the competition, because this game becomes so tedious.

Your dinosaur cannot move about the screen nimbly dodging other creatures and spitting at them as it's rooted to the spot. Instead, your solitary control key in the whole game is the space bar. This must be pressed down for an interval of time, and on release the fireball wobbles its way across the screen; the distance travelled is related to length of time the key was held down.

The supply of fireballs is limited to 10 per game, with a bonus level of 1 fireball for every alien successfully demolished.

Of course, you could always go for expert level, and start off with 5 and get 2 extra for every hit.

Verdict

Not destined to become one of the all time greats in the 64 Hall of Fame, and for a new company trying to make its way in the computer software scene this is a very disappointing start.

Pete Gerrard

RATING	
Lasting appeal	
Playability	
Use of machine	
Value for money	

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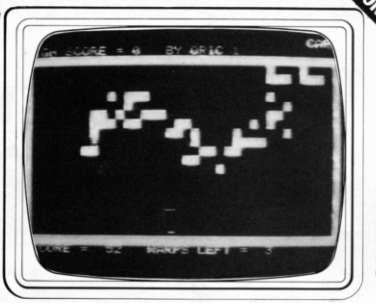
Jungle chase



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Title *Jungle Chase*
Machine *Oric 1 48K*
Application *Game*
Language *Tansoft Basic*
Author *R de Mercado*

Have you ever fancied youself as a jungle explorer? If you have then here's a game for you.

Having stumbled across a man-eating plant whilst exploring the deepest jungles of darkest Africa, you have to try to escape. You must avoid the flesh-eating plant as much as you can and not become surrounded by it. You do not, unfortunately, have any weapons, so you cannot attack the plant. However, you do have the ability to warp away from your current position three times to a new, random one.

2	Set screen colours, red ink on black paper.
3	Initialise the high score of zero to "ORIC 1".
4	Gosub and define the plant character and the explorer zero.
7-8	Set up a random x/y position for the explorer.
9	Set up the score and warps.
21	Gosub and give the instructions.
25	Clear the screen and set the ink and paper colours.
30-35	Print the surrounding jungle.
50	Plot the explorer onto the screen.
110	Remember the position of the explorer.
115-116	Print up the number of warps and the current score.
117-118	Print up the high score and who.
120	Select a random number to specify the next position of the plant.
121-124	Jump to the appropriate routine to check the place where the plant is going to be.
125	Make sure G is in the range 1-4.
127-145	Check the positions top, bottom, right, left to see what character is there.
150	Put the plant onto the screen.
155	If bell is on then ping.
160	Save position of explorer.
165	If there are some warps left then skip the next bit.
170	Check for surround.
200	Get a key from the keyboard.
210	If space bar and there are warps left, then warp.
220	Bell on if "B".

```
0 REM COPYRIGHT R.de Mercado
1 REM JUNGLE CHASE
2 PRINTCHR$(6):PRINTCHR$(17)
3 HS=0:HS$="ORIC 1"
4 GOSUB 1000
7 X=INT(RND(1)*36)+1:IF X<2 THEN GOTO 7
8 Y=INT(RND(1)*19)+1:IF Y<2 THEN GOTO 8
9 S=1:W=3
21 GOSUB 2000
25 CLS:PAPER0:INK2
30 FOR I=1 TO 37:PLOT I,1,"!":PLOT I,21,"!":NEXT I
35 FOR I=1 TO 21:PLOT 1,I,"!":PLOT 38,I,"!":NEXT I
50 PLOT X,Y,CHR$(35)
100 REM PLAY
110 A=X:B=Y
115 PLOT 2,22,"SCORE = ":PLOT 10,22,STR$(S) :PLOT 16,22,"WARPS LEFT
 ="
116 PLOT 29,22,STR$(W)
117 PLOT 1,0,"HIGH SCORE = ":PLOT 13,0,STR$(HS):PLOT 18,0,"BY "
118 PLOT 21,0,HS$
120 LET G= INT(RND(1)*4)+1
121 IF G=1 THEN GOTO 127
122 IF G=2 THEN GOTO 133
123 IF G=3 THEN GOTO 137
124 IF G=4 THEN GOTO 143
125 GOTO 120
127 IF SCRN(A+1,B)=35 OR SCRN(A+1,B)=33 THEN 120
130 IF A<=37 AND A>=2 THEN A=A+1
132 GOTO 150
133 IF SCRN(A-1,B)=35 OR SCRN(A-1,B)=33 THEN 120
135 IF A<=37 AND A>=2 THEN A=A-1
136 GOTO 150
137 IF SCRN(A,B+1)=35 OR SCRN(A,B+1)=33 THEN 120
140 IF B<=20 AND B>=2 THEN B=B+1
142 GOTO 150
143 IF SCRN(A,B-1)=35 OR SCRN(A,B-1)=33 THEN 120
145 IF B<=20 AND B>=2 THEN B=B-1
150 PLOT A,B,CHR$(33)
155 IF C=1 THEN PING
160 M=X:N=Y
165 IF W>0 THEN GOTO 200
170 IFSCRN(M,N-1)=33ANDSCRN(M,N+1)=33ANDSCRN(M+1,N)=33ANDSCRN(M-1,N
)=33THEN400
200 K$=KEY$
210 IF K$=CHR$(32) AND W>0 THEN GOTO 3000
220 IF K$=CHR$(66) THEN C=1
225 IF K$=CHR$(79) THEN C=0
230 IF K$=CHR$(11)ANDSCRN(X,Y-1)=33THEN 200
235 IF K$=CHR$(11)AND SCRN(X,Y-1)=32 THEN Y=Y-1
236 IF K$=CHR$(11)THEN 270
240 IF K$=CHR$(10) AND SCRN(X,Y+1)=33 THEN 200
245 IF K$=CHR$(10) AND SCRN(X,Y+1)=32 THEN Y=Y+1
246 IF K$=CHR$(10) THEN 270
250 IF K$=CHR$(8) AND SCRN(X-1,Y)=33 THEN 200
255 IF K$=CHR$(8) AND SCRN(X-1,Y)=32 THEN X=X-1
256 IF K$=CHR$(8) THEN 270
260 IF K$=CHR$(9) AND SCRN(X+1,Y)=33 THEN 200
265 IF K$=CHR$(9) AND SCRN(X+1,Y)=32 THEN X=X+1
266 IF K$=CHR$(9) THEN 270
267 FOR K=8 TO 11:IF K$<>CHR$(K) THEN 200:NEXT K
270 A=X:B=Y
290 PLOT M,N,CHR$(32)
300 PLOT X,Y,CHR$(35)
310 S=S+1
320 GOTO 110
400 PLOT 2,24,"I'M AFRAID YOU'RE SURROUNDED PAL"
405 T$=STR$(S)
410 WAIT 200
```

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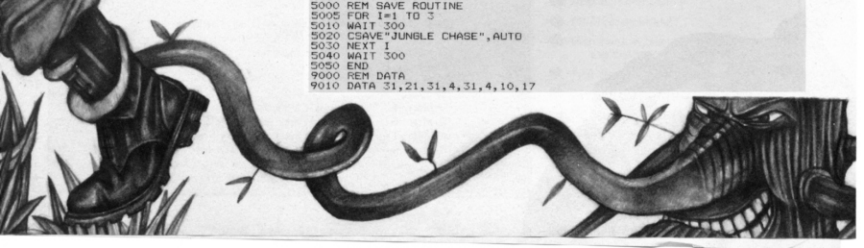
JUNGLE CHASE

▶ 65	225	Bell off if "O".
	230-236	Check for upward movement, depending on plant position.
	240-246	Downward movement (cursor down key pressed).
	250-256	Left.
	260-266	Right.
	270	Save position of the explorer.
	290-300	Update the explorer.
	310	Update the score.
	320	Continue the game.
	400	You are surrounded.
	405	Put the score into a string.
	410	Pause.
	414-418	Print a message depending on the score.
	420-440	Print the score.
	444	Check whether the high score has been beaten.
	450-490	Prompt for another game and act on the answer.
	505	Wait a bit.
	535	Set up the new high score.
	537-550	Print up the new high score.
	555-560	Print JUNGLE CHASE in double height characters.
	565-580	Get the new hi-scorer's name.
	1000-1999	Define the user defined characters for the plant and the explorer.
	2000-2200	Instructions.
	3000	Begin the warp routine.
	3005	Remove explorer from the current position.
	3010-3020	Select a new random position for the explorer to warp to.
	3025	Make the warp sound.
	3030	Replace the explorer.
	3040	Decrement the number of warps.
	3050	Continue the game.
	5000-5050	Save the game three times.
	9010	Data for the explorer character.

```
414 IF S<=10 THEN PLOT 2,24,"HUH,SOME EXPLORER YOU WERE ........"
415 IF S>10 AND S<=30 THEN PLOT 2,24,"YOU WEREN'T MADE FOR JUNGLE L
IFE.."
416 IF S>30 AND S<=50 THEN PLOT 2,24,"I THINK YOU NEED MORE EXPERIS
NCE.."
417 IF S>50 AND S<=100 THEN PLOT 2,24,"HARD LINES,BETTER LUCK NEXT
TIME.."
418 IF S>100 THEN PLOT 2,24,"EAT YOU'RE HEART OUT DAVID BELLAMY.."
420 PLOT 2,24,"NEVER MIND,YOU SCORED "
430 PLOT 24,26,T$
440 PLOT 29,26,"POINTS"
444 IF S>HS THEN GOSUB 500
450 PLOT ,1,14,"ANOTHER GAME Y/N?"
460 GET D$
475 IF D$="Y" THEN GOTO 7
480 IF D$="N" THEN CLS:INK 0:PAPER7
485 IF D$<>"N" THEN 460
490 END
500 REM HI-SCORE
505 WAIT 510
535 HS=S
537 PLOT 14,0,STR$(HS)
538 PRINTCHR$(6);:PRINTCHR$(17)
540 CLS :PRINT:PRINT
550 V$="    JUNGLE CHASE HI-SCORE":PRINT
555 PRINT CHR$(133)CHR$(142)!V$
560 PRINT CHR$(133)CHR$(142)!V$
565 PRINT:PRINT:PRINT:PRINT"PLEASE TYPE IN YOUR NAME UP TO 12":PRIN
T
570 PRINT"LETTERS LONG THEN RETURN":PRINT:PRINT:INPUT H$
575 IF LEN(H$)>15 THEN GOTO 540
576 PRINTCHR$(6);:PRINTCHR$(17)
580 RETURN
997 GOTO 110
998 GET A$
999 END
1000 MEM
1005 RESTORE
1010 FOR I=46344 TO 46751:POKE I,255:NEXT I
1020 FOR I=46760 TO 46855
1030 READ Q:POKE I,Q:NEXT I
1999 RETURN
2000 REM INSTRUCTIONS
2010 CLS:INK INT(RND(1)*7)+1:PAPER0
2020 F$="          JUNGLE CHASE":PRINT
2030 PRINTCHR$(132)CHR$(138)!F$
2032 PRINTCHR$(132)CHR$(138)!F$
2040 PRINT
2050 PRINT"  YOU ARE AN EXPLORER AND YOU ARE":PRINT
2052 PRINT"  IN THE DEEPEST AFRICAN JUNGLE WHEN":PRINT
2054 PRINT"  YOU STUMBLE ACROSS A FAST GROWING,":PRINT
2056 PRINT"  MAN EATING PLANT.":PRINT
2058 PRINT"  THE PLANT GIVES CHASE AND YOU MUST":PRINT
2060 PRINT"  KEEP MOVING AWAY FROM IT.":PRINT
2062 PRINT"THE GAME ENDS WHEN YOU ARE SURROUNDED":PRINT
2064 PRINT"YOU TAKE IT IN TURNS TO MOVE AND":PRINT
2066 PRINT"TO MOVE YOU USE THE RELEVANT":PRINT
2067 PRINT"CURSOR KEYS":PRINT
2068 PRINT"      "YOU SCORE 1 POINT FOR EACH MOVE"
2070 PRINT"PRESS ANY KEY TO CONTINUE":GET R$
2080 CLS: F$="          JUNGLE CHASE":PRINT
2090 PRINTCHR$(132)CHR$(138)!F$
2100 PRINTCHR$(132)CHR$(138)!F$
2110 INK INT(RND(1)*7)+1:PRINT
2120 PRINT"YOU DO,HOWEVER HAVE ONE 'WEAPON'":PRINT
2130 PRINT"YOU HAVE THREE WARPS.":PRINT
2140 PRINT"IF YOU DO GET SURROUNDED THEN PRESS":PRINT
2150 PRINT"THE SPACE BAR AND YOU WILL DISAPPEAR":PRINT
2160 PRINT"AND REAPPEAR AT A RANDOM POSITION ON":PRINT
2170 PRINT"THE SCREEN.ONCE YOUR STOCK OF WARPS":PRINT
2180 PRINT"HAS RUN OUT THEN YOU START WORRYING.":PRINT
2185 PRINT"IF YOU WANT A BELL WHEN IT IS YOUR":PRINT
2186 PRINT"TURN PRESS 'B' AND IF YOU WANT TO ":PRINT
2187 PRINT"TURN IT OFF PRESS 'O'":PRINT
2190 PRINT"          ***** BEST OF LUCK *****"
2200 PRINT"    PRESS ANY KEY TO START":GET R$:RETURN
3000 REM WARP
3005 PLOT X,Y,CHR$(32)
3010 X=INT(RND(1)*36)+1:IF X<2 THEN GOTO 3010
3020 Y=INT(RND(1)*19)+1:IF Y<2 THEN GOTO 3020
3025 ZAP:ZAP:ZAP
3030 PLOT X,Y,CHR$(35)
3040 W=W-1
3050 GOTO 110
5000 REM SAVE ROUTINE
5005 FOR I=1 TO 3
5010 WAIT 300
5020 CSAVE"JUNGLE CHASE",AUTO
5030 NEXT I
5040 WAIT 300
5050 END
9000 REM DATA
9010 DATA 31,21,31,4,31,4,10,17
```



Screen dump

Title *Screen Dump*
Machine *BBC B*
Application *Printing*
Language *6502 Machine Code Asembler*
Author *J M Buckley*

If you have a Centronics 739 printer and a BBC micro computer, then this could be the program for you. This screen dump routine, from J M Buckley of St Albans, takes about four minutes to dump the whole screen because it is written in Assembler. This compares well with an equivalent Basic program, which, the author reckons, will take around 15 to 20 minutes.

The program produces a two tone Graphics Dump. Odd logical colours are printed as solid black, colours with bit one set but not bit zero are printed with alternate dots to give a grey colour. This may be changed in lines 520 to 550 and 650 to 730 of the program. The utility uses PAGE & 11 of the BBC's memory. This is unused except when Data or *SPOOL files are open and allows PAGE to be set as low as &1200 for large programs.

The Screen dump routine itself was designed to work in MODE 0 but will work equally well in all graphics modes. For the lower resolution modes it could be modified to give a more complex range of tones if necessary.

Make sure that the graphics origin has been set to the bottom left hand corner before calling the program (*PRTSCRN with a disk system) by using VDU 29,0;0;.

100 Assemble the code for the screen dump.
110 Switch on the extended messages for the filing system.
120 Save the assembled code under the file name $.PRTSCRN. Note that if data files are being used then the base location &1100 will need to be changed i.e. the code will need to be placed elsewhere in the memory.
130 Reset the filing system messages.
140 End the program.
170 Start the assembling procedure.
180-200 Set up the various variables. Block is used for work space.
210 The code needs to be assembled twice. The first time assembles and takes note of the forward jump addresses. The second pass assigns the addresses to their correct values giving the final code.
220 P% is the origin that the code is assembled to.
240 On the first pass OPO is set to 0 so no assembly errors are generated. The second pass generates an assembly listing.
260-350 Switch on the printer, set printer to graphics mode with the appropriate escape sequence.
370-430 Set up the parameter block for the OSWORD call.
450-490 Re-initialise the zero page locations for each pair of bytes.

```
10REM Centronics Printer machine code
20REM Graphics Dump
30REM J.M.Buckley    3/12/83
40REM Copyright reserved, Unrestricted non-Commercial use encouraged.!
50REM 2-tone version 2.0
60REM uses zero Page &70 -> &77 for parameter block
70REM uses Page &11 for Program, O.K. if no data files. Change lines
80REM 120 and 220 if required.
90
100PROCasseable
110*OPT1,2
120*SAVE $.PRTSCRN 1100 11C6 1100
130*OPT1,0
140END
150
160
170DEFPROCasseable
180block =&70
190oswrch=&FFEE
200osword=&FFF1
210FOR pass=0 TO 3 STEP 3
220P%=&1100
230[
240OPT pass
250.dump_screen
260             LDA £2                  \ Enable printer
270             JSR oswrch
280             LDA £13                 \ start printer at new line
290             JSR wrch_to_printer
300             LDA £27                 \ Switch printer to graphics
310             JSR wrch_to_printer     \ mode with sequence
320             LDA £37                 \ ESC,T,0
330             JSR wrch_to_printer
340             LDA £48
350             JSR wrch_to_printer
360
370             LDA £10                 \ set up parameter block for OSWORD
380             STA block               \ LSB of X
390             LDA £0
400             STA block +1            \ MSB of X
410             STA block +2            \ LSB of Y
420             STA block +3            \ MSB of Y
430
440.loop1
450             LDA £0
460             STA block +5            \ space to build printer bytes
470             STA block +6
480             LDA £5
490             STA block +7            \ bit counter while building bytes
500.loop2
510             LDX £ block MOD 256     \ Set up registers for OSWORD Call
520             LDY £ block DIV 256
530             LDA £9
540             JSR osword
550             LSR block +4            \ result bit 0 into Carry
560             ROL block +5            \ rotate back into printer byte 1 LSB
570             LSR block +4            \ result bit 1 into Carry
580             ROL block +6            \ rotate back into printer byte 2 LSB
590             SEC
600             LDA block               \ reduce X by 2 for each bit
610             SBC £2
```

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Not all home computers stay at home.

The BBC Micro is the ideal family computer–simple to operate, yet fast, powerful, with enormous potential.

But it's nice to know, when you buy one for your home, that the business, educational and scientific worlds agree with your choice.

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

A practical lesson in business admin.

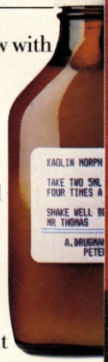
The contribution of the BBC Micro in the classroom has long been recognised at Perins Community School in Hampshire.

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

One of the programs available to Perins teachers such as David Beck, pictured below with his class, is "Newsagent."

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

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



Correcting Jodrell Bank.

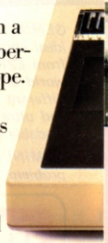
The BBC Micro is a familiar worker around Jodrell Bank.

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

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

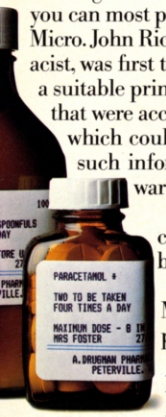
In this application it has been used to make calculations necessary to determine the precise parabolic shape of the dish.

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



The end of the scrawl.

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



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

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

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

Meanwhile back at home.

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

However, it quite quickly became common property.

All three can now write their own programs. Mrs. Yarwood is particularly proud of one program she has compiled to help teach her daughter French vocabulary.

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

All this for only £399.

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

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

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

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

The BBC Microcomputer System.

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SCREEN DUMP

510-670 Perform OSWORD call, transfer bit 0 of the result to byte 1, bit 2 to byte 2, shifting bytes left (equivalent to multiplying by two), decrement the X pointer in zero page, by two. Do this for six bytes.

680-760 You now have two numbers between 0 and 63. The printer requires them between 32 and 95 so add 32. OR the second byte with the first to give solid black for odd colours.

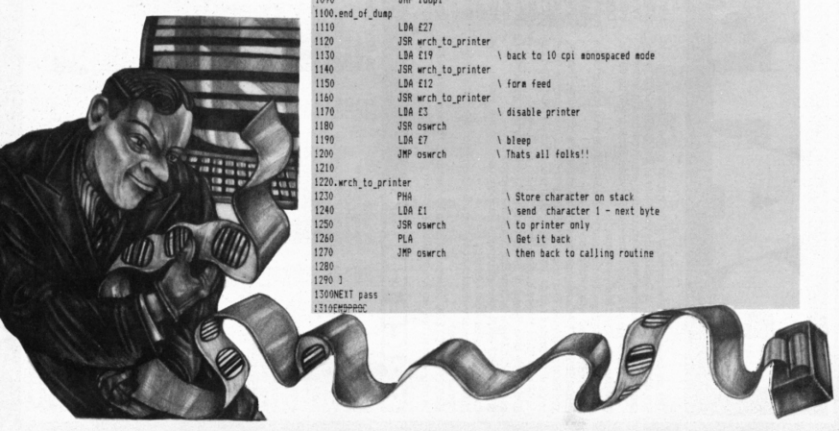
790-930 Increase the Y pointer by four. If Y is now 1024 you have reached the end of the line, otherwise restore X to what it was at the begining of this pair of bytes by adding 12.

950-1090 Send a return to the printer and zero Y. Add 24 to X (12+12 for a new line) If X is greater than 1279 then the dump is finished.

110-1200 You have finished, so restore the printer to normal operation; send a form feed, switch it off, BLEEP.

1230-1270 Subroutine to precede character by 1, ensuring it is sent only to the printer. Works on all OS types.

```
 620            STA block
 630            LDA block +1
 640            SBC £0
 650            STA block +1
 660            DEC block +7          \ 6 pixels for each byte
 670            BPL loop2
 680            LDA block+5
 690            CLC
 700            ADC £32               \ bring to correct range for 739
 710            JSR wrch_to_printer
 720            LDA block +6          \ second byte
 730            ORA block +5          \ Or with byte 1 ( odd colours solid )
 740            CLC
 750            ADC £32               \ bring to 739 range
 760            JSR wrch_to_printer
 770            LDA block +2
 780            CLC
 790            ADC £4                \ increase Y by 4
 774 2        STA block +2
 810            LDA block +3
 820            ADC £0
 830            STA block +3
 840            CMP £4
 850            BEQ newline           \ Y has reached max value so end of line
 860            LDA block
 870            CLC
 880            ADC £12               \ Restore Value of X for new Byte
 890            STA block
 900            LDA block +1
 910            ADC £0
 920            STA block +1
 930            JMP loop1             \ go back for next byte
940.newline
 950            LDA £13               \ newline to printer
 960            JSR wrch_to_printer
 970            LDA £0                \ Set Y back to zero
 980            STA block +2
 990            STA block +3
1000            LDA block
1010            CLC
1020            ADC £24               \ increase X by 24 ( from end of one
1030            STA block             \ byte to start of next)
1040            LDA block+1
1050            ADC £0
1060            STA block +1
1070            CMP £5
1080            BEQ end_of_dump       \ X has reached max value also
1090            JMP loop1
1100.end_of_dump
1110            LDA £27
1120            JSR wrch_to_printer
1130            LDA £19               \ back to 10 cpi monospaced mode
1140            JSR wrch_to_printer
1150            LDA £12               \ form feed
1160            JSR wrch_to_printer
1170            LDA £3                \ disable printer
1180            JSR oswrch
1190            LDA £7                \ bleep
1200            JMP oswrch            \ Thats all folks!!
1210
1220.wrch_to_printer
1230            PHA                    \ Store character on stack
1240            LDA £1                 \ send  character 1 - next byte
1250            JSR oswrch             \ to printer only
1260            PLA                    \ Get it back
1270            JMP oswrch             \ then back to calling routine
1280
1290 ]
1300NEXT pass
1310EMDDDC
```



DATABASICS

This six-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 Z80 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 Speed of 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	Datac Micro Controller	£431	Televideo TS-800 Series	£1,495	Ádler Alphatronic P2	£2,197	Britannia Baby	£2,657	Samurai	£3,214	Altos 800/15	£5,663
Casio PB100	£50	Powertran Cortrex	£454	HP86A	£1,570	Country Com'ters C3000	£2,242	Adler Alphatronic P3	£2,696	Tiger	£3,214	Durango F85	£5,744
TRS-80 PC4	£50	Epson HX20	£472	Osborne I	£1,581	Kemitron K2000E	£2,242	Corona PC1	£2,697	Torch	£3,214	Triton 4	£5,744
Aquarius	£50	Tandy TRS-80 Model 100	£499	Signet 10025	£1,599	Rair Black Box 320S	£2,242	Eagle II	£2,702	Future FX30	£3,220	SWTech. Products SO/9	£5,750
Laser 200	£70	Nascom 3	£549	APL Signet	£1,610	Sanyo MBC 2000	£2,242	Almarc 801	£2,708	Sord M223	£3,277	BASF 7100	£5,805
Oric-1	£80	Commodore 4016	£632	Basis 108	£1,683	Toshiba T-200	£2,242	DEC Rainbow 100	£2,714	Kontron RS180	£3,306	Compustar	£5,837
Sharp PC1251	£80	Research Machine 480Z	£650	Commodore Spr. Pet 9000	£1,719	TMK 332	£2,242	ICL PC Model 10	£2,754	Kaypro 10	£3,340	Sord M243	£5,842
Jupiter Ace	£90	DAI PC	£684	Gemini Galaxy 2	£1,719	Merlin M2215	£2,742	Millbank SX10	£2,754	Sage IV	£3,392	Sage IV	£5,962
Casio FX702P	£90	Apple II	£776	ACT Apricot	£1,719	Bonsai SM 3000	£2,294	Sirius I	£2,754	Digico Prince	£3,392	Rair Business Computer	£6,037
Sinclair Spectrum	£99	Commodore 500	£799	Microsolution Brit. Genius	£1,840	CAL PC	£2,294	Victor 9000	£2,754	OEM Orion	£3,392	Superstar	£6,296
Tandy TRS-80 Pocket 2	£130	Tandy Model 4	£861	Globe 101	£1,850	Sanyo MBC 1250	£2,294	North Star Advantage	£2,766	Barcellos AMT 100	£3,450	Racal 6000	£6,327
Commodore VIC 20	£140	HP 75C	£883	Grundy 8200	£1,850	Casu Mini C2	£2,300	Apple III	£2,780	Kalamazoo 1050	£3,450	TI System 200-250	£6,695
Atari 400	£149	Sharp MZ80B	£900	Genie III	£1,897	Seed System I	£2,300	Sanyo MBC 4050	£2,817	Digital Microsystems 3	£3,576	Wicat 150	£6,846
Sord M5	£150	Franklin Ace	£914	Toshiba T-100	£1,900	Sharp PC3201	£2,300	Bonsai SM 4000	£2,842	Corvus Concept	£3,594	Sundance I	£6,969
Atari 600XL	£160	Apple IIe	£972	Sord M23	£1,932	HP 83	£2,360	Logica VTS Vitesse	£2,863	Televideo TS 1602-C	£3,714	Pascal Mod. Microengine	£7,003
Colour Genie	£168	Mupid 320 GB	£978	Kaypro II	£1,949	HP Series 100, 120	£2,362	Decision-1 Computer O11	£2,869	Adds Multivision	£3,795	Apple Lisa	£7,653
Sharp PC1500	£169	Husky Hunter	£997	Krypton 800 range	£1,949	Sord M23P	£2,369	Olivetti M20	£2,869	Cienio Pronto	£3,795	Sundance II	£8,205
Dragon 32	£174	Commodore 8032	£1,129	Kenilworth 83G	£1,953	TI Prof. Computer	£2,386	DMS Fox	£2,875	Panasonic JD800M	£3,795	Haywood Hinet	£9,550
Texas CC40	£180	Commodore 710	£1,144	Transam Truscan	£1,983	IBM PC	£2,392	Eagle III	£2,950	Kemitron K3000	£3,795	Altos 856-10	£9,631
Tandy TRS 80 colour	£180	Microdecision	£1,144	NCR Decision Mate V	£1,983	Xerox 820 Model II	£2,415	Zenith ZF-120-22	£2,978	DEC PC 350	£3,850	Sundance 16	£10,480
Mattel Intellivision	£190	Duet 16	£1,144	Epson QX10	£1,995	Haywood 3000	£2,439	Monroe EC 8800	£2,990	Vector 4	£3,852	Spectrum	£11,442
Electron	£199	Tulip 1	£1,150	IDS Datamachine	£1,995	LSM4	£2,472	Philips P3500	£3,000	Cifer Club	£3,904		
Camputers Lynx	£225	Fujitsu FM8	£1,150	Tandy TRS-80 Model II	£1,999	Canon CX-1	£2,500	Tanberg EC10	£3,000	Sage II	£4,019		
Dragon 64	£225	Sanyo MBC 1000	£1,195	Kenilworth 83N	£2,012	Sirius 1	£2,525	Archives 1	£3,003	Tandy TRS-80 Model 16	£4,199		
Commodore 64	£229	Pied Piper	£1,226	Caltext Micro	£2,019	IOT Tech Iona	£2,539	Cromemco System 1	£3,025	IBM PCXT	£4,258		
Sharp MZ700	£250	Positron 900	£1,259	Minstrel	£2,059	HP 87XM	£2,571	Wang Professional	£3,076	Hyperion H4500	£4,310		
Atari 800XL	£250	Tandy TRS-80 Model III	£1,299	Portico Miracle Portable	£2,064	Quantum 2000	£2,587	DECPC 325	£3,080	BMC OK 11 F800, Model 20	£4,360		
New Brain A	£269	Cromemco C10	£1,350	LSIM3	£2,064	Ajile	£2,599	Direct 1000	£3,093	ADS 42	£4,500		
Genie II	£299	Commodore 8096	£1,374	Haywood 9000 Composite	£2,064	Canon AS100	£2,633	Equator	£3,099	Televideo TS-80ZH	£4,533		
Atari 800	£300	NEC PC 8001	£1,375	Research Machines 380Z	£2,147	CP1100	£2,639	Hyperion	£3,100	Country Com'ters C1000	£4,542		
Nascom 2	£327	Pasca 640	£1,437	Superbrain JR	£2,150	Seed System 19	£2,600	Clenio Table-Tops 925	£3,105	Micro Five 1000	£5,175		
Microtan 65	£389	NEC PC8000	£1,454	Future Computers FX-20	£2,156	Enterprise 1000	£2,645	ITT 3030	£3,105	Fortune 32:16 System 2	£5,204		
BBC Model B	£399	Signet 2	£1,483	C/WP Cortex	£2,179	Facit 6520	£2,645	HP Series 200 Model 16A	£3,211	Zeus 4	£5,400		
Sharp MZ80A	£399	Magnum	£1,489	Comart Communicator	£2,180	Olympia Boss Model A	£2,645	Cifer Series 1	£3,214	Molecular M200	£5,462		

ABBREVIATIONS

Ap: APL
As: Assembly
Ba: Basic
Co: Cobol
Cm: Comal
Fr: Forth
Fn: Fortran
Pa: Pascal

HARDWARE

Make and model	Price inc VAT	Processor type	Speed (MHz)	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
ACT Apricot	£1,719	8086A	5	256K	768K	80×25	LCD		800×400	W	8	●	1	1			2		2×315K3½F	MSDOS	Ba	●	A7	*PCN* issue 37
Adds Multivision	£3,795	8085A	5	64K	256K	80×25	M		640×240	W	28		1			1			1×350K5¼F	CP/M2.2, Muon	Ba	●	A2	Multi user system
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80×24	M			W	6	●	2			1	3		2×320K5¼F	CP/M	Ba	●	T1	£327 buys extra storage
Adler Alphatronic P3	£2,696	8085A	3	64K		80×24	M			W	6	●	2			1	3		2×790K5¼F	CP/M		●	T1	16 bit option-promised
Ajile	£2,599	8088	4	256K		80×25	M		640×250	W	10	●	1	1		2			2×320K5¼F	MS-DOS	BaAs	●	A9	*PCN* issue 13
Almarc 801	£2,708	Z80	4	64K	512K	80×25	(M+)	●		W			2				11		2×800K5¼F	CP/M		●	A4	8-bit range goes to 20Mb
Aquarius	£68	Z80A	4	4K	52K	40×24	TV	●	320×192	C							1	●		Cassette	Ba		M7	*PCN* issue 7
Altos 800/15	£5,663	Z80	4	192K	208K	80×24	M			W	8	●			1				1×450K5¼F	MP/M		●	L1	Multi user business machine
APL Signet	£1,610	Z80A	4	64K		80×25	Tv(M+)*	●		*			2						2×188K5¼F	APL, CP/M	Ap	●	M1	*APL terminal recommended
Apple II	£776	6502	1	48K	128K	40×24	Tv(M+)	●	256×192	W							8	●		CP/M, DOS 3.3, UCSD-P	Ba	●	A8	Plenty of software and extras
Apple IIe	£972	6502		64K	128K	80×24	(M+)	●	256×192	W						1	8			DOS	Ba	●	A8	Updated Apple II
Apple III	£2,780	6502	2	128K	256K	80×24	(M+)	●	560×192	W		●	1				4		1×140K5¼F	SOS, DOS		●	A8	Will emulate Apple II
Apple Lisa	£9,775	68000	8	1Mb		120×30	M		792×360	W		●	2	1			3		2×860K5¼F	Lisa		●	A8	*PCN* issue 1
Archives I	£3,003	Z80	4	64K		80×25	M	●	240×100	W	23	●	2	1		1	5		2×386K5¼F	CP/M		●	S1	Standard CP/M + graphics
Atari 400	£150	6502B	1.79	16K		40×24	Tv	●	320×192	T	3					7		●		Cassette	Ba	●	A5	Games computer
Atari 800	£300	6502	1.8	48K		40×24	Tv(M+)	●	320×192	W	3					7	4	●		Cassette	Ba	●	A5	Versatile, good graphics
Atari 600XL	£160	6502C	1.79	16K	64K	40×24	(M+)Tv	●	320×192	W	5					4	1	●	1×127K5¼F	DOS 2	Ba	●	A5	Dos 3 available 1984
Atari 800XL	£250	6502C	1.79	64K		40×24	(M+)TvM	●	320×192	W	5					4	1	●	1×127K5¼F	DOS 2	Ba	●	A5	256 colours, 128 at any one time
Barcellos AMT 100	£3,450	Z80A	4	64K	256K	80×24	TvM			W	8	●	1	1		2	3		2×500K8F	CP/M	BaCo	●	B1	Up to four users
BASF 7100	£5,805	Z80A	4	64K		80×24	M			W	26	●	1	1					3×163K5¼F	BOS	Ba	●	C1	Hard disk promised
Basis 108	£1,683	6502	1	64K	126K	80×24	TvM	●	820×168	W	15	●	1	1			6	●				●	C12	Apple bus, Z80, 80 columns
BBC Micro Model B	£399	6502	2	32K		80×30	Tv(M+)	●	640×256	W	10			1		5	3	●		MOS	BaAs	●	A1	*PCN* issue 3
BMC OKI if 800, Model 20	£4,360	Z80B	5	64K	256K	80×25	M	●	640×200	W	15	●	1					●	2×340K5¼F	CP/M	Ba	●	E1	Built-in printer
Bonsai SM 3000	£2,294	Z80	2	64K		80×24	M		80×24	W	14	●	1	1					2×350K5¼F	CP/M		●	B2	CP/M business machine
Bonsai SM 4000	£2,842	8088	5	128K	256K	80×24	M			W	14	●	1	1						CP/M, MP/M, MS-DOS		●	B2	Z80 for 8 bit software
Britannia Baby	£2,657	8085	6.14	64K		80×25	Tv(M+)		80×25	W	11	●	2	1					2×500K5¼F	CP/M	AsBaCo	●	B3	Cobol language included
British Micro Mini 803	£1,490	Z80A	4	64K		80×25	(M+)		512×256	W	17	●	1	1		1			2×400K5¼F	OS/M		●	B4	This is CP/M compatible
CAL PC	£2,294	8088	5	128K	256K	80×25	TvM	●	256×512	W		●	2	1		1	5		2×400K5¼F	CP/M	Ba	●	C3	Also Z80B Processor
C-Base 64A	£401	6502	1	64K	192K	40×24	Tv(M+)	●	256×192	W	51	●					8	●		CP/M, DOS 3.3, UCSD-P	Ba	●	W3	Apple II compatible
Caltext Micro	£2,019	Z80A	4	64K	256K	80×24	TvM			W	36	●	1	1			3		2×400K5¼F	CP/M		●	C3	Range of software included
Camputers Lynx	£225	Z80A	4	48K	192K	40×24	Tv(M+)	●	248×256	W				1		1		●		CP/M	Ba	●	C5	Also 128K with CP/M
Canon AS100	£2,633	8088	4	128K	512K	80×25	M	●	640×400	W	12	●		1			4		2×640K5¼F			●	C4	Choice of CP/M86 or MS-DOS
Canon CX-1	£2,500	6809	4	128K	256K	80×24	M		80×25	W	15	●	3	1	1		2		2×320K5¼F	MCX	BaAs	●	C4	Pascal, Fortran as extras
Casio FX 702P	£90	Cust.		2K		20×1	LCD			C								●		Cassette	Ba		C6	Pocket computer
Casio PB100	£50	Cust.		0.7K	1.7K	60×1	LCD			C		●					1	●		Cassette	Ba		C6	Business pocket computer
Casu Mini C Mark 2	£2,300	Z80A	4	64K		*	(M+)		*	*			4	1			6		2×1Mb8F			●	C7	*Choose your own terminal
Cifer Series 1	£3,214	Z80	4	128K	320K	132×32	TvM			W	40	●	3	1					2×800K5¼F	CP/M		●	C17	Other models available
Cifer Club	£3,904	Z80A	4	64K	256K	80×24	M		1024×300 opt	W	20	●	3	1	1				1×800K 5¼F	CP/M, MP/M opt, UNIX opt		●	C17	Optional 68000 processor
Clenlo Pronto	£3,795	Z80A	4	64K	1Mb	*	Tv(M+)		*	*			2	2			18		2×600K8F	CP/M	Ba	●	C8	*Choice of terminal
Clenlo Table-Top 925	£3,105	Z80A	4	64K	128K	80×25	M			W	11	●	2	2					2×600K8F	CP/M		●	C8	Watch out for the weight
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80×24	M	●	640×200	W	10	●	2	1			8		2×320K5¼F	CP/M, MS-DOS	Ba	●	I1	An IBM lookalike
Commodore VIC 20	£140	6502	1	5K	32K	22×23	Tv(M+)	●	176×158	W	8					3	1	●		Kernal	Ba	●	C9	Very popular home micro
Commodore 64	£229	6510	1	64K		40×25	Tv(M+)	●	320×200	W	8					3		●		Kernal	Ba	●	C9	*PCN* issue 24
Commodore 4016	£632	6502	1	16K	32K	40×25	TvM			W		●			1	1	3	●		Cassette, PETDOS	Ba	●	C9	The original PET
Commodore 700	£1,144	6509	2	128K	896K	80×25	TvM			W	10	●	1		1	2	1	●		Kernal	Ba	●	C9	*PCN* issue 5
Commodore 8032	£1,129	6502	1	32K	96K	80×25	TvM			W		●			1	1		●		Cassette, PETDOS	Ba	●	C9	The 80-column PET

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns x lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE-488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Commodore Super Pet 9000	£1,719	6502	2	96K		80×25	TvM			W		●	1		1	1	2	●		Cassette, PETDOS	Ba	●	C9	Top of the range
Compustar	£5,837	Z80A	4	64K		80×25	M			W		●	2						1×10Mb8H+1×350K5¼F	CP/M	Ba	●	I10	Networking system
Comart Communicator CP100	£2,180	Z80	4	64K	512K	80×24	M			W		●	2	1			10		2×390K5¼F	CP/M		●	C13	Business CP/M micro
Corona PC1	£2,697	8088	5	256K	512K	80×24	M	●	640×320	W	1	●	1	1					2×144K5¼F	CP/M	Ba		N1	Price includes twin disk drive
Corvus Concept	£3,594	68000	8	256K	1Mb	120×60	M		720×560	W	10	●	2			1	4			Merlin	Pa	●	K1	A4 shaped screen
Country Computers C1000	£4,542	6502	1	64K	128K	80×24	M		280×192	W	12	●	1				3		1×10Mb5¼H+1×140K5¼F	DOS, CP/M	Ba	●	C16	Runs all Apple software
Country Computers C3000	£2,242	Z80A	4	64K	256K	*	*			*			1	1					1×5Mb5¼H+1×500K5¼F	CP/M		●	C16	*Terminal own choice
CP1100	£2,639	8086	6	128K	1Mb	*	(M+)*			*			2	1			7		2×390K5¼F	CP/M 86		●	C13	Choose your own terminal
Cromemco System 1	£3,025	Z80	4	64K		80×24	(M+)	●	450×735	W	20	●	1				8		2×390K5¼F	CDOS, Crom		●	C13	Upgrades available
Cromemco C10	£1,350	Z80	4	64K		80×25	M		80×25	W			2	1					1×390K5¼F	CP/M	Ba	●	C18	Low cost CP/M machine
C/WP Cortex	£2,179	Z80		64K		80×25	M		600×240	W	10	●	1	1					2×360K5¼F	CP/M	Ba	●	C20	Z80 plus 6502
DAI PC	£684	8080	2	48K		60×24	Tv(M+)	●	255×335	W			1					●		Cassette	Ba		D9	Optional maths chip
Datac Micro Controller	£431	Z80	2	16K		40×24	Tv(M+)		80×60	W			1			1	1	●			Ba	●	D1	Mainly used in labs
DEC Rainbow 100	£2,714	8088	N/A	64K	192K	132×24	M	●	960×240	W	20	●	2				3		2×400K5¼F	CP/M		●	D2	Versatile business machine
DEC PC 325	£3,080	PDP11/23	N/A	256K		132×24	M	●	960×240	W	20	●	2				1		2×400K5¼F	P/OS		●	D2	Mini in micro clothing
Decision-1 Computer MDC-011	£2,869	Z80A	4	64K	192K		(M+)*			*			3	1		1			2×400K5¼F	CP/M	Ba	●	I2	*Buy your own terminal
Digico Prince	£3,392	Z80A	4	64K		80×25	M			W	50	●	2				7		2×400K5¼F	CP/M		●	D3	Unusual keyboard
Digital Microsystems DMS-3	£3,576	Z80A	4	64K			(M+)*			*			3			1			2×512K8F	CP/M		●	D4	*Choice of terminal
Direct 1000	£3,093	Z80	4	64K		80×25	M		132×28	W			2						2×300K5¼F	CP/M		●	D5	Standard CP/M machine
DMS Fox	£2,875	Z80A	4	64K		80×24	M			W	16	●	3	1		1			1.2Mb5¼F	CP/M		●	D4	Portable machine
Dragon 32	£174	6809E	1	32K	64K	32×16	Tv(M+)	●	256×192	W				1		4	1	●		Cassette	Ba		D6	Tandy colour lookalike
Dragon 64	£225	M6809	0.89	64K		32×16	Tv(M+)	●	256×192	W				2		4			1×175K5¼F	OS9	Ba	●	D	*PCN* issue 39
Duet 16	£1,144	8086	8	128K	512K	640×400	(M+)	●	640×400	W	12	●	2	1			4		1×720K5¼F	MS, DOS, CP/M	Ba 86	●	L7	Portable business
Durango F85	£5,744	8085A	5	64K	196K	80×64	Tv(M+)			W		●	4			1	12		2×1Mb5¼F	Star Basic	BaCo	●	C3	Built in printer
Eagle II	£2,702	Z80A	4	64K		80×24	M		80×24	W		●	2	1		1			2×500K5¼F	CP/M	Ba	●	M3	Upgrades available
Electron	£199	6502	2	32K		80×32	Tv(M+)	●	640×256	W	10							●		MOS	BaAs	●	A1	Excellent beginners' machine
Enterprise 1000	£2,645	*	8	64K			M			W	10	●	2			2			2×358K5¼F	Enterprise		●	D7	Micro Nova 16-bit
Epson HX20	£472	6301	1	16K	32K	20×4	LCD		120×32	W	13	●	2				2	●		Cassette	Ba		E2	Powerful portable
Epson QX10	£1,995	Z80	4	192K	256K	80×25	M		640×400	W	18	●	1	1			5		2×320K5¼F	CP/M	Ba	●	E2	Expansion required for Valdocs
Equator	£6,842	Z80A	4	64K	448K	80×24	M		255×560	W	14	●	7	1		1	8		1×5Mb5¼F+1×750K5¼F	CP/M, MP/M, Turbo DOS		●	E3	Two bigger models available
Facit 6520	£2,645	Z80	4	64K	128K	80×24	M		80×24	W	8	●	2						2×320K5¼F	CP/M, Facit DOS	Ba	●	F1	Concurrent printing
Fortune 32:16 System 2	£5,204	68000	6	256K	1Mb	80×24	M	●	1024×1024	W	16	●	1				20		2×800K5¼F	Unix		●	I3	Genuine 16-bit
Franklin Ace 1000	£914	6502	1	64K	128K	40×24	M, Tv	●	256×192	W		●		1		4	1	●	2×140K5¼F	opt CP/M	Ba	●	C15	Apple IIe compatible
Fujitsu FM8	£1,150	6809	1	64K		80×25	(M+)	●	640×200	W	10	●	1	1		4	1	●		Flex	Ba		S2	Good for business graphics
Future Computers FX-20	£2,156	8088	8	128K	1Mb	80×25	M		800×400	W	20	●	2			2			2×800K5¼F	CP/M 86, MS-DOS		●	E1	Business micro, runs CP/M
Future FX-30	£3,220	8088	8	128K	1Mb	80×25	M	●	1,280×500	W	30	●			1	3	2		1×800 5¼F+1×5Mb5¼F	CP/M86, CP/M80 emulation		●	E1	Hard disk version
Genie II	£299	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W	4	●	1				1	●		Cassette	Ba	●	L2	Speeded-up Genie I
Genie III	£1,897	Z80A	3.2	64K		80×24	M		160×72	W	8	●	1	1		1	3		2×700K5¼F	New DOS	Ba	●	L2	CP/M costs extra
Colour Genie	£168	Z80	2.2	32K		40×24	Tv(M+)	●	160×96	W	8		1	1		2	1	●		Cassette	Ba		L2	Home games machine
Gemini Galaxy 2	£1,719	Z80	4	64K	512K	80×25	M		160×75	W	10	●	1	1		1	5	●	2×400K5¼F	CP/M		●	G1	Low cost British system
Globe 101	£1,850	8085	3	64K		80×24	M			W	20	●	3						2×325K5¼F	CP/M		●	G4	Wordstar plus Mail Merge inc.
Grundy 8200	£1,850	Z80	4	64K	256K	80×24	M		160×70	W	10	●	1	1					2×390K5¼F	CP/M		●	C19	Software included
Haywood 9000 Composite	£2,064	Z80A	4	64K	192K	80×25	M		64×255	W	34	●	2				8		2×320K5¼F	CP/M	As	●	H1 *	Designed for network
Hitachi PC1	£2,985	8088	5	320K	576K	80×25	M	●	640×200	W	10	●	1	1		2	5		2×320K5¼F	MS DOS	Ba, As	●	H6	Will be Pro-Tested, Issue 44

HP 75C	£883	Cust.	N/A	16K	24K	32×1	(M+)			C					1	4	●	1.3K card reader	HP	Ba		H2	Calculator/computer
HP 85	£2,360	Cust.	N/A	16K	32K	32×20	M		255×191	W	8	●	1			4	4	●	Cassette	Ba	●	H2	Engineers' machine
HP 86A	£1,570	Cust.	N/A	64K	512K	80×24	M		544×240	W			1	1		2	4		HP	Ba	●	H2	CP/M optional
HP 87XM	£2,571	Cust.	N/A	128K	640K	80×24	M		544×240	W	14	●	1	1	1	3	4		HP DOS	Ba	●	H2	Special technical uses
HP Series 100, 120	£2,362	Z80A	3.68	64K		80×24	M		80×24	W	8	●	2			1			CP/M	Ba	●	H2	Top end HP business system
HP Series 200 Model 16A	£3,212	68000	8	128K	750K	80×25	M			W	5		1		1	2			HP		●	H2	Genuine 16-bit
Husky Hunter	£997	NSC800	4	80K	208K	40×8	LCD		240×64	C	8		1						CP/M	Ba	●	D10	Waterproof, with metal case
Hyperion	£3,100	8088	4.7	256K		80×25	M		320×200	W	10	●	1	1		1			1×320K5¼F	MS, DOS, CP/M 86	BaAs	●	G5	Same as Ajile
Hytech H4500	£4,310	Z80	4	64K	208K	80×25	M		80×25	W	26	●	1			3			2×403K5¼F	CP/M	Ba	●	H3	Standard CP/M micro
IBM PC	£2,392	8088	4.7	64K	576K	80×25	(M+)	●	640×200	W	10	●			1	5			1×360K5¼F	MS-DOS	Ba	●	I9	Slow but reliable
IBM PCXT	£4,258	8088	4.77	128K	640K	80×25	(M+)	●	350×720	W	12	●				8			1×10Mb5¼H	DOS 2	Ba	●	I9	8087 co-processor possible
ICL PC Model 10	£2,754	8085	3	64K	256K	80×24	Tv(M+)			W	11	●	2			8			2×700K5¼F	CP/M	Ba	●	I4	Bottom of range
ICL PC Model 15	£2,702	8085A	5	64K	512K	80×25	M	●		W		●	8						1×13.3Mb5¼H	CP/M, MP/M	Ba	●	I4	Suitable for small business
IDS Datamachine	£1,995	Z80	4	64K	1Mb	"	Tv(M+)		"				2			15			2×400K5¼F	CP/M	Ba	●	I8	*Depends on terminal
IO Tech Iona	£2,539	Z80	4	69K	960K	80×24	M	●	160×75	W	12	●	1	1		8	●		2×400K5¼F	CP/M		●	I5	Good colour versatility
Intellivision + micro adaptor	£189.90	CP1610	2,4	5K		20×12	Tv	●	160×96	C						1	●		Cassette	Ba		M7	Computer adaptor is £89.95
ITT 3030	£3,105	Z80A	4	64K	256K	80×24	Tv(M+)		80×24	W	8	●	1			1	1		2×280K5¼F	CP/M, BOS		●	I7	Top end business system
Jupiter Ace	£90	Z80	3.25	3K	51K	32×24	Tv(M+)		64×46	C			●			1	●			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
Kaypro II	£1,949	Z80	4	64K		80×24	M			W		●	1	1					2×200K5¼F	CP/M	Ba	●	C15	*PCN* issue 35
Kaypro 10	£3,340	Z80A	4	64K		80×24	M		100×160	W		●		1		2			1×10Mb5¼H	CP/M	Ba	●	C15	*PCN* issue 35
Kemitron K2000E	£2,242	Z80	4	64K		80×24	(M+)		80×24	W			2	1		11			1×300K5¼F	CP/M		●	K4	Scientific Keyboard
Kemitron K3000	£3,795	Z80	4	64K	256K	80×24	(M+)		80×24	W		●	2			14			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		5			2×350K5¼F	CP/M		●	K5	British portable
Kontron RSI 80	£3,306	Z80	4	64K	128K	80×25	M		256×512	W	16	●	2	1		8			2×303K5¼F	Kontron	Ba	●	K6	O/S CP/M based
Krypton 800 range	£1,949	Z80A	4	64K	256K	80×24	M		80×24	W	13	●	2	1		8			2×386K5¼F	CP/M		●	T8	Fully definable characters
Laser 200	£70	Z80A	3.6	4K	64K	32×16	TV	●	32×16	C			1			1	●			Ba		C14	Cheap colour computer
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		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	1		4			2×1Mb5¼F	CP/M, MS-DOS	Ba	●	L4	High-res colour graphics
Magnum	£1,489	Z80	4	64K		80×25	M			W		●	2						2×400K5¼F	CP/M		●	I6	Inexpensive CP/M machine
Merlin M2215	£2,742	8085	5	64K		24×80	M			W	22	●	2			2			2×780K5¼F	CP/M	Ba	●	B7	Business computer
Micro Five 1000	£5,175	8088	8	128K	512K	25×80	TvM		512×512	W	20	●	10			2			2×1Mb5¼F+2×6.3Mb5¼H	"		●	F2	*Choose your own O/S
Microdecision	£1,144	Z80	4	64K		80×24	(M+)		"				2						1×200K5¼F	CP/M	Ba,Pilot	●	M9	*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?
Microtan 65	£389	6502	1	8K	48K	25×64	(TvM+)			W		●	1	2			●		Tanbug	Ba		●	M8	*PCN* issue 26
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
Minstrel	£2,059	Z80	4	64K	352K								2	1					2×400K5¼F	CP/M opt		●	H4	Choose your terminal
Molecular M200	£5,462	Z80	4	64K	320K		(M+)*			"			2			1	16		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
Mupid 320-GB	£978	Z80A	4	64K	128K	40×24	Tv(M+)	●	320×240	W	55	●			1	2	1	●		CP/M+	BaAs		P6	*PCN* issue 22
Nascom 2/3	£327	Z80A	4	2K	64K	16×48	Tv(M+)		48×96	W			1			4	●			NAS, SYS	BaAs	●	L5	Old reliable
NCR Decision Mate V	£1,983	Z80A	4	64K	512K	24×80	M	●	640×400	W	20	●				7			2×320K5¼F	CP/M 80	As	●	N3	*PCN* issue 8
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
NEC PC8001	£1,375	Z80A	4	64K		80×24	M	●	100×200	W	10	●		1			●		2×144K5¼F	CP/M	Ba		N1	Price includes twin disk drive
Newbrain A	£269	Z80A	4	32K	512K	80×30	Tv(M+)		640×220	C			2			1	●		Cassette	Ba		G3	A lot of prgmise
North Star Advantage	£2,766	Z80	4	64K		80×24	M		640×240	W	15		1			6			2×360K5¼F	CP/M		●	T9	16-bit option
OEM Orion	£3,392	8086	8	128K	896K	80×25	TvM		800×400	W	13	●	11			6			2×500K5¼F	CP/M 86	BaCo	●	O5	*Full communications machine
Olivetti M20	£2,869	Z8000	3	160K	512K	80×25	M	●	512×256	W		●	1	1		5			2×320K5¼F	PCOS	Ba	●	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 28 lines on screen
Oric 1	£80	6502A	1	16K	48K	40×28	Tv(M+)	●	240×200	C				1		1	●		Cassette	Ba		O2	4-colour printer opt
Osborne 1	£1,581	Z80	4	64K		104×24	M		104×24	W	10	●	1		1				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

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Pied Piper	£1,226	Z80A	4	64K		80×24	Tv(M+)			W	36			1			1		1×780K5¼F	CP/M			S11	*PCN* issue 4
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
Portico Miracle Portable	£2,064	Z80A	4	128K	256K	80×25	M		640×250	W	10	●	2	1			5		2×400K5¼F	CP/M		●	P7	*PCN* issue 28
Positron 900	£1,259	6809	1	64K	256K	"	(M+)		"	"			4		1		3			O/S 9	Ba	●	P4	*You choose your terminal
Powertran Cortex	£454	9995	12	64K	1Mb	40×24	Tv(M+)	●	256×192	W	12	●	1					●			BaAs		M2	Mainly sold as £340 kit
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	256K	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
Racal 6000	£6,327	Z80	5	64K	256K	80×26	M		80×26	W	21	●	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	Z80A	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
Sage IV	£5,962	68000	8	128K	1Mb	"	(M+)	●		"			6	1	1				2×640K5F+1×6MbH5¼	UCSD-P System	PaBaFn	●	T10	*Terminal own choice
Samurai	£2,754	8086	4.6	128K	768K	80×25	M	●	720×400	W	12	●	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	Z80	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 disk model costs £3,622
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80×24	M		80×24	W			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	£347	Z80	2	48K		40×25	M		80×50	W		●						●		Sharp Basic	Ba	●	S4	CP/M facility extra
Sharp MZ80B	£900	Z80A	4	64K		80×25	M		320×200	C	10	●						●		Sharp Basic	Ba	●	S4	Unusual keyboard
Sharp MZ700	£250	Z80A	4	64K	68K	40×25	Tv(M+)	●	80×50	W	5			1		2	1	●		Sharp	Ba	●	S4	*PCN* issue 27
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD		24×1	C	18	●					1	●		Sharp Basic	Ba		S4	Pocket computer
Sharp PC1500	£169	Cust.	1.3	3.5K	11.5K	26×1	LCD		156×7	C	6	●	1	1			2	●		Cassette	Ba		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		●	S9	Choice of keyboards
Signet 2	£1,483	Z80	4	64K		80×24	(M+)	●	512×256	W	18	●	2						2×200K5¼F	CP/M			S9	Multi-user system
Sinclair ZX81	£40	Z80A		1K	16K	32×24	Tv		64×44	C							1	●		Cassette	Ba		S5	Sold a million
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32×24	Tv	●	256×192	C							1	●		Cassette	Ba	●	S5	*PCN* issue 14
Sirius I	£2,525	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	£150	Z80A	4	4K	16K	40×24	Tv(M+)	●	256×196	C				1		2		●		Cassette	Ba		S6	*PCN* issue 12
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		2×290K3½F	Sord O/S, SB80	BaPips	●	S6	Complete with suitcase
Sord M223	£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
SWTP SO9	£5,750	6809	2	256K	1.2Mb	80×24	M			W	15	●	1	1					2×1.5Mb5¼F	Flex, Uniflex		●	S7	Top end SWTP
Spectrum	£11,442	68000	8	256K	4Mb	"	(M+)		"	"			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 disk
Superbrain JR	£2,127	Z80A	4	64K		80×24	M		560×240	W		●	2				1		2×160K5¼F	CP/M	Ba	●	I10	Bigger models available
Superstar	£6,296	Z80	4	64K		80×24	Tv(M+)		80×24				1	1			8		1×10Mb5¼H+1×400K5¼F	CP/M 80	Ba	●	B7	Includes hard disk
Tandberg EC10	£3,000	8080A	2	64K		80×25	M			W		●	7						1×250K8F	CP/M, TOS	Ba	●	T3	Very early machine
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80×24	M		80×24	W	2	●	2	1					1×500K8F	TRS-DOS	Ba	●	T4	Big business machine
Tandy TRS-80 Model III	£1,299	Z80A	2	48K		64×16	M		128×48	W		●	1	1		1		●	2×184K5¼F	TRS-DOS	Ba	●	T4	Standard TRS 80
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80×24	M			W	2	●	2	1					2×1.2Mb8F	TRS-DOS	BaAs		T4	True 16-bit

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Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
HARDWARE																								
Tandy TRS-80 Colour Computer	£180	6809E	1	16K	32K	32×16	Tv	●	256×192	W			1					●	Cassette	Ba		●	T4	Related to Dragon 32
Tandy TRS-80 PC4	£50	Cust.	N/A	½K	1½K	12×1	LCD		12×1	C	9	●			1	1			Cassette	Ba		●	T4	Low-cost pocket computer
Tandy Model 4	£861	Z80A	2	16K	128K	80×24	M		80×24	W	10		1	1				●	1×187K5¼F	TRS DOS	Ba	●	T4	Floppies versions available
Tandy Model 100	£499	8085	2.4	8K	32K	40×8	LCD		240×62	W			1					●			Ba		T4	Software built in
Tandy TRS-80 PC2	£130	Cust.	1.3	2.6K	16K	26×1	LCD		156×7	C	6	●						●	Cassette	Ba			T4	Plotter available
Televideo TS-802H	£4,533	Z80	4	64K		80×24	M		80×24	W	15	●	2			1			1×256K5¼F+1×7Mb5¼H	CP/M		●	C11	Recently upgraded
Televideo TS-800 Series	£1,495	Z80A	4	64K		80×24	M		80×24	W	15	●	2			1				CP/M		●	C11	Standard CP/M machine
Televideo TS 1602-C	£1,323	8088	5	128K	256K	80×24	M		576×424	W	15	●	2			1			2×256K5¼F	CP/M-86		●	C11	Graphics, but no colour
Tiger	£3,214	Z80	4	62K	256K	80×24	M	●	512×512	W	10	●	1	1	1	3	2	●	2×1Mb5¼F	CP/M-86			H5	*PCN* issue 36
TI Professional Computer	£2,386	8088	5	64K	256K	80×25	M			W	12	●		1					1×320K5¼F				T5	*PCN* issue 3
Texas CC40	£180	Cust.		6K	18K	31×1	LCD		31×1	C	4							●			Ba		T5	Cartridge software available
TI System 200-250	£6,695	9900	4	64K		80×24	M		80×24	W	12	●	1						1×5Mb5¼H	UCSD-P, PX10			T5	Bigger version available
TMK 332	£2,242	8085A	5	64K		80×24	M		190×96	W	22	●	2	1					2×320K5¼F	CP/M	Ba		P5	*6502 I/O processor
Torch	£3,214	Z80*	4/2	96K		80×30	TvM	●	640×256	W	15	●	1	1		4		●	2×400K5¼F	CPN	Ba		T6	CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80×25	TvM	●	640×200	W	8	●	1	1	1		2		2×256K5¼F	CP/M	Ba		O4	Pro test March 18
Toshiba T-200	£2,242	8085	2.6	64K		80×24	M		80×24	W	13	●	1		1				2×256K5¼F	CP/M	Ba		O4	Standard CP/M machine
Transam Truscan	£1,983	Z80A	4	64K		80×24	TvM		640×288	W			2	1		1	5		2×190K5¼F	CP/M			T7	S-100 machine
Triton 4	£5,744	Z80A	4	64K	160K	80×24	M			W	8	●	1	1			3		2×1.2Mb8F	MPSL-BOS			T11	Upgradable to Winchester disk
Tulip 1	£1,150	8086	8	128K	896K	80×24	M	●	760×288	W	16	●	1	1		6	1		1×5.25K5¼F	CP/M	Ba		N2	IBM PC software compatible
Vector 4	£3,852	8088	5	128K	256K	80×24	M	●	640×312	W	15	●	1	1		1	2		2×630K5¼F	CP/M, CP/M 86	Ba		A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80×25	M		800×400	W	7	●	2	1			4		2×600K5¼F	CP/M 86, MS-DOS	Ba		D8	Same as Sirius 1
Wang Professional	£3,076	8086	8	128K	256K	80×25	M		800×300	W	16	●	1	1					2×360K5¼F	MSDOS,CP/M80,USCDP	Ba		W4	8087 co-processor optional
Wicat 150	£6,846	68000	8	256K	1.5Mb	80×25	M		400×300	W	20		2	1			1		2×616K5F	MCS	Ba		S10	Upgradable to 32 user system
Wilkes YD8110	£4,025	8086	5	128K	896K	80×24	M	●	960×624	W	21	●			1		6		2×1.2Mb8F	CP/M 86	Ba		W2	Standard CP/M machine
Xerox 820 Model II	£2,415	Z80A	4	64K		80×24	M		1024×512	W			2	2			2		2×160K5¼F	CP/M			R4	Powerful graphics
Zenith ZF-120-22	£2,978	8088	5	128K	192K	80×25	M		640×225	W	18	●	2	1	1	1	5		2×320K5¼F	CP/M, MS-DOS, Z Basic			Z1	*PCN* issue 28
Zeus 4	£5,400	Z80	4	64K	320K	80×25	(M+)		80×25	W	11	●	10						1×6Mb5¼H+1×250K5¼F	CP/M, Muse	As	●	M5	Designed as multi-user

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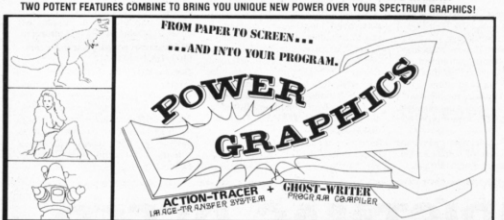

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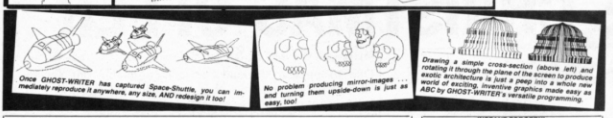

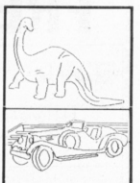

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Wanted: Memotech keyboard and buffer pack for ZX81. Must be in perfect condition. J. Moffett, 121 Knockbreda Park, Belfast BT6 0HE. Tel: (0232) 640075.

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Sharp MZ80K software. 22 cassettes and book for sale, only £40 the lot. Includes user notes. Tel: John, 01-472 1331 after 6pm.

48K Oric, as new, boxed, plus printer cable, £100. Tel: 01-841 1815.

Commodore 3032 (32K), dual disk drives and printer. All vgc. Also assembler software and all cables, £925 ono. Tel: Brighton (0273) 771577.

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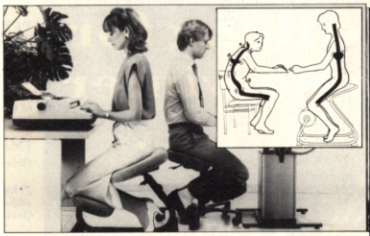
Acorn checks out in chess



Well, Acorn got it half wrong. Using the 'precocious' (Acorn's word) BBC micro it almost predicted the outcome of the World Chess Championship semi-finals.

In the first semi-final its probability ratings were Kasparov (youthful genius and hero of the Russian people) 89 per cent, Korchnoi (ageing defector, enemy of the Russian people) 11 per cent. In the event Acorn nearly came a major cropper.

Korchnoi took an early lead but Kasparov clawed his waay back to finally overhaul his experienced opponent.

In the other semi-final Acorn had the competitors more evenly matched and ended up predicting the wrong winner. Its ratings were Zoltan Ribli (rising star from Hungary) 60 per cent, Vassily Smyslov (Russian veteran) 40 per cent.

As it turned out experience triumphed over youth and Smyslov had a relatively easy win.

Pull the cord

Furniture makers are among the unsung heroes of the micro revolution. While we find ever more ways to damage our health with advanced technology, the tireless upholsterers are beavering away to keep us fit.

Prayer has nothing to do with it, whatever you might think of the photo. It's all a question of posture. On these remarkable chairs slouching is physically impossible — as the diagram so graphically demonstrates.

NEXT WEEK

Hitachi hit? *A full Pro-Test of Hitachi's new and colourful PC.*

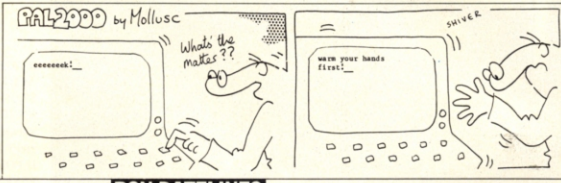
Jet propelled *PCN puts the Integrex Colourjet printer through its paces.*

Electron II *The second part of our pull-out-and-keep guide to the Electron.*

64 Basic *Taking stock of a Basic compiler for Commodore's 64.*

In focus *Peripherals move centre stage in the Databasics section.*

Gameplay *Reviews of games for the Dragon 32, Commodore 64 and Vic 20.*



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Which Computer? Show	January 17-20	NEC, Birmingham	Clapp & Poliak Europe Ltd., 01-747 3131
Northern Home Entertainment Show	January 19-22	Excelsior Hotel, Manchester Airport	Stamley Wire Advertising Ltd., 01-253 6637
Acorn Education Exhibition	January 25-27	Central Hall, Westminster	Computer Marketplace (Exhibitions) Ltd, 01-930 1612
Peripherals Suppliers	January 31-February 2	Cunard International	Reed Exhibitions, 01-643 8040
Communications & Computer Systems Fair — CABLES	February 2-4	Pontin's, Prestatyn, Wales	Pontin's Ltd., 07456 2267
London Home Computer Show	February 3-5	Royal Horticultural Society's Old Hall, Westminster, SW1	Andy Jones, 0562 751126
10th ZX Microfair	February 4	Alexandra Palace, N22	Mike Johnstone, 801 9172
The Apricot & Sirius Show	February 7-9	Kensington & Chelsea Town Hall	Dennis Jarrett, 241 2448
Taunton YMCA Computer Exhibition	February 11	Taunton YMCA, Somerset	P. Wojeik, 0823 74667
LET '84	February 13-15	Heathrow Penta Hotel	Anthony Farrar, 0923 774262
International Home Computers, Video Games & Software Exhibition	February 13-15	Heathrow Penta	Wheatland Journals Ltd., 0923 774262
Information Technology & Office Automation Exhibition and Conference	February 21-24	Barbican Centre, London EC1	B.E.D. Exhibitions Ltd., 01-647 1001
OEM Only Conference	March 7	Hilton Hotel, London W1	Tom Lewis, 01-994 6477
Computer Trade Show	March 13-15	Wembley Conference Centre, Middlesex	Reed Exhibitions, 01-643 8040

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
International Winter Consumer Electronics Show 22-25	January 6-10	Las Vegas, USA	Consumer Electronics Shows, Chicago, 0101 312 861 1040
National Software Show (East)	February 3-5	Miami Beach, Florida, USA	Raging Bull, USA, 0101 415 459063
Personal Business Computer Show	February 29-March 3	Hong Kong	Overseas Exhibition Services Ltd., 01-486 1951

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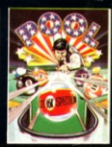

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